SCHROCK CHARLES A
Form 4
February 28, 2007

FORM 4

Check this box if no longer subject to Section 16. Form 4 or Form 5 obligations may continue. *See* Instruction 1(b).

UNITED STATES SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

STATEMENT OF CHANGES IN BENEFICIAL OWNERSHIP OF SECURITIES

Filed pursuant to Section 16(a) of the Securities Exchange Act of 1934, Section 17(a) of the Public Utility Holding Company Act of 1935 or Section 30(h) of the Investment Company Act of 1940

OMB APPROVAL	
OMB Number:	3235-0287
Expires:	January 31, 2005
Estimated average burden hours per response...	0.5

(Print or Type Responses)

1. Name and Address of Reporting Person *
SCHROCK CHARLES A

(Last) (First) (Middle)

700 NORTH ADAMS STREET, P. O. BOX 19001

(Street)

GREEN BAY, WI 54307-9001

(City) (State) (Zip)

2. Issuer Name **and** Ticker or Trading Symbol
INTEGRYS ENERGY GROUP, INC. [TEG]

3. Date of Earliest Transaction (Month/Day/Year)
02/26/2007

4. If Amendment, Date Original Filed(Month/Day/Year)

5. Relationship of Reporting Person(s) to Issuer

(Check all applicable)

_____ Director _____ 10% Owner
__X__ Officer (give title below) _____ Other (specify below)
President, WPSC, a subsidiary

6. Individual or Joint/Group Filing(Check Applicable Line)
_X_ Form filed by One Reporting Person
___ Form filed by More than One Reporting Person

Table I - Non-Derivative Securities Acquired, Disposed of, or Beneficially Owned

1.Title of Security (Instr. 3)	2. Transaction Date (Month/Day/Year)	2A. Deemed Execution Date, if any (Month/Day/Year)	3. Transaction Code (Instr. 8)		4. Securities Acquired (A) or Disposed of (D) (Instr. 3, 4 and 5)			5. Amount of Securities Beneficially Owned Following Reported Transaction(s) (Instr. 3 and 4)	6. Ownership Form: Direct (D) or Indirect (I) (Instr. 4)	7. Nature of Indirect Beneficial Ownership (Instr. 4)
			Code	V	Amount	(A) or (D)	Price			
Common Stock	02/26/2007		M		11,500	A	$ 29.875	13,579	D	
Common Stock	02/26/2007		S		11,500	D	$ 57.99	2,079	D	
Common Stock								3,123.2342	I	By ESOP
Common Stock								503.966	I	by Stk Invest Plan

Reminder: Report on a separate line for each class of securities beneficially owned directly or indirectly.

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SEC 1474 (9-02)

Table II - Derivative Securities Acquired, Disposed of, or Beneficially Owned
(*e.g.*, puts, calls, warrants, options, convertible securities)

1. Title of Derivative Security (Instr. 3)	2. Conversion or Exercise Price of Derivative Security	3. Transaction Date (Month/Day/Year)	3A. Deemed Execution Date, if any (Month/Day/Year)	4. Transaction Code (Instr. 8)		5. Number of Derivative Securities Acquired (A) or Disposed of (D) (Instr. 3, 4, and 5)		6. Date Exercisable and Expiration Date (Month/Day/Year)		7. Title and Amo Underlying Secu (Instr. 3 and 4)	
				Code	V	(A)	(D)	Date Exercisable	Expiration Date	Title	Am Nu Sh
Employee Stock Option (Right to buy)	$ 29.875 (1)	02/26/2007		M			11,500	02/11/2000	02/11/2009	Common Stock	
Employee Stock Option (Right to buy)	$ 34.09 (2)							12/13/2002	12/13/2011	Common Stock	
Employee Stock Option (Right to buy)	$ 37.96 (3)							12/12/2003	12/12/2012	Common Stock	
Employee Stock Option (Right to buy)	$ 44.73 (4)							12/10/2004	12/10/2013	Common Stock	
Employee Stock Option (Right to buy)	$ 48.11 (5)							12/08/2005	12/08/2014	Common Stock	
Employee Stock Option (Right to buy)	$ 52.73 (6)							12/07/2007	12/07/2016	Common Stock	
Employee Stock Option (Right to buy)	$ 54.85 (7)							12/07/2006	12/07/2015	Common Stock	

Performance Rights	$ 0 (8)	01/01/2007 (9)	06/30/2007	Common Stock	
Performance Rights	$ 0 (8)	01/01/2008 (9)	06/30/2008	Common Stock	
Performance Rights	$ 0 (8)	01/01/2009 (9)	06/30/2009	Common Stock	
Performance Rights	$ 0 (8)	01/01/2010 (9)	06/30/2010	Common Stock	
Phantom Stock Unit	(10)	(11)	(12)	Common Stock	15

Reporting Owners

Reporting Owner Name / Address	Relationships			
	Director	10% Owner	Officer	Other
SCHROCK CHARLES A 700 NORTH ADAMS STREET P. O. BOX 19001 GREEN BAY, WI 54307-9001			President, WPSC, a subsidiary	

Signatures

By: Peter H. Kauffman as Power of Attorney For: Mr. Schrock	02/28/2007
**Signature of Reporting Person	Date

Explanation of Responses:

* If the form is filed by more than one reporting person, *see* Instruction 4(b)(v).

** Intentional misstatements or omissions of facts constitute Federal Criminal Violations. *See* 18 U.S.C. 1001 and 15 U.S.C. 78ff(a).

(1) The option vests in four equal annual installments beginning on February 11, 2000.

(2) The option vests in four equal annual installments beginning on December 13, 2002.

(3) The option vests in four equal annual installments beginning on December 12, 2003.

(4) The option vests in four equal annual installments beginning on December 10, 2004.

(5) The option vests in four equal annual installments beginning on December 8, 2005.

(6) The option vests in four equal annual installments beginning on December 7, 2007.

(7) The option vests in four equal annual installments beginning on December 7, 2006.

(8) Performance shares vest and are issued three years after the performance shares are awarded and the final number of shares issued is determined based on company performance against an established industry benchmark.

(9) Performance shares vest and are issued three years after the performance shares are awarded and the final number of shares issued is determined based on company performance against an established industry benchmark.

(10) These phantom stock units convert to common stock on a one-for-one basis.

(11) Unless the participant has selected a later commencement date, distribution of stock and equivalents will commence within 60 days following the end of the calendar year in which occurs the participant's retirement or termination of service.

(12) Unless the participant has selected a later commencement date, distribution of stock and equivalents will commence within 60 days following the end of the calendar year in which occurs the participant's retirement or termination of service.

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1,000

—

880591EF5

12/15/2018

3.770%

1

1

880591EF5

6/15/2019

3.770%

29

28

88059TEL1

11/15/2018

2.650%

1

1

88059TEL1

5/15/2019

2.650%

1

2

880591CU4

12/15/2017

6.250%

—

650

880591EC2

4/1/2018

4.500%

—

1,000

88059TFS5

10/15/2017

4.125%

—

46

Total current maturities of power bonds issued at par

1,032

1,728

Total current debt outstanding, net

$
2,332

$
3,815

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TVA redeemed $1.0 billion of power bonds on October 15, 2018.
Long-Term Debt
At September 30

CUSIP or Other Identifier	Maturity	Coupon Rate		Effective Call Date	2018 Par		2017 Par	Stock Exchange Listings
electronotes®(2)	5/15/2020 - 2/15/2043	2.375% - 3.625%		2/15/2015 - 2/15/2018(5)	$221		$226	None
880591EQ1	10/15/2018	1.750%			—		1,000	New York
880591EV0	3/15/2020	2.250%			1,000		—	New York
880591EL2	2/15/2021	3.875%			1,500		1,500	New York
880591DC3	6/7/2021	5.805%	(3)		261	(1)	268	New York, Luxembourg
880591EN8	8/15/2022	1.875%			1,000		1,000	New York
880591ER9	9/15/2024	2.875%			1,000		1,000	New York
880591CJ9	11/1/2025	6.750%			1,350		1,350	New York, Hong Kong, Luxembourg, Singapore
880591EU2	2/1/2027	2.875%			1,000		1,000	New York
880591300(4)	6/1/2028	3.550%			273		273	New York
880591409(4)	5/1/2029	3.360%			232		232	New York
880591DM1	5/1/2030	7.125%			1,000		1,000	New York, Luxembourg
880591DP4	6/7/2032	6.587%	(3)		326	(1)	335	New York, Luxembourg
880591DV1	7/15/2033	4.700%			472		472	New York, Luxembourg
880591EF5	6/15/2034	3.770%			273		303	None
880591DX7	6/15/2035	4.650%			436		436	New York
880591CK6	4/1/2036	5.980%			121		121	New York
880591CS9	4/1/2036	5.880%			1,500		1,500	New York
880591CP5	1/15/2038	6.150%			1,000		1,000	New York
880591ED0	6/15/2038	5.500%			500		500	New York
880591EH1	9/15/2039	5.250%			2,000		2,000	New York
880591EP3	12/15/2042	3.500%			1,000		1,000	New York
880591DU3	6/7/2043	4.962%	(3)		195	(1)	201	New York, Luxembourg
880591CF7	7/15/2045	6.235%		7/15/2020	140		140	New York
880591EB4	1/15/2048	4.875%			500		500	New York, Luxembourg
880591DZ2	4/1/2056	5.375%			1,000		1,000	New York
880591EJ7	9/15/2060	4.625%			1,000		1,000	New York
880591ES7	9/15/2065	4.250%			1,000		1,000	New York
Subtotal					20,300		20,357	
Unamortized discounts, premiums, issue costs, and other					(143	)	(152)	
Total long-term outstanding power					20,157		20,205	

bonds, net		
Long-term debt of variable interest entities, net	1,127	1,164
Long-term notes payable	23	69
Total long-term debt, net	$21,307	$21,438

Notes
(1) Includes net exchange gain from currency transactions of $147 million and $125 million at September 30, 2018 and 2017, respectively.
(2) Includes one electronotes® issue with partial maturities of principal for each required annual payment.
(3) The coupon rate represents TVA's effective interest rate.
(4) TVA PARRS, CUSIP numbers 880591300 and 880591409, may be redeemed under certain conditions. See Put and Call Options above.
(5) The bonds are callable on or after the dates shown.

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Maturities Due in the Year Ending September 30

	2019	2020	2021	2022	2023	Thereafter	Total
Long-term power bonds, long-term debt of variable interest entities, and notes payable including current maturities(1)	$1,116	$1,092	$1,901	$1,072	$69	$17,474	$22,724
Short-term debt, net of discounts	1,216	—	—	—	—	—	1,216

Note
(1) Long-term power bonds does not include non-cash items of foreign currency exchange gain of $147 million, unamortized debt issue costs of $56 million, and net discount on sale of Bonds of $88 million. Long-term debt of VIE does not include non-cash item of unamortized debt issue costs of $10 million.

Credit Facility Agreements

TVA and the U.S. Treasury, pursuant to the TVA Act, have entered into a memorandum of understanding under which the U.S. Treasury provides TVA with a $150 million credit facility. This credit facility was renewed in 2018 with a maturity date of September 30, 2019. Access to this credit facility or other similar financing arrangements with the U.S. Treasury has been available to TVA since the 1960s. TVA can borrow under the U.S. Treasury credit facility only if it cannot issue Bonds in the market on reasonable terms, and TVA considers the U.S. Treasury credit facility a secondary source of liquidity. The interest rate on any borrowing under this facility is based on the average rate on outstanding marketable obligations of the U.S. with maturities from date of issue of one year or less. There were no outstanding borrowings under the facility at September 30, 2018. The availability of this credit facility may be impacted by how the U.S. government addresses the possibility of approaching its debt limit.

TVA also has funding available under the four long-term revolving credit facilities totaling $2.7 billion: a $150 million credit facility that matures on December 12, 2019, a $500 million credit facility that matures on February 1, 2022, a $1.0 billion credit facility that matures on June 13, 2023, and a $1.0 billion credit facility that matures on September 28, 2023. The interest rate on any borrowing under these facilities varies based on market factors and the rating of TVA's senior unsecured, long-term, non-credit-enhanced debt. TVA is required to pay an unused facility fee on the portion of the total $2.7 billion that TVA has not borrowed or committed under letters of credit. This fee, along with letter of credit fees, may fluctuate depending on the rating of TVA's senior unsecured, long-term, non-credit-enhanced debt. At September 30, 2018 and 2017, there were $921 million and $1.2 billion, respectively, of letters of credit outstanding under the facilities, and there were no borrowings outstanding. See Note 15 — Other Derivative Instruments — Collateral.

The following table provides additional information regarding TVA's funding available under the four long-term revolving credit facilities:

Summary of Long-Term Credit Facilities
At September 30, 2018

Maturity Date	Facility Limit	Letters of Credit Outstanding	Cash Borrowings	Availability
December 2019	$150	$ 38	$ —	$ 112
February 2022	500	500	—	—
June 2023	1,000	383	—	617
September 2023	1,000	—	—	1,000
Total	$2,650	$ 921	$ —	$ 1,729

Lease/Leasebacks

Prior to 2004, TVA received approximately $945 million in proceeds by entering into lease/leaseback transactions for 24 new peaking CTs. TVA also received approximately $389 million in proceeds by entering into lease/leaseback transactions for qualified technological equipment and software ("QTE") in 2003. Due to TVA's continuing involvement in the operation and maintenance of the leased units and equipment and its control over the distribution of power produced by the combustion turbine facilities during the leaseback term, TVA accounted for the lease proceeds as financing obligations. On September 20, 2017, TVA acquired 100 percent of the equity interests in two SPEs created for the purpose of facilitating a portion of the leaseback arrangements. See Note 9. As a result of the acquisition, TVA effectively settled $70 million of its leaseback obligations related to eight CTs. On July 20, 2016, TVA acquired 100 percent of the equity interests in two SPEs created for the purpose of facilitating lease/leaseback arrangements. As a result of the acquisition, TVA effectively settled $70 million of its leaseback obligations related to eight CTs. At September 30, 2018 and 2017, the outstanding leaseback obligations related to the remaining CTs and QTE were $301 million and $338 million, respectively.

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14. Accumulated Other Comprehensive Income (Loss)

AOCI represents market valuation adjustments related to TVA's currency swaps. The currency swaps are cash flow hedges and are the only derivatives in TVA's portfolio that have been designated and qualify for hedge accounting treatment. TVA records exchange rate gains and losses on its foreign currency-denominated debt, and any related accrued interest in net income and marks its currency swap assets and liabilities to market through other comprehensive income (loss) ("OCI"). TVA then reclassifies an amount out of AOCI into net income, offsetting the exchange gain/loss recorded on the debt. For the years ended September 30, 2018 and 2017, TVA reclassified $26 million of losses and $26 million of gains, respectively, related to its cash flow hedges from AOCI to Interest expense. See Note 15.

TVA records certain assets and liabilities that result from the regulated ratemaking process that would not be recorded under GAAP for non-regulated entities. As such, certain items that would generally be reported in AOCI or that would impact the statements of operations are recorded as regulatory assets or regulatory liabilities. See Note 7 for a schedule of regulatory assets and liabilities. See Note 15 for a discussion of the recognition in AOCI of gains and losses associated with certain derivative contracts. See Note 16 for a discussion of the recognition of certain investment fund gains and losses as regulatory assets and liabilities. See Note 20 for a discussion of the regulatory accounting related to components of TVA's benefit plans.

15. Risk Management Activities and Derivative Transactions

TVA is exposed to various risks. These include risks related to commodity prices, investment prices, interest rates, currency exchange rates, and inflation as well as counterparty credit and performance risks. To help manage certain of these risks, TVA has historically entered into various derivative transactions, principally commodity option contracts, forward contracts, swaps, swaptions, futures, and options on futures. Other than certain derivative instruments in its trust investment funds, it is TVA's policy to enter into these derivative transactions solely for hedging purposes and not for speculative purposes. TVA has suspended its FTP and no longer uses financial instruments to hedge risks related to commodity prices; however, TVA plans to continue to manage fuel price volatility through other methods and to periodically reevaluate its suspended FTP program for future use of financial instruments.

Overview of Accounting Treatment

TVA recognizes certain of its derivative instruments as either assets or liabilities on its consolidated balance sheets at fair value. The accounting for changes in the fair value of these instruments depends on (1) whether TVA uses regulatory accounting to defer the derivative gains and losses, (2) whether the derivative instrument has been designated and qualifies for hedge accounting treatment, and (3) if so, the type of hedge relationship (for example, cash flow hedge).

The following tables summarize the accounting treatment that certain of TVA's financial derivative transactions receive:

Summary of Derivative Instruments That Receive Hedge Accounting Treatment (part 1)
Amount of Mark-to-Market Gain (Loss) Recognized in Accumulated Other Comprehensive Income (Loss)
For the years ended September 30

Derivatives in Cash Flow Hedging Relationship	Objective of Hedge Transaction	Accounting for Derivative Hedging Instrument	2018	2017
Currency swaps	To protect against changes in cash flows caused by changes in foreign	Unrealized gains and losses are recorded in AOCI and reclassified to interest expense to	$ 10	$ 59

currency exchange rates (exchange rate risk)	the extent they are offset by gains and losses on the hedged transaction

Summary of Derivative Instruments That Receive Hedge Accounting Treatment (part 2)[1]

Amount of Gain (Loss) Reclassified from Accumulated Other Comprehensive Income to Interest Expense		
For the years ended September 30		
Derivatives in Cash Flow Hedging Relationship	2018	2017
Currency swaps	$(26)	$ 26

Note
(1) There were no ineffective portions or amounts excluded from effectiveness testing for any of the periods presented. Based on forecasted foreign currency exchange rates, TVA expects to reclassify approximately $28 million of gains from AOCI to interest expense within the next 12 months to offset amounts anticipated to be recorded in interest expense related to exchange gain on the debt.

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Summary of Derivative Instruments That Do Not Receive Hedge Accounting Treatment
Amount of Gain (Loss) Recognized in Income on Derivatives(1)
For the years ended September 30

Derivative Type	Objective of Derivative	Accounting for Derivative Instrument	2018	2017
Interest rate swaps	To fix short-term debt variable rate to a fixed rate (interest rate risk)	Mark-to-Market gains and losses are recorded as regulatory assets or liabilities Realized gains and losses are recognized in interest expense when incurred during the settlement period	$(89)	$(101)
Commodity derivatives under FTP	To protect against fluctuations in market prices of purchased commodities (price risk)	Mark-to-Market gains and losses are recorded as regulatory assets or liabilities Realized gains and losses are recognized in fuel expense or purchased power expense when the related commodity is used in production	(8)	(36)

Note
(1) All of TVA's derivative instruments that do not receive hedge accounting treatment have unrealized gains (losses) that would otherwise be recognized in income but instead are deferred as regulatory assets and liabilities. As such, there was no related gain (loss) recognized in income for these unrealized gains (losses) for the years ended September 30, 2018 and 2017.

Fair Values of TVA Derivatives
At September 30

	2018		2017	
Derivatives That Receive Hedge Accounting Treatment:				
	Balance	Balance Sheet Presentation	Balance	Balance Sheet Presentation
Currency swaps				
£200 million Sterling	$(67)	Accounts payable and accrued liabilities $(5); Other long-term liabilities $(62)	$(67)	Accounts payable and accrued liabilities $(5); Other long-term liabilities $(62)
£250 million Sterling	(12)	Accounts payable and accrued liabilities $(5); Other long-term liabilities $(7)	(15)	Accounts payable and accrued liabilities $(4); Other long-term liabilities $(11)
£150 million Sterling	(15)	Accounts payable and accrued liabilities $(3); Other long-term liabilities $(12)	(21)	Accounts payable and accrued liabilities $(2); Other long-term liabilities $(19)
Derivatives That Do Not Receive Hedge Accounting Treatment:				
	Balance	Balance Sheet Presentation	Balance	Balance Sheet Presentation
Interest rate swaps				
$1.0 billion notional	$(878)	Accounts payable and accrued liabilities $(56); Other long-term liabilities $(822)	$(1,093)	Accounts payable and accrued liabilities $(66); Other long-term liabilities $(1,027)
$476 million notional	(317)	Accounts payable and accrued liabilities $(20); Other long-term liabilities $(297)	(410)	Accounts payable and accrued liabilities $(25); Other long-term liabilities $(385)

$42 million notional	(4	)	Accounts payable and accrued liabilities $(1); Other long-term liabilities $(3)	(8	)	Accounts payable and accrued liabilities $(2); Other long-term liabilities $(6)
Commodity contract derivatives	60		Other current assets $41; Other long-term assets $31; Other long-term liabilities $(8); Accounts payable and accrued liabilities $(4)	(60	)	Other current assets $8; Other long-term assets $2; Other long-term liabilities $(9); Accounts payable and accrued liabilities $(61)
FTP Derivatives under FTP(1)	—		N/A	(5	)	Other current assets $(4); Accounts payable and accrued liabilities $(1)

Note
(1) Fair values of certain derivatives under the FTP that were in net liability positions totaling $4 million at September 30, 2017, were recorded in TVA's margin cash accounts in Other current assets. These derivatives were transacted with futures commission merchants, and cash deposits were posted to the margin cash accounts held with each futures commission merchant to offset the net liability positions in full. At September 30, 2018, TVA had no derivatives under the FTP in net liability positions.

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Cash Flow Hedging Strategy for Currency Swaps

To protect against exchange rate risk related to three British pound sterling denominated Bond transactions, TVA entered into foreign currency hedges at the time the Bond transactions occurred. TVA had the following currency swaps outstanding at September 30, 2018:

Currency Swaps Outstanding
At September 30, 2018

Effective Date of Currency Swap Contract	Associated TVA Bond Issues Currency Exposure	Expiration Date of Swap	Overall Effective Cost to TVA
1999	£200 million	2021	5.81%
2001	£250 million	2032	6.59%
2003	£150 million	2043	4.96%

When the dollar strengthens against the British pound sterling, the exchange gain on the Bond liability and related accrued interest is offset by an equal amount of loss on the swap contract that is reclassified out of AOCI. Conversely, the exchange loss on the Bond liability and related accrued interest is offset by an equal amount of gain on the swap contract that is reclassified out of AOCI. All such exchange gains or losses on the Bond liability and related accrued interest are included in Long-term debt, net and Accounts payable and accrued liabilities, respectively. The offsetting exchange losses or gains on the swap contracts are recognized in AOCI. If any gain (loss) were to be incurred as a result of the early termination of the foreign currency swap contract, the resulting income (expense) would be amortized over the remaining life of the associated Bond as a component of Interest expense. The values of the currency swap liabilities are included in Accounts payable and accrued liabilities and Other long-term liabilities on the consolidated balance sheets.

Derivatives Not Receiving Hedge Accounting Treatment

Interest Rate Derivatives. Generally TVA uses interest rate swaps to fix variable short-term debt to a fixed rate, and TVA uses regulatory accounting treatment to defer the MtM gains and losses on its interest rate swaps. The net deferred unrealized gains and losses are classified as regulatory assets or liabilities on TVA's consolidated balance sheets and are included in the ratemaking formula when gains or losses are realized. The values of these derivatives are included in Accounts payable and accrued liabilities and Other long-term liabilities on the consolidated balance sheets, and realized gains and losses, if any, are included in TVA's consolidated statements of operations. For the years ended September 30, 2018 and 2017, the changes in market value of the interest rate derivatives resulted in deferred unrealized gains of $310 million and $472 million, respectively.

Commodity Derivatives. TVA enters into certain derivative contracts for coal and natural gas that require physical delivery of the contracted quantity of the commodity. TVA marks to market all such contracts and defers the fair values as regulatory assets or liabilities on a gross basis. At September 30, 2018, TVA's coal contract derivatives had terms of up to three years and TVA's natural gas contract derivatives had terms of up to four years.

Commodity Contract Derivatives
At September 30

	2018			2017		
	Number of Contracts	Notional Amount	Fair Value (MtM)	Number of Contracts	Notional Amount	Fair Value (MtM)
Coal contract derivatives	13	20 million tons	$ 58	20	17 million tons	$ (67)
	61		$ 2	53		$ 7

Natural gas contract derivatives	359 million mmBtu	271 million mmBtu

Derivatives Under FTP. TVA has suspended its FTP and no longer uses financial instruments to hedge risks related to commodity prices. At September 30, 2018, TVA had no open commodity derivatives under the FTP. Under the FTP, TVA was authorized to purchase and sell futures, swaps, options, and combinations of these instruments (as long as they were standard in the industry) to hedge TVA's exposure to (1) the price of natural gas, fuel oil, electricity, coal, emission allowances, nuclear fuel, and other commodities included in TVA's fuel cost adjustment calculation, (2) the price of construction materials, and (3) contracts for goods priced in or indexed to foreign currencies. The combined transaction limit for the fuel cost adjustment and construction material transactions was $130 million (based on one-day value at risk). In addition, the maximum hedge volume for the construction material transactions was 75 percent of the underlying net notional volume of the material that TVA anticipated using in approved TVA projects, and the market value of all outstanding hedging transactions involving construction materials was limited to $100 million at the execution of any new transaction. The portfolio value at risk limit for the foreign currency transactions was $5 million and was separate and distinct from the $130 million transaction limit discussed above. TVA's policy prohibits trading financial instruments under the FTP for speculative purposes.

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Derivatives under Financial Trading Program[1]
At September 30

	2018		2017	
	Notional Amount (in mmBtu)	Fair Value (MtM) (in millions)	Notional Amount (in mmBtu)	Fair Value (MtM) (in millions)
Natural gas				
Swap contracts	—	$ —	2,800,000	$ (5)

Note
(1) Fair value amounts presented are based on the net commodity position with the counterparty. Notional amounts disclosed represent the net value of contractual amounts.

Prior to the suspension of the FTP, TVA deferred all FTP unrealized gains (losses) as regulatory liabilities (assets) and recorded only realized gains or losses to match the delivery period of the underlying commodity. In addition to the open commodity derivatives disclosed above, TVA had closed derivative contracts with a market value of $(3) million at September 30, 2017. TVA experienced the following unrealized and realized gains and losses related to the FTP at the dates and during the periods, as applicable, set forth in the tables below:

Financial Trading Program Unrealized Gains (Losses)
At September 30

FTP unrealized gains (losses) deferred as regulatory liabilities (assets)	2018	2017
Natural gas	$ —	$(5)

Financial Trading Program Realized Gains (Losses)
At September 30

Decrease (increase) in fuel expense	2018	2017
Natural gas	$(6)	$(29)
Decrease (increase) in purchased power expense		
Natural gas	$(2)	$(7)

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Offsetting of Derivative Assets and Liabilities

The amounts of TVA's derivative instruments as reported in the consolidated balance sheets as of September 30, 2018 and 2017, are shown in the table below.

Derivative Assets and Liabilities

	At September 30, 2018		
	Gross Amounts of Recognized Assets/Liabilities	Gross Amounts Offset in the Balance Sheet(1)	Net Amounts of Assets/Liabilities Presented in the Balance Sheet(2)
Assets			
Commodity derivatives not subject to master netting or similar arrangement	$ 72	$ —	$ 72
Liabilities			
Currency swaps(3)	$ 94	$ —	$ 94
Interest rate swaps(3)	1,199	—	1,199
Total derivatives subject to master netting or similar arrangement	1,293	—	1,293
Commodity derivatives not subject to master netting or similar arrangement	12	—	12
Total liabilities	$ 1,305	$ —	$ 1,305

	At September 30, 2017		
	Gross Amounts of Recognized Assets/Liabilities	Gross Amounts Offset in the Balance Sheet(1)	Net Amounts of Assets/Liabilities Presented in the Balance Sheet(2)
Assets			
Commodity derivatives not subject to master netting or similar arrangement	10	—	10
Liabilities			
Currency swaps(3)	$ 103	$ —	$ 103
Interest rate swaps(3)	1,511	—	1,511
	5	(4)	1

Commodity derivatives under FTP			
Total derivatives subject to master netting or similar arrangement	1,619	(4)	1,615
Commodity derivatives not subject to master netting or similar arrangement	70	—	70
Total liabilities	$ 1,689	$ (4)	$ 1,685

Notes
(1) Amounts primarily include counterparty netting of derivative contracts, margin account deposits for futures commission merchants transactions, and cash collateral received or paid in accordance with the accounting guidance for derivatives and hedging transactions.
(2) There are no derivative contracts subject to a master netting arrangement or similar agreement which are not offset in the consolidated balance sheets.
(3) Letters of credit of approximately $921 million and $1.2 billion were posted as collateral at September 30, 2018 and 2017, respectively, to partially secure the liability positions of one of the currency swaps and one of the interest rate swaps in accordance with the collateral requirements for these derivatives.

Other Derivative Instruments

Investment Fund Derivatives. Investment funds consist primarily of funds held in the NDT, ART, SERP, and DCP. All securities in the trusts are classified as trading. See Note 16 — Investments Funds for a discussion of the trusts' objectives and the types of investments that they hold. The NDT and ART may invest in derivative instruments which may include swaps, futures, options, forwards, and other instruments. At September 30, 2018 and 2017, the NDT held investments in forward contracts to purchase debt securities. The fair values of these derivatives were in asset positions totaling $45 million and $19 million at September 30, 2018 and 2017, respectively.

Collateral. TVA's interest rate swaps and currency swaps contain contract provisions that require a party to post collateral (in a form such as cash or a letter of credit) when the party's liability balance under the agreement exceeds a certain threshold. At September 30, 2018, the aggregate fair value of all derivative instruments with credit-risk related contingent features that were in a liability position was $1.3 billion. TVA's collateral obligations at September 30, 2018, under these arrangements, were approximately $875 million, for which TVA had posted approximately $921 million in letters of credit. These letters of credit reduce the available balance under the related credit facilities. TVA's assessment of the risk of its nonperformance includes a reduction in its exposure under the contract as a result of this posted collateral.

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For all of its derivative instruments with credit-risk related contingent features:

- If TVA remains a majority-owned U.S. government entity but Standard & Poor's Financial Services, LLC ("S&P") or Moody's Investors Service, Inc. ("Moody's") downgrades TVA's credit rating to AA or Aa2, respectively, TVA's collateral obligations would likely increase by $22 million; and

- If TVA ceases to be majority-owned by the U.S. government, TVA's credit rating would likely be downgraded and TVA would be required to post additional collateral.

Counterparty Risk

TVA may be exposed to certain risks when a counterparty has the potential to fail to meet its obligations in accordance with agreed terms. These risks may be related to credit, operational, or nonperformance matters. To mitigate certain counterparty risk, TVA analyzes the counterparty’s financial condition prior to entering into an agreement, establishes credit limits, monitors the appropriateness of those limits, as well as any changes in the creditworthiness of the counterparty, on an ongoing basis, and when required, employs credit mitigation measures, such as collateral or prepayment arrangements and master purchase and sale agreements, to mitigate credit risk.

Customers. TVA is exposed to counterparty credit risk associated with trade accounts receivable from delivered power sales to LPCs, and from industries and federal agencies directly served, all located in the Tennessee Valley region. Of the $1.6 billion and $1.4 billion of receivables from power sales outstanding at September 30, 2018 and 2017, respectively, nearly all counterparties were rated investment grade. TVA is also exposed to risk from exchange power arrangements with a small number of investor-owned regional utilities related to either delivered power or the replacement of open positions of longer-term purchased power or fuel agreements. TVA believes its policies and procedures for counterparty performance risk reviews have generally protected TVA against significant exposure related to market and economic conditions. See Note 1 — Allowance for Uncollectible Accounts and Note 3.

TVA had revenue from two LPCs that accounted for 17 percent of total operating revenue for the years ended both September 30, 2018 and September 30, 2017.

Suppliers. If one of TVA's fuel or purchased power suppliers fails to perform under the terms of its contract with TVA, TVA might lose the money that it paid to the supplier under the contract and have to purchase replacement fuel or power on the spot market, perhaps at a significantly higher price than TVA was entitled to pay under the contract. In addition, TVA might not be able to acquire replacement fuel or power in a timely manner and thus might be unable to satisfy its own obligations to deliver power. Nuclear fuel requirements, including uranium mining and milling, conversion services, enrichment services, and fabrication services, are met from various suppliers, depending on the type of service. TVA purchases the majority of its natural gas requirements from a variety of suppliers under short-term contracts.

To help ensure a reliable supply of coal, TVA had coal contracts with multiple suppliers at September 30, 2018. The contracted supply of coal is sourced from multiple geographic regions of the U.S. and is to be delivered via various transportation methods (i.e., barge, rail, and truck). Emerging technologies, environmental regulations, and low natural gas prices have contributed to weak demand for coal. As a result, coal suppliers are facing increased financial pressure, which has led to relatively poor credit ratings and bankruptcies. Continued difficulties by coal suppliers could result in consolidations, additional bankruptcies, restructurings, contract renegotiations, or other scenarios. Under these scenarios and TVA’s potential available responses, TVA does not anticipate a significant financial impact in obtaining continued fuel supply for its coal-fired generation.

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

TVA has a power purchase agreement that expires on March 31, 2032, with a supplier of electricity for 440 megawatts ("MW") of summer net capability from a lignite-fired generating plant. TVA has determined that the supplier has the equivalent of a non-investment grade credit rating; therefore, the supplier has provided credit assurance to TVA under the terms of the agreement.

Derivative Counterparties. TVA has entered into physical and financial contracts that qualify as derivatives for hedging purposes, and TVA's NDT fund and qualified defined benefit pension plan have entered into derivative contracts for investment purposes. If a counterparty to one of TVA's hedging transactions defaults, TVA might incur substantial costs in connection with entering into a replacement hedging transaction. If a counterparty to the derivative contracts into which the NDT fund and the qualified pension plan have entered for investment purposes defaults, the value of the investment could decline significantly or perhaps become worthless. TVA has concentrations of credit risk from the banking and coal industries because multiple companies in these industries serve as counterparties to TVA in various derivative transactions. At September 30, 2018, all of

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TVA's currency swaps and interest rate swaps as well as all of the derivatives in the NDT were with banking counterparties whose Moody's credit ratings were A3 or higher.

TVA classifies qualified forward coal and natural gas contracts as derivatives. See Derivatives Not Receiving Hedge Accounting Treatment above. At September 30, 2018, the coal contracts were with counterparties whose Moody's credit rating, or TVA’s internal analysis when such information was unavailable, ranged from Caa3 to Ba3. At September 30, 2018, the natural gas contracts were with counterparties whose ratings ranged from B1 to A2. See Suppliers above for discussion of challenges facing the coal industry. TVA's total value for derivative contracts with coal and natural gas counterparties in an asset position as of September 30, 2018, was approximately $72 million.

TVA previously utilized two futures commission merchants ("FCMs") to clear commodity contracts, including futures, options, and similar financial derivatives. These transactions were executed under the FTP on exchanges by the FCMs on behalf of TVA. TVA maintained margin cash accounts with the FCMs. TVA made deposits to the margin cash accounts to adequately cover any net liability positions on its derivatives transacted with the FCMs. At September 30, 2018, TVA had no positions under the FTP. See the note to the Fair Values of TVA Derivatives table above.

16. Fair Value Measurements

Fair value is determined based on the exchange price that would be received for an asset or paid to transfer a liability (an exit price) in the asset or liability's principal market, or in the absence of a principal market, the most advantageous market for the asset or liability in an orderly transaction between market participants. TVA uses market or observable inputs as the preferred source of values, followed by assumptions based on hypothetical transactions in the absence of market inputs.

Valuation Techniques

The measurement of fair value results in classification into a hierarchy by the inputs used to determine the fair value as follows:

Level 1	—	Unadjusted quoted prices in active markets accessible by the reporting entity for identical assets or liabilities. Active markets are those in which transactions for the asset or liability occur with sufficient frequency and volume to provide pricing.
Level 2	—	Pricing inputs other than quoted market prices included in Level 1 that are based on observable market data and that are directly or indirectly observable for substantially the full term of the asset or liability. These include quoted market prices for similar assets or liabilities, quoted market prices for identical or similar assets in markets that are not active, adjusted quoted market prices, inputs from observable data such as interest rate and yield curves, volatilities and default rates observable at commonly quoted intervals, and inputs derived from observable market data by correlation or other means.
Level 3	—	Pricing inputs that are unobservable, or less observable, from objective sources. Unobservable inputs are only to be used to the extent observable inputs are not available. These inputs maintain the concept of an exit price from the perspective of a market participant and should reflect assumptions of other market participants. An entity should consider all market participant assumptions that are available without unreasonable cost and effort. These are given the lowest priority and are generally used in internally developed methodologies to generate management's best estimate of the fair value when no observable market data is available.

A financial instrument's level within the fair value hierarchy (where Level 1 is the highest and Level 3 is the lowest) is based on the lowest level of input significant to the fair value measurement.

The following sections describe the valuation methodologies TVA uses to measure different financial instruments at fair value. Except for gains and losses on SERP and DCP assets, all changes in fair value of these assets and liabilities have been recorded as changes in regulatory assets, regulatory liabilities, or AOCI on TVA's consolidated balance sheets and consolidated statements of comprehensive income (loss). Except for gains and losses on SERP and DCP assets, there has been no impact to the consolidated statements of operations or the consolidated statements of cash flows related to these fair value measurements.

Investment Funds

At September 30, 2018, Investment funds were composed of $2.9 billion of securities classified as trading and measured at fair value. Trading securities are held in the NDT, ART, SERP, and DCP. The NDT holds funds for the ultimate decommissioning of TVA's nuclear power plants. The ART holds funds primarily for the costs related to the future closure and retirement of TVA's other long-lived assets. The balances in the NDT and ART were $2.1 billion and $714 million, respectively, at September 30, 2018.

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TVA established a SERP to provide benefits to selected employees of TVA which are comparable to those provided by competing organizations. The DCP is designed to provide participants with the ability to defer compensation until employment with TVA ends. The NDT, ART, SERP, and DCP funds are invested in portfolios of securities generally designed to achieve a return in line with overall equity and debt market performance.

The NDT, ART, SERP, and DCP are composed of multiple types of investments and are managed by external institutional investment managers. Most U.S. and international equities, U.S. Treasury inflation-protected securities, real estate investment trust securities, and cash securities and certain derivative instruments are measured based on quoted exchange prices in active markets and are classified as Level 1 valuations. Fixed-income investments, high-yield fixed-income investments, currencies, and most derivative instruments are non-exchange traded and are classified as Level 2 valuations. These measurements are based on market and income approaches with observable market inputs.

Private equity limited partnerships and private real estate investments may include holdings of investments in private real estate, venture capital, buyout, mezzanine or subordinated debt, restructuring or distressed debt, and special situations through funds managed by third-party investment managers. These investments generally involve a three to four year period where the investor contributes capital, followed by a period of distribution, typically over several years. The investment period is generally, at a minimum, 10 years or longer. The NDT had unfunded commitments related to private equity limited partnerships of $119 million and unfunded commitments related to private real estate of $28 million at September 30, 2018. The ART had unfunded commitments related to private equity limited partnerships of $38 million and unfunded commitments related to private real estate of $12 million at September 30, 2018. These investments have no redemption or limited redemption options and may also impose restrictions on the NDT’s and ART's ability to liquidate its investments. There are no readily available quoted exchange prices for these investments. The fair value of the investments is based on TVA’s ownership percentage of the fair value of the underlying investments as provided by the investment managers. These investments are typically valued on a quarterly basis. TVA’s private equity limited partnerships and private real estate investments are valued at net asset values ("NAV") as a practical expedient for fair value. TVA classifies its interest in these types of investments as investments measured at net asset value in the fair value hierarchy.

Commingled funds represent investment funds comprising multiple individual financial instruments. The commingled funds held by the NDT, ART, SERP, and DCP consist of either a single class of securities, such as equity, debt, or foreign currency securities, or multiple classes of securities. All underlying positions in these commingled funds are either exchange traded or measured using observable inputs for similar instruments. The fair value of commingled funds is based on NAV per fund share (the unit of account), derived from the prices of the underlying securities in the funds. These commingled funds can be redeemed at the measurement date NAV and are classified as Commingled funds measured at net asset value in the fair value hierarchy.

Realized and unrealized gains and losses on trading securities are recognized in current earnings and are based on average cost. The gains and losses of the NDT and ART are subsequently reclassified to a regulatory asset or liability account in accordance with TVA's regulatory accounting policy. See Note 1 — Cost-Based Regulation. TVA recorded unrealized gains and losses related to its trading securities held during each period as follows:

	Unrealized Investment Gains (Losses)		
	At September 30		
Fund	Financial Statement Presentation	2018	2017
SERP	Other income (expense)	$ 1	$ 4
DCP	Other income (expense)	1	2
NDT	Regulatory asset	18	92
ART	Regulatory asset	15	43

Currency and Interest Rate Derivatives

See Note 15 — Cash Flow Hedging Strategy for Currency Swaps and Derivatives Not Receiving Hedge Accounting Treatment for a discussion of the nature, purpose, and contingent features of TVA's currency swaps and interest rate swaps. These swaps are classified as Level 2 valuations and are valued based on income approaches using observable market inputs for similar instruments.

Commodity Contract Derivatives

Most of these contracts are valued based on market approaches which utilize short- and mid-term market-quoted prices from an external industry brokerage service. A small number of these contracts are valued based on a pricing model using long-term price estimates from TVA's coal price forecast. To value the volume option component of applicable coal contracts, TVA uses a Black-Scholes pricing model which includes inputs from the forecast, contract-specific terms, and other market inputs. These contracts are classified as Level 3 valuations.

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Nonperformance Risk

The assessment of nonperformance risk, which includes credit risk, considers changes in current market conditions, readily available information on nonperformance risk, letters of credit, collateral, other arrangements available, and the nature of master netting arrangements. TVA is a counterparty to currency swaps, interest rate swaps, commodity contracts, and other derivatives which subject TVA to nonperformance risk. Nonperformance risk on the majority of investments and certain exchange-traded instruments held by TVA is incorporated into the exit price that is derived from quoted market data that is used to mark the investment to market.

Nonperformance risk for most of TVA's derivative instruments is an adjustment to the initial asset/liability fair value. TVA adjusts for nonperformance risk, both of TVA (for liabilities) and the counterparty (for assets), by applying credit valuation adjustments ("CVAs"). TVA determines an appropriate CVA for each applicable financial instrument based on the term of the instrument and TVA's or the counterparty's credit rating as obtained from Moody's. For companies that do not have an observable credit rating, TVA uses internal analysis to assign a comparable rating to the counterparty. TVA discounts each financial instrument using the historical default rate (as reported by Moody’s for CY 1983 to CY 2017) for companies with a similar credit rating over a time period consistent with the remaining term of the contract. The application of CVAs resulted in a less than $1 million decrease in the fair value of assets and a $1 million decrease in the fair value of liabilities at September 30, 2018.

Fair Value Measurements

The following tables set forth by level, within the fair value hierarchy, TVA's financial assets and liabilities that were measured at fair value on a recurring basis at September 30, 2018 and 2017. Financial assets and liabilities have been classified in their entirety based on the lowest level of input that is significant to the fair value measurement. TVA's assessment of the significance of a particular input to the fair value measurement requires judgment and may affect the determination of the fair value of the assets and liabilities and their classification in the fair value hierarchy levels.

Fair Value Measurements
At September 30, 2018

	Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	Total
Assets				
Investments				
Equity securities	$ 220	$ —	$ —	$220
Government debt securities	199	37	—	236
Corporate debt securities	—	499	—	499
Mortgage and asset-backed securities	—	50	—	50
Institutional mutual funds	126	—	—	126
Forward debt securities contracts	—	45	—	45
Private equity funds measured at net asset value(1)	—	—	—	132
Private real estate funds measured at net asset value(1)	—	—	—	124
Commingled funds measured at net asset value(1)	—	—	—	1,430
Total investments	545	631	—	2,862
Commodity contract derivatives	—	13	59	72

Total	$ 545	$ 644	$ 59	$2,934

	Quoted Prices in Active Markets for Identical Liabilities (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	Total
Liabilities				
Currency swaps(2)	$ —	$ 94	$ —	$94
Interest rate swaps	—	1,199	—	1,199
Commodity contract derivatives	—	11	1	12
Total	$ —	$ 1,304	$ 1	$1,305

Notes

(1) Certain investments that are measured at fair value using the net asset value per share (or its equivalent) practical expedient have not been categorized in the fair value hierarchy. The fair value amounts presented in this table are intended to permit reconciliation of the fair value hierarchy to the amounts presented in the consolidated balance sheets.

(2) TVA records currency swaps net of cash collateral received from or paid to the counterparty, to the extent such amount is not recorded in Accounts payable and accrued liabilities. See Note 15 — Offsetting of Derivative Assets and Liabilities.

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Fair Value Measurements
At September 30, 2017

	Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	Total
Assets				
Investments				
Equity securities	$ 226	$ —	$ —	$226
Government debt securities	100	42	—	142
Corporate debt securities	—	373	—	373
Mortgage and asset-backed securities	—	49	—	49
Institutional mutual funds	94	—	—	94
Forward debt securities contracts	—	19	—	19
Private equity funds measured at net asset value(1)	—	—	—	136
Private real estate funds measured at net asset value(1)	—	—	—	113
Commingled funds measured at net asset value(1)	—	—	—	1,451
Total investments	420	483	—	2,603
Commodity contract derivatives	—	8	2	10
Total	$ 420	$ 491	$ 2	$2,613

	Quoted Prices in Active Markets for Identical Liabilities (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	Total
Liabilities				
Currency swaps(2)	$ —	$ 103	$ —	$103
Interest rate swaps	—	1,511	—	1,511
Commodity contract derivatives	—	1	69	70
Commodity derivatives under FTP(2)				
Swap contracts	—	1	—	1
Total	$ —	$ 1,616	$ 69	$1,685

Notes
(1) Certain investments that are measured at fair value using the net asset value per share (or its equivalent) practical expedient have not been categorized in the fair value hierarchy. The fair value amounts presented in this table are intended to permit reconciliation of the fair value hierarchy to the amounts presented in the consolidated balance sheets.
(2) Due to the right of setoff and method of settlement, TVA elects to record commodity derivatives under the FTP based on its net commodity position with the counterparty or FCM. Deposits are made to TVA's margin cash accounts held with each FCM to offset any net liability positions in full for derivatives that are transacted with FCMs. TVA records currency swaps net of any cash collateral received from or paid to the counterparty, to the extent such amount

is not recorded in Accounts payable and accrued liabilities. See Note 15 — Offsetting of Derivative Assets and Liabilities.

TVA uses internal valuation specialists for the calculation of its commodity contract derivatives fair value measurements classified as Level 3. Analytical testing is performed on the change in fair value measurements each period to ensure the valuation is reasonable based on changes in general market assumptions. Significant changes to the estimated data used for unobservable inputs, in isolation or combination, may result in significant variations to the fair value measurement reported.

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The following table presents a reconciliation of all commodity contract derivatives measured at fair value on a recurring basis using significant unobservable inputs (Level 3):
Fair Value Measurements Using Significant Unobservable Inputs

	Commodity Contract Derivatives
Balance at October 1, 2016	$ (127)
Purchases	—
Issuances	—
Sales	—
Settlements	—
Change in net unrealized gains (losses) deferred as regulatory assets and liabilities	60
Balance at September 30, 2017	(67)
Purchases	—
Issuances	—
Sales	—
Settlements	—
Change in net unrealized gains (losses) deferred as regulatory assets and liabilities	125
Balance at September 30, 2018	$ 58

The following table presents quantitative information related to the significant unobservable inputs used in the measurement of fair value of TVA's assets and liabilities classified as Level 3 in the fair value hierarchy:
Quantitative Information about Level 3 Fair Value Measurements

	Fair Value at September 30, 2018	Valuation Technique(s)	Unobservable Inputs	Range
Assets				
Commodity contract derivatives	$ 59	Pricing model	Coal supply and demand	0.7 - 0.8 billion tons/year
			Long-term market prices	$12.25 - $112.24/ton
Liabilities				
Commodity contract derivatives	$ 1	Pricing model	Coal supply and demand	0.7 - 0.8 billion tons/year
			Long-term market prices	$12.25 - $112.24/ton

Quantitative Information about Level 3 Fair Value Measurements

	Fair Value at September 30, 2017	Valuation Technique(s)	Unobservable Inputs	Range
Assets				
Commodity contract derivatives	$ 2	Pricing model	Coal supply and demand	0.6 - 0.7 billion tons/year
			Long-term market prices	$11.40 - $112.23/ton
Liabilities				

Commodity contract derivatives	$ 69	Pricing model	Coal supply and demand	0.6 - 0.7 billion tons/year
			Long-term market prices	$11.40 - $112.23/ton

Other Financial Instruments Not Recorded at Fair Value

TVA uses the methods and assumptions described below to estimate the fair values of each significant class of financial instrument. The fair value of the financial instruments held at September 30, 2018 and 2017, may not be representative of the actual gains or losses that will be recorded when these instruments mature or are called or presented for early redemption. The estimated values of TVA's financial instruments not recorded at fair value at September 30, 2018 and 2017, were as follows:

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Estimated Values of Financial Instruments Not Recorded at Fair Value

		At September 30, 2018		At September 30, 2017	
	Valuation Classification	Carrying Amount	Fair Value	Carrying Amount	Fair Value
EnergyRight® receivables (including current portion)	Level 2	$112	$112	$125	$127
Loans and other long-term receivables, net (including current portion)	Level 2	$138	$123	$118	$107
EnergyRight® financing obligation (including current portion)	Level 2	$127	$143	$144	$161
Unfunded loan commitments	Level 2	$—	$3	$—	$18
Membership interests of variable interest entity subject to mandatory redemption (including current portion)	Level 2	$30	$37	$32	$41
Long-term outstanding power bonds (including current maturities), net	Level 2	$21,189	$23,896	$21,933	$26,857
Long-term debt of variable interest entities (including current maturities), net	Level 2	$1,165	$1,256	$1,200	$1,356
Long-term notes payable (including current maturities)	Level 2	$69	$68	$122	$121

Due to the short-term maturity of Cash and cash equivalents, Restricted cash and cash equivalents, and Short-term debt, net (each considered a Level 1 valuation classification), the carrying amounts of these instruments approximate their fair values.

The fair value for loans and other long-term receivables is estimated by determining the present value of future cash flows using a discount rate equal to lending rates for similar loans made to borrowers with similar credit ratings and for similar remaining maturities, where applicable. The fair value of long-term debt and membership interests of VIE subject to mandatory redemption is estimated by determining the present value of future cash flows using current market rates for similar obligations, giving effect to credit ratings and remaining maturities.

17. Proprietary Capital

Appropriation Investment

TVA's power program and stewardship (nonpower) programs were originally funded primarily by appropriations from Congress. In 1959, Congress passed an amendment to the TVA Act that required TVA's power program to be self-financing from power revenues and proceeds from power program financings. While TVA's power program did not directly receive appropriated funds after it became self-financing, TVA continued to receive appropriations for certain multipurpose and other nonpower mission-related activities as well as for its stewardship activities. TVA has not received any appropriations from Congress for any activities since 1999, and since that time, TVA has funded stewardship program activities primarily with power revenues.

The 1959 amendment to the TVA Act also required TVA, beginning in 1961, to make annual payments to the U.S. Treasury from net power proceeds as a repayment of and as a return on the Power Program Appropriation Investment until a total of $1.0 billion of the Power Program Appropriation Investment has been repaid in accordance with the 1959 amendment. TVA fulfilled its requirement to repay $1.0 billion of the Power Program Appropriation Investment in 2014. The TVA Act requires TVA to continue making payments to the U.S. Treasury as a return on the remaining $258 million of the Power Program Appropriation Investment.

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The table below summarizes TVA's activities related to appropriated funds and retained earnings.
Summary of Proprietary Capital Activity
At or for the years ended September 30

	2018		2017	
	Power Program	Nonpower Programs	Power Program	Nonpower Programs
Appropriation Investment	$258	$ 4,351	$258	$ 4,351
Retained Earnings				
Balance at beginning of year	8,282	(3,779)	7,594	(3,771)
Net income (expense) for year	1,127	(8)	693	(8)
Return on power program appropriation investment	(5)	—	(5)	—
Balance at end of year	9,404	(3,787)	8,282	(3,779)
Net proprietary capital at September 30	$9,662	$ 564	$8,540	$ 572

Payments to the U.S. Treasury

TVA paid the U.S. Treasury $5 million, $5 million, and $6 million in 2018, 2017, and 2016, respectively, as a return on the Power Program Appropriation Investment. The amount of the return on the Power Program Appropriation Investment is based on the Power Program Appropriation Investment balance at the beginning of that year and the computed average interest rate payable by the U.S. Treasury on its total marketable public obligations at the same date. The interest rates payable by TVA on the Power Program Appropriation Investment were 2.09 percent, 2.00 percent, and 2.04 percent for 2018, 2017, and 2016, respectively.

Accumulated Other Comprehensive Income (Loss)

The items included in AOCI consist of market valuation adjustments for certain derivative instruments. See Note 15.

TVA records exchange rate gains and losses on debt and related accrued interest in net income and marks its currency swap assets and liabilities to market through OCI. TVA had unrealized gains (losses) of $10 million and $59 million in 2018 and 2017, respectively, on the mark-to-market of currency swaps. TVA then reclassifies an amount out of AOCI into net income, offsetting the gain/loss from recording the exchange gain/loss on the debt and related accrued interest. The amounts reclassified from OCI into net income resulted in increases (decreases) to net income of $(26) million, $26 million, and $(129) million in 2018, 2017, and 2016, respectively. These reclassifications, coupled with the recording of the exchange gain/loss on the debt and related accrued interest, did not have an impact on net income in 2018, 2017, and 2016. Based on forecasted foreign currency exchange rates, TVA expects to reclassify approximately $28 million of gains from AOCI to interest expense within the next 12 months to offset amounts anticipated to be recorded in interest expense related to exchange gain on the debt and related accrued interest.

18. Other Income (Expense), Net

Income and expenses not related to TVA’s operating activities are summarized in the following table:
Other Income (Expense), Net
For the years ended September 30

	2018	2017	2016
Interest income	$ 23	$ 23	$ 24
External services	14	14	12
Gains (losses) on investments	6	9	7
Miscellaneous	7	10	—
Total other income (expense), net	$ 50	$ 56	$ 43

19. Supplemental Cash Flow Information

Interest paid was $1.2 billion for 2018 and $1.3 billion for both 2017 and 2016. These amounts differ from interest expense in certain years due to the timing of payments and interest capitalized for major capital expenditures. There was no interest capitalized in 2018 or 2017 and $235 million capitalized in 2016 as part of the Watts Bar Unit 2 construction.

Construction in progress and Nuclear fuel expenditures included in Accounts payable and accrued liabilities at September 30, 2018, 2017, and 2016 were $372 million, $425 million, and $526 million, respectively, and are excluded from the

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Statements of Consolidated Cash Flows for the years ended September 30, 2018, 2017 and 2016 as non-cash investing activities.

Excluded from the Statement of Consolidated Cash Flows for the years ended September 30, 2017 and 2016 as non-cash financing activities were capital lease obligations incurred related to purchase power assets of $10 million and $81 million, respectively. There were no capital leases incurred during 2018. Also excluded from the Statement of Consolidated Cash Flows for the years ended September 30, 2017 and 2016 were $74 million and $78 million, respectively, of notes payable related to TVA's acquisition of equity interests in certain SPEs. See Note 9.

Cash flows from futures contracts, forward contracts, option contracts, and swap contracts that are accounted for as hedges are classified in the same category as the item being hedged or on a basis consistent with the nature of the instrument.

20. Benefit Plans

TVA sponsors a qualified defined benefit plan (“pension plan”) that covers most of its full-time employees hired prior to 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 postemployment 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").

Overview of Plans and Benefits

Retirement Plans. The participants in the pension plan receive either a traditional final average pay pension or a cash balance pension. The traditional pension benefit is based on the participant’s creditable service, average monthly salary for their highest three consecutive years of eligible compensation, and a pension factor based on the participant’s age and years of service, less a Social Security offset. The cash balance pension benefit is based on pay and interest credits accumulated in the participant’s account and the participant’s age.

Participants in the pension plan are also eligible to receive 401(k) plan matching contributions, may be eligible to receive 401(k) plan non-elective contributions and may be eligible to make after-tax contributions of up to $10,000 per year to the pension plan, which at the election of the participant are invested in either the fixed fund, which receives a fixed interest rate set forth in the plan, or the variable fund, which receives a rate of return based on an S&P 500 index fund. Participants in the pension plan may also become eligible for a supplemental pension benefit based on age and years of service at retirement, which is provided to help offset the cost of retiree medical insurance. Employees first hired on or after July 1, 2014, are participants in the 401(k) plan only and receive both non-elective and matching contributions to their accounts in the 401(k) plan.

On August 8, 2016, the TVARS Board approved amendments to the pension plan and the 401(k) plan, and these amendments were also approved by the TVA Board on August 25, 2016. The amendments, which became effective on October 1, 2016, changed future retirement benefits for employees and retirees and made certain other changes regarding TVA's minimum funding requirements to the pension plan and plan governance. These amendments shift future benefit accruals from the cash balance pension to the 401(k) plan based on hire date and years of service as of October 1, 2016. For cash balance participants first hired on or after January 1, 1996, and having 10 or more years of service as of October 1, 2016, participants will begin receiving non-elective contributions to their accounts in the 401(k) plan and reduced pay credits to their cash balance accounts in the pension plan. For cash balance participants first hired on or after January 1, 1996, and having less than 10 years of service as of October 1, 2016, participants will begin receiving non-elective contributions and higher matching contributions to their accounts in the 401(k) plan and will no longer receive pay credits to their cash balance accounts; however, their cash balance accounts will continue to receive interest credits. Current cash balance participants in the pension plan who were first hired before January 1, 1996, and elected to switch pension structures from traditional to cash balance did not experience a shift in future benefit accruals from the cash balance plan to the 401(k) plan.

The amendments also made the following additional benefit changes: reducing the future cash balance interest crediting rate and the fixed fund interest rate with a floor and ceiling based on the assumed rate of investment return on TVARS assets; closing the fixed and variable funds to new contributions from pension plan participants first hired on or after January 1, 1996; reducing the rate of future cost-of-living-adjustments ("COLAs") while increasing the maximum eligible COLA; vesting COLAs; increasing the eligibility age for COLAs for pension plan participants under age 50; restricting COLAs to pension amounts based on compensation up to Executive Level IV; eliminating future COLAs to SERP participants with less than 10 years of service; and capping the maximum supplemental benefit amounts.

The amendments also changed the annual minimum contribution required by TVA to the pension plan to the greater of (a) the minimum contribution calculated by TVARS's actuary according to the TVARS Rules and Regulations, or (b) $300 million, for a period of 20 years (from 2017 through 2036) or, if earlier, through the fiscal year in which the plan reaches and remains at a 100 percent funded status under the actuarial rules applicable to TVARS.

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On May 23, 2018, the TVARS Board approved amendments to the pension plan and 401(k) plan. These amendments allow employees who are continuing to accrue cash balance benefits in the pension plan to voluntarily elect to switch future participation to the 401(k) plan only, and employees with cash balance accounts in the pension plan who have a 401(k) only benefit the additional option to waive their rights to benefits under the pension plan and transfer their cash balance accounts (and fixed and variable accounts, if any) to the 401(k) plan. TVARS presented these amendments to TVA for its review and consideration, and the amendments became effective July 8, 2018.

Under the plan amendments, the voluntary election options were offered to eligible TVA employees during a two-month window from July 1, 2018, to August 31, 2018, with changes and transfers becoming effective on October 1, 2018. As a result, there were $23 million of one-time transfers to the 401(k) plan based upon employee elections. These amendments did not trigger curtailment or settlement accounting.

401(k) Plan. Under the 401(k) plan, the non-elective and matching contributions TVA makes to participant accounts are based on the participant's employment hire date and years of service. Non-elective employer contributions for eligible participants range from three percent to six percent and matching employer contributions range from 1.5 percent to six percent. TVA recognized approximately $80 million in 401(k) plan contribution costs in both 2018 and 2017. TVA recognized $38 million in 401(k) plan contribution costs in 2016. The increase in costs in 2017 to 2018, was primarily a result of the 2016 plan amendments. The 2018 plan amendments are expected to have a de minimis impact on the 401(k) plan costs of less than $1 million. The 2019 plan contribution costs are estimated to be approximately $83 million.

Supplemental Executive Retirement Plan. TVA has established a SERP for certain executives in critical positions to provide supplemental pension benefits tied to compensation that exceeds limits imposed by IRS rules applicable to the qualified defined benefit pension plan.

Other Post-Retirement Benefits. TVA sponsors two unfunded post-retirement benefit plans that provide for non-vested contributions toward the cost of certain eligible retirees' medical coverage. The first plan covers only certain retirees and surviving dependents who do not qualify for TVARS benefits, including the supplemental pension benefit. The second plan is designed to place a limit on the out-of-pocket amount certain eligible retirees pay for medical coverage and provides a credit based on years of TVA service and monthly base pension amount, reduced by any TVARS supplemental pension benefits or any TVA contribution from the first plan, described above. Effective January 2017, all Medicare-eligible retirees and spouses were provided Medicare coverage through a private exchange. Transition to the exchange does not affect any TVARS supplemental benefits for eligible retirees, and the credit will continue to be calculated in the same manner as before.

Other Post-Employment Benefits. TVA employees injured in work-related incidents are covered by the workers' compensation program for federal employees administered through the Department of Labor by the Office of Workers' Compensation Programs in accordance with the provisions of the Federal Employees' Compensation Act ("FECA"). FECA provides compensation and medical benefits to federal employees for permanent and temporary disability due to employment-related injury or disease.

Accounting Mechanisms

Regulatory Accounting. TVA has classified all amounts related to unrecognized prior service costs, net actuarial gains or losses, and the funded status as regulatory assets or liabilities as such amounts are probable of collection in future rates. Additionally, TVA recognizes pension costs as regulatory assets or regulatory liabilities to the extent that the amount calculated under U.S. GAAP as pension expense differs from the amount TVA contributes to the pension plan as pension plan contributions. As a result of recent plan design changes, future contributions are expected to exceed the expense calculated under U.S. GAAP. Accordingly, TVA will discontinue this regulatory accounting practice once all such deferred costs have been recovered, at which time it will recognize pension costs in accordance with U.S. GAAP.

Cost Method. TVA uses the projected unit credit cost method to determine the service cost and the projected benefit obligation for retirement, termination, and ancillary benefits. Under this method, a “projected accrued benefit” is calculated at the beginning of the year and at the end of the year for each benefit that may be payable in the future. The “projected accrued benefit” is based on the plan’s accrual formula and upon service at the beginning or end of the year, but it uses final average compensation, social security benefits, and other relevant factors projected to the age at which the employee is assumed to leave active service. The projected benefit obligation is the actuarial present value of the “projected accrued benefits” at the beginning of the year for employed participants and is the actuarial present value of all benefits for other participants. The service cost is the actuarial present value of the difference between the “projected accrued benefits” at the beginning and end of the year.

Amortization of Net Gain or Loss. TVA utilizes the corridor approach for gain/loss amortization. Differences between actuarial assumptions and actual plan results are deferred and amortized into periodic cost only when the accumulated differences exceed 10 percent of the greater of the projected benefit obligation or the market-related value of plan assets. If necessary, the excess is amortized over the average remaining service period of participating employees expected to receive benefits. The current projected amortization periods of unrecognized net gain or loss is approximately 10 years for the pension plan and 12 years for the post-retirement plan.

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Amortization of Prior Service Cost/(Credit). Amortization of net prior service cost/(credit) resulting from a plan change is included as a component of period expense in the year first recognized and every year thereafter until it is fully amortized. The increase or decrease in the benefit obligation due to the plan change is amortized over the average remaining service period of participating employees expected to receive benefits under the plan. The pension and post-retirement plans have prior service credits related to plan changes made in 2009, 2010, 2016 and 2018 with remaining amortization periods ranging from over two to 11 years. However, when a plan change reduces the benefit obligation, existing positive prior service costs are reduced or eliminated starting with the earliest established before a new prior service credit base is established.

Asset Method. TVA's asset method calculates a market-related value of assets ("MRVA") that recognizes realized and unrealized investment gains and losses over a three-year smoothing period to decrease the volatility of annual net periodic pension benefit costs. The MRVA is used to determine the expected return on plan assets, a component of net periodic pension benefit cost. The difference in the expected return on the MRVA and the actual return on the fair value on plan assets is recognized as an actuarial (gain)/loss in the pension benefit obligation at September 30. However, the MRVA has no impact on the fair value of plan assets measured at September 30.

Obligations and Funded Status

The changes in plan obligations, assets, and funded status for the years ended September 30, 2018 and 2017, were as follows:

Obligations and Funded Status
For the years ended September 30

	Pension Benefits		Other Post-Retirement Benefits	
	2018	2017	2018	2017
Change in benefit obligation				
Benefit obligation at beginning of year	$12,601	$13,083	$494	$571
Service cost	53	60	14	18
Interest cost	473	464	19	21
Plan participants' contributions	7	9	—	—
Collections(1)	—	—	25	47
Actuarial (gain) loss	(658)	(286)	(46)	(80)
Plan change	—	—	(17)	—
Net transfers (to) from variable fund/401(k) plan(2)	(26)	(12)	—	—
Expenses paid	(6)	(5)	—	—
Benefits paid	(719)	(712)	(61)	(83)
Benefit obligation at end of year	11,725	12,601	428	494
Change in plan assets				
Fair value of net plan assets at beginning of year	7,989	7,145	—	—
Actual return on plan assets	454	759	—	—
Plan participants' contributions	7	9	—	—
Collections(1)	—	—	25	47
Net transfers (to) from variable fund/401(k) plan(2)	(26)	(12)	—	—
Employer contributions(3)	304	805	36	36
Expenses paid	(6)	(5)	—	—
Benefits paid	(719)	(712)	(61)	(83)
Fair value of net plan assets at end of year	8,003	7,989	—	—

Funded status	$(3,722)	$(4,612)	$(428)	$(494)

Notes
(1) Collections include retiree contributions as well as provider discounts and rebates.
(2) Includes one-time transfers to the 401(k) of $23 million related to the 2018 plan amendment.
(3) Other Post-Retirement Benefits Employer contributions are reduced by provider discounts and rebates.

The pension actuarial gain for 2018 primarily reflects the impact of the increase in the discount rate from 3.85 percent to 4.35 percent, which decreased the liability by $676 million. Based on the results obtained from the most recent experience study

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performed in 2018, TVA had gains of $138 million due to mortality assumption changes offset by losses of $46 million due to the revision of other demographic and experience based assumptions. In addition, TVA recognized losses related to the change in the assumptions on lump sum elections and annuity benefits as a result of the 2016 plan amendments, which increased the liability by $110 million.

The pension actuarial gain for 2017 primarily reflects the impact of the increase in the discount rate from 3.65 percent to 3.85 percent, which decreased the liability by $292 million. In addition, gains of $117 million were due to mortality assumption changes. These gains were partially offset by a $119 million loss related to a change in the assumption of participant benefit payment elections, based on recent plan experience.

The other post-retirement actuarial gain for 2018 was primarily due to the increase in the discount rate from 3.95 percent to 4.40 percent, which decreased the liability by $28 million. Based on the results obtained from the recent experience study performed during 2018, TVA recognized gains of $6 million due to mortality assumption changes and $23 million of additional gains in other experience related assumptions. These gains were partially offset by losses of $8 million related to per capita claim costs and retiree contributions assumptions and $3 million in actuarial losses related to actual experience different from assumed.

For CY 2019, TVA made plan changes to the other post-retirement benefit plan resulting in a decrease in the liability of $17 million. This decrease is primarily related to the use of a new national preferred formulary and utilization manager program.

The other post-retirement benefit actuarial gain for 2017 was primarily due to lower per capita costs, which decreased the liability by $66 million. In addition, gains of $18 million were due to an increase in the discount rate from 3.70 percent to 3.95 percent, and gains of $6 million resulted from the updated mortality assumption. These gains were slightly offset by a change in the pre-Medicare trend rate, primarily driven by recent increases in prescription drug costs.

Amounts related to these benefit plans recognized on TVA's consolidated balance sheets consist of regulatory assets that have not been recognized as components of net periodic benefit cost at September 30, 2018 and 2017, and the funded status of TVA’s benefit plans, which are included in Accounts payable and accrued liabilities and Post-retirement and post-employment benefit obligations:

Amounts Recognized on TVA's Consolidated Balance Sheets
At September 30

	Pension Benefits		Other Post-Retirement Benefits	
	2018	2017	2018	2017
Regulatory assets (liabilities)	$3,119	$4,009	$ (73)	$ (23)
Accounts payable and accrued liabilities	(6)	(4)	(28)	(33)
Pension and post-retirement benefit obligations(1)	(3,716)	(4,608)	(400)	(461)

Note
(1) The table above excludes $360 million and $408 million of post-employment benefit costs that are recorded in Post-retirement and post-employment benefit obligations on the Consolidated Balance Sheets at September 30, 2018 and 2017, respectively.

Unrecognized amounts included in regulatory assets or liabilities yet to be recognized as components of accrued benefit cost at September 30, 2018 and 2017, consisted of the following:

Post-Retirement Benefit Costs Deferred as Regulatory Assets
At September 30

	Pension Benefits		Other Post-Retirement Benefits	
	2018	2017	2018	2017
Unrecognized prior service credit	$(819)	$(918)	$(159)	$(163)
Unrecognized net loss	3,842	4,885	86	140
Amount capitalized due to actions of regulator	96	42	—	—
Total regulatory assets	$3,119	$4,009	$(73)	$(23)

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The projected benefit obligation, accumulated benefit obligation, and fair value of plan assets for the pension plan at September 30, 2018 and 2017, were as follows:

Projected Benefit Obligations and Accumulated
Benefit Obligations in Excess of Plan Assets
At September 30

	2018	2017
Projected benefit obligation	$11,725	$12,601
Accumulated benefit obligation	11,659	12,461
Fair value of net plan assets	8,003	7,989

The components of net periodic benefit cost and other amounts recognized as changes in regulatory assets for the years ended September 30, 2018 and 2017, were as follows:

Components of Net Periodic Benefit Cost
For the years ended September 30

	Pension Benefits			Other Post-Retirement Benefits		
	2018	2017	2016	2018	2017	2016
Service cost	$53	$60	$133	$14	$18	$16
Interest cost	473	464	564	19	21	29
Expected return on plan assets	(478)	(457)	(446)	—	—	—
Amortization of prior service credit	(99)	(99)	(23)	(22)	(22)	(6)
Recognized net actuarial loss	409	472	310	8	14	7
Curtailment	—	—	(78)	—	—	—
Total net periodic benefit cost as actuarially determined	358	440	460	19	31	46
Amount expensed (capitalized) due to actions of regulator	(54)	365	(179)	—	—	—
Change in net periodic benefit cost	$304	$805	$281	$19	$31	$46

The amounts in the regulatory asset that are expected to be recognized as components of net periodic benefit cost during the next fiscal year are as follows:

Expected Amortization of Regulatory Assets in 2019
At September 30, 2018

	Pension Benefits	Other Post-Retirement Benefits	Total
Prior service credit	$ (99)	$ (24)	$(123)
Net actuarial loss	327	4	331

The amount in the components of net periodic benefit cost expected to be expensed due to actions of the regulator in the next fiscal year is $10 million.

Plan Assumptions

TVA's reported costs of providing the plan benefits are impacted by numerous factors including the provisions of the plans, changing employee demographics, and various assumptions, the most significant of which are noted below.

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Actuarial Assumptions Utilized to Determine Benefit Obligations at September 30

	Pension Benefits		Other Post-Retirement Benefits	
	2018	2017	2018	2017
Discount rate	4.35%	3.85%	4.40 %	3.95 %
Rate of compensation increase	3.60%	5.43%	N/A	N/A
Cost of living adjustment (COLA)[1]	2.00%	2.00%	2.00 %	2.00 %
Pre-Medicare eligible				
Initial health care cost trend rate	N/A	N/A	6.25 %	6.50 %
Ultimate health care cost trend rate	N/A	N/A	5.00 %	5.00 %
Year ultimate trend rate is reached	N/A	N/A	2024	2024
Post-Medicare eligible				
Initial health care cost trend rate	N/A	N/A	— %	— %
Ultimate health care cost trend rate	N/A	N/A	4.00 %	4.00 %
Year ultimate trend rate is reached	N/A	N/A	2021	2021

Note
(1) The COLA rate is the ultimate long-term rate.

Actuarial Assumptions Utilized to Determine Net Periodic Benefit Cost for the Years Ended September 30[1]

	Pension Benefits			Other Post-Retirement Benefits		
	2018	2017	2016	2018	2017	2016
Discount rate	3.85%	3.65%	4.50%	3.95 %	3.70 %	4.65 %
Expected return on plan assets	6.75%	7.00%	7.00%	N/A	N/A	N/A
Cost of living adjustment (COLA)[2]	2.00%	2.00%	2.40%	2.00 %	2.00 %	2.40 %
Rate of compensation increase	5.34%	5.43%	5.55%	N/A	N/A	N/A
Pre-Medicare eligible						
Initial health care cost trend rate	N/A	N/A	N/A	6.50 %	6.50 %	7.00 %
Ultimate health care cost trend rate	N/A	N/A	N/A	5.00 %	5.00 %	5.00 %
Year ultimate trend rate is reached	N/A	N/A	N/A	2024	2019	2019
Post-Medicare eligible						
Initial health care cost trend rate	N/A	N/A	N/A	— %	— %	7.00 %
Ultimate health care cost trend rate	N/A	N/A	N/A	4.00 %	4.00 %	5.00 %
Year ultimate trend rate is reached	N/A	N/A	N/A	2021	2021	2019

Notes
(1) The actuarial assumptions used to determine the benefit obligations at September 30 of each year are subsequently used to determine net periodic benefit cost for the following year except the rate of compensation increase assumption.
(2) The COLA assumption is the ultimate rate. The actual calendar year rate is used in determining the expense, and for years thereafter the ultimate rate is used.

Discount Rate. In selecting the assumed discount rate, TVA reviews market yields on high-quality corporate debt and long-term obligations of the U.S. Treasury and endeavors to match, through the use of a hypothetical bond portfolio, instrument maturities with the maturities of its pension obligations in accordance with the prevailing accounting standards. The selected bond portfolio is derived from a universe of high quality corporate bonds of Aa-rated quality or higher. After the bond portfolio is selected, a single interest rate is determined that equates the present value of the plan's projected benefit payments discounted at this rate with the market value of the bonds selected. Based on recent market trends and economic conditions, TVA increased its discount rate used to determine the pension benefit obligation and other post-retirement benefit obligation.

Rate of Return. The qualified defined benefit pension plan is the only plan that is funded with qualified plan assets. In determining the expected long-term rate of return on pension plan assets, TVA uses a process that incorporates actual historical asset class returns and an assessment of expected future performance and takes into consideration external actuarial advice, the current outlook on capital markets, the asset allocation policy, and the anticipated impact of active management. Asset allocations are periodically updated using the pension plan asset/liability studies and are part of the determination of the estimates of long-term rates of return. The TVARS asset allocation policy diversifies plan assets across multiple asset classes so as to minimize the risk of large losses. The asset allocation policy is designed to be dynamic in nature and responsive to changes in the funded status of TVARS. Changes in the expected return rates are based on annual studies performed by third party professional investment consultants. Taking into account changes in the plan's asset target allocation mix, capital market outlooks, and the most recent studies, TVA management adopted a 6.75 percent expected long-term rate of return on plan

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assets in 2017 to calculate the 2018 net periodic pension cost, and had no changes to the assumption in 2018. The 6.75 percent expected long-term return on plan assets will be used to calculate the 2019 net periodic pension cost.

Compensation Increases. Assumptions related to compensation increases are based on the results obtained from an actual company experience study performed during the most recent five years for plan participants. TVA obtained an updated study in 2018 and determined that future compensation would likely increase at rates between 2.50 percent and 14.00 percent per year, depending upon the employee's age. The average assumed compensation increase used to determine benefit obligations is based upon the current active participants.

Mortality. The mortality assumption is comprised of a base table that represents the current future life expectancy adjusted by an improvement scale to project future improvements in life expectancy. TVA's mortality assumptions are based upon actuarial projections in combination with studies of the actual mortality experience of TVA's pension and post-retirement benefit plan participants while taking into consideration the published Society of Actuaries ("SOA") mortality table and projection scale at September 30. Based upon the recent 2018 experience study, TVA adjusted its version of the SOA RP-2014 mortality table to reflect increases in female mortality and adopted a modified version of the SOA MP-2017 improvement scale to measure the pension and other post-retirement benefit obligations at September 30, 2018.

The following mortality assumptions were used to determine the benefit obligations for the pension and other post-retirement benefit plans at September 30, 2018, 2017, and 2016. Assumptions used to determine year-end benefit obligations are the assumptions used to determine the subsequent year’s net periodic benefit costs.

Mortality Assumptions
At September 30

	2018	2017	2016
Mortality table	RP-2014 table (adjusted)	RP-2014 table (adjusted)	RP-2014 table (adjusted)
Improvement scale	MP-2017 (modified)	MP-2016 (modified)	RP-2015 scale (modified)

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

Cost of Living Adjustment. COLAs are an increase in the benefits for eligible retirees to help maintain the purchasing power of benefits as consumer prices increase. Eligible retirees receive a COLA on pension and supplemental benefits equal to the percentage change in the Consumer Price Index for All Urban Consumers (“CPI-U”) in January following any year in which the 12-month average CPI-U exceeded by as much as one percent the 12-month average of the CPI-U for the preceding year in which a COLA was given. Increases in the COLA will be the percent increase in CPI-U over the preceding year less 0.25 percent, with a 6.00 percent cap for any one year.

TVA's COLA assumption is derived from long-term expectations of the expected future rate of inflation, based upon capital market assumptions, economic forecasts, and the Federal Reserve policy. The actual calendar year COLA and the long- term COLA assumption are used to determine the benefit obligation at September 30 and the net periodic benefit costs for the following fiscal year. The actual calendar year COLAs for 2018 and 2017 were 1.84 percent and 0.99 percent, respectively. For 2016 there was no COLA.

Sensitivity of Costs to Changes in Assumptions. The following chart reflects the sensitivity of pension cost to changes in certain actuarial assumptions:
Sensitivity to Certain Changes in Pension Assumptions
At September 30, 2018

Actuarial Assumption	Change in Assumption	Impact on 2018 Pension Cost	Impact on 2018 Projected Benefit Obligation
Discount rate	(0.25)%	$ 16	$ 330
Rate of return on plan assets	(0.25)%	18	N/A
Cost of living adjustments	0.25 %	28	217

Each fluctuation above assumes that the other components of the calculation are held constant and excludes any impact for unamortized actuarial gains or losses.

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The following chart reflects the sensitivity of post-retirement benefit cost to changes in the health care trend rate:
Sensitivity to Changes in Assumed Health Care Cost Trend Rates
At September 30, 2018

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

Each fluctuation above assumes that the other components of the calculation are held constant and excludes any impact for unamortized actuarial gains or losses.

Plan Investments

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

As set forth above, the qualified pension plan assets are invested across global public equity, private equity, safety oriented fixed income, opportunistic fixed income, public real assets, and private real assets. The TVARS asset allocation policy includes permissible deviations from target allocations, and action can be taken, as appropriate, to rebalance the plan's assets consistent with the asset allocation policy. At September 30, 2018 and 2017, the asset holdings of TVARS included the following:
Asset Holdings of TVARS
At September 30

		Plan Assets at September 30	
Asset Category	Target Allocation	2018	2017
Global public equity	35 %	44 %	44 %
Private equity	8 %	7 %	5 %
Safety oriented fixed income	17 %	16 %	21 %
Opportunistic fixed income	15 %	10 %	10 %
Public real assets	15 %	15 %	13 %
Private real assets	10 %	8 %	7 %
Total	100 %	100 %	100 %

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Fair Value Measurements

The following table provides the fair value measurement amounts for assets held by TVARS at September 30, 2018:
TVA Retirement System
At September 30, 2018

	Total[(1)(2)]	Quoted Prices in Active Markets for Identical Assets/Liabilities (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Assets				
Equity securities	$ 1,787	$ 1,786	$ —	$ 1
Preferred securities	10	4	6	—
Debt securities				
Corporate debt securities	1,151	—	1,148	3
Residential mortgage-backed securities	377	—	371	6
Debt securities issued by U.S. Treasury	696	696	—	—
Debt securities issued by foreign governments	322	—	304	18
Asset-backed securities	129	—	103	26
Debt securities issued by state/local governments	17	—	17	—
Commercial mortgage-backed securities	74	—	70	4
Commingled funds measured at net asset value[(3)]				
Equity	1,175	—	—	—
Debt	317	—	—	—
Commodities	232	—	—	—
Blended	109	—	—	—
Institutional mutual funds	109	109	—	—
Cash equivalents and other short-term investments	358	42	316	—
Certificates of deposit	2	—	2	—
Private credit measured at net asset value[(3)]	8	—	—	—
Private equity measured at net asset value[(3)]	631	—	—	—
Private real estate measured at net asset value[(3)]	583	—	—	—
Securities lending collateral	318	—	318	—
Derivatives				
Futures	7	7	—	—
Swaps	8	—	8	—
Foreign currency forward receivable	3	—	3	—
Total assets	$ 8,423	$ 2,644	$ 2,666	$ 58
Liabilities				
Futures	$ 3	$ 3	$ —	$ —
Foreign currency forward payable	3	—	3	—

Written options	1	—	1	—
Total liabilities	$ 7	$ 3	$ 4	$ —

Notes
(1) Excludes approximately $95 million in net payables associated with security purchases and sales and various other payables.
(2) Excludes a $318 million payable for collateral on loaned securities in connection with TVARS's participation in securities lending programs.
(3) In accordance with Subtopic 820-10, certain investments that are measured at fair value using the net asset value per share (or its equivalent) practical expedient have not been classified in the fair value hierarchy.

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The following table provides the fair value measurement amounts for assets held by TVARS at September 30, 2017:
TVA Retirement System
At September 30, 2017

	Total(1)(2)	Quoted Prices in Active Markets for Identical Assets/Liabilities (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Assets				
Equity securities	$ 1,771	$ 1,770	$ —	$ 1
Preferred securities	14	3	11	—
Debt securities				
Corporate debt securities	1,100	—	1,088	12
Residential mortgage-backed securities	325	—	317	8
Debt securities issued by U.S. Treasury	193	193	—	—
Debt securities issued by foreign governments	331	—	307	24
Asset-backed securities	146	—	109	37
Debt securities issued by state/local governments	19	—	17	2
Commercial mortgage-backed securities	68	—	62	6
Commingled funds measured at net asset value(3)				
Equity	1,134	—	—	—
Debt	709	—	—	—
Commodities	224	—	—	—
Institutional mutual funds	155	155	—	—
Cash equivalents and other short-term investments	916	—	916	—
Certificates of deposit	6	—	6	—