

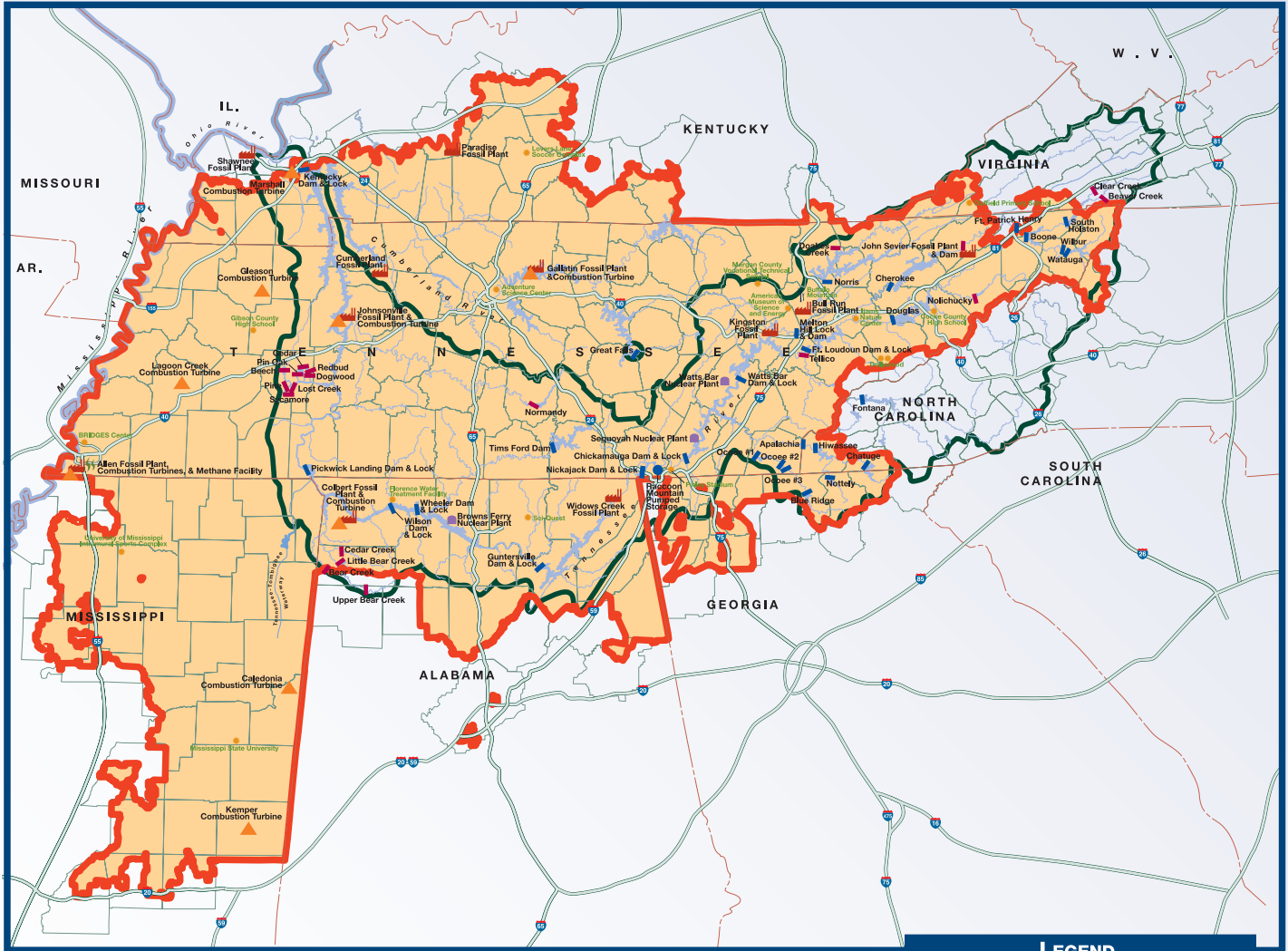
TVA's Pumped-storage facility at Raccoon Mountain, near Chattanooga, Tennessee, provides a clean energy back-up during peak demand.

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TVA utilizes a wide variety of assets to meet the energy needs for the people living in the Tennessee Valley.

TVA Regional Assets Map



LEGEND

- State Line
- Water
- Power Service Area
- TVA Watershed
- TVA Hydroelectric Dam
- TVA Non-Power Dam
- TVA Coal-Fired Plant
- TVA Nuclear Plant
- TVA Combustion Turbine Plant
- TVA Pumped-Storage Plant
- TVA Customer Service Office
- TVA Economic Development Office
- Green Power Switch® Solar Site
- Green Power Switch® Wind Site
- Green Power Switch® Methane Site

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January 2010

5 Energy Resource Options

Maintaining the diversity of TVA's energy resource options is fundamental to the ability of providing low-cost, reliable power. In order to fill the forecasted capacity gap defined in Chapter 4 – Need for Power Analysis, TVA considered the addition of a wide range of supply-side generating resources as well as energy efficiency and other demand-side resource options.

TVA's future portfolio of generating assets consists of various fuel sources and diverse technologies that support varying power demand and the other services required for reliable operation of the power system. TVA's resource portfolio also includes power purchases through both short- and long-term contracts, as well as increasing the use of renewable resources and demand-side options (i.e., EEDR programs).

5.1 Selection Criteria

During the scoping process, TVA identified a broad range of resource options. The criteria, listed in Sections 5.1.1 and 5.1.2, were applied to these options to narrow down and establish a more manageable portfolio. A complete list of resource options considered is in the associated EIS.

5.1.1 Criteria for Considering Resource Options

The following criteria were applied to determine what resource options should be considered as viable for the IRP analysis:

- The resource option must utilize a developed and proven technology, or one that has reasonable prospect of becoming commercially available before 2029
- The resource option must be available to TVA, either within the TVA region or importable through market purchases
- The resource option must be economical and contribute to the reduction of air pollutants, including greenhouse gases, from the TVA power supply portfolio in alignment with overall TVA objectives

5.1.2 Criteria for Not Considering Resource Options

The following criteria were applied to determine what resource options should not be considered for further analysis in this IRP:

- The technology is still in very early stages in terms of maturity, in the research phase or under development and not widely available during the IRP planning period
- The resource option was previously considered by TVA and found to be uneconomic or not technically feasible
- The resource option is considered part of what private developers or individuals could elect to do as part of their participation in EEDR programs or their development of renewable resource purchase options for TVA's consideration, but is not a resource option TVA would implement on its own

5.2 Options Included in IRP Evaluation

Resource options that TVA considered in the IRP evaluation included existing assets in TVA's current generation portfolio from TVA-owned facilities and power purchases. Options for new generation also included TVA-owned assets and power purchases as well as repowering of current assets. The primary resource options are nuclear, fossil and renewable generation, energy storage and EEDR. A comprehensive description of all resource options, components, characteristics and technologies is included in the associated EIS.

5.2.1 Nuclear Generation

Nuclear – Existing Generation

The capacity of TVA's existing nuclear units is approximately 6,900 MW, which includes three reactors at Browns Ferry Nuclear Plant, two reactors at Sequoyah Nuclear Plant and one at Watts Bar Nuclear Plant. On Aug. 1, 2007, the TVA Board of Directors approved the completion of the 1,150 MW Unit 2 reactor at the Watts Bar Nuclear Plant. This project is included as a current resource in TVA's generating portfolio and is scheduled for completion in 2013.

Nuclear – New Generation

TVA included Bellefonte Units 1 and 2 at the Bellefonte brownfield site as options in this IRP. In addition to the Bellefonte units, non-site specific options based on the Advanced Passive 1000 reactor design were also considered.

5.2.2 Fossil-Fueled Generation

Coal

Coal – Existing Generation

TVA currently operates 11 coal-fired power plants consisting of 56 active coal-fired generating units and three idled units with a total capacity of 14,500 MW. While some strategies assumed the continued operation of all the remaining coal-fired assets, others assumed placing varying amounts of coal-fired generating capacity into long-term idle status. Three of TVA's coal-fired units were idled in fall 2010. The goal of long-term idling is to preserve the asset, so that with modifications and environmental additions it could be reintroduced into TVA's generating portfolio in the future if power system conditions warrant.

In addition to its owned coal-fired assets, TVA also has access to the output from a coal-fired power plant (of approximately 430 MW) through a long-term PPA.

Coal – New Generation

TVA included supercritical pulverized coal (SCPC) plants with carbon capture and sequestration (CCS) technology as well as integrated gasification combined cycle (IGCC) plants with CCS technology as resource options in the IRP evaluation.

Natural Gas

Natural Gas – Existing Generation

TVA has 87 combustion turbines (CT) at nine power plants, with a combined generating capacity of approximately 6,000 MW. In addition, TVA has the capacity to generate up to 890 MW from its distributor partnership with the Southaven Combined Cycle (CC) Plant and 540 MW at the Lagoon Creek CC Plant, which came online in summer 2010. TVA is also in the process of completing the construction of an 880 MW combined cycle plant at John Sevier that is expected to be operational in 2012.

Power purchases from natural gas-fired units owned by independent power producers are also part of the current resource portfolio. TVA is currently a party to a long-term lease of a 900 MW CC plant and has PPAs of more than 1,000 MW related to natural gas-fired combined cycle plants.

Natural Gas – New Generation

The IRP evaluation includes both combustion turbine and combined cycle natural gas fueled options. Resource options evaluated in this IRP included procurement of power from existing merchant combined cycle plants along with self-built TVA or customer-owned combined cycle plants of up to 1,730 MW without specific site locations. The refurbishment of the natural gas-fired Gleason plant, consisting of three natural gas-fired combustion turbines, was evaluated as a resource option in this IRP, which increases the available capacity from 360 to 530 MW.

Petroleum Fuels

Petroleum Fuels – Existing Generation

Currently, TVA contracts for a number of diesel fuel generated power purchases, totaling 120 MW.

Petroleum Fuels – New Generation

Petroleum power purchases are expected to be phased out by 2029. There are no diesel fuels or other petroleum based resource options as a primary fuel source under consideration in this IRP because of emissions from these facilities.

5.2.3 Renewable Generation

TVA defines renewable energy as energy production that is sustainable and often naturally replenished (e.g., solar, wind, methane, biomass, geothermal and hydro). TVA presently provides renewable energy from TVA facilities and from energy acquired by PPAs. For purposes of the IRP analysis, planning strategies were developed to test a broad range of renewable additions. Therefore, renewable additions incorporated into this IRP were scheduled based on two given renewable portfolio amounts—2,500 MW and 3,500 MW. These targets are beyond TVA's current renewable resource plan (represented as the 1,500 MW portfolio), but would be in addition to TVA's existing clean energy generation sources, which include existing hydro and nuclear. As described below, renewable energy from these resources is also considered in this IRP. Additional detail can be found in Appendix D – Development of Renewable Energy Portfolios.

Conventional Hydroelectric

Hydroelectric – Existing Generation

TVA operates 109 conventional hydroelectric generating facilities at 29 of its dams. These facilities have the capacity to generate 3,538 MW of electricity. TVA is also systematically updating aging turbines and other equipment in its hydro plants.

Hydroelectric – New Generation

TVA included additional as-yet-unapproved modernization projects (a total of 90 MW by 2029) as a resource option for its IRP evaluation as well as up to 144 MW of small hydro by 2029. TVA also included small- and low-head hydropower as an IRP resource option.

Energy Storage

Energy Storage – Existing Generation

TVA operates one large energy storage facility, the 1,615 MW Raccoon Mountain Pumped-Storage Plant, which provides critical flexibility to the TVA system by storing power at off-peak times for use when demand is high.

Energy Storage – New Generation

An additional pumped-storage resource option of 850 MW was included in all cases going forward. In addition, a compressed air energy storage (CAES) option is evaluated in this IRP. TVA did not evaluate any electric battery storage options because of operational limitations.

Wind

Wind – Existing Facilities

TVA currently purchases the output from the Southeast's largest wind farm, consisting of 15 turbines on Buffalo Mountain near Oak Ridge, Tenn. In addition, TVA owns an additional three turbines at that location.

TVA has also entered into contracts with other third-party developers for the long-term purchase of wind power. Requests for proposals were issued in December 2008 for additional wind power. By the end of 2010, TVA had contracted to receive power from approximately 1,600 MW of wind power. Iberdrola Renewables began supplying 300 MW from the Streator Cayuga Ridge Wind Farm in Livingston County, Ill. Additional wind power agreements exist with Horizon Wind Energy LLC (115 MW which started in fall 2010), CPV Renewable Energy Company (365 MW starting 2012) and Invenergy LLC (600 MW starting in 2012). All contracts are contingent on meeting applicable environmental requirements and obtaining firm transmission paths to TVA.

All wind contracts selected were competitive with forecasted market electricity prices at the time those contracts were evaluated. In December 2008, when TVA issued the request for proposals, no economically feasible in-Valley proposals were received.

Wind – New Generation

TVA cannot take direct advantage of the current investment incentives offered to wind power developers. These incentives help make wind power more economically competitive with other generation resources. As such, the option of constructing its own wind power facilities in the TVA region was not included. Instead, TVA has taken the approach of procuring wind power resources through PPAs and included this as a resource option in this IRP. The procurement of wind resources, whether in or imported to the TVA region, through a request for proposal process ensures lower costs to TVA customers. This approach could change to a self-build option in the future if investment incentives and/or future federal or state renewable mandates change.

Solar

Solar – Existing Generation

TVA owns 14 photovoltaic (PV) installations with a combined capacity of about 280 kW of capacity. TVA also purchases power from PV installations through TVA's Generation PartnersSM program.

Solar – New Generation

For reasons similar to new wind generation, TVA cannot take advantage of the current investment incentives offered to solar power developers that help make solar power more economically competitive with other resource options. As a result, TVA has taken the approach of procuring solar power resources through PPAs and included it as a resource option in this IRP. This approach could change to a self-build option in the future if investment incentives and/or federal or state renewable mandates change.

Biomass

Biomass – Existing Generation

TVA generates electricity by co-firing methane from a nearby sewage treatment plant at Allen Fossil Plant and by co-firing wood waste at Colbert Fossil Plant. In addition, TVA currently purchases about 91 MW of biomass-fueled generation. These purchases include 9.6 MW of landfill gas generation, 70 MW of wood waste generation and 11 MW of corn milling residue generation.

Biomass – New Generation

TVA included up to 490 MW of biomass generation and landfill gas generation as resource options to be evaluated in this IRP. Most of this biomass is generated through PPAs, while

some of it is not. TVA also included the conversion of existing coal-fired units to biomass-fired units and co-firing biomass with coal at existing coal-fired units as IRP resource options to be evaluated. TVA is currently performing biomass fuel availability surveys in the region, and a comprehensive study is underway to assess the feasibility of converting one or more coal-fired units to biomass fuel.

5.2.4 Energy Efficiency and Demand Response

EEDR – Existing Program

TVA has an existing portfolio of programs focused on EEDR. As currently implemented, TVA's EEDR portfolio focuses on reduction in peak demand and has an avoided peak capacity in excess of 300 MW, as of FY10.

EEDR – New Program

This IRP reflects TVA's increased focus on EEDR. These reductions are in addition to energy savings from laws, policies and independent programs of distributors of TVA power. The IRP reference strategy includes an EEDR program that reduces required energy and capacity needs by approximately 14,000 GWh and 4,700 MW, respectively, by 2029.

A list of proposed EEDR programs for TVA implementation is listed in the associated EIS.

5.2.5 Power Purchases

Power purchases refer to the procurement of energy and/or capacity from other suppliers for use on the TVA system in lieu of TVA constructing and operating its own resources. Power purchases provide additional diversity for TVA's portfolio. TVA is currently a party to numerous short- and long-term PPAs. PPA options are included in the IRP evaluation. For all PPAs, it is assumed that the supplier will either interconnect with TVA transmission or obtain a transmission path to TVA if outside the TVA region.

5.2.6 Repowering Resources

Repowering electrical generating plants is the process by which utilities update and change the fuel source or technology of existing plants to realize gains in efficiency or output that was not possible at the time the plant was constructed. TVA has included approved repowering projects in its forecast for existing resources and included other as-yet-unapproved repowering options in the IRP evaluation.