



## TVA Renewable Energy Vision

April 5- 6 2011

Presented by:

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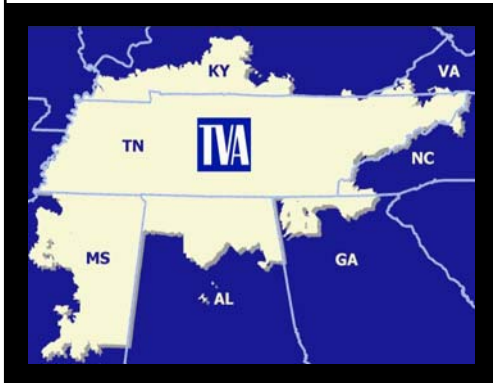
Vice President, Technology Innovation

EPRI Renewable Energy Council Meeting

Palo Alto, CA 94303



## Tennessee Valley Authority



- A federal corporation funded entirely by power sales
- Provides electricity, economic development, flood control, and navigation
- Service Area:
  - 7-state region
  - 80,000 square miles
  - 9 million people
  - 650,000 businesses and industries
- 2009 revenue: \$11 billion



### Our VISION

ONE OF THE NATION'S LEADING PROVIDERS OF LOW-COST AND CLEANER ENERGY BY 2020

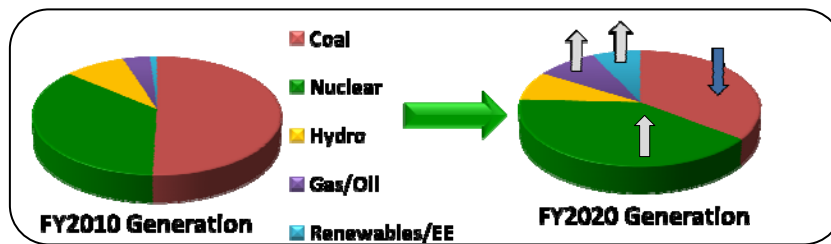
Acting to meet the region's needs for the future, while improving our core business today.

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

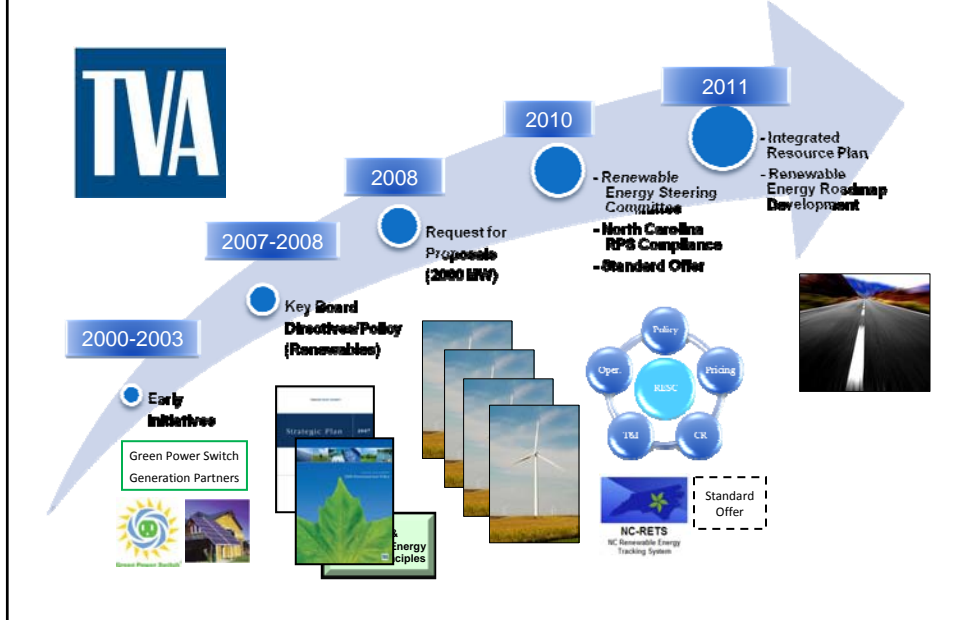


## TVA's Renewed Vision

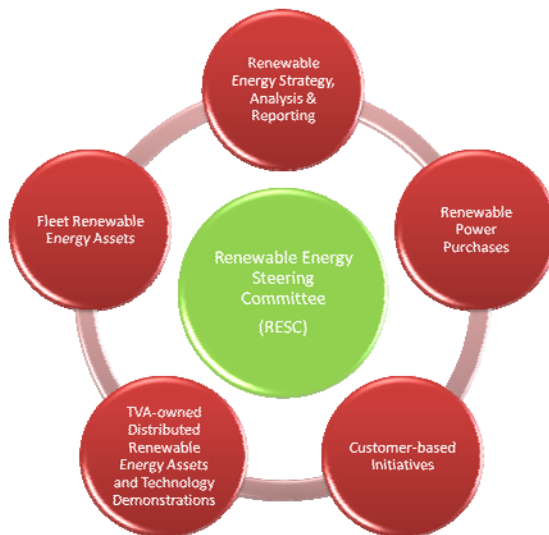
*Provide Cleaner Low-Cost Power*



# TVA's Evolving Renewable Energy Story



## TVA Renewable Energy Steering Committee



### Statement Of Purpose:

- 1) Strategy/Planning**  
 Develop and recommend unified, TVA-wide renewable energy strategies and implementation plans
- 2) Prudent Investment**  
 Evaluate economic and social costs/benefits of various renewable energy program options and recommend prudent growth and investment in TVA's renewable energy portfolio
- 3) Coordinate Implementation**  
 Oversee and track action to implement executive-level decisions.



## Renewable Purchases

- Existing wind purchases of 1,625 MW with 415 MW currently delivering power

- Other renewable purchases

- Extension and expansion of contract with landfill gas facility north of Knoxville

- Additional 225 MW of PPAs in negotiation



*All resources competitively procured against Board approved initiative to purchase up to 2,000 MW of renewable and clean resources*



## Renewable Standard Offer

- The Renewable Standard Offer program is designed to encourage the exploration and development of small to mid-sized renewable energy in the Valley
- All of the major renewable power generating technologies covered
- Simplified application and contracting process
- Projects between 200 kW and 20 MW eligible
- 10, 15, or 20 year fixed price contracts structured as a buy-all arrangements
- First contract signed with landfill gas facility in West Tennessee
- Two additional applications received with several others in progress



## Melton Hill Sustainable Recreation Demonstration

**Objective:** Integration of multiple new and emerging renewable energy and energy efficiency technologies in a retrofit of an existing recreation site to demonstrate how clean technologies can create an eco-friendly recreation system.



### Clean & Green Recreation Model Will Demonstrate

- Technologies and strategies that will reduce TVA's environmental footprint
- Leadership in Renewables Research and Technology
- Greater Energy Efficiency
- Responsible Stewardship
- Clean energy recreation model for the region and nation



## Melton Hill Sustainable Recreation Demonstration

### Renewable Energy

- 7 Different Solar Photovoltaic Technologies
- Solar Water Heating
- Small Wind Technology

### Energy Efficiency

- Solar powered LED lighting
- Energy Efficient Lighting controls (timers, photocell, motion sensors)

### Stormwater Management

- Riparian buffers, CCP permeable pavers

### Electric Vehicles

- Charging Stations

### Coal Combustion Product Reuse

- Coal Ash Roofing Shingles
- Pervious Pavers, Block, and Concrete Walkways

### Water Efficiency

- Low flow fixture retrofits
- Automated fixture motion controls

### Waste Recycling

- Containers, dumpsters



April 22, 2011 Site Dedication



## TENNESSEE VALLEY SOLAR SOLUTIONS CONFERENCE



- Collaboration between TVA, the Tennessee Solar Institute, State of Tennessee
- August 9-10, 2011, Opryland Resort and Convention Center in Nashville, TN
- TVA uniquely poised to bring together a diverse group of stakeholders in a collaborative forum to facilitate innovative solar solutions.
- The collaborative and educational forum will demonstrate TVA's leadership in clean energy options and support the development of clean energy industries in the Tennessee Valley.

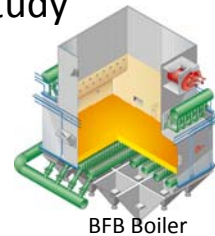


Ruby Falls 16kW Solar PV System in Chattanooga



## Shawnee Fossil Plant Unit 10 Biomass Conversion Feasibility Study

- This study established that biomass conversion is technically feasible and that the unit can be converted to a Bubbling Fluidized Bed (BFB) unit firing biomass
- Portfolio view for TVA Fleet under consideration



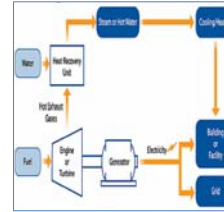
BFB Boiler





## Combined Heat & Power and Waste Heat Recovery Assessment

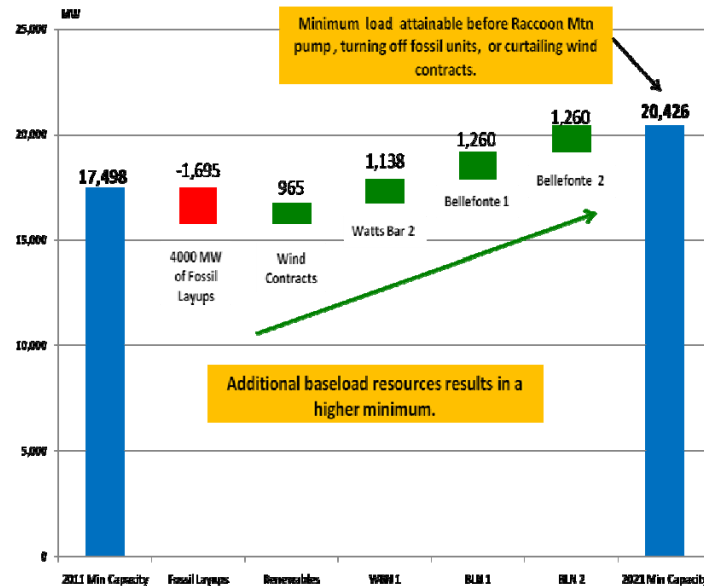
- Resource for CHP and WHR among TVA's Industrial Customers
- CHP/WHR offers potential for clean energy, increased efficiency, and grid benefits <sup>1</sup>
- Joint Effort with EPRI launched to view generation and grid benefits
- Deliverables: site assessment reports, economic analysis, preliminary CHP/WHR design package, final report



<sup>1</sup> Renewable Energy in the South, Southeast Energy Efficiency Alliance, December 2010



## Turndown Challenge: The future





## Energy Storage Can Mitigate, But...

- Capital costs
- Need to be able to quantify multiple benefits (not just arbitrage) for economics to work, and lack of market in Valley for regulation, ramping, reserves, etc., means establishing value for these services is difficult.
- Permitting will be difficult for many technologies, especially pumped hydro and compressed air energy storage (CAES).
- Limited siting possibilities – requires access to transmission; proper geology for CAES, topography for pumped hydro: water (in some cases); gas (for some CAES)
- Many technologies unproven – advanced CAES cycles, low fuel CAES, adiabatic CAES, isothermal CAES, liquid air energy storage, some batteries and flow batteries.
- Uncertain environmental impacts – if storage enables additional renewables, it's green; if renewables are unavailable and coal charges storage, system emissions increase.



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