



# Integrated Resource Plan

## 2021 IRP Public Input Meeting

### June 18-19, 2020





# Agenda

June 18, 2020

- Introductions
- Stakeholder Feedback Form Update
- Conservation Potential Assessment Update
- Optimization Modeling
- Lunch Break (45 min) 11:15am PT/12:15pm MT
- Modeling Updates
- Modeling Energy (Battery) Storage
- Break 2:30pm PT/3:30pm MT
- Wrap-Up/ Next Steps

June 19, 2020

- 2019 IRP Highlights / 2021 IRP Topics and Timeline
- Request for Proposal (RFP) Update
- Lunch Break (45 min) 11:30 PT/12:30 MT
- Transmission Overview and Update
- Break 1:15pm PT/2:15pm MT
- Q&A/ Wrap-Up



# Stakeholder Feedback Form Update





# Stakeholder Feedback Form Update

- The stakeholder feedback form process is being updated June 26, 2020 to include a web-based form. The new form will:
  - Allow stakeholders to enter their feedback and submit it without downloading a word document.
  - Allow for attachments to maintain flexibility.
  - Automatically be emailed to the IRP inbox.
- The new interactive stakeholder feedback form will be linked on PacifiCorp's existing website at: [pacificorp.com/energy/integrated-resource-plan/comments](http://pacificorp.com/energy/integrated-resource-plan/comments)
- Stakeholder feedback forms are being assigned numbers in the 2021 IRP cycle.
- Stakeholder feedback forms and responses will continue to be posted on PacifiCorp's website.



# Stakeholder Feedback Form Recap

- 12 stakeholder feedback forms submitted to date.
- Stakeholder feedback forms and responses can be located at [pacificorp.com/energy/integrated-resource-plan/comments](http://pacificorp.com/energy/integrated-resource-plan/comments)
- Depending on the type and complexity of the stakeholder feedback received responses may be provided in a variety of ways including, but not limited to, a written response, a follow-up conversation, or incorporation into subsequent public input meeting material.
- Stakeholder feedback following the previous public input meetings is summarized on the following slides for reference.

# Summary - Recent Stakeholder Feedback Forms



Stakeholder	Date	Topic	Brief Summary (complete form available online)	Response (posted online when available)
Utah Valley Earth Forum	Dec 31, 2009	CPA Draft Scope of Work	Request to include renewable-fuel power, and combined heat and power in CPA.	PaciCorp considers these resource types outside the CPA process.
Southwest Energy Efficiency Project/Utah Clean Energy	Jan 3, 2020	CPA Draft Scope of Work	Questions regarding demand response potential and energy efficiency potential in the Conservation Potential Assessment, and request that draft measures be made available.	PaciCorp made requested changes where possible and posted updated draft measures.
Utah Valley Earth Forum	Feb 4, 2020	CPA Draft Measures	Suggested a list of measures to be included in the CPA.	PaciCorp advised where list items are being considered in CPA.
Washington Utilities and Transportation Commission Staff	Feb 10, 2020	CPA Draft Measures	Requested changes to the draft measures, and changes to how they are shared with stakeholders.	PaciCorp detailed intent of format and timeline, and made some requested changes.
Utah Clean Energy	Feb 14, 2020	CPA Draft Measures	Questions and recommendations on emerging technology, requested changes to residential and non-residential measure list.	PaciCorp provided clarification and made requested changes.

# Summary - Recent Stakeholder Feedback Forms



Stakeholder	Date	Topic	Brief Summary (complete form available online)	Response (posted online when available)
Oregon Citizens' Utility Board	Feb 20, 2020	Demand Response in CPA	Questions on smart thermostats program, suggestions on irrigation load control program, TOU demand rate for electric vehicles, time of use demand rates, and third party contracts for demand response.	PacifiCorp advised what programs are underway, and referred to dockets where other programs could be considered.
Utah Clean Energy	April 2, 2020	CPA Measure Lists	Questions and suggestions regarding demand-side management and demand response measure lists.	Provided clarity on measure questions, and incorporated recommendations.
Utah Valley Earth Forum	April 23, 2020	CPA Workshop April 16, 2020	Questioned the reported percent penetration for electric vehicles from the April 16, 2020 public input meeting workshop presentation.	PacifiCorp explained how the value was calculated.
Utah Clean Energy	April 30, 2020	CPA DSM Measures	Resource suggestions and feedback on the major measure lists, including water heater – solar system, pool heater – solar water heating system, solar assisted gas water heating, high-SEER heat pump water heater, and a GIWH DR measure to include solar PV.	PacifiCorp will consider the resource suggestions, and GIWH DR is included under the Tier 4 emerging tech HPWH.
Oregon Public Utilities Commission Staff	May 4, 2020	CPA Demand Response	Questioned if the costs for residential smart thermostat control program have been updated with AMI deployment completion.	PacifiCorp explained how program costs with and without AMI are calculated in the CPA.



# Summary - Recent Stakeholder Feedback Forms

Stakeholder	Date	Topic	Brief Summary (complete form available online)	Response (posted online when available)
Oregon Public Utilities Commission Staff	May 4, 2020	CPA Demand Response	Questioned if more detailed estimates of the IT-related costs for implementing a PTR programs have been developed, updated, or impacted by AMI deployment.	PacifiCorp advised that cost estimates have not been developed or updated.
Oregon Public Utilities Commission Staff	May 4, 2020	CPA Demand Response	Questioned if the costs demand response pilot programs have been updated to reflect the benefits of AMI deployment.	PacifiCorp explained how program costs with and without AMI are calculated in the CPA.



# Conservation Potential Assessment Update





# 2021 CPA Workshops

Date	Major Topics Recap
January 21, 2020	<ul style="list-style-type: none"><li>• Feedback on CPA work plan</li><li>• Study methodology and updated approaches</li><li>• EE source data hierarchy and ramp rates by state</li><li>• New measures, EE and DR</li><li>• New DR approach ideas</li></ul>
February 18, 2020	<ul style="list-style-type: none"><li>• EE Measure list changes (205)</li><li>• Major measures identification</li><li>• Baseline development, regional and state variation</li><li>• Savings and cost variations drivers</li><li>• Cost credits – risk reduction, NW Power Act, T&amp;D deferral</li><li>• DR measure mapping of grid services</li></ul>
April 16, 2020	<ul style="list-style-type: none"><li>• Announced shift in schedule, Draft supply curve in August</li><li>• Technical drivers of differences between states</li><li>• Load and potential differences</li></ul>



# 2021 CPA Next Steps

## Presentations

- Draft CPA Technical Potential Results in August 2021 IRP Stakeholder Meeting
- Discuss feedback received and planned updates in September 2021 IRP Stakeholder Meeting
- Final CPA Technical Achievable Potential results in October 2021 IRP Stakeholder Meeting

## CPA/IRP Analysis

- ✓ Market Profiles posted for Stakeholder review
- ✓ Jurisdictional Incentive and Administrative Cost analysis posted for Stakeholder review
- Finish Measure Characterization and Develop Supply Curves
- Determine modeling methodology for CPA (EE & DR) in IRP
  - Includes EE Bundling approach
  - DR grid services
  - Applicable cost credits

# 2019 IRP – DR Actions Update



## Demand Response 2019 Preferred Portfolio Selections by Year through 2029 (MW)

State	Product	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Total
OR	Ancillary Services	-	-	-	-	-	-	-	-	-	-	7.5	7.5
WA	Ancillary Services	-	-	-	-	-	-	-	-	-	-	1.9	1.9
UT	Ancillary Services	-	-	-	-	8.3	-	5.3	-	-	-	-	13.6
UT	Cool/WH	4.1	-	7.0	-	9.9	-	-	7.2	-	-	6.7	34.9
UT	Thermostat	-	-	-	-	-	-	-	-	-	-	116.7	116.7
WY	Ancillary Services	-	-	-	-	-	-	3.0	-	-	-	-	3.0
TOTAL		4.1	-	7.0	-	18.2	-	8.3	7.2	-	-	132.8	177.6

In 2019 IRP Action Plan

- Stakeholder comments questioning limited uptake of DR in West
- Other flexible resource selections include 600MW energy storage by 2023 with solar PV
- Request to discuss DR pilot ideas and RFP potential

# Demand Response - OR/WA/CA Discussion



## April 14, 2020 Meeting

- Review of existing programs, 2019 IRP DR selections and comments
- Potential assessment results, areas of focus
- Ideas for next steps – Two paths to explore

### Pilot

- An experiment or trial undertaking prior to full-scale operation or use
- Oregon examples: energy storage, transportation electrification
- Test customer behavior, technical challenges, actual performance vs estimated
- Cost recovery structure / process for justification and approval vs. cost effective resource acquisition for system need
- Scope / Magnitude limitations

### RFP

- Results in best combination of proven resources to meet system needs
  - Cost competitive with other options
  - Price and non price aspects to ranking / scoring
- Multi-staged – 1<sup>st</sup> DR vs DR, 2<sup>nd</sup> Short list with 2020 All-Source finalists to determine best combination of resources
- Potential for significant scale expectations in short term

# 2019 IRP DR Conditions to Acknowledgement



## Oregon LC 70, Order No. 20-186

- Action Item 4 acknowledged with conditions
- For DR:
  - PacifiCorp pursue demand response acquisition with a demand response RFP. To the extent practicable, demand response bids may be considered with bids from the all-source RFP.
  - PacifiCorp should work with non-bidding stakeholders from OR and other interested states to determine whether PacifiCorp should move forward with cost-effective demand response bids, or with a demand response pilot, or both.
  - PacifiCorp and/or Staff are to provide an update on demand response efforts at a regular public meeting before the 2021 IRP is filed.



# Proposed Draft DR RFP Schedule

	Q2 2020		Q3 2020		Q4 2020		Q1 2021	Q2 2021	
DR RFP	Stakeholder meeting 4/14	LC 70 - Oregon acknowledgement with DR conditions, 5/7	DR Valuation, Stakeholder RFP response sorting (Oregon conditions)		Draft RFP	RFP Released Nov / Dec	Short list Evaluation	Combined Evaluation	
All Source RFP					Oct 15 Short list	Transmission Cluster Study			
CPA - DR Potential	Measures Defined		Draft Supply Curve		Final Supply Curve				
2021 IRP	IRP stakeholder meetings							2021 IRP Filed	



# Optimization Modeling



# Optimization Modeling Topics



- Optimization Principals
  - Meaning
  - Compare/Contrast
    - Stepwise Modeling Approach
    - Optimization Modeling Approach
  - Optimization Modeling Example
  - Advantages and Complexities
- 2019 IRP Optimization Challenges
  - Model Alignment
    - Capacity Expansion, Stochastics
    - Granularity
    - Operating Reserves
  - Endogenous Option Modeling
  - Batteries
- 2021 IRP Optimization Updates
  - Plexos
  - Next steps



# Optimization Principles



# Optimization Principles

- Optimization Modeling (OM) is also referred to as:
  - IRP Optimization means Linear Programming or Linear Optimization
- OM can be meaningfully compared to the alternative of “stepwise” problem solving
- Key Features:
  - OM is a mathematical model
  - OM math achieves the best (optimal) outcome (such as the lowest Present Value Revenue Requirement (PVRR))
  - OM solutions recognize and obey constraints, requirements, parameters and relationships (e.g., reserves requirements, unit capabilities, transmission constraints, market prices, etc.)
  - OM math avoids the need to examine every possible combination of inputs and options to determine the correct optimal solution



# Stepwise Approach

- Solves a problem by executing a series of intuitive steps
- Example: If you know that you must hold reserves on your energy system, some of your steps might be:
  - Rank your generators by reserve carrying cost, low to high
  - Hold reserves on each unit, in order, until reserve requirements are met
  - Determine how much generating capacity is left after reserves
  - Rank order your units by energy production cost, low to high
  - Generate from each unit, in order, until all loads are met
  - Calculate remaining generating capability (“excess energy”)
  - Sell excess energy at market:
    - ...when economic; compare production cost to market prices
    - ...when deliverable; keep a running total of transmission usage
- Repeat your steps for every hour (or other period) of every year, accounting for what you did in the prior hour (e.g., unit commitment)



# OM Approach

- OM mathematically determines the best (optimal) solution:
  - By eliminating solutions that cannot meet requirements (infeasible)
  - By eliminating feasible solutions that cannot be the optimal solution
  - By assessing linear relationships to get as close to the optimal solution as possible and;
  - Provides available output about the best solution. Possible output includes:
    - Discrete decisions (e.g., add capacity at a particular site, acquire a particular DSM package)
    - Energy production of modeled resources, usage of transmission, purchases of capacity or energy from markets
- Not all information is needed to provide a solution
  - Example:
    - No need for a reserve stack
    - No need to assign reserves to specific units



# Simple OM Example

How much gas energy and how much coal energy should we generate?

Objective: Minimize system costs assuming two generating units (one gas, one coal), one transmission line, and one load area, operating for a period of one hour.

Relationships: A transmission line conveys energy to the load area.

Parameters and Constraints (in a single hour):

- Generate up to 120 MW from our gas unit
- Generate up to 150 MW from our coal unit
- Transmission capacity and load requirement are both 200 MW

Run cost:

- 1 MWh of gas-power costs \$2 to generate
- 1 MWh of coal-power costs \$3 to generate
- Failure to meet load costs \$100/MW

# OM Simple Example, continued



- Modeled constraints and objectives become mathematical constraints and objectives, expressed as inequalities:

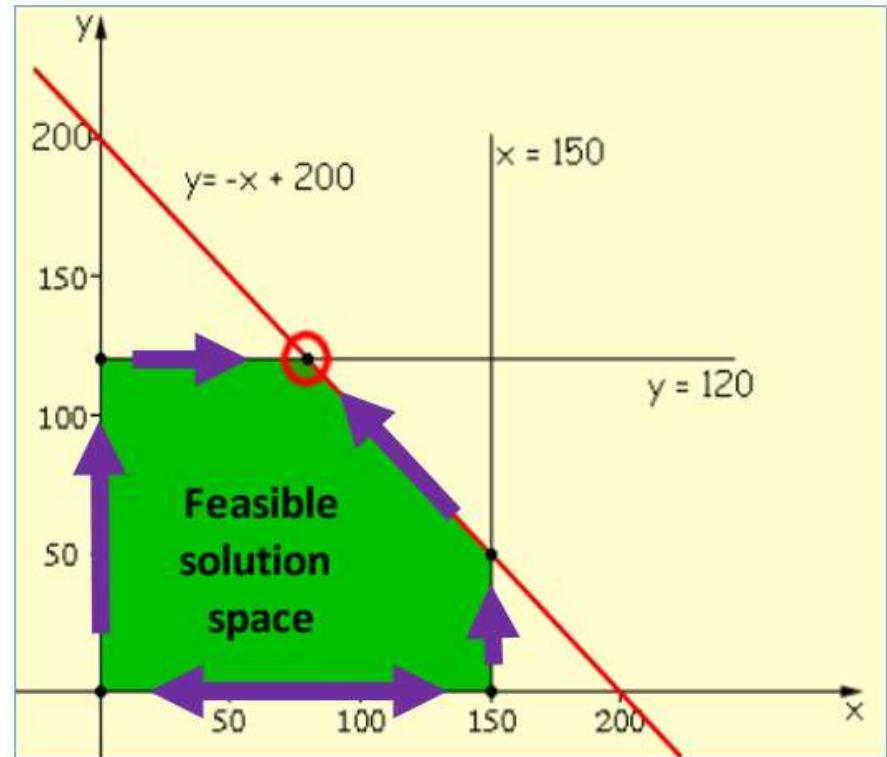
Linear Inequalities	Purpose
$x \leq 150$	Coal can generate up to 150 MW
$y \leq 120$	Gas can generate up to 120 MW
$x + y \leq 200$	Total generation cannot exceed transmission
$x \geq 0$	Coal generation cannot be negative
$y \geq 0$	Gas generation cannot be negative

- The model uses these inequalities to define a “feasible solution space” – a range of possible solutions that *might* be the right answer
- Load *requirement* compared to load *constraint*

# OM Simple Example, continued



- The graph at right illustrates how the math defines the “feasible solution space”
- The load requirement dictates that only solutions along the red line could be the right answer. (At each point on the red line, the generation total is 200 MW, avoiding the \$100/MW penalty for not meeting load.)
- The model “searches” for the edge of the feasible solution space, then examines other solutions along that edge to see if moving in one direction or the other improves the solution (lower PVRR).
- The model quickly arrives at the optimal solution, found at one end (vertex) of the 200 MW load requirement.
- This vertex meets all requirements and constraints, and produces the lowest PVRR. No other solution does this.



# OM Advantages and Complexities



- You get the best (i.e., optimal) answer
  - Complexity: The best answer may not be immediately intuitive
  - (However, if it isn't intuitive you investigate for related setup errors)
- Multi-dimensional problem solving; detailed precision and accuracy that non-optimization approaches cannot match
  - Complexity: Determining an acceptable amount of complexity
  - Complexity: Tremendous amounts of data are required
  - Complexity: Time required to produce and analyze results
- OM math is incredibly fast for what it does; has the **effect** of examining every possibility
  - Complexity: All desired outputs may not be readily available

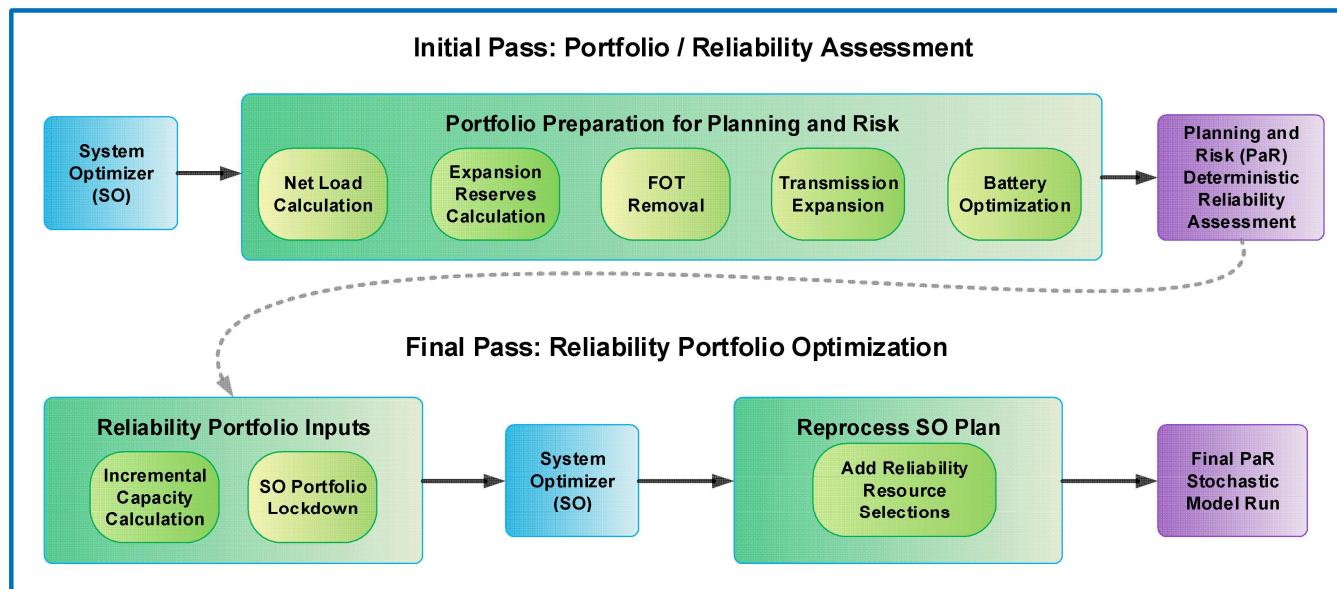


# 2019 Optimization Challenges

# 2019 IRP Challenges, Alignment



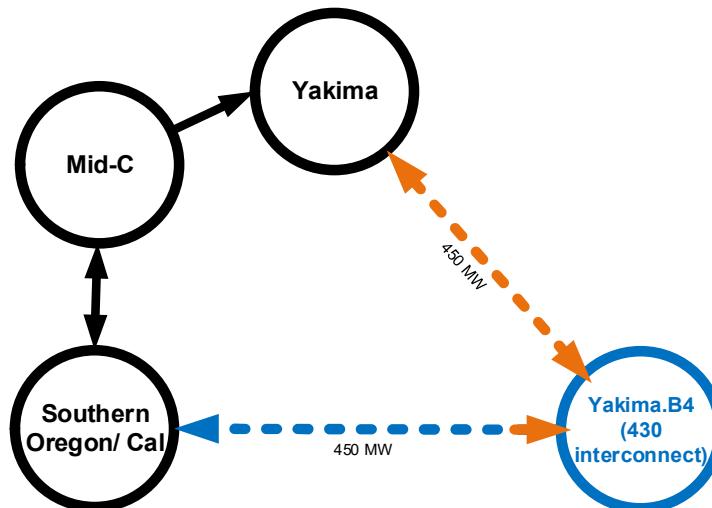
- Model Alignment - Capacity Expansion and Dispatch Modeling, Stochastics
  - Granularity adjustment
    - Aggregation differences had solar generating at night
  - Operating Reserves, Reliability
    - Expansion model saw only the Planning Reserve Margin
    - Reliability Assessment added 10 new steps and many weeks



# 2019 IRP Challenges, Transmission



- Prior to the 2019 IRP, transmission options were addressed through true-ups
- Endogenous transmission modeling
  - In the 2019 IRP we created a way to allow for endogenous selection



- Drawbacks
  - 2, 3 or even 4 copies of every resource
  - Modeling intensive
  - Performance intensive
  - Limited to single-path

# 2019 IRP Challenges, Retirements



- Retirements
  - Interrelationships between units and plants make endogenous retirements highly impractical
  - Addressed through modeling many, many retirement scenarios
    - Unit-by-unit
    - Alternate year
    - Stacked studies
    - Family tree
  - Challenges in the 2019 IRP Approach
    - Modeling intensive
    - Performance intensive
    - Cannot model every possible combination



# 2021 IRP Optimization Updates



# 2021 IRP - Plexos

- The optimization math remains the same
- The interface, organization and available modeling objects are much more aligned with our needs.
- Challenges addressed:
  - Granularity – significantly more control over model alignment and aggregation sampling
  - Reliability – reserves and loss of load probability (LOLP) can be incorporated into the expansion planning in addition to the planning reserve margin (PRM)
    - Zero extra steps, gaining months back in the IRP process
  - Endogenous transmission
    - No complex topology additions or analytics, just math constraints
    - No need to create multiple copies of every resource
    - Multiple paths can be modeled as one option
  - Retirements – IRP is exploring how to best leverage the new model's capabilities



# Modeling Energy (Battery) Storage





# Energy Storage Topics

- Planned projects
- Operating parameters (modeling inputs)
- Combined Resource + Battery interactions
- Grid services
- Capacity-contribution of energy-limited resources



# Energy Storage Overview

- What are energy storage resources?
  - Act as resources when discharging and as loads when charging
  - Typically very flexible when controlled by system operator
- Key benefits of energy storage
  - Energy: moves from low-value periods to high-value periods
  - Capacity: can be an alternative to generation, transmission, and/or distribution additions.
- Planned energy storage projects in Oregon and Utah will help further refine cost, performance and benefit information

# Planned Energy Storage Projects



## Utility-scale projects:

- Utah SB 115—The Sustainable Transportation and Energy Plan (STEP)
  - Panguitch Battery Storage project (1 MW/5MWh) was placed in commercial operation on March 9, 2020
- Oregon HB 2193
  - If authorized by Commission, procure energy storage by 1/1/2020 with at least 5 MWh and no more than 1% of 2014 Oregon system peak load.
    - The Commission approved a stipulation supporting a 2MW/6MWh project with a 2021 COD.
    - Contracts are in progress to design and procure energy storage.

# Energy Storage Operating Parameters



- **Discharge capacity:** The maximum output to the grid, in megawatts (MW), a.k.a. nameplate capacity.
- **Storage capacity:** The maximum output to the grid, starting from a full charge, in megawatt-hours (MWh).
- **Hours of storage:** The length of time an energy storage system can operate at its maximum discharge capacity, when starting from fully charged, measured in hours.
- **Charge capacity:** The maximum input from the grid, in MW.
- **Round-trip efficiency:** The output of the energy storage system to the grid, divided by the input necessary to provide that level of output, stated as a percentage.
- **Station service:** Some energy storage systems draw power for temperature control and other needs.

# Energy Storage Operating Parameters



(continued)

- **State of charge:** How full a storage system is, calculated by dividing the available MWh of output at a given charge level by the storage capacity, stated as a percentage.
- **Storage capacity degradation:** Storage capacity often degrades as part of charge-discharge cycles, and can be measured as the degradation per thousand cycles.
- **Cycle life:** This is the total number of full charge and discharge cycles that energy storage equipment is rated for. 3,000 cycles is common for lithium-ion resources.
- **Depth of discharge:** Operating at a very high or very low state of charge, particularly for an extended period of time, can cause more rapid degradation.

# Energy Storage Operating Parameters



**(continued)**

- **Augmentation/Variable degradation cost:**

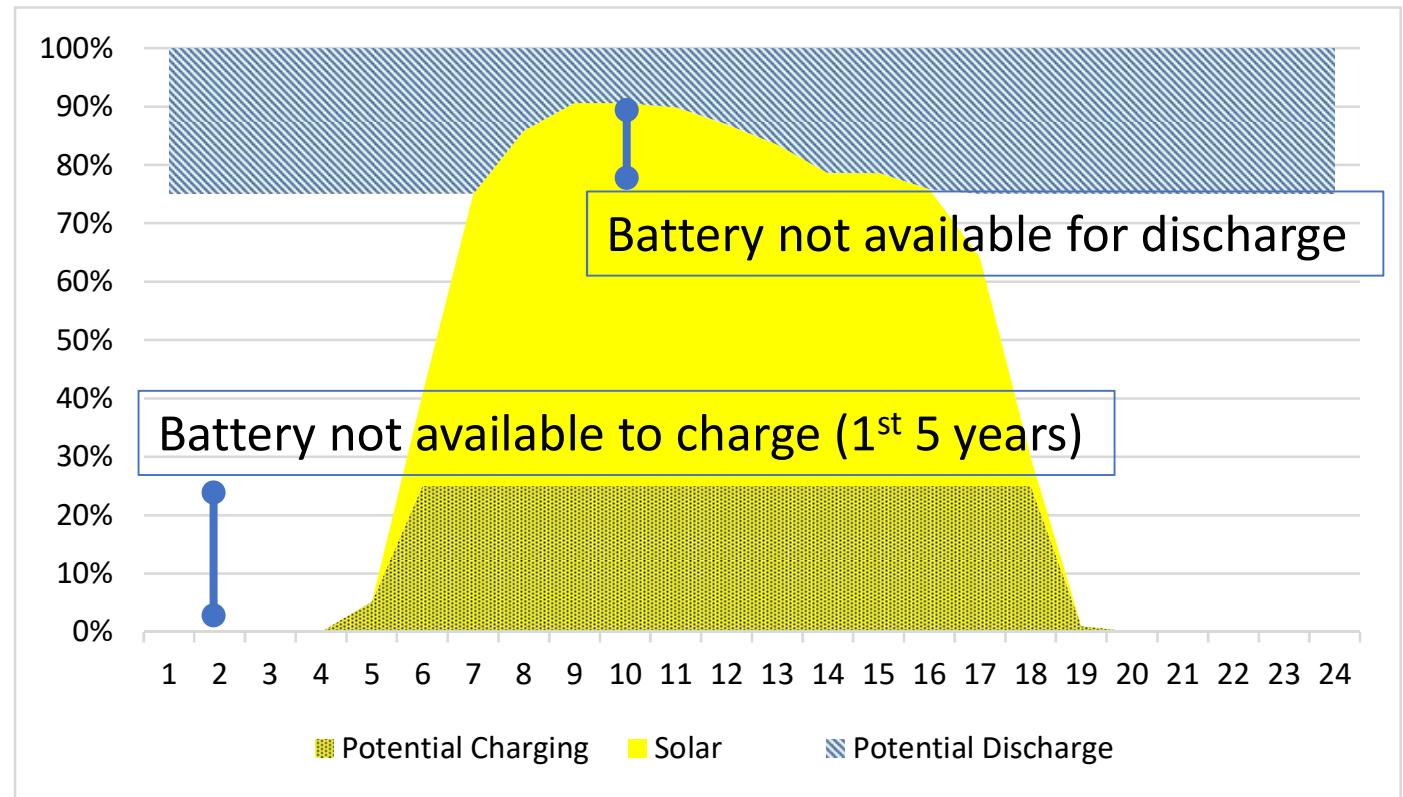
- Lithium-ion energy storage modules can be gradually replaced (or supplemented) to maintain the desired storage capacity, can be augmented at a single point in time, or can be replaced when cycle limits are reached
- Absent frequent augmentation, battery systems will generally have some level of degradation.
- In the 2019 IRP, the replacement cost of storage equipment was included as a \$/MWh cost whenever batteries were discharged.
- For the 2021 IRP, PacifiCorp expects to revisit the modeling options in Plexos related to degradation as well as the contractual structures for batteries.



# Combined Battery Interactions

## Solar with 25% energy storage

- Output limited by interconnection.
- Storage may be able to charge from grid, but restricted in the first five years operation if solar investment tax credit (ITC) is claimed.



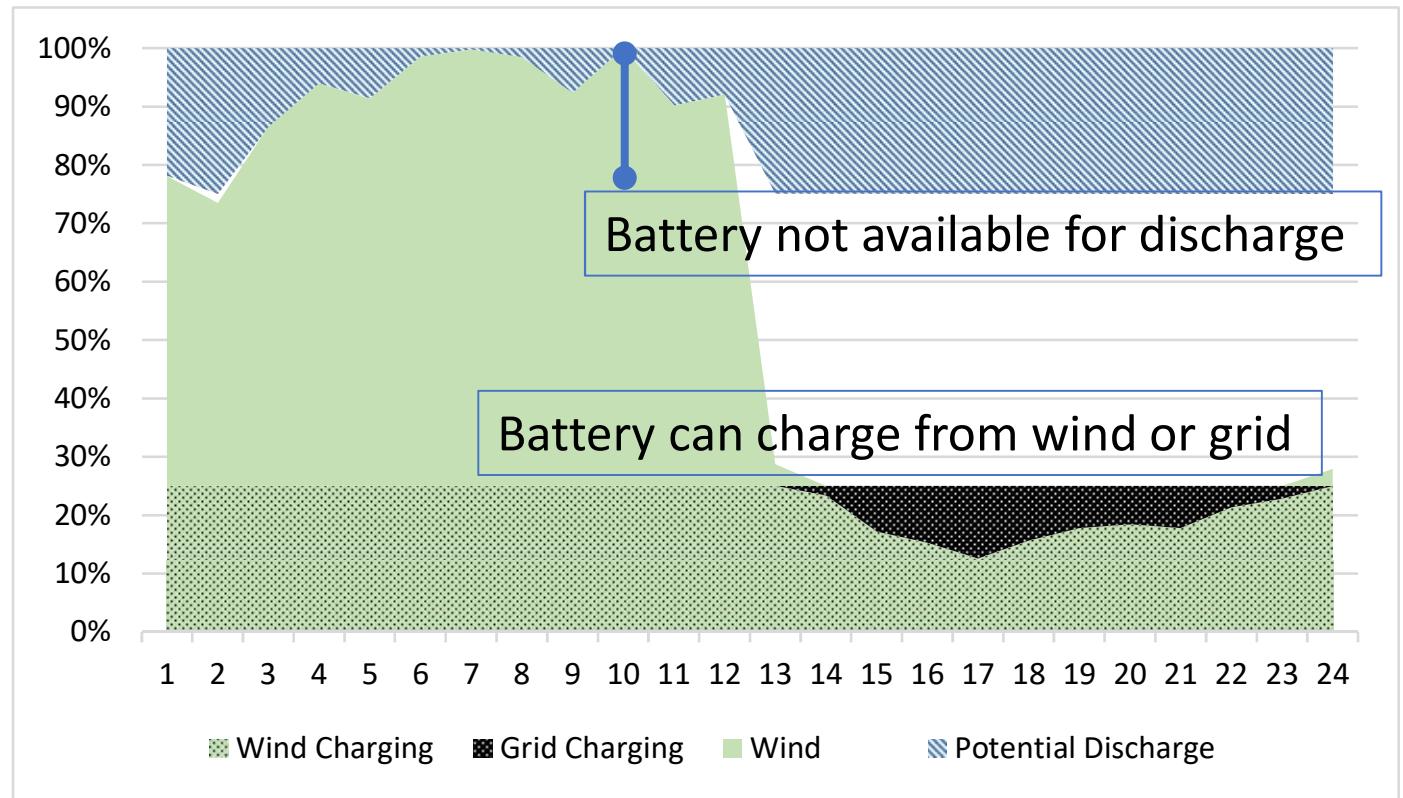
- Reduced capacity contribution vs. stand-alone storage
  - Capacity already assigned to solar resource can't be double-counted
  - Impact is small – contribution of solar in the middle of the day is low.
  - Impact increases as storage as a percentage of nameplate increases.



# Combined Battery Interactions

## Wind with 25% energy storage

- Output limited by interconnection.
- Storage likely to be able to charge from grid from day 1.
- Incremental discharge capability less certain than with solar – may get locked in for long duration.



- Reduced capacity contribution vs. stand-alone storage
  - Capacity already assigned to wind resource can't be double-counted
  - Impact varies with wind contribution and unused discharge capacity.
  - Impact increases as storage as a percentage of nameplate increases.



# Energy Storage Grid Services

## Captured within IRP models:

- **Energy arbitrage:** charging, discharging, and losses
- **Operating reserves:** spin, non-spin, and regulation reserve
- **Generation capacity:** ensuring reliability targets are met

## Not captured in IRP models:

- **Transmission and Distribution Capacity**
  - These services are location-specific with higher granularity than is represented in the IRP model.
  - PacifiCorp uses an “Alternative Evaluation Tool” to assess where distributed resources, including energy storage, could be competitive with a traditional T&D solution for a specific forecasted needs in the next ten years.
- **Intra-hour dispatch**
  - IRP modeling has hourly granularity, so it does not capture intra-hour dispatch, for instance in the Energy Imbalance Market.
  - An Intra-hour Flexible Resource Credit was proposed in the 2019 IRP, but was informational only, and did not impact modeling or portfolio selection.



# Energy: Dispatch Optimization

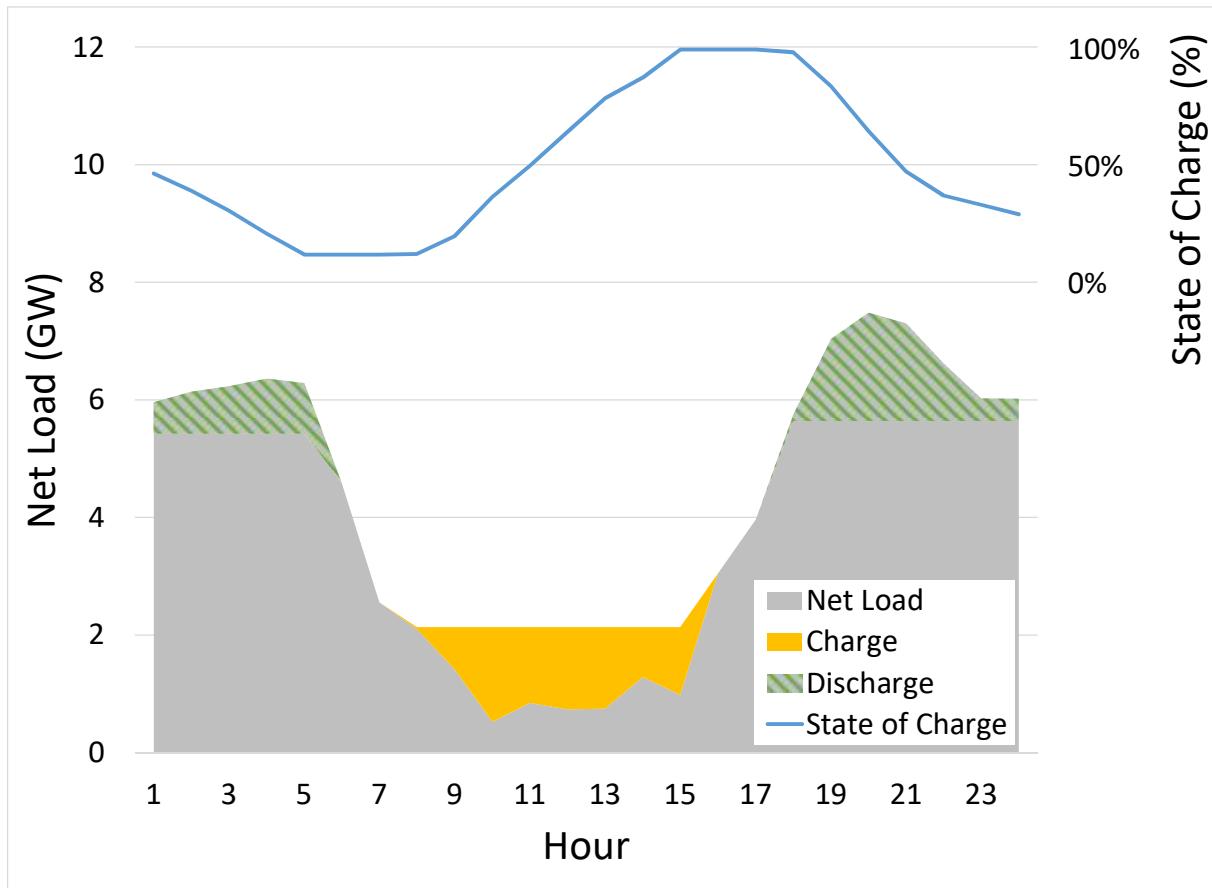
Storage resources primarily follow system requirements, rather than fluctuations of their combined resource.

- “Smoothing” onsite resource output ignores potentially offsetting variations of variable resources elsewhere.
- Cycling hydro or thermal plants is cheap – use more fuel/water now and use less fuel/water later, net is close to zero.
- Cycling a battery is expensive due to efficiency losses and degradation
  - This creates a price spread between charging and discharging – more economic options should be deployed before switching between the two.
  - Short duration adjustments while other units catch up or rapid changes while not crossing zero may be economic.



# 2019 IRP Methodology

## Peak-Shave/Valley-Fill Energy Storage

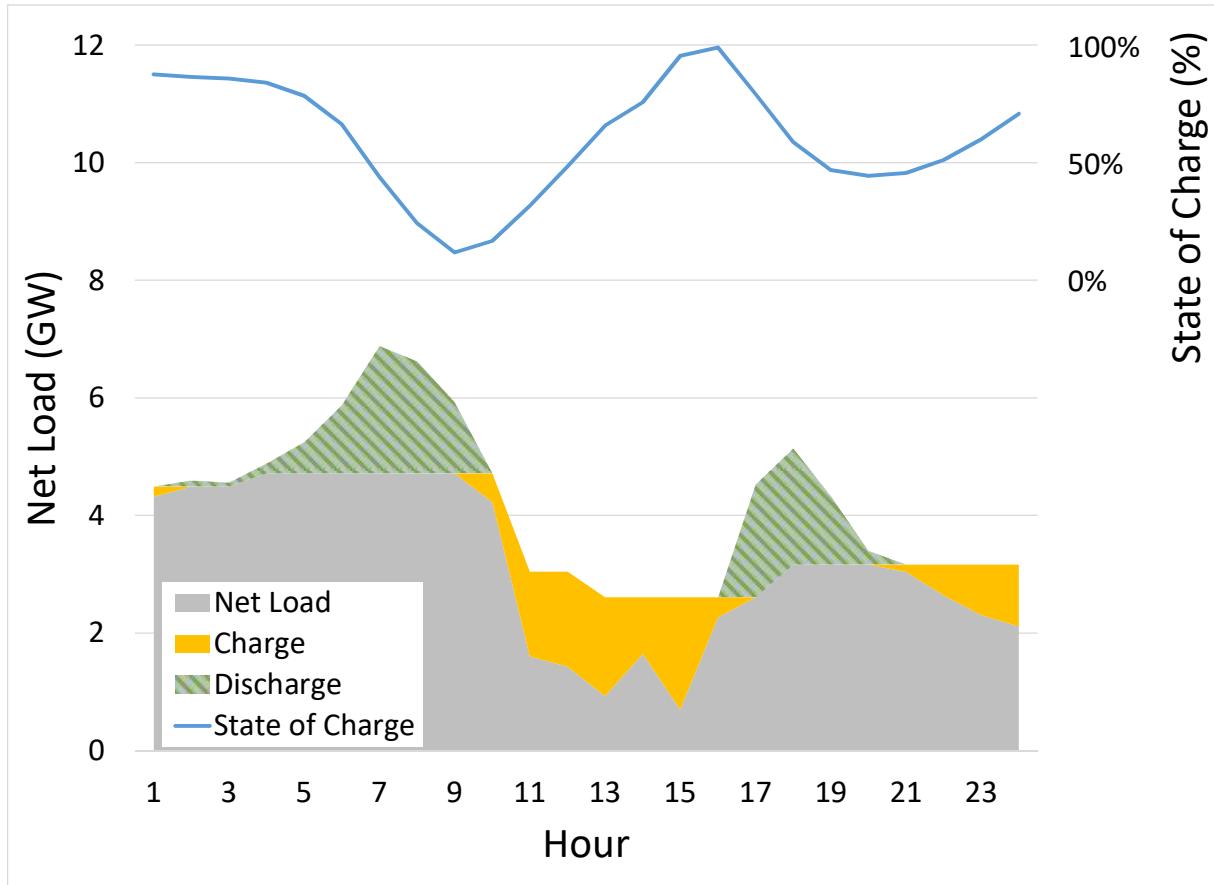


- Sample summer day, 2038
- 2,400 MW energy storage capacity
- Dispatch calculated using constrained linear optimization
- Minimum 30 minutes of discharge held in battery to provide reserves
- Minimum storage in hour-ending 5
- Maximum storage in hour-ending 15



# 2019 IRP Methodology

## Peak-Shave/Valley-Fill Energy Storage



- Sample winter day, 2038
- 2,400 MW energy storage capacity
- Minimum 30 minutes of discharge held in battery to provide reserves
- Morning and evening discharge and fill
- Minimum storage in hour-ending 9
- Maximum storage in hour-ending 16



# 2019 IRP Highlights/ 2021 IRP Topics and Timeline

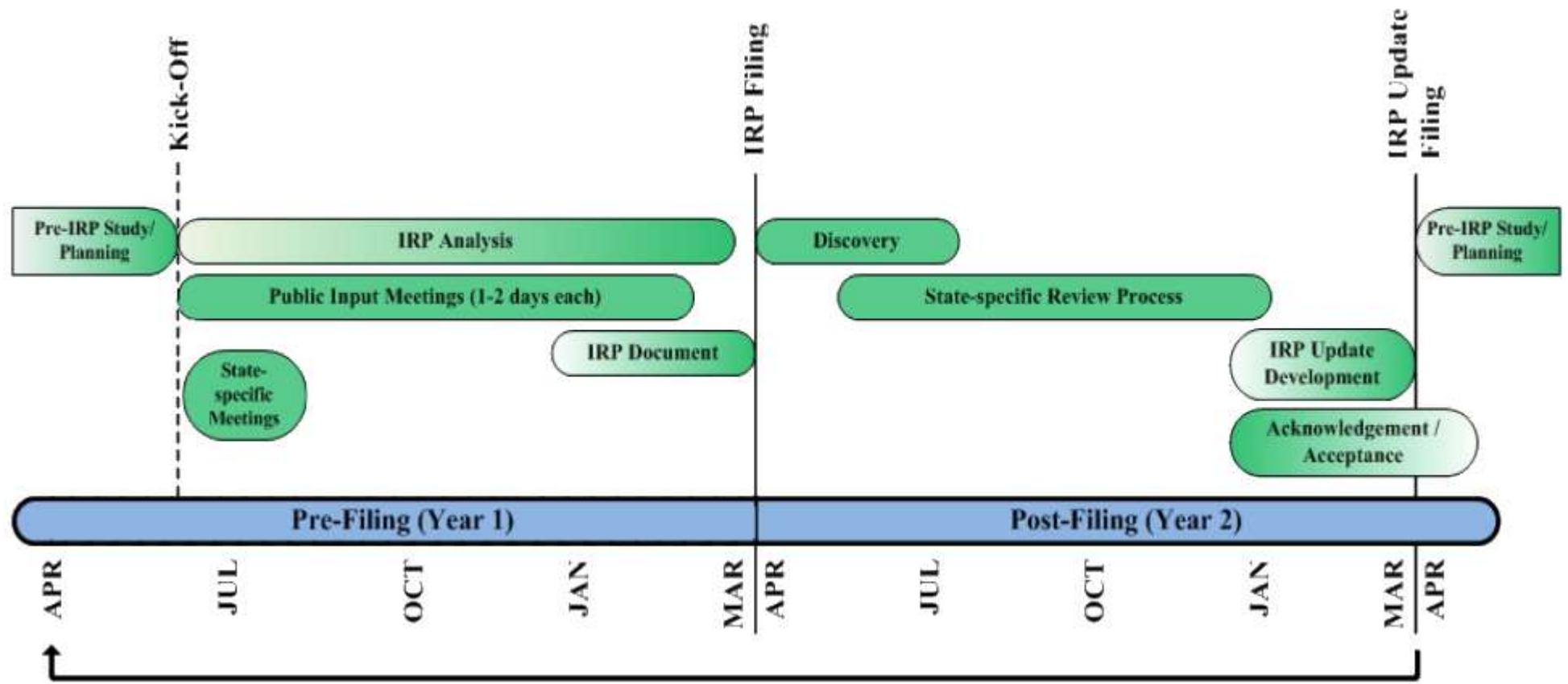
## June 19, 2020





# 2021 Integrated Resource Plan Topics and Timeline

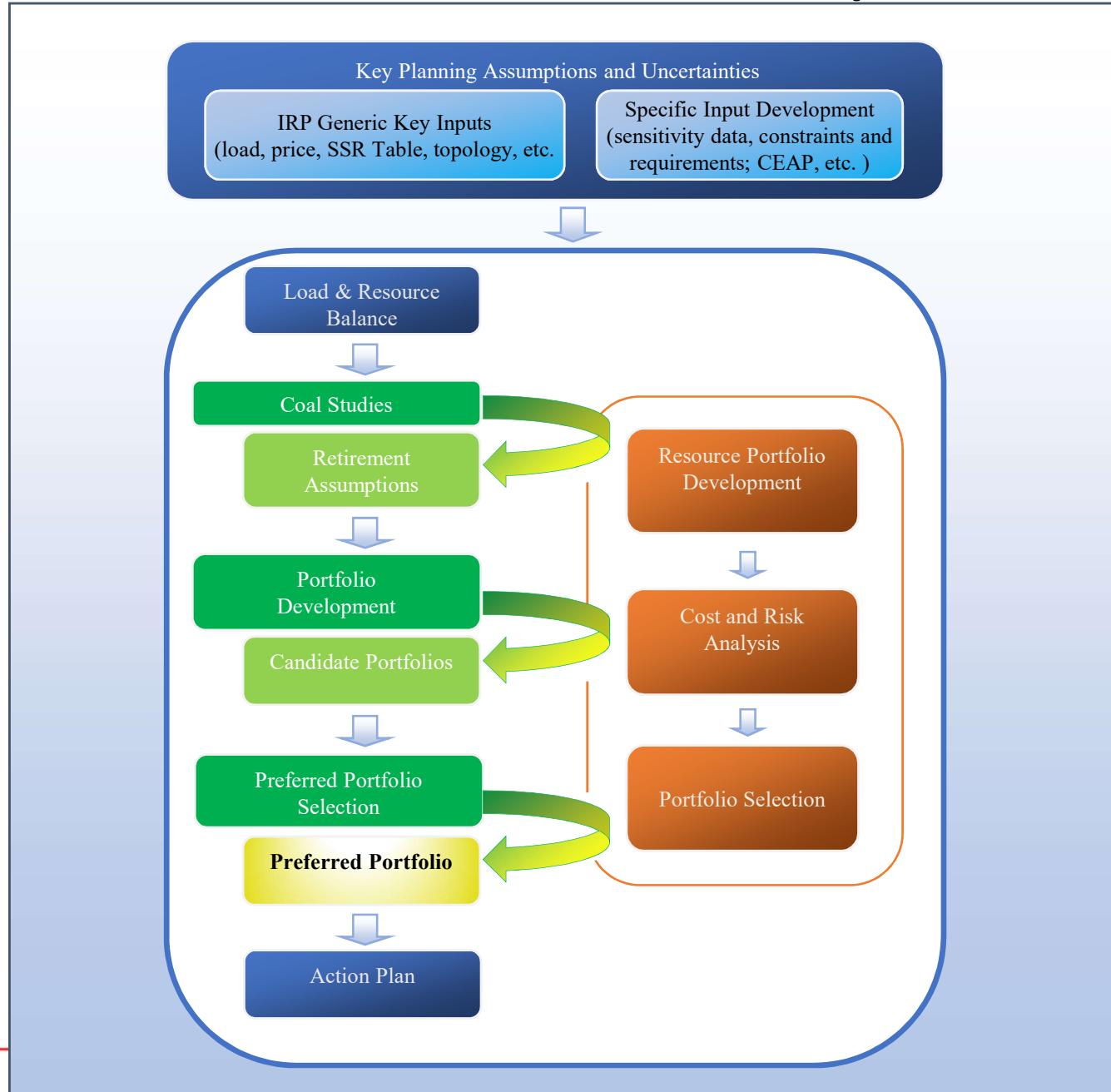
# IRP Process Overview\*



\* Stakeholder participation milestones, timing and activities shown above are illustrative and subject to change.



# IRP Portfolio Development



# 2021 IRP Supplemental Studies



- Loss of Load Probability Study (LOLP) / Planning Reserve Margin (PRM)
- Wind and Solar Capacity Contribution Study
- Flexible Capacity Reserve Study (wind / solar integration costs and to consider natural gas / storage)
- Conservation Potential Assessment (DSM potential study)
- Private Generation Market Penetration Study
- Stochastic Parameter Updates
- Resource Adequacy / Market Reliance Assessment

# 2021 IRP Modeling Assumptions



## Key Modeling Assumptions:

- Corporate Tax Rate (Tax Reform Act)
- Production Tax Credits
- Energy Storage
- Stochastic Parameters
- Flexible Reserve Study
- DSM Cost Bundles

## Other Items:

- Distribution System Planning
- Multi-State Protocol

# 2021 IRP Public Input Meetings



Tentative Public Input Meeting Schedule and Topics (*topics are tentative and subject to change*)

- June 18-19, 2020
  - Conservation Potential Assessment Update, Modeling Optimization, Modeling Update, Modeling Battery Storage
  - IRP Process Overview, 2019 IRP Highlights, RFP Update, Transmission Update
- July 30-31, 2020
  - Load Forecast, Distribution System Planning, Supply-side Resource Efforts, Private Generation Study, Coal Study Discussion
  - Market Reliance Assessment, Environmental Policy Update, 2021 IRP Modeling Assumptions and Updates
- August TBD, 2020
  - Conservation Potential Assessment Workshop

# 2021 IRP Public Input Meetings



Tentative Public Input Meeting Schedule and Topics (*topics are tentative and subject to change*)

- September 17-18, 2020
  - Draft Supply-side Resource Table, Transmission Overview and Updates, Flexible Reserve Study Cost Results, Planning Reserve Margin Results, Portfolio Discussion, Coal Studies, Clean Energy Transformation Act (CETA)
- October 22-23, 2020
  - Supply-side Resource Table Levelized Costs, Intra-Hour Flexible Resource Credits, Updated CO2 Assumptions, Modeling Improvements, Storage Modeling Improvements, Coal Studies Discussion, CPA Final Supply Curves, DSM Bundling Methodology
- December 3-4, 2020
  - Coal Studies Discussion

# 2021 IRP Public Input Meetings



Tentative Public Input Meeting Schedule and Topics (*topics are tentative and subject to change*)

- January 14-15, 2021
  - Portfolio Analysis Results, Additional Portfolios Under Development
- February 25-26, 2021
  - Preferred Portfolio and Action Plan, Portfolio Analysis Results, Transmission Analysis Results
- April 1, 2019 – 2021 IRP Filing Date



# 2019 IRP Order Requirements and Action Plan Updates

# 2019 IRP Acknowledgement Process



- 2019 IRP was acknowledged / accepted:
  - Oregon – June 8, 2020; Docket No. LC 70
  - Washington – No action taken; Docket No. UE-180259
  - Idaho – Comments expected August 2020: Docket No. PAC-E-19-16
  - Utah – May 13, 2020; Docket No. 19-035-02
  - Wyoming – Hearing scheduled for July 13-17, 2020; 20000-522-EA-19
  - California – Filing requirements tied to RPS compliance reporting, no order yet



# 2019 IRP Order Requirements

State	Order / Letter Reference	Description
OR	Order 20-186, P.9	Direct PacifiCorp to include in its 2021 IRP development process an updated analysis identifying the most cost-effective coal retirements individually and in combination.
OR	Order 20-186, P.10	PacifiCorp is to work with stakeholders on the judgement calls where SCR can be reasonably avoided or not.
OR	Order 20-186, P.10	PacifiCorp is to update its inputs for correct Jim Bridger cost assumptions, as well as update its assumptions to reflect changes to the economy associated with COVID-19.
OR	Order 20-186, P.10	PacifiCorp is to provide a workshop or update for the Oregon Commission on PacifiCorp's timeline and sequence for incorporating nodal pricing and other MSP issues and EDAM into its IRP process.
OR	Order 20-186, P.13	Direct PacifiCorp to provide a workshop or presentation on how it calculates the capacity contribution of renewables (including solar and wind co-located with battery storage) for its 2019 and 2021 IRPs.
OR	Order 20-186, P.13	Regarding the QF issues, we accept PacifiCorp's commitment to produce a sensitivity or other explanation of the impact of renewing QFs on its load resource balance and direct PacifiCorp to include this in its 2021 IRP.
OR	Order 20-186, P. 14	We find that PacifiCorp reasonably allowed for additional flexible reserves, given its initial reliability analysis in this IRP, but we also agree with Staff and stakeholders that, for future IRPs, PacifiCorp needs to improve the analytical foundations for incorporating additional reliability resources into the IRP.



# 2019 IRP Order Requirements

State	Order / Letter Reference	Description
OR	Order 20-186, P.21	Regarding conditions relating to non-wires alternatives, we accept PacifiCorp's offer of a Commission workshop before the 2021 IRP is filed. The workshop should address how PacifiCorp's IRP relates to its long-term transmission plan.
OR	Order 20-186, P.23	PacifiCorp should work with stakeholders and Staff in the 2021 IRP development process to select two to four bundling strategies in an effort to identify the highest level of cost-effective energy efficiency by state and across the system. The collaborative decision process should consider bundling energy efficiency measures by energy cost, capacity contribution cost and measure type, as well as potentially by other metrics. The company should report on the collaborative process, bundling methods chosen, and any results in a filing before the filing of the 2021 IRP. PacifiCorp may hire a third party to conduct this analysis if needed due to resource constraints, but should coordinate with stakeholders on the scope of the work and timing.
OR	Order 20-186, P.23	PacifiCorp and/or Staff are to provide an update on demand response efforts at a regular public meeting before the 2021 IRP is filed.
OR	Order 20-186, P.23	Staff recommends that PacifiCorp conduct a Class 3 DSM workshop. PacifiCorp agreed to provide a stakeholder workshop during 2021 IRP development. We ask that the 2021 IRP summarize the timeframes and participation rates of any existing or planned Class 3 DSM pilots or schedules.



# 2019 IRP Order Requirements

State	Order / Letter Reference	Description
OR	Order 20-186, P.24	We acknowledge this action item (6b) and accept PacifiCorp's agreement to add detail to this language in the 2021 IRP to more clearly explain its REC management for states with and without RPS requirements management of RECs.
OR	Order 20-186, P.24	Require PacifiCorp include a proposal for the scope of a potential climate adaptation study in its 2021 IRP. This will also allow PacifiCorp to use its next IRP process to solicit stakeholder feedback on the scope of its plan. Additional discussion in the 2021 IRP of adaptation actions already taking place in the course of normal business, such as changes to modeling inputs such as heating and cooling days or water constraints, is encouraged in the meantime.
OR	Order 20-186, P.25-26	We ask PacifiCorp and Staff to review the Oregon compliance list, to determine which items they both agree are no longer relevant or necessary, and to provide an update on the list in the 2021 IRP docket. If certain items are not agreed upon or require our review, we ask Staff to bring those to a public meeting before the 2021 IRP.
UT	P.13	Any FERC queue reform will certainly impact some of the issues addressed by the 2019 IRP, but the ongoing nature of that process does not impact whether PacifiCorp substantially complied with the Guidelines in the development of the 2019 IRP. Other dockets, including future integrated resource planning, are appropriate venues to evaluate the implications of the results of queue reform.
UT	P.15	Reliability assessments will only become more crucial as PacifiCorp's resource mix changes in the future, and those assessments must become an increasingly core aspect of future IRP processes.

# 2019 IRP Action Item Updates



- Action Item 1a – Existing Resource Actions - Naughton Unit 3:
  - PacifiCorp will complete the gas conversion of Naughton Unit 3, including completion of all required regulatory notices and filings, in 2020. Initiate procurement of materials in Q4 2019. Conversion completed in 2020.
- Action Item 1b – Existing Resource Actions - Cholla Unit 4:
  - PacifiCorp will initiate the process of retiring Cholla Unit 4, and will remove Cholla Unit 4 from service no later than January 2023.
  - PacifiCorp will continue to coordinate with the plant operator to transition employees, develop plans to cease plant operations, safely remove the unit from service, finalize decommissioning plans and confirm joint-ownership obligations; complete required regulatory notices and filings; administer termination, amendment, or close-out of existing permits, contracts and other agreements; and coordinate with state and local stakeholders as appropriate. By Q1 2020, the plant operator will be requested to develop plans to cease plant operations, safely remove the unit from service, finalize decommissioning plans, and confirm joint-ownership obligations.
  - By the end of Q1 2020, the plant operator will be requested to develop plans to cease plant operations, safely remove the unit from service, finalize decommissioning plans, and confirm joint-ownership obligations
  - By Q2 2020, the plant operator will be requested to file required transmission interconnection and transmission services unit retirement notices/request for study.
  - By Q4 2020, PacifiCorp will finalize an employee transition agreement with the plant operator.

# 2019 IRP Action Item Updates



- Action Item 1c – Existing Resource Actions - Jim Bridger Unit 1:
  - PacifiCorp will initiate the process of retiring Jim Bridger Unit 1 by the end of December 2023, including completion of all required regulatory notices and filings. By the end of Q2 2020, file a request with PacifiCorp transmission to study the year-end 2023 retirement of Jim Bridger Unit 1. By the end of Q2 2021, confirm transmission system reliability assessment and year-end 2023 retirement economics in 2021 IRP filing.
  - By the end of Q2 2021, finalize an employee transition plan.
  - By the end of Q2 2021, develop a community action plan in coordination with community leaders.
  - By the end of Q4 2021, initiate the process with the Wyoming Public Service Commission for approval of a reverse request for proposals for a potential sale of Jim Bridger Unit 1.
  - By the end of Q4 2023, administer termination, amendment, or close-out of existing permits, contracts, and other agreements.
- Action Item 1d – Existing Resource Actions – Naughton Units 1-2:
  - PacifiCorp will initiate the process of retiring Naughton Units 1-2 by the end of December 2025, including completion of all required regulatory notices and filings. By the end of Q2 2022, file a request with PacifiCorp transmission to study the year-end 2025 retirement of Naughton Units 1 and 2.
  - By the end of Q2 2022, finalize an employee transition plan.
  - By the end of Q2 2022, develop a community action plan in coordination with community leaders.

# 2019 IRP Action Item Updates



- Action Item 1d (continued)– Existing Resource Actions - Naughton Units 1-2:
  - By the end of Q2 2023, confirm transmission system reliability assessment and year-end 2025 retirement economics in 2023 IRP filing.
  - By the end of Q4 2023, initiate the process with the Wyoming Public Service Commission for approval of a reverse request for proposals for a potential sale of Naughton Units 1 and 2.
  - By the end of Q4 2023, administer termination, amendment, or close-out of existing permits, contracts, and other agreements.
- Action Item 1e – Existing Resource Actions - Craig Unit 1:
  - The plant operator will be requested to administer termination, amendment, or close-out of existing permits, contracts, and other agreements to support retiring Craig Unit 1, including completion of all required regulatory notices and filings, by the end of December 2025.
- Action Item 2a – Customer Preference Request for Proposals:
  - PacifiCorp will work with customers to achieve their respective resource preference requirements. By the end of Q4 2019, sign a fifteen year 80 megawatt (MW) Power Purchase Agreement (PPA) for Utah solar for six Utah Schedule 34 customers. By the end of Q4 2019, sign two 20-year PPAs of approximately 80 MW for a large Utah Schedule 34 customer. Monitor the finalization of rules by the Public Service Commission of Utah for House Bill (HB) 411 (anticipated by the end of Q1 2020), that provides a path forward for development of a program for participating communities to begin procuring renewable resources.

# 2019 IRP Action Item Updates



- Action Item 2b – All Source Request for Proposals:
  - PacifiCorp will issue an all-source request for proposals (RFP) to procure resources that can achieve commercial operations by the end of December 2023.
  - By the end of Q4 2019, file a request for interconnection queue reform with the Federal Energy Regulatory Commission (FERC) and make state filings to initiate the process of identifying an independent evaluator.
  - In Q1 2020, file a draft all-source RFP with the Public Utility Commission of Oregon, the Public Service Commission of Utah, and the Washington Utilities and Transportation Commission, as applicable.
  - In Q2 2020, receive approval from FERC to reform the interconnection queue.
  - In Q2 2020, receive approval of the all-source RFP from applicable state regulatory commissions and issue the RFP to the market.
  - In Q3 2020, identify a preliminary final shortlist from the all-source RFP and initiate transmission interconnection studies consistent with queue reform as approved by FERC.
  - In Q2 2021, identify a final shortlist from the all-source RFP, and file for approval of the final shortlist in Oregon, file, certificate of public convenience and necessity (CPCN) applications, as applicable.
  - By Q2 2022 execute definitive agreements with winning bids from the all-source RFP.
  - By Q4 2023, winning bids from the all-source RFP achieve commercial operation.

# 2019 IRP Action Item Updates



- Action Item 3a – Energy Gateway South:
  - By December 31, 2023, PacifiCorp will seek to build the approximately 400-mile, 500-kilovolt (kV) transmission line from the Aeolus substation near Medicine Bow, Wyoming to the Clover substation near Mona, Utah.
  - By Q2 2021, receive the final CPCN from the Wyoming Public Service Commission and the Public Service Commission of Utah (initial filing dates for the CPCN to be determined after stakeholder engagement).
  - By the end of Q4 2021, issue full notice to proceed to construct Energy Gateway South.
  - In Q4 2023, construction of Energy Gateway South is completed and placed in service.
- Action Item 3b – Utah Valley Reinforcements:
  - Utah Valley Reinforcements: As necessary to facilitate interconnection of customer-preference resources, PacifiCorp will proceed with system reinforcements in the Utah Valley.
  - In Q2 2020, complete the Spanish Fork 345 kV/138 kV transformer upgrade.
  - In Q4 2020, complete rebuild of approximately five miles of the Spanish Fork-Timp138 kV line in the Utah Valley.
- Action Item 3c – Northern Utah Reinforcements:
  - Rebuild two miles of the Morton Court –Fifth West 138 kV line.
  - Loop existing Populus Terminal 345 kV line into both Bridger and Ben Lomond; build 345 kV yard with 345/138 transformer and 138 kV yard buildout at Bridger plus ancillary 345 kV and 230 kV circuit breakers at Ben Lomond.
  - Complete identified plan of service supporting 2019 IRP preferred portfolio for resource additions in northern Utah.

# 2019 IRP Action Item Updates



- Action Item 3d – Utah South Reinforcements:
  - Develop plan of service in support of 2019 IRP preferred portfolio for resource additions in southern Utah.
  - Complete rebuild of the Mona –Clover #1 & #2 345 kV lines.
  - Identify route and terminals for new approximately 70-mile 345 kV line in southern/central Utah.
  - Yakima Washington Reinforcements: To facilitate interconnection of preferred portfolio resources in the Yakima area, PacifiCorp will proceed with protection system and remedial action scheme upgrades to local 230 kV and 115 kV substations not otherwise included in network upgrade requirements for generator interconnection requests.
  - In Q2 2020, complete the Vantage-Pomona Heights 230 kV line (in process).
  - By Q2 2022, establish the type and location of new resources and finalize project scope, as necessary.
- Action Item 3e – Yakima Washington Reinforcements:
  - To facilitate interconnection of preferred portfolio resources in the Yakima area, PacifiCorp will proceed with protection system and remedial action scheme upgrades to local 230 kV and 115 kV substations not otherwise included in network upgrade requirements for generator interconnection requests.
  - In Q2 2020, complete the Vantage-Pomona Heights 230 kV line (in process).
  - By Q2 2022, establish the type and location of new resources and finalize project scope, as necessary.

# 2019 IRP Action Item Updates



- Action Item 3f – Boardman to Hemmingway:
  - Continue to support the project under the conditions of the Boardman to Hemingway Transmission Project (B2H) Joint Permit Funding Agreement.
  - Continue to participate in the development and negotiations of the construction agreement.
  - Continue analysis in efforts to identify customer benefits that may include contributions to reliability, interconnection of additional resources, geographical diversity of intermittent resources, Energy Imbalance Market, and resource adequacy.
  - Continue negotiations for plan of service post B2H for parties to the permitting agreement..
- Action Item 3g – Energy Gateway West:
  - Energy Gateway West Segment D.2, continue construction with target in-service date of 12/31/2020.
  - Continue permitting for the Energy Gateway transmission plan, with near term targets as follows:
  - For Segments D.3, and E, continue funding of the required federal agency permitting environmental consultant actions required as part of the federal permits. Also, continue to support the projects by providing information and participating in public outreach.
- Action Item 4 – Demand-Side Management Actions
  - PacifiCorp will acquire cost-effective Class 2 DSM (energy efficiency) resources targeting annual system energy and capacity selections from the preferred portfolio.
  - Energy Efficiency Bundling: PacifiCorp will continue to evaluate alternate bundling methodologies of Class 2 DSM in the 2019 IRP.

# 2019 IRP Action Item Updates



- Action Item 4 (continued) – Demand-Side Management Actions
  - Direct-Load Control: PacifiCorp will acquire cost-effective Class 1 DSM (i.e., demand response) in Utah targeting approximately 29 MW of incremental capacity from 2020 through 2023.
- Action Items 5– Front Office Transactions
  - Acquire short-term firm market purchases for on-peak delivery from 2019-2021 consistent with the Risk Management Policy and Energy Supply Management Front Office Procedures and Practices. These short-term firm market purchases will be acquired through multiple means: Balance of month and day-ahead brokered transactions in which the broker provides a competitive price.
  - Balance of month, day-ahead, and hour-ahead transactions executed through an exchange, such as the Intercontinental Exchange, in which the exchange provides a competitive price.
  - Prompt-month, balance-of-month, day-ahead, and hour-ahead non-brokered bi-lateral transactions.
- Action Items 6a– Renewable Portfolio Standards
  - PacifiCorp will pursue unbundled RFPs to meet its state RPS compliance requirements.
  - As needed, issue RFPs seeking then current-year vintage unbundled RECs that will qualify in meeting California RPS targets through 2020. As needed, issue RFPs seeking then current-year or forward-year vintage unbundled RECs that will qualify in meeting Washington RPS targets.
- Action Items 6b– Renewable Energy Credit Sales
  - Maximize the sale of RECs that are not required to meet state RPS compliance obligations.



# PacifiCorp 2020 All-Source Request for Proposals (RFPs)





## Purpose and Scope of 2020AS RFP

- The 2020 all-source RFP (2020AS RFP) is seeking resources to meet the company's projected needs as identified in the 2019 IRP, which included 1,823 megawatts (MW) of new proxy solar resources co-located with 595 MW of new proxy battery energy storage system (BESS) capacity and 1,920 MW of new proxy wind resources. Except for long-lead projects like pumped storage, the 2020AS RFP is seeking new resources that can achieve commercial operation by the end of 2024 to align with the federal production tax credit being extended after the 2019 IRP was filed.
- 2020AS RFP targets exclude resource capacity added to meet assumed customer preference targets that are included in the 2019 IRP preferred portfolio.
- PacifiCorp will also accept bids from new and existing resources that meet the December 31, 2024 on-line date but will allow for pumped storage hydro to bid as a long-lead time resource requiring time to develop and construct, placing completion beyond December 31, 2024.
- Proposals must be capable of interconnecting with or delivering to PacifiCorp's transmission system in its east or west balancing authority areas (PACE and PACW, respectively).
- PacifiCorp is not submitting any self-build ownership proposals (benchmark resources) or accepting any bids from any PacifiCorp affiliate.
- Bid fee(s) of \$10,000 will be required for each base proposal and two (2) alternatives. Bidders will also be allowed to offer up to three (3) additional alternatives at a fee of \$3,000 each.
- Intent to bid form and bidder credit information will be required prior to bid submittal(s).



# Resource Types

RESOURCE TYPE	BID STRUCTURE ACCEPTED		
	PPA	BSA	BTA
Renewable	X		X
Renewable Plus Battery Storage	X		X
Non-renewable	X		X
Standalone Battery Storage		X	X
Pumped Storage Hydro		TOLL	X

- Bids will be accepted from existing operating facilities with certain conditions.
- All renewable capacity, energy, and associated environmental attributes go to PacifiCorp.
- BTA bids MUST directly interconnect to PacifiCorp's system.
- Proposed BTA projects must be constructed to PacifiCorp standards and specifications.



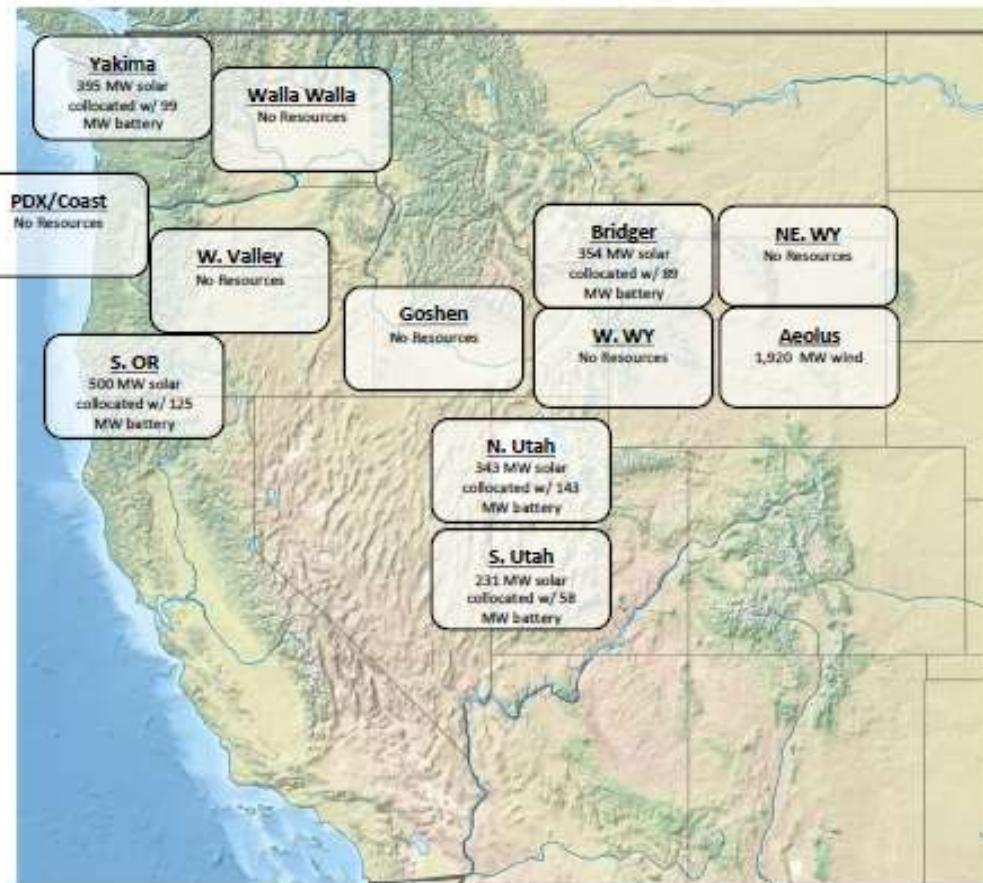
## Bid Structures

- Build-transfer transaction whereby the bidder develops the project, assumes responsibility for construction and ultimately transfers the asset to PacifiCorp in accordance with the terms of a build-transfer agreement (BTA). Under this transaction structure, the bidder will be responsible for all development, design, equipment supply, construction, commissioning, and performance testing, and will be required to design and construct the resource in conformance with PacifiCorp's specifications.
- Power-purchase agreement (PPA) with exclusive ownership by PacifiCorp of any and all capacity and environmental attributes associated with all energy generated with terms up to 25 years. PacifiCorp provides two forms of PPA; resource only and BESS collocated with a renewable resource.
- Control of the output of a BESS as a standalone BESS through a Battery Storage Agreement (BSA).
- Pumped storage hydro will be transacted through an individually negotiated tolling agreement.

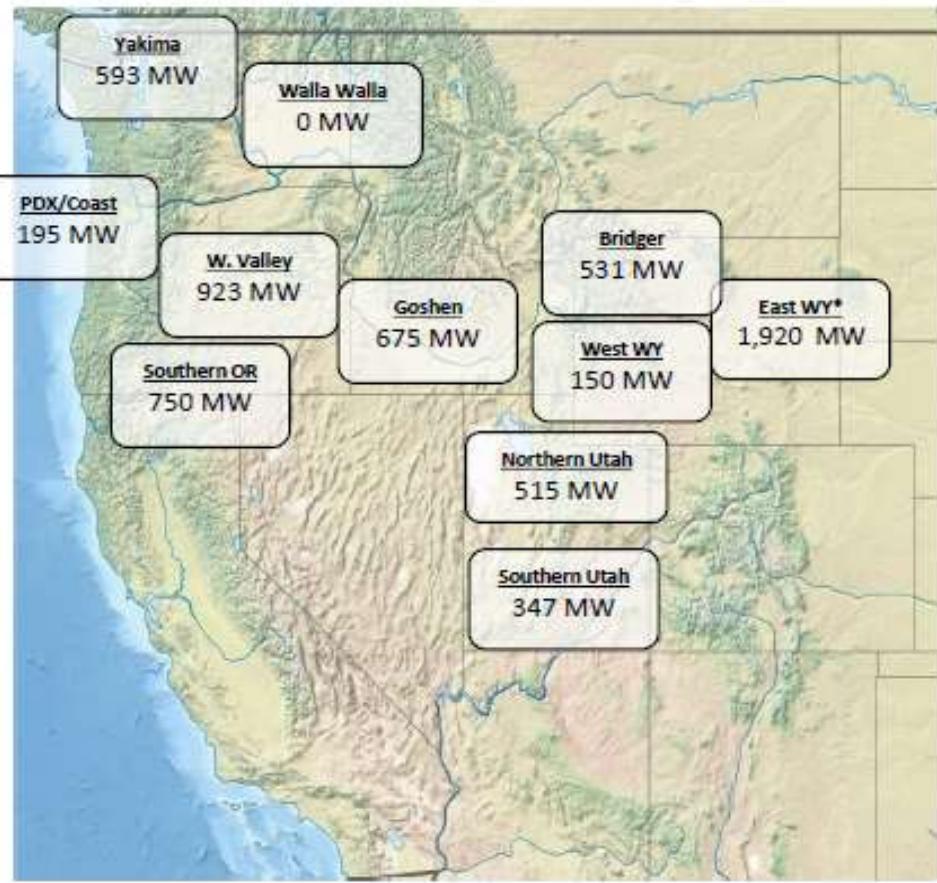


# Locational Capacity Limits

2019 IRP Preferred Portfolio Resources Online by Year-End 2023  
(Excludes Customer Preference Resources)



Locational Initial Shortlist Capacity Limits  
(1.5x Pref. Port. or 1.5x Assumed Interconnection Limit)



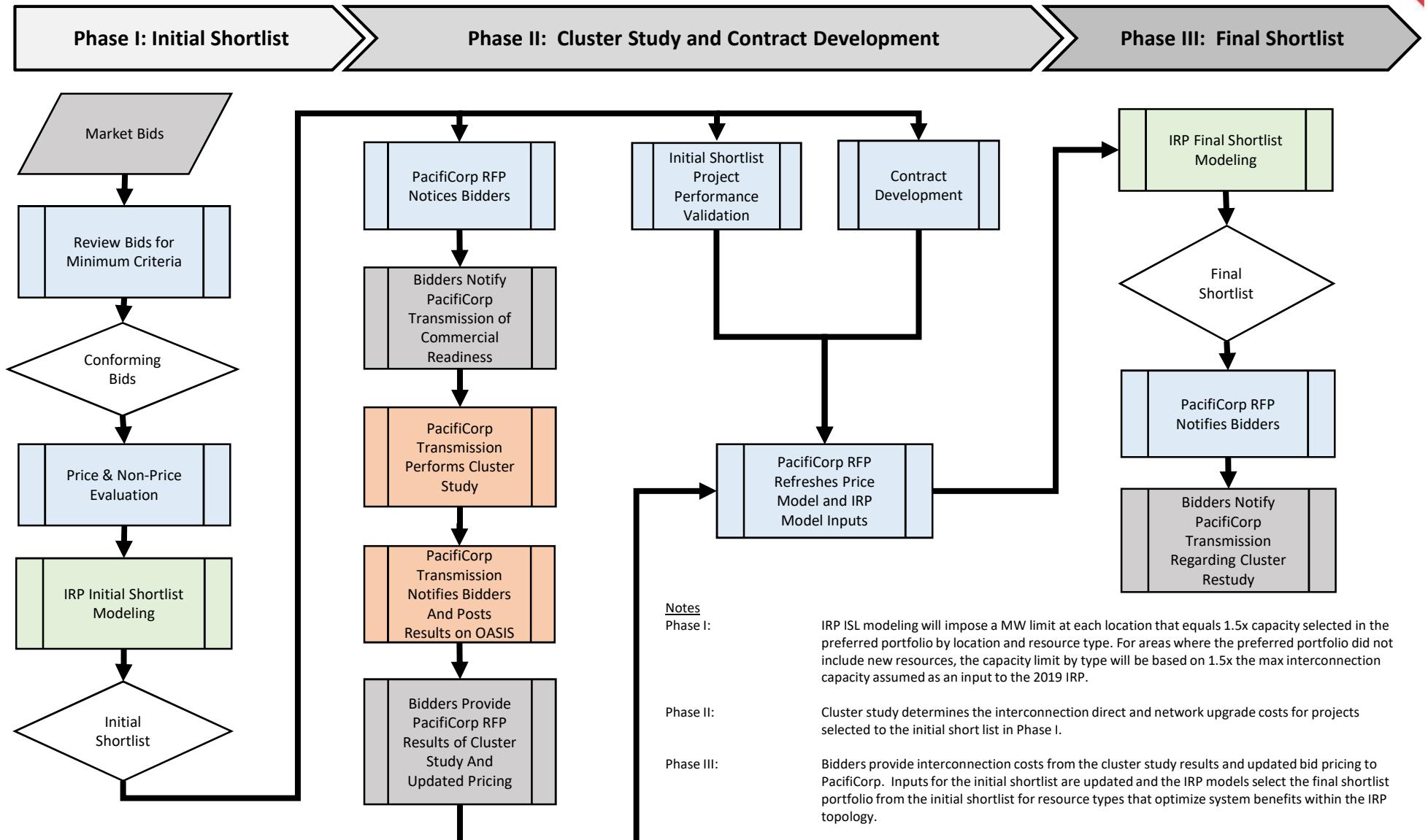
\*Note, eastern Wyoming includes Aeolus and NE Wyoming, which combined, will be limited to 1,920 MW.



## Interconnection Queue Reform Impact on RFP

- PacifiCorp Transmission has received approval from Federal Energy Regulatory Commission (FERC) reforming its interconnection study process set forth in its Open Access Transmission Tariff (OATT). PacifiCorp Transmission has replaced its long standing “serial queue” interconnection study process with a “first-ready, first-served, cluster” interconnection study approach.
- PacifiCorp’s process for bid evaluation, scoring, modeling, and selection reflects PacifiCorp Transmission’s proposed interconnection queue reform process as described in the OATT.
- Costs for any direct assigned and transmission network upgrades associated with the interconnection of a proposed project to PacifiCorp’s transmission system will not be a bid requirement or included in the initial shortlist price evaluation.
- PacifiCorp will review the bidder’s interconnection documentation to confirm it aligns with the bid submittal.
- Bidders should be aware of and clearly understand the specific steps, criteria, milestones and schedule of PacifiCorp Transmission queue reform and transition cluster study process.
- Bidders selected to the initial shortlist who are rejected by PacifiCorp Transmission for not meeting all of PacifiCorp Transmission’s non-commercial readiness criteria necessary to be included in the transition cluster study will be removed by PacifiCorp from the initial shortlist and deemed a non-conforming bid.

# Evaluation Process



# RFP Milestones / Schedule (Subject to Change)



Milestone	Date	Day
RFP Issued to market	07/06/2020	Monday
Notice of Intent to Bid due	07/20/2020	Monday
Last day for RFP questions to IEs for Q&A	08/03/2020	Monday
RFP bids due	08/10/2020	Monday
Bid eligibility screening completed	08/17/2020	Monday
Initial Shortlist (ISL) scoring/ranking completed	09/04/2020	Friday
IRP modeling generates ISL	10/05/2020	Monday
IEs' review of ISL completed	10/09/2020	Friday
PaciCorp notifies bidders selected to ISL	10/14/2020	Wednesday
ISL bidders notify Pac Trans to enter cluster study	10/15/2020	Thursday
Capacity factor and BESS evaluation on ISL started	10/19/2020	Monday
Begin contract review and negotiations with ISL (subject to OAR waiver)	10/19/2020	Monday
Capacity factor and BESS evaluation on ISL completed	01/31/2021	Sunday
Complete contract negotiations on near final draft with bidders	03/31/2021	Wednesday
Cluster study results posted to OASIS / bidders notified by Pac Trans	04/15/2021	Thursday
Bidders provide ISL price update including cluster study results	04/22/2021	Thursday
Submit updated bids to IRP modeling	04/27/2021	Tuesday
IRP modeling generates Final Shortlist (FSL)	05/20/2021	Thursday
Final Shortlist (FSL) selected	05/25/2021	Tuesday
IEs' review of FSL Completed	06/01/2021	Tuesday
Complete negotiation of T&Cs for resource agreements	10/15/2021	Friday
Execute Agreements	11/08/2021	Monday
Winning Bid Guaranteed COD	12/31/2024	Tuesday



# Transmission Overview and Updates



# Transmission Overview Agenda



- Regional Planning Update
- Energy Gateway
  - Segment C – Oquirrh to Terminal
  - Segment D2 – Aeolus to Bridger/Anticline
  - Segments D1, D3, E – Gateway West
  - Segment F – Gateway South
  - Segment H – Boardman to Hemingway
- 2019 IRP Transmission Modeling Enhancements

# FERC Order 1000 Regional Planning



- FERC Order No. 1000 is a Final Rule that reforms the Commission's electric transmission planning and cost allocation requirements for public utility transmission providers.
- The rule builds on the reforms of Order No. 890 and corrects remaining deficiencies with respect to transmission planning processes and cost allocation methods.
- Pre 2020 to meet the requirements of FERC Order 1000 PacifiCorp was a member of the Northern Tier Transmission Group (NTTG)
- Beginning in 2020 PacifiCorp became a member of the newly formed NorthernGrid, combining ColumbiaGrid and NTTG, regional planning organization to continue to meet the requirements of FERC Order 1000.
- Jurisdictional and non-jurisdictional entities have formed a single transmission planning association – NorthernGrid – that will facilitate regional transmission planning across the Pacific Northwest and Intermountain West. The association members have executed a Planning Agreement that will provide the region with:
  - One common set of data and assumptions
  - More opportunities to identify regional transmission projects
  - A single stakeholder forum
  - Elimination of duplicative administrative processes



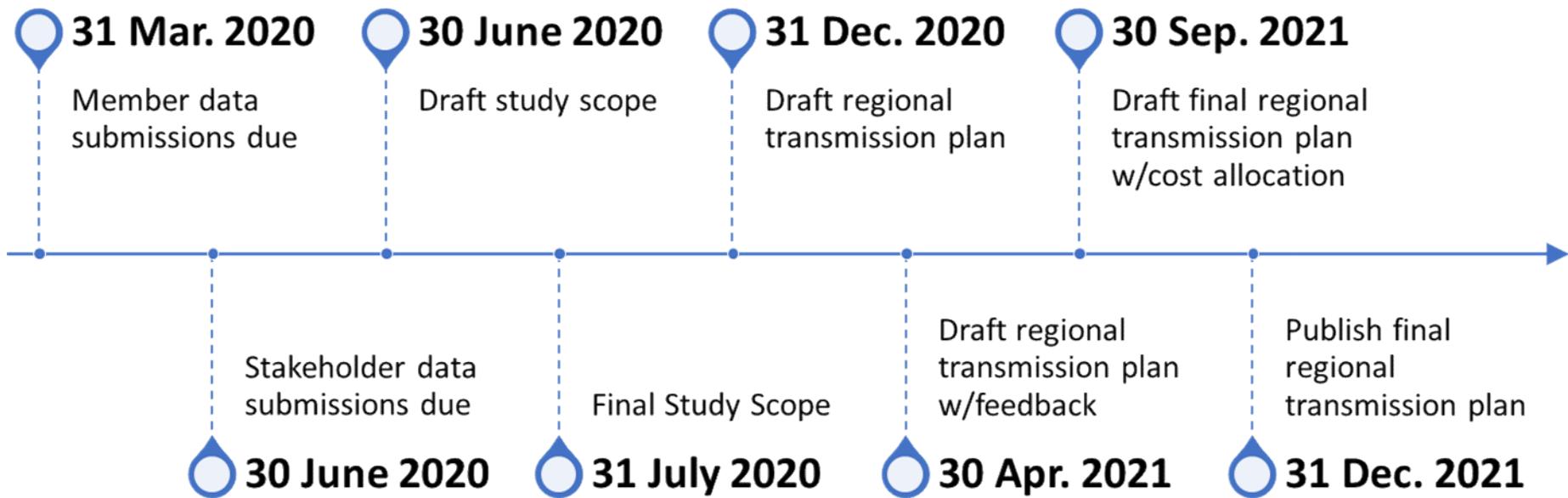
# Regional Planning

- NorthernGrid regional planning organization is made up of PacifiCorp, Idaho Power, NorthWestern Energy, Portland General Electric, Avista, BHE Canada, Bonneville Power Administration, Chelan County PUD, Enbridge, Grant County PUD, Puget Sound Energy, Seattle City Light, Snohomish County PUD, and Tacoma Power.
- NorthernGrid web page: <https://www.northernggrid.net>
- The wide participation envisioned in this process (including transmission owners, customers and state regulators) is intended to result in transmission expansion plans that meet a variety of needs and have a broad basis of support.
- NorthernGrid currently facilitates compliance with FERC requirements (including Order Nos. 890 and 1000) for those utilities that are required (or elect) to comply with such requirements, including cost allocation, when applicable.
- Through PacifiCorp's participation the Energy Gateway Project has been and will continue to be fully vetted through the regional planning process.

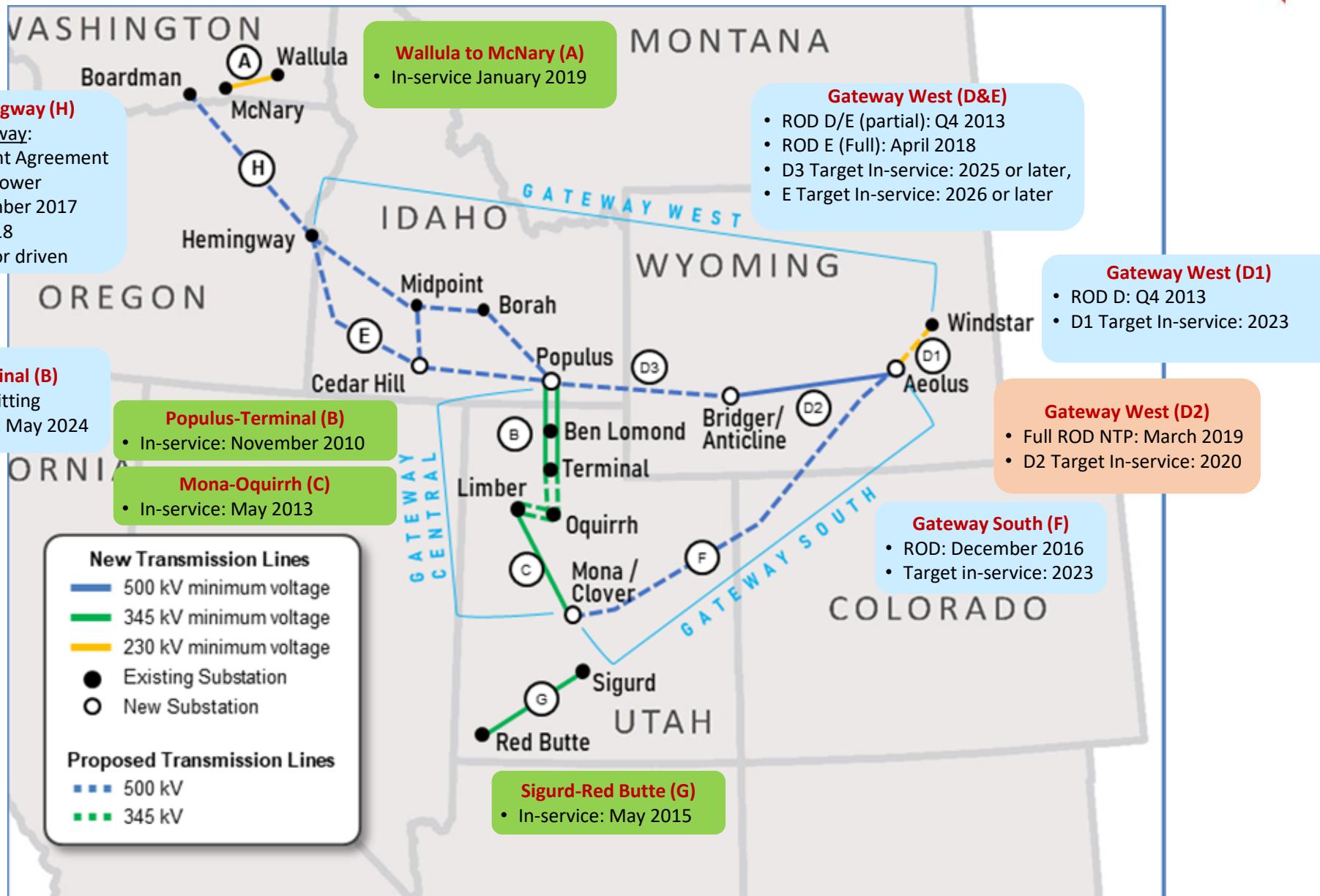


# Regional Planning

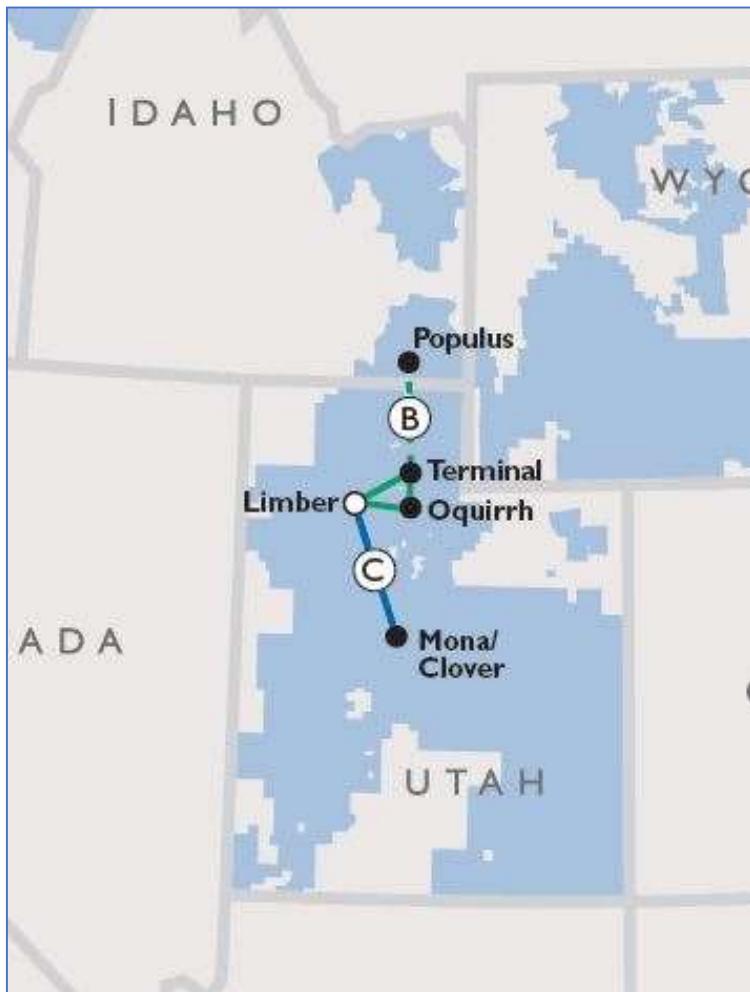
## NorthernGrid 2020-2021 Planning Cycle General Schedule and Deliverables



# Energy Gateway Program Status



# Oquirrh-to-Terminal (Segment C)

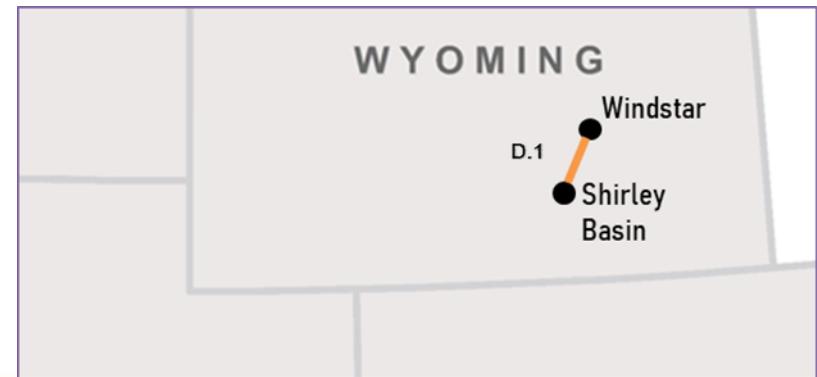


- 14-mile, double-circuit 345-kilovolt line, Oquirrh-to-Terminal
- Line route is within existing right of way that includes realignments to accommodate construction of the Utah Department of Transportation Mountain View Corridor project
- No federal permitting required
- Adds 650MW of transfer capacity on Path C (south) and 500MW of transfer capacity on Wasatch Front South
- Reinforces the Gateway Central north to south transmission path improving overall load serving capability to the Wasatch Front.
- Provide a parallel line to existing Wasatch Front 345 kV lines improving the reliability of northern Utah for loss of multiple 345 kV lines.
- Strengthens the Wasatch Front transmission system (increased fault duty) by more tightly coupling the northern Utah and southern Utah transmission systems, allowing additional generation resources to be transferred into northern Utah from eastern Wyoming and southern Utah.
- Improves grid reliability by providing better operational control of the backbone transmission system during outage conditions.
- Supports the company's NERC TPL-001-4 transmission system reliability efforts, which are necessary to improve grid reliability performance
- Target in-service date: May 2024



# Gateway West (Segment D1)

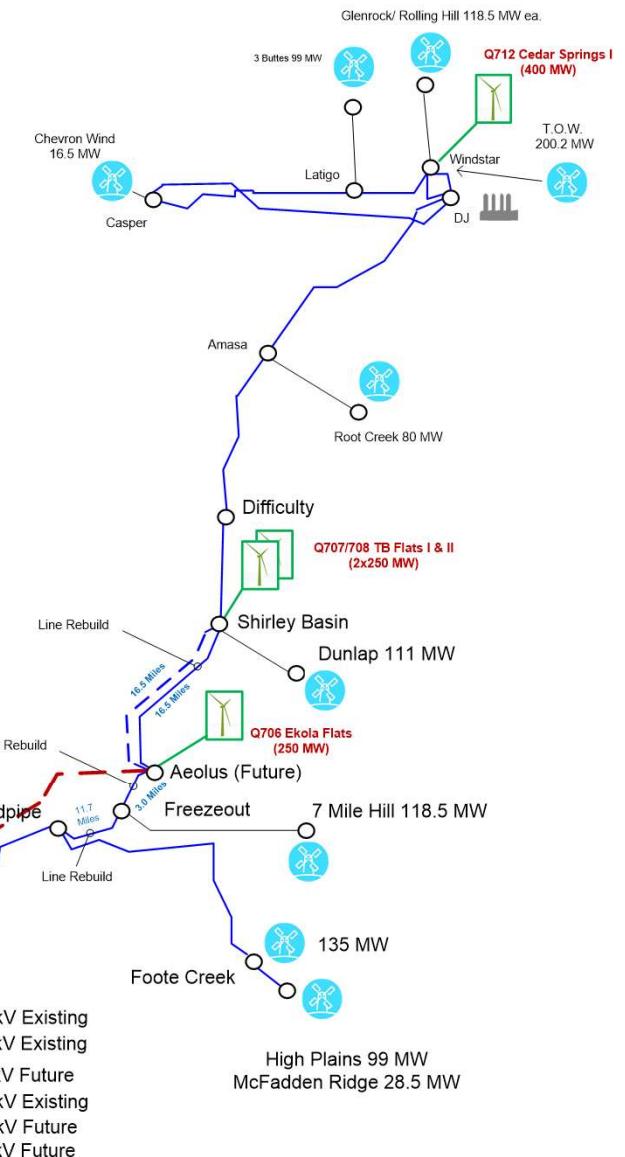
- Gateway West (including Segment D.1) Windstar to Shirley Basin) Record of Decision was issued in November 2013 and the Right of Way Grant was received in December 2013 – 60 miles of single-circuit 230 kilovolt transmission plus rebuild 60 miles of single-circuit 230 kilovolt transmission
- Remaining federal permitting related right of way activities needed (Wyoming only)
  - Biological surveys for special status plant species
  - Paleontological surveys
  - Cultural surveys on all federal lands
  - Wetland delineations of all right of way and access road areas
- Remaining state/private permitting related right of way activities needed (Wyoming only)
  - Cultural surveys on all state lands and private lands
  - Geotechnical surveys
  - Sage grouse working group sessions
  - Wyoming Industrial Siting Permit: First jurisdictional meeting will be held in July, 2020, application will be filed in January, 2021 and the permit is expected to be approved in April, 2021.
  - Conditional use permits required in Carbon and Natrona counties will be initiated in September 2020
- Target in Service: 2023





# Gateway West (Segment D2)

- Approximately 140 miles single circuit 500 kilovolt line and 5 miles of 345 kilovolt
- Segment D 2: Aeolus-to-Anticline/Bridger project in-service December 2020 with a project cost of \$679.2m
- Part of Energy Vision 2020
- Wyoming Certificate of Public Convenience and Necessity – bench decision received April 12, 2018
- Bureau of Land Management Right of Way Grant received November 2013
- Target in Service:  
December 31, 2020



# Gateway West (Segment D2) Transmission/Substation Construction Update



- 500/345kV transmission line construction on track for October 31, 2020, substantial completion: 100% structure foundations; 91% structure erection; 51% wire stringing
- 500kV Substation construction on track for October 31, 2020, substantial completion:
  - Aeolus – excavation, piping, cable trench, grounding and 230kV bus installation 100% complete; conduit – 95%; station steel – 97%; equipment setting – 91%; 230kV yard mechanically complete
  - Anticline – excavation, cable trench and station steel 100% complete; piping – 99%; grounding – 95%; equipment setting – 89%; bus installation – 94%
  - Jim Bridger – excavation and grounding 100% complete; steel – 88%
  - Latham substation expansion – 100% complete
- Transformer factory testing complete; all transformers in transit or delivered
- All reactors onsite and being assembled; all circuit breakers delivered and being installed
- Latham STATCOM installation on track for October 31, 2020, substantial completion
- 230kV Network Upgrades:
  - Transmission line construction behind schedule due to BLM 2019-2020 winter range restrictions; however, a contingency solution (shoofly connection) has been instituted to supply back-feed power to Ekola Flats by the June 15, 2020 required date. All work on track for October 31, 2020, substantial completion.
  - Substation construction/modifications at all locations are on track for October 31, 2020, substantial completion: Windstar – underway; Shirley Basin – underway; Freezeout – 100% complete; wind farm collector substations – underway



# Gateway West (Segment D3)

- 200-mile, 500-kV Energy Gateway West (GWW) Segment D.3 transmission line, from Bridger/Anticline to Populus by year-end 2025 or later
  - Adds 1700 MW of transfer capability from south-central Wyoming (Bridger/Anticline) to southeastern Idaho
  - Allows interconnection of an additional 228 MW of renewable generation resources in central Wyoming and 249 MW in south eastern Idaho
- Completes the east to west transmission link between eastern Wyoming and southwest Idaho, support higher levels of wind integration in eastern Wyoming.
- The project supports higher transfers levels from eastern Wyoming across southern Wyoming to southeast Idaho and into to northern Utah.
- Provides a parallel path to Bridger West 345 kV transmission system improving the reliability of southwest Wyoming and southeast Idaho during line outage conditions.



- Strengthens the southwest Wyoming and southeast Idaho transmission system (increased fault duty) by more tightly coupling the two areas, allowing additional generation resources to be interconnected.
- Improves the Bridger West transmission system reliability by providing congestion relief on the 345 kV lines during outage conditions
- Supports the company's NERC TPL-001-4 transmission system reliability efforts, which are necessary to improve grid reliability performance.
- Bureau of Land Management Right of Way Grant received November 13, 2013
- Target in Service: 2025 or later



# Gateway West (Segment E)

- 450 miles, 500 kilovolts Energy Gateway West – Segment E transmission line, from Populus to Hemingway
  - Adds 630 megawatts of transfer capability from eastern Idaho (Populus) to central Idaho (Hemingway)
  - Allows interconnection of an additional 500 megawatts of renewable generation resources in southeastern Idaho
- Completes the east to west transmission link between southeast Idaho and southwest Idaho, support higher levels of renewable integration in southeast Idaho
- The project supports higher transfers levels from east to west across Idaho, supporting new Wyoming resources being delivered to Treasure Valley of southwest Idaho and the Pacific Northwest (via the Boardman – Hemingway project)
- Provides a parallel path to Populus West and Midpoint West 345 kilovolts and 230 kilovolts transmission system improving the reliability of southern Idaho during line outage conditions
- Strengthens the PacifiCorp and Idaho Power transmission systems (increased fault duty) by interconnecting the geographically diverse areas of southwest Idaho and southeast Idaho together, allowing additional generation resources to be interconnected or transferred
- Improves grid reliability by providing better operational control of the southern Idaho backbone transmission system during outage conditions



- Improves the southern Idaho transmission system reliability by providing congestion relief on the 345 kilovolts and 230 kilovolts lines during outage conditions
- Supports PacifiCorp's NERC TPL-001-4 transmission system reliability efforts, which are necessary to improve grid reliability performance
- Bureau of Land Management record of decision and right of way grant issued November 2013 for sub-segments 1-7 and 10
- Bureau of Land Management Record of Decision and Right of Way Grant issued on May 2018 for sub-segments 8 and 9
- Target in service: 2026 or later



# Gateway South (Segment F)

## Gateway South Segment F (Aeolus to Mona/Clover)

- 2019 Integrated Resource Plan Preferred Portfolio
- Delivers long-term customer savings
- Addresses transmission reliability and interconnection constraints
- Adds approximately 1,700 MWs of transfer capability from eastern Wyoming (Aeolus) to the central Utah energy hub (Mona/Clover)
- Allows interconnection of an additional 1,920 MWs of renewable generation resources in eastern Wyoming
- Final Environmental Impact Statement issued May 2016
- Record of Decision issued December 13, 2016
- Target in-service date: 2023



# Gateway South (Segment F) Permitting Update



- Gateway South Segment F (Aeolus to Mona) Record of Decision was issued in December 2016 and the Right of Way (ROW) Grant was received in January 2017
- Remaining federal permitting related right of way activities
  - Bureau of Land Management and U.S. Forest Service full notice to proceed, target date May 1, 2021
  - Conduct the required preconstruction surveys through early 2021 to support full agency full notice to proceed by May 1, 2021. These include biological, noxious weeds, paleontological, cultural resource surveys
  - Wetland delineations of all right of way and access road areas where project crosses to minimize wetland mitigation requirements
  - Mitigation discussions for any identified impacts with the U.S. Fish and Wildlife Service, Utah Department of Natural Resources, Colorado Department of Wildlife, and Wyoming Game and Fish
  - Development of adaptive management plans for impacted species via mitigation
- Remaining state/private permitting activities
  - Certificates of Public Convenience and Necessity required in Wyoming and Utah. Filings are planned in April 2020
  - Wyoming Industrial Siting permitting initiated in January 2020, hearing scheduled October 21, 2020
  - 9 county conditional use permits required across the project. Applications will begin in May 2020
- Cross Mountain Ranch Conservation Easement Colorado
- Sage grouse working group sessions to develop habitat equivalency analysis for final impact run based on final transmission design right of way and subsequent mitigations for state agency mitigation in Wyoming, Colorado, and Utah
- Climatology studies for conductor/towers initiation

# Boardman-to-Hemingway (Segment H)



- 290 miles, 500kV single circuit transmission line
- Benefits to PacifiCorp customers include reducing reliance on third party transmission service, cost savings that result from arbitrage of low cost northwest markets relative to southwest markets, capacity benefits resulting from winter and summer peaking differences across PacifiCorp's system, and increased load serving capability in Central Oregon
- Idaho Power has identified Boardman to Hemingway in its preferred resource portfolio with an in-service date in 2026 and initiated contractual owner negotiations in Q2 2019 to proceed with building the line
- Current project schedule
  - Pre-construction activities start Q4 2019 – Q3 2022
  - Oregon final order and site certificate – Q1 2022
  - BLM Notice to Proceed / Plan of Development – Q3 2023
  - Line construction start Q2 2023
  - Substation construction start Q1 2024
  - Project in-service mid-year 2026



- Project participants: Idaho Power, Bonneville Power Administration, PacifiCorp
- Final environmental impact statement published November 25, 2016
- BLM Record of Decision received November 2017
- USFS ROD received November 2018
- Oregon Energy Facility Siting Council proposed order expected to be issued 2020; Site Certificate expected 2022.



# 2019 IRP

## Post-filing IRP Discussion





# 2019 IRP Timeline

- Following an 18-month public-input process, PacifiCorp filed its 2019 IRP in its six states – October 18, 2019
  - 2019 IRP data discs and supplemental information filed – October 25, 2019
  - 2019 IRP second supplement and data disc replacement files filed – November 8, 2019
- On October 30, 2019 – the Public Utility Commission of Oregon issued its procedural schedule, Docket LC-70.
- On November 6, 2019 – the Public Utility Commission of Utah issued its procedural schedule, Docket 19-035-02.
- On November 7, 2019 – the Washington Utilities and Transportation Commission approved staff's petition to not take action on the 2019 IRP (Docket UE-180259) and to focus on completion of the clean energy legislation implementation rulemaking and IRP rulemaking to inform the 2021 IRP.
- On November 7, 2019 – the Public Service Commission of Wyoming opened an investigation into the 2019 IRP, Docket 20000-552-EA-19.
- The Public Utility Commission of Idaho has not yet taken action on the 2019 IRP, Docket PAC-E-19-16.

# Transmission Information and Outcomes in the IRP



- In the IRP Document:
  - Volume I, Chapter 4 (Transmission): Discussion of specific transmission projects, reliability standards, system constraints, etc.
  - Volume I, Chapter 6 (Resource Options), pages 168-169: Summary of materials in this workshop.
  - Volume II, Appendix M (Case Study Fact Sheets): Case-by-case summary of incremental transmission additions plus transmission and resource maps.
- On the Confidential Data Disk, System Optimizer Portfolio Summary
  - “Portfolio Sum” tab
    - The second table of this tab shows a summary of selected incremental transmission, including the year and added capacity.
  - “TieBuild” tab
    - The table reports the year, project, topology bubbles, capacity and capital cost for all potential upgrades.
    - Filter the “Capital Cost” to exclude zeroes, which will result in a filtered list of the selected options.
    - This view shows both incremental additions and transmission “recovered” after retirements.



# Transmission Planning

- PacifiCorp transmission planning considered known transmission capacity and limitations of WECC rated paths and internal paths to provide inputs to the IRP model for baseline transmission capacity between IRP bubbles and the estimated amount of new generation that could be added in various locations.
- Transmission planning also provided a list of estimated incremental transmission capacity additions that the IRP model could select when the model selected generation resource additions within an IRP bubble that exceeded the baseline transmission capacity of that bubble. Incremental transmission capacity selection options were based on the following information:
  - Planned network system improvements (projects included in proposed budget, local transmission plan and/or regional transmission plan)
  - Completed generator interconnection studies
    - megawatt size
    - location
    - system improvements identified
  - Estimated cost for construction based on voltage class, line mileage and substation integration requirements.

# Interconnection Queue Reform Overview



- Since Open Access in 1996, PacifiCorp has increased its owned generation resource portfolio through a combination of: (1) “greenfield” projects, where PacifiCorp requests and holds a position in the interconnection queue and develops the project from its inception; and (2) third-party acquisitions, where the third party requests and holds a position in the interconnection queue and develops the project until commercial operation (or near commercial operation) before selling the resource to PacifiCorp
- PacifiCorp must largely bring on incremental generation by conducting a highly regulated competitive solicitation process. Participation by both company and third-party projects in PacifiCorp’s requests for proposal not only increases the likelihood that PacifiCorp’s state commissions will find they satisfy regulatory metrics, but also that PacifiCorp will receive competitively priced bids
- While the queue congestion levels affected PacifiCorp’s ability to hold high-priority queue positions in some areas, PacifiCorp has nevertheless been able to maintain its desired level of low-cost resource development thus far, and it sought to proactively address the issue with its recent FERC queue reform proposal to ensure that success continues
- If the Federal Energy Regulatory Commission approves PacifiCorp’s request for reformed interconnection processing rules, it will facilitate more competitive access to PacifiCorp’s system in the short to medium term, but it will not impact projects with signed large generator interconnection agreements and thus no impact to the 1,920 MWs projects in the queue behind Gateway South Segment F Aeolus to Mona and Gateway West Segment D.1 Windstar to Aeolus
- Current status of PacifiCorp’s queue reform effort is as follows:
  - On March 6, 2020, the Federal Energy Regulatory Commission issued a deficiency letter seeking additional information about a limited number of issues. PacifiCorp filed a response on March 13, 2020
  - On April 10, 2020, 12 entities filed comments on PacifiCorp’s March 13, 2020 response arguing for modifications to PacifiCorp’s proposals on the timing of and eligibility requirements associated with the first cluster study, commercial readiness criteria, and technical modeling adjustments. PacifiCorp is preparing a concise response to make limited clarifications and indicate areas of compromise, which is due on April 27, 2020
  - The Federal Energy Regulatory Commission approved PacifiCorp’s tariff revisions on May 12, 2020. The order included a January 31, 2020 cutoff date for interconnection requests to be included in the transition cluster study. At least one intervenor has filed for re-hearing at this point.



# Additional Information / Next Steps





# Additional Information

- Public Input Meeting and Workshop Presentation and Materials:
  - [pacificorp.com/energy/integrated-resource-plan/public-input-process](http://pacificorp.com/energy/integrated-resource-plan/public-input-process)
- 2021 IRP Stakeholder Feedback Forms:
  - [pacificorp.com/energy/integrated-resource-plan/comments](http://pacificorp.com/energy/integrated-resource-plan/comments)
- IRP Email / Distribution List Contact Information:
  - [IRP@PacifiCorp.com](mailto:IRP@PacifiCorp.com)
- IRP Support and Studies – CPA Draft Documents
  - [pacificorp.com/energy/integrated-resource-plan/support](http://pacificorp.com/energy/integrated-resource-plan/support)



# Next Steps

- Upcoming Public Input Meeting Dates:
  - June 18-19, 2020 – General Public Input Meeting
  - July 30-31, 2020 – Public Input Meeting
  - August (TBD), 2020 – Conservation Potential Assessment Technical Workshop
  - September 17-18, 2020 – Public Input Meeting
  - October 22-23, 2020 – Public Input Meeting
  - December 3-4, 2020 – Public Input Meeting
  - January 14-15, 2021 – Public Input Meeting
  - February 25-26, 2021 – Public Input Meeting

*\*meeting dates are subject to change*