TVA’s Strategy for Future Energy Development

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Tennessee Valley Authority

Briefing to Southern States Energy Board
July 16, 2011
The Storms of April, 2011
The TVA transmission system suffered the worst damage in its history

353 transmission structures damaged; 108 lines out of service

128 customer connection points interrupted

850,000 customers lost service

Several TVA plants shut down
Rapid Restoration

4,000 workers labored 24/7 to restore transmission service

One week later

- 122 of 128 customer connections were in service
- Most large industries had some power supply

System is stable and secure

Full restoration of the 500-kV system likely by mid-July
Effects on Browns Ferry

Lost most off-site power; all 3 units shut down safely

Declared an Unusual Event

Diesel generators powered shutdown cooling and reactors stayed in a safe shutdown condition

Re-established off-site power 5 days after storms

Rebuilding the 500-kV system will take months and will limit the plant’s output
TVA’s Vision

One of the Nation’s Leading Providers of Low-Cost and Cleaner Energy by 2020
Serve the People of the Tennessee Valley by being:

• The **Nation’s leader** in improving our air quality
• The **Nation’s leader** in increased nuclear production
• The **Southeast’s leader** in increased energy efficiency

And by improving our core business to continue providing low rates, high reliability & responsible stewardship
Nation’s Leader in Improving Air Quality

Cleaner Power Production

- Lower production from high emission generators
- Significantly increase production from low-emission electricity generators

Reduce Emissions

- Further reduce $\text{SO}_2$
- $\text{NO}_x$, mercury and particulate emissions from TVA plants
Coal Plant Decisions

Why:

• Legal and regulatory risks
• Pending regulations
• Age of coal units
• Emissions from older units
• Cost of older units
• Other utilities’ experience
Expected Regulations Affecting Coal—Timing May Vary

- Ozone
  - Revised Ozone NAAQS
  - Ozone NAAQS Vacated
  - CAIR Remanded
  - CAIR Vacated
  - CAIR Reconsidered

- SO2/NO2
  - SO2 Primary NAAQS
  - SO2/NO2 Replacement Rule Expected
  - Final CAIR Replacement Rule Expected
  - Effluent Guidelines proposed rule expected
  - SO2/NO2 Secondary NAAQS

- CAIR
  - CAIR Phase I Seasonal NOx Cap
  - CAIR Phase I Annual SO2 Cap

- Water
  - Effluent Guidelines
    - Final rule expected
    - 316(b) Compliance 3-4 yrs after final rule

- PM2.5
  - PM-2.5 SIPs due ('97)
  - CAMR & Deisting Rule vacated

- Ash
  - Nonattainment Designations

- Hg/HAPS
  - HAPs MACT final rule expected
  - Final EPA MACT

- CO2
  - Compliance with CAIR Replacement Rule

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Adapted from Wegman (EPA 2003)
Age of Coal Units

- **Retire**
- **Evaluating for Idle/Control**
- **Controlled**

Units over 50 years old
TVA’s Emission Reductions

Sulfur Dioxide

- Thousands of Tons/Year
- ~90% Reduction

Nitrogen Oxide

- Thousands of Tons/Year
- ~90% Reduction

Mercury

- Pounds/Year
- ~60% Reduction

Carbon Dioxide

- Millions of Tons/Year
Other Announced Retirements

<table>
<thead>
<tr>
<th>Utility</th>
<th>Units</th>
<th>Megawatts</th>
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<tbody>
<tr>
<td>American Electric</td>
<td>26</td>
<td>6,000</td>
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<tr>
<td>Duke</td>
<td>21</td>
<td>1,877</td>
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<tr>
<td>Progress</td>
<td>11</td>
<td>1,533</td>
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<tr>
<td>Southern</td>
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<td>Xcel</td>
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<td>Exelon</td>
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<td>Dynegy</td>
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<tr>
<td>AES</td>
<td>6</td>
<td>455</td>
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<tr>
<td>NRG</td>
<td>3</td>
<td>364</td>
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<tr>
<td><strong>Totals</strong></td>
<td><strong>85</strong></td>
<td><strong>13,401</strong></td>
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</table>
Plant Retirement Key Takeaways

Age, new regulations and the opportunity to manage risks and costs are driving coal unit retirements.

After retiring 18 units, the coal fleet still will have the largest generating capacity on the TVA system.

TVA will maintain an ample, reliable power supply.
New generation

• Lead the Nation in delivery of new nuclear capacity
Our Nuclear Fleet Today

- Watts Bar: Operational
- Sequoyah: Construction
- Bellefonte: Potential
- Browns Ferry: Operational
New Nuclear Projects

Watts Bar Unit 2

- 1,180 megawatts
- Commercial operation in 2013
- On time and within budget

Bellefonte Unit 1

- 1,260 megawatts
- Studies support completing Unit 1
- TVA board decision expected this year
In Summary

Bellefonte will be:

- Lower in operating costs with higher reliability than coal or gas
- Fueled from North American supplies
- Cleaner than any realistic alternative
- Beneficial to the community
- Safe
125-megawatt reactors would be built in groups

Could replace aging coal units and use existing sites and transmission

“Passive” safety design

4 to 5-year fuel cycle

mPower group plans to demonstrate this technology by 2020
Current and Potential Nuclear Fleet

TVA Nuclear Capacity in Megawatts

- Sequoyah 1 & 2
- Browns Ferry 2
- Browns Ferry 3 & Watts Bar 1
- Watts Bar 2
- Bellefonte 1*
- Browns Ferry 1
- SMR*

*Pending Approval
Japanese Tsunami
TVA’s Response

• Monitoring events closely in Japan
• Reviewing readiness for natural or man-made disasters
• Identifying vulnerabilities
• Providing short, intermediate, and long-term recommendations for TVA sites
• Communicating accurate and timely information
Key Nuclear Takeaways

TVA plants aren’t exposed to major earthquakes or tsunamis.

TVA plants have significant design differences and safety retrofits, compared to Japan’s.

We’re planning for simultaneous natural disasters.

We’re incorporating lessons learned from Japan.

We’re continuing with our plans to expand the fleet.

**TVA’s nuclear plants remain safe.**
Energy Efficiency

• Help consumers and businesses use energy more efficiently and save money
Energy Efficiency Program Goal

Energy Efficiency savings from 2010–2015 as percent of sales

- **TVA Goal**: 3.5%
- **Peer One**: 3%
- **Peer Two**: 2.4%
- **Peer Three**: 1.7%
- **Peer Four**: 1.4%
Demand Management

Reduce peak power usage with demand management tools, including time-of-use rates.
## Sufficient Capacity for 2020

<table>
<thead>
<tr>
<th>Description</th>
<th>Capacity</th>
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</thead>
<tbody>
<tr>
<td><strong>2011 Firm Capacity</strong></td>
<td>36,200</td>
</tr>
<tr>
<td><strong>Coal Retirements</strong></td>
<td>-2,700</td>
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<tr>
<td><strong>Expected Additions</strong></td>
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<tr>
<td>Energy Efficiency</td>
<td>2,900</td>
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<tr>
<td>Nuclear</td>
<td>2,800</td>
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<tr>
<td>Gas</td>
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<tr>
<td><strong>Estimated Total Capacity by 2020</strong></td>
<td>41,200</td>
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<table>
<thead>
<tr>
<th>Description</th>
<th>Capacity</th>
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</thead>
<tbody>
<tr>
<td><strong>2020 Load and Reserves Forecast</strong></td>
<td>40,150</td>
</tr>
<tr>
<td>±5% on Load Requirements</td>
<td>42,150 -38,150</td>
</tr>
</tbody>
</table>
A More Balanced Power Supply

Today

Gas
Coal
Nuclear
Efficiency/Renewables
Hydro

2020

Thousand Megawatts
Our VISION

One of the Nation’s Leading Providers of Low-Cost and Cleaner Energy by 2020

- Low Rates
- Cleaner Air
- High Reliability
- More Nuclear Generation
- Responsibility
- Greater Energy Efficiency

Acting to meet the region’s needs for the future, while improving our core business today.