

Westar Energy Presentation: Transmission 101 SPP Energy Imbalance Market

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TOPICS

- I. Transmission 101

- II. Proposed Energy Markets in the SPP

Part I: Transmission 101

PRO FORMA OPEN ACCESS TRANSMISSION TARIFF (OATT)

Non-discriminatory access to Transmission Grid by all qualified customers according to standard terms and conditions.

- Transmission and Ancillary Services rates, and terms and conditions must be approved by FERC.
- Retail Rates include an appropriate subset of the Transmission and Ancillary Services Rates; KCC approves Retail Rates.
- Standard Ancillary Services.
- Point-to-Point (PTP) Service and Network Integration Transmission Service (NITS).
- Open Access Same-time Information System (OASIS) – non-discriminatory access to transmission information by all qualified customers.
- Customers have right to complain and, FERC has right to audit for compliance and investigate for abuse.

SPP OATT

SPP administers access to its regional grid on behalf of Transmission Owner (TO) members.

- PTP and NITS Service.
- Pro forma “terms & conditions.”
- Pro forma Ancillary Services.
- Provider of Last Resort (POLR).
- Describes ATC/AFC calculation, Transmission Planning, Customer-requested Transmission Upgrades, Revenue Distribution, Loss Compensation, etc.
- License Plate Transmission Rates.
- TO members include Federal and State Power Authorities, Municipals, and Cooperatives.
- http://www.spp.org/Publications/SPP_Tariff.pdf

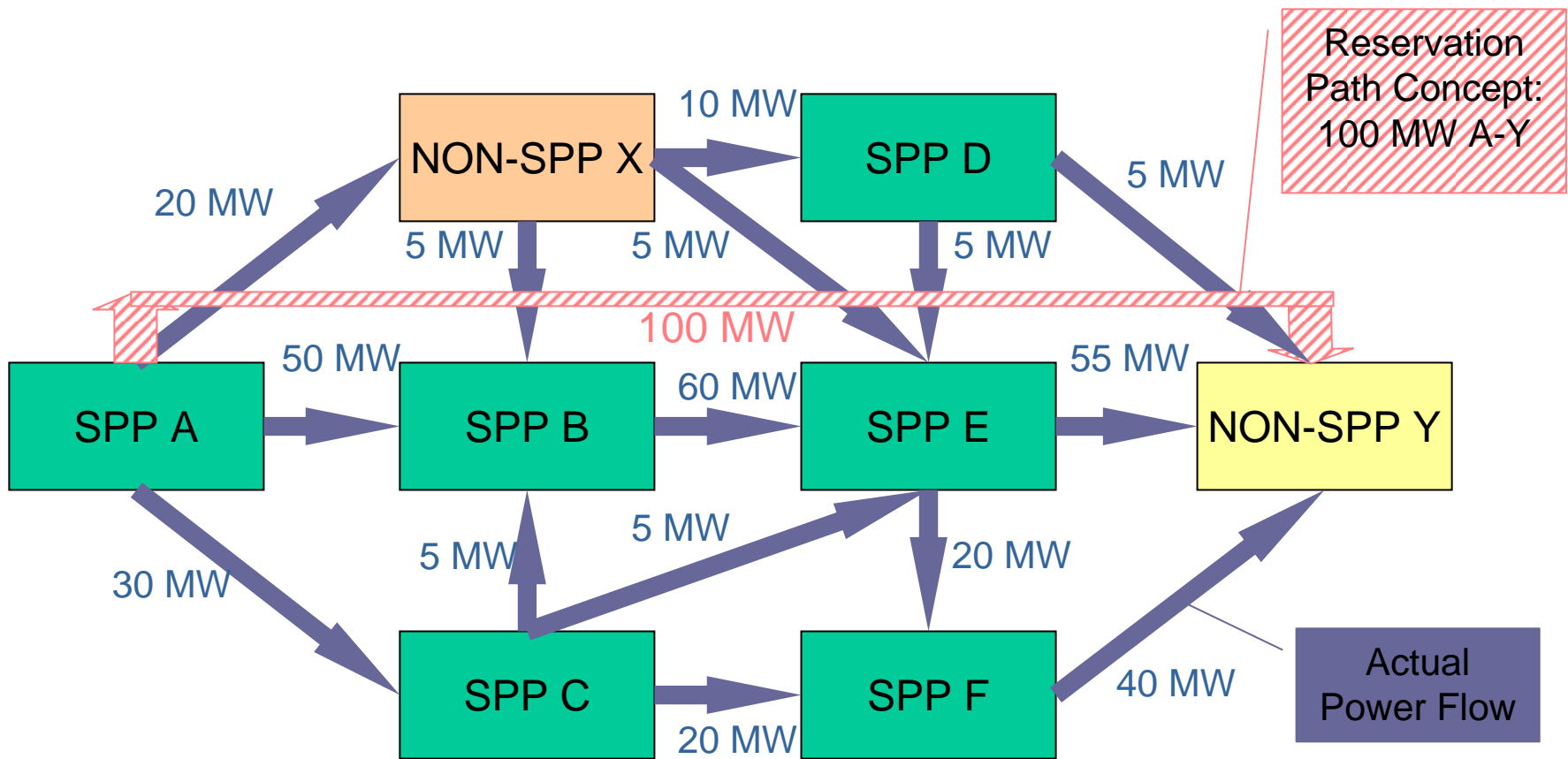
ATC/AFC PROCESS

- SPP calculates ATC and AFC based on the following information provided by members and other transmission providers:
 - Resource Plan and Load Forecast(s).
 - Generation Outage Information.
 - Transmission Line/Equipment Outage Information.
 - Known transfer capabilities of Transmission Line/Equipment.
 - De-ratings.
 - Transfer Distribution Factors (TDF) (SPP calculates from data provided by members).
 - Data provided by Interconnected Transmission Providers for flowgates in their systems.
 - Other Transmission Providers are expected to reciprocate this process.
- SPP posts AFC values in its OASIS site.

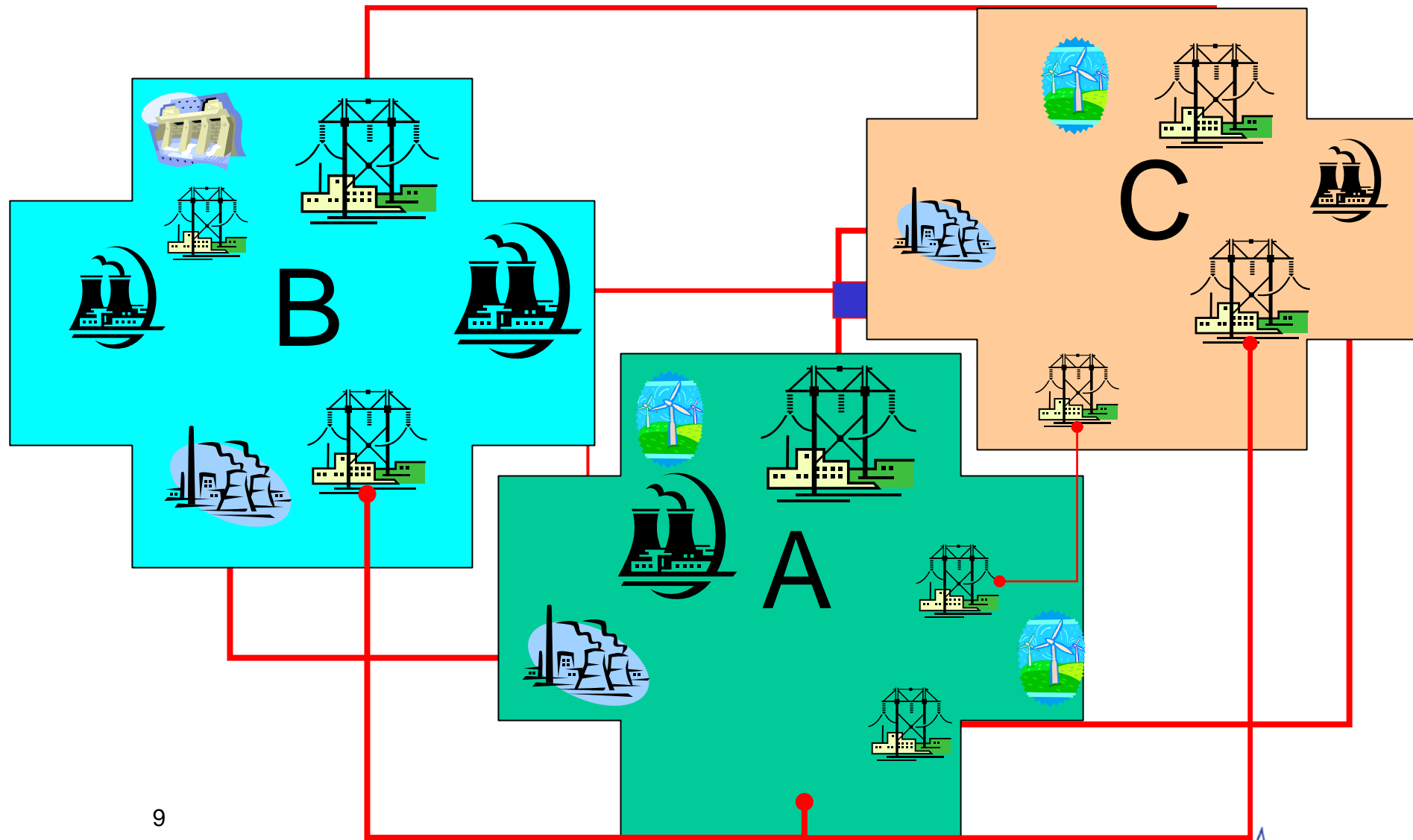
TRANSMISSION RIGHT PROCUREMENT PROCESS

- Transmission Customers (TC) are required to qualify.
- Qualified TCs submit request for PTP service via OASIS, e.g., 50 MWs from KCPL-EES.
- SPP examines AFC on effected flowgates against request.
 - Examines both SPP and other Transmission Providers' flowgates.
- If adequate transmission capacity exists on evaluated flowgate(s), request is approved.
- Customer confirms approved request: a financially binding right to “move” power from KCPL to EES.
 - “Moving” power should be considered in terms of altering generation mix in KCPL and EES: Raising KCPL generation by 50 MW and lowering generation in EES by 50 MW.
- Customer submits tags against confirmed rights.
- SPP verifies tags against right and state of the Transmission grid, approves or denies tags.
- If a tag is approved, customer “moves” power from KCPL to EES.

RESERVATION PATH VS. POWER FLOW



NETWORK & LOOP FLOWS



TRANSMISSION SERVICE

- Two basic types of Transmission Service under Pro Forma OATT:
 - Point to Point (PTP).
 - Network Integration (NITS).
- Bilateral Transmission and/or Energy Supply Agreements entered prior to implementation of Pro Forma Tariff (of TOs and SPP) are typically referred to as GFAs (Grandfathered Agreements).
 - Provided executed prior to mid-1996 (Order 888) or prior to SPP OATT implementation.
- Transmission Services under OATT are either Firm or Non-Firm.
- GFA priority may depend on contract language.

TRANSMISSION SERVICE

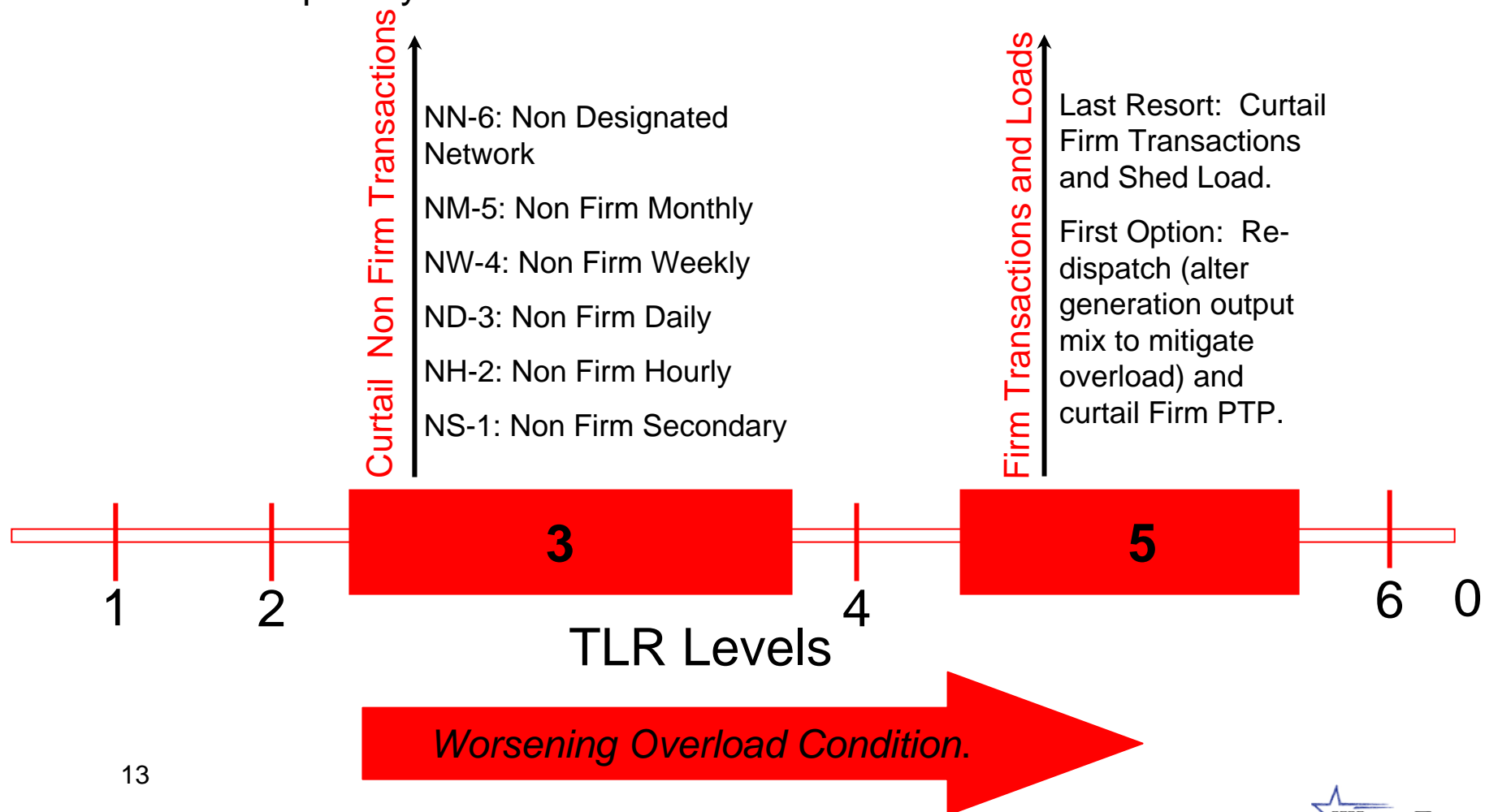
- SPP NITS allows the NITS Customer the right to generate power from the Customer's Designated Network Resources (DNR, i.e., Generation Portfolio) for its Load(s) on Firm priority.
- SPP NITS allows the NITS Customer the ability to purchase economy power from any resources (Non-Designated Resources) anywhere within SPP to serve its Load(s) on Non-Firm Priority.
- Transmission Customers taking NITS service under a Transmission Owner's OATT (e.g., AEP OATT) have slightly different restrictions.

OVERLOAD RELIEF

- Transmission System can become overloaded (i.e., exceed safe operational limits) for a number of reasons:
 - Unexpected outage of Transmission Equipment and/or Generation Plant.
 - Equipment De-rating.
 - Poor AFC/ATC data coordination among neighboring Transmission Providers.
 - Weather conditions.
 - High volume of transactions.
- NERC defined Transmission Loading Relief (TLR) process is used to manage overload conditions.
 - A purely physical, reactive process of managing system problems.
 - NOT an economic management of system problems.
 - Standard Overload Management Tool for most of the U.S. (Areas that do not use any Market-Based Congestion Management Tool).

TLR LEVELS & PRIORITY OF SERVICE

- System Operators curtail transaction in TLR situations according to the transaction's priority level.



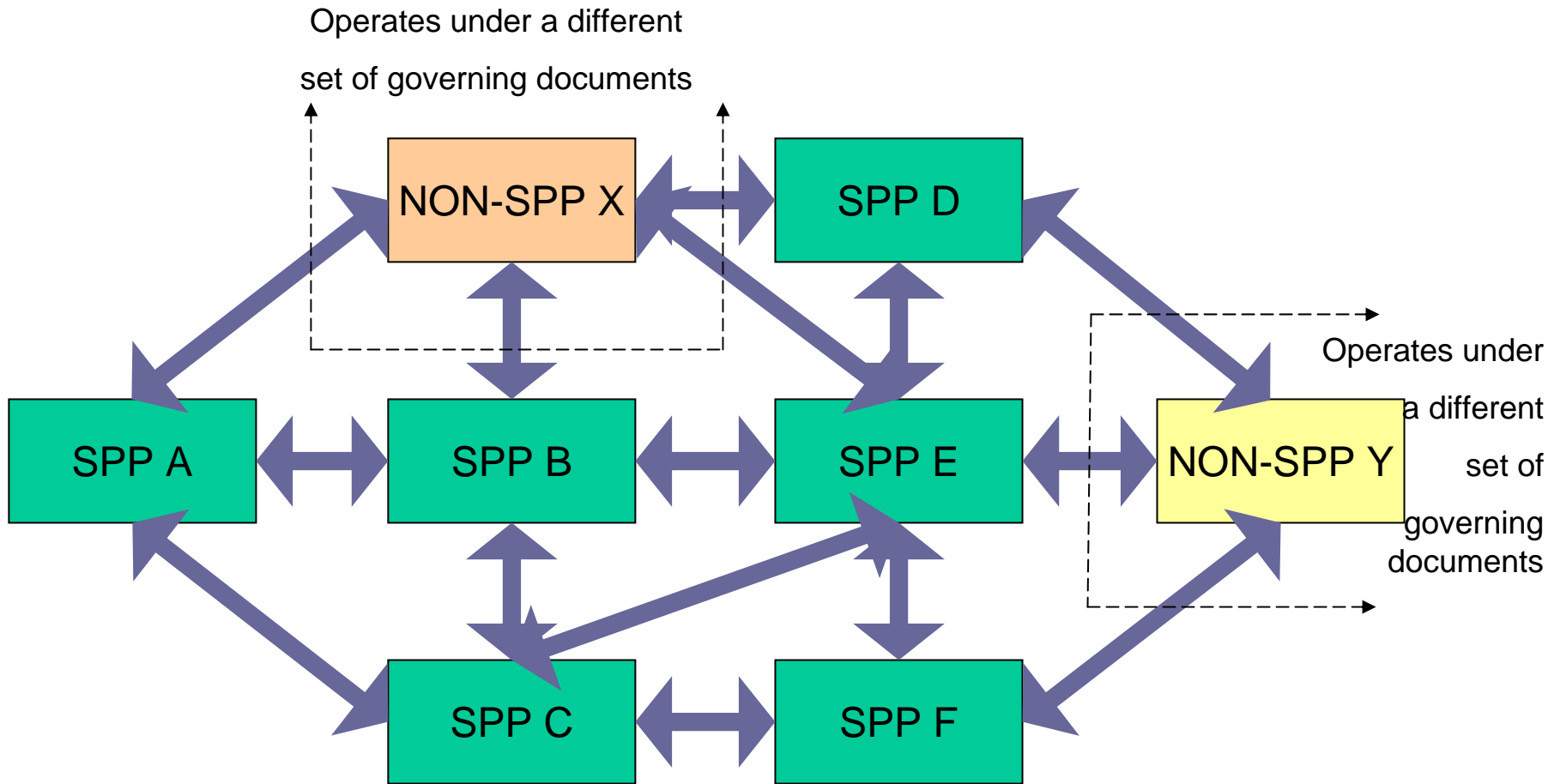
ROLE OF “IDC” IN TLR

- Interchange Distribution Calculator is a NERC tool used to calculate TLR curtailments.
- Control Area Operators and Generators do not have access to the entire IDC; they have access to a subset of this tool (i.e., GSF and TDF) to arrange re-dispatch.
- Components of the IDC includes:
 - Transaction Inputs (NERC E-Tags).
 - Base model of Transmission System.
 - Transaction Database.
 - Transfer Distribution Factor (TDF) Matrix.
 - Flowgate Information.
- Reliability Coordinators enter MW amount relief needed on an overloaded flowgate.
- IDC generates a list of transactions, and MWs by transaction, to curtail.
- Reliability Coordinators order affected Control Areas to modify respective tags.
- The TDFs SPP use to act on Transmission Requests are NOT necessarily the same TDFs used in the IDC.

SEAMS ISSUES

- Simply stated, Seams Issues are created when connected Transmission Providers/Owners willfully or inadvertently affect their neighbor's operations.
- Seams Issues are unavoidable because of the highly interconnected nature of the transmission grid, and the physics of AC power flow.

SEAMS ISSUES



SEAMS ISSUES

- Seams Issues magnify during periods of high transaction volume.
- Seams Issues can be caused by:
 - Transmission Providers/Owners operate under different governing documents (e.g., Tariff, Operations Protocols, Reliability Criteria, Flowgate Definition, Standards).
 - Transmission Providers/Owners do not properly communicate ATC/AFC/Outage data with each other.
 - Coordinated Planning or lack thereof ...
- Can threaten reliability and economics.
- Seams issues may be managed by:
 - Joint Operating Agreement(s)
 - Data and Outage Coordination
 - Planning Coordination
 - Mutual respect
 - Similar Standards and Operations Protocols
 - Knowledge Sharing

ANCILLARY SERVICES

- Schedule 1: Scheduling & Tariff Administration
- Schedule 2: Reactive Supply & Voltage Control
- Schedule 3: Regulation & Frequency Response
- Schedule 4: Energy Imbalance
- Schedule 5: Spinning Reserve
- Schedule 6: Supplemental (Non-Spinning) Reserve
- *Phase I (Energy Imbalance) Market will replace current Schedule 4*

ANCILLARY SERVICES

- Schedule 1: Scheduling & Tariff Administration
 - Supports Transmission Provider's administrative costs, OASIS and Scheduling System maintenance costs
 - MWh scheduled for PTP Customers
 - Monthly Control Area peak used for Network Customers
 - 20 cent cap
 - SPP: Compliments membership assessments for capital projects.
 - Paid by Network and Point-to-Point Customers.
- Schedule 2: Reactive Supply & Voltage Control
 - Control Areas provide this service.
 - Cost-based rate filed with FERC.
 - Pass through to Control Area Operator.
 - Paid by Network and Point-to-Point Customers.

ANCILLARY SERVICES

- **Schedule 3: Regulation & Frequency Response**
 - Control Areas' affiliate generators provide this service.
 - Cost-based rate filed with FERC.
 - Pass through to Control Area Operator.
 - Generators on Automatic Generation Control (AGC) continuously alter output to minimize Control Area's ACE.
 - LSE Options: self-provide, bilateral purchases, or purchase from SPP.
- **Schedule 4: Energy Imbalance**
 - Transmission Owner's affiliate generators provide this service.
 - Cost-based rate filed with FERC.
 - Typically: Incremental Cost of production+10% or 90% of Decrement Cost.
 - Many Transmission Owners have a \$100 floor for supplying Imbalance Energy.
 - Pass through to Transmission Owner.
 - Paid by Network Customers and Load Serving Entities using PTP transactions.
- **Phase I (Energy Imbalance) Market will replace current Schedule 4.**

ANCILLARY SERVICES

- Schedule 5: Spinning Reserve & Schedule 6: Supplemental Reserve
 - Transmission Owner’s affiliate generators provide this service.
 - Cost-based rate filed with FERC.
 - Reserve requirement(s) set by NERC and/or Regional Reliability Council Policies.
 - Pass through to Transmission Owner.
 - LSE Options: self-provide, bilateral purchases, or purchase from SPP.
- Provider of Last Resort (POLR) Function
 - Order 888 and 2000 requirement
 - Transmission Provider (SPP) must arrange for Ancillary Services 3-6 if not self supplied by Transmission Customer.
 - SPP procures from host Control Area
 - Host Transmission Owner’s filed rates
 - Pass-through

RESERVE SHARING GROUP

- A pool to share Reserves.
- Lowers Day to Day Operating Reserves requirement compared to if not participating in RSG.
- RSG Members respond to other RSG member's contingency.
- Deployment: administered and facilitated by SPP.
- Settlement: bilateral transactions between RSG members.
- Typically priced at cost of quick start resources plus an overhead; \$100 floor is not unusual.
- RSG membership includes external entities (e.g., Sunflower, CLECO, Entergy).

Part II: Proposed Energy Markets in the SPP

THREE PHASES OF SPP ENERGY MARKETS DESIGN

- Phase I: Imbalance Energy Market
 - Increment I: Granular scheduling, load & resource meters, financially non-binding Imbalance Energy invoicing
 - Increment II: Resource/Ancillary Services Plans, Balancing function driven by SPP RTO_SS.¹
 - Increment III: Financially binding Imbalance Energy Market live.
- Phase II: Congestion Management based on: Day Ahead and Real-time Energy markets, and Financial Transmission Rights.
- Phase III: Ancillary Services market(s).

¹Regional Transmission Organization Scheduling System

THREE PHASES OF SPP ENERGY MARKETS DESIGN

- Factors driving the preference for phased implementation:
 - Stakeholders preferred to:
 - Minimize implementation risks.
 - Leverage learning/experience curves.
 - Critical path driven implementation deadline.
 - Minimize costs by using software already developed.

PHASE I: THE ENERGY IMBALANCE MARKET

Increment I of Phase I

- Register Settlement Locations: Loads and Resources.
- SPP EMS/State Estimator – 5000+ Nodes.
- Hourly integration of load and generation meters.
- Meter Data Communication.
- Highly granular Resource-to-Load scheduling.
- Financially non-binding Imbalance Energy invoices.
 - SPP: fine-tune settlement engine.
 - Market participants: adjust internal scheduling, accounting, and billing systems.

PHASE I: THE ENERGY IMBALANCE MARKET

Increment II of Phase I

- Market Participants to submit Resource and Ancillary Services Plans.
- All SPP Control Areas start using RTO_SS.
- Net Scheduled Interchange (NSI) and RTO_SS.
- Control Areas provide Regulation and Balancing Services using SPP's NSI value.

PHASE I: THE ENERGY IMBALANCE MARKET

Increment III of Phase I

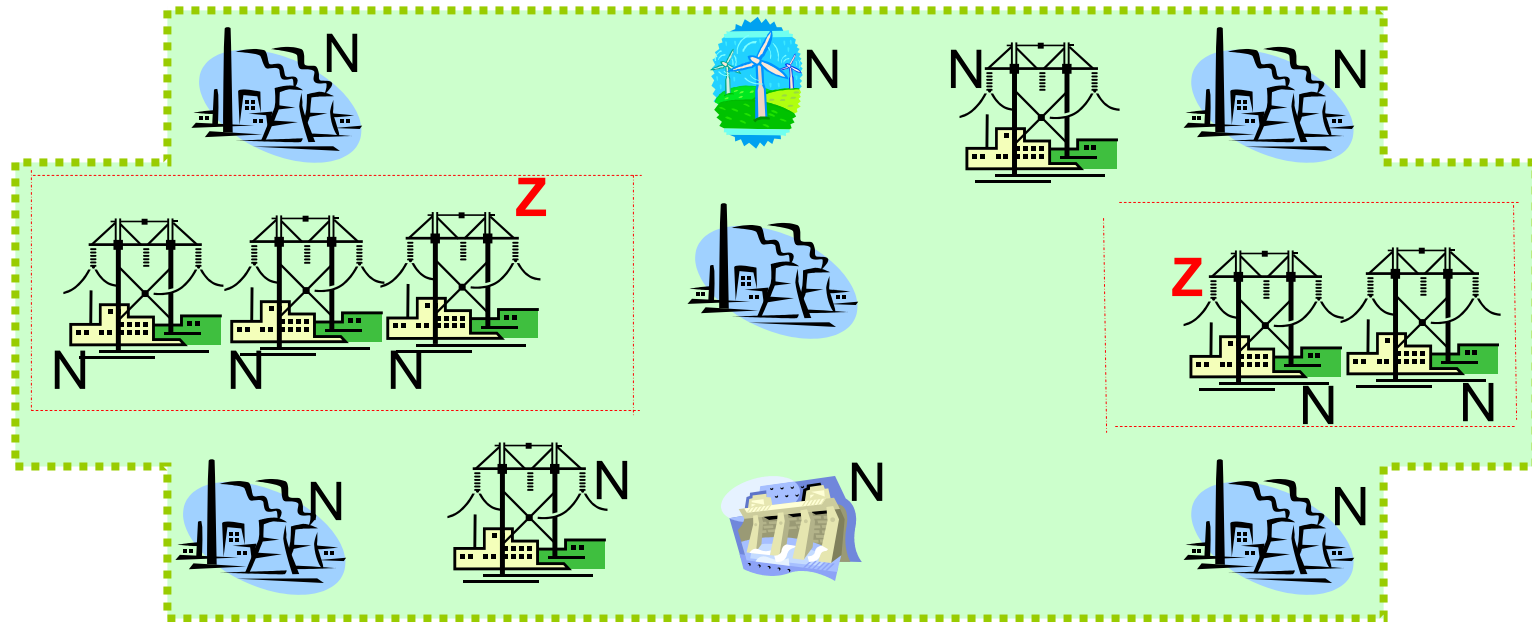
- Financially binding Imbalance Energy Market live.
- Granular, settlement location specific Market System Schedules.
- Utilities have the following options:
 - Commit their own resources, and/or
 - Offer their resources into the market, and/or
 - Purchase from the market, and/or
 - Transact bilaterally.
- Imbalance is the difference between actual and scheduled (at registered settlement locations).
- Offer based market to set the Locational Imbalance Price (LIP).

PHASE I: THE ENERGY IMBALANCE MARKET

High Level Technical Concepts

- NOT a Capacity Market.
- Real time, dispatched in 15 minute increment.
- Location specific (Zonal or Nodal) settlement for Load.
- Nodal Settlement for Resources.
- Security Constrained Economic Dispatch of Markets Bids/Offers only.
- VAR, Regulation, and Reserves: preserve current practice.
- Intra SPP Inadvertent Energy: Managed financially as Imbalance Energy.
- SPP will manage SPP-Eastern Interconnect Inadvertent Energy transactions.
- A combination of TLR and limited Generation Re-dispatch to be used to manage system overloads.
- Generator Owners perform unit commitment according to transmission rights.
- Generation dispatch performed by Owners and/or Control Area Operator and/or SPP.

IMBALANCE MARKET: NODAL AND ZONAL PRICING



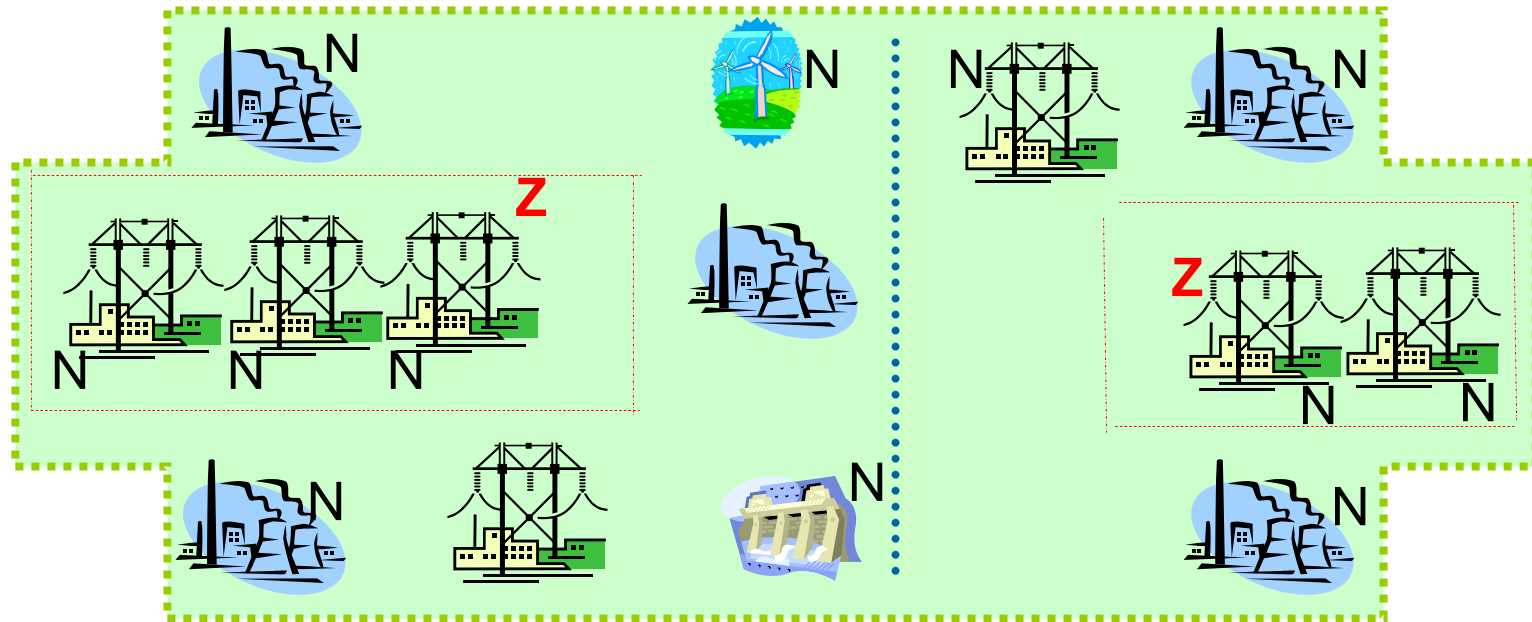
Price is Local Imbalance Price.

LIP of Resource: Cost of producing the next MW at the Resource Bus (according to offer to EIS market, if offered).

LIP of Load: Cost of serving (producing and delivering) the next MW at the load node bus (if nodal), or a calculated aggregate of the node LIPs for zones.

If there is no constraint in the system, the LIP across the entire footprint should be same (minor differential may result from transmission losses etc).

IMBALANCE MARKET: NODAL AND ZONAL PRICING



Assumption: Generation is relatively cheaper in Western part compared to Eastern part.

If a transmission constraint occurs between West and East:

TLR process will curtail transactions regardless of economics.

EIS market process will try to find the cheapest source of power to serve load in East when import of cheaper power from the West is longer viable (due to constraint).

Constraint will result in different prices in East and West.

OTHER MARKET DEVELOPMENT RELATED ACTIVITES

- Feasibility of a Single SPP Control Area.
- Development of Market Monitoring and Mitigation Protocols.
- Development of a SPP-internal Market Monitoring Unit.
- Cost/Benefit Study.
- Market Participant Preparation.
- Software and Model development.

Additional questions?

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Katie Duncan, Training.