2020 IRP PROCESS AND APPROACH

Seattle City Light Resource Planning

Stakeholders Meeting - January 10, 2020

MEETING LOGISTICS

Click here to: Join Skype Meeting

Trouble Joining? Try Skype Web App

Join by phone

206-386-1200,,11749# (US)	English (United States)
844-386-1200,,11749# (US)	English (United States)

Conference ID: 11749

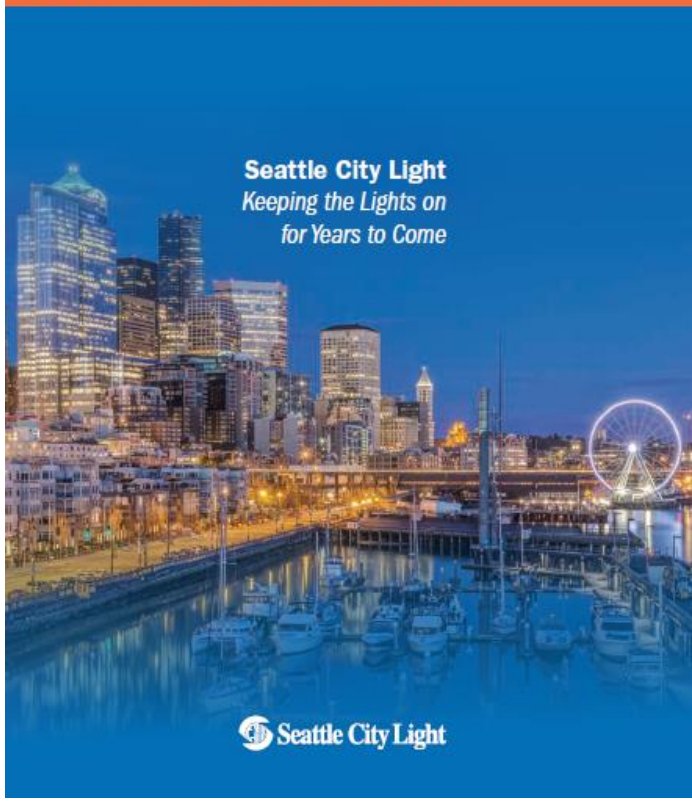
- If you need to reach us during the meeting
  - First use Skype chat feature
  - If chat doesn't work, call Shirley Louie at 206-386-4514
  - Email isn't the best way to reach us during the meeting

TODAY'S MEETING OBJECTIVES

- Informational meeting
- Review IRP process
- Technical process overview
- City Light's key model information
- 2020 IRP goals and challenges
- Next steps and feedback

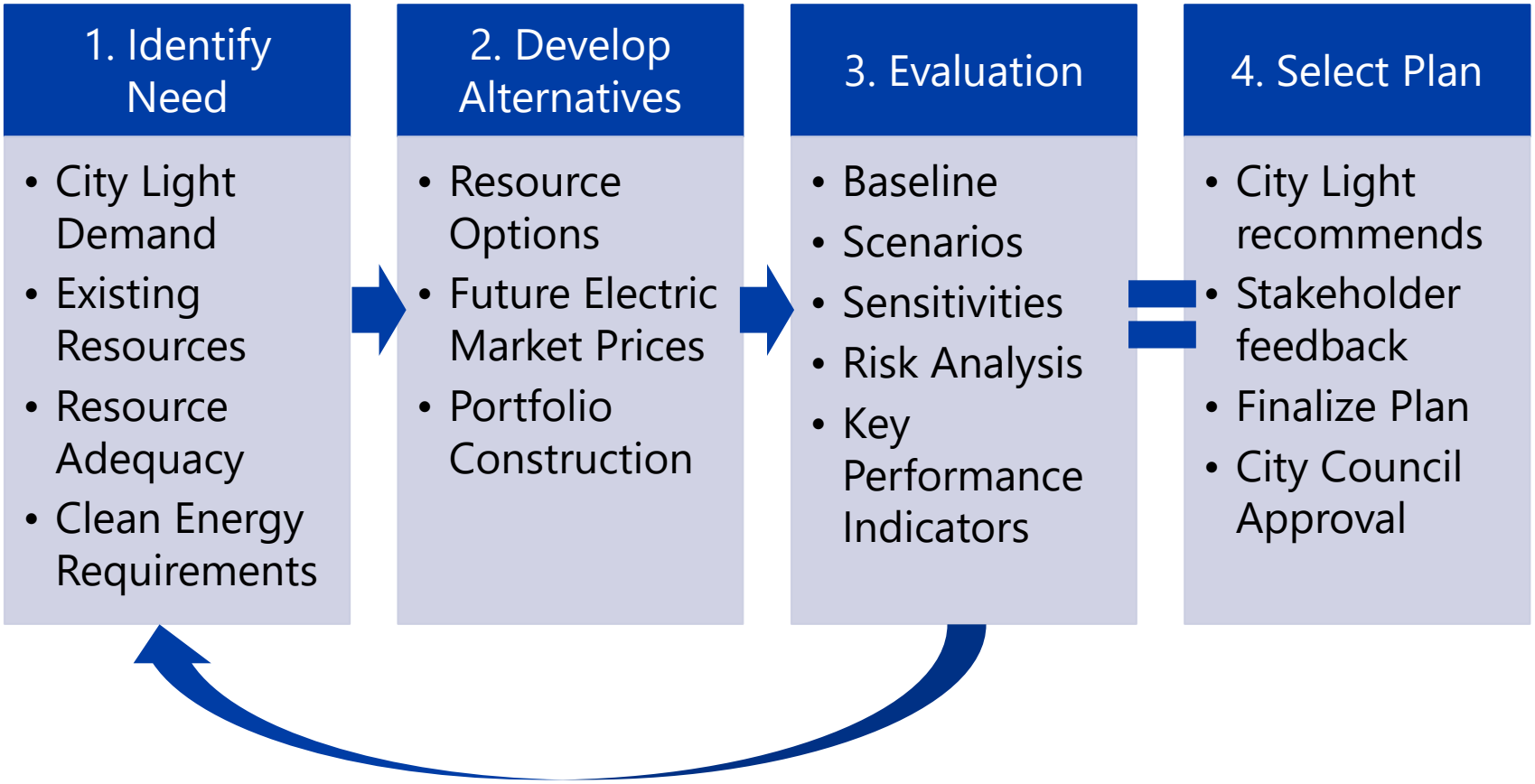
INTEGRATED RESOURCE PLANNING

- Identifies how City Light plans to meet Seattle area's electric power supply needs for the next 10 to 20 years
- Explains the mix of generation and demand-side resources that we plan to use for:
  - Clean Energy Transformation Act (NEW)
  - Energy Independence Act
  - Adequate power supply
  - Seattle's policies and ordinances
- Presents a 10-year clean energy implementation plans and a 2-year action plan



HIGH-LEVEL INTEGRATED RESOURCE PLAN TIMELINE

TECHNICAL PROCESS



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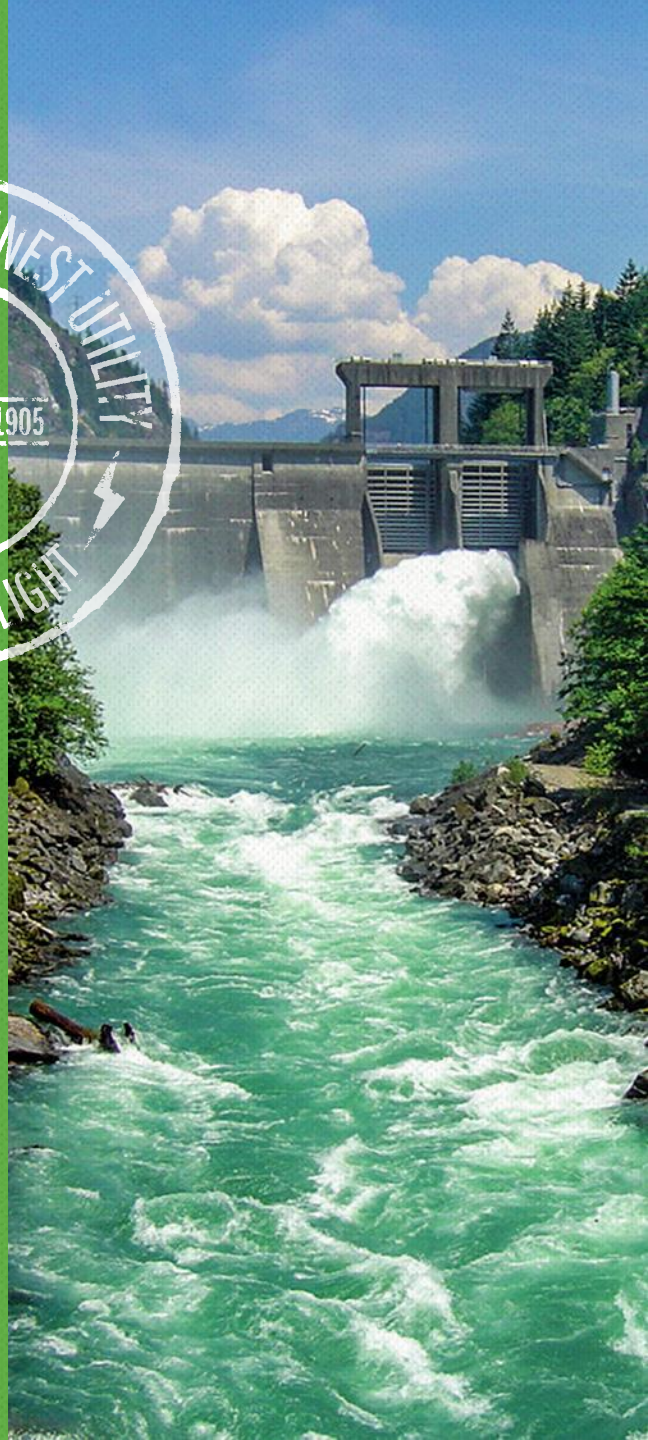


RESOURCE ADEQUACY

Approach and model explained

WHAT IS RESOURCE ADEQUACY?

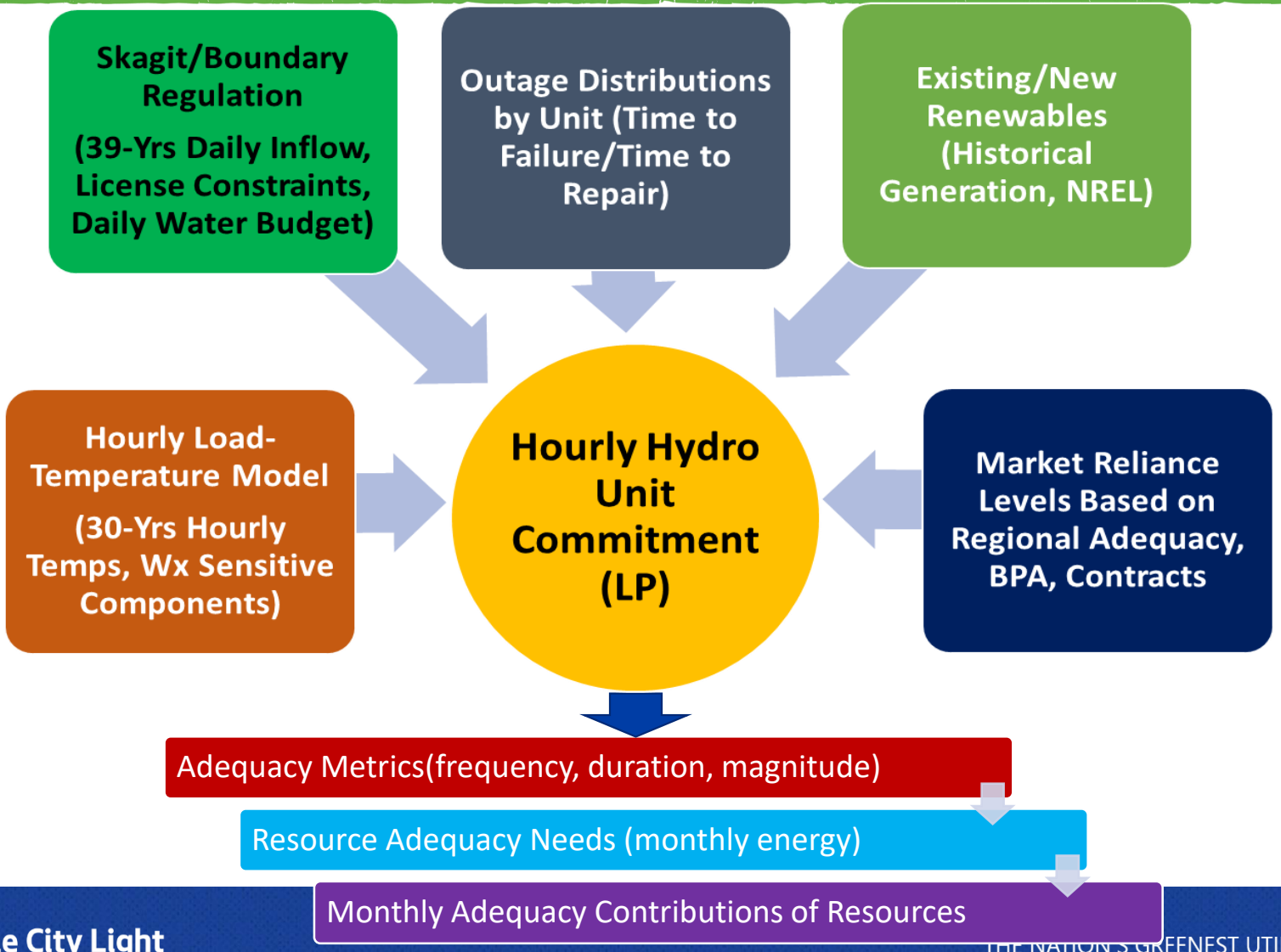
From John Fazio's 10/16/2019 presentation

- A power supply is adequate if it can supply all electrical needs, **within an acceptable level of tolerance**, accounting for unscheduled component outages and unexpectedly high demand

NEW RESOURCE ADEQUACY MODEL
HYDRO **R**ISK AND **R**ELIABILITY **A**NALYZER

- Objective function: Maximize generation to meet hourly **demand** given the following
  - Daily water inflows, hydro power plant operating objectives
  - unit efficiencies, unit level outages, min/max unit generation capability
  - operating reserve requirements
  - market reliance levels based on regional analysis/studies
- Produces hydro units' hourly maximum generation patterns; calculates chronologically hourly energy surplus or deficit for all simulations
- Computes adequacy metrics and contributions by month

HYDRRA - MODELING FRAMEWORK
A MONTE CARLO APPROACH



MONTHLY ENERGY ADEQUACY NEEDS HYDRRA OUTPUTS

- define 'bad' events or relevant curtailment events, calculate metrics(frequency, duration, magnitude)
- establish a metric target(s) on the bad events
- vary energy loads until the metric target is achieved
- adequacy need is the difference between the current energy available and the energy needed to meet the target metric
- adequacy needs vary by scenario (load, hydro)
  - electrification impacts on load
  - climate change impacts on loads and hydro

ADEQUACY METRICS CALCULATED BY MONTH

Metric	Definition
LOLEV (events/year)	Loss of load events = Total events divided by total number of games (event = contiguous set of curtailment hours)
EUE (MW-hours)	Expected Unserved Energy = Total curtailment energy divided by the total number of games
LOLP (percent)	Loss of Load Probability = Total number of games with one or more curtailment event divided by the total number of games
LOLH (hours/year)	Loss of load hours = Total curtailment hours divided by total number of games

MONTHLY ADEQUACY CONTRIBUTIONS

- Also known as ELCC-effective load carrying capability
- Amount of incremental load a resource can serve without degrading adequacy; measured as the likelihood that a new resource can reliably contribute to resource adequacy
- Accounts for hydro flexibility, BPA block contract interactions, and can vary by month and year
- Adequacy contributions calculated for each resource option:
  - energy efficiency programs by customer class
  - demand response for winter and summer months
  - renewables: solar (utility scale and behind the meter), wind
  - other renewables: geothermal/biomass
  - other resources: storage, existing(owned/contracts)

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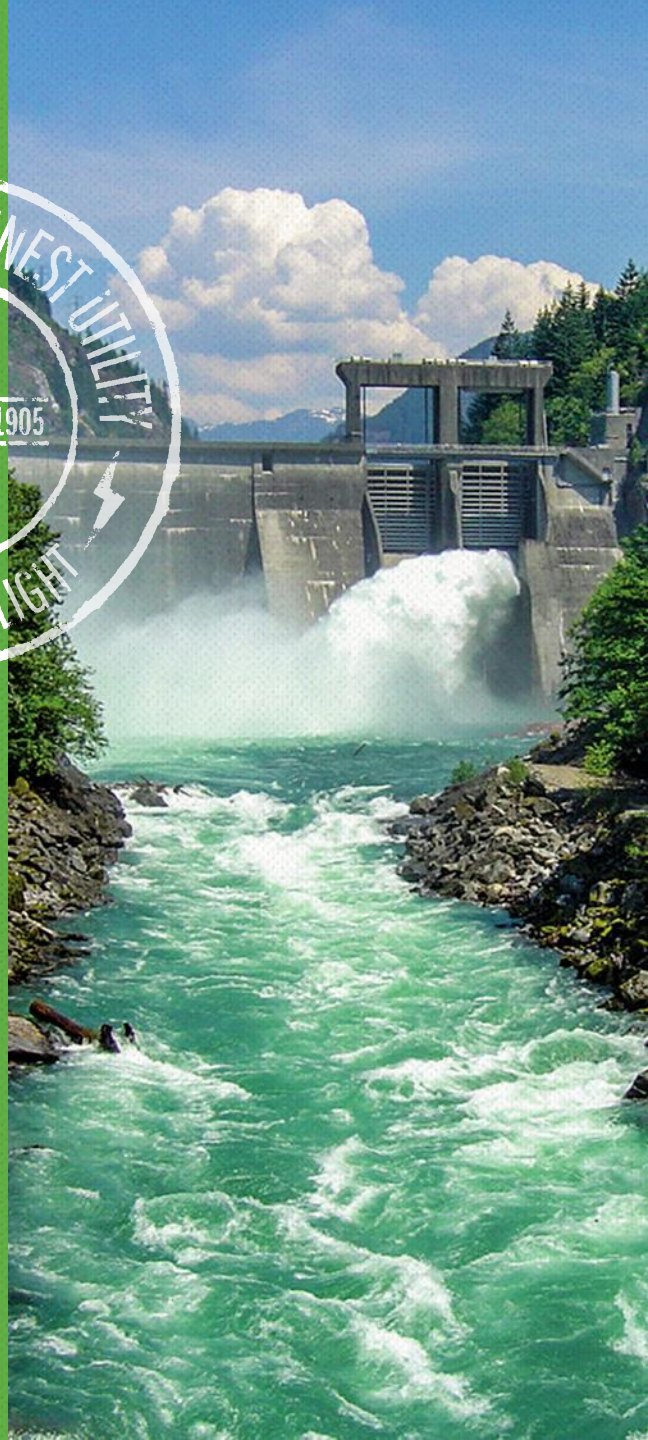
BASELINE AND SCENARIO WESTERN POWER MARKET FUTURES

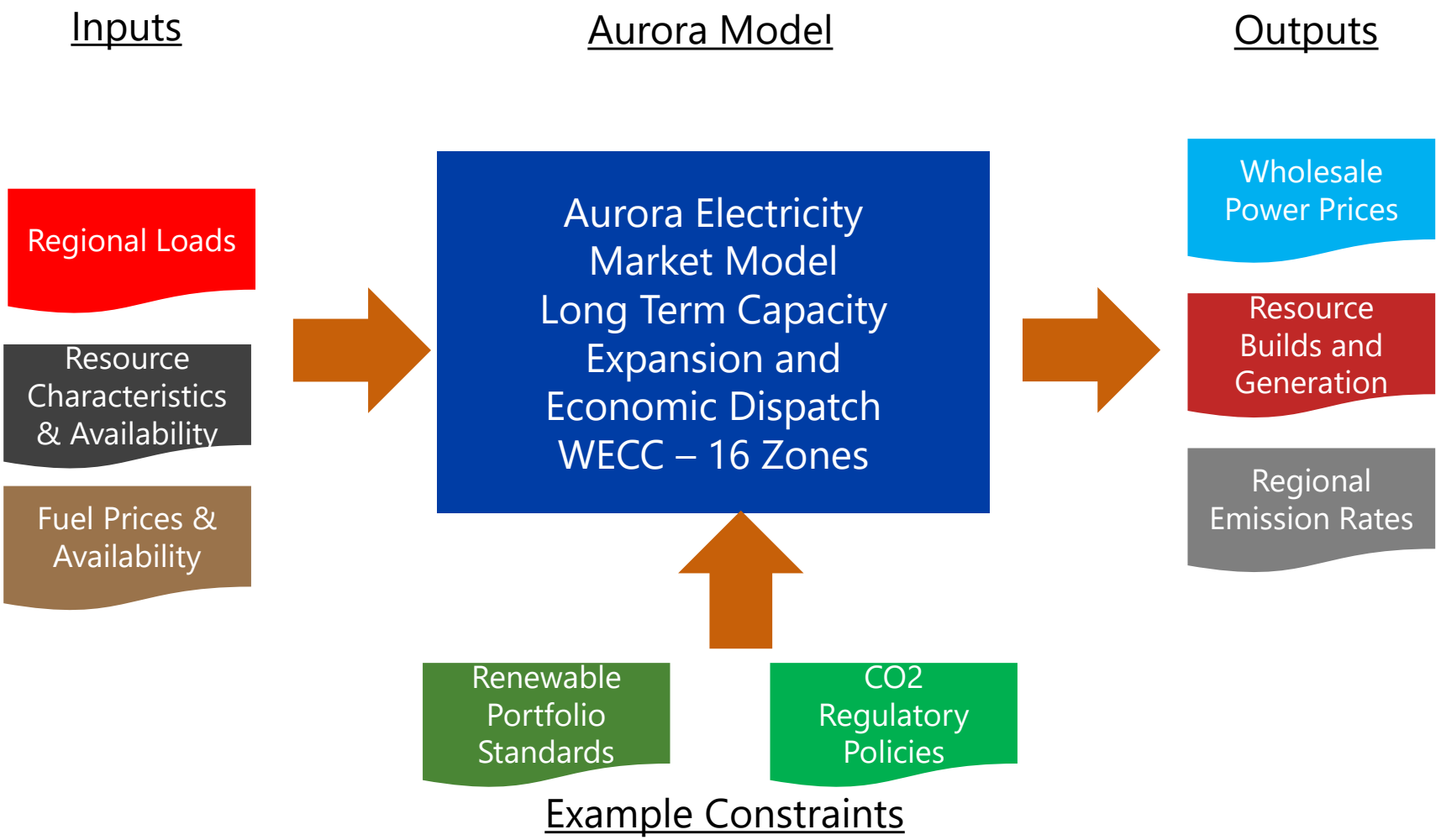
AURORA Model



AURORA MODEL

- A third-party fundamentals-based COTS production cost model that City Light uses to simulate the western US electric system based on a zonal topology
- Transmission connections allows for economic imports and exports between zones to meet demand, given transfer capacity, losses and wheeling costs
- Resource dispatching that may economically add/retire resources within zones to maintain adequate supply and demand based on user specified reserve margins
- Produces hourly electric market prices based on the variable costs of the marginal resource that meets load for each hour (marginal clearing price methodology)

AURORA ELECTRICITY MARKET MODEL



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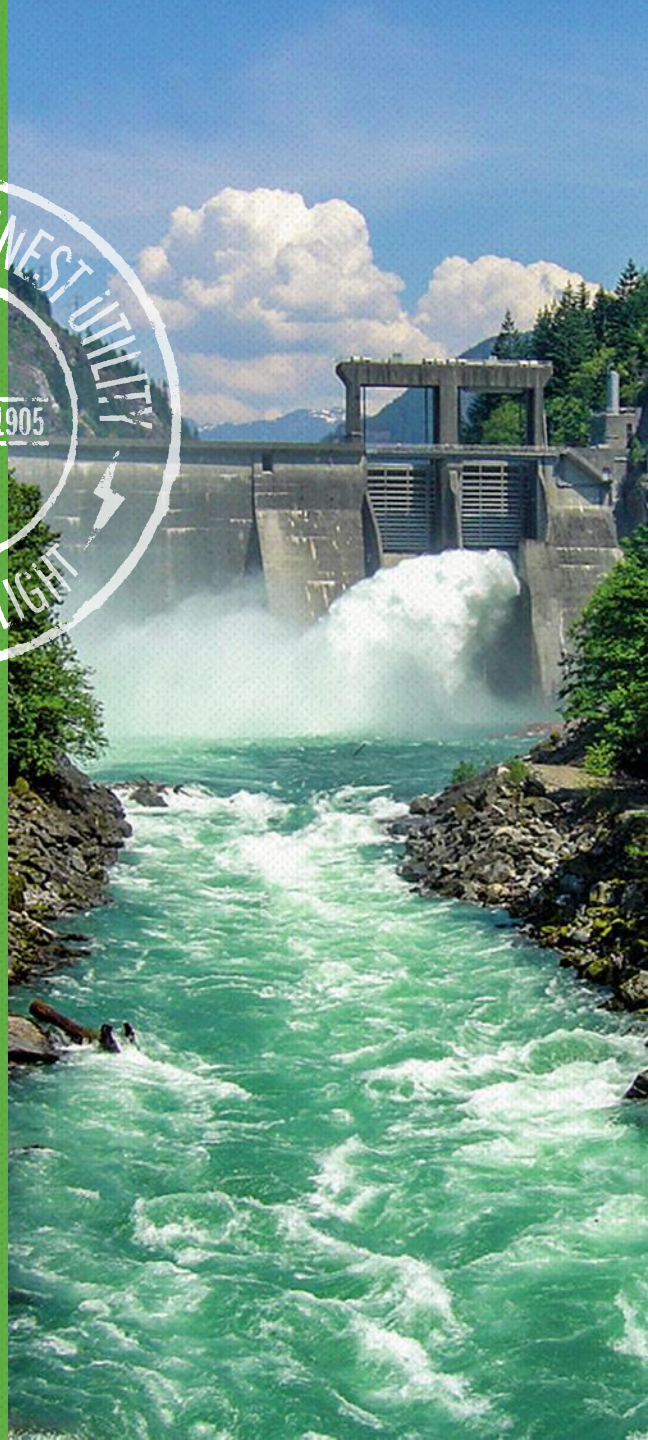

PORTFOLIO CONSTRUCTION

Seattle Area Resource Addition Advisor

SEATTLE'S AREA RESOURCE ADDITIONS ADVISOR (SARAA)

- Model Output
  - Resource Additions (supply-Side, demand-side, REC, energy transformation)
- Inputs
  - Resource option information (costs, generation, option life, contributions to needs)
  - Regional information (power prices, regional emissions rates)
- Objective Function
  - Minimize Net Present Value of City Light's portfolio cost (Resource costs includes transmission costs, power purchase costs, market revenues)
- Constraints
  - Resource Adequacy (monthly energy need and resource option contributions)
  - Energy Independence Act
  - Clean Energy Transformation Act requirement
  - User defined constraints

RESOURCE OPTIONS - ATTRIBUTES

	Scenario independent		Scenario dependent		Further Locational Value & Customer Classification Needed	
	Clean Energy		Reliability	Energy Value	Equity Value	Transmission & Distribution Value
Resource Type	CETA Eligible	EIA Eligible	Resource Adequacy Contribution	Clean Policy mitigation benefit & Resource Revenues		
Owned: Hydro	X					
Owned: Renewable PPA	X	X				
Owned: BPA	X					
New Option: Renewable	X	X				
New Option: Non- Renewable						
New Option: Distributed Gen.	X	X				
New Option: DR						
New Option: Energy Efficiency	X	X				
Alt – Option: RECs		X				
Alt – Option: Energy Transformation Offset	X					

Sample Resource Option Variation

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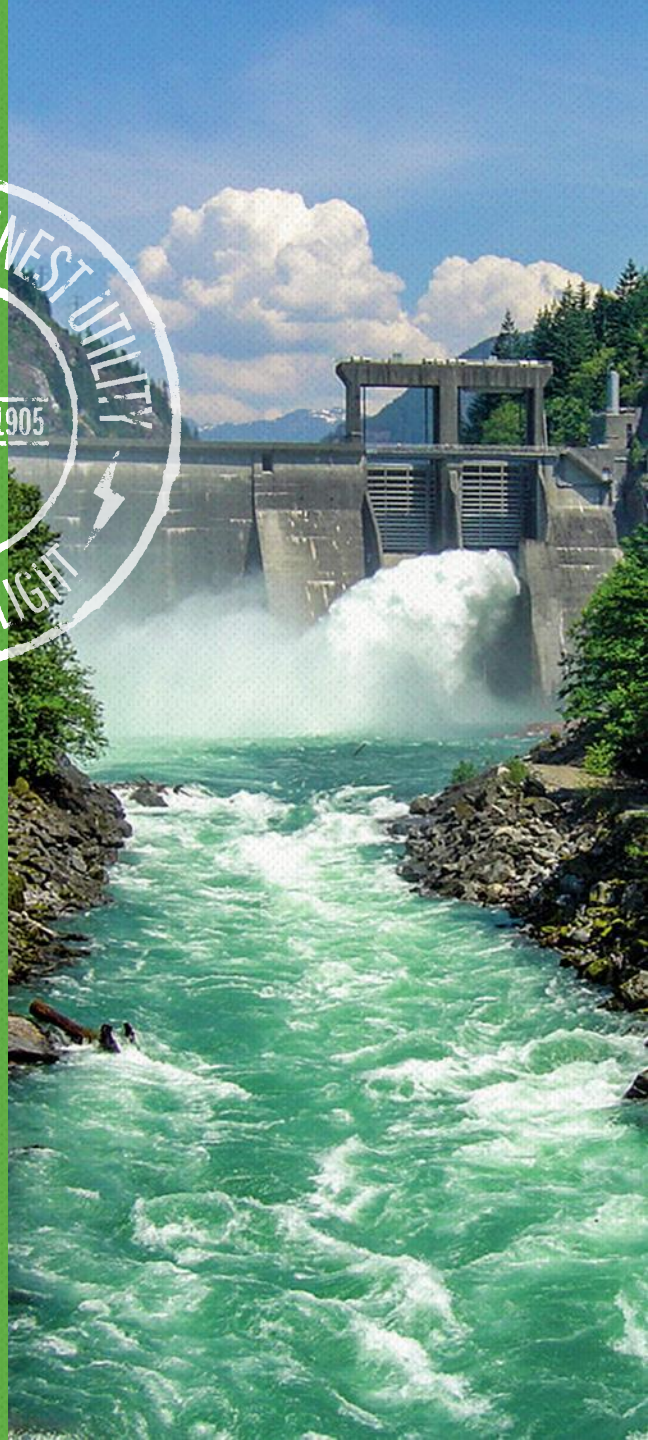


WRAP UP AND FEEDBACK

HIGH-LEVEL INTEGRATED RESOURCE PLAN TIMELINE

Meetings held

Kickoff Regional Resource Adequacy
Conservation Potential Assessment
Demand forecast review
Overview technical process and models

2020 IRP GOALS

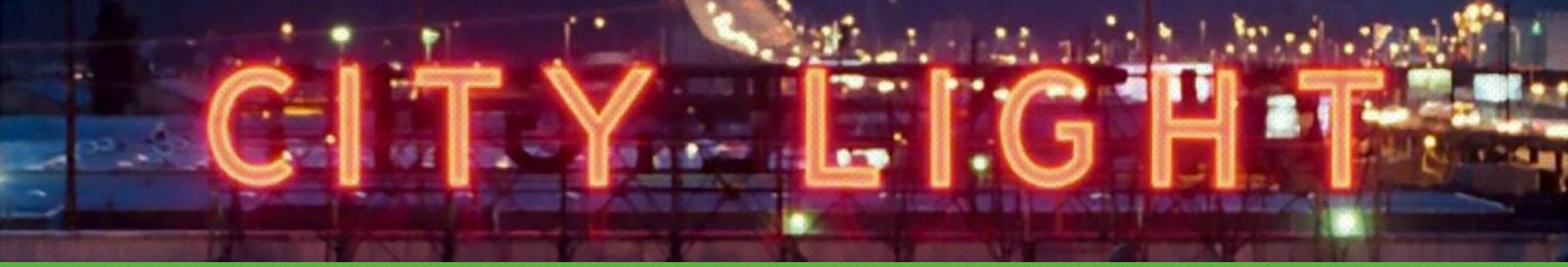
- Creating flexible framework, methods and tools
- Protect the utility from bad outcomes and identify potential threat
- Providing information to understand costs and risks
- Preparing specific and measurable action plans

CHALLENGES FOR THIS IRP

- More complex analysis requirements
  - seasonality of resource adequacy and contributions
  - new energy policies
  - demand-side resource interactions with hydro and BPA
  - Appropriate methods and metrics for equity and transmission and distribution benefits
- Clean Energy Transformation Act, Electrification, Climate Change
  - Rulemaking ongoing and participation needs
  - What are the rules and how will it be implemented matters
  - Timing and magnitude of impacts on end uses, load shapes
  - Changes in inflow patterns and impacts on hydro regulations

NEXT STEPS

- We need to have time to complete baseline
  - resource adequacy
  - future market prices
  - create initial portfolio results
- How can we work together to achieve successful outcomes?



OUR MISSION

Seattle City Light is dedicated to delivering customers affordable, reliable and environmentally responsible electricity services.

OUR VISION

We resolve to provide a positive, fulfilling and engaging experience for our employees. We will expect and reinforce leadership behaviors that contribute to that culture. Our workforce is the foundation upon which we achieve our public service goals and will reflect the diversity of the community we serve.

We strive to improve quality of life by understanding and answering the needs of our customers. We aim to provide more opportunities to those with fewer resources and will protect the well-being and safety of the public.

We aspire to be the nation's greenest utility by fulfilling our mission in an environmentally and socially responsible manner.

OUR VALUES

Safety, Environmental Stewardship, Innovation, Excellence, Customer Care

THE NATION'S GREENEST UTILITY
SINCE 1905
SEATTLE CITY LIGHT

Seattle City Light

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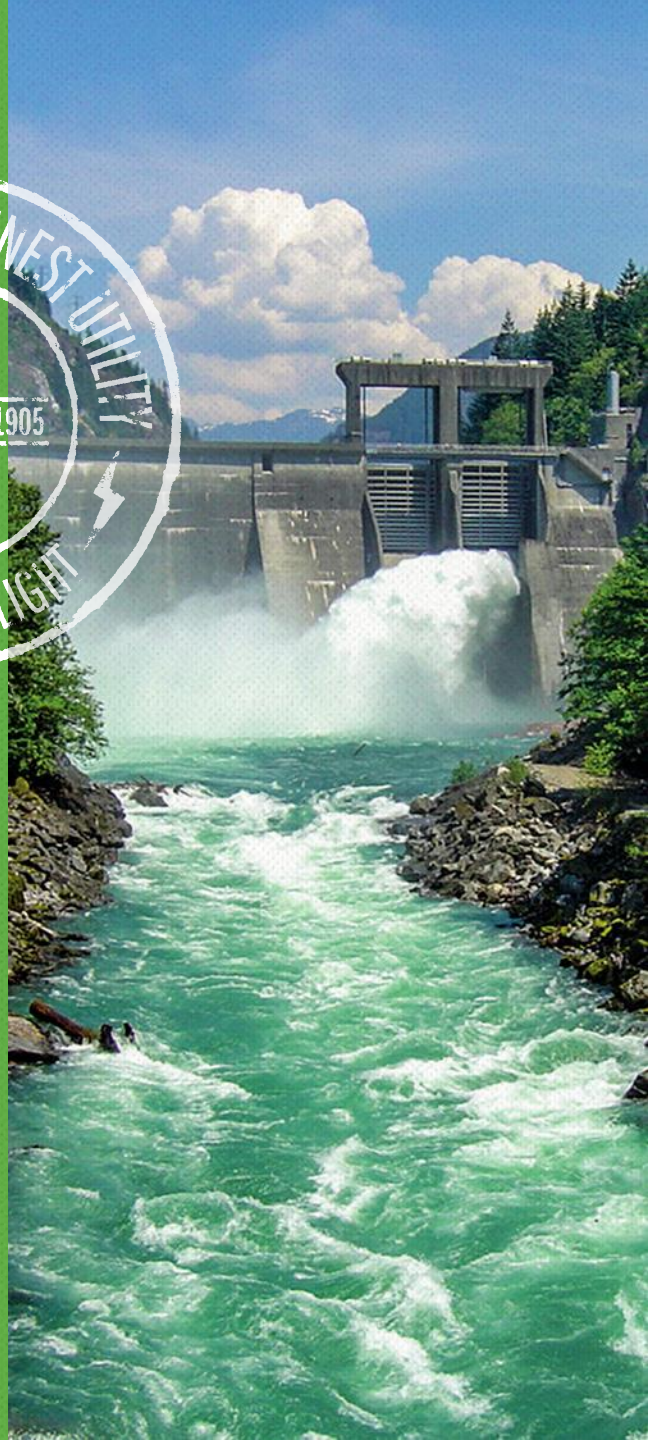
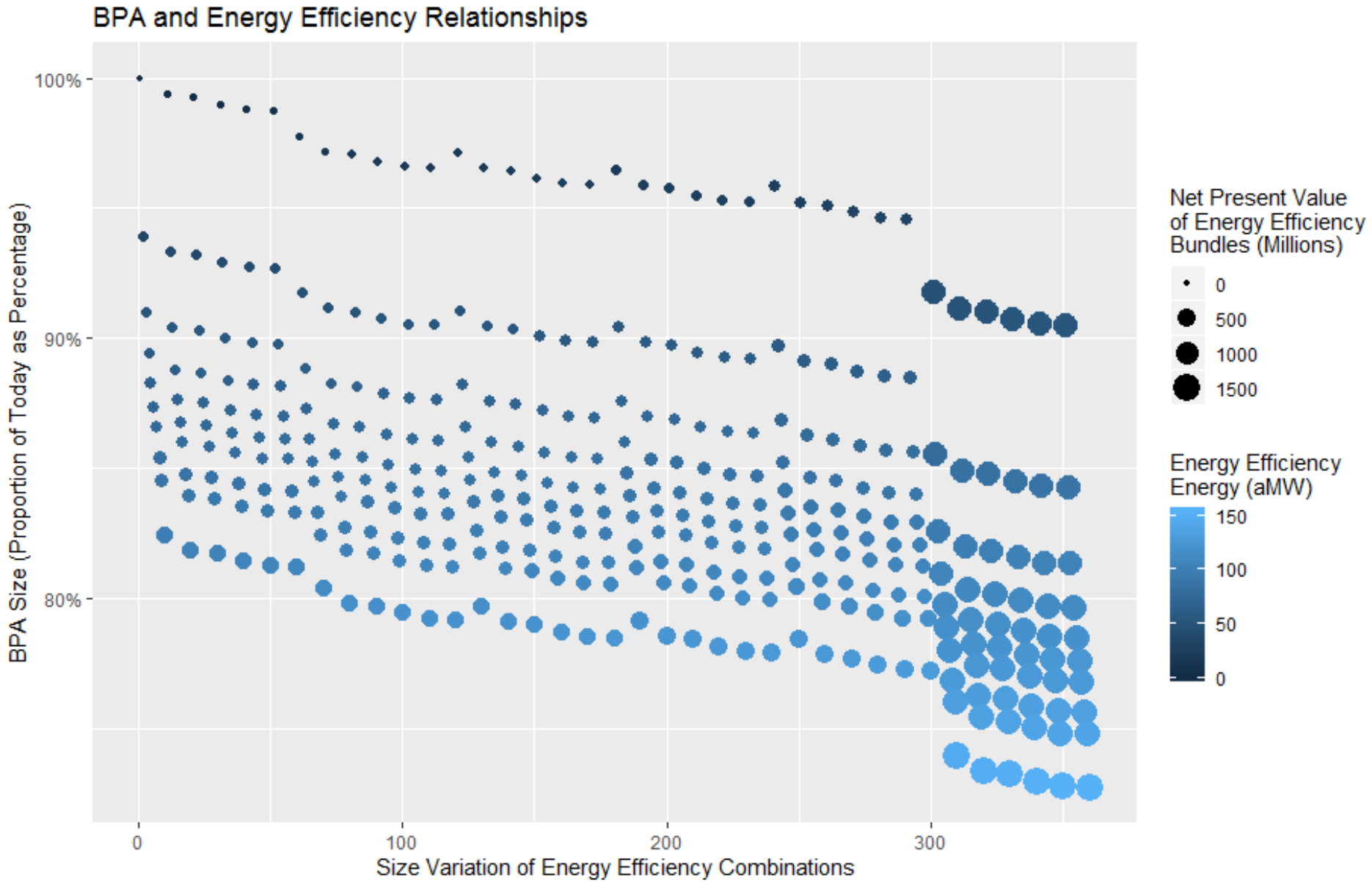


APPENDIX


BPA and Energy Efficiency Relationships
100%
90%
80%
BPA Size (Proportion of Today as Percentage)
0
100
200
300
Size Variation of Energy Efficiency Combinations
Net Present Value of Energy Efficiency Bundles (Millions)
0
500
1000
1500
Energy Efficiency Energy (aMW)
150
100
50
0

EE SAVINGS INTERACTIONS WITH BPA BLOCK