THE FREEZE DATE WHITEPAPER

Joint and Common Market

Issue Review

Purpose: *A d*eeper dive into the details of the proposed changes to the Firm Flow Entitlement methodology

Key Takeaways:

- Deficiencies exist within the current methodology:
  - A static list of generation resources and Transmission Service Rreservations from 2004 are used to determine transmission rights
  - Double counting of impacts and the use of directional impacts when respecting Flowgate limits
- Solutions address these issues by:
  - Better recognizing system changes and investments as well as the evolution of planning and operational practices
  - Addressing calculation design flaws inappropriate for Market-to-Market

Overview

- Introduction and Background
- Inputs to the NNL Impact Calculation
- NNL Impact Calculation
- Allocation Calculation
- Firm Flow Entitlement Calculation
- Market Flow Calculation
- General Updates

Acronyms

TLR – Transmission Loading Relief
CMP – Congestion Management Process
FFE - Firm Flow Entitlement
FFL – Firm Flow Limit
TLR – Transmission Loading Relief
HBAA – Historical Balancing Authority Area
TSR – Transmission Service Reservation
CMR – Congestion Management Resource
BAA – Balancing Authority Area
GTL – Generation-to-Load
PTP – Point-to-Point

Review – Interregional Congestion Management

- Reliability Coordinators (RC) use Flowgates to allow neighboring RCs to re-dispatch impacting neighboring generation
- Prioritization of flows (Firm vs Non-Firm)
- Two Primary congestion management mechanisms
  - **Transmission Loading Relief (TLR)**
    - Generation or Interchange Transactions (Tags) above a 'Curtailment Threshold' can be re-dispatched or 'cut' to provide relief on a Flowgate
  - **Market-to-Market (M2M)**
    - Economic re-dispatch includes all generation as an input to its solution to provide relief on a Flowgate
    - Financial payments made after the fact to compensate for 'Overuse'

Review – Interregional Congestion Management

Transmission Loading Relief (TLR)

- NERC standard procedure in place since 1990's
- Ensures interregional reliability for the Eastern Interconnection
- Administered by RC's through the Interchange Distribution Calculator (IDC)
- Curtails ***forward*** Impacts to provide relief

Congestion Management Process (CMP)

- Attachment II of MISO-PJM JOA, PJM-TVA JRCA
- A mechanism introduced in 2004 to facilitate market integrations, and their impact on TLR by introducing firm and non-firm Market Flow distinctions

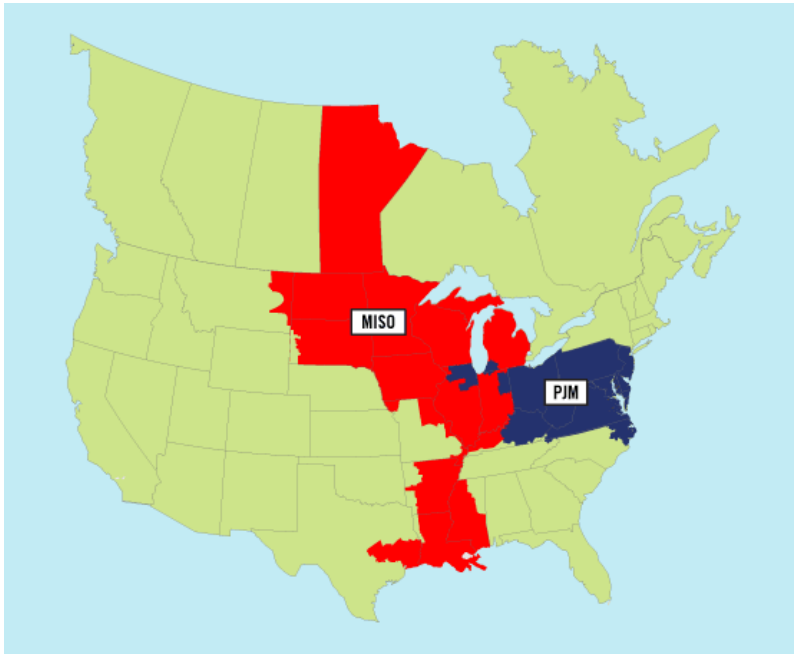
Market-to-Market (M2M) Coordination

- Has existed between MISO and PJM since 2005
- Coordinates Locational Marginal Pricing (LMP) based congestion management between two bid-based market entities
- Built upon the rules created by the CMP
- Provides relief using both **forward *and* reverse** impacts

Review: Market Integrations

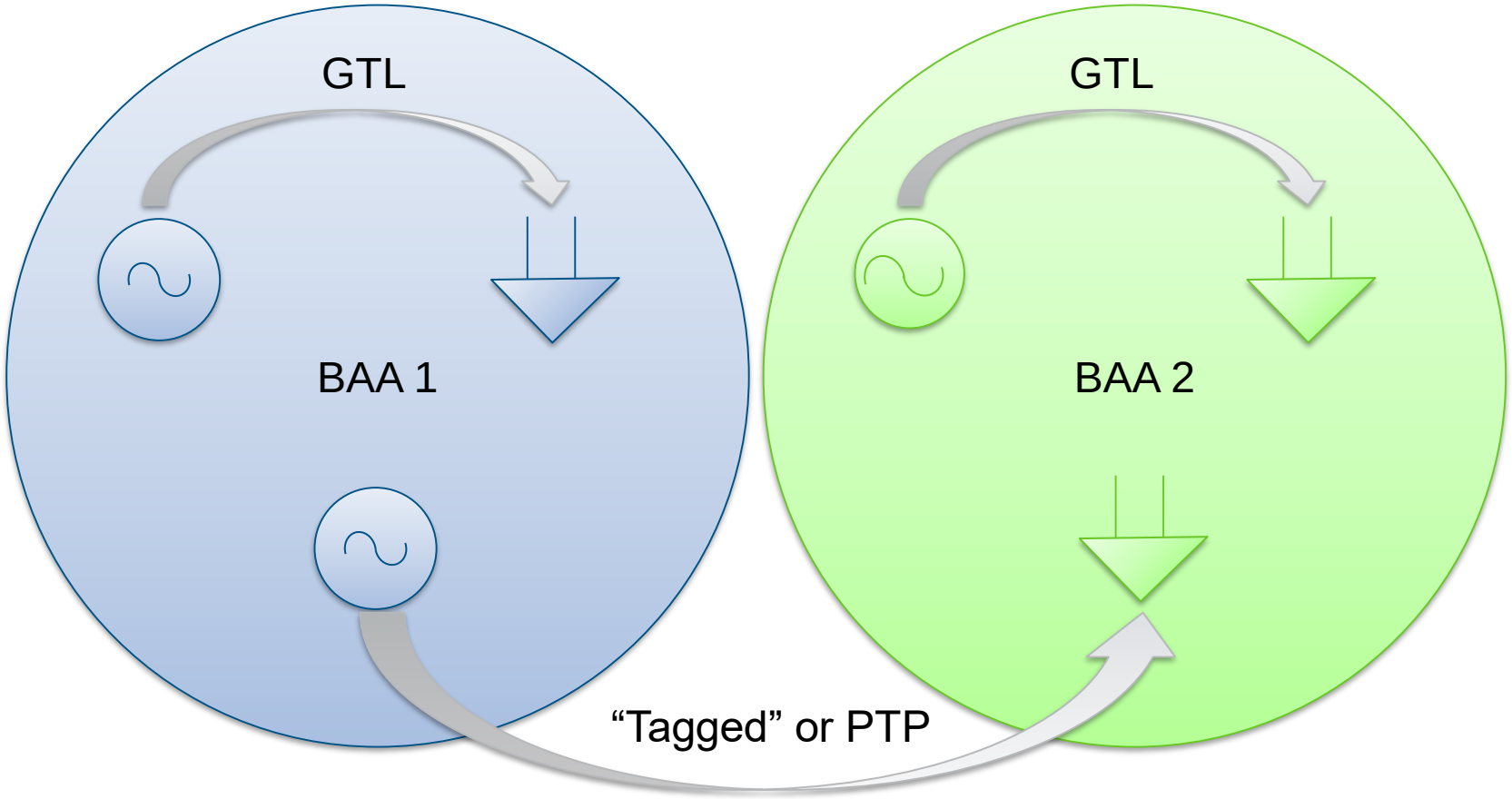
- PJM and MISO are a collection of Historical Balancing Authority Areas (HBAA) and Transmission Providers (TP)

- These integrations caused a great deal of discussion around the concept of ‘Granularity’ in the IDC, which affects:
  - Impact of Generation serving Load (GTL)
  - Impact of Point-to-Point (PTP) transactions



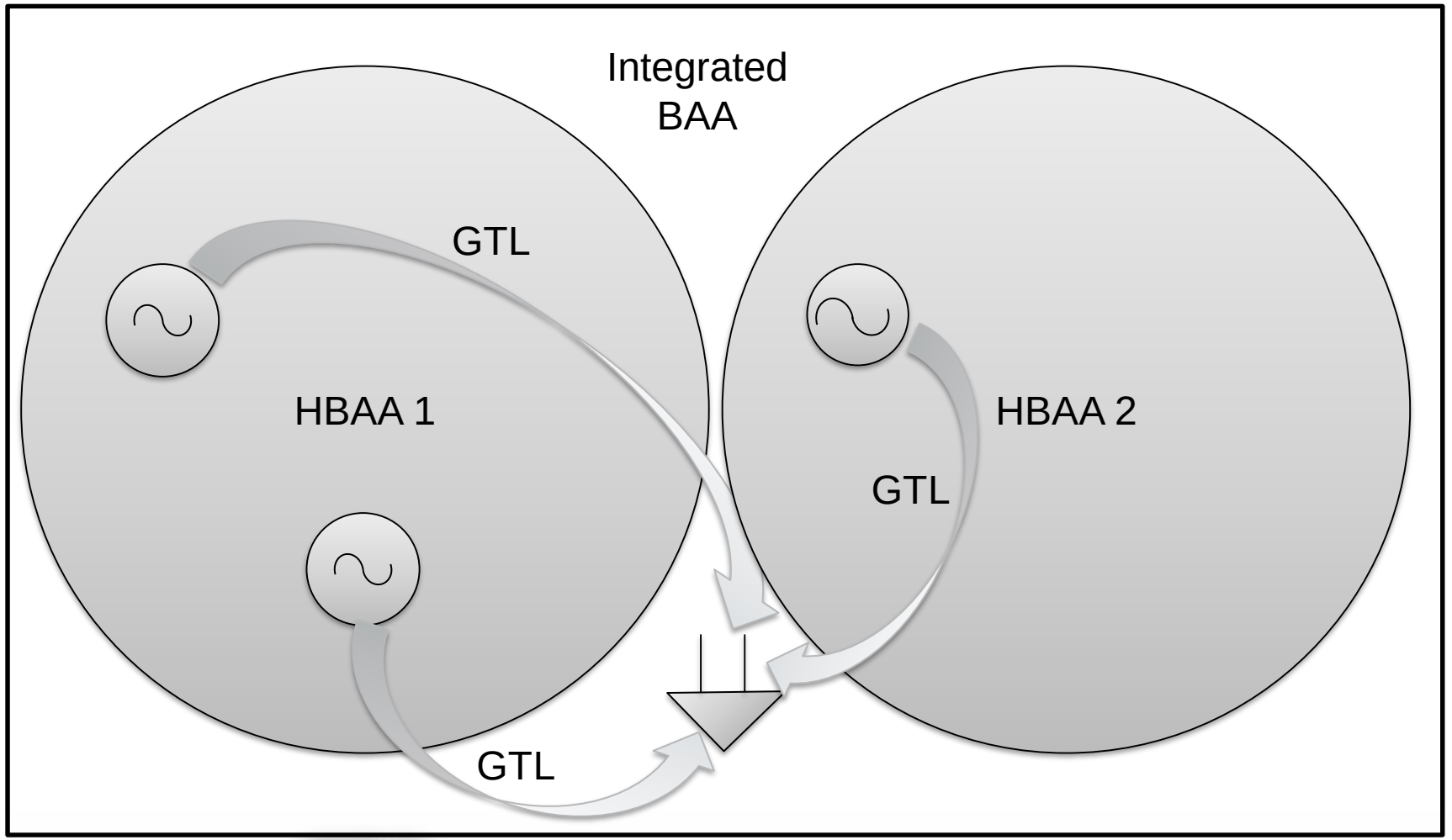
Market Integrations - The Issue of 'Granularity'

- Before integrations, generation in each BAA served its own load
- Transfers between BAAs were tagged (firm and non-firm), and visible for curtailment in the IDC
- A tagged Interchange Transaction between BAA1 and BAA2 could be curtailed by an external entity who needs congestion relief

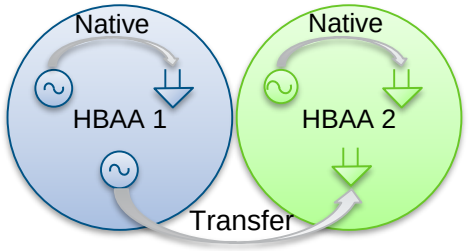


Market Integrations - The Issue of 'Granularity' (Cont.)

- After integrations the granularity of how load is being served becomes more coarse, all generators are serving all integrated BAA load
- Transfers between HBAA are no longer tagged, but use network service
- This can affect whether a generator or transactions are eligible for curtailment in the IDC due to the distribution factor 'Curtailment Threshold' of 5%



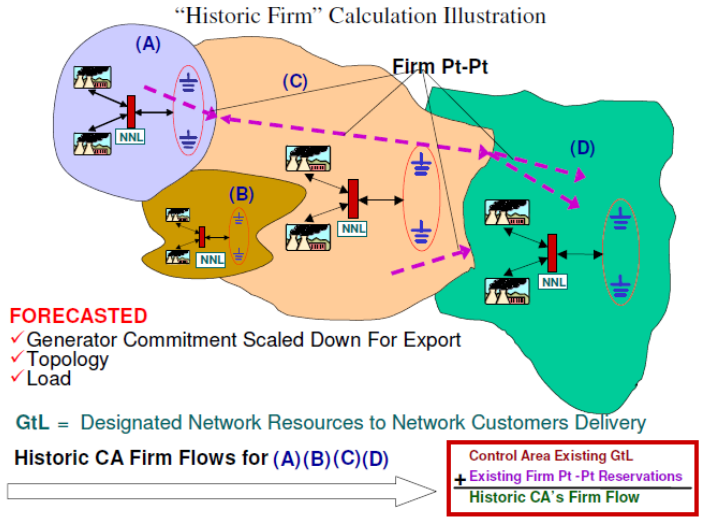
Review: Market Flow



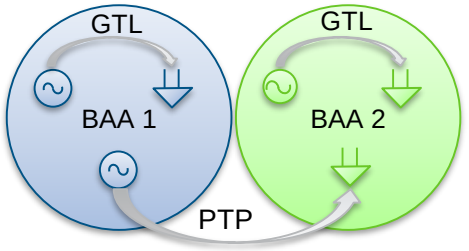
- Defined in the CMP
- Describes the **real-time** use or impact of a Market Based Operating Entity on a coordinated Flowgate by serving its load (GTL)
- Two Components
  - Native Market Flow – Generation serving load within the same HBAA
  - Transfer Market Flow – Generation serving leftover load in BAA

Review: The “Freeze Date”

- Reference date of April 1, 2004, known as “Freeze Date”, is used as mechanism to determine firm rights on flowgates based on pre-market firm flows.
- Generators called Designated Network Resources (DNR) that existed as of the Freeze Date are assigned a higher priority
- Firm transfers between HBAAs are “Frozen”



Review: Firm Flow Limits & Entitlements (FFL/FFE)



- Defined in the CMP
- Estimates **in advance** the *entitled* use or impact of a Market Based Operating Entity on a Coordinated Flowgate when serving its load
- Two Components
  - GTL – Generation serving load within the same HBAA
    - Freeze Date DNRs take first priority
    - Post-Freeze-Date DNRs take second priority
  - PTP - Historical Transfer – set by Freeze Date TSRs

Coordination Today

TLR

- Market Flow - Calculated to respect HBAA boundaries
- FFL - Calculated to respect HBAA boundaries

Same Calculation

Market-to-Market

- Market Flow - Calculated to respect HBAA boundaries
- FFE - Calculated to respect HBAA boundaries

Coordination Tomorrow

TLR

- Market Flow – Calculated by the IDC once Parallel Flow Visualization (PFV) goes live
- FFL – Status quo, ongoing discussion

Market-to-Market

- Market Flow - Calculated at the current BAA/Market boundary
- FFE – Reconciles pre-integration (HBAA) and post-integration (BAA/Market) boundaries

Different Calculation

Parallel Flow Visualization (PFV)[1]

- Prescribed in WEQ-008 of the new v3.3 NAESB Standards to determine equitability for TLR
- Likely to go-live in mid-to-late 2021
- Calculates real-time impact (GTL) for each BA on the Eastern Interconnection
- Relieves the need for a Market Flow Calculation

[1] PFV Whitepaper - https://naesb.org/pdf4/weq_bps090314a1.docx

Firm and Non-Firm Flows for TLR

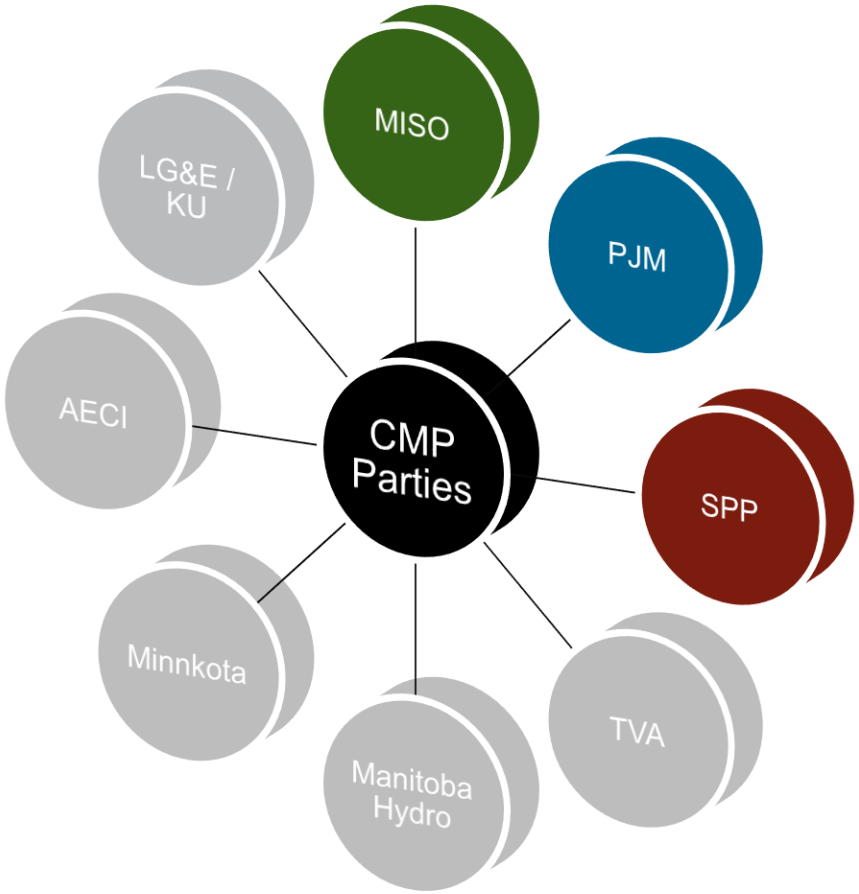
Current

Entity Type	Real-time GTL	Firm & Non-Firm
Market Based	Market Flow	CMP FFL
Non-Market Based	IDC NNL	All Firm

After PFV

Entity Type	Real-time GTL	Firm & Non-Firm
Market Based	PFV	CMP
Non-Market Based	PFV	PFV

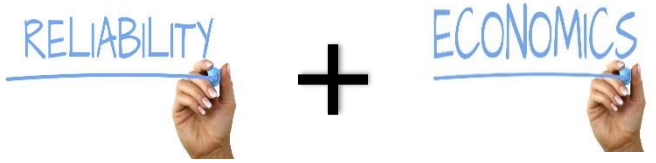
Agreement to update Market-to-Market



- Market Based Operating Entities Agree on FFE and Market Flow enhancements

Review: M2M Coordination

- Joint re-dispatch that ensures reliability by optimizing economics



- Relief Obligation is dynamically calculated as a function of the flowgate exceedance

- Most efficient set of redispatch instructions provides needed relief regardless of what flows are Firm or Non-Firm

Review: M2M Settlements

- Uses Market Flow and FFE
- After-the-Fact calculation
- Two types of payments
  - **Overuse** - Neighboring market is **overusing** on a Flowgate (Market Flow > FFE), **charged payments** by Flowgate Owner
  - **Re-dispatch Credit** – Neighboring **market** is underusing on a Flowgate (Market Flow < FFE), **credited payments** from Flowgate Owner

Market Flow – Summary Changes

Current Methodology:

EMS Based

- Respects historical granularity
- ‘Control Zone’ Weighted Load Shift Factors
- Native/Transfer design
- Used for M2M and TLR

New Methodology:

EMS Based

- Uses BAA granularity
- BAA Weighted Load Shift Factors
- Only used for M2M with PFV GTL used for TLR

FFE – Summary Changes

Current Methodology: Historical rights

- HBAA operations: Static transfers & potentially unserved load
- 2004 TSRs and resources
- Directional Allocations

New Methodology: Historical rights plus system evolution

- HBAA & BAA operations: transfers & no unserved load
- All active TSRs and resources
- Net Allocations align with M2M
- Honor Contract Path Limits where they exist

INPUTS TO THE NNL IMPACT CALCULATION

General Assumptions

1. All generation from the IDC model is included in the base model
2. Currently, impacts of generators are limited to those included on a merit order list and from TSRs on the Freeze Date list
3. For each future operating horizon, an up-to-date load forecast, generation and transmission outage list is used to initialize the calculation

Impact Granularity & Resource Inclusion

Pre-Market Integration Granularity

Post-Market Integration Granularity

Bucket 1

- Active Historical TSRs
- Active CMRs (Pre-2004)
- HBAA Granularity

Bucket 2

- Active TSRs (Post 2004)
- Active CMRs (Post 2004)
- HBAA Granularity

Bucket 3

- All Active Remaining CMRs
- HBAA Granularity

Bucket 4

- All Active TSRs
- All Active CMRs BAA Granularity

Transmission Service Reservations

Current Approach:

- TSRs representing the pre-market historical rights are used to identify impacts currently
  - Identified through the frozen, or static “Freeze Date” list (including inactive)
- These TSRs are now a mix of Inter-BA and Intra-BA TSRs

- **Proposed Approach**:
- Active Inter-BA FD TSRs through Bucket 1
  - Both FD CMRs and Energy Only resources (EORs) are eligible for PTP Impacts
- Remaining Active Inter-BA TSRs through Bucket 2
  - All available CMRs and EORs are eligible for PTP Impacts
- Intra-BA TSRs are reflected as transfers through Buckets 3 and 4

Congestion Management Resources

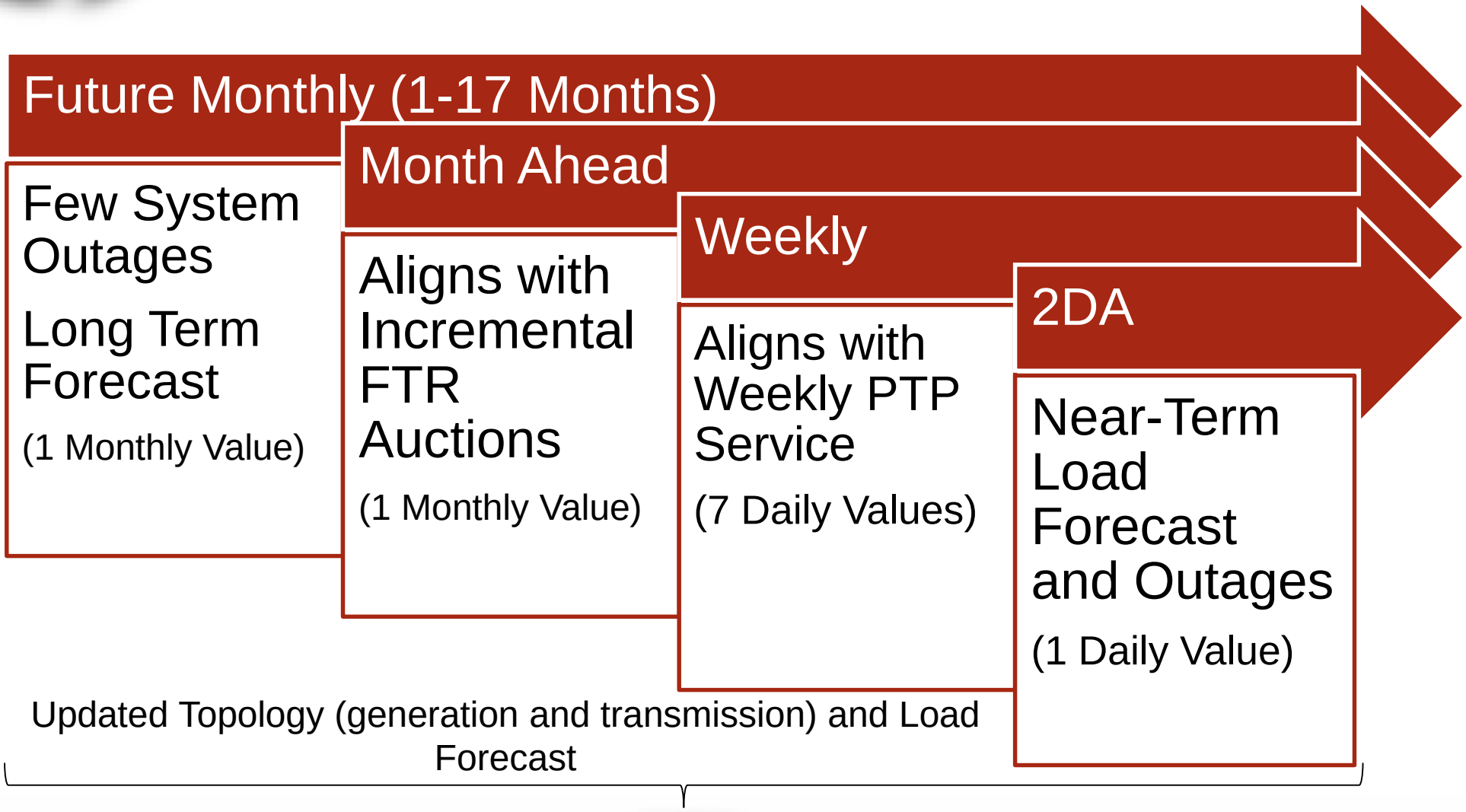
- Designated Network Resources and NITS scheduling rights as defined in Open Access Transmission Tariffs (OATT)

- Dispatched in merit order to meet load

Generator Group	Group Description	In Service Date	CMR	Priority Range	Dispatched for GTL	Scaling for Freeze Date Inter-BA TSR Exports	Scaling for Post Freeze Date Inter-BA TSR Exports
1	Freeze Date CMR	Prior to April 1, 2004	Y	1-20000	Y	Y	Y
2	Post-Freeze-Date CMR	Post April 1, 2004	Y	20001-40000	Y	N	Y
3	Freeze Date EOR	Prior to April 1, 2004	N	N/A	N	Y	Y
4	Post Freeze Date EOR	Post April 1, 2004	N	N/A	N	N	Y

Generator Merit Order Priorities

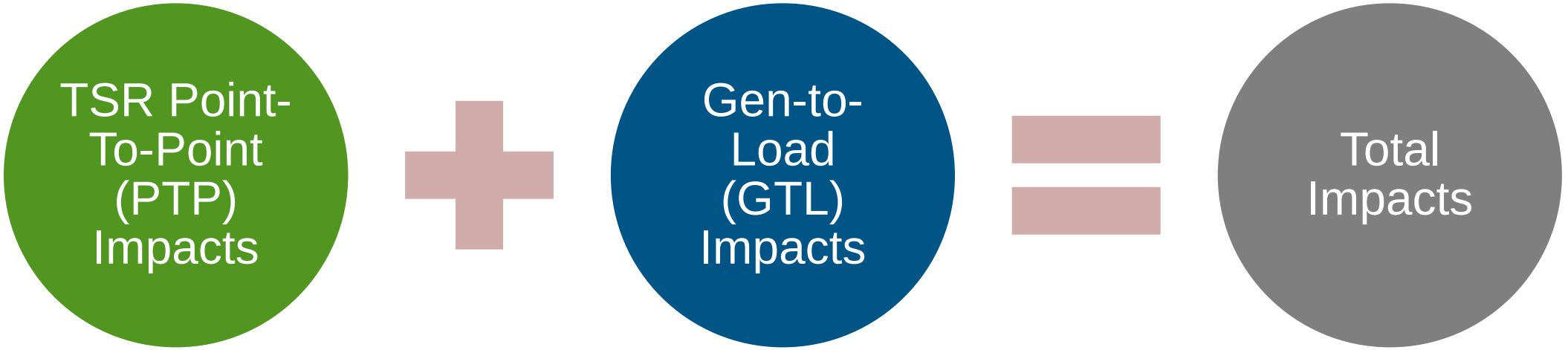
NNL Impact Run Types



NNL IMPACT CALCULATION

Impact Calculation Methodology

The total impacts on flowgates are quantified by accounting for both Transmission Service Reservations (TSRs) impacts and impacts of Generation Dispatch using Congestion Management Resources(DNRs) for serving Network Load



Impact Calculation Methodology

1. Bucket 1 – Serve HBAA Load
   A. Active Freeze Date Inter-BA TSRs **(PTP)**
   B. Freeze Date CMRs **(GTL)**

2. Bucket 2 – Continue to Serve HBAA Load
   A. All Active Inter-BA TSRs **(PTP)**
   B. Post-Freeze-Date CMRs **(GTL)**

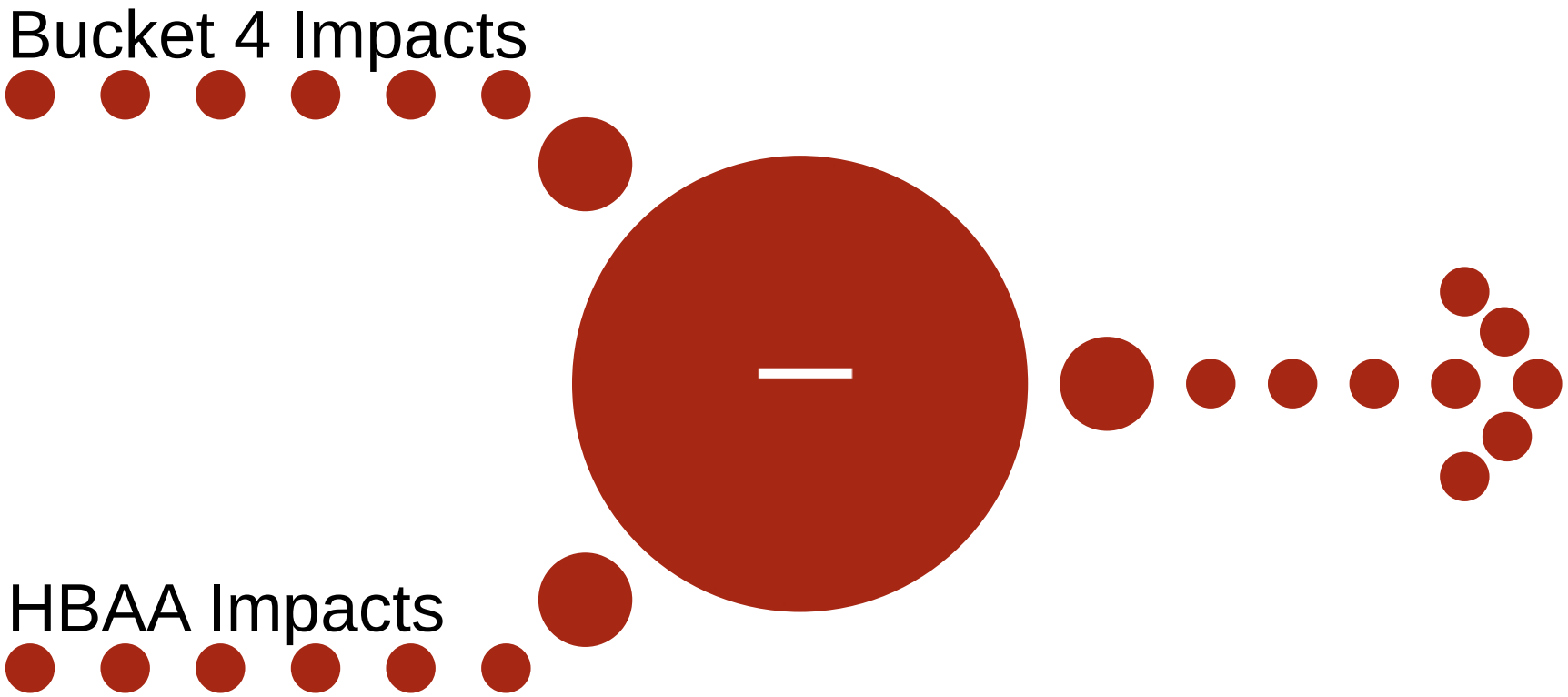
3. Bucket 3 – Serve remaining BAA Load
   A. Excess HBAA serve short HBAA on a pro-rata basis **(GTL)**

HBAA Impacts

1. Bucket 4 – Serve All BAA Load
   A. All Active Inter-BA TSRs **(PTP)**
   B. Post-Freeze-Date CMRs **(GTL)**

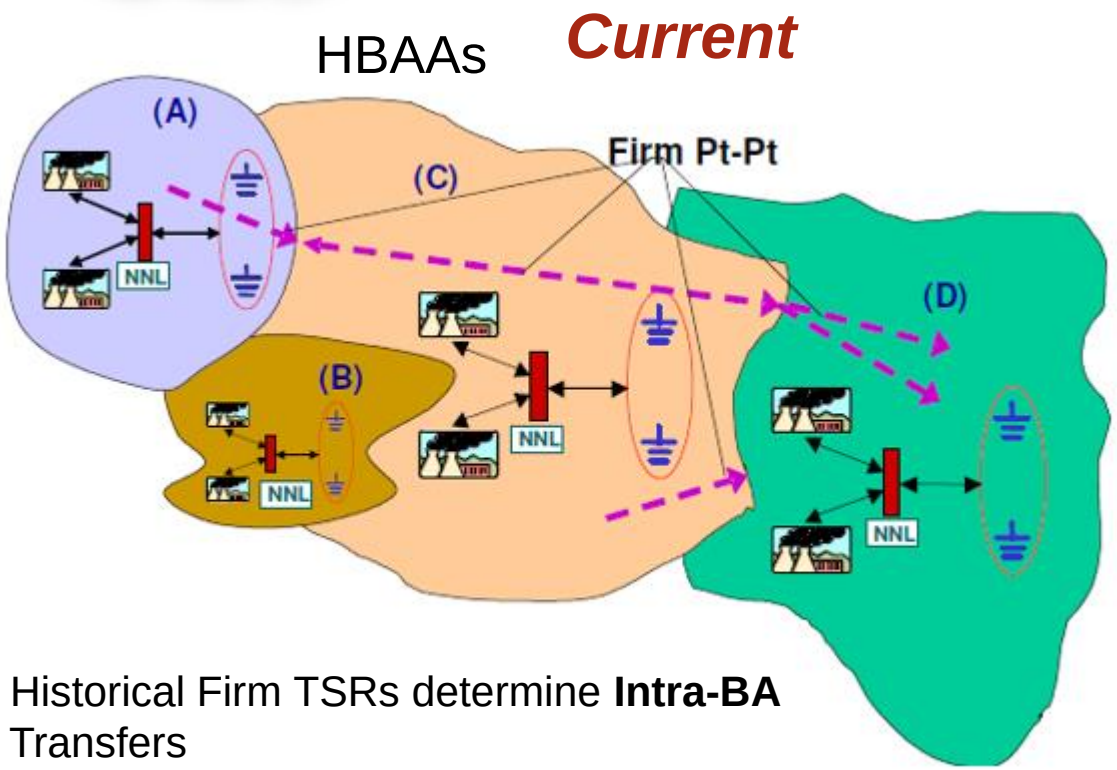
Bucket 4 BAA Impacts

Impact Calculation Methodology (Cont.)



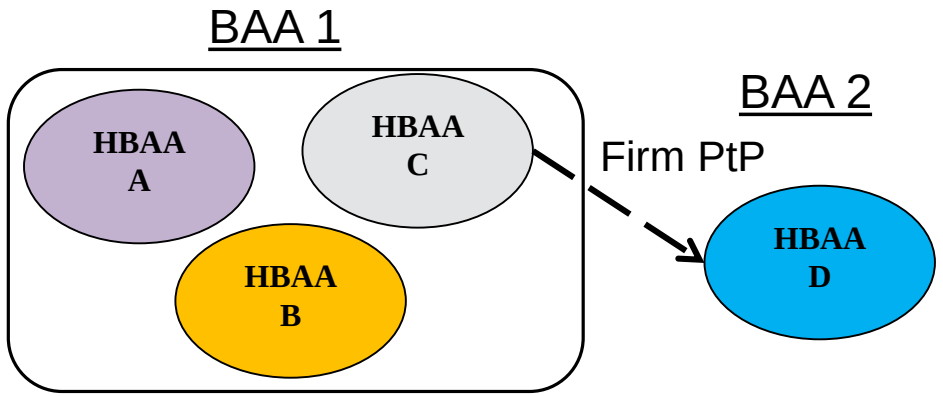
TSR Changes

Current



- Historical Firm TSRs determine **Intra-BA** Transfers
- PTP Impacts are calculated from historical Firm TSRs
- HBAA load adjusted by net TSR imports
- PTP impacts calculated using GTG method

Proposed



- Only active Historical **Inter-BAA** TSRs are included in bucket 1
- All other active **Inter-BAA** TSRs are included in bucket 2
- HBAA and BAA Generation is decremented by net path TSR exports
- HBAA and BAA Load is decremented by net path TSR imports
- Transfers between HBAAs in same BAA are included in buckets 3 and 4 (reliability transfer or market dispatch)
- PTP impacts calculated using GTL method

Accounting For TSRs

Net Adjustments (M2M)

- Generation is decremented by net HBAA exports while load is decremented by net HBAA exports
- Works well with M2M, but not for TLR, which considers directional impacts

Directional Adjustments (TLR)

- Generation is decremented by gross HBAA exports while load is decremented by gross HBAA exports
- Works well with TLR, but not for M2M, misrepresents amount of generation serving load

Point-to-Point Impact Calculation

TSR PTP Impacts

Current Approach:

- TSRs are netted at each HBAA prior to the impact calculation
  - Load is decremented for net imports
  - Generation is **not** decremented for total exports
  - Result is PTP impacts and GTL impacts are being double counted when calculating a directional FFL, as TLR uses directional flows

Proposed Approach:

- A Hybrid TSR method will be used to Net TSRs at a source/sink level:
  - Net value for each unique path (source/sink pair)
  - The sum of all net exporting paths from service point decrement generation at that point
  - The sum of all net importing paths into service point will decrement load at that point

TSR Examples

LBA	Generation A	Load B	Export TSR MW C	Export TSR Sink D	Import TSR MW E	Import TSR Source F
1	600	400	150	LBA 2	200	LBA 2 = 100 MW LBA 3 = 100 MW
2	275	200	100	LBA 1	150	LBA 1
3	500	300	100	LBA 1	0	NA

Directional *Net* *Hybrid*

LBA	Generation MW A - C	Load B - E	Generation MW A - net imports, or A - [if C - E>0, C)]	Load B - net exports, or B - [if E - C>0, E - C)]	Generation MW A - exports, netted on each path	Load B - imports, netted on each path
1	450	200	600	350	550	300
2	175	50	275	150	275	150
3	400	300	400	300	400	300

Note: tables summarize whitepaper examples in section 7.7

Generation-to-Load Impact Calculation

GTL Impacts

Current Approach:

- Includes ‘designated network resources’ (DNRs) as of Freeze Date
- HBAA based GTL Impacts Calculation:
  - FD DNRs are dispatched using merit order to serve the adjusted load (by imports) at HBAA level
  - Remaining unserved load is then served by Post FD DNRs and EORs on a pro-rata basis

Proposed Approach:

- Includes ‘congestion management resources’ (CMRs) which currently serve network load
- HBAA based GTL Impacts Calculation:
  - Only CMRs are considered for the GTL impacts, adjusted for exports
  - Bucket 1 dispatch using FD CMRs and Bucket 2 dispatch using Post FD CMRs
  - Bucket 3 GTL reflects generation in long HBAAs serving load in short HBAAs

Prevailing Bucket 4 Impacts

- The prevailing bucket 4 impacts represent the change or delta impact between historical HBAA to RTO dispatch
- Mainly applicable to markets entities (MISO/SWPP/PJM)
- The prevailing bucket 4 calculation differs for year 0, year 4, and year 8 to allow for phase out mechanism of bucket 3

PB4 Impacts = Net RTO(B4) - Net HBAA(B1+B2+B3) impacts

For Year 0 to 4:	PB4 impacts are capped to Zero if negative **(Historical HBAA impacts higher priority)**
For Year 4 to 8:	PB4 50% counter flows included if negative & Bucket 3 is capped to 50%
From Year 8 :	PB4 100% counter flows included if negative & Bucket 3 step is retired

For year 0 to 4 PB4 counter flows are not included as the bucket 4 counter flows should not reduce the Historical HBAA impacts

Prevailing Bucket 4 Calculation

Gen-to-Load and Firm TSR Impacts									
Case	**Bucket 4**	**Bucket 1 to 3**	**Prevailing Bucket 4 (RTO-HBAA)**				**Final Impacts (HBAA+PB4)**		
	RTO Dispatch	HBAA Dispatch	**RTO-HBAA**	Year 0	Year 4	Year 8	Year 0	Year 4	Year 8
1	60	20	40	40	40	40	60	60	60
2	50	100	-50	0	-25	-50	100	75	50
3	50	-25	75	75	75	75	50	50	50

* In this example Bucket 1 to 3 HBAA impacts are constant for year 0,4,8 for simplicity

PB4 net impacts on a flowgate are capped if the sum of B1, B2, B3, and PB4 impacts exceeds the net RTO Dispatch

MISO Sub Regional Limit

- MISO subregions have firm, contractual limitation used in the planning process
  - Current firm contract path limitation is 1,000 MW between the Midwest and South
- The proposed methodology implements the firm contract path sub regional dispatch limitation in Buckets 3 and 4 of the impact calculation
- A settlement agreement allows for increased transfers between the sub regions
  - This change does not impact current processes that consider the higher non-firm values

ALLOCATION CALCULATION

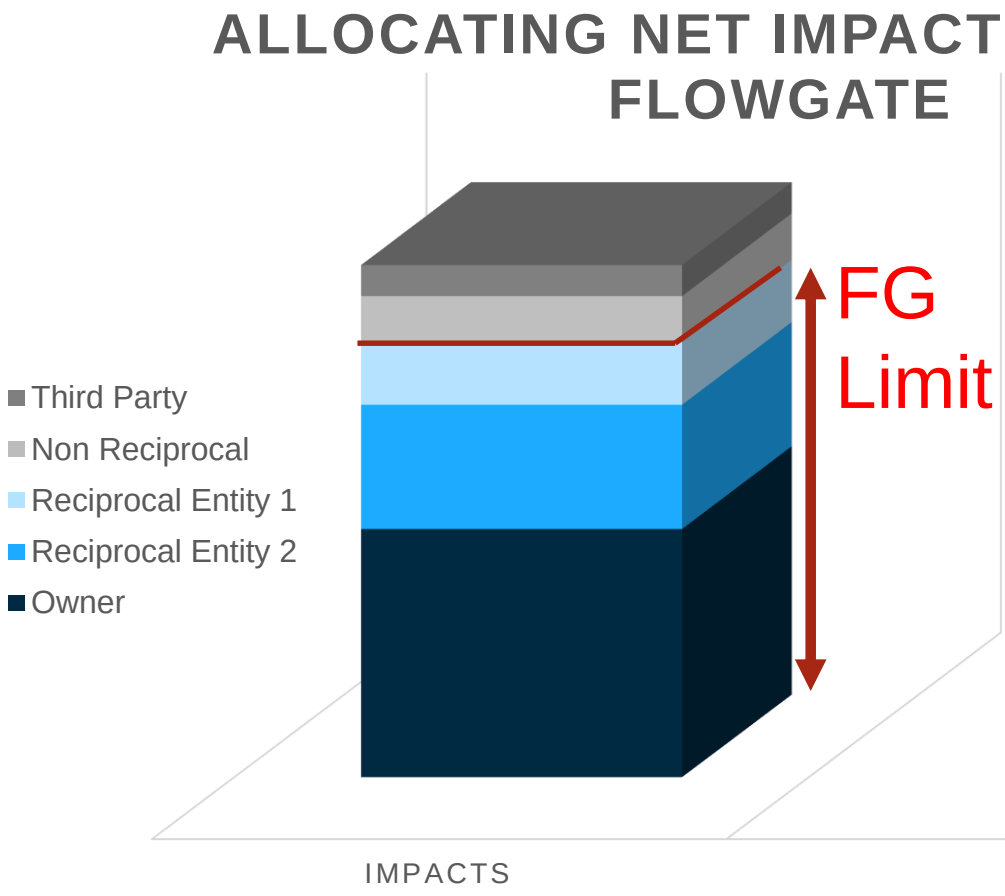
12 Specific Classifications Prioritize Impacts

		B1				B2				B3				Prevailing B4			
Net Impact		Owner	CMP RCF	CMP Non-RCF	Third Party	Owner	CMP RCF	CMP Non-RCF	Third Party	Owner	CMP RCF	CMP Non-RCF	Third Party	Owner	CMP RCF	CMP Non-RCF	Third Party
>5%	Priority Rank	1				2				3				9	10		
<5%		4			N/A	5	6		N/A	7	8		N/A	11	12		N/A

- Total impact on a flowgate determined by adding up impacts 1 through 12
  - Third Party <5% are not counted towards Total impact (same as today)
- **All** impacts are eligible for allocation except Third Party <5% impacts
  - >5% Impacts are allocated to all Entities
  - <5% impacts are allocated to all CMP entities
  - Over Impacted Flowgates or Excess capacity is determined by comparing Total impacts (1-12) to Rating
- If FG over impacted, then impacts are removed starting at priority 12, until total considered impacts are at rating
- Non-owner CMP entities curtail <5% flows before owner in B2,B3,B4
- If FG under impacted, then Excess capacity to owner

Input #1 Net Allocations

Net Allocations



Principles

- Respect Flowgate limits
- Prioritize historical impacts
- Prioritize coordinated impacts
- Prioritize curtailable impacts
- Award excess to Transmission Provider of Flowgate

Allocations Consider 4 Major Impact Categories

Net Allocations

Total Impact = Bucket 1+ Bucket 2+ Bucket 3 +Prevailing Bucket 4

Pre-Market Integration Granularity

Bucket 1

- GTL Impacts
- PTP Impacts

Bucket 2

- GTL Impacts
- PTP Impacts
- Priority Rights

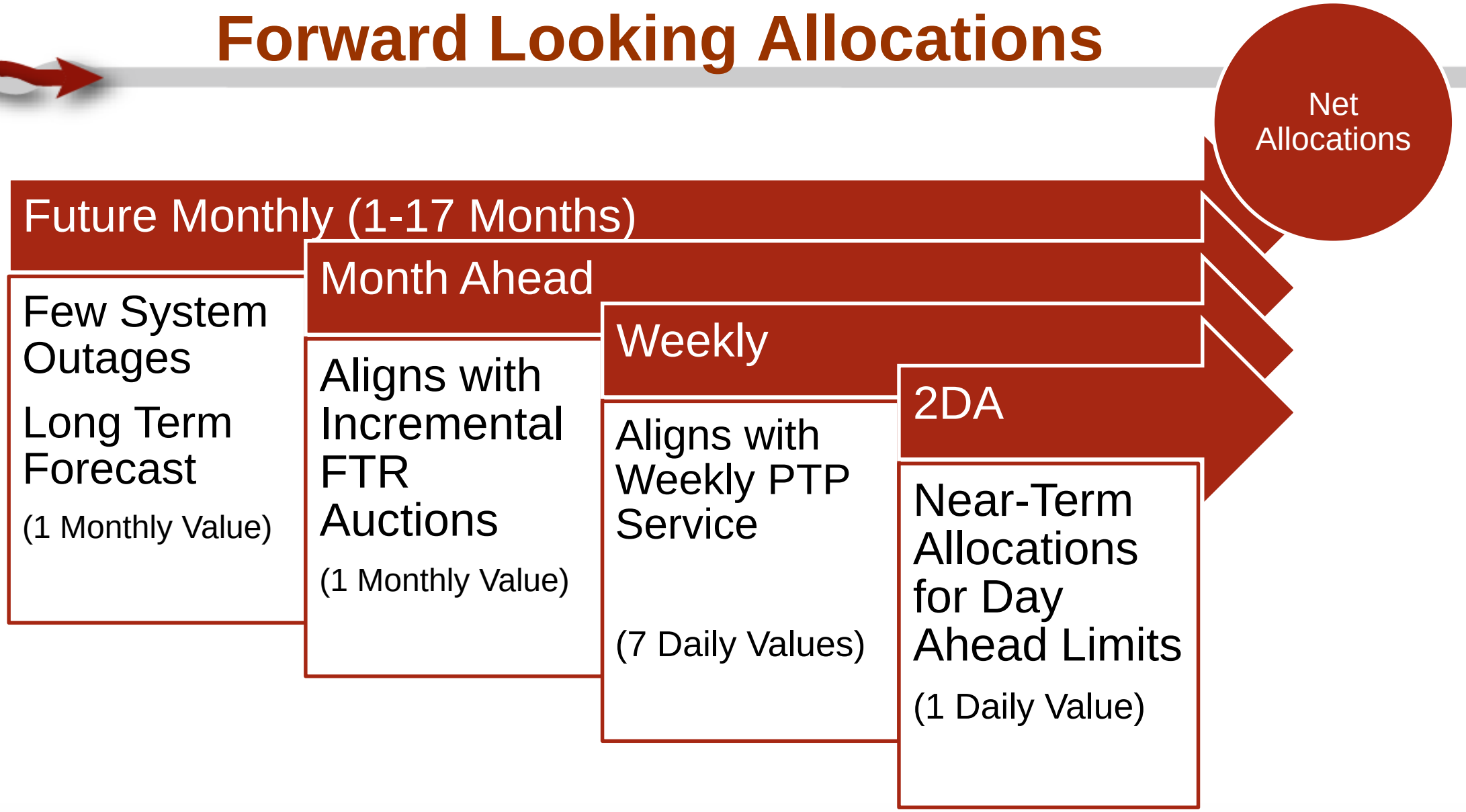
Bucket 3

- Transfers (limited) Excess HBAAs serve short HBAAs
- Priority Rights
- 8 Year Transition

Bucket 4

- GTL Impacts
- PTP Impacts
- Market Based Transfers
- Priority Rights
- Excess to Owner

Forward Looking Allocations



Higher-Of-Logic

Net Allocations

Month	Operating Window	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
Seasonal	12 Monthly Windows	50	50	50	50	50	50	50	50	50	50	50	50
Monthly	6 Monthly Windows	50	50	50	60	50	50	50	60	50	50	50	50
Weekly	7 Daily Windows	50	40	50	70	50	60	50	70	50	50	50	50
2DA	1 Day Windows	50	30	50	30	50	70	50	70	50	50	50	50
	Resulting Allocation	50	50	50	60	50	70	50	70	50	50	50	50

Highest value sets Allocation to honor forward commitments

Net Allocation Examples

All Net Impacts on a Flowgate

	B1				B2				B3				Prevailing B4				
Impacts	**Owner**	**CMP RCF**	**CMP Non-RCF**	**Third Party**	**Owner**	**CMP RCF**	**CMP Non-RCF**	**Third Party**	**Owner**	**CMP RCF**	**CMP Non-RCF**	**Third Party**	**Owner**	**CMP RCF**	**CMP Non-RCF**	**Third Party**	**Total**
>5%	10	5		5	10	5		5	5	10			5	5			65
>5% rank	1				2				3				9	10			
<5%	10	5	5	~~5~~	5	5	5	~~5~~	10	10	5		5	15	5		85
<5% rank	4			N/A	5	6		N/A	7	8		N/A	11	12		N/A	
Total Net Impacts on a Flowgate = 150 MW																	

Third Party <5% flows are not allocated as their flows are not curtailed in market-to market process during congestion

Under Allocated Scenario

Flowgate is under allocated when total impacts (1 to 12) on a flowgate is less than flowgate limit

- Total Impact (Priority 1 to 12) = 150MW
- Rating=200MW

Excess Capacity to Owner = Rating - Total Impact
= 200 - 150
= 50 MW

Owner Final Allocation = 60 + 50
= 110 MW

Entities	Total Impact	Final Allocation
Owner	60	110
CMP RCF	60	60
CMP Non-RCF	20	20
Third Party	10	10
Total	150	200

Over Allocated Scenario

Flowgate is over allocated when total impacts (1 to12) on a flowgate is greater than flowgate limit

- Total Impact (Priority 1 to 12) =150MW
- Rating=100MW

Over Allocated by = Rating-Total Impact
Over Allocated by= 100-150= -50MW

Curtailment =50MW to be at Limit

Entities	Total Impact	Final Allocation
Owner	60	50
CMP RCF	60	30
CMP Non-RCF	20	10
Third Party	10	10
Total	150	100

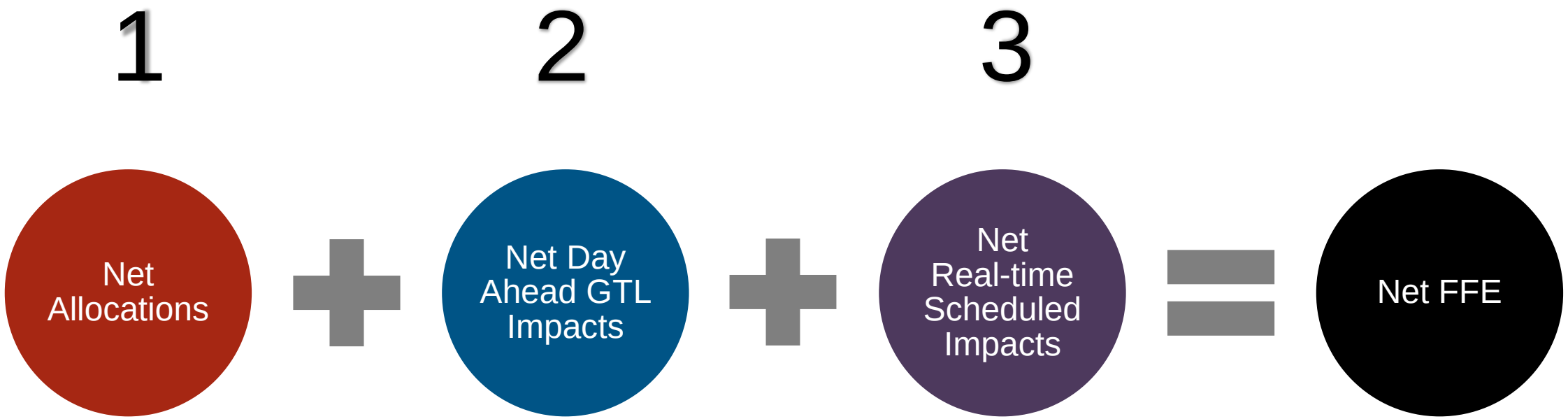
Net Impacts Curtailment for Over Allocation

	B1				B2				B3				Prevailing B4				
Impacts	**Owner**	**CMP RCF**	**CMP Non-RCF**	**Third Party**	**Owner**	**CMP RCF**	**CMP Non-RCF**	**Third Party**	**Owner**	**CMP RCF**	**CMP Non-RCF**	**Third Party**	**Owner**	**CMP RCF**	**CMP Non-RCF**	**Third Party**	**Total**
>5%	10	5		5	10	5		5	5	10			~~5~~	~~5~~			65
>5% rank	1				2				3				9	10			
<5%	10	5	5		5	5	5		10	~~10~~	~~5~~		~~5~~	~~15~~	~~5~~		85
<5% rank	4			N/A	5	6		N/A	7	8		N/A	11	12		N/A	
Total Net Impacts on a Flowgate after curtailment= 100 MW																	

* Red indicates impacts curtailed for 50MW of over allocation to cap the impacts to flowgate rating(100MW)

FFE CALCULATION

FFE Formulation



Input #2 Day-Ahead GTL Impacts

Net Day Ahead GTL Impacts

- Expected GTL usage for each entity tomorrow based on updated topology and load forecast
- 24 hourly values
- Used to identify expected unused allocation or coordinate expected overuse

Input #3 Real-time Schedule Impacts

Net Real-time Scheduled Impacts

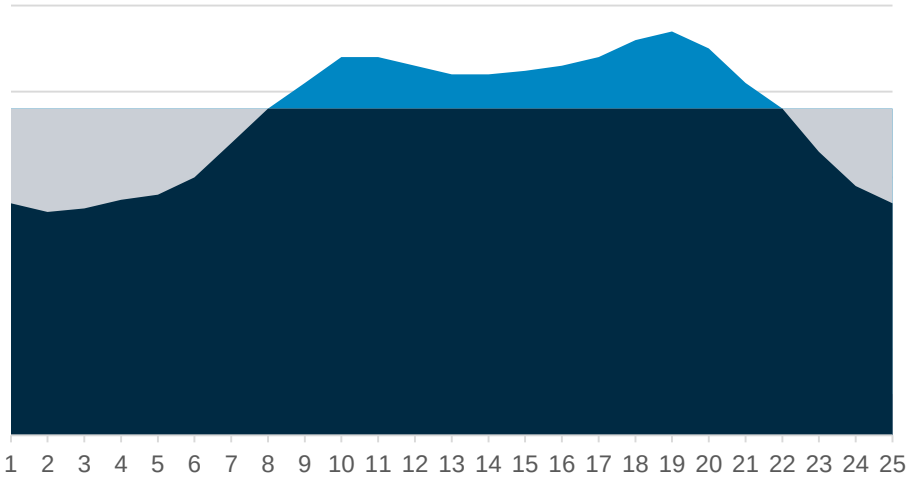
- Scheduled Impacts quantify impact of Interchange Transactions firmed up by Firm PTP TSRs that are included in the Allocation calculation
- These impacts are subtracted from Allocation to remove commercial impacts (GTL)
- Calculated every 15 minutes

Firm Flow Entitlement Calculation

Net FFE

$$If\ (Net\ 2DA\ Allocation - Net\ Schedule\ Impact) < Net\ DA\ GTL$$
$$FFE = Net\ 2DA\ Allocation - Net\ Schedule\ Impact$$

$$If\ (Net\ 2DA\ Allocation - Net\ Schedule\ Impact) > Net\ DA\ GTL$$
$$FFE = minimum\ (Net\ DA\ GTL, Net\ 2DA\ Allocation)$$



- Light blue represents anticipated overuse based on Day Ahead forecast
- Grey represents anticipated under-use
- Dark Blue represents FFE

MARKET FLOW CALCULATION (MFC)

MFC - Granularity Change

PJM and MISO

- Update Market Flow calculation to use current Balancing Authority Area (BAA) granularity when calculating GTL, removing historical granularity

MISO Only

- Process includes Midwest to South sub regional transfer limitations

Other MFC Changes

- Used only for M2M, as PFV GTL will be used with TLR

- The hybrid method will be used to net Interchange Transactions (e-tags) at a source/sink level:
  - Net value for each unique path (source/sink pair)
  - The sum of all net exporting paths from service point decrement generation at that point
  - The sum of all net importing paths into service point will decrement load at that point

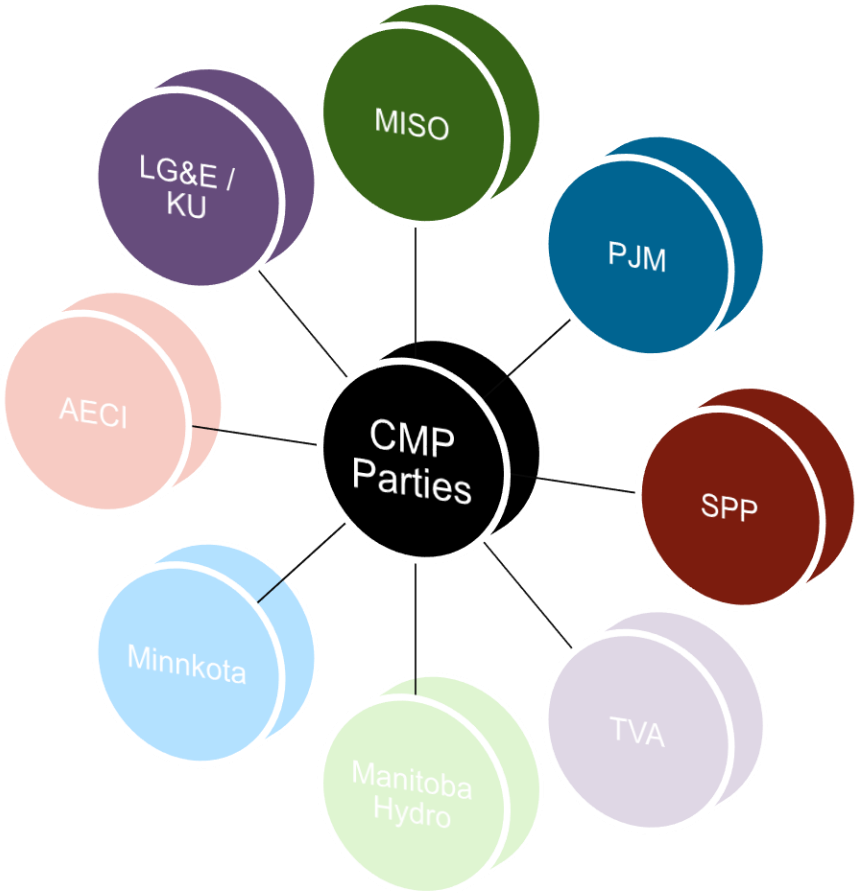
MFC – MISO Sub Regional Limit

- Market Flow will be determined based on Firm Contract Path Capacity

- Aligns approach with allocation process
  - Results in consistent methodologies for settlement process inputs

GENERAL UPDATES

FFL Status



- All CMP entities continue to work on FFL enhancements

FFL Status

- Combined solution is being formulated. Finalizing:
  - Which TSRs should be included
  - Directional vs Net approach
  - How to allocate impacts properly for use in TLR
  - Changes (if any) to the IDC to accommodate PFV for CMP overrides

FFE/FFL Timeline

Task	Description	Anticipated Date	Status
1	Finalize Whitepaper for FFE	Complete	✓
2	Engage OATI for cost and time estimates	Complete	✓
3	Communication and feedback with stakeholders	Ongoing	★
4	Start CMP Language Drafting	Ongoing	★
5	Evaluate inclusion of FFL solution*	Q4 2020	★
6	FERC Prefiling Meetings	Q1 2021	★
7	FERC Filing	Q2 2021	★
8	Start Development and Testing	Q2 2021	★
9	Implementation	6/1/2022	★

* CMPWG will continue to work on conceptual agreement to FFL in parallel

Freeze Date Whitepaper

Freeze Date Straw Proposal was posted for August 2018 JCM

https://www.pjm.com/-/media/committees-groups/stakeholder-meetings/pjm-miso-joint-common/2020/20200818/20200818-item-01-freeze-date-straw-proposal-ffe-solution.ashx

Contacts

Solicit stakeholder feedback – send comments to:

- Matt Sutton msutton@misoenergy.org
- Zhaoxia Xie zxie@misoenergy.com
- Joe Ciabattoni Joseph.Ciabattoni@pjm.com
- Joe Rushing Joseph.Rushing@pjm.com