2021 Electric Integrated Resource Plan

Technical Advisory Committee Meeting No. 1 Agenda

Thursday, June 18, 2020

Virtual Meeting

Topic	Time	Staff
Introductions	9:00	
TAC Expectations and Process Overview	9:05	Lyons
2020 IRP Acknowledgement	9:45	Lyons
Break	10:15	
CETA Rulemaking Update	10:30	Bonfield
Modeling Process Overview	11:00	Gall
Lunch	12:00	
Generation Options	1:00	Hermanson
Break	2:00	
Highly Impacted Communities Discussion	2:15	Gall
Adjourn	3:30	

2021 Electric IRP
TAC Expectations and Process Overview

John Lyons, Ph.D.
First Technical Advisory Committee Meeting
June 18, 2020

Updated Meeting Guidelines

- IRP team is working remotely, still available by email and phone for questions and comments
- Some processes are taking longer remotely
- Adding stakeholder feedback form to the IRP website – posted with responses
- Researching best way to share other IRP data
- Virtual IRP meetings on Skype until back in the office and able to hold large group meetings
- TAC presentations and notes will still be posted on IRP page

Virtual TAC Meeting Reminders

- Please mute mics unless speaking or asking a question
- Use the Skype chat box to write out or let us know you have a question or comment
- Respect the pause
- Please try not to speak over the presenter or a speaker who is voicing a question or thought
- Remember to state your name before commenting for the note taker
- This is a public advisory meeting – presentations and comments will be recorded and documented

Integrated Resource Planning

The Integrated Resource Plan (IRP):

- Required by Idaho and Washington* every other year
  - Covering timing of 2020 and 2021 IRPs in next presentation
- Guides resource strategy over the next twenty + years
- Current and projected load & resource position
- Resource strategies under different future policies
  - Generation resource choices
  - Conservation / demand response
  - Transmission and distribution integration
  - Avoided costs
- Market and portfolio scenarios for uncertain future events and issues

Technical Advisory Committee

- The public process piece of the IRP – input on what to study, how to study, and review of assumptions and results
- Wide range of participants involved in all or parts of the process
  - Ask questions
  - Help with soliciting new members
- Open forum while balancing need to get through all of the topics
- Welcome requests for studies or different assumptions.
  - Time or resources may limit the number or type of studies
  - Earlier study requests allow us to be more accommodating
  - **August 1, 2020** is the study request deadline
- Planning team is available by email or phone for questions or comments between the TAC meetings

2021 Electric IRP TAC Schedule

- TAC 1: Thursday, June 18, 2020
- TAC 2: Thursday, August 6, 2020 (Joint with Natural Gas TAC)
- TAC 3: Tuesday, September 29, 2020
- TAC 4: Tuesday, November 17, 2020
- TAC 5: Thursday, January 21, 2021
- Public Outreach Meeting: February 2021
- TAC agendas, presentations and meeting minutes available at: https://myavista.com/about-us/integrated-resource-planning

2021 IRP Key Dates – Work Plan

- Identify Avista's supply resource options – May 2020
- Finalize natural gas price forecast – June 2020
- Finalize demand response options – July 2020
- Finalize energy efficiency options – July 2020
- Update and finalize energy and peak forecast – July 2020
- Finalize electric price forecast – August 2020
- Transmission and distribution studies due – August 2020
- Determine portfolio and market future studies – August 2020
- Due date for TAC study requests – August 1, 2020
- Finalize PRiSM model assumptions – September 2020
- Simulate market scenarios in Aurora – September 2020
- Portfolio analysis and reliability analysis – October 2020
- Present portfolio analysis to TAC – November 2020

2021 IRP Public Data Release Schedule

- Supply Side Resource Options – June 2020
- Conservation Potential Study Data – July 2020
- Demand Response Potential Study Data – July 2020
- Peak & energy Load Forecast – July 2020
- Wholesale Natural Gas Price Forecast – August 2020
- Wholesale Electric Price Forecast – September 2020
- Transmission Interconnect Costs – September 2020
- Existing Resource Data – September 2020
- Annual Capacity Needs Assessment – November 2020

2021 IRP Key Document Dates

- Filed 2021 IRP Work Plan April 1, 2020
- Internal IRP draft released at Avista on December 4, 2020
- External draft released to the TAC on January 4, 2021
- Comments and edits from TAC due on March 1, 2021
- Final editing and printing – March 2020
- Final IRP submission to Commissions and TAC on April 1, 2021

Today's TAC Agenda

9:00 – Introductions

9:05 – TAC Expectations and Process Overview, Lyons

9:45 – IRP Acknowledgement, Lyons

10:15 – Break

10:30 – CETA Rulemaking Update, Bonfield

11:00 – Modeling Process Overview, Gall

Noon – Lunch

1:00 – Generation Options, Hermanson

2:00 – Break

2:15 – Highly Impacted Communities Discussion, Gall

3:30 – Adjourn

2020 Electric IRP Acknowledgement Update

John Lyons, Ph.D.
First Technical Advisory Committee Meeting
June 18, 2020

Normal Acknowledgement Process

- Avista's electric IRP previously submitted to Idaho and Washington Commissions every other August in odd years
- Commissions set periods for public comments and meetings
- Acknowledgements issued detailing IRP outcomes, comments and expectations for the next IRP
- Normally, we provide details about the acknowledgments in this meeting

How The IRP Changed

- Expectations and passage of the Clean Energy Transformation Act (CETA) in 2019 led to six month IRP extensions
  - February 28, 2020 in Idaho in AVU-E-19-01 Order No. 34312
  - Washington further extended until April 1, 2021
  - Two IRPs in two years

Idaho

- AVU-E-19-01 (https://puc.idaho.gov/case/Details/3633)
- Requests from the Mayor of Sandpoint, Idaho, Idaho Forest Group, Idaho Conservation League and Embodied Virtue for the IPUC to hold a public hearing in North Idaho
- IPUC set a deadline of August 19, 2020 for public comments about the IRP with Avista replies due September 2, 2020
- Will update the TAC on future comments and acknowledgement
- Ongoing discussions with Commission Staff and ICL concerning several aspects about modeling, Colstrip and the impact of CETA on Idaho customers

Washington

- Submitted the 2020 IRP to the Washington UTC
- Washington Commission temporarily suspended issuing IRP acknowledgement letters in UE-180738 Order 02 until December 31, 2020
- Progress filed report filed on October 25, 2019 to accommodate CETA rulemaking
  - Commission cannot legally acknowledge an IRP without meeting certain CETA guidelines which still need to have rulemaking completed
- Next draft electric IRP must be submitted by January 4, 2021 and final 2021 electric IRP must be submitted by April 1, 2021
- No specific requirements or expectations from an acknowledgment letter from the 2020 IRP

Washington

- 2021 IRP expectations are going to focus on the results of CETA rulemaking

Some Washington UTC requests on the work plan include:

- Provide opportunity for stakeholder input on the CPA before finalizing the options
- How equity issues required under CETA will be incorporated in the IRP (TAC 1 and TAC 2)
- Extending participation beyond the TAC through some form of public outreach at a higher level before the end of the IRP process (February 2021)
- Concerns over draft CEIP being included in the IRP
- Provide a general outline of when Avista will provide data or files for stakeholder review and comment deadlines (first presentation today)

DRAFT

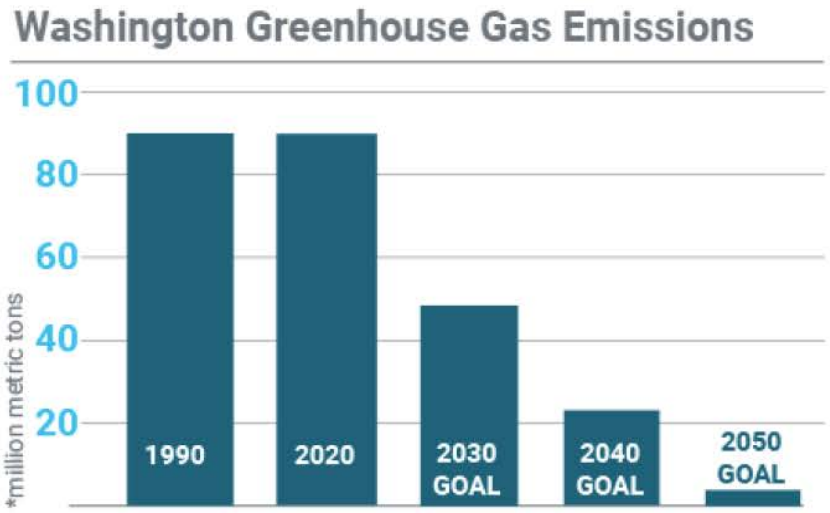
Clean Energy Transformation Act (CETA)

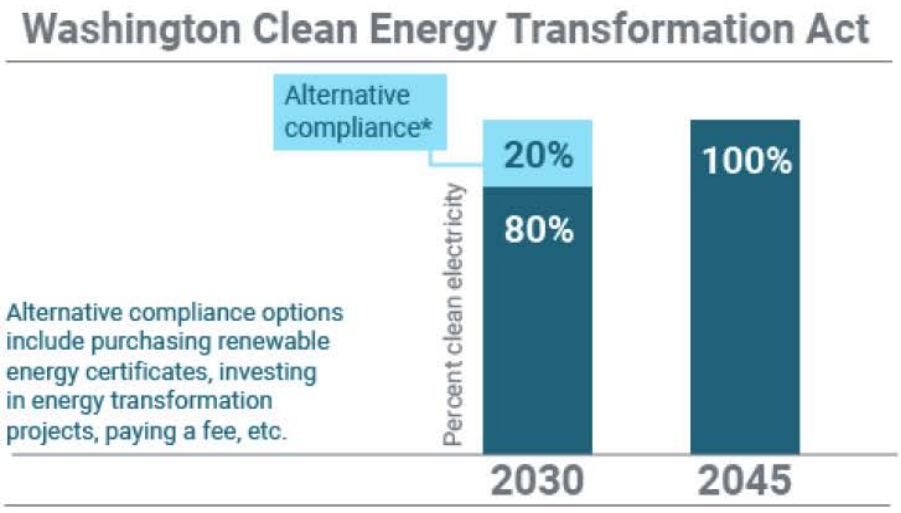
Overview and Implementation Status

Shawn Bonfield, Sr. Manager Regulatory Policy & Strategy
First Technical Advisory Committee Meeting
June 18, 2020

CETA: A Brief Overview

- Senate Bill 5116 – passed by legislature in 2019
- Applies to all electric utilities in WA and sets specific milestones to reach required 100% clean electric supply
- By 2025 – eliminate coal-fired resources from serving WA customers
- By 2030 – electric supply must be greenhouse gas neutral,
- By 2045 – electric supply must be 100% renewable or be generated from zero-carbon resources



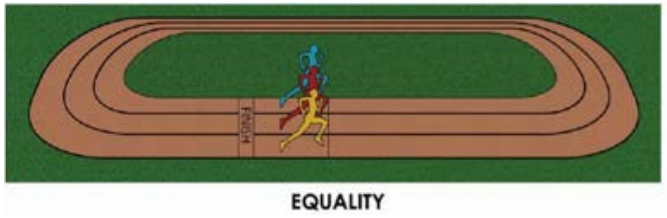


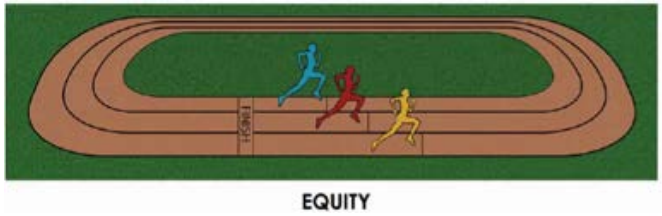
Source: WA Department of Commerce

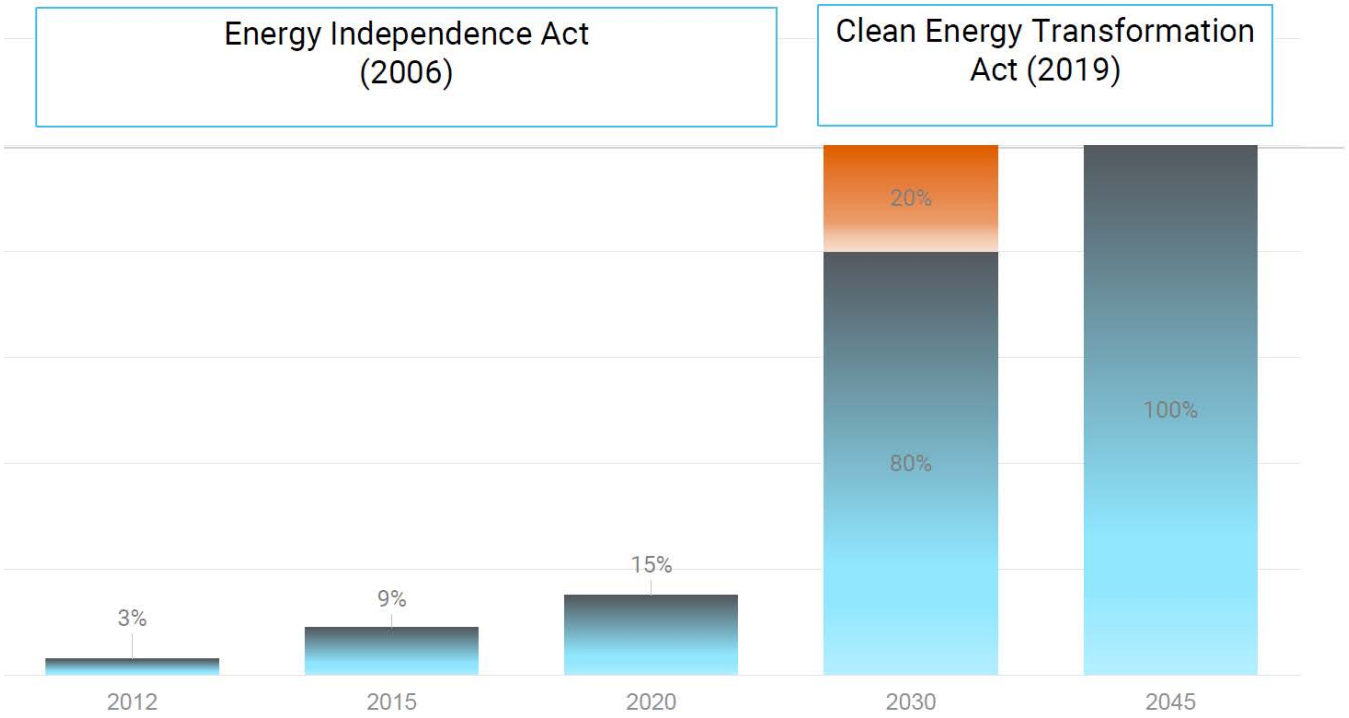
CETA: Additional Details

Utilities must:

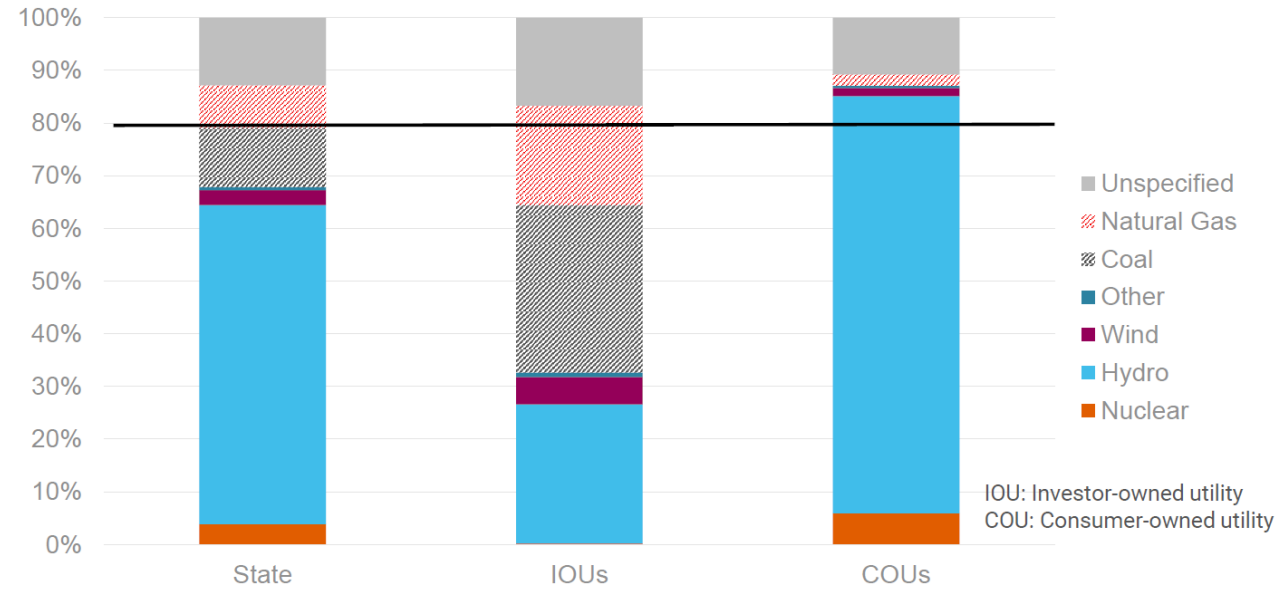
- Ensure the equitable distribution of energy and nonenergy benefits and reduction of burdens to vulnerable populations and highly impacted communities
- Ensure long-term and short-term public health and environmental benefits and reduction of costs and risks
- Ensure energy security and resiliency
- Make progress toward and meet the standards of the law:
  - While maintaining and protecting the safety, reliable operation, and balancing of the electric system
  - At the lowest reasonable cost







WA utilities' existing resource mix



Source: WA Department of Commerce

Key dates

Dec 2020	Agencies complete initial rules
Jan 2022	Utilities submit 1st clean energy implementation plans (2022-2025)
Jun 2022	Agency rules on market transactions and double-counting
Dec 2025	Deadline to remove coal from portfolios
Jan 2026	2nd CEIP submitted (2026-2029)
2030	GHG Neutral standard takes effect
2045	100% Clean Electricity standard takes effect

Source: WA Department of Commerce

UTC CETA Implementation Plan UE-190485 (Closed)

- Phase 0 – overall implementation plan
  - Process timeline and scope of issues

- Phase I - August 2019 to January 1, 2021
  - Elements that must be complete by January 1, 2021 as required by Section 10 of SB 5116
  - Publish the social cost of carbon on UTC's website by September 15, 2019
  - Initiate dockets for various rulemakings relating to CETA implementation

- Phase II – January 1, 2021 to June 30, 2022
  - Rulemakings with deadlines after January 1, 2021
  - Amend IRP rules to incorporate Cumulative Impact Analysis
  - Carbon and Electricity Markets Rulemaking

Social Cost of Carbon
U-190730 (Closed)

- New section added to chapter 80.28 RCW, outlining cost of greenhouse gas emissions resulting from the generation of electricity and use of natural gas, the UTC must adjust the social cost of carbon to reflect the effect of inflation.

- Social Cost of Carbon published on UTC website in September 2019:
  - https://www.utc.wa.gov/regulatedIndustries/utilities/Pages/SocialCostofCarbon.aspx

Energy Independence Act (EIA) Rulemaking – UE-190652

- E2SSB 5116: Amending WAC 480-109, Energy Independence Act (EIA) rules
  a. Streamline E2SSB 5116 with EIA rules. (§ 10(3))
  b. Discuss equitable distribution of benefits.
  c. Discuss low-income definition, if needed. (§ 2(25))
  d. Discuss energy assistance need definition, if needed. (§ 2(16))
  e. Consider incorporating low-income energy efficiency target.
  f. Incorporate updates to hydro eligibility and tracking. (§ § 28 and 29)

Status: Written comments due on draft rules July 6th. Rule adoption hearing set for July 28th.

Clean Energy Implementation Plan (CEIP) Rulemaking UE-191023

- E2SSB 5116: New Chapter, Clean Energy Implementation Plans (CEIPs)
  a. Provide guidelines for Clean Energy Implementation Plans. (§ 6)
  b. Discuss equitable distribution of benefits. (§ 4(8))
  c. Develop incremental cost methodology at the beginning of the rulemaking. (§ 6)
  d. Address reporting and compliance, and the penalty process. (§ 9(1)(a))

Status: First draft of rules released May 5, 2020 with comments due June 2, 2020. Second set of draft rules to be released in July timeframe.

Electric IRP Updates Rulemaking UE-190698

- E2SSB 5116 and EHB 1126: Amending WAC 480-100-238, Electric Integrated Resource Plans (IRP)
  a. Update inputs to IRPs (e.g., hydro eligibility and tracking;4 resource adequacy; distributed energy resources principles from EHB 1126; and demand response).
  b. Update structure of IRPs.
  c. Update public involvement process.
  d. Update outputs of IRP Clean Energy Action Plans. (§ 14(2))
  e. Incorporate the social cost of carbon into IRPs. (§ 14(3)(a))
  f. Refine the development of avoided costs to reflect E2SSB 5116 and social cost of carbon.
  g. Develop resource value test based on review of E2SSB 5116 and social cost of carbon.
  h. Discuss equitable distribution of benefits. (§ 4(8))
  i. Discuss assessment informed by cumulative impact analysis, as needed. (§ 14(1)(k))
  j. Amend IRP rules to incorporate the Cumulative Impact Analysis complete by Department of Health workgroup. (ch. 288, § 14(11))
  k. Incorporate distributed energy resources elements from EHB 1126. (ch. 205, § 1)

Status: Development and preparation of draft rules ongoing.

Purchase of Electricity (PoE) Rulemaking UE-190837

- E2SSB 5116: Amending WAC 480-107, Resource Acquisition (Requests for Proposals, or RFP)
  a. Incorporate existing work on RFPs from Docket U-161024.
  b. Ensure that the E2SSB 5116 standard is met in construction and acquisition of property and the provision of electric service. (§ 5)
  c. Incorporate resource adequacy considerations. (§ 6(2)(a)(iv))
  d. Discuss equitable distribution of benefits. (§ 6(1)(c)(iii))

Status: Second round of draft rules issued June 1, 2020 with comments due June 29, 2020.

Carbon & Electricity Markets Workgroup UE-190760

- E2SSB 5116: With the Department of Commerce, initiate a Carbon and Electricity Markets Workgroup for regular discussions to inform Phase II rulemaking.
- Define requirements for load met with market purchases. (ch. 288, § 13)

Status: Workgroup to hold four educational workshops to set a base of understanding. Second workshop scheduled for June 10, 2020. Public work sessions to begin in Fall 2020 with rulemaking complete June 30, 2021.

Department of Commerce Rulemakings

- Thermal Renewable Energy Credits – applies to all utilities
- Reporting and demonstration of compliance – applies to all utilities
- CEIP for consumer-owned utilities – ensure alignment with UTC rules
- Cost methodology for rate impact – applies to all utilities

Rules effective January 1, 2021

Department of Ecology Rulemakings

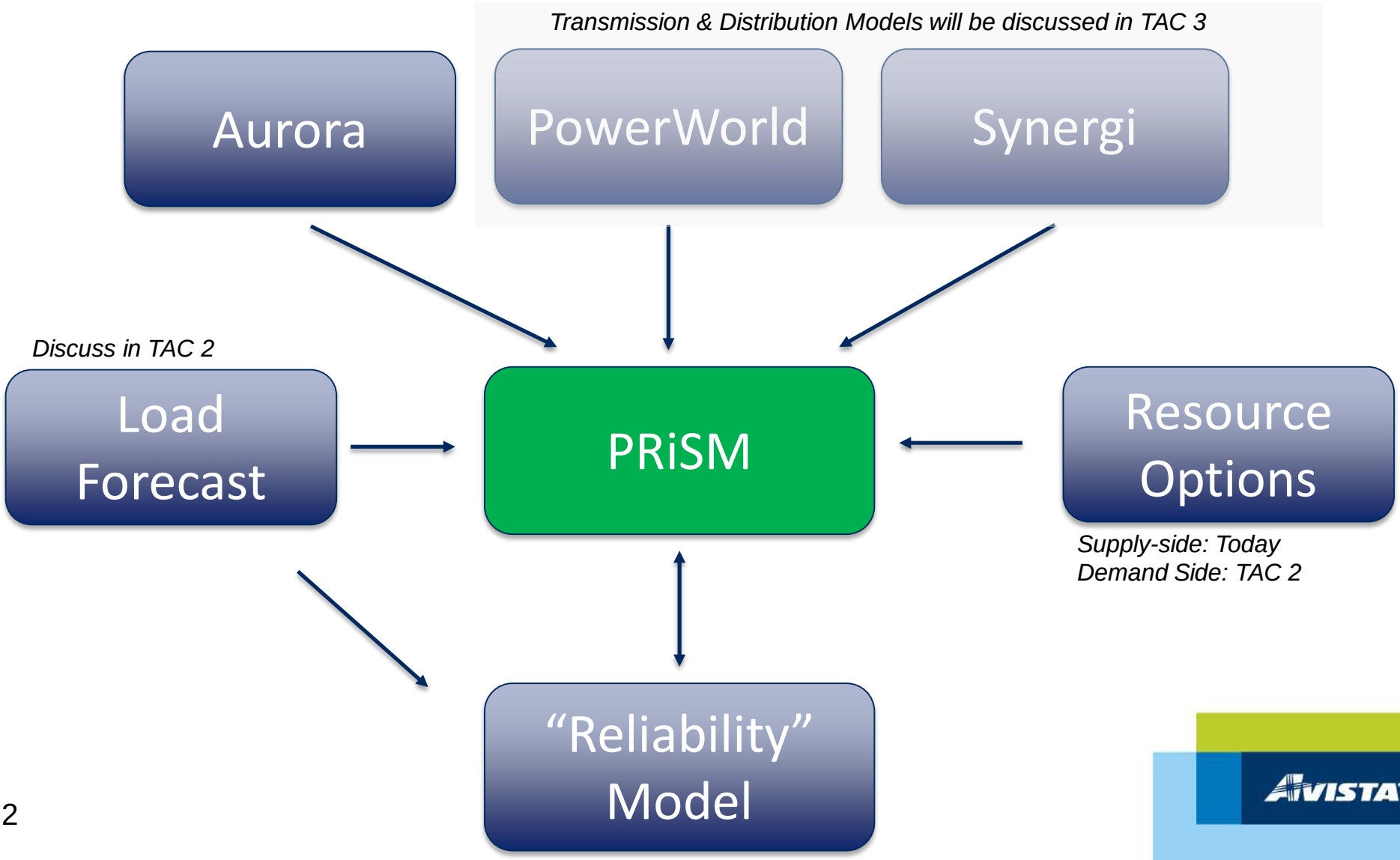
- Ecology is starting rulemaking for Chapter 173-444 WAC, Clean Energy Transformation Rule to implement parts of the Clean Energy Transformation Act assigned to Ecology. The rulemaking will:
  - Establish a process to determine what types of energy transformation projects may be eligible to meet the Clean Energy Transformation Act.
  - Establish a process and requirements to develop standards, methodologies, and procedures to evaluate energy transformation projects.
  - Provide greenhouse gas emission factors for electricity.

- Timeline
  - Spring 2020 – develop and prepare rule language
  - Summer 2020 – public hearing and comment
  - December 2020 – adopt rule
  - January 2021 – rule effective

2021 Electric IRP
Modeling Process Overview

James Gall, IRP Manager
First Technical Advisory Committee Meeting
June 18, 2020

IRP Planning Models



Aurora

- Electric Market- Production Cost Model
- Developed by Energy Exemplar
- Industry standard and widely used in the Pacific Northwest
- Avista started using software for the 2003 IRP
- Simulates generation dispatch to meet load allowing for system constraints

Inputs:

- Regional loads*
- Fuel prices*
- Fuel availability*
- Resources (availability*)
- New resources costs
- Transmission
- System Constraints

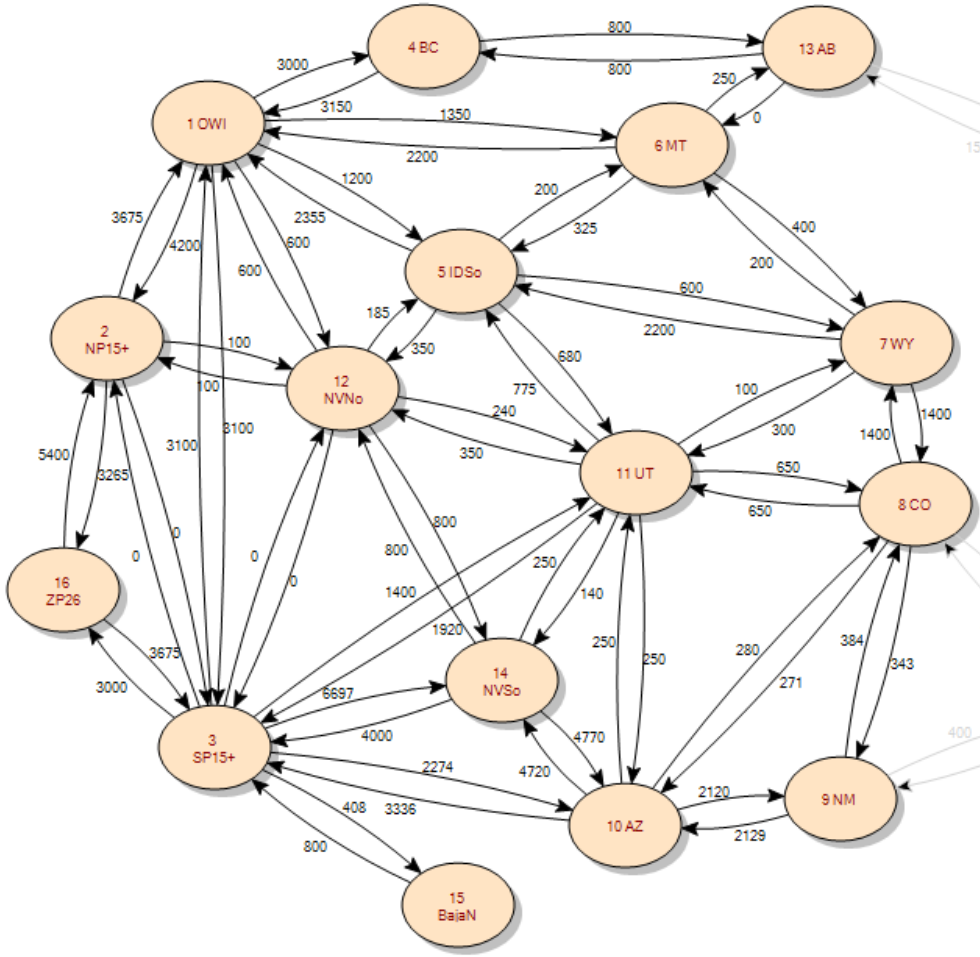
Outputs:

- Market prices
- Energy mix
- Transmission usage
- Emissions
- Power plant margins, generation levels, fuel costs
- Avista's variable power supply costs

*Stochastic input

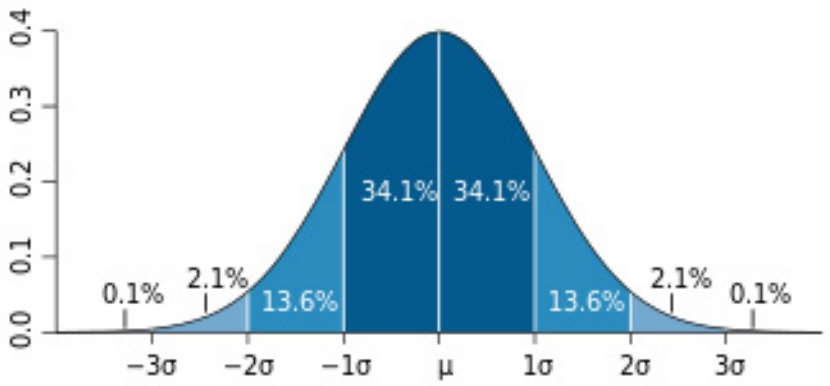
Aurora Pricing Methodology

- Each area contains a load and resources.
- Aurora dispatches resources to meet the load for each hour.
- Resource dispatch is dependent on fuel availability (wind, solar, hydro) and economic dispatch of the resource (fuel price).
- The model includes resource outages for maintenance and forced outage.
- For each location and hour, the model estimate a wholesale electric price using the marginal resource to serve the load.



Stochastic vs. Deterministic Analysis

- Deterministic analysis forecasts for a specific set of inputs.
  - Easier to understand
  - Works great for sensitivity analysis of specific changes
- Stochastic analysis forecasts for a range of inputs.
  - Range (or distribution) of results
  - Works great to understand risks of the inputs with variation
- Avista uses mean value of stochastic analysis for its Expected Case scenario.



Aurora Model Assumptions

- Forecast will start with the 2020 IRP
  - Uses latest available database from Energy Exemplar
- Proposed database changes
  - Natural gas prices (TAC 2)
  - Include new resource additions and announced retirements
  - Include known state/province environmental laws; including adjustments for oversupply events
  - Review inputs for load and new resources options
    - EV/rooftop solar forecast
    - New resources cost
  - Add proprietary Avista system information
  - Add stochastic distribution of regional hydro, natural gas, wind, and loads
- Avista will discuss non-confidential modeling changes in TAC 3
- All other Aurora assumptions are default values

Aurora Run Process

- Once inputs are finalized (July 2020)
- Run Long Term “LT” study to estimate new resource additions for the full hourly study
- Test reliability under 500 simulations of varying hydro, load, forced outage, and wind conditions for future year (i.e. 2035)
- Update LT study to reflect any “need” for new resources and validate regional reliability
- Run deterministic study
- Run stochastic study (500 simulations, each hour for 2022-45)
- Run scenarios

What Aurora Outputs are used?

- Resource dispatch for Avista existing resources and resource options
  - Estimate profitability of each supply and demand side resource
  - Estimate dispatch for REC calculation for CETA
- Value the cost to serve Avista's load
- Estimate the emissions associated with supply side and storage resources
- Estimate regional emission rates for savings for energy efficiency resources
- Gain understanding of the region market
- Data is used to populate PRiSM Model

PRiSM- Preferred Resource Strategy Model

- Internally developed using Excel based linear/mixed integer program model (What's Best & Gurobi)
- Selects new resources to meet Avista's capacity, energy, and renewable energy requirements
- Outputs:
  - Power supply costs (variable and fixed)
  - Power supply costs variation
  - New resource selection (generation/conservation)
  - Emissions
  - Capital requirements

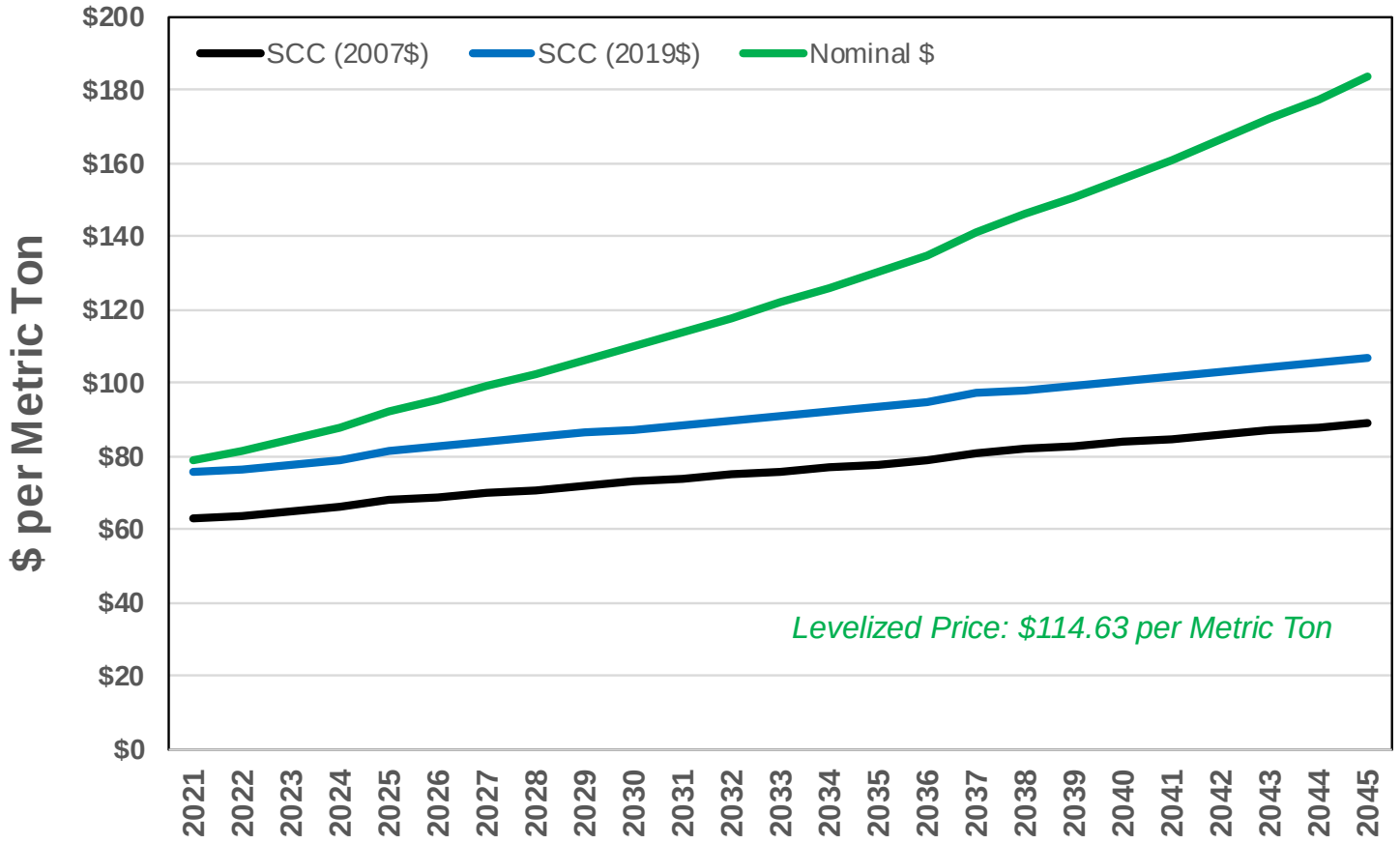
What's new with PRiSM for this IRP

- New resources may be added to either WA, ID, or combined customer requirements.
- Existing resources will be allocated to each state using the PT ratio (~65% WA and ~35% ID).
- States may sell RECs between states.
- Washington's former share of Colstrip units will be assigned to new "shareholder" portfolio after 2025.

Social Cost of Carbon (SCC)

- Social cost of carbon will be applied for new resource options for Washington customers; including
  - "Resulting" dispatch of natural gas resources from Aurora forecast of future real-time operations.
  - upstream emissions associated with natural gas drilling and transportation used to run facility.
  - manufacturing, construction, and operation of all resources (using NREL study).
  - storage and market resources will include estimate based on the average emissions rate of the region.
  - energy efficiency resources will use the hourly marginal emission rate of the region and reduction.
  - SCC will not be used for biomass/geothermal resources
- SSC prices will not be included for Idaho customers; although Avista could study this as a scenario

Social Cost of Carbon Prices



- Social cost of carbon dioxide in 2007 dollars using the 2.5% discount rate, listed in table 2, technical support document: Technical update of the social cost of carbon for regulatory impact analysis under Executive Order No. 12866, published by the interagency working group on social cost of greenhouse gases of the United States government, August 2016.
- Adjust to 2019$ using Bureau of Economics GDP
- Adjust to Nominal $ using 2.11% annual inflation rate

Issues not finalized

- Prices of REC transfer between states
  - Avista acquires new qualifying resources to meet Washington's portion of the law, although it may transfer RECs between Idaho and Washington for the 20% portion of CETA
- How to count REC's toward meet the "80%" portion of CETA
  - Must bundled RECs only qualify if meeting Avista WA state load each hour?
  - Serve any WA state load or any utility load?
  - Avista needs clarification from WUTC

What is Reliability Planning

- Estimate the probability of failure to serve all load
  - Avista's reliability target is 95% of all simulations serve 100% of load and reserve requirments
- Model randomizes events
  - Hydro, weather (load, wind, resource capacity), forced outages
- Typically large sample size 1,000 simulations
- Can be used to validate if a portfolio is reliable
  - Estimate the required planning reserve margin (PRM)
  - May be used to estimate peak credits for new resources (ELCC)
- Gold standard: regional wide program with enforced requirements to each utility
  - Set required methodology, planning margin, and resource contribution based on regional model

Reliability Modeling

- 2020 IRP included ELCC analysis for a new resource alternatives and Avista Preferred Resource Portfolio for the year 2030
- Avista sees areas to improve in reliability modeling
  - Quantity of future years
  - Create ELCC curve for new resources
  - Study all portfolio's reliability requirements
  - Improve model speed
    - Single year study takes 3 days
  - Create dynamic capability with PRiSM

Options to Address Reliability Modeling

Option	Pros	Cons
Continue using existing model (ARAM- excel model with solver)	• Results reliable for Avista system • Fully developed • Potential for modest speed improvements • Control intellectual property	• Slow • Limited to two processes • User data/knowledge intensive
Build custom professional software	• Likely faster speed • Reliable results • Potential to integrate with PRiSM	• Time to implement • Cost
Adapt Aurora	• User knowledge • Cost • Flexibility • Data management • Parallel processing limit by machines	• Slow (cost to speed up-Gurobi) • Hydro logic- results in higher LOLP • May only work for LOLH • Storage logic is slow
New Genesis Model (Power Council)	• Regional standard • Addresses regional market availability issues • Strong hydro logic • New technology	• Regional focus • Model in progress; not available for this IRP
Purchase Software/Hire Consultant	• Flexibility • Data management • Reliable results ?	• Cost • Implementation time • Risk
Regional Resource Adequacy Market	• Clear requirements for load and resources on a regional basis • Best case scenario	• Market in development not ready for this IRP • May have to make estimates for future years

Reliability Next Steps

- Continue testing Aurora application with Gurobi to understand speed improvements and result improvements
- If we use ARAM
  - Remain with single year study (2030 or 2035)
  - Use 2020 IRP ELCC estimates
  - Estimate ELCC curves for key resources (wind/ storage)
  - Conduct study for each portfolio- may result in different planning margins
  - Move to using RA logic for next IRP if a regional program is developed
- Aurora option may expand options to additional forecast years and ELCC studies
- Update progress with TAC once solution is finalized

Data Availability Proposal

- **Aurora**
  - Model requires licensing agreement with Energy Exemplar
  - Avista specific data is confidential
  - Model results will be retained by Avista
  - Avista will provide summary level results for all studies (i.e. regional prices, regional emissions, regional dispatch)
- **PRiSM**
  - All files will be available, includes annual data for each of 500 simulations for Avista resources and load
  - Requires What's Best and Gurobi license to solve, but results are fully visible
- **Load Forecast**
  - Models are confidential; models includes specific customer information and confidential data
  - Monthly energy and peak data will be available by state, along with break down between new +/- loads (i.e. rooftop solar, electric vehicles, and natural gas)
  - Full discussion of process will be covered in TAC 2
- **Resource Costs**
  - Supply-side resources spreadsheet will be available with all calculations
  - Demand-side resources; measure list and costs will be public for energy efficiency and demand response.
- **Transmission & Distribution**
  - All models and data are confidential
  - Avista will provide cost and requirements for resource integration as provided in prior IRPs
  - Full discussion of process will be covered in TAC 3
- **Reliability Planning**
  - Availability will depend on modeling solution
  - Results will be retained and available

2021 Electric IRP
Generation Resource Options

Lori Hermanson, Senior Power Supply Analyst
First Technical Advisory Committee Meeting
June 18, 2020

Overview & Considerations

- The assumptions discussed are “today’s” estimates – likely to be periodically revised
- IRP supply-side resources are commercially available technologies with potential for development within or near Avista service territory
- Resource costs vary depending on location, equipment, fuel prices and ownership; while IRPs use point estimates, actual costs will be different.
- Certain resources will be modeled as purchase power agreements (PPA) while others will be modeled as Avista “owned”. These assumptions do not mean they are the only means of resource acquisition.
- No transmission or interconnection costs are included at this time.
- Natural gas prices are 2020 IRP prices and will be revised with the “final” assumptions
- An Excel file will be distributed with all resources, assumptions and cost calculations for TAC members to review and provide feedback.

Outlook Since Last IRP

- Natural gas small CT – 4.4% ⬆
- Natural gas CCCT - 5.8% ⬆
- Solar – 8% ⬇
- Wind – 0.3% ⬇
- Lithium Ion Storage – 8% ⬆

Gas turbines 2022 vs 2020; others are 2022 vs 2022

Proposed Natural Gas Resource Options

Peakers

- Simple Cycle Combustion Turbine (CT)
  - Aero and frame units
  - Smaller units 44 MW to 84 MW
- Hybrid CT
  - 92 MW
- Reciprocating Engines
  - 9 MW to 18 MW units with up to 10 engines

Baseload

- Both modern and advanced Combined Cycle CT (CCCT) will be evaluated
  - Smaller option 249 MW (3x2)
  - Larger options 311 MW to 587 MW (1x1)
- Large 2x1 technology not modeled

Natural gas turbines are modeled using a 30-year life with Avista ownership

Renewable Resource Options

All Purchase Power Agreement (PPA) Options

Wind

- On-system wind (100 MW)
- Off-system wind (100 MW)
- Montana wind (100 MW)
- Offshore wind (100 MW)
  - Share of a larger project

Solar

- Fixed PV Array (5 MW AC)
- On-System Single Axis Tracking Array (100 MW AC)
- Off-system Single Axis Tracking Array (100 MW AC) located in southern PNW
- On-System Single Axis Tracking Array (100 MW AC) with 25 MW 4 hour lithium-ion storage resource
- May model alternative solar with smaller battery configurations

Other “Clean” Resource Options

- Geothermal (25 MW)
  - Off-system PPA
- Biomass (25 MW)
  - i.e. Kettle Falls 3 or other
- Nuclear (100 MW)
  - Off-system PPA share of a mid-size facility
- Renewable Hydrogen
  - Fuel Cell (25 MW)
  - Natural Gas Turbine Retrofit

Storage Technologies

Lithium-Ion

- Assumes: 88% round trip efficiency (RTE), 10-year operating life
- Assumes Avista ownership
- 5 MW Distribution Level
  - 6 hours (30 MWh)
- 25 MW Transmission Level
  - 4 hours (100 MWh)
  - 8 hours (200 MWh)
  - 16 hours (400 MWh)

Other Storage Options

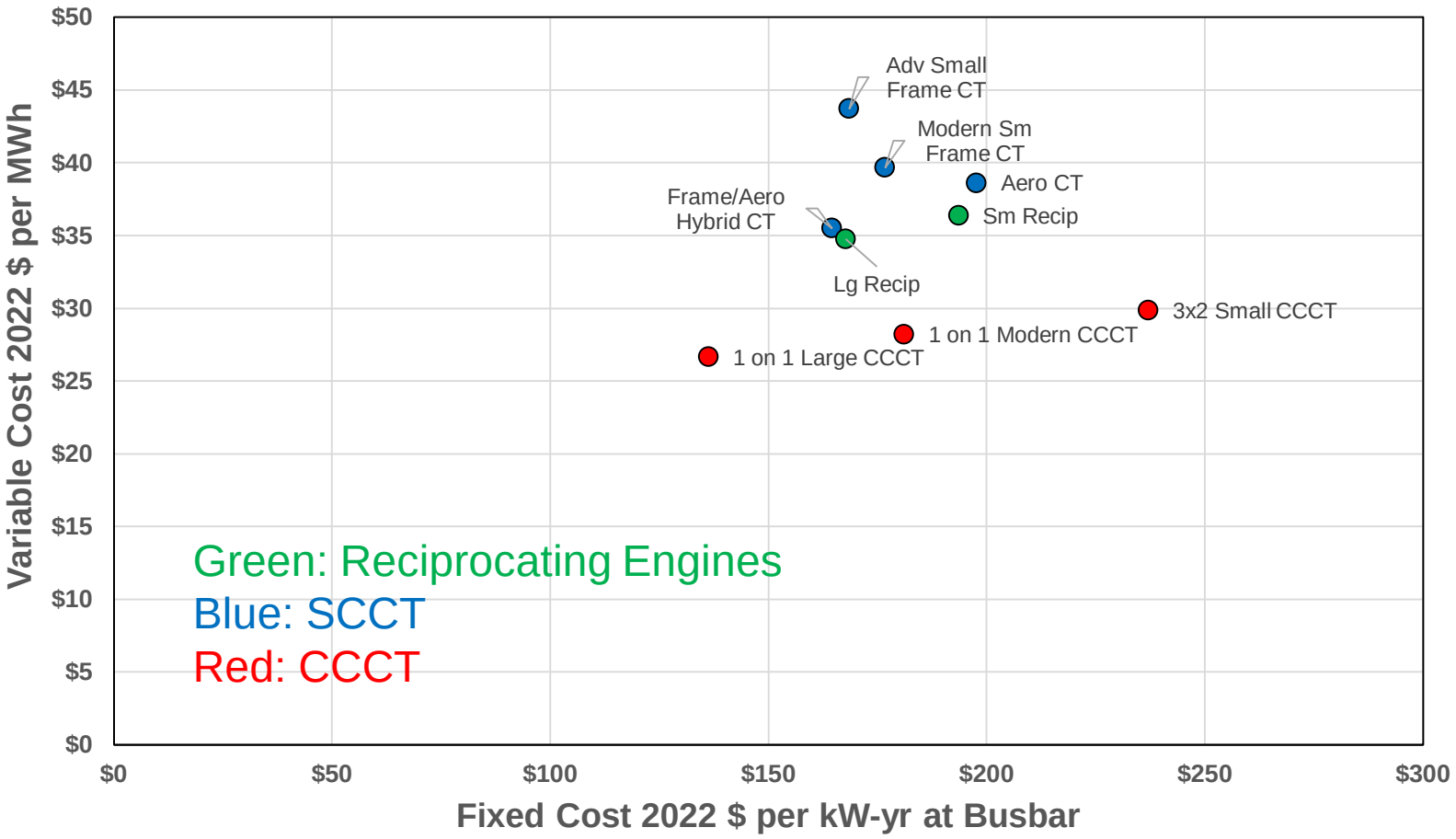
- Assumes 20 to 30-year life and Avista ownership
- 25 MW Vanadium Flow (70% RTE)
  - 4 hours (100 MWh)
- 25 MW Zinc Bromide Flow (67% RTE)
  - 4 hours (100 MWh)
- 25 MW Liquid Air (60-70% RTE)
- 100 MW Pumped Hydro
  - Share of larger project
  - PPA assumption

Updates to storage costs are likely as additional information becomes available

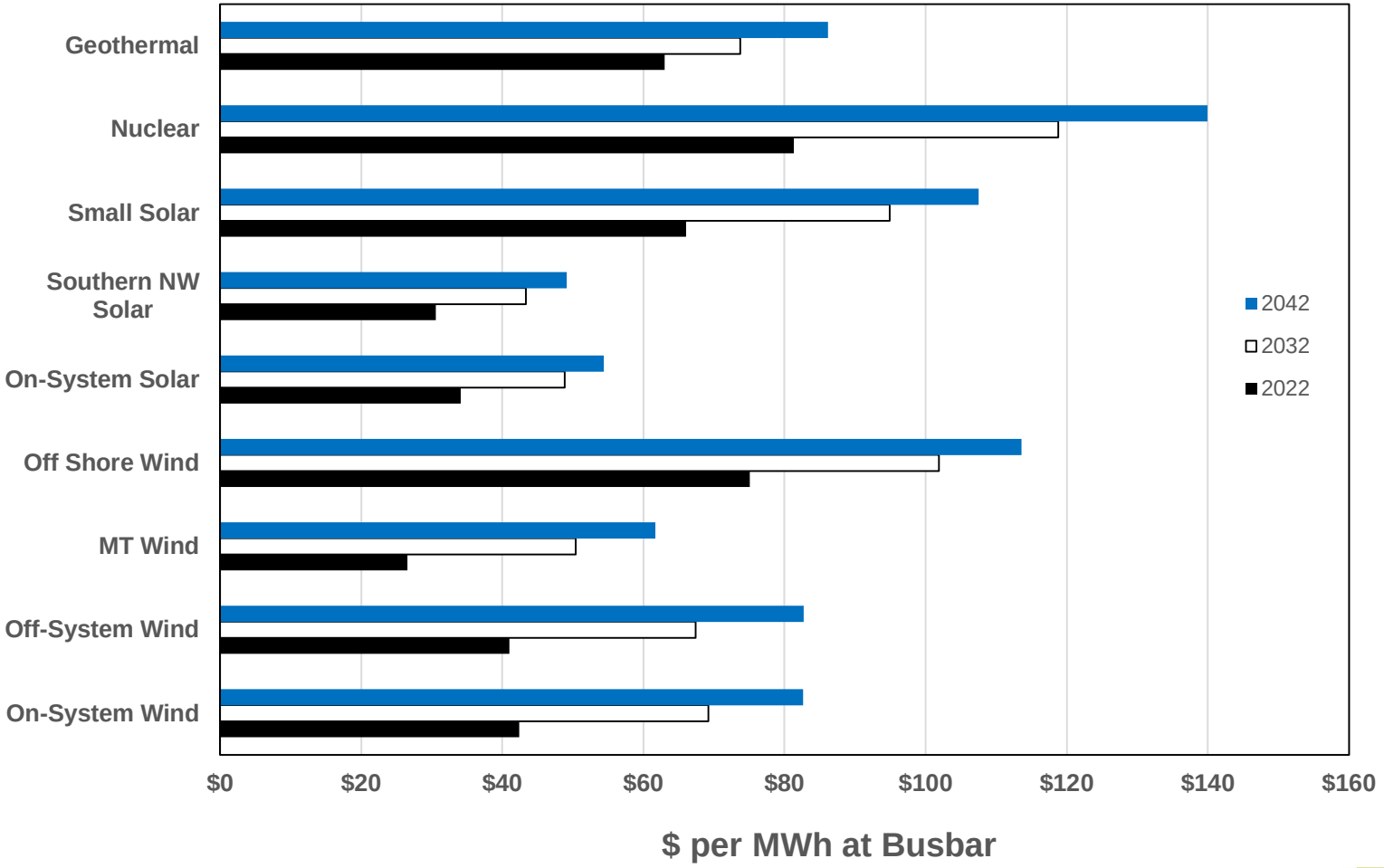
Resource Upgrades

- **Rathdrum CT** *[natural gas peaker]*
  - 5 MW by 2055 uprates
  - 24 MW add supplemental compression
  - 17 MW (summer), 0 MW (winter) Inlet Evaporation
- **Kettle Falls** *[biomass]*
  - 12 MW by repowering with larger turbine during replacement
- **Long Lake 2nd Powerhouse** *[hydroelectric]*
  - 68 MW, 12 aMW with additional powerhouse located at the current “cutoff” dam
- **Cabinet Gorge** *[hydroelectric]*
  - 110 MW, 18 aMW using the “bypass” tunnels to capture runoff spill

Natural Gas Fixed & Variable Costs



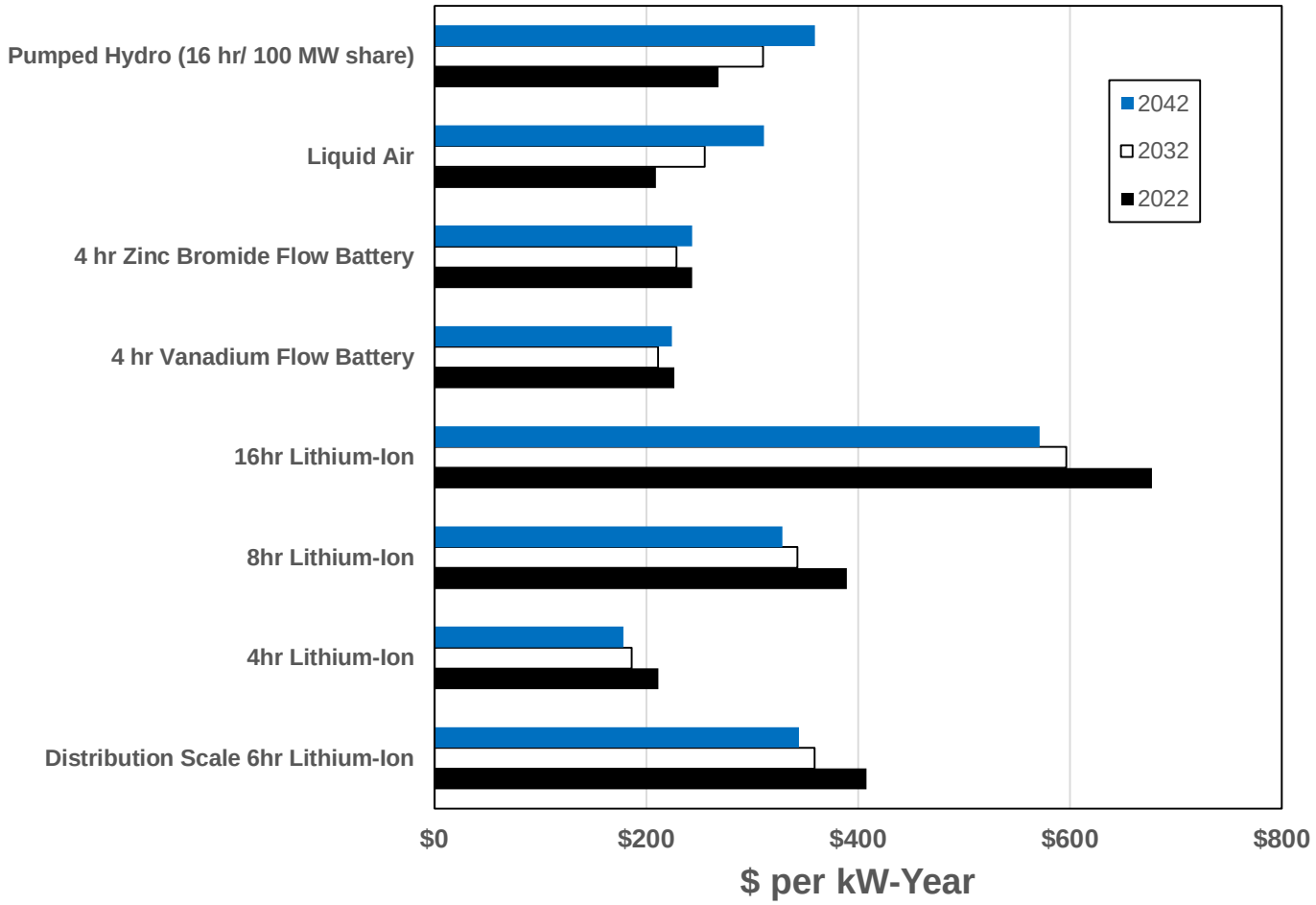
PPA Resource Cost Analysis



Prices include utility loading such as variability integration and revenue taxes

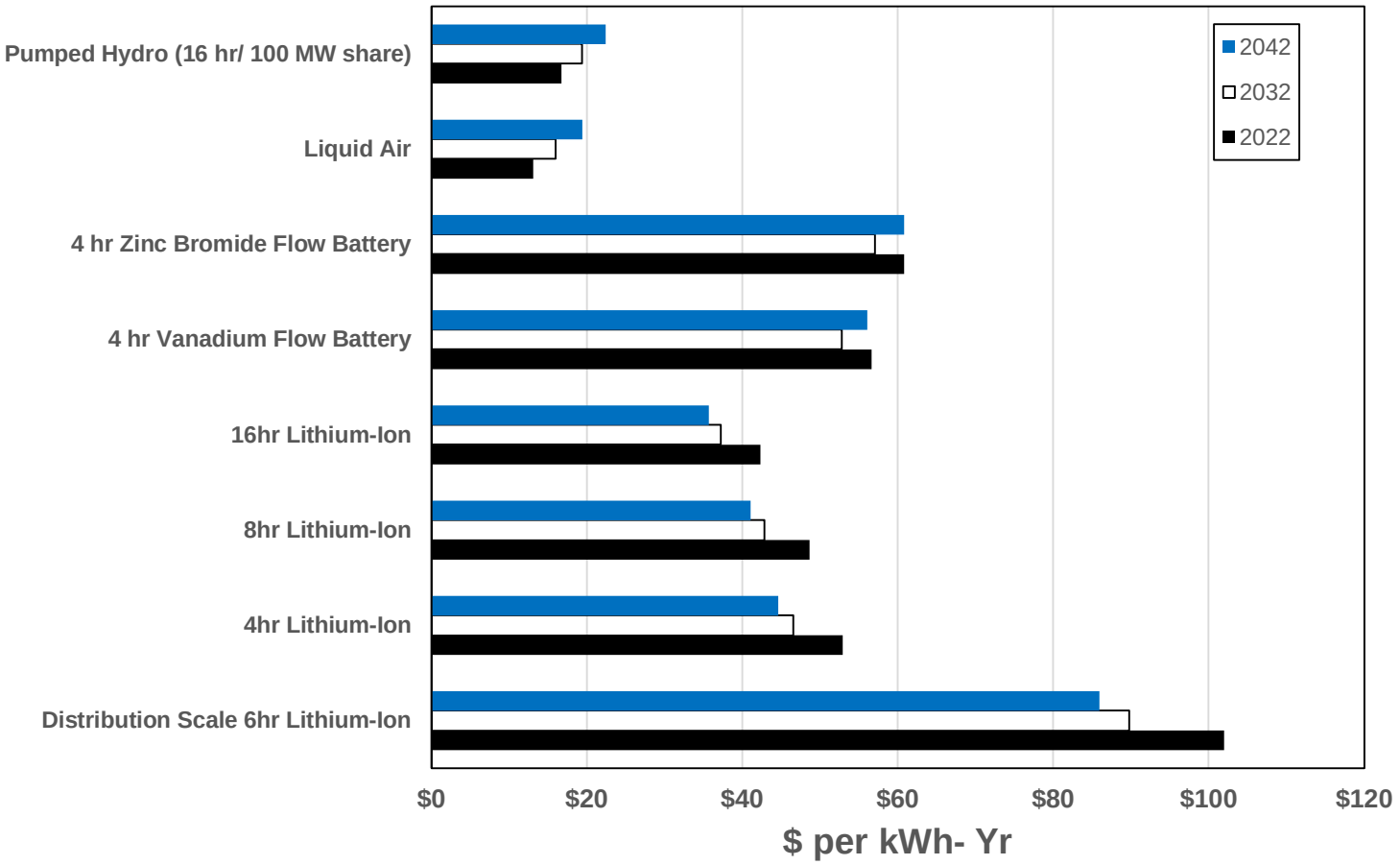
Storage Costs

Capacity based cost analysis

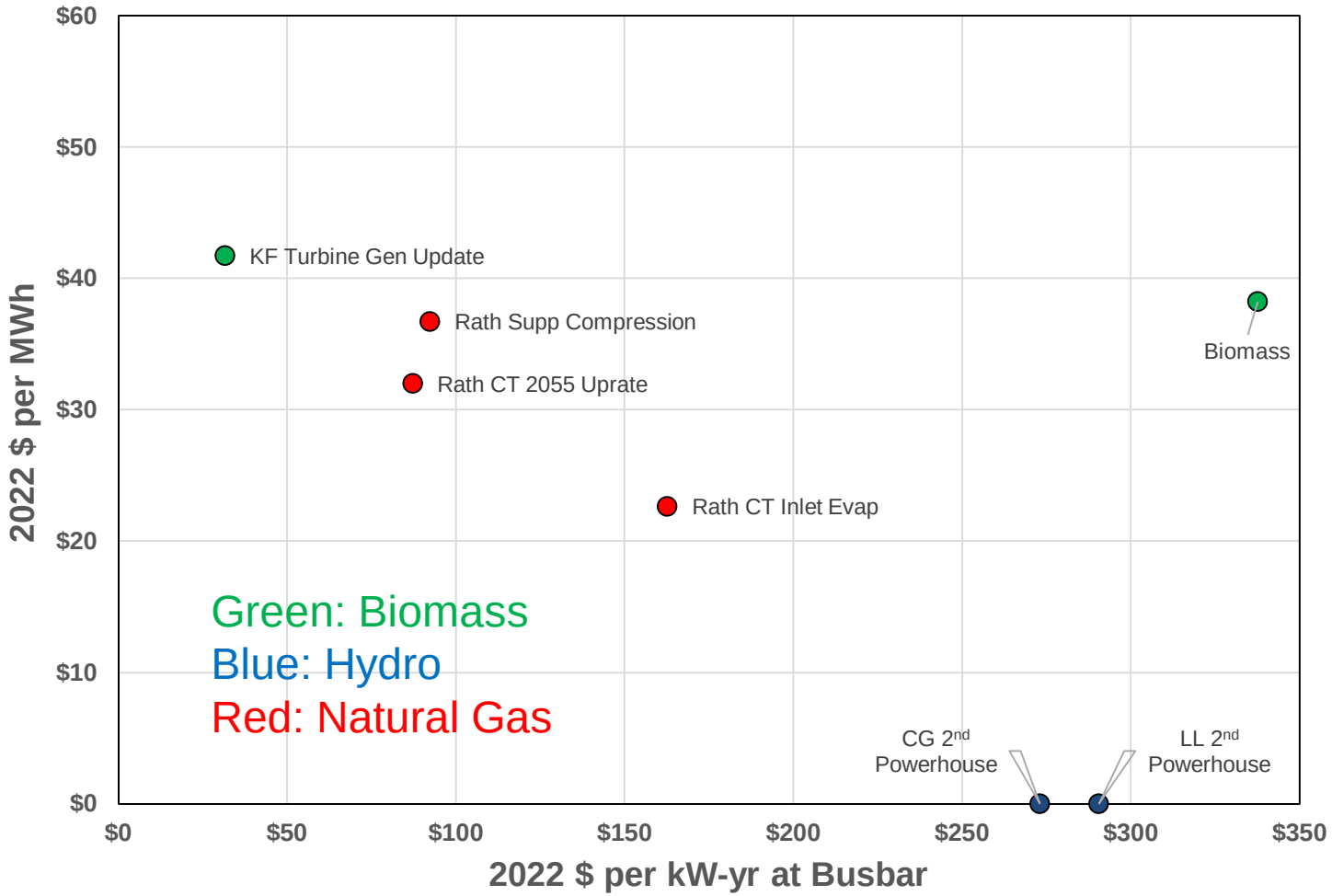


Storage Costs

Energy based cost analysis



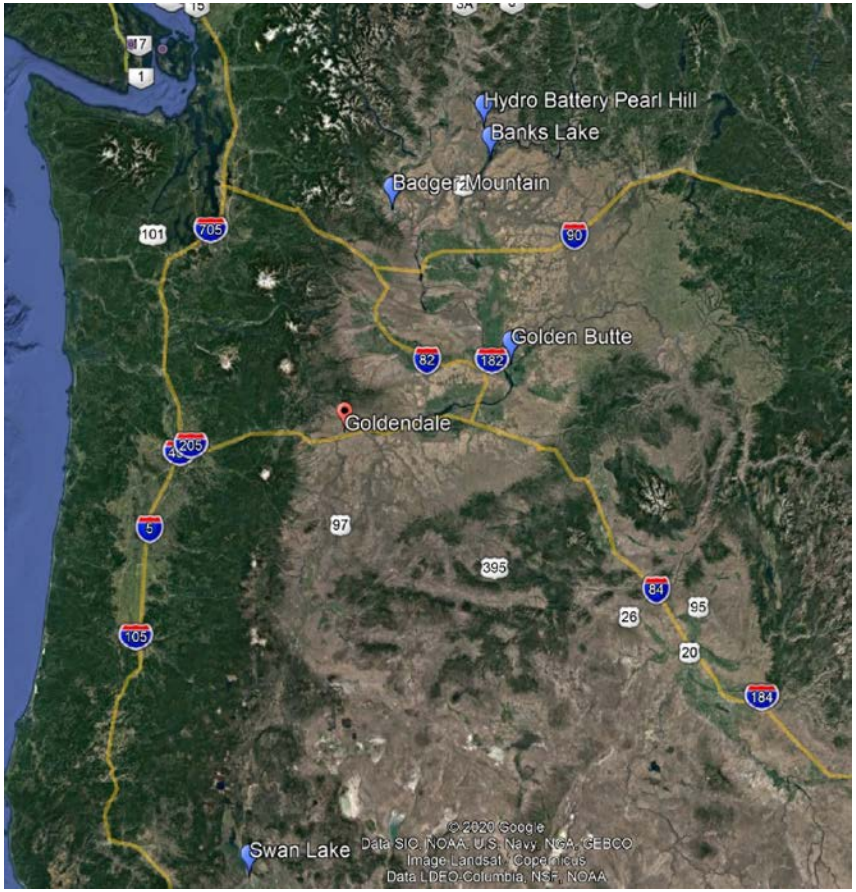
Facility Upgrade Cost Analysis



Other Power Purchase Options

- Market Power Purchases
  - Firm purchases
  - Real-time
- Mid-Columbia Hydro
  - Renegotiate slice contracts from Mid-C PUDs
- Acquire existing resources from IPPs
- Renegotiate Lancaster PPA
- BPA
  - Block surplus contract: up to 7-year term at BPA “cost”
  - NR Energy Sales: $78.94 MWh
  - After 2028, other potential options when current Regional Dialogue contracts expire

Other Items for TAC Input



- Pumped hydro
  - Model specific projects vs. generic options
- Hydrogen Technologies (still researching)
  - Fuel cell
  - Gas turbine retrofit
- Will consider other resource options subject to TAC input

Review Excel Sheet

2021 Electric IRP
Washington Vulnerable Populations & Highly Impacted Communities

James Gall, IRP Manager

First Technical Advisory Committee Meeting

June 18, 2020

CETA: Section 1

(6) The legislature recognizes and finds that the public interest includes, but is not limited to:

- The equitable distribution of energy benefits and reduction of burdens to vulnerable populations and highly impacted communities;
- long-term and short-term public health, economic, and environmental benefits and the reduction of costs and risks;
- and energy security and resiliency.

It is the intent of the legislature that in achieving this policy for Washington, there should not be an increase in environmental health impacts to highly impacted communities.

Definitions

(23) "Highly impacted community" means a community designated by the department of health based on cumulative impact analyses in section 24 of this act or a community located in census tracts that are fully or partially on "Indian country" as defined in 18 U.S.C. Sec. 1151

(40) "Vulnerable populations" means communities that experience a disproportionate cumulative risk from environmental burdens due to:

(a) Adverse socioeconomic factors, including unemployment, high housing and transportation costs relative to income, access to food and health care, and linguistic isolation; and

(b) Sensitivity factors, such as low birth weight and higher rates of hospitalization.

How Avista Reaches These Communities Today

- Low income assistance
- Senior/disability rate discount
- Project share
- Energy efficiency programs
- Energy fairs and workshops
- Corporate and Avista Foundation giving
- Energy home audits
- Prevention of wood smoke part of energy efficiency analysis
- Wildfire mitigation program
- Public access to hydro facilities
- Park development
- Neighborhood engagement when developing projects
- Tribal hiring
- Energy pathways program
- Tribal settlements
- Hydro relicensing outreach
- Wildlife land purchases

IRP Requirements (Section 14)

(k) An assessment, informed by the cumulative impact analysis conducted under section 24 of this act, of: Energy and nonenergy benefits and reductions of burdens to vulnerable populations and highly impacted communities; long-term and short-term public health and environmental benefits, costs, and risks; and energy security and risk;

Sec. 24. By December 31, 2020, the department of health must develop a cumulative impact analysis to designate the communities highly impacted by fossil fuel pollution and climate change in Washington. The cumulative impact analysis may integrate with and build upon other concurrent cross-agency efforts in developing a cumulative impact analysis and population tracking resources used by the department of health and analysis performed by the University of Washington department of environmental and occupational health sciences. [https://www.doh.wa.gov/CETA/CIA]

How Will Avista Address These New Requirements?

- Gain perspectives from advisory group(s) for additional requirements or from new rules
- Identify and engage highly impacted communities & vulnerable populations
  - Advisory groups
  - Encourage representatives to either participate in existing advisory groups or potentially create a new advisory group to address the community impacts.
- Create baseline data
- Estimate benefits/impacts from IRP

Identifying Communities or “Customers”

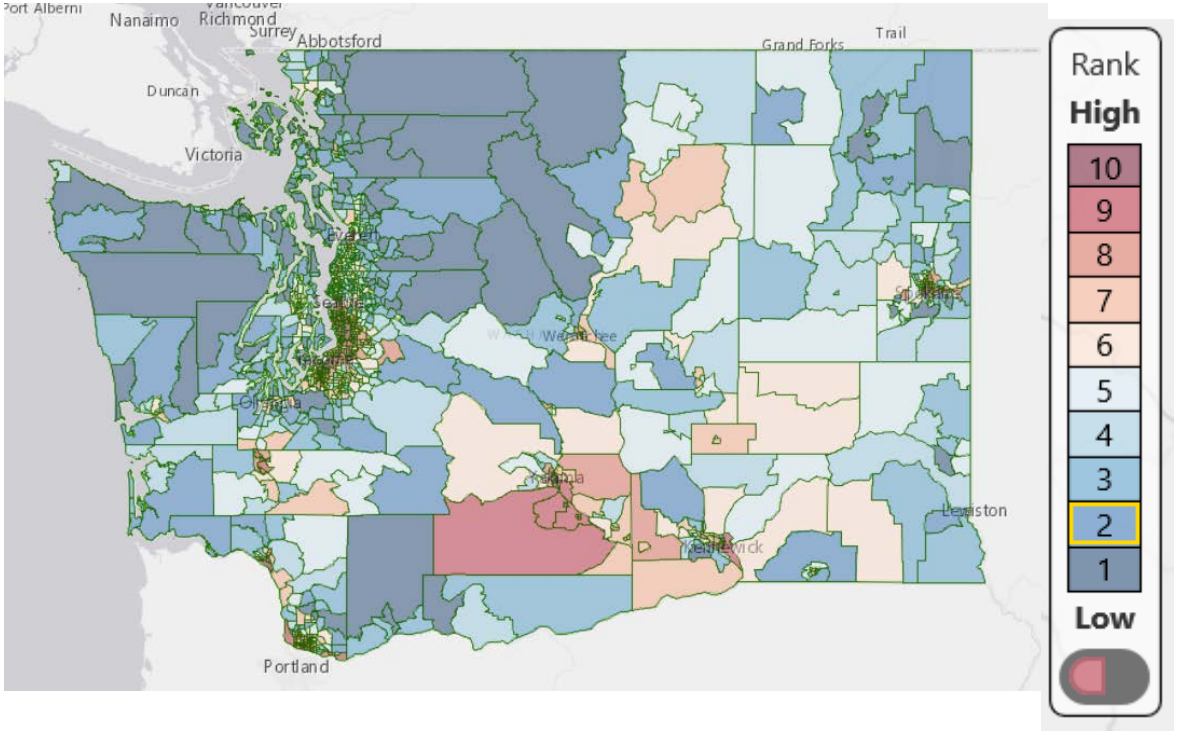
Highly Impacted Communities

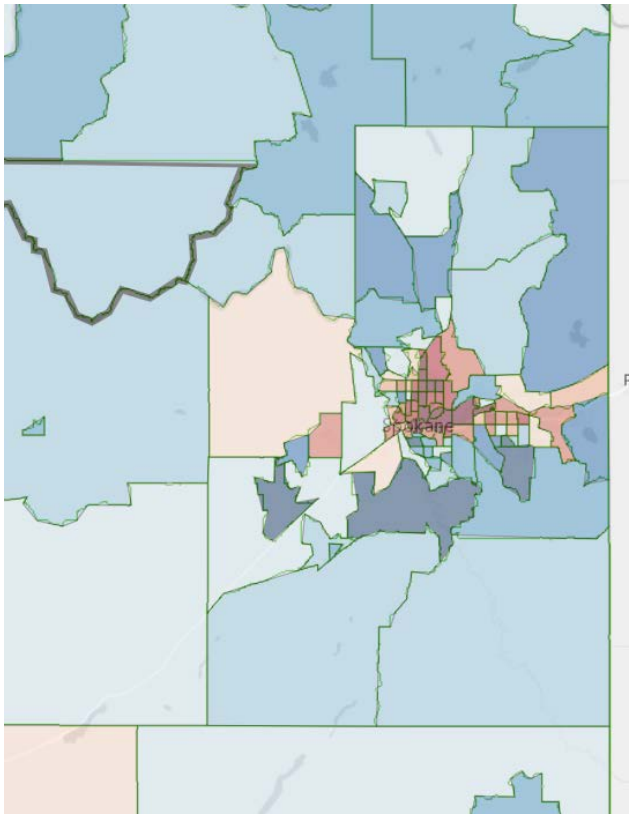
- Cumulative Impact Analysis
- Tribal lands
  - Spokane
  - Colville
- Locations should be available by end of 2020
  - State held workshops in August & September 2019

Vulnerable Populations

- Use Washington State Health Disparities map
  - What is disproportionate on a scale of 1 to 10?
  - Avista proposes areas with a score 8 or higher in either Socioeconomic factors or Sensitive population metrics
- Should we include other metrics to identify these communities?

Environmental Health Disparities Map

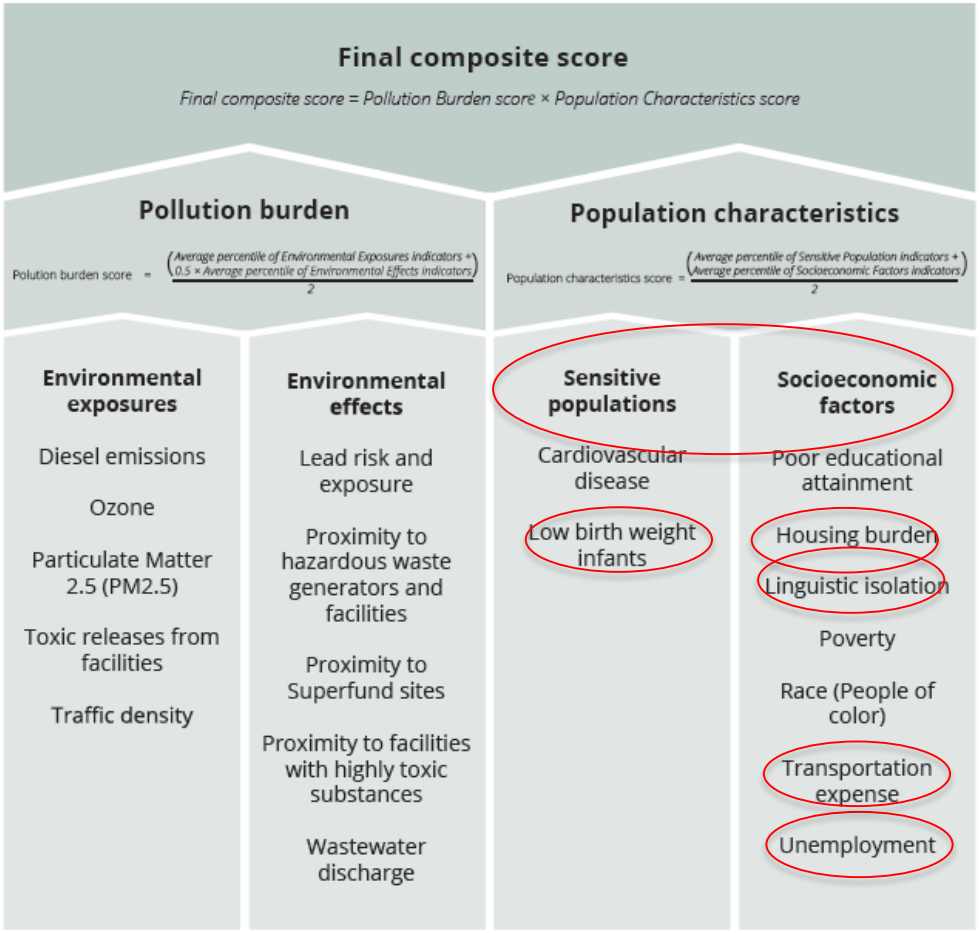




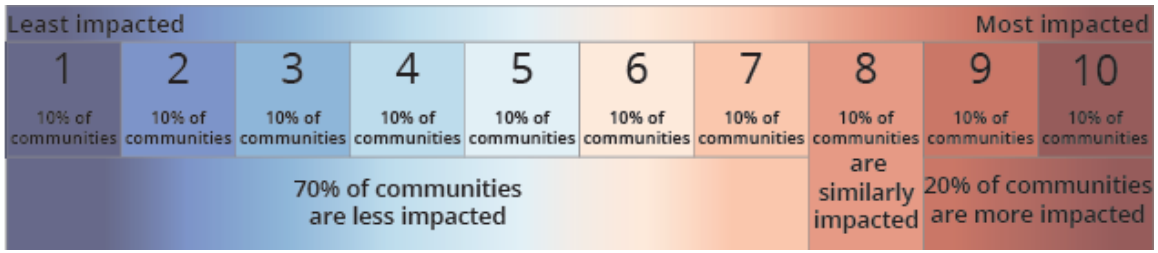
https://fortress.wa.gov/doh/wtn/wtnibl/

Data by FIPS Code

Environmental Health Scoring

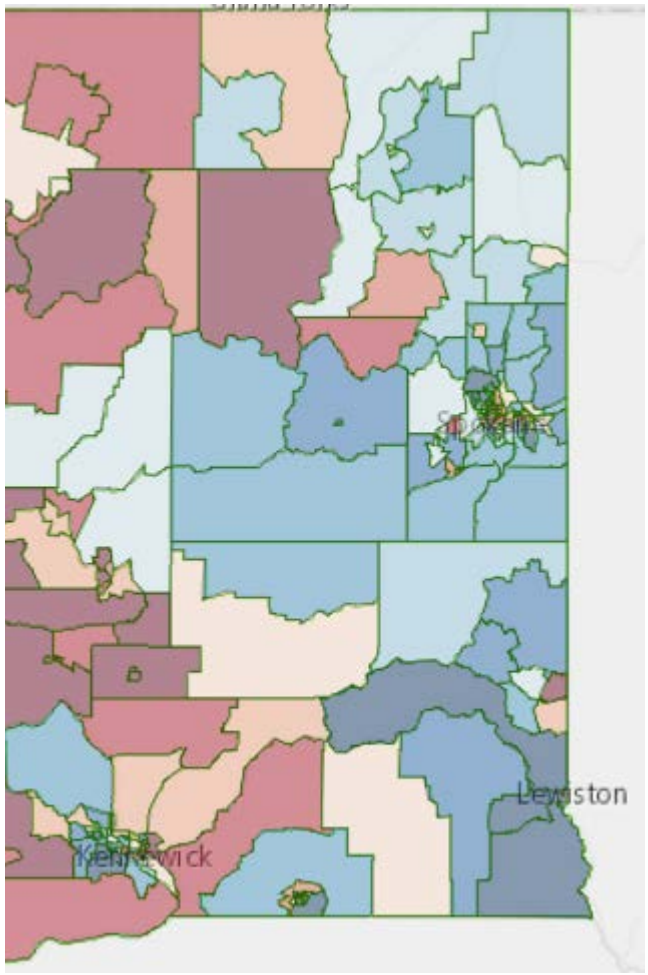


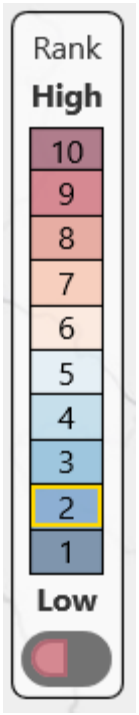
Circle areas match definition of vulnerable population, although access to food & health care, higher rates of hospitalization are not expressively included but are an indication of poverty



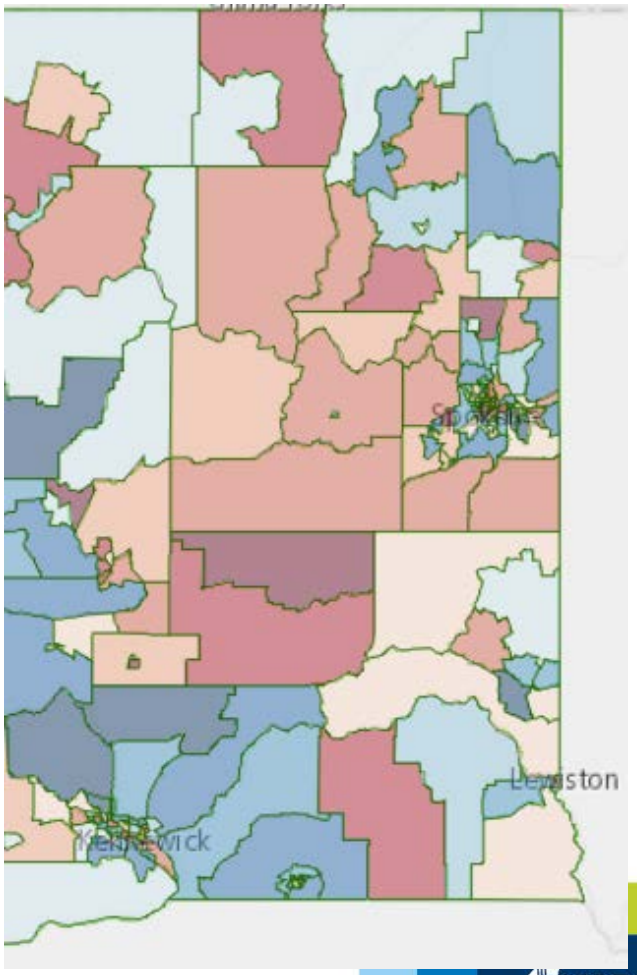
Eastern Washington Communities

Socioeconomic Factors

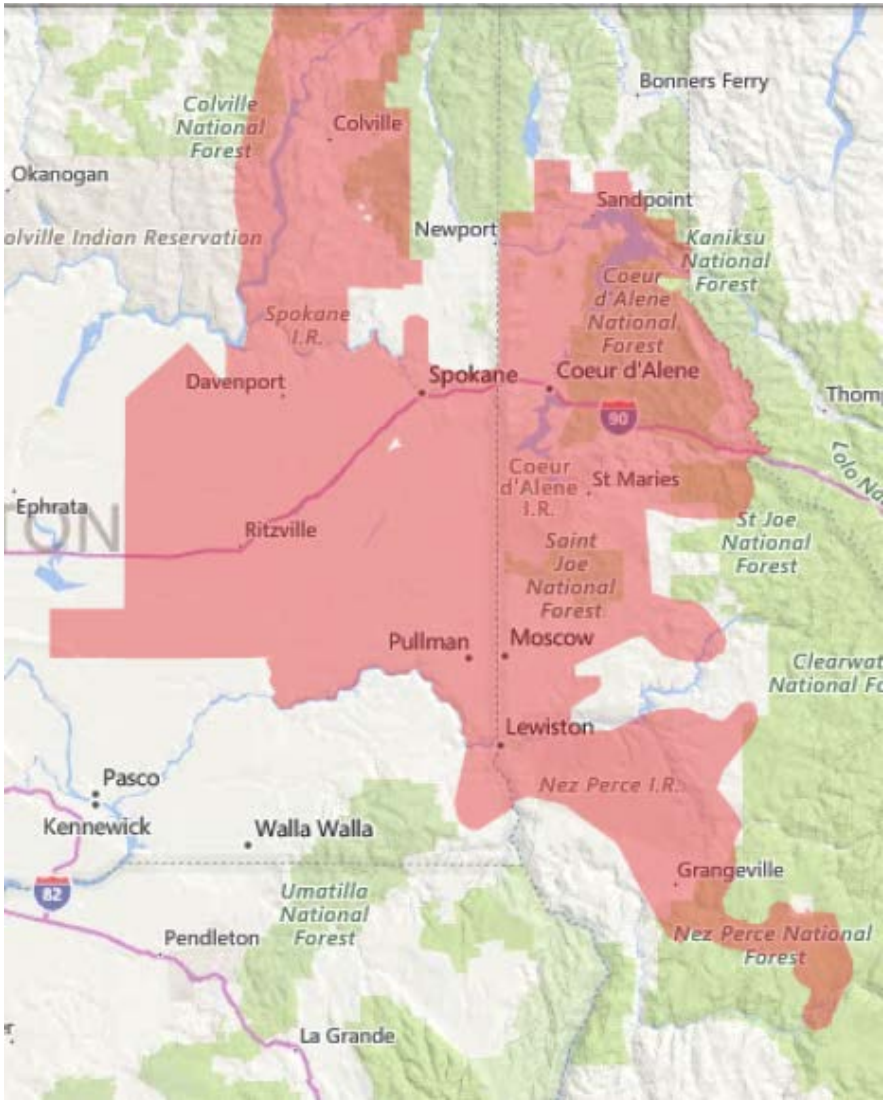




Sensitive Populations



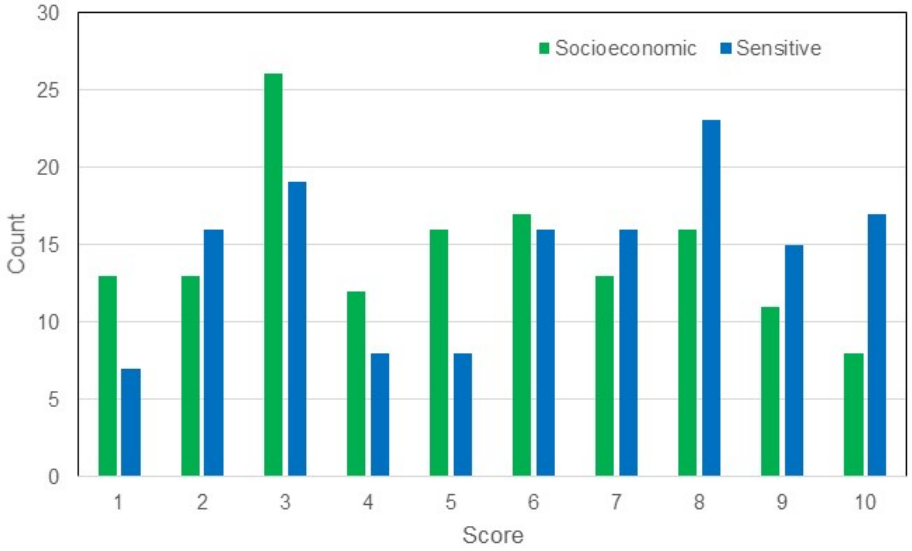
Avista Electric Service Territory



Data Analysis of Vulnerable Populations

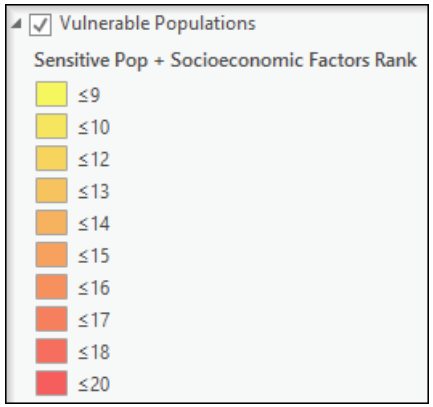
Avista has 145 communities identified

- 35 (24%) have an 8 or higher for Socioeconomic Factors
- 55 (38%) have an 8 or higher for Sensitive Populations
- 67 (46%) are considered vulnerable

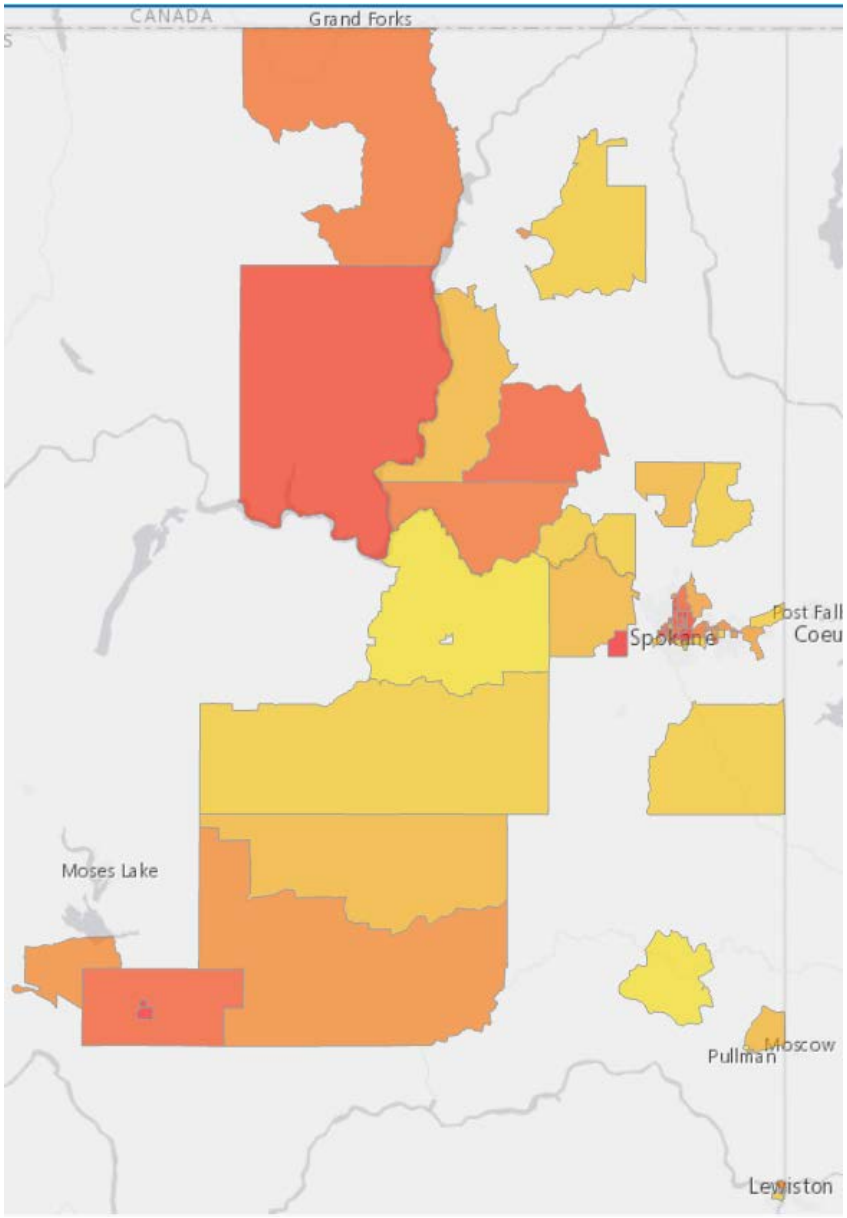


	Socioeconomic	Sensitive
Avista (Mean)	5.1 (5 median)	6.0 (6 median)
State (Mean)	5.4 (5 median)	5.2 (5 median)
Avista (Stdev)	2.67	2.83
State (Stdev)	2.88	2.88

Selected Vulnerable Populations



Data is shown by combined score



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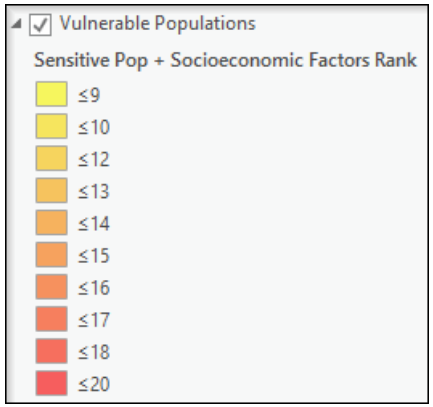
Spokane Area “Avista” Vulnerable Populations



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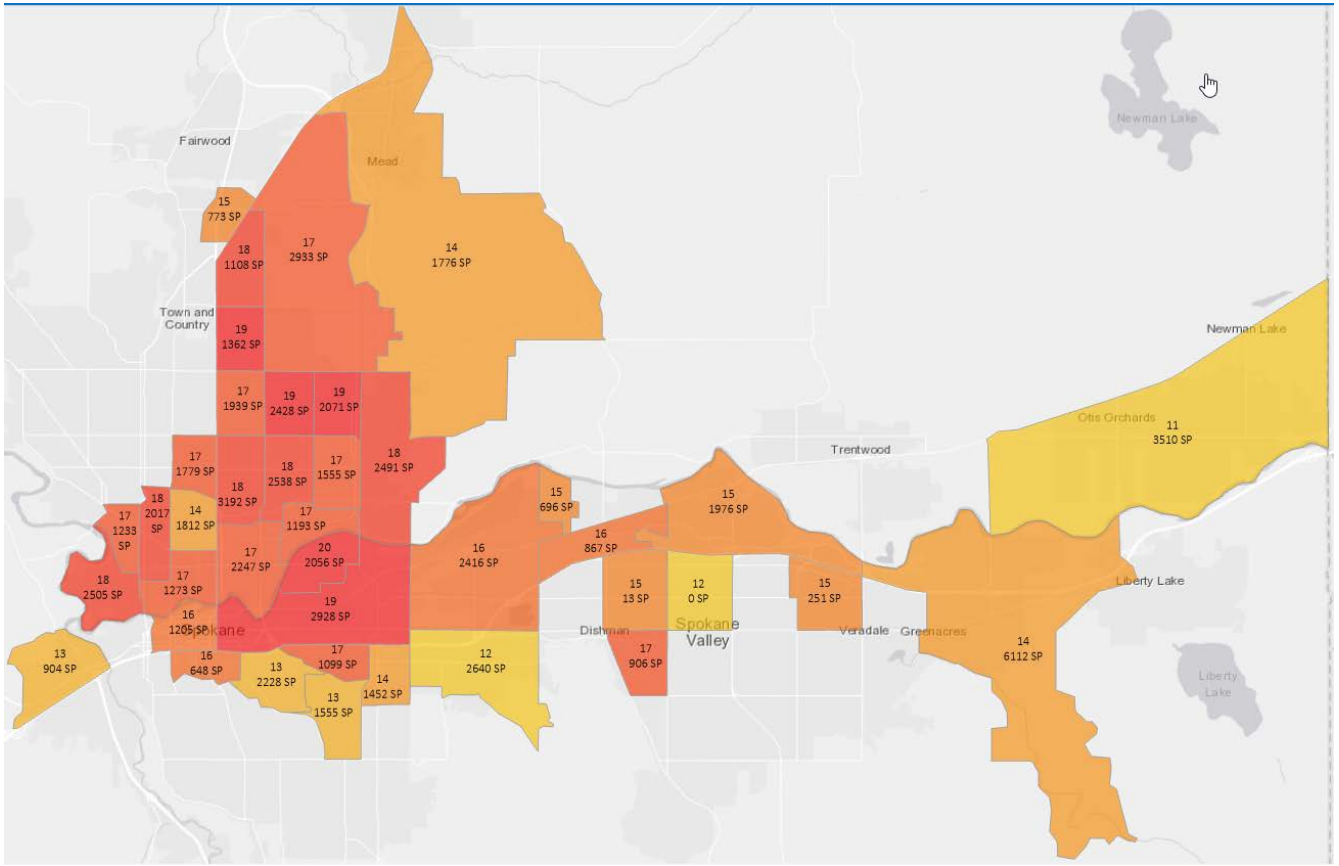

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IRP Metrics

Metric	IRP Relationship
Energy Usage per Customer	• Expected change taking into account selected energy efficiency then compare to remaining population. • EE includes low income programs and TRC based analysis which includes non-economic benefits.
Cost per Customer	• Estimate cost per customer then compare to remaining population. • How do IRP results compare to above 6% of income?

Preference	• Should the IRP have a monetary preference?
	  • For example- should all customers pay more to locate assets (or programs) in areas with vulnerable populations or highly impacted communities?
	  • If so, how much more?

IRP Metrics

Metric	IRP Relationship
Reliability • SAIFI: System Average Interruption Frequency Index • MAIFI: Momentary Average Interruption Frequency Index	• Calculate baseline for each distribution feeder and match with communities • Estimate benefits for area with potential IRP distribution projects • Compare to other communities as baseline • May be more appropriate in Distribution plan rather than IRP
Resiliency: • SAIDI: System Average Interruption Duration Index • CAIDI: Customer Average Interruption Duration Index • CELID: Customer's Experiencing Long Duration Outages	
Resource Analysis	• Estimate emissions (NO_X, SO_2, PM2.5, Hg) from power projects located in/near identified communities • Identify new resource or infrastructure project candidates with benefit to communities; i.e. economic benefit, reliability benefit • Identify how resource can benefit energy security

TAC Input

- What other metrics can we provide in an IRP to show vulnerable populations and highly impacted communities are not harmed by the transition to clean energy