Synapse
Energy Economics, Inc.

Greening TVA:

Leveraging Energy Efficiency to Replace TVA's Highly Uneconomic Coal Units

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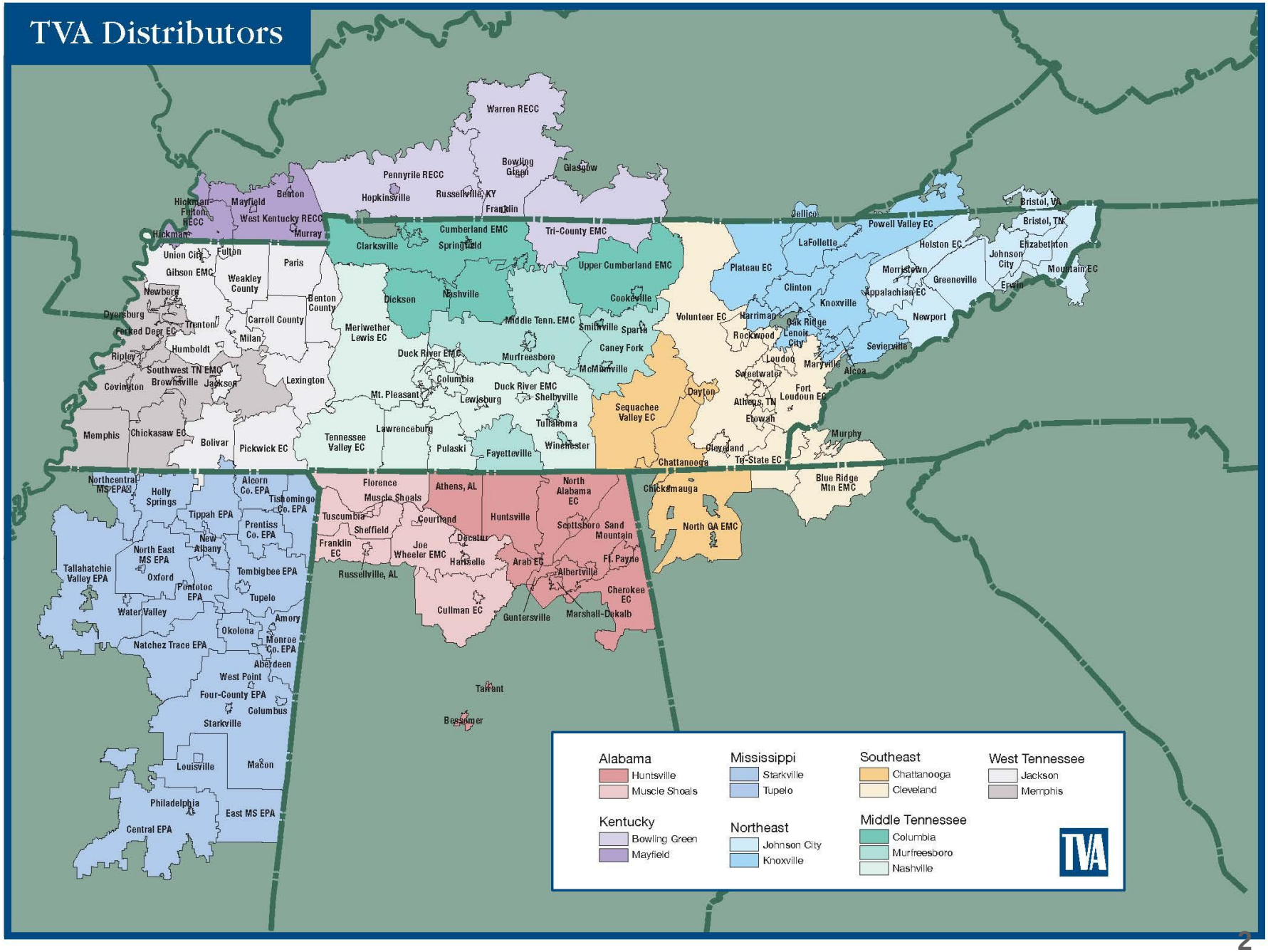
TVA Distributors

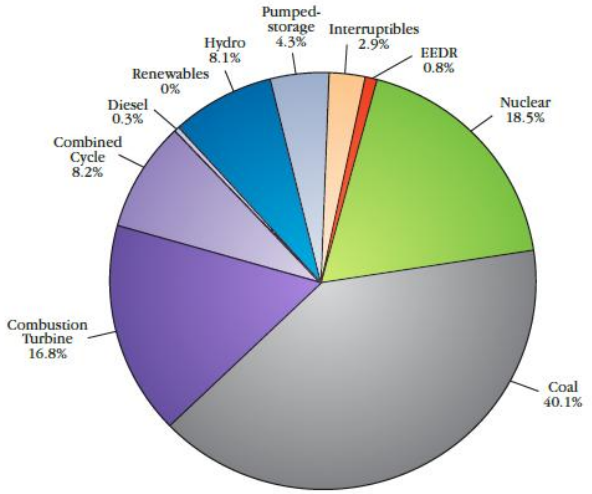


Tennessee Valley Authority

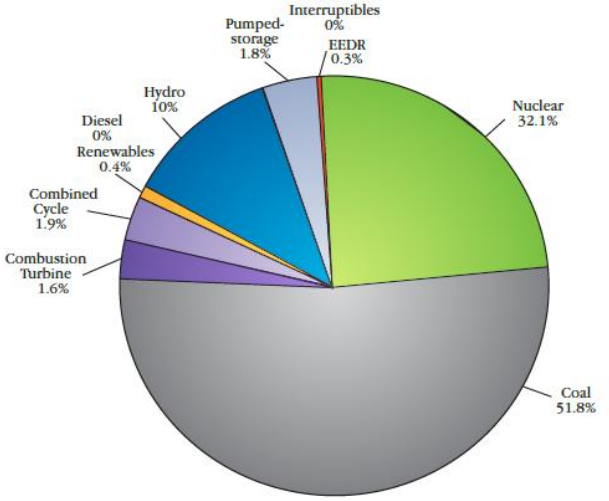
- Federally Owned Corporation
  - Chartered 1933 for job creation
  - No traditional regulatory oversight
  - G&T – distributes to 155 LDC
- TVA owns 63 coal units (about 14.5 GW)
  - 24 slated for retirement via 2011 consent decree
  - 39 currently operating and "expected" to continue operating
  - Consent decree requires
    - 15 FGD
    - 11 SCR
    - 18 baghouses

    or retirement / repower to biomass

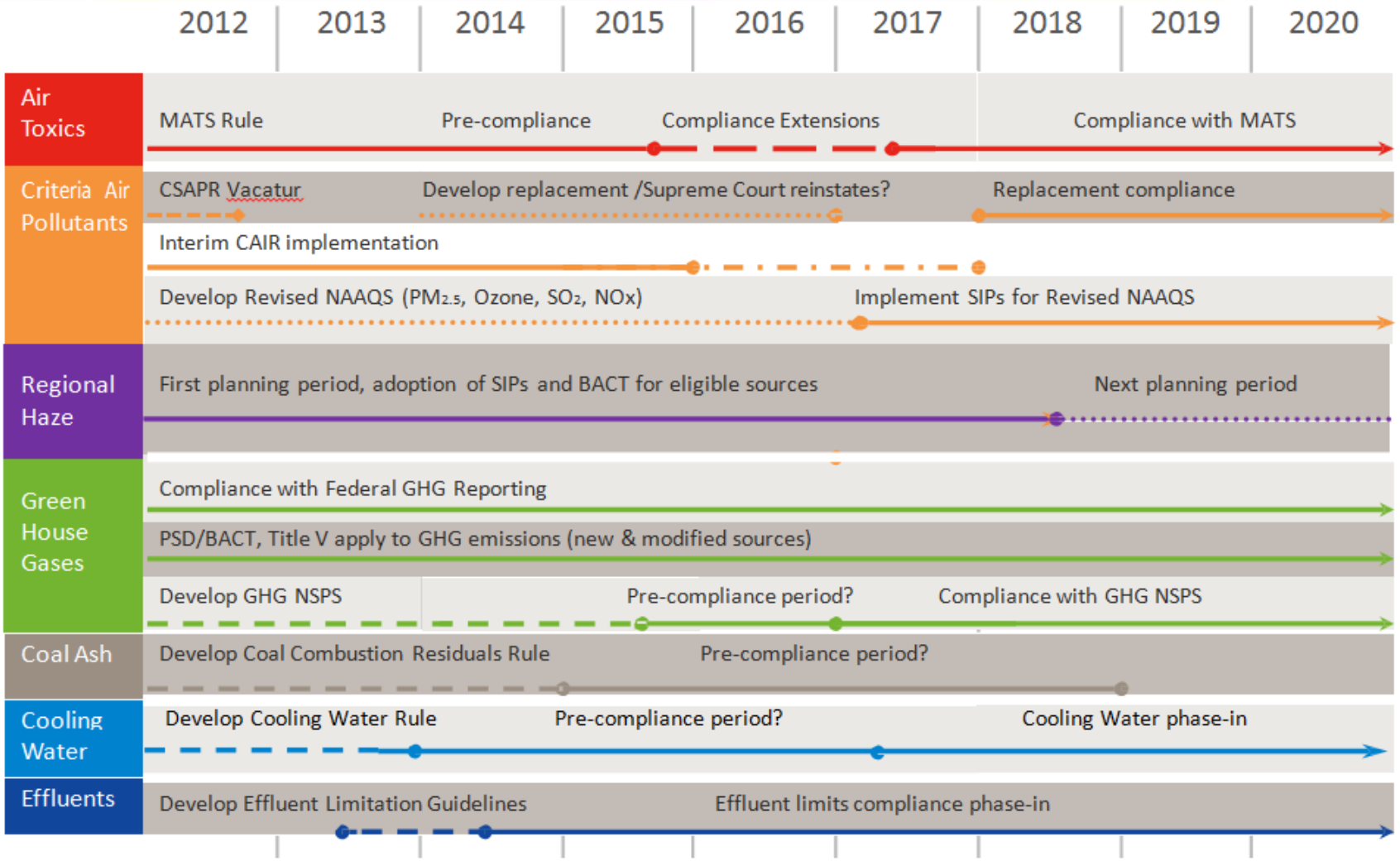
Capacity (2010)



Energy (2010)



US EPA Regulation



Source: Adapted by Synapse from ISO-NE presentation to Environmental Advisory Group, July 19, 2013.

Keeping coal alive costs billions

Plant / Unit	State	FGD (Million $)	SCR (Million $)	Baghouse (Million $)	ACI (Million $)	Wet Cooling Tower (Million $)	Coal Combustion Residuals (Million $)	Effluent Treatment (Million $)	Total Capital (Million $)
Gallatin 1	TN	$177	$67	$44	$3	$30	$58	$55	$434
Gallatin 2	TN	$177	$67	$44	$3	$30	$58	$55	$434
Gallatin 3	TN	$177	$67	$44	$3	$35	$59	$60	$465
Gallatin 4	TN	$177	$67	$44	$3	$34	$59	$60	$464
Allen Steam 1	TN	$190	$67	$44	$3	$32	$63	$76	$413
Allen Steam 2	TN	$190	$67	$44	$3	$30	$63	$76	$411
Allen Steam 3	TN	$190	$67	$44	$3	$28	$63	$76	$410
Colbert 1	AL	$132	$47	$35	$3	$18	$53	$36	$324
Colbert 2	AL	$132	$47	$35	$3	$16	$53	$36	$321
Colbert 3	AL	$132	$47	$35	$3	$14	$53	$36	$320
Colbert 4	AL	$132	$47	$35	$3	$17	$53	$36	$323
Colbert 5	AL	$273		$79	$4	$36	$68	$100	$560
Shawnee 1	KY	$122	$44		$4	$15	$50	$28	$263
Shawnee 2	KY	$122	$44		$4	$16	$50	$28	$264
Shawnee 3	KY	$122	$44		$4	$17	$50	$28	$264
Shawnee 4	KY	$122	$44		$4	$15	$50	$28	$263
Shawnee 5	KY	$122	$44		$4	$17	$50	$28	$265
Shawnee 6	KY	$122	$44		$4	$16	$50	$28	$264
Shawnee 7	KY	$122	$44		$4	$16	$50	$28	$264
Shawnee 8	KY	$122	$44		$4	$15	$50	$28	$263
Shawnee 9	KY	$122	$44		$4	$16	$50	$28	$264
Widows Creek 7	AL			$86	$4	$44	$62	$92	$288
Widows Creek 8	AL			$94	$4	$44	$61	$87	$291
Paradise 1	KY			$97	$4		$62	$88	$251
Paradise 2	KY			$97	$4		$62	$88	$251
Paradise 3	KY			$135	$4		$72	$103	$314
Bull Run 1	TN			$112	$4	$69	$101	$246	$532
Cumberland 1	TN			$161	$4	$145	$75	$176	$563
Cumberland 2	TN			$162	$4	$135	$75	$176	$553
John Sevier 3	TN	$131	$47	$35	$3	$19	$58	$62	$355
Kingston 1	TN			$31	$3	$9	$50	$29	$123
Kingston 2	TN			$31	$3	$7	$50	$29	$121
Kingston 3	TN			$31	$3	$9	$50	$29	$123
Kingston 4	TN			$31	$3	$8	$50	$29	$122
Kingston 5	TN			$35	$3	$11	$51	$33	$133
Kingston 6	TN			$35	$3	$13	$51	$33	$135
Kingston 7	TN			$35	$3	$11	$51	$33	$134
Kingston 8	TN			$35	$3	$12	$51	$33	$134
Kingston 9	TN			$35	$3	$13	$51	$33	$136
								Total	$11,810

$1.2 billion
(TVA announces $1.1 b)

$725 million
(TVA announces $650 m)

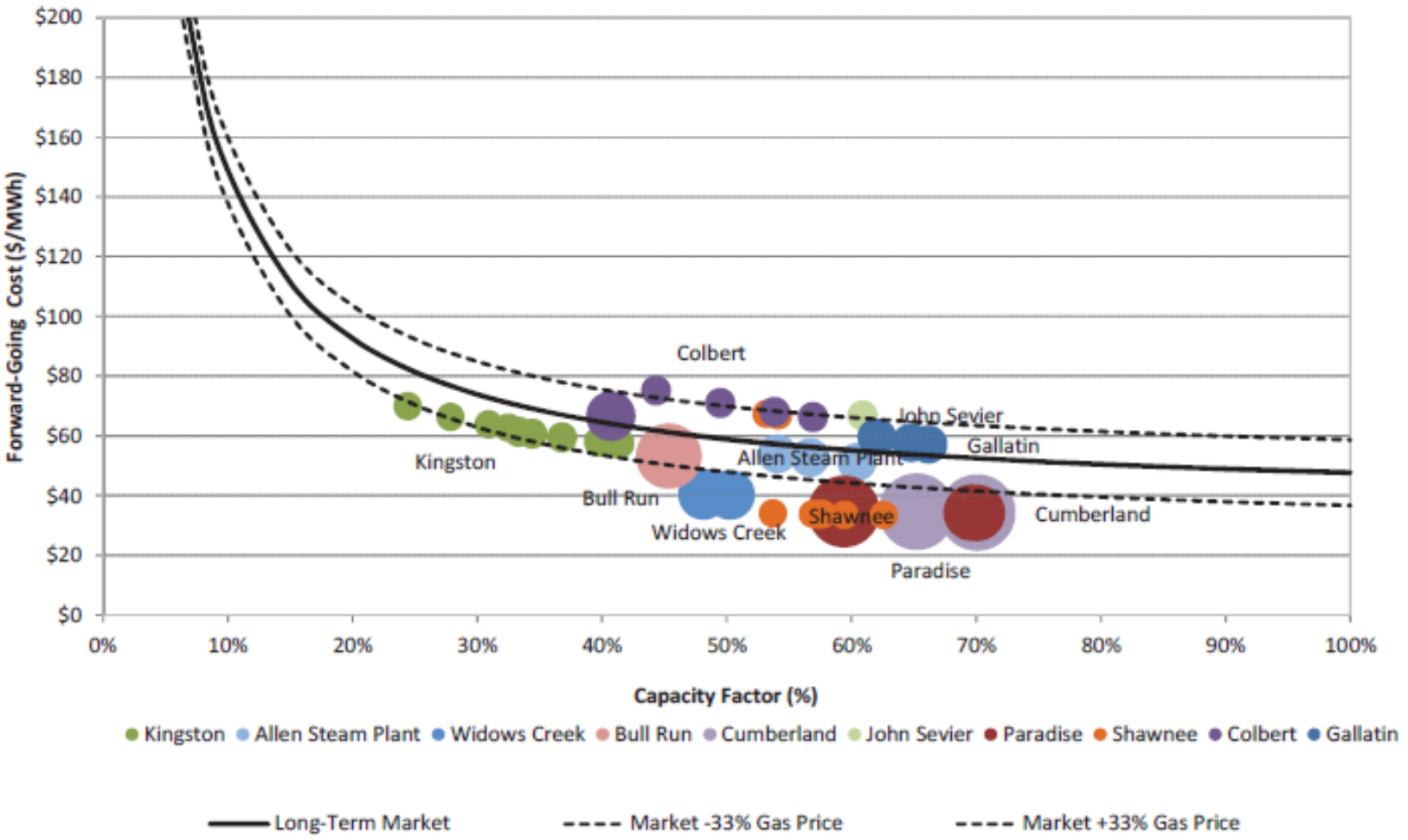
Meeting the Consent decree will cost:

- $3.9 Billion in Capital Costs

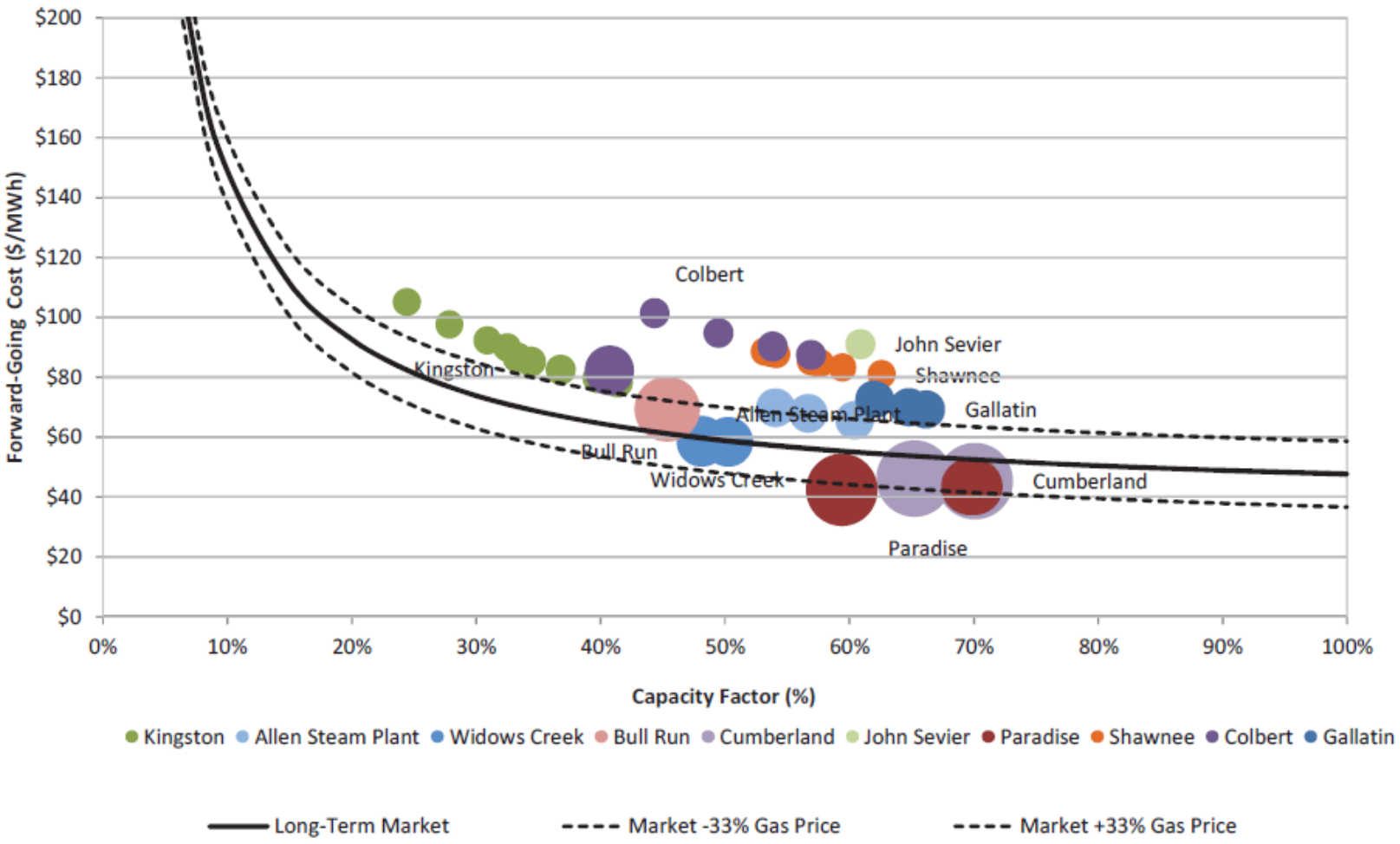
Meeting all EPA rules w/o CO2 price:

- $11.8 Billion in Capital Costs
- $24.6 Billion Present Value for Capital and New Operations & Maintenance Expenses

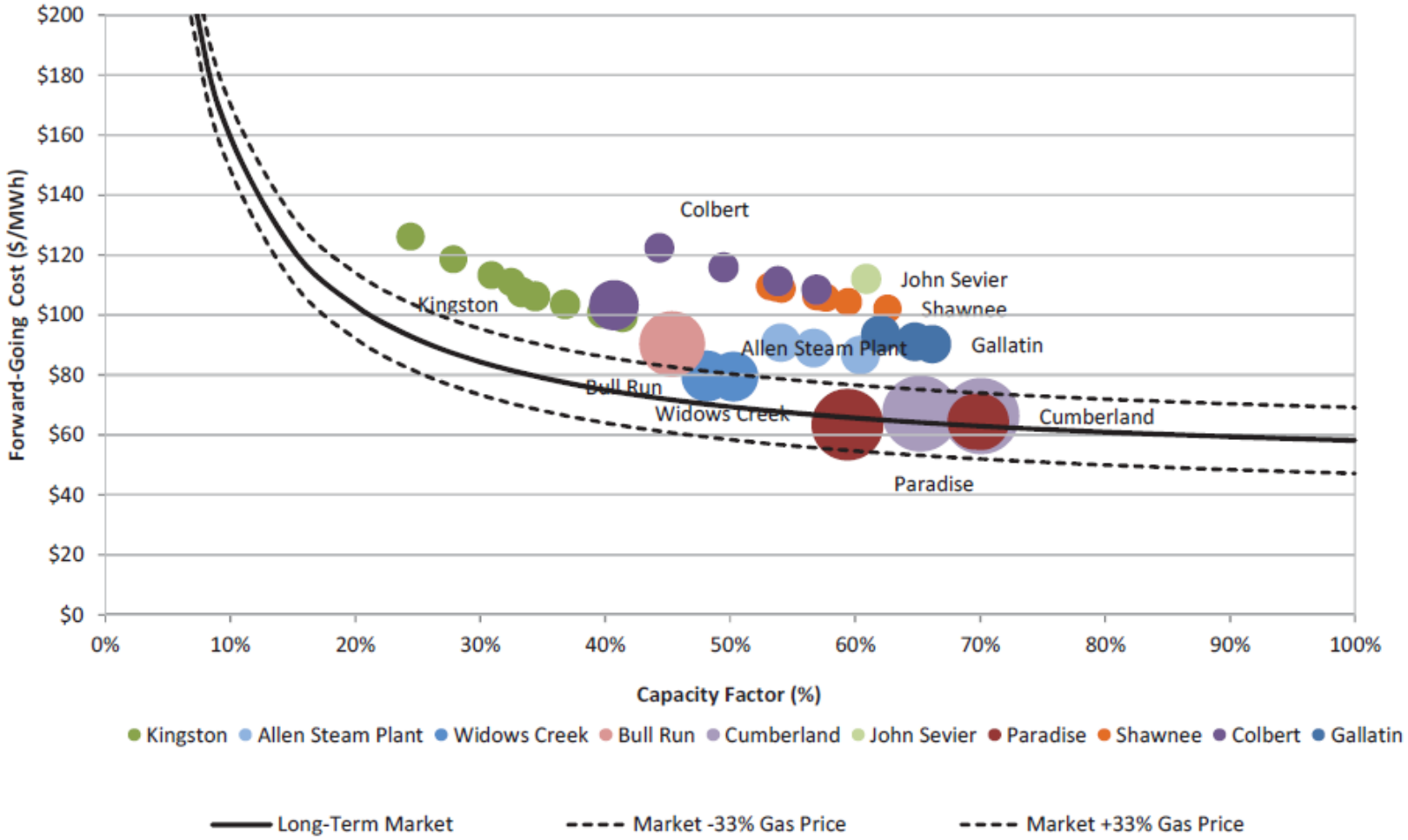
Consent Decree Only: Forward-Going Costs of Existing TVA Coal Units relative to Long-Term Market Costs



All Environmental Regs + $0 CO2 price – 47% of the fleet is uneconomic



All Environmental Regs + $21 CO2 price - A modest CO2 price renders almost the entire fleet uneconomic



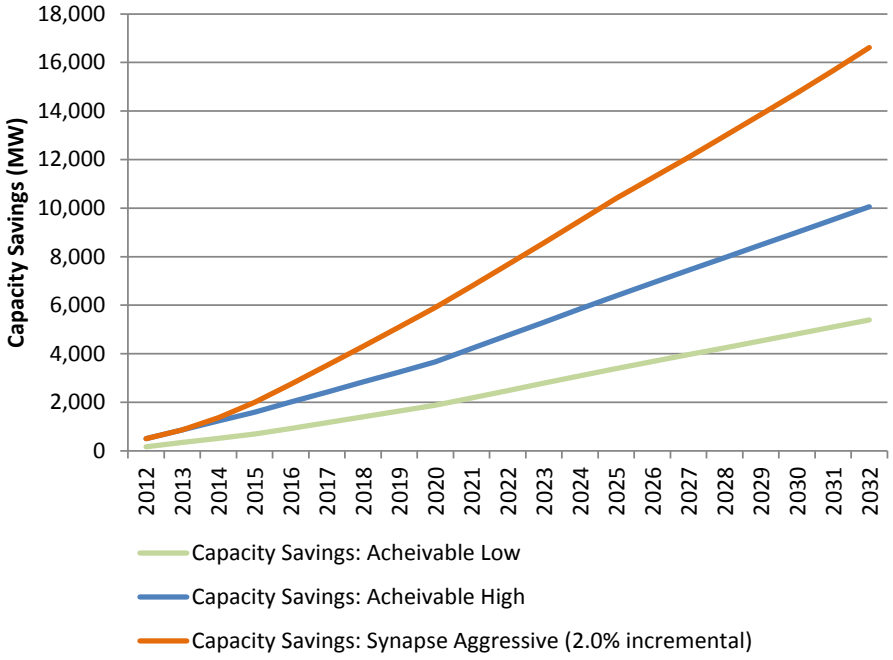
TVA 2011 IRP

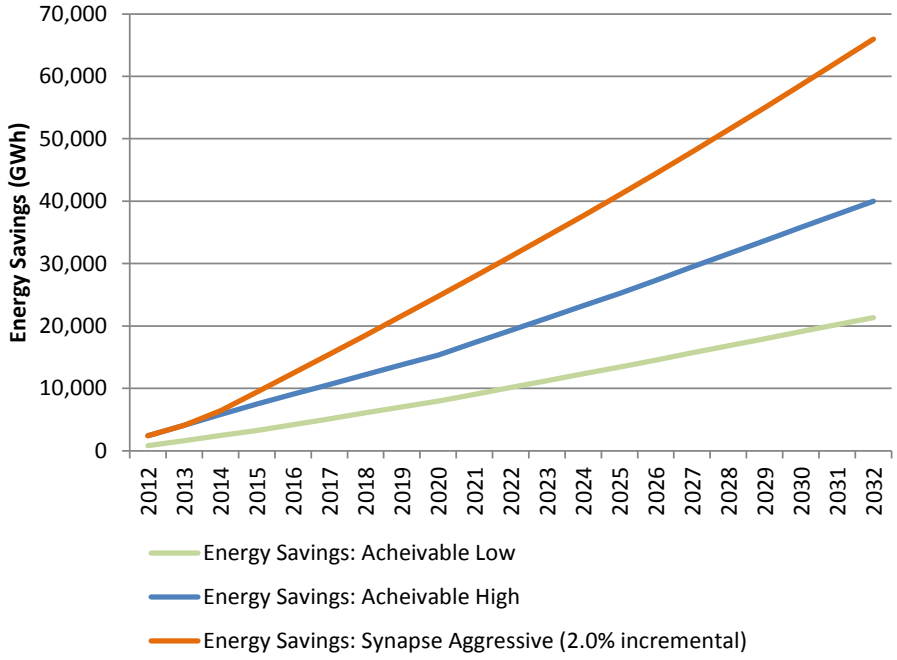
- Extensive IRP process in mid-2011
- However, TVA 2011 IRP did not evaluate the economic merits of coal power retirements.
- TVA IRP did not optimize RE and EE resources.

Energy Efficiency for TVA

- GEP 2011 EE potential study found abundant cost-effective energy efficiency (EE) potential TVA territory
- TVA can promote EE aggressively to retire some of the largest coal plants, reduce costs to consumers, reduce pollutions, and save lives.

Efficiency can power TVA cleanly and quickly

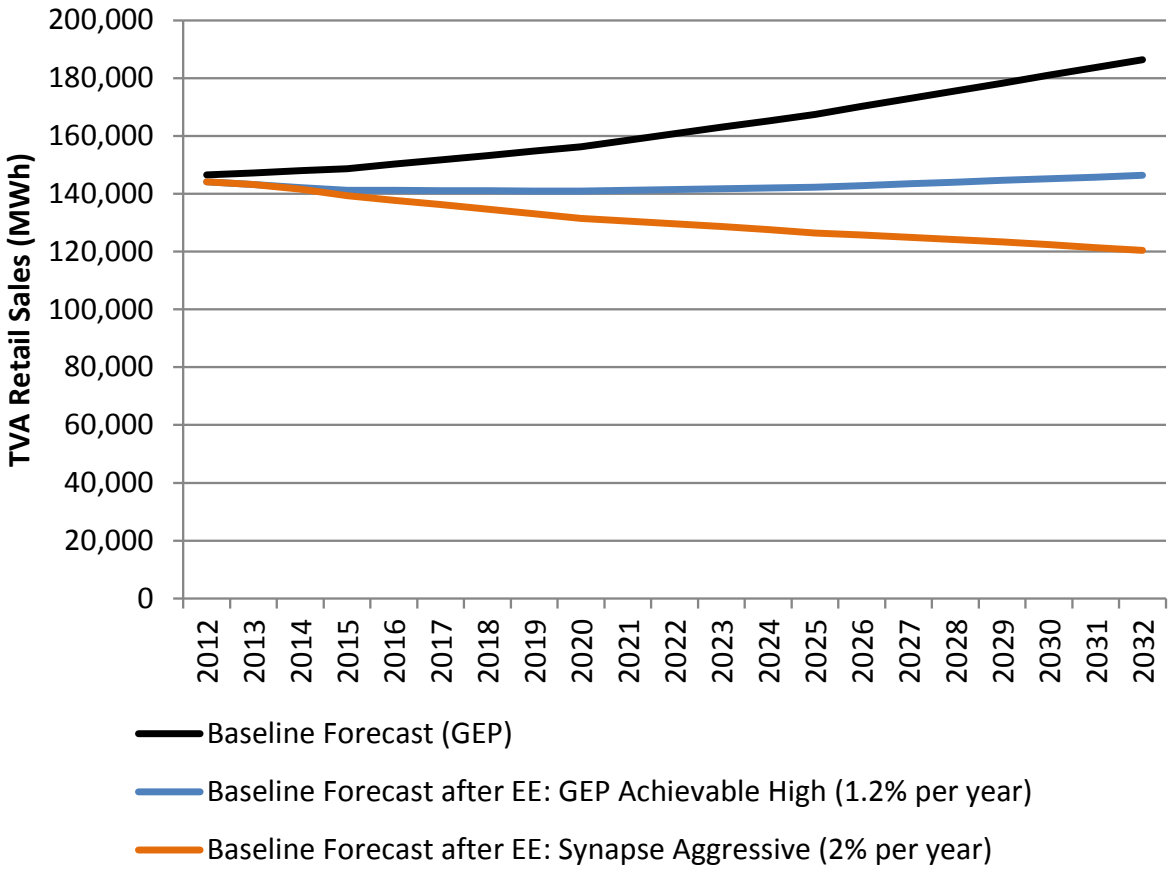




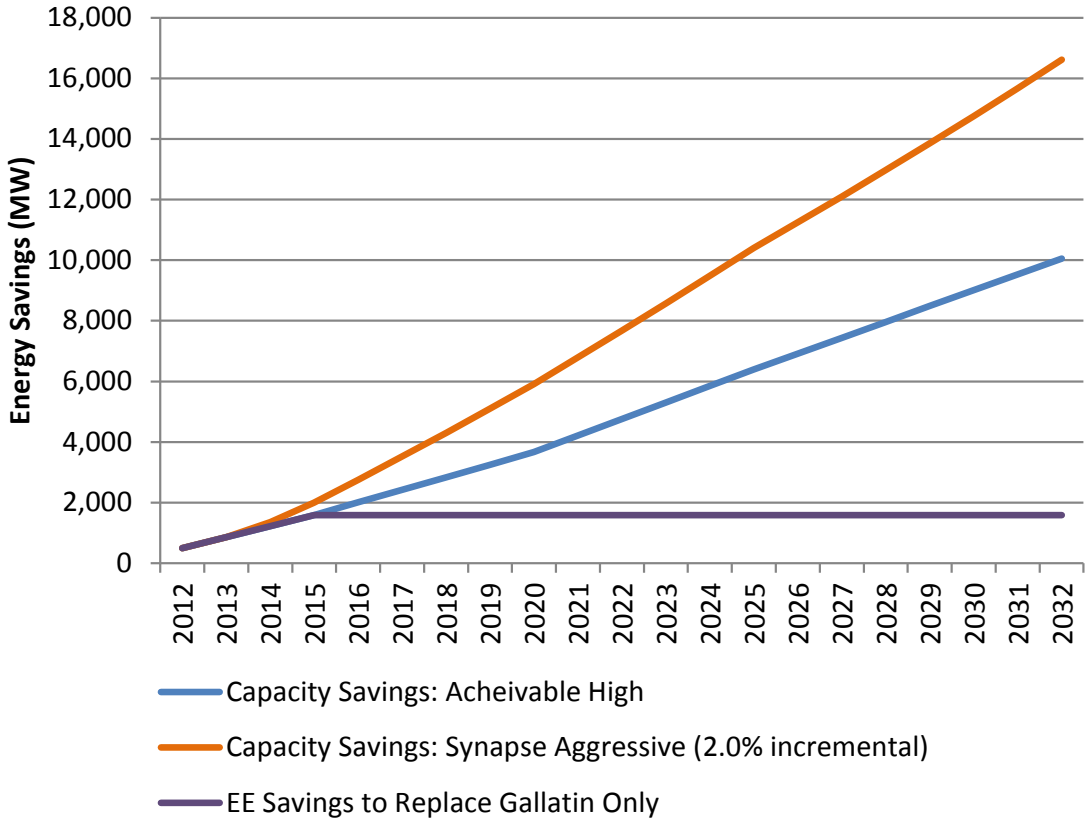
TVA's own study shows significant energy efficiency savings at a 1.2% annual savings rate (the "Achievable High" scenario). It is sufficient to replace 1,590 MW – or at least one coal power plant -- by 2015.

The Synapse Aggressive EE scenario represents current savings from leading states and utilities (2% incremental savings per year). 2% per year achieves capacity savings of 2,750 MW by 2016, enough to offset several coal units.

Efficiency means no expensive retrofits and falling demand.



Efficiency is more cost-effective than retrofits – the Gallatin example.

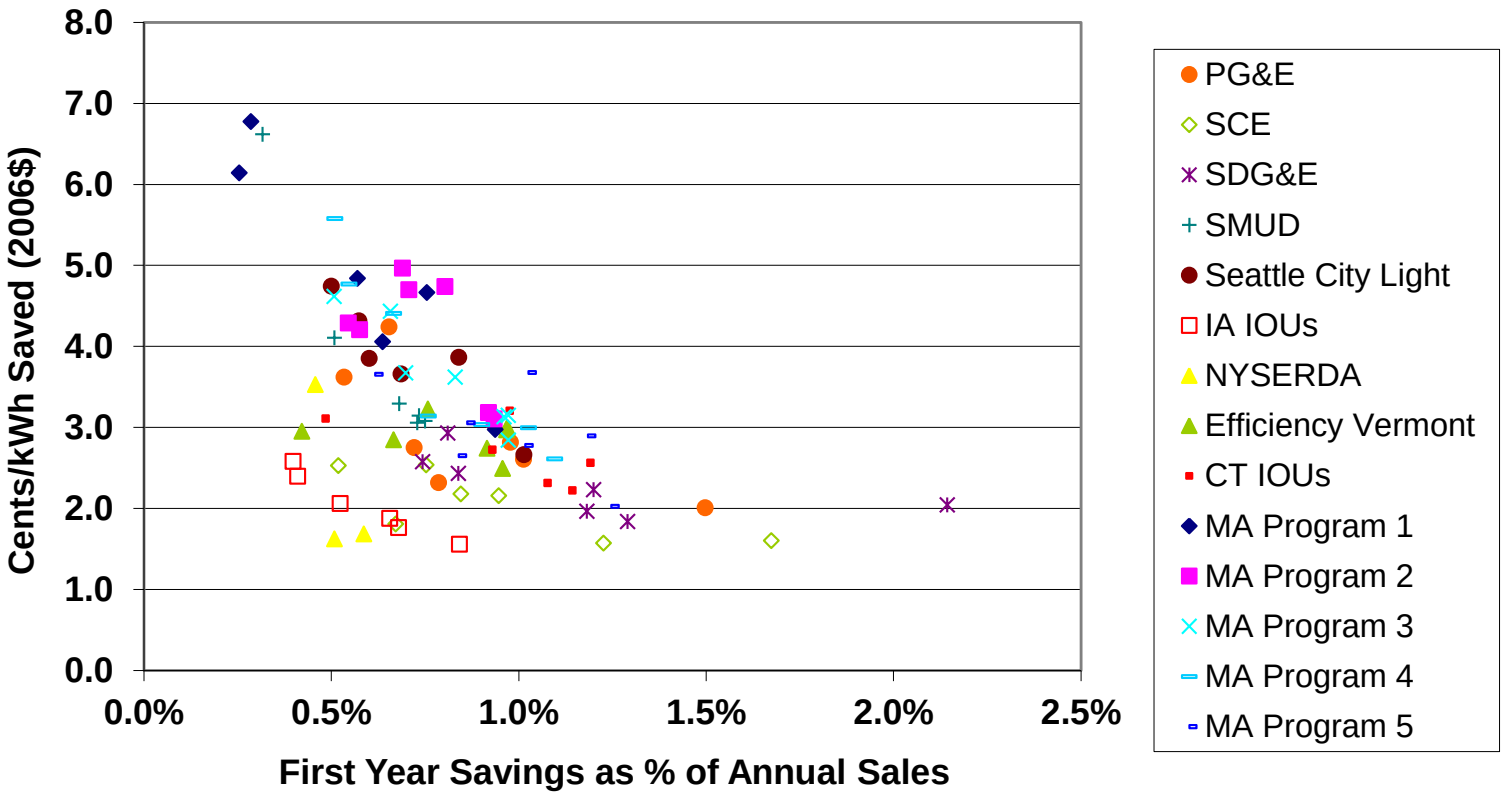


Present value (cost) of retrofitting and operating Gallatin 2015-2032 = $5.7 billion (no CO2)
= $7.4 billion ($21 CO2)

Cost of obtaining EE sufficient to replace Gallatin to 2032 = $3.0 billion

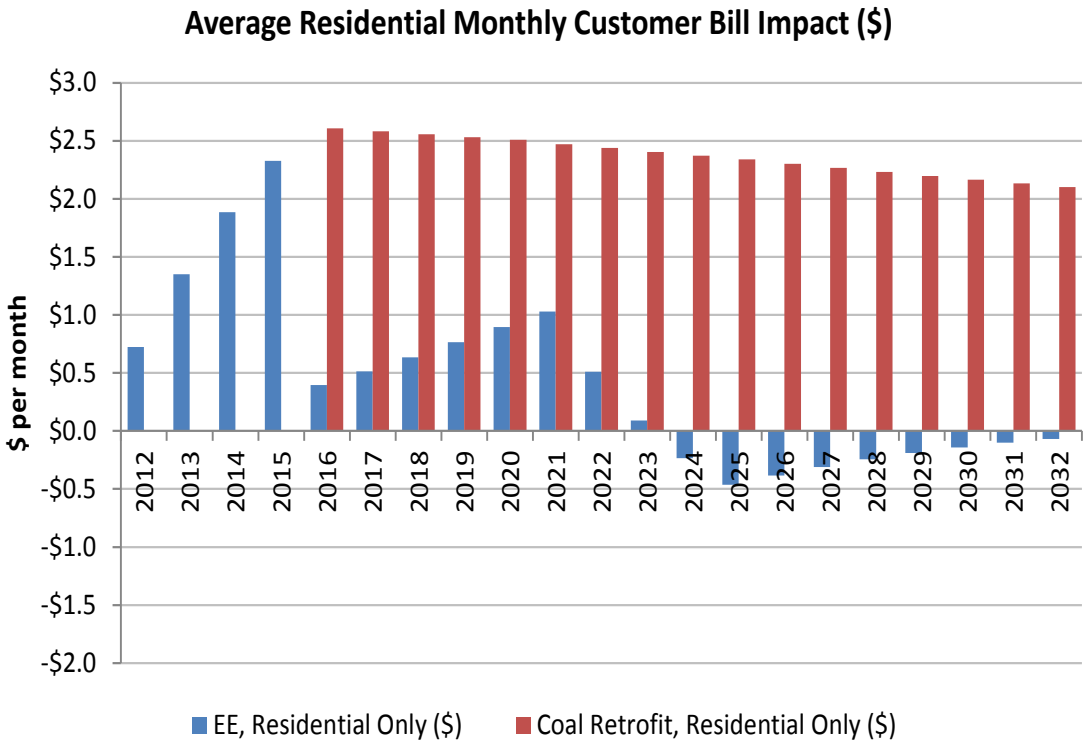
Savings = $2.7 – 4.4 billion

Cost of Saved Energy



Source: Synapse Energy Economics. 2008. Costs and Benefits of Electric Utility Energy Efficiency in Massachusetts

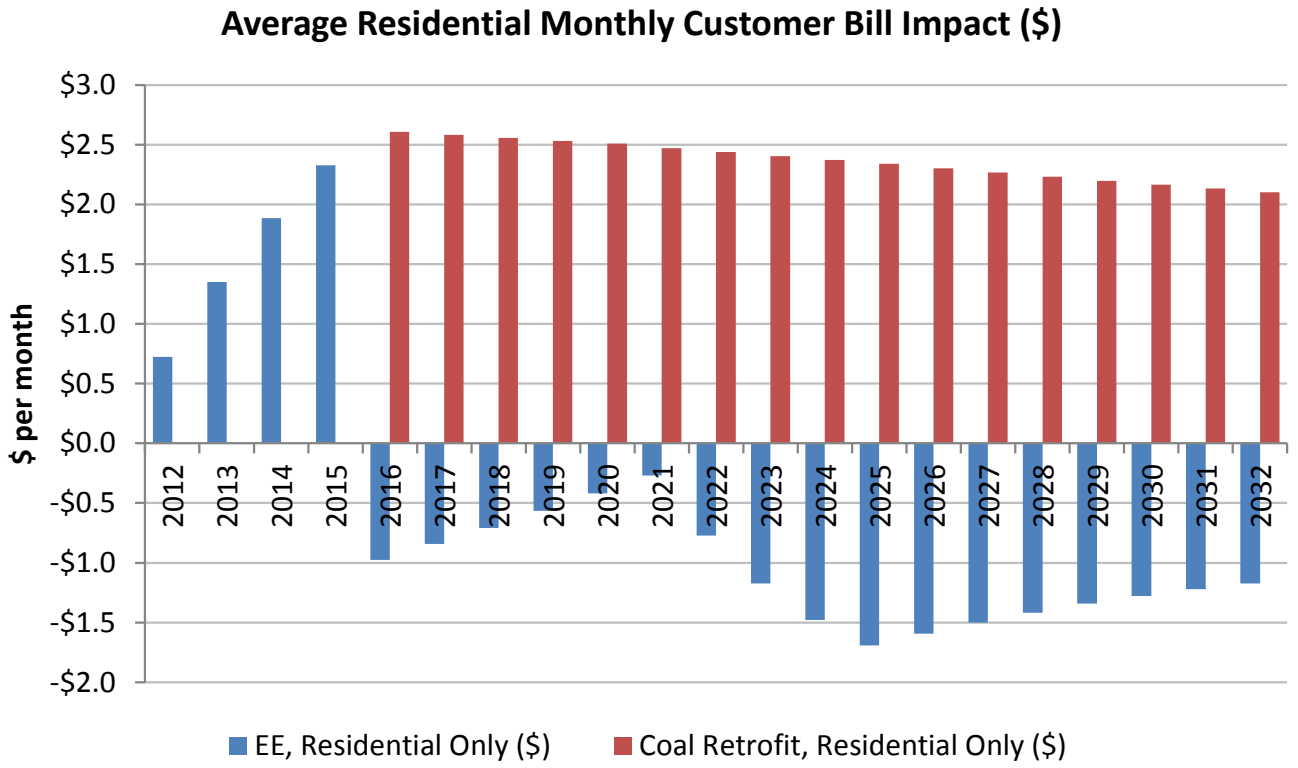
Moving beyond coal lowers your power bills – the Gallatin example.



Replacing just the Gallatin plant with EE knocks $1.5 to $3 per month off residential bills, starting in 2016.

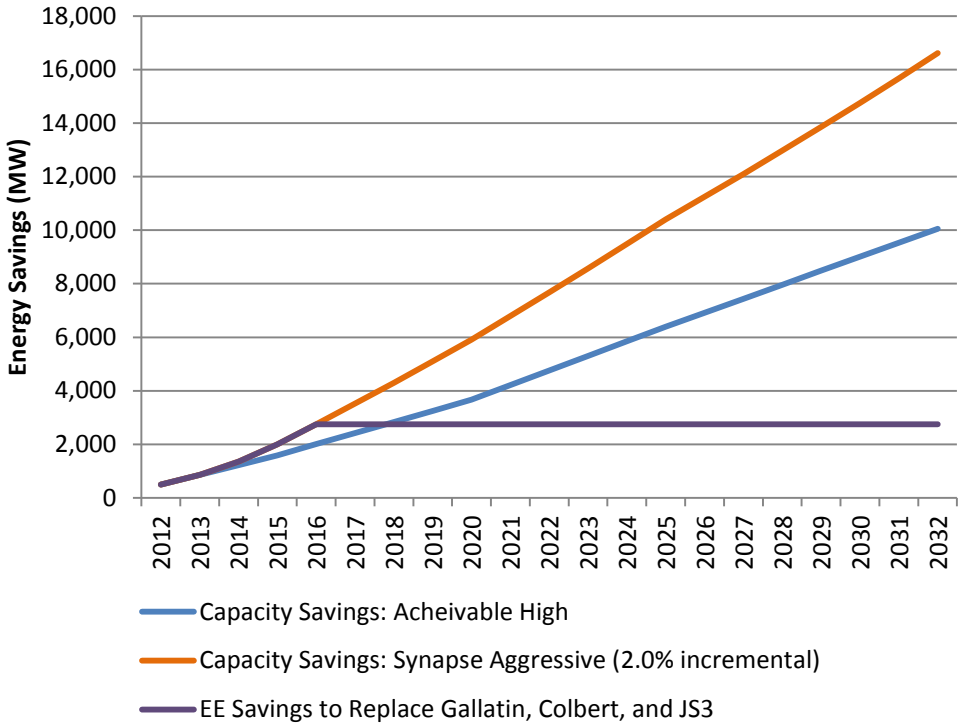
Notes: Average TVA residential bill = $130 in 2011
Calculation assumes that costs are spread evenly across rate classes

Bigger savings are possible as carbon regulation continues – the Gallatin example.



If a $21 CO2 price is implemented, efficiency lowers bills still more, compared with running the Gallatin plant.

More efficiency means more avoided costs – Replacing 2,750 MW by 2016 saves billions over the next decades.



Replacing up to 2,750 MW by 2016 (with 2% annual savings) saves even more money:

Present value of retrofitting and operating coal plants 2015-2032 = $12.6 billion (no CO2)
= $15.9 billion ($21 CO2)

Present value of obtaining EE to replace coal plants to 2032 = $6.0 billion

Savings = $6.6 – 9.9 billion

Conclusions

TVA's coal fleet is largely uneconomic.

If TVA can replace as much of it with energy efficiency as possible, it will save money, lower bills, and save lives.

<u>It's time for TVA to lead.</u>

Further Information

For further information, see our report “TVA Coal in Crisis - Using Energy Efficiency to Replace TVA’s Highly Non-Economic Coal Units” available at http://www.synapse-energy.com/Downloads/SynapseReport.2012-08.SC.TVA-Coal-in-Crisis.12-041.pdf

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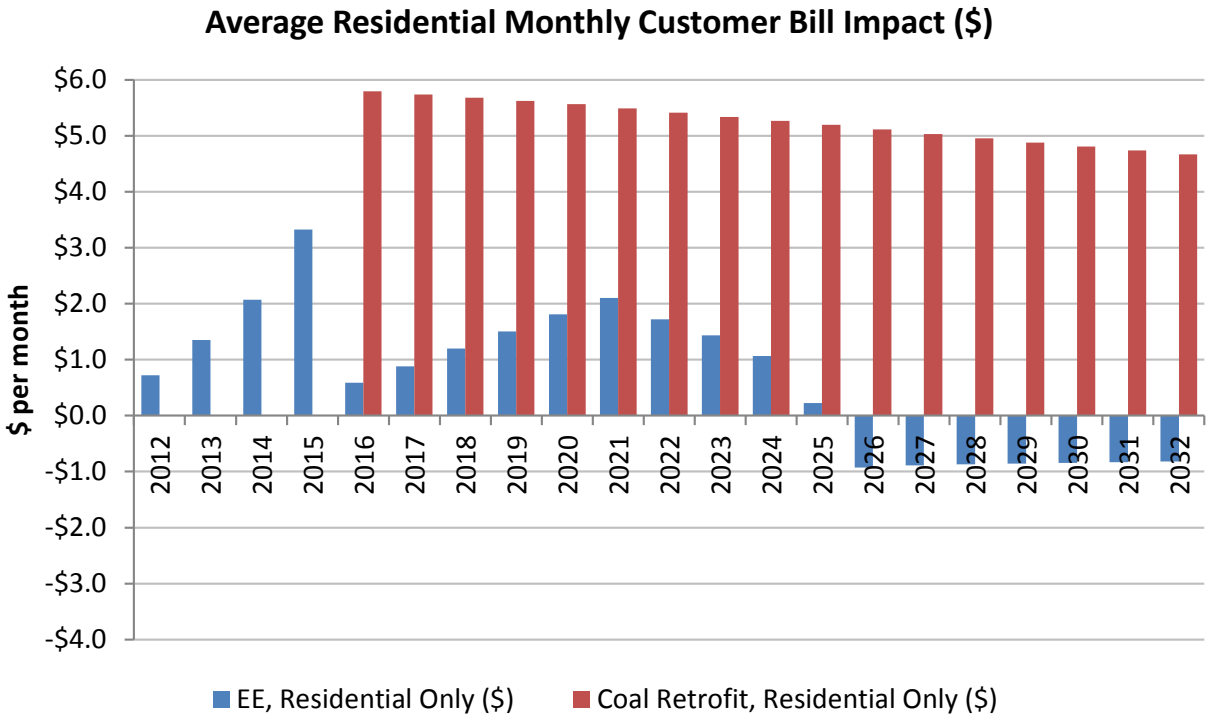
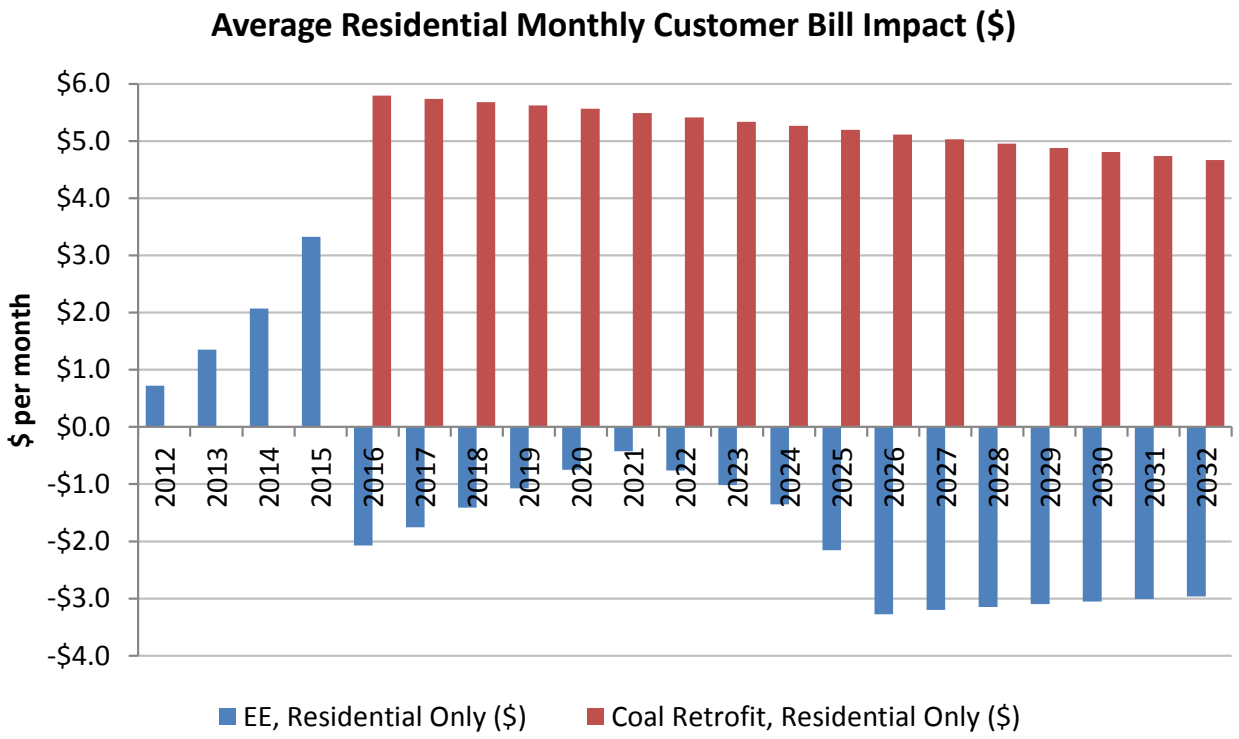
More efficiency means even lower bills...



Replacing 2,750 MW (the equivalent of Gallatin, Colbert and John Sevier 3) with efficiency saves $5 or more per month for residential consumers.

… and lower still with carbon costs factored in



Replace 2,750 MW with efficiency, and see monthly bills fall by $7 or more.