Tennessee Valley Authority
Form 10-Q
January 31, 2019
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UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 10-Q

(MARK ONE)
x QUARTERLY REPORT PURSUANT TO SECTION 13, 15(d), OR 37 OF THE SECURITIES EXCHANGE ACT OF 1934
For the quarterly period ended December 31, 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)

None
(Former name, former address and former fiscal year, if changed since last report)

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 and posted on its corporate Web site, if any, every Interactive Data File required to be submitted and posted 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 and post 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 (Do not check if a smaller reporting company)   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 terms or acronyms that may be used in this Quarterly Report on Form 10-Q for the quarter ended December 31, 2018 (the "Quarterly 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
CAA	Clean Air Act
CAIR	Clean Air Interstate Rule
CCR	Coal combustion residuals
CME	Chicago Mercantile Exchange
CO_2	Carbon dioxide
COL	Combined construction and operating license
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
DOE	Department of Energy
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESPA	Early Site Permit Application
FASB	Financial Accounting Standards Board
FCM	Futures Commission Merchant
FERC	Federal Energy Regulatory Commission
FTP	Financial Trading Program
GAAP	Accounting principles generally accepted in the United States of America
GHG	Greenhouse gas
GWh	Gigawatt hour(s)
HAP	Hazardous Air Pollutants
IRP	Integrated Resource Plan
JSCCG	John Sevier Combined Cycle Generation LLC
kWh	Kilowatt hour(s)
LPC	Local power company customer of TVA
MATS	Mercury and Air Toxics Standards
MD&A	Management's Discussion and Analysis of Financial Condition and Results of Operations
mmBtu	Million British thermal unit(s)
MtM	Mark-to-market
MW	Megawatt
NAAQS	National Ambient Air Quality Standards
NAV	Net asset value
NDT	Nuclear Decommissioning Trust
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation

NO_x	Nitrogen oxide

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NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
NSR	New Source Review
OCI	Other comprehensive income (loss)
PARRS	Putable Automatic Rate Reset Securities
PM	Particulate matter
QER	Quadrennial Energy Review
QTE	Qualified technological equipment and software
REIT	Real Estate Investment Trust
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
TCWN	Tennessee Clean Water Network
TDEC	Tennessee Department of Environment & Conservation
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
VIE	Variable interest entity
XBRL	eXtensible Business Reporting Language

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FORWARD-LOOKING INFORMATION

This Quarterly 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," 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;
- Inability to use regulatory accounting or loss of regulatory accounting approval for certain costs;
- The requirement or decision to make additional contributions to TVA's Nuclear Decommissioning Trust ("NDT"), Asset Retirement Trust ("ART") or pension plans;

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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 in TVA's Annual Report on Form 10-K for the year ended September 30, 2018 (the "Annual Report"), and Part I, Item 2, Management's Discussion and Analysis of Financial Condition and Results of Operations in this Quarterly Report for a discussion of factors that could cause actual results to differ materially from those in a forward-looking statement. New factors emerge from time to time, and it is not possible for TVA 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 (2019, 2018, etc.) in this Quarterly Report are to TVA's fiscal years ending September 30. Years that are preceded by "CY" are references to calendar years.

Notes

References to "Notes" are to the Notes to Consolidated Financial Statements contained in Part I, Item 1, Financial Statements in this Quarterly Report.

Available Information

TVA's Annual Reports on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K, and all amendments to those reports, are available on TVA's website, free of charge, as soon as reasonably practicable after such reports are electronically filed with or furnished to the Securities and Exchange Commission ("SEC"). TVA's website is www.tva.gov. Information contained on TVA's website shall not be deemed to be incorporated into, or to be a part of, this Quarterly Report. All TVA SEC reports are available to the public without charge from the website maintained by the SEC at www.sec.gov.

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PART I - FINANCIAL INFORMATION

ITEM 1. FINANCIAL STATEMENTS

TENNESSEE VALLEY AUTHORITY
CONSOLIDATED STATEMENTS OF OPERATIONS (Unaudited)
Three Months Ended December 31
(in millions)

	2018	2017
Operating revenues		
Revenue from sales of electricity	$2,681	$2,509
Other revenue	44	40
Total operating revenues	2,725	2,549
Operating expenses		
Fuel	441	475
Purchased power	297	220
Operating and maintenance	745	646
Depreciation and amortization	345	423
Tax equivalents	132	124
Total operating expenses	1,960	1,888
Operating income	765	661
Other income (expense), net	24	12
Other net periodic benefit cost	64	63
Interest expense	302	322
Net income (loss)	$423	$288

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

TENNESSEE VALLEY AUTHORITY
CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME (LOSS) (Unaudited)
Three Months Ended December 31
(in millions)

	2018	2017
Net income (loss)	$423	$288
Other comprehensive income (loss)		
Net unrealized gain (loss) on cash flow hedges	(52)	39
Reclassification to earnings from cash flow hedges	18	(3)
Total other comprehensive income (loss)	(34)	36
Total comprehensive income (loss)	$389	$324

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

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TENNESSEE VALLEY AUTHORITY
CONSOLIDATED BALANCE SHEETS (Unaudited)
(in millions)
ASSETS

	December 31, 2018	September 30, 2018
Current assets		
Cash and cash equivalents	$ 301	$ 299
Accounts receivable, net	1,541	1,657
Inventories, net	1,018	961
Regulatory assets	380	414
Other current assets	106	86
Total current assets	3,346	3,417
Property, plant, and equipment		
Completed plant	61,319	61,114
Less accumulated depreciation	(29,384)	(29,335)
Net completed plant	31,935	31,779
Construction in progress	1,923	1,999
Nuclear fuel	1,470	1,487
Capital leases	146	149
Total property, plant, and equipment, net	35,474	35,414
Investment funds	2,592	2,862
Regulatory and other long-term assets		
Regulatory assets	6,962	6,612
Other long-term assets	373	362
Total regulatory and other long-term assets	7,335	6,974
Total assets	$ 48,747	$ 48,667

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

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TENNESSEE VALLEY AUTHORITY
CONSOLIDATED BALANCE SHEETS (Unaudited)
(in millions)
LIABILITIES AND PROPRIETARY CAPITAL

	December 31, 2018	September 30, 2018
Current liabilities		
Accounts payable and accrued liabilities	$ 1,541	$ 1,982
Accrued interest	304	305
Current portion of leaseback obligations	38	38
Current portion of energy prepayment obligations	—	10
Regulatory liabilities	194	187
Short-term debt, net	2,333	1,216
Current maturities of power bonds	32	1,032
Current maturities of long-term debt of variable interest entities	38	38
Current maturities of notes payable	45	46
Total current liabilities	4,525	4,854
Other liabilities		
Post-retirement and post-employment benefit obligations	4,377	4,476
Asset retirement obligations	4,688	4,665
Other long-term liabilities	2,837	2,715
Leaseback obligations	263	263
Regulatory liabilities	95	104
Total other liabilities	12,260	12,223
Long-term debt, net		
Long-term power bonds, net	20,143	20,157
Long-term debt of variable interest entities, net	1,127	1,127
Long-term notes payable	22	23
Total long-term debt, net	21,292	21,307
Total liabilities	38,077	38,384
Commitments and contingencies		
Proprietary capital		
Power program appropriation investment	258	258
Power program retained earnings	9,827	9,404
Total power program proprietary capital	10,085	9,662
Nonpower programs appropriation investment, net	562	564
Accumulated other comprehensive income (loss)	23	57
Total proprietary capital	10,670	10,283
Total liabilities and proprietary capital	$ 48,747	$ 48,667

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

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TENNESSEE VALLEY AUTHORITY
CONSOLIDATED STATEMENTS OF CASH FLOWS (Unaudited)
For the Three Months Ended December 31
(in millions)

	2018	2017
Cash flows from operating activities		
Net income (loss)	$423	$288
Adjustments to reconcile net income (loss) to net cash provided by operating activities		
Depreciation and amortization[1]	350	433
Amortization of nuclear fuel cost	81	94
Non-cash retirement benefit expense	79	82
Prepayment credits applied to revenue	(10)	(25)
Other regulatory amortization and deferrals	22	(6)
Changes in current assets and liabilities		
Accounts receivable, net	117	70
Inventories and other current assets, net	(67)	7
Accounts payable and accrued liabilities	(353)	(179)
Accrued interest	—	(24)
Pension contributions	(75)	(75)
Other, net	(65)	(39)
Net cash provided by operating activities	502	626
Cash flows from investing activities		
Construction expenditures	(500)	(551)
Nuclear fuel expenditures	(97)	(71)
Loans and other receivables		
Advances	—	(6)
Repayments	2	1
Other, net	(6)	(1)
Net cash used in investing activities	(601)	(628)
Cash flows from financing activities		
Long-term debt		
Redemptions and repurchases of power bonds	(1,002)	(698)
Redemptions of notes payable	(1)	(2)
Short-term debt issues (redemptions), net	1,105	717
Payments on leases and leasebacks	(1)	(1)
Other, net	—	(1)
Net cash provided by (used in) financing activities	101	15
Net change in cash, cash equivalents, and restricted cash	2	13
Cash, cash equivalents, and restricted cash at beginning of period	322	311
Cash, cash equivalents, and restricted cash at end of period	$324	$324
Supplemental disclosures		
Significant non-cash transactions		
Accrued capital and nuclear fuel expenditures	$372	$294

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

Note

(1) Includes amortization of debt issuance costs and premiums/discounts.

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TENNESSEE VALLEY AUTHORITY
CONSOLIDATED STATEMENTS OF CHANGES IN PROPRIETARY CAPITAL (Unaudited)
For the Three Months Ended December 31, 2018 and 2017
(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, 2017	$ 258	$ 8,282	$ 572	$ 21	$ 9,133
Net income (loss)	—	290	(2)	—	288
Total other comprehensive income (loss)	—	—	—	36	36
Return on power program appropriation investment	—	(1)	—	—	(1)
Balance at December 31, 2017	$ 258	$ 8,571	$ 570	$ 57	$ 9,456
Balance at September 30, 2018	$ 258	$ 9,404	$ 564	$ 57	$ 10,283
Net income (loss)	—	425	(2)	—	423
Total other comprehensive income (loss)	—	—	—	(34)	(34)
Return on power program appropriation investment	—	(2)	—	—	(2)
Balance at December 31, 2018	$ 258	$ 9,827	$ 562	$ 23	$ 10,670

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

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

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1. Nature of Operations and 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 ("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 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 Tennessee Valley Authority Act of 1933 (the "TVA Act"). The TVA Act requires TVA to charge rates for power that will produce gross revenues

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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 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. TVA fulfilled its obligation under the TVA Act to repay $1.0 billion of the Power Program Appropriation Investment with the 2014 payment and therefore, 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 (2019, 2018, 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

TVA prepares its consolidated interim financial statements in conformity with GAAP for consolidated interim financial information. Accordingly, TVA's consolidated interim financial statements do not include all of the information and notes required by GAAP for annual financial statements. As such, they should be read in conjunction with the audited financial statements for the year ended September 30, 2018, and the notes thereto, which are contained in TVA's Annual Report on Form 10-K for the year ended September 30, 2018 (the "Annual Report"). In the opinion of management, all adjustments (consisting of items of a normal recurring nature) considered necessary for fair presentation are included in the consolidated interim financial statements.

The accompanying consolidated interim 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 7. 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.

Reclassifications

Certain historical amounts have been reclassified in the accompanying consolidated financial statements to the current presentation. TVA reclassified $63 million of net periodic benefit cost from Operating and maintenance expense to Other net periodic benefit cost in the Consolidated Statements of Operations for the three months ended December 31, 2017 as a result of the retrospective presentation of financing costs due to the implementation of the new accounting standard for defined benefit plan cost effective for TVA October 1, 2018. TVA also reclassified $13 million from Restricted cash and cash equivalents to Other long-term assets on the Consolidated Balance Sheet at September 30, 2018. Additionally, reclassifications have been

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made to the December 31, 2017, Consolidated Statement of Cash Flows, consolidating certain previously reported amounts within Cash flows from operating activities as Other regulatory amortization and deferrals and Other, net.

Cash, Cash Equivalents, and Restricted Cash

Cash includes cash on hand, non-interest bearing cash, and deposit accounts. All highly liquid investments with original maturities of three months or less are considered cash equivalents. Cash and cash equivalents that are restricted, as to withdrawal or use under the terms of certain contractual agreements, are recorded in Other long-term assets in the Consolidated Balance Sheets. Restricted cash and cash equivalents includes cash held in trusts that are currently restricted for TVA economic development loans and for certain TVA environmental programs in accordance with agreements related to compliance with certain environmental regulations. See Note 18 — Legal Proceedings —Environmental Agreements.

The following table provides a reconciliation of cash, cash equivalents, and restricted cash reported in the Consolidated Balance Sheets and Consolidated Statements of Cash Flows.
Cash, Cash Equivalents, and Restricted Cash

	December 31, 2018	September 30,2018
Cash and cash equivalents	$ 301	$ 299
Restricted cash and cash equivalents included in Other long-term assets	23	23
Total Cash, cash equivalents, and restricted cash	$ 324	$ 322

Revenues

TVA recognizes revenue from contracts with customers to depict the transfer of goods or services to customers in an amount to which the entity expects to be entitled in exchange for those goods or services. For the generation and transmission of electricity, this is generally at the time the power is delivered to a metered customer delivery point for the customer's consumption or distribution. As a result, 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. TVA engages in other arrangements in addition to power sales. Revenue from activities related to TVA's overall mission (e.g., generation and transmission of power and stewardship of TVA-owned or controlled property) are recorded as other operating revenue. Revenues that are not related to the overall mission are recorded in other income (expense), net.

From time to time, TVA may transfer 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 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.

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 December 31, 2018, and September 30, 2018, for accounts receivable. Additionally, loans receivable of $139 million and $138 million at December 31, 2018, and September 30, 2018, respectively, are included in Accounts receivable, net and Other long-term assets and are reported net of allowances for uncollectible accounts of less than $1 million at both December 31, 2018, and September 30, 2018.

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. The Allen Combined Cycle Plant ("Allen CC") began pre-commercial 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

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service during December 2017. Estimated revenue of $1 million related to these projects was capitalized to offset project costs for the three months ended December 31, 2017. TVA also capitalized related fuel costs for these construction projects of approximately $2 million during the three months ended December 31, 2017. No such amounts were capitalized during the three months ended December 31, 2018.

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 external depreciation studies. These studies are updated at least every five years. Depreciation expense was $308 million and $319 million for the three months ended December 31, 2018 and 2017, respectively.

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 2019.

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 post-retirement 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 non-operating expenses. Additionally, the guidance stipulates that only the service cost component of net benefit cost is eligible for capitalization in assets. The guidance requires retrospective presentation of the service and non-service cost components in the consolidated statement of operations.
Effective Date for TVA	October 1, 2018
Effect on the Financial Statements or Other Significant Matters	TVA adopted this standard on a retrospective basis for the prior period presented resulting in lower operating expenses and higher non-operating expenses in the Consolidated Statements of Operations of $64 million and $63 million for the three months ended December 31, 2018 and 2017, respectively. There was no impact on the Consolidated Balance Sheets because TVA has historically capitalized only the service cost component, which is consistent with the new guidance.

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.
	October 1, 2018

Effective Date for TVA	
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 did not have a material impact on TVA's financial condition, results of operations, or cash flows because changes in fair value accounting are recognized through regulatory accounting.

Revenue from Contracts with Customers

Description	This guidance, including subsequent amendments, 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	October 1, 2018

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Effect on the Financial Statements or Other Significant Matters	TVA adopted this standard using the modified retrospective method with no material changes to the amount or timing of revenue recognition. In accordance with the modified retrospective method, TVA’s previously issued financial statements have not been restated to comply the new accounting standard. TVA recognizes revenue when it satisfies a performance obligation by transferring control to the customer. For the generation and transmission of electricity, this is generally at the time the power is delivered to a metered customer delivery point for a customer's consumption or distribution. As a result, revenues from power sales are recorded as electricity is delivered to customers. TVA utilized certain practical expedients including applying the guidance to open contracts at the date of adoption, applying the guidance to a portfolio of contracts with similar characteristics, and recognizing revenue in the amount for which it has the right to invoice. As a result of adoption of the standard, TVA did not have a cumulative-effect adjustment to proprietary capital.

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	October 1, 2018
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 adoption of the standard had no impact on TVA's financial condition, results of operations, or presentation or disclosure of cash flows.

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	October 1, 2018
Effect on the Financial Statements or Other Significant Matters	Adoption of this standard resulted in a change to the beginning-of-period and end-of-period cash and cash equivalents and restricted cash amounts shown on the Consolidated Statements of Cash Flows. TVA applied this standard on a retrospective basis for the prior periods presented.

The following accounting standards have been issued but as of December 31, 2018, were not effective and had not been adopted by TVA.

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 does not currently plan to 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 financing 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.

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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 the existing standard. TVA plans to elect certain of the practical expedients included in the new standard. TVA has selected a lease system solution and continues to evaluate the completeness of the lease population, the effectiveness of internal control related to leases, and appropriate financial statement disclosure. 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 post-retirement 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.

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. Early adoption is permitted, and TVA is currently evaluating its adoption options.
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.

Financial Instruments - Credit Losses

Description	This guidance eliminates the probable initial recognition threshold in current GAAP and, instead, requires an allowance to be recorded for all expected credit losses for certain financial assets that are not measured at fair value. The allowance for credit losses is based on historical information, current

	conditions, and reasonable and supportable forecasts. The new standard also makes revisions to the other than temporary impairment model for available-for-sale debt securities. Disclosures of credit quality indicators in relation to the amortized cost of financing receivables are further disaggregated by year of origination.
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 December 31, 2018	At September 30, 2018
Power receivables	$ 1,465	$ 1,570
Other receivables	76	87
Accounts receivable, net	$ 1,541	$ 1,657

Note

Allowance for uncollectible accounts was less than $1 million at December 31, 2018 and September 30, 2018, and therefore is not represented in the table above.

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4. Inventories, Net

The table below summarizes the types and amounts of TVA's inventories:
Inventories, Net

	At December 31, 2018	At September 30, 2018
Materials and supplies inventory	$ 731	$ 725
Fuel inventory	315	266
Renewable energy certificates/emission allowance inventory, net	15	14
Allowance for inventory obsolescence	(43)	(44)
Inventories, net	$ 1,018	$ 961

5. Other Long-Term Assets

The table below summarizes the types and amounts of TVA's other long-term assets:
Other Long-Term Assets

	At December 31, 2018	At September 30, 2018
Loans and other long-term receivables, net(1)	$ 136	$ 125
EnergyRight® receivables	88	90
Commodity contract derivative assets	27	31
Prepaid capacity payments	25	27
Restricted cash and cash equivalents(1)	23	23
Other	74	66
Other long-term assets	$ 373	$ 362

Note
(1) Certain historical amounts have been reclassified to conform with current year presentation of Restricted cash and cash equivalents.

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 loans receivable that have been in default for 180 days or more or that TVA has determined are uncollectible. Given this continuing involvement, TVA accounts for the transfer of the loans receivable as secured borrowings. The current and long-term portions of the loans receivable are reported in Accounts receivable, net and Other long-term assets, respectively, on TVA's consolidated balance sheets. At both December 31, 2018, and September 30, 2018, the carrying amount of the loans receivable, net of discount, reported in Accounts receivable, net was approximately $22 million. See Note 9 for information regarding the associated financing obligation.

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6. 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 December 31, 2018	At September 30, 2018
Current regulatory assets		
Gallatin coal combustion residual facilities	$ 29	$ 38
Unrealized losses on interest rate derivatives	75	73
Environmental agreements	1	3
Unrealized losses on commodity contracts	5	4
Environmental cleanup costs – Kingston ash spill	195	266
Fuel cost adjustment receivable	75	30
Total current regulatory assets	380	414
Non-current regulatory assets		
Deferred pension costs and other post-retirement benefits costs	3,059	3,119
Non-nuclear decommissioning costs	1,086	1,019
Nuclear decommissioning costs	1,006	784
Gallatin coal combustion residual facilities	866	861
Unrealized losses on interest rate derivatives	800	692
Environmental agreements	12	11
Unrealized losses on commodity contracts	5	8
Other non-current regulatory assets	128	118
Total non-current regulatory assets	6,962	6,612
Total regulatory assets	$ 7,342	$ 7,026
Current regulatory liabilities		
Fuel cost adjustment tax equivalents	$ 144	$ 146
Unrealized gains on commodity derivatives	50	41
Total current regulatory liabilities	194	187
Non-current regulatory liabilities		
Deferred other post-retirement benefits cost	68	73
Unrealized gains on commodity derivatives	27	31
Total non-current regulatory liabilities	95	104
Total regulatory liabilities	$ 289	$ 291

7. 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.

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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 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.

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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 December 31, 2018, and September 30, 2018, as reflected in the Consolidated Balance Sheets are as follows:

Summary of Impact of VIEs on Consolidated Balance Sheets

	At December 31, 2018	At September 30, 2018
Current liabilities		
Accrued interest	$ 25	$ 11
Accounts payable and accrued liabilities	2	2
Current maturities of long-term debt of variable interest entities	38	38
Total current liabilities	65	51
Other liabilities		
Other long-term liabilities	28	28
Long-term debt, net		
Long-term debt of variable interest entities, net	1,127	1,127
Total liabilities	$ 1,220	$ 1,206

Interest expense of $14 million and $15 million for the three months ended December 31, 2018 and 2017, respectively, is included in the Consolidated Statements of Operations related to debt of VIEs and membership interests of VIEs subject to mandatory redemption.

Creditors of the VIEs have no 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.

8. Gallatin Coal Combustion Residual Facilities

Background

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, alleging that pollutants from Gallatin have been discharged 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, and civil penalties of up to $17,000 per day for each day TVA is found to have violated the statutes. The Tennessee Scenic Rivers Association ("TSRA") and Tennessee Clean Water Network ("TCWN") are also plaintiffs. Trial in this action is anticipated to begin in October 2019.

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 sought 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 (the "August 2017 Order") that found 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 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.

On October 2, 2017, TVA appealed the court's decision to the United States Court of Appeals for the Sixth Circuit ("Sixth Circuit"). 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. On October 22, 2018, the plaintiffs filed a petition requesting that the full Sixth Circuit rehear the case. On January 17, 2019, the Sixth Circuit denied the petition. The plaintiffs have 90 days from January 17, 2019, to request review by the United States Supreme Court.

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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), that began on 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 permitting activities for the new facility, design and construction of the new facility onsite at Gallatin, 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 over the 24 year expected 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 plans on completing capital projects related to construction of a permanent bottom ash dewatering facility and non-CCR wastewater treatment facilities. 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 be required to move the CCR materials offsite, which 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. It is estimated that the process of obtaining the necessary permits for offsite disposal, locating or constructing an offsite facility, and moving all of the CCR materials offsite would take approximately 40 years.

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.

At December 31, 2018, related liabilities of $866 million and $23 million were recorded in Other long-term liabilities and Accounts payable and accrued liabilities, respectively.

9. Other Long-Term Liabilities

Other long-term liabilities consist primarily of liabilities related to certain derivative agreements, liabilities for environmental remediation, and liabilities under agreements related to compliance with certain environmental regulations. See Note 18 — Legal Proceedings — Environmental Agreements. The table below summarizes the types and amounts of Other long-term liabilities:

Other Long-Term Liabilities

	At December 31, 2018	At September 30, 2018
Interest rate swap liabilities	$ 1,205	$ 1,122
Gallatin coal combustion residual facilities liability	866	862
Capital lease obligations	177	178
Currency swap liabilities	132	81
EnergyRight® financing obligation	99	102
Paradise pipeline financing[1]	80	80
Accrued long-term service agreement[1]	74	74

Other[1]	204	216
Total other long-term liabilities	$ 2,837	$ 2,715

Note
(1) Certain amounts have been reclassified to conform with current year presentation.

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 December 31, 2018, and September 30, 2018, the carrying amount of the interest rate swap liabilities reported in Accounts payable and accrued liabilities was approximately $75 million and $77 million, respectively. See Note 13 —Derivatives Not Receiving Hedge Accounting Treatment — Interest Rate Derivatives for information regarding the interest rate swap liabilities.

Gallatin Coal Combustion Residual Facilities Liability. The estimated cost of the potential Gallatin CCR project is approximately $900 million. The current and long-term portions of the resulting obligation are reported in Accounts payable and

accrued liabilities and Other long-term liabilities, respectively, on TVA's consolidated balance sheets. As of December 31, 2018, and September 30, 2018, related liabilities of $23 million and $30 million, respectively, were recorded in Accounts payable and accrued liabilities. See Note 8 for information regarding the Gallatin CCR facilities.

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. The carrying amount of the financing obligation reported in Accounts payable and accrued liabilities for both December 31, 2018, and September 30, 2018, was approximately $25 million. See Note 5 for information regarding the associated loans receivable.

Paradise Pipeline Financing. TVA reserves firm pipeline capacity on an approximately 19 mile pipeline owned by Texas Gas, which serves TVA's Paradise Combined Cycle Plant. The capacity contract contains a lease component because of TVA's exclusive right to use the pipeline. Because TVA was initially involved in the construction of the pipeline as a result of funding certain FERC filing fees prior to construction, TVA was considered the owner of the pipeline during the construction period for accounting purposes. Due to TVA's continuing involvement in the pipeline after the construction period, TVA accounted for the transaction as a financing transaction. This amount is shown in Other long-term liabilities in the December 31, 2018, and September 30, 2018, Consolidated Balance Sheets.

Accrued Long-Term Service Agreement. TVA has entered into various long-term service agreements for major maintenance activities at certain of TVA's combined cycle plants. TVA uses the direct expense method of accounting for these arrangements and accrues for parts when TVA takes ownership, and for contractor services when they are rendered. Under certain of these arrangements, parts received and services rendered exceed payments made. As a result, TVA has recorded an accrued long-term service agreement obligation in Other long-term liabilities in the December 31, 2018, and September 30, 2018, Consolidated Balance Sheets.

10. Asset Retirement Obligations

During the three months ended December 31, 2018, TVA's total asset retirement obligations ("ARO") liability increased $20 million as a result of periodic accretion, partially offset by settlement activity from ongoing ARO projects at TVA facilities. The nuclear and non-nuclear accretion amounts were deferred as regulatory assets. During the three months ended December 31, 2018, $36 million of the related non-nuclear regulatory assets were amortized into expense as these amounts were collected in rates. See Note 6. TVA maintains investment trusts to help fund its decommissioning obligations. See Note 14 — Investment Funds and Note 18 — Contingencies — Decommissioning Costs for a discussion of the trusts' objectives and the current balances of the trusts.

Asset Retirement Obligation Activity[1]

	Nuclear	Non-Nuclear	Total
Balance at September 30, 2018	$ 2,989	$ 1,790	$ 4,779
Settlements	—	(25)	(25)
Accretion (recorded as regulatory asset)	34	11	45
Balance at December 31, 2018	$ 3,023	$ 1,776	$ 4,799

Note
(1) The current portion of ARO in the amount of $111 million and $115 million is included in Accounts payable and accrued liabilities at December 31, 2018, and September 30, 2018, respectively.

On January 25, 2019, TVA approved a change in the preferred closure method for the Allen West Impoundment from closure in place to closure by removal. The cost impact of changing the closure method is expected to result in an increase of approximately $31 million to the non-nuclear AROs during the second quarter of 2019. The method of final closure for this impoundment will depend on various factors, including the completion of all environmental

reviews.

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11. Debt and Other Obligations

Debt Outstanding

Total debt outstanding at December 31, 2018, and September 30, 2018, consisted of the following:
Debt Outstanding

	At December 31, 2018	At September 30, 2018
Short-term debt		
Short-term debt, net	$ 2,333	$ 1,216
Current maturities of power bonds	32	1,032
Current maturities of long-term debt of variable interest entities	38	38
Current maturities of notes payable	45	46
Total current debt outstanding, net	2,448	2,332
Long-term debt		
Long-term power bonds[1]	20,283	20,300
Long-term debt of variable interest entities	1,127	1,127
Long-term notes payable	22	23
Unamortized discounts, premiums, issue costs, and other	(140)	(143)
Total long-term debt, net	21,292	21,307
Total outstanding debt	$ 23,740	$ 23,639

Note
(1) Includes net exchange gain from currency transactions of $163 million and $147 million at December 31, 2018, and September 30, 2018, respectively.

Debt Securities Activity

The table below summarizes the long-term debt securities activity for the period from October 1, 2018, to December 31, 2018:
Debt Securities Activity

	Date	Amount[1]	Interest Rate
Redemptions/Maturities			
electronotes®	First Quarter 2019	$ 1	2.65 %
2013 Series A	October 2018	1,000	1.75 %
2009 Series B	December 2018	1	3.77 %
Total redemptions/maturities of power bonds		1,002	
Notes payable		1	1.64 %
Total redemptions/maturities of debt		$ 1,003	

Note
(1) All redemptions were at 100 percent of par.

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 December 31, 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 four long-term revolving credit facilities totaling $2.7 billion: a $150 million credit facility that matures on December 11, 2021, a $500 million credit facility that matures on February 1, 2022, a $1.0 billion credit facility that matures on September 28, 2023, and a $1.0 billion credit facility that matures on June 13, 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-

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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 December 31, 2018, and September 30, 2018, there were approximately $854 million and $921 million, respectively, of letters of credit outstanding under the facilities, and there were no borrowings outstanding. See Note 13 — 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 December 31, 2018

	Facility Limit	Letters of Credit Outstanding	Cash Borrowings	Availability
Maturity Date				
December 2021	$150	$ 37	$ —	$ 113
February 2022	500	500	—	—
June 2023	1,000	148	—	852
September 2023	1,000	169	—	831
Total	$2,650	$ 854	$ —	$ 1,796

Lease/Leasebacks

TVA previously entered into leasing transactions to obtain third-party financing for 24 peaking combustion turbine units ("CTs") as well as certain qualified technological equipment and software (collectively, "QTE"). Due to TVA's continuing involvement with the combustion turbine facilities and the QTE during the leaseback term, TVA accounted for the lease proceeds as financing obligations. At both December 31, 2018, and September 30, 2018, the outstanding leaseback obligations related to the remaining CTs and QTE were $301 million.

12. Accumulated Other Comprehensive Income (Loss)

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. During the three months ended December 31, 2018 and 2017, TVA reclassified $18 million of losses and $3 million of gains, respectively, related to its cash flow hedges from AOCI to Interest expense.

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 6 for a schedule of regulatory assets and liabilities. See Note 13 for a discussion of the recognition in AOCI of gains and losses associated with certain derivative contracts. See Note 14 for a discussion of the recognition of certain investment fund gains and losses as regulatory assets and liabilities. See Note 17 for a discussion of the regulatory accounting related to components of TVA's benefit plans.

13. 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 Financial Trading Program ("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).

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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)

Derivatives in Cash Flow Hedging Relationship	Objective of Hedge Transaction	Accounting for Derivative Hedging Instrument	Three Months Ended December 31 2018	2017
Currency swaps	To protect against changes in cash flows caused by changes in foreign currency exchange rates (exchange rate risk)	Unrealized gains and losses are recorded in AOCI and reclassified to interest expense to the extent they are offset by gains and losses on the hedged transaction	$ (52)	$ 39

Summary of Derivative Instruments That Receive Hedge Accounting Treatment (part 2)
Amount of Gain (Loss) Reclassified from Accumulated Other Comprehensive Income to Interest Expense[(1)]

Derivatives in Cash Flow Hedging Relationship	Three Months Ended December 31 2018	2017
Currency swaps	$ (18)	$ 3

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 $50 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 net exchange gain on the debt.

Summary of Derivative Instruments That Do Not Receive Hedge Accounting Treatment
Amount of Gain (Loss) Recognized in Income on Derivatives[(1)]

Derivative Type	Objective of Derivative	Accounting for Derivative Instrument	Three Months Ended December 31 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	$ (20)	$ (24)
Commodity contract	To protect against fluctuations in market prices of purchased coal or	Mark-to-market gains and losses are recorded as regulatory assets or liabilities	—	(3)

derivatives	natural gas (price risk)	Realized gains and losses due to contract settlements are recognized in fuel expense as incurred		
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

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 three months ended December 31, 2018 and 2017.

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Fair Values of TVA Derivatives

	At December 31, 2018		At September 30, 2018	
Derivatives That Receive Hedge Accounting Treatment:				
	Balance	Balance Sheet Presentation	Balance	Balance Sheet Presentation
Currency swaps				
£200 million Sterling	$(76)	Accounts payable and accrued liabilities $(6); Other long-term liabilities $(70)	$(67)	Accounts payable and accrued liabilities $(5); Other long-term liabilities $(62)
£250 million Sterling	(37)	Accounts payable and accrued liabilities $(5); Other long-term liabilities $(32)	(12)	Accounts payable and accrued liabilities $(5); Other long-term liabilities $(7)
£150 million Sterling	(33)	Accounts payable and accrued liabilities $(3); Other long-term liabilities $(30)	(15)	Accounts payable and accrued liabilities $(3); Other long-term liabilities $(12)

Derivatives That Do Not Receive Hedge Accounting Treatment:				
	Balance	Balance Sheet Presentation	Balance	Balance Sheet Presentation
Interest rate swaps				
$1.0 billion notional	$(932)	Accounts payable and accrued liabilities $(55); Other long-term liabilities $(877)	$(878)	Accounts payable and accrued liabilities $(56); Other long-term liabilities $(822)
$476 million notional	(343)	Accounts payable and accrued liabilities $(19); Other long-term liabilities $(324)	(317)	Accounts payable and accrued liabilities $(20); Other long-term liabilities $(297)
$42 million notional	(5)	Accounts payable and accrued liabilities $(1); Other long-term liabilities $(4)	(4)	Accounts payable and accrued liabilities $(1); Other long-term liabilities $(3)
Commodity contract derivatives	67	Other current assets $50; Other long-term assets $27; Other long-term liabilities $(5); Accounts payable and accrued liabilities $(5)	60	Other current assets $41; Other long-term assets $31; Other long-term liabilities $(8); Accounts payable and accrued liabilities $(4)

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 three currency swaps outstanding as of December 31, 2018, with total currency exposure of £600 million and expiration dates ranging from 2021 to 2043.

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 mark-to-market ("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 three months ended December 31, 2018 and 2017, the changes in fair market value of the interest rate swaps resulted in the deferral of unrealized losses of $110 million and unrealized gains of $28 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 market values

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as regulatory assets or liabilities on a gross basis. At December 31, 2018, TVA's coal and natural gas contract derivatives both had terms of up to three years.

Commodity Contract Derivatives

	At December 31, 2018			At September 30, 2018		
	Number of Contracts	Notional Amount	Fair Value (MtM)	Number of Contracts	Notional Amount	Fair Value (MtM)
Coal contract derivatives	16	17 million tons	$ 63	13	20 million tons	$ 58
Natural gas contract derivatives	53	347 million mmBtu	$ 4	61	359 million mmBtu	$ 2

Derivatives Under FTP. TVA has suspended its FTP and no longer uses financial instruments to hedge risks related to commodity prices. 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. TVA did not experience any unrealized gains and losses related to the FTP at December 31, 2018 or September 30, 2018. TVA experienced the following realized losses related to the FTP during the periods set forth in the table below:

Financial Trading Program Realized Gains (Losses)

	Three Months Ended December 31	
	2018	2017
Decrease (increase) in fuel expense		
Natural gas	$ —	$ (6)
Decrease (increase) in purchased power expense		
Natural gas	—	(2)

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Offsetting of Derivative Assets and Liabilities

The amounts of TVA's derivative instruments as reported in the consolidated balance sheets at December 31, 2018, and September 30, 2018, are shown in the table below:

Derivative Assets and Liabilities

	At December 31, 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	$77	$ —	$ 77
Liabilities			
Currency swaps[3]	$146	$ —	$ 146
Interest rate swaps[3]	1,280	—	1,280
Total derivatives subject to master netting or similar arrangement	1,426	—	1,426
Commodity derivatives not subject to master netting or similar arrangement	10	—	10
Total liabilities	$1,436	$ —	$ 1,436

	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

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 that are not offset in the consolidated balance sheets.

(3) Letters of credit of approximately $854 million and $921 million were posted as collateral at December 31, 2018, and September 30, 2018, 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 Nuclear Decommissioning Trust ("NDT"), the Asset Retirement Trust ("ART"), the Supplemental Executive Retirement Plan ("SERP"), and the TVA Deferred Compensation Plan ("DCP"). See Note 14 — Investment Funds for a discussion of the trusts, plans, and types of investments. The NDT and ART may invest in derivative instruments which may include swaps, futures, options, forwards, and other instruments. At December 31, 2018, and September 30, 2018, the NDT held investments in forward contracts to purchase debt securities. The fair values of these derivatives were in net asset positions totaling $43 million and $45 million at December 31, 2018, and September 30, 2018, 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 December 31, 2018, the aggregate fair value of all derivative instruments with credit-risk related contingent features that were in a liability position was $1.4 billion. TVA's collateral obligations at December 31, 2018, under these

arrangements were approximately $938 million, for which TVA had posted approximately $854 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.

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. 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. See Note 1 — Allowance for Uncollectible Accounts and Note 3.

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 December 31, 2018. The contracted supply of coal is sourced from multiple geographic regions of the United States 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, restructuring, 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.

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 December 31, 2018, all of 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 December 31, 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 December 31, 2018, the natural gas contracts were with counterparties whose ratings ranged from B1 to A2. See Suppliers above for discussion of challenges

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facing the coal industry. TVA's total value for derivative contracts with coal and natural gas counterparties in an asset position as of December 31, 2018, was approximately $77 million.

14. 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 December 31, 2018, Investment funds were composed of $2.6 billion of equity securities and debt securities classified as trading measured at fair value. Equity and trading debt 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 $1.9 billion and $639 million, respectively, at December 31, 2018.

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, private real estate investments, and private credit 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

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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 $130 million, unfunded commitments related to private real estate of $27 million, and unfunded commitments related to private credit of $12 million at December 31, 2018. The ART had unfunded commitments related to private equity limited partnerships of $53 million, unfunded commitments related to private real estate of $12 million, and unfunded commitments related to private credit of $6 million at December 31, 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 their 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, private real estate investments, and private credit 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 equity and trading debt 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 equity and trading debt securities held during each period as follows:

Unrealized Investment Gains (Losses)

		Three Months Ended December 31	
Fund	Financial Statement Presentation	2018	2017
SERP	Other income (expense)	$ (6)	$ 1
DCP	Other income (expense)	(3)	—
NDT	Regulatory asset	(201)	47
ART	Regulatory asset	(104)	20

Currency and Interest Rate Derivatives

See Note 13 — 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.

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

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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 December 31, 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 as of December 31, 2018, and September 30, 2018. 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 December 31, 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	$ 194	$ —	$ —	$193
Government debt securities	174	40	—	214
Corporate debt securities	—	442	—	442
Mortgage and asset-backed securities	—	35	—	35
Institutional mutual funds	209	—	—	209
Forward debt securities contracts	—	43	—	43
Private credit measured at net asset value[(1)]	—	—	—	17
Private equity funds measured at net asset value[(1)]	—	—	—	118
Private real estate funds measured at net asset value[(1)]	—	—	—	126
Commingled funds measured at net asset value[(1)]	—	—	—	1,195
Total investments	577	560	—	2,592
Commodity contract derivatives	—	14	63	77
Total	$ 577	$ 574	$ 63	$2,669

	Quoted Prices in Active Markets for Identical Liabilities	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	Total

	(Level 1)			
Liabilities				
Currency swaps[2]	$ —	$ 146	$ —	$146
Interest rate swaps	—	1,280	—	1,280
Commodity contract derivatives	—	10	—	10
Total	$ —	$ 1,436	$ —	$1,436

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 13 — Offsetting of Derivative Assets and Liabilities.

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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 13 — 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 Three Months Ended December 31
Balance at beginning of period	$ (67)
Change in net unrealized gains (losses) deferred as regulatory assets and liabilities	(6)
Balance at December 31, 2017	$ (73)
Balance at beginning of period	$ 58
Change in net unrealized gains (losses) deferred as regulatory assets and liabilities	5
Balance at December 31, 2018	$ 63

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 December 31, 2018	Valuation Technique(s)	Unobservable Inputs	Range
Assets				
Commodity contract derivatives	$ 63	Pricing model	Coal supply and demand	0.7 - 0.8 billion tons/year
			Long-term market prices	$12.25 - $112.64/ton
Liabilities				
Commodity contract derivatives	$ —	Pricing model	Coal supply and demand	0.7 - 0.8 billion tons/year
			Long-term market prices	$12.25 - $112.64/ton

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

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Other Financial Instruments Not Recorded at Fair Value

TVA uses the methods and assumptions described below to estimate the fair value of each significant class of financial instrument. The fair value of the financial instruments held at December 31, 2018, and September 30, 2018, 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 December 31, 2018, and September 30, 2018, were as follows:

Estimated Values of Financial Instruments Not Recorded at Fair Value

		At December 31, 2018		At September 30, 2018	
	Valuation Classification	Carrying Amount	Fair Value	Carrying Amount	Fair Value
EnergyRight® receivables (including current portion)	Level 2	$110	$109	$112	$112
Loans and other long-term receivables, net (including current portion)	Level 2	$139	$124	$138	$123
EnergyRight® financing obligation (including current portion)	Level 2	$124	$140	$127	$143
Unfunded loan commitments	Level 2	$—	$7	$—	$3
Membership interest of variable interest entities subject to mandatory redemption (including current portion)	Level 2	$30	$37	$30	$37
Long-term outstanding power bonds (including current maturities), net	Level 2	$20,175	$23,484	$21,189	$23,896
Long-term debt of variable interest entities (including current maturities), net	Level 2	$1,165	$1,267	$1,165	$1,256
Long-term notes payable (including current maturities)	Level 2	$67	$67	$69	$68

The carrying value of Cash and cash equivalents, Restricted cash and cash equivalents, and Short-term debt, net 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.

15. Revenue

As described in Note 1, TVA adopted Revenue from Contracts with Customers effective October 1, 2018, using the modified retrospective method of adoption, which does not require restatement of prior year reported results. As a result of the adoption of this standard, no cumulative effect adjustment was recorded. Additionally, comparative disclosures for 2018 operating results with the previous revenue recognition rules are not applicable as TVA’s revenue recognition has not materially changed as a result of the new standard.

Revenue from Sales of Electricity

TVA's revenue from contracts with customers is primarily derived from the generation and sale of electricity to its customers and is included in Revenue from sales of electricity on the Consolidated Statements of Operations. Electricity is sold to LPCs for distribution to their end use customers, directly served industrial companies, federal agencies, and others.

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LPC sales	Approximately 92 percent of TVA's revenue from sales of electricity are to LPCs, which then distribute the power to their customers using their own distribution systems. Power is delivered to each LPC at delivery points within the LPC's service territory. TVA recognizes revenue when the customer takes possession of the power at the delivery point. For power sales, the performance obligation to deliver power is satisfied in a series over time because the sales of electricity over the term of the customer contract are a series of distinct goods that are substantially the same and have the same pattern of transfer to the customer. TVA has no continuing performance obligations subsequent to delivery. Using the output method for revenue recognition provides a faithful depiction of the transfer of electricity as customers obtain control of the power and benefit from its use at delivery. Additionally, TVA has an enforceable right to consideration for energy delivered at any discrete point in time and will recognize revenue at an amount that reflects the consideration to which TVA is entitled for the energy delivered. The amount of revenue is based on contractual prices approved by the TVA Board. Customers are invoiced monthly for power delivered as measured by meters located at the delivery points. The net transaction price is offset by certain credits available to customers that are known at the time of billing. Credits are designed to achieve objectives of the TVA Act and include items such as hydro preference credits for residential customers of LPCs, economic development credits to promote growth in the Tennessee Valley, and interruptible credits allowing TVA to reduce industrial customer usage in periods of peak demand to balance system demand. Payments are typically due within approximately one month of invoice issuance.
Directly served customers	Directly served customers, including industrial customers, federal agencies, and other customers, take power for their own consumption. Similar to LPCs, power is delivered to a delivery point, at which time the customer takes possession and TVA recognizes revenue. For all power sales, the performance obligation to deliver power is satisfied in a series over time since the sales of electricity over the term of the customer contract are a series of distinct goods that are substantially the same and have the same pattern of transfer to the customer. TVA has no continuing performance obligations subsequent to delivery. Using the output method for revenue recognition provides a faithful depiction of the transfer of electricity as customers obtain control of the power and benefit from its use at delivery. Additionally, TVA has an enforceable right to consideration for energy delivered at any discrete point in time and will recognize revenue at an amount that reflects the consideration to which TVA is entitled for the energy delivered. The amount of revenue is based on contractual prices approved by the TVA Board. Customers are invoiced monthly for power delivered as measured by meters located at the delivery points. The net transaction price is offset by certain credits available to customers that are known at the time of billing. Examples of credits include items such as economic development credits to promote growth in the Tennessee Valley and interruptible credits allowing TVA to reduce industrial customer usage in periods of peak demand to balance system demand. Payments are typically due within approximately one month of invoice issuance.

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 ancillary goods or services.

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Disaggregated Revenue

During the three months ended December 31, 2018, revenues generated from TVA's electricity sales were $2.7 billion and accounted for virtually all of TVA's revenues. TVA's revenues by state for the three months ended December 31, 2018 and 2017 are detailed in the table below.

Operating Revenues By State
Three Months Ended December 31
(in millions)

	2018	2017
Alabama	$392	$361
Georgia	67	63
Kentucky	168	159
Mississippi	251	237
North Carolina	20	16
Tennessee	1,771	1,660
Virginia	12	12
Subtotal	2,681	2,508
Off-system sales	—	2
Revenue capitalized during pre-commercial plant operations[1]	—	(1)
Revenue from sales of electricity	2,681	2,509
Other revenues	44	40
Total operating revenues	$2,725	$2,549

Note
(1) Represents revenue capitalized during pre-commercial operations of $1 million at Allen CC for the three months ended December 31, 2017. See Note 1 — Pre-Commercial Plant Operations.

TVA's revenues by customer type for the three months ended December 31, 2018 and 2017 are detailed in the table below.

Operating Revenues by Customer Type
Three Months Ended December 31
(in millions)

	2018	2017
Revenue from sales of electricity		
Local power companies	$2,468	$2,316
Industries directly served	184	165
Federal agencies and other	29	29
Revenue capitalized during pre-commercial plant operations[1]	—	(1)
Revenue from sales of electricity	2,681	2,509
Other revenues	44	40
Total operating revenues	$2,725	$2,549

Note
(1) Represents revenue capitalized during pre-commercial operations of $1 million at Allen CC for the three months ended December 31, 2017. See Note 1 — Pre-Commercial Plant Operations.

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The number of LPCs with the contract arrangements described below, the revenues derived from such arrangements for the three months ended December 31, 2018, and the percentage of TVA's total operating revenues for the three months ended December 31, 2018 represented by these revenues are summarized in the table below.

TVA Local Power Company Contracts
At December 31, 2018

Contract Arrangements[1]	Number of LPCs	Sales to LPCs in the Three Months Ended December 31, 2018 (in millions)	Percentage of Total Operating Revenues in the Three Months Ended December 31, 2018
20-year termination notice	3	$ 33	1.2 %
15-year termination notice	11	124	4.5 %
12-year termination notice	1	6	0.2 %
10-year termination notice	52	852	31.2 %
6-year termination notice	1	12	0.5 %
5-year termination notice	86	1,441	52.9 %
Total	154	$ 2,468	90.5 %

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.

Contract Balances

Contract assets represent an entity's right to consideration in exchange for goods and services that the entity has transferred to customers. TVA does not have any material contract assets as of December 31, 2018.

Contract liabilities represent an entity's obligations to transfer goods or services to customers for which the entity has received consideration or the amounts that are due from the customers. These contract liabilities are primarily related to upfront consideration received prior to the satisfaction of the performance obligation.

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 15 years. TVA accounted for the prepayment as unearned revenue and reported the obligation to deliver power under this arrangement as Energy prepayment obligations and Current portion of energy prepayment obligations on the September 30, 2018 Consolidated Balance Sheet. TVA recognized approximately $100 million of noncash revenue in each year of the arrangement as electricity was delivered to MLGW based on the ratio of units of kilowatt hours delivered to total units of kilowatt hours under contract. At December 31, 2018, $1.5 billion had been recognized as noncash revenue on a cumulative basis during the life of the agreement, $10 million and $25 million of which was recognized as noncash revenue and a corresponding reduction in the balance of Energy prepayment obligations during the three months ended December 31, 2018 and 2017, respectively. Discounts to account for the time value of money, which were recorded as a reduction to electricity sales, amounted to $4 million and $11 million for the three months ended

December 31, 2018 and 2017, respectively.

Economic Development Incentives. Under certain economic development programs, TVA offers incentives to existing and potential power customers in certain business sectors that make multi-year commitments to invest in the Tennessee Valley. TVA records those incentives as reductions of revenue. For the incentives that are approved but are not paid, they are recorded in Accounts payable and accrued liabilities and Other long-term liabilities in the consolidated balance sheets. At December 31, 2018 and 2017, the outstanding unpaid incentives were $141 million and $137 million, respectively. Those incentives may be subject to clawback provisions if the customers fail to meet certain program requirements.

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16. Other Income (Expense), Net

Income and expenses not related to TVA's operating activities are summarized in the following table

Other Income (Expense), Net

	Three Months Ended December 31	
	2018	2017
Bellefonte deposit	$ 21	$ —
Interest income	$ 6	$ 6
External services	3	4
Miscellaneous	1	—
Gains (losses) on investments	(7)	2
Total other income (expense), net	$ 24	$ 12

During the three months ended December 31, 2018, other income (expense), net increased $12 million primarily driven by $21 million of other income related to a deposit liability received by TVA as a down payment on the sale of Bellefonte Nuclear Plant ("Bellefonte"). The purchaser, Nuclear Development, LLC, failed to fulfill the requirements of the sales contract with respect to obtaining NRC approval of the transfer of required nuclear licenses and payment of the remainder of the selling price before the November 30, 2018, closing date. The other income was partially offset by $7 million of unrealized losses on the SERP and DCP investments during the quarter.

17. Benefit Plans

TVA sponsors a qualified defined benefit plan ("pension plan") that covers most of its full-time employees hired before July 1, 2014, a qualified defined contribution plan ("401(k) plan") that covers most of its full-time employees, two unfunded post-retirement health care plans that provide for non-vested contributions toward the cost of eligible retirees' medical coverage, other post-employment benefits, such as workers' compensation, and the SERP. The pension plan and the 401(k) plan are administered by a separate legal entity, the TVA Retirement System ("TVARS"), which is governed by its own board of directors (the "TVARS Board").

The components of net periodic benefit cost and other amounts recognized as changes in regulatory assets for the three months ended December 31, 2018 and 2017, were as follows:

Components of TVA's Benefit Plans[(1)]

	For the Three Months Ended December 31			
	Pension Benefits		Other Post-Retirement Benefits	
	2018	2017	2018	2017
Service cost	$ 12	$ 14	$ 3	$ 4
Interest cost	123	118	4	5
Expected return on plan assets	(119)	(120)	—	—
Amortization of prior service credit	(25)	(25)	(6)	(6)
Recognized net actuarial loss	82	103	1	2
Total net periodic benefit cost as actuarially determined	73	90	2	5
Amount expensed (capitalized) due to actions of regulator	3	(14)	—	—

Total net periodic benefit cost	$76	$76	$ 2	$ 5

Note
(1) The components of net benefit cost other than the service cost component are included in Other net periodic benefit cost in the Consolidated Statements of Operations.

The 2019 TVA minimum required pension plan contribution is $300 million. TVA contributes $25 million per month to TVARS and as of December 31, 2018, had contributed $75 million. The remaining $225 million will be contributed by September 30, 2019. For the three months ended December 31, 2018, TVA also contributed $22 million to the 401(k) plan and $13 million (net of $1 million in rebates) to the other post-retirement plan. TVA expects to contribute $6 million to the SERP in 2019 in the second quarter of 2019.

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18. Contingencies and Legal Proceedings

Contingencies

Nuclear Insurance. Section 170 of the Atomic Energy Act, commonly known as the Price-Anderson Act, provides a layered framework of protection to compensate for liability claims of members of the public for personal injury and property damages arising from a nuclear event in the U.S. This protection consists of two layers of coverage:

- The primary level is private insurance underwritten by American Nuclear Insurers ("ANI") and provides public liability insurance coverage of $450 million for each operating reactor. If this amount is not sufficient to cover claims arising from an accident, the second level, Secondary Financial Protection, applies.

- Within the Secondary Financial Protection level, the owner of each nuclear reactor has a contingent obligation to pay a retrospective premium, equal to its proportionate share of the loss in excess of the primary level, regardless of proximity to the incident of fault, up to a maximum of approximately $138 million per reactor per incident. With TVA's seven reactors, the maximum total contingent obligation per incident is $963 million. This retrospective premium is payable at a rate currently set at approximately $20 million per year per incident per reactor. Currently, 99 reactors are participating in the Secondary Financial Protection program.

In the event that a nuclear power plant event results in third-party damages, the primary level provided by ANI combined with the Secondary Financial Protection would provide approximately $14.1 billion in coverage.

Federal law requires that each NRC power reactor licensee obtain property insurance from private sources to cover the cost of stabilizing or shutting down a reactor after an accident. TVA carries property, decommissioning, and decontamination
insurance from Nuclear Electric Insurance Limited ("NEIL"), totaling $5.1 billion for its licensed nuclear plants with up to $2.1 billion available for a loss at any one site. Some of this insurance may require the payment of retrospective premiums up to a
maximum of approximately $128 million.

TVA purchases accidental outage (business interruption) insurance for TVA's nuclear sites from NEIL. In the event that an accident covered by this policy takes a nuclear unit offline or keeps a nuclear unit offline, NEIL will pay TVA, after a waiting period, an indemnity (a set dollar amount per week) up to a maximum indemnity of $490 million per unit. This insurance policy may require the payment of retrospective premiums up to a maximum of approximately $44 million.

Workers' Compensation. The Federal Employees' Compensation Act ("FECA") governs liability to TVA employees for service-connected injuries. TVA purchases insurance that compensates TVA for certain FECA costs. In addition, TVA sponsors an Owner Controlled Insurance Program ("OCIP") that provides workers' compensation and liability insurance for a select group of contractors performing maintenance, modifications, outage, and new construction activities at TVA facilities. The insurance and OCIP are subject to the terms and conditions of the relevant policies including deductibles and 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.

Decommissioning Costs. TVA recognizes legal obligations associated with the future retirement of certain tangible long-lived assets related primarily to nuclear generating plants, coal-fired generating plants, hydroelectric generating plants/dams, transmission structures, and other property-related assets. See Note 10.

Nuclear Decommissioning. Provision for decommissioning costs of nuclear generating units is based on options prescribed by the NRC procedures to dismantle and decontaminate the facilities to meet the NRC criteria for license termination. At December 31, 2018, the estimated future decommissioning cost of $3.0 billion was included in AROs. The actual decommissioning costs may vary from the derived estimates because of, among other things, 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. Utilities that own and operate nuclear plants are required to use different procedures in calculating nuclear decommissioning costs under GAAP than those that are used in calculating nuclear decommissioning costs when reporting to the NRC. The two sets of procedures produce different estimates for the costs of decommissioning primarily because of differences in the underlying assumptions.

TVA maintains a NDT to provide funding for the ultimate decommissioning of its nuclear power plants. See Note 14 — Investment Funds. TVA monitors the value of its NDT and believes that, over the long term and before cessation of nuclear plant operations and commencement of decommissioning activities, adequate funds from investments and additional contributions, if necessary, will be available to support decommissioning. TVA's operating nuclear power units are licensed through various dates between 2033 - 2055, depending on the unit. It may be possible to extend the operating life of some of the units with approval from the NRC.

Non-Nuclear Decommissioning. The estimated future non-nuclear decommissioning ARO was $1.8 billion at December 31, 2018. 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 how costs will escalate with inflation. 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 selected closure methodology, changes in available technology, and changes in the cost of labor, materials, and equipment.

TVA maintains an ART to help fund the ultimate decommissioning of its non-nuclear power assets. See Note 14. Estimates involved in determining if additional funding will be made to the ART include inflation rate, rate of return projections on the fund investments, and the planned use of other sources to fund decommissioning costs.

Environmental Matters. TVA's power generation activities, like those across the utility industry and in other industrial sectors, are subject to federal, state, and local environmental laws and regulations. Major areas of regulation affecting TVA's activities include air quality control, water quality control, and management and disposal of solid and hazardous wastes. In the future, regulations in all of these areas are expected to become more stringent. Regulations are also expected to apply to new emissions and sources, with a particular emphasis on climate change, renewable generation, and energy efficiency.

TVA has incurred, and expects to continue to incur, substantial capital and operating and maintenance costs to comply with evolving environmental requirements primarily associated with, but not limited to, the operation of TVA's coal-fired generating units. Environmental requirements placed on the operation of TVA's coal-fired and other generating units will likely continue to become more restrictive over time. Litigation over emissions or discharges from coal-fired generating units is also occurring, including litigation against TVA. Failure to comply with environmental and safety laws can result in TVA being subject to enforcement actions, which can lead to the imposition of significant civil liability, including fines and penalties, criminal sanctions, and/or the shutting down of non-compliant facilities.

TVA estimates that compliance with existing and future Clean Air Act ("CAA") requirements (excluding greenhouse gas ("GHG") requirements) could lead to costs of approximately $160 million from 2019 to 2023, which include future clean air controls, existing controls capital projects, and air operations and maintenance projects. TVA also estimates additional expenditures of $1.1 billion from 2019 to 2023 relating to TVA's CCR conversion program, not including costs related to any new requirements related to the Gallatin CCR facilities lawsuits, as well as expenditures of approximately $442 million from 2019 to 2024 relating to compliance with Clean Water Act requirements. Future costs could differ from these estimates if new environmental laws or regulations become applicable to TVA or the facilities it operates, or if existing environmental laws or regulations are revised or reinterpreted. There could also be costs that cannot reasonably be predicted at this time, due to uncertainty of actions, that could increase these estimates.

Liability for releases and cleanup of hazardous substances is primarily regulated by the federal Comprehensive Environmental Response, Compensation, and Liability Act, 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 operations at some facilities have resulted in contamination that TVA is addressing. At December 31, 2018, and September 30, 2018, TVA's estimated liability for cleanup and similar environmental work for those sites for which sufficient information is available to develop a cost estimate was approximately $31 million and $12 million, respectively, on a non-discounted basis, and was included in Accounts payable and accrued liabilities and Other long-term liabilities on the Consolidated Balance Sheets.

Potential Liability Associated with Workers’ Exposure to CCR Materials. In response to the 2008 ash spill at 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 United States District Court for the Eastern District of Tennessee (“Eastern District”) by employees of a contractor involved in the cleanup and family members of some of the employees. The plaintiffs

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, among other issues, general causation and the second determining specific causation and damages. 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 list of medical conditions, ranging from hypertension to cancer. On January 11, 2019, the district court referred the parties to mediation. Depending on the outcome of mediation, the litigation will proceed to the second phase on the question of whether Jacobs's failures did in fact cause the plaintiffs' alleged injuries and damages. While TVA is not a party to this litigation, TVA could be contractually obligated to reimburse Jacobs for some amounts that Jacobs is required to pay as a result of this litigation. Further, TVA will continue monitoring this litigation to determine whether this or similar cases could have broader implications for the utility industry.

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 a catastrophic event or otherwise.

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General. At December 31, 2018, TVA had accrued $17 million of probable losses with respect to Legal Proceedings. Of the accrued amount, $12 million is included in Other long-term liabilities and $5 million is included in Accounts payable and accrued liabilities. 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.

Environmental Agreements. In April 2011, TVA entered into two substantively similar agreements, one with the Environmental Protection Agency ("EPA") and the other with Alabama, Kentucky, North Carolina, Tennessee, and three environmental advocacy groups: the Sierra Club, the National Parks Conservation Association, and Our Children's Earth Foundation (collectively, the "Environmental Agreements"). They became effective in June 2011. Under the Environmental Agreements, TVA committed to (1) retire on a phased schedule 18 coal-fired units with a combined summer net dependable capability of 2,200 MW, (2) control, convert, or retire additional coal-fired units with a combined summer net dependable capability of 3,500 MW, (3) comply with annual, declining emission caps for sulfur dioxide ("SO_2") and nitrogen oxide, (4) invest $290 million in certain TVA environmental projects (of which TVA had spent approximately $277 million as of December 31, 2018), (5) provide $60 million to Alabama, Kentucky, North Carolina, and Tennessee to fund environmental projects, and (6) pay civil penalties of $10 million. In exchange for these commitments, most past claims against TVA based on alleged New Source Review and associated violations were waived and cannot be brought against TVA. Future claims, including those for sulfuric acid mist and GHG emissions, can still be brought against TVA, and claims for increases in particulates can also be pursued at many of TVA's coal-fired units. Additionally, the Environmental Agreements do not address compliance with new laws and regulations or the cost associated with such compliance.

The liabilities related to the Environmental Agreements are included in Accounts payable and accrued liabilities and Other long-term liabilities on the December 31, 2018 Consolidated Balance Sheet. In conjunction with the approval of the
Environmental Agreements, the TVA Board determined that it was appropriate to record TVA's obligations under the Environmental Agreements as regulatory assets, and they are included as such on the December 31, 2018 Consolidated
Balance Sheet and will be recovered in rates in future periods. TVA has substantially completed the requirements in the
Environmental Agreements related to retiring coal-fired units or installing controls on such units.

Cases Involving Gallatin Fossil Plant CCR Facilities. TVA is a party in two lawsuits relating to alleged releases of waste materials from the CCR facilities at Gallatin. See Note 8 — Background — Lawsuit Brought by TDEC and — Lawsuit Brought by TSRA and TCWN.

Consent Decree Involving Colbert Fossil Plant. In May 2013, the Alabama Department of Environmental Management
("ADEM") and TVA entered into a consent decree concerning alleged violations of the Alabama Water Pollution Control Act. The
consent decree required, among other things, that TVA continue remediation efforts TVA had begun prior to the suit being filed
and stop using an unlined landfill after a lined landfill is approved and constructed. TVA also paid $150,000 to Alabama under this 2013 consent decree. In August 2018, the parties agreed to amend the consent decree to deal with groundwater issues identified after TVA published groundwater monitoring reports in accordance with the CCR rule. The amended consent decree requires TVA to investigate the nature and extent of any groundwater contamination, develop and implement a remedy, provide semiannual status reports to ADEM, and remedy any seeps identified during inspections. TVA also paid $100,000 to Alabama under the amended consent decree.

Case Involving Tennessee River Boat Accident. On July 23, 2015, plaintiffs filed suit in the United States District Court
for the Northern District of Alabama, seeking recovery for personal injuries sustained when the plaintiffs' boat struck a TVA
transmission line which was being raised from the Tennessee River during a repair operation. The district court dismissed the
case, finding that TVA's exercise of its discretion as a governmental entity in deciding how to carry out the operation barred any
liability for negligence. In August 2017, the United States Court of Appeals for the Eleventh Circuit affirmed the decision. The
plaintiffs petitioned the U.S. Supreme Court ("Supreme Court") for review of the decision, arguing that the provision of the TVA
Act which allows suit to be brought against TVA does not allow TVA to claim immunity for discretionary actions. On September
27, 2018, the Supreme Court granted the plaintiffs' petition to review the case. On January 14, 2019, oral argument was held before the Supreme Court.

Case Involving Bellefonte Nuclear Plant. On November 30, 2018, Nuclear Development, LLC filed suit against TVA in the United States District Court for the Northern District of Alabama. The plaintiff alleges that TVA breached its agreement to sell Bellefonte to the plaintiff. The plaintiff seeks, among other things, (1) an injunction requiring TVA to maintain Bellefonte and the associated NRC permits until the case is concluded, (2) an order compelling TVA to complete the sale of Bellefonte to the plaintiff, and (3) if the court does not order TVA to complete the sale, monetary damages in excess of $30 million. On December 26, 2018, Nuclear Development, LLC and TVA filed a joint stipulation with the court. Under the stipulation, Nuclear Development, LLC withdrew its request for an expedited hearing on its injunction in exchange for TVA's agreement to continue to maintain Bellefonte in accordance with the NRC permits and to give Nuclear Development, LLC and the court five days prior notice of any filing by TVA to terminate the permits or sell the site.

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ITEM 2. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS
(Dollars in millions except where noted)

Management's Discussion and Analysis of Financial Condition and Results of Operations ("MD&A") explains the results of operations and general financial condition of the Tennessee Valley Authority ("TVA"). The MD&A should be read in conjunction with the accompanying unaudited consolidated financial statements and TVA's Annual Report on Form 10-K for the fiscal year ended September 30, 2018 (the "Annual Report").

Executive Overview

TVA's net income for the three months ended December 31, 2018, was $423 million, as compared with net income of $288 million for the same period of the prior year. As is often the case for electric utilities, weather is a primary driver of TVA's sales and revenue. TVA's service territory experienced colder than normal weather during the three months ended December 31, 2018, resulting in higher energy sales compared to the three months ended December 31, 2017, which experienced relatively normal weather. Revenue from the sales of electricity increased $172 million for the three months ended December 31, 2018, as compared to the same period of the prior year. This was primarily due to the higher energy sales and the base rate adjustment that became effective October 1, 2018.

Fuel and purchased power expense increased $43 million for the three months ended December 31, 2018, as compared to the same period of the prior year. This was primarily due to an increase in purchased power utilized to meet the increased demand for the period. Operating and maintenance expense increased $99 million for the three months ended December 31, 2018, as compared to the same period of the prior year. This was primarily driven by accelerated recovery of the regulatory asset for Environmental cleanup costs related to the Kingston ash spill in accordance with the TVA Board's ratemaking authority and additional planned nuclear outage days, which increased outage expense.
During the first quarter of 2019, TVA completed physical work on the second phase of the extended power uprate ("EPU") project at Browns Ferry Nuclear Plant ("Browns Ferry"). Power ascension testing is currently underway. TVA plans to begin the final phase of the project in the spring of 2019.
TVA continues 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 $4.3 billion in investments and more than 25,000 jobs created or retained during the first quarter of 2019.
During the first quarter of 2019, TVA implemented 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. 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. TVA continues to work with local power companies to provide flexibility to meet future changing needs of consumers.
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 continues to update the IRP, which 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. TVA is also conducting economic analyses of all its generating assets, considering load outlook, economic benefits and costs, performance, and environmental and social impacts. TVA has prepared Environmental Assessments ("EA") pursuant to National Environmental Policy Act ("NEPA") at certain plants, which will help inform plans for future power supply.

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Results of Operations

Sales of Electricity

The following chart compares TVA's sales of electricity for the three months ended December 31, 2018 and 2017:
Sales of Electricity
Three Months Ended
December 31
(millions of kWh)
Note
(1) Includes approximately 20 million kilowatt hours ("kWh") of pre-commercial generation for the three months ended December 31, 2017. See Note 1 — Pre-Commercial Plant Operations.

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.

	Degree Days						
	Variation from Normal						Variation from Prior Period
	2018 Actual	Normal	Percent Variation	2017 Actual[(1)]	Normal[(1)]	Percent Variation	Percent Change
Heating Degree Days							
Three Months Ended December 31	1,351	1,240	9.0 %	1,268	1,240	2.3 %	6.5 %
Cooling Degree Days							
Three Months Ended December 31	123	54	127.8 %	106	54	96.3 %	16.0 %
Total Degree Days							
Three Months Ended December 31	1,474	1,294	13.9 %	1,374	1,294	6.2 %	7.3 %

Note
(1) The prior period degree day information has been adjusted in order to incorporate a change in TVA's current calculation of this information. Every five years this calculation is updated in order to incorporate the current 15-year period of weather history. The most recent update, to incorporate weather history for CYs 2001-2015, occurred during the first quarter of 2019.

Sales of electricity increased approximately two percent for the three months ended December 31, 2018, as compared to the same period of the prior year, primarily due to increased sales volume for LPCs driven predominantly by a seven percent increase in total degree days. During November 2018, TVA recorded its second highest peak power demand for the month of

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November at 26,714 megawatts with a system average temperature of 24 degrees Fahrenheit. In addition to the increased sales volume for LPCs, sales to industries directly served increased slightly, particularly in the polysilicon sector.

Financial Results

The following table compares operating results for the three months ended December 31, 2018 and 2017:
Summary Consolidated Statements of Operations

	Three Months Ended December 31		
	2018	2017	Percent Change
Operating revenues	$2,725	$2,549	6.9 %
Operating expenses	1,960	1,888	3.8 %
Operating income	765	661	15.7 %
Other income, net	24	12	100.0 %
Other net periodic benefit cost	64	63	1.6 %
Interest expense, net	302	322	(6.2)%
Net income	$423	$288	46.9 %

Operating Revenues. Operating revenues for the three months ended December 31, 2018 and 2017, consisted of the following:
Operating Revenues
Three Months Ended
December 31
Note
(1) Excludes a contra-revenue amount of approximately $1 million representing revenue capitalized during pre-commercial operations for the three months ended December 31, 2017. See Note 1 — Pre-Commercial Plant Operations.

TVA's current rate structure provides pricing signals intended to signal higher cost periods to serve its customers and capture a portion of TVA’s fixed costs in fixed charges. The structure includes three base revenue components: time of use demand charges, time of use energy charges, and a grid access charge ("GAC"). The demand charges are based upon the customer's peak monthly usage and increases as the peak increases, and the energy charges are based on time differentiated kWh used by the customer. Both of these components can be significantly impacted by weather. The GAC, which was implemented in October 2018, captures a portion of fixed costs and will be offset by a corresponding reduction to the energy rates. The GAC will also reduce impact of weather variability to the overall rate structure. Recognizing the need for flexibility, all LPCs were presented with the option to implement the GAC in October 2018 or defer the implementation until October 2019.

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Seventy-nine LPCs elected to implement in October 2018, while the remaining 75 have elected to implement wholesale changes in October 2019. In addition to base revenues, 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.

The changes in revenue components for the three months ended December 31, 2018, compared to the three months ended December 31, 2017, are summarized below:

	Three Months Ended December 31		
	2018	2017	Change
Base revenue			
Energy revenue	$1,140	$1,198 [1]	$ (58)
Demand revenue	858	783	75
Grid access charge	114	—	114
Other charges and credits[2]	(138)	(144)	6
Total base revenue	1,974	1,837	137
Fuel cost recovery	707	670	37
Off-system sales	—	2	(2)
Revenue from sales of electricity	2,681	2,509	172
Other revenue	44	40	4
Total operating revenues	$2,725	$2,549	$ 176

Notes
(1) Includes the impact of revenue capitalized during pre-commercial operations of approximately $1 million for the three months ended December 31, 2017. See Note 1 — Pre-Commercial Plant Operations.
(2) Includes economic development credits to promote growth in the Tennessee Valley, hydro preference credits for residential customers of LPCs, and interruptible credits allowing TVA to reduce industrial customer usage in periods of peak demand to balance system demand. See Note 15 — Revenue from Sales of Electricity.

Operating revenues increased $176 million for the three months ended December 31, 2018, as compared to the same period of the prior year, primarily due to a $137 million increase in base revenue. The $137 million increase in base revenue was driven by an increase of $96 million attributable to higher effective rates during the three months ended December 31, 2018, as compared to the same period of the prior year, resulting from the base rate adjustment that became effective October 1, 2018. In addition, $40 million of the increase in base revenue was attributable to higher sales volume during the three months ended December 31, 2018, as compared to the same period of the prior year. During November 2018, TVA recorded its second highest peak power demand for the month of November at 26,714 megawatts with a system average temperature of 24 degrees Fahrenheit. Further, fuel cost recovery revenues increased $37 million, driven by a $21 million increase attributable to higher fuel rates and a $16 million increase attributable to higher 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 less nuclear generation offset by increased purchased power.

Operating Expenses. Operating expense components as a percentage of total operating expenses for the three months ended December 31, 2018 and 2017, consisted of the following:

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The following table shows TVA's net generation and purchased power by generating source for the periods indicated:

Power Supply from TVA-Operated Generation Facilities and Purchased Power

	Three Months Ended December 31					
	2018		2017			
	kWh (millions)	Percent of Power Supply	kWh (millions)	Percent of Power Supply	Change	Percentage Change
Coal-fired	6,480	17 %	7,541	20 %	(1,061)	(14)%
Nuclear	13,810	36 %	16,154	42 %	(2,344)	(15)%
Hydroelectric	4,809	12 %	3,387	9 %	1,422	42 %
Natural gas and/or oil-fired(1)	6,611	17 %	6,037	16 %	574	10 %
Total TVA-operated generation facilities(2)	31,710	82 %	33,119	87 %	(1,409)	(4)%
Purchased power (non-renewable)(3)	5,018	13 %	2,877	8 %	2,141	74 %
Purchased power (renewable)(4)	1,909	5 %	1,927	5 %	(18)	(1)%
Total purchased power	6,927	18 %	4,804	13 %	2,123	44 %
Total power supply	38,637	100 %	37,923	100 %	714	2 %

Notes
(1) The natural gas and/or oil-fired amount includes 20 million kWh of pre-commercial generation at the Allen Combined Cycle Plant for the three months ended December 31, 2017. See Note 1 — Pre-Commercial Plant Operations.
(2) Generation from TVA-owned renewable resources (non-hydro) is less than one percent for all periods shown and therefore is not represented in the table above.
(3) 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 1,028 million kWh and 1,089 million kWh for the three months ended December 31, 2018 and 2017, respectively.
(4) Purchased power (renewable) includes power purchased from the following renewable sources: hydroelectric, solar, wind, and cogeneration.

Fuel

Fuel expense decreased $34 million for the three months ended December 31, 2018, as compared to the same period of the prior year. This was primarily due to a four percent decrease in TVA-owned generation, contributing $20 million to the decrease. Additionally, variances in fuel rate recovery contributed $14 million to the decrease.

Purchased Power

Purchased power expense increased $77 million for the three months ended December 31, 2018, as compared to the same period of the prior year. This was primarily due to an increase in volume of $99 million driven by increased demand, as TVA experienced its second highest power peak for the month of November during November 2018 while in a period of lower TVA-owned generation availability driven by planned outage timing. Partially offsetting this increase was a decrease of $22 million in the price of the purchased power and variances in fuel rate recovery.

Operating and Maintenance

Operating and maintenance expense increased $99 million for the three months ended December 31, 2018, as compared to the same period of the prior year. This was primarily driven by an increase of $54 million due to accelerated recovery of the regulatory asset for Environmental cleanup costs related to the Kingston ash spill in accordance with the TVA Board's ratemaking authority. Additionally, there was an increase in planned nuclear outage days which increased outage expense by $50 million.

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Depreciation and Amortization

Depreciation and amortization expense decreased by $78 million for the three months ended December 31, 2018, as compared to the same period of the prior year. This was primarily driven by $58 million of prior year accelerated amortization of 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. Additionally, this decrease was driven by $26 million due to the retirements of certain units at Allen Fossil Plant and Johnsonville Fossil Plant. Partially offsetting this decrease was an increase of approximately $6 million from new additions to Completed plant.

Tax Equivalents

Tax equivalents expense increased $8 million for the three months ended December 31, 2018, as compared to the same period of the prior year. This change is primarily driven by an increase in TVA's overall revenue in 2018, which is used as the basis for calculating tax equivalent expense.

Interest Expense. Interest expense and interest rates for the three months ended December 31, 2018 and 2017, were as follows:

Interest Expense and Rates

	Three Months Ended December 31		
	2018	2017	Percent Change
Interest expense[1]	$302	$322	(6.2)%
Average blended debt balance[2]	$23,670	$25,263	(6.3)%
Average blended interest rate[3]	4.88 %	4.94 %	(1.2)%

Notes

(1) Total 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.

Total interest expense decreased $20 million for the three months ended December 31, 2018, as compared to the same period of the prior year. This was primarily driven by a decrease of $19 million due to lower average balances on long-term debt and a decrease of $9 million due to lower average rates on long-term debt. Partially offsetting these decreases was an increase of $6 million in short-term interest primarily due to higher average rates on short-term debt.

Other Income (Expense), Net. During the three months ended December 31, 2018, other income (expense), net increased $12 million primarily driven by $21 million of other income related to a deposit liability received by TVA as a down payment on the sale of Bellefonte Nuclear Plant ("Bellefonte"). The purchaser, Nuclear Development, LLC, failed to fulfill the requirements of the sales contract with respect to obtaining NRC approval of the transfer of required nuclear licenses and payment of the remainder of the selling price before the November 30, 2018, closing date. See Key Initiatives and Challenges
— Surplus Property — Bellefonte Nuclear Plant for additional details. The other income was partially offset by $7 million of unrealized losses on the SERP and DCP investments during the first quarter of 2019.

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

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revolving credit facilities totaling $2.7 billion, and proceeds from other financings. See Note 11 — Credit Facility Agreements. Other financing arrangements may include sales of receivables, loans, and other assets.

The TVA Act authorizes TVA to issue bonds, notes, or other evidences of indebtedness (collectively, "Bonds") in an amount not to exceed $30.0 billion outstanding at any time. Power bonds outstanding, excluding unamortized discounts and premiums and net exchange gains from foreign currency transactions, at December 31, 2018, were $22.8 billion (including current maturities). 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 7), 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 7, and Note 11 for additional information.

Debt Securities. TVA's Bonds are not obligations of the United States, and the United States 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 December 31, 2018, the average maturity of long-term power bonds was 16.83 years, and the average interest rate was 4.65 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 December 31, 2018. TVA also had secured notes outstanding at December 31, 2018, that were assumed in asset acquisitions and business combinations in prior years. See Lease Financings below, Note 7, and Note 11 for additional information.

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

	At December 31, 2018	Three Months Ended December 31, 2018	At December 31, 2017	Three Months Ended December 31, 2017
Gross Amount Outstanding (at End of Period) or Average Gross Amount Outstanding (During Period)				
Discount Notes	$ 2,335	$ 1,999	$ 2,722	$ 2,084
Weighted Average Interest Rate				
Discount Notes	2.338 %	2.270 %	1.246 %	1.110 %
Maximum Month-End Gross Amount Outstanding (During Period)				
Discount Notes	N/A	$ 2,390	N/A	$ 2,722

Lease Financings. TVA has entered into certain leasing transactions with special purpose entities ("SPEs") to obtain third-party financing for 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 7 and Note 11 for information about TVA's lease financing activities. During 2017 and 2016, TVA acquired 100 percent of the equity interests in certain special purpose entities created for the purpose of facilitating lease financing. TVA may seek to enter into similar arrangements in the future.

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Summary Cash Flows

A major source of TVA's liquidity is operating cash flows resulting from the generation and sale of electricity. Cash, cash equivalents, and restricted cash were $324 million at both December 31, 2018 and 2017. A summary of cash flow components for the three months ended December 31, 2018 and 2017, 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.

Net cash flows provided by operating activities decreased $124 million for the three months ended December 31, 2018, as compared to the same period of the prior year, primarily driven by timing of payments and increased operating and maintenance expense resulting from increased planned nuclear outage days. This was partially offset by increased base revenue, driven by colder than normal weather and the base rate adjustment that became effective October 1, 2018, and lower interest paid.

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.

Net cash flows used in investing activities decreased $27 million for the three months ended December 31, 2018, as compared to the same period of the prior year driven by the completion of the Allen Combined Cycle Plant ("Allen CC") and clean air controls projects at Gallatin Fossil Plant ("Gallatin") and Shawnee Fossil Plant ("Shawnee"). With the prior year 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.

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.

Net cash flows provided by financing activities increased $86 million for the three months ended December 31, 2018, as compared to the same period of the prior year. TVA redeemed $1.0 billion of power bonds during the first quarter of 2019 and $698 million during first quarter of 2018. To assist in funding these maturities, TVA issued additional short-term debt of $1.1 billion during the first quarter of 2019 and $717 million during the first quarter of 2018. Lower net cash flow from operating activities in the first quarter of 2019 resulted in the need for net debt issuances to maintain targeted cash balance levels during the first quarter of 2019.

Contractual Obligations

TVA has obligations and commitments to make future payments under certain contracts. During the three months ended December 31, 2018, there were no material changes in TVA's contractual obligations outside of the ordinary course of business. TVA's contractual obligations are discussed in Item 7, Management's Discussion and Analysis of Financial Condition and Results of Operations — Liquidity and Capital Resources and Note 21 of the Notes to Consolidated Financial Statements in the Annual Report.

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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 December 31, 2018, TVA had spent $33 million on installation of the fiber optic lines and expects to spend an additional $267 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.

Renewable Purchased Power Agreements. In efforts to meet customer preferences and requirements for cleaner and greener energy, TVA has entered into certain purchased power agreements (“PPAs”) with renewable resource providers during 2019. The agreements are the latest to stem from TVA’s 2017 request for proposals. During the first quarter of 2019, TVA signed four solar PPAs for 674 MW of solar generation at sites in Tennessee and Alabama. These four solar projects are expected to come online in 2021. TVA will procure the renewable energy and sell the Renewable Energy Certificates to specific customers, allowing TVA to increase its renewable energy portfolio without additional costs to other Valley customers. These agreements are part of progressive partnerships that align the core values of TVA and the public power model with TVA's customers' desire for renewable energy.

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

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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 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 is 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 objectives and programs for each focus area and a flexible approach for long-term planning. These changes align with TVA's mission and will help TVA be better equipped to prioritize funding plans and create efficiencies in business planning and stewardship project implementation. TVA anticipates that the draft Supplemental Environmental Impact Statement ("SEIS") to analyze the potential effects of proposed changes and the draft of the Natural Resource Plan will be available for public review and comment in May 2019. The final SEIS and updated NRP are expected to be published in early 2020.

Generation Resources

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 four dams.

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 Nuclear Regulatory Commission ("NRC") for Watts Bar Nuclear Plant ("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 Nuclear Plant ("Sequoyah") Units 1 and 2 in 2019. TVA will subsequently address conditions at Browns Ferry as needed. TVA is deferring the decision on the need for additional modifications until after the modeling work is complete.
As of December 31, 2018, TVA had spent $159 million on the modifications and improvements related to extreme flooding preparedness and expects to spend up to an additional $21 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 addressed 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 completed ultrasonic testing for Unit 1 in the third quarter of 2018 and Unit 2 in the first quarter of 2019. Results for both units were within acceptable standards. Retesting will not be required until 2028.

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. In June 2018, the NRC conducted a follow-up inspection at Watts Bar and noted some improvement. 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. In August 2018, the NRC documented a chilled work environment in an additional department. 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 Sequoyah 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. During the first quarter of 2019, TVA completed physical work on the second phase of the EPU project at Browns Ferry. Power ascension testing is currently underway. TVA plans to begin the final phase of the project in the spring of 2019. Full EPU power is expected to be achieved following the noted outages and extensive power ascension testing for each unit. The project involves 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.

Optimum Energy Portfolio. TVA must continuously evaluate all generating assets to ensure an optimum energy portfolio that provides safe, clean, and reliable power while maintaining flexibility and fiscal responsibility to the people of the Tennessee Valley. During its August 2018 meeting, the TVA Board approved a plan to take a closer look at some of the plants in TVA’s fleet. TVA is currently performing assessments of Bull Run Fossil Plant ("Bull Run") and Paradise Fossil Plant ("Paradise"). These assessments include transmission resiliency, fuel security, financial considerations, and NEPA EAs. These studies will provide the TVA Board with information to consider when determining the future status of the plants.

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 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 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.

On January 25, 2019, TVA approved a change in the preferred closure method for the Allen West Impoundment from closure in place to closure by removal. The cost impact of changing the closure method is expected to result in an increase of approximately $31 million to the non-nuclear AROs during the second quarter of 2019. The method of final closure for this impoundment will depend on various factors, including the completion of all environmental reviews.

Groundwater monitoring. Compliance with the EPA's CCR rule (the "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 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 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 published 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 TVA must cease use 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.

With the exception of the impoundments at Gallatin, the CCR Conversion Program is currently scheduled to be completed by 2023, although this schedule may change depending on the final closure method selected for each facility. 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 petitioned for a rehearing, which was subsequently denied. The plaintiffs have 90 days from January 17, 2019, to request review by the United States Supreme Court. 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 December 31, 2018, TVA had spent approximately $1.5 billion on its CCR Conversion Program. TVA expects to spend an additional $1.1 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.

Potential Liability Associated with Workers' Exposure to CCR Materials. In response to the 2008 ash spill at 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 United States District Court for the Eastern District of Tennessee ("Eastern District") by employees of a contractor involved in the cleanup and family members of some of the employees. The plaintiffs 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, among other issues, general causation and the second determining specific causation and damages. 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 list of medical conditions, ranging from hypertension to cancer. On January 11, 2019, the district court referred the parties to mediation. Depending on the outcome of mediation, the litigation will proceed to the second phase on the question of whether Jacobs's failures did in fact cause the plaintiffs' alleged injuries and damages. While TVA is not a party to this litigation, TVA could be contractually obligated to reimburse Jacobs for some amounts that Jacobs is required to pay as a result of this litigation. Further, TVA will continue monitoring this litigation to determine whether this or similar cases could have broader implications for the utility industry.

River Management. Above normal rainfall and runoff has continued to help 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 during the first quarter of 2019 were 153 percent and 212 percent of normal, respectively. TVA used flood storage capacity in large tributary reservoirs during the first quarter to reduce flows coming into the Tennessee River and ultimately reduce flood levels at key locations across the Tennessee River Valley.

Small Modular Reactors. TVA submitted an Early Site Permit Application ("ESPA") for review by the NRC in May 2016. The progress of the NRC's review of the ESPA is consistent with the NRC's published schedule. The ESPA is based on the

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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.

Seismic Activity. The TVA service area experienced several earthquakes during the first quarter of 2019. Inspections were completed and no impacts to the TVA generating facilities or dams were identified. TVA's generating system continued to operate safely.

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 preventative and ongoing maintenance as a part of this safety program.

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 December 31, 2018, TVA had spent $137 million related to this project and expects to spend an additional $320 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 December 31, 2018, TVA had spent $12 million related to this project and expects to spend an additional $137 million.

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 to November 30, 2018. Nuclear Development, LLC, failed to obtain NRC approval of the transfer of the Bellefonte nuclear licenses. TVA determined that the Atomic Energy Act required that this approval be obtained before closing. TVA declined to provide a second extension of the purchase agreement. On November 30, 2018, Nuclear Development, LLC, filed suit against TVA in the United States District Court for the Northern District of Alabama. See Note 18 — Legal Proceedings for a discussion of the lawsuit filed by Nuclear Development, LLC.

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

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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.

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.

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 initiated 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 10.

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 reduced wholesale energy rates for Standard Service and introduced 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

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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.

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.

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 in the Annual Report.

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 November 2018, FERC approved a revision to the standard. TVA has 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.

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 1995 levels and emissions of sulfur dioxide ("SO_2") have been reduced by 98 percent below 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 2005 levels. This includes 3,049 tons from units rated at less than 25 MWs. To remain consistent and provide clear information and to align with the EPA’s reporting requirements, TVA intends to continue to report CO_2 emissions on a calendar year basis.

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Clean Air Act

Mercury and Air Toxics Standards for Electric Utility Units. The U.S. Court of Appeals for the District of Columbia Circuit ("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 ("HAP") 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 (the "Supplemental Finding") in April 2016. Several groups filed petitions with the D.C. Circuit challenging the Supplemental Finding. In April 2017, the EPA, under the new Administration, announced that it was reviewing the Supplemental Finding. On December 27, 2018, the EPA released a proposed rule to replace the Supplemental Finding with a new finding that it is not appropriate and necessary to regulate HAP emissions from steam electric utilities. However, the EPA also proposed that the new finding would not remove the source category from regulation under Section 112 of the Clean Air Act ("CAA") and would not rescind the MATS requirements. Additionally, the EPA proposed to find that further restrictions on HAP emissions are not warranted upon conducting a residual risk and technology review for this source category. Until a final rule is issued, specific impacts to TVA cannot be determined; however, as proposed, the rule would not change TVA’s MATS compliance requirements or strategy.

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 National Ambient Air Quality Standards (“NAAQS”) and the CY 1997 and CY 2006 fine particle NAAQS by reducing power plant emissions that contribute to pollution in other states. In September 2016, the EPA issued an update to CSAPR (the "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. On December 6, 2018, the EPA finalized its determination that the CSAPR Update Rule fully addresses the obligations for 22 states in the eastern U.S. under the good neighbor provision of the CAA regarding interstate pollution transport for the 2008 ozone NAAQS. Tennessee and Kentucky, states in which TVA operates coal-fired units, are among the states subject to the CSAPR Update Rule.

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 a notice in the Federal Register on January 19, 2017, proposing to deny the petition on the basis that the CAA provides other options to address the impact of interstate air pollution. These options include the use of the “good neighbor provision” in Section 110 of the CAA and the authority granted states under Section 126 of the CAA to petition the EPA Administrator to set emission limits. 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.

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 NOx emissions
from sources emitting at least 400 tons of NOx in CY 2017 from nine states including Kentucky. The New York petition requests
that the EPA require daily NOx 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 NOx emissions are already limited by the CSAPR
Update Rule and are declining, and current EPA modeling projects no additional requirements to reduce Kentucky NOx
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.

Proposed Revisions to New Source Performance Standards for Greenhouse Gas Emission Standards for Electric Generating Units. On December 6, 2018, the EPA proposed revisions to the GHG emission standards for new, modified, and reconstructed electric utility generating units that were finalized by the EPA on October 23, 2015. For coal-fired units, the EPA

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proposes to revise the current new source standards by eliminating carbon capture and storage technology from what constitutes standards of performance that reflect the best system of emission reduction. The resulting limits are less stringent and can be met by modern coal-fired units (e.g., supersaturated steam generators) in combination with best operating practices, but without carbon capture and sequestration. The EPA is not proposing to revise the standard for gas-fired units. If finalized as proposed, the revisions are not expected to significantly impact TVA since TVA does not currently plan to construct, modify, or reconstruct any coal-fired units.

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 NOx 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 NOx 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 NOx 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.

Cleanup of Solid and Hazardous Wastes

Coal Combustion Residuals. 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 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 CCR Rule that allow for continued operation of unlined impoundments in certain situations and that exempt inactive impoundments at inactive facilities from regulation. Subsequent to the decision, the EPA filed a motion asking the court to voluntarily remand the rule finalized in July 2018 without vacating it. The EPA's rationale for seeking a remand is that more time is needed to complete a new rulemaking to establish revised timelines for unlined impoundments to initiate closure and that such rulemaking will necessitate reexamining the October 31, 2020, closure deadline for some unlined impoundments. As a result of these developments, it is not possible to predict changes to the CCR Rule and potential impacts on TVA.

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 Part I, Item 2, 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 — Background — Lawsuit Brought by TDEC and Lawsuit Brought by TSRA and TCWN.

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Estimated Required Environmental Expenditures

The following table contains information about TVA's current estimates of expenditures for projects related to environmental laws and regulations:

Estimated Potential Environmental Expenditures[1][2]
At December 31, 2018
(in millions)

	Remaining 2019	2020	Thereafter[3]	Total
Coal combustion residual conversion program[4]	$ 278	$318	$ 505	$1,101
Clean air control projects[5]	27	27	106	160
Clean Water Act requirements[6]	35	33	374	442

Notes
(1) These estimates are subject to change as additional information becomes available and as regulations change.
(2) These estimates include $247 million, $237 million, and $564 million for the remainder of 2019, 2020, and thereafter, respectively, in capital expenditures.
(3) See Note 18 — 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 $141 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 Part I, Item 2, Management's Discussion and Analysis of Financial Condition and Results of Operations — Key Initiatives and Challenges — 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 (i.e., Section 316(b) and effluent limitation guidelines for steam electric power plants).

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 its activities, as a result of catastrophic events or otherwise. At December 31, 2018, TVA had accrued $17 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 18 — Legal Proceedings, which discussions are incorporated into this Part I, Item 2, Management's Discussion and Analysis of Financial Condition and Results of Operations.

Off-Balance Sheet Arrangements

At December 31, 2018, TVA had no off-balance sheet arrangements.

Critical Accounting Policies and 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 financial statements. Although the financial statements are prepared in conformity with accounting principles generally accepted in the U.S., 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 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 would materially impact TVA's financial condition, results of operations, or cash flows. TVA's critical accounting policies are discussed in Item 7, Management's Discussion and Analysis of Financial Condition and Results of Operations — Critical Accounting Policies and Estimates and Note 1 of the Notes to Consolidated Financial Statements in the Annual Report.

New Accounting Standards and Interpretations

For a discussion of new accounting standards and interpretations, see Note 2, which discussion is incorporated into this Part I, Item 2, Management's Discussion and Analysis of Financial Condition and Results of Operations.

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.

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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.

Other Matters

Corporate Governance

On October 1, 2018, Michael D. Skaggs, previously Executive Vice President, Operations, was promoted to Executive Vice President and Chief Operating Officer.

On November 14, 2018, William D. Johnson, TVA’s President and Chief Executive Officer, informed the TVA Board of his intention to retire during the first half of calendar year 2019.

The term of Eric M. Satz as a member of the TVA Board ended January 3, 2019, with the adjournment of the most recent session of Congress. Although his term of office expired May 18, 2018, the TVA Act permitted him to continue to serve as a Director until the end of this session of Congress.

ITEM 3. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

There are no material changes related to market risks disclosed under Item 7, Management's Discussion and Analysis of Financial Condition and Results of Operations — Risk Management Activities in the Annual Report. See Note 13 for additional information regarding TVA's derivative transactions and risk management activities.

ITEM 4. CONTROLS AND PROCEDURES

Disclosure Controls and Procedures

TVA's management, including the President and Chief Executive Officer, the Executive Vice President and Chief Financial Officer, and members of the Disclosure Control Committee, including the Vice President and Controller (Principal Accounting Officer), evaluated the effectiveness of TVA's disclosure controls and procedures (as defined in Rule 13a-15(e) under the Securities Exchange Act of 1934) as of December 31, 2018. Based on this evaluation, TVA's management, including the President and Chief Executive Officer, the Executive Vice President and Chief Financial Officer, and members of the Disclosure Control Committee, including the Vice President and Controller (Principal Accounting Officer), concluded that TVA's disclosure controls and procedures were effective as of December 31, 2018, to ensure that information required to be disclosed by TVA in reports that it files or submits under the Exchange Act, is recorded, processed, summarized, and reported, within the time periods specified in the Securities and Exchange Commission's rules and forms, and include controls and procedures designed to ensure that information required to be disclosed by TVA in such reports is accumulated and communicated to TVA's management, including the President and Chief Executive Officer, the Executive Vice President and Chief Financial Officer, and members of the Disclosure Control Committee, including the Vice President and Controller (Principal Accounting Officer), as appropriate, to allow timely decisions regarding required disclosure.

Changes in Internal Control over Financial Reporting

TVA adopted Revenue from Contracts with Customers effective October 1, 2018. As a result, we performed implementation controls, including contract reviews, to adopt the new standard, and implemented certain changes to our control activities. Other than the items described above, there were no changes in TVA's internal control over financial reporting during the quarter ended December 31, 2018, that materially affected, or are reasonably likely to materially affect, TVA's internal control over financial reporting.

PART II - OTHER INFORMATION

ITEM 1. 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 its 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 financial condition, results of operations, and cash flows.

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For a discussion of certain current material Legal Proceedings, see Note 8 and Note 18 — Legal Proceedings, which discussions are incorporated by reference into this Part II, Item 1, Legal Proceedings.

ITEM 1A. RISK FACTORS

There are no material changes related to risk factors from the risk factors disclosed in Item 1A, Risk Factors in the Annual Report.

ITEM 6. EXHIBITS

Exhibit No.	Description
10.1	Amendment Dated as of December 11, 2018, to December Maturity Community Bank Credit Agreement Dated as of December 12, 2016 (Incorporated by reference to Exhibit 10.1 to TVA's Current Report on Form 8-K filed on December 14, 2018, File No. 000-52313)
31.1	Rule 13a-14(a)/15d-14(a) Certification Executed by the Chief Executive Officer
31.2	Rule 13a-14(a)/15d-14(a) Certification Executed by the Chief Financial Officer
32.1	Section 1350 Certification Executed by the Chief Executive Officer
32.2	Section 1350 Certification Executed by the Chief Financial Officer
101.INS	TVA XBRL Instance Document
101.SCH	TVA XBRL Taxonomy Extension Schema
101.CAL	TVA XBRL Taxonomy Extension Calculation Linkbase
101.DEF	TVA XBRL Taxonomy Extension Definition Linkbase
101.LAB	TVA XBRL Taxonomy Extension Label Linkbase
101.PRE	TVA XBRL Taxonomy Extension Presentation Linkbase

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SIGNATURES

Pursuant to the requirements of Section 13, 15(d), or 37 of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

Date: January 30, 2019 TENNESSEE VALLEY AUTHORITY
(Registrant)

By: /s/ William D. Johnson
William D. Johnson
President and Chief Executive Officer
(Principal Executive Officer)

By: /s/ John M. Thomas, III
John M. Thomas, III
Executive Vice President and Chief Financial Officer
(Principal Financial Officer)