

A decorative graphic consisting of a thin yellow circle on the left. A thick horizontal bar with a gradient from olive green to white is positioned across the middle. A large black left square bracket is on the left side of the bar, and a large yellow right square bracket is on the right side of the bar. The text "Electricity 101" is centered on the bar.

Electricity 101

Presented to the GECTF
January 29th, 2004

[Electricity 101]

- Agenda
 - Overview of Electricity
 - The Scheduling Process
 - “Day in the Life of a Transaction”
 - Congestion Management Overview
 - Settlement Credit Overview
 - Summation

[Introductions]

- Kalim Tippitt - The Structure Group
- Andrew Rodriguez - PJM

- Michael Gildea – Constellation

Why Is Electricity So Difficult Compared to Gas?

- No Real Storage
 - Need to match Supply and Demand in Real Time
- Requires the coordination of fuel management
- Highly interconnected transmission systems
- Many Entities, Few Standardized Rules
 - 170 different Transmission Providers and Open Access Transmission Tariffs (OATTs)
- Complexity of the Commodity
 - Reactive Power, Pumped Storage, Loop Flows, etc...
- Conflicts between Federal and States Rights
 - Is deregulation good or evil

[Overview]

- Concepts and Historical Background
- Open Access Same-time Information System
- Transaction Information System

[Entities]

- North American Energy Standards Board (NAESB)
 - Market-based Standards
- North American Electric Reliability Council (NERC)
 - Reliability Standards
- Regional Reliability Organizations (RROs)
 - The 10 Regional Councils that make up NERC. Focused on regional/local reliability concerns
 - ECAR, SERC, MAIN, MAPP, MAAC, FRCC, NEPOOL, ERCOT, WECC, SPP

[Entities]

- Federal Energy Regulatory Commission (FERC)
 - Wholesale Transactions and Markets, Interstate Commerce
- Public Utility Commissions (PUCs)
 - Retail Transactions and Consumer Choice

[Entities]

- Transmission Providers (TPs)
 - Administer Local Transmission Tariffs and Provide Grid Operations. Approximately 150.
- Regional Transmission Organizations (RTOs) and
- Independent System Operators (ISOs)
 - Generally Operate Regional Markets, Administer Regional Transmission Tariffs, and Provide Grid Operations. Typically created by several TPs giving control to an independent entity.
 - ERCOT, PJM, MISO, ISO-NE, NYISO, Cal ISO, IMO

[Entities]

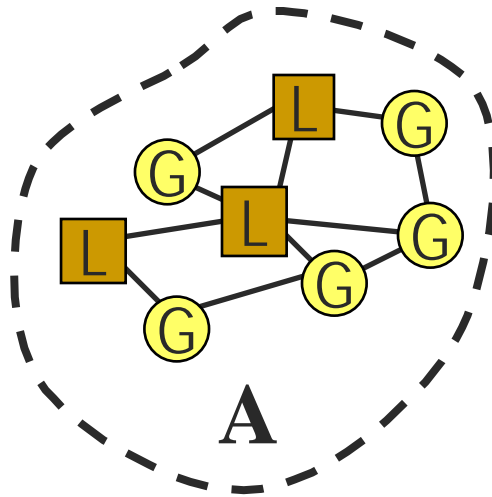
- Control Areas (CAs)
 - Metered areas required to maintain balanced generation and load (maintain Area Control Error (ACE)). Approximately 120.
- Purchasing/Selling Entities (PSEs)
 - Entities that purchase and sell energy. May or may not own generation or have obligation to serve load. Approximately 900.
- Generation Provider Entities (GPEs),
- Non-Utility generators (NUGs)
and
- Independent Power Producers (IPPs)
 - Owners of generation that sell energy and/or capacity.

[Entities]

- Load Serving Entities (LSEs),
- Large Industrial Customers,
and
- Transmission Dependent Utilities (TDUs)
 - Wholesale consumers of Power.
- Non-Jurisdictional Entities (NJE)
 - TVA, BPA, WAPA
- Municipals, Cooperatives

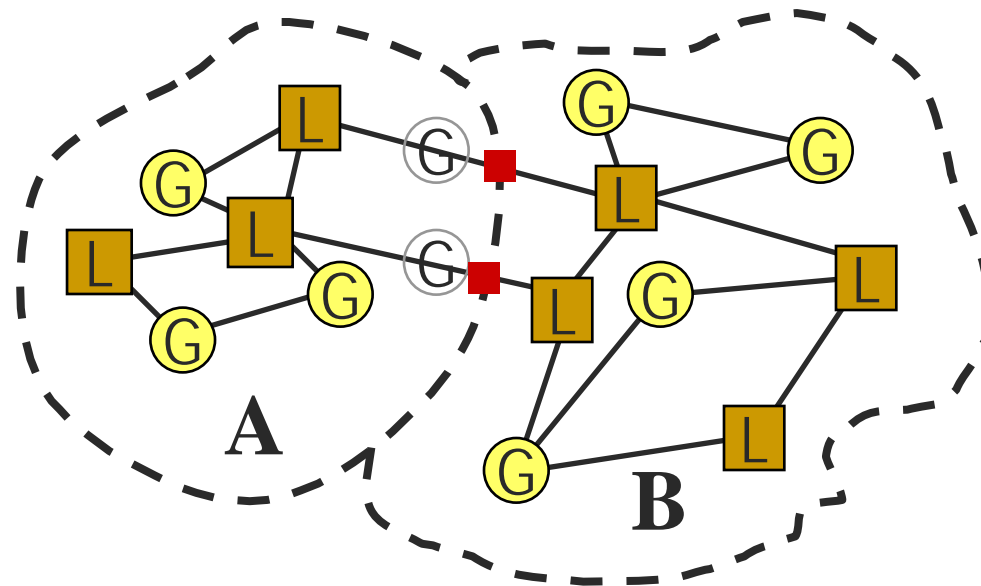
Historical Background

- Electrically Isolated Systems
 - Expensive to Address Reserve Needs
 - Not as Reliable due to Transient Effects



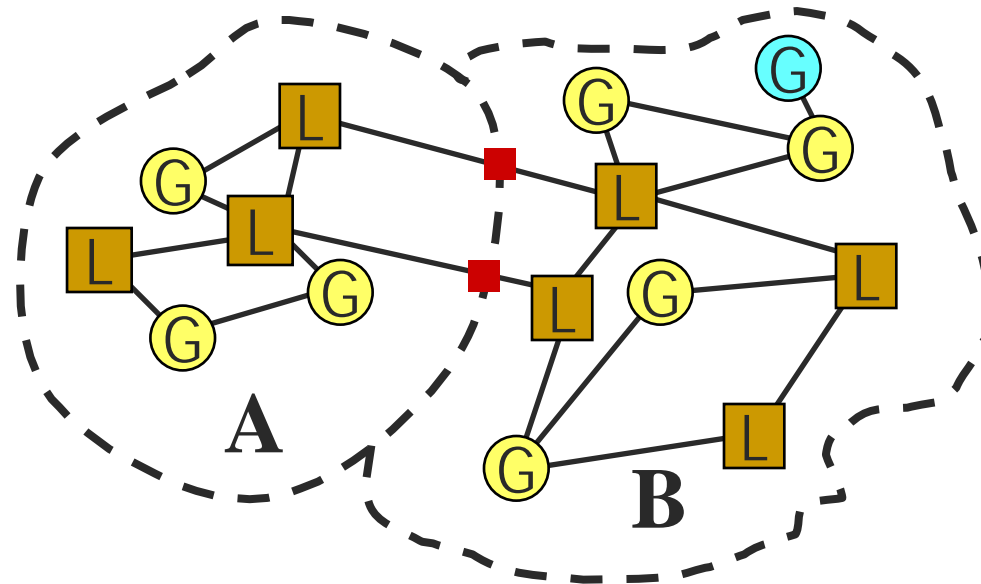
Historical Background

- Interconnected Systems
 - Allows for “Reserve Sharing”
 - Distributes Transient Effects
 - Allows for Purchase/Sale of Economy Energy



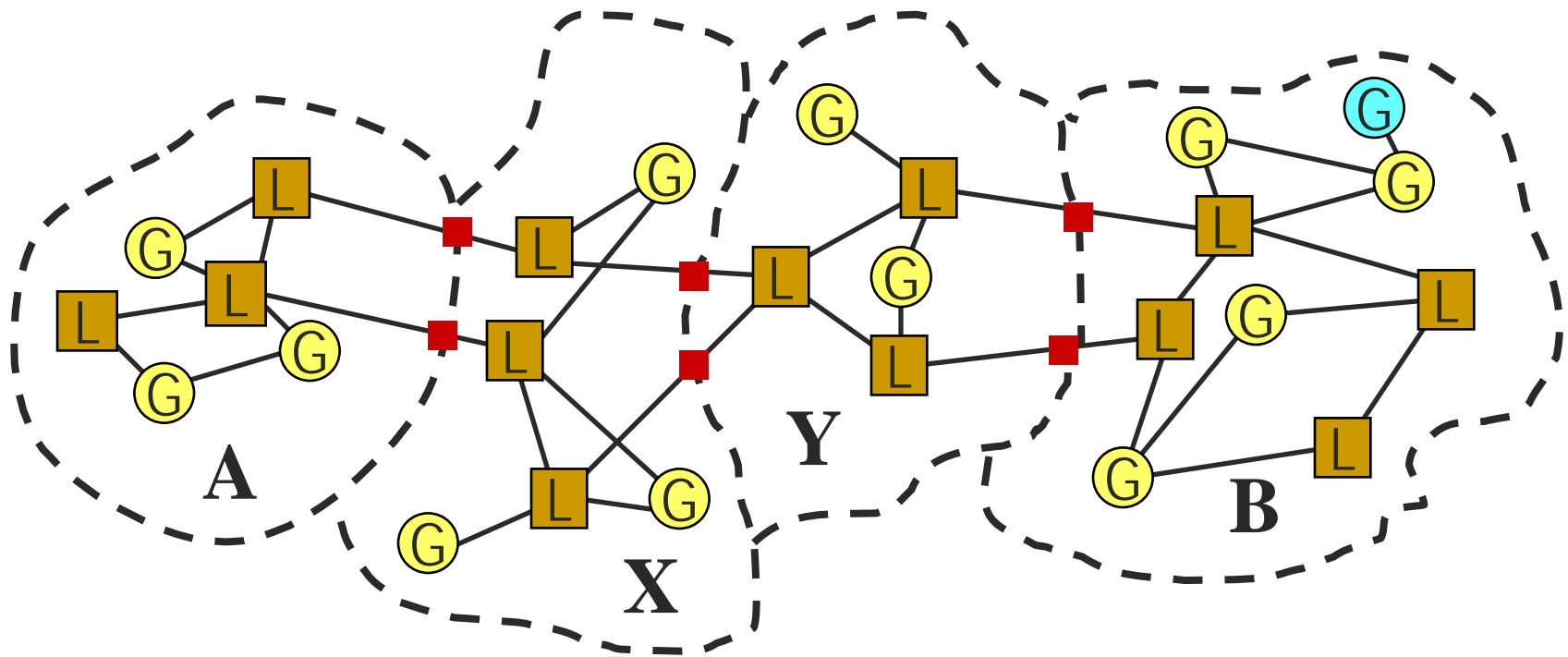
Historical Background

- The Energy Policy Act
 - Exempt Wholesale Generators
 - Wholesale Wheeling

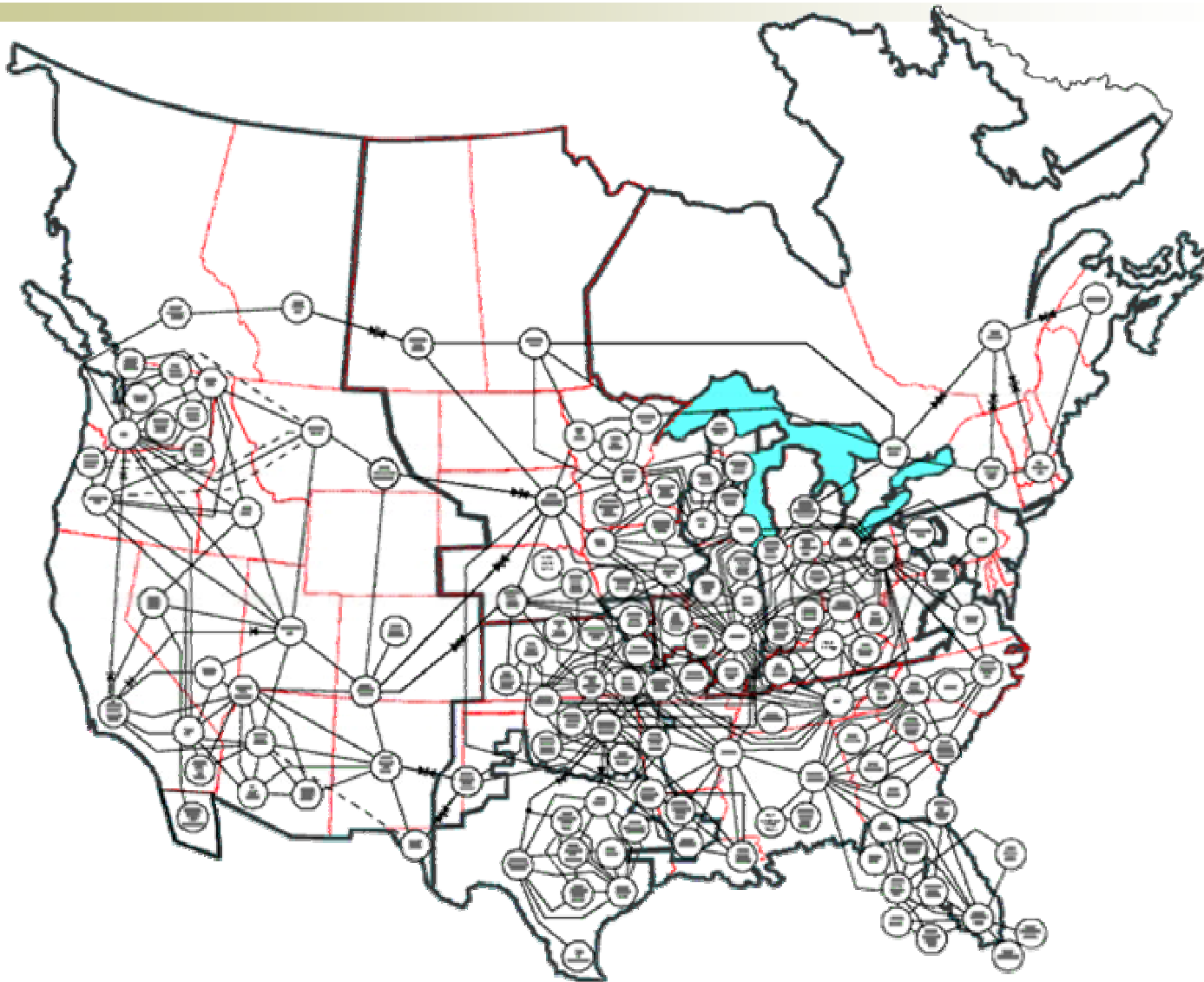


Historical Background

- Wholesale Wheeling



NERC Control Areas



[Historical Background]

- FERC Order 888
 - Functional Unbundling
 - Pro Forma Tariff
- FERC Order 889
 - Standards of Conduct
 - Open Access Same-time Information System
 - Standards and Communications Protocols

[Goals of the OASIS]

- Allow transmission customers to :
 - Request and offer service
 - Obtain transmission system information
 - Obtain product information
 - View denials and curtailments
 - Obtain data for modeling and audit purposes

[OASIS Postings]

- Available Transmission Capacity
- Total Transmission Capacity
- Transmission Products and Prices
- Ancillary Service Offerings and Prices
- Specific Requests and Responses
- Transmission Service Schedules

[OASIS]

- Accessed over the Internet
- Several nodes across North America
- One node may host several providers

Typical OASIS Site

- General Information
- Transmission Services
- Ancillary Services
- Miscellaneous
- Messages

GENERAL INFORMATION

75% Discount Jan 10 - 23.....See Disc

| General | Tariff | Transmission |
|--|---|---|
| INFO.HTM | Regional Tariff | Transmission Loading Relief |
| Email List Sign-up | Price Matrix | Flowgate Definitions |
| Organizational Information | Discounts | ATC Indices |
| Code of Conduct | Scheduling & Reactive Rates | Curtailments |
| Computer Outage Policy | Provider Tariff Revenue | Studies |
| Node Maintenance | Tariff Customer List | CBM |
| Performance Log | | |

TRANSMISSION SERVICES

- [QUERY Service Types](#)
- [QUERY Offerings](#)
- [QUERY Requests](#)

- [POST Offering](#)
- [UPDATE Offering](#)

- [SUBMIT Request](#)
 - [Next Hour](#) [Next Day](#)
- [POST Reassignment](#)
- [POST Alternate POR/POD](#)

ANCILLARY SERVICES

- [QUERY Service Types](#)
- [QUERY Offerings](#)
- [QUERY Requests](#)

- [POST Offering](#)
- [UPDATE Offering](#)

- [SUBMIT Request](#)

MISCELLANEOUS

- [QUERY Schedules](#)
- [QUERY Curtailments](#)

- [POST Schedule](#)

MESSAGES

- [QUERY Messages](#)
- [QUERY Standards Of Conduct](#)
- [QUERY Personnel Transfers](#)
- [QUERY Discretion](#)

- [POST Message](#)
- [POST Standards Of Conduct](#)
- [POST Personnel Transfers](#)
- [POST Discretion](#)

[Transmission Firmness]

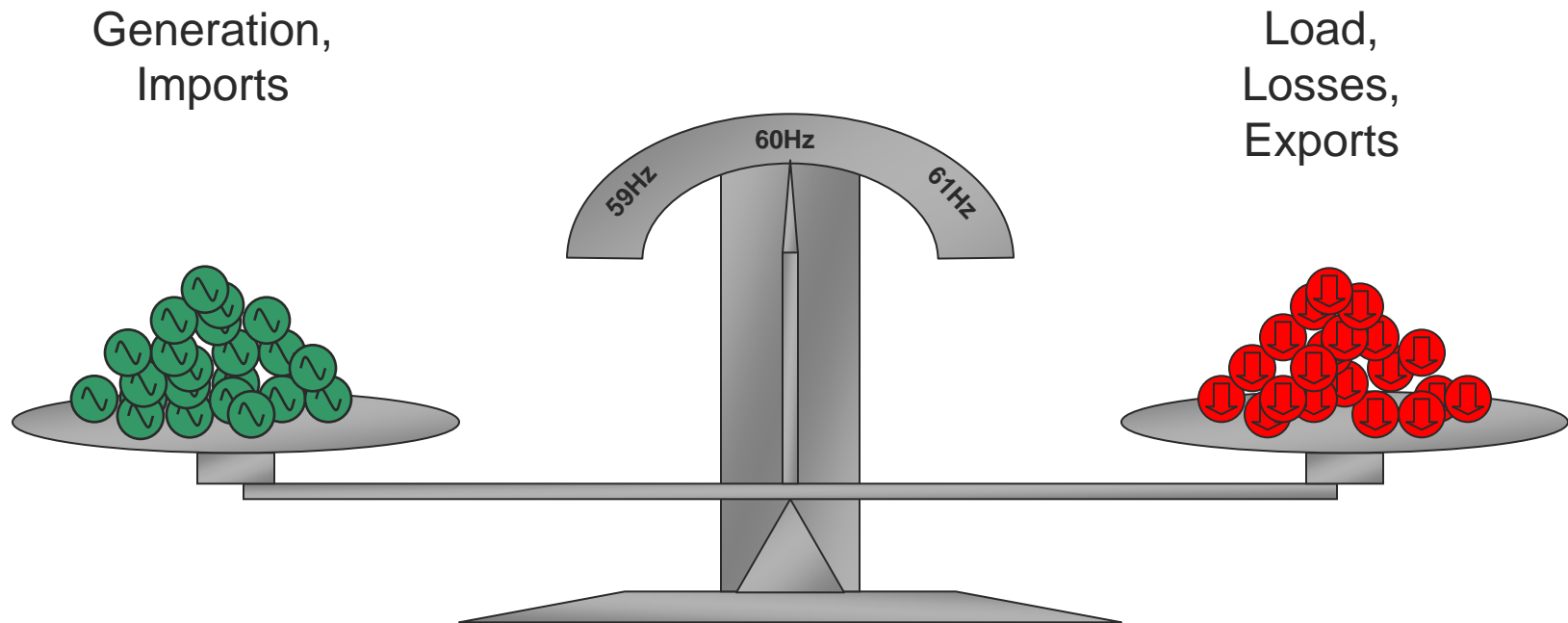
- Firm
 - Priority 7
- Multiple Levels of ‘Non-Firmness’
 - Based on duration
 - Network, Monthly, Weekly, Daily, Hourly, Secondary (Redirected), Next-Hour
 - Priorities 6-0

[Ancillary Services]

- Required of Load to support system
- Transmission provider is Provider of Last Resort (POLR)
- Tradable Capacity (different names per market)
 - Spinning Reserves - < 10 Minute Product
 - Supplemental Reserves - < 30 Minute Product
 - Regulation & Frequency Control
- Centrally Managed (typically)
 - Scheduling & Dispatch
 - Reactive Power & Voltage Support
 - Imbalance
 - Black Start

[Frequency]

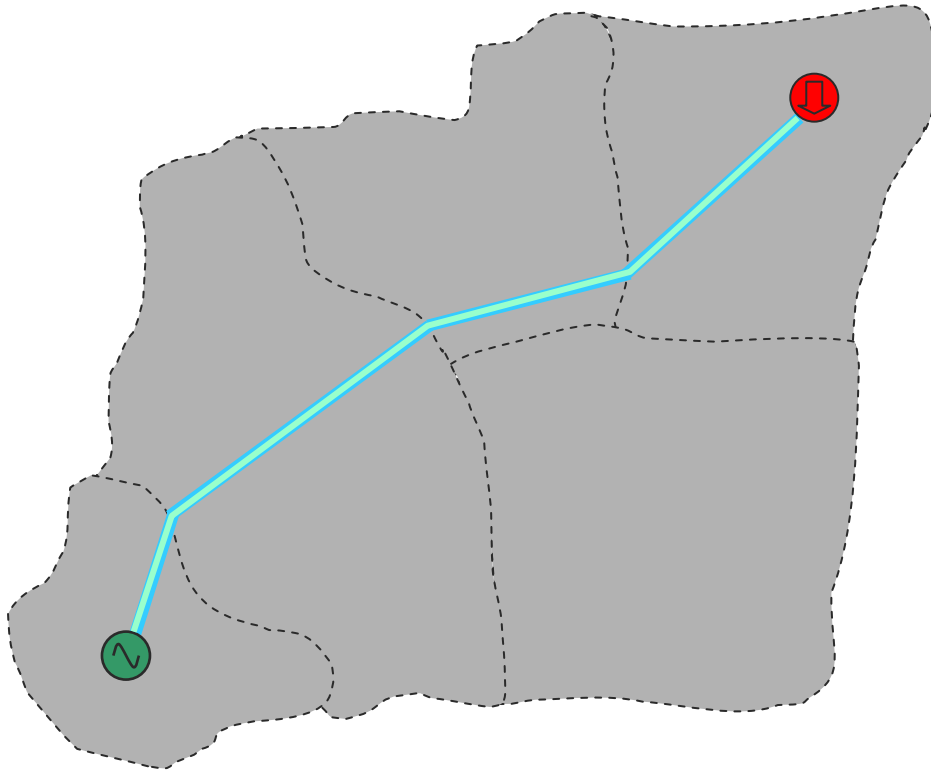
Maintaining the Energy Balance 60Hz



Transmission Service

- Point to Point Transmission service
 - PTP refers to the kind of service use in *interchange transactions* (moving energy from one Control Area to another)
 - Interchange transactions are Tagged (i.e., NERC mandates information describing the transaction be reported to the IDC)
 - Point to Point service is what most people think of when you talk about *transmission reservations* on the OASIS

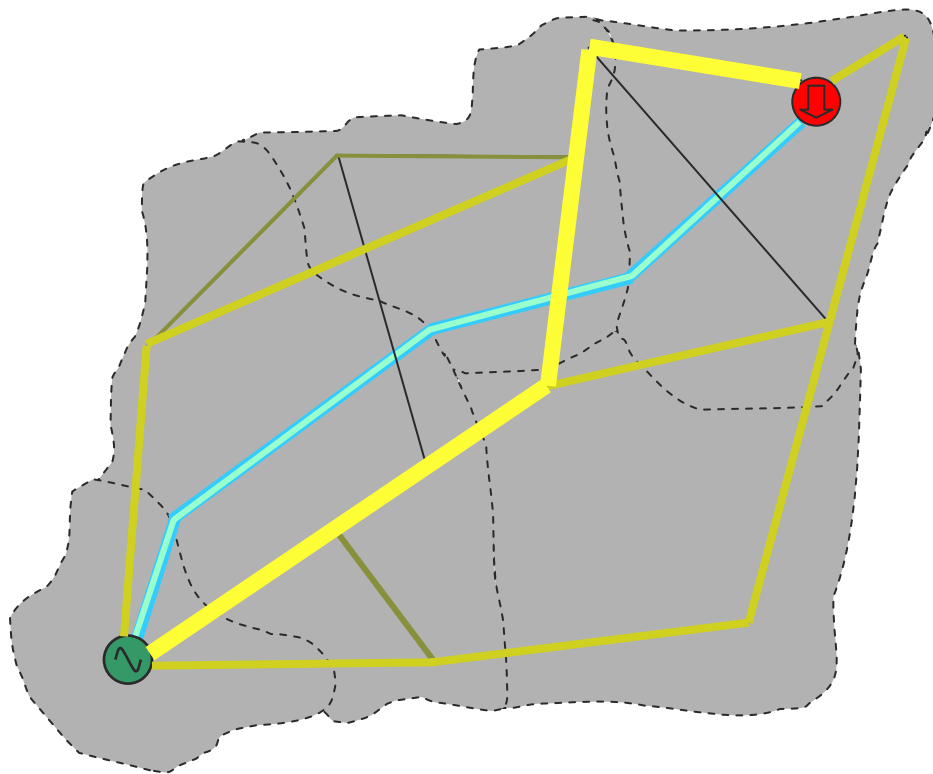
[PTP - Example]



4 “legs” of PTP service

1 “Contract Path”

PTP - Example



4 “legs” of PTP service

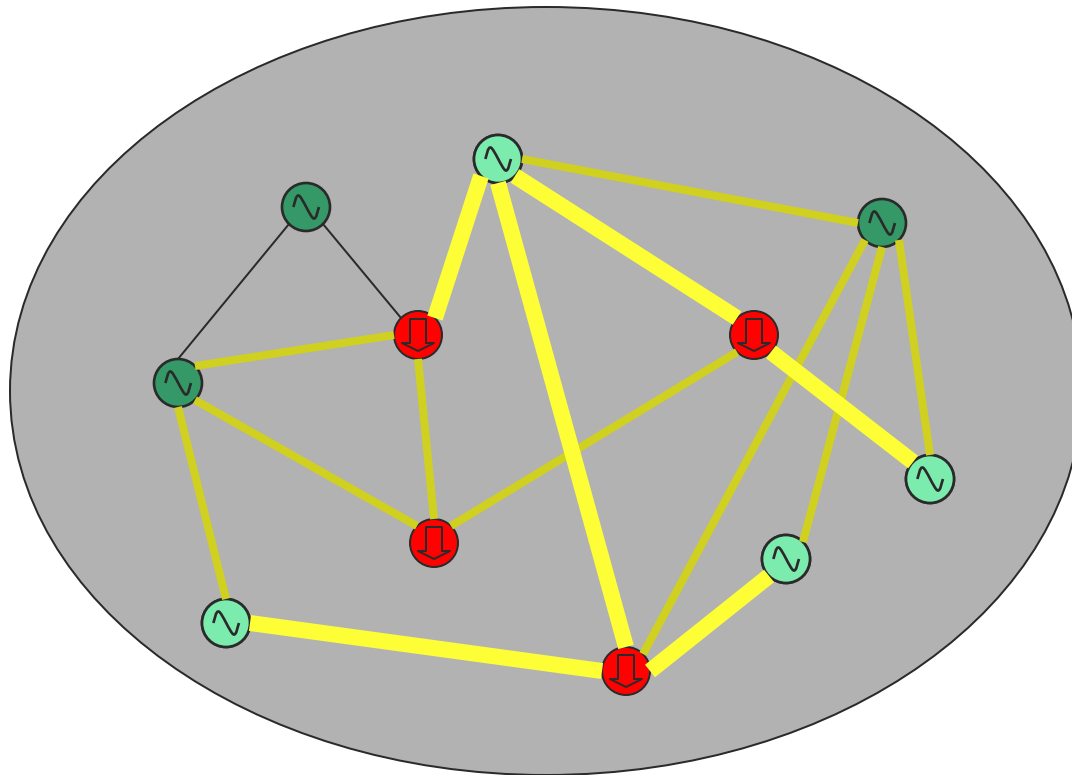
1 “Contract Path”

Flows due to Point to Point

[Transmission Service]

- Network Integrated Transmission Service
 - NITS is transmission service used to serve *native load with designated network resources*
 - Designated resources are generators that have met certain deliverability criteria and been specified by the transmission customer as used to serve their customers
 - Native load is load *internal* to the Control Area that would historically be served by the incumbent utility

[NNL - Example]



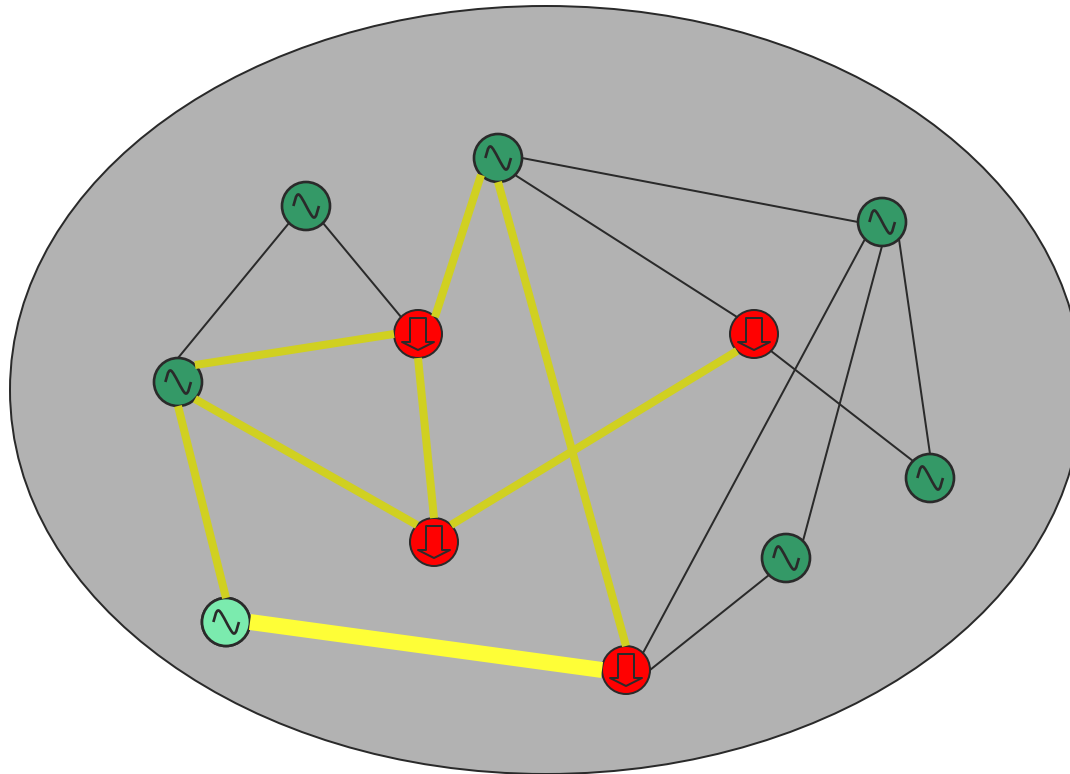
Designated
Resources

Flows due to
NNL

[Flowgates]

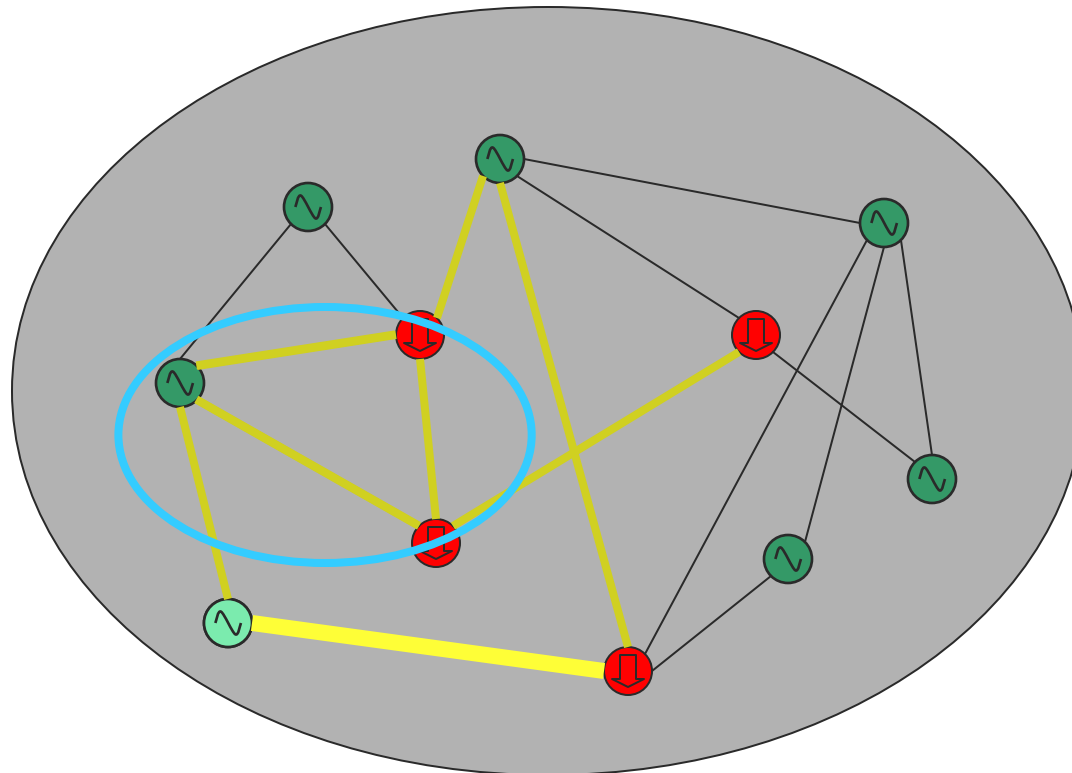
- A *flowgate* is a representative aggregate of one or more transmission elements to be used in the analysis of the transmission system

[Flowgates]



Impact of this
specific
designated
resource

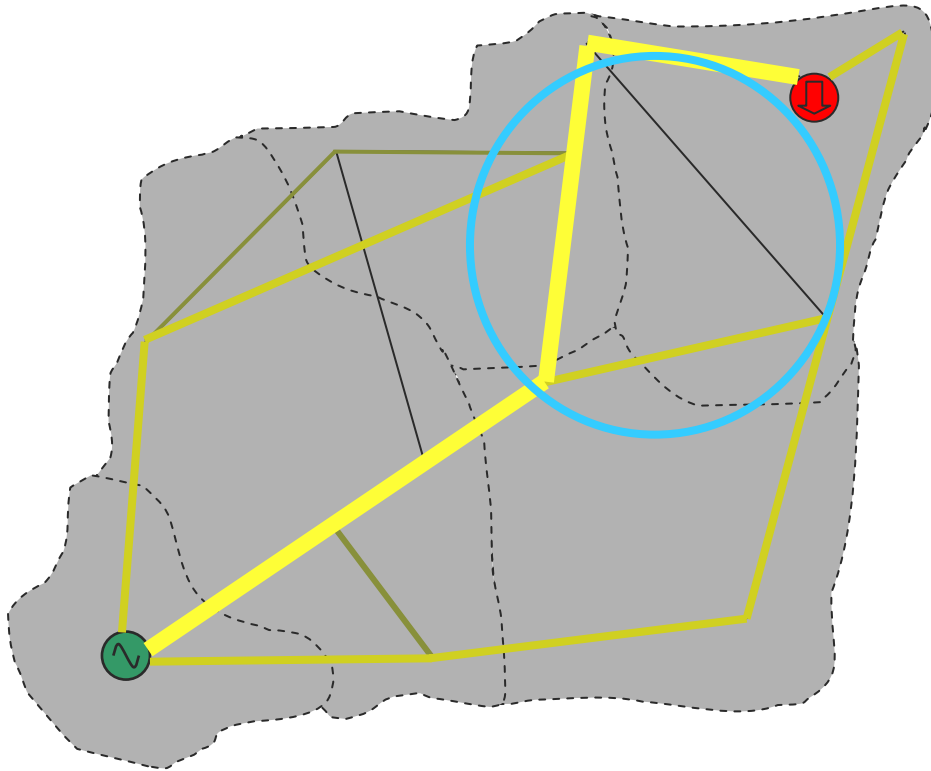
Flowgates



Impact of this
specific
designated
resource

On this specific
flowgate

[Flowgates]



Impact of this
Interchange
Transaction on this
particular flowgate

[AFC/ATC and TTC]

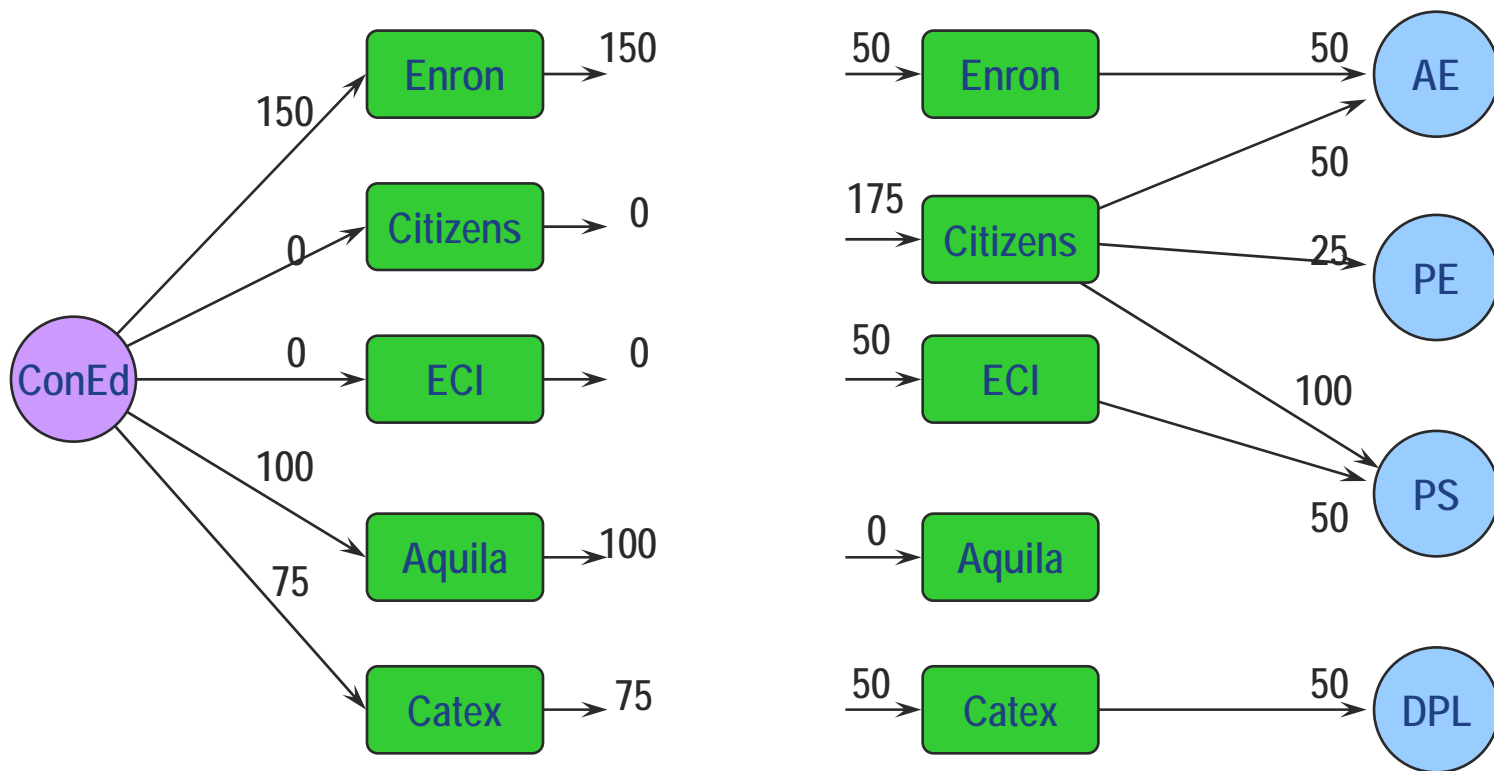
- Flowgates are used to discuss the flows of energy transfers
- When someone requests transmission on the OASIS, providers:
 1. Identify affected flowgates
 2. Determine Available Flowgate Capacity for each flowgate
 3. Limit Available Transfer Capability based on the most constrained AFC
 4. If the ATC is less than the impact of the transmission request, the request is denied

Transaction Information System (Electronic Tagging)

- Documents Interchange Transactions
 - Identifies “Source to Sink” flows
 - Provides common link for all parties
 - Indicates
 - Losses
 - Transmission Reservation
 - Contract Information

Transaction Information System

NYPP-PJM, 9/13/95, HE 1200

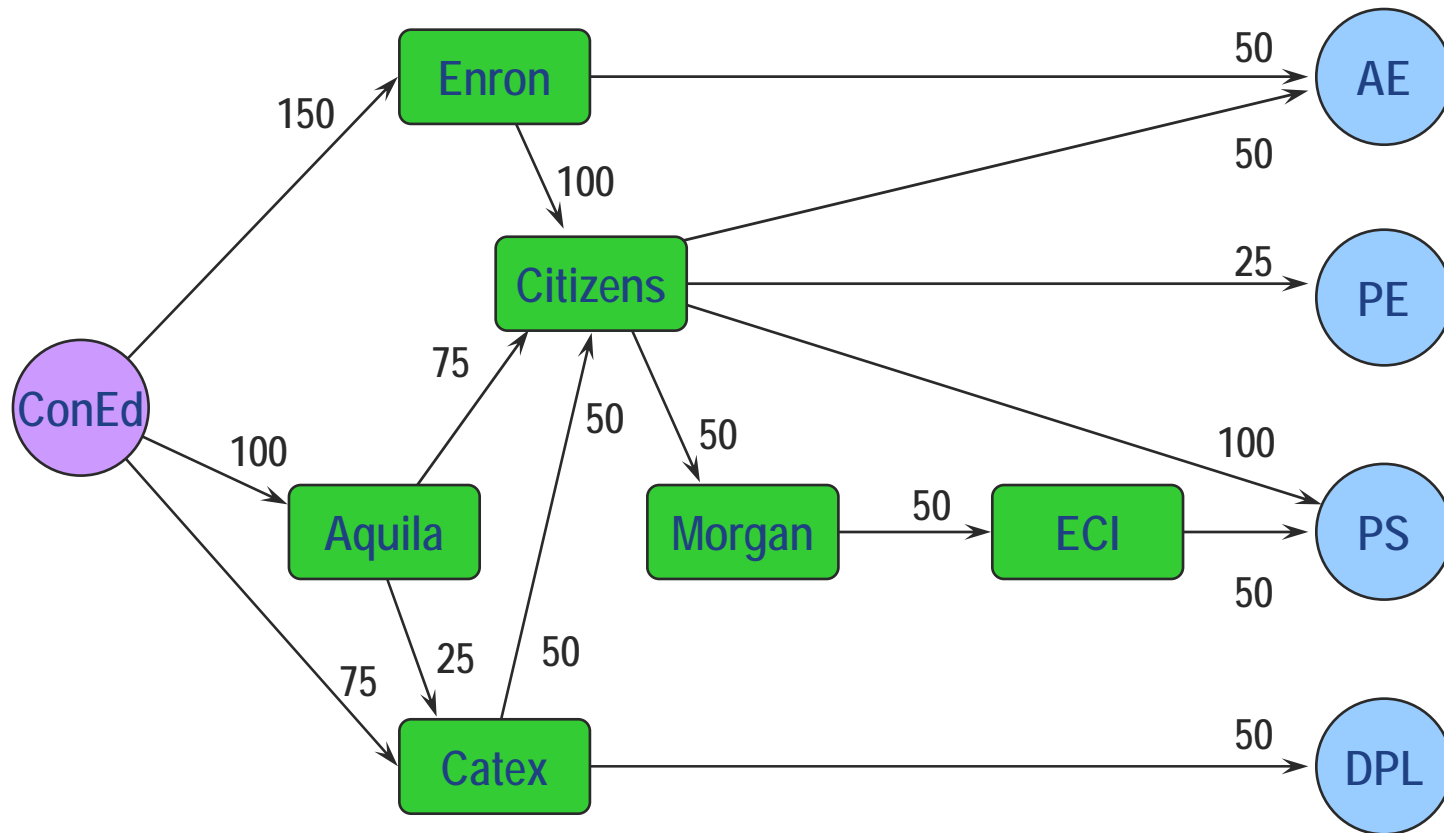


Reported by NYPP

Reported by PJM

Transaction Information System

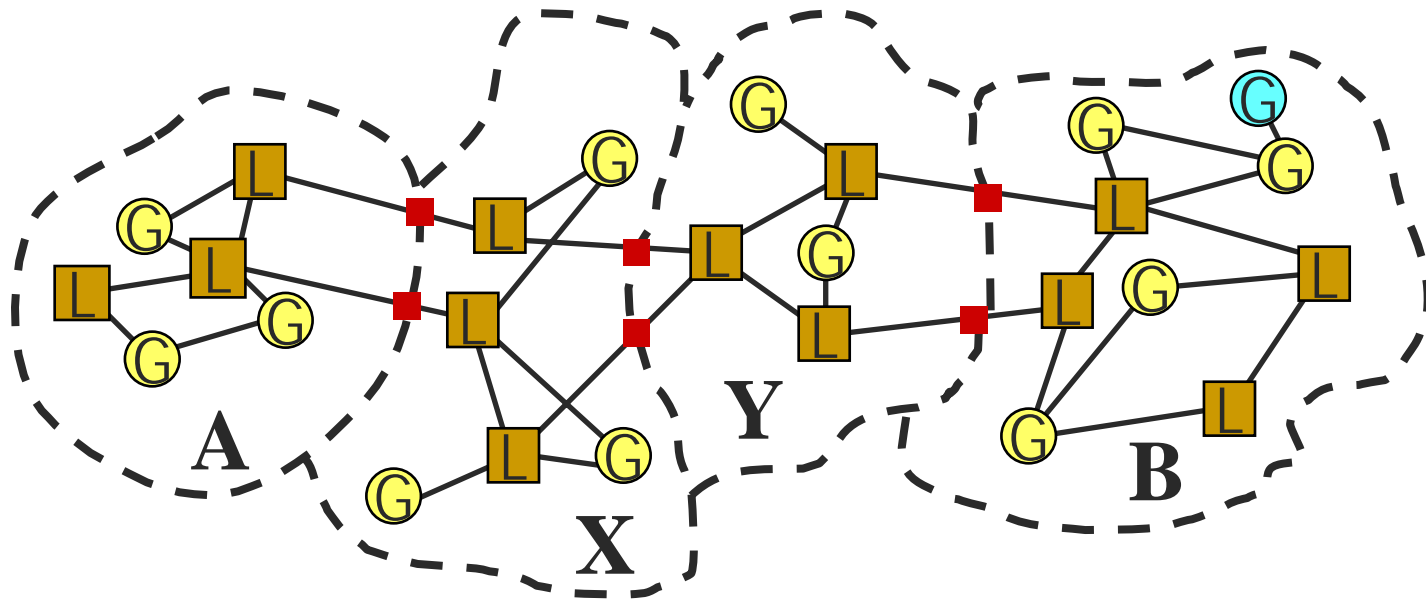
NYPP-PJM, 9/13/95, HE 1200



Resolution

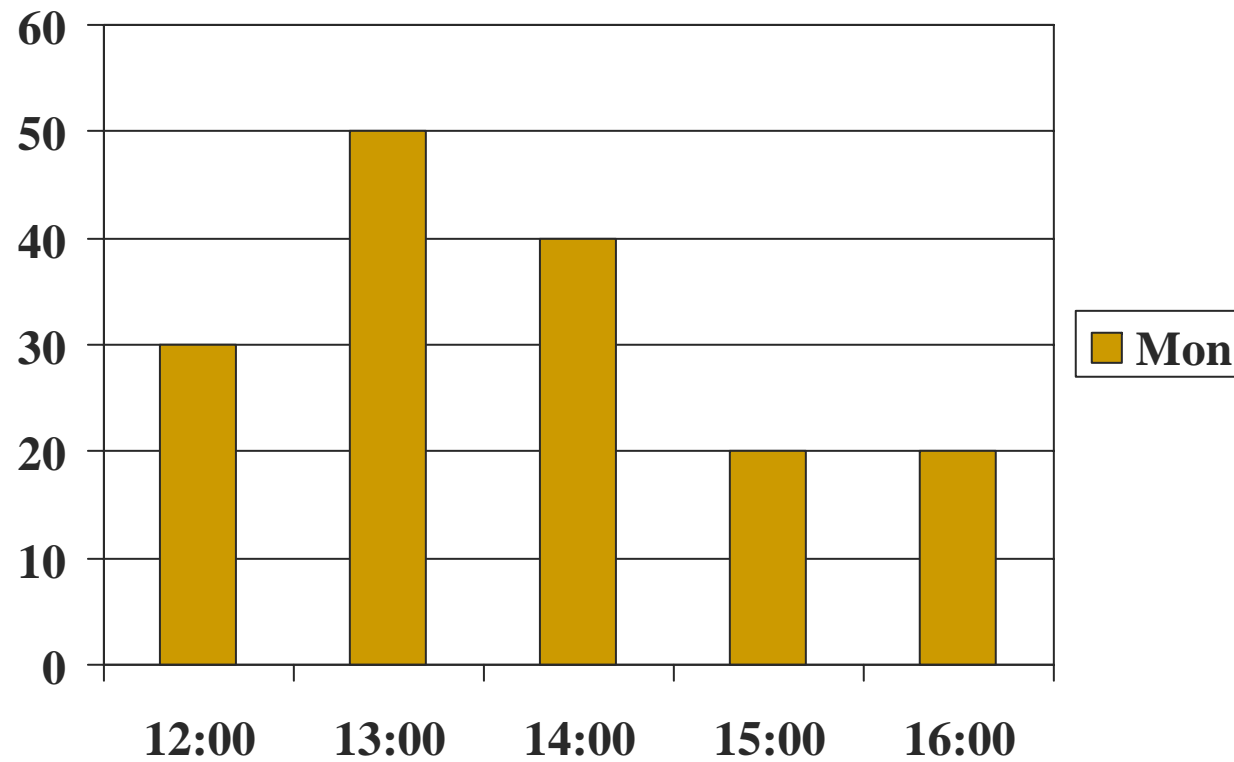
Transaction Information System

- Transaction Path



Transaction Information System

■ Energy Profile



[Transaction Information System]

- Information exchanged over the Internet
- Transaction “Tags” are Approved or Denied by Control Areas and Transmission Providers
- Approved transactions are forwarded to the Interchange Distribution Calculator

[Interchange Distribution Calculator]

- Accepts Tags as Input
- Uses source/sink data from tag to model actual physical flows
- Identifies need for curtailments to mitigate line overload conditions

A Day In the Life of a Transaction

- Day Ahead Perspective
 - Trading
 - Scheduling
- Real Time Perspective
 - Trading
 - Scheduling
- Settlement Overview
 - Credit Implications



[Trading Overview]

- Real Time, Short Term, Long Term
- Day Ahead - Evaluate Position by Control Area/ISO/Trading Hub
 - Unit Status
 - Fuel Availability
 - Load Forecast
 - Weather Forecasts
 - Transmission Outages/Availability

[Trading Overview]

- Traders will flatten out or take a Long or Short position in the market
- Scheduler left with physical transaction
 - What to do?

[Tag Timeline]

- Most day ahead business is conducted from 6:00 am to Noon (Tags and schedules typically have a 12:00 noon deadline)
- From noon to end of day is primarily spent checking out and preparing books for hourly desk and next day.

[Timing Conventions]

- Power is traded
 - On Peak – 7 to 22, 8 to 23
 - Off Peak – everything else
 - Super Peak
 - Hourly
 - Balance of Week
 - Balance of Month
 - Monthly
 - Term
- Delivery hours are quoted in Hour Ending (HE)
 - HE1 is Hour Ending 1, or 12:00 midnight to 1:00am
- Day Light Savings Time

[Scheduling]

- Transmission Availability
- Booking Out
- Purchasing Transmission
- Tagging
- ISO Scheduling

[Checking Availability]

- In order to determine if a path is viable for scheduling, ATC or AFC must be checked on the OASIS

Closing Out Physical Positions

- Scheduler has unmatched buys and sells per trading hub
- Bookouts – attempt to match buys and sells to eliminate delivery risk and cost of transmission (net the position to zero; booked out financially)
- Physical Schedules – that which could not be booked out must be physically scheduled and delivered
- ATC/AFC must be kept in mind, along with existing transmission portfolio

Submit Transmission Requests

- Daily Firm requests (on most providers) must be entered in no later than 10am CST the day prior to the start of service.
- Once a request is submitted it is given an “Assignment Reference” number (A-Ref or OASIS Number).
- Request may be granted or refused based on TP evaluation.

[Losses]

- Similar to Shrinkage associated with Compressor Stations
- Transmission Lines utilizes some energy based on friction as electricity is transported
- Each Transmission Provider has their own loss rate/calculation and rules
- Financial or Physical

[Tags]

- All day ahead transaction information resides in Tag
 - Energy Profile
 - Loss Profile
 - Transmission Reservation A-Refs
- As well as contract path (wheeling) and title path (ownership) of energy
 - Generator/Seller/Source
 - Transmission Provider(s)
 - Imports, Exports, and Wheels
 - POR/PODs and Firmness
 - Marketer(s)
 - Load/Buyer/Sink

[Tagging Nuances]

- Horizontal Stacking
 - Utilizing multiple reservations over multiple hours (i.e., one reservation for off peak, one for on-peak)
- Vertical Stacking
 - Utilizing multiple reservations over the same hours (i.e., reservation 1 for 75MW, reservation 2 for 25MW, total transfer for the hour 100MW)

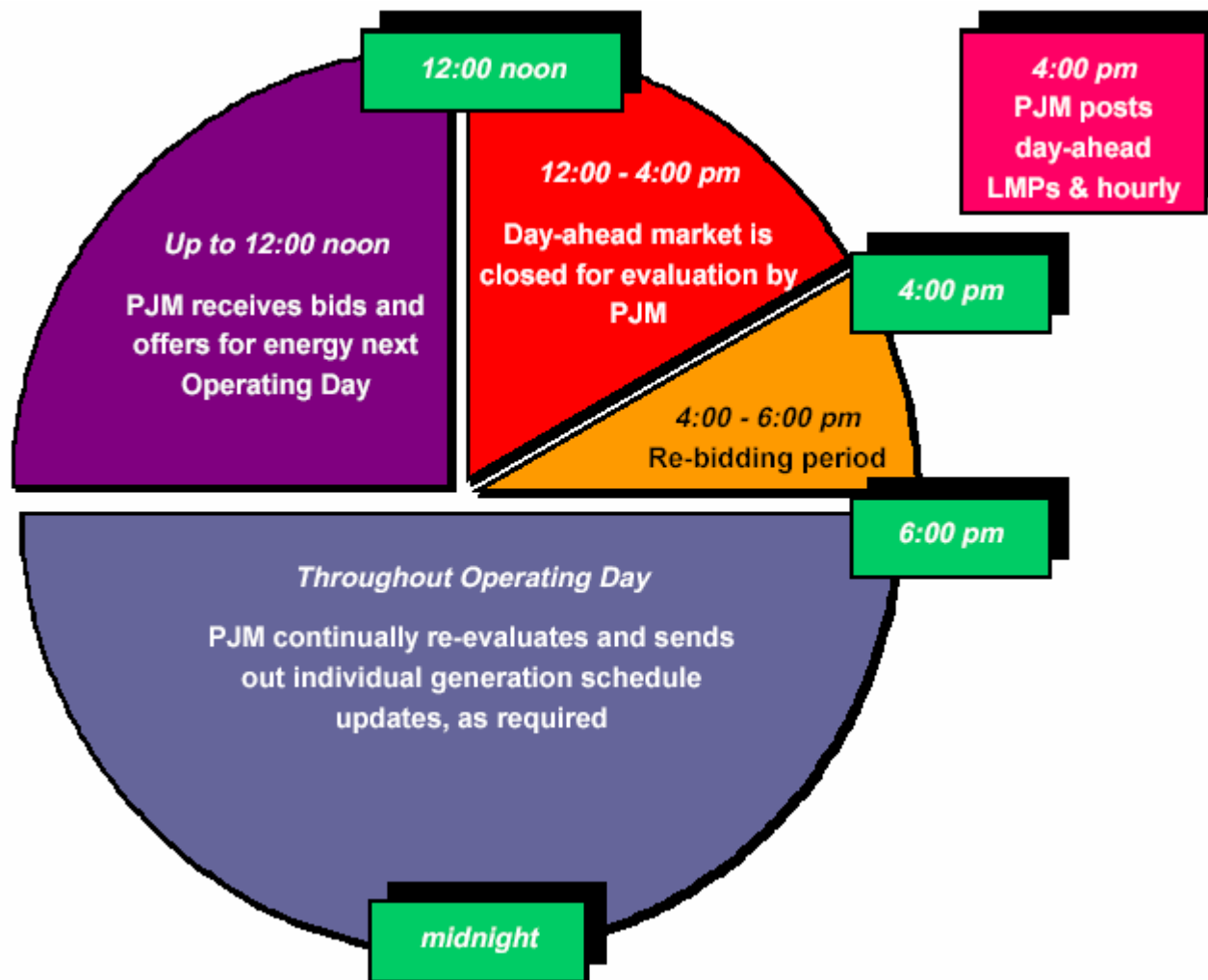
[RTO/ISO Schedules]

- RTOs and ISOs have their own scheduling requirements
- Ramp – PJM , for example, requires all imports to verify that there is room on the interface
 - PJM allows you to move the schedule if ramp not available (745-2145)
- Contract – PJM, NE require a contract exists between the two transacting parties

[RTO/ISO Schedules]

- ISO Schedule
 - Some ISOs require a schedule be submitted in addition to the Tag
 - Including your energy profile
- Resource Plan
 - For each unit, provide all operating parameters
- More confirmations
 - Both counterparties confirm their schedules

PJM Day-Ahead -Timeline



[Checking Out]

- Following scheduling, values are confirmed one final time to ensure everything is balanced

[Real Time]

- We spent all this time scheduling Units and Transmission, Booking out, etc...
- Then everything falls apart in Real Time
- Hourly transaction occur “day-of” flow

[Real Time]

- Each hour, trading “opportunities” are identified and utilized
 - Unplanned Unit Outage
 - Arbitrage Opportunities
 - Adjust for deviations between forecasted load and generation
- Transmission Constraints and Curtailments also drive need for real time trading
- Typically, trading is done from the top of the hour to the bottom of the hour (xx:00 to xx:30)

[Tag Timelines]

| Transaction Duration | PSE Submit Deadline | Actual Tag Submission Time | Provider Assessment Time | Time to Start of Transaction |
|----------------------|---------------------------|-------------------------------|-------------------------------|------------------------------|
| Less than 24 Hours | 20 Minutes prior to start | ≤1 Hour prior to start | ≤ 10 Minutes from tag receipt | ≥ 10 Min |
| | | >1 to <4 hours prior to start | ≤20 Minutes from tag receipt | ≥ 40 Min |
| | | ≥ 4 Hours prior to start | ≤ 2 Hours from tag receipt | ≥ 2 Hours |
| 24 Hours or longer | 4 Hours prior to start | Any | ≤ 2 Hours from tag receipt | ≥ 2 Hours |



OASIS Timelines

| Class | Service Increment | Time Queued Prior to Start | Provider Evaluation Time Limit | Customer Confirmation Time Limit After Accepted or Counteroffer | Provider Counter Time Limit After Rebid |
|----------|-------------------|----------------------------|--------------------------------|---|---|
| Non Firm | Hourly | <1 Hour | Best effort | 5 mins | 5 mins |
| | | >1 hour | 30 minutes | 5 mins | 5 mins |
| | | Day ahead | 30 minutes | 30 mins | 10 mins |
| | Daily | N/A | 30 minutes | 2 hours | 10 mins |
| | Weekly | N/A | 4 hours | 24 hours | 4 hours |
| | Monthly | N/A | 2 days | 24 hours | 4 hours |
| Firm | Daily | <24 hours | Best Effort | 2 hours | 30 mins |
| | | N/A | 30 days | 24 hours | 4 hours |
| | Weekly | N/A | 30 days | 48 hours | 4 hours |
| | Monthly | N/A | 30 days | 4 days | 4 hours |
| | yearly | 60 days | 30 days | 15 days | 4 hours |

[Congestion Mgmt]

- Due to imperfect analysis and the gap between contract path and reality, it can be difficult to ensure the system is capable of meeting the demands placed upon it
- Procedures used to mitigate anticipate or unforeseen overloads are called Congestion Management

Eastern Interconnection - NERC TLR

- Marketers write tags that document energy flow from Generator to Load
- Tags are uploaded to the Interchange Distribution Calculator
- The IDC analyzes each tag for impacts on various flowgates using TDFs
- The IDC also analyzes expected NNL flows using GLDFs
- When congestion occurs (TLR), the IDC tells which transactions and flows to cut based on service priority and impact
- As the transactions and congestion change, the IDC tells how to reload and reallocate
- TLR 3 curtails non-firm (priorities 0-6)
- TLR 5 curtails firm (priority 7)

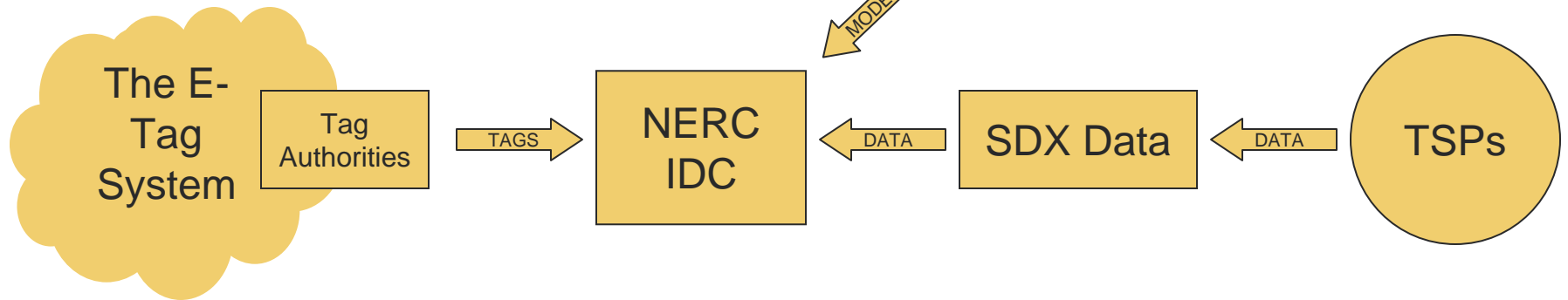
[The IDC]

- Uses various *Distribution Factors* to estimate relief requirements
- Additional Complexity
 - The IDC looks at *Transmission Priority*, the location of the constraint, the path of the transaction, and numerous other factors when utilizing TDFs for Point-to-Point service
 - Transmission Priority refers to the “firmness” of the service. NERC recognizes 8 levels of firmness:
7-Firm, 6-Non-Firm-Network, 5-Non-Firm-Monthly, 4-Non-Firm-Weekly, 3-Non-Firm-Daily, 2-Non-Firm-Hourly, 1-Non-Firm-Redirected, and 0-Non-Firm-Next-Hour

How TLR Works Today

Point to Point
service is "Tagged"

IDC Estimates NNL

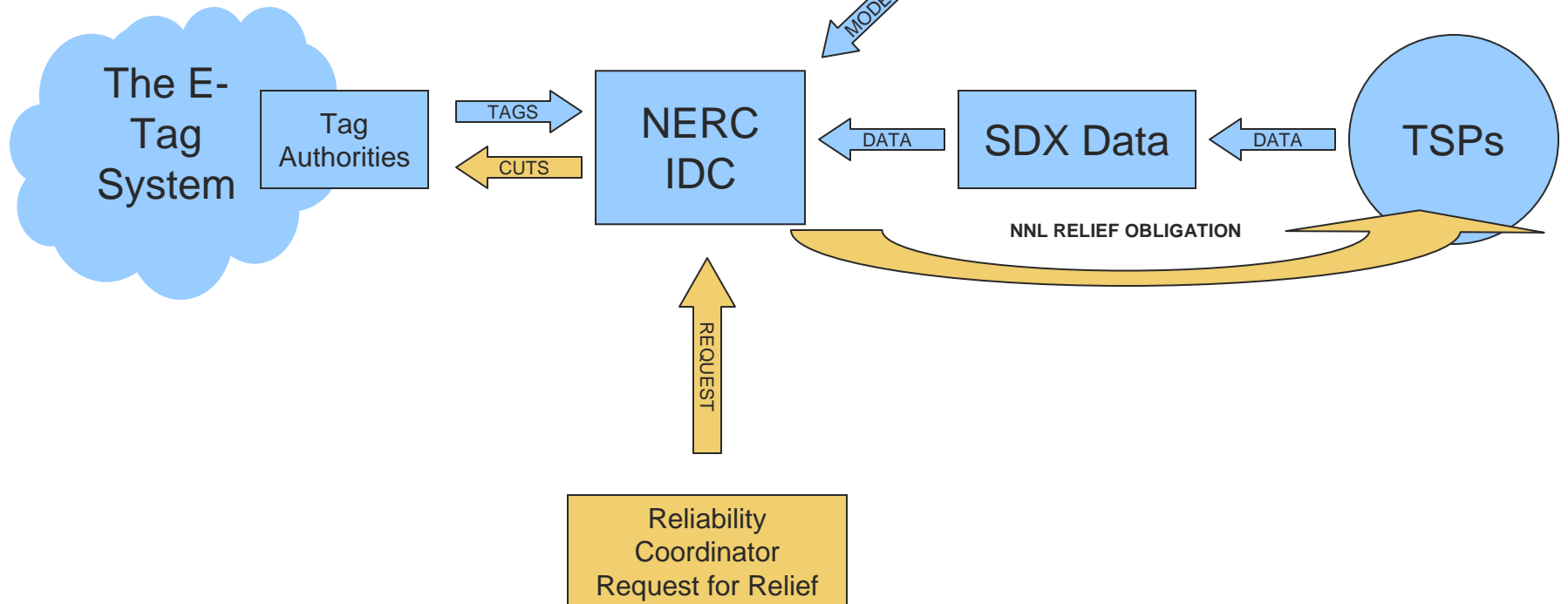


*SDX and the Base Case
also used to determine PTP
Impacts based on tags*

How TLR Works Today

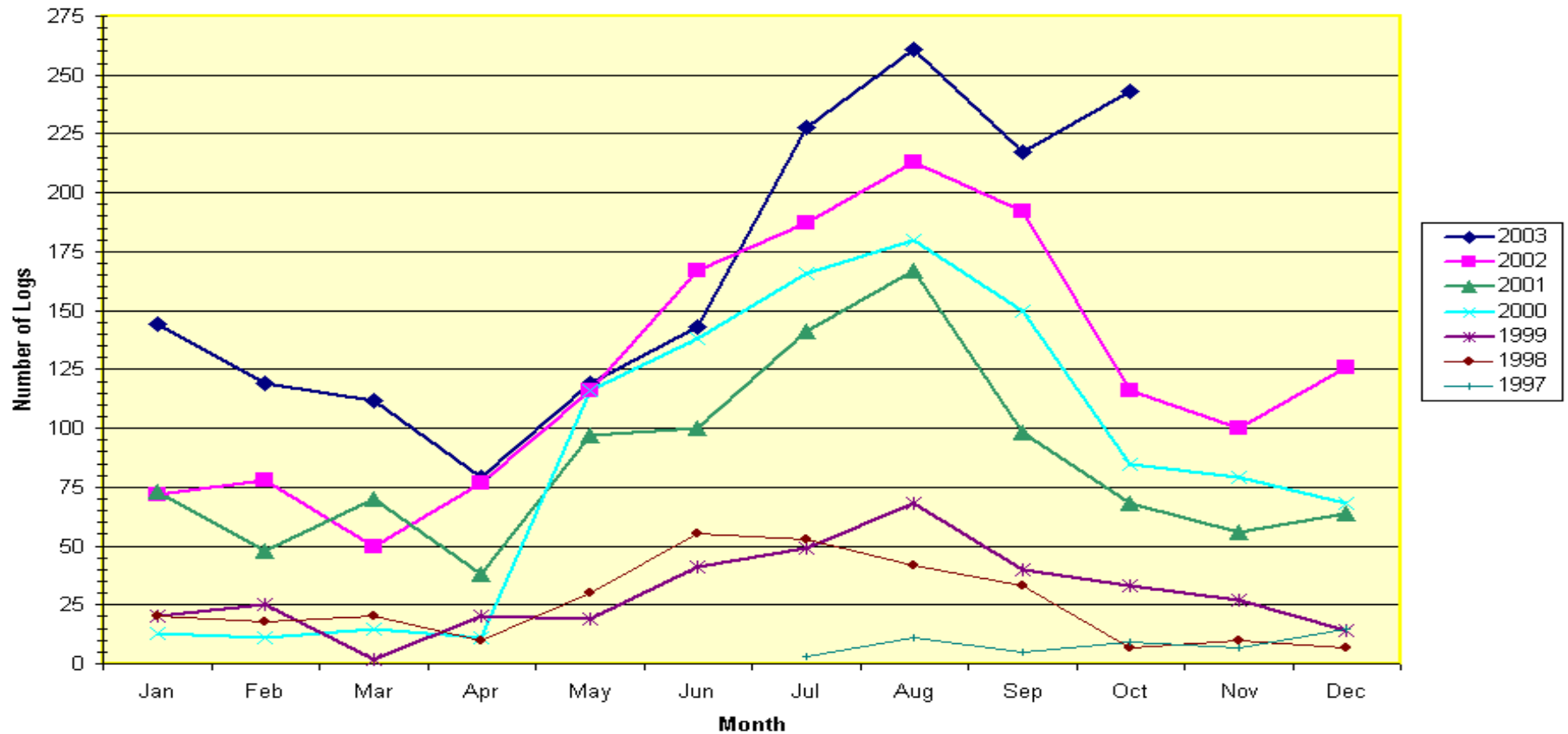
Point to Point
service is "Tagged"

IDC Estimates NNL



Year Over Year TLR

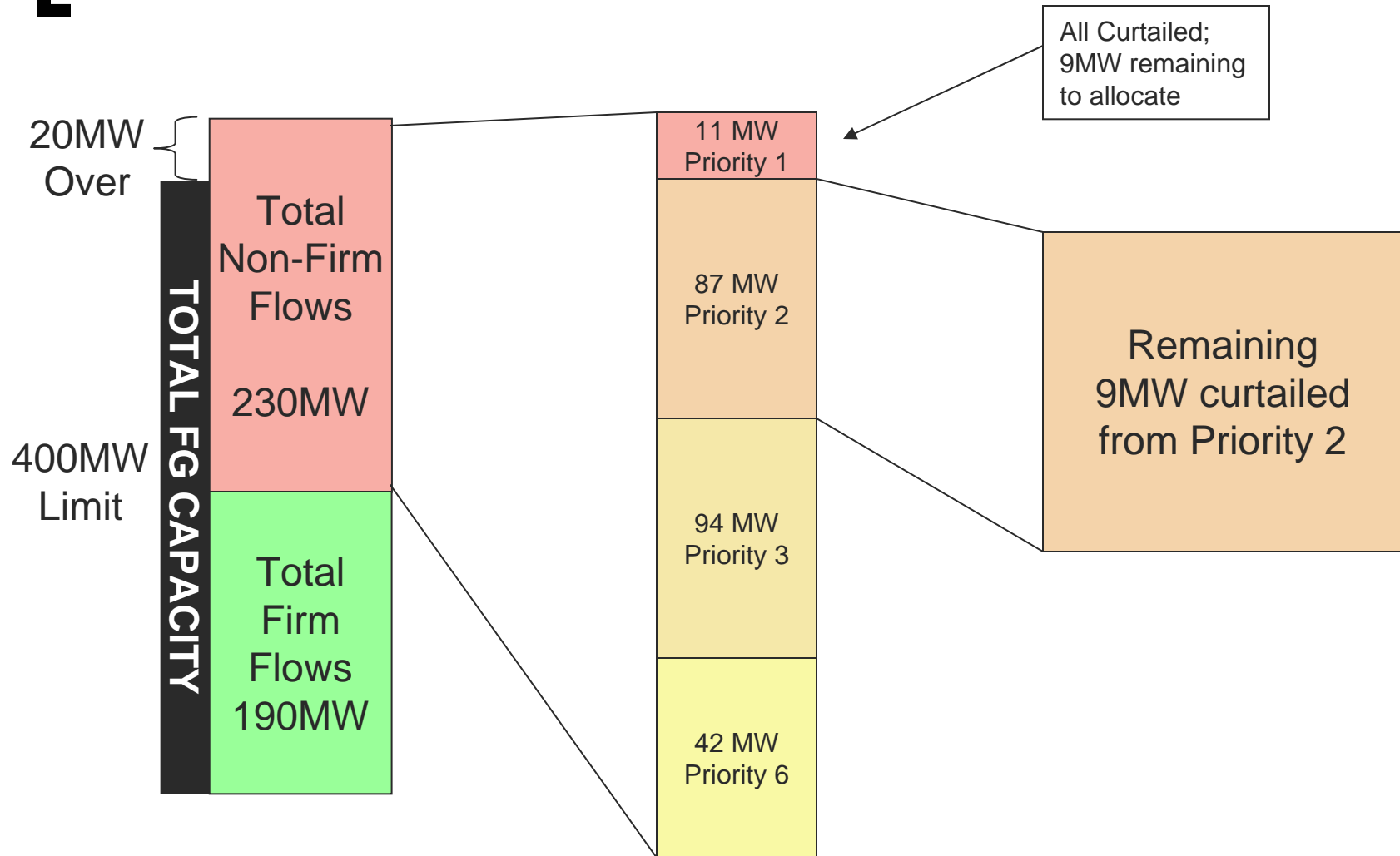
Total Number of Level Two or Higher TLR Logs
By Month



How the IDC Determines Relief Obligation

- The IDC is given a total relief obligation
- The IDC looks at total impacts
- The IDC allocates the relief obligation on a pro-rata basis per impacts per transmission priority
- If the relief can be provided using non-firm, the TLR stays at a level 3; if necessary, it will escalate to a TLR 5

How the IDC Determines Relief Obligation



The Western Interconnection Unscheduled Flow Mitigation

- Similar to TLR, but without the IDC
 - West is much less densely interconnected, so much easier to determine impact of transaction on a specific path
 - Reconfiguration of Current System
 - Flow Reductions

Some ISO/RTOs Locational Marginal Pricing

- To manage internal congestion problems, some entities utilize centralized markets and Locational Marginal Pricing (LMP)
- LMP fights congestion by incenting generation patterns based on price signals
- Instead of curtailing transactions to alleviate congestion, the RTO makes it uneconomical to create congestion (or lucrative to alleviate it)

Financial Hedging Instruments

- Just as Transmission Priority provides a physical hedge against congestion (firmer service), LMP markets often provide financial hedges (FTRs, TCCs, CRRs, etc...)
- These ensure that the economic signals used to mitigate congestion can be ignored by people willing to purchase “price protection” up front
- Only a fixed amount of Financial Hedges are made available (i.e., capacity is not infinite)
- Offsetting protection revenues are funded by congestion charges to unhedged entities

[Post-flow Checkout]

- After flow, at end of day and end of month, checkouts are confirmed again to verify what actually flowed
- What actually happened?
 - Cuts
 - TLR Impacts on volumes
 - LD
 - Over/Under Generated Consumed
 - Dispatches
 - Capacity Payments
 - Differences in ISOs, timeframes disputes



[Settlements]

Accounting processes all data for billing/payment

- Bilateral Settlement
- RTO/ISO Settlement
- Transmission Provider Settlement
- Capacity Auctions

[Credit - Before Enron Collapse]

- Credit not an issue
 - Everyone was AAA
 - Lots of Players
- Multiple agreements per Counterparty:
 - Energy Master Agreement
 - Capacity or A/S Master Agreement
 - Full Requirements/PPA Master Agreement
 - Coal Master Agreement
 - Natural Gas Master Agreement
- Each Contract could specify credit or collateral requirements
- Some netting
- Some Sleeve deals being done to “help out”
- Contracts had credit rating trigger – seldom used

[Credit - After Enron Collapse]

- Everyone is concerned about credit
 - Not only fewer AAA rated Companies, but
 - Fewer Companies Marketing Power
- Move to consolidate agreements
 - Reduce credit requirement
 - Reduce collateral posting
 - Help manage cash flow
- Netting Prevalent
- AAA Counterparties no longer sleeving deals for free

[Credit - Future Today]

- Target - Not Only Netting Agreements, But Cross Commodity Netting
 - Different Legal Entities
 - Coal and Fuel Providers Independent
- Clearing Houses – credit limits and collateral
 - Cross Commodity
 - AND Cross Counterparty
- Major Information Technology Headache - Great to have the agreements in place, how do you implement?
 - Natural Gas -Trade Capture, Accounting, and Scheduling Systems
 - Power - Trade Capture, Accounting, and Scheduling Systems
 - All Ends up in your GL system

[Credit With ISOs]

- We have discussed the efforts to streamline bilateral settlement and reduce credit requirements
- What About ISOs?
 - Each ISO has its own settlement calendars and credit requirements

[RTO/ISO Settlement Timelines]

■ Midwest ISO

- TD – 1 thru TD + 1
 - Operational and market data downloaded from loaded from MOS systems
 - Perform shadow settlements
- TD + 7 Days
 - Settlement Reports and supporting details are available generated by COS
 - Composed of a at least 3 XML file containing all required data

■ PJM

- TD – 1 thru TD + 5
 - Operational data downloaded from PJM systems
 - “Preliminary” statements for ancillary services available for downloading
 - Market information available from PJM website
 - Perform shadow settlements
- Next Month + 5-6 Business Days
 - Invoice, Settlement Statements, and supporting details are available for download.
 - Composed of 12+ files per day

[RTO/ISO Settlement Timelines]

- NY
 - TD – 1 thru TD + 3
 - Operational and market data downloaded from loaded from NY ISO systems
 - Perform shadow settlements
 - TD + 3 Days
 - Settlement Reports and supporting details are available.
 - Composed of a two .csv files containing all required data
 - Endless true ups

[Final Settlement]

- Final Settlements Posted
 - CA – 60 business days, disputes continue
 - ERCOT – 6 months, disputes continue
 - MISO – 55 days after flow
 - PJM – 60 days after flow

[Day in the Life]

- Questions?

[Where We Are Today]

- General concern that existing process are unwieldy
- Conflicting business rules between regions introduce inefficiencies, or “seams”
- Industry Initiatives
 - OASIS Phase II
 - NERC/NAESB Transition
 - The NERC Functional Model
 - NERC Standards Development
 - RTO/ISO Seams Coordination Activities
 - IDC Granularity Changes

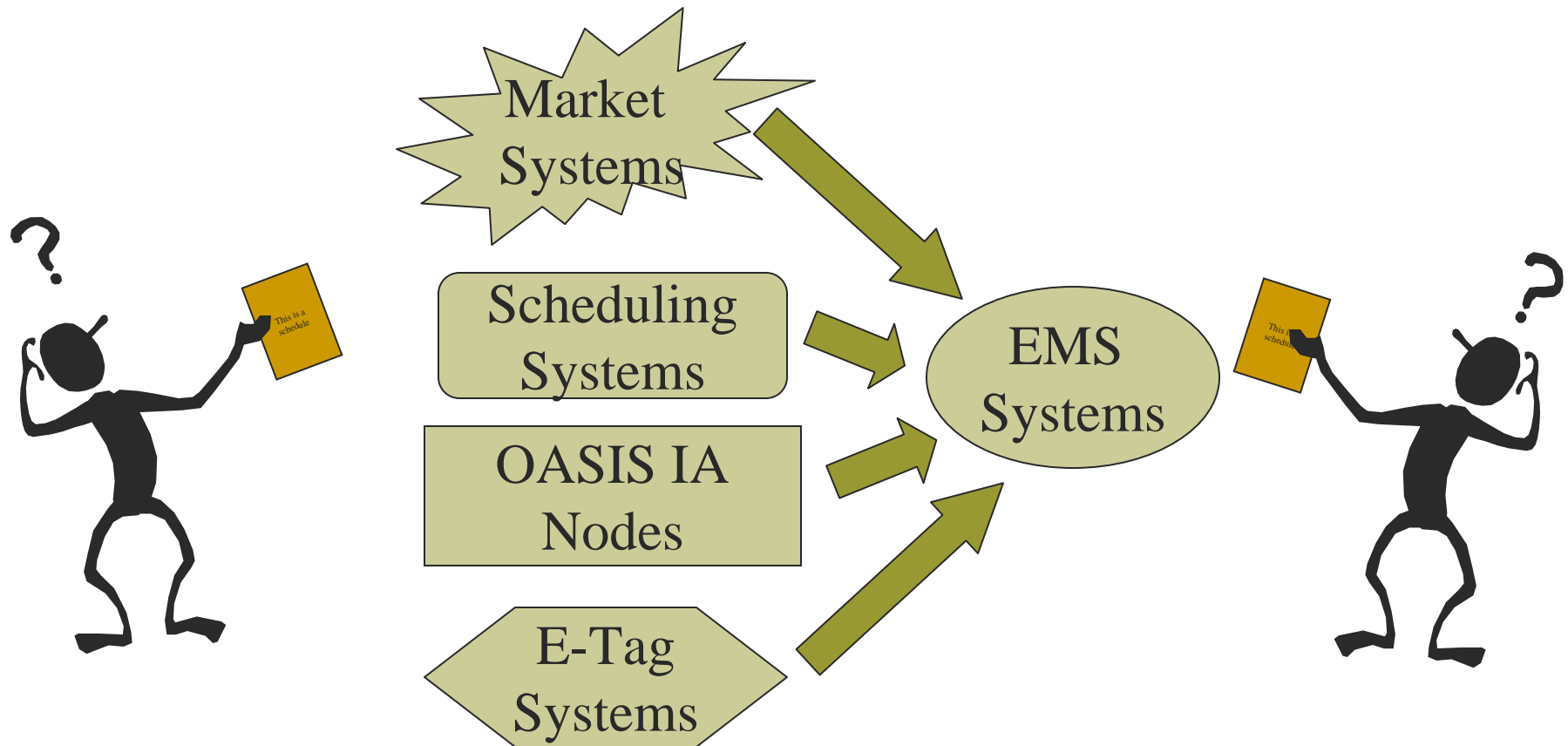


[OASIS Phase II and Electronic Scheduling]

- NERC started developing ideas through Industry Forums and Working Groups
- Now being led by NAESB, due to market impacts
- Goal – allow customers to directly request both Energy and Transmission schedules through one consistent interface

[Current Process]

- Several components:



[Current Process - Flaws]

- This process is burdensome to the marketplace, as there is no “simple” way to transact business
 - Each provider may have their own systems to deal with
 - Longer transaction become increasingly complex
 - Overhead and associated risk make the transaction “not worth the trouble”

[Current Process - Flaws]

- This process is prone to errors, because it relies on linking these systems together manually (they were not designed to be linked)
 - Tags use OASIS Numbers, Contract Refs
 - Reservations may be tied to Tag IDs
 - Contracts may be tied to other Contracts
 - Scheduling Systems may be tied to tags
 - Etc...

[Current Process - Flaws]

- Timelines - Existing inconsistent trading and scheduling timelines between gas and power make it impossible to unwind/enter a position

[OASIS Phase II]

- Intention is to develop a robust platform that can be easily integrated into enterprise systems
 - EMS Systems
 - Market Systems
 - Transmission Auctions
 - Scheduling Systems
 - Position Management systems
 - Deal Blotters
 - Billing and Settlements Systems

[NERC/NAESB Transition]

- As NAESB grows, NERC will transition its market-based components to NAESB
- Still discussion on the best approach for this transition

[NERC Functional Model]

- Redefining traditional model of “CA, TP, PSE”
- Defining functional responsibilities, then certifying entities on their ability to meet that responsibility
- Ideally, will help delineate boundary between market and reliability

NERC Standards Development

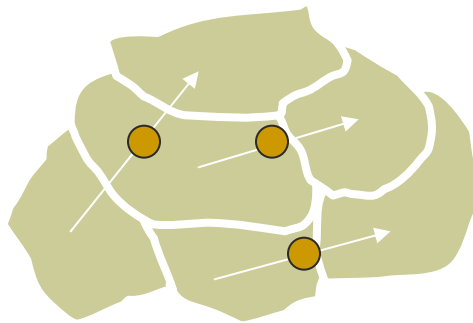
- As transition is occurring, NERC is rewriting existing policies to be “reliability focused”
- New documents will be measurable standards
- Will only focus on measurable reliability criteria – not process or rules, just results

RT/ISO Seams Coordination Activities

- Inter-RTO Council
- Regional Seams Agreements
 - MISO/PJM JOA
 - Reciprocal Agreements
 - PJM/MISO “Joint and Common Market”
 - WECC SSGWI

IDC Granularity Weakness

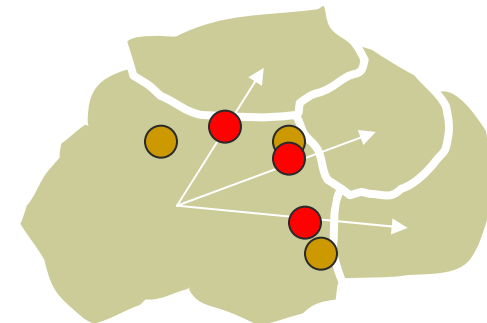
- IDC is based on “Control Area” model
- For historic system, this is acceptable – historic CA configuration is small enough to where granularity is not a problem
- Growing RTOs lead to larger CAs, and granularity becomes more and more coarse.



3 Transactions

6 CAs

Easily identified impacts



Same Transactions

Only 3 CAs

Impacts are shifted due to CA Expansion

IDC Granularity Weakness

- Plans to change IDC
- Focus on determining wide area relief obligation
- No more reliance on tags – just on generator output, system load, and network topology
- RTOs would be told to provide relief – but not obligated to do so in any specific way
 - TLR-style Curtailments
 - Centralized Redispatch
 - Load Shedding

Conclusion

- Power is complex
- In general, standardization (where appropriate) will help
- Cross Commodity Standardization (where appropriate) will help
- NAESB, NERC, and Industry efforts are underway to mitigate inefficiencies

[Questions?]
