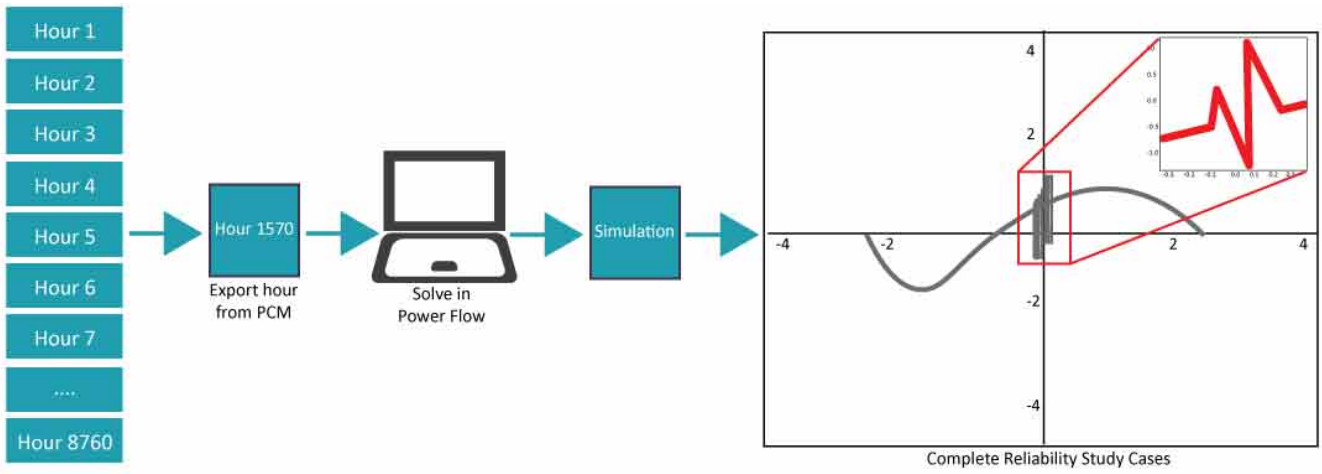
## What is the Round-Trip?

The Round-Trip is a method of using a Production Cost Model (PCM) to develop data for a Power Flow (PF) model. This linkage makes it possible to do a stability study on one or more parts of the output from a PCM. A PCM uses economic information to balance generation with historical load forecasts. Alternatively, in the PF Model, the load and generation are user inputs based on the user's criteria. Using the PCM to balance generation with load allows more easy creation of PF datasets and alignment of the two datasets.

The Round-Trip process selects one hour from the results of the economic dispatch, exports the data into a PF, solves the model, and then enables a user to run stability studies to assess how changes to the generation dispatch and load profile could impact the reliability of the Bulk Electric System (BES).

**Figure 1: Round-Trip Process**




## What does the Round-Trip Provide?

PF data sets are created by combining data submitted by relevant entities throughout the Western Interconnection into a representation of a single "hour" snapshot of the power system. Each individual entity develops its own data based on predefined requirements. These PF data sets can be time-intensive to create. The PF data sets are very detailed representations of the power system and can be used to thoroughly examine and identify possible reliability risks.

A PCM data set represents a period, in this case a year-10 data set, that has the resolution to look at each of the 8,760 hours in the study year. Once the PCM is developed, it is feasible to vary data assumptions and perform analyses to identify potential reliability risks.

The Round-Trip provides consistency between the data produced by a PCM study case and the data needed to solve a PF to use the strengths of both data sets. The process allows for potential reliability

risks to be identified in a PCM simulation and then have other aspects of the risks examined in PF simulations. This facilitates analyses of economic, dynamic and stability characteristics of the BES with PCM and PF modeling tools using load, resource and transmission topology data. The PCM analysis produces generation dispatch results for all 8,760 hours in the test year. For example, in a single hour (such as 4:00 p.m. – 5:00 p.m. on August 21, 2026), as demand (load) changes, the amount of generation selected to serve load will adjust to balance the system. Data used for a PF model requires additional information and must be built for each hour that is studied. While it would not be practical to build the data, and run the analyses for all 8,760 hours of the study year, there are usually 3-5 hours during a test year for which more detailed analyses is desired. This limited analysis could provide significant insight into potential reliability risks.

## What are the Benefits of the Round-Trip?

The Round-Trip functionality is composed of a process, data sets, and a software solution. Its benefits include:

- The ability to perform stability and dynamic analyses of an hour from the economic dispatch to evaluate flows on the system during adverse conditions (such as a contingency analysis to evaluate how the system might respond to a loss of generation, load, or transmission components).
- Consistent load, resource and transmission topology to allow easy exchange of data and results.

## What are some Round-Trip Modeling Considerations?

**Need for Targeted PF Analyses:** Only a single hour of the collective 8,760 hours in a PCM case can be used for analysis with a PF model at a time. The load, resource and transmission system data needed to solve a PF are specific to each hour of the year. Thus, any PF, stability or dynamic analyses facilitated by round-trip capability only apply to the exported hour. To fully understand the dynamic and stability implications of the PCM case, it would be necessary to solve 8,760 PF cases. However, identifying potential reliability risks related to a smaller number of hours can produce meaningful insights for a manageable number of PF cases.

**Unique Reactive and Voltage Profiles:** PF analyses use “reactive profiles” and “voltage profiles” that describe the reactive power and voltage characteristics needed for the PF analysis that are unique to each hour of the year. Any of the 8,760 hours of the PCM simulation selected for exporting into a PF model requires creating or modifying a unique reactive and voltage profile for that hour. This case-by-case undertaking requires significant computational and resource commitments.

**Generation Mapping:** There must be a one-to-one map of the generators in the PCM data set to the generators in the PF. If there are differences, the PF will not solve. This mapping is also the only way data such as transient stability data can be used for analysis.

**Time Requirement for a PF Solution:** The PCM and PF use differing methods of creating the required load and generation balance. Transitioning from a PCM-based solution into a PF solution requires manual data adjustments. For example, to solve a PF model, it is necessary to describe the location of all generators. However, not all generation used in the PCM model, such as future renewable resources, are mapped for use in the PF model. Creating a stable system solution can be time-consuming.

## Further Information

www.wecc.biz/round-trip