Available Transfer Capability (ATC)

EE 521 Analysis of Power Systems
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Available Transfer Capability (ATC)

ATC measures the residual transfer capability in the physical transmission network for the purpose of further commercial activity over existing transmission commitments.
Transmission commitments

- **Recallable transmission service:**
  Transmission service which a transmission provider has the right to interrupt in whole or in part under the terms and conditions of the open access transmission tariff.

- **Non-recallable transmission service:**
  Transmission service which cannot be interrupted by a transmission provider for economic reasons, but that can be curtailed for reliability reasons.
Transmission commitments (cont.)

- Non-recallable transmission service has priority over recallable transmission service.
- Reserved(or scheduled) recallable transfers may be recalled for non-recallable transfer requests.
Transmission Reliability Margin (TRM)

- TRM is kind of a safety margin to ensure reliable system operation as system conditions change.
- Uncertainty exists in future system topology, load demand and power transactions.
- TRM could be 8% or 10% of the Total Transfer Capability (TTC).
NERC: Available Transfer Capability (ATC)

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ATC is **mathematically** defined as the Total Transfer Capability (TTC) less the Transmission Reliability Margin (TRM), less the sum of committed transmission uses including retail customer service and the Capacity Benefit Margin (CBM*).

\[ \text{ATC} = \text{TTC} - \text{TRM} - \text{Existing Transmission Commitments} \]

* Capacity Benefit Margin: CBM is defined as that amount of transmission transfer capability reserved by load serving entities to ensure access to generation from interconnected systems to meet generation reliability requirements. Its use is intended only for the time of emergency generation deficiencies.
Total Transfer Capability (TTC)

- Power system conditions
- Critical contingencies
- Parallel path flows
- Non-simultaneous and simultaneous transfers
- Transmission line capacities
Procedure to calculate TTC

1. Start with a base case power flow
2. Increase generation in area A and increase demand in area B by the same amount
3. Check the normal thermal, stability and voltage constraints
4. Evaluate the first contingency event and ensure that the emergency operating limits are met
5. When the emergency limit is reached for a first contingency, the corresponding (pre-contingency) transfer amount from area A to area B is the TTC
Example [2]

Calculate ATC from area A to area B.

It is assumed that one of two lines between area A and area C is the critical single contingency.
Example [2]

1. Base case power flow.
Example [2]

2. Increase generation in area A and increase demand in area B by the same amount.

Net power transferred from area A to area B in the base case: 2834 MW.
3. Check the normal thermal, stability and voltage constraints.
4. Evaluate the first contingency event and ensure that the emergency operating limits are met.
5. When the emergency limit is reached for a first contingency, the corresponding (pre-contingency) transfer amount from area A to area B is the **TTC**.
**First Contingency Incremental Transfer Capability (FCITC)**

**First Contingency Total Transfer Capability (FCTTC)**

*First Contingency Incremental Transfer Capability (FCITC)* is the amount of electric power, incremental above normal base power transfers that can be transferred over the interconnected transmission systems in a reliable manner.

*First Contingency Total Transfer Capability (FCTTC)* is the sum of normal base power transfers and *FCITC*. *FCTTC* is the total amount of electric power that can be transferred between two areas of the interconnected transmission systems in a reliable manner.
Calculation of FCTTC and FCITC

\( FCTTC \) : Net power transferred from area A to area B at thermal limit = 2834 MW

\( FCITC = FCTTC \) - the scheduled power transferred from area A to area B in the base case = 2834 MW – 0 MW = 2834 MW
Conclusions

• ATC measures the residual transfer capability in the physical transmission network for the purpose of further commercial activity over existing transmission commitments.

• ATC and TTC depends on system generation dispatch and system load level, power transfers between areas, network topology, and the limits imposed on the transmission network due to thermal, voltage and stability constraints.

- The purposes of ATC’s:
  - to deliver electric power reliably
  - to provide flexibility for changing system conditions
  - to reduce the need for installed generating capacity
  - to allow trading of electric power among systems
References
