Tennessee Valley Authority
Form 10-K
November 15, 2018
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UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549
FORM 10-K

(MARK ONE)
x ANNUAL REPORT PURSUANT TO
SECTION 13, 15(d), OR 37 OF THE SECURITIES EXCHANGE ACT OF 1934
For the fiscal year ended September 30, 2018
OR
o TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
For the transition period from _____ to _____
Commission file number 000-52313
TENNESSEE VALLEY AUTHORITY
(Exact name of registrant as specified in its charter)

A corporate agency of the United States created by an act of Congress (State or other jurisdiction of incorporation or organization)	62-0474417 (IRS Employer Identification No.)
400 W. Summit Hill Drive Knoxville, Tennessee (Address of principal executive offices)	37902 (Zip Code)

(865) 632-2101
(Registrant’s telephone number, including area code)

Securities registered pursuant to Section 12(b) of the Act: None
Securities registered pursuant to Section 12(g) of the Act: None

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13, 15(d), or 37 of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days.
Yes x No o

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§ 232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files).
Yes x No o

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the definitions of “large accelerated filer,” “accelerated filer,” “smaller reporting company,” and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer o		Accelerated filer o	
Non-accelerated filer x	Smaller reporting company o		Emerging growth company o

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. o

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes o No x

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GLOSSARY OF COMMON ACRONYMS

Following are definitions of some of the terms or acronyms that may be used in this Annual Report on Form 10-K for the fiscal year ended September 30, 2018 (the "Annual Report"):

Term or Acronym	Definition
AFUDC	Allowance for funds used during construction
AOCI	Accumulated other comprehensive income (loss)
ARO	Asset retirement obligation
ART	Asset Retirement Trust
ASLB	Atomic Safety and Licensing Board
BLEU	Blended low-enriched uranium
Bonds	Bonds, notes, or other evidences of indebtedness
BSER	Best system of emission reduction
CAA	Clean Air Act
CAIR	Clean Air Interstate Rule
CCR	Coal combustion residuals
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CME	Chicago Mercantile Exchange
CO_2	Carbon dioxide
COL	Combined construction and operating license application
COLA	Cost-of-living adjustment
CSAPR	Cross-State Air Pollution Rule
CTs	Combustion turbine unit(s)
CVA	Credit valuation adjustment
CY	Calendar year
DCP	Deferred Compensation Plan
DER	Distributed Energy Resources
DOE	Department of Energy
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
ERS	EnergyRight® Solutions programs
ESPA	Early Site Permit Application
FASB	Financial Accounting Standards Board
FCM	Futures Commission Merchant
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
FTP	Financial Trading Program
GAAP	Accounting principles generally accepted in the United States of America
GHG	Greenhouse gas
GP	Generation Partners
GPP	Green Power Providers
GPS	Green Power Switch®
GWh	Gigawatt hour(s)
HMM	Hydro Major Maintenance Program
IRP	Integrated Resource Plan
IRUs	Indefeasible rights of use
JSCCG	John Sevier Combined Cycle Generation LLC
kW	Kilowatts

kWh	Kilowatt hour(s)
LPC	Local power company customer of TVA
LTDCP	Long-Term Deferred Compensation Plan
MATS	Mercury and Air Toxics Standards
MD&A	Management’s Discussion and Analysis of Financial Condition and Results of Operations
MLGW	Memphis Light, Gas and Water Division
MLPs	Master Limited Partnerships
mmBtu	Million British thermal unit(s)
MtM	Mark-to-market

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MW	Megawatt
NAAQS	National Ambient Air Quality Standards
NAV	Net asset value
NDT	Nuclear Decommissioning Trust
NEIL	Nuclear Electric Insurance Limited
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NES	Nashville Electric Service
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
NSR	New Source Review
NYSE	New York Stock Exchange
OCI	Other comprehensive income (loss)
OMB	Office of Management and Budget
PARRS	Putable Automatic Rate Reset Securities
PM	Particulate matter
QER	Quadrennial Energy Review
QTE	Qualified technological equipment and software
RECs	Renewable Energy Certificates
REIT	Real Estate Investment Trust
RSO	Renewable Standard Offer
SCCG	Southaven Combined Cycle Generation LLC
SCRs	Selective catalytic reduction systems
SEC	Securities and Exchange Commission
SERP	Supplemental Executive Retirement Plan
SHLLC	Southaven Holdco LLC
SMR	Small modular reactor(s)
SO_2	Sulfur dioxide
SOA	Society of Actuaries
SSSL	Seven States Southaven, LLC
TCWN	Tennessee Clean Water Network
TDEC	Tennessee Department of Environment & Conservation
TIPS	Treasury Inflation-Protected Securities
TOU	Time-of-use
TVA Act	The Tennessee Valley Authority Act of 1933, as amended, 16 U.S.C. §§ 831-831ee
TVARS	Tennessee Valley Authority Retirement System
U.S. Treasury	United States Department of the Treasury
USACE	U.S. Army Corps of Engineers
VIE	Variable interest entity
XBRL	eXtensible Business Reporting Language

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FORWARD-LOOKING INFORMATION

This Annual Report on Form 10-K ("Annual Report") contains forward-looking statements relating to future events and future performance. All statements other than those that are purely historical may be forward-looking statements. In certain cases, forward-looking statements can be identified by the use of words such as "may," "will," "should," "expect," "anticipate," "believe," "intend," "project," "plan," "predict," "assume," "forecast," "estimate," "objective," "possible," "probably," "likely," "potential," "speculate," the negative of such words, or other similar expressions.

Although the Tennessee Valley Authority ("TVA") believes that the assumptions underlying the forward-looking statements are reasonable, TVA does not guarantee the accuracy of these statements. Numerous factors could cause actual results to differ materially from those in the forward-looking statements. These factors include, among other things:

- New, amended, or existing laws, regulations, or administrative orders or interpretations, including those related to environmental matters, and the costs of complying with these laws, regulations, or administrative orders or interpretations;
- The cost of complying with known, anticipated, or new emissions reduction requirements, some of which could render continued operation of many of TVA's aging coal-fired generation units not cost-effective or result in their removal from service, perhaps permanently;
- Significant reductions in demand for electricity produced through non-renewable or centrally located generation sources that may result from, among other things, economic downturns, increased energy efficiency and conservation, increased utilization of distributed generation and microgrids, and improvements in alternative generation and energy storage technologies;
- Changes in customer preferences for energy produced from cleaner generation sources;
- Changes in technology;
- Actions taken, or inaction, by the U.S. government relating to the national or TVA debt ceiling or automatic spending cuts in government programs;
- Costs or liabilities that are not anticipated in TVA’s financial statements for third-party claims, natural resource damages, environmental clean-up activities, or fines or penalties associated with unexpected events such as failures of a facility or infrastructure;
- Addition or loss of customers by TVA or the local power company customers of TVA ("LPCs");
- Significant delays, cost increases, or cost overruns associated with the construction and maintenance of generation, transmission, navigation, flood control, or related assets;
- Changes in the amount or timing of funding obligations associated with TVA's pension plans, other post-retirement benefit plans, or health care plans;
- Increases in TVA's financial liabilities for decommissioning its nuclear facilities or retiring other assets;
- Risks associated with the operation of nuclear facilities or coal combustion residual ("CCR") facilities;
- Physical attacks on TVA's assets;
- Cyber attacks on TVA's assets or the assets of third parties upon which TVA relies;
- The outcome of legal or administrative proceedings, including the CCR proceedings involving the Gallatin Fossil Plant ("Gallatin") as well as any other CCR proceedings that may be brought in the future;
- The failure of TVA's generation, transmission, navigation, flood control, and related assets and infrastructure, including CCR facilities, to operate as anticipated, resulting in lost revenues, damages, or other costs that are not reflected in TVA’s financial statements or projections;
- Differences between estimates of revenues and expenses and actual revenues earned and expenses incurred;
- Weather conditions;

Catastrophic events such as fires, earthquakes, explosions, solar events, electromagnetic pulses ("EMP"), geomagnetic disturbances ("GMDs"), droughts, floods, hurricanes, tornadoes, or other casualty events or pandemics, wars, national emergencies, terrorist activities, or other similar events, especially if these events occur in or near TVA's service area;

- Events at a TVA facility, which, among other things, could result in loss of life, damage to the environment, damage to or loss of the facility, and damage to the property of others;
- Events or changes involving transmission lines, dams, and other facilities not operated by TVA, including those that affect the reliability of the interstate transmission grid of which TVA's transmission system is a part and those that increase flows across TVA's transmission grid;
- Disruption of fuel supplies, which may result from, among other things, economic conditions, weather conditions, production or transportation difficulties, labor challenges, or environmental laws or regulations affecting TVA's fuel suppliers or transporters;
- Purchased power price volatility and disruption of purchased power supplies;
- Events which affect the supply of water for TVA's generation facilities;
- Changes in TVA's determinations of the appropriate mix of generation assets;
- Ineffectiveness of TVA's efforts at adapting its organization to an evolving marketplace and remaining cost competitive;
- Inability to obtain, or loss of, regulatory approval for the construction or operation of assets;
- The requirement or decision to make additional contributions to TVA's Nuclear Decommissioning Trust ("NDT") or Asset Retirement Trust ("ART");

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- Limitations on TVA's ability to borrow money which may result from, among other things, TVA's approaching or substantially reaching the limit on bonds, notes, and other evidences of indebtedness specified in the Tennessee Valley Authority Act of 1933, as amended, 16 U.S.C. §§ 831-831ee (the "TVA Act");
- An increase in TVA's cost of capital that may result from, among other things, changes in the market for TVA's debt securities, changes in the credit rating of TVA or the U.S. government, or, potentially, an increased reliance by TVA on alternative financing should TVA approach its debt limit;
- Changes in the economy and volatility in financial markets;
- Reliability or creditworthiness of counterparties;
- Changes in the market price of commodities such as coal, uranium, natural gas, fuel oil, crude oil, construction materials, reagents, electricity, or emission allowances;
- Changes in the market price of equity securities, debt securities, or other investments;
- Changes in interest rates, currency exchange rates, or inflation rates;
- Ineffectiveness of TVA's disclosure controls and procedures or its internal control over financial reporting;
- Inability to eliminate identified deficiencies in TVA's systems, standards, controls, or corporate culture;
- Inability to attract or retain a skilled workforce;
- Inability to respond quickly enough to current or potential customer demands or needs;
- Events at a nuclear facility, whether or not operated by or licensed to TVA, which, among other things, could lead to increased regulation or restriction on the construction, ownership, operation, or decommissioning of nuclear facilities or on the storage of spent fuel, obligate TVA to pay retrospective insurance premiums, reduce the availability and affordability of insurance, increase the costs of operating TVA's existing nuclear units, or cause TVA to forego future construction at these or other facilities;
- Loss of quorum of the TVA Board of Directors (the "TVA Board");
- Changes in the priorities of the TVA Board or TVA senior management; or
- Other unforeseeable events.

See also Item 1A, Risk Factors, and Item 7, Management's Discussion and Analysis of Financial Condition and Results of Operations. New factors emerge from time to time, and it is not possible for management to predict all such factors or to assess the extent to which any factor, or combination of factors, may impact TVA's business or cause results to differ materially from those contained in any forward-looking statement. TVA undertakes no obligation to update any forward-looking statement to reflect developments that occur after the statement is made.

GENERAL INFORMATION

Fiscal Year

References to years (2018, 2017, etc.) in this Annual Report are to TVA's fiscal years ending September 30 except for references to years in the biographical information about directors and executive officers in Item 10, Directors, Executive Officers and Corporate Governance, as well as to years that are preceded by "CY," which references are to calendar years.

Notes

References to "Notes" are to the Notes to Consolidated Financial Statements contained in Item 8, Financial Statements and Supplementary Data in this Annual Report.

Property

TVA does not own real property and real property interests (collectively, "real property"). TVA acquires real property in the name of the United States, and such legal title in real property is entrusted to TVA as the agent of the United

States to accomplish the purposes of the TVA Act. TVA acquires personal property in the name of TVA. Accordingly, unless the context indicates the reference is to TVA's personal property, any statement in this Annual Report referring to TVA property shall be read as referring to the real property of the United States that has been entrusted to TVA as its agent.

Available Information

TVA files annual, quarterly, and current reports with the Securities and Exchange Commission ("SEC") under Section 37 of the Securities Exchange Act of 1934. TVA's SEC filings are available to the public on the SEC's website at www.sec.gov or on TVA's website at www.tva.gov. Information contained on TVA's website shall not be deemed to be incorporated into, or to be a part of, this Annual Report.

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PART I

ITEM 1. BUSINESS

The Corporation

Tennessee Valley Authority ("TVA") is a corporate agency and instrumentality of the United States ("U.S.") that was created in 1933 by federal legislation in response to a proposal by President Franklin D. Roosevelt. TVA was created to, among other things, improve navigation on the Tennessee River, reduce the damage from destructive flood waters within the Tennessee River system and downstream on the lower Ohio and Mississippi Rivers, further the economic development of TVA's service area in the southeastern United States, and sell the electricity generated at the facilities TVA operates. Today, TVA operates the nation's largest public power system and supplies power to a population of nearly 10 million people.

TVA manages the Tennessee River, its tributaries, and certain shorelines to provide, among other things, year-round navigation, flood damage reduction, and affordable and reliable electricity. Consistent with these primary purposes, TVA also manages the river system to provide recreational opportunities, adequate water supply, improved water quality, natural resource protection, and economic development. TVA performs these management duties in cooperation with other federal and state agencies that have jurisdiction and authority over certain aspects of the river system. In addition, the TVA Board of Directors (the "TVA Board") has established two councils — the Regional Resource Stewardship Council and the Regional Energy Resource Council ("RERC") — to advise TVA on its stewardship activities in the Tennessee Valley and its energy resource activities.

Initially, all TVA operations were funded by federal appropriations. Direct appropriations for the TVA power program ended in 1959, and appropriations for TVA's stewardship, economic development, and multipurpose activities ended in 1999. Since 1999, TVA has funded all of its operations almost entirely from the sale of electricity and power system financings. TVA's power system financings consist primarily of the sale of debt securities and secondarily of alternative forms of financing, such as lease arrangements. As a wholly-owned government corporation, TVA is not authorized to issue equity securities.

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Service Area

TVA's service area, the area in which it sells power, is defined by the TVA Act. TVA supplies power in most of Tennessee, northern Alabama, northeastern Mississippi, and southwestern Kentucky and in portions of northern Georgia, western North Carolina, and southwestern Virginia. Under the TVA Act, subject to certain minor exceptions, TVA may not, without the enactment of authorizing federal legislation, enter into contracts that would have the effect of making it, or the wholesale customers that distribute TVA power ("local power company customers" or "LPCs"), a source of power supply outside the area for which TVA or its LPCs were the primary source of power supply on July 1, 1957. This provision is referred to as the “fence” because it bounds TVA’s sales activities, essentially limiting TVA to power sales within a defined service area.

Note
See Power Supply and Load Management Resources.

In addition, the Federal Power Act ("FPA") includes a provision that helps protect TVA’s ability to sell power within its service area. This provision, called the "anti-cherrypicking" provision, prevents the Federal Energy Regulatory Commission ("FERC") from ordering TVA to provide access to its transmission lines to others to deliver power to customers within TVA’s defined service area. As a result, the anti-cherrypicking provision reduces TVA’s exposure to loss of its customers.

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In 2018, the revenues generated from TVA's electricity sales were $11.1 billion and accounted for virtually all of TVA's revenues. TVA's revenues by state for each of the last three years are detailed in the table below.

Operating Revenues By State
For the years ended September 30
(in millions)

	2018	2017	2016
Alabama	$1,600	$1,524	$1,504
Georgia	267	252	255
Kentucky	696	665	640
Mississippi	1,052	1,016	999
North Carolina	66	57	58
Tennessee	7,350	7,041	6,968
Virginia	48	47	48
Subtotal	11,079	10,602	10,472
Off-system sales	7	6	7
Revenue capitalized during pre-commercial plant operations[(1)]	(11)	(22)	(18)
Revenue from sales of electricity	11,075	10,586	10,461
Other revenues	158	153	155
Total operating revenues	$11,233	$10,739	$10,616

Note
(1) Represents revenue capitalized during pre-commercial operations of $11 million at Allen Combined Cycle Plant ("Allen CC") in 2018, $22 million at Watts Bar Nuclear Plant ("Watts Bar") Unit 2, Paradise Combined Cycle Plant, and Allen CC in 2017, and $18 million at Watts Bar Unit 2 in 2016. See Note 1 — Pre-Commercial Plant Operations.

Customers

TVA is primarily a wholesaler of power, selling power to LPCs that then resell power to their customers at retail rates. TVA's LPCs consist of (1) municipalities and other local government entities ("municipalities") and (2) customer-owned entities ("cooperatives"). These municipalities and cooperatives operate public power electric systems whose primary purpose is not to make a profit but to supply electricity to the general public or the cooperatives' members. TVA also sells power directly to certain end-use customers, primarily large commercial and industrial loads and federal agencies with loads larger than 5,000 kilowatts ("kW"). Whether TVA or an LPC serves a new power customer is determined by the applicable TVA-LPC wholesale power contract. Each contract contains a formula that balances the size of the LPC and the amount of any TVA infrastructure investment to determine which party is entitled to serve the new customer. In addition, power in excess of the needs of the TVA system may, where consistent with the provisions of the Tennessee Valley Authority Act of 1933 (the "TVA Act"), be sold under exchange power arrangements with other specific electric systems. See Item 7, Management's Discussion and Analysis of Financial Condition and Results of Operations — Results of Operations — Financial Results — Operating Revenues.

Operating Revenues by Customer Type
For the years ended September 30
(in millions)

	2018	2017	2016
Revenue from sales of electricity			
Local power companies	$10,262	$9,741	$9,696
Industries directly served	695	735	649
Federal agencies and other	129	132	134
Revenue capitalized during pre-commercial plant operations[(1)]	(11)	(22)	(18)
Revenue from sales of electricity	11,075	10,586	10,461

Other revenues	158	153	155
Total operating revenues	$11,233	$10,739	$10,616

Note

(1) Represents revenue capitalized during pre-commercial operations of $11 million at Allen CC in 2018, $22 million at Watts Bar Unit 2, Paradise Combined Cycle Plant, and Allen CC in 2017, and $18 million at Watts Bar Unit 2 in 2016. See Note 1 — Pre-Commercial Plant Operations.

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Local Power Companies

Revenues from LPCs accounted for approximately 91 percent of TVA's total operating revenues in 2018. At September 30, 2018, TVA had wholesale power contracts with 154 LPCs. Each of these contracts requires the LPC to purchase from TVA all of the electric power required for service to the LPC's customers. LPCs purchase power under contracts that range from five to 20 years to terminate.

See table below for LPC information by contract arrangement term.

TVA Local Power Company Contracts
At September 30, 2018

Contract Arrangements[1]	Number of LPCs	Sales to LPCs in 2018 (in millions)	Percentage of Total Operating Revenues in 2018	
20-year termination notice	3	$ 133	1.2	%
15-year termination notice	11	498	4.5	%
12-year termination notice	1	26	0.2	%
10-year termination notice	51	3,507	31.2	%
6-year termination notice	1	49	0.4	%
5-year termination notice	87	6,049	53.9	%
Total	154	$ 10,262	91.4	%

Note
(1) Ordinarily, the LPCs and TVA have the same termination notice period; however, in contracts with five of the LPCs with five-year termination notices, TVA has a 10-year termination notice (which becomes a five-year termination notice if TVA loses its discretionary wholesale rate-setting authority). Two of the LPCs have five-year termination notices or a shorter period if any act of Congress, court decision, or regulatory change requires or permits that election.

TVA's two largest LPCs — Memphis Light, Gas and Water Division ("MLGW") and Nashville Electric Service ("NES") — have contracts with a five-year and a 10-year termination notice period, respectively. Sales to MLGW and NES accounted for nine percent and eight percent, respectively, of TVA's total operating revenues in 2018.

The power contracts between TVA and LPCs provide for the purchase of power by LPCs at the wholesale rates established by the TVA Board. Under the TVA Act, the TVA Board is authorized to regulate LPCs to carry out the purposes of the TVA Act through contract terms and conditions as well as through rules and regulations. TVA regulates LPCs primarily through the provisions of TVA's wholesale power contracts. All of the power contracts between TVA and the LPCs require that power purchased from TVA be sold and distributed to the ultimate consumer without discrimination among consumers of the same class and prohibit direct or indirect discriminatory rates, rebates, or other special concessions. In addition, there are a number of wholesale power contract provisions through which TVA seeks to ensure that the electric system revenues of the LPCs are used only for electric system purposes. Furthermore, almost all of these contracts specify the resale rates and charges at which the LPC must resell TVA power to its customers. These rates are revised from time to time, subject to TVA approval, to reflect changes in costs, including changes in the wholesale cost of power.

TVA also regulates LPC policies for customer deposits, termination of service for non-payment, information to consumers, and billing through a service practice policy framework. TVA's regulatory framework provides for consistent regulatory policy for ratepayers across the Tennessee Valley, while recognizing local considerations. The regulatory provisions in TVA's wholesale power contracts are designed to carry out the objectives of the TVA Act,

including the objective of providing for adequate supply of power at the lowest feasible rates. See Rates — Rate Methodology below.

Other Customers

Revenues from directly served industrial customers accounted for approximately six percent of TVA's total operating revenues in 2018. Contracts with these customers are subject to termination by the customer or TVA upon a minimum notice period that varies according to a number of factors, including the customer's contract demand and the period of time service has been provided. TVA also serves seven federal customers, including U.S. Department of Energy ("DOE") facilities and military installations, which accounted for approximately one percent of TVA's total operating revenues in 2018.

Other Revenue

Other revenue consists primarily of wheeling and network transmission charges, sales of excess steam that is a by-product of power production, delivery point charges for interconnection points between TVA and the customer, and certain other minor items. Other revenue accounted for $158 million, or approximately one percent, of TVA's total operating revenues in 2018.

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Rates

Rate Authority

The TVA Act gives the TVA Board sole responsibility for establishing the rates TVA charges for power. These rates are not subject to judicial review or to review or approval by any state or federal regulatory body. Under the TVA Act, TVA is required to charge rates for power that will produce gross revenues sufficient to provide funds for:

- Operation, maintenance, and administration of its power system;
- Payments to states and counties in lieu of taxes ("tax equivalents");
- Debt service on outstanding indebtedness;
- Payments to the U.S. Treasury in repayment of and as a return on the government's appropriation investment in TVA's power facilities (the "Power Program Appropriation Investment"); and
- Such additional margin as the TVA Board may consider desirable for investment in power system assets, retirement of outstanding bonds, notes, or other evidences of indebtedness ("collectively, Bonds") in advance of their maturity, additional reduction of the Power Program Appropriation Investment, and other purposes connected with TVA’s power business, having due regard for the primary objectives of the TVA Act, including the objective that power shall be sold at rates as low as are feasible. See Note 17 — Appropriation Investment.

TVA fulfilled its requirement to repay $1.0 billion of the Power Program Appropriation Investment in 2014; therefore, the repayment of this amount is no longer a component of rate setting.

Rate Methodology

TVA uses a wholesale rate structure comprised of a base rate and a fuel rate that is automatically determined each month by the operation of the fuel cost adjustment formula. In setting the base rates, TVA uses a debt-service coverage ("DSC") methodology to derive annual revenue requirements in a manner similar to that used by other public power entities that also use the DSC rate methodology. Under the DSC methodology, rates are calculated so that an entity will be able to cover its operating costs and to satisfy its obligations to pay principal and interest on debt. This ratemaking approach is particularly suitable for use by entities financed primarily, if not entirely, by debt, such as TVA, and helps ensure that TVA produces gross revenues sufficient to fund requirements specified in the TVA Act listed under Rate Authority above.

TVA recovers fuel costs and tax equivalents payments associated with fuel cost adjustments through a monthly rate adjustment reflecting the costs paid by TVA for fuel. Beginning on October 1, 2018, fuel costs are allocated to three groups of customers: Standard Service (residential and small commercial customers), Large Manufacturing customers with contract demands greater than 5 MW, and Large General Service customers with contract demands greater than 5 MW. Fuel costs are allocated to these three classes of customers in relation to their average hourly loads and TVA's hourly incremental dispatch costs. Total monthly fuel costs include costs for natural gas, fuel oil, coal, purchased power, emission allowances, nuclear fuel, and other fuel-related commodities as well as realized gains and losses on derivatives purchased to hedge the costs of such commodities.

Since the fall of 2013, TVA, LPCs, and directly served industries have worked collaboratively to develop changes to TVA's rates that focus on TVA’s long-term pricing efforts. A comprehensive rate restructuring was implemented in October 2015 to improve pricing by better aligning rates with underlying cost drivers and to send improved pricing signals, while maintaining competitive industrial rates and keeping residential rates affordable.

Consistent with the pricing goals and changes implemented in the 2015 rate restructuring, TVA staff recommended, and the TVA Board approved, the proposed 2018 rate change on May 10, 2018. This change will reduce wholesale

energy rates for Standard Service and introduce a Grid Access Charge ("GAC") at an offsetting rate to better recover fixed costs. Recognizing the need for flexibility, TVA presented all LPCs with the option to implement the wholesale changes in October 2018 or defer the implementation of the GAC until October 2019. The 2018 rate change better reflects the wholesale cost of energy and recognizes the value of the grid’s reliability and associated fixed costs. This modernized approach to pricing provides bill stability while maintaining reliability and fairness for all TVA's customers.

Power Supply and Load Management Resources

General

TVA seeks to balance production capabilities with power supply requirements by promoting the conservation and efficient use of electricity and, when necessary, buying, building, or leasing assets or entering into power purchase agreements. TVA also seeks to employ a diverse mix of energy generating sources and works toward obtaining greater amounts of its power supply from clean (low or zero carbon emitting) resources.

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Power generating facilities operated by TVA at September 30, 2018, included 29 conventional hydroelectric sites, one pumped-storage hydroelectric site, six coal-fired sites, three nuclear sites, 17 natural gas and/or oil-fired sites, one diesel generator site, 14 solar energy sites, digester gas co-firing capacity at one coal-fired site, and biomass co-firing potential (located at coal-fired sites), although certain of these facilities were out of service as of September 30, 2018. See Item 2, Properties — Generating Properties — Net Capability for a discussion of these facilities. TVA also acquires power under power purchase agreements of varying durations, including short-term contracts of less than 24-hours in duration. See Item 7, Management's Discussion and Analysis of Financial Condition and Results of Operations — Results of Operations — Financial Results — Operating Expenses.

The following table shows TVA's generation and purchased power by generating source as a percentage of all electric power generated and purchased (based on kilowatt hours ("kWh")) for the periods indicated:

Power Supply by Generating Source
For the years ended September 30

Generation Resource	2018	2017	2016
Nuclear	39%	38%	33%
Natural gas and/or oil-fired	20%	16%	16%
Coal-fired	19%	25%	29%
Hydroelectric	9%	7%	8%
Purchased power (non-renewable)	9%	9%	9%
Purchased power (renewable)	4%	5%	5%

Note
TVA's non-hydro renewable resources from TVA facilities are less than one percent for all periods shown, and therefore are not represented on the table above. Purchased power (renewable) contains the majority of non-hydro renewable energy supply.

Nuclear

At September 30, 2018, TVA had three nuclear sites consisting of seven units in operation. The units at Browns Ferry Nuclear Plant ("Browns Ferry") are boiling water reactor units, and the units at Sequoyah Nuclear Plant ("Sequoyah") and Watts Bar are pressurized water reactor units. Operating information for each of these units is included in the table below.

TVA Nuclear Power
At September 30, 2018

Nuclear Unit	Summer Net Capability (MW)	Net Capacity Factor for 2018 (%)	Date of Expiration of Operating License
Browns Ferry Unit 1	1,101	94.5	2033
Browns Ferry Unit 2	1,103	96.3	2034
Browns Ferry Unit 3	1,105	83.9	2036
Sequoyah Unit 1	1,152	85.7	2040
Sequoyah Unit 2	1,140	97.9	2041
Watts Bar Unit 1	987	95.5	2035
Watts Bar Unit 2	1,135	78.3	2055

Note
The summer net capability for Browns Ferry excludes the impact of the Extended Power Uprate project. The generating capability is expected to increase by an estimated 465 MW after completion of the project and sufficient run time to validate the new capacity.

Extended Power Uprate. On August 14, 2017, the Nuclear Regulatory Commission ("NRC") approved TVA's request for a 465 MW extended power uprate ("EPU") project at Browns Ferry. TVA is implementing the EPU project during plant refueling outages. Physical work on Unit 3 was completed, and the unit was synced to the grid in April 2018. On July 13, 2018, Unit 3 reached the new EPU 100 percent power. Work is underway for Unit 1 and will commence in the spring of 2019 for Unit 2. Full EPU power is expected to be achieved following the noted outages and extensive power ascension testing for each unit. See Item 7, Management's Discussion and Analysis of Financial Condition and Results of Operations — Key Initiatives and Challenges — Generation Resources — Extended Power Uprate.

Other Nuclear Initiatives. TVA has submitted an Early Site Permit Application to the NRC to license small modular reactors ("SMRs") at TVA's Clinch River Site in Oak Ridge, Tennessee. See Item 7, Management's Discussion and Analysis of Financial Condition and Results of Operations — Key Initiatives and Challenges — Generation Resources — Small Modular Reactors.

Other Nuclear Matters. Operating nuclear facilities subjects TVA to waste disposal, decommissioning, and insurance requirements, as well as litigation risks. See Fuel Supply — Nuclear Fuel below for a discussion of spent nuclear fuel and low-

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level radioactive waste ("radwaste"), Note 21 — Contingencies for a discussion of TVA's nuclear decommissioning liabilities and the related trust and nuclear insurance, and Note 21 — Legal Proceedings for a discussion of legal and administrative proceedings related to TVA's nuclear program, which discussions are incorporated herein by reference.

Coal-Fired

As of September 30, 2018, TVA had six coal-fired plants consisting of 26 active units, accounting for 7,886 MW of summer net capability. Coal-fired units are either active or retired. TVA considers units to be in an active state when the unit is generating, available for service, or temporarily unavailable due to equipment failures, inspections, or repairs. All other coal-fired units are considered retired.

Coal-fired plants have been subject to increasingly stringent regulatory requirements over the last few decades, including those under the Clean Air Act ("CAA") and the regulations promulgated thereunder. Increasing regulatory costs have caused TVA to consider whether or not to make the required capital investments to continue operating these coal-fired facilities. In April 2011, TVA entered into two agreements (collectively, the "Environmental Agreements") to address a dispute under the CAA. The first agreement is a Federal Facilities Compliance Agreement with the Environmental Protection Agency ("EPA"). The second agreement is with Alabama, Kentucky, North Carolina, Tennessee, and three environmental advocacy groups: the Sierra Club, National Parks Conservation Association, and Our Children’s Earth Foundation. Under the Environmental Agreements, TVA agreed to retire 18 of its 59 coal-fired units by the end of 2017 and was generally absolved from any liability, subject to certain limitations and exceptions, under the New Source Review ("NSR") requirements of the CAA for maintenance, repair, and component replacement projects that were commenced at TVA's coal-fired units prior to the execution of the agreements. TVA also agreed to retire, repower, or install air pollution controls on 16 of the remaining coal-fired units. As of September 30, 2018, TVA has completed the requirements in the Environmental Agreements related to retiring coal-fired units or installing controls on such units. See Natural Gas and/or Oil-Fired below.

TVA is moving toward a more balanced generation plan with greater reliance on lower-cost and cleaner energy generation technologies. Since September 30, 2010, TVA has reduced its summer net capability of coal-fired units by 6,682 MW. TVA’s long-range plans will continue to consider the costs and benefits of significant environmental investments at its remaining coal-fired plants.

Natural Gas and/or Oil-Fired

As of September 30, 2018, TVA’s natural gas and oil-fired fleet consisted of 101 combustion turbine power blocks (87 simple-cycle units and 14 combined-cycle power units). Sixty of the simple-cycle units are currently capable of quick-start response allowing full generation capability in approximately 10 minutes. The economic dispatch of natural gas-fired plants depends on both the day-to-day price of natural gas and the price of other available intermediate resources such as coal-fired plants. TVA uses simple-cycle units to meet peaking or backup power needs. TVA also uses cogeneration at one simple-cycle unit.

TVA’s strategy of portfolio diversification and air emissions reductions includes the addition of natural gas-fired plants to its generation fleet. In April 2018, TVA completed a natural gas-fired facility at the former Allen Fossil Plant ("Allen") with a generation capacity of approximately 1,106 MW. As of September 30, 2018, TVA had no natural gas-fired facilities under construction. See Item 7, Management's Discussion and Analysis of Financial Condition and Results of Operations — Key Initiatives and Challenges — Generation Resources — Coal and Natural Gas-Fired Units.

See Item 2, Properties — Generating Properties, Note 9, Note 10, and Note 13 for a discussion of lease arrangements into which TVA has entered in connection with certain combustion turbine units. Because of TVA's strategy of portfolio diversification and reduction of air emissions, TVA may decide to make further strategic investments in

natural gas-fired facilities in the future by purchase, construction, or lease.

Hydroelectric

Conventional Hydroelectric Dams. TVA maintains 29 conventional hydroelectric dams with 109 generating units throughout the Tennessee River system for the production of electricity. As of September 30, 2018, these units accounted for 3,782 MW of summer net capability. The amount of electricity that TVA is able to generate from its hydroelectric plants depends on a number of factors, including the amount of precipitation and runoff, initial water levels, generating unit availability, and the need for water for competing water management objectives. When these factors are unfavorable, TVA must increase its reliance on higher cost generation plants and purchased power. In addition, a portion of energy generated by nine U.S. Army Corps of Engineers ("USACE") dams on the Cumberland River system contributes to the TVA power system. See Weather and Seasonality below and Item 7, Management's Discussion and Analysis of Financial Condition and Results of Operations — Key Initiatives and Challenges — Dam Safety and Remediation Initiatives.

Raccoon Mountain Pumped-Storage Plant. As of September 30, 2018, TVA has four units at Raccoon Mountain Pumped-Storage Plant ("Raccoon Mountain") with a total net summer capability of 1,616 MW. These units are utilized to balance the transmission system as well as generate power. TVA uses electricity generated by its fleet during periods of low

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demand to operate pumps that fill the reservoir at Raccoon Mountain. Then, during periods of high or peak demand, the water is released and the pumps reverse to work as power generating turbines.

Hiwassee Hydro Unit 2. Hiwassee Hydro Unit 2 has a unique reversible turbine/generator that acts as a pump and a turbine enhancing TVA's ability to balance baseload generation. Hiwassee Hydro Unit 2 has a summer net capability of 86 MW.

Hydro Modernization Program. TVA is scheduled to complete the Hydro Modernization Program in 2019 with the completion of South Holston Unit 1 and Pickwick Landing Dam ("Pickwick") Unit 2. The Hydro Modernization program began in 1992 and focuses on units with potential to increase peaking capacity and improve reliability. As of September 30, 2018, modernization had been completed on 60 conventional hydroelectric units, including Pickwick Unit 3 in 2018. The modernization projects resulted in 444 MW of increased capacity from the conventional hydroelectric units, with an average efficiency gain of approximately five percent. In 2019, TVA will transition to a new program, the Hydro Major Maintenance Program, intended to focus on life extension and addressing reliability risks that will support the preservation of TVA's hydro fleet capacity. Hydroelectric generation will continue to be an important part of TVA's energy mix.

Other Renewable Energy Resources

TVA's renewable energy portfolio includes both TVA-owned assets and renewable energy purchases. TVA owns 14 solar sites with a total net summer capability of approximately 1 MW. Certain coal-fired units have the capability for digester gas and biomass co-firing, which is accounted for as coal-fired generation summer net capability.

TVA tracks its renewable energy commitments and claims through the management of renewable energy certificates ("RECs"). The RECs, which each represent 1 MWh of renewable energy generation, are principally associated with wind, solar, biomass, and low-impact hydroelectric. TVA also acquires RECs from renewable purchased power.

Diesel Generators

As of September 30, 2018, TVA had one diesel generator plant consisting of five units, and this facility accounted for 9
MW of summer net capability.

Distributed Energy Resources

Consumer desire for energy choice is, among other things, driving the expectation for flexible options in the electric industry. TVA and LPCs are working together to leverage the strengths of the Tennessee Valley public power model to provide distributed energy solutions that are economic, sustainable, and flexible. TVA will focus on the safety and reliability impacts of these resources as they are interconnected to the grid and will ensure that the pricing of electricity remains as low as feasible. Additional regulatory considerations and analysis may be required as the distributed energy resources ("DER") market, technologies, and programs evolve. TVA will work to develop pricing and regulatory structures with a deliberate and thoughtful analysis of each current and future program offering. This will require strong partnerships with LPCs to reinforce local control, provide customers choices, and provide end-use consumers the flexibility they desire. In May 2017, the TVA Board authorized up to $300 million to be spent over the next 10 years, subject to annual budget availability and necessary environmental reviews, to build an enhanced fiber network that will better connect its operational assets. Fiber is a vital part of TVA's modern communication infrastructure. The new fiber optic lines will improve the reliability and resiliency of the generation and transmission system while enabling the system to better accommodate DER as they enter the market.

TVA has encouraged the development of solar, wind, biomass, and low-impact hydroelectric generation systems across the Tennessee Valley through various current and former offerings. As of September 30, 2018, the combined participation for all such renewable solutions is approximately 450 MW of installed operating capacity with nearly 134 MW of additional approved capacity. Additionally, TVA contracts for approximately 1,215 MW of operating wind capacity from outside the Tennessee Valley via power purchase agreements.

New energy management systems and energy storage technologies present opportunities for more sophisticated and integrated operation of the entire grid. The advent of electric vehicles and small-scale renewable generation has hastened the development of battery technologies that have the potential to mitigate the intermittent supply issues associated with many renewable generation options. Implementation of these technologies in conjunction with two-way communication to the site creates the potential for more efficient usage of other DER on the grid.

Onsite energy management technologies and the proliferation of companies interested in providing services to support and aggregate the impacts of such systems provide another DER opportunity. Such systems can afford the consumer benefits through reduced consumption, increased comfort, detailed energy use data, and savings from time-sensitive rate structures. TVA and LPCs must consider the integration of the impacts from changes in energy usage patterns resulting from the operation of such systems.

Demand response systems that take advantage of the increasing sophistication in communication to homes, businesses, and distribution system assets also afford the opportunity for more granular control of system demand.

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Technologies can manage individual customer systems to shift usage from peak to off-peak periods and create significant reductions in the need for peak generation output. More sophisticated distribution control systems can also lower peak demand through control of excess voltage on the grid on either a dispatchable or continuous basis.

TVA is leading an initiative to determine the value of DER for its system. Initial efforts are focused on small-scale distributed (rooftop) solar, but the efforts are general enough to allow for other distributed options. These efforts are ongoing, led by a team that includes technical support from the Electric Power Research Institute ("EPRI"), to develop a methodology to identify site preferences on the distribution systems of the LPCs. This work, along with locational analysis already completed by TVA, will help in placing utility-scale solar in furtherance of the Integrated Resource Plan recommendations as well as distributed solar to meet the needs of LPCs. See Research and Development below.

Purchased Power and Other Agreements

TVA acquires power from a variety of power producers through long-term and short-term power purchase agreements as well as through spot market purchases. During 2018, TVA acquired approximately 11 percent of the power that it purchased on the spot market, approximately one percent through short-term power purchase agreements, and approximately 88 percent through the long-term power purchase agreements described below, including agreements for long-term renewable generation resources.

A portion of TVA’s capability provided by power purchase agreements is provided under contracts that expire between 2023 and 2038, and the most significant of these contracts are described in the table below.

Power Purchase Contracts
At September 30, 2018

Type of Facility	Location	Summer Net Capability (MW)	Contract Termination Date
Lignite	Mississippi	440	2032
Natural gas	Alabama	720	2023
Natural gas	Alabama	615	2026
Solar	Alabama	75	2037
Solar[1]	Tennessee	53	2038
Solar	Tennessee	4.8	2031
Solar	Tennessee	4.5	2032
Hydroelectric[2]	Tennessee and Kentucky	347	Upon three years' notice
Wind	Iowa	198	2031
Wind	Iowa	101	2030
Wind	Kansas	201	2032
Wind	Kansas	165	2033
Wind	Illinois	150	2032
Wind	Illinois	200	2032
Wind	Illinois	200	2033
Wind	Tennessee	27	2025

Notes
(1) Power delivery is expected to commence in the second quarter of 2019.
(2) TVA’s contract with Southeastern Power Administration ("SEPA") is for 405 MW of capacity; however, at September 30, 2018, TVA’s capacity under the contract was 347 MW because of repairs being completed by the USACE. TVA expects this period of reduced capacity to be in effect until July 2019.

Under federal law, TVA is required to purchase energy from qualifying facilities (cogenerators and small power producers) at TVA's avoided cost of either generating this energy itself or purchasing this energy from another source.

TVA fulfills this requirement through the Dispersed Power Production Program. As of September 30, 2018, there were 36 generation sources, with a combined qualifying capacity of 259 MW, whose power TVA purchases under this program.

Fuel Supply

General

TVA's consumption of various types of fuel depends largely on the demand for electricity by TVA's customers, the availability of various generating units, and the availability and cost of fuel. See Item 7, Management's Discussion and Analysis of Financial Condition and Results of Operations — Results of Operations — Financial Results — Operating Expenses.

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Nuclear Fuel

Current Fuel Supply. Converting uranium to nuclear fuel generally involves four stages: the mining and milling of uranium ore to produce uranium concentrates; the conversion of uranium concentrates to uranium hexafluoride gas; the enrichment of uranium hexafluoride; and the fabrication of the enriched uranium hexafluoride into fuel assemblies. For its forward four-year (2019-2022) requirements, TVA currently has 100 percent of its uranium mining and milling, conversion services, enrichment services, and fabrication services requirements either in inventory or under contract with various suppliers. TVA anticipates being able to fill its needs beyond this period by normal contracting processes as market forecasts indicate that the fuel cycle components will be readily available. The net book value of TVA's nuclear fuel inventory was $1.5 billion and $1.4 billion at September 30, 2018 and 2017, respectively. See Note 15 — Counterparty Risk.

TVA, the DOE, and certain nuclear fuel contractors have entered into agreements providing for surplus DOE highly enriched uranium (uranium that is too highly enriched for use in a nuclear power plant) to be blended with other uranium. The enriched uranium that results from this blending process, which is called blended low-enriched uranium ("BLEU"), is fabricated into fuel that can be used in a nuclear power plant. This blended nuclear fuel was first loaded in a Browns Ferry reactor in 2005 and the last reload of BLEU material is currently underway at Browns Ferry. BLEU fuel was loaded into Sequoyah Unit 2 three times but is not expected to be used in the Sequoyah reactors in the future. There is a potential to receive additional BLEU fuel beginning in 2020, and it would be used in future Browns Ferry reloads. Under the terms of the interagency agreement between the DOE and TVA, the DOE participates in the savings generated by TVA's use of the BLEU. See Note 1 — Blended Low-Enriched Uranium Program for a more detailed discussion of the BLEU project.

TVA, the DOE, and certain nuclear fuel contractors have entered into agreements providing for the production, processing, and storage of low-enriched uranium that is to be made using surplus DOE highly enriched uranium and other uranium. Low-enriched uranium can be fabricated into fuel for use in a nuclear power plant. Production of the low-enriched uranium is expected to begin in spring or summer of 2019. Under the terms of the interagency agreement between the DOE and TVA, the DOE will reimburse TVA for a portion of the costs of converting the highly enriched uranium to low-enriched uranium.

Low-Level Radioactive Waste. Radwaste results from certain materials and supplies used in the normal operation of nuclear electrical generation units. TVA sends shipments of radwaste to burial facilities in Clive, Utah and Andrews, Texas. TVA is capable of storing some radwaste at its own facilities for an extended period of time, if necessary.

Spent Nuclear Fuel. All three nuclear sites have dry cask storage facilities. Sequoyah will need additional capacity by 2028. Watts Bar will need additional capacity by 2041. Browns Ferry will need additional storage capacity by the end of 2020. A project is underway at Browns Ferry to build another independent spent fuel storage installation pad and is scheduled for completion by January 2020. To recover the cost of providing long-term, onsite storage for spent nuclear fuel, TVA filed a breach of contract suit against the U.S. in the Court of Federal Claims in 2001. As a result of this lawsuit and related agreements, TVA has collected approximately $273 million through 2018.

Tritium-Related Services. TVA and the DOE are engaged in a long-term interagency agreement under which TVA will, at the DOE’s request, irradiate tritium-producing burnable absorber rods ("TPBARs") to assist the DOE in producing tritium for the Department of Defense ("DOD"). This agreement, which ends in 2035, requires the DOE to reimburse TVA for the costs that TVA incurs in connection with providing irradiation services and to pay TVA an irradiation services fee at a specified rate per TPBAR over the period when irradiation occurs.

In general, TPBARs are irradiated for one operating cycle, which lasts about 18 months. At the end of the cycle, TVA removes the irradiated rods and loads them into a shipping cask. The DOE then ships them to its tritium-extraction

facility. TVA loads a fresh set of TPBARs into the reactor during each refueling outage. Irradiating the TPBARs does not affect TVA's ability to safely operate the reactors to produce electricity.

TVA has provided irradiation services using only Watts Bar Unit 1 since 2003. Although the interagency agreement provides for irradiation services to be performed at Watts Bar and Sequoyah, TVA expects the Watts Bar site to provide sufficient capacity to fulfill this agreement in the near term. The DOE notified TVA of future increased needs for tritium requiring the use of a second reactor. TVA submitted a license amendment to the NRC in December 2017 to authorize the irradiation of TPBARs in Watts Bar Unit 2. The NRC is expected to issue a decision by May 2019.

Coal

Coal consumption at TVA's coal-fired generating facilities during 2018 and 2017 was approximately 17 million tons and 21 million tons, respectively. At September 30, 2018 and September 30, 2017, TVA had 30 days and 36 days of system-wide coal supply at full burn rate, respectively, with net book values of $164 million and $253 million, respectively.

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TVA utilizes both short-term and long-term coal contracts. During 2018, long-term contracts made up 97 percent of coal purchases and short-term contracts accounted for the remaining three percent. TVA plans to continue using contracts of various lengths, terms, and coal quality to meet its expected consumption and inventory requirements. During 2018 and 2017, TVA purchased coal by basin as follows:
The following charts present the proportion of each delivery method TVA utilizes for its coal supply for the periods indicated:
Generally, total system coal inventories were at or below target levels for 2018 as inventory levels were adjusted for unit retirements and unit generation mix changes.

Natural Gas and Fuel Oil

During 2018, TVA purchased a significant amount of its natural gas requirements from a variety of suppliers under contracts with terms of up to three years and purchased substantially all of its fuel oil requirements on the spot market. The net book value of TVA’s natural gas inventory was $18 million and $15 million at September 30, 2018 and 2017, respectively. The net book value of TVA’s fuel oil inventory was $84 million and $87 million at September 30, 2018 and 2017, respectively. At September 30, 2018, 80 of the combustion turbines that TVA operates were dual-fuel capable, and TVA has fuel oil stored on each of these sites as a backup to natural gas.

TVA purchases natural gas from multiple suppliers on a daily, monthly, seasonal, and term basis. During 2018, daily, monthly, seasonal, and term contracts accounted for 35 percent, 11 percent, 16 percent and 38 percent of purchases, respectively. TVA plans to continue using contracts of various lengths and terms to meet the projected natural gas needs of its natural gas fleet. During 2018, TVA transported natural gas on eight separate pipelines, with approximately 33 percent being transported on a single pipeline. During 2018, TVA maintained a total of approximately 1,409,500 million British thermal unit(s) ("mmBtu") per day of firm transportation capacity on seven major pipelines, with approximately 31 percent of total firm transportation capacity being maintained on a single pipeline.

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TVA utilizes natural gas storage services at seven facilities with a total capacity of 8.25 billion per cubic feet ("Bcf") of firm service and 2.30 Bcf of interruptible service to manage the daily balancing requirements of the eight pipelines used by TVA, with approximately 43 percent of the total storage capacity being maintained at a single facility. During 2018, storage levels were generally maintained at between 40 and 80 percent of the maximum contracted capacity at each facility. As TVA's natural gas requirements grow, it is anticipated that additional storage capacity may need to be acquired to meet the needs of the generating assets as well as their operating requirements. In 2019, TVA does not expect to add a significant amount of firm capacity to its storage portfolio.

Transmission

The TVA transmission system is one of the largest in North America. TVA's transmission system has 69 interconnections with 13 neighboring electric systems, and delivered nearly 163 billion kWh of electricity to TVA customers in 2018. In carrying out its responsibility for transmission grid reliability in the TVA service area, TVA has operated with 99.999 percent reliability since 2000 in delivering electricity to customers. See Item 2, Properties — Transmission Properties.

Pursuant to its Transmission Service Guidelines, TVA offers transmission services to eligible customers to transmit wholesale power in a manner that is comparable to TVA's own use of the transmission system. TVA has also adopted and operates in accordance with its published Transmission Standards of Conduct and separates its transmission function from its power marketing function.

TVA is subject to federal reliability standards that are set forth by the North American Electric Reliability Corporation ("NERC") and approved by FERC. These standards are designed to maintain the reliability of the bulk electric system, including TVA's generation and transmission system, and include areas such as maintenance, training, operations, planning, modeling, critical infrastructure, physical and cyber security, vegetation management, and facility ratings. TVA recognizes that reliability standards and expectations continue to become more complex and stringent for transmission systems.

Additional transmission upgrades may be required to maintain reliability. TVA invested $419 million between 2011 and 2018 to maintain reliability as a result of retired coal-fired units, and estimates future expenditures to be approximately $10 million for 2019 to 2020. Upgrades may include enhancements to existing lines and substations or new installations as necessary to provide adequate power transmission capacity, maintain voltage support, and ensure generating plant and transmission system stability. In May 2017, the TVA Board approved a $300 million multi-year, strategic fiber initiative that will expand TVA's fiber capacity and improve the reliability and resiliency of the transmission system. The network expansion is designed to help meet the power system's growing need for bandwidth as well as accommodate the integration of new DER.

The TVA Board approved $245 million for the construction of a new system operations center ("SOC"). The new secured facility is being built to accommodate a new energy management system and to adapt to new regulatory requirements. The facility is expected to be constructed by 2021 and fully operational by 2023.

Weather and Seasonality

Weather affects both the demand for and the market prices of electricity. TVA's power system is generally a dual-peaking system in which the demand for electricity peaks during the summer and winter months to meet cooling and heating needs. TVA uses degree days to measure the impact of weather on its power operations. Degree days measure the extent to which average temperatures in the five largest cities in TVA's service area vary from 65 degrees Fahrenheit. See Item 7, Management's Discussion and Analysis of Financial Condition and Results of Operations — Results of Operations — Sales of Electricity.

Competition

TVA provides electricity in a service area that is largely free of competition from other electric power providers based on the provisions of the TVA Act. This service area is defined primarily by provisions of law and long-term contracts. The fence limits the region in which TVA or LPCs that distribute TVA power may provide power. The anti-cherrypicking provision limits the ability of others to use the TVA transmission system for the purpose of serving customers within TVA’s service area. State service territory laws limit unregulated third parties' ability to sell electricity to consumers. All TVA wholesale power contracts are all requirements contracts. However, other utilities may use their own transmission lines to serve customers within TVA's service area, and third parties are able to avoid the restrictions on serving end-use customers by selling or leasing generating assets to a customer rather than selling electricity. These threats underscore the need for TVA to strategically price its products and services and design rates to be competitive. There have also been some efforts in the past to erode the anti-cherrypicking provision, and the protection of the anti-cherrypicking provision could be limited and perhaps eliminated by federal legislation at some time in the future.

TVA also faces competition in the form of emerging technologies. Improvements in energy efficiency technologies, smart technologies, and energy storage technologies may reduce the demand for centrally provided power. The growing interest by customers in generating their own power through DER has the potential to lead to a reduction in the load served by TVA as well as cause TVA to re-evaluate how it operates the overall grid system to continue to provide highly reliable power at

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affordable rates. See Item 7, Management's Discussion and Analysis of Financial Condition and Results of Operations — Key Initiatives and Challenges — Distributed Energy Resources.

Finally, TVA and other utility companies are facing an evolving marketplace of increased competition driven by customer choice and behavior. As technology develops, consumers' demands for access to diverse products and services may increase, creating opportunities for growth with new products and services resulting from emerging technologies.

Research and Development

Investments in TVA's research portfolio are supported through partnership and collaboration with LPCs, EPRI and other research consortiums, the DOE and other federal agencies, national labs, peer utilities, universities, and industry vendors and participation in professional societies.

TVA makes annual investments in science and technological innovation to help meet future business and operational challenges. Each year, TVA's annual research portfolio is updated based on a broad range of operational and industry drivers that help assess key technology gaps, performance issues, or other significant issues that should be addressed through research and development. Core research activities directly support optimization of TVA's generation and transmission assets, air and water quality, energy utilization, and distributed/clean energy integration. TVA has recently launched a research program focused on evaluating the potential to deploy grid-scale battery energy storage technology to optimize utilization of existing TVA generation assets and improve the resiliency of the transmission system. This research will guide future application of battery storage as part of the evolving bulk power system in the region.

In the area of energy utilization, TVA evaluates emerging energy efficiency and load management technologies for market and program readiness. TVA's efforts are directed towards demonstrating and validating the performance, reliability, and consumer acceptance of new efficiency technologies as well as the value of energy efficiency and load management technologies for the consumer, LPCs, and TVA.

TVA is also beginning the assessment of potential electrification programs that may improve resource utilization and reduce environmental impacts (especially in the transportation sector). This assessment includes a multi-stakeholder vision and roadmap effort aimed at identifying the path forward for electric vehicles in Tennessee. This approach provides for broad engagement from industry, government and utilities and could be applied in other states in the TVA service territory. In addition, TVA is continuing its evaluation of potential electric vehicle adoption strategies through coordination of activities with EPRI and industry stakeholders related to operational fleet requirements. The needs of LPCs to provide guidance on matters of plug-in electric vehicle grid integration and readiness for various transportation electrification technologies are also areas of focus.

Research in this area of electrification applications includes compatibility of charging stations to work efficiently with various types of electric vehicles, impact of charging stations on the power grid, refinement of power-system control processes to maximize energy efficiency, and development of smart charging strategies to maximize the potential of electricity to replace petroleum as the transportation fuel of choice.

TVA and its LPCs are engaged in several initiatives related to grid modernization, including research into technologies and applications with the potential to advance an intelligent transmission and distribution system. Smart meter technology has the potential to shift usage patterns away from peak demand times which could change costs significantly. Additionally, an intelligent transmission system would give TVA the ability to nearly instantaneously diagnose problems, make corrections, and engage transmission and generation resources quickly so that power would keep flowing. This could promote reduced emissions, lower energy costs, and add greater flexibility to accommodate

the new consumer-generated sources under TVA's renewable energy programs. See Power Supply and Load Management Resources — Distributed Energy Resources.

Finally, TVA is evaluating smaller, clean power sources that can be aggregated to provide power necessary to meet regular demand. Research efforts into clean DER seek to understand the scope and impact of DER on operations and business economics and to develop strategies for adapting to the evolving electricity landscape in the Tennessee Valley. Of particular interest are investigations into the potential applications of battery storage and modeling existing and expected solar power deployments in the Tennessee Valley to evaluate the full extent of system impacts of those renewable resources. Initial economic analyses have been conducted to identify the value of DER (particularly photovoltaic solar generation) to both TVA and the LPC system. See Item 7, Management's Discussion and Analysis of Financial Condition and Results of Operations — Key Initiatives and Challenges — Distributed Energy Resources.

Flood Control Activities

The Tennessee River watershed has one of the highest annual rainfall totals of any watershed in the U.S., averaging 51 inches per year. During 2018, approximately 60 inches of rain fell in the Tennessee Valley. TVA manages the Tennessee River system in an integrated manner, balancing hydroelectric generation with navigation, flood damage reduction, water quality and supply, and recreation. TVA spills or releases excess water through its dams in order to reduce flood damage to the Tennessee Valley. TVA typically spills only when all available hydroelectric generating turbines are operating at full capacity and additional water still needs to be moved downstream.

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Environmental Stewardship Activities

TVA’s mission includes managing the Tennessee River, its tributaries, and federal lands along the shoreline to provide, among other things, year-round navigation, flood damage reduction, affordable and reliable electricity, and, consistent with these primary purposes, recreational opportunities, adequate water supply, improved water quality, and natural resource protection. There are 49 dams that comprise TVA’s integrated reservoir system. Each dam may also have ancillary structures used to support or assist the main dam's function. The reservoir system provides approximately 800 miles of commercially navigable waterways and also provides significant flood reduction benefits both within the Tennessee River system and downstream on the lower Ohio and Mississippi Rivers. The reservoir system also provides a water supply for residential and industrial customers, as well as cooling water for TVA’s coal-fired plants, combined cycle plants, and nuclear power plants. TVA’s Environmental Policy provides objectives for an integrated approach related to providing cleaner, reliable, and low-cost energy, supporting sustainable economic growth, and engaging in proactive environmental stewardship in a balanced and ecologically sound manner. The Environmental Policy provides additional direction in several environmental stewardship areas, including water resource protection and improvements, sustainable land use, and natural resource management.

TVA serves the people of the TVA region through the integrated management of the Tennessee River system and public lands, which includes approximately 11,000 miles of shoreline, 650,000 surface acres of reservoir water, and 293,000 acres of reservoir lands. TVA accomplishes this mission and supports the objectives of the TVA Environmental Policy through implementation of its natural resources stewardship strategy. Within this strategy, TVA confirms a desire to remain agile, balance competing demands, and be a catalyst for collaboration in order to protect and enhance biological, cultural, and water resources as well as create and sustain destinations for recreation and opportunities for learning and research. As part of the strategy, TVA will also assist water-based community development with technical support, land agreements, and permitting using planning, clear regulations, meaningful guidelines, and consistent enforcement. Additional guidance for carrying out many of TVA's essential stewardship responsibilities is provided in TVA's Natural Resource Plan ("NRP"). TVA is currently updating its Natural Resource Plan. See Item 7, Management’s Discussion and Analysis of Financial Condition and Results of Operations — Key Initiatives and Challenges — Natural Resource Plan.

Economic Development Activities

Economic development, along with energy production and environmental stewardship, is one of the primary statutory purposes of TVA. TVA works with its LPCs, regional, state, and local agencies, and communities to showcase the advantages available to businesses locating or expanding in TVA's service area. TVA's primary economic development goals are to recruit companies to locate in the Tennessee Valley, encourage expansion of existing business and industry that provide quality jobs, and assist communities in the Tennessee Valley with economic growth opportunities. TVA seeks to meet these goals through a combination of initiatives and partnerships designed to provide financial assistance, technical services, industry expertise, and site-selection assistance to new and existing businesses.

Economic development programs developed by TVA include those which focus on supporting all communities including rural and economically distressed communities across the Tennessee Valley by working in close partnership with other federal and state organizations. TVA also jointly offers incentive programs with participating LPCs. These programs offer competitive incentives to existing and potential power customers in certain business sectors that make multi-year commitments to invest in the Tennessee Valley. In addition to financial support for these programs, TVA offers resources to communities and economic developers in the areas of recruitment, leadership development, industrial product preparedness (sites and buildings), planning, and project assistance.

TVA's economic development efforts helped recruit or expand over 211 companies into the TVA service area during 2018. These companies announced capital investments of over $11.3 billion and the expected creation and/or retention

of over 65,400 jobs.

Regulation

Congress

TVA exists pursuant to the TVA Act as enacted by Congress and carries on its operations in accordance with this legislation. Congress can enact legislation expanding or reducing TVA's activities, change TVA's structure, and even eliminate TVA. Congress can also enact legislation requiring the sale of some or all of the assets TVA operates or reduce the U.S.'s ownership in TVA. To allow TVA to operate more flexibly than a traditional government agency, Congress exempted TVA from all or parts of certain general federal laws that govern other agencies, such as federal labor relations laws and the laws related to the hiring of federal employees, the procurement of supplies and services, and the acquisition of land. Other federal laws enacted since the creation of TVA that are applicable to other agencies have been made applicable to TVA, including those related to paying employees overtime and protecting the environment, cultural resources, and civil rights.

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Securities and Exchange Commission

Section 37 of the Securities Exchange Act of 1934 (the "Exchange Act") requires TVA to file with the SEC such periodic, current, and supplementary information, documents, and reports as would be required pursuant to Section 13 of the Exchange Act if TVA were an issuer of a security registered pursuant to Section 12 of the Exchange Act. Section 37 of the Exchange Act exempts TVA from complying with Section 10A(m)(3) of the Exchange Act, which requires each member of a listed issuer's audit committee to be an independent member of the board of directors of the issuer. Since TVA is an agency and instrumentality of the U.S., securities issued or guaranteed by TVA are "exempted securities" under the Securities Act of 1933, as amended (the "Securities Act"), and may be offered and sold without registration under the Securities Act. In addition, securities issued or guaranteed by TVA are "exempted securities" and "government securities" under the Exchange Act. TVA is also exempt from Sections 14(a)-(d) and 14(f)-(h) of the Exchange Act (which address proxy solicitations) insofar as those sections relate to securities issued by TVA, and transactions in TVA securities are exempt from rules governing tender offers under Regulation 14E of the Exchange Act. Also, since TVA securities are exempted securities under the Securities Act, TVA is exempt from the Trust Indenture Act of 1939 insofar as it relates to securities issued by TVA, and no independent trustee is required for these securities.

Federal Energy Regulatory Commission

Under the FPA, TVA is not a "public utility," a term which primarily refers to investor-owned utilities. Therefore, TVA is not subject to the full jurisdiction that FERC exercises over public utilities under the FPA. TVA is, however, an "electric utility" and a "transmitting utility" as defined in the FPA and, thus, is directly subject to certain aspects of FERC's jurisdiction. Under the FPA, for example, TVA (1) must comply with certain standards designed to maintain transmission system reliability, (2) can be ordered to interconnect its transmission facilities with the electrical facilities of independent generators and of other electric utilities that meet certain requirements, (3) can be ordered to transmit wholesale power provided that the order (a) does not impair the reliability of the TVA or surrounding systems and (b) meets the applicable requirements concerning terms, conditions, and rates for service, as well as the anti-cherrypicking provision, (4) is subject to FERC review of the transmission rates and the terms and conditions of service that TVA provides, and (5) is prohibited from (a) reporting false information on the price of electricity sold at wholesale or the availability of transmission capacity to a federal agency with intent to fraudulently affect the data being compiled by the agency and (b) using manipulative or deceptive devices or contrivances in connection with the purchase or sale of power or transmission services subject to FERC's jurisdiction.

In addition, the FPA provides FERC with authority (1) to order refunds of excessive prices on short-term sales (transactions lasting 31 days or less) by all market participants, including TVA, in price gouging situations if such sales are through an independent system operator or regional transmission organization under a FERC-approved tariff, (2) to issue regulations requiring the reporting, on a timely basis, of information about the availability and prices of wholesale power and transmission service by all market participants, including TVA, (3) to investigate electric industry practices, including TVA's operations that are subject to FERC's jurisdiction, and (4) to impose civil penalties of up to $1 million per day for each violation of the provisions of the FPA discussed in the prior paragraph that are applicable to TVA. Criminal penalties may also result from such violations.

Finally, while not required to do so, TVA has elected to implement various FERC orders and regulations pertaining to public utilities on a voluntary basis to the extent that they are consistent with TVA's obligations under the TVA Act.

Nuclear Regulatory Commission

TVA operates its nuclear facilities in a highly regulated environment and is subject to the oversight of the NRC, an independent federal agency that sets the rules that users of radioactive materials must follow. The NRC has broad

authority to impose requirements relating to the licensing, operation, and decommissioning of nuclear generating facilities. In addition, if TVA fails to comply with requirements promulgated by the NRC, the NRC has the authority to impose fines, shut down units, or modify, suspend, or revoke TVA's operating licenses.

Environmental Protection Agency

TVA is subject to regulation by the EPA in a variety of areas, including air quality control, water quality control, and management and disposal of solid and hazardous wastes. See Environmental Matters below.

States

The Supremacy Clause of the U.S. Constitution prohibits states, without federal legislative consent, from regulating the manner in which the federal government conducts its activities. As a federal agency, TVA is exempt from regulation, control, and taxation by states except in certain areas where Congress has clearly made TVA subject to state regulation. See Environmental Matters below.

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Other Federal Entities

TVA’s activities and records are also subject to review to varying degrees by other federal entities, including the Government Accountability Office and the Office of Management and Budget ("OMB"). There is also an Office of the Inspector General which reviews TVA’s activities and records.

Taxation and Tax Equivalents

TVA is not subject to federal income taxation. In addition, neither TVA nor its property, franchises, or income is subject to taxation by states or their subdivisions. The TVA Act, however, does require TVA to make tax equivalent payments to states and counties in which TVA conducts power operations or in which TVA has acquired properties previously subject to state and local taxation. The total amount of these payments is five percent of gross revenues from the sale of power during the preceding year excluding sales or deliveries to other federal agencies and off-system sales with other utilities, with a provision for minimum payments under certain circumstances. Except for certain direct payments TVA is required to make to counties, distribution of tax equivalent payments within a state is determined by individual state legislation.

Environmental Matters

TVA's activities, particularly its power generation activities, are subject to comprehensive regulation under environmental laws and regulations relating to air pollution, water pollution, and management and disposal of solid and hazardous wastes, among other issues. Emissions from all TVA-owned and operated units (including small combustion turbine units of less than 25 MWs) have been reduced from historic peaks. Emissions of nitrogen oxide ("NO_x") have been reduced by 94 percent below peak CY 1995 levels and emissions of sulfur dioxide ("SO_2") have been reduced by 98 percent below CY 1977 levels through CY 2017. For CY 2017, TVA’s emission of carbon dioxide ("CO_2") from its sources was 56 million tons, a 47 percent reduction from CY 2005 levels. This includes 3,049 tons from units rated at less than 25 MWs. TVA intends to continue reporting CO_2 emissions on a calendar year basis to align with the EPA's reporting requirements and remain consistent with TVA's prior disclosures.

Clean Air Act

The CAA establishes a comprehensive program to protect and improve the nation’s air quality and control sources of air pollution. The major CAA programs that affect TVA’s power generation activities are described below.

National Ambient Air Quality Standards. The CAA requires the EPA to set National Ambient Air Quality Standards ("NAAQS") for certain air pollutants. The EPA has done this for ozone, particulate matter ("PM"), SO_2, nitrogen dioxide ("NO_2"), carbon monoxide, and lead. Over the years, the EPA has made the NAAQS more stringent. Each state must develop a plan to be approved by the EPA for achieving and maintaining NAAQS within its borders. These plans impose limits on emissions from pollution sources, including TVA fossil fuel-fired plants. Areas meeting a NAAQS are designated as attainment areas. Areas not meeting a NAAQS are designated as non-attainment areas, and more stringent requirements apply in those areas, including stricter controls on industrial facilities and more complicated permitting processes. TVA fossil fuel-fired plants can be impacted by these requirements. All TVA generating units are located in areas designated as in attainment with NAAQS.

Cross-State Air Pollution Rule. The EPA issued the Cross-State Air Pollution Rule ("CSAPR") in July 2011, requiring several states in the eastern U.S. to improve air quality relative to the CY 1997 ozone NAAQS and the CY 1997 and CY 2006 fine particle NAAQS by reducing power plant emissions that contribute to pollution in other states. CSAPR replaced the Clean Air Interstate Rule ("CAIR"), a similar but less stringent rule. The U.S. Court of Appeals for the District of Columbia Circuit ("D.C. Circuit") vacated CSAPR before implementation began, but in April 2014, the

U.S. Supreme Court ("Supreme Court") reversed the D.C. Circuit's decision and remanded CSAPR back to the D.C. Circuit. In October 2014, the D.C. Circuit granted the EPA's motion to restore CSAPR but delayed the compliance deadlines by three years. Under the revised compliance deadlines, Phase I emission reductions in SO_2 and NO_x became effective on January 1, 2015, and were followed by Phase II reductions on May 1, 2017. TVA complies with CSAPR aided by significant prior reductions in SO_2 and NO_x emissions and planned future reductions.

On September 7, 2016, the EPA issued an update to CSAPR ("CSAPR Update Rule") to address cross-state pollution relative to the CY 2008 ozone NAAQS, and also to respond to a July 2015 remand of the CSAPR emission budgets for certain states by the D.C. Circuit. In this update, the EPA implemented more stringent Phase II reductions for NO_x that become effective on May 1, 2017. TVA has not had and does not currently anticipate significant changes to its operations based on the CSAPR Update Rule.

Mercury and Air Toxics Standards for Electric Utility Units. The D.C. Circuit upheld the Mercury and Air Toxics Standards ("MATS") rule on April 15, 2014. In June 2015, however, the U.S. Supreme Court left the rule in place but remanded it back to the D.C. Circuit, finding that the EPA was required to consider cost before deciding whether the regulation of hazardous air pollutants emitted from steam electric utilities was appropriate and necessary. In response to the Supreme Court's remand, the EPA published the final Supplemental Finding That It is Appropriate and Necessary to Regulate Hazardous Air Pollutants from Coal- and Oil-Fired Electric Utility Steam Generating Units in April 2016. Several groups have filed petitions with the D.C. Circuit challenging the EPA’s determination. The MATS rule remains in effect while these challenges are pending,

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and TVA's MATS compliance strategy will not be affected by these challenges. On October 5, 2018, the EPA submitted a pre-publication proposal to reconsider the MATS rule to the OMB for interagency review. Until the proposed reconsideration is published and finalized, specific impacts to TVA cannot be determined.

Environmental Agreements. See Note 21 — Legal Proceedings — Environmental Agreements for a discussion of the Environmental Agreements, which discussion is incorporated herein by reference.

Acid Rain Program. Congress established the Acid Rain Program to achieve reductions in emissions of SO_2 and NO_x, the primary pollutants implicated in the formation of acid rain. The program includes a cap-and-trade emission reduction program for SO_2 emissions from power plants. TVA continues to reduce SO_2 and NO_x emissions from its coal-fired plants, and the SO_2 allowances allocated to TVA under the Acid Rain Program are sufficient to cover the operation of its coal-fired plants. In the TVA service area, the limitations imposed on SO_2 and NO_x emissions by the CSAPR program are more stringent than the Acid Rain Program. Therefore, TVA forecasts that the Acid Rain Program will have no impact on TVA other than administrative reporting.

Regional Haze Program. In June 2005, the EPA issued the Clean Air Visibility Rule, amending its CY 1999 regional haze rule, which had established timelines for states to improve visibility in national parks and wilderness areas throughout the U.S. with a target of reaching no anthropogenic impacts on visibility in these areas by CY 2064. One requirement under the amended rule is that certain types of older existing sources are required to install best available retrofit technology. No additional controls or lower operating limits are required for any TVA units to meet best available retrofit technology requirements. On January 10, 2017, the EPA published the final rule "Protection of Visibility: Amendments to Requirements for State Plans." The rule changed some of the requirements for Regional Haze State Implementation Plans ("Regional Haze SIPs"). TVA does not expect significant impacts to its operations from these changes, but specific impacts cannot be determined until future Regional Haze SIPs are developed.

Opacity. Opacity, or visible emissions, measures the denseness (or color) of power plant plumes and has traditionally been used by states as a means of monitoring good maintenance and operation of particulate control equipment. Under some conditions, retrofitting a unit with additional equipment to better control SO_2 and NO_x emissions can adversely affect opacity performance, and TVA and other utilities have addressed this issue. The evaluation of utilities' compliance with opacity requirements is coming under increased scrutiny, especially during periods of startup, shutdown, and malfunction. Historically, state implementation plans developed under the CAA typically excluded periods of startup, shutdowns, and malfunctions, but on June 12, 2015, the EPA finalized a rule to eliminate such exclusions. The EPA rule required states to modify their implementation plans by November 12, 2016. Kentucky, Tennessee, and Mississippi submitted implementation plans, but Alabama has not. Environmental petitioners and several states filed petitions for judicial review of the EPA final rule before the D.C. Circuit. On April 24, 2017, the D.C. Circuit, at the request of the new EPA Administrator, ordered this litigation to be held in abeyance pending the EPA's review to determine whether to reconsider all or part of the rule. TVA does not expect significant impacts from these rule changes.

Petition to Expand the Ozone Transport Region. On December 9, 2013, eight of the twelve states that make up the Ozone Transport Region ("OTR") submitted a petition, pursuant to section 176A(a) of the CAA, requesting the EPA to add nine states, including Kentucky and Tennessee, to the OTR. The EPA failed to act on the petition within the 180-day period provided under the CAA. On October 6, 2016, six of the eight states filing the petition sued the EPA in the U.S. District Court for the Southern District of New York, asking the court to require the EPA to act on the petition by a date certain. In response to this lawsuit, the EPA published, on January 19, 2017, a notice in the Federal Register proposing to deny the petition on the basis that the CAA provides other options, such as the use of the "good neighbor provision" in Section 110 and the authority granted states under Section 126 to petition the EPA Administrator to set emission limits, to address the impact of interstate air pollution. The EPA also states that its CSAPR Update Rule is a significant step to control states' emission reduction obligations under Section 110 to meet

the CY 2008 ozone NAAQS. The comment period on this proposal closed on May 15, 2017. On October 27, 2017, the EPA denied the petition. On December 22, 2017, the eight petitioning states filed in the D.C. Circuit a petition for judicial review of the EPA’s denial of the petition to add states to the OTR. Until the court issues its ruling, it is not possible to determine potential impacts to TVA.

Kentucky Startup/Shutdown Regulations. On April 1, 2018, the Kentucky Division for Air Quality published final revised startup/shutdown regulations for new and existing indirect heat exchangers. Shawnee Fossil Plant ("Shawnee") and Paradise Fossil Plant ("Paradise") have boilers which will be subject to these rules when incorporated into their air permits. The revised rules do not significantly impact operations at Shawnee or Paradise.

Kentucky State Implementation Plan to Address Downwind Ozone Impacts. Emissions from utility units in Kentucky that contribute to ozone are already limited by the CSAPR Update Rule and are declining. On February 28, 2018, Kentucky submitted a proposed revision to its state implementation plan (“SIP”) to address downwind state ozone impacts. The proposed SIP did not require emission reductions beyond current requirements, and on July 13, 2018, the EPA approved Kentucky's revised SIP. No additional emission reductions are required by the SIP for TVA's Kentucky generating units.

New York Petition to Address Impacts from Upwind High Emitting Sources. On March 12, 2018, the State of New York filed a petition with the EPA under Section 126(b) of the CAA to address ozone impacts on New York from the NO_x emissions

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from sources emitting at least 400 tons of NO_x in CY 2017 from nine states including Kentucky. The New York petition requests that the EPA require daily NO_x limits for utility units with SCRs such as Paradise Unit 3 and emission reductions from utility units without SCRs such as Shawnee Units 2, 3 and 5-9. Kentucky utility unit NO_x emissions are already limited by the CSAPR Update Rule and are declining, and current EPA modeling projects no additional requirements to reduce Kentucky NO_x emissions are necessary. Until the EPA responds to New York's Section 126(b) petition, it is not possible to determine potential impacts on TVA's Paradise and Shawnee units.

Proposed Affordable Clean Energy Rule. On December 28, 2017, the EPA published an advanced notice of proposed rulemaking ("ANPR") to solicit information for a possible future rule: "State Guidelines for Greenhouse Gas Emissions from Existing Electric Utility Generating Units." This possible future rule would be a replacement rule for the Clean Power Plan ("CPP") should it be repealed or overturned. The ANPR solicited input on a broad range of issues. On August 21, 2018, the EPA proposed the Affordable Clean Energy ("ACE") rule to replace the CPP. The proposed rule sets guidelines requiring states to determine greenhouse gas ("GHG") emission standards for TVA's existing coal-fired units based on efficiency improvements that can be achieved at reasonable cost. TVA operates coal-fired units in Tennessee and Kentucky. Impacts to these units cannot be determined until the EPA finalizes the ACE rule, states submit to the EPA their SIPs implementing guidelines in the ACE rule, and the EPA approves these SIPs. The proposed rule allows states three years to submit their SIPs, and allows the EPA one year for approval.

New Source Performance Standards. On October 23, 2015, the EPA finalized New Source Performance Standards for carbon emissions from new, modified, and reconstructed power plants. These standards apply to two types of fossil fuel-fired sources: (1) stationary combustion turbines, generally firing natural gas, and (2) electric utility steam generating units, generally firing coal. These standards reflect the degree of emission limitation achievable through the application of the best system of emission reduction ("BSER") that the EPA has determined to be adequately demonstrated for each type of source. These standards apply to the new TVA combined-cycle plants at the Paradise and Allen sites. The design of these plants enables them to comply with the new standards.

Petitions were filed for judicial review of the New Source Performance Standards for carbon emissions. On August 10, 2017, the D.C. Circuit issued an order, at the request of the EPA Administrator, holding the case in abeyance pending the EPA's review of the New Source Performance Standards.

Maryland Petition to Address Impacts from Upwind Electric Generating Units. On September 27, 2017, the State of Maryland filed a lawsuit against the EPA for failing to act within 60 days on Maryland's petition under Section 126 of the CAA to address ozone impacts on Maryland from the NO_x emissions of 36 electric generating units, including TVA's Paradise coal-fired Unit 3. On October 4, 2017, a group of seven environmental advocacy groups filed a similar complaint against the EPA. At issue in Maryland's petition are alleged excessive NQ emissions from the 36 electric generating units as a result of SCR units not being operated continuously. Paradise coal-fired Unit 3 is equipped with a SCR that TVA continuously operates to the greatest extent technically practicable in order to minimize NO_x emissions. On October 5, 2018, the EPA denied Maryland's petition in light of the existing regulations already addressing emissions from the generating units identified in the petition. On October 15, 2018, the State of Maryland filed a petition for judicial review with the D.C. Circuit asking the court to review the EPA's decision.

Climate Change

Executive Actions. On March 28, 2017, President Trump issued Executive Order ("EO") 13783, "Promoting Energy Independence and Economic Growth." The EO reversed or altered many actions taken by the federal government in the last four years of the Obama Administration to address climate change and mandates that federal agencies review existing regulations and actions that potentially burden energy development and use. Several EOs, policy statements, and reports that established climate change objectives were rescinded or revoked. EO 13783 did not mandate that the EPA reconsider its finding under the CAA that GHG emissions cause climate change and therefore endanger public

health and the environment.

While EO 13783 requires review of all agency actions that potentially burden the safe, efficient development of domestic energy resources, the final specific requirements and impacts from implementation of this EO are not possible to predict at this time. It is likely that there will be some delay in the development of future GHG reduction requirements.

On May 17, 2018, EO 13834, "Efficient Federal Operations", was signed. EO 13834 emphasizes meeting statutory requirements and gives agencies greater flexibility and discretion to decide how best to improve operations in order to “optimize energy and environmental performance, reduce waste, and cut costs.” It also calls on the White House Council of Environmental Quality to streamline pre-existing environmental orders by “refocusing agencies on cost-effectively meeting mandates and goals” established by law. The order seeks to consolidate requirements related to energy and water efficiency, high performance buildings, renewable energy consumption, and federal vehicle fleet management. TVA consistently seeks to improve its operations in order to optimize energy and environmental performance and does not anticipate significant changes in its planning or operations as a result of the new EO.

International Accords. On September 3, 2016, the U.S. formally accepted the Paris Agreement. The agreement met the threshold of at least 55 countries that account for at least 55 percent of global GHG emissions and formally entered into

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force on November 4, 2016. The durability of the Paris Agreement commitments is uncertain after the President's announcement on June 1, 2017, that the U.S. would withdraw from the agreement. Under the terms of the agreement, the earliest possible effective date for withdrawal by the U.S. is November 4, 2020, four years after the agreement came into effect. Future U.S. GHG regulation designed to meet the Paris Agreement goals could impact TVA in ways that cannot be determined at this time.

In response to President Trump's Paris withdrawal announcement, 17 states have formed the U.S. Climate Alliance, a bipartisan coalition of governors committed to reducing GHG emissions consistent with the goals of the Paris Agreement. North Carolina is the only state in the TVA region that is a U.S. Climate Alliance member. Among other commitments, each state commits to implement policies that advance the goals of the Paris Agreement, aiming to reduce GHG emissions by at least 26-28 percent below CY 2005 levels by CY 2025 and to accelerate new and existing policies to reduce carbon pollution and promote clean energy deployment at the state and federal level. In June 2017, America's Pledge was announced as a collaborative opportunity for these states to work with U.S. cities and businesses representing more than half of the U.S. economy. In September 2018, America's Pledge released its economy-wide policy analysis with recommendations of how states, cities, businesses, and other stakeholders can influence U.S. decarbonization. It is premature to determine potential impacts to TVA.

Litigation. In addition to legislative activity, climate change issues have been the subject of a number of lawsuits, including lawsuits against TVA. See Note 21 for additional information.

Indirect Consequences of Regulation or Business Trends. Legal, technological, political, and scientific developments regarding climate change may create new opportunities and risks. The potential indirect consequences could include an increase or decrease in electricity demand, increased demand for generation from alternative energy sources, and subsequent impacts to business reputation and public opinion. See Power Supply and Load Management Resources above.

Physical Impacts of Climate Change. TVA manages the potential effects of climate change on its mission, programs, and operations within its environmental management processes. The goal of the adaptation planning process is to ensure TVA continues to achieve its mission and program goals and to operate in a secure, effective, and efficient manner in a changing climate by integrating climate change adaptation efforts in coordination with state and local partners, tribal governments, and private stakeholders. TVA's Climate Change Adaptation Plan was last updated in June 2018.

Actions Taken by TVA to Reduce GHG Emissions. TVA has reduced GHG emissions from both its generation stations and its operations. As discussed earlier in this Item 1, Business, recent TVA Board actions have focused on TVA's plan to balance its coal-fired generation by increasing its nuclear capacity, modernizing its hydroelectric generation system, increasing natural gas-fired generation, installing emission control equipment on certain of its coal-fired units, increasing its purchases of renewable energy, and investing in energy efficiency initiatives to reduce energy use in the Tennessee Valley. Additionally, TVA has invested to reduce energy use in its operations. The combination of more stringent environmental regulations, lower natural gas prices, and lower demand for energy across the Tennessee Valley has reduced the utilization of coal-fired generation. These factors have resulted in lower CO_2 emissions from the TVA system.

Renewable/Clean Energy Standards

Twenty-nine states and the District of Columbia have established enforceable or mandatory requirements for electric utilities to generate a certain amount of electricity from renewable sources. One state within the TVA service area, North Carolina, has a mandatory renewable standard that, while not applying directly to TVA, does apply to TVA's LPCs serving retail customers in that state. TVA's policy is to provide compliance assistance to any distributor of

TVA power, and TVA is providing assistance to the covered LPCs that sell TVA power in North Carolina. Likewise, the Mississippi Public Service Commission adopted an energy efficiency rule applying to electric and natural gas providers in the state, and TVA is supplying information on participation in TVA's energy efficiency programs to support the covered Mississippi LPCs.

Water Quality Control Developments

Cooling Water Intake Structures. On May 19, 2014, the EPA released a final rule under Section 316(b) of the Clean Water Act relating to cooling water intake structures ("CWIS") for existing power generating facilities. The rule requires changes in CWIS used to cool the vast majority of coal, gas, and nuclear steam-electric generating plants and a wide range of manufacturing and industrial facilities in the U.S. The final rule requires CWIS to reflect the best technology available for minimizing adverse environmental impacts, primarily by reducing the amount of fish and shellfish that are impinged or entrained at a cooling water intake structure. These new requirements will potentially affect a number of TVA’s fossil- and nuclear-fueled facilities and will likely require capital upgrades to ensure compliance. Most TVA facilities are projected to require retrofit of CWIS with “fish-friendly” screens and fish return systems to achieve compliance with the new rule. The rule is being implemented through permits issued under the National Pollutant Discharge Elimination System ("NPDES") in Section 402 of the Clean Water Act. State agencies administer the NPDES permit program in most states including those in which TVA’s facilities are located. In addition, the responsible state agencies must provide all permit applications to the U.S. Fish & Wildlife Service for a 60-day review prior to public notice and an opportunity to comment during the public notice. As a result, the permit may include requirements for additional studies of threatened and endangered species arising from U.S. Fish & Wildlife Service

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comments and may require additional measures be taken to protect threatened and endangered species and critical habitats directly or indirectly related to the plant cooling water intake. TVA's review of the final rule indicates that the rule offers adequate flexibility for cost-effective compliance. The required compliance timeframe is linked to plant specific NPDES permit renewal cycles (i.e., technology retrofits), and compliance is expected to be required in the CYs 2022-2024 timeframe.

Hydrothermal Discharges. The EPA and many states continue to focus regulatory attention on potential effects of hydrothermal discharges. Many TVA plants have variances from thermal standards under Section 316(a) of the Clean Water Act that are subject to review as NPDES permits are renewed. Specific data requirements in the future will be determined based on negotiations between TVA and regulators. If plant thermal limits are made more stringent, TVA may have to install cooling towers at some of its plants and operate installed cooling towers more often. This could result in a substantial cost to TVA.

Steam-Electric Effluent Guidelines. On November 3, 2015, the EPA published a final rule to revise the existing steam- electric effluent limitation guidelines ("ELGs") that updates the technology-based water discharge limitations for power plants nationwide. The CY 2015 ELGs establish more stringent performance standards for existing and new sources that will require power plants that generate more than 50 MW to regulate discharges of toxic pollutants from seven primary wastewater streams. The primary impact for TVA is on the operation of existing and any potential new coal-fired generation facilities. The rule has the potential to impact long-term investment decisions being made relative to the long-term compliance and operability of TVA coal-fired units. Compliance with new requirements is required in the CYs 2018-2023 timeframe and will necessitate major upgrades to wastewater treatment systems at all coal-fired plants. Dry fly ash handling is mandated by the rule. The rule also requires either dry bottom ash handling systems or "no discharge" recycle of bottom ash transport waters. In addition, new technology-based limits on flue gas desulfurization ("FGD") wastewater require primary physical or chemical treatment and secondary biological treatment to meet extremely low limits for arsenic, mercury, and selenium. On April 12, 2017, in response to Petitions for Reconsideration by the Utility Water Act Group and the Small Business Administration, the EPA Administrator announced his decision to reconsider the ELG rule. The EPA also proposed a rule to postpone the rule's compliance deadlines pending the EPA's reconsideration of the rule.

On August 11, 2017, the EPA Administrator announced his decision to conduct a rulemaking to potentially revise the new, more stringent effluent limitations that apply to bottom ash transport water and FGD wastewater in the CY 2015 rule. A legal challenge of the rule is currently pending before the U.S. Court of Appeals for the Fifth Circuit. At the EPA's request, the court on August 22, 2017, entered an order severing and holding in abeyance the litigation related to the portions of the CY 2015 rule concerning bottom ash transport water, FGD wastewater, and gasification wastewater (which is not applicable to TVA) pending further agency action. Thus, the litigation is indefinitely on hold as to the bottom ash transport water and FGD wastewater claims until the EPA's further rulemaking has concluded. The litigation will continue as to the other claims.

On September 18, 2017, the EPA published a final rule postponing certain compliance/applicability dates to provide the EPA time to review and revise, as necessary, the new and stringent ELGs previously established for FGD wastewater and bottom ash transport water. The EPA pushed back the compliance dates for these two wastestreams from the CYs 2018-2023 timeframe to CYs 2020-2023. Other requirements and applicability dates of the rule for fly ash transport water, flue gas mercury control wastewater, and gasification wastewater remain in effect. As a result of these developments, it is not possible to predict the changes in the rule and TVA's associated expenditures to attain compliance.

With regard to its Cumberland Fossil Plant ("Cumberland"), TVA contends the ELG rulemaking did not appropriately consider available data that could affect these national limits as they applied at Cumberland given its unique "once-through" scrubber design. TVA has been working with the State of Tennessee and the EPA in an effort to address

this issue. Compliance with the rule at Cumberland without modification to address the unique design could cause TVA to incur disproportionately high costs at Cumberland or experience other operational outcomes that TVA cannot predict at this time. The EPA’s reconsideration of the CY 2015 rule is likely to impact this issue at Cumberland and could result in TVA’s request needing revision or being unnecessary.

Other Clean Water Act Requirements. As is the case in other industrial sectors, TVA and other utilities are also facing more stringent requirements related to the protection of wetlands, reductions in storm water impacts from construction activities, new water quality criteria for nutrients and other pollutants, new wastewater analytical methods, and regulation of pesticide discharges.

Cleanup of Solid and Hazardous Wastes

Liability for releases and cleanup of hazardous substances is imposed under the federal Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), and other federal and parallel state statutes. In a manner similar to many other industries and power systems, TVA has generated or used hazardous substances over the years.

TVA Sites. TVA operations at some of its facilities have resulted in contamination that TVA is addressing including at TVA's Environmental Research Center ("ERC") at Muscle Shoals, Alabama. At September 30, 2018, TVA’s estimated liability for cleanup and similar environmental work for those sites for which sufficient information was available to develop a cost estimate is approximately $12 million and was included in Accounts payable and accrued liabilities and Other long-term liabilities on the

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consolidated balance sheet. In addition, the ERC has an active groundwater monitoring program as part of a Resource Conservation and Recovery Act ("RCRA") Corrective Action Permit.

Non-TVA Sites. TVA is aware of alleged hazardous-substance releases at certain non-TVA areas for which it may have some liability. See Note 21 — Contingencies — Environmental Matters.

Coal Combustion Residuals. The EPA published its final rule governing coal combustion residuals ("CCR") on April 17, 2015. The rule regulates CCRs as nonhazardous waste under Subtitle D of the RCRA. While states may adopt the rule's requirements into their regulatory programs, the rule does not require states to adopt the requirements, nor does it enable states to seek to directly enforce the rule through delegated permitting programs. The rule provides for self-implementation by utilities and allows enforcement through citizen suits in federal court. Although the rule became effective October 19, 2015, certain provisions have later effective dates. TVA’s review of the final rule indicates that the rule offers adequate flexibility for compliance. See Item 7, Management's Discussion and Analysis of Financial Condition and Results of Operations — Key Initiatives and Challenges — Generation Resources — Coal Combustion Residual Facilities for a discussion of the impact on TVA’s operations, including the cost and timing estimates of related projects.

On December 16, 2016, President Obama signed the Water Infrastructure Improvements for the Nation Act ("WIIN Act"), which provides a path to CCR regulation implementation through state or federal-based permitting as an alternative to self-implementation and enforcement through citizen suits in federal courts. Pending adoption of state permitting programs in states in TVA’s service area, TVA does not anticipate any impact on the design or implementation timeframe for TVA’s ongoing CCR activities at this time.

In May 2017, industry petitioners asked the EPA to reconsider the CCR rule and to incorporate new flexibility provided by the WIIN Act – specifically, authority to make site-specific, risk-based decisions on implementing the federal criteria and to postpone upcoming regulatory deadlines during the new rulemaking. The EPA had previously agreed through settlement to revisit several elements of the CCR rule, so it will already be re-opening the rule. On September 14, 2017, the EPA announced plans to address the request to revisit key parts of its CY 2015 CCR rule. Subsequently, the EPA issued a proposed rule on March 15, 2018, to amend portions of the CCR rule. The EPA also noted that the March 15 action was the first of two phases of amendments planned for the CCR rule. On July 17, 2018, the EPA issued a final rule which included a subset of the previously proposed changes which provided additional flexibility and an extension of certain deadlines to align the rule with the previously issued Steam-Electric Effluent Guidelines rule. In addition, on September 18, 2017, the EPA filed a motion to hold the CCR litigation in abeyance and to postpone oral argument in the case while it reconsiders the CCR rule. The D.C. Circuit denied the EPA's motion. In an August 21, 2018, opinion, the court vacated and remanded to the EPA for additional consideration sections of the CY 2015 CCR rule that allow for continued operation of unlined impoundments in certain situations and that exempt inactive impoundments at inactive facilities from regulation. As a result of these developments, it is not possible to predict changes to the CCR rule and potential impacts on TVA.

In August 2015, the Tennessee Department of Environment and Conservation ("TDEC") issued an order that (1) allowed TDEC to oversee TVA’s implementation of the EPA’s CCR rule and (2) required TVA to assess CCR contamination risks at seven of TVA’s eight coal-fired plants in Tennessee and to remediate any unacceptable risks. The TDEC order does not allege that TVA is violating any CCR regulatory requirements nor does it assess TVA penalties. The TDEC order sets out an iterative process through which TVA and TDEC will identify and evaluate any CCR contamination risks and, if necessary, respond to such risks.

On August 4, 2017, the U.S. District Court for the Middle District of Tennessee ordered TVA to excavate the CCR materials from its CCR facilities at Gallatin and move them to a lined facility. A panel of the Sixth Circuit reversed the decision on September 24, 2018. The plaintiffs have petitioned for a rehearing. See Note 8 — Background — Lawsuit

Brought by TDEC and Lawsuit Brought by TSRA and TCWN and Note 21 — Legal Proceedings — Cases Involving Gallatin Fossil Plant CCR Facilities.

Groundwater Contamination. Environmental groups and state regulatory agencies are increasing their attention on alleged groundwater contamination associated with CCR management activities. Seven of TVA's coal-fired plants are in some level of state regulatory groundwater assessment. Four of those plants (Colbert Fossil Plant ("Colbert"), Gallatin, Cumberland, and Shawnee) have investigations beyond monitoring and reporting. Five of those (Gallatin, Shawnee, Paradise, Johnsonville Fossil Plant ("Johnsonville"), and Widows Creek Fossil Plant ("Widows Creek")) have groundwater remediation monitoring with state regulatory involvement. As a result of these assessments and increased attention, TVA may have to change how it manages CCRs at some of its plants, potentially resulting in higher costs. See Item 7, Management's Discussion and Analysis of Financial Condition and Results of Operations — Key Initiatives and Challenges — Generation Resources — Coal Combustion Residual Facilities, Note 8 — Background — Lawsuit Brought by TDEC and Lawsuit Brought by TSRA and TCWN and Note 21 — Legal Proceedings — Cases Involving Gallatin Fossil Plant CCR Facilities.

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Environmental Investments

From 1970 to 2018, TVA spent approximately $6.7 billion on controls to reduce emissions from its coal-fired power plants. In addition, TVA has reduced emissions by idling or retiring coal-fired units and relying more on cleaner energy resources including natural gas and nuclear generation.

SO_2 Emissions and NOx Emissions. To reduce SO_2 emissions, TVA operates scrubbers on 19 of its coal-fired units and switched to lower-sulfur coal at 13 coal-fired units. To reduce NOx emissions, TVA operates SCRs on 19 coal-fired units, operates low-NOx burners or low-NOx combustion systems on 19 units, operates over-fire air on one cyclone unit, optimized combustion on six units, and operates NO_x control equipment year round when units are operating (except during start-up, shutdown, and maintenance periods). TVA has also retired 33 of 59 coal-fired units. Except for seven units at Shawnee, the remaining coal-fired units will have scrubbers and SCRs. See Power Supply and Load Management Resources — Coal-Fired above.

Particulate Emissions. To reduce particulate emissions of air pollutants, TVA has equipped all of its coal-fired units with scrubbers, mechanical collectors, electrostatic precipitators, and/or bag houses.

There could be additional material costs if further reductions of GHGs, including CO_2, are mandated by legislative, regulatory, or judicial actions and if more stringent emission reduction requirements for conventional pollutants are established. These costs cannot reasonably be predicted at this time because of the uncertainty of these actions. A number of emerging EPA regulations establishing more stringent air, water, and waste requirements could result in significant changes in the structure of the U.S. power industry, especially in the eastern half of the country.

TVA currently anticipates spending significant amounts on environmental projects through 2025, including investments in new clean energy generation including nuclear and renewables to reduce TVA's overall environmental footprint. TVA environmental project expenditures also result from coal-fired plant decommissioning and from effective ash management modernization. Based on TVA's decisions regarding certain coal-fired units under the Environmental Agreements, the amount and timing of expenditures could change. See Power Supply and Load Management Resources — Coal-Fired above and Estimated Required Environmental Expenditures below.

Estimated Required Environmental Expenditures

The following table contains information about TVA’s current estimates on projects related to environmental laws and regulations.

Estimated Potential Environmental Expenditures[1][2]
At September 30, 2018
(in millions)

	2019	2020	Thereafter[3]	Total
Coal combustion residual conversion program[4]	$355	$318	$ 505	$1,178
Clean air control projects[5]	27	26	110	163
Clean Water Act requirements[6]	46	33	387	466

Notes
(1) These estimates are subject to change as additional information becomes available and as regulations change.
(2) These estimates include $316 million, $237 million, and $583 million for the remainder of 2019, 2020, and thereafter, respectively, in capital expenditures.
(3) See Note 21 — Commitments and Contingencies.
(4) Includes costs associated with pond closures, conversion of wet to dry handling, and landfill activities. TVA is continuing to evaluate the rules and their impact on its operations, including the cost and timing estimates of related

projects. Includes approximately $159 million for Gallatin projects that are part of the original activities scheduled in TVA's CCR Conversion Program and excludes costs resulting from any new requirements related to the Gallatin lawsuits. See Item 7 Management's Discussion and Analysis of Financial Condition and Results of Operations — Key Initiatives and Challenges — Generation Resources — Coal Combustion Residual Facilities and Note 8.

(5) Includes air quality projects that TVA is currently performing to comply with existing air quality regulations, but does not include any projects that may be required to comply with potential GHG regulations or transmission upgrades.

(6) Includes projects that TVA is currently planning to comply with revised rules under the Clean Water Act regarding CWIS and ELGs for steam electric power plants.

Employees

On September 30, 2018, TVA had 10,023 employees, of whom 3,402 were trades and labor employees. Neither the federal labor relations laws covering most private sector employers nor those covering most federal agencies apply to TVA. However, the TVA Board has a long-standing policy of acknowledging and dealing with recognized representatives of its employees, and that policy is reflected in long-term agreements to recognize the unions (or their successors) that represent TVA employees. Federal law prohibits TVA employees from engaging in strikes against TVA.

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ITEM 1A. RISK FACTORS

The risk factors described below, as well as the other information included in this Annual Report, should be carefully considered. Risks and uncertainties described in these risk factors could cause future results to differ materially from historical results as well as from the results anticipated in forward-looking statements. Although the risk factors described below are the ones that TVA considers significant, additional risk factors that are not presently known to TVA or that TVA presently does not consider significant may also impact TVA's business operations. See Forward Looking Information above for a description of some matters that could affect the below risks or generate new risks. Although the TVA Board has the authority to set TVA's own rates and may mitigate some risks by increasing rates, there may be instances in which TVA would be unable to partially or completely eliminate one or more of these risks through rate increases over a reasonable period of time or at all. Accordingly, the occurrence of any of the following could have a material adverse effect on TVA's cash flows, results of operations, and financial condition.

For ease of reference, the risk factors are presented in four categories: (1) regulatory, legislative, and legal risks, (2) operational risks, (3) financial, economic, and market risks, and (4) general business risks.

REGULATORY, LEGISLATIVE, AND LEGAL RISKS

New laws, regulations, or administrative orders, or congressional action or inaction, may negatively affect TVA's cash flows, results of operations, and financial condition, as well as the way TVA conducts its business.

Because TVA is a corporate agency and instrumentality established by federal law, it may be affected by a variety of laws, regulations, and administrative orders that do not affect other electric utilities. For example, federal legislation may expand or reduce TVA's activities, change its governance structure, require TVA to sell some or all of the assets that it operates, require TVA to take certain other operational or regulatory actions, reduce or eliminate the U.S.'s ownership of TVA, or even liquidate TVA. Additionally, Congress could act, or fail to take action, on various issues that may result in impacts to TVA, including but not limited to action or inaction related to the national debt ceiling or automatic spending cuts in government programs.

Although it is difficult to predict exactly how new laws, regulations, or administrative orders or congressional action or inaction may impact TVA, some of the possible effects are described below.

TVA may become subject to additional environmental regulation.

New environmental laws, regulations, or orders may become applicable to TVA or the facilities it operates, and existing environmental laws or regulations may be revised or reinterpreted in a way that adversely affects TVA, including substantially increasing TVA's cost of operations or requiring significant capital expenditures. Possible areas of future laws or regulations include, but are not limited to, GHGs, CCRs, water quality, renewable energy portfolio standards, and natural gas production and transmission.

TVA's ability to control or allocate funds could be restricted.

Other federal entities may attempt to restrict TVA's ability to access or control its funds that are on deposit in TVA’s account in the U.S. Treasury. For example, should the U.S. Treasury approach its debt ceiling, the U.S. Treasury might, as part of an effort to control cash disbursements, attempt to require TVA to receive approval before disbursement of funds from TVA’s U.S. Treasury account. Additionally, the OMB might, in the event that automatic spending cuts go into effect, attempt to require TVA to reduce its budget by a specified percentage (although the legal applicability of such a situation to TVA would depend upon the wording of the legislation making the automatic spending cuts). Such attempts to restrict TVA's ability to control or allocate funds in those specific types of situations

could adversely affect its cash flows, results of operations, and financial condition, its relationships with creditors, vendors, and counterparties, the way it conducts its business, and its reputation.

TVA may lose its protected service territory.

TVA's service area is defined primarily by provisions of law and long-term contracts. The fence limits the region in which TVA or LPCs which distribute TVA power may provide power. The anti-cherrypicking provision limits the ability of others to use the TVA transmission system for the purpose of serving customers within TVA's service area. State service territory laws limit unregulated third parties' ability to sell electricity to consumers. All wholesale power contracts between TVA and LPCs are all requirements contracts. However, other utilities may use their own transmission lines to serve customers within TVA's service area, and third parties are able to avoid the restrictions on serving end-use customers by selling or leasing generating assets to a customer rather than selling electricity.

From time to time, there have been efforts to erode the protection of the anti-cherrypicking provision, and the protection of the anti-cherrypicking provision could be limited and perhaps eliminated by federal legislation at some time in the

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future. If federal legislation were to eliminate or reduce the coverage of the anti-cherrypicking provision but retain the fence, TVA could more easily lose customers that it could not replace within its specified service area. The loss of these customers could adversely affect TVA's cash flows, results of operations, and financial condition.

The TVA Board may lose its sole authority to set rates for electricity.

Under the TVA Act, the TVA Board has the sole authority to set the rates that TVA charges for electricity, and these rates are not subject to further review. If the TVA Board loses this authority or if the rates become subject to external review, there could be material adverse effects on TVA including, but not limited to, being unable to set rates at a level sufficient to generate adequate revenues to service TVA's financial obligations, properly operate and maintain its assets, and provide for reinvestment in its power program and becoming subject to additional regulatory oversight that could impede its ability to adapt its business to changing circumstances.

TVA may lose responsibility for managing the Tennessee River system.

TVA's management of the Tennessee River system is important to effectively operate its power system. TVA's ability to integrate management of the Tennessee River system with power system operations increases power system reliability and reduces costs. Restrictions on how TVA manages the Tennessee River system could negatively affect its operations, change the way it conducts such operations, or increase costs.

TVA may lose responsibility for managing real property currently under its control.

TVA's management of real property containing power generation and transmission structures as well as certain reservoir shorelines is important for navigation, flood control, and the effective operation of the power system. Restrictions on or the loss of the authority to manage these properties could negatively affect TVA's operations, change the way it conducts such operations, or increase costs.

Existing laws, regulations, and orders may negatively affect TVA's cash flows, results of operations, and financial condition, as well as the way TVA conducts its business.

TVA is required to comply with comprehensive and complex laws, regulations, and orders. The costs of complying with these laws, regulations, and orders are expected to be substantial, and costs could be significantly more than TVA anticipates, especially in the environmental and nuclear areas. In addition, TVA is required to obtain numerous permits and approvals from governmental agencies that regulate its business, and TVA may be unable to obtain or maintain all required regulatory approvals. If there is a delay in obtaining required regulatory approvals or if TVA fails to obtain or maintain any approvals or to comply with any law, regulation, or order, TVA may have to change how it operates certain assets, may be unable to operate certain assets, or may have to pay fines or penalties if it continues to operate the assets.

Additional NRC requirements may negatively affect TVA's cash flows, results of operations, and financial condition or impact TVA's ability to operate its nuclear facilities.

Supplementary NRC rulemaking is under development to mitigate beyond-design basis flooding events and seismic events. Complying with these or other requirements adopted by the NRC may require significant capital expenditures and may negatively affect TVA's cash flows, results of operations, and financial condition. Should TVA be unable to comply with the requirements, TVA may not be able to operate its nuclear facilities as currently contemplated by TVA's generation plans.

TVA is involved in various legal and administrative proceedings whose outcomes may affect TVA's finances and operations.

TVA is involved in various legal and administrative proceedings, including actions arising from citizen enforcement of environmental requirements, and is likely to become involved in additional proceedings in the future in the ordinary course of business, as a result of catastrophic events, as a result of environmental conditions at TVA property or areas where TVA has disposed of materials or property, or otherwise. The additional proceedings could involve, among other things, challenges to TVA's CCR facilities and nuisance suits involving TVA's coal-fired plants. Although TVA cannot predict the outcome of the individual matters in which TVA is involved or will become involved, the resolution of these matters could require TVA to make expenditures in excess of established reserves and in amounts that could have a material adverse effect on TVA's cash flows, results of operations, and financial condition. Similarly, resolution of any such proceedings may require TVA to change its business practices or procedures, change how it operates its coal-fired units, reduce emissions to a greater extent than TVA had planned, close existing CCR facilities sooner than planned, build new CCR facilities sooner than planned, build new CCR facilities that were not planned, or even cease operation of some coal-fired units. These events also could have a material adverse effect on TVA's cash flows, results of operations, and financial condition.

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TVA is largely restricted to a defined service area.

TVA's ability to expand its customer base is constrained by its inability to pursue new customers outside its service area. Accordingly, reductions in demand have to be offset by such actions as reducing TVA's internal costs or increasing rates. Any failure of such measures to fully offset the reduced demand for power may negatively affect TVA's cash flows, results of operations, and financial condition.

TVA may become subject to additional NERC requirements.

TVA is subject to federal reliability standards that are set forth by NERC and approved by FERC. TVA recognizes that reliability standards and expectations continue to become more complex and stringent for transmission systems. At present there are approximately 90 mandatory standards subject to enforcement containing approximately 1,300 requirements and sub-requirements that must be met. Complying with these or additional requirements set forth by NERC may require significant capital expenditures and may negatively affect TVA's cash flows, results of operations, and financial condition.

TVA could be divested by the federal government or be required to sell some or all of its assets.

From time to time, presidential administrations have suggested that the federal government should either divest TVA or require TVA to sell some or all of its assets, including its transmission system. Either event could trigger change of control provisions in certain material contracts or covenants in TVA’s bond documents that concern the sale or disposal of a substantial portion of TVA’s power properties. TVA may, among other things, be required to pay off debt more quickly than anticipated and be unable to access credit facilities. Additionally, the loss of the transmission system could interfere with TVA’s operations and require TVA to contract for the transmission of electricity to TVA customers. These factors could negatively affect TVA's operations, change the way it conducts such operations, and increase costs.

OPERATIONAL RISKS

TVA may incur delays and additional costs in its major projects and may be unable to obtain necessary regulatory approval.

Among other projects, TVA is conducting the EPU project at Browns Ferry, undertaking repairs at certain hydroelectric facilities, and closing some coal-fired plants and their supporting infrastructure. These activities involve risks of overruns in the cost of labor and materials as well as risks of schedule delays, which may result from, among other things, changes in laws or regulations, lack of productivity, human error, and the failure to schedule activities properly. In addition, if TVA does not or cannot obtain the necessary regulatory approvals or licenses, is otherwise unable to complete the development or construction of a facility, decides to cancel construction of a facility, incurs delays or cost overruns in connection with constructing a facility, or is required to change how it will conduct construction, repair, or closure activities, TVA's cash flows, financial condition, and results of operations could be negatively affected. Further, if projects are not completed according to specifications, TVA may suffer, among other things, delays in receiving licenses, reduced plant efficiency, reduced transmission system integrity and reliability, and higher operating costs.

TVA may not be able to operate one or more of its nuclear power units.

Should issues develop with TVA’s nuclear power units that TVA is unable to correct, TVA might voluntarily shut down one or more units or be ordered to do so by the NRC. Returning the unit(s) into operation could be a lengthy and expensive process, or might not be possible depending on circumstances. In either case, TVA's cash flows, results of

operations, financial condition, and reputation may be negatively affected.

Operating nuclear units subjects TVA to nuclear risks and may result in significant costs that adversely affect its cash flows, results of operations, and financial condition.

TVA has seven operating nuclear units. Risks associated with these units include the following:

Nuclear Risks. A nuclear incident at one of TVA's facilities could have significant consequences including loss of life, damage to the environment, damage to or loss of the facility, and damage to non-TVA property. Although TVA carries certain types of nuclear insurance, the amount that TVA is required to pay in connection with a nuclear incident could significantly exceed the amount of coverage provided by insurance. Any nuclear incident in the U.S., even at a facility that is not operated by or licensed to TVA, has the potential to impact TVA adversely by obligating TVA to pay up to $133 million per year and a total of $891 million per nuclear incident under the Price-Anderson Act. Any such nuclear incident could also negatively affect TVA by, among other things, obligating TVA to pay retrospective insurance premiums, reducing the availability and affordability of insurance, increasing the costs of operating nuclear units, or leading to increased regulation or restriction on the construction, operation, and

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decommissioning of nuclear facilities. Moreover, federal legislation could impose revenue-raising measures on the nuclear industry to pay claims exceeding the limit for a single incident under the Price-Anderson Act. Further, the availability or price of insurance may be impacted by TVA's acts or omissions, such as a failure to properly maintain a facility, or events outside of TVA's control, such as an equipment manufacturer's inability to meet a guideline, specification, or requirement.

Decommissioning Costs. TVA maintains a Nuclear Decommissioning Trust ("NDT") for the purpose of providing funds to decommission its nuclear facilities. The NDT is invested in securities generally designed to achieve a return in line with overall equity and debt market performance. TVA might have to make unplanned contributions to the NDT if, among other things:

- The value of the investments in the NDT declines significantly or the investments fail to achieve the assumed real rate of return;
- The decommissioning funding requirements are changed by law or regulation;
- The assumed real rate of return on plan assets, which is currently five percent, is lowered by the TVA Board or is overly optimistic;
- The actual costs of decommissioning are more than planned;
- Changes in technology and experience related to decommissioning cause decommissioning cost estimates to increase significantly;
- TVA is required to decommission a nuclear plant sooner than it anticipates; or
- The NRC guidelines for calculating the minimum amount of funds necessary for decommissioning activities are significantly changed.

If TVA makes additional contributions to the NDT, the contributions may negatively affect TVA's cash flows, results of operations, and financial condition.

Increased Regulation. The NRC has broad authority to adopt requirements related to the licensing, operating, and decommissioning of nuclear generation facilities that can result in significant restrictions or requirements on TVA. If the NRC modifies existing requirements or adopts new requirements, TVA may be required to make substantial capital expenditures at its nuclear plants or make substantial contributions to the NDT. In addition, if TVA fails to comply with requirements promulgated by the NRC, the NRC has the authority to impose fines, shut down units, or modify, suspend, or revoke TVA's operating licenses.

Waste Disposal. TVA’s nuclear operations produce various types of nuclear waste materials, including spent fuel. TVA has been storing the spent fuel in accordance with NRC regulations in anticipation that a final storage site for all such waste will be developed and put in operation by the U.S. government. If no such site is forthcoming or if no alternative disposal or reuse plan is developed, then TVA might be required to arrange for the safe and permanent disposal of the spent fuel itself. Such a requirement would cause TVA to incur substantial expense, including substantial capital expenditures, and could cause TVA to change how it operates its nuclear plants.

Availability of Components. Nuclear facilities require specialized components and access to intellectual property for operation. As the number of reliable suppliers of such components and access to intellectual property is reduced, the availability of the components and access to the intellectual property will also likely decrease. If TVA is unable to

secure either the original components, intellectual property, or replacements approved for use by the NRC, TVA might have to change how it conducts its operations.

TVA’s operation of coal combustion residual facilities exposes it to additional costs and risks.

TVA operates coal-fired units which produce CCR as byproducts of the power production process. The CCR is contained within dedicated facilities operated by TVA. TVA has closed some of these facilities in compliance with state and federal laws and is in the process of closing others. Some facilities are intended to remain open during the life of the associated generation unit. Many of these facilities were constructed prior to the requirement that such facilities be built with liners and thus do not contain such liners. TVA has been involved in litigation with regard to certain of these facilities, and has been ordered to move all CCR material from unlined facilities at Gallatin Fossil Plant to a lined facility that will have to be constructed for that purpose. (Although a panel of the Sixth Circuit reversed this decision, the plaintiffs have petitioned for a rehearing.) TVA could be subject to similar litigation and orders at other TVA facilities. TVA has also been ordered by TDEC to undertake investigations for all facilities in Tennessee. TVA could be required to restrict or stop the use of any or all CCR facilities or relocate CCR material to other lined facilities which do not currently

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exist. These measures would impact how TVA operates its facilities, cause TVA to incur greater expenses than currently anticipated for operating, closing, or decommissioning existing CCR facilities, and negatively impact TVA's cash flow, results of operations, and financial condition. Actual decommissioning costs may also vary from estimates because of changes in current assumptions, such as the assumed dates of decommissioning, changes in regulatory requirements, changes in technology, and changes in the cost of labor, materials, and equipment. Additionally, the relocation of materials would result in a lengthy process with the potential for environmental and safety impacts, which could cause extensive adverse financial and reputational impacts to TVA.

TVA's facilities and operations may be damaged or interfered with by physical attacks, threats, or other interference.

TVA has an extensive generation and transmission system and supporting infrastructure that includes, among other things, TVA's generation facilities and transmission infrastructure such as substations, towers, and control centers. Some of TVA's hydroelectric facilities include navigation locks which are necessary for commerce along the Tennessee River system. TVA also operates flood control dams and supporting infrastructure. Because of TVA's status as a governmental corporation and TVA's role as predominately the sole power provider for its service territory, TVA may be targeted by individuals, groups, or nation states for physical attacks or threats of such attacks. Although TVA's operations are protected by automated monitoring systems, TVA employees, local law enforcement, or a combination thereof, it may not be possible to effectively deter or prevent attacks. Such attacks could pose health and safety risks, significantly disable or destroy TVA assets, interfere with TVA's operations, result in additional regulatory or security requirements, and negatively affect TVA's cash flows, results of operations, and financial condition.

TVA's facilities and information infrastructure may not operate as planned due to cyber threats to TVA's assets and operations.

TVA's operations are heavily computerized and include assets such as information technology and networking systems. As with all industries, the reliance on computerization and networking makes TVA a target for cyber attacks, and the risk of such attacks may increase as individual devices and equipment become accessible via the internet. TVA has been targeted by cyber attacks in the past and anticipates that it will be targeted in the future. These attacks may have been carried out, or in the future could be carried out, by individuals, groups, or nation states. Although TVA has extensive cyber safeguards and works with industry specialists and relevant governmental authorities to deter, stop or mitigate cyber attacks, it is possible that these measures might not prevent all attacks. In such a case, a cyber attack could compromise sensitive data, significantly disrupt operations, require additional expenditures for cyber security, negatively affect TVA's cash flows, results of operations, financial condition, and reputation, and pose health and safety risks. Additionally, the theft, damage, or improper disclosure of sensitive data may also subject TVA to penalties and claims from third parties.

Cyber attacks on third parties could interfere with or harm TVA.

TVA relies on third parties for various services, including transferring funds to non-TVA entities in the ordinary course of business. As with TVA, these third parties are heavily computerized and include assets such as information technology and networking systems. If these third parties undergo cyber attacks, the services they provide TVA could be disrupted. This disruption could interfere with TVA's abilities to perform its obligations to others or transfer funds or make payments, which in turn could negatively affect TVA's financial condition and reputation. Additionally, the theft, damage, or improper disclosure of sensitive data held by these third parties may also subject TVA to additional harm.

TVA's assets or their supporting infrastructure may not operate as planned.

Many of TVA's assets, including generation, transmission, navigation, and flood control assets, have been operating for several decades and have been in nearly constant service since they were completed. Additionally, certain of TVA's newer assets utilize advanced technology which could experience technical or operating issues. The failure of TVA's assets or supporting infrastructure, including information technology systems, to perform as planned may cause health, safety, or environmental problems and may even result in events such as the failure of a dam, the inability to maintain a reservoir at the normal or expected level, or an incident at a coal-fired, gas-fired, or nuclear plant or a CCR facility. If these assets or their supporting infrastructure fail to operate as planned, if necessary repairs or upgrades are delayed or cannot be completed as quickly as anticipated, or if necessary spare parts are unavailable, TVA, among other things:

- May have to invest a significant amount of resources to repair or replace the assets or the supporting infrastructure;
- May have to remediate collateral damage caused by a failure of the assets or the supporting infrastructure;
- May not be able to maintain the integrity or reliability of the transmission system at normal levels;
- May have to operate less economical sources of power;

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- May have to purchase replacement power on the open market at prices greater than its generation costs;
- May be required to invest substantially to meet more stringent reliability standards;
- May be unable to maintain insurance on affected facilities, or be required to pay higher premiums for coverage, unless necessary repairs or upgrades are made;
- May be unable to operate the assets for a significant period of time; or
- May not be able to meet its contractual obligations to deliver power.

Any of these potential outcomes may negatively affect TVA's cash flows, results of operations, financial condition, and reputation.

TVA’s safety programs may not prevent accidents that could, among other things, impact TVA’s operations or financial condition.

TVA’s safety program, no matter how well designed and operated, may not completely prevent accidents. In addition to the potential human cost of accidents, which could include injury to employees or members of the public, significant accidents could impact TVA’s ability to carry out operations, cause it to shut down facilities, subject it to additional regulatory scrutiny, expose it to litigation, damage its reputation, interfere with its ability to attract or retain a skilled workforce, or harm its financial condition.

Weather conditions may influence TVA's ability to supply power and its customers' demands for power.

Extreme temperatures may increase the demand for power and require TVA to purchase power at high prices to meet the demand from customers, while unusually mild weather may result in decreased demand for power and lead to reduced electricity sales. Also, in periods of below normal rainfall or drought, TVA's low-cost hydroelectric generation may be reduced, requiring TVA to purchase power or use more costly means of producing power. Additionally, periods of either high or low levels of rainfall may impede river traffic, impacting barge deliveries of critical items such as coal and equipment for power facilities. Furthermore, high river water temperatures in the summer may limit TVA's ability to use water from the Tennessee or Cumberland River systems for cooling at certain of TVA's generating facilities, thereby limiting its ability to operate these generating facilities. This situation would be aggravated during periods of reduced rainfall or drought. If changes in the climate make such shifts in weather more common or extreme, TVA may be required to, among other things, change its generation mix or change how it conducts its operations, which could have a material adverse effect on TVA's cash flows, results of operations, and financial condition.

Catastrophic events may negatively affect TVA's cash flows, results of operations, and financial condition.

TVA's cash flows, results of operations, and financial condition may be adversely affected, either directly or indirectly, by catastrophic events such as fires, earthquakes, explosions, solar events, electromagnetic pulses ("EMP"), droughts, floods, tornadoes, wars or other casualty events or national emergencies, terrorist activities, pandemics, or other similar destructive or disruptive events. These events, the frequency and severity of which are unpredictable, may, among other things, lead to legislative or regulatory changes that affect the construction, operation, and decommissioning of nuclear units and the storage of spent fuel; limit or disrupt TVA's ability to generate and transmit power; limit or disrupt TVA's ability to provide flood control and river management; reduce the demand for power; disrupt fuel or other supplies; require TVA to produce additional tritium; lead to an economic downturn; require TVA

to make substantial capital investments for repairs, improvements, or modifications; and create instability in the financial markets. If public opposition to nuclear power makes operating nuclear plants less feasible as a result of any of these events, TVA may be forced to shut down its nuclear plants. This would make it substantially more difficult for TVA to obtain greater amounts of its power supply from low or zero carbon emitting resources and to replace its generation capacity when faced with retiring or idling certain coal-fired units. Additionally, some studies have predicted that climate change may cause catastrophic events, such as droughts and floods, to occur more frequently in the Tennessee Valley region, which could adversely impact TVA.

TVA's service reliability could be affected by problems at other utilities or at TVA facilities, or by the increase in intermittent sources of power.

TVA's transmission facilities are directly interconnected with the transmission facilities of neighboring utilities and are thus part of the larger interstate power transmission grid. Certain of TVA's generation and transmission assets are critical to maintaining reliability of the transmission system. Additionally, TVA uses certain assets that belong to third parties to transmit power and maintain reliability. Accordingly, problems at other utilities as well as at TVA's facilities may cause interruptions in TVA's service to TVA's customers, increase congestion on the transmission grid, or reduce service reliability. In addition, the increasing contribution of intermittent sources of power, such as wind and solar, may

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place additional strain on TVA's system as well as on surrounding systems. If TVA suffers a service interruption, increased congestion, or reduced service reliability, TVA's cash flows, results of operations, financial condition, and reputation may be negatively affected.

TVA's supplies of fuel, purchased power, or other critical items may be disrupted.

TVA purchases coal, uranium, natural gas, fuel oil, and electricity from a number of suppliers. Additionally, TVA contracts for conversion of uranium into nuclear fuel and purchases other items, such as anhydrous ammonia, liquid oxygen, or replacement parts that are critical to the operation of certain generation assets. TVA also purchases power from other power producers when the purchase of such power is appropriate due to economic opportunities or operational concerns. Disruption in the acquisition or delivery of fuel, purchased power, contracted services, or other critical supplies may result from a variety of physical and commercial events, political developments, international trade restrictions or tariffs, legal actions, or environmental regulations affecting TVA's suppliers as well as from transportation or transmission constraints. If one of TVA's suppliers fails to perform under the terms of its contract with TVA, TVA might have to purchase replacement fuel, power, or other critical supplies, perhaps at a significantly higher price than TVA is entitled to pay under the contract. In some circumstances, TVA may not be able to recover this difference from the supplier. In addition, any disruption of TVA's supplies could require TVA to operate higher cost generation assets, thereby negatively affecting TVA's cash flows, results of operations, and financial condition. Moreover, if TVA is unable to acquire enough replacement fuel, power, or supplies, or does not have sufficient reserves to offset the loss, TVA may not be able to operate certain assets or provide enough power to meet demand, resulting in power curtailments, brownouts, or even blackouts.

Events that affect the supply or quality of water in the Tennessee River system and Cumberland River system or elsewhere may interfere with TVA's ability to generate power.

An inadequate supply of water in the Tennessee River system and Cumberland River system could negatively impact TVA's cash flows, results of operations, and financial condition by reducing generation not only at TVA's hydroelectric plants but also at its coal-fired and nuclear plants, which depend on water from the river systems near which they are located for cooling and for use in boilers where water is converted into steam to drive turbines. Certain of TVA’s gas-fired facilities not located near a river require alternative sources of water, such as from wells or local utility companies. Further, the water must be of a particular quality for use in TVA’s equipment. If the available water is not of sufficient quality for TVA’s use, then TVA must either treat the water or obtain alternate sources. An inadequate supply of quality water could result, among other things, from periods of low rainfall or drought, the withdrawal of water from the river systems by governmental entities or others, incidents affecting bodies of water not managed by TVA, or supply issues which affect water providers. While TVA manages the Tennessee River and a large portion of its tributary system to provide much of the water necessary for the operation of its power plants, the USACE operates and manages other bodies of water upon which some of TVA's facilities rely. Events at these bodies of water or their associated hydroelectric facilities may interfere with the flow of water and may result in TVA's having insufficient quality water to meet the needs of its plants. If TVA has insufficient water of the necessary quality to meet the needs of its plants, TVA may be required to treat the water, reduce generation at its affected facilities to levels compatible with the available supply of water, or take additional steps that change how TVA conducts its operations or cause TVA to incur additional expense.

TVA's determination of the appropriate mix of generation assets may change.

TVA has determined that its power generation assets should consist of a mix of nuclear, coal-fired, natural gas-fired, and renewable power sources, including hydroelectric. In making this determination, TVA took various factors into consideration, including the anticipated availability of its nuclear units, the availability of non-nuclear facilities, the forecasted cost of natural gas and coal, the forecasted demand for electricity, and environmental compliance including

the expense of adding air pollution controls to its coal-fired units. If any of these assumptions materially change or are impacted by subsequent events, then TVA's generation mix may not address its operational needs in the most efficient manner. Resolving such a situation may require capital expenditures or additional power purchases, and TVA's cash flows, results of operations, financial condition, and reputation may be negatively affected.

FINANCIAL, ECONOMIC, AND MARKET RISKS

TVA’s cost reduction efforts may not be successful.

TVA is continuing to work to reduce operating expenses and to offset reductions in power demand. The failure to achieve or maintain cost reductions could adversely affect TVA's rates, reputation, cash flows, results of operations, and financial condition.

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TVA may have to make significant contributions in the future to fund its qualified pension plan.

At September 30, 2018, TVA's qualified pension plan had assets of approximately $8.0 billion compared to liabilities of approximately $11.7 billion. The plan is mature with approximately 24,000 retirees and beneficiaries receiving benefits of over $700 million per year. The costs of providing benefits depend upon a number of factors, including, but not limited to, provisions of the plan; changing experience and assumptions related to terminations, retirements, and mortality; rates of increase in compensation levels; rates of return on plan assets; discount rates used in determining future benefit obligations and required funding levels; optional forms of benefit payments selected; future government regulation; and levels of contributions made to the plan.

Although the plan is frozen to new participants, any of these factors or any number of these factors could keep at high levels, or even increase, the costs of providing benefits and require TVA to make contributions to the plan in amounts that significantly exceed TVA's planned contributions. Unfavorable financial market conditions may result in lower expected rates of return on plan assets, loss in value of the investments, and lower discount rates used in determining future benefit obligations. These changes would negatively impact the funded status of the plan. Additional contributions to the plan and absorption of additional costs would negatively affect TVA's cash flows, results of operations, and financial condition.

TVA's debt ceiling could be made more restrictive. Additionally, approaching or reaching TVA's debt ceiling could limit TVA's ability to carry out its business.

The TVA Act provides that TVA can issue Bonds in an amount not to exceed $30.0 billion outstanding at any time. At September 30, 2018, TVA had $22.7 billion of Bonds outstanding (not including non-cash items of foreign currency exchange gain of $147 million, unamortized debt issue costs of $56 million and net discount on sale of Bonds of $88 million).

Approaching or reaching the debt ceiling may negatively affect TVA's business by limiting TVA's ability to access capital markets and increasing the amount of debt TVA must service. Also, federal legislation may lower TVA's debt ceiling or broaden the types of financial instruments that are covered by the ceiling. Either of these scenarios may also restrict TVA's ability to raise capital to acquire new power program assets or maintain existing ones, to carry out upgrades or improvements to existing assets or build new ones, to purchase power under long-term power purchase agreements, or to meet regulatory requirements. In addition, approaching or reaching the debt ceiling may lead to increased legislative or regulatory oversight of TVA's activities and could lead to negative rating actions by credit rating agencies.

TVA may be unable to meet its current cash requirements if TVA's access to the debt markets is limited.

TVA uses cash provided by operations together with proceeds from power program financings and other financing arrangements to fund its current cash requirements. It is critical that TVA continues to have access to the debt markets in order to meet its cash requirements. The importance of having access to the debt markets is underscored by the fact that TVA, unlike most utilities, relies almost entirely on debt capital since, as a governmental instrumentality, TVA cannot issue equity securities.

TVA's credit ratings may be impacted by congressional actions or by a downgrade of the U.S.'s sovereign credit ratings.

TVA's current credit ratings are not based solely on its underlying business or financial condition but are based to a large extent on the legislation that defines TVA's business structure. Key characteristics of TVA's business defined by legislation include (1) the TVA Board's ratemaking authority, (2) the current competitive environment, which is

defined by the fence and the anti-cherrypicking provision, and (3) TVA's status as a corporate agency and instrumentality of the U.S. If Congress takes any action that effectively alters any of these characteristics, TVA's credit ratings could be downgraded.

Although TVA Bonds are not obligations of the U.S., TVA, as a corporate agency and instrumentality of the U.S., may be impacted if the sovereign credit ratings of the U.S. are downgraded. Such a downgrade of the U.S.'s sovereign credit ratings could, among other things, result in a downgrade of TVA's credit rating. Additionally, the economy could be negatively impacted resulting in reduced demand for electricity, an increase in borrowing costs, and an increase in the cost of fuels, supplies, and other materials required for TVA's operations.

TVA, together with owners of TVA securities, may be impacted by downgrades of TVA's credit ratings.

Downgrades of TVA's credit ratings may have material adverse effects on TVA's cash flows, results of operations, and financial condition as well as on investors in TVA securities. Among other things, a downgrade could increase TVA's interest expense by increasing the interest rates that TVA pays on new securities that it issues. Such an increase may reduce the amount of cash available for other purposes, which may result in the need to increase borrowings, to reduce

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other expenses or capital investments, or to increase power rates. A downgrade may also result in TVA's having to post collateral under certain physical and financial contracts that contain ratings triggers. A downgrade below a contractual threshold may prevent TVA from borrowing under four credit facilities totaling $2.7 billion or posting letters of credit as collateral under these facilities. At September 30, 2018, there were $921 million of letters of credit outstanding under these facilities. If TVA were no longer able to post letters of credit as collateral, TVA would likely have to post cash as collateral, which would negatively affect TVA’s liquidity. Further, a downgrade may lower the price of TVA securities in the secondary market, thereby negatively impacting investors who sell TVA securities after the downgrade and diminishing the attractiveness and marketability of TVA securities.

TVA's assumptions about the future may be inaccurate.

TVA uses certain assumptions in order to develop its plans for the future. Such assumptions include economic forecasts, anticipated energy and commodity prices, cost estimates, construction schedules, power demand forecasts, the appropriate generation mix to meet demand, and potential regulatory environments. Should these assumptions be inaccurate, or be superseded by subsequent events, TVA's plans may not be effective in achieving the intended results, which could negatively affect cash flows, results of operations, and financial condition, as well as TVA's ability to meet electricity demand and the way TVA conducts its business.

Demand for electricity may significantly decline or change, negatively affecting TVA's cash flows, results of operations, and financial condition.

Some of the factors that could reduce or change the demand for electricity include, but are not limited to, the following:

Economic downturns. Renewed economic downturns in TVA's service area or other parts of the U.S. could reduce overall demand for power and thus reduce TVA's power sales and cash flows, especially if TVA's industrial customers, which constitute a material portion of TVA’s demand, reduce their operations and thus their consumption of power.

Loss of customers. TVA could lose customers, particularly LPCs, if customers choose another utility to meet some or all of their power needs where available, pursue self-generation to meet some or all of their power needs, or move their operations outside of TVA’s service territory. At September 30, 2018, TVA had wholesale power contracts with 154 LPCs. A significant portion of TVA’s total operating revenues are concentrated in a small number of these LPCs. The loss of customers could have a material adverse effect on TVA's cash flows, results of operations, or financial condition, and could result in higher rates, especially because of the difficulty in replacing customers on account of the fence.

Change in demands for electricity generated from renewable sources. TVA has been adapting its generation mix to account for the growing preference for electricity generated by renewable sources, such as solar or wind. If demand by customers for power that is largely or exclusively generated from renewable sources exceeds TVA’s ability to produce such power, TVA might have to change how it operates and may incur additional expense in meeting this demand.

Increased utilization of DER. As the amount of DER grows on the TVA system, the need for TVA’s traditional generation resources may be reduced, and the ability of the system to reliably and economically operate in conjunction with these DER may become more challenging. If TVA is unable to compensate for the resulting decrease in demand for TVA electricity,TVA’s cash flows, results of operations, and financial condition could be negatively impacted, resulting in higher rates and changes to TVA’s operations.

Increased energy efficiency and conservation. Increasingly efficient use of energy as well as conservation efforts have reduced the demand for power. Further reductions, if TVA is unable to compensate for them, could negatively affect TVA's cash flows, results of operations, and financial condition and could result in higher rates and changes to TVA’s operations, especially if the reductions occur during an economic downturn or a period of slow economic growth.

Change in technology could require TVA to change how it conducts its operations, affect relationships with customers, or impact its financial condition.

TVA’s primary business is to sell power it produces, for the most part, from large facilities such as nuclear power plants, hydroelectric facilities, natural gas-fired facilities, and coal-fired units. TVA sells power to LPCs and directly served customers. Research and development activities are ongoing to improve existing and alternative technologies to produce or store electricity, including large-scale energy storage, gas or wind turbines, fuel cells, microturbines, solar cells, and distributed energy or storage resources. It is possible that advances in these or other alternative technologies could reduce the costs of such production methods to a level that will enable these technologies to compete effectively with traditional power plants such as TVA's. These technologies could be more appealing to

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customers and could lead them to bring pressure on TVA to modify the power contracts to allow customers to generate some of their own power requirements or purchase power from other suppliers. Other customers might also cease purchasing power from TVA altogether. To the extent that sales to such customers are reduced or eliminated, TVA's cash flows, results of operations, and financial condition could be negatively affected. TVA could also be required to modify how it operates its traditional plants or further modify its generation mix to reduce reliance on these facilities.

Additionally, demand could change in terms of amount or timing as devices and equipment become more connected to the internet and it becomes possible to adjust real-time consumption of power. Such increased control over power consumption could, among other things, affect how TVA operates its facilities or dispatches power, or require TVA to change its pricing structure or rates.

TVA is subject to a variety of market risks that may negatively affect TVA's cash flows, results of operations, and financial condition.

TVA is subject to a variety of market risks, including, but not limited to, commodity price risk, investment price risk, interest rate risk, counterparty credit and performance risk, and currency exchange rate risk.

Commodity Price Risk. TVA's rates may increase if prices of commodities critical to operations, including coal, uranium, natural gas, fuel oil, crude oil, construction materials, or emission allowances, increase.

Investment Price Risk. TVA is exposed to investment price risk in its NDT, its Asset Retirement Trust ("ART"), its Supplemental Executive Retirement Plan ("SERP"), its Deferred Compensation Plan ("DCP"), and its pension plan. If the value of the investments held in the NDT or the pension fund either decreases or fails to increase in accordance with assumed rates of return, TVA may be required to make substantial contributions to these funds. In addition, although TVA is not required to make contributions to the ART, it may choose to do so, particularly if TVA's estimates of its non-nuclear asset retirement obligation liabilities increase. TVA may also choose to make contributions to the SERP and DCP from time to time.

Interest Rate Risk. Changes in interest rates may increase the amount of interest that TVA pays on new Bonds that it issues, decrease the return that TVA receives on short-term investments, decrease the value of the investments in the NDT, the ART, TVA's pension fund, the SERP and the DCP, increase the amount of collateral that TVA is required to post in connection with certain of its derivative transactions, and increase the losses on the mark-to-market valuation of certain derivative transactions into which TVA has entered.

Counterparty Credit and Performance Risk. TVA is exposed to the risk that its counterparties will not be able to perform their contractual obligations. If TVA's counterparties fail to perform their obligations, TVA's cash flows, results of operations, and financial condition may be adversely affected. In addition, the failure of a counterparty to perform may make it difficult for TVA to perform its obligations, particularly if the counterparty is a supplier of electricity or fuel.

Currency Exchange Rate Risk. Over the next several years, TVA plans to spend a significant amount of capital on various projects. A portion of this amount may be spent on contracts that are denominated in one or more foreign currencies. Additionally, TVA’s three issues of Bonds denominated in British pounds sterling are hedged by currency swap agreements. The value of the U.S. dollar compared with other currencies has fluctuated widely in recent years, including fluctuations in the U.S. dollar to British pound sterling exchange rate primarily driven by the “BREXIT” vote for the United Kingdom to leave the European Union. If not effectively managed, foreign currency exposure could negatively impact TVA's counterparty risk, cash flows, results of operations, and financial condition.

TVA's ability to use derivatives to hedge certain risks may be limited.

Under the Dodd-Frank Wall Street Reform and Consumer Protection Act and its implementing regulations, TVA is subject to recordkeeping, reporting, and reconciliation requirements related to its derivative transactions. In addition, depending on how regulatory agencies interpret and implement the provisions of this act, TVA's hedging costs may increase, and TVA may have to post additional collateral and margin in connection with its derivative transactions. These occurrences may, among other things, negatively affect TVA's cash flows and cause TVA to reduce or modify its hedging activities, which could increase the risks to which TVA is exposed.

The market for TVA Bonds might be limited.

Although many TVA Bonds are listed on stock exchanges, there can be no assurances that any market will develop or continue to exist for any Bonds. Additionally, no assurances can be made as to the ability of the holders to sell their Bonds or as to the price at which holders will be able to sell their Bonds. Future trading prices of Bonds will depend on many factors, including prevailing interest rates, the then-current ratings assigned to the Bonds, the amount of Bonds outstanding, the time remaining until the maturity of the Bonds, the redemption features of the Bonds, the market for

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similar securities, and the level, direction, and volatility of interest rates generally, as well as the liquidity of the markets for those securities.

If a particular series of Bonds is offered through underwriters, those underwriters may attempt to make a market in the Bonds. Dealers other than underwriters may also make a market in TVA Bonds. However, the underwriters and dealers are not obligated to make a market in any TVA Bonds and may terminate any market-making activities at any time without notice.

Further, certain investors use the environmental impact or sustainability of an industry as a criteria for deciding whether to invest in that industry. TVA's use of fossil fuels or nuclear power could lead such investors to not purchase TVA Bonds.

In addition, legal limitations may affect the ability of banks and others to invest in Bonds. For example, national banks may purchase TVA Bonds for their own accounts in an amount not to exceed 10 percent of unimpaired capital and surplus. Also, TVA Bonds are "obligations of a corporation which is an instrumentality of the United States" within the meaning of Section 7701(a)(19)(C)(ii) of the Internal Revenue Code for purposes of the 60 percent of assets limitation applicable to U.S. building and loan associations.

TVA may be unable to use regulatory accounting for some or all costs.

TVA uses regulatory accounting to defer certain costs. To qualify for regulatory accounting, costs must meet certain accounting criteria and be approved for regulatory accounting treatment by the TVA Board in its capacity as TVA's regulator. If costs do not meet, or cease to meet, these criteria, or if the TVA Board disallows the treatment or ceases to be TVA's sole regulator in such areas, TVA may not be able to defer those costs. Such an inability to defer costs would likely have a substantial impact on TVA's financial condition and results of operations and could impact the timing and amounts of TVA's rate recovery. For a discussion of regulatory accounting, see Item 7, Management's Discussion and Analysis of Financial Condition and Results of Operations - Critical Accounting Policies and Estimates.

TVA's financial control system cannot guarantee that all control issues and instances of fraud or errors will be detected.

No financial control system, no matter how well designed and operated, can provide absolute assurance that the objectives of the control system are met, and no evaluation of financial controls can provide absolute assurance that all control issues and instances of fraud or errors can be detected. The design of any system of financial controls is based in part upon certain assumptions about the likelihood of future events, and there can be no assurance that any design will succeed in achieving its stated goals under all potential future conditions, regardless of how remote.

Payment of principal and interest on TVA securities is not guaranteed by the U.S.

Although TVA is a corporate agency and instrumentality of the U.S. government, TVA securities are not backed by the full faith and credit of the U.S. Principal and interest on TVA securities are payable solely from TVA's net power proceeds. Net power proceeds are the remainder of TVA's gross power revenues after deducting the costs of operating, maintaining, and administering its power properties and payments to states and counties in lieu of taxes, but before deducting depreciation accruals or other charges representing the amortization of capital expenditures, plus the net proceeds from the sale or other disposition of any power facility or interest therein. If TVA were to experience extreme financial difficulty and were unable to make payments of principal or interest on its Bonds, the federal government would not be legally obligated to prevent TVA from defaulting on its obligations. An inability to pay some or all of the principal or interest owed on a TVA security would likely have a negative impact on TVA's

financial condition, reputation, and relationship with the investment community, and could result in cross-defaults in other financial arrangements.

GENERAL BUSINESS RISKS

TVA may not be able to implement its business strategy successfully.

TVA’s financial condition and results of operations are largely dependent on the extent to which it can implement its business strategy successfully. TVA’s strategy includes maintaining low rates, aligning operations and maintenance spending with revenues, effectively maintaining low rates, being responsible stewards, living with its means, meeting reliability expectations and providing a balanced portfolio, and continuously improving, empowering, and engaging its employees. This strategy is subject to business, economic and competitive uncertainties and contingencies, many of which are beyond its control. If TVA is unable to successfully implement its business strategy, TVA’s financial condition and results of operations could be negatively affected.

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TVA's organizational structure may not adequately support TVA's anticipated business needs or enable it to meet the needs of its current or potential customers.

TVA has been modifying its organizational structure to better adapt to the forecasted economic environment. If TVA's assumptions about either its forecasts or the proper internal structure of the company to meet the expected environment are inaccurate or if this structure does not adequately support TVA's needs, TVA could face operational or financial challenges that could adversely affect TVA's cash flows, results of operations, and financial condition as well as TVA's ability to attract or retain a skilled workforce and to meet the needs of its current or potential customers.

TVA may have difficulty in adapting its business model to changes in the utility industry and customer preferences.

The traditional business model for power production, selling power from centrally located plants, is facing pressure from a variety of sources, including the potential for self-generation by current or potential customers, new technologies such as energy storage, and increased energy efficiency. These pressures may reduce the demand for TVA power. If TVA does not or cannot adapt to this pressure by adequately changing its business model, TVA's financial condition and results of operations could be negatively affected.

TVA's quasi-governmental status may interfere in its ability to quickly respond to the needs of its current or potential customers or to act solely in the interest of its ratepayers.

As a quasi-governmental entity, TVA has certain legal requirements that prevent it from responding as quickly to potential changes in the market or requests from current or potential customers as might be desired or in comparison to other utilities. For example, TVA is required to comply with the National Environmental Policy Act ("NEPA"), which requires environmental reviews to be performed in connection with certain projects. The delay in responding to requests could damage relationships with current customers, deter potential customers from moving into TVA's service territory, or damage TVA's reputation.

In addition, TVA's nature as a quasi-governmental entity imposes additional pressures that most companies do not face, such as the requirement to support economic development and promote recreational opportunities. TVA must balance these obligations with the requirement to provide power at the least system cost. If TVA does not adequately communicate how it fulfills its various missions and the value it provides, its reputation may be harmed, which may result in political pressure to change its nature or operations as well as in the loss of public support.

TVA's reputation may be negatively impacted.

As with any company, TVA's reputation is a vital element of its ability to effectively conduct its business. TVA's reputation could be harmed by a variety of factors, including the failure of a generating asset or supporting infrastructure, failure to effectively manage land and other natural resources entrusted to TVA, real or perceived violations of environmental regulations, real or perceived issues with TVA's safety culture or work environment, significant delays in construction projects, acts or omissions of TVA management, the perception of such acts or omissions, measures taken to offset reductions in demand, or a significant dispute with one of TVA's customers. Any deterioration in TVA's reputation may harm TVA's relationships with its customers and stakeholders, may increase TVA's cost of doing business, may interfere with its ability to attract and retain a skilled workforce, and may potentially lead to the enactment of new laws and regulations, or the modification of existing laws and regulations, that negatively affect the way TVA conducts its business.

Failure to attract and retain an appropriately qualified workforce may negatively affect TVA's results of operations.

TVA's business depends on its ability to recruit and retain key executive officers as well as skilled professional and technical employees. The inability to attract and retain an appropriately qualified workforce could adversely affect TVA's ability to, among other things, operate and maintain generation and transmission facilities, complete large construction projects, and successfully implement its continuous improvement initiatives.

Loss of a quorum of the TVA Board could limit TVA's ability to adapt to meet changing business conditions.

Under the TVA Act, a quorum of the TVA Board is five members. Becoming a member of the TVA Board requires confirmation by the U.S. Senate following appointment by the President. Further, the TVA Board members may not continue in office indefinitely until a successor is appointed. As a result, a delay in the appointment or confirmation of directors can threaten the TVA Board's quorum. The TVA Board is responsible for, among other things, establishing the rates TVA charges for power as well as TVA's long-term objectives, policies, and plans. Accordingly, loss of a quorum for an extended period of time would impair TVA's ability to change rates and to modify these objectives, policies, and plans. Such an impairment would likely have a negative impact on TVA's ability to respond to significant changes in technology, the regulatory environment, or the industry overall and, in turn, negatively affect TVA's cash flows, results of operations, and financial condition.

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Changes in the membership of the TVA Board and TVA senior management could impact how TVA operates.

The TVA Board is comprised of up to nine part-time members serving staggered, five-year terms. One to two Board members' terms typically expire each year. In addition, there is always the possibility that one or more members of TVA's senior management may retire or otherwise leave TVA. The individuals filling either the TVA Board or senior management positions may wish to change how TVA operates in whole or in part. If the changes are not successful or TVA is not able to adapt properly to such changes, TVA's financial condition, results of operations, reputation, and relationship with customers could be negatively affected.

ITEM 1B. UNRESOLVED STAFF COMMENTS

Not applicable.

ITEM 2. PROPERTIES

TVA holds personal property in its own name but holds real property as agent for the U.S. TVA may acquire real property as an agent of the U.S. by negotiated purchase or by eminent domain.

Generating Properties

At September 30, 2018, TVA-operated generating assets consisted of 26 active coal-fired units, seven nuclear units, 109 conventional hydroelectric units, four pumped-storage units, 14 combined-cycle power blocks, 87 simple-cycle units, five diesel generator units, and 14 solar sites. In addition, TVA has digester gas co-firing potential at one coal-fired site as well as biomass co-firing potential at its coal-fired sites. As of September 30, 2018, 24 of the simple-cycle combustion turbine units and four of the combined-cycle power blocks were leased to special purpose entities ("SPEs") and leased back to TVA under long-term leases. See Note 13 — Lease/Leasebacks. In addition, TVA is leasing the three Caledonia combined-cycle power blocks under a long-term lease. For a discussion of these assets, see Item 1, Business — Power Supply and Load Management Resources.

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Net Capability

The following table summarizes TVA's summer net capability in megawatts ("MW") at September 30, 2018:

SUMMER NET CAPABILITY[1]
At September 30, 2018

Source of Capability	Location	Number of Units	Summer Net Capability (MW)	Date First Unit Placed in Service (CY)	Date Last Unit Placed in Service (CY)
TVA-Operated Generating Facilities					
Nuclear					
Browns Ferry[2]	Alabama	3	3,309	1974	1977
Sequoyah	Tennessee	2	2,292	1981	1982
Watts Bar	Tennessee	2	2,122	1996	2016
Total Nuclear		7	7,723		
Coal-Fired					
Bull Run	Tennessee	1	865	1967	1967
Cumberland	Tennessee	2	2,470	1973	1973
Gallatin	Tennessee	4	976	1956	1959
Kingston	Tennessee	9	1,398	1954	1955
Paradise	Kentucky	1	971	1963	1970
Shawnee	Kentucky	9	1,206	1953	1955
Total Coal-Fired		26	7,886		
Natural Gas and/or Oil-Fired[3][4]					
Simple-Cycle Combustion Turbine					
Allen	Tennessee	20	456	1971	1972
Brownsville	Tennessee	4	468	1999	1999
Colbert	Alabama	8	392	1972	1972
Gallatin	Tennessee	8	642	1975	2000
Gleason	Tennessee	3	500	2000	2000
Johnsonville	Tennessee	20	1,269	1975	2000
Kemper	Mississippi	4	348	2002	2002
Lagoon Creek	Tennessee	12	1,048	2001	2002
Marshall County	Kentucky	8	608	2002	2002
Subtotal Simple-Cycle Combustion Turbine		87	5,731		
Combined-Cycle Combustion Turbine					
Ackerman[5]	Mississippi	1	713	2007	2007
Allen[6]	Tennessee	1	1,106	2018	2018
Caledonia[7]	Mississippi	3	765	2003	2003
John Sevier[8]	Tennessee	1	871	2012	2012
Lagoon Creek[9]	Tennessee	1	525	2010	2010
Magnolia	Mississippi	3	918	2003	2003
Paradise[10]	Kentucky	1	1,100	2017	2017
Southaven	Mississippi	3	780	2003	2003
Subtotal Combined-Cycle Combustion Turbine		14	6,778		
Total Natural Gas and/or Oil-Fired		101	12,509		

Hydroelectric					
Conventional Plants	Alabama	36	1,176	1925	1962
	Georgia	2	35	1931	1956
	Kentucky	5	223	1944	1948
	North Carolina	6	492	1940	1956
	Tennessee	60	1,856	1912	1972
Pumped-Storage[11]	Tennessee	4	1,616	1978	1979
Total Hydroelectric		113	5,398		
Diesel Generator					
Meridian	Mississippi	5	9	1998	1998
TVA Non-hydro Renewable Resources[12]			1		
Total TVA-Operated Generating Facilities			33,526		
Contract Renewable Resources[13]			314		
Power Purchase and Other Agreements[14]			3,674		
Total Summer Net Capability			37,514		

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Notes
(1) Net capability is defined as the ability of an electric system, generating unit, or other system component to carry or generate power for a specified time period
and does not include operational limitations such as derates.
(2) The summer net capability for Browns Ferry excludes the impact of the EPU project. The generating capability is expected to increase by
an estimated 465 MW after completion of the project and sufficient run time to validate the new capacity.
(3) See Generating Properties above for a discussion of TVA-operated natural gas and/or oil-fired facilities subject to leaseback and long-term lease arrangements.
(4) Peak firing of simple-cycle combustion turbine units accounts for 326 MW of short-term capability.
(5) Ackerman Combined Cycle Facility is a single steam cycle unit driven by two gas turbines (2x1 configuration).
(6) Allen Combined Cycle Facility is a single steam cycle unit driven by two gas turbines (2x1 configuration).
(7) Caledonia Combined Cycle Plant is currently a leased facility operated by TVA.
(8) John Sevier Combined Cycle Facility is a single steam cycle unit driven by three gas turbines (3x1 configuration).
(9) Lagoon Creek Combined Cycle Facility is a single steam cycle unit driven by two gas turbines (2x1 configuration).
(10) Paradise Combined Cycle Facility is a single steam cycle unit driven by three gas turbines (3x1 configuration).
(11) See Item 1, Business — Power Supply and Load Management Resources — Hiwassee Hydro Unit 2 for a discussion of Hiwassee Hydro Unit 2.
(12) TVA owns 1 MW of solar installations at 14 sites.
(13) Contract Renewable Resources include capability from various renewable energy programs established by TVA to encourage the development of solar, wind, biomass, and low-impact hydroelectric generation systems across the Tennessee Valley.
(14) Power Purchase and Other Agreements includes renewable resources. See Item 1, Business — Power Supply and Load Management Resources — Purchased Power and Other Agreements for information on renewable energy power purchase contracts.

Transmission Properties

TVA's transmission system interconnects with systems of surrounding utilities and consisted primarily of the following assets at September 30, 2018:

- Approximately 2,500 circuit miles of 500 kilovolt, 11,700 circuit miles of 161 kilovolt, 2,000 circuit miles of other voltage transmission lines, and 3,600 miles of fiber;
- 508 transmission substations, power switchyards, and switching stations; and
- 1,321 customer connection points (customer, generation, and interconnection).

At September 30, 2018, certain qualified technological equipment and other software related to TVA's transmission system were leased to private entities and leased back to TVA under long-term leases. See Note 13 — Lease/Leasebacks.

Natural Resource Stewardship Properties

TVA operates and maintains 49 dams and manages the following natural resource stewardship properties:

- Approximately 11,000 miles of reservoir shoreline;
- Approximately 293,000 acres of reservoir land;
- Approximately 650,000 surface acres of reservoir water; and
- Approximately 80 public recreation areas throughout the Tennessee Valley, including campgrounds, day-use areas, and boat launching ramps.

Additionally, TVA manages over 170 agreements for commercial recreation (such as campgrounds and marinas).

As part of its stewardship responsibilities, TVA approval is required to be obtained before any obstruction affecting navigation, flood control, or public lands can be constructed in or along the Tennessee River and its tributaries.

Buildings

TVA has a variety of buildings and structures located throughout its service area including generation and transmission facilities, corporate offices, customer service centers, power service centers, warehouses, visitor centers, and crew quarters. The most significant of these buildings are its Knoxville Office Complex ("KOC") and the Chattanooga Office Complex in Tennessee, as well as a significant number of buildings in Muscle Shoals, Alabama. In 2013, TVA initiated a study of its real estate portfolio for the purpose of reducing cost, right-sizing the portfolio, and aligning its real estate with TVA’s strategic direction over the next 10 to 20 years. As part of this effort, TVA completed a comprehensive assessment of its real estate holdings in the Knoxville region in 2016. For a discussion of these real estate holdings, see Disposal of Property — Knoxville Property.

Disposal of Property

TVA has broad authority to dispose of personal property but only limited authority to dispose of real property. TVA's primary, but not exclusive, authority to dispose of real property is briefly described below:

- TVA has authority to dispose of surplus real property at a public auction;
- TVA may dispose of real property for certain specified purposes, including providing replacement lands for certain entities whose lands were flooded or destroyed by dam or reservoir construction, providing real property for recreational use, and granting easements and rights-of-way upon which are located transmission or distribution lines;

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- TVA can dispose of real property in connection with the construction of generating plants or other facilities under certain circumstances; and
- TVA has authority to grant easements for rights-of-way and other purposes.

the Basic Tennessee Valley Authority Power Bond Resolution adopted by the TVA Board on October 6, 1960, as amended on September 28, 1976, October 17, 1989, and March 25, 1992 (the "Basic Resolution"), prohibits TVA from mortgaging any part of its power properties and from disposing of all or any substantial portion of these properties unless TVA provides for a continuance of the interest, principal, and sinking fund payments due and to become due on all outstanding Bonds, or for the retirement of such Bonds.

Bellefonte Nuclear Plant. On November 14, 2016, following a public auction, TVA entered into a contract to sell substantially all of the Bellefonte site to Nuclear Development, LLC for $111 million. Nuclear Development, LLC, paid TVA $22 million on November 14, 2016, with the remaining $89 million due at closing. Nuclear Development, LLC, had up to two years from November 14, 2016, to close on the property, and TVA agreed to maintain the site until closing. Nuclear Development, LLC, requested and was granted an extension of the initial closing date. Nuclear Development, LLC now has until November 30, 2018 to close on the property, and TVA will continue to maintain the site until then. See Note 7 — Deferred Nuclear Generation Units.

Muscle Shoals Property. In alignment with its strategic direction of right-sizing its real estate portfolio, TVA drafted a strategy to further reduce a significant number of buildings and property in Muscle Shoals, Alabama, including the disposition of 900 acres of the 1000 acres approved by the TVA Board in 2012. On April 20, 2018, following a public auction, TVA entered into a contract to sell the property to Muscle Shoals Holdings, LLC for $5 million. The Alabama Department of Environmental Management granted the release of an existing environmental permit, and the transaction closed on July 23, 2018.

Knoxville Property. In 2016, TVA completed a comprehensive assessment of its real estate holdings in the Knoxville, Tennessee region including the KOC and adjacent Summer Place Complex ("SPC"). As a result of this study and a subsequent environmental assessment in 2017, TVA is planning to consolidate most of its Knoxville area employees into one location in the KOC West Tower and plans to convey the East Tower and the SPC.

ITEM 3. LEGAL PROCEEDINGS

From time to time, TVA is party to or otherwise involved in lawsuits, claims, proceedings, investigations, and other legal matters ("Legal Proceedings") that have arisen in the ordinary course of conducting TVA’s activities, as a result of catastrophic events or otherwise. While the outcome of the Legal Proceedings to which TVA is a party cannot be predicted with certainty, any adverse outcome to a Legal Proceeding involving TVA may have a material adverse effect on TVA’s cash flows, results of operations, and financial condition. For a discussion of Legal Proceedings involving TVA, see Note 8 and Note 21 — Legal Proceedings, which discussions are incorporated by reference into this Item 3.

ITEM 4. MINE SAFETY DISCLOSURES

Not applicable.

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PART II

ITEM 5. MARKET FOR REGISTRANT'S COMMON EQUITY, RELATED STOCKHOLDER MATTERS AND ISSUER PURCHASES OF EQUITY SECURITIES

Not applicable.

ITEM 6. SELECTED FINANCIAL DATA

The following selected financial data for the years 2014 through 2018 should be read in conjunction with the audited financial statements and notes thereto (collectively, the "Consolidated Financial Statements") presented in Item 8, Financial Statements and Supplementary Data. Certain reclassifications have been made to the 2014, 2015, and 2016 financial statement presentations to conform to the 2017 and 2018 presentations.

Selected Financial Data[1][2]
For the years ended, or at, September 30
(dollars in millions)

	2018	2017	2016	2015	2014
Sales (millions of kWh)	160,338	152,362	155,855	158,163	158,057
Peak load (MW)[3]	32,509	29,899	29,824	32,751	33,352
Operating revenues	$11,233	$10,739	$10,616	$11,003	$11,137
Net income	$1,119	$685	$1,233	$1,111	$469
Total assets	$48,667	$50,017	$50,494	$48,745	$45,514
Financial obligations					
Long-term debt, net[4]					
Long-term power bonds, net	$20,157	$20,205	$20,901	$22,617	$21,880
Long-term debt of variable interest entities, net	1,127	1,164	1,199	1,233	1,265
Long-term notes payable	23	69	48	—	—
Total long-term debt, net	$21,307	$21,438	$22,148	$23,850	$23,145
Current debt, net[4]					
Short-term debt, net	$1,216	$1,998	$1,407	$1,034	$596
Current maturities of power bonds	1,032	1,728	1,555	32	1,032
Current maturities of long-term debt of variable interest entities	38	36	35	33	32
Current maturities of notes payable	46	53	27	—	—
Total current debt, net	$2,332	$3,815	$3,024	$1,099	$1,660
Total debt[4]	$23,639	$25,253	$25,172	$24,949	$24,805
Capital leases[5]	$182	$187	$181	$105	$109
Leaseback obligations	$301	$339	$467	$616	$691

Notes
(1) See Item 7, Management's Discussion and Analysis of Financial Condition and Results of Operations for a description of certain items in 2018, 2017, and 2016 affecting results in those years.

(2) See Item 1A, Risk Factors and Note 21 for a discussion of risks and contingencies that could affect TVA's future financial results.
(3) TVA met an all-time summer peak demand of 33,482 MW on August 16, 2007, at 102 degrees Fahrenheit and an all-time winter peak demand of 33,352 MW on January 24, 2014, at 7.3 degrees Fahrenheit.
(4) See Note 10 and Note 13 — Debt Outstanding.
(5) Included in Accounts payable and accrued liabilities and Other long-term liabilities on the consolidated balance sheets.

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ITEM 7. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS
(Dollars in millions except where noted)

The following Management's Discussion and Analysis of Financial Condition and Results of Operations ("MD&A") is intended to help the reader understand Tennessee Valley Authority ("TVA"), its operations, and its present business environment. The MD&A is provided as a supplement to, and should be read in conjunction with, TVA's consolidated financial statements and the accompanying notes thereto contained in Item 8, Financial Statements and Supplementary Data of this Annual Report on Form 10-K for the fiscal year ended September 30, 2018 (the "Annual Report"). The MD&A includes the following sections:

- Business and Mission - a general description of TVA's business, objectives, strategic priorities, and core capabilities;
- Executive Overview - a general overview of TVA's activities and results of operations for 2018;
- Results of Operations - an analysis of TVA's consolidated results of operations for the three years presented in its consolidated financial statements;
- Liquidity and Capital Resources - an analysis of cash flows, a description of aggregate contractual obligations, and an overview of financial position;
- Key Initiatives and Challenges - an overview of current and future initiatives and challenges facing TVA;
- Critical Accounting Policies and Estimates - a summary of accounting policies that require critical judgments and estimates;
- Fair Value Measurements - a description of TVA's investments and derivative instruments and valuation considerations;
- Legislative and Regulatory Matters - a summary of laws and regulations that may impact TVA; and
- Risk Management Activities - a description of TVA's risk governance and exposure to various market risks.

Business and Mission

Business

TVA operates the nation's largest public power system. At September 30, 2018, TVA provided electricity to approximately 49 large industrial customers, seven federal agency customers, and 154 local power company customers of TVA ("LPCs") that serve nearly 10 million people in parts of seven southeastern states. TVA generates nearly all of its revenues from the sale of electricity, and in 2018 revenues from the sale of electricity totaled $11.1 billion. As a wholly-owned agency and instrumentality of the United States ("U.S."), however, TVA differs from other electric utilities in a number of ways:

- TVA is a government corporation.
- The area in which TVA sells power is limited by the Tennessee Valley Authority Act of 1933 (the "TVA Act") under a provision known as the "fence"; however, another provision of federal law known as the "anti-cherrypicking" provision generally protects TVA from being forced to provide access to its transmission lines to others for the purpose of

delivering power to customers within substantially all of TVA's defined service area.

The rates TVA charges for power are set solely by the TVA Board of Directors (the "TVA Board") and are not set or reviewed by another entity, such as a public utility commission. In setting rates, however, the TVA Board is charged by the TVA Act to have due regard for the primary objectives of the TVA Act, including the objective that power be sold at rates as low as feasible.

TVA is not authorized to raise capital by issuing equity securities. TVA relies primarily on cash from operations and proceeds from power program borrowings to fund its operations and is authorized by the TVA Act to issue bonds, notes, or other evidences of indebtedness ("collectively, Bonds") in an amount not to exceed $30.0 billion outstanding at any given time. Although TVA's operations were originally funded primarily with appropriations from Congress, TVA has not received any appropriations from Congress for any activities since 1999 and, as directed by Congress, has funded essential stewardship activities primarily with power revenues.

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TVA's Mission of Service

TVA was built for the people, created by federal legislation, and charged with a unique mission - to improve the quality of life in a seven-state region through the integrated management of the region’s resources. TVA's mission focuses on three key areas:

ENERGY ENVIRONMENT ECONOMIC DEVELOPMENT

- Energy - Delivering affordable, reliable power;
- Environment - Caring for the region's natural resources; and
- Economic Development - Creating sustainable economic growth.

While TVA's mission has not changed since it was established in 1933, the climate in which TVA operates continues to evolve. The business and economic environment has become more challenging due to economic conditions, tougher environmental standards, and the need to diversify its power supply and adapt to changing customer usage behaviors, new technologies, and emerging, non-traditional competition. To continue TVA’s mission of service, it must realize four strategic imperatives through people performance excellence:

- Rates - Maintain low rates;
- Stewardship - Be responsible stewards;
- Debt - Live within its means;
- Asset Portfolio - Meet reliability expectations and provide a balanced portfolio; and
- People Performance Excellence - Continuously improve, empower, and engage employees.

TVA’s mission sets the stage for its strategic planning process that includes strategic objectives, initiatives, and scorecards for performance designed to provide clear direction for improving TVA's core business.

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Linking the Mission to Performance

TVA has formulated key performance measures to support its strategic imperatives. The intent of these measures is to align employees to TVA’s mission by focusing its collective efforts on operational excellence, fiscal responsibility, and economic development and environmental stewardship. The measures are designed to promote teamwork, encourage high performance behaviors, and motivate TVA employees to achieve goals aligned with TVA’s mission and values. The 2018 corporate results compared with targets for these key measures are reflected in the chart below. See Item 11, Executive Compensation — Compensation Discussion and Analysis for information regarding how the measures are calculated.

Corporate Measure	Weight	Actual	Threshold	Target	Stretch
Load not served (system minutes)	30%	3.3	4.8	4.0	3.6
TVA total spending ($ millions)	30%	$4,353	$4,920	$4,781	$4,643
Nuclear unit capability factor (UCF) (%)	20%	91.3%	89.3%	90.1%	90.9%
Coal seasonal equivalent forced outage rate (%)	10%	12.5%	7.3%	6.1%	4.9%
Combined cycle seasonal equivalent forced outage rate (%)	10%	1.6%	2.4%	1.7%	0.9%

Executive Overview

TVA’s net income for the years ended September 30, 2018 and 2017, was $1.1 billion and $685 million, respectively. As is often the case for electric utilities, weather is a primary driver of TVA's sales. TVA's service territory experienced overall warmer than normal weather for much of 2018 and record-setting low temperatures during the month of January 2018, compared to the milder weather experienced for much of 2017. Revenue from the sales of electricity increased $489 million for the year ended September 30, 2018, as compared to the prior year, primarily due to higher sales volume to LPCs, who are more weather sensitive, and the base rate adjustment that became effective October 1, 2017. In addition, operating and maintenance expense decreased $508 million for the year ended September 30, 2018, as compared to the prior year, primarily driven by a one-time discretionary pension contribution in 2017, and a decrease in nuclear planned outage days. Depreciation and amortization expense increased $810 million for the year ended September 30, 2018, as compared to the prior year driven by $857 million of accelerated amortization of the Deferred nuclear generating units and Nuclear training costs regulatory assets due to excess revenues collected in 2018 in accordance with the TVA Board's ratemaking authority.

In 2011, TVA entered into two substantively similar agreements, one with the Environmental Protection Agency ("EPA") and the other with several states and environmental groups. During 2018, consistent with these agreements, TVA installed two selective catalytic reduction systems ("SCRs") at the Gallatin Fossil Plant ("Gallatin") and installed scrubbers and SCRs for Units 1 and 4 at the Shawnee Fossil Plant ("Shawnee"). TVA also retired Units 1-4 of the Johnsonville Fossil Plant ("Johnsonville"), Units 1-3 of the Allen Fossil Plant ("Allen") after completion of the natural gas-fired Allen Combined Cycle Plant ("Allen CC"), and Unit 20 of the Johnsonville Combustion Turbine Plant (“Johnsonville CT”), which allows for cogeneration capability. With these actions, TVA has completed the requirements in the environmental agreements related to retiring or installing controls on coal-fired units.

TVA also completed the first phase of the extended power uprate ("EPU") project at Browns Ferry Nuclear Plant ("Browns Ferry") and plans to complete the next two phases by the end of 2019. With the completion of the construction projects at Allen CC, Johnsonville CT, and Browns Ferry, TVA will have replaced approximately 1,200 MW of coal-fired generation capability with over 1,600 MW of clean energy capacity. TVA does not foresee needing additional large, base-load generation units for at least the next decade.

In May 2017, the TVA Board authorized up to $300 million to build an enhanced fiber network that will better connect its operational assets. The new fiber optic lines will improve the reliability and resiliency of the generation and transmission system, while enabling the system to better accommodate distributed energy resources ("DER"). The TVA Board also approved up to $245 million for the construction of a new system operations center (“SOC”). The

secured facility is being built to accommodate a new energy management system and to adapt to new regulatory requirements. Both of these initiatives will position TVA to continue providing competitive and reliable power to its customers.

During 2018, TVA continued to achieve 99.999 percent reliability in delivering energy to its customers. TVA's reliability and economic development efforts continued to attract and encourage the expansion of business and industries in the Tennessee Valley, with over $11.3 billion in investments and approximately 65,400 jobs created or retained during the year.

Consistent with national trends, energy demand in the areas served by TVA and the LPCs has been essentially flat over the past five years. TVA anticipates this trend to continue as technological advances, consumer demand for generation, energy management technologies, and distributed energy increase. To accommodate this trend, TVA began working with its LPCs on its long-term pricing and product development strategies in the fall of 2013. Since that time, TVA has collaborated with its LPCs to

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refine some of these details. At its May 10, 2018 meeting, the TVA Board approved a change to the structure of its wholesale electric power rates through pricing that better aligns wholesale rates with the underlying cost to serve customers. TVA is continuing to work with LPCs to implement these changes, which became effective on October 1, 2018. With this proactive rate structure change, TVA expects to provide a stable foundation that gives the flexibility to embrace new trends and to continue delivering more innovative energy options.

Additionally, TVA remains committed to planning its system in a way that ensures evolving resource portfolios remain reliable and provide the most value to all customers. TVA utilizes an Integrated Resource Plan ("IRP") to provide direction on how to best meet future electricity demand. TVA has begun working on an updated IRP that will consider many views of the future to determine how TVA can continue to provide low-cost, reliable electricity, support environmental stewardship, and spur economic development in the Tennessee Valley over the next 20 years.

Results of Operations

Sales of Electricity

Sales of electricity accounted for nearly all of TVA's operating revenues in 2018, 2017, and 2016. TVA sells power at wholesale rates to LPCs that resell the power to their customers at retail rates. TVA also sells power to directly served customers, consisting primarily of federal agencies and customers with large or nonstandard loads. In addition, power that exceeds the needs of the TVA system is sold under exchange power arrangements with certain other power systems.

The following chart compares TVA’s sales of electricity for the years ended September 30, 2018, 2017, and 2016:

Sales of Electricity
For the years ended
September 30
(millions of kWh)

Notes
(1) Includes approximately 429 million kilowatt hours ("kWh") of pre-commercial generation at Allen CC. See Note 1 — Pre-Commercial Plant Operations.
(2) Includes approximately 857 million kWh of pre-commercial generation at Watts Bar Nuclear Plant ("Watts Bar") Unit 2, Paradise Combined Cycle Plant, and Allen CC. See Note 1 — Pre-Commercial Plant Operations.
(3) Includes approximately 579 million kWh of pre-commercial generation at Watts Bar Unit 2. See Note 1 — Pre-Commercial Plant Operations.

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Weather affects both the demand for TVA power and the price for that power. TVA uses degree days to measure the impact of weather on its power operations. Degree days measure the extent to which average temperatures in the five largest cities in TVA's service area vary from 65 degrees Fahrenheit.

2018 Compared to 2017

	Degree Days								
	2018	Normal	Percent Variation	2017	Normal	Percent Variation	2018	2017	Percent Change
Heating Degree Days	3,287	3,360	(2.2)%	2,378	3,360	(29.2)%	3,287	2,378	38.2 %
Cooling Degree Days	2,314	1,863	24.2 %	2,007	1,863	7.7 %	2,314	2,007	15.3 %
Total Degree Days	5,601	5,223	7.2 %	4,385	5,223	(16.0)%	5,601	4,385	27.7 %

Sales of electricity increased approximately five percent for the year ended September 30, 2018, as compared to the prior year, primarily due to increased sales volume for LPCs driven predominantly by a 28 percent increase in total degree days. Colder than normal weather during January 2018 led to TVA setting an all-time record for energy demand in a 24-hour period, as TVA delivered 706 million kWh of energy to the Tennessee Valley. Also in January 2018, TVA set three of its top-12 winter peak demand records. In addition, TVA's service territory experienced overall warmer than normal weather during the third and fourth quarters of 2018. Partially offsetting the increased sales volume for LPCs was a slight decrease in sales to industries directly served, particularly in the pulp and paper and polysilicon sectors.

2017 Compared to 2016

	Degree Days								
	2017	Normal	Percent Variation	2016	Normal	Percent Variation	2017	2016	Percent Change
Heating Degree Days	2,378	3,360	(29.2)%	2,634	3,381	(22.1)%	2,378	2,634	(9.7)%
Cooling Degree Days	2,007	1,863	7.7 %	2,360	1,863	26.7 %	2,007	2,360	(15.0)%
Total Degree Days	4,385	5,223	(16.0)%	4,994	5,244	(4.8)%	4,385	4,994	(12.2)%

Sales of electricity decreased approximately two percent for the year ended September 30, 2017, as compared to the prior year, primarily due to decreased sales volume for LPCs driven primarily by a 12 percent decrease in total degree days. Additionally, a decrease in sales to federal agencies and other occurred primarily as a result of a decrease in off-system sales, as TVA had less excess generation available for sale to the market as compared to the prior year. Partially offsetting these decreases was an increase in sales to industries directly served as a result of increased production of customers in the polysilicon, metal, and chemical sectors.

Financial Results

The following table compares operating results for 2018, 2017, and 2016:

Summary Consolidated Statements of Operations	2018	2017	2016
Operating revenues	$11,233	$10,739	$10,616
Operating expenses[(1)]	8,921	8,764	8,290
Operating income	2,312	1,975	2,326
Other income, net	50	56	43

Net interest expense	1,243	1,346	1,136
Net income	$1,119	$685	$1,233

Note

(1) For the year ended September 30, 2018, TVA recorded $857 million of accelerated amortization of the Deferred nuclear generating units and Nuclear training costs regulatory assets. See Note 7. For the year ended September 30, 2017, TVA made to a one-time additional discretionary $500 million contribution to TVA's pension plan.

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Operating Revenues. Operating revenues for the years ended September 30, 2018, 2017, and 2016 consisted of the following:

Operating Revenues
For the years ended
September 30

Notes
(1) Excludes a contra-revenue amount of approximately $11 million representing revenue capitalized during pre-commercial operations at Allen CC. See Note 1 — Pre-Commercial Plant Operations.
(2) Excludes a contra-revenue amount of approximately $22 million representing revenue capitalized during pre-commercial operations at Watts Bar Unit 2, Paradise Combined Cycle Plant, and Allen CC. See Note 1 — Pre-Commercial Plant Operations.
(3) Excludes a contra-revenue amount of approximately $18 million representing revenue capitalized during pre-commercial operations at Watts Bar Unit 2. See Note 1 — Pre-Commercial Plant Operations.

The rate structure in effect provides price signals intended to reflect higher cost periods to serve LPCs and their end-use customers. Under this structure, weather can positively or negatively impact both volume and effective rates. This is because the wholesale structure includes two components: a demand charge and an energy charge. The demand charge is based on the customer's peak monthly usage and increases as the peak increases. The energy charge is based on the kWh used by the customer. The rate structure also includes a separate fuel rate that includes the costs of natural gas, fuel oil, purchased power, coal, emission allowances, nuclear fuel, and other fuel-related commodities; realized gains and losses on derivatives purchased to hedge the costs of such commodities; and payments to states and counties in lieu of taxes ("tax equivalents") associated with the fuel cost adjustments. Beginning in October 2018 (and more fully in October 2019 when all LPCs will be priced under the new wholesale structure), the rate structure will include a third component to capture a portion of fixed charges. This third component is known as the Grid Access Charge ("GAC") and will be offset by a reduction to the energy charge. The GAC will reduce the variability in revenues caused by weather. See Item 1, Business — Rates — Rate Methodology.

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The changes in revenue components are summarized below:

	2018	Variance 2018 vs 2017	2017	Variance 2017 vs 2016	2016
Base revenue	$8,129 [1]	$ 630	$7,499 [2]	$ 31	$7,468 [3]
Fuel cost recovery	2,939	(142)	3,081	95	2,986
Off-system sales	7	1	6	(1)	7
Revenue from sales of electricity	11,075	489	10,586	125	10,461
Other revenue	158	5	153	(2)	155
Total operating revenues	$11,233	$ 494	$10,739	$ 123	$10,616

Notes

(1) Includes the impact of revenue capitalized during pre-commercial operations of approximately $11 million for the year ended September 30, 2018, at Allen CC. See Note 1 — Pre-Commercial Plant Operations.

(2) Includes the impact of revenue capitalized during pre-commercial operations of approximately $22 million for the year ended September 30, 2017, at Watts Bar Unit 2, Paradise Combined Cycle Plant, and Allen CC. See Note 1 — Pre-Commercial Plant Operations.

(3) Includes the impact of revenue capitalized during pre-commercial operations of approximately $18 million for the year ended September 30, 2016, at Watts Bar Unit 2. See Note 1 — Pre-Commercial Plant Operations.

2018 Compared to 2017

Operating revenues increased $494 million for the year ended September 30, 2018, as compared to the prior year, primarily due to a $630 million increase in base revenue. The $630 million increase in base revenue was driven by an increase of $460 million resulting from higher sales volume during the year ended September 30, 2018, as compared to the prior year. Colder than normal weather during January 2018 led to TVA setting an all-time record for energy demand in a 24-hour period. Also in January 2018, TVA set three of its top-12 winter peak demand records. In addition, TVA's service territory experienced overall warmer than normal weather during the third and fourth quarters of 2018. Further, approximately $159 million of the increase in base revenue was attributable to higher effective rates during the year ended September 30, 2018, as compared to the prior year, resulting from the base rate adjustment that became effective October 1, 2017. The base revenue increase was also due in part to an approximately $11 million decrease in capitalization of revenue resulting from pre-commercial generation during the year ended September 30, 2018, as compared to the prior year. See Note 1 — Pre-Commercial Plant Operations. Partially offsetting these increases was a $142 million decrease in fuel cost recovery revenues, driven by a $305 million decrease attributable to lower fuel rates partially offset by a $163 million increase attributable to higher energy sales. The lower fuel rates experienced were primarily driven by lower market prices for natural gas and a change in the mix of generation resources, including more nuclear, natural gas, and hydroelectric generation and less coal-fired generation.

2017 Compared to 2016

Operating revenues increased $123 million for the year ended September 30, 2017, as compared to the prior year, primarily due to a $95 million increase in fuel cost recovery revenues and a $31 million increase in base revenue. The $95 million increase in fuel cost recovery revenues reflects a $160 million increase attributable to higher fuel rates partially offset by a $65 million decrease attributable to lower energy sales. The higher fuel rates experienced were primarily driven by higher market prices for natural gas and a change in the mix of generation resources, including significantly less hydroelectric generation. The $31 million increase in base revenue was predominantly driven by an increase of $280 million attributable to higher effective rates during the year ended September 30, 2017, as compared to the prior year, due to the base rate adjustment that became effective October 1, 2016, partially offset by a decrease of $246 million resulting from lower sales volume. In addition, this increase in base revenue was partially offset by the capitalization of approximately $22 million of revenue resulting from pre-commercial generation at Watts Bar

Unit 2 and Paradise Fossil Plant ("Paradise") and Allen CC. See Note 1 — Pre-Commercial Plant Operations.

See Sales of Electricity above for further discussion of the change in the volume of sales of electricity and Operating Expenses below for further discussion of the change in fuel expense.

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Operating Expenses. Operating expense components as a percentage of total operating expenses for 2018, 2017, and 2016 consisted of the following:

The following table summarizes TVA's expenses for various fuels for the years indicated:

Fuel Expense for TVA-Owned Facilities[1]

For the years ended September 30

	Fuel Expense By Source			Cost per kWh[4]		
	2018	2017	2016	2018	2017	2016
Coal[2]	$847	$1,060	$1,275	2.68	2.71	2.77
Natural gas and/or oil-fired[3]	846	706	632	2.64	2.78	2.51
Nuclear fuel	374	334	277	0.58	0.57	0.52
Total fuel	$2,067	$2,100	$2,184	1.62	1.70	1.76

Notes

(1) Excludes effects of the fuel cost adjustment deferrals and amortization on fuel expense in the amounts of $(18) million, $69 million, and $(58) million for the years ended September 30, 2018, 2017, and 2016, respectively.

(2) Fuel expense related to oil consumed for startup at coal-fired facilities was $21 million, $18 million, and $21 million for the years ended September 30, 2018, 2017, and 2016, respectively.

(3) Fuel expense related to oil consumed for generation at natural gas and/or oil-fired facilities was $8 million, $2 million, and $2 million for the years ended September 30, 2018, 2017, and 2016, respectively.

(4) Total cost per kWh is based on a weighted average.

The following table shows TVA's generation and purchased power by generating source as a percentage of all electrical power generated and purchased (based on kWh) for the periods indicated:

Power Supply from TVA-Operated Generation Facilities and Purchased Power

For the years ended September 30

(millions of kWh)

	2018		2017		2016	
Coal-fired	31,471	19 %	39,019	25 %	46,028	29 %
Nuclear[1]	64,194	39 %	58,742	38 %	52,897	33 %
Hydroelectric	13,736	9 %	10,967	7 %	12,618	8 %
Natural gas and/or oil-fired[2]	32,104	20 %	25,485	16 %	25,221	16 %
Total TVA-operated generation facilities[3]	141,505	87 %	134,213	86 %	136,764	86 %
Purchased power (non-renewable)[4]	14,183	9 %	13,586	9 %	13,807	9 %
Purchased power (renewable)[5]	7,245	4 %	7,127	5 %	8,300	5 %
Total purchased power	21,428	13 %	20,713	14 %	22,107	14 %
Total power supply	162,933	100%	154,926	100%	158,871	100%

Notes

(1) The nuclear generation amount for the years ended September 30, 2017 and 2016 includes approximately 495 million kWh and 579 million kWh, respectively, of pre-commercial generation at Watts Bar Unit 2. See Note 1 — Pre-Commercial Plant Operations.

(2) The natural gas and/or oil-fired generation amount for the years ended September 30, 2018 and 2017, includes approximately 429 million kWh and 362 million kWh, respectively, of pre-commercial generation at Allen and Paradise Combined Cycle Plants. See Note 1 — Pre-Commercial Plant Operations.

(3) Generation from TVA-owned non-hydro renewable resources is less than one percent for all periods shown and therefore is not represented in the table above.

(4) Purchased power (non-renewable) includes generation from Caledonia Combined Cycle Plant, which is currently a leased facility operated by TVA. Generation from Caledonia Combined Cycle Plant was 4,125 million kWh, 4,276 million kWh, and 4,532 million kWh for the years ended September 30, 2018, 2017, and 2016, respectively.

(5) Purchased power (renewable) includes power purchased from the following renewable sources: hydroelectric, solar, wind, and cogeneration.

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2018 Compared to 2017

Fuel

Fuel expense decreased $120 million for the year ended September 30, 2018, as compared to the prior year. The impact of lower effective fuel rates, driven by lower market prices for natural gas and changes in the mix of generation resources, including more nuclear, natural gas, and hydroelectric generation and less coal-fired generation, contributed $234 million to the decrease. As an indication of the general market direction, the average Henry Hub natural gas spot price for the year ended September 30, 2018, was approximately three percent lower than the price for the prior year. Partially offsetting this decrease was a $114 million increase in fuel expense driven by a five percent increase in generation from TVA-operated resources to meet increased sales during the period.

Purchased Power

Purchased power expense decreased $18 million for the year ended September 30, 2018, as compared to the prior year. This was primarily due to a decrease of $42 million in the price of the purchased power and variances in fuel rate recovery. Partially offsetting these decreases was an increase of $24 million driven by a three percent increase in power purchased to meet increased sales during the period.

Operating and Maintenance

Operating and maintenance expense decreased $508 million for the year ended September 30, 2018, as compared to the prior year. This decrease was primarily due to a $494 million decrease in pension expense for 2018 which is attributable to a one-time additional discretionary $500 million contribution to TVA's pension plan in 2017, which was recognized as pension expense. See Note 20. Additionally, there was a decrease in refueling outage days which reduced outage expense by $35 million, primarily from planned outages. These decreases in operating and maintenance expense were partially offset by an increase of $28 million in inventory write-off expense, as compared to the prior year, primarily related to transitioning from a site-specific inventory management policy to a fleet-wide strategy for each generation type.

Depreciation and Amortization

Depreciation and amortization expense increased by $810 million primarily driven by $857 million of accelerated amortization of the Deferred nuclear generating units and Nuclear training costs regulatory assets due to excess revenues collected in 2018 in accordance with the TVA Board's ratemaking authority. See Note 7. These items were partially offset by a decrease of $100 million in depreciation expense related to the retirement of certain units at Allen Fossil Plant, Paradise Fossil Plant, and Johnsonville Fossil Plant. In addition, there was an increase of approximately $53 million for net additions to completed plant including the completion of Allen Combined Cycle Plant, which commenced commercial operations in April 2018, and Paradise Combined Cycle Plant, which commenced commercial operations in April 2017.

Tax Equivalents

Tax equivalents expense decreased $7 million for the year ended September 30, 2018, as compared to the prior year. This change is primarily driven by a decrease in the tax equivalents collected in the fuel rate recovery. The tax equivalents collected in the fuel rate recovery equal five percent of the fuel revenues.

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2017 Compared to 2016

Fuel
Fuel expense increased $43 million for the year ended September 30, 2017, as compared to the prior year. The impact of higher effective fuel rates, driven by changes in the mix of generation resources, including less hydroelectric generation, and higher market prices for natural gas, contributed approximately $84 million to the increase. As an indication of the general market direction, the average Henry Hub natural gas spot price for the year ended September 30, 2017, was approximately 33 percent higher than the price for the prior year. Partially offsetting this increase was a $41 million decrease in fuel expense driven by a two percent decrease in generation from TVA-owned resources.

Purchased Power
Purchased power expense increased $27 million for the year ended September 30, 2017, as compared to the same period of the prior year. This was primarily due to an increase of $80 million driven by changes in the mix of generation resources purchased, including solar and natural gas, and higher market prices for natural gas. Partially offsetting this increase was a decrease of $54 million primarily due to overall lower demand and therefore a decrease in the volume of purchased power.

Operating and Maintenance
Operating and maintenance expense increased $520 million for the year ended September 30, 2017, as compared to the prior year. This increase was primarily due to an additional discretionary $500 million contribution to TVA's pension plan in 2017, which was recognized as additional pension expense. See Note 20. Additionally, nuclear refueling outage expense increased $89 million, primarily from a significant increase in planned outage days, as compared to the prior year. These increases were partially offset by a $26 million decrease in coal outage expense primarily from planned outages and a $43 million decrease due to a reduction in workforce related to identified efficiencies and staffing changes needed to support TVA's generating fleet.

Depreciation and Amortization
Depreciation and amortization expense decreased $119 million for the year ended September 30, 2017, as compared to the prior year. Implementation of a new depreciation study during the first quarter of 2017 resulted in approximately $224 million less depreciation expense. The decrease in depreciation expense as a result of the new depreciation rates is primarily attributable to changes in retirement date assumptions for coal-fired plants and changes in the estimated service lives for transmission assets. See Note 1 — Property, Plant, and Equipment, and Depreciation — Depreciation. In addition, the retirement of Colbert Fossil Plant ("Colbert") Units 1-4 in March 2016 and Paradise Fossil Plant Units 1 and 2 in April 2017 contributed $29 million and $50 million, respectively, to the decrease. Partially offsetting these decreases was an increase of approximately $184 million primarily from net additions to Completed plant, including $133 million associated with Watts Bar Unit 2 commencing commercial operations in October 2016 and $12 million associated with Paradise Combined Cycle Plant commencing commercial operations in April 2017.

Tax Equivalents
Tax equivalents expense increased $3 million for the year ended September 30, 2017, as compared to the same period of the prior year. This change primarily reflects an increase in the accrued tax equivalent expense related to the fuel cost adjustment mechanism. The accrued tax equivalent expense is equal to five percent of the fuel cost adjustment mechanism revenues and increased for the year ended September 30, 2017, as compared to the same period of the prior year.

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Interest Expense. Interest expense and interest rates for 2018, 2017, and 2016 were as follows:

Interest Expense and Rates
For the years ended September 30

	2018	Percent Change	2017	Percent Change	2016
Interest expense[1]	$1,243	(7.7)%	$1,346	(1.8)%	$1,371
Allowance for funds used during construction	—	— %	—	(100.0)%	(235)
Net interest expense	$1,243	(7.7)%	$1,346	18.5 %	$1,136
Average blended debt balance[2]	$24,832	(1.8)%	$25,281	(0.7)%	$25,450
Average blended interest rate[3]	4.81 %	(5.9)%	5.11 %	(0.8)%	5.15 %

Notes
(1) Interest expense includes amortization of debt discounts, issuance, and reacquisition costs, net.
(2) Includes average balances of long-term power bonds, debt of variable interest entities ("VIE"), and discount notes.
(3) Includes interest on long-term power bonds, debt of VIE, and discount notes.

2018 Compared to 2017

Total interest expense decreased $103 million for the year ended September 30, 2018, as compared to the prior year. This was primarily driven by a decrease of $97 million due to lower average balances and rates on long-term debt, partially offset by an increase of $20 million due to higher average balances and rates on short-term debt. The total interest expense decrease was also attributable to $8 million of lower interest on alternative financing debt and $18 million of lower interest on debt discount and reacquisition.

2017 Compared to 2016

Net interest expense increased $210 million for the year ended September 30, 2017, as compared to the prior year. During the year ended September 30, 2016, TVA capitalized $235 million in allowance for funds used during construction ("AFUDC") related to the Watts Bar Unit 2 construction project. TVA did not capitalize any AFUDC in 2017. Interest expense excluding AFUDC was $25 million lower for the year ended September 30, 2017, as compared to the prior year, primarily due to lower interest rates on long-term debt.

Liquidity and Capital Resources

Sources of Liquidity

To meet cash needs and contingencies, TVA depends on various sources of liquidity. TVA’s primary sources of liquidity are cash from operations and proceeds from the issuance of short-term and long-term debt. Current liabilities may exceed current assets from time to time in part because TVA uses short-term debt to fund short-term cash needs, as well as to pay scheduled maturities and other redemptions of long-term debt. The daily balance of cash and cash equivalents maintained is based on near-term expectations for cash expenditures and funding needs.

In addition to cash from operations and proceeds from the issuance of short-term and long-term debt, TVA's sources of liquidity include a $150 million credit facility with the United States Department of the Treasury ("U.S. Treasury"), four long-term revolving credit facilities totaling $2.7 billion, and proceeds from other financings. See Note 13 — Credit Facility Agreements. Other financing arrangements may include sales of receivables, loans, and other assets.

The TVA Act authorizes TVA to issue Bonds in an amount not to exceed $30.0 billion outstanding at any time. In March 2018, TVA issued $1.0 billion of power bonds maturing in March 2020. See Note 13 — Debt Securities Activity. Power bonds outstanding, excluding unamortized discounts and premiums and net exchange losses from foreign currency transactions, at September 30, 2018 and 2017, were $22.7 billion (including current maturities) and $24.2 billion (including current maturities), respectively. The balance of Bonds outstanding directly affects TVA's capacity to meet operational liquidity needs and to strategically use Bonds to fund certain capital investments as management and the TVA Board may deem desirable. Other options for financing not subject to the limit on Bonds, including lease financings (see Lease Financings below and Note 10), could provide supplementary funding if needed. Currently, TVA believes that it has adequate capability to fund its ongoing operational liquidity needs and make planned capital investments over the next decade through a combination of Bonds, additional power revenues through power rate increases, cost reductions, or other ways. See Lease Financings below, Note 10, and Note 13 for additional information.

Debt Securities. TVA's Bonds are not obligations of the U.S., and the U.S. does not guarantee the payments of principal or interest on Bonds. TVA's Bonds consist of power bonds and discount notes. Power bonds have maturities of between one and 50 years. At September 30, 2018, the average maturity of long-term power bonds was 16.3 years, and the

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average interest rate was 4.52 percent. Discount notes have maturities of less than one year. Power bonds and discount notes have a first priority and equal claim of payment out of net power proceeds. Net power proceeds are defined as the remainder of TVA's gross power revenues after deducting the costs of operating, maintaining, and administering its power properties and payments to states and counties in lieu of taxes, but before deducting depreciation accruals or other charges representing the amortization of capital expenditures, plus the net proceeds from the sale or other disposition of any power facility or interest therein. In addition to power bonds and discount notes, TVA had long-term debt associated with certain VIEs outstanding at September 30, 2018. TVA also had secured notes outstanding at September 30, 2018, that were assumed in asset acquisitions and business combinations in prior years. See Lease Financing below, Note 10, and Note 13 for additional information.

Power bonds and discount notes are both issued pursuant to Section 15d of the TVA Act and pursuant to the Basic Tennessee Valley Authority Power Bond Resolution adopted by the TVA Board on October 6, 1960, as amended on September 28, 1976, October 17, 1989, and March 25, 1992 (the "Basic Resolution"). The TVA Act and the Basic Resolution each contain two bond tests: the rate test and the bondholder protection test.

Under the rate test, TVA must charge rates for power which will produce gross revenues sufficient to provide funds for:

- Operation, maintenance, and administration of its power system;
- Tax equivalents;
- Debt service on outstanding Bonds;
- Payments to the U.S. Treasury in repayment of and as a return on the Power Program Appropriation Investment; and
- Such additional margin as the TVA Board may consider desirable for investment in power system assets, retirement of outstanding Bonds in advance of maturity, additional reduction of the Power Program Appropriation Investment, and other purposes connected with TVA’s power business, having due regard for the primary objectives of the TVA Act, including the objective that power shall be sold at rates as low as are feasible. See Note 17 — Appropriation Investment.

TVA fulfilled its requirement to repay $1.0 billion of the Power Program Appropriation Investment in 2014; therefore, the repayment of this amount is no longer a component of rate setting.

The rate test for the one-year period ended September 30, 2018, was calculated after the end of 2018, and TVA met the test’s requirements.

Under the bondholder protection test, TVA must, in successive five-year periods, use an amount of net power proceeds at least equal to the sum of the depreciation accruals and other charges representing the amortization of capital expenditures and the net proceeds from any disposition of power facilities, for either the reduction of its capital obligations (including Bonds and the Power Program Appropriation Investment) or investment in power assets.

The bondholder protection test for the five-year period ended September 30, 2015, was calculated after the end of 2015, and TVA met the test’s requirements. TVA must next meet the bondholder protection test for the five-year period ending September 30, 2020.

TVA uses proceeds from the issuance of discount notes, in addition to other sources of liquidity, to fund short-term cash needs and scheduled maturities of long-term debt.

The following table provides additional information regarding TVA's short-term borrowings.
Short-Term Borrowing Table

	At September 30 2018	For the year ended September 30 2018	At September 30 2017	For the year ended September 30 2017	At September 30 2016	For the year ended September 30 2016
Gross Amount Outstanding (at End of Period) or Average Gross Amount Outstanding (During Period)						
Discount notes	$ 1,217	$ 1,910	$ 1,999	$ 1,280	$ 1,407	$ 1,323
Weighted Average Interest Rate						
Discount notes	2.045 %	1.500 %	1.000 %	0.668 %	0.203 %	0.240 %
Maximum Month-End Gross Amount Outstanding (During Period)						
Discount notes	N/A	$ 2,722	N/A	$ 2,062	N/A	$ 1,561

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TVA ended the year at September 30, 2018, with a lower balance of short-term debt than at September 30, 2017, due primarily to higher operating cash flows. The average balance of short-term debt was higher in 2018 than 2017 due primarily to the timing of cash flows.

TVA generally uses proceeds from the issuance of power bonds to refinance maturing power bonds or other financing obligations, as necessary, or for other power system purposes. The total balance of power bonds may decline in periods where redemptions of power bonds exceed issuance due to net positive cash flow from operating and investing activities. TVA projects that it will reduce the balance of Bonds and other financing obligations to less than $22.0 billion by 2023.

TVA issued $1.0 billion of power bonds during both 2018 and 2017. TVA redeemed $1.8 million and $1.6 billion of power bonds during 2018 and 2017, respectively. For additional information about TVA debt issuance activity and debt instruments issued and outstanding at September 30, 2018 and 2017, including rates, maturities, outstanding principal amounts, and redemption features, see Note 13 — Debt Securities Activity and Debt Outstanding.

TVA Bonds are traded in the public bond markets and are listed on the New York Stock Exchange ("NYSE") except for TVA's discount notes, the 2009 Series B power bonds, and the power bonds issued under TVA's electronotes® program. TVA's Putable Automatic Rate Reset Securities are traded on the NYSE under the exchange symbols “TVC” and “TVE.” Other bonds listed on the NYSE are assigned various symbols by the exchange, which are noted on the NYSE's website. TVA has also listed certain bonds on foreign exchanges from time to time, including the Luxembourg, Hong Kong, and Singapore Stock Exchanges. See Item 1A, Risk Factors for additional information regarding the market for TVA's Bonds.

Although TVA Bonds are not obligations of the U.S., TVA, as a corporate agency and instrumentality of the U.S. government, may be impacted if the sovereign credit ratings of the U.S. are downgraded. Additionally, TVA may be impacted by how the U.S. government addresses situations of approaching its statutory debt limit. According to statements made by nationally recognized credit rating agencies, downward pressure on the ratings of the U.S. could eventually develop if there are no changes in current policies and budget deficits and the trajectory of debt begins to increase; additionally, current ratings factor in the prospect that debates over raising the debt ceiling of the U.S. government could continue to be protracted and difficult. The outlook on the ratings of the U.S. government and TVA is currently stable with all three agencies that provide ratings on TVA Bonds. TVA’s rated senior unsecured Bonds are currently rated Aaa, AAA, and AA+. TVA's short-term discount notes are not rated.

Lease Financings. TVA has entered into certain leasing transactions with special purpose entities ("SPEs") to obtain third-party financing for certain of its facilities. These SPEs are sometimes identified as VIEs of which TVA is determined to be the primary beneficiary. TVA is required to account for these VIEs on a consolidated basis. See Note 10 and Note 13 for information about TVA’s lease financing activities, and see Note 9 for information regarding TVA’s recent acquisition of equity interests in certain SPEs created for the purpose of facilitating lease financing. During 2017 and 2016, TVA acquired 100 percent of the equity interests in certain SPEs created for the purpose of facilitating lease financing. TVA may seek to enter into similar lease transactions in the future.

Summary Cash Flows

A major source of TVA's liquidity is operating cash flows resulting from the generation and sale of electricity. Cash and cash equivalents were $299 million at September 30, 2018, and $300 million at both September 30, 2017 and 2016. A summary of cash flow components for years ended September 30 follows:

Cash provided by (used in):

Operating Activities. TVA’s cash flows from operations are primarily driven by sales of electricity, fuel expense, and operating and maintenance expense. The timing and level of cash flows from operations can be affected by the weather, changes in working capital, commodity price fluctuations, outages, and other project expenses.

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2018 Compared to 2017

Net cash flows provided by operating activities increased $1.2 billion for 2018 compared to 2017, as a result of increases in base revenues, lower operating and maintenance expenses, and lower interest paid. Increases in base revenue were attributable to increases in electricity sales primarily due to overall warmer than normal weather for much of 2018 and record-setting low temperatures during the month of January 2018 and the base rate adjustment that became effective October 1, 2017.

Lower operating expenses were driven by a one-time discretionary pension contribution in 2017 and decreases in nuclear planned outage days. Additionally, interest paid decreased in 2018 due to lower average balances and rates on long-term debt.

2017 Compared to 2016

Net cash flows provided by operating activities decreased by $306 million for 2017 compared to 2016 primarily due to increases in cash used for pension contributions, fuel costs, and outage costs. These changes were partially offset by increases in revenue collections due to timing, the increase to the effective base rate, and additional fuel cost recovery.

Investing Activities. The majority of TVA's investing cash flows are due to investments to acquire, upgrade, or maintain generating and transmission assets, including environmental projects and the purchase of nuclear fuel.

2018 Compared to 2017

Net cash flows used in investing activities decreased by $267 million for 2018 compared to 2017, driven by the completion of Paradise Combined Cycle Plant, Allen CC, and the clean air controls at Gallatin and Shawnee. With the completion of these projects, TVA does not foresee needing additional large, base-load generation units for at least the next decade. These decreases were partially offset by increases in nuclear fuel expenditures. Nuclear fuel expenditures vary depending on the number of outages and the prices and timing of purchases of uranium and enrichment services.

2017 Compared to 2016

Net cash flows used in investing activities decreased by $577 million for 2017 compared to 2016, primarily driven by the completion of Watts Bar Unit 2 in October 2016 and Paradise Combined Cycle Plant in April 2017.

Financing Activities. TVA's cash flows provided by or used in financing activities are primarily driven by the timing and level of cash flows provided by operating activities, cash flows used in investing activities, and net issuance and redemption of debt instruments to maintain a strategic balance of cash on hand.

2018 Compared to 2017

Net cash flows used in financing activities increased $1.5 billion for 2018 compared to 2017. TVA had $1.6 billion in net debt redemptions in 2018 compared to $38 million net debt redemptions in 2017. The increase in redemptions is primarily due to the $1.2 billion increase in operating cash flows, which resulted in additional debt reduction. These increases in redemptions were partially offset by decreases in payments on lease and leasebacks due to the 2017 acquisition of the residual interests in a lease/leaseback arrangement. See Note 9.

2017 Compared to 2016

Net cash flows used in financing activities were $200 million for 2017 as compared to $71 million of net cash provided by financing activities in 2016. Increased cash flows from operations and decreased investing expenditures reduced TVA's borrowing needs. During 2017, TVA also realized proceeds from the issuance of a $1.0 billion power bond carrying an interest rate of 2.88 percent and a term of ten years. The proceeds from the bond issuance were used in part to redeem a portion of $1.6 billion of other long-term debt, primarily power bonds. In addition, TVA had $583 million of short-term debt net issuances for 2017 as compared to $370 million in 2016. TVA generally uses short-term debt to meet working capital needs and other cash requirements while maintaining minimal cash balances.

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Cash Requirements and Contractual Obligations

The future planned capital expenditures for property, plant, and equipment additions, including clean air projects and new generation, and nuclear fuel are estimated to be as follows:

Estimated Capital Expenditures[1]
For the year ended September 30

	2019	2020	2021
Capacity expansion expenditures	$318	$233	$234
Environmental expenditures[2]	298	220	190
Nuclear fuel	432	358	377
Transmission expenditures	428	504	486
Other capital expenditures[3]	863	915	874
Total capital expenditures	$2,339	$2,230	$2,161

Notes

(1) TVA plans to fund these expenditures with cash from operations and proceeds from power program financings. This table shows only expenditures that are currently planned. Additional expenditures may be required, among other things, for TVA to meet growth in demand for power in its service area or to comply with new environmental laws, regulations, or orders.

(2) Estimated capital expenditures include costs for Gallatin projects that are part of the original activities scheduled in TVA's coal combustion residuals ("CCR") Conversion Program of approximately $96 million, $24 million, and $3 million for 2019, 2020, and 2021, respectively. These amounts exclude costs related to any new requirements related to the Gallatin lawsuits. See Item 7, Management's Discussion and Analysis of Financial Condition and Results of Operations — Key Initiatives and Challenges — Coal Combustion Residual Facilities and Note 8.

(3) Other capital expenditures are primarily associated with short lead time construction projects aimed at the continued safe and reliable operation of generating assets.

TVA continually reviews its capital expenditures and financing programs. The amounts shown in the table above are forward-looking amounts based on a number of assumptions and are subject to various uncertainties. Amounts may differ materially based upon a number of factors, including, but not limited to, changes in assumptions about system load growth, environmental regulation, rates of inflation, total cost of major projects, and availability and cost of external sources of capital. See Forward-Looking Information and Item 1A, Risk Factors.

TVA has certain obligations and commitments to make future payments under contracts, including contracts executed in connection with certain of the planned construction expenditures. The following table sets forth TVA's estimates of future payments at September 30, 2018. See Note 10, Note 11, Note 13, Note 20, and Note 21 for a further description of these obligations and commitments.

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Commitments and Contingencies

Payments due in the year ending September 30

	2019	2020	2021	2022	2023	Thereafter	Total
Debt[1]	$2,249	$1,030	$1,860	$1,028	$29	$ 16,500	$22,696
Interest payments relating to debt[2]	1,079	1,058	1,017	966	945	15,200	20,265
Debt of VIEs[3]	38	40	41	43	40	973	1,175
Interest payments relating to debt of VIEs	54	52	50	49	47	496	748
Notes payable	46	23	—	—	—	—	69
Interest payments relating to notes payable	1	—	—	—	—	—	1
Lease obligations							
Capital[4]	51	51	51	51	51	468	723
Non-cancelable operating[5]	34	28	26	12	2	1	103
Purchase obligations							
Power[6]	312	304	302	268	180	1,178	2,544
Fuel[7]	1,538	1,001	687	383	334	1,577	5,520
Other[8]	145	47	40	55	41	242	570
Gallatin coal combustion residual facilities[9]	44	40	15	12	9	825	945
Environmental Agreements	3	2	2	1	1	5	14
Membership interests of variable interest entity subject to mandatory redemption	2	3	3	3	2	18	31
Interest payments related to membership interests of variable interest entity subject to mandatory redemption	2	2	2	2	1	8	17
Flood response commitment to NRC	13	9	—	—	—	—	22
Unfunded loan commitments	3	—	—	—	—	—	3
Long-term monitoring costs - Kingston ash spill	1	1	1	1	2	12	18
Payments on other financings	59	60	217	36	10	233	615
Retirement Plan[10]	300	300	300	300	300	3,900	5,400
Total	$5,974	$4,051	$4,614	$3,210	$1,994	$ 41,636	$61,479

Notes

(1) Does not include non-cash items of foreign currency exchange gain of $147 million, unamortized debt issue costs of $56 million, and net discount on sale of Bonds of $88 million.

(2) Includes the effects of interest rate derivatives employed to manage interest rate risk.

(3) Debt of VIEs does not include the non-cash item of unamortized debt issue costs of $10 million.

(4) Includes the interest component of capital leases based on the interest rates stated in the lease agreements and excludes certain related executory costs. Minimum commitments related to executory costs are included in purchase obligations.

(5) Does not include purchased power agreements of $147 million that are accounted for as operating leases and included in power purchase obligations.

(6) Includes commitments for energy and/or capacity under power purchase agreements from coal-fired, hydroelectric, diesel, and gas-fired facilities, as well as transmission service agreements to support purchases of power from the market.

(7) Includes commitments to purchase nuclear fuel, coal, and natural gas, as well as related transportation and storage services.

(8) Primarily includes long-term service contracts, contracts that contain minimum purchase levels for the purchase of limestone along with related storage and transportation, and contractual obligations related to load control programs.

(9) Includes $861 million long-term liability for costs of constructing a lined facility onsite and excavating and moving the ash and $47 million of estimated costs related to construction of a permanent bottom ash dewatering facility and wastewater process ponds. The estimated capital expenditures represent costs for Gallatin projects that are part of the original activities scheduled in TVA’s CCR Conversion Program. See Note 8.

(10) Pursuant to amendments to the TVA Retirement System ("TVARS") Rules and Regulations that became effective October 1, 2016, TVA will contribute to TVARS for a period of 20 years (2017-2036) or, if earlier, through the fiscal year in which it is determined by actuarial valuation that TVARS has reached and remained at a 100 percent funded status, an amount not less than the greater of (a) the minimum required TVARS actuarial valuation contribution or (b) $300 million.

In addition to the obligations above, TVA has energy prepayment obligations in the form of revenue discounts. As of September 30, 2018, the remaining balances of TVA's energy prepayment obligations and related interest payments were $10 million and $4 million, respectively. These remaining balances will be recognized in revenue during 2019. See Note 1 — Energy Prepayment Obligations.

EnergyRight® Solutions Program. TVA purchases certain loans receivable from its LPCs in association with the EnergyRight® Solutions program. Depending on the nature of the energy-efficiency project, loans may have a maximum term of five years or ten years. The loans receivable are then transferred to a third-party bank with which TVA has agreed to repay in full any loan receivable that has been in default for 180 days or more or that TVA has determined is uncollectible. As of September 30, 2018, the total carrying amount of the loans receivable, net of discount, was approximately $112 million. Such

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amounts are not reflected in the Commitments and Contingencies table above. The total carrying amount of the financing obligation was approximately $127 million at September 30, 2018. See Note 6 and Note 11 for additional information.

Off-Balance Sheet Arrangements

At September 30, 2018, TVA had no off-balance sheet arrangements.

Key Initiatives and Challenges

Distributed Energy Resources

Consumer desire for energy choice is, among other things, driving the expectation for flexible options in the electric industry. TVA and LPCs are working together to leverage the strengths of the Tennessee Valley public power model to provide distributed energy solutions that are economic, sustainable, and flexible. TVA will focus on the safety and reliability impacts of these resources as they are interconnected to the grid and will ensure that the pricing of electricity remains as low as feasible. Additional regulatory considerations and analysis may be required as the DER market, technologies, and programs evolve. TVA will work to develop pricing and regulatory structures with a deliberate and thoughtful analysis of each current and future program offering. This will require strong partnerships with LPCs to reinforce local control, give customers choices, and provide end-use consumers the flexibility they desire.

In May 2017, the TVA Board authorized up to $300 million to be spent over the next 10 years, subject to annual budget availability and necessary environmental reviews, to build an enhanced fiber network that will better connect its operational assets. Fiber is a vital part of TVA’s modern communication infrastructure. The new fiber optic lines will improve the reliability and resiliency of the generation and transmission system while enabling the system to better accommodate DER as they enter the market. As of September 30, 2018, TVA had spent $25 million on installation of the fiber optic lines and expects to spend an additional $275 million to complete the project.

Changing Customer Preferences

As more consumers and businesses are demanding cleaner and greener energy, the utility industry is evolving to meet those needs. As TVA also evolves, it will see impacts to the way it does business from the pricing of products, transmission of energy, and development of new products and services for its customers in support of changing customer preferences and its economic development efforts. End-use customers are becoming more technologically sophisticated and want greater control over their energy usage. Larger companies are focusing more on sustainability and requiring more energy efficiency as well as cleaner, greener, renewable energy options. The continuing challenge for TVA and others is finding ways to meet the needs and preferences of customers while successfully developing flexible pricing models to accommodate the evolving markets.

Integrated Resource Planning

TVA has begun the process of updating its IRP, a comprehensive study that provides direction on how to best meet future power demand by identifying the need for generating capacity, determining the best mix of resources, and evaluating the evolving role of DER. The IRP will consider many views of the future to determine how TVA can continue to provide low-cost, reliable electricity, support environmental stewardship, and spur economic development in the Tennessee Valley over the next 20 years. To inform TVA's next long-term financial plan and proactively address the changing utility marketplace, TVA began this work sooner than originally planned.

To ensure TVA best meets projected future needs, TVA will continue its tradition of innovation in each IRP. The 2011 IRP focused on diversifying and modernizing its generation portfolio, part of which included adding cost-effective renewables. The 2015 IRP identified DER as a growing trend in the utility industry and designed a mechanism where energy efficiency could be chosen as a resource. The 2019 IRP will explore various DER scenarios, considering the speed and amount of DER penetration, improve TVA's understanding of the impact and benefit of system flexibility with increasing renewable and distributed resources, and determine the implications to TVA's diverse portfolio mix for the next 20 years.

TVA is primarily a wholesale power provider, and the LPCs are the service provider for most end-use customers. Due to this public power business model, collaboration with customers and stakeholders is a vital part of the IRP. Opportunities for customer and stakeholder engagement and for public comment include public meetings, webinars, the IRP working group, and the Regional Energy Resource Council ("RERC"). The IRP working group and RERC consist of representatives from LPCs, direct-served customers, non-governmental organizations, state and local governments, and academia. As part of the IRP decision-making process, and in alignment with the National Environmental Policy Act ("NEPA"), TVA will also analyze potential environmental implications associated with an updated IRP by issuing an environmental impact statement ("EIS").

During the scoping period which ended in April 2018, TVA received over 80 comments which will help identify issues that are important to the public and will help lay the foundation for development of the IRP and the EIS. TVA published the IRP Scoping Report on its website in August 2018. This report captures comments received during public scoping meetings, submitted online or by mail, as well as information on how the IRP and EIS are being developed. Additionally, TVA hosted

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quarterly webinars and seven IRP Working Group meetings and provided several updates on the 2019 IRP to the RERC throughout 2018. TVA anticipates issuing the draft IRP and EIS for public review and comment in February 2019.

Natural Resource Plan

TVA has begun the process of updating its Natural Resource Plan ("NRP"), which was completed in 2011 to guide TVA’s management of the public lands and waters within its seven-state service area. TVA remains committed to a balanced management approach and is considering changes to the NRP that include defined strategies, objectives, and programs for each of the proposed 10 focus areas. The NRP would provide a flexible approach for long-term planning, which would help TVA prioritize funding and support its mission. During 2018, TVA hosted four public open houses and a webinar to obtain public input on the scope of the project, answer questions, and receive comments. The public scoping period closed in August 2018. TVA anticipates that the draft Supplemental Environmental Impact Statement ("SEIS") to analyze the potential effects of proposed changes will be published in May 2019. The final SEIS and updated NRP are scheduled to be published in early 2020.

Generation Resources

Nuclear Response Capability. Since the events that occurred in 2011 at the Fukushima Daiichi Nuclear Power Plant ("Fukushima Events"), the Nuclear Regulatory Commission ("NRC") adopted additional detailed guidance on the expected response capability to be developed by each nuclear plant site. The NRC issued orders that modified each plant’s license to require implementation of additional external event mitigation capabilities. TVA has implemented these strategies and physical plant modifications to address the actions outlined in this guidance at Sequoyah Nuclear Plant ("Sequoyah") and Watts Bar. Implementation is in progress at Browns Ferry and is scheduled to be completed in 2019. As of September 30, 2018, TVA had spent $272 million on modifications related to these actions at all of its nuclear plants and expects to spend an additional $7 million to complete the remaining modifications intended to address this guidance.

Extreme Flooding Preparedness. Updates to the TVA analytical hydrology model completed in 2009 indicated that under "probable maximum flood" conditions, some of TVA's dams might not have been capable of regulating the higher flood waters. A "probable maximum flood" is an extremely unlikely event; however, TVA is obligated to provide protection for its nuclear plants against such events. As a result, TVA installed a series of modifications at three dams, and work on the fourth, Fort Loudoun Dam, was completed during the third quarter of 2018.

Since 2009, TVA has performed further hydrology modeling of portions of the TVA watershed using updated modeling tools. The revised hydrology models were reviewed and approved by the NRC for Watts Bar Units 1 and 2. However, TVA identified an error in the modeling that will require the models for Watts Bar Units 1 and 2 to be resubmitted. TVA plans to resubmit models for Watts Bar Units 1 and 2 during 2019. In addition, TVA plans to submit models for Sequoyah Units 1 and 2 in 2019. TVA will subsequently address conditions at Browns Ferry as needed. TVA has deferred some modifications until the updated Watts Bar and Sequoyah models are completed. As of September 30, 2018, TVA had spent $152 million on the modifications and improvements related to extreme flooding preparedness and expects to spend up to an additional $28 million to complete the modifications.

NRC Seismic Assessments. On May 9, 2014, the NRC notified licensees of nuclear power reactors in the central and eastern U.S. of the results of seismic hazard screening and prioritization evaluations performed by unit owners and reviewed by the NRC staff. Because the seismic hazards for Browns Ferry, Sequoyah, and Watts Bar had increases in seismic parameters beyond the technical information available when the plants were designed and licensed, TVA must conduct seismic risk evaluations for these plants. TVA completed the risk evaluation for Watts Bar and submitted it to the NRC on June 30, 2017; the evaluation concluded that no additional actions were required. The evaluations for

Browns Ferry and Sequoyah are due by December 31, 2019.

Mitigation of Beyond-Design-Basis Events. NRC rulemaking has been developed to codify the requirements promulgated by orders related to beyond-design-basis flooding and seismic events discussed above. The NRC staff submitted the draft final rule — Mitigation of Beyond-Design-Basis Events — to the NRC Commission on December 15, 2016, requesting approval to publish the final rule. The final rule is expected to be issued in 2019. Minimal changes between the orders and final rule requirements are expected. Once issued, TVA will review the final rule to identify any gaps to compliance. Gaps could result in TVA having to make modifications to one or more of its nuclear plants. Cost estimates for any required modifications cannot be developed until after the rule is finalized, but costs for modifications could be substantial. See Extreme Flooding Preparedness. and NRC Seismic Assessments above.

Baffle-Former Bolt Degradation. In July 2016, Westinghouse Electric Co., LLC ("Westinghouse") issued a Nuclear Safety Advisory Letter ("NSAL") 16-01 that addresses recently identified degradation of baffle-former bolts in some U.S. pressurized water reactors ("PWRs"). Baffle-former bolts help hold together a structure inside certain reactor vessels. Sequoyah Units 1 and 2, both PWRs, are referenced in the NSAL. Visual inspections of baffle-former bolts in Sequoyah Units 1 and 2 during 2017 refueling outages showed no degradation of baffle-former bolts. TVA performed ultrasonic testing on Unit 1 and results were within acceptable standards, with no bolts requiring replacement. Retesting will not be required until 2028. TVA plans to complete inspections for Unit 2 during the refueling outage in the first quarter of 2019.

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Work Environment at Nuclear Plants. In March 2016, the NRC issued a Chilling Effect Letter ("CEL") to TVA regarding work environment concerns identified at Watts Bar. As a result of alternative dispute resolution, the NRC issued a Confirmatory Order in July 2017 documenting numerous commitments TVA made related to monitoring nuclear safety culture across the fleet. TVA has implemented the actions as required to date including conducting a nuclear safety culture survey across the fleet. In June 2018, the NRC conducted a follow-up inspection at Watts Bar, and while improvements were noted, the inspection identified issues in an additional department at the site. In the mid-cycle assessment letter issued in June 2018, the NRC issued a Cross Cutting Issue ("CCI") in safety conscious work environment and outlined the closure criteria for both the CEL and the CCI. TVA is working to implement actions to address the issues in the additional department and closure criteria for the CEL and CCI.

Tritium-Producing Burnable Absorber Rods. TVA was a cooperating agency in the February 2016 Department of Energy ("DOE") Final SEIS for the Production of Tritium in a Commercial Light Water Reactor. On April 5, 2017, due to an anticipated need for more tritium-producing burnable absorber rods ("TPBARs"), the DOE announced its preferred alternative for irradiation services, which included use of an additional reactor. As a result of TVA's assessment and concurrence with the DOE's alternative, TVA submitted a license amendment to the NRC in December 2017 to authorize the irradiation of TPBARs in Watts Bar Unit 2. The NRC is expected to issue a decision by May 2019. Subject to approval of the license amendment, tritium production in Watts Bar Unit 2 is projected to start in the fall of 2020. The DOE's decision also allows for irradiation of TPBARs at the Sequoyah site in the future; however, TVA does not have plans to employ Sequoyah units for tritium production in the near term.

Extended Power Uprate. TVA is undertaking an EPU project at Browns Ferry that is expected to increase the amount of electrical generation capacity of its reactors. The license for each reactor was amended to allow reactor operation at the higher power level. The Browns Ferry EPU license amendments were approved by the NRC on August 14, 2017, following a nearly two-year review.

TVA is implementing the EPU project during plant refueling outages. Physical work on Unit 3 was completed, and the unit was synced to the grid in April 2018. On July 13, 2018, Unit 3 reached the new EPU 100 percent power. Work is underway for Unit 1 and will begin in the spring of 2019 for Unit 2. Full EPU power is expected to be achieved following the noted outages and extensive power ascension testing for each unit. The project has involved and continues to involve extensive engineering analyses and modification and replacement of certain existing plant components to enable the units to produce the additional power requested by the license amendments. The project is estimated to cost approximately $475 million and add approximately 465 MW of generating capacity.

Performance of Suppliers. On March 29, 2017, Westinghouse, a subsidiary of Toshiba Corporation ("Toshiba"), filed for protection under Chapter 11 of the U.S. Bankruptcy Code. On January 4, 2018, Brookfield Business Partners L.P. ("Brookfield Business Partners"), together with institutional partners, announced that they have entered into an agreement to acquire 100 percent of Westinghouse. Westinghouse has emerged from bankruptcy and the sale was closed and became effective on August 1, 2018.

Clean Air Projects. During 2011, the TVA Board approved the addition of emission control equipment on four units at Gallatin. TVA completed the addition of scrubbers during 2016 and SCRs during 2017 and 2018. In addition, the TVA Board authorized the installation of SCRs and scrubbers on Shawnee Units 1 and 4 during 2015. These systems were placed in service during 2018. All of the above actions were in compliance with the Environmental Agreements.

Coal Combustion Residual Facilities. TVA has committed to a programmatic approach to the elimination of wet storage of CCRs within the TVA service area. Under this program (the “CCR Conversion Program”), TVA has committed to (1) convert all operational coal-fired plants to dry CCR storage, (2) close all wet storage facilities, and (3) meet all applicable state and federal regulations. To carry out its CCR Conversion Program, TVA is undertaking the following actions:

Dry generation and dewatering projects. Conversion of coal plant CCR wet processes to dry generation or dewatering is complete at Bull Run Fossil Plant ("Bull Run") and Kingston Fossil Plant ("Kingston"). Construction is underway at Gallatin, Paradise, and Shawnee. Construction will begin at Cumberland Fossil Plant ("Cumberland") in 2019.

Landfills. Lined and permitted dry storage facilities have been constructed and are operational at Bull Run, Kingston, and Gallatin. Construction of new lined and permitted dry storage facilities are scheduled to begin at Cumberland, Paradise, and Shawnee in 2019. Construction of additional lined facilities may occur to support future business requirements.

Wet CCR impoundment closures. TVA is planning to close wet CCR impoundments in accordance with federal and state requirements when (1) coal-fired plants are converted to dry CCR processes and dry storage landfills become operational or (2) the related plant operations cease. Closure project schedules and costs are driven by the selected closure methodology (such as cap and close in place or closure by removal). TVA issued an EIS in June 2016 that addresses the closure of CCR impoundments at TVA's coal-fired plants. TVA issued its associated Record of Decision in July 2016. Although the EIS was designed to be programmatic in order to address the mode of impoundment closures, it specifically addressed closure methods at 10 impoundments. TVA subsequently decided to close those impoundments. The method of final closure for each of these

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facilities will depend on various factors, including the results of studies conducted pursuant to NEPA and approval by appropriate state regulators. Additional NEPA studies will be conducted as other facilities are designated for closure.

Groundwater monitoring. Compliance with the EPA's CCR rule as well as other requirements will require additional engineering and analysis as well as implementation of a comprehensive groundwater monitoring program. As further analyses are performed, including evaluation of monitoring results, there is the potential for additional costs for investigation and/or remediation. TVA expects to continue to evaluate and update these cost estimates.

On March 2, 2018, in accordance with the EPA's CCR rule, TVA published the results of groundwater testing at TVA's active CCR facilities. The initial results showed statistically significant increases above background in the levels of certain constituents at some facilities. The increases do not necessarily indicate a regulatory or permit violation; rather, they trigger further testing to determine if the increases are attributable only to the CCR facility and, if so, what steps need to be taken. TVA will work in compliance with the CCR Rule and, as appropriate, with its regulators to carry out the required investigations. TVA's permits remain in effect and operations have not been impacted.

In compliance with the EPA's CCR Rule, TVA will publish the results of additional groundwater testing at TVA's active CCR facilities in the second quarter of 2019. If the results show statistically significant increases over the established groundwater protection standards for certain constituents, there will be further testing to determine whether the increases are attributable only to the CCR facility. In addition, there could be additional costs for investigation and/or remediation. TVA may also have to cease use of any impacted unlined CCR surface impoundments no later than October 31, 2020 (and potentially earlier based on other factors). As required by the EPA's CCR Rule, TVA will continue to publish reports in the second quarter of each year on annual groundwater monitoring and corrective actions at its active CCR facilities.

In addition, on November 16, 2018, TVA will publish on its CCR website the results of location demonstrations performed at various CCR facilities in accordance with the CCR Rule. These results and the additional groundwater testing results will help determine whether any impacted unlined CCR facility can remain open or if it must be closed. If a facility must be closed, the results specific to each facility will dictate whether it must be closed by April 2019 or October 2020. TVA has already been working to convert its CCR disposal to dry systems and has plans to close all unlined CCR surface impoundments.

The CCR Conversion Program is scheduled to be completed by 2023 with the exception of the impoundments at Gallatin. The impoundments at Gallatin are pending additional studies to determine the final closure methodology and schedule. While plans are currently being formulated for the CCR closure methodology for Gallatin, TVA is involved in two lawsuits relating to alleged releases of waste materials from the CCR facilities at Gallatin. On August 4, 2017, the court in one case ordered TVA to move all materials from the existing impoundments to a lined facility. Although a panel of the Sixth Circuit reversed this decision, the plaintiffs have petitioned for a rehearing. The costs of constructing a lined facility onsite and excavating and moving the ash is approximately $900 million. If TVA is required to use a facility offsite, then the costs could be approximately $2.0 billion, plus an amount of additional costs reflecting the expected impacts of inflation given the extended duration of an offsite relocation project. These amounts do not include costs or penalties associated with any order in the other case. These amounts cannot be estimated at this time, but could be material. See Note 8.

As of September 30, 2018, TVA had spent approximately $1.5 billion on its CCR Conversion Program. TVA expects to spend approximately an additional $1.2 billion on the CCR Conversion Program through 2023, excluding new requirements related to the Gallatin CCR facilities lawsuits. These estimates may change depending on the final closure method selected for each facility. Once the CCR Conversion Program is completed, TVA will continue to undertake certain CCR projects, including building new landfill sections under existing permits and closing existing sections once they reach capacity. See Item 1, Business — Environmental Matters — Cleanup of Solid and Hazardous

Wastes — Coal Combustion Residuals.

Potential Liability Associated with Workers' Exposure to CCR Materials. In response to the 2008 ash spill at the Kingston, TVA hired Jacobs Engineering Group, Inc. ("Jacobs") to oversee certain aspects of the cleanup. After the cleanup was completed, Jacobs was sued in the U.S. District Court for the Eastern District of Tennessee ("Eastern District") by a group of workers who alleged that Jacobs had failed to take or provide proper health precautions and misled workers about the health risks associated with exposure to coal fly ash, which is a CCR material. The plaintiffs alleged that exposure to the fly ash caused a variety of significant health issues and illnesses, including in some cases death. The case was split into two phases, with the first phase considering general causation and the second determining specific causation. On November 7, 2018, a jury hearing the first phase returned a verdict in favor of the plaintiffs, including determinations that Jacobs failed to adhere to its contract with TVA or the Site Wide Safety and Health Plan in place; Jacobs failed to provide reasonable care to the plaintiffs; and Jacobs's failures were capable of causing a specific list of medical conditions, ranging from hypertension to cancer. The case will now proceed on the question of whether Jacobs's failures did in fact cause the plaintiffs' alleged injuries. While TVA is not a party to this litigation, TVA could be obligated to reimburse Jacobs for some amounts that Jacobs is required to pay as a result of this litigation, but TVA cannot estimate at this time the amount of any such reimbursement obligations. Further, TVA will continue monitoring this litigation to determine whether this or similar cases could have broader implications for the utility industry.

Coal and Natural Gas-Fired Units. Pre-commercial operations on Units 1 and 2 of the Allen CC began in September 2017, and the plant began commercial operations April 30, 2018. The plant has a generation capacity of approximately 1,100 MW with a cost under $900 million. Units 1 and 2 of the Allen CC replaced Units 1-3 of the Allen, which were retired in March

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2018. See Regulatory Compliance — Allen Groundwater Investigation. below. The retirements of these units were in compliance with the Environmental Agreements.

Pre-commercial operations on Unit 20 of the Johnsonville Combustion Turbine Plant, which allows for cogeneration capability, began in September 2017, and the unit was placed in service during the first quarter of 2018. Unit 20 replaced Johnsonville's cogeneration capability formerly provided by Units 1-4, which were retired in December 2017. These units had a summer net capability of 428 megawatts. The retirements of these units were in compliance with the Environmental Agreements.

River Management. While the first half of 2018 saw near normal rainfall and runoff, the second half of 2018 saw above normal rainfall and runoff in the Tennessee Valley. Rainfall during the second half of 2018 was 131 percent of normal while runoff was 124 percent of normal. Above normal runoff has persisted since February 2018 and has helped TVA meet its river system commitments, including managing minimum river flows for navigation; generating low-cost hydroelectric power; maintaining water quality, water supply, and recreation for the Tennessee Valley; having cool water available to meet thermal compliance and enabling normal operation of TVA's nuclear and fossil-fueled plants; and oxygenating water to help fish species remain healthy. Rainfall and runoff in the Tennessee Valley in 2018 were 118 percent and 116 percent of normal, respectively, which resulted in conventional hydroelectric generation being 22 percent higher during 2018 as compared to 2017.

Small Modular Reactors. TVA submitted an Early Site Permit Application ("ESPA") for review by the NRC in May 2016. The progress of NRC’s review of the ESPA is consistent with the NRC’s published schedule. The ESPA is based on the potential future construction and operation of two or more small modular reactors ("SMRs") units at TVA’s Clinch River site in Oak Ridge, Tennessee. TVA’s ESPA is based upon information regarding the various SMR designs under development in the U.S. TVA and the DOE are working under an interagency agreement to jointly fund licensing activities for the Clinch River site with DOE reimbursement of up to 50 percent of TVA's eligible costs through 2020.

TVA is developing the Clinch River site at a pace consistent with progress being made by developers on the engineering and licensing of SMR designs. The project has a great deal of flexibility at this early stage and by working to reduce licensing risk, TVA will be in a position to build an SMR if and when additional power sources are needed. Any decision to construct an SMR would require approval by the TVA Board.

Dam Safety and Remediation Initiatives

Assurance Initiatives. TVA has an established dam safety program, which includes procedures based on the Federal Guidelines for Dam Safety, with the objective of reducing the risk of a dam safety event. The program is comprised of various engineering activities for all of TVA’s dams including safety reassessments using modern industry criteria and the new probable maximum flood and site-specific seismic load cases. One aspect of the guidelines is that dam structures will be periodically assessed to assure that TVA's dams meet current design criteria. These assessments include material sampling of the dam and foundational structures and detailed engineering analysis. TVA will continue its preventative and ongoing maintenance as a part of this safety program. As of September 30, 2018, TVA had spent $103 million on dam safety assurance initiatives and expects to spend up to an additional $153 million through 2021.

Boone Dam Remediation. In October 2014, a sinkhole was discovered near the base of the earthen embankment at Boone Dam, and a small amount of water and sediment was found seeping from the river bank below the dam. TVA identified underground pathways contributing to the seepage and prepared a plan to repair the dam, which consists of the construction of a composite seepage barrier wall in the dam's earthen embankment. TVA has completed low mobility grouting, the upstream line of high mobility grouting, and construction of an upstream and downstream

buttress. In addition, a contractor for construction of the concrete cut-off wall has been selected.

As design and construction plans are finalized, the estimated cost and duration continue to be refined. As of September 30, 2018, TVA had spent $126 million related to this project and expects to spend an additional $331 million through 2022. TVA is continuing to work with the community to help mitigate local impacts of the extended drawdown.

Pickwick South Embankment Remediation. Reassessments of Pickwick Landing Dam ("Pickwick") found low safety factors for post-earthquake stability indicating that the dam is at significant risk for slope stability failure following a seismic event in portions of the south embankment. Slope stability failure could lead to a breach of the south embankment and loss of the reservoir, resulting in loss of life and damage to property downstream, disruption to navigation, and loss of generation and recreation.

TVA is planning to upgrade the south embankment by constructing berms on the upstream and downstream slopes. The design phase of the project began during the first quarter of 2017, and the project is expected to be in full construction during 2019. The project is currently estimated to be completed in two years. However, the project may take longer than two years depending on successful construction sequencing. As of September 30, 2018, TVA had spent $11 million related to this project and expects to spend an additional $92 million.

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Surplus Property

TVA continues to study its real estate portfolio for the purpose of aligning its real estate holdings with TVA's strategic direction. A comprehensive assessment of its real estate holdings has been completed, and TVA is implementing a strategy aimed at reducing cost and right-sizing its portfolio as part of the effort.

Bellefonte Nuclear Plant. On November 14, 2016, following a public auction, TVA entered into a contract to sell substantially all of the Bellefonte site to Nuclear Development, LLC for $111 million. Nuclear Development, LLC, paid TVA $22 million on November 14, 2016, with the remaining $89 million due at closing. Nuclear Development, LLC, had up to two years from November 14, 2016, to close on the property, and TVA agreed to maintain the site until closing. Nuclear Development, LLC, requested and was granted an extension of the initial closing date. Nuclear Development, LLC now has until November 30, 2018 to close on the property, and TVA will continue to maintain the site until then. See Note 7 — Deferred Nuclear Generation Units.

Muscle Shoals Property. In alignment with its strategic direction of right-sizing its real estate portfolio, TVA has drafted a strategy to further reduce a significant number of buildings and property in Muscle Shoals, Alabama, including the disposition of 900 acres of the 1,000 acres approved by the TVA Board in 2012. On April 20, 2018, following a public auction, TVA entered into a contract to sell the property to Muscle Shoals Holdings, LLC for $5 million. The Alabama Department of Environmental
Management granted the release of an existing environmental permit. The transaction closed on July 23, 2018.

Knoxville Property. In 2016, TVA completed a comprehensive assessment of its real estate holdings in the Knoxville, Tennessee region including the Knoxville Office Complex ("KOC") and adjacent Summer Place Complex ("SPC"). As a result of this study and a subsequent environmental assessment in 2017, TVA is planning to consolidate most of its Knoxville area employees into one location in the West Tower of the KOC and plans to convey the SPC and the East Tower of the KOC.

Regulatory Compliance

Steam-Electric Effluent Guidelines. On November 3, 2015, the EPA published a final rule revising the existing steam-electric effluent limitation guidelines ("ELGs"). The ELGs update the existing technology-based water discharge limitations for power plants. Compliance with new requirements is required in the 2018-2023 timeframe and will necessitate major upgrades to wastewater treatment systems at all coal-fired plants. Dry fly ash handling is mandated by the rule. The rule also requires either dry bottom ash handling systems or “no discharge” recycle of bottom ash transport waters, and new technology-based limits on flue gas desulfurization ("FGD") (scrubber) wastewater require primary physical/chemical treatment and secondary biological treatment to meet extremely low limits for arsenic, mercury, and selenium.

The EPA published a rule on September 18, 2017, postponing certain compliance/applicability dates to provide the EPA time to review and revise, as necessary, the 2015 ELGs for FGD wastewater and bottom ash transport water. The EPA pushed back the compliance dates for these two wastestreams from the 2018-2023 timeframe to 2020-2023. However, requirements and 2018-2023 applicability dates for fly ash transport water, flue gas mercury control wastewater, and gasification wastewater remain in effect. See Item 1, Business — Environmental Matters — Water Quality Control Developments — Steam-Electric Effluent Guidelines.

TVA currently has four plants with wet scrubbers that will have to comply with the scrubber-related limits, the largest being Cumberland. TVA is working to address future compliance with the ELGs at Cumberland given its unique "once-through" scrubber design. Compliance with the current rule at Cumberland without modification to address the unique design could cause TVA to incur disproportionately high costs at Cumberland or experience other operational

outcomes which TVA cannot predict at this time.

Allen Groundwater Investigation. The 2015 EPA CCR rule required TVA to conduct additional engineering and analysis, as well as implement a comprehensive groundwater monitoring program. As a result of this groundwater monitoring program, TVA reported to the Tennessee Department of Environment and Conservation ("TDEC") in May 2017 elevated levels of arsenic, lead, and fluoride in water samples taken at a few shallow-aquifer groundwater monitoring wells around the east coal ash impoundment at Allen. TVA, under the oversight of TDEC, has been conducting a remedial investigation into the nature and extent of the contamination. In July 2017, TVA received a Remedial Site Investigation request from TDEC, outlining the objectives of the investigation and requiring TVA to provide a work plan.

The plan, which was submitted to TDEC in September 2017, included more extensive groundwater monitoring sampling to identify the source and extent of the contamination. The plan also included groundwater modeling to determine the current groundwater flow conditions and likely future conditions that may develop as a result of pumping cooling water from the deeper aquifer to the Allen CC, including a pump test involving the cooling water withdrawal wells. While evaluation continues, TVA has suspended plans to obtain cooling water from the deeper aquifer. TVA is constructing water tanks on site and is purchasing cooling water from its LPC, Memphis Light, Gas and Water Division ("MLGW"). The use of water tanks rather than the wells may impose some operational restrictions on the Allen CC due to the lower availability of cooling water.

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A Remedial Investigation Report summarizing the results of the investigation was submitted to TDEC in March 2018, and TDEC provided subsequent comments on the report to be addressed by TVA. On July 20, 2018, TVA submitted responses to the comments on the Remedial Investigation Report, an initial Remedial Design Report, and a Groundwater Pre-design Work Plan to TDEC. In the aforementioned responses submitted to TDEC, it was stated that TVA is required to complete a NEPA review that analyzes various alternatives prior to making a final decision on closure. TVA further stated that, as part of the NEPA review process, TVA would identify closure by removal as the preferred alternative for the Allen east impoundment. TVA is expected to begin its public NEPA review process at Allen in November 2018 to analyze closure alternatives to support a final decision on the appropriate closure methodology. For additional discussion on the impact to TVA’s asset retirement obligations ("AROs"), see Note 12.

Pension Fund

As of September 30, 2018, TVA's qualified pension plan had assets of $8.0 billion compared with liabilities of $11.7 billion. The funded status of the plan may not improve significantly in the near term because of the significant amount of benefits paid each year to plan beneficiaries and the historically low discount rates used to measure the plan's benefit obligation. The plan currently has approximately 34,000 participants, of which approximately 24,000 are retirees and beneficiaries currently receiving benefits. Benefits of over $700 million are expected to be paid in 2019. TVA made a contribution of $300 million to the plan in 2018. See Note 20.

Ratemaking

At its August 22, 2018, meeting, the TVA Board approved a base rate adjustment which became effective on October 1, 2018. The base rate adjustment is expected to contribute approximately $200 million to 2019 revenues.

Since the fall of 2013, TVA, LPCs and directly served industries have worked collaboratively to develop changes to TVA's rates that focus on TVA’s long-term pricing efforts. A comprehensive rate restructuring was implemented in October 2015 to improve pricing by better aligning rates with underlying cost drivers and sending improved pricing signals, while maintaining competitive industrial rates and keeping residential rates affordable.

Consistent with the pricing direction and changes implemented in the 2015 rate restructuring, TVA staff recommended, and the TVA Board approved, the proposed 2018 rate change on May 10, 2018. This change will reduce wholesale energy rates for Standard Service and introduce a GAC at an offsetting rate to better recover fixed costs. Recognizing the need for flexibility, all LPCs were presented with the option to implement the wholesale changes in October 2018 or defer the implementation of the GAC until October 2019. Seventy-nine LPCs elected to implement the wholesale changes in October of 2018, while the remaining 75 have elected to implement the wholesale changes in October of 2019.

The 2018 rate change better reflects the wholesale cost of energy and recognizes the value of the grid’s reliability and associated fixed costs. This modernized approach to pricing provides bill stability while maintaining reliability and fairness for all TVA's customers. Concurrent with this process, an Environmental Assessment was completed on May 4, 2018, resulting in a finding of no significant impact. See Distributed Energy Resources and Item 1, Business — Rates — Rate Methodology.

Safeguarding Assets

Physical Security — Non-Nuclear Asset Protection. TVA utilizes a variety of security technologies, security awareness activities, and security personnel to prevent sabotage, vandalism, and thefts. Any of these activities could negatively impact the ability of TVA to generate, transmit, and deliver power to its customers. TVA's Police and Emergency Management personnel are active participants with numerous professional and peer physical security organizations in

both the electric industry and law enforcement communities.

Physical attacks on transmission facilities across the country have heightened awareness of the need to physically protect facilities. TVA continues to work with the North American Electric Reliability Corporation ("NERC"), the SERC Reliability Corporation, the North American Transmission Forum, and other utilities to implement industry approved recommendations and standards.

Nuclear Security. Nuclear security is carried out in accordance with federal regulations as set forth by the NRC. These regulations are designed for the protection of TVA's nuclear power plants, the public, and employees from the threat of radiological sabotage and other nuclear-related terrorist threats. TVA has security forces to guard against such threats.

Cybersecurity. TVA operates in a highly regulated environment with respect to cybersecurity. TVA's cybersecurity program aligns or complies with the Federal Information Security Management Act, the NERC Critical Infrastructure Protection requirements, and the NRC requirements for cybersecurity, as well as industry best practices. As part of the U.S. government, TVA coordinates with and works closely with the Department of Homeland Security and the United States Computer Emergency Readiness Team ("US-CERT"). US-CERT functions as a liaison between the Department of Homeland Security and the public and private sectors to coordinate responses to security threats from the internet.

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The risk of these cybersecurity events continues to intensify. While TVA has been, and will likely continue to be, subjected to such attacks, to date the attacks have not impacted TVA's ability to operate as planned or compromised data which could involve TVA in lawsuits, claims, proceedings, investigations, and other legal matters ("Legal Proceedings"). See Item 1A, Risk Factors — Operational Risks — TVA's facilities and information infrastructure may not operate as planned due to cyber threats to TVA's assets and operations.

Over the last few years, there has been an increase of malicious cyber activity across all industries, including the energy sector. This activity has caused the need for heightened awareness and preparedness. Although TVA has not been compromised during these recent incidents, it is leveraging its federal intelligence partners to better predict, detect, and respond to these potential attacks.

Transmission Assets. In addition to physical and cybersecurity attacks, TVA's transmission assets are vulnerable to various types of electrically charged energy disruptions such as those from geomagnetic disturbances ("GMDs") and electromagnetic pulses ("EMP"). Because the effects of GMD and EMP are similar, they are often considered together. In September 2016, the Federal Energy Regulatory Commission ("FERC") approved a new standard to address GMD events, and in May 2018, FERC proposed a revised standard. TVA has already met the requirements of the original standard and most of the requirements of the revised standard, and has evaluated the effects of solar storms ranging from NERC's reference case to possible extreme levels. TVA continues as an active participant with NERC in this field. The most serious threats from EMP are those caused by high-altitude nuclear explosions. Like others in the industry, TVA is coordinating with federal and state authorities, NERC, Electric Power Research Institute ("EPRI"), and other grid owners and operators to address this concern.

Critical Accounting Policies and Estimates

TVA's consolidated financial statements are prepared in accordance with accounting principles generally accepted in the United States of America ("GAAP"), which require management to make estimates, judgments, and assumptions that affect the amounts reported in the consolidated financial statements and accompanying notes. Each of these estimates varies in regard to the level of judgment involved and its potential impact on TVA's financial results. Estimates are deemed critical either when a different estimate could have reasonably been used, or where changes in the estimate are reasonably likely to occur from period to period, and such use or change also would materially impact TVA's financial condition, results of operations, or cash flows. TVA's critical accounting policies are also discussed in Note 1 of the Notes to Consolidated Financial Statements.

TVA believes that its most critical accounting policies and estimates relate to the following:

- Regulatory Accounting;
- Gallatin Coal Combustion Residuals;
- AROs; and
- Pension and Other Post-Retirement Benefits.

Management has discussed the development, selection, and disclosure of critical accounting policies and estimates with the Audit, Risk, and Regulation Committee of the TVA Board. While TVA's estimates and assumptions are based on its knowledge of current events and actions it may undertake in the future, actual results may ultimately differ from these estimates and assumptions.

Regulatory Accounting

The TVA Board is authorized by the TVA Act to set rates for power sold to customers; thus, TVA is "self-regulated." Additionally, TVA's regulated rates are designed to recover its costs of providing electricity. In view of demand for

electricity and the level of competition, TVA has assumed that rates, set at levels that will recover TVA's costs, can be charged and collected. As a result of these factors, TVA records certain assets and liabilities that result from the regulated ratemaking process that would not be recorded under GAAP for non-regulated entities. Regulatory assets generally represent incurred costs that have been deferred because such costs are probable of future recovery in customer rates. Regulatory liabilities generally represent obligations to make refunds to customers for previous collections of costs that are not likely to be incurred or deferral of gains that will be credited to customers in future periods. The timeframe over which the regulatory assets are recovered from customers or regulatory liabilities are credited to customers is subject to annual TVA Board approval. At September 30, 2018, TVA had $7.0 billion of Regulatory assets and $291 million of Regulatory liabilities.

TVA assesses whether the regulatory assets are probable of future recovery by considering factors such as applicable regulatory changes, potential legislation, and changes in technology. Based on these assessments, TVA believes the existing regulatory assets are probable of recovery. This determination reflects the current regulatory and political environment and is subject to change in the future.

In 2017, the TVA Board authorized management to accelerate amortization of certain regulatory assets to the extent actual net income in 2018 exceeds the budgeted amount, up to the aggregate amount of those certain regulatory assets. Assets included in this Board action include: deferred nuclear generating units, environmental cleanup costs related to the Kingston ash spill, and nuclear training costs related to the refurbishing and restarting of Browns Ferry Unit 1 and the construction of Watts

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Bar Unit 2. TVA recorded $857 million of accelerated amortization of the Deferred nuclear generating units and Nuclear training costs regulatory assets in 2018. The TVA Board is authorizing TVA to use the amount included in the 2019 rate action for these two regulatory assets, to the extent needed, to accelerate amortization of the Environmental cleanup costs - Kingston ash spill regulatory asset in 2019.

TVA does not believe there is a reasonable likelihood that there will be a material change in the estimates or assumptions used to record regulatory assets and liabilities. If future recovery of regulatory assets ceases to be probable, or any of the other factors described herein cease to be applicable, TVA would be required to write off these costs and recognize them in net income or other comprehensive income.

Gallatin Coal Combustion Residuals

In 2017, TVA recorded the liability related to the Gallatin CCR facilities as a regulatory asset to be collected as amounts are paid out, starting October 1, 2018.

TVA may incur significant environmental clean-up costs related to its CCR facilities at Gallatin. See Note 8. These costs are based upon estimates of the incremental direct costs of the remediation effort, including costs of compensation and benefits for those employees who are expected to devote a significant amount of time directly to the remediation effort. Such amounts are included in the estimate when it is probable that a liability has been incurred as of the financial statement date and the amount of loss can be reasonably estimated. When both of those recognition criteria are met and the estimated loss is a range, TVA accrues the amount that appears to be a better estimate than any other estimate within the range, or accrues the minimum amount in the range if no amount within the range is a better estimate than any other amount. If the actual costs materially differ from the estimate, TVA’s results of operations, financial condition, and cash flows could be affected materially.

At September 30, 2018, the costs include, among other things, environmental studies concerning the existing and new facilities, the licensing activities for the new facility, design and construction of the new facility, relocating the material from the existing facilities to the new facility, closing the existing facilities, monitoring activities, and the expected impacts of inflation given the anticipated duration of the project. At September 30, 2018, TVA has estimated these costs to be approximately $900 million. The TVA Board approved regulatory accounting treatment for certain costs associated with compliance with orders or settlements related to lawsuits involving CCR facilities. See Note 8 — Financial Impact.

The following categories could have a significant effect on estimates related to environmental clean-up costs of Gallatin coal combustion residuals:

- Final Removal Method - It is reasonably possible that TVA will not be able to obtain the necessary permits to build the facility on the Gallatin site and will be required to move the CCR materials offsite. Offsite relocation for this or any other reason would materially increase TVA’s project cost estimate. If TVA is required to use a facility offsite, then the costs could be approximately $2.0 billion, plus an amount of additional costs reflecting the expected impacts of inflation given the extended duration of an offsite relocation project.

- Uncertainty Inherent in Project Cost Estimates - The ultimate cost of the removal project will depend on actual timing and results of ongoing litigation, environmental studies, licensing, site subsurface conditions, contractor availability, weather, equipment, available material resources, and other contingency factors. These contingency factors could cause the project cost estimate to change materially in the near term. TVA updates its estimate for project costs as changes in these factors are determined to be probable of occurring.

- Excluded Costs - The costs do not include such items as any additional order or penalty arising from the TDEC lawsuit, which cannot be reasonably estimated at this time. In the event that these costs become probable and reasonably estimable, they could materially increase TVA’s project cost estimate.

Asset Retirement Obligations

TVA recognizes legal obligations associated with the future retirement of certain tangible long-lived assets. These obligations relate to TVA’s generating facilities, including coal-fired, nuclear, hydroelectric, and natural gas and/or oil-fired. They also pertain to coal ash impoundments, transmission facilities, and other property-related assets. Activities involved with the retirement of these assets could include decontamination and demolition of structures, removal and disposal of wastes, and site restoration. TVA periodically reviews its estimated asset retirement obligation ("ARO") liabilities. Revisions to the ARO estimates are made whenever factors indicate that the timing or amounts of estimated cash flows have changed. Any change to an ARO liability is recognized prospectively as an equivalent increase or decrease in the carrying value of the capitalized asset. Any accretion or depreciation expense related to these liabilities and assets is charged to a regulatory asset. See Note 7 — Nuclear Decommissioning Costs and Non-Nuclear Decommissioning Costs and Note 12.

Nuclear Decommissioning. Utilities that own and operate nuclear plants are required to recognize a liability for legal obligations related to nuclear decommissioning. An equivalent amount is recorded as an increase in the carrying value of the capitalized asset and allocated to a regulatory asset over the useful life of the capitalized asset. The initial obligation is

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measured at its estimated fair value using various judgments and assumptions. Fair value is developed using an expected present value technique that is based on assumptions of market participants and that considers estimated retirement costs in current period dollars that are inflated to the anticipated decommissioning date and then discounted back to the date the ARO was incurred. Decommissioning cost studies are updated for each of TVA's nuclear units at least every five years. Changes in assumptions and estimates included within the calculations of the value of the AROs could result in significantly different results than those identified and recorded in the financial statements.

At September 30, 2018, the estimated future nuclear decommissioning cost recognized in the financial statements was $3.0 billion and was included in AROs, and the unamortized regulatory asset related to nuclear decommissioning ARO costs of $703 million was included in Regulatory assets.

The following key assumptions can have a significant effect on estimates related to the nuclear decommissioning costs reported in TVA's nuclear ARO liability:

Timing and Method – In projecting decommissioning costs, two assumptions must be made to estimate the timing of plant decommissioning. First, the date of the plant's retirement must be estimated. At Browns Ferry and Sequoyah, the estimated retirement date is based on the unit with the longest license period remaining. At Watts Bar, the estimated retirement date is based on each unit's license period. Second, an assumption must be made on the timing of the decommissioning. TVA has ascribed probabilities to two different decommissioning methods related to its nuclear decommissioning obligation estimate: the DECON method and the SAFSTOR method. The DECON method requires that radioactive contamination be removed from a site and safely disposed of or decontaminated to a level that permits the site to be released for unrestricted use shortly after it ceases operation. The SAFSTOR method allows nuclear facilities to be placed and maintained in a condition that allows the facilities to be safely stored and subsequently decontaminated to levels that permit release for unrestricted use. TVA bases its nuclear decommissioning estimates on site-specific cost studies, which are updated for each of TVA’s nuclear units at least every five years. Changes in probabilities ascribed to the assumptions or the timing of decommissioning can significantly change the present value of TVA's obligations.

Cost Estimates – There is limited experience with actual decommissioning of large nuclear facilities. Changes in technology and experience as well as changes in regulations regarding nuclear decommissioning could cause cost estimates to change significantly. TVA's cost studies assume current technology and regulations.

Cost Escalation Rate – TVA uses expected inflation rates over the remaining timeframe until the costs are expected to be incurred to estimate the amount of future cash flows required to satisfy TVA’s decommissioning obligations.

Discount Rate – TVA uses its incremental borrowing rate over a period consistent with the remaining timeframe until the costs are expected to be incurred to calculate the present value of the weighted estimated cash flows required to satisfy TVA’s decommissioning obligations.

The actual decommissioning costs may vary from the derived estimates because of changes in current assumptions, such as the assumed dates of decommissioning, changes in regulatory requirements, changes in technology, and changes in the cost of labor, materials, and equipment. A 10 percent change in TVA's ARO for nuclear decommissioning cost at September 30, 2018, would have affected the liability by approximately $300 million.

Non-Nuclear Decommissioning. At September 30, 2018, the estimated future non-nuclear decommissioning cost recognized in the financial statements was $1.8 billion and was included in AROs, and the unamortized regulatory asset related to non-nuclear decommissioning ARO costs of $1.0 billion was included in Regulatory assets. This decommissioning cost estimate involves estimating the amount and timing of future expenditures and making judgments concerning whether or not such costs are considered a legal obligation. Estimating the amount and timing

of future expenditures includes, among other things, making projections of the timing and duration of the asset retirement process and predicting how costs will escalate with inflation. The following key assumptions can have a significant effect on estimates related to the non-nuclear decommissioning costs:

Timing and Method – In projecting non-nuclear decommissioning costs, the date of the asset's retirement must be estimated. In instances where the retirement of a specific asset will precede the retirement of the generating plant, the anticipated retirement date of the specific asset is used. Additionally, TVA expects to incur certain ongoing costs subsequent to the initial asset retirement. TVA develops its cost estimates based on likelihood of decommissioning method where options exist in fulfilling legal obligations (e.g., cap and close in place or clean closure for coal ash impoundments). The decommissioning method is determined based on several factors including available technologies, environmental studies, cost factors, resource availability, and timing requirements. As these factors are considered and decommissioning methods are determined, the detailed project schedules and estimates are adjusted. During 2016, TVA management updated its non-nuclear plant closure method assumption from a maintain-in-place method to a plant demolition method. See Note 8.

Technology and Regulation – Changes in technology and experience as well as changes in regulations regarding non-nuclear decommissioning could cause cost estimates to change significantly. TVA's cost estimates generally assume current technology and regulations. In April 2015, the EPA published its final rule governing CCRs, which regulates landfill and

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impoundment location, design, and operations; dictates certain pond-closure conditions; and establishes groundwater monitoring and closure and post-closure standards. As a result of this ruling, in 2015 TVA made revisions to the assumptions and estimates used to calculate its CCR AROs. TVA continues to evaluate the impact of the rule on its operations, including cost and timing estimates of related projects. As a result, further adjustments to its ARO liabilities may be required as estimates are refined.

Cost Escalation Rate – TVA uses expected inflation rates over the remaining timeframe until the costs are expected to be incurred to estimate the amount of future cash flows required to satisfy TVA’s decommissioning obligations.

Discount Rate – TVA uses its incremental borrowing rate over a period consistent with the remaining timeframe until the costs are expected to be incurred to calculate the present value of the weighted estimated cash flows required to satisfy TVA’s decommissioning obligations.

The actual decommissioning costs may vary from the derived estimates because of changes in current assumptions, such as the assumed dates of decommissioning, changes in the discount or escalation rates, changes in regulatory requirements, changes in technology, and changes in the cost of labor, materials, and equipment. A 10 percent change in TVA's ARO for non-nuclear decommissioning costs at September 30, 2018, would have affected the liability by approximately $179 million.

Pension and Other Post-Retirement Benefits

TVA sponsors a defined benefit pension plan that is qualified under section 401(a) of the Internal Revenue Code and covers substantially all of its full-time annual employees hired prior to July 1, 2014. TVARS, a separate legal entity governed by its own board of directors, administers the qualified defined benefit pension plan. TVA also provides a Supplemental Executive Retirement Plan ("SERP") to certain executives in critical positions, which provides supplemental pension benefits tied to compensation levels that exceed limits imposed by IRS rules applicable to the qualified defined benefit pension plan. Additionally, TVA provides post-retirement health care benefits for most of its full-time employees who reach retirement age while still working for TVA.

TVA's pension and other post-retirement benefits contain uncertainties because they require management to make certain assumptions related to TVA's cost to provide these benefits. Numerous factors are considered including the provisions of the plans, changing employee demographics, various actuarial calculations, assumptions, and accounting mechanisms. The most significant of these factors are discussed below.

Expected Return on Plan Assets. The qualified defined benefit pension plan is the only plan that is funded with qualified plan assets. In determining the expected long-term rate of return on pension plan assets, TVA uses a process that incorporates actual historical asset class returns and an assessment of expected future performance and takes into consideration external actuarial advice, the current outlook on capital markets, the asset allocation policy, and the anticipated impact of active management.` In 2017, TVA adopted a 6.75 percent expected long-term rate of return on plan assets to measure the 2018 net periodic benefit pension cost. In 2018, based upon review of the current plan’s asset target allocation mix, capital market outlooks, and the most recent studies, TVA management maintained the 6.75 percent expected long-term rate of return on plan assets assumptions, which will be used to calculate the 2019 net periodic pension cost.

TVA recognizes the impact of asset performance on pension expense over a three-year phase-in period through a "market-related" value of assets calculation. The "market-related" value of assets recognizes investment gains and losses over a three-year period and is used in calculating expected return on plan assets and net gain or loss for pension cost determination.

A higher expected rate of return assumption decreases the net periodic pension benefit costs, whereas a lower expected rate of return assumption increases the net periodic pension benefit cost. The plan's actual rate of return for 2018 was 5.84 percent compared to the assumption of 6.75 percent. The difference between the expected and actual return on plan assets resulted in an actuarial loss of $24 million that is recognized as an increase in the related regulatory asset and an increase in the pension benefit obligation at September 30, 2018.

Discount Rate. TVA’s discount rates are derived by identifying a theoretical settlement portfolio of high quality corporate bonds of Aa quality or higher sufficient to provide for the projected benefit payments. The model matches the present value of the projected benefit payments to the market value of the theoretical settlement bond portfolio with any resulting excess funds presumed to be reinvested and used to meet successive year benefit payments. A single equivalent discount rate is determined to align the present value of the required cash flow with the value of the bond portfolio. The resulting discount rates are reflective of both the current interest rate and the distinct liability of the pension and post-retirement benefit plans.

The discount rate is somewhat volatile because it is determined based upon the prevailing rate as of the measurement date. A higher discount rate decreases the plan obligations and correspondingly decreases the net periodic pension and net post-retirement benefit costs for those plans where actuarial losses are being amortized. Alternatively, a lower discount rate increases net periodic pension and net periodic post-retirement benefit costs. The discount rates used to determine the pension and post-retirement benefit obligations were 4.35 percent and 4.40 percent, respectively, at September 30, 2018.

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Health Care Cost Trends. TVA reviews actual recent cost trends and projected future trends in establishing health care cost trend rates. There were no changes for 2018 in the cost trend assumptions that were adopted in 2017 for pre-Medicare participants. The current trend rate assumption used to determine the pre-Medicare eligible postretirement obligation is 6.25 percent with the rate assumed to gradually decrease each successive year until it reaches a 5.00 percent annual increase in health care costs in 2024 and beyond. TVA maintained the post-Medicare eligible health care cost trend assumption at zero percent through 2020 at which time it increases to 4.00 percent in 2021 and beyond as a result of the move of Medicare eligible retirees to a private exchange beginning January 2017.

Cost of Living Adjustments. Cost of living adjustments ("COLAs") are an increase in the benefits for eligible retirees to help maintain the purchasing power of benefits as consumer prices increase. This assumption is based on the long-term expected future rate of inflation based on the capital market outlooks, economic forecasts, and the Federal Reserve policy. See Note 20 for further discussion on the calculation of the COLA. The actual COLA for CY 2018 was 1.84 percent, and the COLA assumption for CY 2019 and thereafter is 2.00 percent. A higher COLA increases the pension benefit obligation whereas a lower assumption decreases the obligation. The actual calendar year COLA and the long-term COLA assumption are used to determine the benefit obligation at September 30 and the net periodic benefit costs for the following fiscal year.

Sensitivity to Changes in Key Assumptions

The following tables illustrate the estimated effects of changing certain of the critical actuarial assumptions discussed above, while holding all other assumptions constant and excluding any impact for unamortized actuarial gains and losses:

Sensitivity to Certain Changes in Pension Assumptions
At September 30, 2018

Actuarial Assumption	Current Assumption	Change in Assumption	Impact
Effect on 2018 pension expense:			
Discount rate	3.85 %	(0.25)%	$ 16
Expected return on assets	6.75 %	(0.25)%	18
COLA	2.00 %	0.25 %	28
Effect on benefit obligation			
Discount rate	4.35 %	(0.25)%	330
COLA	2.00 %	0.25 %	217

Sensitivity to Changes in Assumed Health Care Cost Trend Rates
At September 30, 2018

	1% Increase	1% Decrease
Effect on total of service and interest cost components for the year	$ 4	$ (4)
Effect on end-of-year accumulated post-retirement benefit obligation	62	(59)

Mortality and Other Experience Assumptions. TVA's mortality assumptions are based upon actuarial projections in combination with actuarial studies of the actual mortality experience of TVARS's pension and post-retirement benefit plan participants taking into consideration the Society of Actuaries ("SOA") mortality table and projection scales as of September 30, 2018. TVA continues to monitor the availability of updates to mortality tables, longevity improvement scales, and mortality reviews and experience studies to consider whether these updates should be reflected in the current year mortality assumption.

Based on the results obtained from the experience study performed during 2018, TVA adjusted its version of the SOA RP-2014 mortality table to reflect increases in female mortality and adopted a modified version of the SOA MP-2017 improvement scale to measure the pension and post-retirement benefit obligations at September 30, 2018. The change in TVA's mortality assumptions resulted in a decrease in the pension and other post-retirement benefit obligations of $138 million and $6 million, respectively.

The results from the experience study also included revisions to certain assumptions, such as timing and rates of retirement and withdrawals, rate of compensation increases, and other experience related assumptions. These changes resulted in an increase in the pension retirement benefit obligation of $46 million and a $23 million decrease in the accumulated post-retirement benefit obligation.

Contributions. The minimum pension contribution for 2018 was $300 million and was paid in twelve monthly installments. TVA made contributions of $4 million to the SERP and $25 million, net of rebates and subsidies received, to the unfunded other post-retirement benefit plans. TVA expects to contribute $300 million to TVARS, $6 million to the SERP, and $29 million to the other post-retirement benefit plans in 2019.

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Accounting Mechanisms. In accordance with current accounting guidance, TVA utilizes a number of accounting mechanisms that reduce the volatility of reported pension expense. Differences between actuarial assumptions and actual plan results are deferred and amortized into period expense only when the accumulated differences exceed 10 percent of the greater of the projected benefit obligation or the market-relative value of plan assets. If necessary, the excess is amortized over the
average future expected working lifetime of participants expected to receive benefits, which is approximately 10 years for the pension plan and 12 years for the post-retirement plan. Additionally, TVA recognizes pension costs as regulatory assets or regulatory liabilities to the extent that the amount calculated under U.S. GAAP as pension expense differs from the amount TVA contributes to the pension plan as pension plan contributions. As a result of recent plan design changes, future contributions are expected to exceed the expense calculated under U.S. GAAP. Accordingly, TVA will discontinue this regulatory accounting practice once all such deferred costs have been recovered, at which time it will recognize pension costs in accordance with U.S. GAAP. Furthermore, amortization of net prior service cost/(credit) resulting from a plan change is included as a component of period expense in the year first recognized and every year thereafter until it is fully amortized. The increase or decrease in the benefit obligation due to a plan change is amortized over the average remaining service period of participating employees expected to receive benefits under the plans. The pension and post-retirement plans currently have prior service credits from plan changes made in 2009, 2010, 2016, and 2018 with remaining amortization periods of two to 11 years.

Fair Value Measurements

Investments

Investment Funds. Investments classified as trading consist of amounts held in the Nuclear Decommissioning Trust ("NDT"), Asset Retirement Trust ("ART"), SERP, and Deferred Compensation Plan ("DCP"). These assets are generally measured at fair value based on quoted market prices or other observable market data such as interest rate indices. These investments are primarily U.S. and international equities, real estate investment trusts, fixed income investments, high-yield fixed income investments, U.S. Treasury Inflation-Protected Securities, commodities, currencies, derivative instruments, and other investments. TVA has classified all of these trading securities as either Level 1, Level 2, or Investments measured at net asset value. See Note 16 — Valuation Techniques for a discussion of valuation levels of the investments.

Plan Investments. TVA’s qualified benefit pension plan is funded with qualified plan assets. These investments are primarily global public equities, private equities, fixed income securities, public real assets, and private real assets. See Note 20 — Fair Value Measurements for disclosure of fair value measurements for investments held by TVARS that support TVA’s qualified defined benefit pension plan.

Pricing. Prices provided by third-parties for the assets in investment funds and plan investments are subjected to automated tolerance checks by the investment portfolio trustee to identify and avoid, where possible, the use of inaccurate prices. Any such prices identified as outside the tolerance thresholds are reported to the vendor that provided the price. If the prices are validated, the primary pricing source is used. If not, a secondary source price that has passed the applicable tolerance check is used (or queried with the vendor if it is out of tolerance), resulting in either the use of a secondary price, where validated, or the last reported default price, as in the case of a missing price. For monthly valued accounts, where secondary price sources are available, an automated inter-source tolerance report identifies prices with an inter-vendor pricing variance of over two percent at an asset class level. For daily valued accounts, each security is assigned, where possible, an indicative major market index, against which daily price movements are automatically compared. Tolerance thresholds are established by asset class. Prices found to be outside of the applicable tolerance threshold are reported and queried with vendors as described above.

For investment funds, TVA additionally performs its own analytical testing on the change in fair value measurements each period to ensure the valuations are reasonable based on changes in general market assumptions. TVA also performs pricing tests on various portfolios comprised of securities classified in Levels 1 and 2 on a quarterly basis to confirm accuracy of the values received from the investment portfolio trustee. For plan investments, TVARS reviews the trustee's Service Organization Controls report and the pricing policies of the trustee's largest pricing vendor.

Derivatives

TVA has historically entered into various derivative transactions, including commodity option contracts, forward contracts, swaps, swaptions, futures, and options on futures, to manage various market risks. Other than certain derivative instruments included in investment funds, it is TVA's policy to enter into these derivative transactions solely for hedging purposes and not for speculative purposes.

Currency and Interest Rate Derivatives. TVA has three currency swaps and four “fixed for floating” interest rate swaps. The currency swaps protect against changes in cash flows caused by volatility in exchange rates related to outstanding Bonds denominated in British pounds sterling. The currency and interest rate swaps are classified as Level 2 valuations as the rate curves and interest rates affecting the fair value of the contracts are based on observable data. The application of credit valuation adjustments ("CVAs") did not materially affect the fair value of these assets and liabilities at September 30, 2018.

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Commodity Contracts. TVA enters into commodity derivatives for coal and natural gas that require physical delivery of the contracted quantity of the commodity. The fair values of these derivative contracts are determined using internal models based on income approaches. TVA develops an overall coal forecast based on widely-used short-term and mid-range market data from an external pricing specialist in addition to long-term internal estimates. To value the volume option component of applicable coal contracts, TVA uses a Black-Scholes pricing model which includes inputs from the overall coal price forecast, contract-specific terms, and other market inputs. Based on the use of certain significant unobservable inputs, these valuations are classified as Level 3 valuations. Additionally, any settlement fees related to early termination of coal supply contracts are included at the contractual amount. The application of CVAs did not materially affect the fair value of these assets and liabilities at September 30, 2018.

TVA maintains policies and procedures to value commodity contracts using what is believed to be the best and most relevant data available. In addition, TVA’s risk management group reviews valuations and pricing data. TVA retains independent pricing vendors to assist in valuing certain instruments without market liquidity.

Commodity Derivatives under the Financial Trading Program. TVA established a Financial Trading Program ("FTP") under which it could purchase and sell futures, swaps, options, and similar derivative instruments to hedge its exposure to changes in prices of natural gas, fuel oil, coal, and other commodities. TVA has suspended its FTP and no longer uses financial instruments to hedge risks related to commodity prices; however, TVA plans to continue to manage fuel price volatility through other methods and to periodically reevaluate its suspended FTP program for future use of financial instruments.

Fair Value Considerations

In determining the fair value of its financial instruments, TVA considers the source of observable market data inputs, liquidity of the instrument, credit risk, and risk of nonperformance of itself or the counterparty to the contract. The conditions and criteria used to assess these factors are described below.

Sources of Market Assumptions. TVA derives its financial instrument market assumptions from market data sources (e.g., CME and Moody's Investors Service, Inc. ("Moody's")). In some cases, where market data is not readily available, TVA uses comparable market sources and empirical evidence to derive market assumptions and determine a financial instrument's fair value.

Market Liquidity. Market liquidity is assessed by TVA based on criteria as to whether the financial instrument trades in an active or inactive market. A financial instrument is considered to be in an active market if the prices are fully transparent to the market participants, the prices can be measured by market bid and ask quotes, the market has a relatively high trading volume, and the market has a significant number of market participants that will allow the market to rapidly absorb the quantity of the assets traded without significantly affecting the market price. Other factors TVA considers when determining whether a market is active or inactive include the presence of government or regulatory control over pricing that could make it difficult to establish a market-based price upon entering into a transaction.

Nonperformance Risk. In determining the potential impact of nonperformance risk, which includes credit risk, TVA considers changes in current market conditions, readily available information on nonperformance risk, letters of credit, collateral, other arrangements available, and the nature of master netting arrangements. TVA is a counterparty to derivative instruments that subject TVA to nonperformance risk. Nonperformance risk on the majority of investments and certain exchange-traded instruments held by TVA is incorporated into the exit price that is derived from quoted market data that is used to value the investment.

Nonperformance risk for most of TVA's derivative instruments is an adjustment to the initial asset/liability fair value. TVA adjusts for nonperformance risk, both of TVA (for liabilities) and the counterparty (for assets), by applying a CVA. TVA determines an appropriate CVA for each applicable financial instrument based on the term of the instrument and TVA's or the counterparty's credit rating as obtained from Moody's. For companies that do not have an observable credit rating, TVA uses internal analysis to assign a comparable rating to the company. TVA discounts each financial instrument using the historical default rate (as reported by Moody's for CY 1983 to CY 2017) for companies with a similar credit rating over a time period consistent with the remaining term of the contract.

All derivative instruments are analyzed individually and are subject to unique risk exposures. The application of CVAs resulted in a less than $1 million decrease in the fair value of assets and a $1 million decrease in the fair value of liabilities at September 30, 2018.

Collateral. TVA's interest rate swaps and currency swaps contain contract provisions that require a party to post collateral (in a form such as cash or a letter of credit) when the party's liability balance under the agreement exceeds a certain threshold. See Note 15 — Other Derivative Instruments — Collateral for a discussion of collateral related to TVA's derivative liabilities.

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New Accounting Standards and Interpretations

See Note 2 for a discussion of recent accounting standards and pronouncements which were issued by the Financial Accounting Standards Board ("FASB"), became effective for TVA, or were adopted by TVA during the presented periods.

Legislative and Regulatory Matters

TVA continues to monitor how regulatory agencies are interpreting and implementing the provisions of the Dodd-Frank Wall Street Reform and Consumer Protection Act, which was enacted in July 2010. As a result, TVA has become subject to recordkeeping, reporting, and reconciliation requirements related to its derivative transactions. In addition, depending on how regulatory agencies interpret and implement the provisions, TVA’s hedging costs may increase, and TVA may have to post additional collateral and margin in connection with its derivative transactions.

For a discussion of environmental legislation and regulation, see Item 1, Business — Environmental Matters.

TVA does not engage, and does not control any entity that is engaged, in any activity listed under Section 13(r) of the Securities Exchange Act of 1934 (the "Exchange Act"), which requires certain issuers to disclose certain activities relating to Iran involving the issuer and its affiliates. Based on information supplied by each such person, none of TVA's directors and executive officers are involved in any such activities. While TVA is an agency and instrumentality of the U.S., TVA does not believe its disclosure obligations, if any, under Section 13(r) extend to the activities of any other departments, divisions, or agencies of the U.S.

Environmental Matters

See Item 1, Business — Environmental Matters, which discussion is incorporated by reference into this Item 7, Management’s Discussion and Analysis of Financial Condition and Results of Operations.

Legal Proceedings

From time to time, TVA is a party to or otherwise involved in Legal Proceedings that have arisen in the ordinary course of conducting its activities, as a result of catastrophic events or otherwise. As of September 30, 2018, TVA had accrued approximately $18 million with respect to Legal Proceedings. No assurance can be given that TVA will not be subject to significant additional claims and liabilities. If actual liabilities significantly exceed the estimates made, TVA's results of operations, liquidity, and financial condition could be materially adversely affected.

For a discussion of certain current material Legal Proceedings, see Note 8 and Note 21 — Legal Proceedings, which discussions are incorporated into this Item 7, Management's Discussion and Analysis of Financial Condition and Results of Operations.

Risk Management Activities

TVA is exposed to various market risks. These market risks include risks related to commodity prices, investment prices, interest rates, currency exchange rates, inflation, and counterparty credit and performance risk. To help manage certain of these risks, TVA has entered into various derivative transactions, including commodity option contracts, forward contracts, swaps, swaptions, futures, and options on futures. Other than certain derivative instruments in its trust investment funds, it is TVA’s policy to enter into these derivative transactions solely for hedging purposes and not for speculative purposes. See Note 15.

Risk Governance

The Enterprise Risk Council ("ERC") is responsible for the highest level of risk oversight at TVA and is also responsible for communicating enterprise-wide risks with policy implications to the TVA Board or a designated TVA Board committee. The ERC is comprised of the Executive Management Committee ("EMC") and the Chief Risk Officer ("CRO") who acts as Chair. ERC members may invite additional attendees to meetings as non-voting participants. The ERC has also established subordinate committees, consisting of business unit leaders to assist in the oversight of fuel and power procurement, DER programs and products, and general risk management.

TVA has a designated Enterprise Risk Management ("ERM") organization within its Financial Services organization responsible for (1) establishing enterprise risk management policies and guidelines, (2) developing an enterprise risk profile aligned with TVA's strategic objectives, (3) performing annual risk assessments across all TVA business units, (4) monitoring and reporting on identified enterprise risks and emerging risks, (5) facilitating enterprise risk discussions with the risk subject matter experts across the organization and at the ERC and TVA Board levels, and (6) developing and improving TVA's risk awareness culture. TVA has cataloged major short-term and long-term enterprise level risks across the organization. A discussion of significant risks is presented in Item 1A, Risk Factors.

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Commodity Price Risk

TVA is exposed to effects of market fluctuations in the price of commodities that are critical to its operations, including electricity, coal, and natural gas. The magnitude of exposure to these risks is influenced by many factors including contract terms and market liquidity. TVA's commodity price risk is substantially mitigated by its cost-based rates, including its total fuel cost adjustment, and long-term fixed price commodity contracts.

TVA manages risk with commodity contract derivatives for both coal and natural gas that require physical delivery of the contracted quantity. A hypothetical 10 percent decline in the market price of coal on September 30, 2018 and 2017, would have resulted in decreases of approximately $63 million and $36 million, respectively, in the fair value of TVA's coal derivative instruments at these dates. A hypothetical 10 percent decline in the market price of natural gas on September 30, 2018 and 2017, would have resulted in decreases of approximately $102 million and $84 million, respectively, in the fair value of TVA's natural gas derivative instruments at these dates.

Investment Price Risk

TVA's investment price risk relates primarily to investments in TVA's NDT, ART, pension fund, SERP, and DCP.

Nuclear Decommissioning Trust. The NDT is generally designed to achieve a return in line with overall equity and debt market performance. The assets of the trust are invested in debt and equity securities, private partnerships, and certain derivative instruments including forwards, futures, options, and swaps, and through these investments the trust has exposure to U.S. equities, international equities, real estate investment trusts, high-yield debt, domestic debt, U.S. Treasury Inflation-Protected Securities ("TIPS"), commodities, and private real estate, private equity, and absolute return strategies. At September 30, 2018 and 2017, an immediate 10 percent decrease in the price of the investments in the trust would have reduced the value of the trust by $205 million and $188 million, respectively.

Asset Retirement Trust. The ART is presently invested to achieve a return in line with equity and debt market performance. The assets of the trust are invested in debt and equity securities and private partnerships, and through these investments the trust has exposure to domestic debt and equities, international equities, and private real estate. At September 30, 2018 and 2017, an immediate 10 percent decrease in the price of the investments in the trust would have reduced the value of the trust by $71 million and $63 million, respectively.

Qualified Pension Plan. The TVARS asset allocation policy for qualified pension plan assets has targets of 43 percent equity including global public and private equity investments, 32 percent fixed income securities, and 25 percent real assets including public and private real asset investments. TVARS has a long-term investment plan that contains a dynamic de-risking strategy which will allocate investments to assets that better match the liability, such as long duration fixed income securities, over time as improved funding status targets are met. Pursuant to the TVARS Rules and Regulations, any proposed changes in asset allocation that would change the system's assumed rate of investment return are subject to TVA's review and veto.

As set forth above, the qualified pension plan assets are invested across global public equity, private equity, safety oriented fixed income, opportunistic fixed income, public real assets, and private real assets. The TVARS asset allocation policy includes permissible deviations from these target allocations, and action can be taken, as appropriate, to rebalance the plan's assets consistent with the asset allocation policy. At September 30, 2018 and 2017, an immediate 10 percent decrease in the value of the net assets of the fund would have reduced the value of the fund by approximately $800 million and $799 million, respectively.

Supplemental Executive Retirement Plan. The SERP is a non-qualified defined benefit pension plan similar to those typically found in other companies in TVA's peer group and is provided to selected employees of TVA. TVA's SERP

was created to recruit and retain key executives. The plan is designed to provide a competitive level of retirement benefits in excess of the limitations on contributions and benefits imposed by TVA's qualified defined benefit plan and Internal Revenue Code Section 415 limits on qualified retirement plans. The SERP currently targets an asset allocation policy for its plan assets of 65 percent equity securities, which includes U.S. and non-U.S. equities, and 35 percent fixed income securities. The SERP plan assets are presently invested to achieve a return in line with overall equity and debt market performance. At September 30, 2018 and 2017, an immediate 10 percent decrease in the value of the SERP investments would have reduced the value of the investments by $7 million and $6 million, respectively.

Deferred Compensation Plan. The DCP is designed to provide participants with the ability to defer compensation until employment with TVA ends. The plan assists in the recruitment of top executive talent for TVA. As in other corporations, deferred compensation can be an integral part of a total compensation package. Assets currently include deferral balances. The default return on investment of the accounts is interest calculated based on the composite rate of all marketable U.S. Treasury issues. Executives may alternatively choose to have their balances adjusted based on the return of certain mutual funds. At both September 30, 2018 and 2017, an immediate 10 percent decrease in the value of the deferred compensation accounts would have reduced the value of the accounts by $3 million.

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Interest Rate Risk

TVA's interest rate risk is related primarily to its short-term investments, short-term debt, long-term debt, and interest rate derivatives.

Investments. At September 30, 2018, TVA had $299 million of cash and cash equivalents, and the average balance of cash and cash equivalents for 2018 was $348 million. The average interest rate that TVA received on its short-term investments during 2018 was 1.60 percent. If the rates of interest that TVA received on its short-term investments during 2018 were 0.60 percent, TVA would have received approximately $3 million less in interest from its short-term investments. At September 30, 2017, TVA had $300 million of cash and cash equivalents, and the average balance of cash and cash equivalents for 2017 was $336 million. The average interest rate that TVA received on its short-term investments during 2017 was less than one percent. If the rates that TVA received on its short-term investments during 2017 were zero percent, TVA would have received approximately $2 million less in interest from its short-term investments. In addition to affecting the amount of interest that TVA receives from its short-term investments, changes in interest rates could affect the value of the investments in its pension plan, ART, NDT, SERP, and DCP. See Risk Management Activities — Investment Price Risk above.

Short-Term Debt. At September 30, 2018, TVA's short-term borrowings were $1.2 billion, and the current maturities of long-term debt were $1.1 billion. Based on TVA's interest rate exposure at September 30, 2018, an immediate one percentage point increase in interest rates would have resulted in an increase of $23 million in TVA's short-term interest expense. At September 30, 2017, TVA's short-term borrowings were $2.0 billion, and the current maturities of long-term debt were $1.8 billion. Based on TVA's interest rate exposure at September 30, 2017, an immediate one percentage point increase in interest rates would have resulted in an increase of $38 million in TVA's short-term interest expense.

Long-Term Debt. At September 30, 2018 and 2017, the interest rates on all of TVA's outstanding long-term debt were fixed (or subject only to downward adjustment under certain conditions). Accordingly, an immediate one percentage point increase in interest rates would not have affected TVA's interest expense associated with its long-term debt. When TVA's long-term debt matures or is redeemed, however, TVA typically refinances debt in whole or in part by issuing additional debt. Accordingly, if interest rates are high when TVA issues this additional debt, TVA's cash flows, results of operations, and financial condition may be adversely affected. This risk is somewhat mitigated by the fact that TVA's debt portfolio is diversified in terms of maturities and has a long average life. At September 30, 2018 and 2017, the average life of TVA's debt portfolio was 16.3 years and 16.6 years, respectively. A schedule of TVA's debt maturities is contained in Note 13 — Debt Outstanding.

Interest Rate Derivatives. Changes in interest rates also affect the mark-to-market valuation of TVA's interest rate derivatives. See Note 15 — Derivatives Not Receiving Hedge Accounting Treatment — Interest Rate Derivatives. TVA had four interest rate swaps outstanding at September 30, 2018 and September 30, 2017. Net unrealized gains and losses on these instruments are reflected on TVA's consolidated balance sheets in a regulatory asset account, and realized gains and losses are reflected in earnings. Based on TVA's interest rate exposure at September 30, 2018 and 2017, an immediate one-half percentage point decrease in interest rates would have increased the interest rate swap liabilities by $196 million and $233 million, respectively.

Currency Exchange Rate Risk

Over the next several years, TVA plans to spend a significant amount of capital on clean air projects, capacity expansion, and other projects. A portion of this amount may be spent on contracts that are denominated in one or more foreign currencies. Additionally, TVA's three issues of Bonds denominated in British pounds sterling are hedged by currency swap agreements. The value of the U.S. dollar compared with other currencies has fluctuated widely in

recent years, including fluctuations in the U.S. dollar to British pound sterling exchange rate primarily driven by the "BREXIT" vote for the United Kingdom to leave the European Union. If not effectively managed, foreign currency exposure could negatively impact TVA's counterparty risk, cash flows, results of operations, and financial condition.

ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

Quantitative and qualitative disclosures about market risk are reported in Item 7, Management's Discussion and Analysis of Financial Condition and Results of Operations — Risk Management Activities, which discussion is incorporated by reference into this Item 7A, Quantitative and Qualitative Disclosures About Market Risk.

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ITEM 8. FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA

TENNESSEE VALLEY AUTHORITY
CONSOLIDATED BALANCE SHEETS
At September 30
(in millions)
ASSETS

	2018	2017
Current assets		
Cash and cash equivalents	$299	$300
Restricted cash and cash equivalents	13	—
Accounts receivable, net	1,657	1,569
Inventories, net	961	1,065
Regulatory assets	414	447
Other current assets	86	65
Total current assets	3,430	3,446
Property, plant, and equipment		
Completed plant	61,114	58,947
Less accumulated depreciation	(29,335)	(28,404)
Net completed plant	31,779	30,543
Construction in progress	1,999	2,842
Nuclear fuel	1,487	1,401
Capital leases	149	161
Total property, plant, and equipment, net	35,414	34,947
Investment funds	2,862	2,603
Regulatory and other long-term assets		
Regulatory assets	6,612	8,698
Other long-term assets	349	323
Total regulatory and other long-term assets	6,961	9,021
Total assets	$48,667	$50,017

The accompanying notes are an integral part of these consolidated financial statements.

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TENNESSEE VALLEY AUTHORITY
CONSOLIDATED BALANCE SHEETS
At September 30
(in millions)

LIABILITIES AND PROPRIETARY CAPITAL	2018	2017
Current liabilities		
Accounts payable and accrued liabilities	$1,982	$1,940
Accrued interest	305	346
Current portion of leaseback obligations	38	37
Current portion of energy prepayment obligations	10	100
Regulatory liabilities	187	163
Short-term debt, net	1,216	1,998
Current maturities of power bonds	1,032	1,728
Current maturities of long-term debt of variable interest entities	38	36
Current maturities of notes payable	46	53
Total current liabilities	4,854	6,401
Other liabilities		
Post-retirement and post-employment benefit obligations	4,476	5,477
Asset retirement obligations	4,665	4,176
Other long-term liabilities	2,715	3,055
Leaseback obligations	263	302
Energy prepayment obligations	—	10
Regulatory liabilities	104	25
Total other liabilities	12,223	13,045
Long-term debt, net		
Long-term power bonds, net	20,157	20,205
Long-term debt of variable interest entities, net	1,127	1,164
Long-term notes payable	23	69
Total long-term debt, net	21,307	21,438
Total liabilities	38,384	40,884
Commitments and contingencies (Note 21)		
Proprietary capital		
Power program appropriation investment	258	258
Power program retained earnings	9,404	8,282
Total power program proprietary capital	9,662	8,540
Nonpower programs appropriation investment, net	564	572
Accumulated other comprehensive income (loss)	57	21
Total proprietary capital	10,283	9,133
Total liabilities and proprietary capital	$48,667	$50,017

The accompanying notes are an integral part of these consolidated financial statements.

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TENNESSEE VALLEY AUTHORITY
CONSOLIDATED STATEMENTS OF OPERATIONS
For the years ended September 30
(in millions)

	2018	2017	2016
Operating revenues			
Revenue from sales of electricity	$11,075	$10,586	$10,461
Other revenue	158	153	155
Total operating revenues	11,233	10,739	10,616
Operating expenses			
Fuel	2,049	2,169	2,126
Purchased power	973	991	964
Operating and maintenance	2,854	3,362	2,842
Depreciation and amortization	2,527	1,717	1,836
Tax equivalents	518	525	522
Total operating expenses	8,921	8,764	8,290
Operating income	2,312	1,975	2,326
Other income (expense), net	50	56	43
Interest expense			
Interest expense	1,243	1,346	1,371
Allowance for funds used during construction	—	—	(235)
Net interest expense	1,243	1,346	1,136
Net income (loss)	$1,119	$685	$1,233

TENNESSEE VALLEY AUTHORITY
CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME (LOSS)
For the years ended September 30
(in millions)

	2018	2017	2016
Net income (loss)	$1,119	$685	$1,233
Other comprehensive income (loss)			
Net unrealized gain (loss) on cash flow hedges	10	59	(139)
Reclassification to earnings from cash flow hedges	26	(26)	129
Total other comprehensive income (loss)	$36	$33	$(10)
Total comprehensive income (loss)	$1,155	$718	$1,223

The accompanying notes are an integral part of these consolidated financial statements.

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TENNESSEE VALLEY AUTHORITY
CONSOLIDATED STATEMENTS OF CASH FLOWS
For the years ended September 30
(in millions)

	2018	2017	2016
Cash flows from operating activities			
Net income (loss)	$1,119	$685	$1,233
Adjustments to reconcile net income (loss) to net cash provided by operating activities			
Depreciation and amortization (including amortization of debt issuance costs and premiums/discounts)	2,554	1,763	1,882
Amortization of nuclear fuel cost	382	341	287
Non-cash retirement benefit expense	324	837	327
Prepayment credits applied to revenue	(100)	(100)	(100)
Fuel cost adjustment deferral	(30)	98	(83)
Fuel cost tax equivalents	(7)	5	(16)
Changes in current assets and liabilities			
Accounts receivable, net	(68)	230	(83)
Inventories and other current assets, net	65	1	50
Accounts payable and accrued liabilities	134	(119)	(4)
Accrued interest	(36)	(17)	(3)
Regulatory asset costs	(13)	(50)	(31)
Pension contributions	(304)	(805)	(281)
Settlements of asset retirement obligations	(106)	(123)	(139)
Other, net	41	(10)	3
Net cash provided by operating activities	3,955	2,736	3,042
Cash flows from investing activities			
Construction expenditures	(1,759)	(2,153)	(2,710)
Nuclear fuel expenditures	(457)	(305)	(300)
Purchases of investments	(49)	(49)	(50)
Loans and other receivables			
Advances	(12)	(11)	(10)
Repayments	4	8	7
Other, net	4	(26)	(50)
Net cash used in investing activities	(2,269)	(2,536)	(3,113)
Cash flows from financing activities			
Long-term debt			
Issues of power bonds	998	999	—
Redemptions and repurchases of power bonds	(1,731)	(1,558)	(76)
Payments on debt of variable interest entities	(36)	(35)	(33)
Redemptions of notes payable	(53)	(27)	—
Short-term debt issues (redemptions), net	(811)	583	370
Payments on leases and leasebacks	(42)	(136)	(159)
Financing costs, net	(3)	(4)	—
Payments to U.S. Treasury	(5)	(5)	(6)
Other, net	(4)	(17)	(25)
Net cash (used in) provided by financing activities	(1,687)	(200)	71
Net change in cash and cash equivalents	(1)	—	—

Cash and cash equivalents at beginning of year	300	300	300
Cash and cash equivalents at end of year	$299	$300	$300

The accompanying notes are an integral part of these consolidated financial statements.

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TENNESSEE VALLEY AUTHORITY
CONSOLIDATED STATEMENTS OF CHANGES IN PROPRIETARY CAPITAL
For the years ended September 30
(in millions)

	Power Program Appropriation Investment	Power Program Retained Earnings	Nonpower Programs Appropriation Investment, Net	Accumulated Other Comprehensive Income (Loss) from Net Gains (Losses) on Cash Flow Hedges	Total
Balance at September 30, 2015	$ 258	$ 6,357	$ 590	$ (2)	$ 7,203
Net income (loss)	—	1,243	(10)	—	1,233
Total other comprehensive income (loss)	—	—	—	(10)	(10)
Return on power program appropriation investment	—	(6)	—	—	(6)
Balance at September 30, 2016	$ 258	$ 7,594	$ 580	$ (12)	$ 8,420
Net income (loss)	—	693	(8)	—	685
Total other comprehensive income (loss)	—	—	—	33	33
Return on power program appropriation investment	—	(5)	—	—	(5)
Balance at September 30, 2017	$ 258	$ 8,282	$ 572	$ 21	$ 9,133
Net income (loss)	—	1,127	(8)	—	1,119
Total other comprehensive income (loss)	—	—	—	36	36
Return on power program appropriation investment	—	(5)	—	—	(5)
Balance at September 30, 2018	$ 258	$ 9,404	$ 564	$ 57	$ 10,283

The accompanying notes are an integral part of these consolidated financial statements.

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
(Dollars in millions except where noted)

1. Summary of Significant Accounting Policies

General

The Tennessee Valley Authority ("TVA") is a corporate agency and instrumentality of the United States ("U.S.") that was created in 1933 by federal legislation in response to a proposal by President Franklin D. Roosevelt. TVA was created to, among other things, improve navigation on the Tennessee River, reduce the damage from destructive flood waters within the Tennessee River system and downstream on the lower Ohio and Mississippi Rivers, further the economic development of TVA's service area in the southeastern U.S., and sell the electricity generated at the facilities TVA operates.

Today, TVA operates the nation's largest public power system and supplies power in most of Tennessee, northern Alabama, northeastern Mississippi, and southwestern Kentucky and in portions of northern Georgia, western North Carolina, and southwestern Virginia to a population of nearly 10 million people.

TVA also manages the Tennessee River, its tributaries, and certain shorelines to provide, among other things, year-round navigation, flood damage reduction, and affordable and reliable electricity. Consistent with these primary purposes, TVA also manages the river system and public lands to provide recreational opportunities, adequate water supply, improved water quality, cultural and natural resource protection, and economic development.

The power program has historically been separate and distinct from the stewardship programs. It is required to be self-supporting from power revenues and proceeds from power financings, such as proceeds from the issuance of bonds, notes, or other evidences of indebtedness ("collectively, Bonds"). Although TVA does not currently receive congressional appropriations, it is required to make annual payments to the United States Department of the Treasury ("U.S. Treasury") as a return on the government's appropriation investment in TVA's power facilities (the "Power Program Appropriation Investment"). In the 1998 Energy and Water Development Appropriations Act, Congress directed TVA to fund essential stewardship activities related to its management of the Tennessee River system and nonpower or stewardship properties with power revenues in the event that there were insufficient appropriations or other available funds to pay for such activities in any fiscal year. Congress has not provided any appropriations to TVA to fund such activities since 1999. Consequently, during 2000, TVA began paying for essential stewardship activities primarily with power revenues, with the remainder funded with user fees and other forms of

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revenues derived in connection with those activities. The activities related to stewardship properties do not meet the criteria of an operating segment under accounting principles generally accepted in the United States of America ("GAAP"). Accordingly, these assets and properties are included as part of the power program, TVA's only operating segment.

Power rates are established by the TVA Board of Directors (the "TVA Board") as authorized by the Tennessee Valley Authority Act of 1933 (the "TVA Act"). The TVA Act requires TVA to charge rates for power that will produce gross revenues sufficient to provide funds for operation, maintenance, and administration of its power system; payments to states and counties in lieu of taxes ("tax equivalents"); debt service on outstanding indebtedness; payments to the U.S. Treasury in repayment of and as a return on the Power Program Appropriation Investment; and such additional margin as the TVA Board may consider desirable for investment in system assets, retirement of outstanding Bonds in advance of maturity, additional reduction of the Power Program Appropriation Investment, and other purposes connected with TVA's business. TVA fulfilled its requirement to repay $1.0 billion of the Power Program Appropriation Investment with the 2014 payment and so this item is no longer a component of rate setting. In setting TVA's rates, the TVA Board is charged by the TVA Act to have due regard for the primary objectives of the TVA Act, including the objective that power shall be sold at rates as low as are feasible. Rates set by the TVA Board are not subject to review or approval by any state or other federal regulatory body.

Fiscal Year

TVA's fiscal year ends September 30. Years (2018, 2017, etc.) refer to TVA's fiscal years unless they are preceded by “CY,” in which case the references are to calendar years.

Cost-Based Regulation

Since the TVA Board is authorized by the TVA Act to set rates for power sold to its customers, TVA is self-regulated. Additionally, TVA's regulated rates are designed to recover its costs. Based on current projections, TVA believes that rates, set at levels that will recover TVA's costs, can be charged and collected. As a result of these factors, TVA records certain assets and liabilities that result from the regulated ratemaking process that would not be recorded under GAAP for non-regulated entities. Regulatory assets generally represent incurred costs that have been deferred because such costs are probable of future recovery in customer rates. Regulatory liabilities generally represent obligations to make refunds to customers for previous collections for costs that are not likely to be incurred or deferral of gains that will be credited to customers in future periods. TVA assesses whether the regulatory assets are probable of future recovery by considering factors such as applicable regulatory changes, potential legislation, and changes in technology. Based on these assessments, TVA believes the existing regulatory assets are probable of recovery. This determination reflects the current regulatory and political environment and is subject to change in the future. If future recovery of regulatory assets ceases to be probable, or any of the other factors described above cease to be applicable, TVA would no longer be considered to be a regulated entity and would be required to write off these costs. All regulatory asset write offs would be required to be recognized in earnings in the period in which future recovery ceases to be probable.

Basis of Presentation

The accompanying consolidated financial statements, which have been prepared in accordance with GAAP, include the accounts of TVA, wholly-owned direct subsidiaries, and variable interest entities ("VIE") of which TVA is the primary beneficiary. See Note 9 and Note 10. Intercompany balances and transactions have been eliminated in consolidation.

Use of Estimates

The preparation of financial statements requires TVA to estimate the effects of various matters that are inherently uncertain as of the date of the consolidated financial statements. Although the consolidated financial statements are prepared in conformity with GAAP, TVA is required to make estimates and assumptions that affect the reported amounts of assets and liabilities, the disclosure of contingent assets and liabilities, and the amounts of revenues and expenses reported during the reporting period. Each of these estimates varies in regard to the level of judgment involved and its potential impact on TVA's financial results. Estimates are considered critical either when a different estimate could have reasonably been used, or where changes in the estimate are reasonably likely to occur from period to period, and such use or change would materially impact TVA's financial condition, results of operations, or cash flows.

Cash and Cash Equivalents

Cash includes cash on hand and non-interest bearing cash and deposit accounts. All highly liquid investments with original maturities of three months or less are considered cash equivalents.

Restricted Cash and Cash Equivalents

Cash and cash equivalents that are restricted as to withdrawal or use under the terms of certain contractual agreements are recorded in Restricted cash and cash equivalents and Other long-term assets in the Consolidated Balance Sheet. Restricted cash and cash equivalents includes cash held in trusts that are currently restricted for TVA economic

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development projects and for certain TVA environmental programs in accordance with agreements related to compliance with certain environmental regulations. See Note 21 — Commitments and Contingencies.

Allowance for Uncollectible Accounts

The allowance for uncollectible accounts reflects TVA's estimate of probable losses inherent in its accounts and loans receivable balances. TVA determines the allowance based on known accounts, historical experience, and other currently available information including events such as customer bankruptcy and/or a customer failing to fulfill payment arrangements after 90 days. It also reflects TVA's corporate credit department's assessment of the financial condition of customers and the credit quality of the receivables.

The allowance for uncollectible accounts was less than $1 million at both September 30, 2018 and 2017, for accounts receivable. Additionally, loans receivable of $138 million and $118 million at September 30, 2018 and 2017, respectively, are included in Accounts receivable, net and Other long-term assets, for the current and long-term portions, respectively, and are reported net of allowances for uncollectible accounts of less than $1 million at both September 30, 2018 and 2017, respectively.

Revenues

Revenues from power sales are recorded as electricity is delivered to customers. In addition to power sales invoiced and recorded during the month, TVA accrues estimated unbilled revenues for power sales provided to five customers whose billing date occurs prior to the end of the month. Exchange power sales are presented in the accompanying consolidated statements of operations as a component of Sales of electricity. Exchange power sales are sales of excess power after meeting TVA native load and directly served requirements. Native load refers to the customers on whose behalf a company, by statute, franchise, regulatory requirement, or contract, has undertaken an obligation to serve.

From time to time TVA transfers fiber optic capacity on TVA’s network to telecommunications service carriers and local power company customers of TVA ("LPCs"). These transactions are structured as indefeasible rights of use ("IRUs"), which are the exclusive right to use a specified amount of fiber optic capacity for a specified term. TVA accounts for the consideration received on transfers of fiber optic capacity for cash and on all of the other elements deliverable under an IRU as revenue ratably over the term of the agreement. TVA does not recognize revenue on any contemporaneous exchanges of its fiber optic capacity for an IRU of fiber optic capacity of the counterparty to the exchange.

TVA engages in a wide array of arrangements in addition to power sales. TVA records revenue when it is realized or realizable and earned when all of the following criteria are met: persuasive evidence of an arrangement exists; delivery has occurred or services have been rendered; the price or fee is fixed or determinable; and collectability is reasonably assured. Revenues from activities related to TVA’s overall mission are recorded as other operating revenue versus those that are not related to the overall mission, which are recorded in Other income (expense), net.

Pre-Commercial Plant Operations

As part of the process of completing the construction of a generating unit, the electricity produced is used to serve the demands of the electric system. TVA estimates revenue from such pre-commercial generation based on the guidance provided by Federal Energy Regulatory Commission ("FERC") regulations. Watts Bar Nuclear Plant ("Watts Bar") Unit 2 commenced pre-commercial plant operations in June 2016, and commercial operations began in October 2016. In addition, the Paradise Combined Cycle Plant commenced pre-commercial plant operations in October 2016, and commercial operations began in April 2017. The Allen Combined Cycle Plant ("Allen CC") began pre-commercial plant operations in September 2017, and began commercial operations in April 2018. Cogeneration capability at

Johnsonville Combustion Turbine Unit 20 commenced pre-commercial plant operations in September 2017, and was placed in service during December 2017. Estimated revenue of $11 million and $22 million related to these projects was capitalized to offset project costs for the years ended September 30, 2018 and 2017, respectively. TVA also capitalized related fuel costs for these construction projects of approximately $19 million and $14 million during the years ended September 30, 2018 and 2017, respectively.

Inventories

Certain Fuel, Materials, and Supplies. Materials and supplies inventories are valued using an average unit cost method. A new average cost is computed after each inventory purchase transaction, and inventory issuances are priced at the latest moving weighted average unit cost. Coal, fuel oil, and natural gas inventories are valued using an average cost method. A new weighted average cost is computed monthly, and monthly issues are priced accordingly.

Allowance for Inventory Obsolescence. TVA reviews material and supplies inventories by category and usage on a periodic basis. Each category is assigned a probability of becoming obsolete based on the type of material and historical usage data. In 2018, TVA started moving from a site-specific inventory management policy to a fleet-wide strategy for each generation type. Based on the estimated value of the inventory, TVA adjusts its allowance for inventory obsolescence.

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Emission Allowances. TVA has emission allowances for sulfur dioxide ("SO_2") and nitrogen oxide ("NO_x") which are accounted for as inventory. The cost of specific allowances used each month is charged to operating expense based on tons of SO_2 and NO_x emitted during the respective compliance periods. Allowances granted to TVA by the Environmental Protection Agency ("EPA") are recorded at zero cost.

Renewable Energy Credits. TVA accounts for Renewable Energy Certificates ("RECs") using the specific identification cost method. RECs that are acquired through power purchases are recorded as inventory and charged to purchased power expense when the RECs are subsequently used or sold. TVA assigns a value to the RECs at the inception of the power purchase arrangement using a relative fair value approach. RECs created through TVA-owned asset generation are recorded at zero cost.

Property, Plant, and Equipment, and Depreciation

Property, Plant, and Equipment. Additions to plant are recorded at cost, which includes direct and indirect costs and may include allowance for funds used during construction ("AFUDC"), if eligible. The cost of current repairs and minor replacements is charged to operating expense. Nuclear fuel inventories, which are included in Property, plant, and equipment, are valued using the average cost method for raw materials and the specific identification method for nuclear fuel in a reactor. Amortization of nuclear fuel in a reactor is calculated on a units-of-production basis and is included in fuel expense. When property, plant, and equipment is retired, accumulated depreciation is charged for the original cost of the assets. Gains or losses are only recognized upon the sale of land or an entire operating unit.

Depreciation. TVA accounts for depreciation of its properties using the composite depreciation convention of accounting. Under the composite method, assets with similar economic characteristics are grouped and depreciated as one asset. Depreciation is generally computed on a straight-line basis over the estimated service lives of the various classes of assets. The estimation of asset useful lives requires management judgment, supported by external depreciation studies of historical asset retirement experience. Depreciation rates are determined based on the external depreciation studies. This study will be updated at least every five years. Depreciation expense for the years ended September 30, 2018, 2017, and 2016 was $1.3 billion, $1.3 billion, and $1.4 billion, respectively. Depreciation expense expressed as a percentage of the average annual depreciable completed plant was 2.45 percent for 2018, 2.49 percent for 2017, and 2.97 percent for 2016. Average depreciation rates by asset class are as follows:

Property, Plant, and Equipment
Depreciation Rates
At September 30
(percent)

	2018	2017	2016
Asset Class			
Nuclear	2.64	2.66	2.37
Coal-fired	2.32	2.33	3.50
Hydroelectric	1.57	1.58	1.29
Gas and oil-fired	2.93	3.27	3.09
Transmission	1.32	1.34	2.80
Other	5.90	6.12	8.97

Coal-Fired. In April 2011, TVA entered into two substantively similar agreements, one with the EPA and the other with Alabama, Kentucky, North Carolina, Tennessee, and three environmental advocacy groups (collectively, the "Environmental Agreements"). See Note 21 — Legal Proceedings — Environmental Agreements. Under the Environmental Agreements, TVA committed to retire 18 coal-fired units on a phased schedule, among other things.

Since its November 2013 meeting, the TVA Board has approved the retirement of certain coal-fired units. Units subsequently retired include: Widows Creek Fossil Plant ("Widows Creek") Units 7 and 8 on September 30, 2015; Colbert Fossil Plant ("Colbert") Units 1-5 on April 16, 2016; Paradise Fossil Plant ("Paradise") Units 1 and 2 on April 15, 2017; Johnsonville Fossil Plant ("Johnsonville") Units 1-4 on December 31, 2017; and Allen Fossil Plant ("Allen") Units 1-3 on March 31, 2018.

As a result of TVA's decision to idle or retire units, TVA recognized $48 million, $104 million and $139 million in accelerated depreciation expense related to the units during the years ended September 30, 2018, 2017, and 2016, respectively. Accelerated depreciation is based on the rate in effect at the time the decision is made to idle or retire a unit.

Capital Lease Agreements. Assets recorded under capital lease agreements are included in property, plant, and equipment. These primarily consist of a natural gas lateral pipeline, power production facilities, water treatment assets, and land of $149 million and $161 million at September 30, 2018 and 2017, respectively. Amortization expense related to capital leases is included in Depreciation and amortization in TVA’s statement of operations, excluding leases and other financing obligations

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where regulatory accounting is applied. See Note 7 — Other Non-Current Regulatory Assets — Deferred Capital Leases and Other Financing Obligations.

On April 4, 2016, TVA entered into a letter agreement with Choctaw Generation Limited Partnership, LLLP (“CGLP”) for the reimbursement of certain capital costs and ongoing operating and maintenance costs related to assets recently constructed at the Red Hills lignite-fired power facility. These capital additions were required to comply with new Mercury and Air Toxics Standards ("MATS"). As a result of the new agreement, TVA was required to reassess a related 1997 power purchase and operating agreement (“PPOA”) with CGLP that was previously classified as an executory contract. This reassessment determined that the PPOA contained a capital lease and resulted in TVA recording a capital lease asset at the estimated fair value of $76 million with an offsetting capital lease liability included in Accounts payable and accrued liabilities and Other long-term liabilities.

Allowance for Funds Used During Construction. TVA may capitalize interest on eligible projects as AFUDC, based on the average interest rate of TVA’s outstanding debt. The allowance is applicable to construction in progress related to eligible projects with (1) an expected total project cost of $1.0 billion or more, and (2) an estimated construction period of at least three years in duration. No AFUDC was capitalized for the years ended September 30, 2018 and 2017. TVA capitalized $235 million of AFUDC for the year ended September 30, 2016, related to the Watts Bar Unit 2 project, which went into service in October 2016.

Reacquired Rights. Property, plant, and equipment includes intangible reacquired rights, net of amortization, of $208 million and $215 million as of September 30, 2018 and 2017, respectively, related to the purchase of residual interests from lease/leaseback agreements of certain combustion turbine units. Amortization expense was $8 million, $4 million, and $1 million for 2018, 2017, and 2016, respectively. See Note 9.

Software Costs. TVA capitalizes certain costs incurred in connection with developing or obtaining internal-use software. Capitalized software costs are included in Property, plant, and equipment on the consolidated balance sheets and are generally amortized over seven years. At September 30, 2018 and 2017, unamortized computer software costs totaled $53 million and $42 million, respectively. Amortization expense related to capitalized computer software costs was $32 million, $26 million, and $43 million for 2018, 2017, and 2016, respectively. Software costs that do not meet capitalization criteria are expensed as incurred.

Impairment of Assets. TVA evaluates long-lived assets for impairment when events or changes in circumstances indicate that the carrying value of such assets may not be recoverable. For long-lived assets, TVA bases its evaluation on impairment indicators such as the nature of the assets, the future economic benefit of the assets, any historical or future profitability measurements, regulatory approval and ability to set rates at levels that allow for recoverability of the assets, and other external market conditions or factors that may be present. If such impairment indicators are present or other factors exist that indicate that the carrying amount of an asset may not be recoverable, TVA determines whether an impairment has occurred based on an estimate of undiscounted cash flows attributable to the asset as compared with the carrying value of the asset. If an impairment has occurred, the amount of the impairment recognized is measured as the excess of the asset’s carrying value over its fair value. Additionally, TVA regularly evaluates construction projects. If the project is canceled or deemed to have no future economic benefit, the project is written off as an asset impairment or, upon TVA Board approval, reclassified as a regulatory asset.

Decommissioning Costs

TVA recognizes legal obligations associated with the future retirement of certain tangible long-lived assets. These obligations relate to fossil fuel-fired generating plants, nuclear generating plants, hydroelectric generating plants/dams, transmission structures, and other property-related assets. These other property-related assets include, but are not limited to, easements and coal rights. Activities involved with retiring these assets could include

decontamination and demolition of structures, removal and disposal of wastes, and site restoration. Revisions to the estimates of asset retirement obligations ("AROs") are made whenever factors indicate that the timing or amounts of estimated cash flows have changed materially. Any accretion or depreciation expense related to these liabilities and assets is charged to a regulatory asset. See Note 7 — Nuclear Decommissioning Costs and Non-Nuclear Decommissioning Costs and Note 12.

Blended Low-Enriched Uranium Program

Under the blended low-enriched uranium ("BLEU") program, TVA, the U.S. Department of Energy ("DOE"), and certain nuclear fuel contractors have entered into agreements providing for the DOE's surplus of enriched uranium to be blended with other uranium down to a level that allows the blended uranium to be fabricated into fuel that can be used in nuclear power plants. Under the terms of an interagency agreement between TVA and the DOE, in exchange for supplying highly enriched uranium materials to the appropriate third-party fuel processors for processing into usable BLEU fuel for TVA, the DOE participates to a degree in the savings generated by TVA’s use of this blended nuclear fuel. TVA accrues an obligation with each BLEU reload batch related to the portion of the ultimate future payments estimated to be attributable to the BLEU fuel currently in use. TVA estimated DOE's portion of the cost savings from the program to be $166 million. The last reload of BLEU material is currently underway at Browns Ferry Nuclear Plant ("Browns Ferry"). There is a potential to receive additional BLEU fuel

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beginning in 2020, and it would be used in future Browns Ferry reloads. At September 30, 2018, TVA had paid out approximately $165 million for this program, and the obligation recorded was $1 million.

Investment Funds

Investment funds consist primarily of trust funds designated to fund decommissioning requirements (see Note 21 — Contingencies — Decommissioning Costs), the Supplemental Executive Retirement Plan ("SERP") (see Note 20 — Overview of Plans and Benefits — Supplemental Executive Retirement Plan), and the Deferred Compensation Plan ("DCP"). The Nuclear Decommissioning Trust ("NDT") holds funds primarily for the ultimate decommissioning of TVA's nuclear power plants. The Asset Retirement Trust ("ART") holds funds primarily for the costs related to the future closure and retirement of TVA's other long-lived assets. The NDT, ART, SERP, and DCP funds are invested in portfolios of securities generally designed to achieve a return in line with overall equity and debt market performance. The NDT, ART, SERP, and DCP funds are all classified as trading.

Energy Prepayment Obligations

In 2004, TVA and its largest customer, Memphis Light, Gas and Water Division ("MLGW"), entered into an energy prepayment agreement under which MLGW prepaid TVA $1.5 billion for the future costs of electricity to be delivered by TVA to MLGW over a period of 180 months. TVA accounted for the prepayment as unearned revenue and is reporting the obligation to deliver power under this arrangement as Energy prepayment obligations and Current portion of energy prepayment obligations on the September 30, 2018 and 2017 Consolidated Balance Sheets. Revenue is recognized in each year of the arrangement, as electricity is delivered to MLGW, based on the ratio of units of kilowatt hours ("kWh") delivered to total units of kWh under contract. At September 30, 2018, approximately $1.49 billion had been recognized as non-cash revenue on a cumulative basis during the life of the agreement, $100 million of which was recognized as non-cash revenue during each of 2018 and 2017. The remaining $10 million is expected to be recognized as non-cash revenue in 2019.

Discounts to account for the time value of money, which are recorded as a reduction to electricity sales, amounted to $46 million for both of the years ended September 30, 2018 and 2017.

Insurance

Although TVA uses private companies to administer its healthcare plans for eligible active and retired employees not covered by Medicare, TVA does not purchase health insurance. Third-party actuarial specialists assist TVA in determining certain liabilities for self-insured claims. TVA recovers the costs of claims through power rates and through adjustments to the participants' contributions to their benefit plans. These liabilities are included in Other liabilities on the balance sheets.

TVA sponsors an Owner Controlled Insurance Program which provides workers' compensation and liability insurance for a select group of contractors performing maintenance, modifications, outage, and new construction activities at TVA facilities.

The Federal Employees' Compensation Act ("FECA") governs liability to employees for service-connected injuries. TVA purchases excess workers' compensation insurance above a self-insured retention.

In addition to excess workers' compensation insurance, TVA purchases the following types of insurance:

- Nuclear liability insurance; nuclear property, decommissioning, and decontamination insurance; and nuclear accidental outage insurance. See Note 21 — Contingencies — Nuclear Insurance.

- Excess liability insurance for aviation, auto, marine, and general liability exposures.

- Property insurance for certain conventional (non-nuclear) assets.

The insurance policies are subject to the terms and conditions of the specific policy, including deductibles or self-insured retentions. To the extent insurance would not provide either a partial or total recovery of the costs associated with a loss, TVA would have to recover any such costs through other means, including through power rates.

Research and Development Costs

Research and development costs are expensed when incurred. TVA's research programs include those related to power delivery technologies, emerging technologies (clean energy, renewables, distributed resources, and energy efficiency), technologies related to generation (fossil fuel, nuclear, and hydroelectric), and environmental technologies.

Tax Equivalents

TVA is not subject to federal income taxation. In addition, neither TVA nor its property, franchises, or income is subject to taxation by states or their subdivisions. The TVA Act requires TVA to make payments to states and counties in which TVA

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conducts its power operations and in which TVA has acquired power properties previously subject to state and local taxation. The total amount of these payments is five percent of gross revenues from sales of power during the preceding year, excluding sales or deliveries to other federal agencies and off-system sales with other utilities, with a provision for minimum payments under certain circumstances. TVA calculates tax equivalent expense by subtracting the prior year fuel cost-related tax equivalent regulatory asset or liability from the payments made to the states and counties during the current year and adding back the current year fuel cost-related tax equivalent regulatory asset or liability. Fuel cost-related tax equivalent expense is recognized in the same accounting period in which the fuel cost-related revenue is recognized.

Maintenance Costs

TVA records maintenance costs and repairs related to its property, plant, and equipment in the consolidated statements of operations as they are incurred except for the recording of certain regulatory assets for retirement and removal costs.

2. Impact of New Accounting Standards and Interpretations

The following are accounting standard updates issued by the Financial Accounting Standards Board ("FASB") that TVA adopted during 2018.

Derivatives and Hedging - Contingent Put and Call Options in Debt Instruments

Description	This guidance clarifies the requirements for assessing whether contingent call or put options that can accelerate the payment of principal on debt instruments are clearly and closely related to their debt hosts. An entity performing the assessment under the amendments in this update is required to assess the embedded call or put options solely in accordance with a four-step decision sequence. The standard includes interim periods within the fiscal year of adoption and requires a modified retrospective transition.
Effective Date for TVA	October 1, 2017
Effect on the Financial Statements or Other Significant Matters	TVA has two issues of Putable Automatic Rate Reset Securities ("PARRS") outstanding. After a fixed-rate period of five years, the coupon rate on the PARRS may automatically be reset downward under certain market conditions on an annual basis. The coupon rate reset on the PARRS is based on a calculation. If the coupon rate is going to be reset, holders may request, for a limited period of time, redemption of the PARRS at par value, with repayment of principal on the reset date. This put option is otherwise not available. For both series of PARRS, the coupon rate will reset downward on the reset date if the rate calculated is below the then-current coupon rate on the PARRS. TVA has determined under the new guidance that contingent put options that can accelerate the payment of principal on the PARRS are clearly and closely related to their debt hosts. The adoption of this standard did not have a material impact on TVA's financial condition, results of operations, or cash flows.

Inventory Valuation

Description	This guidance changes the model used for the subsequent measurement of inventory from the previous lower of cost or market model to the lower of cost or net realizable value. The guidance applies only to inventory valued using methods other than last-in, first-out or the retail inventory method (for example, first-in, first-out or average cost). This amendment is intended to simplify the subsequent measurement of inventory. The standard includes interim periods within the fiscal year of adoption and requires a prospective transition.
Effective Date for TVA	October 1, 2017

Effect on the Financial Statements or Other Significant Matters	The adoption of this standard did not have a material impact on TVA's financial condition, results of operations, or cash flows.

The following accounting standards have been issued but as of September 30, 2018, were not effective and had not yet been adopted by TVA.

Defined Benefit Costs

Description	This guidance changes how information about defined benefit costs for pension plans and other post-retirement benefit plans is presented in employer financial statements. The guidance requires employers that present a measure of operating income in their statement of income to include only the service cost component of net periodic pension cost and net periodic postretirement benefit cost in operating expenses (together with other employee compensation costs). The other components of net benefit cost, including amortization of prior service cost/credit and settlement and curtailment effects, are to be included in nonoperating expenses. Additionally, the guidance stipulates that only the service cost component of net benefit cost is eligible for capitalization in assets.
Effective Date for TVA	The new standard is effective for TVA's interim and annual reporting periods beginning October 1, 2018. While early adoption is permitted, TVA did not adopt the standard early.
Effect on the Financial Statements or Other Significant Matters	TVA has evaluated the impact of adopting this guidance, and if the guidance had been effective for TVA for the years ended 2018, 2017, and 2016, TVA would have reclassified $256 million, $758 million, and $178 million, respectively, of net periodic benefit costs from Operating and maintenance expense to Other income (expense), net on the consolidated statements of operations. There will be no impact on the consolidated balance sheets because TVA has historically capitalized only the service cost component, which is consistent with the new guidance.

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Financial Instruments	
Description	This guidance applies to the recognition and measurement of financial assets and liabilities. The standard requires all equity investments to be measured at fair value with changes in the fair value recognized through net income (other than those accounted for under the equity method of accounting or those that result in consolidation of the investee). The standard also amends presentation requirements related to certain changes in the fair value of a liability and eliminates certain disclosure requirements of significant assumptions for financial instruments measured at amortized cost on the balance sheet. Public entities must apply the amendments by means of a cumulative-effect adjustment to the balance sheet as of the beginning of the fiscal year of adoption.
Effective Date for TVA	The new standard is effective for TVA's interim and annual reporting periods beginning October 1, 2018. Early adoption is not permitted unless specific early adoption guidance is applied. TVA did not adopt the standard early.
Effect on the Financial Statements or Other Significant Matters	TVA currently measures all of its equity investments (other than those that result in the consolidation of the investee) at fair value, with changes in the fair value recognized through net income, unless regulatory accounting is applied. The TVA Board has authorized the use of regulatory accounting for changes in fair value of certain equity investments, and as a result, those changes in fair value are deferred as regulatory assets or liabilities. TVA currently discloses significant assumptions around its estimates of fair value for financial instruments carried at amortized cost on its consolidated balance sheet. The adoption of this standard is not expected to have a material impact on TVA's financial condition, results of operations, or cash flows because TVA holds no available-for-sale securities.
Revenue Recognition	
Description	This guidance is related to revenue from contracts with customers, including subsequent amendments, and replaces the existing accounting standard and industry specific guidance for revenue recognition with a five-step model for recognizing and measuring revenue from contracts with customers. The underlying principle of the guidance is to recognize revenue related to the transfer of goods or services to customers at the amount expected to be collected. The objective of the new standard is to provide a single, comprehensive revenue recognition model for all contracts with customers to improve comparability within and across industries. The new standard also requires enhanced disclosures regarding the nature, amount, timing, and uncertainty of revenue and the related cash flows arising from contracts with customers.
Effective Date for TVA	The new standard is effective for TVA's interim and annual reporting periods beginning October 1, 2018. While early adoption is permitted, TVA did not adopt the standard early.
Effect on the Financial Statements or Other Significant Matters	TVA has completed its evaluation of its revenue and adoption of this guidance will not have a material impact on results of operations, financial position, or cash flows, other than changes in required financial statement disclosures. Consistent with current industry practice, revenues recognized from sales of bundled energy commodities (i.e., contracts involving the delivery of multiple energy commodities such as electricity, capacity, ancillary services, etc.) are generally expected to be recognized upon delivery to the customer in an amount based on the invoice price given that it corresponds directly with the value of the commodities transferred to the customer. TVA has also concluded contributions in aid of construction are not in scope for the guidance and will continue to be accounted for as a reduction of property, plant, and equipment. TVA will utilize certain practical expedients including applying the guidance to open contracts at the date of adoption and to portfolios of contracts with similar characteristics and recognizing revenue for certain contracts under the invoice practical expedient which allows revenue recognition to be consistent with invoiced amounts.

	TVA will apply the modified retrospective method of adoption effective October 1, 2018. Under the modified retrospective method of adoption, prior year reported results are not restated; however, any cumulative-effect adjustment to retained earnings at October 1, 2018 would be recorded. The adoption did not result in a cumulative-effect adjustment. The disclosure requirements included in the guidance will result in increased information being provided in the financial statements. TVA will include disaggregation of revenue including information already provided outside of the financial statement footnotes.

Statement of Cash Flows - Classification of Certain Cash Receipts and Cash Payments	
Description	This standard adds or clarifies guidance on the classification of certain cash receipts and payments on the statement of cash flows as follows: debt prepayment or extinguishment costs, settlement of zero-coupon bonds, contingent consideration payments made after a business combination, proceeds from the settlement of insurance claims, proceeds from the settlement of corporate-owned life insurance policies and bank-owned life insurance policies, distributions received from equity method investees, beneficial interest in securitization transactions, and the application of the predominance principle to separately identifiable cash flows.
Effective Date for TVA	This standard is effective for TVA's interim and annual reporting periods beginning October 1, 2018. While early adoption is permitted, TVA did not adopt the standard early.
Effect on the Financial Statements or Other Significant Matters	TVA's previous treatment of the classification of certain cash receipts and cash payments is consistent with the new standard and there will be no impact on TVA's financial condition, results of operations, or presentation or disclosure of cash flows.

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Statement of Cash Flows - Restricted Cash	
Description	This guidance requires that a statement of cash flows explain the change during the period in the total of cash, cash equivalents, and amounts generally described as restricted cash or restricted cash equivalents. Therefore, amounts generally described as restricted cash and restricted cash equivalents should be included with cash and cash equivalents when reconciling the beginning-of-period and end-of-period total amounts shown on the statement of cash flows. This guidance does not provide a definition of restricted cash or restricted cash equivalents.
Effective Date for TVA	The new standard is effective for TVA's interim and annual reporting periods beginning October 1, 2018. While early adoption is permitted, TVA did not adopt the standard early.
Effect on the Financial Statements or Other Significant Matters	Adoption of this standard will result in a change to the amount of cash and cash equivalents and restricted cash presented when reconciling the beginning-of-period and end-of-period total amounts shown on the consolidated statement of cash flows. For the years ended September 30, 2018, 2017, and 2016, TVA would reflect $13 million, $0 million, and $15 million in transfers of cash and cash equivalents to restricted cash within cash flow from operating activities in the consolidated statement of cash flows. TVA will apply the standard using a retrospective transition method to each period presented.
Derivatives and Hedging - Improvements to Accounting for Hedging Activities	
Description	This guidance better aligns an entity's risk management activities and financial reporting for hedging relationships through changes to both the designation and measurement guidance for qualifying hedging relationships and the presentation of hedge results. To meet that objective, the amendments expand and refine hedge accounting for both nonfinancial and financial risk components and align the recognition and presentation of the effects of the hedging instrument and the hedged item in the financial statements.
Effective Date for TVA	The new standard is effective for TVA's interim and annual reporting periods beginning October 1, 2019. While early adoption is permitted, TVA did not adopt the standard early.
Effect on the Financial Statements or Other Significant Matters	TVA does not expect the adoption of this standard to have a material impact on TVA's financial condition, results of operations, or cash flows.
Lease Accounting	
Description	This guidance changes the provisions of recognition in both the lessee and lessor accounting models. The standard requires entities that lease assets ("lessees") to recognize on the balance sheet the assets and liabilities for the rights and obligations created by leases with terms of more than 12 months. The recognition, measurement, and presentation of expenses and cash flows arising from a lease by a lessee primarily will depend on its classification as a finance (similar to current capital leases) or operating lease. However, unlike current lease accounting rules, which require only capital leases to be recognized on the balance sheet, the new standard will require both types of leases to be recognized on the balance sheet. Operating leases will result in straight-line expense, while finance leases will result in recognition of interest on the lease liability separate from amortization expense. The accounting for the owner of the assets leased by the lessee ("lessor accounting") will remain largely unchanged from current lease accounting rules. The standard allows for certain practical expedients to be elected related to lease term determination, separation of lease and non-lease elements, reassessment of existing leases, and short-term leases. When the standard becomes effective, it will include interim periods within the fiscal year of adoption and will be required to be applied using a modified retrospective transition.

Effective Date for TVA	The new standard is effective for TVA's interim and annual reporting periods beginning October 1, 2019. While early adoption is permitted, TVA does not currently plan to adopt the standard early.
Effect on the Financial Statements or Other Significant Matters	TVA is currently evaluating the potential impact of these changes on its consolidated financial statements and related disclosures. The standard is expected to impact financial position as adoption will increase the amount of assets and liabilities recognized on TVA’s consolidated balance sheets. The standard is not expected to have a material impact on results of operations or cash flows as expense recognition is intended to be substantially the same as under the existing standard. TVA plans to elect certain of the practical expedients included in the new standard. Efforts to date have consisted of evaluating the completeness of the lease population, the effectiveness of internal control related to leases, and appropriate financial statement disclosure and selecting a lease system solution. TVA is also continuing to monitor unresolved industry implementation issues and will analyze the related impacts to lease accounting.

Defined Benefit Plans - Disclosure Requirements

Description	This guidance applies to all employers that sponsor defined benefit pension or other postretirement plans and modifies or clarifies the disclosure requirements for those plans. The amendments in this update remove disclosures that no longer are considered cost-beneficial, clarify the specific requirements of disclosures, and add disclosure requirements identified as relevant. Entities are required to apply the amendments retrospectively.
Effective Date for TVA	The new standard is effective for TVA's annual reporting periods beginning October 1, 2021. While early adoption is permitted, TVA does not currently plan to adopt the standard early.
Effect on the Financial Statements or Other Significant Matters	TVA is currently evaluating the potential impact of these changes on its consolidated financial statements and related disclosures.

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Customer's Accounting for Implementation Costs in a Cloud Arrangement That is a Service Contract	
Description	This guidance relates to the accounting for a customer’s implementation costs in a hosting arrangement that is a service contract. The amendments align the requirements for capitalizing those implementation costs with the requirements for capitalizing implementation costs incurred to develop or obtain internal-use software and hosting arrangements that include an internal-use software license. The amendments also provide requirements for the classification of the capitalized costs and related expense and cash flows in the financial statements, the application of impairment guidance to the capitalized costs, and the application of abandonment guidance to the capitalized costs. Entities are required to apply the amendments either retrospectively or prospectively to all implementation costs incurred after the adoption date.
Effective Date for TVA	The new standard is effective for TVA's interim and annual reporting periods beginning October 1, 2020. While early adoption is permitted, TVA does not currently plan to adopt the standard early.
Effect on the Financial Statements or Other Significant Matters	TVA is currently evaluating the potential impact of these changes on its consolidated financial statements and related disclosures.

3. Accounts Receivable, Net

Accounts receivable primarily consist of amounts due from customers for power sales. The table below summarizes the types and amounts of TVA’s accounts receivable:

Accounts Receivable, Net
At September 30

	2018	2017
Power receivables	$1,570	$1,441
Other receivables	87	129
Allowance for uncollectible accounts	— [1]	(1)
Accounts receivable, net	$1,657	$1,569

Note
(1) Allowance for uncollectible accounts was less than $1 million at September 30, 2018, and therefore is not represented in the table above.

4. Inventories, Net

The table below summarizes the types and amounts of TVA’s inventories:

Inventories, Net
At September 30

	2018	2017
Materials and supplies inventory	$725	$734
Fuel inventory	266	355
RECs/Emission allowance inventory, net	14	15
Allowance for inventory obsolescence	(44)	(39)
Inventories, net	$961	$1,065

5. Net Completed Plant

Net completed plant consisted of the following:

Net Completed Plant
At September 30

	2018			2017		
	Cost	Accumulated Depreciation	Net	Cost	Accumulated Depreciation	Net
Coal-fired	$16,482	$ 11,033	$5,449	$15,937	$ 10,791	$5,146
Gas and oil-fired	5,990	1,459	4,531	4,995	1,359	3,636
Nuclear	25,227	11,310	13,917	25,010	10,834	14,176
Transmission	7,515	3,038	4,477	7,264	3,039	4,225
Hydroelectric	3,087	1,012	2,075	3,015	967	2,048
Other electrical plant	1,881	1,107	774	1,756	1,008	748
Intangible software	3	—	3	—	—	—
Multipurpose dams	900	367	533	928	387	541
Other stewardship	29	9	20	42	19	23
Total	$61,114	$ 29,335	$31,779	$58,947	$ 28,404	$30,543

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6. Other Long-Term Assets

The table below summarizes the types and amounts of TVA’s other long-term assets:

Other Long-Term Assets
At September 30

	2018	2017
EnergyRight® receivables	$90	$100
Loans and other long-term receivables, net	135	115
Commodity contract derivative assets	31	2
Prepaid capacity payments	27	34
Other	66	72
Total other long-term assets	$349	$323

In association with the EnergyRight® Solutions program, LPCs offer financing to end-use customers for the purchase of energy-efficient equipment. Depending on the nature of the energy-efficiency project, loans may have a maximum term of five years or 10 years. TVA purchases the resulting loans receivable from its LPCs. The loans receivable are then transferred to a third-party bank with which TVA has agreed to repay in full any loan receivable that has been in default for 180 days or more or that TVA has determined is uncollectible. Given this continuing involvement, TVA accounts for the transfer of the receivables as secured borrowings. The current and long-term portions of the receivables are reported in Accounts receivable, net and Other long-term assets, respectively, on TVA's consolidated balance sheets. As of September 30, 2018 and 2017, the carrying amount of the receivables, net of discount, reported in Accounts receivable, net was approximately $22 million and $25 million, respectively. See Note 11 for information regarding the associated financing obligation.

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7. Regulatory Assets and Liabilities

Regulatory assets generally represent incurred costs that have been deferred because such costs are probable of future recovery in customer rates. Regulatory liabilities generally represent obligations to make refunds to customers for previous collections for costs that are not likely to be incurred or deferral of gains that will be credited to customers in future periods. Components of regulatory assets and regulatory liabilities are summarized in the table below.

Regulatory Assets and Liabilities
At September 30

	2018	2017
Current regulatory assets		
Gallatin coal combustion residual facilities	$38	$—
Unrealized losses on interest rate derivatives	73	93
Environmental agreements	3	2
Unrealized losses on commodity contracts	4	68
Deferred nuclear generating units	—	237
Environmental cleanup costs – Kingston ash spill	266	44
Fuel cost adjustment receivable	30	1
Other current regulatory assets	—	2
Total current regulatory assets	414	447
Non-current regulatory assets		
Deferred pension costs and other post-retirement benefits costs	3,119	4,009
Non-nuclear decommissioning costs	1,019	703
Gallatin CCR facilities	861	899
Nuclear decommissioning costs	784	823
Unrealized losses on interest rate derivatives	692	982
Environmental agreements	11	13
Unrealized losses on commodity contracts	8	9
Deferred nuclear generating units	—	759
Environmental cleanup costs - Kingston ash spill	—	263
Other non-current regulatory assets	118	238
Total non-current regulatory assets	6,612	8,698
Total regulatory assets	$7,026	$9,145
Current regulatory liabilities		
Fuel cost adjustment tax equivalents	$146	$153
Fuel cost adjustment	—	2
Unrealized gains on commodity derivatives	41	8
Total current regulatory liabilities	187	163
Non-current regulatory liabilities		
Deferred other post-retirement benefits cost	73	23
Unrealized gains on commodity derivatives	31	2
Total non-current regulatory liabilities	104	25
Total regulatory liabilities	$291	$188

In 2017, the TVA Board authorized management to accelerate amortization of certain regulatory assets to the extent actual net income in 2018 exceeds the budgeted amount, up to the aggregate amount of those certain regulatory assets. Assets included in this Board action include: deferred nuclear generating units, environmental cleanup costs related to

the Kingston ash spill, and nuclear training costs related to the refurbishing and restarting of Browns Ferry Unit 1 and the construction of Watts Bar Unit 2. TVA recorded $857 million of accelerated amortization of the Deferred nuclear generating units and Nuclear training costs regulatory assets in 2018. The TVA Board is authorizing TVA to use the amount included in the 2019 rate action for these

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two regulatory assets, to the extent needed, to accelerate amortization of the Environmental cleanup costs - Kingston ash spill regulatory asset in 2019.

Deferred Pension Costs and Other Post-retirement Benefit Costs. TVA measures the funded status of its pension and post-retirement ("OPEB") benefit plans at each year-end balance sheet date. The funded status is measured as the difference between the fair value of plan assets and the benefit obligations at the measurement date for each plan. The changes in funded status are actuarial gains and losses that are recognized in TVA's consolidated balance sheets by adjusting the recognized pension and OPEB liabilities, with the offset deferred as a regulatory asset or a regulatory liability. In an unregulated environment, these deferred costs would be recognized as an increase or decrease to accumulated other comprehensive income (loss) ("AOCI").

"Incurred cost" is a cost arising from cash paid out or an obligation to pay for an acquired asset or service, and a loss from any cause that has been sustained and for which payment has been or must be made. In the cases of pension and OPEB costs, the unfunded obligation represents a projected liability to the employee for services rendered, and thus it meets the definition of an incurred cost. Therefore, amounts that otherwise would be charged to AOCI for these costs are recorded as a regulatory asset or liability since TVA has historically recovered pension and OPEB expense in rates. Through historical and current year expense included in ratemaking, the TVA Board has demonstrated the ability and intent to include pension and OPEB costs in allowable costs and in rates for ratemaking purposes. As a result, it is probable that future revenue will result from inclusion of the pension and OPEB regulatory assets or regulatory liability in allowable costs for ratemaking purposes.

The regulatory asset and liability are classified as long-term, which is consistent with the pension and OPEB liabilities, and are not amortized to the consolidated statements of operations over a specified recovery period. They are adjusted either upward or downward each year in conjunction with the adjustments to the unfunded pension liability and OPEB liability, as calculated by the actuaries. Ultimately the regulatory asset and liability will be recognized in the consolidated statements of operations in the form of pension and OBEB expense as the actuarial liabilities are eliminated in future periods. See Note 20 — Obligations and Funded Status.

Additionally on October 1, 2014, TVA began recognizing pension costs as a regulatory asset to the extent that the amount calculated under GAAP as pension expense differs from the amount TVA contributes to the pension plan. As a result of recent plan design changes, future contributions are expected to exceed the expense calculated under U.S. GAAP. Accordingly, TVA will discontinue this regulatory accounting practice once all such deferred costs have been recovered, at which time it will recognize pension costs in accordance with U.S. GAAP.

Non-Nuclear Decommissioning Costs. Non-nuclear decommissioning costs include: (1) certain deferred charges related to the future closure and decommissioning of TVA's non-nuclear long-lived assets, (2) recognition of changes in the liability, (3) recognition of changes in the value of TVA's ART, and (4) certain other deferred charges under the accounting rules for AROs. TVA has established the ART to more effectively segregate, manage, and invest funds to help meet future non-nuclear AROs. The funds from the ART may be used, among other things, to pay the costs related to the future closure and retirement of non-nuclear long-lived assets under various legal requirements. These future costs can be funded through a combination of investment funds already set aside in the ART, future earnings on those investment funds, and future cash contributions to the ART and future earnings thereon. For 2018, TVA recovered in rates a portion of its estimated current year non-nuclear decommissioning costs and contributions to the ART. Deferred charges will be recovered in rates based on an analysis of the expected expenditures, contributions, and investment earnings required to recover the decommissioning costs. There is not a specified recovery period; therefore, the regulatory asset is classified as long-term consistent with the ART investments and ARO liability.

Gallatin Coal Combustion Residual Facilities. In August 2017, TVA began using regulatory accounting treatment to defer expected future costs related to Gallatin Fossil Plant ("Gallatin") coal combustion residuals ("CCR"). The TVA

Board approved a plan to amortize these costs over the anticipated duration of the Gallatin CCR project (excluding post-closure care), beginning October 1, 2018 as project costs are incurred. See Note 8.

Nuclear Decommissioning Costs. Nuclear decommissioning costs include: (1) certain deferred charges related to the future closure and decommissioning of TVA's nuclear generating units under the Nuclear Regulatory Commission ("NRC") requirements, (2) recognition of changes in the liability, (3) recognition of changes in the value of TVA's NDT, and (4) certain other deferred charges under the accounting rules for AROs. These future costs will be funded through a combination of the NDT, future earnings on the NDT, and, if necessary, additional TVA cash contributions to the NDT and future earnings thereon. See Note 1 — Investment Funds. There is not a specified recovery period; therefore, the regulatory asset is classified as long-term consistent with the NDT investments and ARO liability.

Unrealized Losses on Interest Rate Derivatives. TVA uses regulatory accounting treatment to defer the unrealized gains and losses on certain interest rate derivative contracts. When amounts in these contracts are realized, the resulting gains or losses are included in the ratemaking formula. The unrealized losses on these interest rate derivatives are recorded on TVA's consolidated balance sheets as current and non-current regulatory assets, and the related realized gains or losses, if any, are recorded in TVA's consolidated statements of operations. Gains and losses on interest rate derivatives that are expected to be realized within the next year are included as a current regulatory asset or liability on TVA's consolidated balance sheet.

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Environmental Agreements. In conjunction with the Environmental Agreements (see Note 21 — Legal Proceedings — Environmental Agreements), TVA recorded certain liabilities totaling $360 million ($290 million investment in energy efficiency projects, demand response projects, renewable energy projects, and other TVA projects; $60 million to be provided to Alabama, Kentucky, North Carolina, and Tennessee to fund environmental projects with preference for projects in the Tennessee River watershed; and $10 million in civil penalties). The TVA Board determined that these costs would be collected in customer rates in the future, and, accordingly, the amounts were deferred as a regulatory asset. Through the end of 2018, $276 million has been paid with respect to environmental projects, $60 million has been paid to Alabama, Kentucky, North Carolina, and Tennessee, and $10 million has been paid with respect to civil penalties. The remaining deferred amounts will be charged to expense and recovered in rates over future periods as payments are made through 2027. Amounts included as a current regulatory asset on TVA's consolidated balance sheets represent the costs expected to be incurred in the next 12 months.

Unrealized Gains (Losses) on Commodity Derivatives. Unrealized gains (losses) on coal and natural gas purchase contracts, included as part of unrealized gains (losses) on commodity derivatives, relate to the mark-to-market ("MtM") valuation of coal and natural gas purchase contracts. These contracts qualify as derivative contracts but do not qualify for cash flow hedge accounting treatment. As a result, TVA recognizes the changes in the market value of these derivative contracts as a regulatory liability or asset. This treatment reflects TVA's ability and intent to recover the cost of these commodity contracts on a settlement basis for ratemaking purposes through the fuel cost adjustment. TVA recognizes the actual cost of fuel received under these contracts in fuel expense at the time the fuel is used to generate electricity. These contracts expire at various times through 2020. Unrealized gains and losses on contracts with a maturity of less than one year are included as a current regulatory asset or liability on TVA's consolidated balance sheets. See Note 15.

Deferred Nuclear Generating Units. All accumulated costs related to Bellefonte Nuclear Plant ("Bellefonte") are recorded as a regulatory asset. Additionally, in August 2016 the TVA Board approved the recognition of a regulatory asset for (1) all costs attributable to (a) the expected disposition of Bellefonte assets, including preparing or preserving the Bellefonte site, and (b) associated liabilities directly related to those assets, (2) any related future operating and project costs until the assets are sold, (3) the amount by which the book value of Bellefonte exceeds its fair market value less cost to sell, if any, (4) any subsequent gains and losses resulting from the disposition or impairment of Bellefonte, and (5) any costs attributable to the steam generators for Bellefonte until TVA disposes of the generators.

The TVA Board approved recovery of this asset in future rates at an amount of $237 million per year until fully recovered. In addition to this annual recovery, in 2017, the TVA Board authorized management to accelerate additional amortization of this asset in 2018 to the extent actual net income in 2018 exceeded budgeted net income. TVA fully amortized the remaining balance of $764 million during 2018.

On November 14, 2016, following a public auction, TVA entered into a contract to sell substantially all of the Bellefonte Nuclear Plant ("Bellefonte") site to Nuclear Development, LLC for $111 million. Nuclear Development, LLC, paid $22 million on November 14, 2016, which is recorded as a short-term liability on TVA's Consolidated Balance Sheet at September 30, 2018, with the remaining $89 million due at closing. Nuclear Development, LLC, had up to two years from November 14, 2016, to close on the property, and TVA agreed to maintain the site until closing. Nuclear Development, LLC, requested and was granted an extension of the initial closing date. Nuclear Development, LLC now has until November 30, 2018 to close on the property, and TVA will continue to maintain the site until then. Proceeds from the sale in excess of carrying costs will be recorded as a gain and reflected in earnings.

Environmental Cleanup Costs – Kingston Ash Spill. TVA used regulatory accounting treatment to defer all actual costs incurred and expected future costs related to the Kingston Fossil Plant ("Kingston") Ash Spill. The TVA Board approved a plan to amortize these costs over 15 years beginning on October 1, 2009. Insurance proceeds have been recorded as reductions to the regulatory asset and have reduced amounts collected in future rates. Amounts included as

a current regulatory asset on TVA’s consolidated balance sheets represent the amount to be amortized in the next 12 months. The TVA Board is authorizing TVA to use the amount included in the 2019 rate action for the Deferred nuclear generating units and Nuclear training costs regulatory assets, to the extent needed, to accelerate amortization of the Environmental cleanup costs - Kingston ash spill regulatory asset in 2019. Therefore, the remaining balance at September 30, 2018 is recorded as a current asset.

Fuel Cost Adjustment Receivable. The fuel cost adjustment provides a mechanism to alter rates monthly to reflect changing fuel and purchased power costs, including realized gains and losses relating to transactions under TVA’s Financial Trading Program ("FTP"). There is typically a lag between the occurrence of a change in fuel and purchased power costs and the reflection of the change in fuel rates. Balances in the fuel cost adjustment regulatory accounts represent over-collected or under-collected revenues that offset fuel and purchased power costs, and the fuel rate is designed to recover or refund the balance in less than one year.

Other Non-Current Regulatory Assets. Other non-current regulatory assets consist of the following:

Deferred Capital Leases and Other Financing Obligations. Deferred capital lease and other financing asset costs represent the difference between the FERC's Uniform System of Accounts Prescribed for Public Utilities and Licensees Subject to the Provisions of the Federal Power Act ("Uniform System of Accounts") model balances and the balances under GAAP guidance. Under the Uniform System of Accounts, TVA recognizes the initial capital lease and other financing asset and liability

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at inception of the lease or other obligation; however, the annual expense under the Uniform System of Accounts is equal to the annual lease or other financing obligation payments, which differs from GAAP treatment. This practice results in TVA's asset balances being higher than they otherwise would have been under GAAP, with the difference representing a regulatory asset related to each capital lease or other financing obligation. These costs will be amortized over the respective lease or other financing obligation terms as lease or other financing obligation payments are made. As the costs associated with this regulatory asset are not currently being considered in rates and the asset is expected to increase over the next year, the regulatory asset has been classified as long-term.

Debt Reacquisition Costs. Reacquisition expenses, call premiums, and other related costs, such as unamortized debt issue costs associated with redeemed Bond issues, are deferred and amortized (accreted) on a straight-line basis over the weighted average life of TVA's debt portfolio. Because timing of additional reacquisition expenses and changes to the weighted average life of the debt are uncertain, the regulatory asset is classified as long-term.

Nuclear Training Costs. As a result of refurbishing and restarting Browns Ferry Unit 1 in 2007 and the construction and startup of Watts Bar Unit 2 in 2017, nuclear training costs associated with these units have been deferred as a regulatory asset and amortized over a cost recovery period equivalent to the expected useful life of the operating nuclear units. In addition to this annual recovery, in 2017, the TVA Board authorized management to accelerate additional amortization of this asset in 2018 to the extent actual net income in 2018 exceeded budgeted net income. TVA fully amortized the remaining balance of $93 million during 2018.

Retirement Removal Costs. Retirement removal costs, net of salvage, that are not legally required are recognized as a regulatory asset. Prior to 2017, net removal costs were amortized over a recovery period consistent with the depreciable lives of related assets under the most recent depreciation study. In 2017 and thereafter, net removal costs are amortized over a one-year period subsequent to completion of the removal activities. TVA treats this regulatory asset as long-term in its entirety primarily because it relates to assets that are long-term in nature.

Fuel Cost Adjustment Tax Equivalents. The fuel cost adjustment includes a provision related to the current funding of the future payments TVA will make. As TVA records the fuel cost adjustment, five percent of the calculation that relates to a future asset or liability for tax equivalent payments is recorded as a current regulatory asset or liability and paid or refunded in the following year.

8. Gallatin Coal Combustion Residual Facilities

Background

TVA is planning to close wet CCR impoundments in accordance with federal and applicable state requirements when (1) coal-fired plants are converted to dry CCR processes and dry storage landfills become operational or (2) plant operations cease. Closure project schedules and costs are driven by the selected closure technology. The impoundments at Gallatin are pending additional studies to determine the final closure methodology and schedule. While plans are currently being formulated for the CCR closure methodology for Gallatin, TVA is involved in two lawsuits relating to alleged discharges of pollutants from the CCR facilities at Gallatin.

Lawsuit Brought by TDEC. In January 2015, the Tennessee Department of Environment and Conservation ("TDEC") filed a lawsuit against TVA in the Chancery Court for Davidson County, Tennessee. The lawsuit alleges that pollutants have been discharged into waters of the State from CCR facilities at Gallatin in violation of the Tennessee Water Quality Control Act and the Tennessee Solid Waste Disposal Act. TDEC seeks injunctive relief, which could include an order requiring TVA to relocate the CCR facilities. TDEC also requested civil penalties of up to $17,000 per day for each day TVA is found to have violated the statutes. Tennessee Scenic Rivers Association ("TSRA") and Tennessee Clean Water Network ("TCWN") have been allowed to intervene in the case as plaintiffs. Trial in this

action is anticipated to take place in the fall of 2019. On August 10, 2017, TVA removed the case from state court to the U.S. District Court for the Middle District of Tennessee. On May 14, 2018, the federal court granted plaintiffs' motions to remand the case back to state court and TVA subsequently appealed this decision. On November 1, 2018, TVA filed a motion to withdraw its appeal.

Lawsuit Brought by TSRA and TCWN. In April 2015, TSRA and TCWN filed a lawsuit against TVA in the U.S. District Court for the Middle District of Tennessee alleging that pollutants have been discharged into the Cumberland River from CCR facilities at Gallatin in violation of the Clean Water Act ("CWA"). The plaintiffs are seeking injunctive relief, including an order requiring TVA to relocate the CCR facilities, civil penalties of up to $37,500 per violation per day, and attorneys' fees.

On August 4, 2017, the court issued a decision largely in favor of the plaintiffs (the "August 2017 Order"), finding that TVA had discharged pollutants into the Cumberland River in the past and that the discharge was likely ongoing. The court ordered TVA to excavate the CCR materials and move them to a lined facility. The court further required TVA to file within 30 days a timetable for excavating and removing the materials. The court did not assess any monetary penalties against TVA for the CWA violations, citing the fact that its order to relocate the CCR materials would cause TVA to incur significant costs.

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On September 5, 2017, TVA submitted the required timetable, which assumes that a new lined facility can be permitted and built on the Gallatin site. The process of obtaining the necessary permits, constructing the facility, and moving all of the CCR materials is estimated to take approximately 24 years. Under current regulations, TVA would be required to monitor the existing facilities and the new facility for 30 years after closure. The estimated cost of the potential Gallatin CCR project is approximately $900 million.

On October 2, 2017, TVA appealed the court's decision to the United States Court of Appeals for the Sixth Circuit ("Sixth Circuit"). On January 30, 2018, TVA filed its appellate brief, and on February 7, 2018, 18 states and numerous other entities who were not parties to the case, including the Tennessee Valley Public Power Association and the U.S. Chamber of Commerce, filed “friends of the court” briefs in support of TVA's appeal. On March 15, 2018, the plaintiffs filed their brief urging that the district court's decision be affirmed, and on March 22, 2018, several other entities (including the State of Tennessee and four other states) filed “friends of the court” briefs in support of the plaintiffs. Oral argument was held on August 2, 2018. On September 24, 2018, a panel of the Sixth Circuit reversed the district court decision and held that the district court erred by imposing CWA liability against TVA and that, therefore, the imposition of injunctive relief was an abuse of discretion. The Sixth Circuit’s decision will not be final until the Sixth Circuit issues its order relinquishing jurisdiction over the case. In addition, on October 22, 2018, the plaintiffs filed a motion requesting that the full Sixth Circuit rehear the case.

At September 30, 2018, related liabilities of $862 million and $30 million were recorded in Other long-term liabilities and Accounts payable and accrued liabilities, respectively. Prior to the court's decision, TVA had anticipated spending approximately $200 million to cap and close the existing CCR facilities.

Financial Impact

In August 2017, TVA began using regulatory accounting treatment to defer expected future costs of compliance with orders or settlements related to lawsuits involving the Gallatin CCR facilities. The TVA Board approved a plan to amortize these costs over the anticipated duration of the Gallatin CCR facilities project (excluding post-closure care), beginning October 1, 2018, as project costs are incurred. TVA has estimated these costs to be approximately $900 million. These costs include, among other things, environmental studies concerning the existing and new facilities, the licensing activities for the new facility, design and construction of the new facility, relocating the material from the existing facilities to the new facility, closing the existing facilities, monitoring activities, and an amount of additional costs reflecting the expected impacts of inflation given the anticipated duration of the project. The costs do not include such items as any additional order or penalty arising from the TDEC lawsuit, which cannot be reasonably estimated at this time. TVA has not discounted this environmental obligation to a present value amount. TVA also committed in its timetable to complete capital projects related to construction of a permanent bottom ash dewatering facility and wastewater process ponds. These capital projects, which are not included in the estimate for cleanup costs above, are estimated to cost approximately $91 million and be completed by 2020.

It is reasonably possible that TVA will not be able to obtain the necessary permits to build the facility on the Gallatin site and will be required to move the CCR materials offsite. Offsite relocation would materially increase both the cost and the time to comply with the August 2017 Order. TVA has estimated that if it is required to relocate the materials to a facility off the Gallatin site, TVA may incur up to $2.0 billion in expenses, plus an amount of additional costs reflecting the expected impacts of inflation given the extended duration of an offsite relocation project. These costs include, among other things, environmental studies concerning the existing and new facilities, the licensing activities for the new facility, design and construction of the new facility, relocating the material from the existing facilities to the new facility, closing the existing facilities, and monitoring activities. The process of obtaining the necessary permits for offsite disposal, locating or constructing an offsite facility, and moving all of the CCR materials offsite is estimated to take approximately 40 years. TVA would also be required to monitor the existing facilities, and possibly the offsite facility, for 30 years after the facilities are closed, based on current regulations.

The ultimate cost of the removal project will depend on actual timing and results of ongoing litigation, environmental studies, licensing, permitting, site subsurface conditions, contractor availability, weather, equipment, available material resources, and other contingency factors. These contingency factors could cause the project cost estimate to change materially in the near term. TVA updates its estimate for project costs as changes in these factors are determined to be probable of occurring.

9. Asset Acquisitions

On September 20, 2017, TVA acquired 100 percent of the equity interests in two special purpose entities ("SPEs") designed to administer rent payments TVA makes under certain of its lease/leaseback arrangements. Each entity holds residual interests in four of TVA's peaking combustion turbine units ("CTs"). TVA acquired these entities in order to reacquire the residual interests in eight CTs it had previously granted in the lease/leaseback arrangements.

TVA acquired the entities for total cash consideration of $36 million. The fair value of the assets acquired consisted of $110 million of reacquired rights, and the fair value of liabilities assumed consisted of $74 million in notes payable. Reacquired rights are an intangible asset included in TVA's Completed plant balance and are amortized over the estimated useful life of the underlying CTs. Notes payable assumed in the transaction are included in TVA's Long-term debt and require TVA to make semi-annual payments through May 2020. TVA recognized less than $1 million of amortization expense, related to reacquired rights,

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within TVA's consolidated statements of operations. Transaction costs were not material.

TVA determined that its lease/leaseback obligations were preexisting relationships that were effectively settled in the asset acquisitions. TVA settled the preexisting relationships separately from the asset acquisitions, resulting in a loss on extinguishment of the obligations of $3 million. The carrying value of lease/leaseback obligations effectively settled was $71 million, including accrued interest, and the reacquisition price was $74 million, paid in cash, at the acquisition date.

10. Variable Interest Entities

A VIE is an entity that either (i) has insufficient equity to permit the entity to finance its activities without additional subordinated financial support or (ii) has equity investors who lack the characteristics of owning a controlling financial interest. When TVA determines that it has a variable interest in a VIE, a qualitative evaluation is performed to assess which interest holders have the power to direct the activities that most significantly impact the economic performance of the entity and have the obligation to absorb losses or receive benefits that could be significant to the entity. The evaluation considers the purpose and design of the business, the risks that the business was designed to create and pass along to other entities, the activities of the business that can be directed and which party can direct them, and the expected relative impact of those activities on the economic performance of the business through its life. TVA has the power to direct the activities of an entity when it has the ability to make key operating and financing decisions, including, but not limited to, capital investment and the issuance of debt. Based on the evaluation of these criteria, TVA has determined it is the primary beneficiary of certain entities and as such is required to account for the VIEs on a consolidated basis.

John Sevier VIEs

In 2012, TVA entered into a $1.0 billion construction management agreement and lease financing arrangement with John Sevier Combined Cycle Generation LLC ("JSCCG") for the completion and lease by TVA of the John Sevier Combined Cycle Facility ("John Sevier CCF"). JSCCG is a special single-purpose limited liability company formed in January 2012 to finance the John Sevier CCF through a $900 million secured note issuance (the "JSCCG notes") and the issuance of $100 million of membership interests subject to mandatory redemption. The membership interests were purchased by John Sevier Holdco LLC ("Holdco"). Holdco is a special single-purpose entity, also formed in January 2012, established to acquire and hold the membership interests in JSCCG. A non-controlling interest in Holdco is held by a third party through nominal membership interests, to which none of the income, expenses, and cash flows are allocated.

The membership interests held by Holdco in JSCCG were purchased with proceeds from the issuance of $100 million of secured notes (the "Holdco notes") and are subject to mandatory redemption pursuant to a schedule of amortizing, semi-annual payments due each January 15 and July 15, with a final payment due in January 2042. The payment dates for the mandatorily redeemable membership interests are the same as those of the Holdco notes. The sale of the JSCCG notes, the membership interests in JSCCG, and the Holdco notes closed in January 2012. The JSCCG notes are secured by TVA's lease payments, and the Holdco notes are secured by Holdco's investment in, and amounts receivable from, JSCCG. TVA's lease payments to JSCCG are equal to and payable on the same dates as JSCCG's and Holdco's semi-annual debt service payments. In addition to the lease payments, TVA pays administrative and miscellaneous expenses incurred by JSCCG and Holdco. Certain agreements related to this transaction contain default and acceleration provisions.

Due to its participation in the design, business conduct, and credit and financial support of JSCCG and Holdco, TVA has determined that it has a variable interest in each of these entities. Based on its analysis, TVA has concluded that it is the

primary beneficiary of JSCCG and Holdco and, as such, is required to account for the VIEs on a consolidated basis. Holdco's
membership interests in JSCCG are eliminated in consolidation.

Southaven VIE

In 2013, TVA entered into a $400 million lease financing arrangement with Southaven Combined Cycle Generation LLC ("SCCG") for the lease by TVA of the Southaven Combined Cycle Facility ("Southaven CCF"). SCCG is a special single-purpose limited liability company formed in June 2013 to finance the Southaven CCF through a $360 million secured notes issuance (the “SCCG notes”) and the issuance of $40 million of membership interests subject to mandatory redemption. The membership interests were purchased by Southaven Holdco LLC ("SHLLC"). SHLLC is a special single-purpose entity, also formed in June 2013, established to acquire and hold the membership interests in SCCG. A non-controlling interest in SHLLC is held by a third party through nominal membership interests, to which none of the income, expenses, and cash flows of SHLLC are allocated.

The membership interests held by SHLLC were purchased with proceeds from the issuance of $40 million of secured notes (the "SHLLC notes") and are subject to mandatory redemption pursuant to a schedule of amortizing, semi-annual payments due each February 15 and August 15, with a final payment due on August 15, 2033. The payment dates for the mandatorily redeemable membership interests are the same as those of the SHLLC notes, and the payment amounts are sufficient to provide returns on, as well as returns of, capital until the investment has been repaid to SHLLC in full. The rate of return on investment to SHLLC is 7.0 percent, which is reflected as interest expense in the consolidated statements of operations. SHLLC is required to pay a pre-determined portion of the return on investment to Seven States Southaven, LLC ("SSSL") on each lease payment date as agreed in SHLLC's formation documents (the "Seven States Return"). The current and

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long-term portions of the Membership interests of VIE subject to mandatory redemption are included in Accounts payable and accrued liabilities and Other long-term liabilities, respectively.

The payment dates for the mandatorily redeemable membership interests are the same as those of the SHLLC notes. The SCCG notes are secured by TVA's lease payments, and the SHLLC notes are secured by SHLLC's investment in, and amounts receivable from, SCCG. TVA's lease payments to SCCG are payable on the same dates as SCCG's and SHLLC's semi-annual debt service payments and are equal to the sum of (i) the amount of SCCG's semi-annual debt service payments, (ii) the amount of SHLLC's semi-annual debt service payments, and (iii) the amount of the Seven States Return. In addition to the lease payments, TVA pays administrative and miscellaneous expenses incurred by SCCG and SHLLC. Certain agreements related to this transaction contain default and acceleration provisions.

In the event that TVA were to choose to exercise an early buy out feature of the Southaven facility lease, in part or in whole, TVA must pay to SCCG amounts sufficient for SCCG to repay or partially repay on a pro rata basis the membership interests held by SHLLC, including any outstanding investment amount plus accrued but unpaid return. TVA also has the right, at any time and without any early redemption of the other portions of the Southaven facility lease payments due to SCCG, to fully repay SHLLC's investment, upon which repayment SHLLC will transfer the membership interests to a designee of TVA.

TVA participated in the design, business conduct, and financial support of SCCG and has determined that it has a direct variable interest in SCCG resulting from risk associated with the value of the Southaven CCF at the end of the lease term. Based on its analysis, TVA has determined that it is the primary beneficiary of SCCG and, as such, is required to account for the VIE on a consolidated basis.

Impact on Consolidated Financial Statements

The financial statement items attributable to carrying amounts and classifications of JSCCG, Holdco, and SCCG as of September 30, 2018 and 2017, as reflected in the consolidated balance sheets, are as follows:

Summary of Impact of VIEs on Consolidated Balance Sheets

At September 30

	2018	2017
Current liabilities		
Accrued interest	$11	$11
Accounts payable and accrued liabilities	2	2
Current maturities of long-term debt of variable interest entities	38	36
Total current liabilities	51	49
Other liabilities		
Other long-term liabilities	28	30
Long-term debt, net		
Long-term debt of variable interest entities, net	1,127	1,164
Total liabilities	$1,206	$1,243

Interest expense of $58 million, $59 million, and $61 million related to debt of VIEs and membership interests of variable interest entity subject to mandatory redemption is included in the consolidated statements of operations for the years ended September 30, 2018, 2017, and 2016, respectively.

Creditors of the VIEs do not have any recourse to the general credit of TVA. TVA does not have any obligations to provide financial support to the VIEs other than as prescribed in the terms of the agreements related to these transactions.

11. Other Long-Term Liabilities

Other long-term liabilities consist primarily of liabilities related to certain derivative agreements as well as for environmental remediation liabilities and liabilities under agreements related to compliance with certain environmental regulations. See Note 8, Note 15 — Derivatives Not Receiving Hedge Accounting Treatment — Interest Rate Derivatives, and Note 21 — Legal Proceedings — Environmental Agreements. The table below summarizes the types and amounts of Other long-term liabilities:

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Other Long-Term Liabilities
At September 30

	2018	2017
Interest rate swap liabilities	$1,122	$1,418
Gallatin coal combustion residual facilities liability	862	880
Capital lease obligations	178	182
Currency swap liabilities	81	92
EnergyRight® financing obligation	102	115
Environmental agreements liability	11	13
Membership interests of VIE subject to mandatory redemption	28	30
Commodity contract derivative liabilities	8	9
Other	323	316
Total other long-term liabilities	$2,715	$3,055

Interest Rate Swap Liabilities. TVA uses interest rate swaps to fix variable short-term debt to a fixed rate. The values of these derivatives are included in Accounts payable and accrued liabilities and Other long-term liabilities on the consolidated balance sheets. As of September 30, 2018 and 2017, the carrying amount of the interest rate swap liabilities reported in Accounts payable and accrued liabilities was approximately $77 million and $93 million, respectively. See Note 15 — Derivatives Not Receiving Hedge Accounting Treatment — Interest Rate Derivatives for information regarding the interest rate swap liabilities.

EnergyRight® Financing Obligation. TVA purchases certain loans receivable from its LPCs in association with the EnergyRight® Solutions program. The current and long-term portions of the resulting financing obligation are reported in Accounts payable and accrued liabilities and Other long-term liabilities, respectively, on TVA’s consolidated balance sheets. As of September 30, 2018 and 2017, the carrying amount of the financing obligation reported in Accounts payable and accrued liabilities was approximately $25 million and $29 million, respectively. See Note 6 for information regarding the associated loans receivable.

12. Asset Retirement Obligations

During the year ended September 30, 2018, TVA's total ARO liability increased $475 million.

To estimate its decommissioning obligation related to its nuclear generating stations, TVA uses a probability-weighted, discounted cash flow model which, on a unit-by-unit basis, considers multiple outcome scenarios that include significant estimations and assumptions. Those assumptions include (1) estimates of the cost of decommissioning, (2) the method of decommissioning and the timing of the related cash flows, (3) the license period of the nuclear plant, considering the probability of license extensions, (4) cost escalation factors, and (5) the credit adjusted risk free rate to measure the obligation at the present value of the future estimated costs. TVA has ascribed probabilities to two different decommissioning methods related to its nuclear decommissioning obligation estimate: the DECON method and the SAFSTOR method. The DECON method requires radioactive contamination to be removed from a site and safely disposed of or decontaminated to a level that permits the site to be released for unrestricted use shortly after it ceases operation. The SAFSTOR method allows nuclear facilities to be placed and maintained in a condition that allows the facilities to be safely stored and subsequently decontaminated to levels that permit release for unrestricted use.

TVA bases its nuclear decommissioning estimates on site-specific cost studies. The most recent study was approved and implemented in September 2017. An increase of $250 million was recorded to the nuclear AROs as a result of the updates. Site-specific cost studies are updated for each of TVA’s nuclear units at least every five years.

TVA also has decommissioning obligations related to its non-nuclear generating sites, ash impoundments, transmission substation and distribution assets, and certain general facilities. To estimate its decommissioning obligation related to these assets, TVA uses estimations and assumptions for the amounts and timing of future expenditures and makes judgments concerning whether or not such costs are considered a legal obligation. Those assumptions include (1) estimates of the costs of decommissioning, (2) the method of decommissioning and the timing of the related cash flows, (3) the expected retirement date of each asset, (4) cost escalation factors, and (5) the credit adjusted risk free rate to measure the obligation at the present value of the future estimated costs. TVA bases its decommissioning estimates for each asset on its identified preferred closure method.

During 2018, TVA recorded adjustments to non-nuclear ARO liabilities as a result of projects maturing and estimates being refined. This resulted in an increase of $430 million to the non-nuclear AROs. A majority of this increase was due to a change in closure method at Allen for the East Ash Pond and Coal Yard Runoff Pond, which changed from closure in place to

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closure by removal and resulted in an increase of $338 million.

During 2017, TVA recorded adjustments to non-nuclear ARO liabilities as a result of projects maturing and estimates being refined. This resulted in an increase of $161 million to the non-nuclear AROs. This amount was offset by a decrease of $188 million to non-nuclear AROs due to the reversal of certain Gallatin AROs given that the retirement obligations for the Gallatin ash ponds are now recorded as part of environmental remediation obligations. See Note 8.

Additionally, during the years ended September 30, 2018 and 2017, both the nuclear and non-nuclear liabilities were increased by periodic accretion, partially offset by settlement projects that were conducted during these periods. The nuclear and non-nuclear accretion amounts were deferred as regulatory assets. During 2018, 2017, and 2016, $144 million per year of the related regulatory assets were amortized into expense as these amounts were collected in rates. See Note 7. TVA maintains investment trusts to help fund its decommissioning obligations. See Note 16 and Note 21 — Contingencies — Decommissioning Costs for a discussion of the trusts' objectives and the current balances of the trusts.

Asset Retirement Obligation Activity

	Nuclear	Non-Nuclear	Total
Balance at September 30, 2016	$ 2,492	$ 1,560	$ 4,052
Settlements	—	(123)	(123)
Change in estimate	250	161	411
Additional obligations	—	1	1
Reclassification of Gallatin projects[2]	—	(188)	(188)
Accretion (recorded to regulatory asset)	117	34	151
Balance at September 30, 2017	2,859	1,445	4,304 [1]
Settlements	—	(106)	(106)
Change in estimate	—	430	430
Additional obligations	—	1	1
Accretion (recorded to regulatory asset)	130	35	165
Asset Disposition	—	(15)	(15)
Balance at September 30, 2018	$ 2,989	$ 1,790	$ 4,779 [1]

Notes

(1) The current portions of the ARO liability in the amounts of $115 million and $128 million as of September 30, 2018 and 2017, respectively, are included in Accounts payable and accrued liabilities.

(2) See Note 8 for additional information.

13. Debt and Other Obligations

General

The TVA Act authorizes TVA to issue Bonds in an amount not to exceed $30.0 billion at any time. At September 30, 2018, TVA had only two types of Bonds outstanding: power bonds and discount notes. Power bonds have maturities between one and 50 years, and discount notes have maturities of less than one year. Power bonds and discount notes are both issued pursuant to Section 15d of the TVA Act and pursuant to the Basic Tennessee Valley Authority Power Bond Resolution adopted by the TVA Board on October 6, 1960, as amended on September 28, 1976, October 17, 1989, and March 25, 1992 (the "Basic Resolution"). Bonds are not obligations of the U.S., and the U.S. does not guarantee the payments of principal or interest on Bonds.

Power bonds and discount notes rank on parity and have first priority of payment from net power proceeds, which are defined as the remainder of TVA’s gross power revenues after deducting the costs of operating, maintaining, and administering its power properties and tax equivalent payments, but before deducting depreciation accruals or other charges representing the amortization of capital expenditures, plus the net proceeds from the sale or other disposition

of any power facility or interest therein.

TVA considers its scheduled rent payments under its leaseback transactions, as well as its scheduled payments under its lease financing arrangements involving John Sevier CCF and Southaven CCF, as costs of operating, maintaining, and administering its power properties. Costs of operating, maintaining, and administering TVA's power properties have priority over TVA’s payments on the Bonds. Once net power proceeds have been applied to payments on power bonds and discount notes as well as any other Bonds that TVA may issue in the future that rank on parity with or subordinate to power bonds and discount notes, Section 2.3 of the Basic Resolution provides that the remaining net power proceeds shall be used only for (1) minimum payments into the U.S. Treasury required by the TVA Act as repayment of, and as a return on, the Power Program Appropriation

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Investment, (2) investment in power assets, (3) additional reductions of TVA's capital obligations, and (4) other lawful purposes related to TVA's power program.

The TVA Act and the Basic Resolution each contain two bond tests: the rate test and the bondholder protection test. Under the rate test, TVA must charge rates for power which will produce gross revenues sufficient to provide funds for, among other things, debt service on outstanding Bonds. As of September 30, 2018, TVA was in compliance with the rate test. See Note 1 — General. Under the bondholder protection test, TVA must, in successive five-year periods, use an amount of net power proceeds at least equal to the sum of (1) the depreciation accruals and other charges representing the amortization of capital expenditures and (2) the net proceeds from any disposition of power facilities for either the reduction of its capital obligations (including Bonds and the Power Program Appropriation Investment) or investment in power assets. TVA met the bondholder protection test for the five-year period ended September 30, 2015, and must next meet the bondholder protection test for the five-year period ending September 30, 2020.

Secured Debt of VIEs

On August 9, 2013, SCCG issued secured notes totaling $360 million that bear interest at a rate of 3.846 percent. The SCCG notes require amortizing semi-annual payments on each February 15 and August 15, and mature on August 15, 2033. Also on August 9, 2013, SCCG issued $40 million of membership interests subject to mandatory redemption. The proceeds from the secured notes issuance and the issuance of the membership interests were paid to TVA in accordance with the terms of the Southaven head lease. See Note 10 — Southaven VIE. TVA used the proceeds from the transaction primarily to fund the acquisition of the Southaven CCF from SSSL.

On January 17, 2012, JSCCG issued secured notes totaling $900 million in aggregate principal amount that bear interest at a rate of 4.626 percent. Also on January 17, 2012, Holdco issued secured notes totaling $100 million that bear interest at a rate of 7.1 percent. The JSCCG notes and the Holdco notes require amortizing semi-annual payments on each January 15 and July 15, and mature on January 15, 2042. The Holdco notes require a $10 million balloon payment upon maturity. See Note 10 — John Sevier VIEs. TVA used the proceeds from the transaction to meet its requirements under the TVA Act. Secured debt of VIEs, including current maturities, outstanding at September 30, 2018 and 2017 totaled approximately $1.2 billion each year.

Secured Notes

On July 20, 2016, TVA acquired two entities, in a business combination, designed to administer rent payments TVA makes under certain of its lease/leaseback arrangements. On September 27, 2000, the entities issued secured notes totaling $255 million that had an interest rate of 7.299 percent and required amortizing semi-annual payments on each March 15 and September 15 with a maturity date of March 15, 2019. In 2016, TVA assumed these secured notes in the acquisition at a fair value of $78 million. The secured notes of the entities, including current maturities, outstanding at September 30, 2018 and 2017, totaled approximately $20 million and $48 million, respectively, and are included in Notes payable in TVA's consolidated balance sheets.

On September 20, 2017, TVA acquired two entities, in an asset acquisition, designed to administer rent payments TVA makes under certain of its lease/leaseback arrangements. On November 14, 2001, the entities issued secured notes totaling $272 million that had an interest rate of 5.572 percent and required amortizing semi-annual payments on each May 1 and November 1 with a maturity date of May 1, 2020. In 2017, TVA assumed these secured notes in the acquisition at a fair value of $74 million. The secured notes of the entities, including current maturities, outstanding at September 30, 2018, totaled approximately $48 million, and are included in Notes payable in TVA's consolidated balance sheets. See Note 9.

Short-Term Debt

The following table provides information regarding TVA's short-term borrowings:

Short-term Borrowings
At September 30

	2018	2017	2016
Gross amount outstanding - discount notes	$1,217	$1,999	$1,407
Weighted average interest rate - discount notes	2.045 %	1.000 %	0.203 %

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Put and Call Options

Bond issues of $359 million held by the public are redeemable in whole or in part, at TVA's option, on call dates ranging from the present to 2020 and at call prices of 100 percent the principal amount. Nine Bond issues totaling $219 million, with maturity dates ranging from 2025 to 2043, include a "survivor's option," which allows for right of redemption upon the death of a beneficial owner in certain specified circumstances. These Bonds were classified as long-term as of September 30, 2018.

Additionally, TVA has two issues of PARRS outstanding. After a fixed-rate period of five years, the coupon rate on the PARRS may automatically be reset downward under certain market conditions on an annual basis. The coupon rate reset on the PARRS is based on a calculation. For both series of PARRS, the coupon rate will reset downward on the reset date if the rate calculated is below the then-current coupon rate on the Bond. The calculation dates, potential reset dates, and terms of the calculation are different for each series. The coupon rate on the 1998 Series D PARRS may be reset on June 1 (annually) if the sum of the five-day average of the 30-Year Constant Maturity Treasury ("CMT") rate for the week ending the last Friday in April, plus 94 basis points, is below the then-current coupon rate. The coupon rate on the 1999 Series A PARRS may be reset on May 1 (annually) if the sum of the five-day average of the 30-Year CMT rate for the week ending the last Friday in March, plus 84 basis points, is below the then-current coupon rate. The coupon rates may only be reset downward, but investors may request to redeem their Bonds at par value in conjunction with a coupon rate reset for a limited period of time prior to the reset dates under certain circumstances.

The coupon rate for the 1998 Series D PARRS, which mature in June 2028, has been reset seven times, from an initial rate of 6.750 percent to the current rate of 3.550 percent. In connection with these resets, $301 million of the Bonds have been redeemed; therefore, $274 million of the Bonds were outstanding at September 30, 2018. The coupon rate for the 1999 Series A PARRS, which mature in May 2029, has been reset six times, from an initial rate of 6.50 percent to the current rate of 3.360 percent. In connection with these resets, $293 million of the Bonds have been redeemed; therefore, $232 million of the Bonds were outstanding at September 30, 2018.

Due to the contingent nature of the put option on the PARRS, TVA determines whether the PARRS should be classified as long-term debt or current maturities of long-term debt by calculating the expected reset rate for the Bonds on the calculation dates, described above. If the expected reset rate is less than the then-current coupon rate on the PARRS, the PARRS are included in current maturities. Otherwise, the PARRS are included in long-term debt.

Debt Securities Activity

The table below summarizes the long-term debt securities activity for the period from October 1, 2017, to September 30, 2018.

Debt Securities Activity
For the years ended September 30

	2018	2017
Issues		
2017 Series A	$—	$1,000
2018 Series A[1]	$1,000	—
Discount on debt issues	(2)	(1)
Total	$998	$999
Acquisitions		
Notes payable[2]	$—	$74

Redemptions/Maturities[3]		
Variable interest entities	$36	$35
Notes payable	53	27
electronotes®	52	5
2009 Series B	29	28
2001 Series D	—	525
2007 Series A	—	1,000
1997 Series E	650	—
2008 Series B	1,000	—
Total	$1,820	$1,620

Notes

(1) The 2018 Series A bonds were issued at 99.8 percent of par.

(2) The related leaseback obligation of $70 million previously reported in Other liabilities in TVA's consolidated balance sheets was extinguished in the fourth quarter of 2017 as a result of TVA's acquisition of the equity interests in two SPEs. See Note 9 for additional information.

(3) All redemptions were at 100 percent of par.

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Debt Outstanding

Total debt outstanding at September 30, 2018 and 2017, consisted of the following:
Short-Term Debt
At September 30

CUSIP or Other Identifier	Maturity	Call/(Put) Date	Coupon Rate	2018	2017
Short-term debt, net of discounts				$1,216	$1,998
Current maturities of long-term debt of variable interest entities issued at par				38	36
Current maturities of notes payable				46	53
Current maturities of power bonds issued at par					
880591EQ1	10/15/2018		1.750%	1,000	—
880591EF5	12/15/2018		3.770%	1	1
880591EF5	6/15/2019		3.770%	29	28
88059TEL1	11/15/2018		2.650%	1	1
88059TEL1	5/15/2019		2.650%	1	2
880591CU4	12/15/2017		6.250%	—	650
880591EC2	4/1/2018		4.500%	—	1,000
88059TFS5	10/15/2017		4.125%	—	46
Total current maturities of power bonds issued at par				1,032	1,728
Total current debt outstanding, net				$2,332	$3,815

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TVA redeemed $1.0 billion of power bonds on October 15, 2018.

Long-Term Debt
At September 30

CUSIP or Other Identifier	Maturity	Coupon Rate		Effective Call Date	2018 Par		2017 Par	Stock Exchange Listings
electronotes®[2]	5/15/2020 - 2/15/2043	2.375% - 3.625%		2/15/2015 - 2/15/2018[5]	$221		$226	None
880591EQ1	10/15/2018	1.750%			—		1,000	New York
880591EV0	3/15/2020	2.250%			1,000		—	New York
880591EL2	2/15/2021	3.875%			1,500		1,500	New York
880591DC3	6/7/2021	5.805%	[3]		261	[1]	268	New York, Luxembourg
880591EN8	8/15/2022	1.875%			1,000		1,000	New York
880591ER9	9/15/2024	2.875%			1,000		1,000	New York
880591CJ9	11/1/2025	6.750%			1,350		1,350	New York, Hong Kong, Luxembourg, Singapore
880591EU2	2/1/2027	2.875%			1,000		1,000	New York
880591300[4]	6/1/2028	3.550%			273		273	New York
880591409[4]	5/1/2029	3.360%			232		232	New York
880591DM1	5/1/2030	7.125%			1,000		1,000	New York, Luxembourg
880591DP4	6/7/2032	6.587%	[3]		326	[1]	335	New York, Luxembourg
880591DV1	7/15/2033	4.700%			472		472	New York, Luxembourg
880591EF5	6/15/2034	3.770%			273		303	None
880591DX7	6/15/2035	4.650%			436		436	New York
880591CK6	4/1/2036	5.980%			121		121	New York
880591CS9	4/1/2036	5.880%			1,500		1,500	New York
880591CP5	1/15/2038	6.150%			1,000		1,000	New York
880591ED0	6/15/2038	5.500%			500		500	New York
880591EH1	9/15/2039	5.250%			2,000		2,000	New York
880591EP3	12/15/2042	3.500%			1,000		1,000	New York
880591DU3	6/7/2043	4.962%	[3]		195	[1]	201	New York, Luxembourg
880591CF7	7/15/2045	6.235%		7/15/2020	140		140	New York
880591EB4	1/15/2048	4.875%			500		500	New York, Luxembourg
880591DZ2	4/1/2056	5.375%			1,000		1,000	New York
880591EJ7	9/15/2060	4.625%			1,000		1,000	New York
880591ES7	9/15/2065	4.250%			1,000		1,000	New York
Subtotal					20,300		20,357	
Unamortized discounts, premiums, issue costs, and other					(143	)	(152	)
Total long-term outstanding power					20,157		20,205	

bonds, net		
Long-term debt of variable interest entities, net	1,127	1,164
Long-term notes payable	23	69
Total long-term debt, net	$21,307	$21,438

Notes

(1) Includes net exchange gain from currency transactions of $147 million and $125 million at September 30, 2018 and 2017, respectively.

(2) Includes one electronotes® issue with partial maturities of principal for each required annual payment.

(3) The coupon rate represents TVA's effective interest rate.

(4) TVA PARRS, CUSIP numbers 880591300 and 880591409, may be redeemed under certain conditions. See Put and Call Options above.

(5) The bonds are callable on or after the dates shown.

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Maturities Due in the Year Ending September 30

	2019	2020	2021	2022	2023	Thereafter	Total
Long-term power bonds, long-term debt of variable interest entities, and notes payable including current maturities[1]	$1,116	$1,092	$1,901	$1,072	$ 69	$ 17,474	$22,724
Short-term debt, net of discounts	1,216	—	—	—	—	—	1,216

Note

(1) Long-term power bonds does not include non-cash items of foreign currency exchange gain of $147 million, unamortized debt issue costs of $56 million, and net discount on sale of Bonds of $88 million. Long-term debt of VIE does not include non-cash item of unamortized debt issue costs of $10 million.

Credit Facility Agreements

TVA and the U.S. Treasury, pursuant to the TVA Act, have entered into a memorandum of understanding under which the U.S. Treasury provides TVA with a $150 million credit facility. This credit facility was renewed in 2018 with a maturity date of September 30, 2019. Access to this credit facility or other similar financing arrangements with the U.S. Treasury has been available to TVA since the 1960s. TVA can borrow under the U.S. Treasury credit facility only if it cannot issue Bonds in the market on reasonable terms, and TVA considers the U.S. Treasury credit facility a secondary source of liquidity. The interest rate on any borrowing under this facility is based on the average rate on outstanding marketable obligations of the U.S. with maturities from date of issue of one year or less. There were no outstanding borrowings under the facility at September 30, 2018. The availability of this credit facility may be impacted by how the U.S. government addresses the possibility of approaching its debt limit.

TVA also has funding available under the four long-term revolving credit facilities totaling $2.7 billion: a $150 million credit facility that matures on December 12, 2019, a $500 million credit facility that matures on February 1, 2022, a $1.0 billion credit facility that matures on June 13, 2023, and a $1.0 billion credit facility that matures on September 28, 2023. The interest rate on any borrowing under these facilities varies based on market factors and the rating of TVA's senior unsecured, long-term, non-credit-enhanced debt. TVA is required to pay an unused facility fee on the portion of the total $2.7 billion that TVA has not borrowed or committed under letters of credit. This fee, along with letter of credit fees, may fluctuate depending on the rating of TVA's senior unsecured, long-term, non-credit-enhanced debt. At September 30, 2018 and 2017, there were $921 million and $1.2 billion, respectively, of letters of credit outstanding under the facilities, and there were no borrowings outstanding. See Note 15 — Other Derivative Instruments — Collateral.

The following table provides additional information regarding TVA's funding available under the four long-term revolving credit facilities:

Summary of Long-Term Credit Facilities
At September 30, 2018

Maturity Date	Facility Limit	Letters of Credit Outstanding	Cash Borrowings	Availability
December 2019	$150	$ 38	$ —	$ 112
February 2022	500	500	—	—
June 2023	1,000	383	—	617
September 2023	1,000	—	—	1,000
Total	$2,650	$ 921	$ —	$ 1,729

Lease/Leasebacks

Prior to 2004, TVA received approximately $945 million in proceeds by entering into lease/leaseback transactions for 24 new peaking CTs. TVA also received approximately $389 million in proceeds by entering into lease/leaseback transactions for qualified technological equipment and software ("QTE") in 2003. Due to TVA's continuing involvement in the operation and maintenance of the leased units and equipment and its control over the distribution of power produced by the combustion turbine facilities during the leaseback term, TVA accounted for the lease proceeds as financing obligations. On September 20, 2017, TVA acquired 100 percent of the equity interests in two SPEs created for the purpose of facilitating a portion of the leaseback arrangements. See Note 9. As a result of the acquisition, TVA effectively settled $70 million of its leaseback obligations related to eight CTs. On July 20, 2016, TVA acquired 100 percent of the equity interests in two SPEs created for the purpose of facilitating lease/leaseback arrangements. As a result of the acquisition, TVA effectively settled $70 million of its leaseback obligations related to eight CTs. At September 30, 2018 and 2017, the outstanding leaseback obligations related to the remaining CTs and QTE were $301 million and $338 million, respectively.

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14. Accumulated Other Comprehensive Income (Loss)

AOCI represents market valuation adjustments related to TVA's currency swaps. The currency swaps are cash flow hedges and are the only derivatives in TVA's portfolio that have been designated and qualify for hedge accounting treatment. TVA records exchange rate gains and losses on its foreign currency-denominated debt, and any related accrued interest in net income and marks its currency swap assets and liabilities to market through other comprehensive income (loss) ("OCI"). TVA then reclassifies an amount out of AOCI into net income, offsetting the exchange gain/loss recorded on the debt. For the years ended September 30, 2018 and 2017, TVA reclassified $26 million of losses and $26 million of gains, respectively, related to its cash flow hedges from AOCI to Interest expense. See Note 15.

TVA records certain assets and liabilities that result from the regulated ratemaking process that would not be recorded under GAAP for non-regulated entities. As such, certain items that would generally be reported in AOCI or that would impact the statements of operations are recorded as regulatory assets or regulatory liabilities. See Note 7 for a schedule of regulatory assets and liabilities. See Note 15 for a discussion of the recognition in AOCI of gains and losses associated with certain derivative contracts. See Note 16 for a discussion of the recognition of certain investment fund gains and losses as regulatory assets and liabilities. See Note 20 for a discussion of the regulatory accounting related to components of TVA's benefit plans.

15. Risk Management Activities and Derivative Transactions

TVA is exposed to various risks. These include risks related to commodity prices, investment prices, interest rates, currency exchange rates, and inflation as well as counterparty credit and performance risks. To help manage certain of these risks, TVA has historically entered into various derivative transactions, principally commodity option contracts, forward contracts, swaps, swaptions, futures, and options on futures. Other than certain derivative instruments in its trust investment funds, it is TVA's policy to enter into these derivative transactions solely for hedging purposes and not for speculative purposes. TVA has suspended its FTP and no longer uses financial instruments to hedge risks related to commodity prices; however, TVA plans to continue to manage fuel price volatility through other methods and to periodically reevaluate its suspended FTP program for future use of financial instruments.

Overview of Accounting Treatment

TVA recognizes certain of its derivative instruments as either assets or liabilities on its consolidated balance sheets at fair value. The accounting for changes in the fair value of these instruments depends on (1) whether TVA uses regulatory accounting to defer the derivative gains and losses, (2) whether the derivative instrument has been designated and qualifies for hedge accounting treatment, and (3) if so, the type of hedge relationship (for example, cash flow hedge).

The following tables summarize the accounting treatment that certain of TVA's financial derivative transactions receive:

Summary of Derivative Instruments That Receive Hedge Accounting Treatment (part 1)
Amount of Mark-to-Market Gain (Loss) Recognized in Accumulated Other Comprehensive Income (Loss)
For the years ended September 30

Derivatives in Cash Flow Hedging Relationship	Objective of Hedge Transaction	Accounting for Derivative Hedging Instrument	2018	2017
Currency swaps	To protect against changes in cash flows caused by changes in foreign	Unrealized gains and losses are recorded in AOCI and reclassified to interest expense to	$ 10	$ 59

currency exchange rates (exchange rate risk)	the extent they are offset by gains and losses on the hedged transaction

Summary of Derivative Instruments That Receive Hedge Accounting Treatment (part 2)[(1)]

Amount of Gain (Loss) Reclassified from Accumulated Other Comprehensive Income to Interest Expense

For the years ended September 30

Derivatives in Cash Flow Hedging Relationship	2018	2017
Currency swaps	$(26)	$ 26

Note

(1) There were no ineffective portions or amounts excluded from effectiveness testing for any of the periods presented. Based on forecasted foreign currency exchange rates, TVA expects to reclassify approximately $28 million of gains from AOCI to interest expense within the next 12 months to offset amounts anticipated to be recorded in interest expense related to exchange gain on the debt.

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Summary of Derivative Instruments That Do Not Receive Hedge Accounting Treatment
Amount of Gain (Loss) Recognized in Income on Derivatives[1]
For the years ended September 30

Derivative Type	Objective of Derivative	Accounting for Derivative Instrument	2018	2017
Interest rate swaps	To fix short-term debt variable rate to a fixed rate (interest rate risk)	Mark-to-Market gains and losses are recorded as regulatory assets or liabilities Realized gains and losses are recognized in interest expense when incurred during the settlement period	$(89)	$(101)
Commodity derivatives under FTP	To protect against fluctuations in market prices of purchased commodities (price risk)	Mark-to-Market gains and losses are recorded as regulatory assets or liabilities Realized gains and losses are recognized in fuel expense or purchased power expense when the related commodity is used in production	(8)	(36)

Note
(1) All of TVA's derivative instruments that do not receive hedge accounting treatment have unrealized gains (losses) that would otherwise be recognized in income but instead are deferred as regulatory assets and liabilities. As such, there was no related gain (loss) recognized in income for these unrealized gains (losses) for the years ended September 30, 2018 and 2017.

Fair Values of TVA Derivatives
At September 30

	2018		2017	
Derivatives That Receive Hedge Accounting Treatment:				
	Balance	Balance Sheet Presentation	Balance	Balance Sheet Presentation
Currency swaps				
£200 million Sterling	$(67)	Accounts payable and accrued liabilities $(5); Other long-term liabilities $(62)	$(67)	Accounts payable and accrued liabilities $(5); Other long-term liabilities $(62)
£250 million Sterling	(12)	Accounts payable and accrued liabilities $(5); Other long-term liabilities $(7)	(15)	Accounts payable and accrued liabilities $(4); Other long-term liabilities $(11)
£150 million Sterling	(15)	Accounts payable and accrued liabilities $(3); Other long-term liabilities $(12)	(21)	Accounts payable and accrued liabilities $(2); Other long-term liabilities $(19)
Derivatives That Do Not Receive Hedge Accounting Treatment:				
	Balance	Balance Sheet Presentation	Balance	Balance Sheet Presentation
Interest rate swaps				
$1.0 billion notional	$(878)	Accounts payable and accrued liabilities $(56); Other long-term liabilities $(822)	$(1,093)	Accounts payable and accrued liabilities $(66); Other long-term liabilities $(1,027)
$476 million notional	(317)	Accounts payable and accrued liabilities $(20); Other long-term liabilities $(297)	(410)	Accounts payable and accrued liabilities $(25); Other long-term liabilities $(385)

$42 million notional	(4)	Accounts payable and accrued liabilities $(1); Other long-term liabilities $(3)	(8)	Accounts payable and accrued liabilities $(2); Other long-term liabilities $(6)
Commodity contract derivatives	60	Other current assets $41; Other long-term assets $31; Other long-term liabilities $(8); Accounts payable and accrued liabilities $(4)	(60)	Other current assets $8; Other long-term assets $2; Other long-term liabilities $(9); Accounts payable and accrued liabilities $(61)
FTP Derivatives under FTP[1]	—	N/A	(5)	Other current assets $(4); Accounts payable and accrued liabilities $(1)

Note

(1) Fair values of certain derivatives under the FTP that were in net liability positions totaling $4 million at September 30, 2017, were recorded in TVA's margin cash accounts in Other current assets. These derivatives were transacted with futures commission merchants, and cash deposits were posted to the margin cash accounts held with each futures commission merchant to offset the net liability positions in full. At September 30, 2018, TVA had no derivatives under the FTP in net liability positions.

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Cash Flow Hedging Strategy for Currency Swaps

To protect against exchange rate risk related to three British pound sterling denominated Bond transactions, TVA entered into foreign currency hedges at the time the Bond transactions occurred. TVA had the following currency swaps outstanding at September 30, 2018:

Currency Swaps Outstanding
At September 30, 2018

Effective Date of Currency Swap Contract	Associated TVA Bond Issues Currency Exposure	Expiration Date of Swap	Overall Effective Cost to TVA
1999	£200 million	2021	5.81%
2001	£250 million	2032	6.59%
2003	£150 million	2043	4.96%

When the dollar strengthens against the British pound sterling, the exchange gain on the Bond liability and related accrued interest is offset by an equal amount of loss on the swap contract that is reclassified out of AOCI. Conversely, the exchange loss on the Bond liability and related accrued interest is offset by an equal amount of gain on the swap contract that is reclassified out of AOCI. All such exchange gains or losses on the Bond liability and related accrued interest are included in Long-term debt, net and Accounts payable and accrued liabilities, respectively. The offsetting exchange losses or gains on the swap contracts are recognized in AOCI. If any gain (loss) were to be incurred as a result of the early termination of the foreign currency swap contract, the resulting income (expense) would be amortized over the remaining life of the associated Bond as a component of Interest expense. The values of the currency swap liabilities are included in Accounts payable and accrued liabilities and Other long-term liabilities on the consolidated balance sheets.

Derivatives Not Receiving Hedge Accounting Treatment

Interest Rate Derivatives. Generally TVA uses interest rate swaps to fix variable short-term debt to a fixed rate, and TVA uses regulatory accounting treatment to defer the MtM gains and losses on its interest rate swaps. The net deferred unrealized gains and losses are classified as regulatory assets or liabilities on TVA's consolidated balance sheets and are included in the ratemaking formula when gains or losses are realized. The values of these derivatives are included in Accounts payable and accrued liabilities and Other long-term liabilities on the consolidated balance sheets, and realized gains and losses, if any, are included in TVA's consolidated statements of operations. For the years ended September 30, 2018 and 2017, the changes in market value of the interest rate derivatives resulted in deferred unrealized gains of $310 million and $472 million, respectively.

Commodity Derivatives. TVA enters into certain derivative contracts for coal and natural gas that require physical delivery of the contracted quantity of the commodity. TVA marks to market all such contracts and defers the fair values as regulatory assets or liabilities on a gross basis. At September 30, 2018, TVA's coal contract derivatives had terms of up to three years and TVA's natural gas contract derivatives had terms of up to four years.

Commodity Contract Derivatives
At September 30

	2018			2017		
	Number of Contracts	Notional Amount	Fair Value (MtM)	Number of Contracts	Notional Amount	Fair Value (MtM)
Coal contract derivatives	13	20 million tons	$ 58	20	17 million tons	$ (67)
	61		$ 2	53		$ 7

Natural gas contract derivatives	359 million mmBtu	271 million mmBtu

Derivatives Under FTP. TVA has suspended its FTP and no longer uses financial instruments to hedge risks related to commodity prices. At September 30, 2018, TVA had no open commodity derivatives under the FTP. Under the FTP, TVA was authorized to purchase and sell futures, swaps, options, and combinations of these instruments (as long as they were standard in the industry) to hedge TVA’s exposure to (1) the price of natural gas, fuel oil, electricity, coal, emission allowances, nuclear fuel, and other commodities included in TVA’s fuel cost adjustment calculation, (2) the price of construction materials, and (3) contracts for goods priced in or indexed to foreign currencies. The combined transaction limit for the fuel cost adjustment and construction material transactions was $130 million (based on one-day value at risk). In addition, the maximum hedge volume for the construction material transactions was 75 percent of the underlying net notional volume of the material that TVA anticipated using in approved TVA projects, and the market value of all outstanding hedging transactions involving construction materials was limited to $100 million at the execution of any new transaction. The portfolio value at risk limit for the foreign currency transactions was $5 million and was separate and distinct from the $130 million transaction limit discussed above. TVA's policy prohibits trading financial instruments under the FTP for speculative purposes.

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Derivatives under Financial Trading Program[1]
At September 30

	2018		2017	
	Notional Amount (in mmBtu)	Fair Value (MtM) (in millions)	Notional Amount (in mmBtu)	Fair Value (MtM) (in millions)
Natural gas				
Swap contracts	—	$ —	2,800,000	$ (5)

Note
(1) Fair value amounts presented are based on the net commodity position with the counterparty. Notional amounts disclosed represent the net value of contractual amounts.

Prior to the suspension of the FTP, TVA deferred all FTP unrealized gains (losses) as regulatory liabilities (assets) and recorded only realized gains or losses to match the delivery period of the underlying commodity. In addition to the open commodity derivatives disclosed above, TVA had closed derivative contracts with a market value of $(3) million at September 30, 2017. TVA experienced the following unrealized and realized gains and losses related to the FTP at the dates and during the periods, as applicable, set forth in the tables below:
Financial Trading Program Unrealized Gains (Losses)
At September 30

FTP unrealized gains (losses) deferred as regulatory liabilities (assets)	2018	2017
Natural gas	$ —	$(5)

Financial Trading Program Realized Gains (Losses)
At September 30

Decrease (increase) in fuel expense	2018	2017
Natural gas	$(6)	$(29)
Decrease (increase) in purchased power expense		
Natural gas	$(2)	$(7)

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Offsetting of Derivative Assets and Liabilities

The amounts of TVA's derivative instruments as reported in the consolidated balance sheets as of September 30, 2018 and 2017, are shown in the table below.

Derivative Assets and Liabilities

	At September 30, 2018		
	Gross Amounts of Recognized Assets/Liabilities	Gross Amounts Offset in the Balance Sheet[1]	Net Amounts of Assets/Liabilities Presented in the Balance Sheet[2]
Assets			
Commodity derivatives not subject to master netting or similar arrangement	$ 72	$ —	$ 72
Liabilities			
Currency swaps[3]	$ 94	$ —	$ 94
Interest rate swaps[3]	1,199	—	1,199
Total derivatives subject to master netting or similar arrangement	1,293	—	1,293
Commodity derivatives not subject to master netting or similar arrangement	12	—	12
Total liabilities	$ 1,305	$ —	$ 1,305

	At September 30, 2017		
	Gross Amounts of Recognized Assets/Liabilities	Gross Amounts Offset in the Balance Sheet[1]	Net Amounts of Assets/Liabilities Presented in the Balance Sheet[2]
Assets			
Commodity derivatives not subject to master netting or similar arrangement	10	—	10
Liabilities			
Currency swaps[3]	$ 103	$ —	$ 103
Interest rate swaps[3]	1,511	—	1,511
	5	(4)	1

Commodity derivatives under FTP			
Total derivatives subject to master netting or similar arrangement	1,619	(4)	1,615
Commodity derivatives not subject to master netting or similar arrangement	70	—	70
Total liabilities	$ 1,689	$ (4)	$ 1,685

Notes

(1) Amounts primarily include counterparty netting of derivative contracts, margin account deposits for futures commission merchants transactions, and cash collateral received or paid in accordance with the accounting guidance for derivatives and hedging transactions.

(2) There are no derivative contracts subject to a master netting arrangement or similar agreement which are not offset in the consolidated balance sheets.

(3) Letters of credit of approximately $921 million and $1.2 billion were posted as collateral at September 30, 2018 and 2017, respectively, to partially secure the liability positions of one of the currency swaps and one of the interest rate swaps in accordance with the collateral requirements for these derivatives.

Other Derivative Instruments

Investment Fund Derivatives. Investment funds consist primarily of funds held in the NDT, ART, SERP, and DCP. All securities in the trusts are classified as trading. See Note 16 — Investments Funds for a discussion of the trusts' objectives and the types of investments that they hold. The NDT and ART may invest in derivative instruments which may include swaps, futures, options, forwards, and other instruments. At September 30, 2018 and 2017, the NDT held investments in forward contracts to purchase debt securities. The fair values of these derivatives were in asset positions totaling $45 million and $19 million at September 30, 2018 and 2017, respectively.

Collateral. TVA's interest rate swaps and currency swaps contain contract provisions that require a party to post collateral (in a form such as cash or a letter of credit) when the party's liability balance under the agreement exceeds a certain threshold. At September 30, 2018, the aggregate fair value of all derivative instruments with credit-risk related contingent features that were in a liability position was $1.3 billion. TVA's collateral obligations at September 30, 2018, under these arrangements, were approximately $875 million, for which TVA had posted approximately $921 million in letters of credit. These letters of credit reduce the available balance under the related credit facilities. TVA's assessment of the risk of its nonperformance includes a reduction in its exposure under the contract as a result of this posted collateral.

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For all of its derivative instruments with credit-risk related contingent features:

- If TVA remains a majority-owned U.S. government entity but Standard & Poor's Financial Services, LLC ("S&P") or Moody's Investors Service, Inc. ("Moody's") downgrades TVA's credit rating to AA or Aa2, respectively, TVA's collateral obligations would likely increase by $22 million; and

- If TVA ceases to be majority-owned by the U.S. government, TVA's credit rating would likely be downgraded and TVA would be required to post additional collateral.

Counterparty Risk

TVA may be exposed to certain risks when a counterparty has the potential to fail to meet its obligations in accordance with agreed terms. These risks may be related to credit, operational, or nonperformance matters. To mitigate certain counterparty risk, TVA analyzes the counterparty’s financial condition prior to entering into an agreement, establishes credit limits, monitors the appropriateness of those limits, as well as any changes in the creditworthiness of the counterparty, on an ongoing basis, and when required, employs credit mitigation measures, such as collateral or prepayment arrangements and master purchase and sale agreements, to mitigate credit risk.

Customers. TVA is exposed to counterparty credit risk associated with trade accounts receivable from delivered power sales to LPCs, and from industries and federal agencies directly served, all located in the Tennessee Valley region. Of the $1.6 billion and $1.4 billion of receivables from power sales outstanding at September 30, 2018 and 2017, respectively, nearly all counterparties were rated investment grade. TVA is also exposed to risk from exchange power arrangements with a small number of investor-owned regional utilities related to either delivered power or the replacement of open positions of longer-term purchased power or fuel agreements. TVA believes its policies and procedures for counterparty performance risk reviews have generally protected TVA against significant exposure related to market and economic conditions. See Note 1 — Allowance for Uncollectible Accounts and Note 3.

TVA had revenue from two LPCs that accounted for 17 percent of total operating revenue for the years ended both September 30, 2018 and September 30, 2017.

Suppliers. If one of TVA's fuel or purchased power suppliers fails to perform under the terms of its contract with TVA, TVA might lose the money that it paid to the supplier under the contract and have to purchase replacement fuel or power on the spot market, perhaps at a significantly higher price than TVA was entitled to pay under the contract. In addition, TVA might not be able to acquire replacement fuel or power in a timely manner and thus might be unable to satisfy its own obligations to deliver power. Nuclear fuel requirements, including uranium mining and milling, conversion services, enrichment services, and fabrication services, are met from various suppliers, depending on the type of service. TVA purchases the majority of its natural gas requirements from a variety of suppliers under short-term contracts.

To help ensure a reliable supply of coal, TVA had coal contracts with multiple suppliers at September 30, 2018. The contracted supply of coal is sourced from multiple geographic regions of the U.S. and is to be delivered via various transportation methods (i.e., barge, rail, and truck). Emerging technologies, environmental regulations, and low natural gas prices have contributed to weak demand for coal. As a result, coal suppliers are facing increased financial pressure, which has led to relatively poor credit ratings and bankruptcies. Continued difficulties by coal suppliers could result in consolidations, additional bankruptcies, restructurings, contract renegotiations, or other scenarios. Under these scenarios and TVA’s potential available responses, TVA does not anticipate a significant financial impact in obtaining continued fuel supply for its coal-fired generation.

On March 29, 2017, Westinghouse, a subsidiary of Toshiba Corporation ("Toshiba"), filed for protection under Chapter 11 of the U.S. Bankruptcy Code. On January 4, 2018, Brookfield Business Partners L.P. ("Brookfield Business Partners"), together with institutional partners, announced that they have entered into an agreement to acquire 100 percent of Westinghouse. Westinghouse has emerged from bankruptcy and the sale was closed and became effective on August 1, 2018.

TVA has a power purchase agreement that expires on March 31, 2032, with a supplier of electricity for 440 megawatts ("MW") of summer net capability from a lignite-fired generating plant. TVA has determined that the supplier has the equivalent of a non-investment grade credit rating; therefore, the supplier has provided credit assurance to TVA under the terms of the agreement.

Derivative Counterparties. TVA has entered into physical and financial contracts that qualify as derivatives for hedging purposes, and TVA's NDT fund and qualified defined benefit pension plan have entered into derivative contracts for investment purposes. If a counterparty to one of TVA's hedging transactions defaults, TVA might incur substantial costs in connection with entering into a replacement hedging transaction. If a counterparty to the derivative contracts into which the NDT fund and the qualified pension plan have entered for investment purposes defaults, the value of the investment could decline significantly or perhaps become worthless. TVA has concentrations of credit risk from the banking and coal industries because multiple companies in these industries serve as counterparties to TVA in various derivative transactions. At September 30, 2018, all of

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TVA's currency swaps and interest rate swaps as well as all of the derivatives in the NDT were with banking counterparties whose Moody's credit ratings were A3 or higher.

TVA classifies qualified forward coal and natural gas contracts as derivatives. See Derivatives Not Receiving Hedge Accounting Treatment above. At September 30, 2018, the coal contracts were with counterparties whose Moody's credit rating, or TVA’s internal analysis when such information was unavailable, ranged from Caa3 to Ba3. At September 30, 2018, the natural gas contracts were with counterparties whose ratings ranged from B1 to A2. See Suppliers above for discussion of challenges facing the coal industry. TVA's total value for derivative contracts with coal and natural gas counterparties in an asset position as of September 30, 2018, was approximately $72 million.

TVA previously utilized two futures commission merchants ("FCMs") to clear commodity contracts, including futures, options, and similar financial derivatives. These transactions were executed under the FTP on exchanges by the FCMs on behalf of TVA. TVA maintained margin cash accounts with the FCMs. TVA made deposits to the margin cash accounts to adequately cover any net liability positions on its derivatives transacted with the FCMs. At September 30, 2018, TVA had no positions under the FTP. See the note to the Fair Values of TVA Derivatives table above.

16. Fair Value Measurements

Fair value is determined based on the exchange price that would be received for an asset or paid to transfer a liability (an exit price) in the asset or liability's principal market, or in the absence of a principal market, the most advantageous market for the asset or liability in an orderly transaction between market participants. TVA uses market or observable inputs as the preferred source of values, followed by assumptions based on hypothetical transactions in the absence of market inputs.

Valuation Techniques

The measurement of fair value results in classification into a hierarchy by the inputs used to determine the fair value as follows:

Level 1	Unadjusted quoted prices in active markets accessible by the reporting entity for identical assets or liabilities. Active markets are those in which transactions for the asset or liability occur with sufficient frequency and volume to provide pricing.
Level 2	Pricing inputs other than quoted market prices included in Level 1 that are based on observable market data and that are directly or indirectly observable for substantially the full term of the asset or liability. These include quoted market prices for similar assets or liabilities, quoted market prices for identical or similar assets in markets that are not active, adjusted quoted market prices, inputs from observable data such as interest rate and yield curves, volatilities and default rates observable at commonly quoted intervals, and inputs derived from observable market data by correlation or other means.
Level 3	Pricing inputs that are unobservable, or less observable, from objective sources. Unobservable inputs are only to be used to the extent observable inputs are not available. These inputs maintain the concept of an exit price from the perspective of a market participant and should reflect assumptions of other market participants. An entity should consider all market participant assumptions that are available without unreasonable cost and effort. These are given the lowest priority and are generally used in internally developed methodologies to generate management's best estimate of the fair value when no observable market data is available.

A financial instrument's level within the fair value hierarchy (where Level 1 is the highest and Level 3 is the lowest) is based on the lowest level of input significant to the fair value measurement.

The following sections describe the valuation methodologies TVA uses to measure different financial instruments at fair value. Except for gains and losses on SERP and DCP assets, all changes in fair value of these assets and liabilities have been recorded as changes in regulatory assets, regulatory liabilities, or AOCI on TVA's consolidated balance sheets and consolidated statements of comprehensive income (loss). Except for gains and losses on SERP and DCP assets, there has been no impact to the consolidated statements of operations or the consolidated statements of cash flows related to these fair value measurements.

Investment Funds

At September 30, 2018, Investment funds were composed of $2.9 billion of securities classified as trading and measured at fair value. Trading securities are held in the NDT, ART, SERP, and DCP. The NDT holds funds for the ultimate decommissioning of TVA's nuclear power plants. The ART holds funds primarily for the costs related to the future closure and retirement of TVA's other long-lived assets. The balances in the NDT and ART were $2.1 billion and $714 million, respectively, at September 30, 2018.

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TVA established a SERP to provide benefits to selected employees of TVA which are comparable to those provided by competing organizations. The DCP is designed to provide participants with the ability to defer compensation until employment with TVA ends. The NDT, ART, SERP, and DCP funds are invested in portfolios of securities generally designed to achieve a return in line with overall equity and debt market performance.

The NDT, ART, SERP, and DCP are composed of multiple types of investments and are managed by external institutional investment managers. Most U.S. and international equities, U.S. Treasury inflation-protected securities, real estate investment trust securities, and cash securities and certain derivative instruments are measured based on quoted exchange prices in active markets and are classified as Level 1 valuations. Fixed-income investments, high-yield fixed-income investments, currencies, and most derivative instruments are non-exchange traded and are classified as Level 2 valuations. These measurements are based on market and income approaches with observable market inputs.

Private equity limited partnerships and private real estate investments may include holdings of investments in private real estate, venture capital, buyout, mezzanine or subordinated debt, restructuring or distressed debt, and special situations through funds managed by third-party investment managers. These investments generally involve a three to four year period where the investor contributes capital, followed by a period of distribution, typically over several years. The investment period is generally, at a minimum, 10 years or longer. The NDT had unfunded commitments related to private equity limited partnerships of $119 million and unfunded commitments related to private real estate of $28 million at September 30, 2018. The ART had unfunded commitments related to private equity limited partnerships of $38 million and unfunded commitments related to private real estate of $12 million at September 30, 2018. These investments have no redemption or limited redemption options and may also impose restrictions on the NDT’s and ART's ability to liquidate its investments. There are no readily available quoted exchange prices for these investments. The fair value of the investments is based on TVA’s ownership percentage of the fair value of the underlying investments as provided by the investment managers. These investments are typically valued on a quarterly basis. TVA’s private equity limited partnerships and private real estate investments are valued at net asset values ("NAV") as a practical expedient for fair value. TVA classifies its interest in these types of investments as investments measured at net asset value in the fair value hierarchy.

Commingled funds represent investment funds comprising multiple individual financial instruments. The commingled funds held by the NDT, ART, SERP, and DCP consist of either a single class of securities, such as equity, debt, or foreign currency securities, or multiple classes of securities. All underlying positions in these commingled funds are either exchange traded or measured using observable inputs for similar instruments. The fair value of commingled funds is based on NAV per fund share (the unit of account), derived from the prices of the underlying securities in the funds. These commingled funds can be redeemed at the measurement date NAV and are classified as Commingled funds measured at net asset value in the fair value hierarchy.

Realized and unrealized gains and losses on trading securities are recognized in current earnings and are based on average cost. The gains and losses of the NDT and ART are subsequently reclassified to a regulatory asset or liability account in accordance with TVA's regulatory accounting policy. See Note 1 — Cost-Based Regulation. TVA recorded unrealized gains and losses related to its trading securities held during each period as follows:

		Unrealized Investment Gains (Losses) At September 30	
Fund	Financial Statement Presentation	2018	2017
SERP	Other income (expense)	$ 1	$ 4
DCP	Other income (expense)	1	2
NDT	Regulatory asset	18	92
ART	Regulatory asset	15	43

Currency and Interest Rate Derivatives

See Note 15 — Cash Flow Hedging Strategy for Currency Swaps and Derivatives Not Receiving Hedge Accounting Treatment for a discussion of the nature, purpose, and contingent features of TVA's currency swaps and interest rate swaps. These swaps are classified as Level 2 valuations and are valued based on income approaches using observable market inputs for similar instruments.

Commodity Contract Derivatives

Most of these contracts are valued based on market approaches which utilize short- and mid-term market-quoted prices from an external industry brokerage service. A small number of these contracts are valued based on a pricing model using long-term price estimates from TVA's coal price forecast. To value the volume option component of applicable coal contracts, TVA uses a Black-Scholes pricing model which includes inputs from the forecast, contract-specific terms, and other market inputs. These contracts are classified as Level 3 valuations.

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Nonperformance Risk

The assessment of nonperformance risk, which includes credit risk, considers changes in current market conditions, readily available information on nonperformance risk, letters of credit, collateral, other arrangements available, and the nature of master netting arrangements. TVA is a counterparty to currency swaps, interest rate swaps, commodity contracts, and other derivatives which subject TVA to nonperformance risk. Nonperformance risk on the majority of investments and certain exchange-traded instruments held by TVA is incorporated into the exit price that is derived from quoted market data that is used to mark the investment to market.

Nonperformance risk for most of TVA's derivative instruments is an adjustment to the initial asset/liability fair value. TVA adjusts for nonperformance risk, both of TVA (for liabilities) and the counterparty (for assets), by applying credit valuation adjustments ("CVAs"). TVA determines an appropriate CVA for each applicable financial instrument based on the term of the instrument and TVA's or the counterparty's credit rating as obtained from Moody's. For companies that do not have an observable credit rating, TVA uses internal analysis to assign a comparable rating to the counterparty. TVA discounts each financial instrument using the historical default rate (as reported by Moody’s for CY 1983 to CY 2017) for companies with a similar credit rating over a time period consistent with the remaining term of the contract. The application of CVAs resulted in a less than $1 million decrease in the fair value of assets and a $1 million decrease in the fair value of liabilities at September 30, 2018.

Fair Value Measurements

The following tables set forth by level, within the fair value hierarchy, TVA's financial assets and liabilities that were measured at fair value on a recurring basis at September 30, 2018 and 2017. Financial assets and liabilities have been classified in their entirety based on the lowest level of input that is significant to the fair value measurement. TVA's assessment of the significance of a particular input to the fair value measurement requires judgment and may affect the determination of the fair value of the assets and liabilities and their classification in the fair value hierarchy levels.

Fair Value Measurements
At September 30, 2018

	Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	Total
Assets				
Investments				
Equity securities	$ 220	$ —	$ —	$220
Government debt securities	199	37	—	236
Corporate debt securities	—	499	—	499
Mortgage and asset-backed securities	—	50	—	50
Institutional mutual funds	126	—	—	126
Forward debt securities contracts	—	45	—	45
Private equity funds measured at net asset value[1]	—	—	—	132
Private real estate funds measured at net asset value[1]	—	—	—	124
Commingled funds measured at net asset value[1]	—	—	—	1,430
Total investments	545	631	—	2,862
Commodity contract derivatives	—	13	59	72

Total	$ 545	$ 644	$ 59	$2,934

	Quoted Prices in Active Markets for Identical Liabilities (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	Total
Liabilities				
Currency swaps[2]	$ —	$ 94	$ —	$94
Interest rate swaps	—	1,199	—	1,199
Commodity contract derivatives	—	11	1	12
Total	$ —	$ 1,304	$ 1	$1,305

Notes

(1) Certain investments that are measured at fair value using the net asset value per share (or its equivalent) practical expedient have not been categorized in the fair value hierarchy. The fair value amounts presented in this table are intended to permit reconciliation of the fair value hierarchy to the amounts presented in the consolidated balance sheets.

(2) TVA records currency swaps net of cash collateral received from or paid to the counterparty, to the extent such amount is not recorded in Accounts payable and accrued liabilities. See Note 15 — Offsetting of Derivative Assets and Liabilities.

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Fair Value Measurements
At September 30, 2017

	Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	Total
Assets				
Investments				
Equity securities	$ 226	$ —	$ —	$226
Government debt securities	100	42	—	142
Corporate debt securities	—	373	—	373
Mortgage and asset-backed securities	—	49	—	49
Institutional mutual funds	94	—	—	94
Forward debt securities contracts	—	19	—	19
Private equity funds measured at net asset value[1]	—	—	—	136
Private real estate funds measured at net asset value[1]	—	—	—	113
Commingled funds measured at net asset value[1]	—	—	—	1,451
Total investments	420	483	—	2,603
Commodity contract derivatives	—	8	2	10
Total	$ 420	$ 491	$ 2	$2,613

	Quoted Prices in Active Markets for Identical Liabilities (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	Total
Liabilities				
Currency swaps[2]	$ —	$ 103	$ —	$103
Interest rate swaps	—	1,511	—	1,511
Commodity contract derivatives	—	1	69	70
Commodity derivatives under FTP[2]				
Swap contracts	—	1	—	1
Total	$ —	$ 1,616	$ 69	$1,685

Notes

(1) Certain investments that are measured at fair value using the net asset value per share (or its equivalent) practical expedient have not been categorized in the fair value hierarchy. The fair value amounts presented in this table are intended to permit reconciliation of the fair value hierarchy to the amounts presented in the consolidated balance sheets.

(2) Due to the right of setoff and method of settlement, TVA elects to record commodity derivatives under the FTP based on its net commodity position with the counterparty or FCM. Deposits are made to TVA's margin cash accounts held with each FCM to offset any net liability positions in full for derivatives that are transacted with FCMs. TVA records currency swaps net of any cash collateral received from or paid to the counterparty, to the extent such amount

is not recorded in Accounts payable and accrued liabilities. See Note 15 — Offsetting of Derivative Assets and Liabilities.

TVA uses internal valuation specialists for the calculation of its commodity contract derivatives fair value measurements classified as Level 3. Analytical testing is performed on the change in fair value measurements each period to ensure the valuation is reasonable based on changes in general market assumptions. Significant changes to the estimated data used for unobservable inputs, in isolation or combination, may result in significant variations to the fair value measurement reported.

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The following table presents a reconciliation of all commodity contract derivatives measured at fair value on a recurring basis using significant unobservable inputs (Level 3):

Fair Value Measurements Using Significant Unobservable Inputs

	Commodity Contract Derivatives
Balance at October 1, 2016	$ (127)
Purchases	—
Issuances	—
Sales	—
Settlements	—
Change in net unrealized gains (losses) deferred as regulatory assets and liabilities	60
Balance at September 30, 2017	(67)
Purchases	—
Issuances	—
Sales	—
Settlements	—
Change in net unrealized gains (losses) deferred as regulatory assets and liabilities	125
Balance at September 30, 2018	$ 58

The following table presents quantitative information related to the significant unobservable inputs used in the measurement of fair value of TVA's assets and liabilities classified as Level 3 in the fair value hierarchy:

Quantitative Information about Level 3 Fair Value Measurements

	Fair Value at September 30, 2018	Valuation Technique(s)	Unobservable Inputs	Range
Assets				
Commodity contract derivatives	$ 59	Pricing model	Coal supply and demand	0.7 - 0.8 billion tons/year
			Long-term market prices	$12.25 - $112.24/ton
Liabilities				
Commodity contract derivatives	$ 1	Pricing model	Coal supply and demand	0.7 - 0.8 billion tons/year
			Long-term market prices	$12.25 - $112.24/ton

Quantitative Information about Level 3 Fair Value Measurements

	Fair Value at September 30, 2017	Valuation Technique(s)	Unobservable Inputs	Range
Assets				
Commodity contract derivatives	$ 2	Pricing model	Coal supply and demand	0.6 - 0.7 billion tons/year
			Long-term market prices	$11.40 - $112.23/ton
Liabilities				

Commodity contract derivatives	$ 69	Pricing model	Coal supply and demand	0.6 - 0.7 billion tons/year
			Long-term market prices	$11.40 - $112.23/ton

Other Financial Instruments Not Recorded at Fair Value

TVA uses the methods and assumptions described below to estimate the fair values of each significant class of financial instrument. The fair value of the financial instruments held at September 30, 2018 and 2017, may not be representative of the actual gains or losses that will be recorded when these instruments mature or are called or presented for early redemption. The estimated values of TVA's financial instruments not recorded at fair value at September 30, 2018 and 2017, were as follows:

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Estimated Values of Financial Instruments Not Recorded at Fair Value

	Valuation Classification	At September 30, 2018 Carrying Amount	At September 30, 2018 Fair Value	At September 30, 2017 Carrying Amount	At September 30, 2017 Fair Value
EnergyRight® receivables (including current portion)	Level 2	$112	$112	$125	$127
Loans and other long-term receivables, net (including current portion)	Level 2	$138	$123	$118	$107
EnergyRight® financing obligation (including current portion)	Level 2	$127	$143	$144	$161
Unfunded loan commitments	Level 2	$—	$3	$—	$18
Membership interests of variable interest entity subject to mandatory redemption (including current portion)	Level 2	$30	$37	$32	$41
Long-term outstanding power bonds (including current maturities), net	Level 2	$21,189	$23,896	$21,933	$26,857
Long-term debt of variable interest entities (including current maturities), net	Level 2	$1,165	$1,256	$1,200	$1,356
Long-term notes payable (including current maturities)	Level 2	$69	$68	$122	$121

Due to the short-term maturity of Cash and cash equivalents, Restricted cash and cash equivalents, and Short-term debt, net (each considered a Level 1 valuation classification), the carrying amounts of these instruments approximate their fair values.

The fair value for loans and other long-term receivables is estimated by determining the present value of future cash flows using a discount rate equal to lending rates for similar loans made to borrowers with similar credit ratings and for similar remaining maturities, where applicable. The fair value of long-term debt and membership interests of VIE subject to mandatory redemption is estimated by determining the present value of future cash flows using current market rates for similar obligations, giving effect to credit ratings and remaining maturities.

17. Proprietary Capital

Appropriation Investment

TVA’s power program and stewardship (nonpower) programs were originally funded primarily by appropriations from Congress. In 1959, Congress passed an amendment to the TVA Act that required TVA’s power program to be self-financing from power revenues and proceeds from power program financings. While TVA’s power program did not directly receive appropriated funds after it became self-financing, TVA continued to receive appropriations for certain multipurpose and other nonpower mission-related activities as well as for its stewardship activities. TVA has not received any appropriations from Congress for any activities since 1999, and since that time, TVA has funded stewardship program activities primarily with power revenues.

The 1959 amendment to the TVA Act also required TVA, beginning in 1961, to make annual payments to the U.S. Treasury from net power proceeds as a repayment of and as a return on the Power Program Appropriation Investment until a total of $1.0 billion of the Power Program Appropriation Investment has been repaid in accordance with the 1959 amendment. TVA fulfilled its requirement to repay $1.0 billion of the Power Program Appropriation Investment in 2014. The TVA Act requires TVA to continue making payments to the U.S. Treasury as a return on the remaining $258 million of the Power Program Appropriation Investment.

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The table below summarizes TVA's activities related to appropriated funds and retained earnings.

Summary of Proprietary Capital Activity
At or for the years ended September 30

	2018		2017	
	Power Program	Nonpower Programs	Power Program	Nonpower Programs
Appropriation Investment	$258	$ 4,351	$258	$ 4,351
Retained Earnings				
Balance at beginning of year	8,282	(3,779)	7,594	(3,771)
Net income (expense) for year	1,127	(8)	693	(8)
Return on power program appropriation investment	(5)	—	(5)	—
Balance at end of year	9,404	(3,787)	8,282	(3,779)
Net proprietary capital at September 30	$9,662	$ 564	$8,540	$ 572

Payments to the U.S. Treasury

TVA paid the U.S. Treasury $5 million, $5 million, and $6 million in 2018, 2017, and 2016, respectively, as a return on the Power Program Appropriation Investment. The amount of the return on the Power Program Appropriation Investment is based on the Power Program Appropriation Investment balance at the beginning of that year and the computed average interest rate payable by the U.S. Treasury on its total marketable public obligations at the same date. The interest rates payable by TVA on the Power Program Appropriation Investment were 2.09 percent, 2.00 percent, and 2.04 percent for 2018, 2017, and 2016, respectively.

Accumulated Other Comprehensive Income (Loss)

The items included in AOCI consist of market valuation adjustments for certain derivative instruments. See Note 15.

TVA records exchange rate gains and losses on debt and related accrued interest in net income and marks its currency swap assets and liabilities to market through OCI. TVA had unrealized gains (losses) of $10 million and $59 million in 2018 and 2017, respectively, on the mark-to-market of currency swaps. TVA then reclassifies an amount out of AOCI into net income, offsetting the gain/loss from recording the exchange gain/loss on the debt and related accrued interest. The amounts reclassified from OCI into net income resulted in increases (decreases) to net income of $(26) million, $26 million, and $(129) million in 2018, 2017, and 2016, respectively. These reclassifications, coupled with the recording of the exchange gain/loss on the debt and related accrued interest, did not have an impact on net income in 2018, 2017, and 2016. Based on forecasted foreign currency exchange rates, TVA expects to reclassify approximately $28 million of gains from AOCI to interest expense within the next 12 months to offset amounts anticipated to be recorded in interest expense related to exchange gain on the debt and related accrued interest.

18. Other Income (Expense), Net

Income and expenses not related to TVA’s operating activities are summarized in the following table:

Other Income (Expense), Net
For the years ended September 30

	2018	2017	2016
Interest income	$ 23	$ 23	$ 24
External services	14	14	12
Gains (losses) on investments	6	9	7
Miscellaneous	7	10	—
Total other income (expense), net	$ 50	$ 56	$ 43