Confidential

# **TVA Strategic Considerations: Generation, Funding and Pricing**

# Public-Private Partnership Proposal

September 2013

## Introduction

*Tennessee Valley Authority ("TVA") should pursue a generation strategy that best aligns with its mission for clean, reliable and low cost power* 

1 Retire, do not scrub, the 29 coal facilities that do not meet MATS <sup>(1)</sup> clean air standards and / or are uneconomical to operate

- Closing these coal plants would free up ~\$8 billion of cash flow that TVA would otherwise use on scrubbing capex and operating costs
- Coupled with cash on hand today this would provide TVA with \$9.5 billion of cash through 2020

2 Use portion of cash surplus to reduce industrial rates by 30% in FY 2014 and maintain residential / commercial rates at FY 2014 levels

Increase competiveness to neighboring geographies

#### 3 Fund nuclear plant capital requirements through a public-private partnership

- Watts Bar construction debt should be refinanced using Alternative Financing<sup>(2)</sup>
  - Avoid a rate increase by refinancing the construction debt with ~\$3 billion of Alternative Financing and ~\$2 billion of TVA cash on hand
  - Frees up \$5 billion of statutory debt capacity in FY 2016
- Complete Bellefonte construction using Alternative Financing and up to \$4 billion of TVA cash

(2) Alternative Financing refers to debt incurred outside of TVA's statutory debt limit.

<sup>(1)</sup> MATS refers to the "Mercury Air Toxics Standards" which will require coal- and oil-fired power plants to reduce hazardous air pollutant emissions.

# **Executive summary / agenda**

# Retiring coal facilities and executing Alternative Financing for Watts Bar 2 and Bellefonte provides a number of benefits

- *Replaces aging coal infrastructure and diversifies TVA's power generation portfolio* 
  - Assuming scheduled coal plant retirements to comply with MATS and load growth in keeping with TVA's forecast, TVA will not be able to meet energy demand by 2020
  - Diversifies TVA away from carbon-based power sources

#### Bellefonte represents a lower cost alternative relative to natural gas and scrubbed coal plants

- Higher upfront construction costs are offset by longer useful life and investment to date in Unit #1
- Potential incremental value from up to \$2 billion of nuclear power production tax credits

#### • *Greatest flexibility for TVA to deploy surplus cash flow and retain statutory debt capacity*

- Bellefonte construction could be financed entirely with Alternative Financing and cash on hand
- Watts Bar 2 construction debt could be refinanced entirely with Alternative Financing and cash on hand freeing approximately \$5 billion of statutory debt capacity
- TVA would retain flexibility in deploying incremental cash flow and statutory debt capacity created by closing coal plants and using Alternative Financing to reduce rates

#### Alternative Financing structure provides risk sharing and value creation for TVA

- Equity investors would assume some construction overrun risk subject to ability to act as lead contractor
- TVA would retain ownership after the Alternative Financing is fully amortized

### Energy demand

#### TVA's peers and the Energy Information Administration ("EIA") have a more aggressive view on growth in energy sales and peak demand



1.5% per year from 2013 to 2020. Georgia Power Company's 2013 Integrated Resource Plan

System Sales... are projected to grow at an average annual rate of 1.5% from 2011 through 2027. [Residential increase of 1.0%. commercial increase of 1.8%, non-textile industrial increase of 1.0%]

The system summer peak demand on the Duke Energy Carolinas system is expected to grow at an average annual rate of 1.7% from 2011 through 2027.

The forecasts include an adjustment for proposed utility sponsored energy efficiency programs as well as adjustments for the expected growth in Plug-in Hybrid Electric Vehicles and the proposed ban on incandescent lighting.

The Duke Energy Carolinas Integrated Resource Plan

TVA Board Meeting dated 8/22/13. (1)

- Annual Energy Outlook 2013 with Projections to 2040. EIA.gov (April 2013). (2)
- (3) Georgia Power Company's 2013 Integrated Resource Plan (July 2013).
- (4) Duke Energy's 2013 Integrated Resource Plan (September 2012).
- (5) Dominion Virginia Power's 2013 Integrated Resource Plan (August 2013).

# **Projected TVA energy gap**

#### Assuming TVA's base case of 0.4% growth in peak demand from FY 2012 level, TVA will face a deficit of ~5,400 MW by 2020 because of scheduled coal plant retirements

Extended construction lead times and high cost of investment limit TVA's ability to react quickly to demand fluctuations 



#### 2020E TVA capacity shortfall

Peak demand represents the period in which electrical power is provided for a sustained period at a significantly higher than average supply level. (1) Refer to page 13 for further detail.

(2)Based on starting point of 31,098 MW (per page 50 of TVA's 10-K for the period ending 9/30/12) and compounded growth through 2020E.

Capacity measures the contribution of all TVA power stations to the overall capacity of a distribution grid. Notes:

## **Review of TVA energy generation profile**

Construction of Bellefonte will reduce TVA's reliance on carbon-based production and set the stage for low-cost energy in the future

2020E profile with Bellefonte and incremental

Current generation profile (as of 9/30/2012) gas capability<sup>(1)</sup> Coal-fired PPAs / other 12% 1% PPAs / other 6% Hydroelectric 17% Stolo carbon-based Coal-fired Hydroelectric 6 36% 15% 0 0 carbon-based SIGNY Natural gas Nuclear Nuclear / oil-fired 18% 31% 39% Natural gas / oil-fired 25%

Note: Figures above based on implied net summer capability.

(1) Assumes 2020 net summer capability equal to TVA's projected peak demand of 32,107 MW. Retired coal capacity is assumed to be replaced with Bellefonte and new natural gas capacity. Refer to page 14 for detail.

## Illustrative cost of power comparison

#### Bellefonte presents a unique opportunity to take advantage of investment to date to construct a nuclear facility at ~50% of greenfield development cost



Note: Bellefonte analysis does not reflect interest savings from debt paydown.

Refer to page 25 for detailed assumptions.

Note: Analysis based on constant 2012 dollars.

Refer to page 18 for detailed assumptions. (1)

Refer to page 22 for detailed assumptions. (2)

(4) Bellefonte - NEI Fact Sheet (06/13); Natural gas & Coal scrubbing - Nuclear Development LLC estimates. Confidential Does not include interest during construction.

(5)

(3)

## TVA cash flow, adjusted for coal plant retirements

#### Cash flow per August TVA Board Presentation, adjusted for retirement of existing coal plants to comply with MATS and resulting reductions on O&M and capital spending

(\$ in millions, unless otherwise specified)			Fiscal yea	ar ending Sept	ember 30,			Cumulative		
	2014E	2015E	2016E	2017E	2018E	2019E	2020E	2014 - 2020		
Peak demand (MW) <sup>(1)</sup>	31,347	31,473	31,599	31,725	31,852	31,979	32,107			
Capacity (MW)	37,325	36,516	33,567	33,067	30,850	30,350	26,711			
Surplus / (deficit)	5,978	5,043	1,968	1,342	(1,002)	(1,629)	(5,396)			
Sale of electricity	\$10,300	\$10,600	\$10,800							
Other revenue	168	168	168							
Operating revenue	\$10,468	\$10,768	\$10,968							
() Fuel & purchased power	(\$3,498)	(\$3,600)	(\$3,500)							
() Operations & maintenance	(3,437)	(3,200)	(3,200)							
() Tax equivalents	(513)	(528)	(538)					i		
(+) Other income	41	42	43							
EBITDA <sup>(2)</sup>	\$3,061	\$3,482	\$3,773	\$3,773	\$3,773	\$3,773	\$3,773	\$25,411		
(+) O&M savings from coal plant closures <sup>(3)</sup>		_	108	239	342	413	413	1,515		
Pro forma EBITDA	\$3,061	\$3,482	\$3,881	\$4,012	\$4,115	\$4,186	\$4,186	\$26,926		
🗙 () Net interest expense	(\$1,250)	(\$1,250)	(\$1,250)	(\$1,250)	(\$1,250)	(\$1,250)	(\$1,250)	(\$8,750)		
() TVA base capital spend <sup>(4)</sup>	(946)	(1,027)	(1,032)	(1,032)	(1,032)	(1,032)	(1,032)	(7,133)		
(+) Adjustments to base capital spend <sup>(5)</sup>	50	98	170	194	212	212	290	1,227		
() Environmental capital spend (Ash & Kingston)	(217)	(217)	(217)	(217)	(217)	(217)	(217)	(1,519)		
Cash flow available for discretionary spend	\$698	\$1,086	\$1,553	\$1,708	\$1,829	\$1,900	\$1,978	\$10,751		
Discretionary spend <sup>(6)</sup>										
() Transmission capital spend	(\$208)	(\$240)	(\$260)	(\$260)	(\$260)	(\$260)	(\$260)	(\$1,748)		
() Nuclear capital spend (primarily Watts Bar #2)	(956)	(840)	(200)	-	_	_	_	(1,996)		
() Other (Nuclear Fuel)	(313)	-	-	-	_	-	-	(313)		
(+) Financing	900	600	-			-	_	1,500	\$1,287	Excess cash as of $9/30/13$ (7)
Change in cash	\$121	\$606	\$1,093	\$1,448	\$1,569	\$1,640	\$1,718	\$8,194	8,194	Cash flow
									\$9 481	Available cash

0.4% Peak demand growth based on TVA's Board Meeting presentation

2014E – 2016E estimates are based on TVA's Board Meeting presentation. Flat thereafter

O&M savings associated with rationalization of the existing coal plant portfolio

- Adjustments related to base capital savings from coal plant closures and Bellefonte capex already included in TVA budget
- 2014E discretionary capital spend is based on TVA's Board Meeting presentation date 8/22/13; Nuclear Development LLC estimates thereafter

Page 13 of TVA Board Meeting presentation (8/22/13). (1)

(2) Page 64 of TVA Board Meeting presentation (8/22/13).

(3) Refer to page 16 for reconciliation.

(4) Page 56 of TVA Board Meeting presentation (8/22/13).

(5)Refer to page 15 for reconciliation. Page 58 of TVA Board Meeting presentation (8/22/13).

(6) (7) Based on TVA's mandated minimum cash balance of \$200 million.

## **Recommended allocation of available cash**

Alternative financing enables 30% rate reduction and up to \$6 billion contribution to development of nuclear fleet, while improving financial flexibility through lower statutory debt



(1) 2014E baseline industrial sales of \$875 million assumes 17.5 million mWh sold at an average price of \$50.00 / mWh. Following a 30% rate reduction average price will decrease to \$35.00 / mWh resulting in adjusted 2014E industrial sales of \$612.5 million (annual reduction of \$262.5 million through 2020E).

## Comparative analysis of coal scrubbing to Nuclear Development's recommendation

Nuclear Development's recommendation best aligns with TVA's long-term mission

	Coal scrubbing case	Nuclear Development recommendation
Remaining useful life of new / scrubbed facilities in 2020	Less than 15 years of scrubbed coal plants	60 years of Bellefonte
Industrial rates in 2020	<ul> <li>Increase from current level as result of Watts Bar 2</li> <li>Significant additional increases following retirement of coal plants</li> </ul>	30% reduction from current level
Residential rates in 2020	Increase from current level	Unchanged from current level
Statutory debt availability in 2016	<ul> <li>~\$4 billion</li> </ul>	<ul> <li>~\$9 billion</li> <li>- \$5 billion increase due to Watts Bar 2 Alternative Financing</li> <li>- Sufficient to pursue further capacity expansions</li> </ul>
Cost of power	Retain coal power at \$58 – \$65 / mWh <sup>(1)</sup>	<ul> <li>Use lowest available cost of power</li> <li>Bellefonte facility at ~\$45 / mWh <sup>(1,2)</sup></li> <li>Natural gas at ~\$56 / mWh <sup>(1)</sup></li> </ul>

(1) Cost of power estimates based on 5% cost of capital. Refer to page 6 for detail.

(2) Assuming a \$4 billion contribution from TVA and 5% cost of capital, cash cost of power at Bellefonte would be ~\$36 / mWh. Refer to pages 20 - 21 for detail.

# Proposed structure and risk sharing

### Summary terms of the proposed structure for Bellefonte:

- 1. Nuclear Development LLC will form a special purpose entity ("SPE") to ground lease the Bellefonte plants from the TVA
  - Lease for the duration of the construction, operations and renewals
- 2. TVA will enter into take-or-pay PPAs with the SPE
  - ~9,900 mWh of power from each plant (~95% of maximum output after outages)
  - Price of power determination:
    - Cost of capital based on debt and equity amortized over 40 years
    - Cost of capital set when fixed rate financing is closed
    - Increases in O&M and fuel costs after closing would be passed through
- 3. SPE will provide financing to complete construction
  - Equity contribution expected to be 10% of total cost, remainder to be funded with debt
  - SPE will make use of production tax credits
  - TVA can prepay PPA at any point to fund construction
- 4. SPE will assume construction risk subject to certain conditions
  - SPE would oversee bidding and supervising construction contracts through Nuclear Development LLC's contractor
  - PPAs to have date certain provision
- 5. SPE's interest in each plant and its power production will be 100% until all capital provided by the SPE plus its implicit return is repaid or defeased
  - Thereafter, TVA would take ownership of each plant
- 6. TVA would manage operations for the duration of the ground lease

TVA to assume interest rate risk

 Mitigated by ability to choose when to fix rates

SPE to assume some construction risk

# **Financing discussion**

#### Credit Suisse is confident that construction and permanent financing are readily available

- Take-or-pay PPAs from TVA for 95% of expected capacity with date certain starting point
- Lenders will focus on the contractual terms of the PPAs and need to be comfortable that the project has similar credit risk to TVA
- Based on their credit analysis, investors will add a 50-75 bps premium to TVA's cost of debt; however, the modestly higher cost would be mitigated by savings achieved through implementation of Nuclear Development's strategy
- Financing would be available in a wide range of maturities, from overnight commercial paper to 40 years (with amortization)
  - Debt financing should balance interest rate risk and capital structure flexibility

# Appendix

## Power generation capability bridge

### Coal plant closures

## Assuming the bulk of coal facilities are retired to comply with MATS, nuclear generation presents an attractive option to fill 2020 energy demand

(in MW)	Net additions / (reductions) per calendar year									_
	2012A	2013E	2014E	2015E	2016E	2017E	2018E	2019E	2020E	
Beginning balance <sup>(1)</sup>	37,325	37,325	37,325	37,325	36,516	33,567	32,091	30,850	30,350	
										Mandated
B Less: coal plant closures <sup>(2)</sup>										retirement date
Colbert	_	_	_	(304)	(880)	_	_	-	_	Dec'15 / Jun'16
John Sevier	_	_	_	(704)	-	_	_	-	_	Dec'15
Shawnee	-	-	_	_	(1,206)	_	-	-	_	Dec'17
Allen	-	-	-	-	_	-	(741)	-	_	Dec'18
Johnsonville	-	-	_	(924)	-	_	-	-	_	Dec'15 &'17
Paradise	-	-	_	_	-	_	-	-	(2,201)	Dec'20
Widows Creek	-	-	-	-	_	-	_	-	(938)	Dec'20
Bull Run	_	_	_	_	(863)	_	_	-	-	NA <sup>(3)</sup>
Gallatin	-	-	_	-	-	(976)	-	-	_	Dec'17
Total coal plant closures	-	-	-	(1,932)	(2,949)	(976)	(741)	-	(3,139)	-
PPA Expirations	_	_	_	_	_	(500)	(500)	(500)	(500)	
Total capacity retired	-	-	-	(1,932)	(2,949)	(1,476)	(1,241)	(500)	(3,639)	
										Assuming the bulk of
Hust nuclear openings				1 100						coal facilities are retired
VVatts Bar 2	_	_	_	1,123	_	_	_	-	_	to comply with MATS,
Total new generation	-	-	-	1,123	-	-	-	-	-	TVA will face a shortfall
Ending balance	37,325	37,325	37,325	36,516	33,567	32,091	30,850	30,350	\$ 26,711	<b>€</b> L

2012 net summer capacity sourced from TVA's 10-K for the period ending 9/30/2012; projects constant growth of 0.4%

B Coal plant closures based on guidance from Nuclear Development LLC and TVA's 10-K for the period ending 9/30/2012

C) PPA expirations based on Nuclear Development LLC estimates

Watts Bar 2 net summer capacity and scheduled opening based on Nuclear Development LLC estimates

Note: Figures above reflect summer net capability.

(3) No mandated retirement date under environmental regulations for Bull Run.

<sup>(2)</sup> Page 15 of TVA 10-K for the period ending 9/30/2012.

## **Power generation profile**

Summer net capacity

(in MW)

Fleet balance assuming the addition of Bellefonte Unit #1 and Unit #2 capacity plus incremental capacity from gas plants to offset coal plant closures

Generation type	Summer net capability	Deductions ()	Additions (+)	2020E Summer net capability
A Total coal-fired <sup>(1)</sup>	13,605	(9,737)	_	3,868
B Total natural gas and/or oil-fired	9,242	_	3,136	12,378
C Total nuclear	6,710	_	3,383	10,093
Total hydroelectric	5,447	-	_	5,447
Power purchase and other agreements	2,321	(2,000)	_	321
Total summer net capability	37,325	(11,737)	6,519	32,107
As a percent of total:				
Coal-fired	36%			12%
Natural gas / oil-fired	25%			39%
Nuclear	18%			31%
Hydroelectric	15%			17%
PPAs / other	6%			1%
Total	100%			100%

Coal plant closures based on guidance from Nuclear Development LLC and TVA's 10-K for the period ending 9/30/2012

B) For illustrative purposes, total summer net capability has been set equal to market demand by increasing natural gas capacity

Includes the addition of Watts Bar 2 (1,123 MW) in 2015 based on Nuclear Development LLC estimates, Bellefonte Unit 1 in 2018 and Bellefonte Unit 2 in 2020 (2,260 MW combined)

PPA expirations based on Nuclear Development LLC estimates

Note: Additions to summer net capability calculated by multiplying nameplate capacity by utilization. For example, Bellefonte's 2,500 MW of nameplate capacity, net of fueling outages, multiplied by a 95% utilization rate implies 2,260 of incremental capacity.

(1) Page 13 – 15 of TVA 10-K for the period ending 9/30/2012.

### **Base capital spend reconciliation**

- Base capital spend will be reduced in the year prior to plant closures (plant idled)
  - As of 9/30/12, coal-fired net summer capability was 13,605 MW
  - 2014E non-nuclear base capex of ~\$370 million implies a base capital spend of ~\$24,700 / MW
- Analysis below summarizes base capex reduction associated with coal plant closures as detailed on page 13

(\$ in millions)		Fiscal year ending September 30,						
	Capacity (MW)	2014E	2015E	2016E	2017E	2018E	2019E	2020E
Coal plant capex savings <sup>(1)</sup>								
Colbert	1,184	_	\$7	\$29	\$29	\$29	\$29	\$29
Johnsonville	924	_	23	23	23	23	23	23
John Sevier	704	_	17	17	17	17	17	17
Shawnee	1,206	_	_	30	30	30	30	30
Bull Run	863	_	_	21	21	21	21	21
Gallatin	976	-	_	_	24	24	24	24
Allen	741	_	_	_	_	18	18	18
Paradise	2,201	-	_	_	_	_	_	55
Widows Creek	938	-	_	_	_	_	_	23
Total capex savings from coal plant closures		-	\$48	\$120	\$144	\$162	\$162	\$240
Coal plant closure capex savings		-	\$48	\$120	\$144	\$162	\$162	\$240
Bellefonte capital spend already included in TVA budget <sup>(1)</sup>		50	50	50	50	50	50	50
Adjustments to base capital spend		\$50	\$98	\$170	\$194	\$212	\$212	\$290

(1) Nuclear Development LLC estimates.

## **O&M** savings from coal plant closures

• O&M savings realized starting in the year of plant closure

(\$ in millions)		Fiscal year ending September 30,							
	Capacity	2014E	2015E	2016E	2017E	2018E	2019E	2020E	2021E
Coal plant O&M savings (1)									
Colbert	1,184	_	_	\$73	\$73	\$73	\$73	\$73	\$73
John Sevier	704	_	_	35	35	35	35	35	35
Shawnee	1,206	_	_	_	111	111	111	111	111
Bull Run	863	_	_	_	20	20	20	20	20
Gallatin	976	_	_	_	_	103	103	103	103
Allen	741	_	_	_	_	_	71	71	71
Paradise	2,201	_	_	_	_	_	_	_	210
Widows Creek	938	_	_	_	_	_	_	_	71
Total O&M savings from coal plant closures				\$108	\$239	\$342	\$413	\$413	\$694
(1) Nuclear Development LLC estimates.									

\$1.5 billion of total O&M savings through 2020

Note: 2015E Johnsonville O&M savings are assumed to be part of the \$500 million in projected O&M savings per the TVA Board Meeting presentation dated 8/22/13.

# **Impact of Alternative Financing for Watts Bar 2**

- Savings from fuel cost adjuster can be used to offset increased debt service costs
- Alternative Financing enables TVA to avoid planned rate increases and simultaneously reduce statutory debt balance

#### Watts Bar 2

(\$ in millions, except otherwise specified)	
Coal fuel cost / mWh	\$25.00
Less: Nuclear fuel cost / mWh	(5.25)
Fuel cost savings / mWh	\$19.75
Watts Bar 2 generation (gWh)	8,831
Fuel cost adjuster	\$175
PPA financing	
Watts Bar 2 cost	\$5,000
Less: Cash contribution from TVA	(2,000)
Amount to be financed	\$3,000
Interest rate	5.00%
Amortization period	40 years
Annual debt service payment	\$175

### Review of Bellefonte assumptions

Construction budget and capacity	<ul> <li>Total construction budget of \$11 billion as estimated by Nuclear Development LLC         <ul> <li>Unit #1 construction budget of \$7 billion <sup>(1)</sup></li> <li>Unit #2 construction budget of \$4 billion <sup>(2)</sup></li> </ul> </li> <li>Total annual production of 19,808 gWh (95% of nameplate capacity, net of fueling outages <sup>(3)</sup>)</li> </ul>
Construction timing	<ul> <li>Unit #1:</li> <li>Begin construction January 2014</li> <li>Operations commence January 2018</li> <li>Unit #2:</li> <li>Begin construction January 2015</li> <li>Operations commence January 2020</li> </ul>
Operating costs	<ul> <li>Operations and maintenance of \$9.00 / mWh of production <sup>(2)</sup></li> <li>- \$10.00 / mWh of production when only Unit #1 is operational</li> <li>Fuel costs of \$5.25 / mWh of production <sup>(2)</sup></li> <li>Waste costs \$1.00 / mWh of production <sup>(4)</sup></li> </ul>
Funding	<ul> <li>Construction funding:</li> <li>Alternative financing consisting of 90% debt and 10% equity contribution</li> <li>Potential TVA contribution</li> <li>Contribution from Unit #1 operations in 2018 and 2019</li> <li>Permanent funding: <ul> <li>Construction debt converted to permanent debt upon completion of Unit #2</li> <li>Amortized over 40 years, first amortization payment in 2020</li> <li>Equity amortized consistent with the debt</li> <li>Blended cost of capital of 5.00%</li> </ul> </li> <li>Analysis does not include potential benefit associated with production tax credits</li> </ul>

<sup>(1)</sup> Bellefonte Unit 1 Report, Opportunity for an Unrealized Asset (TVA, August 2011). Nuclear Development LLC has added 40% contingency.

Nuclear Development LLC estimates.

<sup>(2)</sup> (3) "Nuclear Power in the World Today" (World Nuclear Association, April 2012).

<sup>(4)</sup> "Costs Related to Waste Management," Nuclear Energy Institute.

### Bellefonte – No contribution from TVA / ~\$11 billion of Alternative Financing at 5%

(\$ in millions, except otherwise specified)

				Fiscal year	ending Decen	1ber 31,		
	2014E	2015E	2016E	2017E	2018E	2019E	2020E	2059E
							(run rate)	(last year)
Unit # 1 generation (gWh)					9,904	9,904	9,904	9,904
Unit # 2 generation (gWh)					-	-	9,904	9,904
Total Bellefonte generation					9,904	9,904	19,808	19,808
Cost of power to TVA / mWh					\$47.64	\$47.64	\$47.64	\$47.64
Bellefonte revenue					\$472	\$472	\$944	\$944
Less: O&M costs					(\$99)	(\$99)	(\$178)	(\$178)
O&M per mWh					10.00	10.00	9.00	9.00
Less: Fuel costs					(\$52)	(\$52)	(\$104)	(\$104)
Fuel cost per mWh					5.25	5.25	5.25	5.25
Less: Waste costs					(\$10)	(\$10)	(\$20)	(\$20)
Waste cost per mWh					1.00	1.00	1.00	1.00
Total costs					(\$161)	(\$161)	(\$302)	(\$302)
Bellefonte operating cash flow before financing					\$311	\$311	\$642	\$642
Sources of cash								
Bellefonte cash flow before financing	-	-	-	-	\$311	\$311	\$642	\$642
TVA contribution	-	-	-	-	-	-	-	-
Construction debt	226	1,496	2,114	3,254	1,876	852	90	-
Equity contribution	25	166	235	362	208	95	10	-
Permanent debt	-	-	-	-	-	-	9,908	-
Total sources	\$251	\$1,663	\$2,348	\$3,616	\$2,395	\$1,258	\$10,649	\$642
Uses of cash								
Unit 1 construction cost	\$250	\$1,550	\$2,000	\$2,500	\$700	-	-	-
Unit 2 construction cost	-	100	300	1,000	1,500	1,000	100	-
Repay construction debt	-	-	-	-	-	-	9,908	-
Interest during construction	1	13	48	116	195	258	-	-
Permanent debt amortization	-	-	-	-	-	-	577	577
Equity amortization	_	_	-	-	-	-	64	64
Total uses	\$251	\$1,663	\$2,348	\$3,616	\$2,395	\$1,258	\$10,649	\$642
Capitalization								
TVA contribution	-	-	-	-	-	-	-	-
Debt	226	1,722	3,836	7,090	8,966	9,818	9,826	-
Equity	\$25	\$191	\$426	\$788	\$996	\$1,091	\$1,092	-

### Bellefonte – \$4 billion contribution from TVA / ~\$7 billion of Alternative Financing at 5%

(\$ in millions, except otherwise specified)

				Fiscal year	ending Decen	1ber 31,		
	2014E	2015E	2016E	2017E	2018E	2019E	2020E	2059E
							(run rate)	(last year)
Unit # 1 generation (gWh)					9,904	9,904	9,904	9,904
Unit # 2 generation (gWh)					-	-	9,904	9,904
Total Bellefonte generation					9,904	9,904	19,808	19,808
Cost of power to TVA / mWh					\$35.88	\$35.88	\$35.88	\$35.88
Bellefonte revenue					\$355	\$355	\$711	\$711
Less: O&M costs					(\$99)	(\$99)	(\$178)	(\$178)
O&M per mWh					10.00	10.00	9.00	9.00
Less: Fuel costs					(\$52)	(\$52)	(\$104)	(\$104)
Fuel cost per mWh					5.25	5.25	5.25	5.25
Less: Waste costs					(\$10)	(\$10)	(\$20)	(\$20)
Waste cost per mWh					1.00	1.00	1.00	1.00
Total costs					(\$161)	(\$161)	(\$302)	(\$302)
Bellefonte operating cash flow before financing					\$194	\$194	\$409	\$409
Sources of cash								
Bellefonte cash flow before financing	-	-	-	_	\$194	\$194	\$409	\$409
TVA contribution	91	600	836	1,273	800	364	36	-
Construction debt	144	952	1,345	2,071	1,197	545	57	-
Equity contribution	16	106	149	230	133	61	6	-
Permanent debt	-	-	-	-	-	-	6,311	-
Total sources	\$251	\$1,658	\$2,331	\$3,574	\$2,324	\$1,164	\$6,820	\$409
Uses of cash								
Unit 1 construction cost	\$250	\$1,550	\$2,000	\$2,500	\$700	-	-	-
Unit 2 construction cost	-	100	300	1,000	1,500	1,000	100	-
Repay construction debt	-	-	-	-	-	-	6,311	-
Interest during construction	1	8	31	74	124	164	-	-
Permanent debt amortization	-	-	-	-	-	-	368	368
Equity amortization	-	-	-	-	-	-	41	41
Total uses	\$251	\$1,658	\$2,331	\$3,574	\$2,324	\$1,164	\$6,820	\$409
Capitalization								
TVA contribution	\$91	\$691	\$1,527	\$2,800	\$3,600	\$3,964	\$4,000	\$4,000
Debt	144	1,096	2,441	4,512	5,709	6,254	6,259	-
Equity	\$16	\$122	\$271	\$501	\$634	\$695	\$695	_

### Bellefonte cash cost sensitivity analysis

- Majority of on-going cost for Bellefonte driven by cost of capital assumptions:
  - \$11 billion of construction costs
  - 40-year financing amortization period (60-year useful life)
  - Does not include potential positive impact of production tax credits
  - Does not include positive impact of interest savings resulting from statutory debt paydown
- Cost of capital would be reduced with contribution from TVA in lieu of Alternative Financing



Review of Natural Gas assumptions

Construction budget and capacity	<ul> <li>Construction budget of \$570 million per Conventional CC plant <sup>(1)</sup></li> <li>Total annual production of 2,716 gWh per plant (assumes 620 MW <sup>(1)</sup> gas plant operating at 50% capacity <sup>(2)</sup>)</li> </ul>
Construction timing	Two year construction period beginning in January 2014, commence operations in January 2016
Operating costs	<ul> <li>Operations and maintenance of \$5.10 / mWh of production <sup>(1)</sup></li> <li>Fuel costs of \$35.25 / mWh of production <ul> <li>Based on \$5.00 / MMBtu natural gas and a heat rate of 7,050 MMBtu / mWh<sup>(1)</sup></li> <li>No waste costs</li> </ul> </li> </ul>
Funding	<ul> <li>Construction funded entirely with contribution from TVA</li> <li>5.00% cost of capital ascribed to TVA contribution</li> <li>Amortized over 25 year useful life, first amortization payment in 2016</li> </ul>

(1) (2) "Updated Capital Cost Estimates for Utility Scale Electricity Generating Plants," (EIA, April 2013).

"Average utilization of the nation's natural gas combined-cycle power plant fleet is rising" (EIA, June 2011).

### New Natural Gas plant

(\$ in millions, except otherwise specified)

		Fiscal year e	ending December	r 31,
	2014E	2015E	2016E	2040E
				(last year)
New gas plant generation (gWh)			2,716	2,716
Cost of power to TVA / mWh			\$56.04	\$56.04
New gas revenue			\$152	\$152
Less: O&M costs			(\$14)	(\$14)
O&M per mWh			5.10	5.10
Less: Fuel costs			(\$96)	(\$96)
Fuel cost per mWh			35.25	35.25
Less: Waste costs			-	-
Waste cost per mWh			_	
New gas plant operating cash flow before financing			\$43	\$43
Sources of cash				
New gas cash flow before financing	_	_	\$43	\$43
Contribution from TVA	308	293	φ10 _	φ10 _
Total sources	\$308	\$293	\$43	\$43
Uses of cash				
New gas plant capex	\$300	\$270	_	_
TVA financing (interest and principal)	8	23	43	43
Total uses	\$308	\$293	\$43	\$43
Capitalization				
Cash	-	-	-	_
TVA financing	\$308	\$600	\$588	-

### EIA plant capital and operating cost estimates

	Plant cha	racteristics	Plant costs (2012 \$s)				
	Nominal capacity (MW)	Heat rate (MMBtu / mWh)	Overnight capital cost (\$ / KW)	Fixed O&M cost (\$ / mWh)	Variable O&M cost (\$ /mWh)	Total O&M cost (\$ / mWh)	
Natural gas:							
Conventional CC	620	7,050	\$917	\$1.50	\$3.60	\$5.10 -	,
Advanced CC	400	6,430	1,023	1.75	3.27	5.02	
Advanced CC with CCS	340	7,525	2,095	3.63	6.78	10.41	i i
Conventional CT	85	10,850	973	0.84	15.45	16.29	

#### Legend:

CC = combined cycle

CCS = carbon capture and sequestration

CT = combustion turbine

### Cost of construction: \$917 / KW x 620 MW \$570 million Cost of fuel: \$5.00 / MMBtu natural gas x 7,050 heat rate \$35.25 / mWh fuel cost

### Review of Coal Scrubbing assumptions

Budget and capacity	<ul> <li>Cost to scrub varies by plant (see table below)</li> <li>10% capacity reduction post-scrub</li> </ul>
Scrubbing timing	Timing varies by plant with first scrubbing project starting in 2014 and completion of final scrubbing project in 2018
Operating costs	Operations and maintenance, fuel and waste vary by plant (see table below)
Funding	Construction funded entirely with contribution from TVA
	5.00% cost of capital ascribed to TVA contribution
	Amortized over 15 year useful life

#### **Operating and capital costs**

#### (\$ in actual)

	Generation capacity (mWh)		Scrubbing cost	Cost (per mWh)			
Plant	Current	Post-Scrubbed	Total <sup>(1)</sup> (per KW)	O&M <sup>(2)</sup>	Fuel <sup>(2)</sup>	Waste (3)	Capital <sup>(4)</sup>
Colbert	5,188,000	4,669,200	\$780,000,000 (\$1,098)	\$15.56	\$30.00	\$3.33	\$16.09
Allen	5,086,720	4,578,048	720,000,000 (1,033)	15.56	23.00	6.67	15.15
Paradise	14,000,000	12,600,000	998,000,000 (520)	17.78	30.00	3.33	7.63
Shawnee	8,548,000	7,693,200	1,320,000,000 (1,127)	14.44	25.00	2.22	16.53
Gallatin	7,952,000	7,156,800	1,120,000,000 (1,028)	14.44	24.00	6.67	15.08
Widows Creek	5,455,339	4,909,805	770,000,000 (1,030)	14.44	30.00	3.33	15.11
John Sevier	2,579,318	2,321,386	NA	15.08	33.00	2.22	_
Total	48,809,377	43,928,439	\$5,708,000,000 (\$854)				

(1) Based on ongoing scrubbing project costs from TVA 10-K for the period ending 9/30/12.

(2) Based on Nuclear Development LLC estimates.

(3) Based on Nuclear Development LLC estimates, in combination with information from TVA 10-K for the period ending 9/30/12.

(4) Assumes funding for scrubbing costs at 5.00% rate with 15 year amortization period.