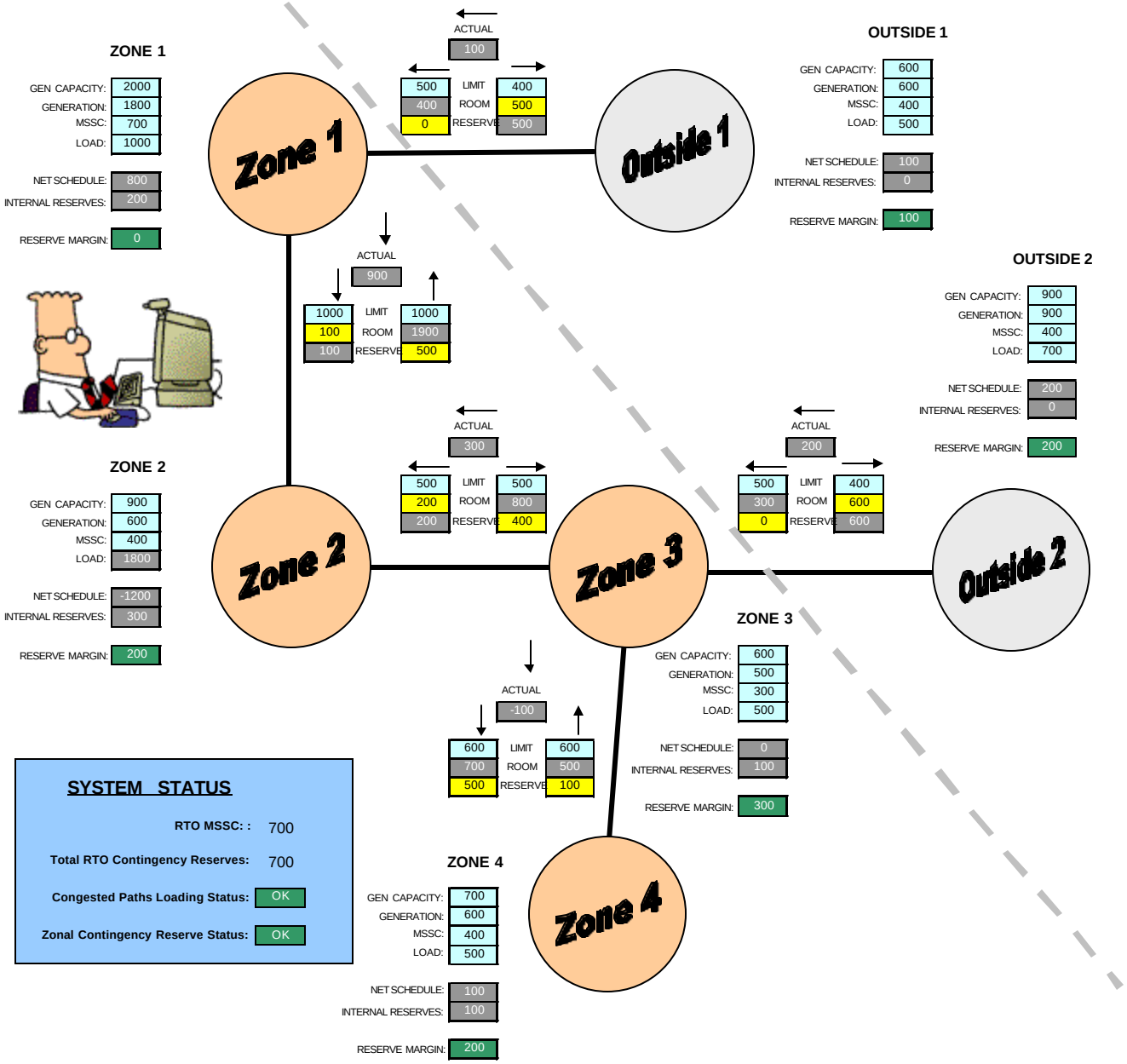
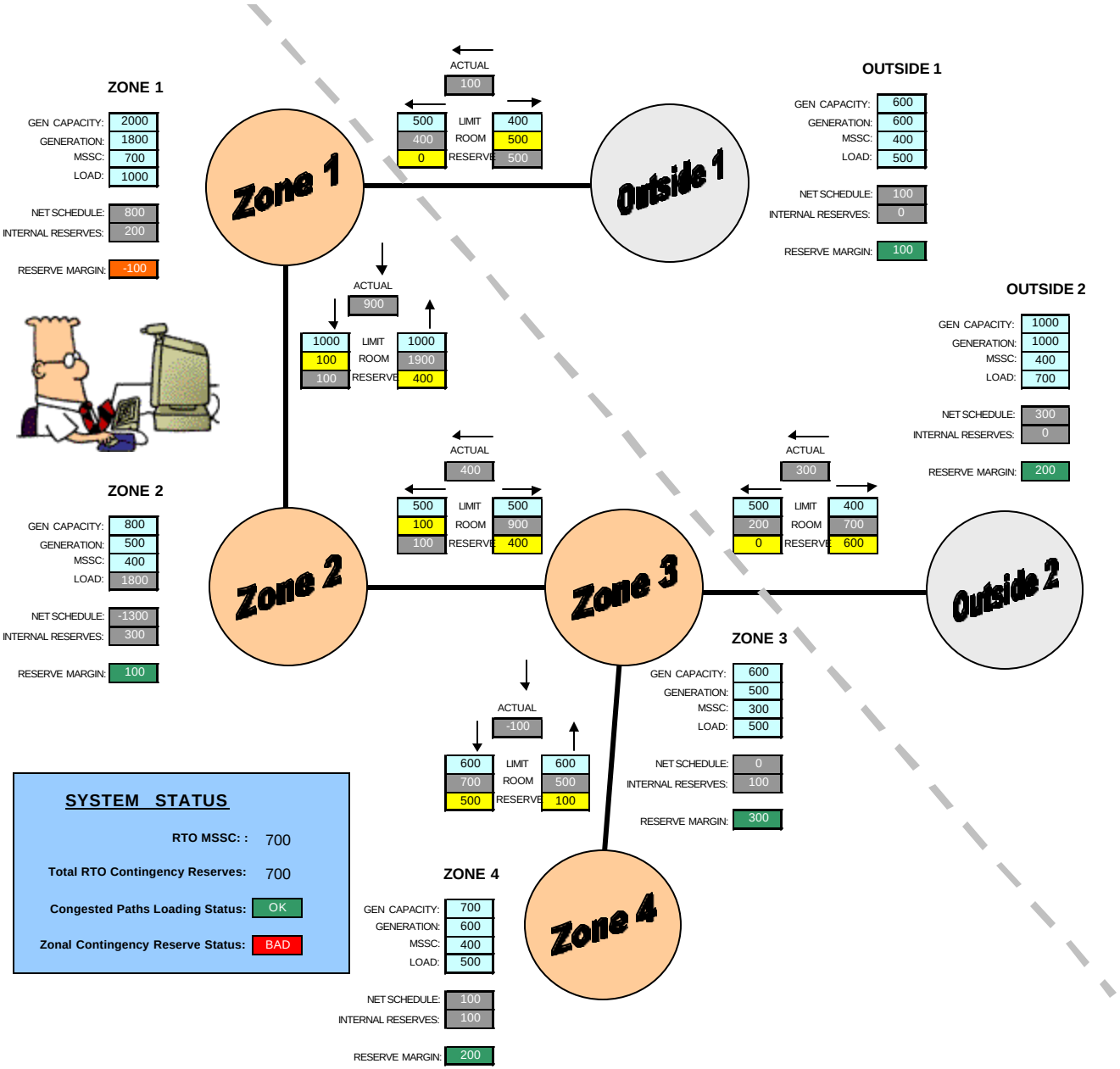
Impact of Transmission Constraints on Reserves

- "Reserves" are these ancillary services:
  - Regulation
  - Load Following Services (Up/Down)
  - Contingency (Spinning/Non-spinning)
  - Replacement Reserve
- Balancing Energy Service provided through the above services.

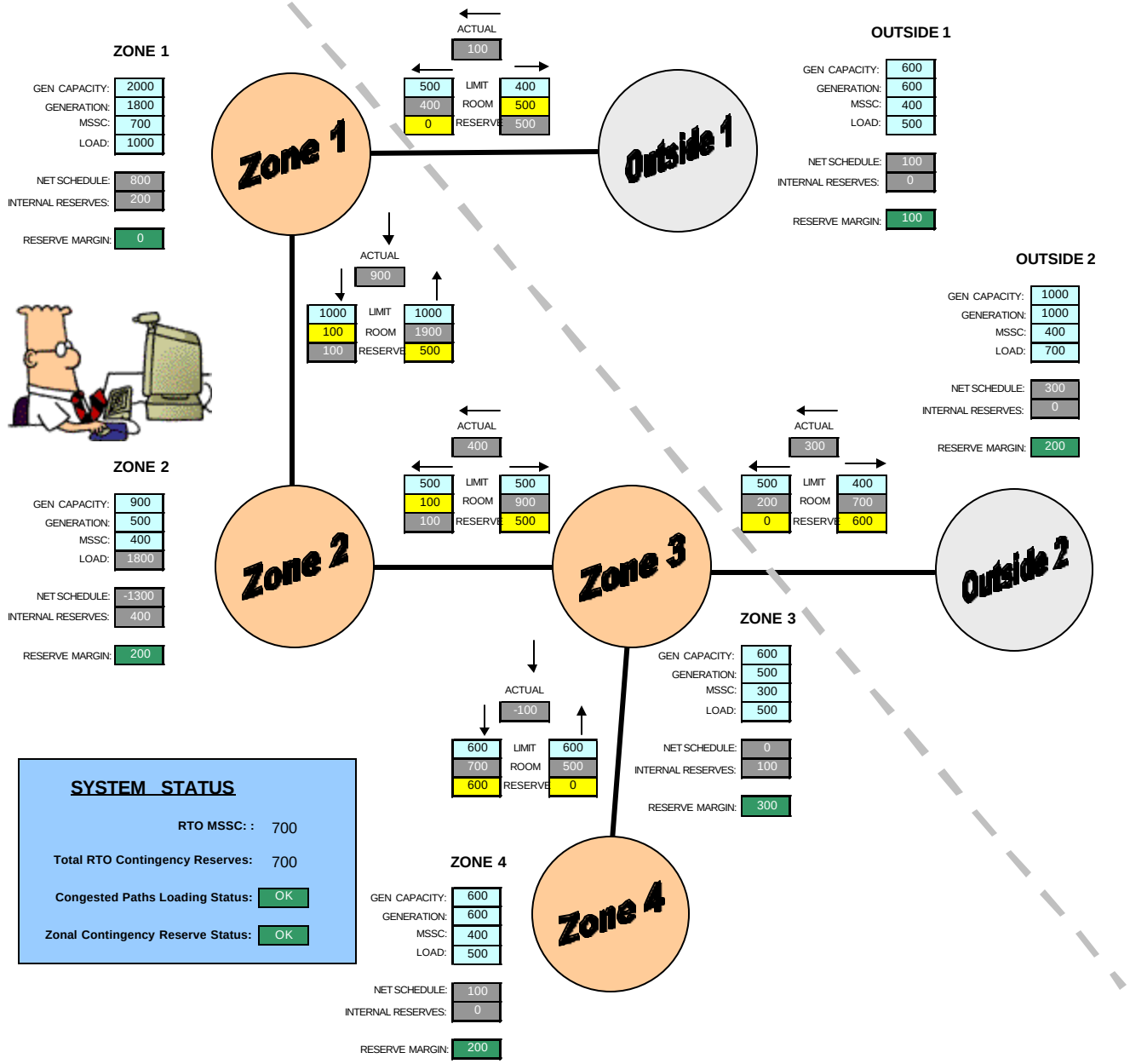
Contingency Reserve Not Constrained by Transmission



Zone 2 Purchase +100 Mw From Outside 2



Move 100 Mw of Reserve From Zone 4 to Zone 2



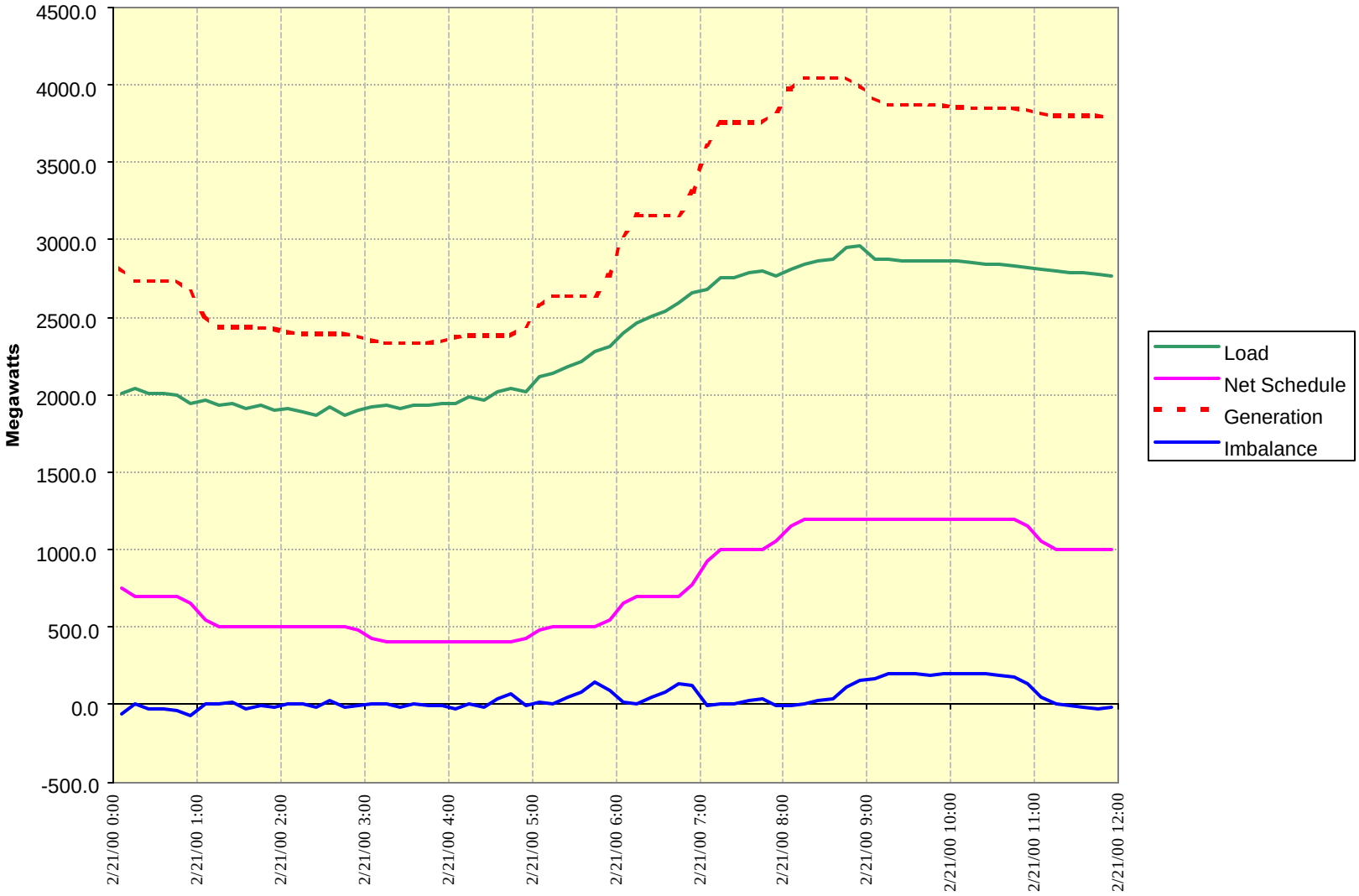
The Adequacy of Reserve Arrangements Will Depend on Both <u>Amounts</u> and <u>Locations</u>

- The requirements for reserves need to be determined on a zone-by-zone basis.
- Sources of reserves must also be identified by the zone in which they reside.
- Transmission requirements needed to transport reserves between zones must be identified and met.

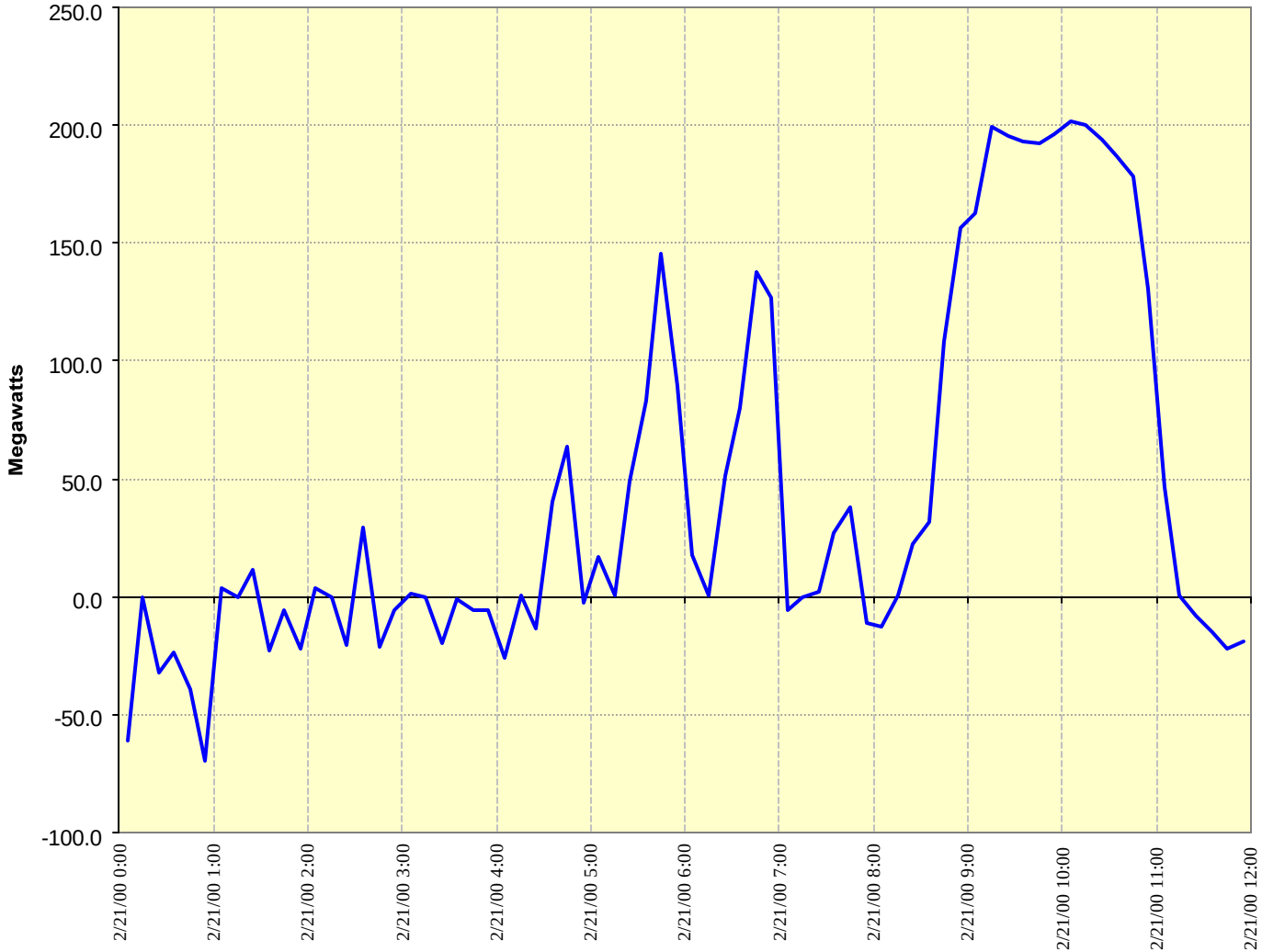
Reserves Related to Maintaining Short-Term Load/Resource Balance

- Load forecasting errors, daily load cycles, and short-term load fluctuations contribute to cause “normal” load/resource imbalances. Generation changes and schedule changes are also contributors.
- Reserves must be available to continually redress these imbalances.
- The amounts of these reserves should be determined on a zone-by-zone basis.
- The overall zonal requirement needs to be broken down into: regulation, load following, and replacement reserves.

Reserves Must Meet The Zonal Imbalances



Somehow Split This Imbalance Into Regulating, Load Following, and Replacement Reserve ???

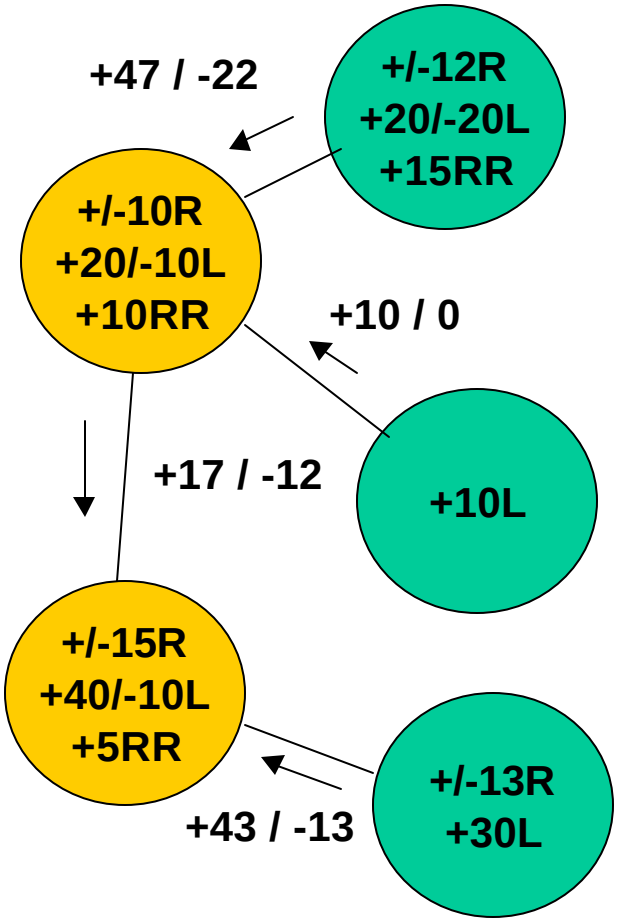


Assuming We Can “Turn the Crank” on Reserves . . .

- SCs (and the RTO) can calculate future zonal reserve requirements based on load forecasts and resource plans. SC’s can look to optimize their resource plans through minimizing the combined costs of energy and reserves.
- The RTO can use after-the-fact readings to determine the actual zonal requirements, and assign RTO costs for acquiring additional reserves back to the SC’s who provided less than they used.
- But what about transmission ???

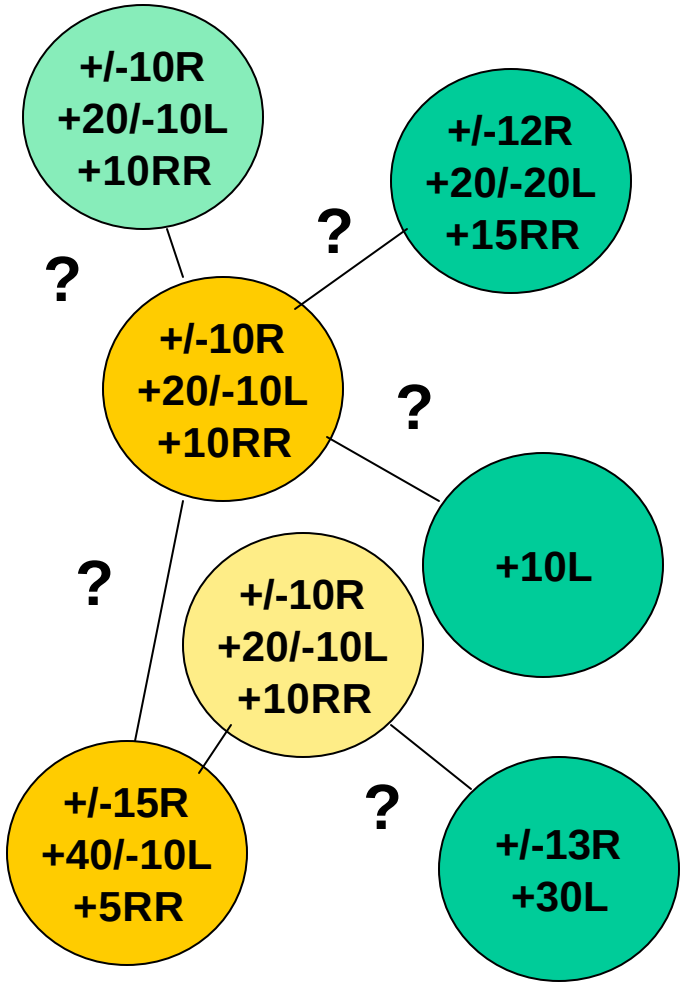
How Will Self-Tracking Work?

- The SC calculates the reserve requirements for the zones where it serves loads.
- The SC finds least-cost way to meet reserve requirements using outside sources and FTRs
- The SC acquires necessary FTRs and directly controls outside sources to maintain zonal balances.
- SC still susceptible to RTO charges if self-tracking is not done well.



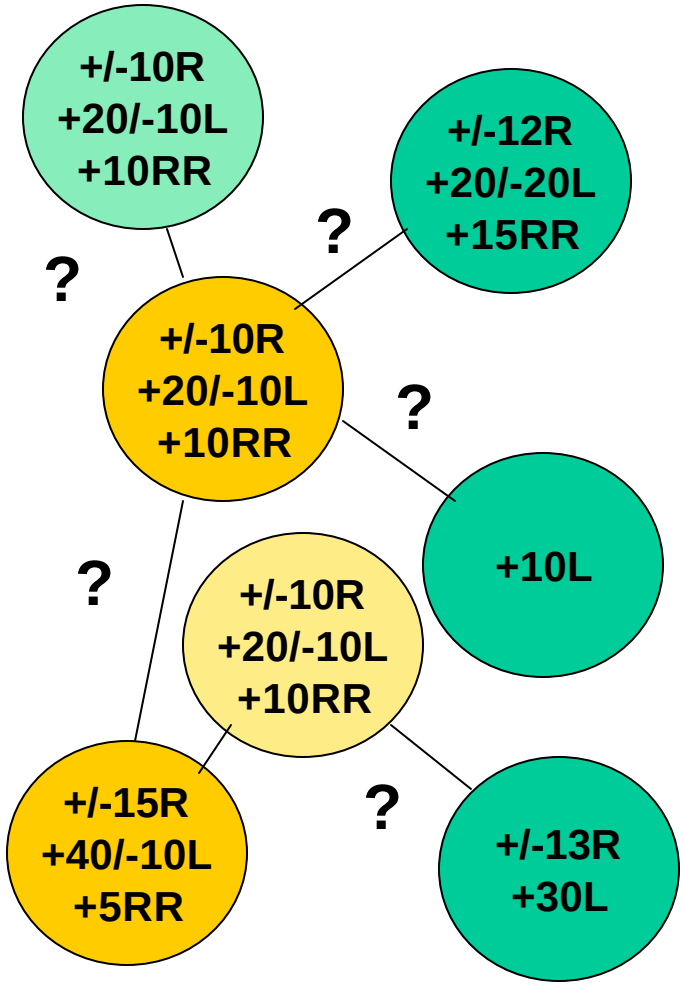
How Will Self-Provision Work?

- The SC calculates the reserve requirements for the zones where it serves loads.
- The SC offers up reserve sources to the RTO equal to its reserve requirement.
- The RTO is expected to combine these “self-provided” reserves with its own reserve purchases to meet the overall RTO needs (excepting those covered by self-tracking).
- SC still susceptible to RTO charges if actual reserve needs exceed predicted requirements.



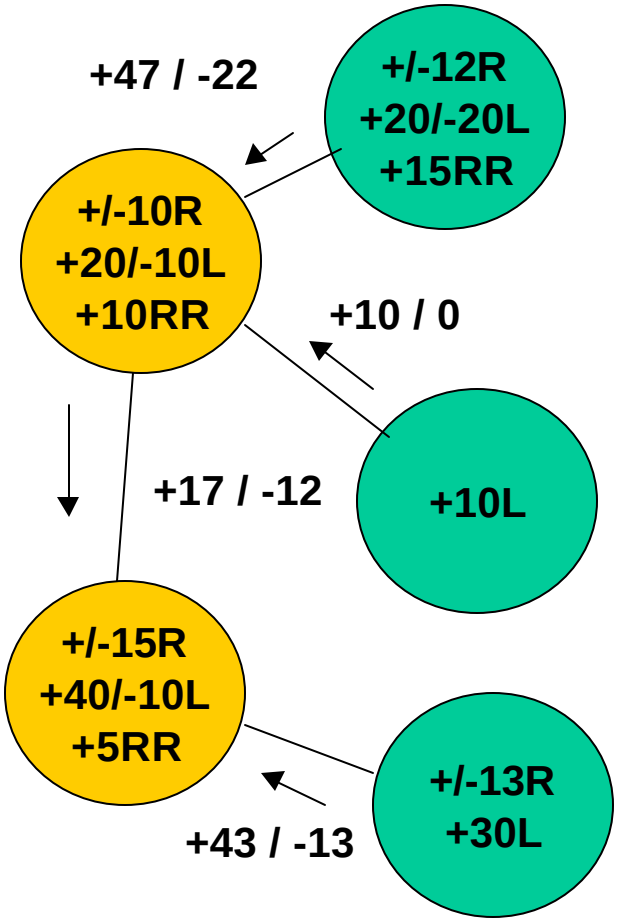
Questions Raised By Self-Provision

- Are “self-providing” SCs financially responsible for FTRs the RTO might need to acquire in order to utilize the offered reserves?
- Assuming the reserve requirements are often met using reserve sources other than its own, on what basis will balancing energy pricing for a “self-providing” SC be determined? (Appendix D says by zonal energy price for dispatched resources)



One Possibility For Self-Provision: Require Transmission From Sources to Zones

- Pros:
  - Provides technically defensible method for assigning transmission costs to SCs. No additional transmission purchased by RTO.
  - Opens possibility that RTO can more closely dispatch "self-provided" reserves to the SC's own reserve requirement, providing much better balancing energy price assurance.

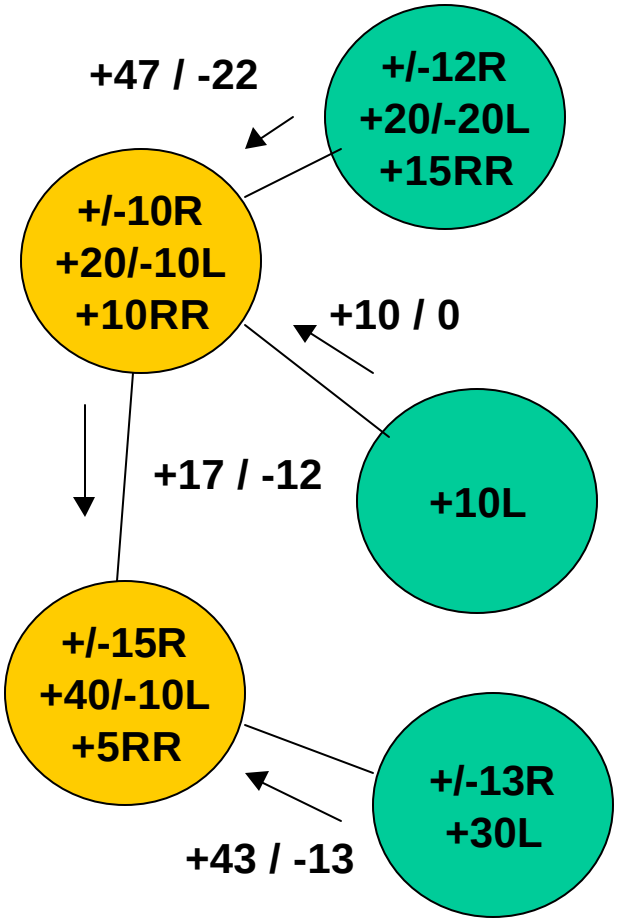


One Possibility For Self-Provision: Require Transmission From Sources to Zones

- Cons:
  - Tends to require SC's to purchase more FTRs than the minimum the RTO will normally need in aggregate.

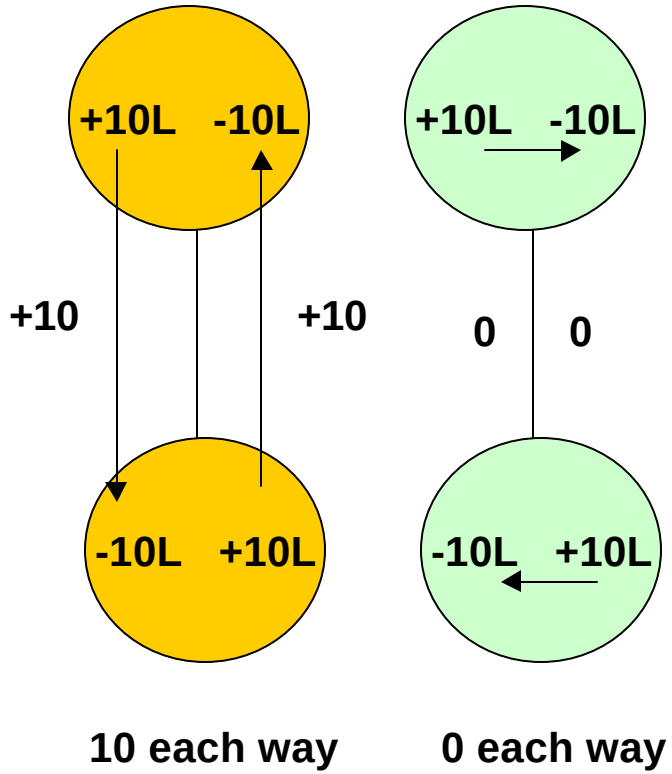
    SC's can reduce excess FTRs by trading rights and obligations amongst the zones.

    Excess FTRs will give the RTO an opportunity to choose among reserve sources based on energy cost.



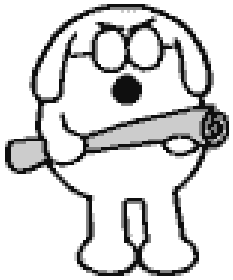
Excess FTR Example

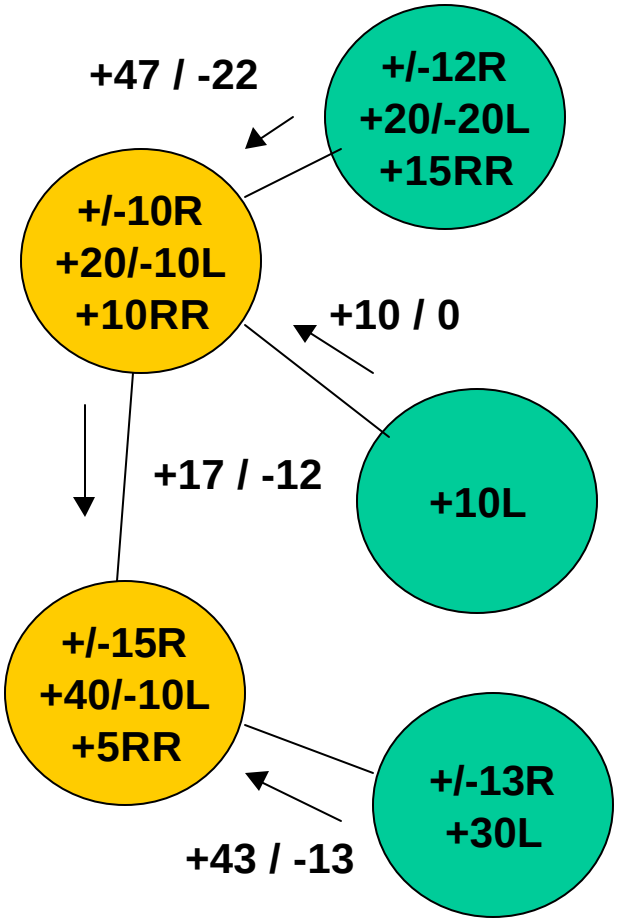
- SCs with identical needs in different zones decide to meet them with their own resources from other zones; each buys FTRs.
- SCs make arrangements to meet each others' needs using resources within the zones; each buys zero FTRs.



One Possibility For Self-Provision: Require Transmission From Sources to Zones

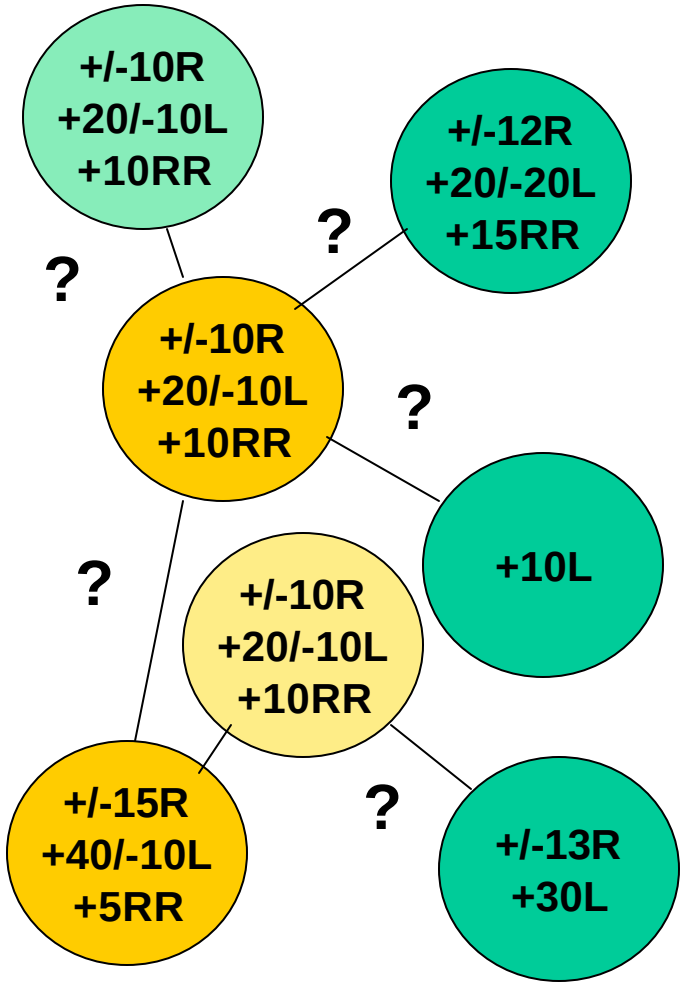
- Cons:
  - Tying the dispatch of reserve sources to the requirements of their "self-providers" may make AGC more complex and may limit the RTO's flexibility.





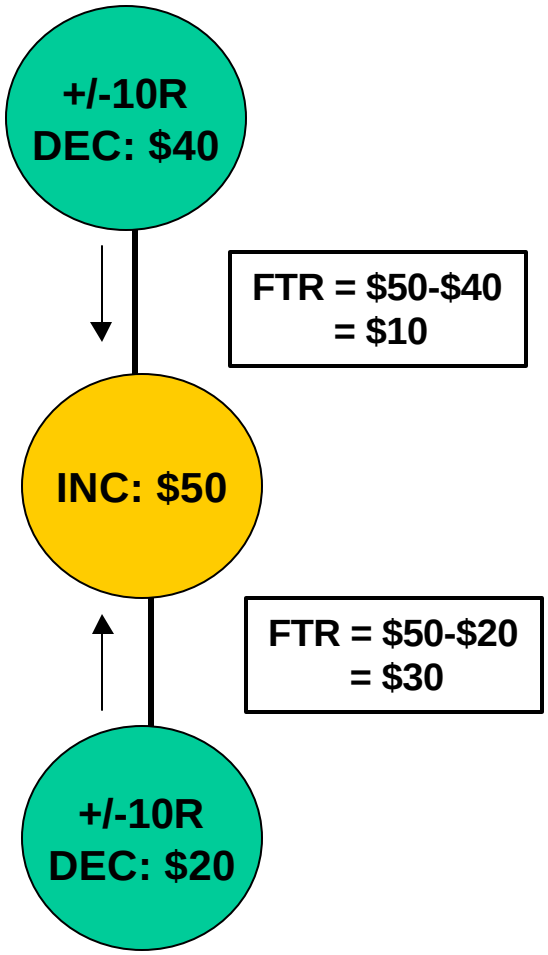
How Will RTO Acquisition Work?

- The RTO inventories zonal reserve requirements not already met by “self-tracking”, and the “self-provided” reserve resources.
- The RTO purchases additional reserve resources and FTRs needed to maintain all zonal balances.
- The RTO directly controls its purchased reserves and the “self-provided” reserves to maintain balances.
- The RTO is responsible for meeting NERC performance criteria.



How Will The RTO Acquire FTRs?

- One possibility: withhold some FTRs from the auction in anticipation of requirements for reserve delivery.
  - Reduces FTRs available to the market.
  - The value of FTRs not reflected in reserve selection.
- Second possibility: allow the RTO to "buy back" FTRs through the congestion management "inc/dec" process (i.e. give the RTO "financial rights")
  - More FTRs in the market.
  - Reserve selection reflects market value of FTRs.



Contingency Reserves Are Different

- In order to satisfy NERC DCS requirement, the RTO must be able to replace any generation loss due to a single contingency within 15 minutes using contingency reserves.
- This means that the RTO must be ready to deliver enough contingency reserve to offset the MSSC in any one of the zones.
- A method for apportioning each zone's MSSC as contingency reserve to the responsible SC's should be possible.
- Because the RTO is required to plan for only its MSSC loss (i.e. the largest zonal MSSC), <u>the zonal contingency reserve requirements are NOT additive!</u>

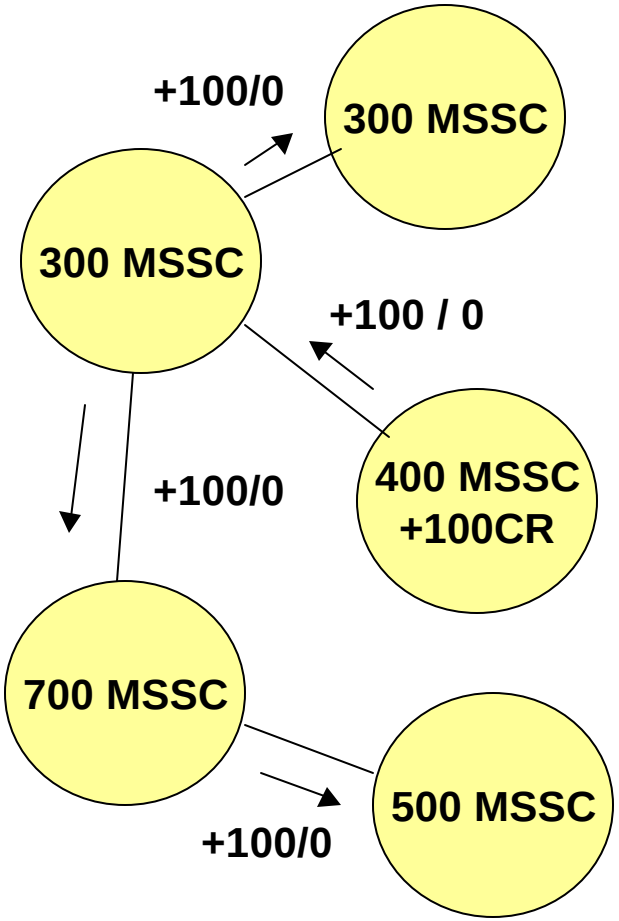
ZONE 2

GEN CAPACITY:	900
GENERATION:	700
MSSC:	400
LOAD:	1900
NET SCHEDULE:	-1200
INTERNAL RESERVES:	200
RESERVE MARGIN:	0

Contingency Reserve For Many MSSC's

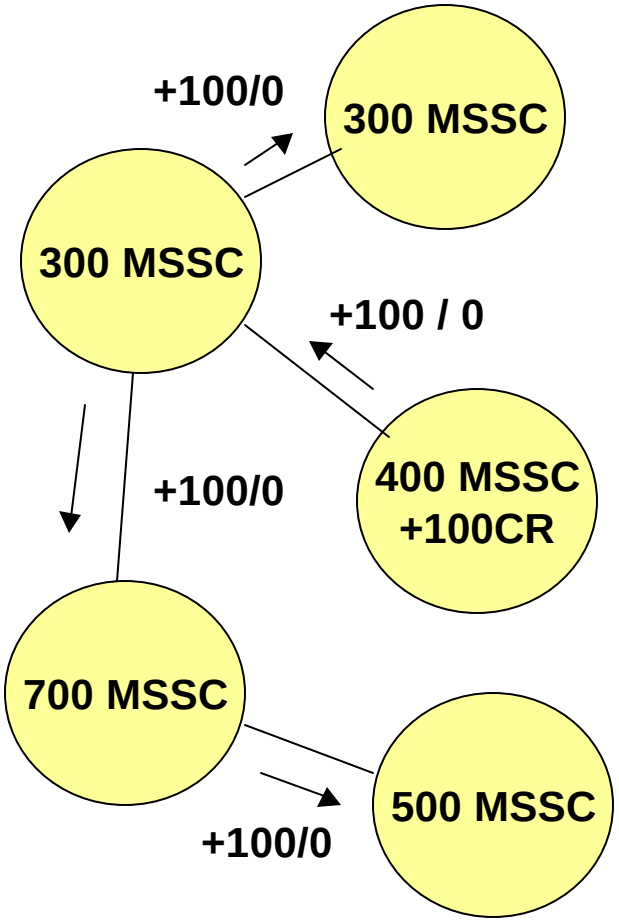
- Because we plan for only one outage at a time (i.e. no multiple contingencies), the same contingency reserve is assumed to be available to meet every generation loss.

- Contingency reserve can be used to offset obligations in other zones provided transmission is available.



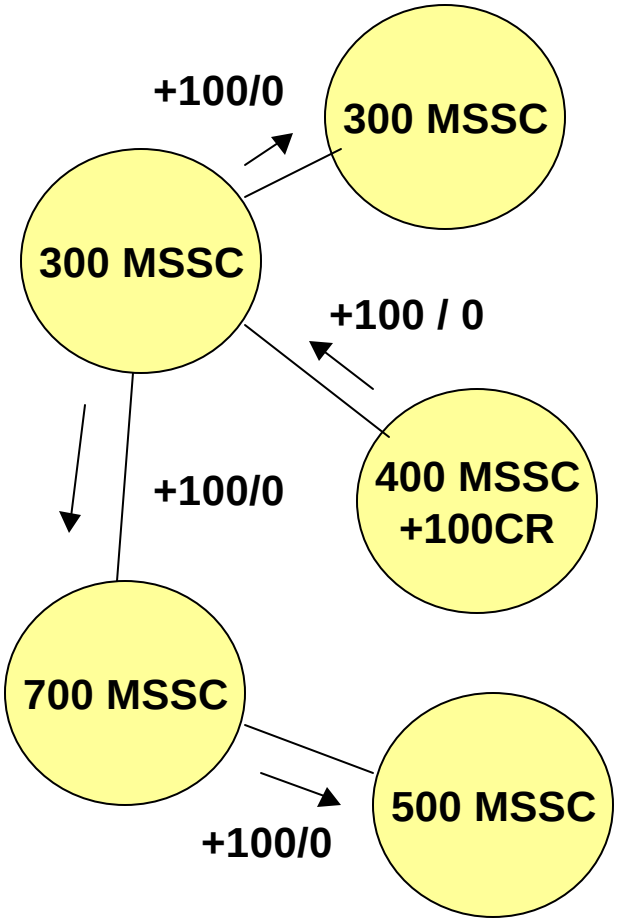
Self Providing Contingency Reserve

- The SC calculates its contingency reserve requirements for each zone.
- The SC offers up contingency reserve sources to the RTO to meet its requirement.
- The RTO combines these “self-provided” contingency reserves with its own contingency reserve purchases to satisfy NERC DCS for the RTO.
- Who is responsible for transmission, especially when FTRs determines which MSSC’s it can be applied against?

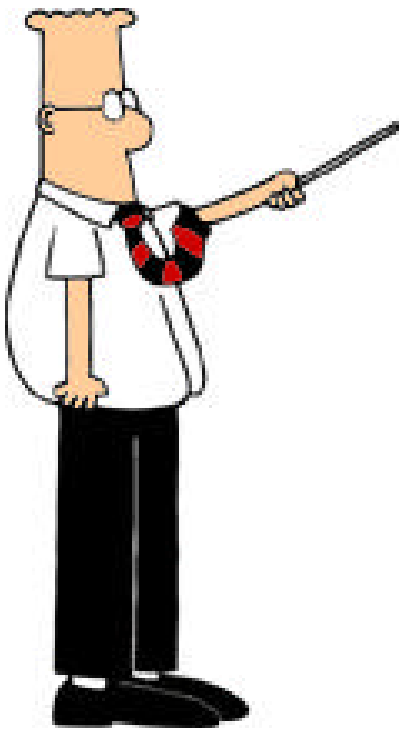


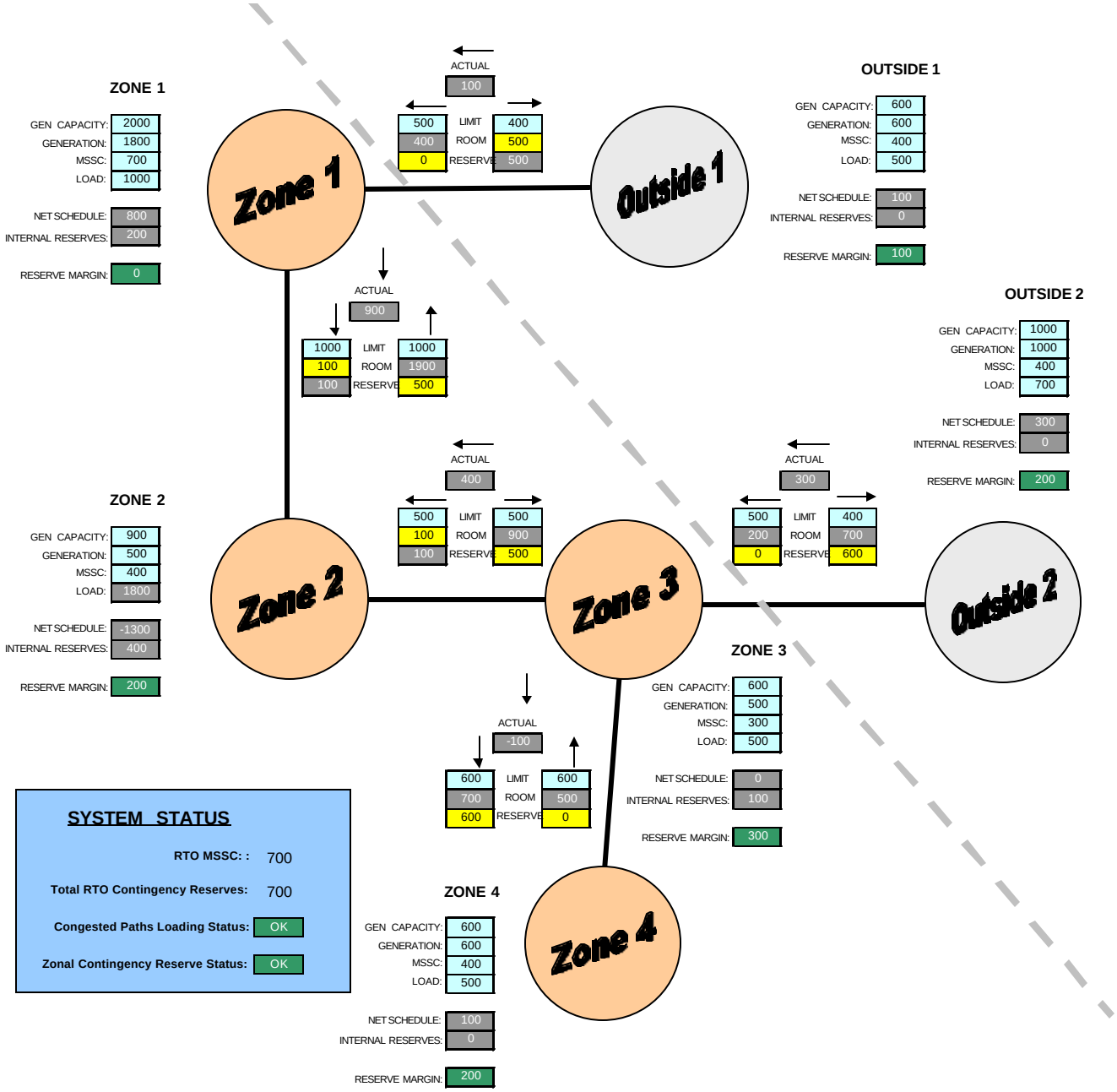
Require Transmission From Sources to Zones?

- Provides a technical basis for assigning transmission costs to the SC's, and the RTO does not need to purchase additional transmission.
- Puts SC in the position to weigh choices between providing more reserves or more transmission.
- Tendency toward excess transmission purchases can be reduced by SC's trading rights and obligations.
- Excess transmission allows the RTO some flexibility to dispatch contingency reserves based on energy costs.



Summary



- The adequacy of reserve arrangements will depend on both amounts and locations.
- SC reserve responsibility can be approached on a zone-by-zone basis. Contingency reserves aside, all other zonal requirements can be added together to determine an SC's overall (minimum) reserve responsibility.
- FTRs are required to import reserves from other zones.
- "Self providers" may need to take responsibility for the cost of FTRs to move their reserves from their source to the zones that require them.
- The RTO needs a means for acquiring the FTRs it needs to use purchased reserves; one way is to grant the RTO "financial rights".
- Excess transmission should be minimized, but does increase flexibility that the RTO can use to dispatch reserves with lower energy costs first.

Embedded Spreadsheet