

CATS-HV/EHV

Introduction to Flowgates

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Flowgate Methodology Intro

- Definition of Flowgate
- How flowgate is different from rated system path methodology
- MAPP Flow-based system overview
- How it's calculated
- Positives/Negative of flowgate
- Could it be implemented in the West

Flowgate Definition

- A designated point on the transmission system through which the Interchange Distribution Calculator calculates the power flow from Interchange Transactions.
- A single transmission element, or group of transmission elements, intended to model MW flow impact relating to transmission limitations and transmission service usage. Within the IDC, Transfer Distribution Factors (see PTDFs and OTDFs as defined below) are calculated to approximate MW flow impact on the Flowgate caused by point-to-point power transfers.

Flowgate Defined in NERC Glossary

- A portion of the Transmission system through which the Interchange Distribution Calculator calculates the power flow from Interchange Transactions.
- A mathematical construct, comprised of one or more monitored transmission Facilities and optionally one or more contingency Facilities, used to analyze the impact of power flows upon the Bulk Electric System.

Flowgate Methodology

- The Flowgate methodology is characterized by identification of key Facilities as Flowgates. Total Flowgate Capabilities are determined based on Facility Ratings and voltage and stability limits. The impacts of Existing Transmission Commitments (ETCs) are determined by simulation. The impacts of ETC, Capacity Benefit Margin (CBM) and Transmission Reliability Margin (TRM) are subtracted from the Total Flowgate Capability, and Postbacks and counterflows are added, to determine the Available Flowgate Capability (AFC) value for that Flowgate. AFCs can be used to determine Available Transfer Capability (ATC).

Rated System Path Methodology

- The Rated System Path Methodology is characterized by an initial Total Transfer Capability (TTC), determined via simulation. Capacity Benefit Margin, Transmission Reliability Margin, and Existing Transmission Commitments are subtracted from TTC, and Postbacks and counterflows are added as applicable, to derive Available Transfer Capability. **Under the Rated System Path Methodology, TTC results are generally reported as specific transmission path capabilities.**

Flow-Based vs. Flowgate

- MAPP Schedule F Tariff
 - LLR vs. TLR
 - PTDF – Power Transfer Distribution Factor
- MAPP-MISO Seams Operating Agreement
- MAPP-MISO Tariff Administration
- IDC – Interchange Distribution Calculator
 - ODF – Line Outage Distribution Factor
 - OTDF – Outage Transfer Distribution Factor

Reciprocal Coordinated Flowgate

- http://toinfo.oasis.mapp.org/oasisinfo/20070921_MISOFG_factor_update.pdf
- ASTFC – Available Share of Total Flowgate Capacity (yes capacity not capability)

Total Flowgate Capability

- The maximum flow capability on a Flowgate, is not to exceed its thermal rating, or in the case of a flowgate used to represent a specific operating constraint (such as a voltage or stability limit), is not to exceed the associated System Operating Limit.

Available Flowgate Capability

- A measure of the flow capability remaining on a Flowgate for further commercial activity over and above already committed uses. It is defined as TFC less Existing Transmission Commitments (ETC), less a Capacity Benefit Margin, less a Transmission Reliability Margin, plus Postbacks, and plus counterflows.

OTDF vs. PTDF

- OTDF – Outage Transfer Distribution Factor - In the post-contingency configuration of a system under study, the electric Power Transfer Distribution Factor (PTDF) with one or more system Facilities removed from service (outaged).
- PTDF – Power Transfer Distribution Factor - In the pre-contingency configuration of a system under study, a measure of the responsiveness or change in electrical loadings on transmission system Facilities due to a change in electric power transfer from one area to another, expressed in percent (up to 100%) of the change in power transfer

Generator Shift Factor

- A factor to be applied to a generator's expected change in output to determine the amount of flow contribution that change in output will impose on an identified transmission facility or Flowgate.

Generator-to-Load Distribution Factor

- The algebraic sum of a Generator Shift Factor and a Load Shift Factor to determine the total impact of an Interchange Transaction on an identified transmission facility or Flowgate.

Distribution Factor

- The portion of an Interchange Transaction, typically expressed in per unit that flows across a transmission facility (Flowgate).

Positives

- Smaller number of posted system elements
- Transition to Financial Transmission Rights models and LMP
- Economy of Scale – Multiple entities banding together to create a single managed model and even thus market

Negatives

- Footprint – Number of **entities/shared system elements** – Hard to do in a vacuum and once you have the size, you're almost an RTO
- Number of realtime studies required, hourly for long-term, every 5 minutes for short-term
- Data reporting requirements
- Coordination
- Startup Costs
- Seams

Can it be done in the West



Additional Information

- MAPP Information (Policies and Procedures)
 - <http://toinfo.oasis.mapp.org/oasisinfo/oatidefault.htm>
- Flowgate Rights and Wrongs by William Hogan
 - <http://ksghome.harvard.edu/~whogan/flow0800r.pdf>
- UK and USA perspective on flowgates
 - <http://www.hks.harvard.edu/hepg/flowgate/PowerUK%20Piece%20on%20Flowgates.pdf>

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