The Western Resource Adequacy Program:

Considerations for Planners and Policymakers

September 2023

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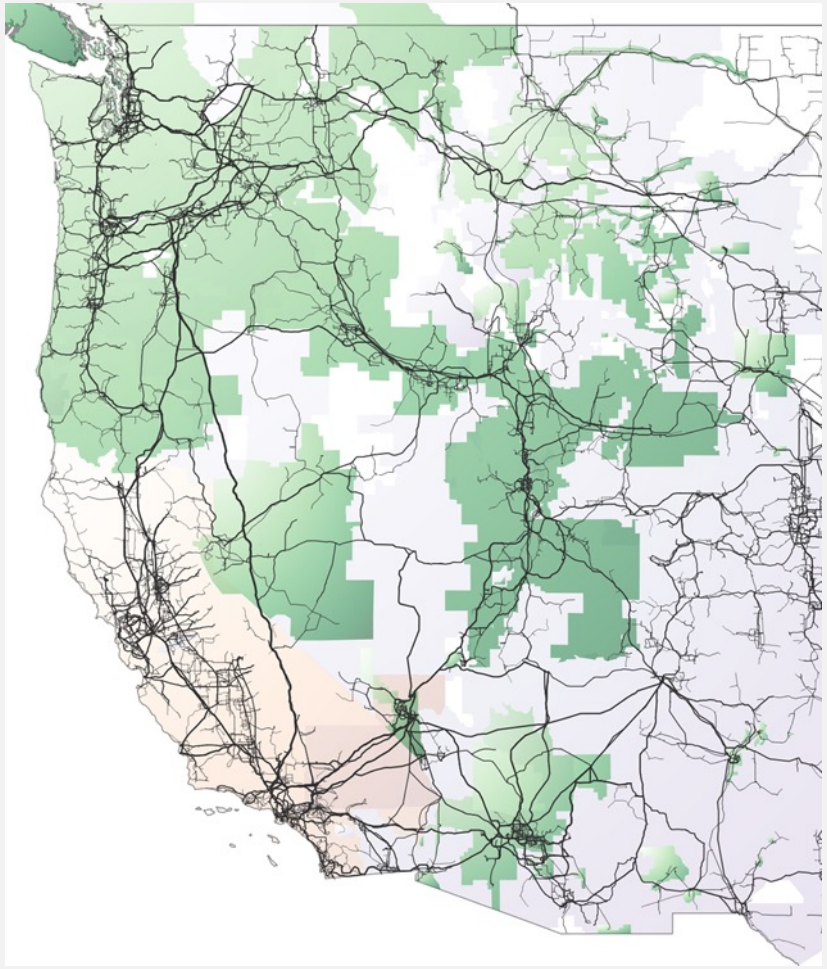
WRAP: Key Takeaways

- WRAP, a first-of-its-kind non-ISO regional Resource Adequacy program, represents a huge step forward toward regional reliability analysis, planning, and coordination for the non-CA West
- WRAP has the potential to help address a major collective action problem for the region – the ability to proactively assess and drive resolution of regional reliability needs through data collection, analysis, and the establishment of binding requirements
- While WRAP is a major step forward, achieving WRAP's full economic and reliability potential will require:
  - **Integration with Planning:** Effective integration of WRAP into utility-level planning and procurement activities, including both near-term compliance and long-term planning
  - **Modeling Gaps:** Program evolutions to address near-term modeling gaps and extend analysis beyond the current limited planning horizon
  - **Data Insights:** Enhanced data transparency to facilitate the integration of WRAP's data insights into utility modeling workflows
  - **Transmission Friction:** Resolving transmission rights friction unique to WRAP as a non-ISO regional Resource Adequacy program



WRAP, CAISO, and the Broader WECC

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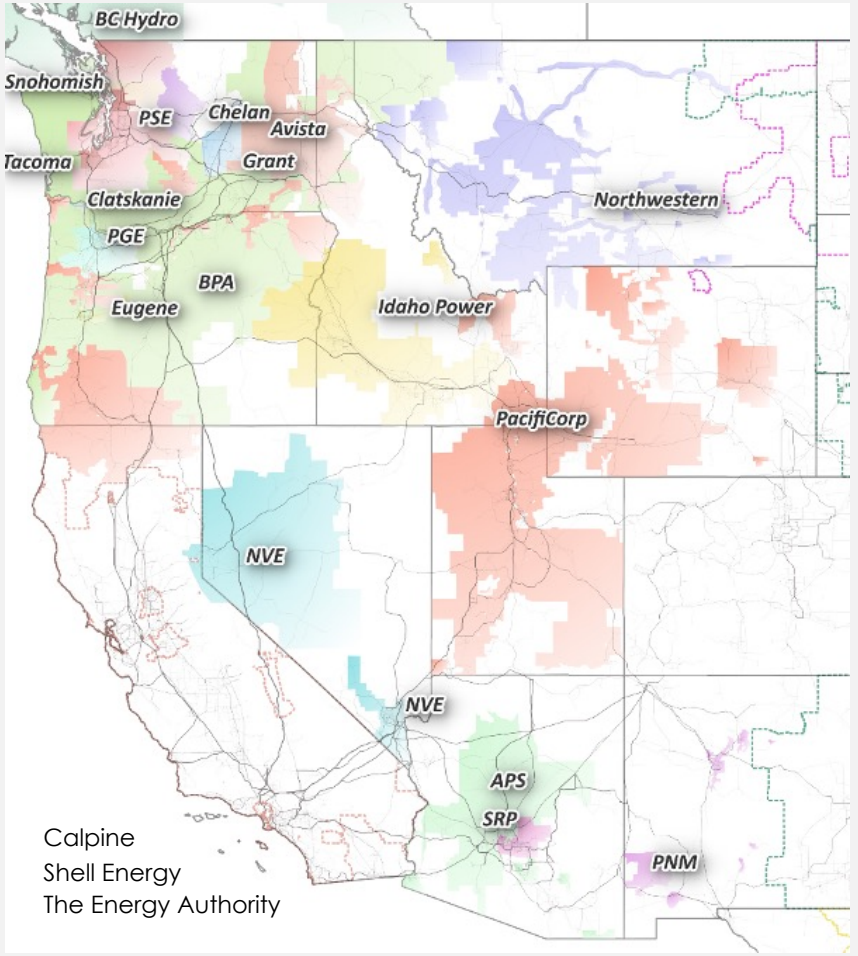
WRAP: The Basics

What is the Western Resource Adequacy Program? How does it work? Who is participating?

What is the WRAP?

- WRAP is a regional reliability program providing an accounting and compliance framework to ensure Participants (utilities) have sufficient resources (capacity) to meet a desired reliability standard
- Mechanically, WRAP consists of two phases:
  - Forward Showing (FS Program):
    - Defines a regional reliability requirement using a probabilistic model
    - Allocates responsibility to Participants and establishes reliability values for all resources
    - Requires participants to show portfolios meeting their assigned reliability requirement
  - Operations Program (Ops Program):
    - Supports real-time transactions between Participants during periods of scarcity
- At its outset, WRAP is expected to have 22 Participants and will cover approximately 2/3 of non-CA WECC load
  - Non-participants include Colorado, rural electric co-operatives, and others
- WRAP will fill some (but not all) of the reliability functions that would be served by a regional Independent System Operator

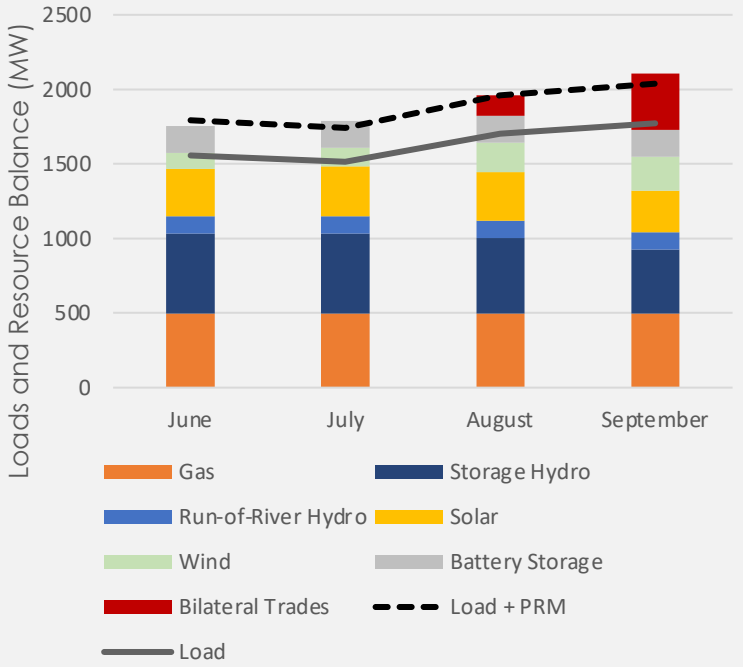


WRAP Participant Footprint

WRAP will cover the majority of non-CA WECC load

Planning: The Forward Showing (FS Program)

- The Forward Showing is the centerpiece of WRAP's planning and procurement compliance program.
  - Each Participant is required to make annual compliance showings, one each for Summer (6/1-9/15) and Winter (11/1-3/15)
  - Load and resource values will fluctuate monthly based on defined accounting structures
  - Participants must show owned, contracted, or otherwise controlled resources to meet each month's load + Planning Reserve Margin
  - At least 75% of the resources shown in the Forward Showing must include firm transmission
- Compliance requirements will be established 1 year prior to the showing deadline
- Advisory compliance requirements will be established 4 years prior to the showing deadline; however, these will change as the portfolio evolves
- Unlike most RA programs, the FS Program bifurcates generation and transmission, requiring participants to procure both

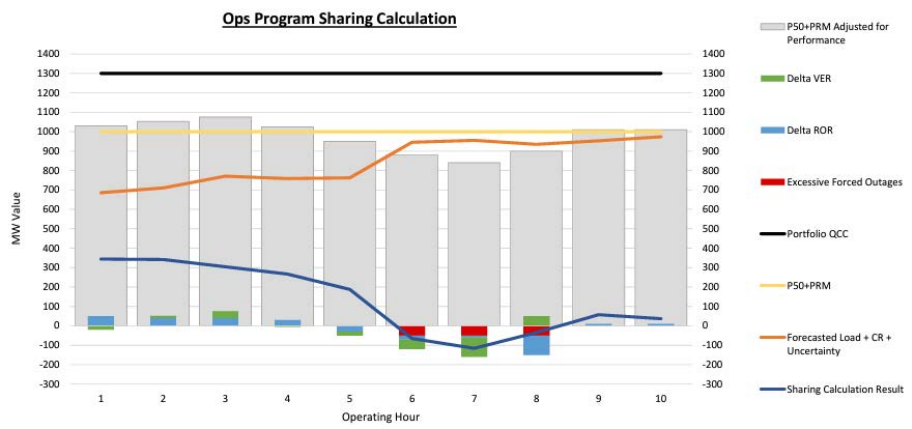


Illustrative Summer Season Showing

Note variations in monthly load and resource values

Real-Time: The Operational Program (Ops Program)

- The Operations Program is intended to facilitate resource sharing during scarcity events:
  - As real-time approaches, the Ops Program will continuously monitor market and reliability conditions beginning 7 days prior to the operating day
  - The Ops Program assesses potential for capacity shortfalls collectively and for any individual participant based on their Forward Showing
  - If shortfalls are identified, the Ops Program will direct any surplus participant to hold back capacity which deficit participant may call on during operating day
- The Ops Program is intended to proactively identify shortfalls and facilitate bilateral trading between surplus and deficit participants with defined trading and pricing rules
- Unlike an ISO, the Ops Program does not include real-time dispatch, market optimization, contingency planning, or inform load-shedding requirements



Illustrative Ops Program Sharing Analysis

Designed to identify shortfalls based on actual resource availability

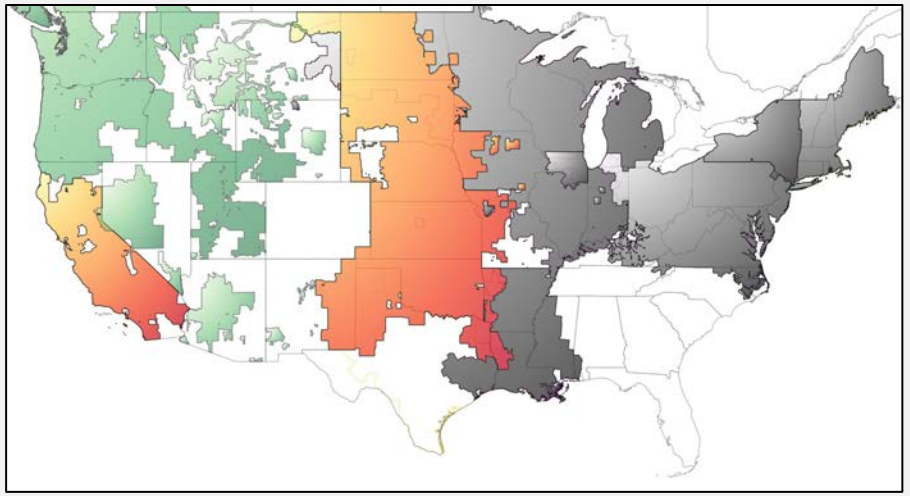
WRAP: Comparative with other RA Programs

- Conceptually, WRAP serves a similar function to Resource Adequacy and Capacity Market programs in other markets
  - WRAP shares many design features with other programs – probabilistic modeling, use of Effective Load Carrying Capability, etc.
  - Similar to CAISO and SPP, WRAP's RA program is bilateral and does not incorporate a centralized market
  - The bifurcation of generation and transmission rights is unique among RA programs, which utilize deliverability studies and geographically specified requirements to establish deliverability and local needs
- Like other RA programs, WRAP will co-exist with a complex patchwork of utility- and state-led planning and procurement efforts

Western Resource Adequacy Program

Bilateral RA Programs (CAISO, SPP)

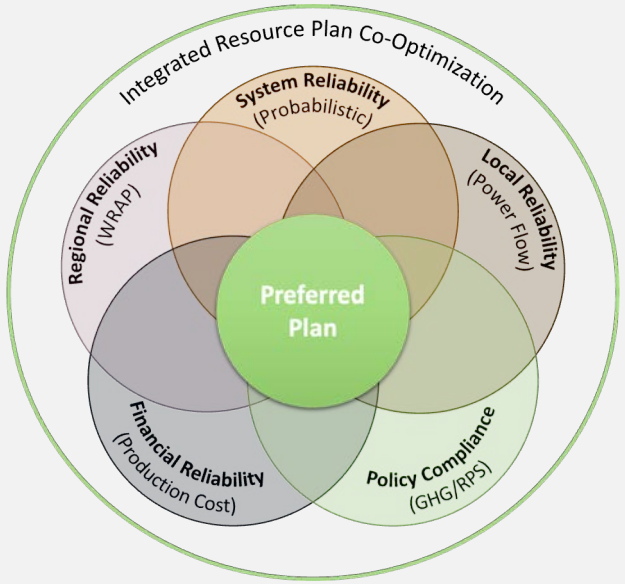
Central Capacity Markets (PJM, MISO, NYISO, ISO-NE)



Regulatory Integration: Near-Term Compliance + Long-Term Planning

WRAP will have significant intersections with existing utility planning and regulatory frameworks

- **Compliance Oversight:** As a compliance obligation, near-term WRAP positions and procurement should be executed by utilities regulated by policymakers in a manner similar to existing regulation of RPS, RA, financial, and other procurement positions
- **Planning Input:** As a planning input, WRAP will have significant overlap with – and opportunity to inform – long-term utility planning processes:
  - Near-term advisory requirements may be directly incorporated as an IRP constraint
  - Mid- and long-term, WRAP has potential *(if data transparency is increased)* to inform key IRP inputs, including regional resource availability, hours of reliability concern, transmission availability, and other key inputs
- Because WRAP's analysis is regional and near-term, it does not displace the need for utility-specific probabilistic reliability modeling, but it can be useful in calibrating utility-specific analysis



Integrated Resource Planning Co-Optimization

WRAP will become an additional constraint for utility modeling workflows to incorporate, but does not displace the need for utility-specific probabilistic reliability analysis

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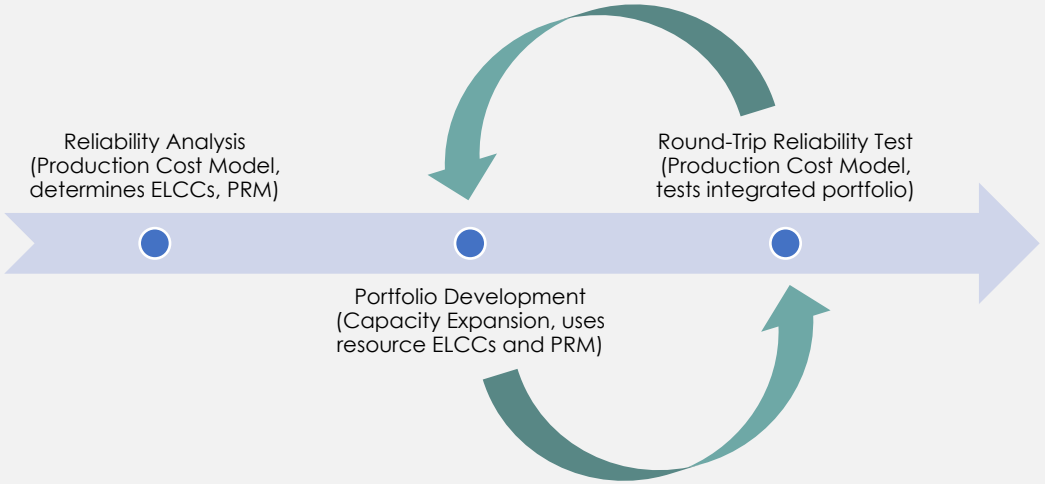
Understanding WRAP:

Issues,Opportunities, Challenges

Utility-Level Probabilistic Modeling

- While WRAP is designed to provide regional reliability insights, utilities will remain responsible for analyzing their specific reliability risk, and should do so using probabilistic reliability modeling
- The need for utility-specific modeling is driven by incongruities between the reliability analysis performed by WRAP and that required to ensure utility-level reliability. Areas of misalignment include:
  - **Regional** versus **utility-specific geographical granularity** (transmission topology)
  - **Collective** versus **individual load-resource position analysis** (hourly load-resource balance)
  - **Integrated** versus **frictional system operations** (transmission priority and curtailment risk)
  - **Programmatic** versus **policy-driven reliability standard** (state- or utility-specific reliability requirements)
- Utility-level planning should follow the rising best practice of round-trip modeling, an iterative process through which reliability needs are developed and affirmed through probabilistic reliability modeling to one or more desired reliability metrics



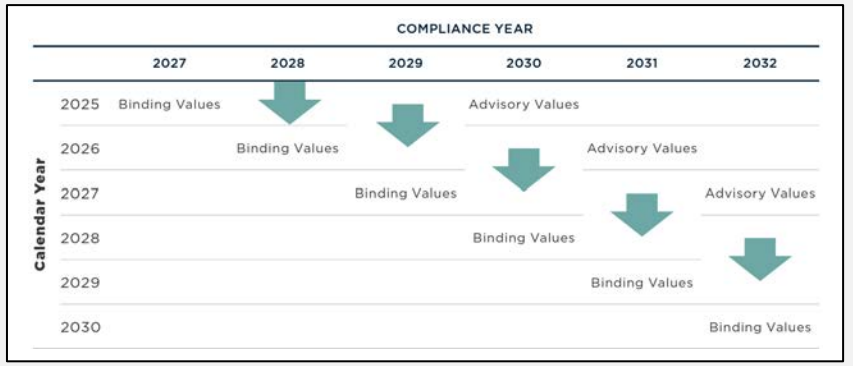
Round-Trip Reliability Modeling

WRAP will become an additional constraint in IRP modeling

Gaps in the Modeling Timeline

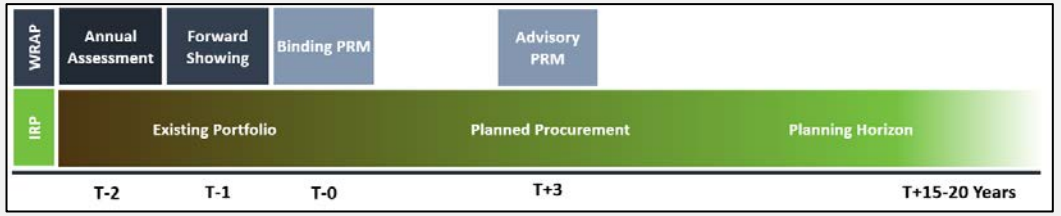
The modeling timeline presents two key gaps:

- **Near-Term Gaps:**
  - Each modeling year assesses only two forward years – T-0 and T+3
  - Changes to modeling results are likely between the advisory (T+3) and binding (T-0) analyses, but will not be identified until the final binding analysis for T+3
  - Participants may experience compliance 'surprises' which could be mitigated through annual modeling of all near-term years (T-0, T+1, T+2, T+3)
- **Long-Term Gaps:**
  - Utility planning and resource development occurs on a long-term scale – typically 15-20 years
  - Increasingly, long-lead time resources (offshore wind, geothermal, hydrogen, etc.) and impending policy deadlines (e.g., coal exit by 2030) enhance the long-term focus
  - While WRAP lays the foundation for long-term data sharing, reliability modeling, and Participant coordination, lack of long-term modeling limits its utility in resolving long-term reliability needs



Near-Term "Gap Years"

Limited near-term modeling may introduce unnecessary gaps in near-term planning, as utilities wait 3 years between advisory and binding values



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Resolving WRAP's modeling gaps will be essential in unlocking WRAP's long-term value.

Leveraging WRAP's Data Insights

WRAP's data collection and analysis process will generate answers to some of the most pivotal and uncertain questions within its Participants' IRPs – questions which can only be answered through regional analysis.

- **Import Assumptions:** Do my modeling results accurately reflect periods of critical reliability risk for the region? During which hours will spot market energy be unavailable?
  - Avista (p. 208-213), Eugene (p 78), Idaho Power (p. 139, 144), NVE (p. 6), PAC (p, 146) , PGE (p. 73-74, 125-126), PNM (p. 76, 151), PSE (p, 7-7, 7-46), Seattle (p. 29), SRP (p. 26), Tacoma (p. 43)
- **Transmission Assumptions:** To what extent can I rely on the availability of firm transmission for reliability resources? During which periods is conditional firm transmission at greatest risk of curtailment?
  - Avista (p. 133), Grant (p. 45), Idaho Power (p. 88), NVE (p. 37), PGE (p. 240), PSE (p. 34-39), Seattle (p. 41)
- **Renewables Assumptions: What is the expected rate of solar, wind, and storage development and how will it impact the economic and reliability value (ELCC) of those resource classes? If I have excess renewables, to what degree will they be purchased versus curtailed?**
  - APS (p. 132), Avista (p. 180), NVE (p. 157-158), PGE p. (72, 633-634), PNM (p.57-59), Northwestern (p. 60)

Despite considerable Participant and societal value, plans for dissemination of WRAP data insights remain undeveloped.

Transferring WRAP's data insights to Participants and policymakers can dramatically improve utility IRP modeling.

Transmission Friction

- While other RA programs enforce geographical requirements to reflect transmission limitations (e.g., CAISO local / MISO zonal requirements), WRAP will be unique in requiring Participants to bilaterally procure transmission rights to pair with non-native resources (75% by FS, 25% by OP)

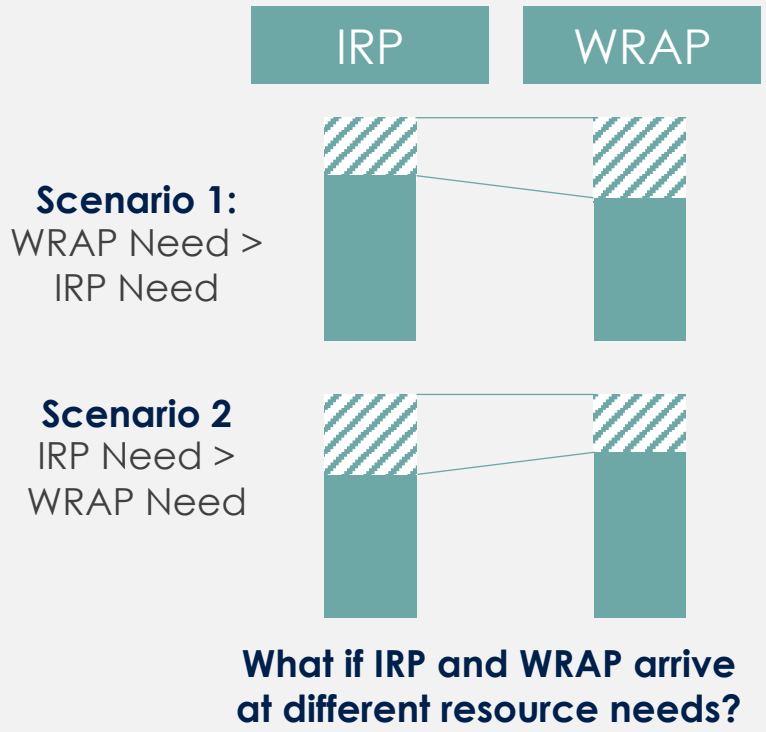
- Physical scarcity in transmission availability coupled with institutional friction in the transmission rights market is likely to constrain the ability of LREs to:
  - Execute bilateral trades with Participants or forward contracts for merchant generation across transmission bottlenecks
  - Have confidence in the deliverability of new generation resources built to leverage regional renewable diversity needing multi-year / long-term transmission rights

- WRAP will likely accelerate existing urgency for transmission development, market integration (e.g., ISO formation), and the importance of integrating utility transmission and resource planning processes

WRAP's transmission-generation bifurcation poses challenges for utilities seeking to leverage regional trades and access geographically diverse resources

Reliability Gaps Between IRP and WRAP

- Given inherent differences in assumptions and methodology, WRAP and IRP reliability analysis will never result in precisely the same assessment of a utility's reliability need for a season (or months within a season) – ideally, gaps between IRP and WRAP will be small and can be managed through bilateral trades to sell excess or fill open positions
- However, large gaps may arise due to analytical or accreditation differences, and may be exacerbated by different frameworks (e.g. annual vs monthly accounting):
  - In **Scenario 1**, the **IRP identifies less reliability need than WRAP**. If the gap is structural in nature, should the utility procure excess capacity beyond its identified need? *Procurement would be necessary to avoid non-compliance charges*
  - In **Scenario 2**, the **IRP identifies more reliability than WRAP**. If the utility procures excess resources for its own reliability needs, should it resell those in WRAP? *Resale would cede the utility's right to use the resource for its own needs*
- While utilities and regulators should seek to identify, understand, and mitigate areas of misalignment, some may be intentional (e.g. a Commission's higher reliability standard) or unavoidable (e.g. differences in ELCC saturation between the utility and the WRAP system)



What if IRP and WRAP arrive at different resource needs?

Identifying and understanding differences between IRP and WRAP modeling inputs and results will support better decision-making for both utilities and regulators

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Bridging the Gaps through Collaboration

- Implementing WRAP will be a learning experience with planners and policymakers at the forefront
- Collaboration between state regulators can identify and elevate common issues across proceedings for resolution within the WRAP governance framework and ensure the program achieves desired customer benefits
- WRAP's success will benefit tremendously from constructive quantitative and qualitative feedback from its user base as the program launches and evolves

Utilities and regulators should lean in to their role in the on-going governance and evolution of the program

Key Takeaways

- WRAP has tremendous potential as a platform for regional coordination and reliability planning.
- While some of WRAP's value can be achieved in its current form, continued program evolution can unlock significantly greater regional benefits by:
  - Addressing near-term and long-term modeling gaps
  - Improving Participant and policymaker access to critical data insights
  - Addressing transmission friction arising from WRAP's bifurcation of generation and transmission
- As WRAP stakeholders, continued engagement with WPP, participating utilities, and regional regulators will be critical in ensuring WRAP's full potential is realized in coming years

WRAP's long-term success and benefits hinge on the program's effective integration into utility planning and procurement processes