
SERTP Interactive Training

Interface Analysis

Disclaimer

- This presentation is for training purposes only and is intended to provide the general methodology for performing interface analysis. The actual studies performed and methodology employed by individual sponsor companies of the Southeastern Regional Transmission Planning process may vary.

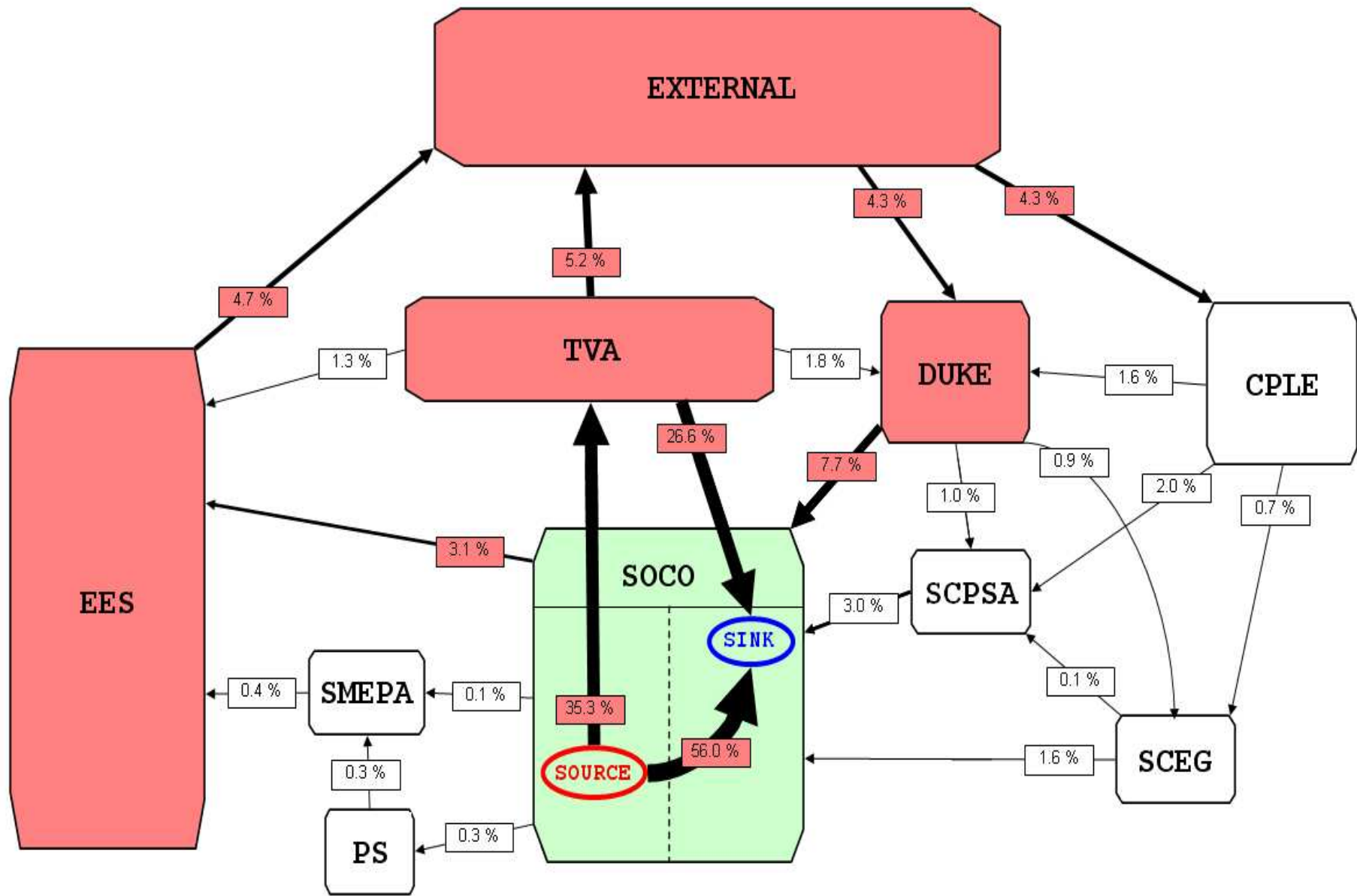
Discussion Points

- When is Interface Analysis Performed?
- Common Terms and Definitions
- Procedure
- Questions?

When is Interface Analysis Performed?

- Transmission Providers typically perform interface analysis during evaluations for:
 - SERTP Economic Studies
 - Point-to-Point Transmission Service (“PTP”)
 - Network Integrated Transmission Service (“NITS”)
 - Generator Interconnections (“GI”)
 - Other types of Bulk Transmission System Studies.

Power Flows from Central AL. to OPC Load



Total Transfer Capability (“TTC”)

- TTC is the amount of electric power that can be moved or transferred reliably from one area to another area of the interconnected transmission systems by way of all transmission lines (or paths) between those areas under specified system conditions.
- TTC values in the Southern Control Area (“SCA”) are determined on an “aggregated basis” in which the transmission facilities of multiple transmission owners located within the SCA (Dalton Utilities, Georgia Transmission Corporation, Municipal Electric Authority of Georgia, and the Southern Companies) are treated as a combined electrical system in transfer analysis studies.

Capacity Benefit Margin (“CBM”)

- CBM is that amount of firm, import transfer capability reserved on interfaces with adjacent Balancing Authority areas to ensure access to generation resources from interconnected systems to meet generation reliability requirements of Load Serving Entities’ (“LSE”) native/network load customers.
- CBM reservations are reserved by the LSEs and can be used during emergency situations. CBM is only withheld when calculating firm transfer capability.

Transmission Reliability Margin (“TRM”)

- TRM is the amount of firm transfer capability necessary to ensure that the interconnected transmission network is secure under a reasonable range of uncertainties in system conditions.
- There are currently no TRM reservations for exports from the SCA.

Existing Transmission Commitments (“ETC”)

$$\text{ETC} = \text{NL} + \text{NITS} + \text{GF} + \text{PTP} + \text{ROR}$$

- ❑ NL is the firm capacity set aside to serve peak Native Load forecast commitments for the time period being calculated, to include losses, and Native Load growth.
 - ❑ NITS is the firm capacity reserved for Network Integration Transmission Service serving Load, to include losses, and Load growth.
 - ❑ GF is the firm capacity set aside for grandfathered Transmission Service and contracts for energy and/or Transmission Service, where executed prior to the effective date of a Transmission Service Provider’s Open Access Transmission Tariff or “safe harbor tariff.”
 - ❑ PTP is the firm capacity reserved for Point-to-Point Transmission Service.
 - ❑ ROR is the firm capacity reserved for Roll-over rights for contracts granting Transmission Customers the right of first refusal to take or continue to take Transmission Service when the Transmission Customer’s Transmission Service contract expires or is eligible for renewal.
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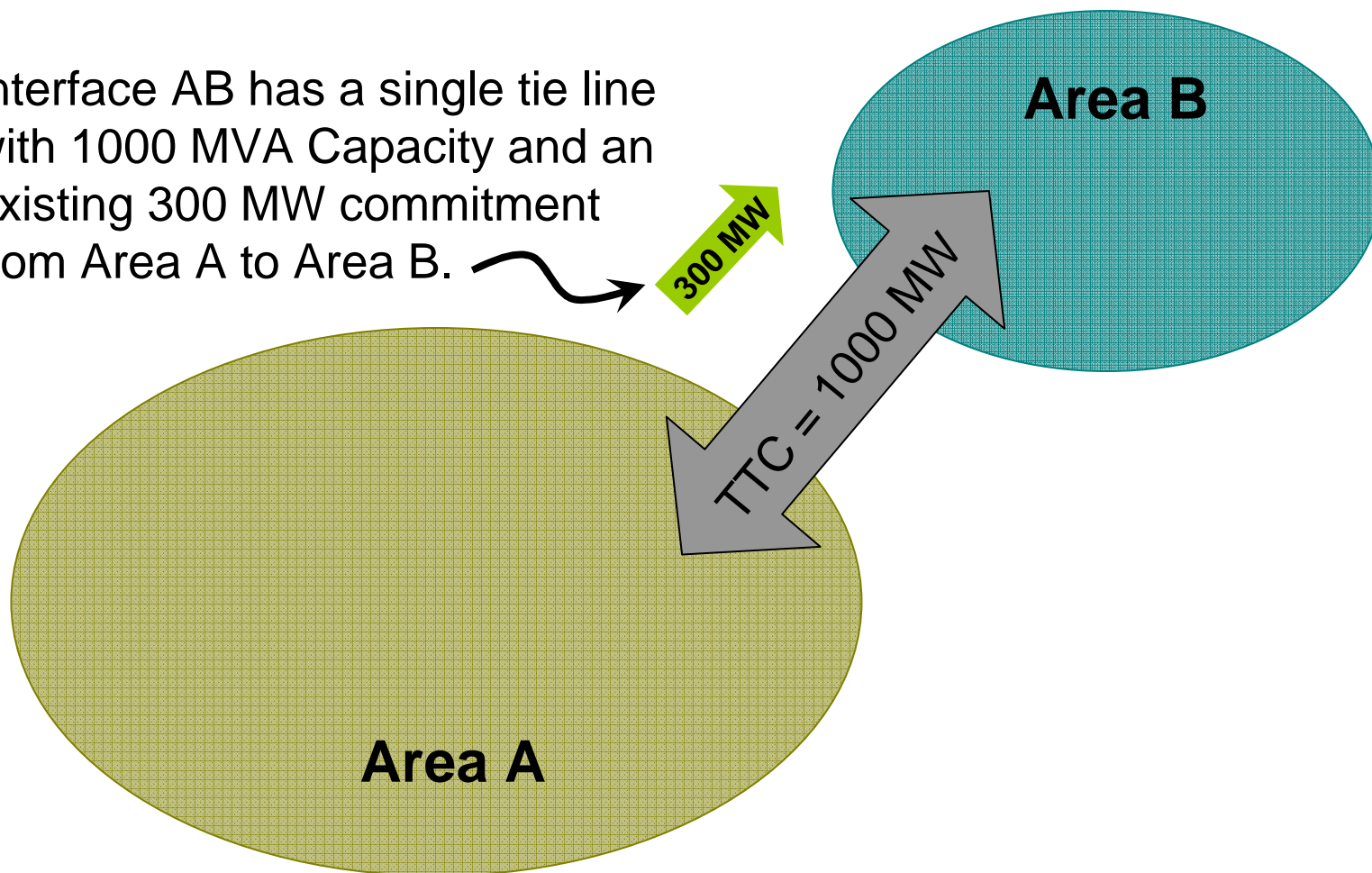
SCA's Northern Interfaces

- The SCA has ties with numerous different control areas, five of which are collectively referred to as the “Northern Interfaces”:
 - Entergy (“EES”),
 - The Tennessee Valley Authority (“TVA”),
 - Duke Power Company (“Duke”),
 - Santee Cooper (“SC”), and
 - South Carolina Electric and Gas (“SCEG”).

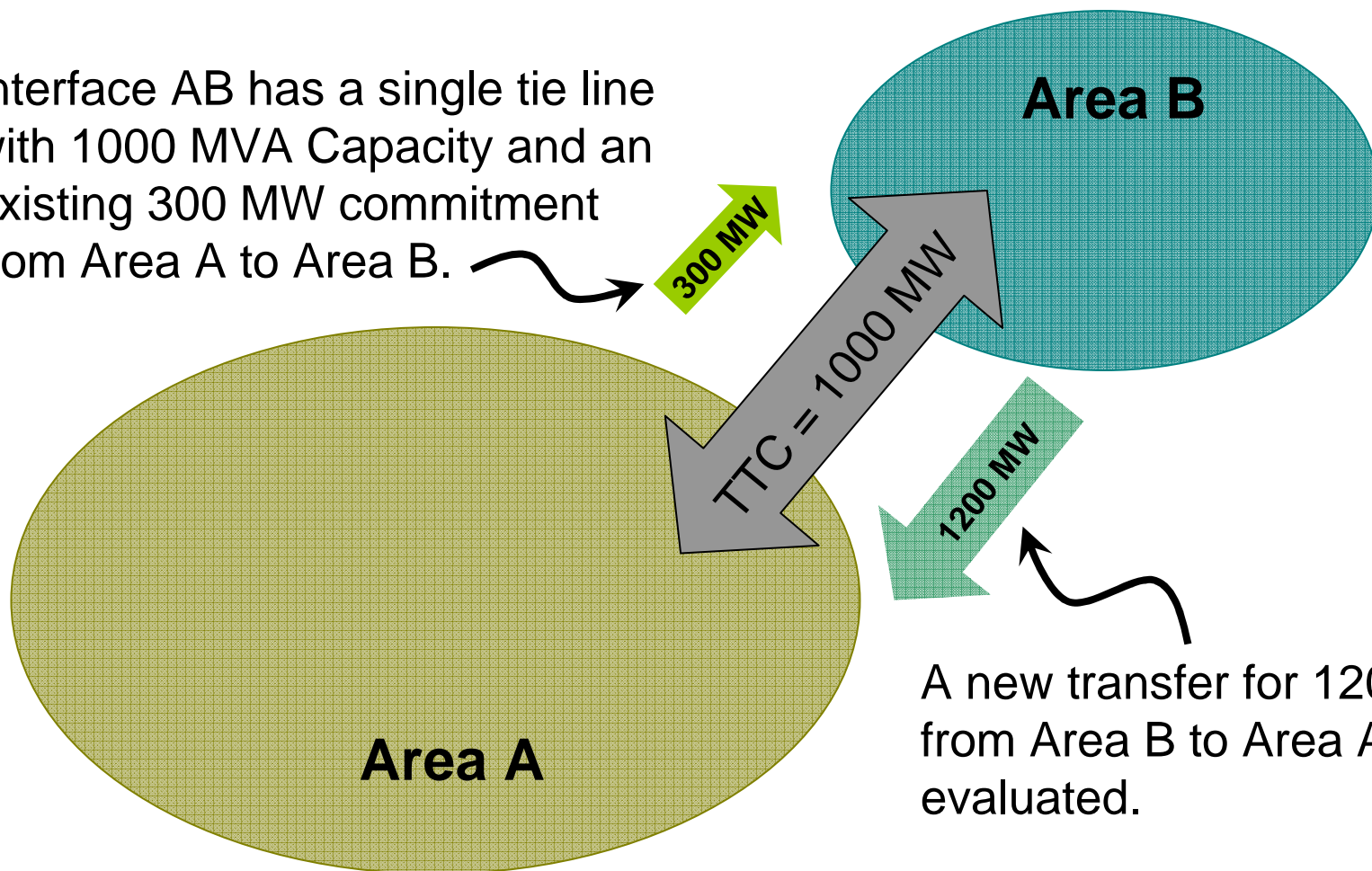
Netting

- “Netting” may result when modeling all import and export commitments/reservations on an interface.

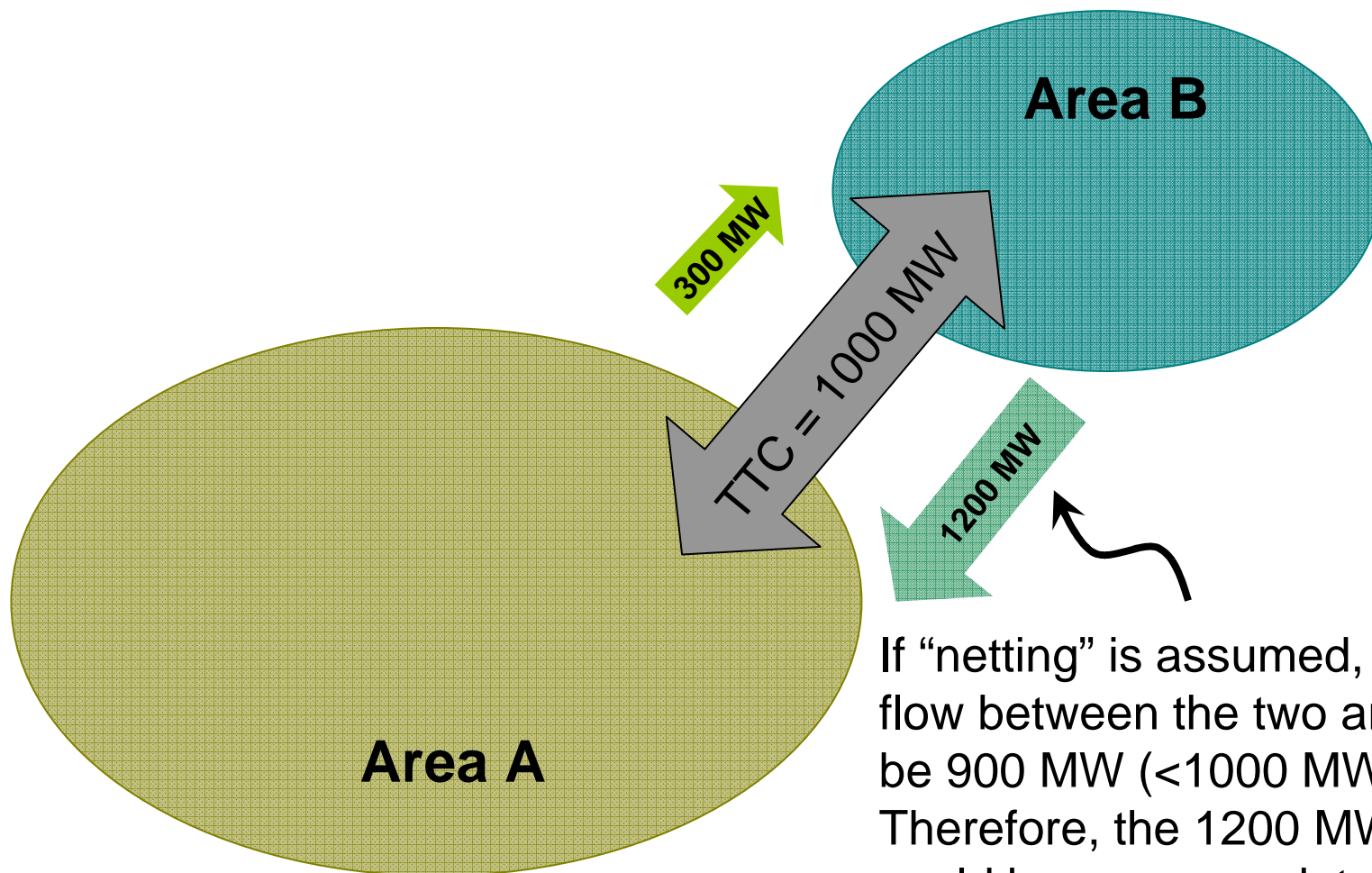
Interface AB has a single tie line with 1000 MVA Capacity and an existing 300 MW commitment from Area A to Area B.



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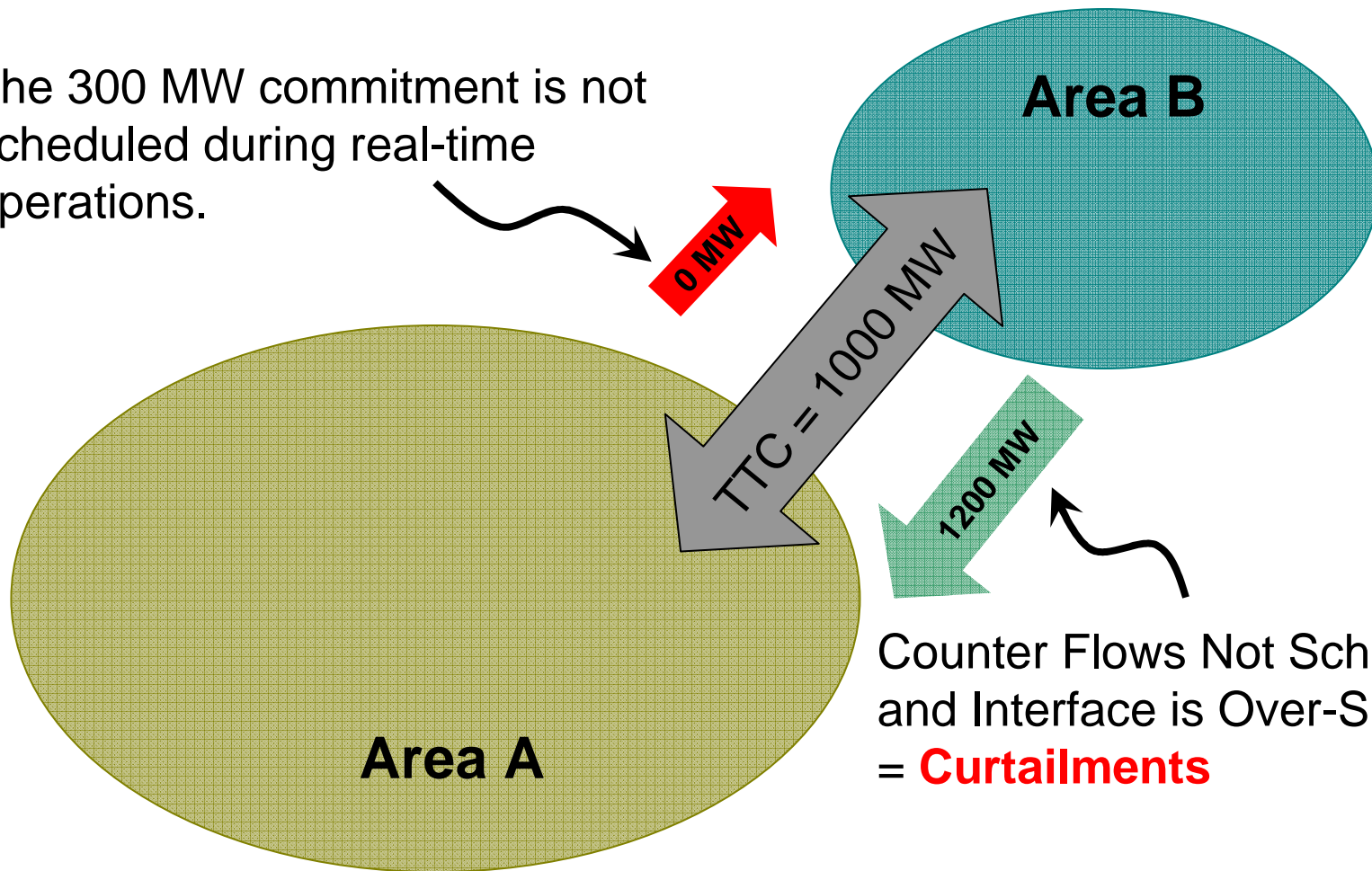


A new transfer for 1200 MW from Area B to Area A is evaluated.



If “netting” is assumed, the net flow between the two areas would be 900 MW (<1000 MW TTC). Therefore, the 1200 MW transfer could be accommodated.

The 300 MW commitment is not scheduled during real-time operations.



Counter Flows Not Scheduled
and Interface is Over-Subscribed
= **Curtailments**

Netting

- Therefore,
 - exports along the northern interface are removed during import transfer capability evaluations; likewise,
 - imports along the northern interface are removed during export transfer capability evaluations.

TTC Allocations for SCA Interfaces

- Transfer capability between the SCA and the areas that make up the northern interfaces is allocated to Dalton Utilities, Georgia Transmission Corporation (“GTC”), Municipal Electric Authority of Georgia (“MEAG”), and the Southern Companies.
- The allocations for the paths between the SCA and the northern interfaces, PowerSouth Electric Cooperative, and Peninsular Florida can be found at:

<http://www.southeasternrtp.com/General/2008/SCAInterfaceAllocations.pdf>

Study Cases Creation

- Two unique sets of power flow cases are built for both Import and Export capability analyses.
 - “OFF” cases refer to a set of cases containing ETC that is prior-queued to the request being evaluated.
 - “ON” cases refer to a set of OFF cases with the additional request under evaluation included.

Study Cases Creation

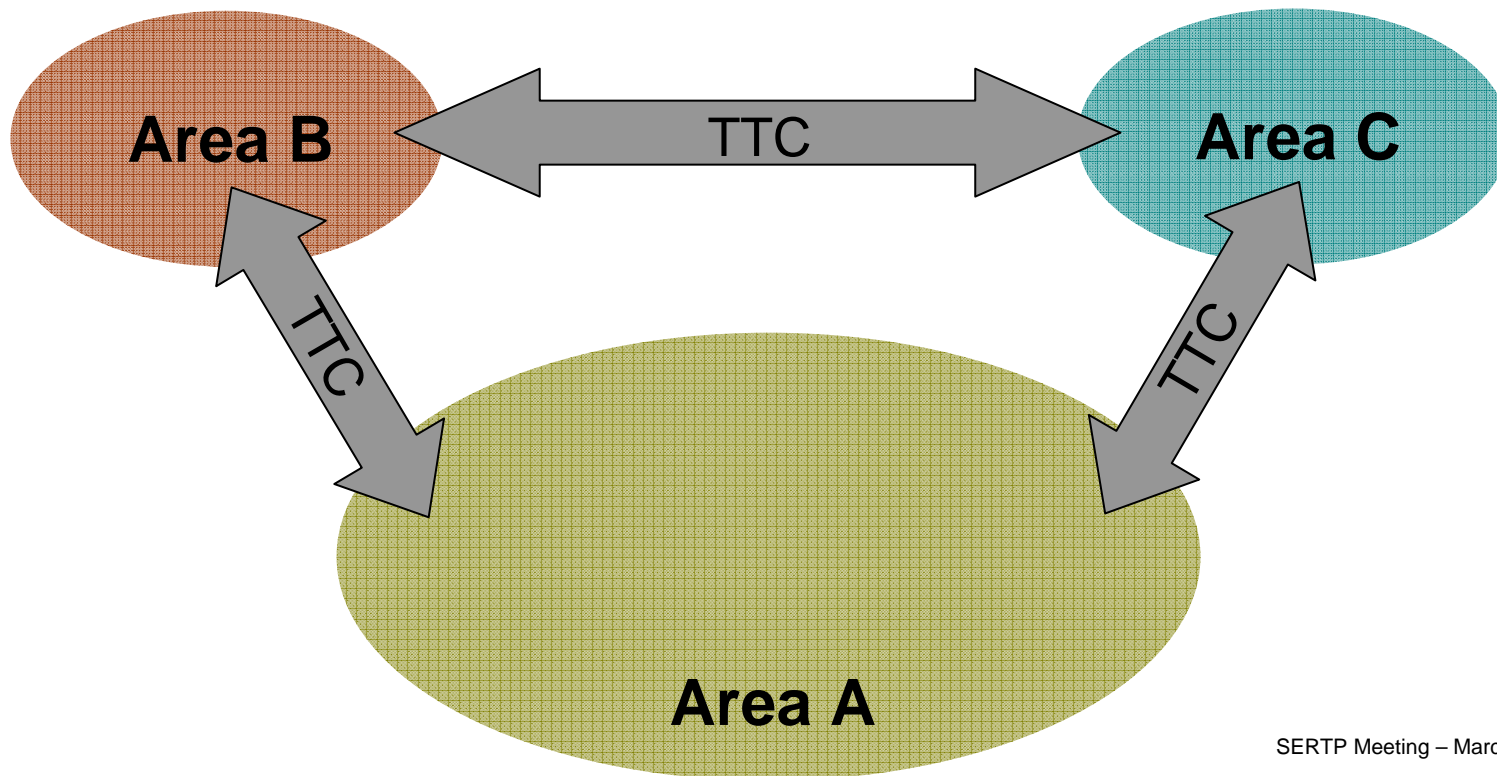
- To create the “OFF” cases:
 - remove exports delivering to the northern interface from the SCA for import evaluations; and
 - remove imports delivering from the northern interface to the SCA for export evaluations.

- A screen to determine if a service provider has enough allocation of a particular interface is performed by calculating the TTC required for each provider to meet their existing commitments for a particular path.

Transfer Amount to Model in Study Cases

For Interface AB, the Transmission Providers of Area A have the following import commitments and their respective allocation of the TTC:

Provider	Import Commitments	Allocation of TTC	Minimum TTC to Meet Commitments
X	100 MW	60 %	
Y	60 MW	30 %	
Z	15 MW	10 %	



Transfer Amount to Model in Study Cases

For Interface AB, the Transmission Providers of Area A have the following import commitments and their respective allocation of the TTC:

Provider	Import Commitments	Allocation of TTC	Minimum TTC to Meet Commitments
X	100 MW	60 %	167 MW
Y	60 MW	30 %	200 MW
Z	15 MW	10 %	150 MW

What is the minimum TTC needed to accommodate the three provider's import commitments from Area B to Area A?

Answer: **200 MW**

TTC Required for Provider X = $100/0.6 = 167$ MW

TTC Required for Provider Y = $60/0.3 = \mathbf{200}$ MW

TTC Required for Provider Z = $15/0.1 = 150$ MW

Transfer Amount to Model in Study Cases

- Therefore, 200 MW are modeled on Interface AB with 120 MW allocated to Company X, 60 MW allocated to Company Y, and 20 MW allocated to Company Z.

- The same calculation is performed for each of the five northern interfaces and the calculated minimum TTC for each respective interface is modeled in the study cases.
 - The TTC is allocated based on the SCA interface allocations.

- For Import Cases, CBM is included in the calculation to determine the total amount of transfers to model.

Study Cases Creation Continued

- Once the previous steps have been performed (remove netting transactions and model total transfers required to meet commitments), the SCA is economically dispatched based on the Load Obligation of the individual companies within the SCA.

- Additionally, numerous Unit-Out scenarios are created.
 - SCA is economically dispatched to account for the loss of generation in each scenario.

Study Cases Creation Continued

- Add the request under evaluation to all of the previously created “OFF” cases to create the “ON” cases.
 - SCA is economically dispatched to account for the loss of generation in each scenario.

Using MUST to Determine FCITC

- First Contingency Incremental Transfer Capability (“FCITC”) is the amount of electric power that can be moved or transferred reliably from one area to another area of the interconnected transmission systems given a set of initial conditions including transfer distribution factors and facilities’ loadings.

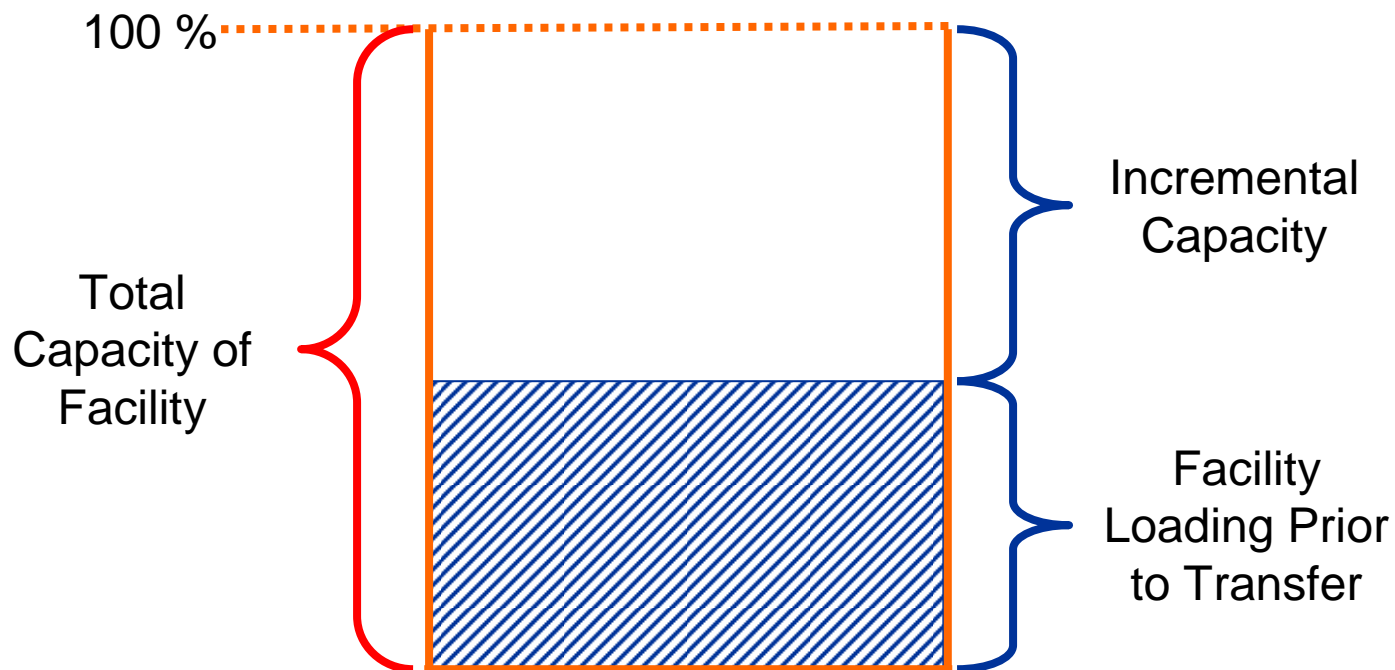
Using MUST to Determine FCITC

■ Transfer Criteria:

- $\geq 2\%$ transfer distribution factor (“tdf”), and
- $>100\%$ loading cutoff

Incremental Transfer Capability (“ITC”)

$$\text{ITC} = \frac{\text{Incremental Capacity}}{\text{Transfer Distribution Factor}}$$



Transmission
Element

Using MUST to Determine FCITC

Subsystem File

Subsystem 'SOCO_LD'

area 1

scale all load

End

Subsystem 'Duke_LD'

area 342

scale all load

End

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Subsystem 'Sim_Source'

participate

system Duke_LD 0.2333

system SC_LD 0.05

system SCEG_LD 0.05

system TVA_LD 0.3333

system EES_LD 0.3333

End

End

Using MUST to Determine FCITC

Monitor File

Monitor branches in area 1
Monitor branches in area 7
Monitor branches in area 8
Monitor ties from area 1
Monitor ties from area 7
Monitor ties from area 8
Monitor branches in area 342 kvrage 230 500
Monitor branches in area 343 kvrage 230 500
Monitor branches in area 344 kvrage 230 500
Monitor branches in area 347 kvrage 161 500
Monitor branches in area 351 kvrage 230 500
End

Using MUST to Determine FCITC

Contingency File

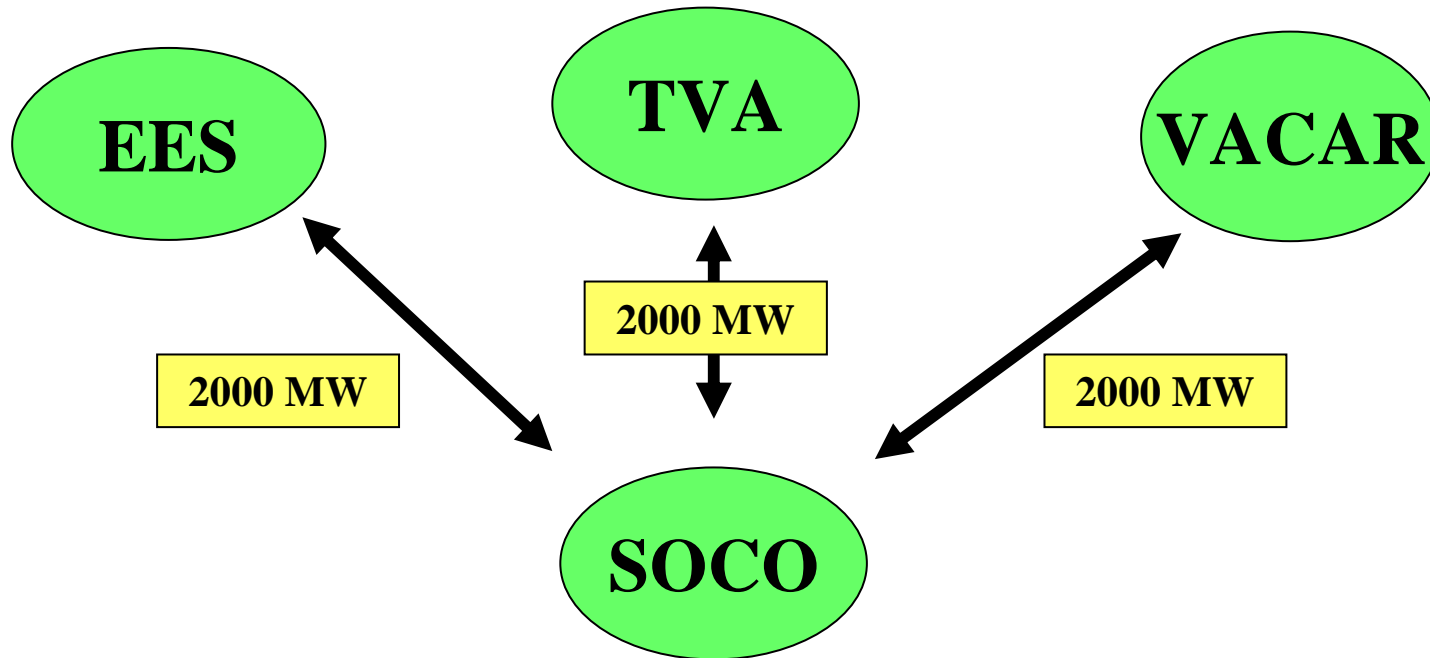
Single branch in area 1
Single branch in area 7
Single branch in area 8
Single tie from area 1
Single tie from area 7
Single tie from area 8
Single branch in area 342 kvrage 230 500
Single branch in area 343 kvrage 230 500
Single branch in area 344 kvrage 230 500
Single branch in area 347 kvrage 161 500
Single branch in area 351 kvrage 230 500
End

Using MUST to Determine FCITC

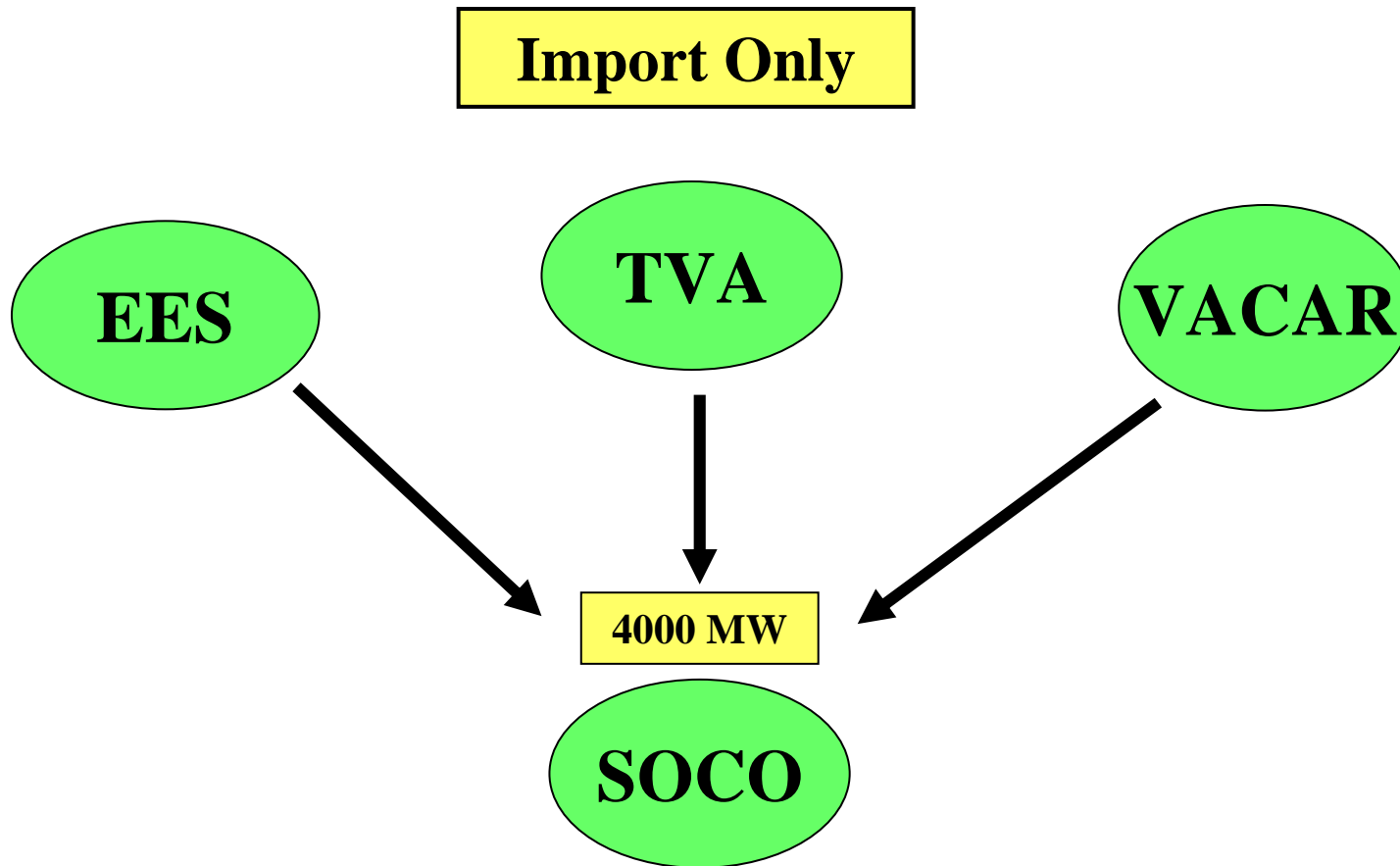
- Two types of transfers are performed:
 - Non-Simultaneous, and
 - Simultaneous

Non-Simultaneous Transfers Performed

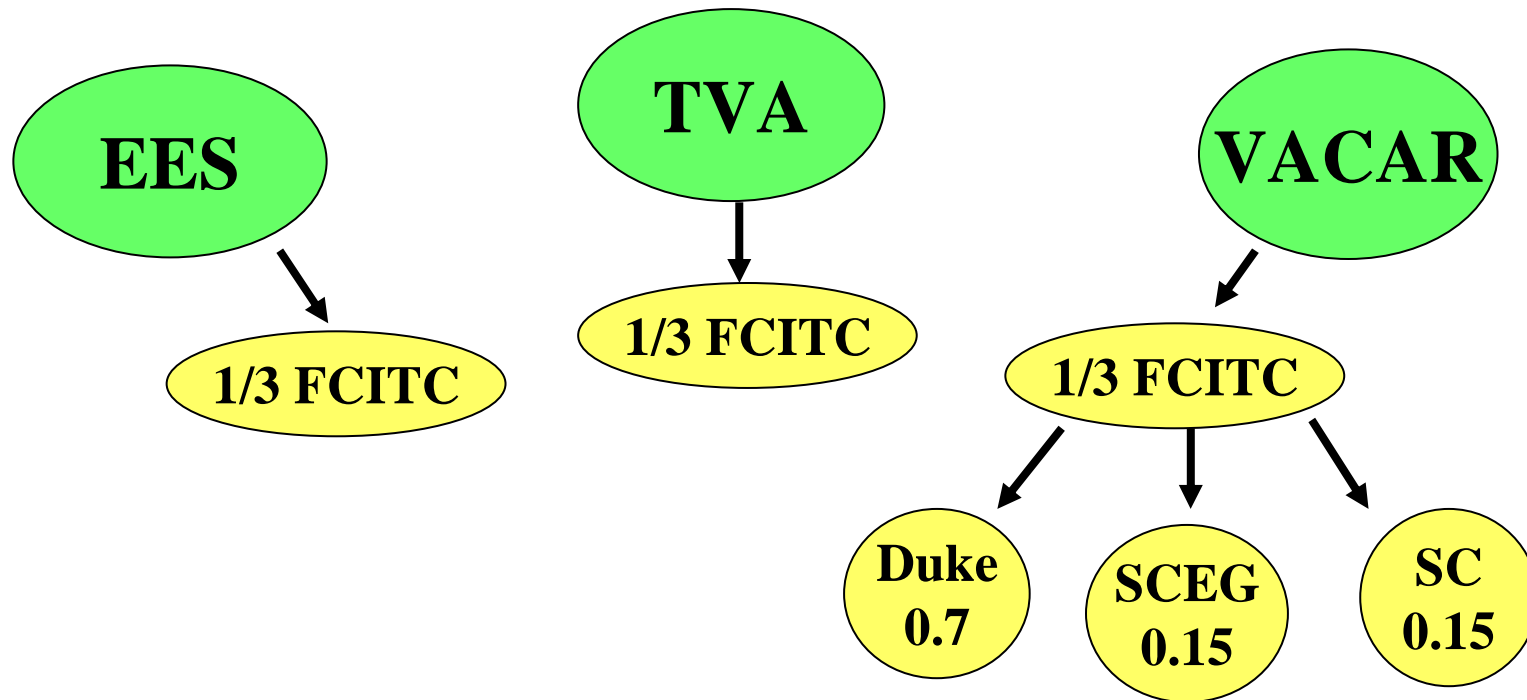
Import/Export



Simultaneous Transfer Performed



Allocation of FCITC for Simultaneous Transfers

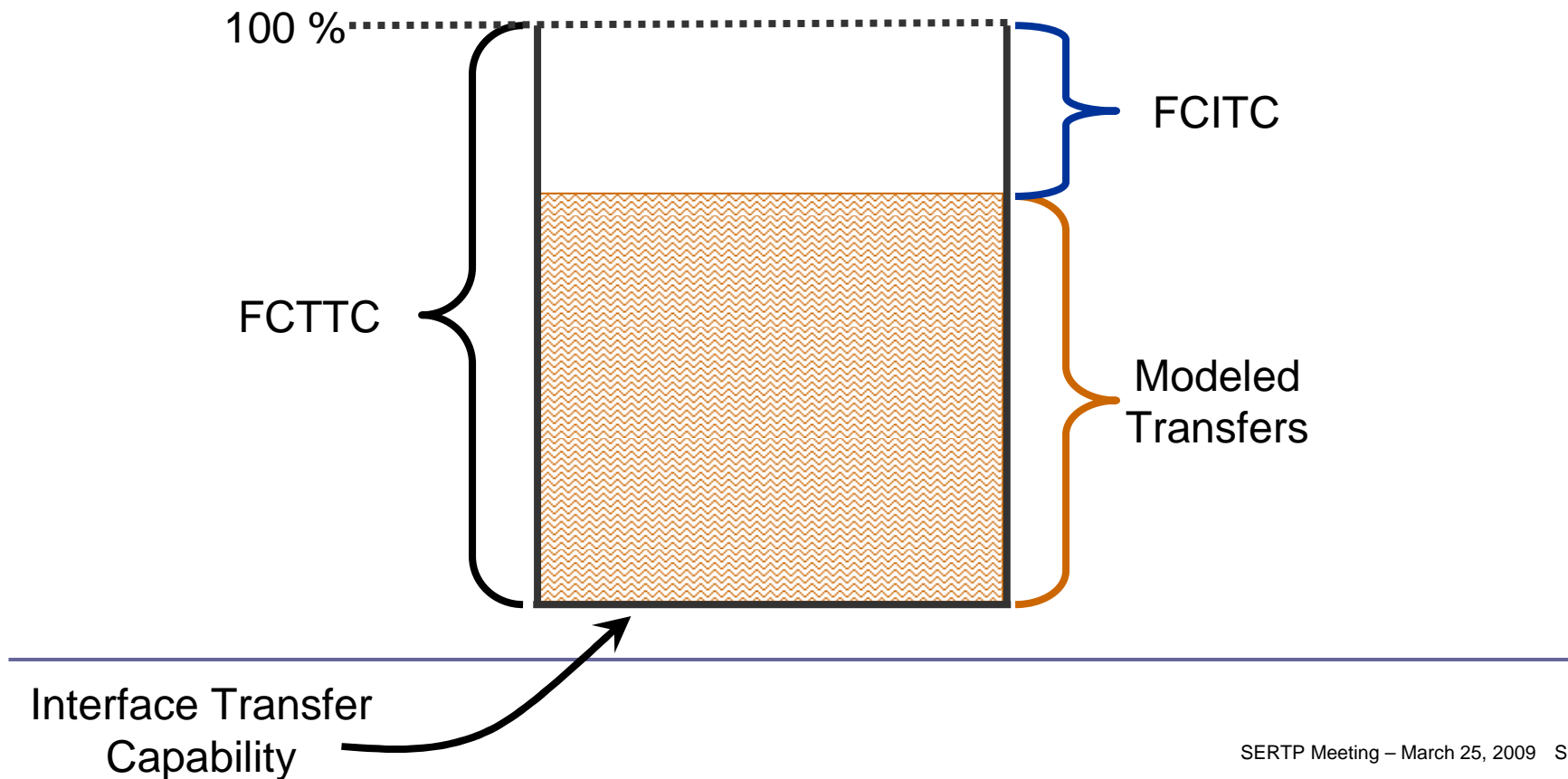


Using MUST to Determine FCITC

- The lower FCITC produced from the two types of transfers is used to determine the TTC for an interface.

First Contingency Total Transfer Capability (“FCTTC”)

$$\text{FCTTC} = \text{FCITC} + \text{Modeled Transfers}$$



Determining Interface Impacts

If **FCTTC – CBM – TRM – ETC > 0**, the request under evaluation can be accommodated.

The request under evaluation can/cannot be accommodated if the above equation results in the following:

<u>“OFF”</u>		<u>“ON”</u>	
True	→	True	} Sufficient Transfer Capability
False	→	True	
False	→	False ⁺	} Insufficient Transfer Capability - May require additional enhancements.
True	→	False	
False	→	False ⁻	

Questions?

