



Grid West

Redispatch Alternatives

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The Structure Group
2000 W. Sam Houston Pkwy. South
Suite 1600
Houston, TX 77042

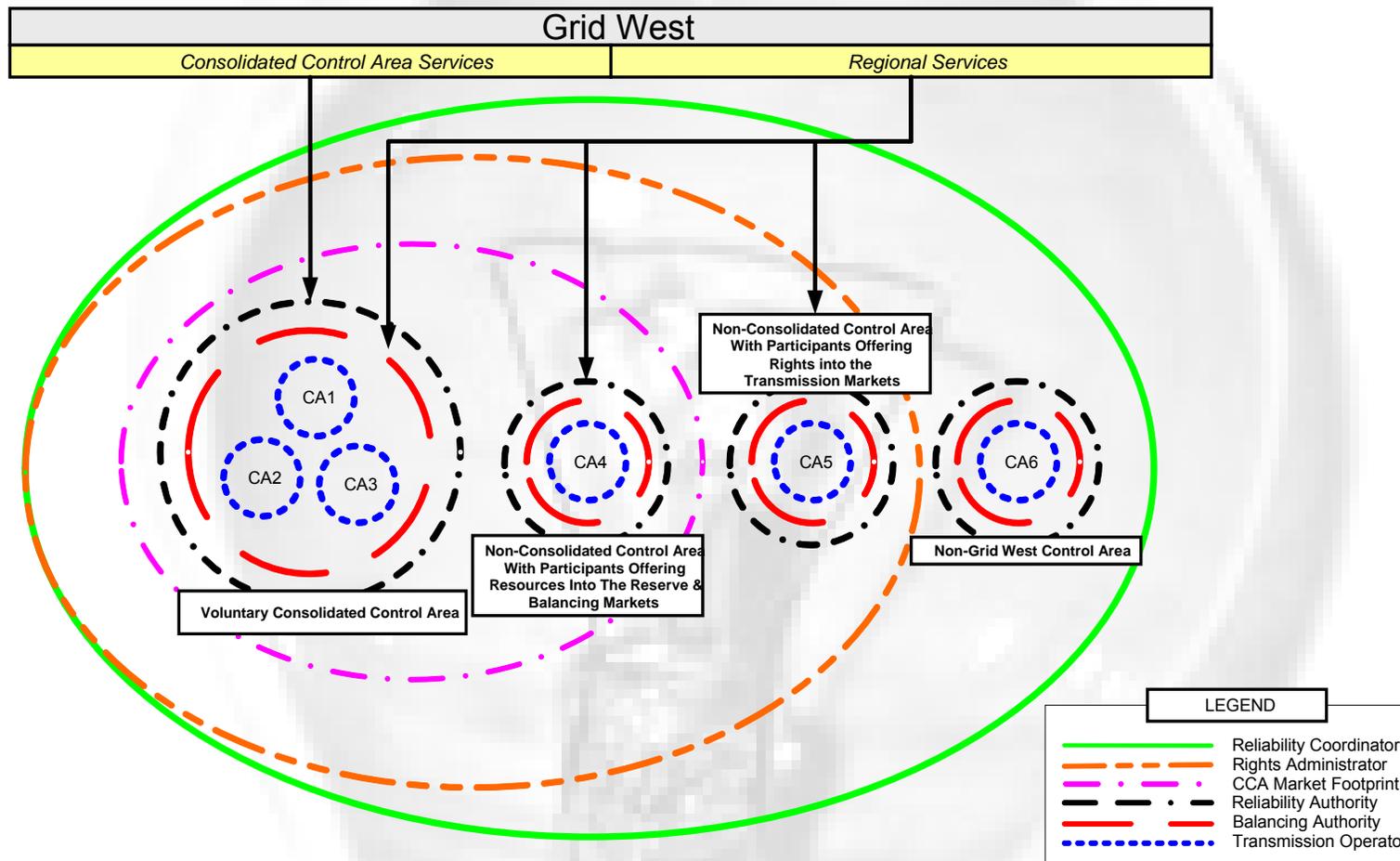


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The RRG Services Model

The following RRG Service Model defines the Grid West services that are to be provided to the Consolidated Control Area and the non-Consolidated Control Areas.



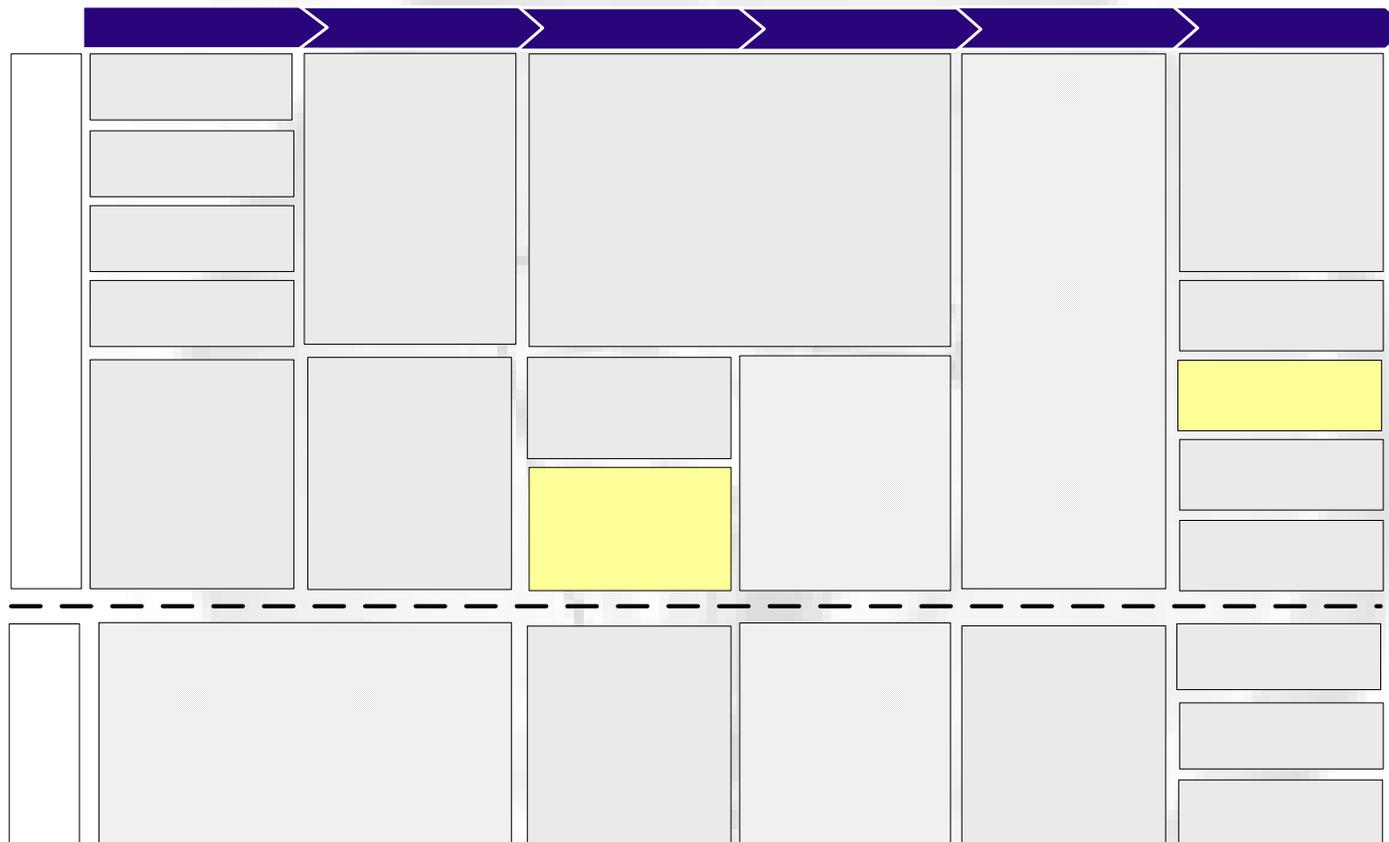
Consolidated Control Area Assumptions

However, the Regional Proposal provides little detail regarding the Consolidated Control Area. So what can we assume at this point?

- Control areas may decide to voluntarily consolidate (we assume that at least two will do so)
- Grid West will provide both regional and Consolidated Control Area (CCA) service
- Certain services (e.g. Reserves Market, Real-Time Energy Services, etc.) in the Beginning State will be provided to the Consolidated Control Area only
- Where possible, resources located within non-consolidated control areas can voluntarily offer to sell into the markets that were formed for the CCA
- Grid West will act as both the Reliability Authority and Balancing Authority for the CCA within the overall perspective of the PNSC, whose function may be enhanced in the future
- Control Areas that choose not to consolidate will serve as the Balancing Authority of their areas
- The division of duties for the Reliability Authority role between the PNSC, Grid West, and the control areas is yet to be resolved



Given the services that are to be provided region wide and on a consolidated control area basis, we developed a high-level functional framework for Grid West:



The Regional Proposal contains the following design boundaries....

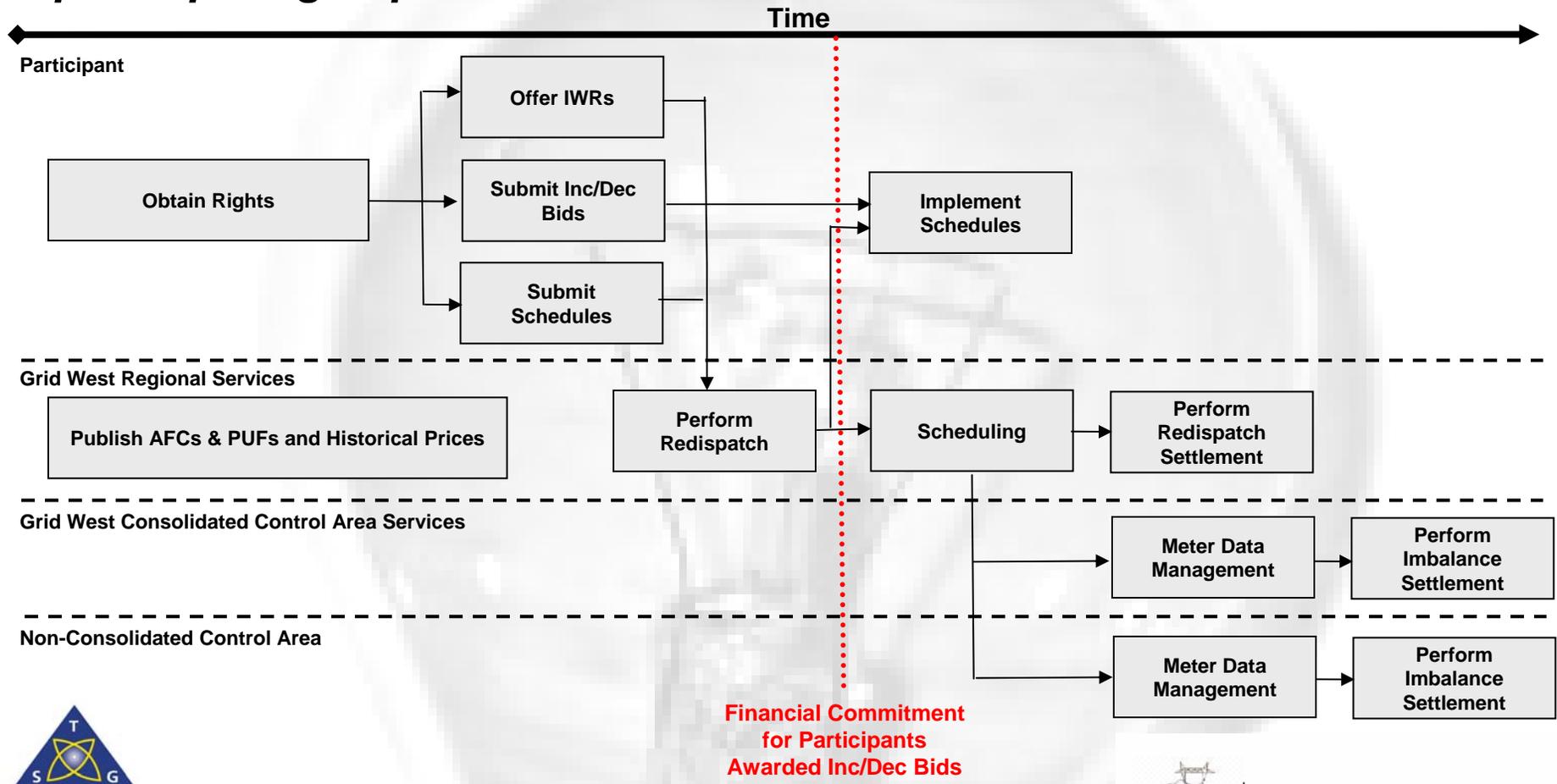
- Participants submit balanced schedules
- Control area consolidation is voluntary
- Existing business practice flexibility must be maintained unless better alternatives can be presented
- Existing Rights can be voluntarily traded through the Regional transmission reconfiguration services

The following are objectives of the Redispatch Service:

- To make best regional use of existing rights, when offered
- To make best use of available flowgate capacity
- To reduce cost of energy schedules across Grid West footprint whenever possible
 - e.g., utilize lower cost generation to serve load whenever offered
- To minimize involuntary curtailment of energy schedules and provide financial incentives for voluntary curtailments

Redispatch Process

In the high-level Redispatch process that we describe below, a key element of the design is a financial commitment by those participating to perform as scheduled.



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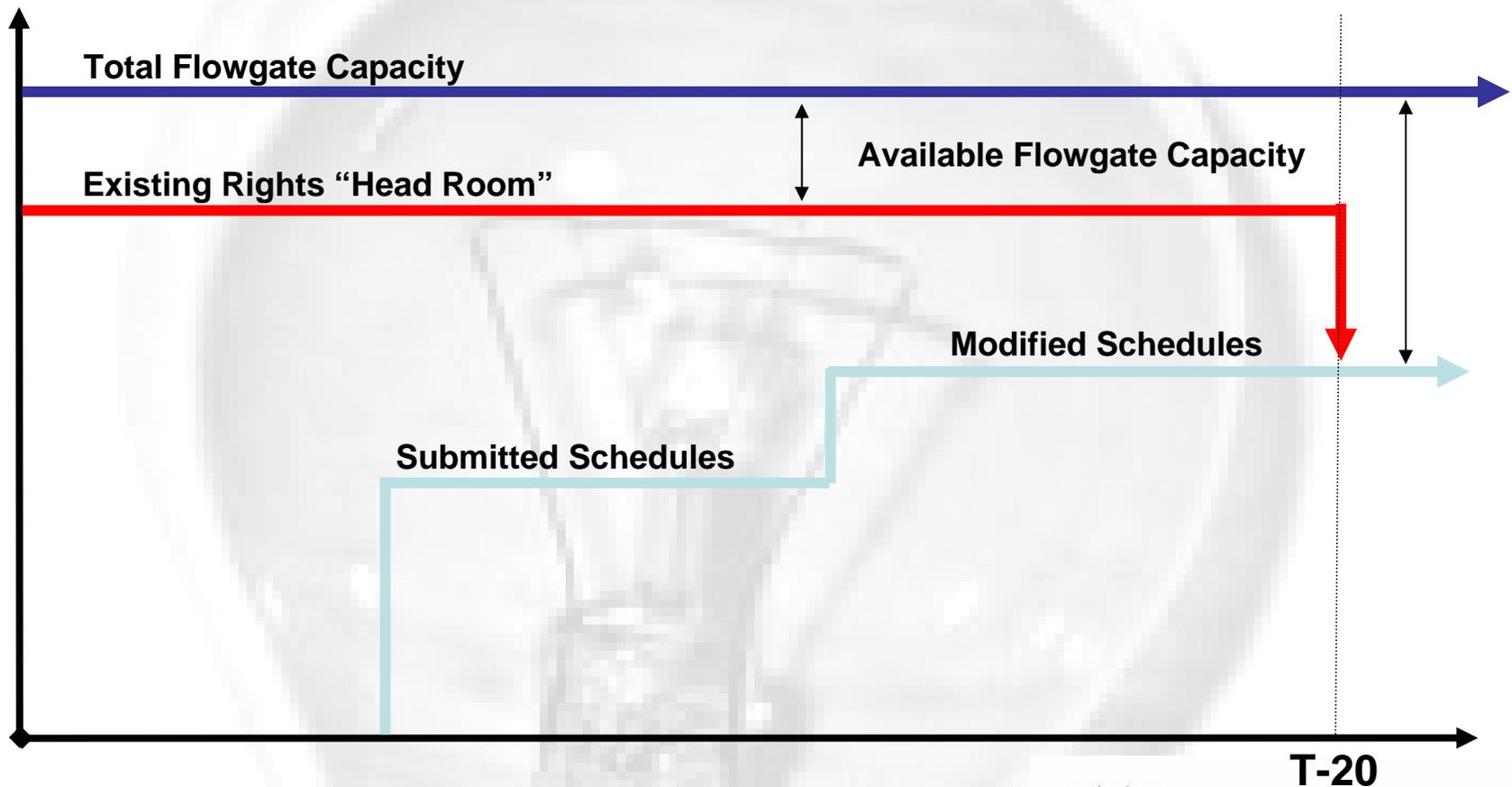
Redispatch Challenges & Considerations

The TSLG looked at the feasibility of a Day-Ahead Redispatch service given the identified design boundaries:

- The RRG Proposal envisioned a region-wide day-ahead Redispatch Service.
- Some participants currently have the right to adjust their schedules up to 20 minutes prior to the Operating Hour without financial consequence.
- The value of a Day-Ahead redispatch market is greatly reduced if it is not accompanied by a financial and/or a physical commitment.
- The desire to maintain scheduling flexibility and the need for a day-ahead financial commitment area competing interests that led to the current sequencing approach.
- Resources are dispatched (and redispatched) as a part of the Real-Time energy market within the Consolidated Control Area

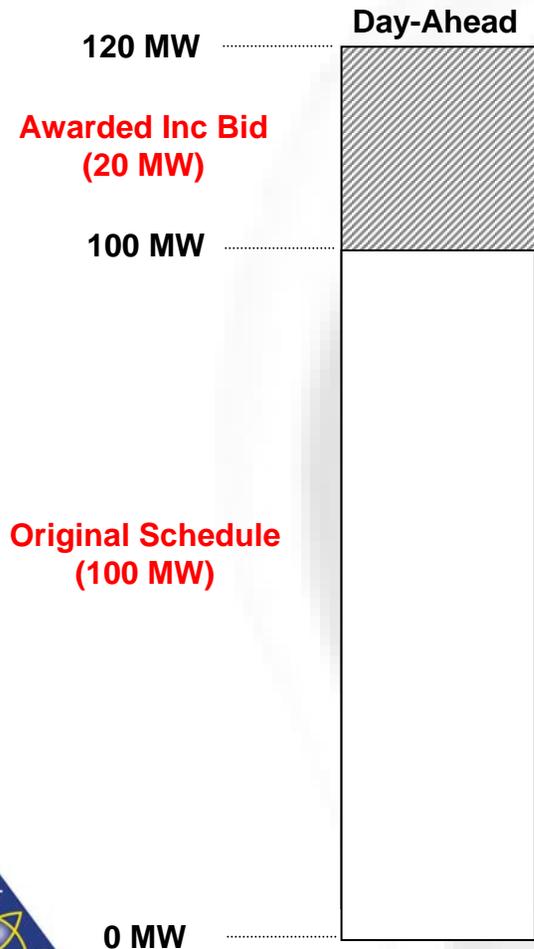
Redispatch Challenges & Considerations

Currently existing rights holders are able to reserve AFC until 20 minutes prior to the Operating Hour. This reduces the amount of AFC available to other participants...

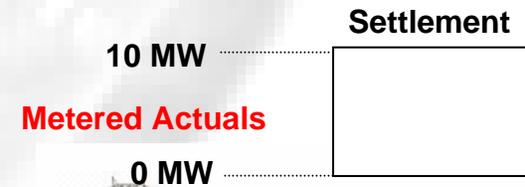
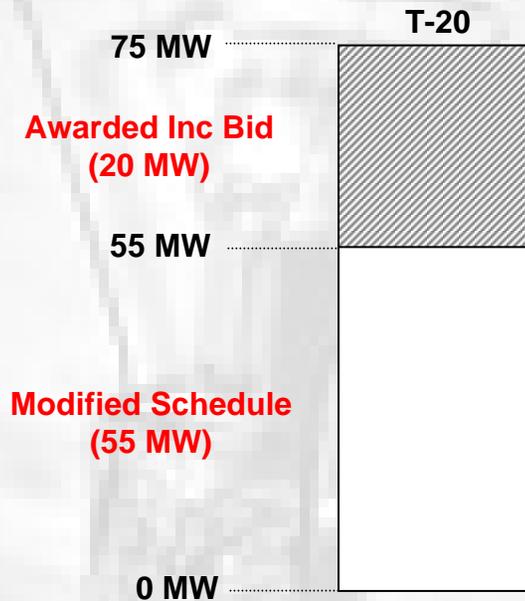


Redispatch Challenges & Considerations

This scheduling flexibility also allows many participants to modify their schedules without financial consequences...



If Participant A is awarded a 20 MW Inc Bid, what is it financially committed to? The awarded inc bid, or BOTH the awarded inc bid and the schedule?



The Redispatch Solution must accommodate the following participant scenarios:

1. Participants with existing rights that have not submitted schedules and are willing to sell them to other participants
2. Participants with existing rights that have submitted schedules but are willing to surrender them for cheaper energy alternatives
3. Participants without adequate rights who are willing to pay for rights to schedule energy on the Grid West system
4. Participants with available resources that are willing to offer them into available markets
5. Participants with existing rights that do not to participate in the market

Simultaneous Reconfiguration & Redispatch Our Original Approach

We originally developed an approach that combined the Reconfiguration and Redispatch Services. The approach...

- Recognized the fact that participants must have transmission rights to schedule a transaction
 - Allowed those who only wanted to buy/sell IWRs to also participate
 - Allowed resources to participate by offering inc/dec
- Allowed for voluntary participation in regional Redispatch Service
- Made most efficient use of the transmission system by simultaneously auctioning transmission rights and redispatching resources

***This approach was presented to the TSLG
using the following example...***

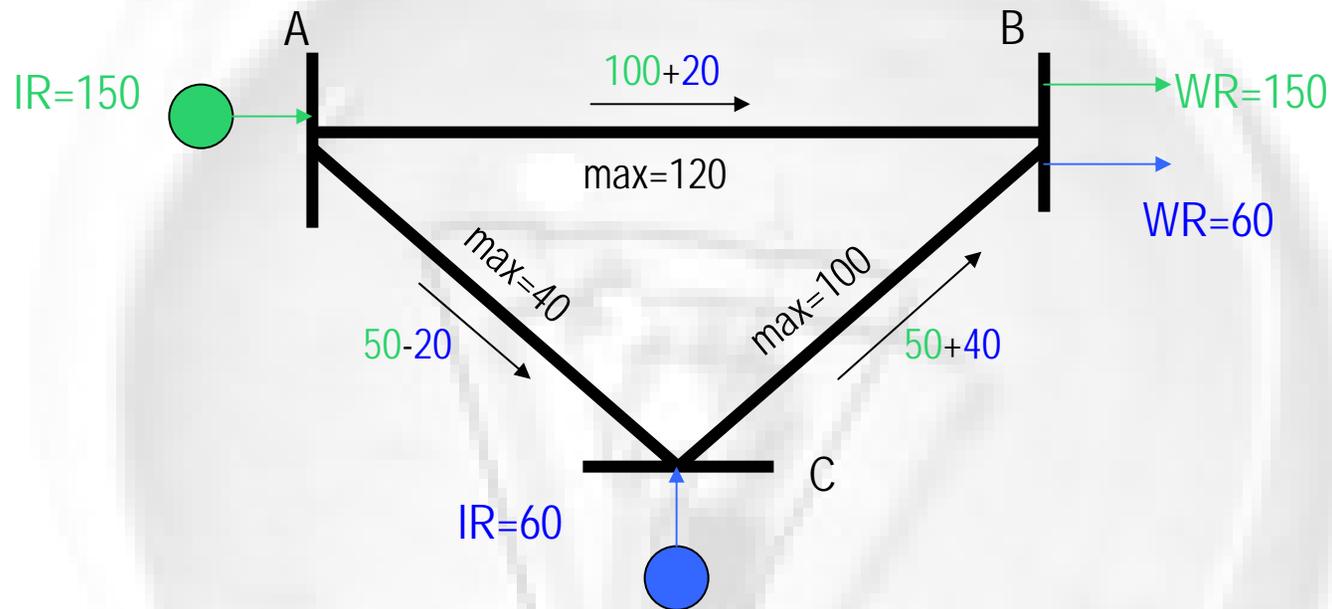
Simultaneous Reconfiguration & Redispatch Our Original Approach

The following three-bus example include the following participants and transmission paths...

- Participants
 - Green Participant – Has an existing IWR of 150. Willing to participate in the RDS market.
 - Orange Participant – Does not have existing rights. Would like to schedule energy from A to B. Willing to pay for rights to do so.
 - Red Participant – Available generation willing to participate in the RDS market.
 - Blue Participant – Has an existing IWR of 60. Willing to participate in the RDS market.
- Paths
 - Path A-B with a thermal limit of 120MW
 - Path A-C with a thermal limit of 40MW
 - Path C-B with a thermal limit of 100MW

Simultaneous Reconfiguration & Redispatch Our Original Approach

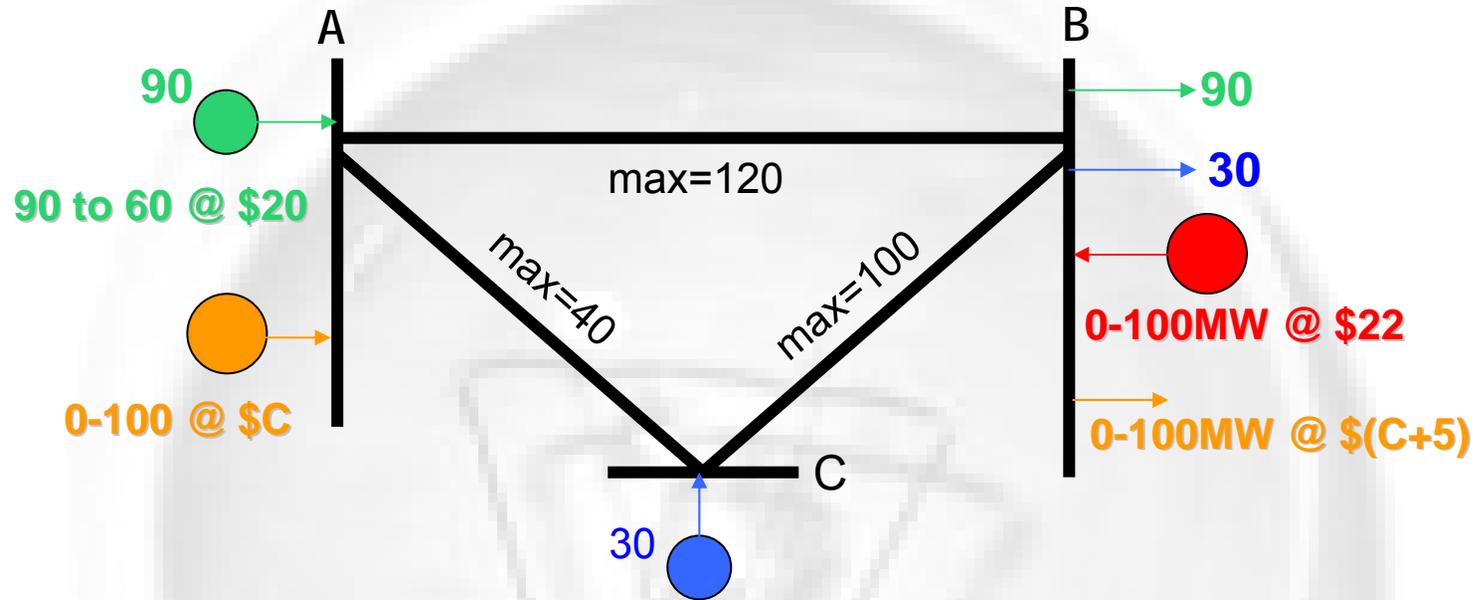
In the following RDS example, if the Green and Blue participants use their rights to the full extent, the following flows will result:



However, additional participants submitting bids/offers can produce a more optimal result...

Simultaneous Reconfiguration & Redispatch Our Original Approach

The following is an example of RDS:

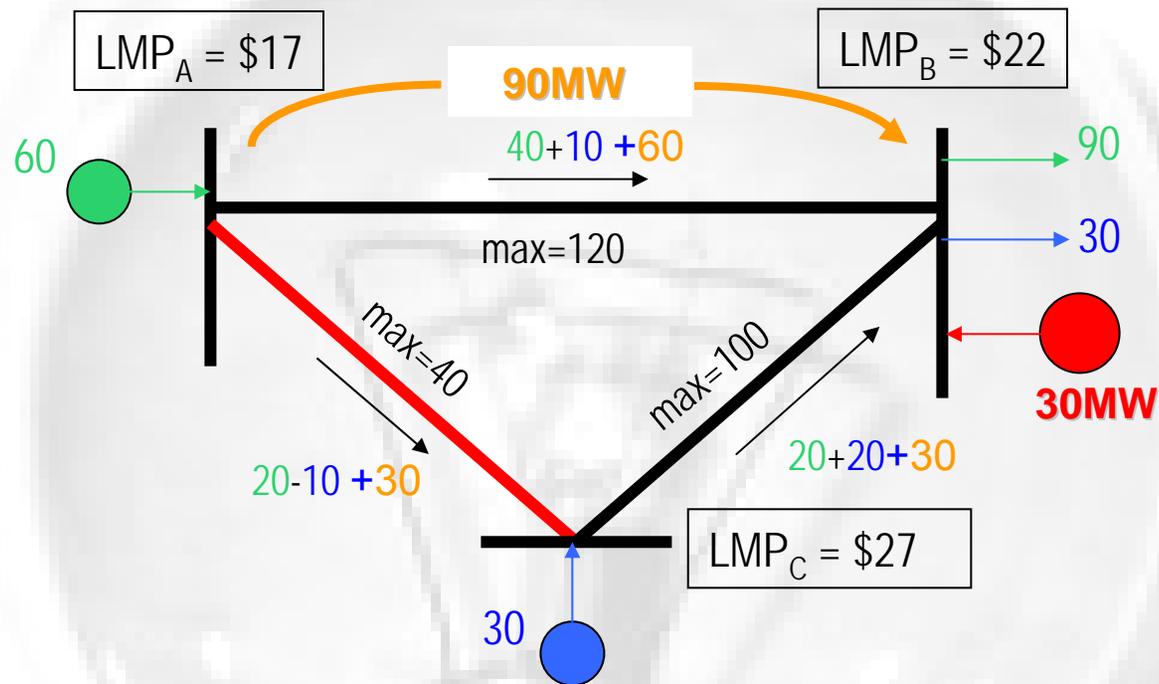


- Green, who has a 150 MW IWR, submits a 90 MW schedule from A to B and offers 60MW from A to B as a price taker. Green also submit a dec bid to buy back up to 30 MW of its generation for \$20/MW.
- Blue, who has a 60 MW IWR, submits a 30 MW schedule from C to B and offers 30 MW IWR from C to B – Blue asks for \$20/MW for its IWR from C to B.
- Orange, a Grid West Participant who does not own rights, offers up to 100 MW of generation at Bus A and bids to buy up to 100 MW at Bus B with price difference of \$5
- Red, a Grid West participant, offers to sell up to 100 MW generation at B at \$22.



Simultaneous Reconfiguration & Redispatch Our Original Approach

RDS solution:



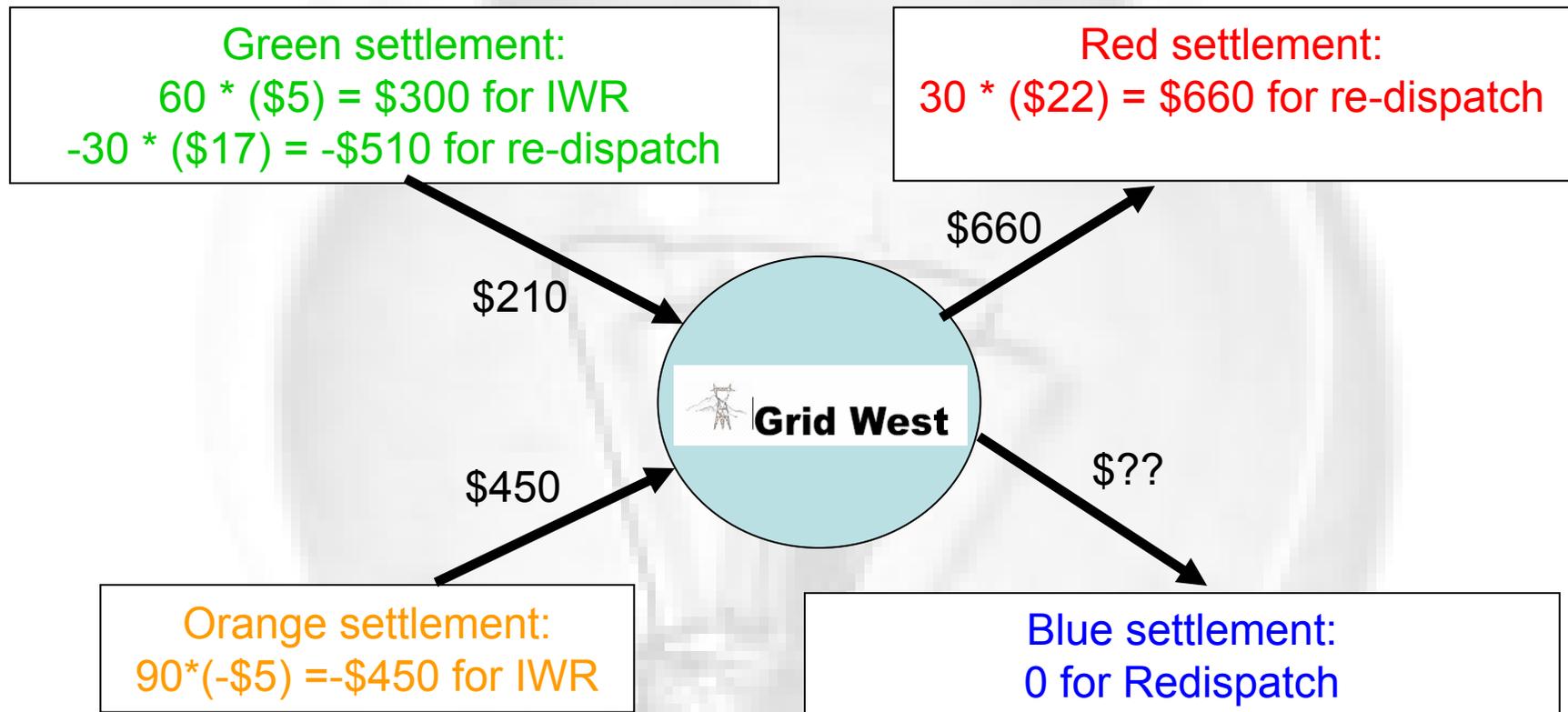
Simultaneous Reconfiguration & Redispatch Outcomes

The previous example demonstrates that a simultaneous reconfiguration and redispatch could produce the following benefits:

- The Green Participant, with existing rights, sold its excess rights for a given price
- The Orange Participant, without existing rights, obtained access to transmission capacity, at a market based price
- The Red Participant, without existing rights, sold less expensive energy to Grid West

Simultaneous Reconfiguration & Redispatch Outcomes

The allocation of RDS revenues to released rights are proportional to the directional rights



Simultaneous Reconfiguration & Redispatch Known Issues

In reviewing the Simultaneous Reconfiguration & Redispatch Option the following issues were uncovered:

- **Unselected Offers** – If a participant's bid is not selected as a part of the simultaneous reconfiguration and redispatch, will it still retain its existing rights or do they forfeit them?
- **Schedule Flexibility** - What is the value of a day-ahead simultaneous reconfiguration and redispatch, if participants can modify their schedules up to 20 minutes prior to the Operating Hour? Also, what are the gaming possibilities?

What can be done to address these concerns?

Simultaneous Reconfiguration & Redispatch Known Issues

To address the known issues, The Structure Group developed two modifications to the original approach

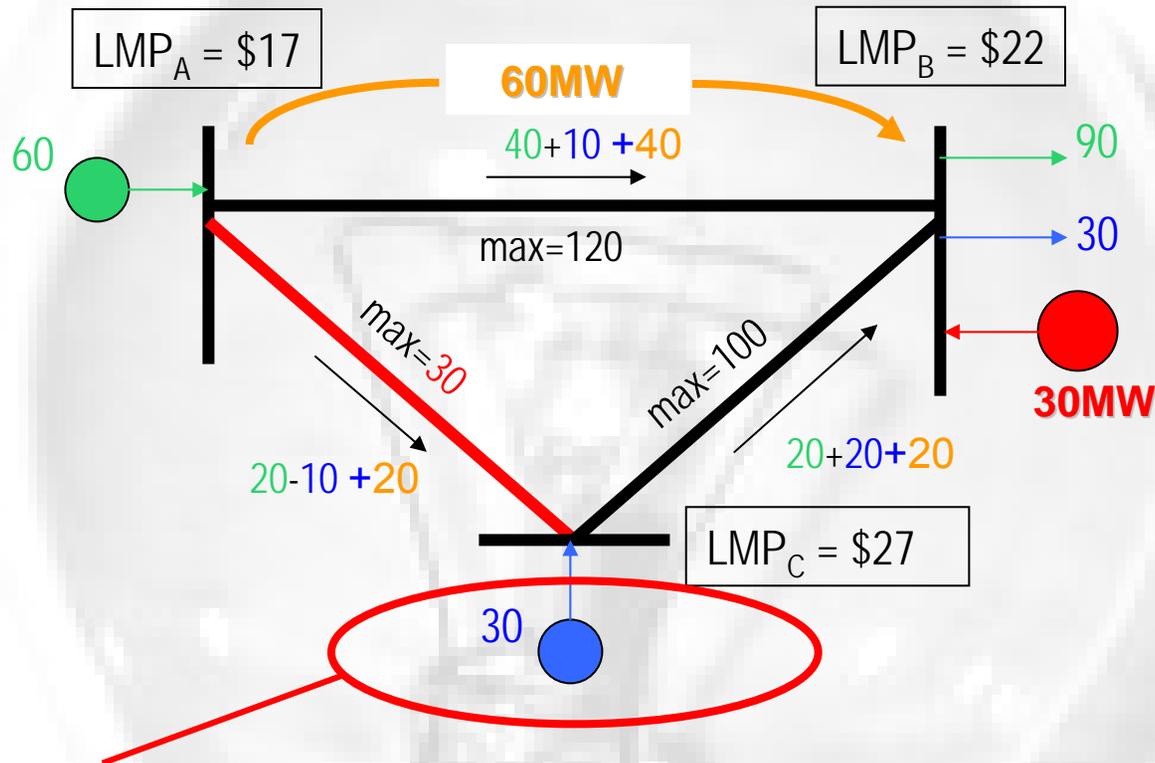
- **The “X Factor”** – By using a “X Factor”, Grid West can maintain enough “headroom” on the system to support changes to schedules.
- **Three Settlements** – By adding an additional settlement, participants are able to gain some of the value associated with a Day-Ahead RDS while maintaining existing scheduling flexibility.

The following examples present each of these modifications in additional detail...

Simultaneous Reconfiguration & Redispatch Addressing the “Hold Harmless” Issue

By using a “X Factor” the A-C path rating from RDS is reduced to 30 MW

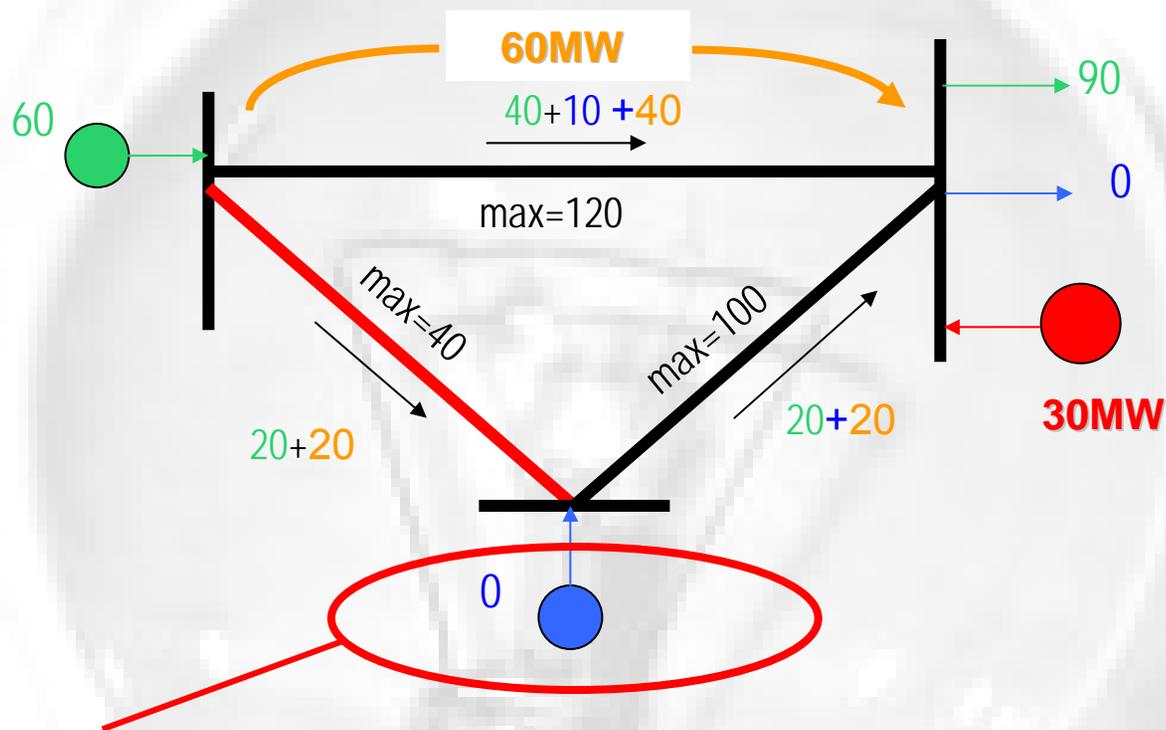
DA final
schedules



This approach allows Blue to be “held harmless”
as it can vary from 0 to 60 MW

Simultaneous Reconfiguration & Redispatch Addressing the “Hold Harmless” Issue

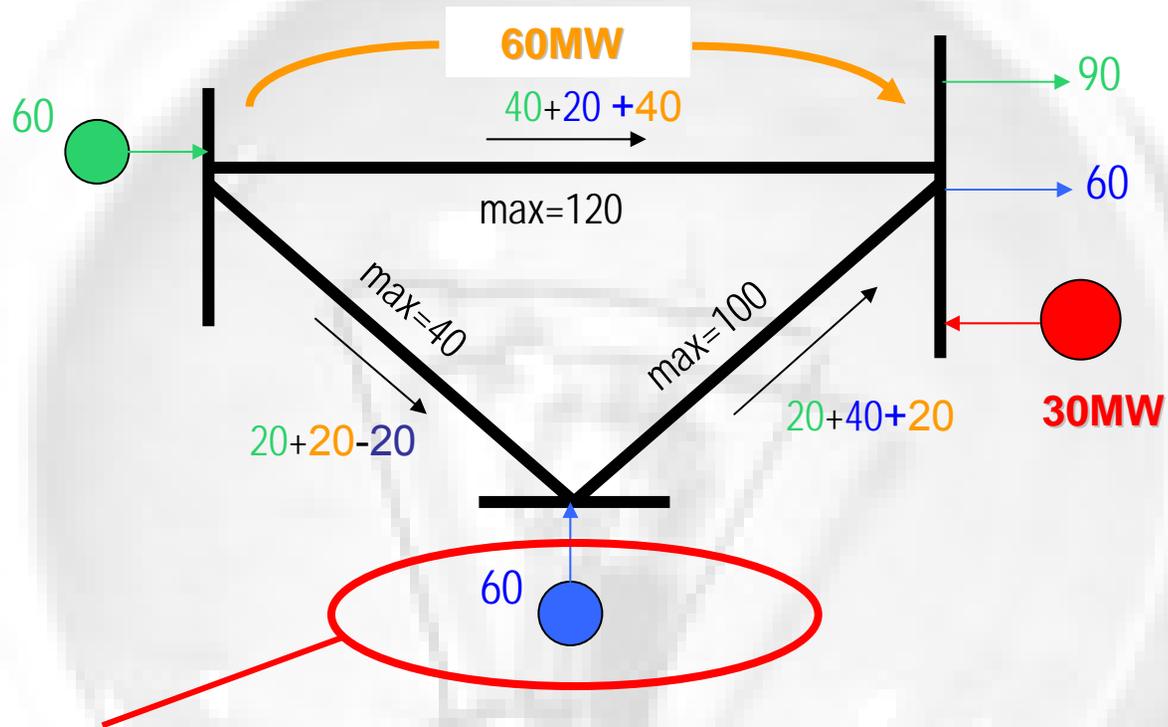
If Blue is withdrawn T-20 before operating hour,



This allows Blue to be “held harmless”

Simultaneous Reconfiguration & Redispatch Addressing the “Hold Harmless” Issue

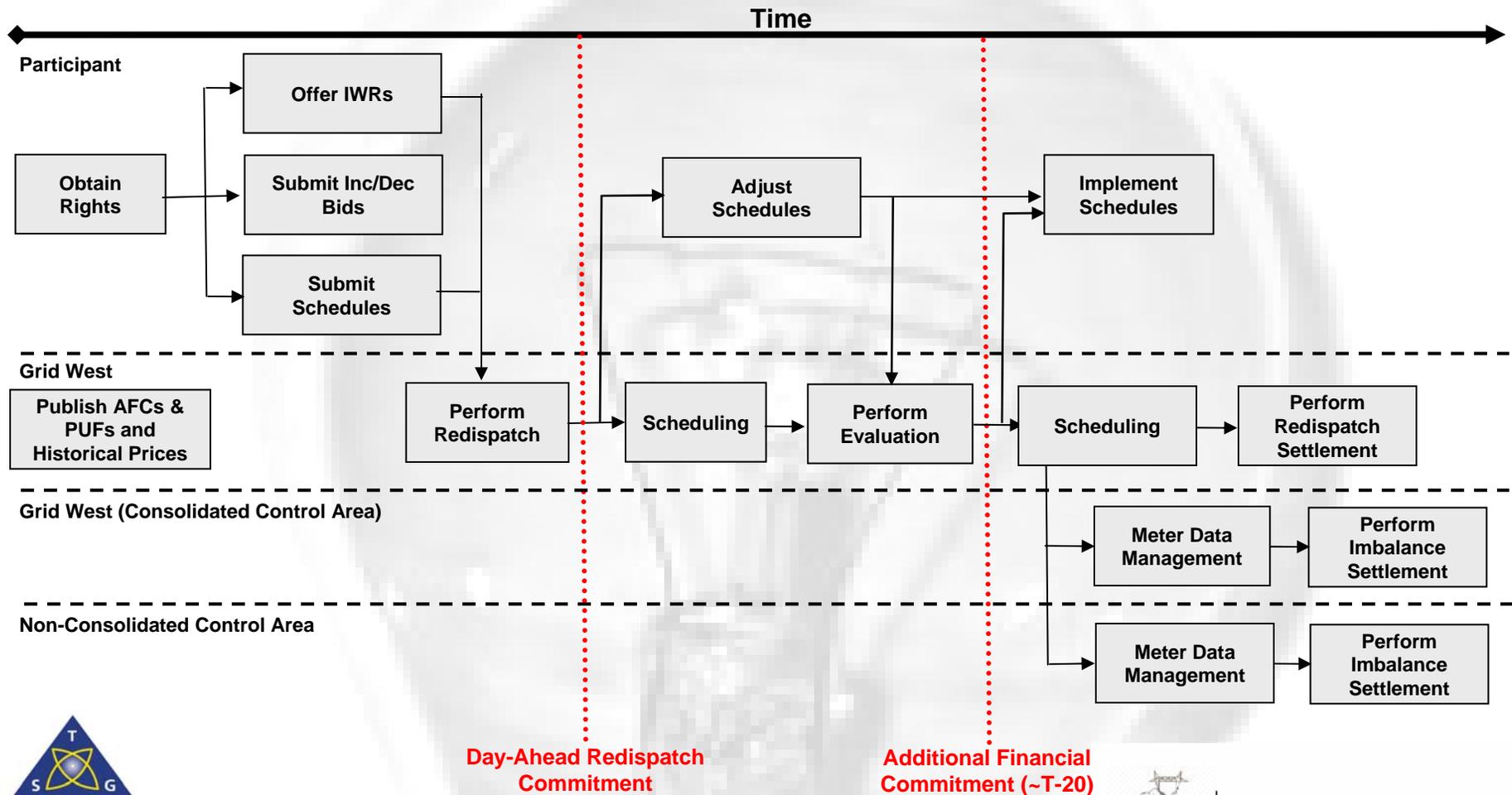
If Blue goes to full capacity T-20 before operating hour,



This allows Blue to be “held harmless”

Simultaneous Reconfiguration & Redispatch Addressing the “Schedule Modification” Issue

An additional financial commitment point could be added at T-20 to allow schedule modification...



Simultaneous Reconfiguration & Redispatch Addressing the “Scheduling Modification” Issue

How do we maintain the benefit derived from Redispatch and still accommodate existing scheduling flexibility ?

- Redispatch schedules are financially binding
- Any adjustments after Redispatch process will not impact the RDS commitment, and are accounted for separately, possibly between the CA and the resource owners
- This can be achieved by utilizing a “three-settlement” approach:
 - Settlement 1: Based upon Day-ahead RDS final schedules
 - Settlement 2: Based upon deviations between DA RDS and Modifications until T-20
 - Settlement 3: Deviation from the last accepted schedule

Simultaneous Reconfiguration & Redispatch Addressing the “Schedule Modification” Issue

“Three-settlement” Example:

Time	Transmission User 1	Transmission User 2	Grid West	Control Area
DA	Gen=100 MW (Sold to RDS pool at \$20)	Load=100 MW (bought from RDS pool at \$20)	Completed final RDS schedules	
T-Z		Anticipate load increase of 20 MW and makes bilateral deal with Gen2 at \$22		
T-20		Request schedule change Load=120 MW, Gen2=20 MW		Evaluate and grant changes
Real-time (assume price=\$25)	Gen=101 MW	Load=124 MW Gen2=23 MW		
First Settlement	-100*20=-\$2000 from GW	100*20=\$2000 to GW	\$2000 due from 2 \$2000 due to 1	
Second Settlement	0	20*22=\$440 to Gen2	NA	
Third Settlement	-1*25=-\$25 from CA/TO	(4-3)*25=\$25 to CA/TO	NA	25 due to 1 25 due from 2

Simultaneous Reconfiguration & Redispatch The Pros & Cons

In light of the established design boundaries, our original approach has the following Pros & Cons:

Pros	Cons
<ul style="list-style-type: none">• Makes most efficient use of the transmission system by simultaneously auctioning transmission rights and redispatching resources• Allows for voluntary Regional Service• No need to have a separate scheduling submission after DA redispatch is completed• Allows for market based schedule curtailment process so far as market signals exist• Can be run in concert with checkout process – RDS should run late in the day	<ul style="list-style-type: none">• Using a “X Factor” results in less available flowgate capacity in the Day-Ahead• “X Factor” estimation and forecast of system conditions may not be accurate/consistent enough and may result in scheduling infeasibility at 20 minutes to dispatch<ul style="list-style-type: none">• This can be overcome by Grid West addressing economic impacts of schedule infeasibility - perhaps in the same fashion as curtailment in adjustment period are handled today (see next slide)

• Note that the problems associated with RDS will be there regardless of the form of the RDS and its timing so far as it runs before T-20.

Redispatch Evaluating Other Options

Based upon TSLG feedback, we developed some additional options for Redispatch Service:

Option	Description	Short Name
A	Region-wide Day-Ahead Simultaneous Reconfiguration & Redispatch (Our Original Approach)	• DA RDS
B	Region-wide Day-Ahead Simultaneous Reconfiguration & Redispatch, followed by a “T-Z” Redispatch (Option A with an additional Redispatch)	• DA RDS + “T-Z” RDS
C	Region-wide Day-Ahead Reconfiguration (no Redispatch in Day-Ahead), followed by a “T-Z” Redispatch	• DA RCS + “T-Z” RDS
D	Region-wide Reconfiguration in the Day-Ahead, followed by a Consolidated Control Area Real-Time Balancing Redispatch (Not a Region-wide Redispatch)	• DA RCS + RT CCA RDS

Redispatch Options
Option A: Day-Ahead Redispatch (The Original Proposal)

As discussed previously

Redispatch Options

Option B: Day-Ahead and “T-Z” Redispatch

Another option is to perform continue to perform a simultaneous RCS/RDS in the Day-Ahead (as originally proposed) and the perform another energy only RDS at “T-Z”

- Perform a Simultaneous Rights Auction and Redispatch in Day-Ahead
- Perform an additional “T-Z” Redispatch X minutes before the Operating Hour
- Both Day-Ahead and “T-Z” schedules are financial commitments by participants
- Day-Ahead incremental schedules are settled using Day-Ahead prices
- “T-Z” incremental schedules (difference between “T-Z” final schedules and Day-Ahead final schedules) are settled using “T-Z” prices
- Real-Time deviations are the difference between metered values and “T-Z” final schedules
- Real-Time deviations are settled in CCA based upon prices derived from the Real-Time Balancing Market, if any; elsewhere using Control Area specific prices/penalties

“Z” needs to be large enough to allow Grid West, Participants, and Control Areas implement the RDS solution...



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Grid West

Redispatch Options

Option B: Day-Ahead and “T-Z” Redispatch

Implementing the “T-Z” RDS solution may require the following activities...

Key Activities

- Schedule validations
- Redispatch run
- E-Tag generation
- E-Tag approval
- Thermal unit commitment
- Interchange Coordination with Neighboring RTOs
- External Control Area checkout

Duration	Activity
0	Grid West pre-validates participants' submissions
0	Deadline of submission
~ 15 min	Grid West validates participants' submissions and resolve discrepancies
~ 30 min	Grid West completes Redispatch Run
~ 15 min	Grid West completes validation of RDS results
~ 5 min	Grid West sends resources schedules to CA and participants
~ 5 min	Grid West computes net interchange schedules and send to CAs along with E-tags. Grid West also approves interchange tags within CAs in Grid West footprint
~ 20 min	Grid West waits for tag approval from CAs not in Grid West footprint, perform checkout with external CAs and resolve discrepancy
~ 15-25 min	Contingency and communication delay

...so what value does Z need to be?



Redispatch Options

Option B: Day-Ahead and “T-Z” Redispatch

The Pros & Cons of Option B are as follows:

Pros	Cons
<ul style="list-style-type: none">• Maintains the pros of the original simultaneous approach• Allows market based scheduling adjustments after Day-Ahead at “T-Z”• Allows further adjustment of schedules	<ul style="list-style-type: none">• Complex operation (scheduling) for GW<ul style="list-style-type: none">• Cost considerations• The smaller Z is the more difficult it will be to implement the “T-Z” RDS solution• Existing T-20 flexibility may not be feasible

Redispatch Options

Option C: Day-Ahead Reconfiguration and “T-Z” Redispatch

Another option is to separate RCS and RDS by performing RCS ONLY in the Day-Ahead and Redispatch at “T-Z”

- Perform Day-Ahead RCS (rights auction only)
- Participants are required to submit schedules that match their rights
- Perform curtailments if infeasibility is detected
- Perform “T-Z” Redispatch
- Only “T-Z” schedules are financially committed
- Day-Ahead rights trades are settled by Grid West
- Day-Ahead schedules are directly addressed by Grid West participants and are not settled by Grid West
- “T-Z” incremental schedules will be settled using “T-Z” prices
- Real-Time deviations are difference between metered values and “T-Z” final schedules
- Real-Time deviations are settled in CCA based on balancing market, if any; elsewhere using CA specific prices/penalties

Redispatch Options

Option C: Day-Ahead Reconfiguration and “T-Z” Redispatch

The Pros & Cons of Option C are as follows:

Pros	Cons
<ul style="list-style-type: none">• Allows for market based schedule adjustment closer to real-time• Rights are preserved until T-120 (or T-90) minutes from dispatch	<ul style="list-style-type: none">• Separate scheduling process after DA RCS is needed• It is not clear how to maintain DA schedules feasibility (curtailment method)• Less efficient use of transmission assets• Departure from RRG proposal that specified a Day-Ahead Redispatch service• Existing T-20 flexibility may not be feasible

Redispatch Options

Option D: Day-Ahead Reconfiguration and Real-Time Balancing Market

Another option is to separate RCS and RDS by performing RCS ONLY in the Day-Ahead and Redispatch in the Real-Time as a part of a Balancing Market

- Closest to prevailing markets
- Only applicable for CCA
- Participants can bid their supplies to the Real-time market to hedge their demand change
- Grid West will send generation base signals every 5 minutes.
- The imbalance settlements are based on the balancing market prices

Redispatch Options

Option D: Day-Ahead Reconfiguration and Real-Time Balancing Market

The Pros & Cons of Option D are as follows:

Pros	Cons
<ul style="list-style-type: none">• Formation of real-time market increase market transparency and creates an anchor for all other markets• Imbalance settlement is market driven	<ul style="list-style-type: none">• More or less back to current practices to set up a Day-ahead operating schedules• Departure from RRG proposal that specified a Day-Ahead Region-wide Redispatch Service

The TSLG Position Considering the Options

Each of the options present opportunities and challenges:

- The Day-Ahead simultaneous energy/rights Redispatch service (Option A) makes the most efficient use of available flowgate capacity
 - The correct application of a “X Factor” and the three settlement approach can be used to address some of the scheduling flexibility issues
- The Day-Ahead Reconfiguration followed by “T-Z” Redispatch (Option C) service allows scheduling flexibility to be better maintained than Option A
 - Lack of DA schedules needs to be addressed perhaps using current practices
- Manual steps required after Redispatch (e.g., eTagging, Check-out, etc.) and thermal unit commitment constraints makes it very difficult, if not impossible, to run an Redispatch market at T-20 (Option B)
- The Day-Ahead Reconfiguration followed by a Real-Time balancing market (Option D) allows scheduling flexibility to be fully maintained
- Lack of DA schedules still remain and need be addressed perhaps using current practices

In the sequencing proposal, the order of Steps 2-3 and Step 4 may be changed depending on CCA timing.

- Step 1 – Grid West created (GWF)
- Step 2 – Grid West initiates centralized scheduling and transmission rights administration (GWF)
 - IWRs administered using a flow based determination of AFC for GWF
 - Capacity Expansion Service initiated (with provisions for dealing with long term requests).
 - Operational relationship established with Reliability Coordinator (PNSC) to share scheduling data and coordinate operational plans
- Step 3 – Grid West offers Reconfiguration Service (GWF)
 - Annual, Monthly, Intra-Month and Daily Auctions
- Step 4 – Grid West initiates real-time markets (CCA)
 - Reserve Market – Voluntary offers from Grid West and non-Grid West entities
 - Real-Time Energy Market – Voluntary inc/dec offers selected using security constrained dispatch optimization
- Step 5 – Grid West offers day-ahead redispatch (energy) market
 - Redispatch will operate in a manner that is consistent with the exercise of existing contract rights
 - Inc/dec offers provided with day-ahead schedules