## TRANSAC Review March 16, 2016

## Base Case Planning Scenarios for the

## 2016-2017 Local Area Transmission Plan

## Planning Scenarios

NWMT used scenario planning and not probabilistic planning for developing the local transmission plan. NWMT may, however, use probabilistic assessment methods within a defined scenario to evaluate uncertainty. Scenarios are designed to examine different load and dispatch patterns in the future in order to identify conditions that stress the transmission system in planning models and simulations in order to reveal potential problems in system adequacy or security under normal or abnormal system conditions. Scenarios are determined per the goals of the transmission plan and looks at a 15-year planning study period: current year, five years, ten years, and fifteen years into the future.

The scenario assumptions may include, but are not limited to, the following:

* Load Forecast (e.g., study year)
* Load Condition to Study (e.g., season, peak load or light load, etc.)
* Generation Available (e.g., generation additions/changes)
* Generation Dispatch Conditions (e.g., how is the generation operated)
* Transmission System Elements Available (e.g., transmission element additions/changes)
* Transmission System Configuration (e.g., what elements are out-of-service)
* Public Policy requirements that are driven by local, state or federal law or regulations

The following “base” scenarios have been found to produce maximum stress on the local or bulk transmission system, and are used for planning purposes:

* Peak Load Scenarios: Two typical heavy load scenarios that tend to stress the local area transmission system:
  + “Heavy Winter”, maximum load conditions (heating with high power factor), maximum thermal generation, median hydro generation, moderate exports.
  + “Heavy Summer”, maximum load conditions (irrigation and cooling, lower power factor), high thermal generation, high hydro generation, and moderate exports. Heavy Summer conditions tend to govern in local area planning scenarios today.
* Off-Peak Load Scenario: A typical light load scenario that tends to stress the bulk or export system:
  + “Light Spring”, light load conditions (little heat or cooling, no irrigation), high thermal generation, high hydro generation, heavy exports. This scenario will be run for the current year and five year scenarios only, as longer term scenarios have been unrevealing in past planning cycles and show improvement in system conditions with load growth.

As a result, 10 base cases plan to be used to study peak and off-peak conditions (heavy summer, heavy winter, and light spring) for the present and future over a 15-year planning horizon (2016 and 2021 for all scenarios, and 2026 and 2031 for peak load scenarios only).

Historical load and system performance weigh heavily in scenario development, along with certain assumptions about the future. Scenarios assumptions can include: load forecasts (growth), load condition (peak, light), generation (as available and how dispatched), transmission (additions, upgrades, and status, in-service or out).

Additional scenarios can be developed to consider other conditions that may stress the system such as: various combinations of path loadings, generation dispatch, time of day variations in load and path loadings, and the effects of new paths, generation, or load.

A “sensitivity analysis” or study of uncertainty scenarios helps establish risks, costs, or other potential impacts of the uncertain future. Uncertainty Scenarios are developed with the knowledge that the future and the assumptions made in scenarios are uncertain. For example, the effects of higher or lower load forecasts can be considered, as well as differences in generation dispatch, or the effects of proposed new generation or load.

Scenarios are examined in present and future cases for system adequacy and security under normal and outage conditions. Adequacy refers to the capacity of the system for future needs, while Security examines the ability of the system to maintain service through system disturbances or outages. The system must be designed and operated to meet reliability criteria and requirements for voltage levels, thermal capacity, and dynamic stability as established by FERC, NERC, WECC, sub-regional and local requirements under normal and outage conditions. Normal operating conditions in which all elements normally in-service system are in-service (referred to as an N-0 condition) are studied. Outage conditions studied include the loss or fault of one (N-1) or more (N-1-1, N-2, etc.) system elements (line, transformer, bus).

When models and simulations reveal system inadequacies under these study conditions, mitigation scenarios are developed to examine the effects and costs of various solutions to problems. Solutions could include, but are not limited to, new construction (transmission lines, substations, shunt devices), generation (new or dispatch changes), system reconfiguration or adjustments (tap changes), special protection schemes, permitted curtailment of transfers or load, demand-side management (DSM), or other solutions.

The base scenarios for the current year, outlined in Table 6 – Study Scenarios, were used to develop the 5-, 10-, and 15-year scenarios, along with the load forecast.

Table – Study Scenarios

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Scenario** | **Load Conditions** | | **Generation** | | | **External Paths** | | | |
| **Demand** | **PF** | **Hydro** | **Thermal** | **Renew-ables** | **MT-NW Path 8** | **MT-ID Path 18** | **MT-SE Path 80** | **MATL Path 83** |
| Heavy Summer | Max | 0.94 | Median – High | High | 0 – Max | Moderate Export | Heavy Export | Moderate Export | Moderate Import or Export |
| Heavy Winter | Max | 0.98 | Low – Median | Max | 0 – Max | Moderate Export | Moderate Export | Moderate Export | Moderate Import or Export |
| Light Spring | Min | 0.95 | High | High | 0 – Max | Heavy –Max Export | Low Import or Export | Low –Moderate Import | Moderate Import or Export |