Integrated Electric Resources & Master Planning

Draft Scope of Services

An Integrated Electric Resources & Master Plan for an electric utility is a plan to provide general guidance in planning to meet forecasted annual peak, energy demand, maintain reliability, and serve changing loads through a combination of supply-side, demand–side, distribution and transmission resources over a specified time period. The planning period typically used in the past was a 20 year planning horizon. The Integrated Electric Resources & Master Planning process provides an opportunity for electric system planners to address complex issues in a structured, inclusive and transparent manner and at the same time provides an opportunity for interested parties both inside and outside the planning area to review, understand and provide input to planning decisions.

Description of City of Columbia Electric Utility System

The City serves retail customers inside and outside the City. The City's electric service area is approximately 60 square miles. The City serves over 50,000 retail electric customers.

The City's transmission system is comprised of approximately 70 miles of 161 and 69 kV lines. The City's transmission system is interconnected to transmission facilities owned by Associated Electric Cooperative, Ameren, City of Fulton, and the University of Missouri.

As of September 30, 2017, the City's distribution system consisted of approximately 850 circuit miles of overhead and underground lines. The City maintains eight distribution substations.

The City provides power and energy to its customers from a combination of owned generating resources and purchased power. The City owns and operates the Columbia Municipal Power Plant which has one natural gas boiler and one gas turbine. The plant has a net rated capacity of 47.5 MW and the last unit was placed in service in 1970. In addition, a 22 MW solid-fuel boiler is being evaluated as a potential biomass option with a final decision within the next year. The plant is used primarily for load following and contributed approximately 2% of system energy during the previous year.

The City also owns five distributed generators, totaling 6 MW, located at three customer sites around Columbia. The generation, which runs on diesel oil, was installed primarily for reliability and emergency purposes. The City also owns 3 MW of landfill gas generation. The facility was built to allow the addition of another 1 MW of generation as the landfill gas supply develops, which is planned for 2018. The City purchased a 144 MW natural gas fired 4 combustion turbine facility, Columbia Energy Center.

The majority of the City's energy is purchased from market participants under long-term contracts. The City has long term purchase agreements in place with the City of Sikeston, Missouri, MJMEUC, Associated Electric Cooperative and Ameresco. The amount and term of these contracts is as follows:

Columbia Water & Light
Long Term Power Supply Contracts

	Capacity (MW)	*Contract Expiration*
City of Sikeston, Missouri	66	Plant Life
MJMEUC – Prairie State	50	Plant Life
MJMEUC – Iatan 2	20	Plant Life
Associated Electric Cooperative (Wind)	6.3	August 2027
Ameresco	3	March 2029
NextEra (Wind)	21	January 2032
NextEra (Wind) – January 2017	27	January 2032

Note: Second NextEra contract increases to 45 MW's in 2023

The City expects to utilize market purchases for short-term requirements and arrange additional power supply contracts to provide sufficient capacity and energy to meet customer loads into the foreseeable future. In 2015, the City entered into a capacity-only contract with Dynegy Marketing and Trade, LLC. The contract starts this year (planning year 2017-2018) with 5 MW's of capacity and runs for ten years. Capacity amounts increase to 45 MW's in planning year 2023-2024 and remain at that level until termination.

The City has contracted with The Energy Authority ("TEA") to act as the MISO market participant for the City. All short-term purchased power arrangements are handled by TEA, with prior approval by the City. In addition, the City has contracted with TEA for power supply risk management services. The City's portfolio is modeled and monthly status updates are held to review current status and future options.

The City became a member of MISO in 2005. The City is a Transmission Owner ("TO") and has contracted with TEA for market participant services. The City receives revenue as a TO and by selling energy in the market when not needed for local requirements. TEA also provides energy risk management services for The City.

Planning Approach

This project will include and interface with a working group appointed by the City Council. Members of the work group will include members of the Water & Light Advisory Board, other citizens from the community and ad hoc City staff members from Sustainability and Community Development. This work group will interface with the process used to develop the Integrated Electric Resource Master Plan including consultant selection, development of assumptions, request for public comment and review of results. In addition to standard information that would be used and generated as part of this planning effort, the following resource documents are expected to be included and integrated into this planning process:

- 2008 Integrated Resource Plan – Burns & McDonnell
- 2013 Update Integrated Resource Plan – Burns & McDonnell
- 161-kV Route E Transmission Evaluation – Burns & McDonnell
- Distribution Reliability Study – Quanta

- Biomass Conversion at the Municipal Power Plant – Lutz, Daly & Brain
- 2040 Long-Range Transportation Plan
- 2015 Community Greenhouse Gas Emissions Inventory

Proposed Scope of Services

- Existing Conditions
    - Load Forecast
        - Estimate the amount of electricity needed in the geographic area served by the electric Utility
            - A Utilities load forecast is one of the major determinants of the quantity and type of resources needed
    - Demand Side Management Programs
        - Review current programs with regard to current participation, participation potential, costs and results of the programs
            - The Utility Services Division was created in the early 1980's and since that time numerous programs have been implemented.
            - Assess current and projected participation levels, energy reductions and demand reductions
    - Generation Resources
        - Review current supply side resources with regards to unit ratings, unit costs, fuel forecasts, emission forecasts and other resource information.
        - Conduct operational and environmental risk evaluation.
        - Estimate Peak and annual capacity factors
        - This is to include all fossil resources, renewable resources and power purchase agreements
    - Transmission and Distribution
        - Review Transmission Import Limits by Interconnection
        - Review Distribution load Serving by substation
- Supply Side Analysis
    - Power Generating Technologies
        - Develop fuel, capacity factor, load following and other forecasts for consideration in the different types of resource analysis
        - Assessment of environmental impacts, regulations and investments necessary to bring existing units in to compliance
        - Develop a methodology for the use of environmental externality costs, such as carbon costs, in the analysis
        - Identify base case assumptions and ranges of sensitivities to be used
        - Development of a power resource analysis
            - This requires a mix of resources to be evaluated including: central power generation stations, local power generation, distributed power generation and storage
- Power Delivery Analysis

- Review Transmission Technologies
  - Develop transmission plans needed to form an overall electricity supply plan
    - Transmission lines carry power from power plants and interconnection points along major branches where it is stepped down for distribution to electricity users
    - Numerous choices for transmission systems and components should be cost estimated and assessed
- Review Distribution Technologies
  - Develop distribution plans needed to form an overall electricity supply plan
    - Distribution systems carry power from the transmission lines via substations and transformers, delivering electric to its final points of use and metering amounts used
    - Distribution Automation
    - Numerous choices for distribution systems and components should be cost estimated and assessed

- Demand-Side Analysis
  - Determine impacts to existing programs due to current and projected energy efficiency standards
  - Forecast total participation expected and rate of acceptance for the programs evaluated
  - Assess expected MW and MWh reduction and avoided costs for programs to be considered
  - Analysis of rate structures to encourage energy efficiency.
  - Assess the benefits and costs of various demand side management options beneficial for the utility to pursue
  - Recommend demand side management programs or projects that look to manage the demand for electricity use and change the time of electricity use.
    - Information/Incentives to encourage efficiency in electricity use
    - Higher-efficiency technologies
      - Residential
      - Commercial
      - Industrial
      - Other Sectors (agricultural, transportation and public lighting)
- Integration Analysis
  - Perform an integrated analysis of the supply and demand side resources using modeling and analytics
  - Perform sensitivities on the analysis for a variety of assumptions including time frame analysis and other sensitivity analysis
  - Assessment and selection based on
    - Financial criteria

        - Performance criteria
        - Environmental criteria
        - Other criteria (aesthetics, community impacts, feasibility and social impacts)
- Report Contents
        - Introduction
            - Goals and objectives
        - Summary
            - Components of recommended plan
        - Electricity Requirements
            - Forecasts and assumptions
        - Supply-side Resources
            - Existing supply, transmission and distribution system
            - Recommendations to meet demand forecasts
        - Demand-side resources
            - Recommended programs and plans
        - External cost and benefits
        - Development of candidate plans
        - Selection of recommended plan
        - Uncertainty and contingency plans
        - Implementation and monitoring
            - Near, interim and full term action plans