BPA Power Approach to Risk-Based Planning

Steven B. Barton, P.E.
Bonneville Power Administration

20 March 2013

BPA Power Approach to Risk-Based Planning

- Primary uncertainty in power planning
  - Weather
    - Streamflows and water supply are estimated by short-term and long-term weather forecasts.
    - Temperature-dependent loads vary
  - Unit Availability
- Current risk-based capability is primarily in long-range planning.

BPA Power Approach to Risk-Based Planning

- Critical Period Approach
  - Planning and adequacy is based on the lowest water supply on record.
    - Single year or multiple consecutive years
    - Provides estimated capability based on historic worse-case hydrologic conditions.

BPA Power Approach to Risk-Based Planning

- Historic Water Years
  - Planning is based on examining expected operations under multiple historic water years.
    - 50 to 70 historic water years
    - Provides a distribution of possible outcomes assuming historical water supply and runoff patterns are likely to repeat.

BPA Power Approach to Risk-Based Planning

- Ensemble Streamflow Prediction (ESP)
  - Planning is based on examining expected operations under multiple streamflow scenarios.
    - Scenarios are based on historic weather patterns applied to existing conditions (e.g. streamflow, snowpack, soil moisture)
    - Currently capable of using 55 scenarios.
    - Provides a distribution of possible outcomes assuming historical weather patterns are likely to repeat.

BPA Power Approach to Risk-Based Planning

- Loss of Load Probability (LOLP)
  - Based on multiple scenarios assessing the risk of failing to meet firm load obligations.
    - Hydrologic uncertainty is represented by either the 80-year modified flows or ESP scenarios.
    - Load uncertainty is represented by gaming temperature-dependent load.
    - Availability of nuclear (CGS) and federal wind generation is stochastically generated.

BPA Power Approach to Risk-Based Planning

- Future Short-term Modeling Approach
  - Short-term ESP and load scenarios are expected to be available within 2 years.
  - The short-term model replacement is scoped to be able to use these.