

Provider of Choice Slice Proposal Framework

Presented by Planned Product Customer Group

April 2024

Introduction – The Planned Product Customer Group

- **The Planned Product Customer Group represents a diverse cross-section of public power utilities across the Pacific Northwest with a keen interest in BPA’s Provider of Choice Planned Product offerings.**
 - Includes current and past Slice/Block and Block customers.
 - Consists of rural and urban communities across multiple states.
 - Represents nearly 50% of BPA’s expected Priority Firm load.

Clark Public Utilities	Grant PUD	Emerald PUD	Snohomish PUD
Clatskanie PUD	Idaho Falls Power	Franklin PUD	Seattle City Light
Eugene Water and Electric Board	Cowlitz PUD	Lewis PUD	Tacoma Public Utilities

Executive Summary

Provider of Choice Slice

BPA Position – Slice as a DA Product

- **BPA has proposed that the POC Slice/Block product be a Day-Ahead product.**
 - Slice would be scheduled hourly prior to the DA market run with no ability to adjust schedules hourly in real-time.
 - **BPA position on Slice as a DA only product is intended to address planning and operational uncertainties and complexities, both now and in the future, that Slice places on BPA.**
 - Current product design creates operational uncertainty around final power delivery obligation up until real-time → capacity required to support product flexibility into real-time is significant burden on federal system.
 - In the future, formation of day-ahead markets and resource adequacy program requirements (such as WRAP) introduce added uncertainty.
 - Current product implementation introduces added complexity under a day-ahead market framework.
 - **Slice product will not be designed to allow customers to submit generation bid curves.**
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BPA Foundational Design Parameters for POC Slice/Block

- Slice/Block product operational implementation is *compatible with how Bonneville would participate in a day-ahead market.*
 - The product *does not require unique market design or exceptions.*
 - Product *can be offered to all customers* including:
 - Customer in same BA as Bonneville.
 - Customer in a different BA to Bonneville and in same market.
 - Customer in a different BA to Bonneville and in a different market.
 - Redesign *does not create additional complexity.*
 - BPA recognizes that *redesign may shift where complexity exists* under Regional Dialogue.
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Customer Issues with Slice as a DA Product

- **Slice as a DA-only product scheduled prior to the DA market run presents several issues in a DA market framework.**
 - Results in sub-optimal outcome for both customers and the region/market due to the difference between the self-scheduled Slice resource and the optimal economic market dispatch for the FCRPS Tier 1 system.
 - Excludes customers from more direct market participation.
 - Unclear how product fits into WRAP forward showing and the DA market Must Offer Obligations (MOO).
 - **Slice as a DA-only product erodes the fundamental characteristics and value of the product as a whole.**
 - Current product flexibility to adjust schedules in RT supports customers' ability to take direct responsibility to serve preference load **AND** integrate clean non-federal resources.
 - DA Slice requires customers to solely rely on non-federal resources and RT market to manage load and resource uncertainty between DA and RT -> Poses challenges for Slice customers' ability to develop clean variable resources
 - DA Slice reduces value of the product to customers, thus impacting the sharing of value and risk between customers and BPA commensurate with the actual cost and capability of the Federal Tier 1 System.
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Customer Proposal – A “*True Slice*” of the System

- **Customers believe an alternative product design reflecting a pure Slice of the FCRPS significantly reduces product complexity and uncertainty yet preserves much of the value of the core Slice product.**
 - A % allocation of the actual capacity volume, energy dispatch, and market costs & revenue of the Tier 1 FCRPS generation over all applicable time horizons and market products.
 - **BPA maintains bidding responsibilities and offers a single bid curve.**
 - Aligns with expectation that BPA is the single market participant responsible for the Tier 1 FCRPS.
 - Customers and BPA would share insights to help inform BPA's bid curve submittals.
 - **Customers would receive a proportionate share of actual system dispatch/benefits through existing DA and real-time market mechanisms.**
 - Leverage “***Combined Interest Resource***” (CIR) functionality of the Market that allows Market Operator (***NOT*** BPA) to allocate Slice must-offer obligation contribution, market awards, and settlement of credits and charges directly to the Slice customer using the Slice contract percentages.
 - Eliminate today's separate customer-specific instances of the Slice Computer Application and re-purpose a single “***system of record***” instance that provides:
 - Customer transparency on system conditions and generation capability necessary for Must-Offer Obligations,
 - Coordination with BPA on DA economic offers, and
 - Customer ability to track and manage Slice contribution to individual portfolio management.
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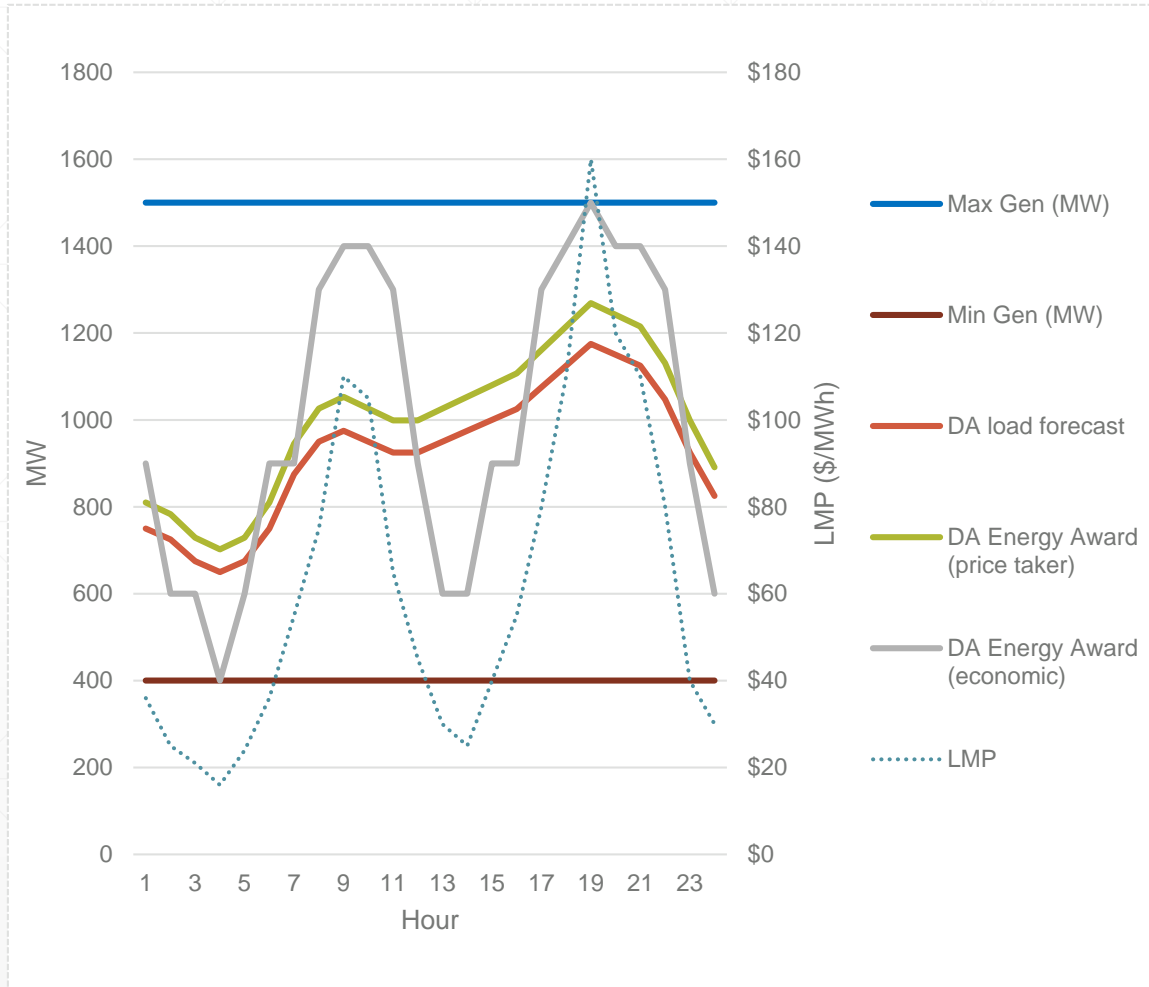
Current BPA POC Slice Proposal – Problem Statement

Provider of Choice Slice

Issue 1: Sub-Optimal Scheduling

- Resources can be offered into an organized market as *fixed schedules* (“price takers”) or *economically offered* (offer curve with price/MW pairs).
 - The market will determine the most optimal dispatch of *economically offered resources*, subject to constraints such as transmission limits, generator parameters, and *fixed schedules*
 - Markets create value through optimizing economic dispatch; fixed schedules lead to suboptimal market outcomes.
 - The difference between a fixed schedule and how the market would have dispatched the resource had it been economically offered is both an opportunity cost for the participant as well as an opportunity cost for the region/market.
 - **In DA Market, we expect BPA to economically offer the flexible portion of the FCRPS**
 - For storage hydro, market optimization shapes available water/energy into most valuable periods
 - BPA and customers would receive benefit by buying from the market during low priced periods; save water/energy to serve load and sell surplus during high load/high price periods
 - **HOWEVER**, under BPA’s POC Slice proposal, Slice schedules would be fixed schedules, preventing customers (and potentially everybody) from benefiting from market optimization of slice customer share of FCRPS flexibility
 - Slice customers would be price takers in the DA and RT market
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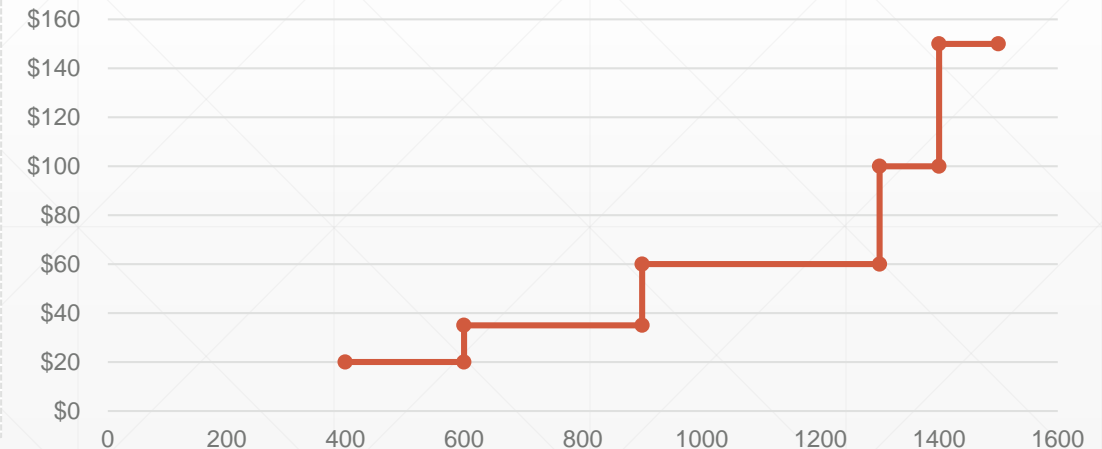
Example: Self-Schedule (Price-Taker) vs Economic Offer



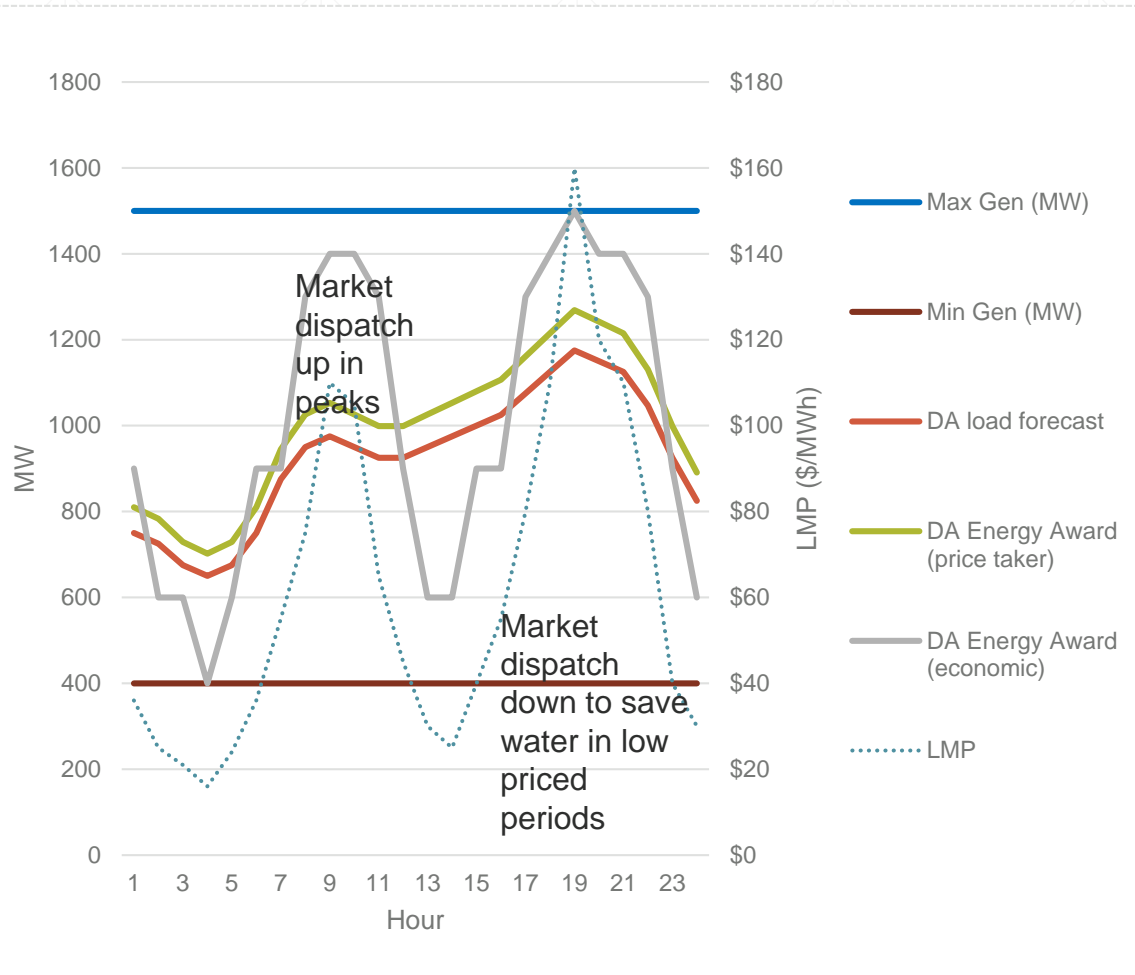
Simplifying Assumptions

- Slice is only resource (illustrative)
- All market participants, including Slice Customers must meet Must Offer Obligation (MOO)
- DA Must-Offer Obligation (MOO) = Forecast Load + Uncertainty (8%)
- Slice daily energy “limit” \approx Total energy obligation
 - In price taker scenario, customer schedules at MOO for each hour
 - Total energy awarded is equal in each scenario
- Min Gen, Max Gen, Daily Energy all feasible within SCA

Offer Curve



Example Observations



- Absent MOO, Slice customers could theoretically schedule based on forecast prices to attempt to replicate optimized outcome, but will typically be suboptimal.
- MOO combined with Fixed Schedule prevents Slice customer from being dispatched down to save water during low-priced hours
 - Limits ability to increase output in more valuable hours (10% loss of value in this example)
 - Limits ability to save water to meet future days' must offer obligation (not captured in this example)
- Low-priced hours are in part driven by high renewable output. Self scheduling a flexible resource during these periods could displace renewable generation.
- Economic bidding of flexible resources is one of the primary benefits of BPA joining DAM.
- BPA's proposal appears to lock Slice out of realizing this benefit. If BPA self-schedules Slice output, would limit overall benefits of FCRPS in market.
- BPA proposal would prevent customers from using Slice to meet market requirements to offer bid range (e.g., EDAM RSE).

Issue 2: Management of Real-Time Uncertainty

- Today, Slice customers utilize hourly flexibility of Slice product to manage load and non-federal resource uncertainty between preschedule (day-ahead) and real-time (hour-ahead).
 - BPA's proposal would eliminate this ability for Slice customers, making it much more challenging for customers to invest in and integrate clean variable energy resources at a time when such supply is needed by the region. This is inconsistent with BPA's Provider of Choice Policy Goals.
 - Real-Time Market may help fill this gap, but increases Slice customer risk relative to today:
 - Increased imbalance MW:
 - Today in EIM, real-time imbalance = difference between meter and hour-ahead base schedule
 - In Day-ahead market, real-time imbalance = difference between meter and day-ahead market award/schedule
 - Organized markets tend to have more volatile prices
 - Offer floor = \$-200/MWh
 - Offer Cap = \$1000/MWh (up to \$2000/MWh during certain conditions)
 - Ideally real-time slice flexibility would be available to mitigate these risks (as it is under Regional Dialogue)
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Principles and Design for an Alternative Proposal

Provider of Choice Slice

Preserve Key Characteristics and Value of Existing Product

- **With anticipated regional load growth and resource retirements, the Slice product allows customers to take direct responsibility to *serve preference load AND integrate clean resources*, placing less of this burden on BPA:**
 - Slice has always been and will continue to be used to serve ***Preference Load***.
 - Provides flexibility to serve Tier 2 PF loads as well as non-PF loads (load growth, NLSL, etc) with embedded “surplus” component of product.
 - Slice/block not guaranteed to meet overall customer load requirements on an hourly basis → customers must also invest in other resources. Due to policy considerations, these are increasingly clean variable energy resources
 - Slice also allows flexibility to integrate existing and new non-federal resources required to serve load on an hourly basis, especially managing the uncertainty of variable energy resources.
 - Greater autonomy and flexibility over long-term resource planning.
 - **Sharing of value and risk between customers and BPA commensurate with the actual cost and capability of the Federal Tier 1 System**
 - For a % of the total cost, buyers should receive an equal % of total system capability.
 - Customers must manage the price and volumetric risk of FCRPS generation, reducing BPA’s exposure to market conditions for non-Slice customers.
 - **Revenue from surplus energy sales flows directly to customers.**
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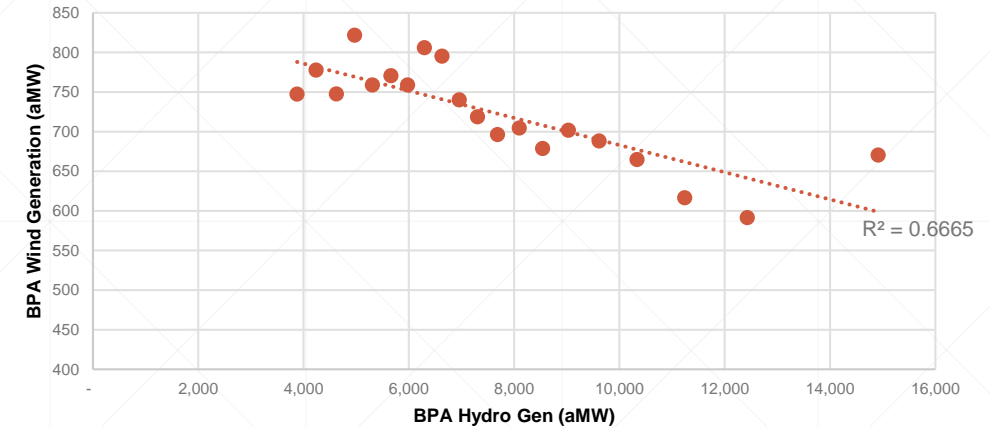
Future Markets Require New Slice Product Principles

- **A Planned Product that is not just *market compatible*, but *market optimized*.**
 - **Product buyers receive economic dispatch benefit**
 - *For a % of the cost, buyers receive an equal % of **the economic value of the system***
 - Economic dispatch is a benefit to individual customers and the region as a whole
 - Better use of all available transmission
 - Lower total production costs for consumers due to more economic redispatch
 - Better renewable integration
 - Less pressure on BAs, including BPA, to “shape and firm” wind/solar generation with their own resources
 - Better and cheaper renewable integration for individual customers – many with new state mandates to address
 - **Clear understanding of how product fits into WRAP forward showing and Must Offer Obligations (MOO)**
 - **Simplified Implementation for BPA**
 - Leverage market mechanisms to simplify settlement
 - Slice customer “schedules” consistent with physical system capability determined by BPA offer curves and market awards.
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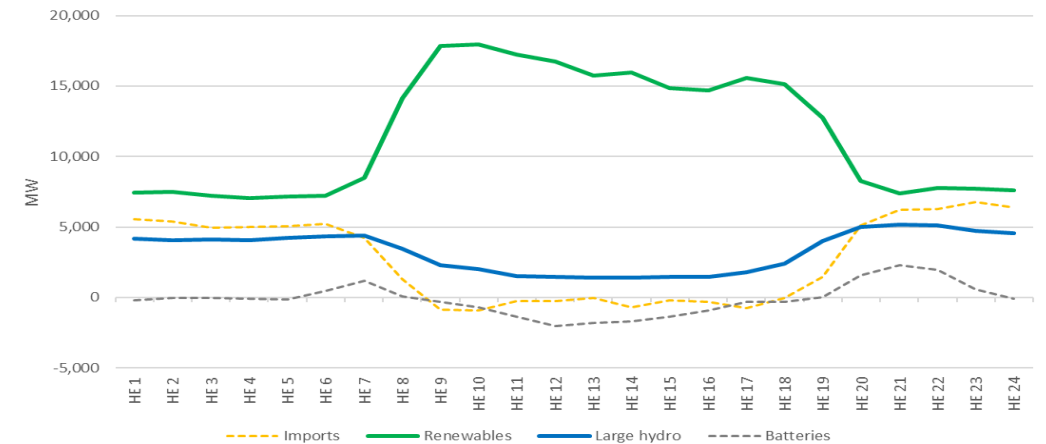
Economic Dispatch improves VER integration

- BPA hydro generation backs down as wind in BPA's BA increases
 - Facilitates load service from VERs
 - Save water for more expensive days/hours
 - Reflective of Slice customer and BPA behavior
- Future buildout of VERs increases need for similar opportunistic behavior
- Economically offered generation will be optimized over the whole market footprint
- BPA Slice proposal with fixed DA schedule **precludes** similar cost-minimizing redispatch behavior
 - **DA Slice schedule would be based on load forecasts to meet Must-Offer Obligations without complete redispatch**

Hourly BPA Hydro vs. Hourly BPA Wind Generation 1/1/2022 through 3/12/2024



CAISO Resource Stack - May 10, 2023



Alternative Proposal Concept – “*True Slice*”

True Slice Characteristics

- True Slice customers pay a ***% of the cost for an equal % of the FCRPS value***
 - True Slice is a pure Slice of the FCRPS, meaning that customers receive ***a % allocation of:***
 - ***Actual capacity volume (as represented by the feasible max system capability)***
 - ***Energy dispatch, and***
 - ***Market revenue***
 - ***For the Tier 1 FCRPS generation over all applicable time horizons and market products.***
 - Day Ahead Awards for energy, flexible ramping, and ancillary services
 - Real Time Balancing Market Awards
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True Slice Characteristics

- **BPA submits *single offer curve* for flexible FCRPS resources**
 - True Slice does **NOT** contemplate customer ability to submit individual generation bid curves to a day-ahead market for the slice portion of the product.
 - Single bid curve for the federal system would include willingness to generate at various MW/Price pairs along with system minimums (must-run), maximums (capacity and energy delivery limits), ramp rates, etc. → all subject to non-power constraints and system conditions.
 - Include processes allowing Slice customer input into BPA offer curve submittals and full transparency of FCRPS generation capability.
 - Allows Customers to calculate Slice contribution to MOO as determined by Slice % of FCRPS feasible max generation capability → Max economic offer of FCRPS flexible resources + FCRPS Self Schedule (non-dispatchable) volumes.
 - Use existing Slice Computer Application (a.k.a, Slice Water Routing Simulator, or SWRS) to provide system generation capability and facilitate customer input into offer curve submittals.
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True Slice Characteristics

- Leverage **“Combined Interest Resource” (CIR)** functionality of the Market
 - Tier 1 FCRPS registered with Market Operator as single CIR for market operation under a single Market Participant → **BPA**.
 - BPA, as single Market Participant registering the CIR, would provide MO with the individual interest percent shares by each of the other individual Market Participants → **Slice customer %s for each Slice customer**.
 - MOO contribution, market awards, real-time redispatch, and settlement of credits and charges for the CIR are allocated **by the MO directly to the Slice customer** using the percentages of submitted interest share → **No separate sub-allocation process required between BPA and customers, Market \$s flow directly to customers, simplifying Cost Pool accounting**.
 - CIR is a "market only" designation → **In no way does it imply or convey any actual asset ownership or control of Federal assets to a Slice customer, nor do Slice customers control, either virtually or physically, any aspect of the FCRPS interaction with the central market**.
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True Slice Characteristics

- **Simplify and streamline today's Slice implementation by re-purposing the Slice Computer application (a.k.a, SWRS).**
 - BPA maintains a ***single instance*** of the existing Slice Water Routing Simulator (SWRS) as opposed to today's multiple instances for each customer.
 - Single instance of SWRS will at all times will represent the most current feasible range (min/max) of Federal Tier 1 System generation capability → same as today.
 - Single instance of SWRS would be "***system of record***" that provides:
 - Customer transparency on system conditions and generation capability necessary for Must-Offer Obligations,
 - Tool for coordination with BPA on market offer curves, and
 - Customer ability to track and manage Slice contribution to individual portfolio management.
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Closing Remarks, Questions & Discussion

Closing Remarks

- **Planned Product customers prefer the True Slice approach to product design over our understanding of BPA's DA Slice design.**
 - Customers have not yet seen BPA's proposal for "*Financial True-up benefits and risks for Slice customers based on day-ahead-market operations*", originally slated for discussion on 4/25
 - **True Slice addresses many of BPA's concerns about product complexity and uncertainty while maintaining much of the fundamental product characteristics that are of value to customers.**
 - Customers receive their share of federal system optimized schedules and dispatch through market awards → Customers' Right-to-Power = BPA's Right-to-Power.
 - Market awards tied to single generation bid curve submitted by BPA. Slice product portion of must-offer met by % share of Tier 1 FCRPS offer curve instead of fixed DA Slice schedules.
 - Real-Time market adjustments and settlements flow through to Slice customers.
 - Product complexities reduced by using existing market functionality to shift complexity from BPA to the Market Operator → Pure Slice is likely **LESS** complex than DA Slice or RD Slice.
 - **Customers are committed to working collaboratively with BPA to find a "*path to yes*" for Slice product design that meets the needs of both BPA and customers.**
 - Customers recognize BPA's desire to stick to the POC schedule, but additional engagement between customer and BPA subject matter experts may be needed during Phase 1 Policy Implementation period to address any critical issues.
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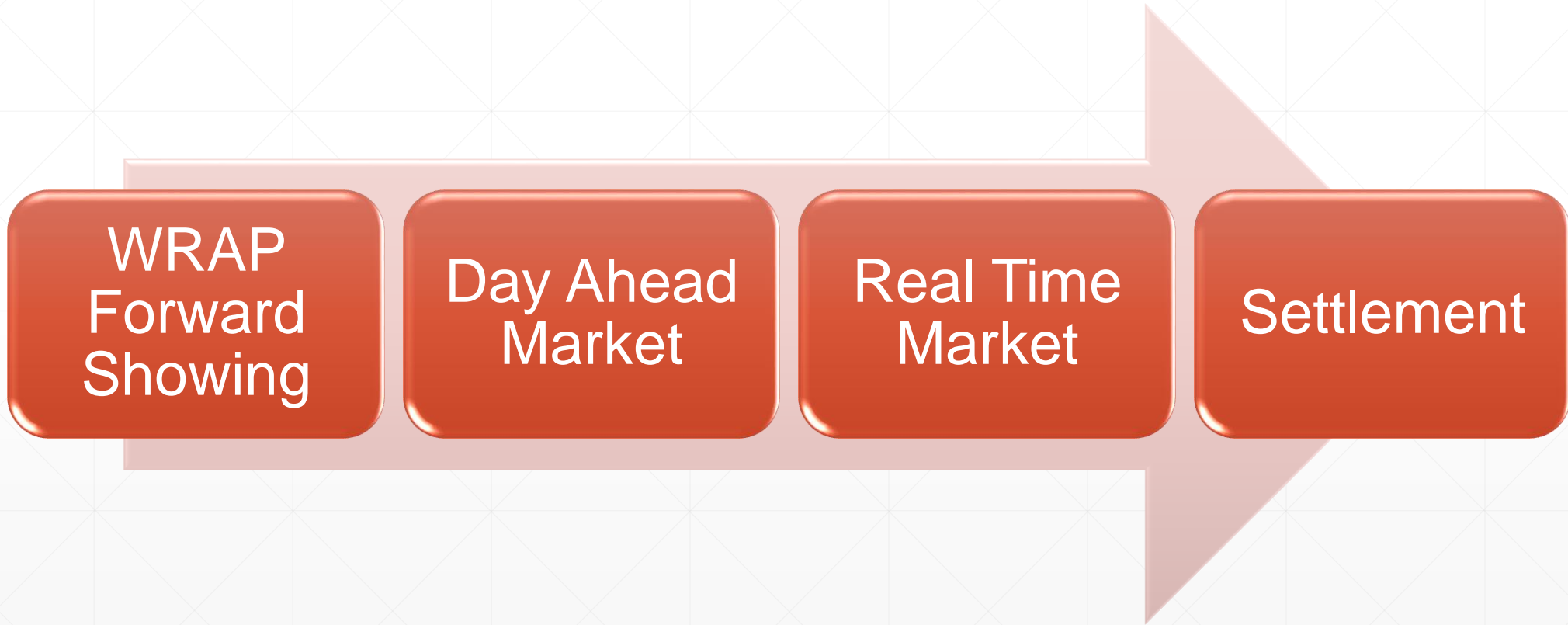
Questions & Discussion

- **Additional materials are included as part of this presentation to assist in answering any detailed questions around the Planned Product customers' True Slice approach to POC Slice product design:**
 - True Slice Concept Lifecycle
 - “Day-in-the-Life” detail on key business processes
 - Miscellaneous back-up and supporting slides not used elsewhere in the presentation
 - Outstanding Issues & Parking Lot Items catalogue
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True Slice Concept Lifecycle

Provider of Choice Slice

TRUE SLICE CONCEPT WALKTHROUGH



True Slice & Resource Adequacy - *WRAP*

Forward Showing



- ***A functional central market requires assurance that enough resource capability is available for the market to solve.***
 - Meeting WRAP Forward Showing is first step in assuring every LRE in the market footprint is procuring their fair-share of required capacity.
- ***Slice Customer as a Market Participant would be a participant in WRAP and would meet all WRAP Forward Showing requirements.***
 - WRAP Qualifying Capacity Contributions (QCCs) of all participant resources, including planned Slice QCC, are sufficient to meet the WRAP Forward Showing requirement of forecast P50 Load plus the Planning Reserve Margin → This is a WRAP requirement today for binding participation.

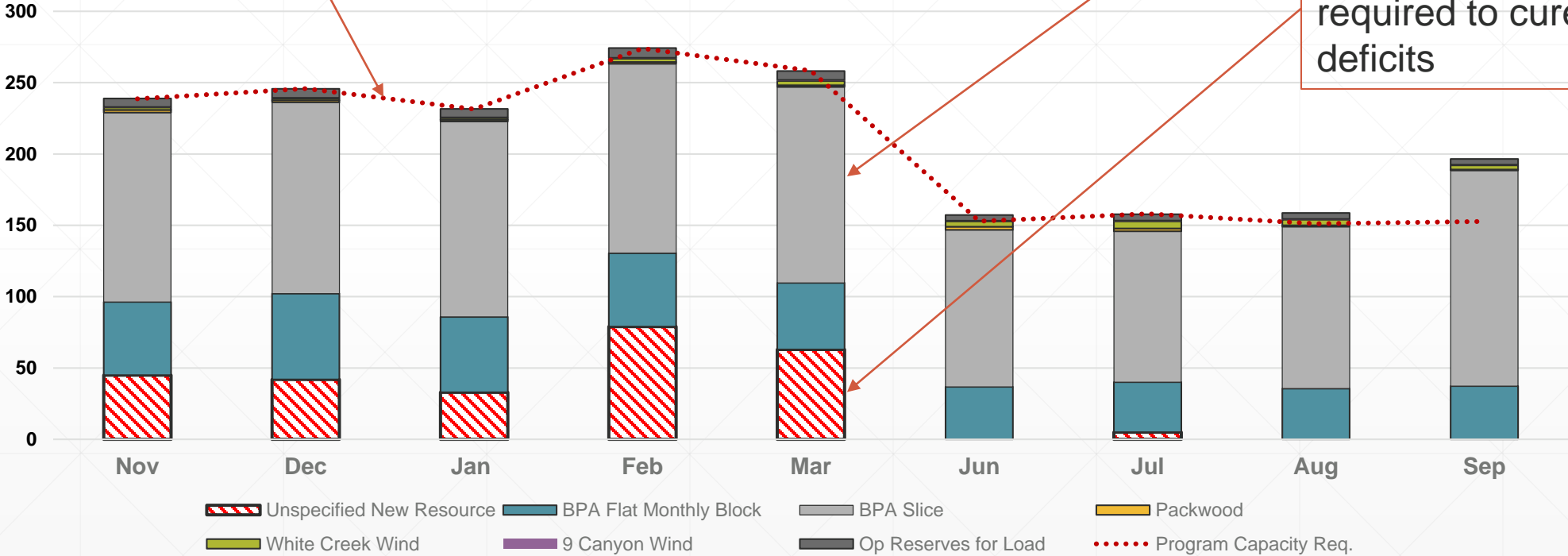
Forward Showing Considerations

Capacity Requirement = P50 Peak Load + PRM

BPA Slice Showing = FCRPS WRAP QCC x Slice %

New Resource required to cure deficits

Forward Showing Example

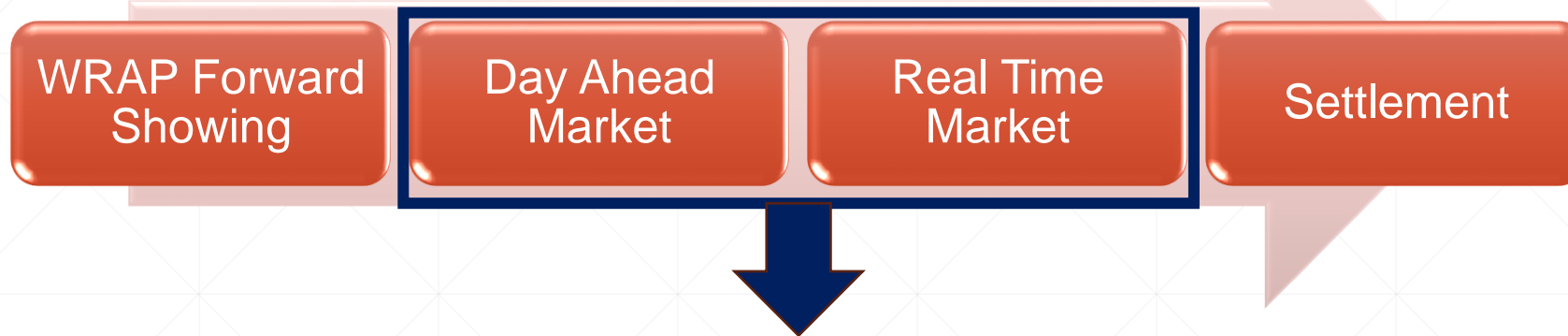


True Slice & Market Framework – SPP M+ & Combined Interest Resource



- **True Slice assumes the SPP Markets+ framework.**
 - SPP M+ market rules still being finalized, so things could change
 - Would need to address a CAISO EDAM framework
- **Federal Tier 1 System is registered with Market Operator (MO) as a Combined Interest Resource (CIR):**
 - The CIR is registered as a single resource for market operation under a single Market Participant (**in this case, BPA**).
 - BPA, as the single Market Participant registering the CIR, would provide MO with the individual interest percent shares (**in this case, the Contract Slice %s**) by each of the other individual Market Participants (**in this case, the individual Slice customers**).
 - Settlement of credits and charges for the CIR are allocated by the MO **directly to the Slice customer** using the percentages of submitted interest share.
 - CIR is a "market only" designation – **In no way does it imply or convey any actual asset ownership or control of Federal assets to a Slice customer.**

True Slice & the Market – SWRS



- ***BPA maintains a single instance of the existing Slice Water Routing Simulator (SWRS), which will at all times represent the most current feasible range (min/max) of Federal Tier 1 System generation capability.***
 - ***Today's separate Customer-specific instances of SWRS will go away.***
- ***SWRS inputs will represent then current RT and DA generation capability for market dispatch as well as planned/forecast generation capability for DA+1d through the 10-day simulation window.***
 - ***SWRS will provide Slice customers transparency on system conditions and generation capability necessary for Must-Offer Obligations, coordination with BPA on DA economic offers, and individual portfolio management.***
- ***Each Slice customer will have access to the single instance of SWRS.***
 - ***Slice customer will be limited to read-only access for the Contract Scenario (system of record), will have full read-write access and functionality for Analysis Scenarios (customer "sandbox").***

True Slice & the Day Ahead Market – *Pre-Day Ahead*



Multi-Day Ahead

- Market is **not** dispatching FCRPS across multiple days. This will continue to be done outside the market.
- Single instance of SWRS will represent multi-day (10 days) system generation capability informed by system and market conditions.
- SWRS will continue to provide a feasible range of system generation capability (min/max).

Pre-Day Ahead Market

- Using SWRS, BPA and customers develop preferred dispatch of system to inform “advisory” offer shape for next morning's DA market submittals reflective of expected market conditions.
- Advisory offer shape in SWRS also provides hourly Feas Max, Feas Min and daily energy limit to be used by Customer to set up expected must-offer obligations for next morning's DA market submittals.

True Slice & the Market – *Day Ahead Must-Offer Obligation*



- In Day Ahead Market, all market participants must economically offer sufficient resources to meet demand forecast plus uncertainty --> ***Must-Offer Obligation or MOO***.
 - MOO is no greater than WRAP forward showing, and resources are adjusted for performance.
 - ***Customer will use generation capability outputs from the single instance of the SWRS (Feas max, Feas min, daily energy limit) to determine Slice contribution to overall MOO.***
 - Because single instance of ***SWRS represents actual Federal Tier 1 System capability***, and because ***Federal Tier 1 System is registered with the Market Operator as a CIR***, this ensures that the ***customer's MOO is in line with BPA's MOO*** for the Federal Tier 1 System resource contribution.
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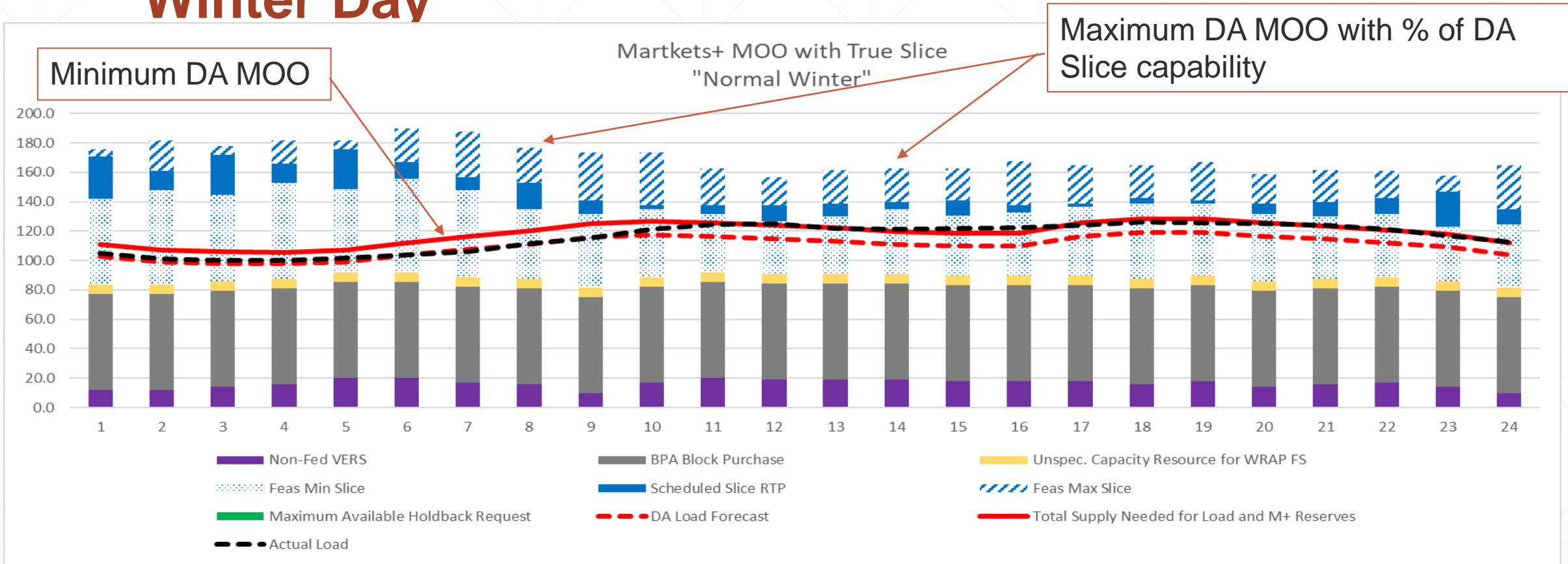
Day Ahead Market – Must Offer Obligation (MOO) – Minimum Requirements*

- For each hour, participant must offer resources =
 - + DA Hourly Load Forecast
 - + Hourly Real Time Reserve Obligation for uncertainty
 - (+/-) WRAP reserve sharing obligation
 - + Forward Sales
 - - Forward Purchases



* Minimum requirements applicable during non-binding season (Apr, May, Oct) and when forecasted loads are less than WRAP planning load

Must-Offer Obligation with True Slice - "Normal Winter Day"

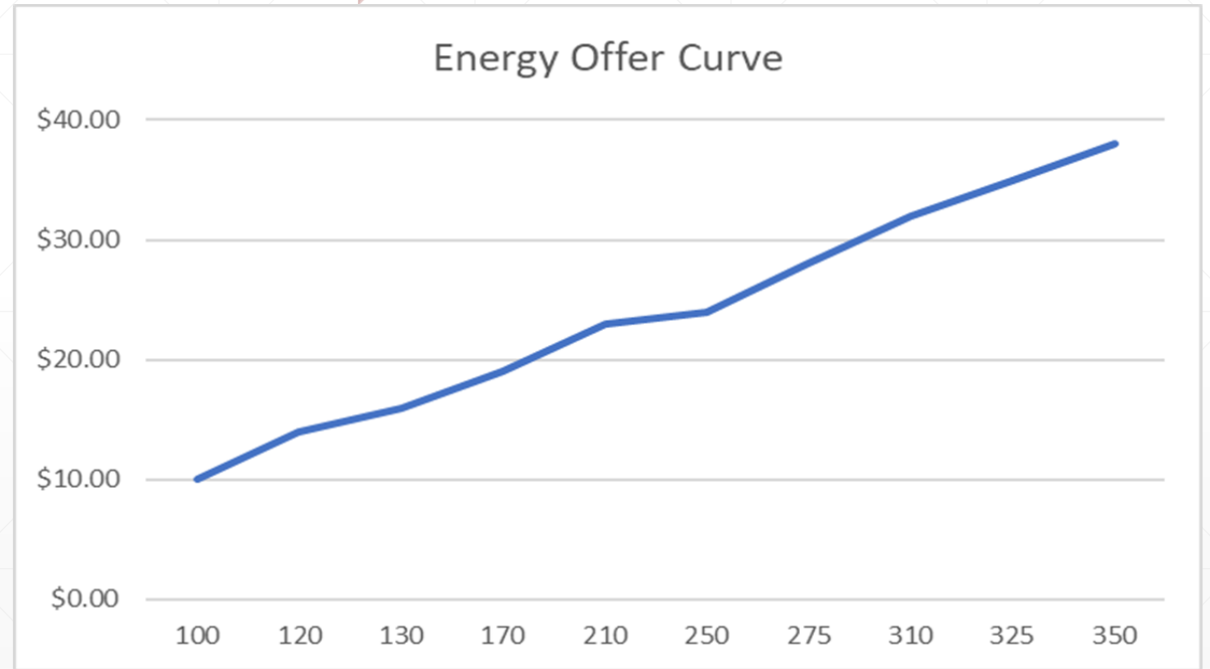


- WRAP FS requirement ensures that in most cases, DA MOO would be the Minimum requirement of DA Load Forecast plus market reserves for uncertainty.

True Slice & the Market – Day Ahead Energy Offer Curve



- As the single registered entity for the Federal Tier 1 System CIR, **BPA submits the DA Economic Offer and generation parameters for the Federal Tier 1 System that includes generation quantity and price pairs.**
 - Economic offers tell the market how many additional MWs a Market Participant is willing to sell when the price reaches a certain level.
 - BPA to provide customers visibility on final DA offer curve submission to market and update SWRS with any system changes.



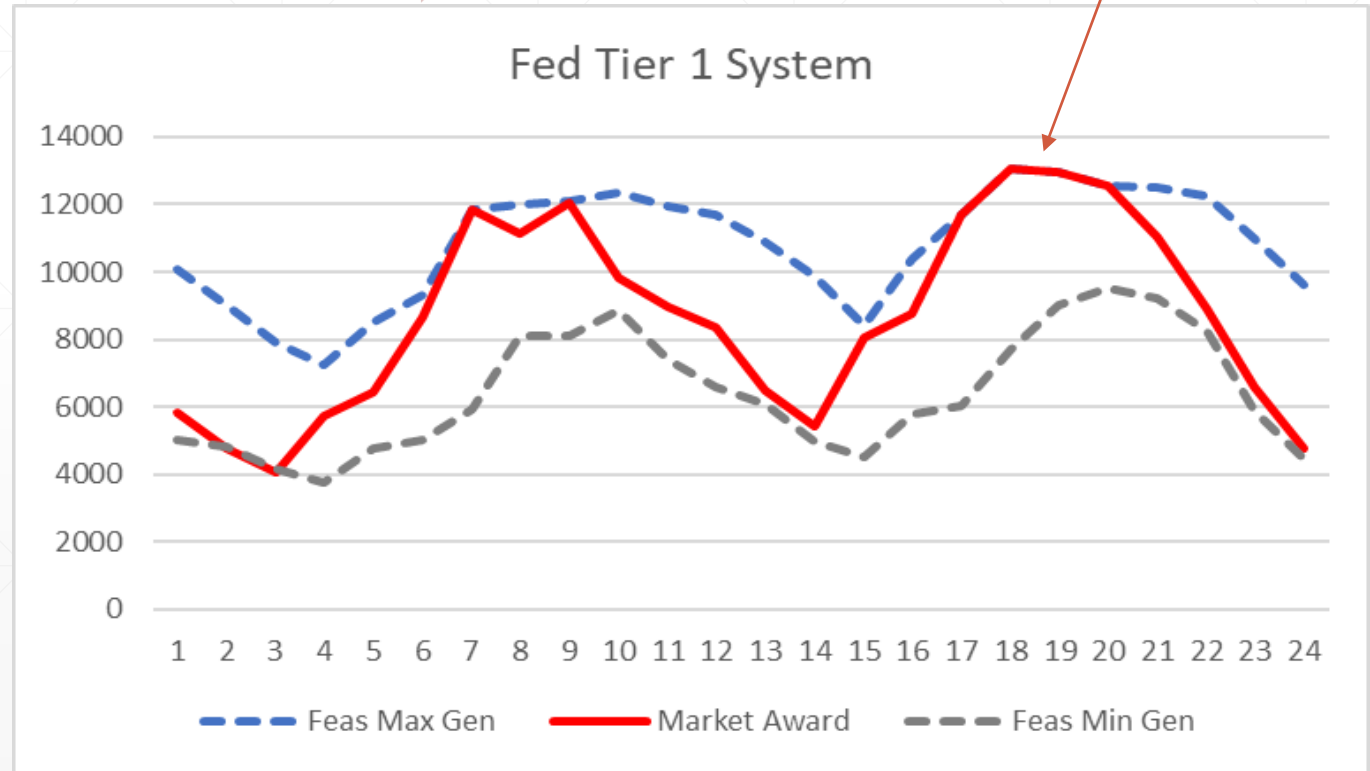
PRICE	\$10.00	\$14.00	\$16.00	\$19.00	\$23.00	\$24.00	\$28.00	\$32.00	\$35.00	\$38.00
MW	100	120	130	170	210	250	275	310	325	350

True Slice & the Market – *Day Ahead Market Awards*



DA Awards determine Slice RTP

- After the Day Ahead market runs, **BPA receives physical dispatch awards for next day Real-Time.**
 - This includes all cleared products for the Fed System, including DA energy, Residual Unit Commitment (RUC), etc.
 - Based on how the CIR works, the MO will be able to allocate these awards directly to the customer based on the registered Slice %s.
- **BPA updates SWRS to reflect next-day physical awards.**



True Slice & the Market – *Real Time Market*



- ***BPA will have control over any **Real-Time** updates/changes to Fed Tier 1 System gen capability, MOO and hourly offers (including Reliability Unit Commitment (RUC) adjustments).***
 - ***Any Real-Time dispatch orders from the market will be BPA's responsibility and actual dispatch of the system to the market will flow back directly to the Customer through the CIR mechanism based on the registered Slice %s.***
 - ***BPA updates SWRS inputs to reflect actual hourly dispatch of the Federal Tier 1 System.***
 - This provides Real-Time transparency on Customer's Slice position in Real-Time.
 - Final SWRS hourly Right-to-Power should reflect actual Fed System generation and could be used for any after-the-fact energy true-ups to actual generation.
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True Slice & the Market – Settlements & After-the-Fact



- **Market Operator settles all market awards and dispatch associated with the Federal Tier 1 System via the CIR mechanism.**
 - **Settlements** for Combined Interest Resource would **flow directly to Slice Customer** since Market Operator has the Slice %s as part of the CIR registration.
 - **Final hourly Right-to-Power in SWRS are trued-up to actual Federal Tier 1 System generation.**
 - True-up amounts are reflected in existing SWRS BOS Deviation Account on frequency TBD.
 - **Any market settlements that are not associated with the CIR registration would be accounted for in appropriate BPA cost pools and allocated according to PRDM.**
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True Slice Day-in-the-Life Detail

Some Key Pre-Requisites – Market Framework, WRAP Forward Showing

- Assuming the SPP Markets+ framework.
 - SPP M+ Tariff and market rules still being finalized, so things could change
 - Would need to address a CAISO EDAM framework
 - Slice Customer as a Market Participant would be a participant in WRAP and would meet all Wrap Forward Showing requirements.
 - WRAP QCCs of all participant resources, including planned Slice QCC, are sufficient to meet the WRAP Forward Showing requirement of forecast P50 Load plus the Planning Reserve Margin.
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Some Key Pre-Requisites – Combined Interest Resource

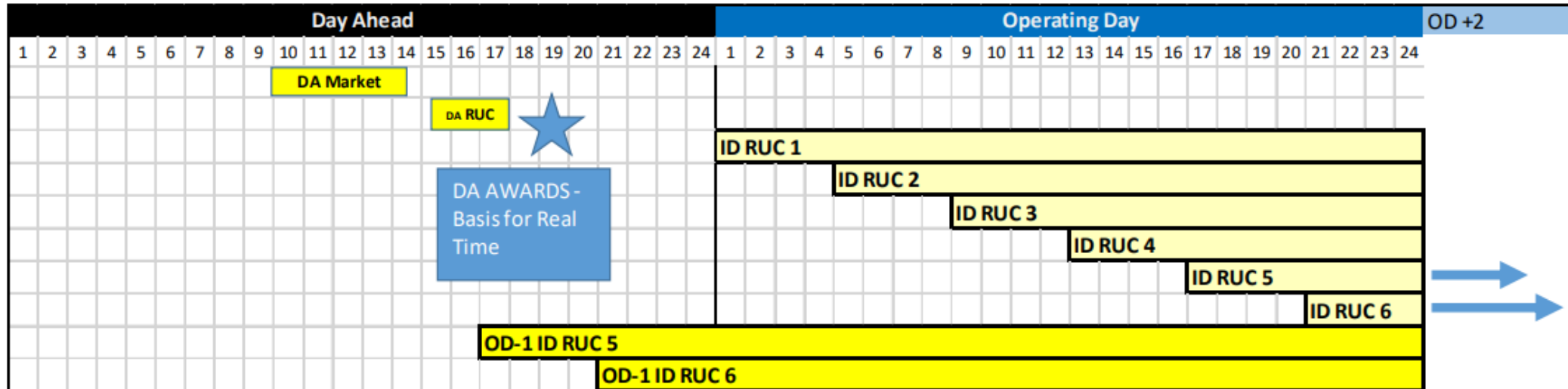
- Federal Tier 1 System is registered with the Market Operator (MO) as one or more *Combined Interest Resource(s) (CIR(s))*:
 - The CIR is registered as a single resource for market operation under a single Market Participant (in this case, BPA).
 - BPA, as the single Market Participant registering the CIR, would provide MO with the individual interest percent shares by each of the other individual Market Participants (in this case, the individual Slice customers, and their contractual Slice %s, respectively).
 - CIR rules state that each individual interest must have contractual rights to or financial obligations for the CIR (in this case, the Block/Slice Contract provides the contractual rights and financial obligations of the CIR - % share of the resource at a % share of the cost).
 - Credits and charges for the CIR are allocated by the MO using the percentages of submitted interest share (in this case, the contractual Slice %s).
 - CIR is a "market only" designation – in no way does it imply or convey any actual asset ownership or control of Federal assets by a Slice customer.
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Some Key Pre-Requisites – Slice Water Routing Simulator (SWRS)

- BPA maintains a single instance of the SWRS with a set of Customer Inputs representing the actual FCRPS.
 - This is probably very similar to an instance of SWRS that the BPA Slice Desk currently maintains on their end.
 - Today's separate Customer-specific instances of SWRS will go away.
 - SWRS will represent at all times the most current set of system inputs (constraints and conditions) - similar to how it's done today
 - Customer Inputs will represent then current RT and DA market dispatch as well as planned/forecast dispatch for DA+1 through the 10-day simulation window.
 - Timing and frequency of automated simulations and input updates TBD, but expected to be similar to today's processes
 - Simulations at least hourly, inputs updated 2-3 times hourly.
 - Feasibility of 10-day simulation must be maintained in similar fashion as today
 - Each Slice customer has access to the single instance of SWRS via the default DUI or the Customer Facing Interface (CFI) - same as it is today
 - SWRS access by Slice customer will be limited to read-only for the Contract Scenario, full read-write access and functionality will be unchanged for Analysis Scenarios.
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Timing of Day-Ahead Market

OVERVIEW OF M+ TIMING



- MPs can change RT offers t-30 for Operating Day
- RUC runs each 4 hours, or as needed to solve for system changes
- In East IM, generation outages are requested for approval unless they are forced (unforeseen). MPs must report unit outages and update Commit Status to the market
- Congestion and location based cost impacts are reflected in the MCC of the real-time LMP. LMPs are visible to the Market.
- Scarcity pricing will be activated to incent supply

Pre-DA Market – 2 days prior to RT deliveries (T-2d)

- Coordination schedule shown on upcoming slides is intended to be *illustrative* – will likely need discussion and adjustment
 - **By 1000** – Customer uses Analysis Scenarios to develop preferred dispatch of system to inform “advisory” offer shape reflective of expected market conditions. Customer promotes preferred Analysis Scenario in SWRS.
 - **1240** – Current RD Slice 12:40 Call re-purposed as Daily Bid Strategy Call:
 - Review prior day awards, actual dispatch and market settlement
 - Review Slice system constraints and conditions for 10-Day simulation window and beyond – same as it is today
 - Review short-term forward market conditions/expectations
 - Discuss bid strategy for next day’s DA market submittal, review/consider any Customer submitted Analysis Scenarios (see above)
 - **1600** – BPA provides summary of expected hourly offer curve for next day DA market submittal and updates SWRS Customer Inputs that represent preferred market award consistent with DA offer curve and expected system and market conditions beyond DA submittal window.
 - Hourly Feas Max, Feas Min and Slice RTP can be used by Customer to set up expected DA MOO for next morning’s DA market submittals
 - 10-Day feasibility maintained for entire simulation window
-

DA Market Submittals – 1 day prior to RT deliveries (T-1d)

- **0500** (needs to meet WRAP deadline of 0520 for submitting performance-adjusted resource forecasts for sharing calculation):
 - BPA sets “final” SWRS Customer Inputs that reflect BPA’s expected hourly offer curve submittal for the Federal System for next-day RT (T).
 - Updated Hourly Feas Max, Feas Min and Slice RTP for next-day RT can be used by Customer to set up DA MOO and portfolio position
 - Assumption: SWRS gen outputs would mirror BPA’s expectation for its own hourly offer shape and therefore would automatically be roughly shaped to the highest value hours.
 - **0630 to 0700** (needs to accommodate WRAP sharing calculation and final Holdback calc and exchange):
 - Customer sets DA hourly up-to Gen shape (presumably based on Hourly Feas Max in SWRS) for next-day RT, includes those values in DA MOO compliance (along with other non-Slice resources)
 - BPA submits DA bids and generation parameters for the Fed Tier 1 System (the CIR) - at a minimum, we would expect these submissions to cover Slice Customers’ hourly Feas Max Gen shape in aggregate due to the nature of how the CIR works
-

DA Market Submittals – 1 day prior to RT deliveries (T-1d)

- **1000 to 1430** – M+ DAM runs at 1000 and DA RUC runs at 1430
 - **No Later than 1800** – BPA gets initial physical awards from DA RUC for next-day RT
 - Based on how the CIR works, the MO should be able to allocate these awards directly back to the Customer based on the Slice %s.
 - **No Later than 1830** – BPA updates SWRS Customer Inputs that reflect next-day RT physical awards
-

RT Delivery Period (including period after DA submittal process above)

- Based on how the CIR works, BPA will have control over any RT updates/changes to Fed Tier 1 System gen capability, MOO and hourly bids (including RUC adjustments).
 - For future discussion/consideration: timing of RT changes in offer quantities and impact on customer RT MOO
 - Any RT dispatch orders from the market will be BPA's responsibility and actual dispatch of the system to the market will flow back directly to the Customer through the CIR based on the Slice %.
 - BPA updates SWRS Customer Inputs to reflect actual hourly dispatch of Fed System.
 - This provides RT transparency on Customer's Slice position in RT.
 - Final SWRS hourly RTPs should therefore reflect actual Fed System generation and can be used for any energy true-ups to actual generation
 - These true-ups can be calculated on a frequency TBD and accounted for in the SWRS BOS Deviation Account.
-

After-the-Fact

- MO settles all market awards and dispatch associated with the Fed Tier 1 System (the CIR).
 - Settlements for CIR would flow directly to Slice Customer since MO has the Slice %s as part of the CIR registration.
 - Any market settlements that are not associated with the CIR registration (maybe some admin fees?) would be accounted for in appropriate BPA cost pools and allocated according to PRDM.
 - Final hourly RTPs in SWRS are trued-up to actual Fed Tier 1 System generation, timing and frequency TBD.
-

Misc. Backup/Detail/Unused Slides

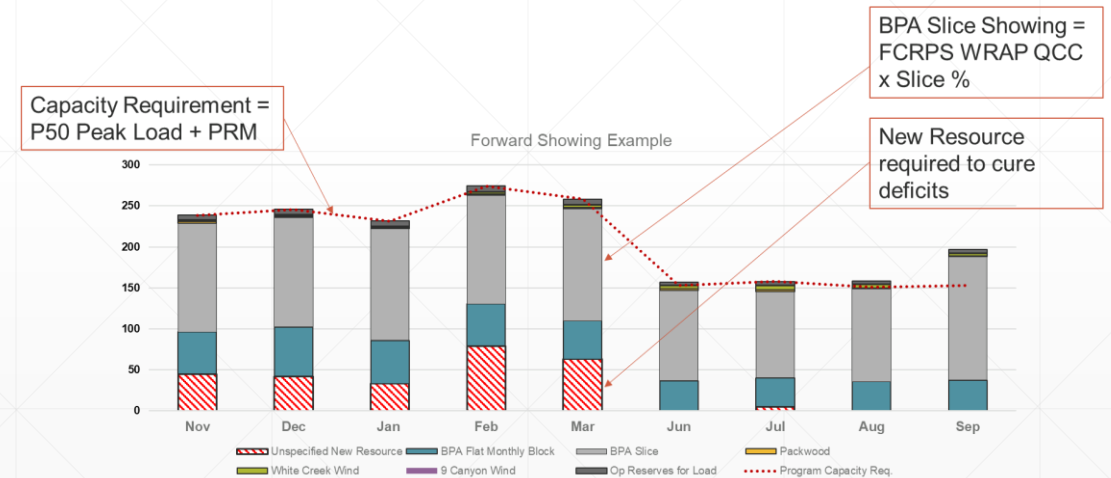
More MOO analysis, some unused Slides

Considerations for other BPA Power Products

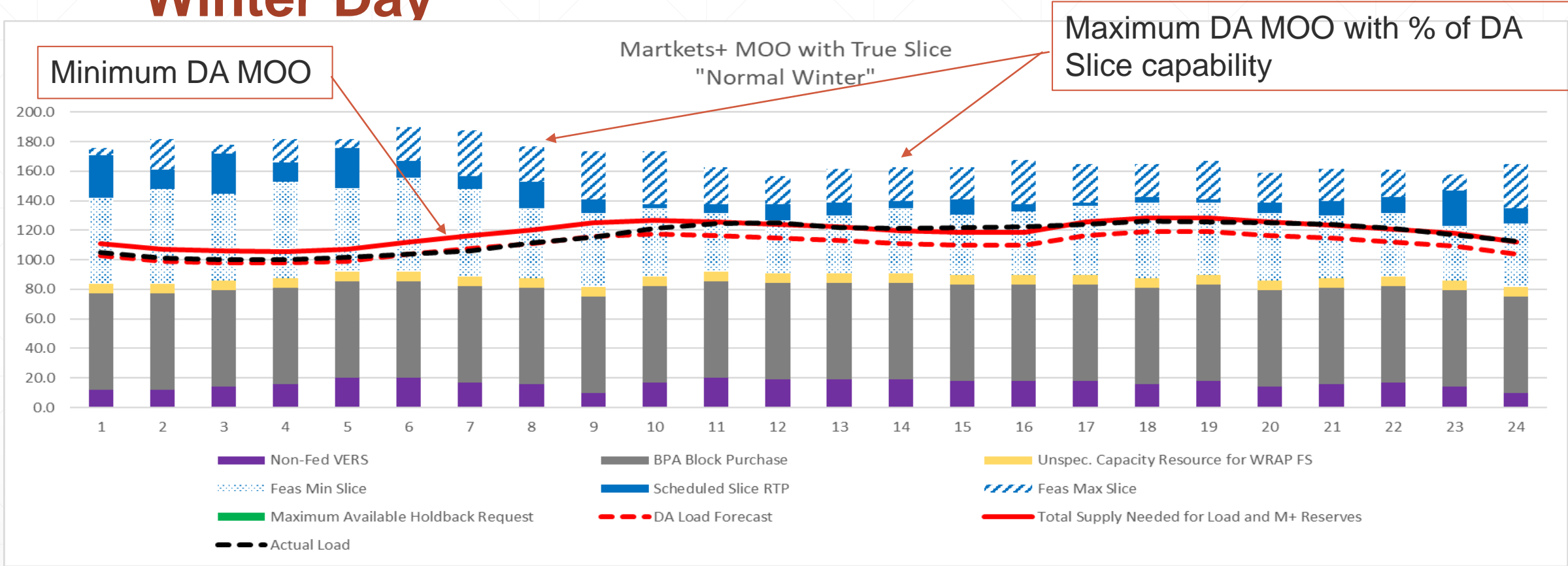
- Problem statement for DA Slice largely applies to Block with Shaping as well
 - BPA's proposal would similarly require customers to finalized flexible portion of Block with Shaping product prior to DA Market run
 - Block with Shaping would also be a price taker in DA Market
 - BPA's proposals for Slice/Block and Block with Shaping collectively leave planned product customers with *no ability* to use defined contractual rights to manage DA-to-RT uncertainty.
 - Ideally flexible elements of all BPA power products would be able to be optimized via DA and RT markets
 - Today's proposal focuses on Slice, but planned product customers interested in seeking similar outcomes for Block with Shaping
-

Day Ahead Market – Must Offer Obligation (MOO) – Maximum Requirements*

- The Maximum Day Ahead Must Offer will not exceed the monthly **WRAP Forward Showing requirement**
- This value can be adjusted in the following ways:
 - Reduction for additional forward purchases
 - Addition of additional forward sales
 - WRAP reserve sharing obligation
 - Day Ahead adjustments for fleet performance

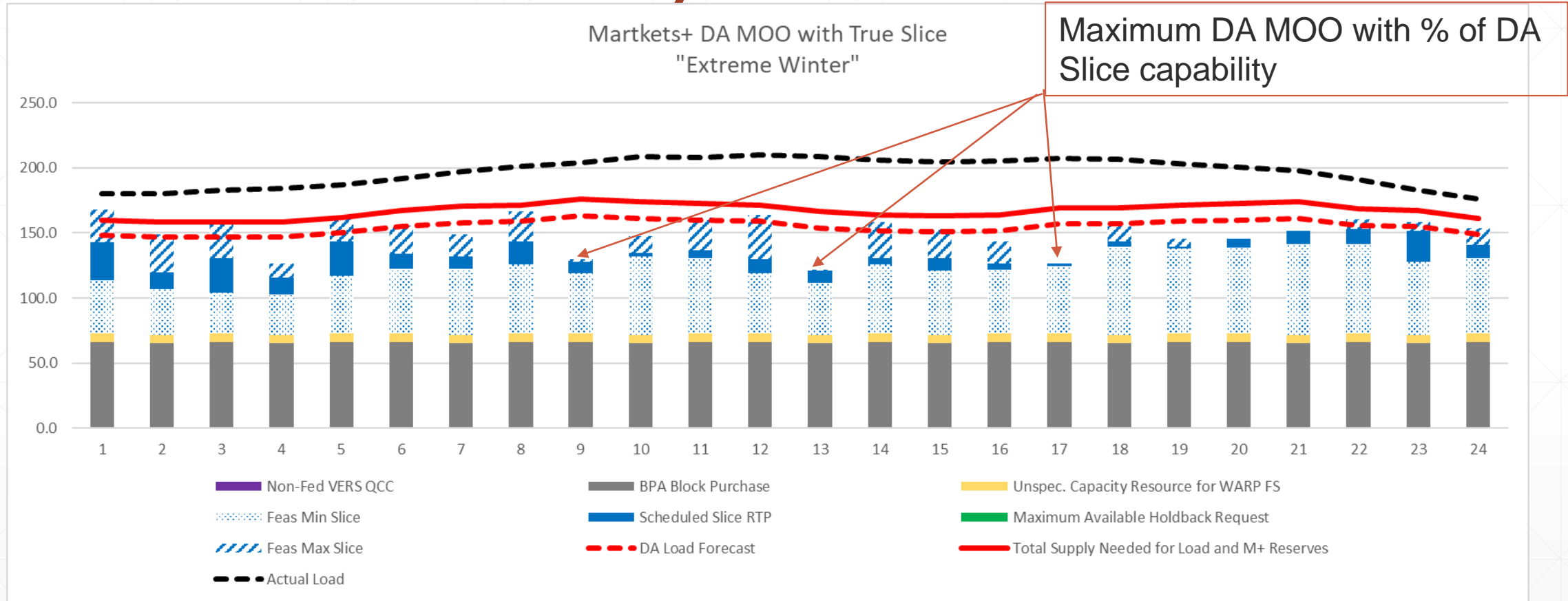


Must-Offer Obligation with True Slice - "Normal Winter Day"



- WRAP FS requirement ensures that in most cases, DA MOO would be the Minimum requirement of DA Load Forecast plus market reserves for uncertainty.

Must-Offer Obligation with True Slice - "Extreme" Winter Day

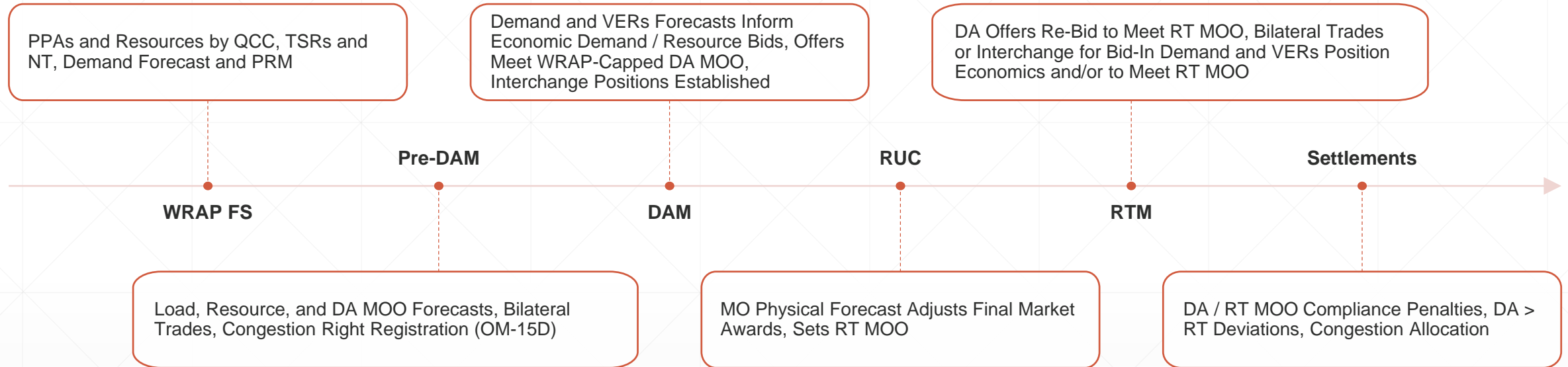


- In extreme weather event, MOO is performance adjusted capability of resources, including actual performance capability of Slice.
- In RT, incremental dispatch of available resources in RUC, including Federal System, meet the RT market demand. Slice customer would get Slice contract % of RT dispatch.

Real Time Balancing Market – Must Offer Obligation (MOO)

- The Maximum Day Ahead Must Offer will not exceed the annual forward showing requirement
 - This value can be adjusted in the following ways:
 - Reduction for additional forward purchases
 - Addition of additional forward sales
 - WRAP reserve sharing obligation
 - Day Ahead adjustments for fleet performance
-

2030 Vision: Serving Load in a Day-Ahead Market



▪ Key Points:

- Forward resource plan must include WRAP QCC eligible resources and NT/PTP plans due prior to Operating Month.
- DA Demand and VERs Bids set economic position for RTM settlement, DA Offers meet DA MOO and set DA RUC exposure.
- RT MOO set prior to RTM and RTM offers are adjusted to manage economic exposure to demand and resource deviation.

True Slice utilizes market mechanisms in SPP M+ Tariff

- **COMBINED INTEREST RESOURCE**

- A Resource registered to reflect shared interest of multiple Asset Owners and modeled as one commercial Resource. Credits and charges for these Resources are allocated post market using the submitted interest share percentages.

- **ASSET OWNER**

- An aggregation of assets defined by a Market Participant through the Market Operator's registration process.

True Slice Outstanding Issues/Parking Lot Items

Compatible with how Bonneville would participate in a day-ahead market	Path to Yes? (Yes/No/Maybe)
Outstanding Issue/Parking Lot Item	Critical for Phase 1?
1) Add issue/item here	
2)	
3)	
4)	
5)	
5)	
7)	
8)	
9)	
10)	

Does not require unique market design or exceptions.	Path to Yes? (Yes/No/Maybe)
Outstanding Issue/Parking Lot Item	Critical for Phase 1?
1) Add issue/item here	
2)	
3)	
4)	
5)	
5)	
7)	
8)	
9)	
10)	

Can be offered to all customers	Path to Yes? (Yes/No/Maybe)
Outstanding Issue/Parking Lot Item	Critical for Phase 1?
1) Add issue/item here	
2)	
3)	
4)	
5)	
5)	
7)	
8)	
9)	
10)	

Does not create additional complexity	Path to Yes? (Yes/No/Maybe)
Outstanding Issue/Parking Lot Item	Critical for Phase 1?
1) Add issue/item here	
2)	
3)	
4)	
5)	
5)	
7)	
8)	
9)	
10)	

Allows more direct market participation	Path to Yes? (Yes/No/Maybe)
Outstanding Issue/Parking Lot Item	Critical for Phase 1?
1) Add issue/item here	
2)	
3)	
4)	
5)	
5)	
7)	
8)	
9)	
10)	

Minimizes sub-optimal market outcomes	Path to Yes? (Yes/No/Maybe)
Outstanding Issue/Parking Lot Item	Critical for Phase 1?
1) Add issue/item here	
2)	
3)	
4)	
5)	
5)	
7)	
8)	
9)	
10)	

Contribution to market Must-Offer Obligation is understood	Path to Yes? (Yes/No/Maybe)
Outstanding Issue/Parking Lot Item	Critical for Phase 1?
1) Add issue/item here	
2)	
3)	
4)	
5)	
5)	
7)	
8)	
9)	
10)	

Interaction with WRAP Forward Showing and Operations is understood	Path to Yes? (Yes/No/Maybe)
Outstanding Issue/Parking Lot Item	Critical for Phase 1?
1) Add issue/item here	
2)	
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5)	
7)	
8)	
9)	
10)	

Preserves fundamental product characteristics and value (i.e., flexibility, load service, non-federal integration, risk sharing, etc.)	Path to Yes? (Yes/No/Maybe)
Outstanding Issue/Parking Lot Item	Critical for Phase 1?
1) Add issue/item here	
2)	
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10)	