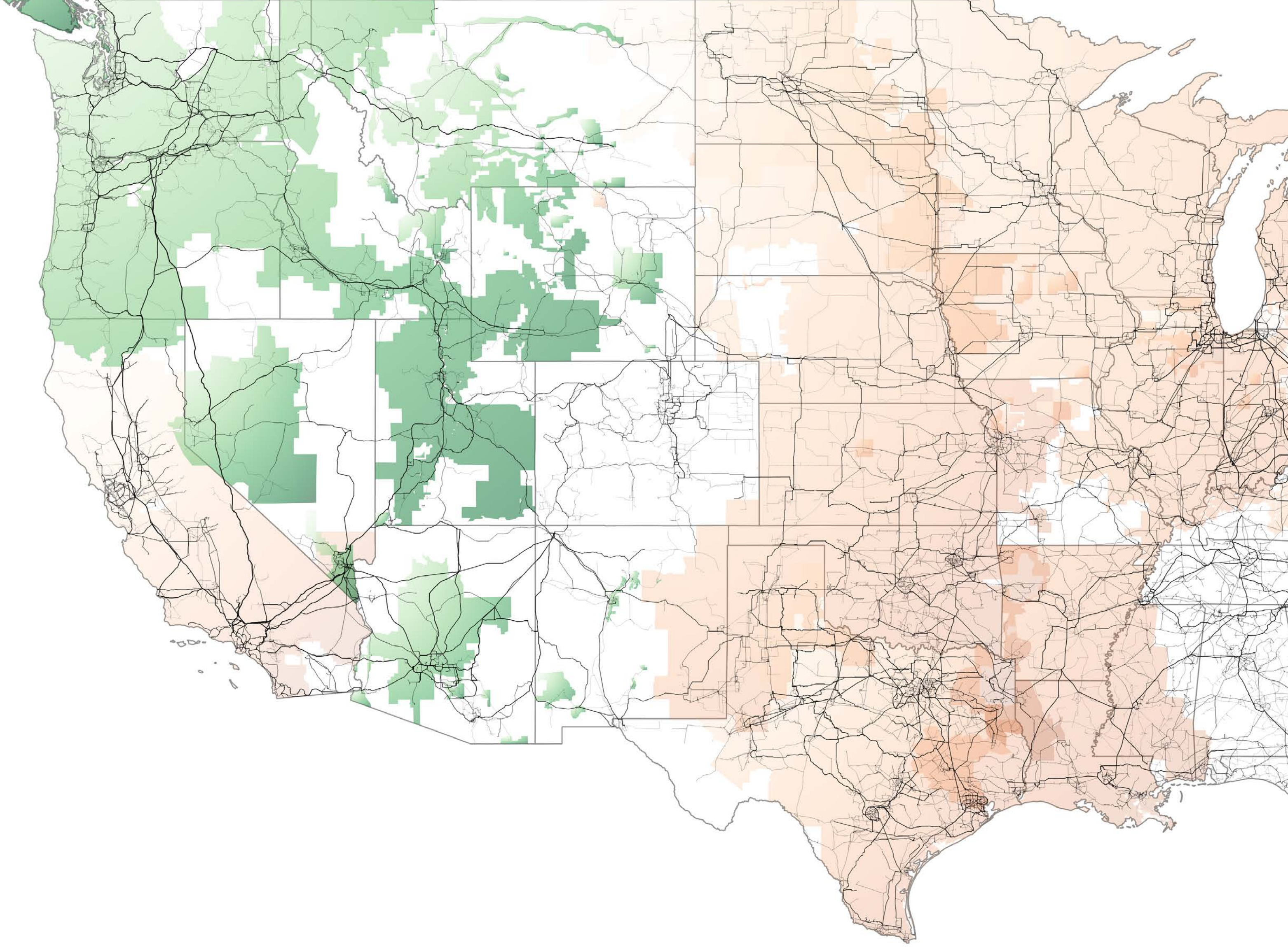
THE WESTERN RESOURCE ADEQUACY PROGRAM

CONSIDERATIONS FOR PLANNERS AND POLICYMAKERS

SEPTEMBER 2023

GridLAB



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EXECUTIVE SUMMARY

When policy discussions for the establishment of a west-wide resource adequacy program began in 2019, the leading indicators of western reliability risk were just beginning to emerge: long-planned thermal retirements, growing drought risk, and correlated heat events were increasingly dominant anxieties for utilities and regulators engaged on electric system planning activities. In the intervening years, the case for a standardized, coordinated resource adequacy program has only grown stronger, and the tireless efforts of the Western Power Pool, its members, and stakeholders across the West to design and implement a resource adequacy program appear increasingly prescient with each passing year.

The Western Resource Adequacy Program, or WRAP, is a multi-state policy construct intended to drive regional coordination and cooperation across the many utility and regulatory decision-makers responsible for resource planning and procurement decisions across the West. WRAP consists of two distinct but related program design features: a biannual forward showing of resource adequacy, intended to ensure each participating utility procures its fair share of resources to meet the collective need; and an operational program intended to identify and resolve shortfalls through a bilateral trading framework between Participants. As of August 2023, WRAP includes 22 Participants from 9 states and 1 province, representing approximately two-thirds of the Western Interconnection retail load outside of California.

For planners and policymakers, it will be essential to understand WRAP and think critically through the various implications of WRAP participation on the utilities within their respective jurisdictions. While many western utilities address resource adequacy individually within their Integrated Resource Plans (IRPs), WRAP has the potential to significantly enhance resource adequacy coordination across the region, and will be critical to incorporate as a key input and workstream within state-level planning and procurement processes.

WRAP fills a major gap in western resource planning, and provides, for the first time, a clear and equitable allocation of responsibility for reliability among utilities based on a common set of assumptions and resource counting rules which have been developed collaboratively among Participants and stakeholders across the region. This process, culminating in the approval of WRAP's tariff by the Federal Energy Regulatory Commission,[1] and now moving to implementation, is a remarkable feat of cooperation among entities with varying regulatory structures, market interests, and policy priorities. In addition to supporting system reliability, WRAP has the potential to result in significant efficiencies as the region leans more heavily into the economies of scale that come with aggregation and the risk-pooling benefits that

1 Federal Energy Regulatory Commission Order Accepting Proposed Tariff, ER22-2762-000, February 10, 2023. https://elibrary.ferc.gov/eLibrary/filelist?accession_number=20230210-3056&optimized=false

come with regional load and resource diversity. In parallel, WRAP has potential to improve utility IRPs through the resolution of critical information gaps—assumptions regarding regional reliability constraints, transmission needs and utilization, and the trajectory of the region's resource mix, among others—although plans for data transparency for Participants, regulators, and other stakeholders remain unresolved.

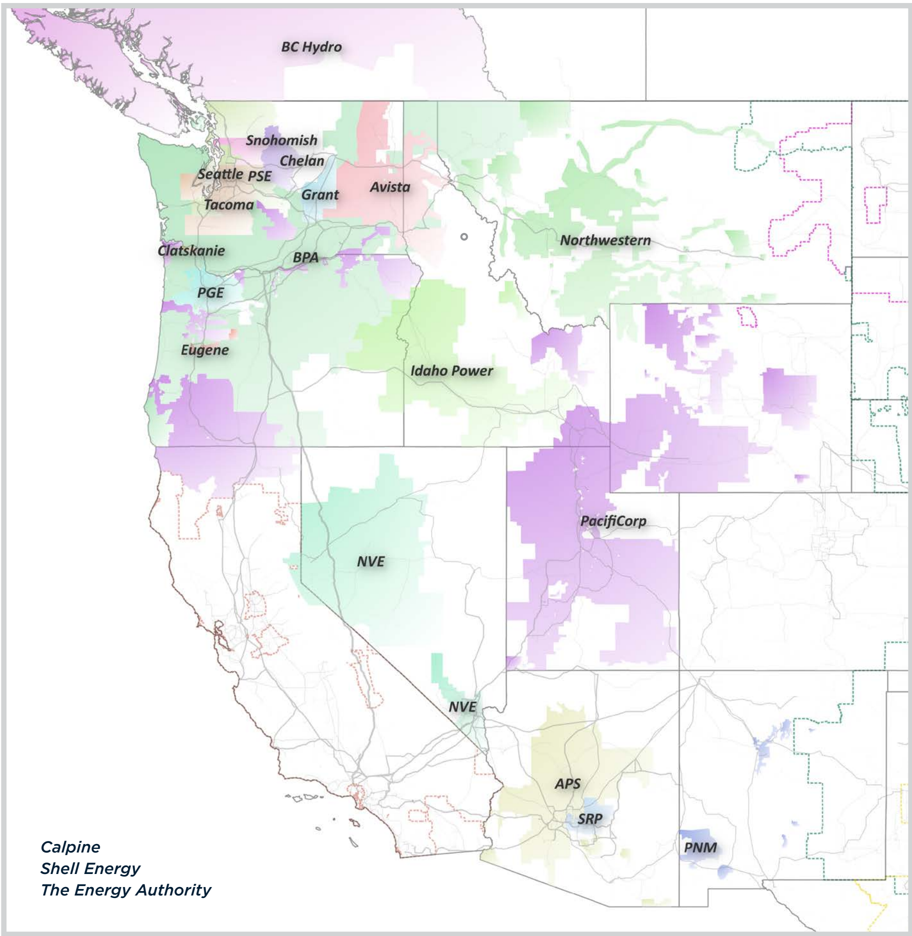


FIGURE 1.

Inaugural WRAP Participants

WRAP's binding compliance obligation, which is expected to go into effect in the 2026-2028 timeframe (Participant decisions regarding implementation timeline are ongoing), is likely to be a highly varied experience across WRAP Participants based on their current resource portfolios and needs. While some Participants may easily comply with their existing resource portfolios and may even enjoy some financial benefits from selling their excess positions and transmission rights, other utilities are likely to require significant additional resources in order to meet their compliance obligations. For some utilities, access to firm transmission rights may be as challenging as access to generation and may also play a key role in the ability to count new resources towards WRAP compliance. Utilities have already begun making regulatory requests for new resource development, partly justified by their need to meet upcoming WRAP obligations[2], and it is likely additional resource requests are forthcoming to state regulators as WRAP requirements and counting rules are finalized and net positions are formed.

While WRAP represents a major step forward in regional reliability coordination, it is a new program which will take time, commitment, and faith from Participants, regulators and stakeholders to fully realize the potential long-run benefits. First, more complete integration with utility resource planning would require an alignment of planning and procurement cycles; that is, WRAP's planning horizon and modeling approach may need to evolve to include more frequently refreshed and more long-term analysis than is currently provided in the two- and five-year ahead advance assessment framework. Second, WRAP has tremendous potential to inform utility IRP regional modeling assumptions, which today are pivotal yet poorly understood due to each utility's limited visibility into regional needs—but this potential can only be fulfilled through the willingness of Participants to improve data transparency and access to WRAP's modeling insights. Third, WRAP is unique among RA programs in its requirements for firm transmission rights, a constraint typically addressed by the overlay of an RA program with an Independent System Operator (ISO)—it is likely that the ability to access firm transmission will be a key limiter to effective and efficient regional transactions, as well as to the development of new resources to be shown for WRAP compliance.

Moreover, achieving the full potential benefit of WRAP will hinge on the ability and commitment of utility planners and policymakers to successfully integrate WRAP at the utility regulatory level. This includes incorporation of WRAP as both a near-term compliance requirement as well as a key input into long-term resource planning processes. If utilities and regulators do not have sufficient information, processes, or confidence in the ability to transact regionally for resources, it is likely that collectively the region may over procure resources to meet individual reliability targets in lieu of leveraging the economies of scale envisioned by WRAP. While regulators may wish to direct their utilities to procure resources beyond those required for WRAP compliance—for instance, to achieve a higher reliability standard or to fulfill state or local energy policies—it would be an unfortunate outcome for the region if Participants over procure simply due to informational or market frictions in the current framework.

The intention of this report is to provide a clear and informative resource for planners and policymakers to understand and engage with WRAP, with specific emphasis on the pathways to integrate WRAP into state-level planning and regulatory efforts, and to inform the program's development in partnership with regulated Participants. While the report is primarily focused on the intersection of WRAP with the state-regulated utility policy framework, it is our hope that the report's insights and recommendations will be helpful for governing boards of public utilities and co-operatives, as well as other industry stakeholders involved in reliability and resource planning processes for the evolving grid.

We provide an overview of the structure and mechanics of WRAP; insights for how utilities and regulators should plan to meet WRAP compliance obligations and recommendations for

2 See, for example, NV Energy's recently approved 4th Amendment to the 2021 IRP from NV Energy and pending application for additional resources in NV Energy's 5th Amendment to the 2021 IRP

integrating WRAP into state-level planning processes; recommendations for participation in the continued policy development of WRAP; and a discussion of critical future policy questions relevant towards western reliability and planning.

The key messages of this paper are as follows. WRAP represents an unprecedented move towards regional coordination in the West and is a powerful step forward for regional resource planning and reliability. Nevertheless, the differing timelines of WRAP (1 to 5 years) and of long-term planning efforts (1 to 20 years) may limit the long-term economic efficiencies intended in the program's design. To achieve the full potential benefits of regional resource transactions and reduced planning reserves envisioned within WRAP, all participating utilities must ensure their long-term planning initiatives align with and leverage WRAP to inform key input assumptions regarding regional reliability risk and resource needs. To bridge this potential gap in alignment, planners and policymakers must simultaneously work to implement WRAP in its initial design, as a near-term program which overlaps (but does not replace) utility-level reliability planning, while engaging with regional partners through the governance structure to enhance WRAP's near-term coordination and long-term planning value through improved resource sharing and long-term reliability analysis.

Our recommendations are as follows:

- **Building Familiarity:** WRAP is complex but is fast becoming an integral element of western resource planning and policymaking. Planners and policymakers should become familiar with the WRAP framework, its key mechanics, and the critical interdependencies between WRAP and other elements of the resource planning ecosystem.
- **Near-Term Compliance Framework:** Like any compliance requirement, utilities should have a defined framework for compliance planning and execution. Planners and policymakers should work together to define the regulatory framework within which utilities will develop WRAP compliance strategies and report out to regulators and stakeholders at key intervals.
- **Integration to Resource Planning:** WRAP has the potential to be a critical new tool in the resource planning toolbelt to support regional reliability in the near term but lacks a framework to inform reliability decision-making beyond its planning horizon. Planners and policymakers should view WRAP and utility reliability modeling as parallel initiatives, each informing but not displacing the need for the other, while striving for improved integration in the long-term.
- **Utility Reliability Modeling:** Beyond the WRAP planning horizon, utilities will continue to face uncertainty regarding key regional input assumptions—transfer capabilities from neighbors, transmission curtailment risk, and hours of regional scarcity, among others. In the near-term, utilities should look to WRAP for data and insights to inform their modeling assumptions, while leaning into the need for robust probabilistic modeling to ensure their resource plans are designed for reliability under a range of reliability metrics. In this regard, WRAP presents a valuable opportunity to standardize modeling approaches and datasets.

- **Long-Term Potential:** The long-run economic and policy potential for WRAP is to enable an acceptable level of reliability with a smaller portfolio through regional load and resource diversity, economies of scale, and reduced planning uncertainty. The region will be far more likely to succeed in this effort with intentional data sharing, modeling, and coordination beyond WRAP's current horizon (binding analysis two years ahead and non-binding, advisory analysis five years ahead); in the current landscape, risk-aversion is likely to push planners and policymakers to err on the side of over procurement in the face of limited advance warning of a short position.

In the implementation of WRAP's initial design, planners and policymakers must confront significant policy questions, including how to align utility and WRAP planning inputs and assumptions (and what constitutes alignment), how to address differences between utility and WRAP reliability requirements, and the degree to which utilities may resolve shortfalls through forward transactions between Participants within the WRAP footprint in lieu of resource development. While WRAP will not be a "drop-in solution" for reliability within an IRP framework, it presents an opportunity to standardize modeling approaches and datasets, particularly for utilities and regulators with limited capacity to develop and maintain their own models.

In the long-term, planners and policymakers should explore how WRAP, as a platform for coordination, secure data-sharing, reliability analysis, and thought leadership, may be utilized to provide forward looking analysis and procurement insights both within and beyond WRAP's informational 5-year horizon. WPP and WRAP Participants have made significant strides to develop that platform—leveraging that platform to the fullest for informing state-led resource planning and procurement could result in significant additional benefits for Participants and the region.

The remainder of the report is organized as follows:

- **Chapter 1:** Understanding WRAP
- **Chapter 2:** Planning for the Forward Showing Compliance Obligation
- **Chapter 3:** Integrating WRAP into State Planning and Procurement Frameworks
- **Chapter 4:** Key Issues for the Future

While WRAP's binding requirements are several years in the future, the timeline for implementing a robust framework for successful WRAP participation is now. The intention of this report is to provide useful insights for state policymakers, planners, regulators, and thought leaders for the western utility sector as they begin the implementation phase of WRAP.

CHAPTER 1

UNDERSTANDING WRAP

Resource adequacy has a well-deserved reputation for its complexity and jargon—WRAP, as a carefully-designed resource adequacy program, is no exception. However, at a conceptual level, WRAP has a relatively straightforward policy intent and can be broadly summarized as a program intended to determine the reliability need within its footprint in the near term, allocate that reliability need as compliance requirements to its Participants, and establish strong financial incentives for Participants to comply with those requirements through their portfolios. In this section, we attempt to distill the key elements of WRAP for planners and policymakers.[3]

At the highest level, WRAP is a reliability program intended to ensure that its participating utilities, as a collective, have sufficient capacity to meet a desired reliability standard. To achieve this outcome, WRAP establishes two programs—the Forward Showing Program (FS Program) and the Operational Program (Ops Program). These two programs require participating members to own or contract for sufficient capacity (and transmission for delivery) to meet their share of the collective reliability need, and, in the event of resource shortfalls, to facilitate bilateral transactions between participating entities at pre-established terms during the operational period.

The Forward Showing Program (FS Program) is a forward-looking resource adequacy compliance program that is similar to those used in other regions. The Operational Program (Ops Program) is an operations-focused capacity sharing program obligating WRAP members to hold back and share excess capacity during scarcity conditions.

3 For policymakers anticipating deeper interaction with utility resource planning, the WRAP Draft Detailed Design Document (March 2023) provides a much more thorough review of program mechanics.

FORWARD SHOWING PROGRAM	OPERATIONAL PROGRAM
• Forward-looking compliance program intended to ensure sufficient resources are available • Assigns each utility a compliance requirement in megawatts • Assigns each generator a specific reliability contribution value • Utility must show portfolio of resources which meet or exceed the utility's compliance requirement in each binding month • Non-compliance charges assessed for failure to meet requirements	• Operational analysis intended to facilitate resource sharing during scarcity events • Continually monitors market and reliability conditions 7 days prior to the operating day • Assesses potential for capacity shortfalls for an individual participant • Directs any surplus participants to hold back capacity which deficit participant may call on during the operating day • May assign charges for failure to deliver energy; waivers may be granted for specific non-delivery circumstances

FIGURE 2. *WRAP's Forward Showing and Operational Programs*

WRAP has various similarities and differences with resource adequacy programs across the US. The California Independent System Operator and Southwest Power Pool, similar to WRAP's design, operate resource adequacy programs based on utility-led procurement and bilateral trading. Resource adequacy programs in eastern markets, such as the capacity markets operated by ISO New England, the New York Independent System Operator, and PJM, are analytically similar but utilize centralized markets to clear capacity. The Midcontinent Independent System Operator has a hybrid framework, in which most capacity is self-shown, but a residual capacity market is operated. WRAP will be the only regional RA program not associated with an Independent System Operator (ISO) or Regional Transmission Operator (RTO).

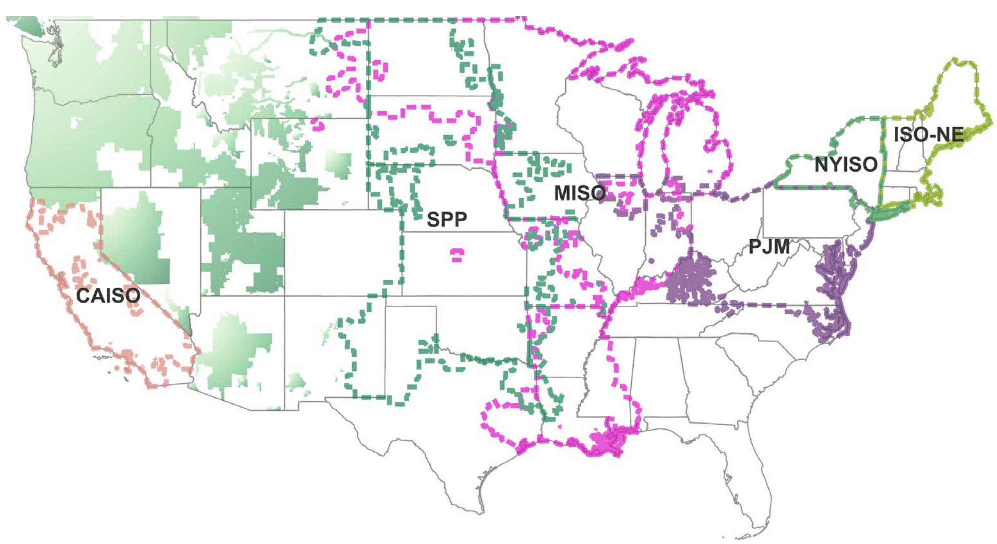


FIGURE 3. *Regional Resource Adequacy and Capacity Market Programs*

WRAP's development coincided with a period of significant resource adequacy policy evolution and program maturation across the regions, and WRAP's design is informed from the experience and analytical frameworks developed in these existing markets. WRAP elements informed by this new wave of resource adequacy design include the use of probabilistic modeling to determine a planning reserve margin, the incorporation of outages into the resource counting of thermal resources, using advanced methodologies for determining the capacity contributions of energy-limited resources (based on the "effective load carrying capability"), and developing a new method for analyzing the contributions of hydroelectric resources intended to reflect the significant role of the hydroelectric system in support of the WRAP region. Each of these design choices moves the program away from legacy methods designed for a less complex planning landscape, such as reliance on a legacy Planning Reserve Margin (PRM) value (e.g., 15%), often derived using deterministic methods.

One notable difference between WRAP and other regional RA programs is the Operational Program, which is intended to fulfill some of the benefits of being part of an Independent System Operator with integrated operations and dispatch. For other regions, the intent of the Operational Program is achieved through optimized dispatch within a central energy market designed to facilitate the types of trading and efficiency targeted by the Operational Program.

THE FORWARD SHOWING PROGRAM

The FS program is the forward-looking planning portion of WRAP.[4] The FS program requires participating Load Responsible Entities (LREs)—utilities and other retailers—to procure resources to meet a defined compliance obligation using resource counting rules established by WPP. Specifically, LREs must show a level of resources, as measured using WPP defined Qualifying Capacity Contributions (QCC), to meet their forecasted load plus a PRM for each month of the forward showing. The FS Program requires two showings per year: a Summer showing made October 31 covering June 1 through September 15 of the following year, and a Winter showing made March 31 covering November 1 through March 15[5] of the following year.

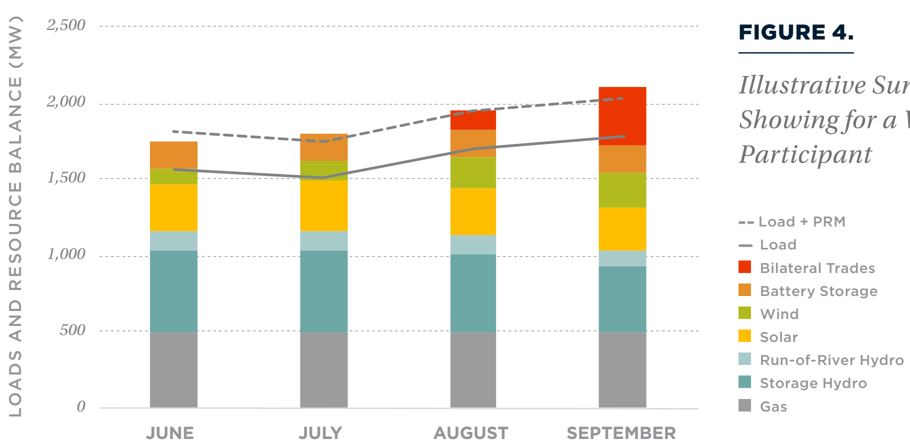


FIGURE 4.

Illustrative Summer Showing for a WRAP Participant

4 Draft Design Document, p. 51

5 Draft Design Document, p. 85

Utility compliance is assessed at a portfolio level and may be achieved through utility-owned or contracted resources, forward purchases from merchant generation, bilateral trades with other utilities, demand-side management efforts, and imports from beyond the WRAP footprint. For many vertical utilities, it is likely that the utility's long-term portfolio (i.e., its owned and contracted resources) will fulfill the bulk of the utility's requirement. Residual needs are likely to be met primarily through forward purchases and trades.

Like the reliability dynamics it represents, the FS Program is complex. A high-level understanding of program compliance dynamics may be sufficient for planners and policymakers who will be engaging with WRAP at a high-level or focusing strictly on implementation. For many planners and policymakers throughout the west, however, a deeper level of engagement will be warranted—within the program's complexities lay a myriad of policy and technical questions, many of which are likely to evolve and remain as points of debate as the program is implemented. In this and subsequent sections, we attempt to provide an additional layer of depth to identify and explore some of these questions.

The process for establishing the reliability requirement (i.e., the level of resources necessary to meet the reliability criterion) and how each resource is counted toward that requirement, is a multi-stage process which must consider the region's load forecast, the portfolio of resources expected to be shown by Participants, internal transmission considerations, anticipated weather variability, and other factors that are analyzed through a probabilistic resource adequacy model by the Program Operator. Once the portfolio has been developed, various analyses and conversions are performed to translate the portfolio into the key compliance inputs—the Forward Showing Planning Reserve Margin (FSPRM, or simply PRM) and the Qualified Capacity Contributions (QCC) of resources, such as the Unforced Capacity (UCAP) rating for fossil resources or the Effective Load Carrying Capability (ELCC) of solar, wind, and energy storage resources.

The first step in determining the reliability parameters is collecting the baseline load and resource data from utilities, which will be provided to WPP at regular intervals. WPP will process the regional load forecasts to determine coincident and non-coincident peaks and determine regional load profiles to import into its reliability model. Similarly, the baseline resources will be assigned by resource class to specific regions to reflect their operating characteristics and available information about individual units (such as outage rates) will be assigned.

Utilizing this input data, WPP will perform a probabilistic Loss of Load Expectation (LOLE) study to determine the level of additional resources needed to meet a desired reliability standard, informed by the portfolio expected to be shown by Participants. Having a reasonable expectation of the future portfolio is essential, as all of the program's parameters, especially resource counting for solar, wind, and storage, will be a function of the quantity and mix of resources on the system.

QCC, ELCC, UCAP? UNDERSTANDING RESOURCE ACCREDITATION

To accurately represent and compare the reliability value of different resources, resource adequacy programs must simplify complex, multi-dimensional data into single values, typically reflecting a monthly, seasonal, or annual assessment of a resource's reliable capacity contribution. This process—which is necessary but complex—is known as **resource counting** or **resource accreditation** and forms the basis for all resource adequacy accounting and compliance.

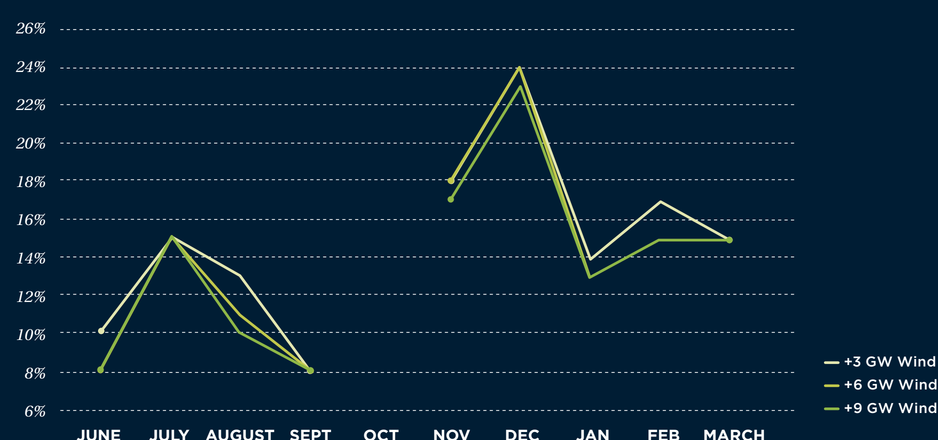
While WRAP has seasonal showings, resources are **counted at the monthly level**, and each resource will have a distinct monthly reliability value known as its **Qualified Capacity Contribution (QCC)**.

For **conventional resources**, such as **gas** or **coal**, this value is usually close to its nameplate capacity, often discounted by an estimated or observed forced outage rate. WRAP will derate conventional resources utilizing historical outages during specific periods, a counting framework known as **UCAP** (Unforced CAPacity).

Hydroelectric resources introduce a variety of novel considerations, which, for a hydro-rich region like the Pacific Northwest, must be carefully considered and implemented. WRAP will assess run-of-river hydroelectric resources, which are not dispatchable, based on their historical performance during critical hours. WRAP will assess storage hydro resources based on a method which considers the resource's performance over the prior 10 years, its energy storage potential, and its expected operational constraints.

For **clean energy resources**, such as **solar, wind, and storage**, resource counting is developed through probabilistic modeling. WRAP will utilize an increasingly popular counting framework known as **Effective Load Carrying Capability (ELCC)**, which compares the resource's reliability contributions to an equivalent level of perfect capacity, considering the timing, variability, and portfolio effects (both positive and negative) of clean resources.

INCREMENTAL GW INSTALLATIONS



Specifically, WRAP will determine if the aggregate regional portfolio, based on the portfolios and forward information shown by Participants, is capable of meeting the loss of load expectation criterion of one day in ten years, or 0.1 event-days/year.[6] If the reliability criterion is not met in aggregate, then WRAP will add a sufficient amount of pure capacity until it is satisfied. The total qualifying capacity contribution (QCC) of the resulting resource portfolio, using the defined counting rules for each resource, is compared to the region's expected peak load to determine the PRM. For example, if peak load was 35,000 MW while the total QCC of the necessary portfolio was 40,250 MW, it would result in a PRM of 15% (35,000 / 40,250 = 1.15).

Once the PRM analysis is complete, the compliance obligations are transferred to the participating utilities. Each showing requires the participating utility to demonstrate resource adequacy based on the defined PRM and counting rules. Utilities must demonstrate firm transmission for resources beyond their system footprint for 75% of their showing in the Forward Showing time frame (NERC Priority 6 or 7) and must obtain the residual 25% through firm or conditional firm source-to-sink transmission by the Operational Program time horizon. Utilities failing to meet their compliance obligations are subject to non-compliance charges indexed to the annual cost of a new resource (the *Cost of New Entry*, or *CONE*), which escalate for large unmet positions and repeated compliance failures.

COMPLIANCE YEAR

Calendar Year	2027	2028	2029	2030	2031	2032
2025	Binding Values			Advisory Values		
2026		Binding Values			Advisory Values	
2027			Binding Values			Advisory Values
2028				Binding Values		
2029					Binding Values	
2030						Binding Values

FIGURE 5. *Annual Assessment Cycle to Inform Resource Planning*

WRAP will perform this analysis annually for two forward years, T-0 and T+3, with the analysis being performed in year T-2. WRAP will establish binding compliance requirements for the T+0 compliance year, as well as advisory requirements for the T+3 forecast year which will be revised prior to the compliance year.

6 Forward Showing Program, 2.1.1, p. 57

For example, in October 2025, WRAP will release binding reliability requirements for Summer 2027, which Participants must show for compliance in October 2026 (12 months advanced notice); WRAP will also release advisory reliability requirements for Summer 2030, which Participants must show for compliance in October 2029 (48 months advanced notice).

THE OPERATIONAL PROGRAM

The Operational Program (Ops Program) is the WRAP element designed to facilitate resource sharing between WRAP Participants in the operational time horizon, during which system conditions are continuously reviewed for the upcoming seven days. The Ops Program is somewhere between a power pool and the 'lite' version of an Independent System Operator (ISO)—it identifies potential deficits and surpluses for all utilities on scarcity days and facilitates bilateral trading between long and short Participants. Effectively, this prioritizes WRAP members when resources are scarce, giving Participants first right of refusal from other Participants' excess, ahead of other regions which may also be seeking surplus power during scarcity periods (e.g., CAISO, non-WRAP members).

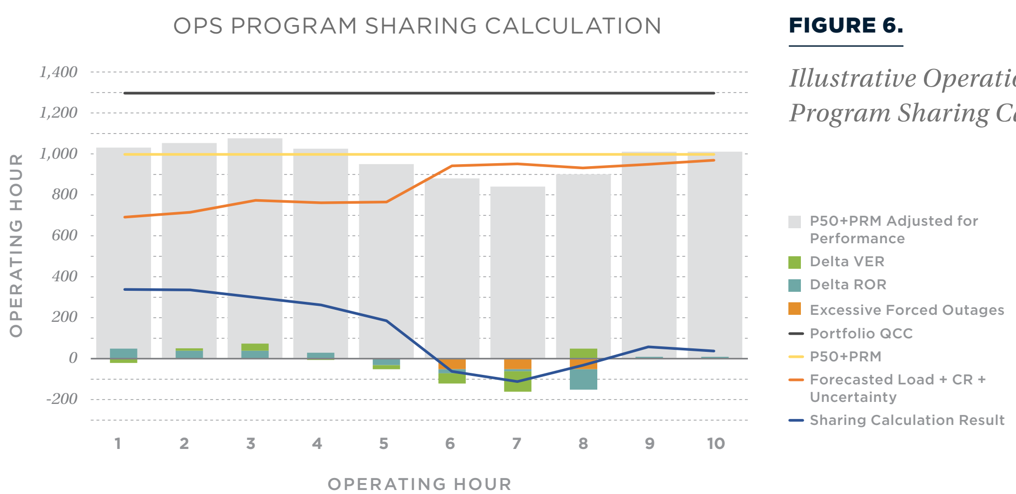


FIGURE 6.

Illustrative Operational Program Sharing Calculation[7]

Mechanically, the Ops Program incorporates continuous monitoring and analysis of operating conditions beginning seven days prior to the operating day. The Ops Program will declare a *Sharing Event* if a WRAP Participant is identified as having a net negative Sharing Calculation result (i.e., a resource deficit). Each Participant's Sharing Calculation, effectively an assessment of that Participant's hourly capacity position, considers the Participant's expected load and the expected availability of its capacity resources, which are adjusted from their capacity value from the FS Program based on differences in expected output from variable renewables ("Delta VER"), run-of-river hydro ("Delta ROR"), and forced outages. In effect, this calculation is an adjustment of the monthly counting rules to their hourly forecasts using updated information from the operational horizon.

7 WPP Detailed Design Draft, p. 142

Participants with excess resources—resources exceeding their forecasted load (including a margin for contingency reserves and potential differences between forecast and actual need)—are allocated a Holdback Requirement if a Participant with a deficiency requests it, which obligates capacity to the Ops Program (preventing other commitments) until the Holdback Requirement is resolved or released.

Between the initiation of a Sharing Event and the operational timeframe, Participants are encouraged to resolve their deficit positions bilaterally, which may include purchasing energy directly from another Participant. At the option of the deficit Participant on the morning of the Operating Day, resources may be held back, which the Participant may call 1.25 hours prior to the operating horizon for the Participant's purchase under defined terms and prices, capped to a day-ahead index not to exceed $2,000/MWh.

In contrast to an ISO, it is worth noting that the Ops Program does not have a role in facilitating least-cost dispatch or directly transacting resources as a central market, a role which may be filled by other regional market initiatives such as the CAISO Extended Day Ahead Market (EDAM) or the Southwest Power Pool's Markets+ Program.

The Ops Program is an important component for operationalizing WRAP and ensuring that the diversity benefit that is captured in the Forward Showing can be realized in the operational timeframe. However, the Ops Program's impact on resource planning is far more limited than the Forward Showing Program, which receives more focus in the remainder of this report. Nevertheless, policymakers should be aware of the interplay between the Ops Program and the development of an ISO or other market structures throughout the west.

CHAPTER 2

PLANNING FOR THE FORWARD SHOWING COMPLIANCE OBLIGATION

The Forward Showing program (FS Program) provides the framework for assessing resource needs, allocates responsibility across Participants, provides standardized accounting for resource transactions, and establishes a strong financial incentive for utility compliance with WRAP requirements. As utilities and regulators prepare for WRAP implementation, it is likely that the FS Program will be a dominant feature discussed in Integrated Resource Plan (IRP) and other regulatory filings. As discussed in Chapter 3, the complex overlay between WRAP's near-term procurement requirements and the long-term view taken by state utility planners will be a critical integration component. This chapter focuses specifically on integrating the FS Program as a compliance obligation, similar to compliance planning for a Renewable Portfolio Standard requirement.

While the binding compliance horizon is just one year from the finalization of reliability requirements to the compliance showing, it will be critical for utilities and regulators to plan much farther into the future to ensure utility compliance with the WRAP obligation. Planning for WRAP compliance will vary across utilities and depend on a utility's compliance position. For some utilities, this exercise may be relatively straightforward—a well-resourced utility may simply need general regulatory guidance to sell its excess capacity to regional partners through short-term transactions while addressing longer-term planning in its IRP (or consider longer-term sales within a broader planning initiative). For other utilities, it is likely that WRAP compliance will be the driver of much more complex and thorny conversations regarding the strategies and policy considerations for cost-effectively filling a short position, particularly one which requires expedited new construction (some of which may be identified within a relatively narrow time window). Given the inherently knottier issues involved, this section emphasizes the policy and market considerations for this latter class of utilities that will need to buy or build their way to WRAP compliance prior to their first binding showing.

FS Program compliance implicates several key questions for regulators:

- **Planning for Compliance:** How and when will regulated utilities indicate their resource positions and compliance strategies, and over what planning horizon?
- **Resource Selection:** What directives or policy obligations should regulators impart on utilities needing to fill a short position or sell a long position?
- **Reasonableness Review:** How should regulators evaluate compliance strategies for resource adequacy, cost effectiveness, risk aversion, and integration with other policy requirements and considerations?

In many states, these regulatory questions are likely to run in parallel to existing planning and procurement review frameworks and may even align with compliance structures for existing state-level resource adequacy requirements. In most cases these requirements are likely to be subsidiary to a larger planning process, such as an Integrated Resource Plan filed every two to three years. We encourage regulators to apply a similar standard for WRAP oversight as is applied in other procurement matters, such as compliance with a Renewable Portfolio Standard or a financial risk management policy; the appropriate level of oversight and scrutiny will depend on the utility and its regulatory framework.

As discussed further in Chapter 3, there will be significant value in embedding WRAP compliance planning into a broader resource planning exercise intended to co-optimize across a range of policy objectives and which likely has a longer planning horizon than WRAP. This is because procurement decisions made for WRAP compliance may be interdependent with other decisions made for broader portfolio needs, including financial hedging, local reliability needs, and achievement of environmental policy goals.

PLANNING FOR COMPLIANCE

WRAP is, by design, a near-term, voluntary compliance program with a binding compliance horizon of approximately one year. Additionally, WRAP intends to provide an advisory Planning Reserve Margin (PRM) and resource counting rules for the third year beyond the compliance year, providing Participants insights four to five years in advance of the operational time horizon.[8] In contrast, state utility planning typically incorporates much longer planning horizons, with cascading levels of specificity and binding obligations for utilities looking out into the future.

For instance, a utility's IRP may perform robust modeling over a twenty-year time horizon with a general resource procurement plan for the next ten years, a more defined and binding set of resource development and retirement decisions over the next five years, and specific portfolio compliance obligations for reliability and renewable energy over the next three years for which a utility must demonstrate a specific set of intended portfolio actions.

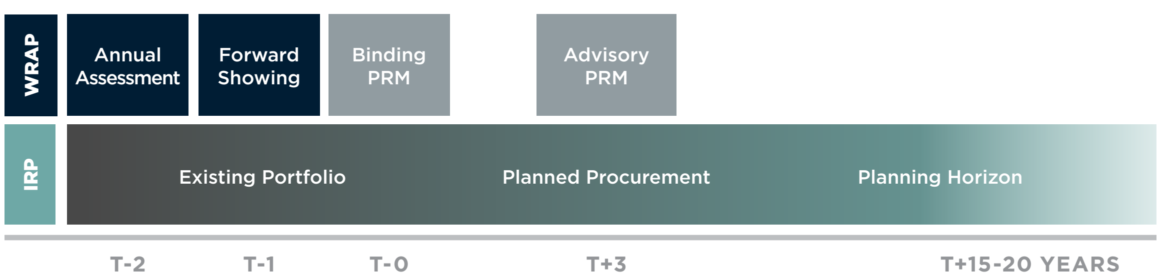


FIGURE 7. *WRAP and IRP Planning and Implementation Horizons, with T-2 as the Assessment Year*

8 WRAP Detailed Design p. 85

In this context, it would be reasonable to view the WRAP compliance obligation as akin to this last category—part of a suite of near-term compliance obligations for which the utility must demonstrate a firm, actionable plan to meet within its IRP. This implies that within an IRP, a utility should be providing regulators with a robust, granular portfolio strategy for compliance with its WRAP requirement, including a clear strategy to address any long or short position, a strategy for mitigating the risk associated with intended but unrealized resources (e.g., projects which are not completed or anticipated bilateral transactions which fall through), and responding to such contingencies should they arise. Similar to other compliance obligations, it would be reasonable for utilities to be required to provide updates at key milestones (such as executing a large transaction or making a filing with WPP) and to advise regulators or take other actions in the event of defined contingencies. As noted above, the specific level of oversight and framework for regulatory review should align with existing standards and expectations tailored to the utility's existing regulatory structure.

Where WRAP differs from other near-term compliance requirements, such as a relatively predictable renewable energy content requirement, is in the potential for the compliance rules to evolve as the compliance horizon approaches. In the context of WRAP, while WPP will provide advisory compliance metrics and resource accounting five years prior to the showing deadline, there are several reasons why the advisory and final compliance requirements may differ, including changes to utility load forecasts, revisions to the modeling inputs or methodology of the reliability analysis, and changes to the resource portfolios shown by utilities.

Among these, the divergence between the modeled and realized regional portfolios may be the most significant uncertainty. For example, under an ELCC-based accreditation scheme, it is expected that the assessed capacity value of solar will decline as solar penetration increases. In the hypothetical scenario where actual solar development by 2030 outpaces modeled solar development rates, as predicted in 2025, it is likely that the binding ELCC values in the final assessment will be lower than the advisory values, a situation which could leave some Participants with an unexpected gap in their portfolios. In other words, a portfolio developed assuming higher advisory ELCC values would not meet the WRAP PRM target using the lower, refreshed ELCC values.

In light of the potential for both portfolio and compliance requirement changes between the utility's approved IRP and the FS Program showing deadline, it may be prudent for regulators to establish a multi-step process outlining an overarching strategy for utility compliance with policy directives for a utility considering various compliance strategies.

HOW 'FIRM' IS THE ADVISORY PRM FOR YEAR T+3?

While forecasting resource adequacy needs into the future is essential, the process is inherently non-linear. WRAP will provide Participants with advisory reliability (PRM) and resource counting (QCC) values for year T+3; because the annual assessment is provided in year T-2, there will be a 5 year gap between the issuance of the advisory PRM and the operational year. By the time the binding values are issued 19 months prior to the operational horizon, long-lead time activities for new resource development are likely already underway—and long-lead time activities not yet begun are likely to be too late. Here are three potential factors which could result in a change between the advisory and binding values:

- **Load Forecast Change:** Load forecast changes, both from the filing utility or from the broader region, may impact the WRAP reliability requirement and / or allocation of the reliability requirement across utilities. This may include continual, minor changes, as well as significant changes through major load forecast changes (for instance, a large utility's electrification analysis).
- **Updated Reliability Analysis:** Continuous improvement of WPP's reliability analysis model and input assumptions, as well as an evolving understanding of the implications of climate change on reliability risk, are likely to drive changes to the reliability requirement and resource accreditation outcomes. A refreshed analysis incorporating more extreme summer temperatures, for instance, could significantly alter the region's reliability risk profile and resulting calibration metrics.
- **Resource Portfolio Changes:** Increased penetration of use-limited resources, such as solar, storage, and wind, will change the reliability contributions and accreditation of those resources—an intended recalibration within the ELCC framework to levelized QCC benefits. While WPP intends to provide forward-looking analysis of the accreditation values under different levels of penetration, it will be difficult to predict the specific alignment of resource penetration values (in megawatts) with future compliance periods. For example, exactly how many gigawatts of storage will be on the system in five years, a major uncertainty, could drive significant swings in resource valuation for the solar and storage fleets.

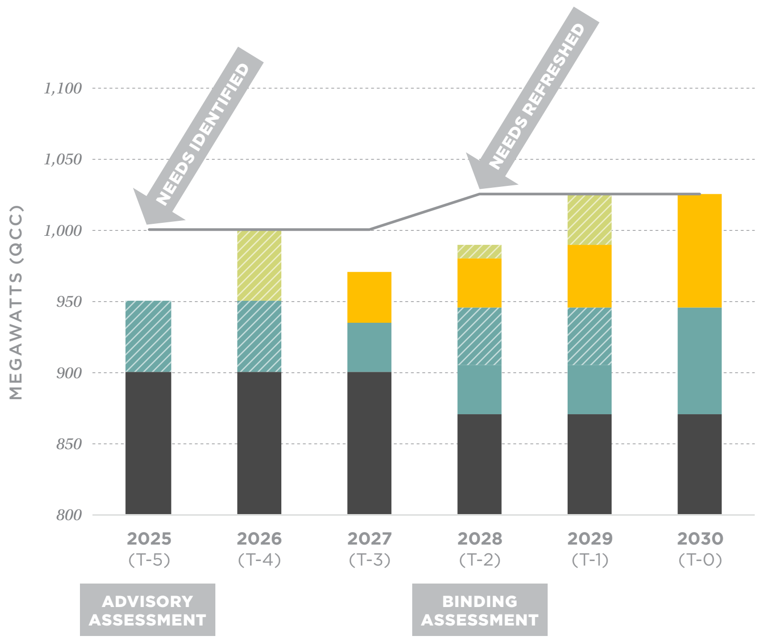


FIGURE 8.

Compliance Position in Lead-Up to August 2030 Showing

In Figure 8, a hypothetical, simplified WRAP compliance plan is illustrated for a utility seeking to fill a 100 MW compliance gap identified in 2025 (T-5) for Compliance Year 2030 (T-0).[9] In 2025, the utility's existing portfolio has a Qualified Capacity Contribution (QCC) of 900 MW, and it has received an advisory assessment of a 1,000 MW QCC compliance obligation for 2030 from WRAP. The timeline below, articulated with values listed in QCC, illustrates how the utility and its regulator would navigate filling its compliance position from the time of its advisory assessment to its final compliance showing:

- In 2025 (T-5), the utility identifies a 50 MW shortfall for August 2030 relative to its existing and planned portfolio. Having identified some of this need within its IRP, it already has plans to develop 50 MW of preferred resources by 2027.
  - 950 / 1000 MW forecast position
- In 2026 (T-4), the utility continues the development of its pre-approved resources and, within a 2026 IRP filing, seeks approval for 50 MW of bilateral trades (1000 / 1000 MW).
  - + 50 MW planned trade
  - 1000 / 1000 MW forecast position
- In 2027 (T-3), the utility advises its regulator that 15 MW of its planned 50 MW of new resources have failed, and it has only successfully negotiated 35 MW of bilateral trades.
  - -15 MW resource, -15 MW trades
  - 970 / 1000 MW forecast position

9 As a simplification, this example is limited to August, a single month of the summer showing; in reality, the utility would be managing a compliance position for each of the months of the binding season.

- In 2028 (T-2), the utility receives the binding compliance values from WRAP (October 31), which have an increased requirement of 25 MW due to a revised load forecast, and a 30 MW reduction in the value of its clean resource fleet due to faster-than-anticipated development of solar and storage. To counter this impact, the utility identifies and executes an option to add 40 MW of storage to an existing solar facility and executes 10 MW of bilateral trades in negotiation, identifying an additional 35 MW of need which will need to be addressed prior to the showing in 2029.
  - +25 MW requirement, -30 MW QCC adjustment, +40 MW new resource, + 10 MW trades
  - 990 / 1025 MW forecast position
- In 2029 (T-1), to complete the resolution of its open position following the 2028 refresh, the utility procures an additional 35 MW of resources ahead of its October 31 compliance filing.
  - +35 MW trades
  - 1025 / 1025 final compliance position
- In 2030 (T-0), the utility enters the Ops Program period with a fully satisfied compliance position, having shown 945 MW of resources from its portfolio and 80 MW from bilateral trades.

As illustrated in this scenario, it is likely that there will be a series of decision points and triggering events which would be useful touch points between the utility and its regulator, thresholds for which regulators should decide in the context of their specific jurisdiction. For the process to be successful, it will be necessary to establish action plans and expectations upfront—developing a clear framework for utility decision-making and regulatory review to avoid 'no-win' policy decisions made in the face of contingency events that threaten non-compliance and reliability risk.

RESOURCE SELECTION

As in any resource procurement process, utilities with short positions will have a range of options and considerations for the types of resources they may pursue. As regulators, it will be valuable to establish upfront how utilities should prioritize resource options, particularly for scenarios in which utilities may be considering and executing contracts prior to a fast-approaching compliance deadline. Even for a need identified 5 years out, the timeline for a utility to develop proposals for consideration, initiate the regulatory process for approval, litigate the issue with the Commission and stakeholders, and get the project built and interconnected may feel rushed. The urgency will be far tighter when needs are identified after the 5-year advisory assessment (T-5) and will be particularly tight if identified in the binding assessment (T-2). Additionally, transmission constraints—both the physical need for additional transmission and friction in the marketplace for rights to existing transmission—are likely to be a significant decision factor in what resources are available to utilities.

In general, the resources available to utilities and regulators seeking new resources will fall into the following three categories:

- **Market Resources and Trades:** Utilities can procure capacity from market resources, which could include merchant generators within the WRAP footprint, eligible imports from beyond the WRAP footprint, and bilateral trades with other WRAP utilities for resources within their portfolios. This pool of existing resources likely represents the best short-term stopgap for most short utilities, particularly for utilities needing to fill a temporary gap while new resources remain in development. Market resource transactions will also be critical for utilities to optimize across seasons and months—for most utilities, there will be monthly variation in the alignment between their resource requirement and their resources' contributions.
- **Customer Resources:** WRAP permits Participants to utilize customer resources, including energy efficiency, demand response, and distributed generation, to achieve compliance either by reducing the Participant's compliance obligation (i.e., load reduction) or by counting the resource towards its supply-side showing. The bifurcated approach delineates how resources may be utilized, with energy efficiency, rooftop solar, and residential demand response treated as load modifiers; and more flexibility offered to automated or large customers demand response programs or separately metered distributed generation.[10] For late emerging needs, such as adjustments from the binding compliance assessment, it is likely the utility will be limited to showing supply side resources for that compliance period.
- **New Resources:** Given the limited time horizon for WRAP, new resources development will likely be limited to needs identified in the advisory assessment or identified separately in an IRP process. In an idealized world, the reliability modeling within a utility's IRP would have already identified the resource need by the time the WRAP requirements are established; however, as discussed in the subsequent chapter, there is potential for parallel analyses from WRAP and the utility to diverge for both

10 WRAP Detailed Design Document, p. 72

intended and unintended reasons. In rare cases, a utility may receive a compliance requirement from WRAP which may fit with opportunities for expedited development, such as expanding the capacity of an existing storage project or adding storage to a solar project in development. Given the committing, long-term nature of resource development and ownership, in general, it is inadvisable to pursue rushed commitments to new infrastructure; in the context of an imminent compliance deadline, this approach should be avoided unless and until all other options, such as bilateral transactions and customer resources, have been exhausted.

In the case of market resources, trades, and new resources, the utility will need to ensure sufficient transmission is available—both physically and contractually—to deliver the resource to the utility's native load. In light of regional transmission needs, this is likely to be significant, particularly for utilities seeking to develop geographically and technologically diverse renewable resource portfolios beyond their balancing areas. This dynamic will increase the importance and value in integrating this requirement into long-term planning, including transmission planning, as discussed in chapter 3.

A variety of utility-specific and policy considerations will inform what resources are best aligned with a utility's needs. For a short-term need following a resource retirement or unmet planned resource development, as well as for a resource need occurring in a limited set of months, it is likely that short-term, bilateral transactions for market resources with a merchant generator or with another WRAP Participant will be sufficient, cost-effective, and have low commitment while long-term resources are secured.

To fill a structural deficiency, a utility will need to pursue new resource development or longer-term transactions with existing resources and trading partners. As discussed in Chapter 3, new resource selection should be co-optimized with other considerations through a robust IRP process, and regulators should thoroughly interrogate long-term resource investments justified primarily for WRAP compliance for their fit with broader portfolio needs.

For example, for a utility with a near-term WRAP compliance gap seeking expedited approval for a new thermal resource, a regulator might wish to ask the following questions:

- Will the new thermal resource remain useful and cost-effective as the utility continues the resource buildout planned and approved in its IRP (i.e., forthcoming clean energy resources)?
- Has the utility thoroughly explored short-term alternatives to development of the new thermal resource, such as deliverable imports or demand-side management programs?
- Has the utility thoroughly explored alternative near-term resource options which may shift the timeline of its approved clean resource buildout forward, rather than duplicate that future buildout with new thermal resources?

REASONABLENESS REVIEW

Effective implementation of WRAP largely hinges on the ability of regulators and utilities to establish clear up-front guidelines and actionable strategies for navigating contingencies arising between an approved long-term plan and the near-term compliance deadline. Regulators should consider when and how to require interim compliance filings between an action plan adopted in an IRP and a final compliance showing made to WPP, as well as establish how the showing made to WPP should be conveyed to and reviewed by state regulators, with special consideration to the tight timelines of program showings.

Such regulatory milestones or triggers may be reasonably aligned with specific actions or thresholds. For instance, a change in resource status—such as a delay for a planned project or the completion of a new resource transaction—could be reasonable triggers for utilities to make a filing to a regulator prior to a compliance showing. Such filings could also be differentiated based on the size of the resource or the value of the transaction, with transactions exceeding specific thresholds triggering review, while smaller transactions may be packaged as part of a regularly scheduled update. Regulators should establish expectations regarding communications and regulatory review in alignment with existing procurement review standards.

BIENNIAL IRP		PROCUREMENT PHASE			SHOWING	
SPRING 2025	SUMMER 2025	OCTOBER 31, 2025	MARCH 31, 2026	SUMMER 2026	SEPTEMBER, 2026	OCTOBER 31, 2026
Filing of Biennial IRP with 2025-2028 WRAP Compliance Plan	Approval of 2025-2028 WRAP Compliance Plan	Compliance and Procurement Strategy Update (filed with Summer T-1 Showing)	Compliance and Procurement Strategy Update (filed with Winter Showing)	Advise regulator of key milestones	Preview final compliance filing to state regulator	Summer 2027 Showing Deadline
Commission Filing	Commission Filing	Commission Filing and WRAP Filing	Commission Filing and WRAP Filing	Commission Filing	Commission Filing	WRAP Filing

FIGURE 9. *Illustrative Timeline for Approval and Review of WRAP Compliance for Summer 2027 Showing*

Regulators should also prepare for the eventuality that a utility may face a non-compliance charge. Regulators should establish clear expectations for the activities a utility should undertake to avoid non-compliance and for when to advise the regulator of the risk of non-compliance. Similarly, regulators should consider how to address rate recovery for non-compliance events, which may be informed by the expectations established upfront regarding utility actions prior to and following a non-compliance event.

In some cases, particularly at the program's outset, non-compliance may be an inevitability for a utility short on resources—and may be a preferred outcome than the utility not participating in WRAP at all. Non-compliance charges have been reduced by half in transition years (Summer 2026 and Winter 2026-2027). Participating in WRAP and paying non-compliance charges gets Participants access to the holdback provisions in the Ops Program, providing the utility priority access to excess resources from other Participants during a scarcity event.

CONCLUSION: WRAP AS A COMPLIANCE REQUIREMENT

Planning and executing for the Forward Showing Program will become a significant and on-going compliance project for WRAP Participants. We encourage utilities and their regulators or governing bodies to proactively consider how utilities should integrate WRAP into their planning and compliance frameworks in a manner which provides utilities clear guidance and policy priorities, while providing policymakers and stakeholders clear insights and engagement points throughout the process. Specifically, we recommend that policymakers establish a process for utilities to analyze and seek approval for their WRAP compliance strategies, identify key procurement milestones for reporting back on those compliance strategies, and determine a framework for accounting and cost recovery for WRAP-related procurement and non-compliance events.

We also identify the timing challenges associated with WRAP as a near-term compliance obligation—WRAP's compliance requirements will be established two years in advance, with additional advisory information five years in advance. While the advisory values will provide utilities with a reasonable timeline to execute on resource needs, there may be subtle or significant differences between the advisory requirements and binding requirements issued three years later.

For many utilities, access to transmission for regional trades and new resource development may be a significant constraint in the near- and mid-term for both WRAP compliance and reliability. Just as WRAP will bring greater transparency and oversight to utility reliance on market transactions for energy, its transmission rights requirement will shift transmission availability from solely being an assumption within an IRP to a central contractual requirement for a utility's compliance with the program. This dynamic elevates the urgency of incorporating both WRAP and transmission planning within mid- and long-term IRP strategy. It also raises significant questions regarding the opportunity to remove regional market friction through the establishment of an ISO, which would manage transmission constraints at the regional level rather than bilaterally.

In an ideal world, reliability analysis in utility IRPs will identify similar resource needs as WRAP to fill structural deficits, as discussed in the subsequent chapter, but there are a range of reasons why resource needs identified in utility IRPs may diverge from resource needs identified in WRAP. Recognizing concerns with expedited resource development, we recommend utilities and their regulators first focus their efforts on resolving late-identified needs through bilateral transactions and customer resources (e.g., demand response programs), and avoid long-term commitments to new infrastructure without the more substantial deliberation which may be afforded from the utility's long-term planning process, such as an IRP filing.

CHAPTER 3
INTEGRATING WRAP INTO STATE PLANNING AND PROCUREMENT FRAMEWORKS

WRAP represents a critical step forward in regional resource planning cooperation for reliability, and, like other compliance requirements, it should be a central component of every participating utility's Integrated Resource Plan (IRP). However, it is important to recognize that WRAP, in its current form, is not a drop-in substitute for reliability analysis within IRP processes, and instead should be considered an augmentation to each utility's existing planning and reliability modeling framework.

While WRAP will serve as a minimum reliability requirement for each participating utility, there may be instances in which a regulator would direct a utility to pursue a higher reliability standard, use a different reliability metric, or perform other complementary analysis specific to the utility's reliability position or system topology. There may also be a range of modeling considerations that result in different outcomes; in particular, the resource mix or load profile of an individual utility may be considerably different from the WRAP region, resulting in very different resource accreditation results than in WRAP or even, in some cases, a different operational risk profile than the system as a whole.

This section is intended to parse out these considerations in the context of the utility's IRP, identifying both opportunities for improved integration as well as structural challenges to integration for Participant and stakeholder engagement as the program evolves.

Integrating WRAP into an IRP will involve several key components:

- **Near-Term Compliance Plan:** Incorporating WRAP compliance as part of an IRP's review of near-term compliance obligations (discussed in Chapter 2)
- **Portfolio Development:** Incorporating WRAP into the mid- and long-term portfolio development process as one of several reliability constraints for mid- and long-term portfolio development and resource decisions
- **Resource Adequacy Accounting:** Aligning the IRP's broader RA counting methodologies with WRAP counting rules for near-term compliance while elevating the role of probabilistic modeling and regional technical coordination to simulate and assess utility-specific reliability risk

A critical and outstanding question within this integration is the technical and procedural overlay between the regional reliability risk assessed through WRAP and the longer-term planning performed by utilities and regulators to execute long-term reliability planning, such as resource build-out and resource retirements. While WRAP establishes a foundation for longer-term coordination and information sharing, as currently framed, its analytical outputs are limited to 5 forward years, and there is significant potential for compliance values (and corresponding resource need) to shift year-to-year as its Participants' portfolios evolve.

Due to this limited planning horizon, it will not be immediately possible for utilities to rely on WRAP—and its analytical outputs and conclusions, such as ELCC values[11]—as a "drop-in replacement" for utilities in their mid- and long-term planning. In this section, we attempt to parse out a path based on the currently envisioned framework while identifying opportunities where WRAP can be leveraged by utilities and regulators to improve long term planning outcomes.

FIGURE 10.

IRP: A Multi-faceted Co-Optimization Problem

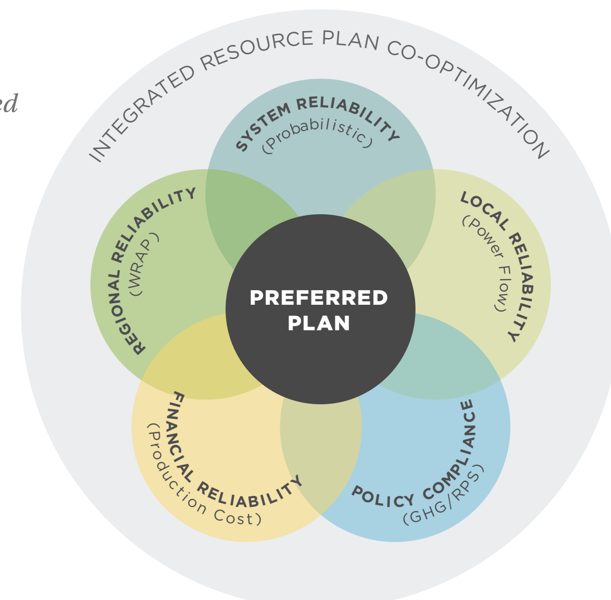


Figure 10 illustrates the multi-faceted nature of Integrated Resource Planning, in which utilities and their regulators must navigate a range of economic and policy considerations to develop a preferred plan which guides procurement actions moving forward. While IRPs vary considerably in their methods, policy frameworks, and prioritization, at a high level, they are aligned in their focus on achieving defined reliability and policy goals with minimum cost and mitigated risk for consumers.

11 This is because the ELCC values are dependent on what else is in the portfolio being analyzed, which is going to change over time and some resources will experience diminishing values over time (particularly for solar and wind) as penetration levels increase.

PREDICTING ELCC TRAJECTORIES

Effective Load Carrying Capability, or ELCC, is a widely utilized method for estimating the reliability contributions of any given resource class, using equivalent 'perfect capacity' as a metric against which all resources are measured.

However, ELCC assessment can be complex and unpredictable—for use-limited resources like solar, wind and battery storage, ELCC declines as a function of penetration on the system. To understand this, consider the first tranche of four-hour storage installed, which readily matches the need to address a four-hour peak. Those resources readily displace a comparable quantity of firm or peaking resources, resulting in an ELCC value close to 100% of nameplate value. The second tranche of storage resources is more complex—if it needs to operate for 6 or 8 hours, its value will decline proportionally, resulting in a lower ELCC. However, on the same system, increased solar resources may narrow the duration of the net peak, reducing the duration of storage need and thereby increasing its ELCC.

While the directional trend is predictable as a function of solar and storage penetration (a "multi-dimensional surface"), it is more difficult for planners to predict when those penetration levels will align with compliance periods, as the ELCC values are estimated as a function of all solar and storage within designated zones in the broader system—not just the resources in any given utility's portfolio.

This can have curious effects—a utility may believe itself to be in compliance for an upcoming period until an ELCC refresh scrambles its portfolio (a common frustration among California load-serving entities). On the other hand, the unpredictability of future ELCC values may introduce uncertainty for a utility considering the replacement of existing firm generation with new clean resources.

This may be particularly acute in the context of WRAP's five-year planning horizon, which introduces multiple years of portfolio evolution and development uncertainty into the mix. While a utility's internal process can refresh ELCC values as its portfolio evolves, it cannot do so for the region's evolving portfolio. By the time the binding values are defined, it may be too late for a utility to address any shortage with new resources. Improving data-sharing and collaboration within WRAP, as well as expanding intermediate portfolio analysis, can make ELCC forecasts more predictable for utilities and regulators to use in mid- and long-term planning.

NEAR-TERM COMPLIANCE

As discussed in Chapter 2, a clear process should be established to ensure utilities effectively plan for near-term WRAP compliance within the IRP for the immediate years following the conclusion of the IRP process. This should include a demonstration within the IRP of the utility's WRAP position based on its existing and planned portfolio as well as a strategy for regulatory review and approval for its disposition of any excess or shortfall. It would be appropriate for the level of review and oversight to be consistent with precedents from the utility's existing regulatory framework, and must also recognize that WRAP, if anything like the California Independent System Operator's bilateral RA program with which it shares many parallels, may involve tight timelines between the finalization of procurement transactions and the compliance showing.

As a hypothetical scenario, for a region with a biennial IRP process, it would be reasonable for the WRAP filing within the IRP to provide a granular and specific plan for the next five or more years of WRAP compliance. This would allow sufficient time for identification of major needs in years three through five (aligning with the advisory year) which would be too late to address if deferred to a subsequent IRP cycle. As discussed in Chapter 2, policymakers should establish a process for utilities to return to their regulatory bodies with regular procurement and compliance updates and establish specific triggers for updates or requests for approval, such as a new contract exceeding specific capacity size, cost, or term parameters.

RESOURCE PLANNING

In concept, WRAP and utility-level resource planning frameworks share much in common—both are intended to model and account for reliability needs in a manner which translates into utility procurement decisions, and, increasingly, the probabilistic methods used by WRAP (e.g., ELCC, UCAP, weather simulation) are emerging as the rising standard within utility IRPs. While it is tempting to view WRAP as a potential replacement of utility-level reliability analysis, there are several practical implications which complicate this task, and, at least in the near-term, are likely to result in WRAP and utility-level reliability planning co-existing as related but distinct tracks within utility IRPs.

While convergence of the parallel reliability frameworks is a beneficial long-term goal, there are both intended and unintended differences in the analyses that will leave them as complementary. First and foremost, the time horizon for WRAP is short term, as discussed in Chapter 2, preventing utilities from replacing their mid- and long-term analysis with WRAP analysis or WRAP data inputs beyond WRAP's horizon. Second, WRAP analysis and utility analysis have different geographical horizons and model different portfolios, which, in an ELCC-based accounting framework, will almost certainly result in differences between the resource counting position of each utility and that of WRAP at any given time.[12] Finally, utilities and regulators may have different intentions regarding reliability analysis, such as consideration of more or different reliability metrics (e.g., outage duration, frequency, and

12 ELCCs will shift as a function of resource saturation and interactive effects, with significant valuation changes as the portfolio changes.

magnitude) and consideration of more severe weather distributions or other risks, as well as the need to analyze the specific locational and temporal granularity of the utility's resources against its load.

WRAP and utility modeling frameworks will also differ in unintended ways—chiefly, in how they model regional inputs and considerations. While WRAP will be able to leverage a robust dataset of load and resources across the west, enabling relatively precise analysis of generation and high-level transmission risks, utility IRPs—unless they are granted access to WRAP analytical insights—will likely be forced to continue reliance on relatively uncalibrated data inputs regarding the regional resource balance, hours of regional scarcity, transmission curtailment risk, or the pace of ELCC effects as a function of resource development.

In this section, we discuss current frameworks for resource planning within IRPs and how WRAP may be effectively integrated as a process or data input, areas where integration may be challenged under the current framework, and potential solutions to the data transparency challenge.

IRP Planning Context and Workflow

In recent years, IRP processes have increasingly been driven by complex analytical tools intended to co-optimize around a range of desired outcomes, generally structured as a least-cost optimization problem subject to reliability and policy constraints. These analytical tools typically incorporate an explicit analysis of system reliability based on probabilistic modeling rather than a deterministic (static), peak-load-based resource adequacy accounting measurement of reliability.

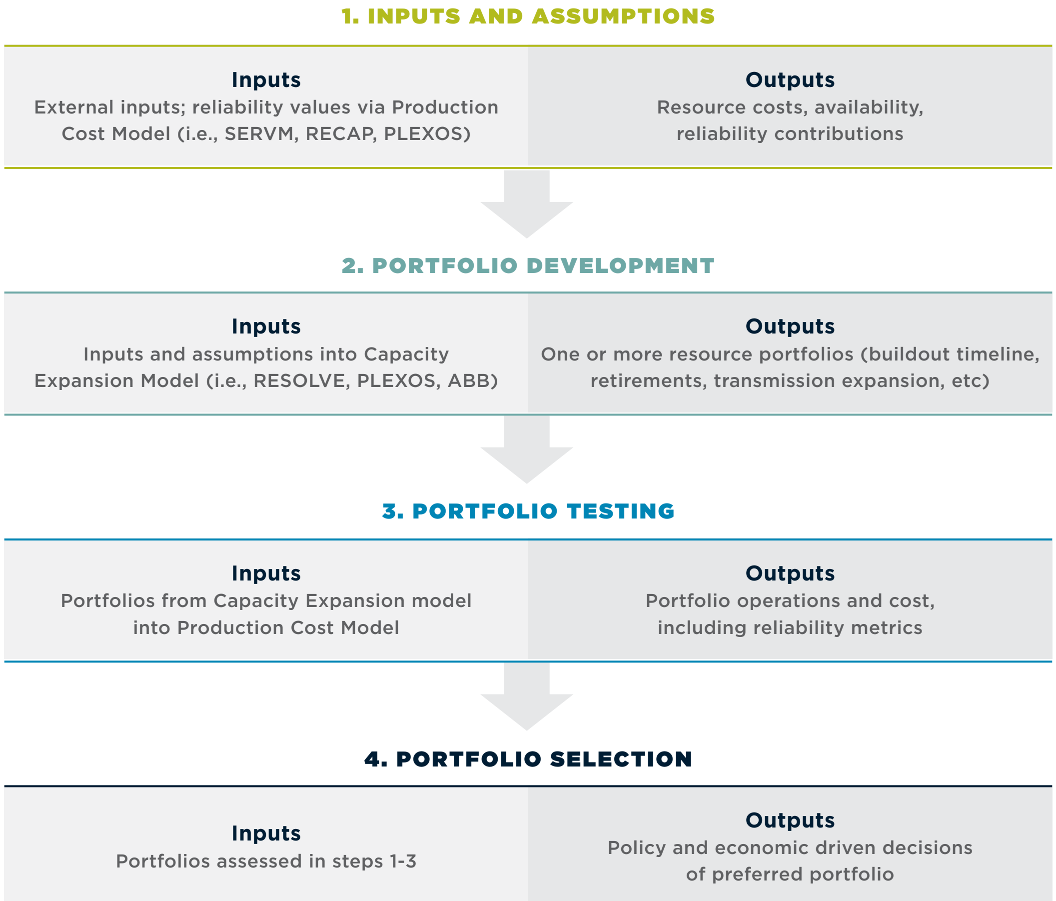


FIGURE 11. *Generalized IRP Process Flow*

Utilities incorporate reliability assumptions and analysis throughout the process. Utilities must make informed decisions regarding what inputs to use for resource and load operations (often informed by historical weather analysis), how to enforce a reliability requirement within a capacity expansion model (typically using a PRM-based approach), and how to test the reliability of integrated portfolios across one or more reliability metrics (using probabilistic modeling).

WRAP Process Flow Integration

While the details of integrating WRAP into this analysis will vary based on the utility's current regulatory process, this report presents a generalized framework for thinking about WRAP integration, including both actions utilities can take today as well as potential actions that could be unlocked through further coordination with WRAP.

As a starting point, we believe that reliability analysis at both the regional (WRAP) and utility-specific level should be grounded in probabilistic methods incorporating the latest and best modeling practices and datasets (such as a sufficient number of load and resource profiles that reflect multiple weather years). This is the intention of the modeling conducted in WRAP and is increasingly dominant in the processes of individual utilities participating in WRAP. A core recommendation of this report is that utility-specific probabilistic resource adequacy modeling processes should be expanded in parallel with the deployment of WRAP—and to the extent possible, leverage comparable tools, datasets, modeling approaches and metrics. Conversely, utility modeling may be an essential benchmark and insight generator for WRAP, with utilities identifying both data and methodological recommendations for WRAP's continued development.

In practice, the mechanics of this integration are complex. WRAP will, by necessity, be a new reliability constraint for IRP portfolios, at least for years which have binding or advisory PRM and resource accreditation values from the program. Secondly, WRAP is likely to generate considerable data, which can be utilized for individual utilities' direct reliability analysis using probabilistic tools and as a resource for generalized inputs and assumptions (resource and weather-dependent profiles) as well as regional insights (transfer capabilities between utilities and hours of scarcity). WRAP will be significantly more valuable as a data resource if its planning horizon, or, at minimum, its role as a clearinghouse of regional planning and resource data, can be expanded to include more years and more frequent analysis, adding both intermediate analysis (years 3 and 4) and looking further into the future (years 6 and beyond). Notably, unlocking this resource potential requires buy-in from the program's governance to provide for both high-level and specific technical data analysis to be disseminated to Participants and regulators.

In light of both the potential and limitations of the currently envisioned framework, we offer a generalized framework for integrating IRP reliability constraints in a WRAP world:

- **System Reliability – Probabilistic Reliability Analysis:** *Portfolio and system-specific probabilistic modeling will be increasingly critical to manage risk specific to the utility and to plan for reliability beyond WRAP's limited time horizon.*
  - Probabilistic modeling assessing the integrated reliability of each utility portfolio under consideration has been incorporated by the majority of larger Western US utilities within their IRPs and should become the minimum standard across the region.
  - WRAP data inputs and outputs may become valuable default assumptions for utility reliability modeling, with specific value in utilizing WRAP modeling results to identify the characteristics and magnitudes of regional resource needs as an input to individual utility IRPs.
  - Separate from the reliability analysis, WRAP analysis may also be useful to utilities and policymakers in assessing emissions and renewable energy modeling results which rely on energy imports and exports and are difficult to model at the individual utility level.

- **WRAP Compliance – Static Resource Adequacy Accounting:** *Incorporation of a WRAP compliance constraint for each portfolio, limited by necessity to the time horizon for which WRAP PRM and accreditation values are available.*
  - Incorporation of a WRAP-based compliance constraint may be a relatively simple 'bolt-on' constraint to the existing process, at least for the periods for which WRAP requirements are forecast, but policymakers should contemplate opportunities to integrate existing reliability standards with the WRAP standard.
  - Utilities still utilizing static resource adequacy standards (in lieu of probabilistic modeling) may wish to align their standards with the WRAP framework—shifting to a monthly compliance construct and alignment with WRAP counting rules (e.g., ELCC, UCAP).
  - At this time, it is unclear how viable it will be for individual utilities to 'extrapolate' WRAP requirements beyond the planning horizon, or even have firm confidence in the advisory values, as certain inputs are expected to shift considerably as resource portfolios change between advisory and binding analyses.

- **Network Reliability – Power Flow Modeling:** *Continued incorporation of risk analysis and needs identification for the specific transmission and generation topology of the utility system being studied.*
  - Integration of WRAP is not expected to meaningfully change the network reliability analysis process or outcomes, which focuses on specific contingency and other risks for a utility's resource system.
  - While not explicitly driven by WRAP, it is possible that these studies may need to give greater consideration to regional needs and trends (such as flexibility requirements) as the portfolio evolves to incorporate more variable energy resources and storage.
  - WRAP may serve as a useful platform for utilities to exchange findings and best practices for power flow modeling in a high-renewables western grid.

These changes are summarized in the graphic below.

RELIABILITY SPHERES	CURRENT PRACTICE	WRAP IMPLEMENTATION	CHANGE REQUIRED
RA Accounting	*State-Level RA Compliance*	*+ WRAP Accounting and Compliance*	*Incorporation of WRAP Compliance Requirements (where available)*
System Reliability	*Probabilistic Modeling*	*Probabilistic Modeling w/ WRAP inputs*	*Integrate WRAP data insights into model (transfers, hours of risk, tx constraints)*
Network Reliability	*Network Reliability Modeling*	*Network Reliability Modeling*	*No Change from WRAP*

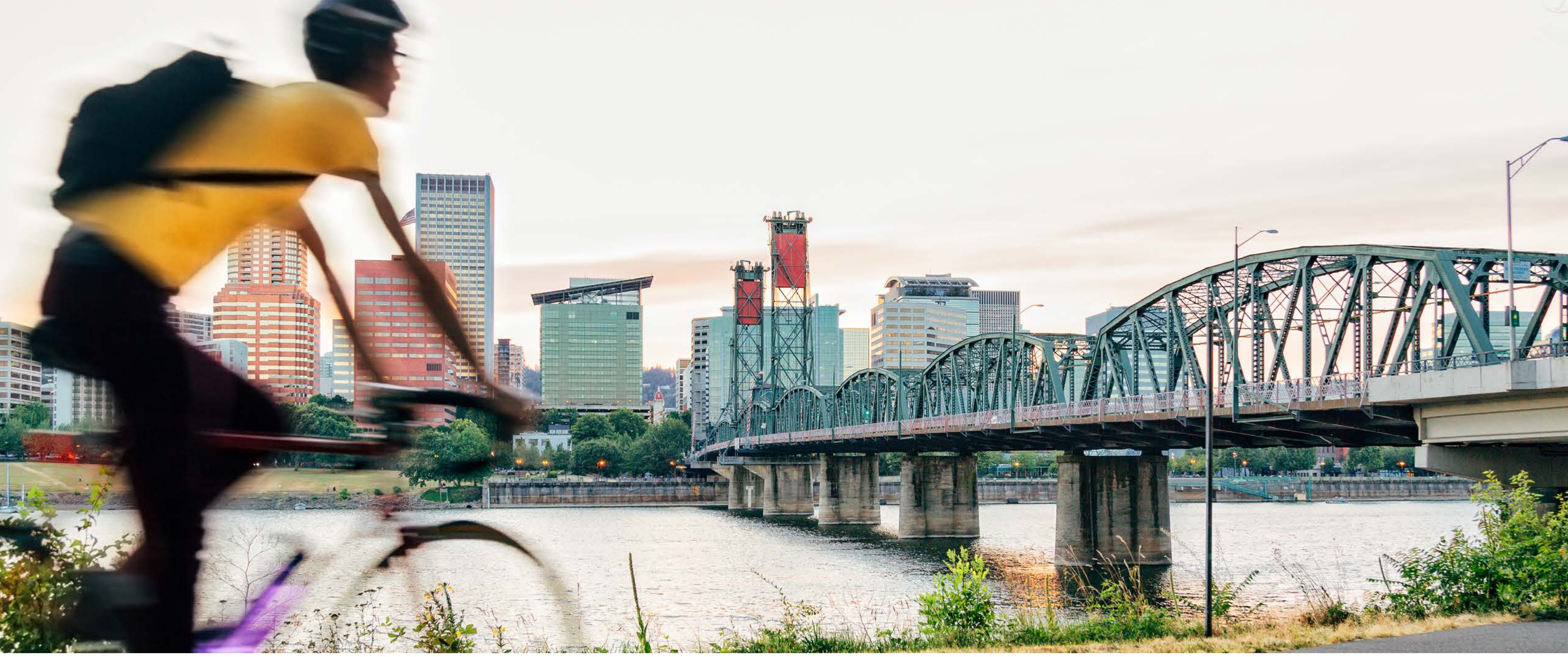
FIGURE 12. *Visualizing WRAP Process Changes in the Mid- and Long-term Reliability Planning Space*

Probabilistic Reliability Modeling

WRAP, like IRPs, will utilize probabilistic modeling to determine reliability needs and compliance requirements, simulating many years of weather data across a range of market conditions. As a multi-jurisdictional compliance framework, WRAP must do this ex ante—providing results to Participants who then use them to complete their compliance filings in a stepwise fashion. This is in contrast to the use of ELCCs within vertical utility IRPs, which (as a best practice) endogenizes shifts to ELCC values as a function of the resource mix in the process of portfolio development. In the near-term (1-2 years), this is likely to result in relatively minor errors being introduced as the portfolio that WRAP analyzes may differ marginally from resources ultimately shown by utilities[13]. In the long-term, the level of uncertainty in the future portfolio mix grows, and predictions regarding long-term system operations (and the value of underlying resources) become increasingly challenging to develop.

In utility IRPs, utilities have the luxury of internally modeling changing reliability dynamics in the process of developing their portfolios, with utilities increasingly incorporating ELCC curves or surfaces to reflect changing values with the changing portfolio. While utility IRPs typically begin with an ex ante assessment of individual resource capacity values, typically informed by an ELCC or similar study, the modeling framework can endogenously show how the ELCC values evolve as a function of resource penetration or the resource mix, for

13 While near-term changes should be minor, recent experience with supply chain disruptions and interconnection delays in California should serve as a reminder that significant departures between the analyzed portfolio and realized portfolio can result in significantly different ELCC outcomes. See, e.g., California Public Utilities Commission Loss of Load Expectation Study, March 3, 2022; Slides 31-35. https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/resource-adequacy-homepage/finalra_lole_elcc_2024_workshop03032022.pdf



example, utilizing a multi-dimensional curve to represent ELCC values at different solar and storage penetrations. Increasingly, while utilities rely on ELCCs for portfolio development, the incorporation of a final probabilistic reliability test is utilized to ensure the integrated system operates (as modeled) consistently with the desired reliability standard. This is increasingly important as reliance on solar, wind, and storage increases, and as load shapes evolve due to electrification and other load modifiers.

This approach also enables utilities and policymakers to assess portfolio reliability using a range of metrics. While traditional analysis has commonly focused on a single metric, typically Loss of Load Expectation (LOLE), which limits the frequency of event days (e.g., one event day in ten years), interest has grown to ensure the system is designed to also avoid low-probability, high-risk outages such as outages of significant duration (hours) or depth (megawatts). The Northwest Power and Conservation Council has led efforts to implement several new metrics for its adequacy analysis, including measures to limit the frequency of very long events ("Duration Value at Risk"), very deep events ("Peak Value at Risk"), and events that are both long and deep ("Energy Value at Risk").[14]

Finally, utility reliability analysis may be necessary to analyze specific, granular reliability dynamics within utility portfolios—whether specific reliability or contingency risks may exist within the utility's system, or how closely a utility's portfolio may align with its hourly load, an insight critical to both reliability and financial planning.

As utilities plan for mid- and long-term portfolio changes, these interactions and reliability considerations become increasingly important—and increasingly out of scope for WRAP's current design, necessitating continued parallel analysis within utility IRPs.

14 Pacific Northwest Power Supply Adequacy Assessment for 2027, Northwest Power and Conservation Council, p. 7-11. https://www.nwcouncil.org/fs/18158/2023-1_adequacyassessment.pdf

ROUND-TRIP MODELING: A RISING INDUSTRY STANDARD

Traditional approaches towards ensuring resource adequacy—translating the resource need into a simple planning reserve margin relative to peak load against which resource capacity values are measured against—is **an attempt to simplify a very complex puzzle** into a simple arithmetic problem. While this simplification was workable in the old world—one of firm resources, predictable loads, and surplus capacity—it is **increasingly challenging to accurately distill system conditions** as system needs and resource characteristics become increasingly complex and interdependent.

WRAP, like many of its member utilities, uses ELCC analysis and other contemporary tools to perform this simplification for compliance accounting purposes. While this is appropriate for compliance, utilities are increasingly finding that this translation is not sufficient on its own to ensure system reliability and have incorporated Round-Trip Modeling to validate system reliability.

Round-Trip modeling refers to a final step in the modeling process to assess whether the integrated portfolio, once developed, operates in a manner consistent with the expectations of the capacity expansion model, which are to generate a cost-effective portfolio that meets the resource adequacy standard.

Specifically, round-trip modeling refers to the inclusion of an **ex post probabilistic modeling run** that assesses whether the portfolio in question passes a specific reliability threshold, such as the **1-event-day-in-ten-years loss of load expectation metric** often cited as the **industry standard**.

The need for round-trip modeling arises from the **interdependent nature of ELCC values**, as well as the limitations of the capacity expansion model used to develop the portfolio. In addition to performing **more model runs over more weather years**, the final probabilistic modeling step can represent **complex interactions among resources** (e.g., solar, storage, and hydroelectric interactions on the energy constraint), assess the impacts of **random and correlated outages**, and incorporate **extreme events** such as correlated load spikes and thermal outages during heat waves.

WRAP as a Key Data Source for IRP Model Calibration

WRAP has tremendous potential to inform key uncertainties in utility IRPs—increasingly, regional interactions are pivotal, yet poorly calibrated inputs in utility IRPs which can significantly alter the view on resource needs and reliability risk. While the WRAP tariff currently contemplates a very limited scope for utilizing WRAP insights, it would be a disservice to Participants and policymakers for WRAP's tremendous insights to remain cloistered within the program rather than utilized to achieve WRAP's goal of improved planning, regional coordination, and ultimately, reliability outcomes.

Regional reliability risks—due to a lack of available resources during periods of critical reliability need—has quickly become a central theme in many utility IRPs and is arguably the core driver behind the development of WRAP. As the region has transitioned from surplus to scarcity, planners have faced increasingly correlated reliability risks as regional heat events simultaneously impact load centers across the Western Interconnection.

From a planning standpoint, this reality has raised concerns for planners and policymakers which previously left considerable open energy and capacity positions in their IRPs. In some cases, the utility intends to close these positions with forward contracts, in others, with spot market purchase (though the assumed availability of spot market purchases has declined significantly in recent years). Increasingly, the import constraint is a central IRP assumption which has considerable impact on the utility's reliability need. Despite its importance, the assumption often lacks robust analysis, as individual utilities cannot predict future availability across the region without substantial coordination and information exchange.

At its core, WRAP will become that platform for coordination and information exchange and is perfectly suited to answer this question. WRAP collects data from Participants on near-term resource decisions and performs probabilistic reliability modeling on the region's portfolio as a whole. This modeling process can, in theory, provide a tremendous amount of data to Participants for their IRP processes.

While WRAP is designed to ensure each utility provides a compliant Forward Showing which meets its requirement, in the IRP ecosystem, a utility and regulator facing an open position may face considerable doubt as to whether the utility may be able to find that capacity in the bilateral market or whether it will be incumbent upon the utility to build new capacity to fill that need. While this may be a theory a utility can test with market outreach, by the time the utility has returned with the conclusion that market resources are not available it may be too late to take action to develop new resources. Moreover, the existence of this dynamic is likely to lead utilities and regulators to take a more conservative planning approach which pushes utilities to build resources regardless of the regional capacity position.

For utilities performing LOLE analysis, WRAP's probabilistic modeling can identify the periods during which reliability constraints are most likely to bind, providing a critical benchmark for utility models and replacing simplified data—e.g., a static import constraint—with more textured and well-calibrated data. For instance, this approach could facilitate a utility's replacement of an import constraint defined through heavy- and low-load hours with one which better reflects the sharp decline in hourly availability during the sunset period.

Similarly, utilities facing limited transmission availability are contemplating the viability of resources with conditional firm transmission to meet IRP directives, which, while able to meet the WRAP requirement, may be curtailed and unable to be delivered during critical periods of scarcity. Within the IRP modeling ecosystem, it can be difficult to assess how significant this risk may be, as utilities have no ability to unilaterally estimate when regional transmission constraints may bind.[15] Analytical insights from WRAP's regional modeling exercise could be highly valuable in answering this question.

Each of these modeling and operational insights can be useful for informing IRP input assumptions and modeling choices. Within WRAP's planning horizon, there may be direct opportunities to apply data from WRAP into utility IRP models, and planners should contemplate the potential mechanics of such integration. Beyond WRAP's planning horizon, insights will be indirect, but may still be useful, as planners extrapolate regional reliability dynamics into the mid-term.

OPPORTUNITIES FOR ENHANCED LONG-TERM PLANNING WITHIN WRAP

WRAP lays the foundation for information sharing, modeling, and planning coordination that could be valuable far beyond the currently envisioned five-year window, and its long-term value may hinge on its ability to provide longer-term insights to its Participants for improved decision-making, and on the ability of utilities to incorporate this information into their own planning processes.

As an example, WRAP's current framework could not provide sufficient information for a utility considering a mid-term resource retirement beyond the current window, such as fossil resource retirements timed to specific triggers (e.g., 2030 or 2040 policy targets), as the planning horizon has not undertaken any reliability analysis of the 2030 period. While it is likely that nearer-term compliance data could be roughly extrapolated—for instance, a utility with a significant gap in year 5 would, all else equal, be unlikely to consider a retirement in year 6—the level of granularity desired in resource planning would require the utility to perform its own, separate analysis to support such a decision.

Moreover, even if the utility felt confident in its ability to meet its own reliability needs, it's possible that the utility's portfolio could fail to meet the requirements of WRAP, particularly if the utility has a unique load shape or has a level of renewable resource penetration that is markedly different from the broader WRAP pool (which would mean that the utility's assessment of capacity value of these resources will differ from the ELCC assessment of the region from WRAP). These complexities may introduce uncertainty or unease for a utility or its regulators considering such a decision, which could have reliability, economic,

15 *See*, e.g., Portland General Electric's 2023 IRP discussion of Conditional Firm resources, p. 522. https://downloads.ctfassets.net/416ywc1laqmd/6B6HLox3jBzYLXOBgskor5/63f5c6a615c6f2bc9e5df78ca27472bd/PGE_2023_CEP-IRP_REVISED_2023-06-30.pdf

and environmental benefits, resulting in delayed or deferred action to replace an aging and polluting resource.

Fortunately, WRAP has established an impressive platform for regional coordination and reliability modeling, the exact foundation which could be leveraged for improved long-term resource coordination if the Participants are inclined to pursue it. A recommendation of this report is that WRAP Participants leverage the successful collaboration that led to the development of WRAP as a near-term construct to develop a regional-platform that can expand information and data sharing to support regionally-informed analysis in the long term. In practice, this would include more regular and structured transfer of IRP resource planning results to WPP, including both resources in development and intended longer-term resources, and the use of those long-term plans for WRAP to perform analysis and provide insights to WRAP members. Critically, this would improve insights for member utilities on the year-by-year regional resource balance (informing the need for regional resource development) as well as year-by-year resource penetration and interactions (informing ELCC values).

CONCLUSION: WRAP IN THE UTILITY PLANNING ECOSYSTEM

Integrating WRAP into the utility planning ecosystem will be an important, multipart challenge for utility planners and policymakers moving forward. Because WRAP's compliance framework is relatively short-term (2- to 5-years) and may not align fully with the reliability considerations of the specific utility or jurisdiction, it will not be viable to utilize WRAP as a drop-in replacement for reliability modeling within utility IRPs.

Instead, utilities will need to continue to model reliability in parallel but should strive to incorporate insights and data from WRAP into their planning processes (and likewise, provide reliability insights and benchmarking to WRAP as active Participants). In contrast to WRAP, utility reliability modeling should continue to be long-term (15-20 years), should lean into probabilistic modeling of the integrated portfolio (round-trip modeling), and should consider an expanded suite of reliability metrics to ensure the range of reliability risks are modeled and mitigated.

Looking ahead, utilities and policymakers have an opportunity to engage with other WRAP Participants to leverage the impressive platform developed by WRAP to inform longer-term resource planning and decision-making, establish more frequent near-term analysis to reflect portfolio evolutions between the advisory and binding compliance horizons, and to ensure WRAP's extensive data insights are used and useful in informing utility IRP modeling. WRAP, as a framework, has the potential for improved data-sharing, reliability analysis, and coordination far beyond its current planning horizon, and this level of analysis will likely be necessary to achieve the full investment cost saving potential envisioned in its initial development.

COULD A WRAP-COMPLIANT UTILITY STILL FACE RELIABILITY RISK?

While WRAP compliance confirms a utility's contributions to regional reliability to WRAP's reliability standard—and is strongly correlated with its own reliability—it is not inherently a complete check on a utility's reliability risk. In addition to the desire of some utilities and regulators to meet higher or different reliability standards, there is a difference between reliability assessed regionally and reliability assessed at the utility level. As one simplified example, imagine a relatively isolated utility with a flat 400 MW load profile. The utility's portfolio includes, as rated within WRAP, 300 MW of thermal resources, 100 MW of solar, and 100 MW of 4-hour storage resources.

Because the utility's load profile is flat, with 400 MW of demand during solar, peak, and overnight hours, the utility would need a portfolio capable of providing 400 MW of output in all hours. While the portfolio can produce 400 MW through the evening peak with its solar and storage resources, it would be unable to serve overnight load once those resources are exhausted. While the utility's probabilistic or ELCC-based analysis would register this risk, ELCCs within WRAP are regional, not specific to each utility's load or portfolio. In this hypothetical, the ELCC value of the utility's portfolio to meeting its own load would differ significantly from the ELCC value assessed within WRAP, potentially introducing both reliability and financial risk to the utility.

It is important to note that WRAP is, in a sense, designed to leverage this sort of regional diversity—the solar and storage resource of that utility are providing the rated level of capacity to the WRAP region, even if they do not cover the utility's load directly. In WRAP's Ops Program, it's likely that under most conditions, bilateral trading would likely be able to serve that utility's needs.

This is a highly contrived example—it would be unlikely for a utility to pursue such a problematic strategy, one which would leave its customers with significant financial and reliability risk from its structurally open energy position. However, this example serves to highlight the potential for significant differences between a resource's ELCC under WRAP and the value it may provide to a utility's customers. Despite strong correlations between WRAP and other reliability analysis, utilities must continue to robustly analyze unique reliability risks using probabilistic modeling tools informed by critical thinking and human judgment. Similar hypothetical scenarios include the following:

- A utility reliant on imports (with deliverability) faces a situation in which these are not delivered due to a transmission contingency
- A utility with a large clean energy portfolio which, for reasons of load shape, ELCC saturation effects, or other considerations, is misaligned between its WRAP compliance position and actualized hourly energy needs
- A utility with a large hydroelectric fleet which appears effective in the Forward Showing but has insufficient reservoir capacity in the Operational Program

CHAPTER 4

KEY ISSUES FOR THE FUTURE

As WRAP and its members move into the implementation phase, many questions and issues have emerged that will have strong implications for the success and evolution of the program, including:

- How will regulators oversee and review utility WRAP compliance?
- How will WRAP overlay with utility and state planning efforts?
- Can the WRAP platform be leveraged for expanded mid- and long-term coordination to realize potential reliability and ratepayer benefits?
- How will WRAP interface with parallel regional market developments in the west?
- How will planners and policymakers work together to support program evolution and enhancements moving forward?

SUCCESSFUL REGULATORY OVERSIGHT OF WRAP COMPLIANCE

As discussed throughout this report, WRAP has significant implications for utility-level integrated resource planning—the main arena in which resource investment and retirement decisions are developed and reviewed by policymakers. To successfully implement and integrate WRAP into resource decision-making, utilities and policymakers must integrate WRAP in two processes—first, as a near-term compliance requirement that utilities must plan to meet, and second, as an input to and an element of mid- and long-term integrated resource planning.

In Chapter 2, we identify a potential process for utility regulators to oversee near-term WRAP compliance, leveraging existing planning and reporting processes to assess near-term compliance. This includes establishing up-front expectations and directives for utilities which need to fill a resource gap or to trade excess resources to regional partners. In this process, utilities may need different strategies for resource gaps which are structural in nature relative to resource needs, which may be transitory as a utility develops a longer-term portfolio.

In this effort, regulators will need to consider their priorities for utilities meeting WRAP compliance, including the types of resources utilities should prioritize, the level of risk utilities (and ultimately, ratepayers) may be taking with different strategies, and the process for resolving non-compliance or other contingency events, which are likely less of an 'if' than a ‘when.’ Each of these considerations may be specific to the utility and regulatory construct under which they are governed, but all are alike in the value of weighing these issues in advance of a contingency.

SUCCESSFUL INTEGRATION OF WRAP INTO STATE PLANNING EFFORTS

In addition to regulatory review of near-term compliance, it will be important for utilities to integrate WRAP into their resource planning initiatives. However, without additional steps taken by either WPP, participating utilities, or regulators, it will be difficult for utilities to utilize WRAP for reliability insights beyond the current near-term planning horizon. Additionally, without improved data access, key WRAP analytical insights will remain closed off to Participants and regulators. Consequently, utilities will need to continue to perform their own reliability modeling beyond the WRAP horizon, assessing reliability risk and resource accreditation for mid- and long-term portfolio planning.

As discussed in Chapter 3, we identify the importance of probabilistic modeling as the centerpiece of each utility’s IRP process, with portfolio-specific reliability modeling at the core of the modeling process, with outcomes tethered to one or more reliability metrics adopted by the utility’s governing body. This is in contrast to static reliability analysis which does not consider the specific, integrated dynamics of the portfolio as a whole. We recommend a three-pronged approach to reliability which incorporates three constraints: utility-specific system reliability (measured probabilistically), WRAP compliance (measured statically), and network reliability analysis (measured through power flow modeling and related tools). This is in contrast to the current practice, in which utilities strictly analyze utility-specific reliability (measured probabilistically and or statically) and network reliability analysis with simplified input-output assumptions informing regional reliability risk.

Additionally, we identify several areas in which WRAP can provide near-term value to the inputs and assumptions of the utilities’ planning exercises. In addition to providing standardized resource input assumptions (e.g., weather-dependent resource profiles), WRAP should be leveraged in informing critical assumptions regarding regional reliability risk during critical periods, such as which hours the WRAP model views as most likely to face binding reliability constraints, among the most important assumptions in utility-specific reliability analysis. While this will be considerably more valuable beyond WRAP’s planned horizon, it will still be useful to incorporate as a default assumption within the near-term analysis.

UNLOCKING WRAP’S MID- AND LONG-TERM POTENTIAL

As a platform for sharing data and assessing regional risk, WRAP is a key tool for identifying and allocating responsibility for capacity needs—however, WRAP’s limited time horizon and lack of intermediate modeling between the 5- and 2-year ahead assessments limit its ability to be relied upon as a drop-in solution for utility reliability modeling and planning. For instance, at this time, it is unclear that WRAP’s currently envisioned framework would provide effective insights into the regional supply-demand balance in 5, 10, or 15 years, preventing utilities from leveraging WRAP to inform resource decisions during this timeframe.

Similarly, lack of mid- and long-term analysis is complicated by the shifting parameters of WRAP, specifically ELCC values of solar, wind, and storage, which will inherently change as a function of resource penetration and interactive effects. No individual utility is capable of forecasting either future penetration or the corresponding ELCC values, preventing it from effectively estimating the reliability contributions (from a WRAP perspective) of its generation fleet.

As a central coordinating body and potential data clearinghouse, WPP has tremendous potential to inform these mid- and long-term inputs, and the institutional inertia from the WRAP process should be built on to unlock the region's longer-term resource planning potential, which could result in considerable ratepayer savings and regional reliability benefits.

THE IMPACT OF PARALLEL MARKET DEVELOPMENT EFFORTS

WRAP is one part of a broader initiative to integrate and formalize western energy markets, including competing initiatives from CAISO and SPP to expand their ISOs into the broader western region. Both entities are supporting market footprint or function expansions: the CAISO through its Extended Day Ahead Market (EDAM) offering for its existing Western Energy Imbalance Market footprint and SPP through its Markets Plus offering.

While this report does not weigh in on the relative merits or integration of each program, it identifies the likely overlap between the roles and responsibilities of WRAP's Forward Showing and Operational Programs with these broader regionalization initiatives.

The first phase of regionalization, focused on energy market expansion, appears to align well with WRAP implementation, that is, market expansion is focused on efficient resource dispatch, and does not incorporate a medium- or long-term planning scope. Likewise, WRAP's role in energy market dispatch is limited, with specific triggers for resource sharing that may be overlaid with energy market participation.

The second phase of regionalization may be more complex. To the extent ISO formation or expansion is successful, it will likely include some form of resource adequacy framework. Additionally, an ISO would likely integrate transmission constraints at the regional level, addressing the bifurcation within the program requiring the procurement of both capacity resources and transmission rights. While it is possible that an ISO would be an evolution and continuation of the WRAP footprint, there is significant potential that WRAP Participants may not uniformly follow the same ISO participation timeline or may not even elect to join an ISO, let alone the same ISO.

A deeper analysis of regional interoperability issues was recently issued by WPP[16], identifying both potential for interoperability between WRAP and enhanced regional markets as well as operability challenges, with particular emphasis on prioritization of access to WRAP resources and how transmission rights and wheeling would be addressed.

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16 WPP White Paper on Interoperability with Markets: Focus on Transfer Scenarios. June, 2023. https://www.westernpowerpool.org/private-media/documents/WPP_WRAP_Interoperability_with_Markets_June_2023.pdf

SUPPORTING CONTINUED PROGRAM GOVERNANCE AND EVOLUTION

Planners and policymakers will play a key role in the continued governance and evolution of WRAP. As utilities and regulators begin to confront the issues outlined in this paper in regulatory proceedings and regional forums, it is likely that a range of opportunities for program refinements and design evolution will arise. While this paper articulates preliminary thinking on WRAP, much more will be learned and discussed during program implementation.

For policymakers, a recognition of your key role as regulators of program Participants—primarily state-regulated, vertical utilities—will be critical in ensuring the interests of your state and its utility customers are well-served by WRAP design and implementation. You will have a key role in ensuring the utilities under your jurisdiction effectively implement WRAP, and it is likely that this process will illuminate design elements that may merit further discussion amongst other state regulators. Additionally, it will be incumbent upon your regulatory organizations to ensure the utilities in your jurisdiction effectively implement WRAP in their IRP and other procurement mechanisms. In addition to the direct role of policymakers on the Committee of State Representatives, regulators should coordinate closely with regulated utilities to ensure their positions as voting Participants within WRAP align with state and customer policy interests.

Planners will be pivotal in WRAP's near- and long-term success. Planners, particularly those deeply engaged in utility modeling and resource planning workflows, will be on the front lines of identifying technical and policy issues at the detailed level, and it will be critical for planners to coordinate closely with utility and regulatory leadership to elevate issues and recommendations through WRAP's processes. Reliability modeling is complex and challenging, and WRAP will benefit tremendously from constructive quantitative and qualitative feedback from its user base as the program is developed. Similarly, WRAP should strive to provide forums for Participants and regulators to benchmark WRAP's modeling inputs and results, bringing the region's best thinkers on reliability together in support of the program's leadership on the cutting edge of reliability modeling.

WRAP is a powerful tool for the region, and an impressive feat of regional coordination and collaboration. As articulated throughout this report, its success and benefits hinge on the ability of planners and policymakers to successfully implement the program in utility-level planning and procurement. In the long-term, unlocking WRAP's full potential will likely require program evolution, filling in near-term and long-term modeling gaps and ensuring WRAP's critical data insights are effectively integrated into utility IRP processes. With thoughtful implementation and governance, WRAP has the potential to play a central role in helping the region maintain reliability through a transformative period. We strongly encourage planners and policymakers to lean in to their leadership role in guiding and developing the program in this critical phase.