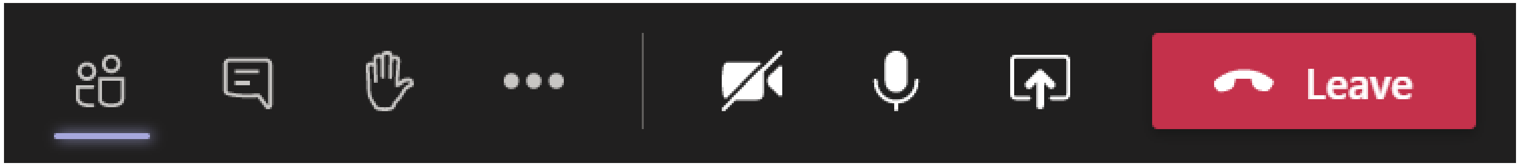
FortisBC Inc. Electric Resource Planning Advisory Group (RPAG) Meeting

June 15, 2021

Housekeeping

- Presenters will turn their cameras on – optional for others
- Please mute yourself when you're not speaking
- If you have a question, please speak up or raise hand



- We will be taking notes and distributing them later – we will not identify individuals or organizations
- Feel free to provide feedback after the meeting

RPAG Purpose and Objective

Purpose:

- Inform, update stakeholders on FortisBC (FBC) resource planning
- Get input and feedback from stakeholders on key planning items

Objective:

- Help develop a more informed and robust resource plan

Feedback

We are seeking your feedback on:

- Proposed level of DSM
- EV charging peak demand mitigation approach
- Access to market for energy purposes
- Capacity self-sufficiency
- Preferred supply resource portfolio

Agenda

8:30 am – 8:45 am	**Introductions**	**Mike Hopkins** – Senior Manager, Resource Planning
8:45 am – 9:15 am	**DSM Scenarios**	**Keith Veerman** – Manager, C&EM
9:15 am – 9:45 am	**EV Charging Mitigation**	**Dan Higginson** – Innovation Specialist
9:45 am – 10:00 am	**Load-Resource Balance**	**Mike Hopkins**
10:00 am – 10:15 am	**Break**	
10:15 am – 11:35 am	**Portfolio Analysis Results**	**Ryan Steele** – Power Supply Planning Specialist
11:35 am – 11:55 am	**Transmission & Distribution**	**Jeremy Webber** – Transmission Planning Engineer
11:55 am – 12:00 pm	**Wrap-Up and Next Steps**	**Mike Hopkins**

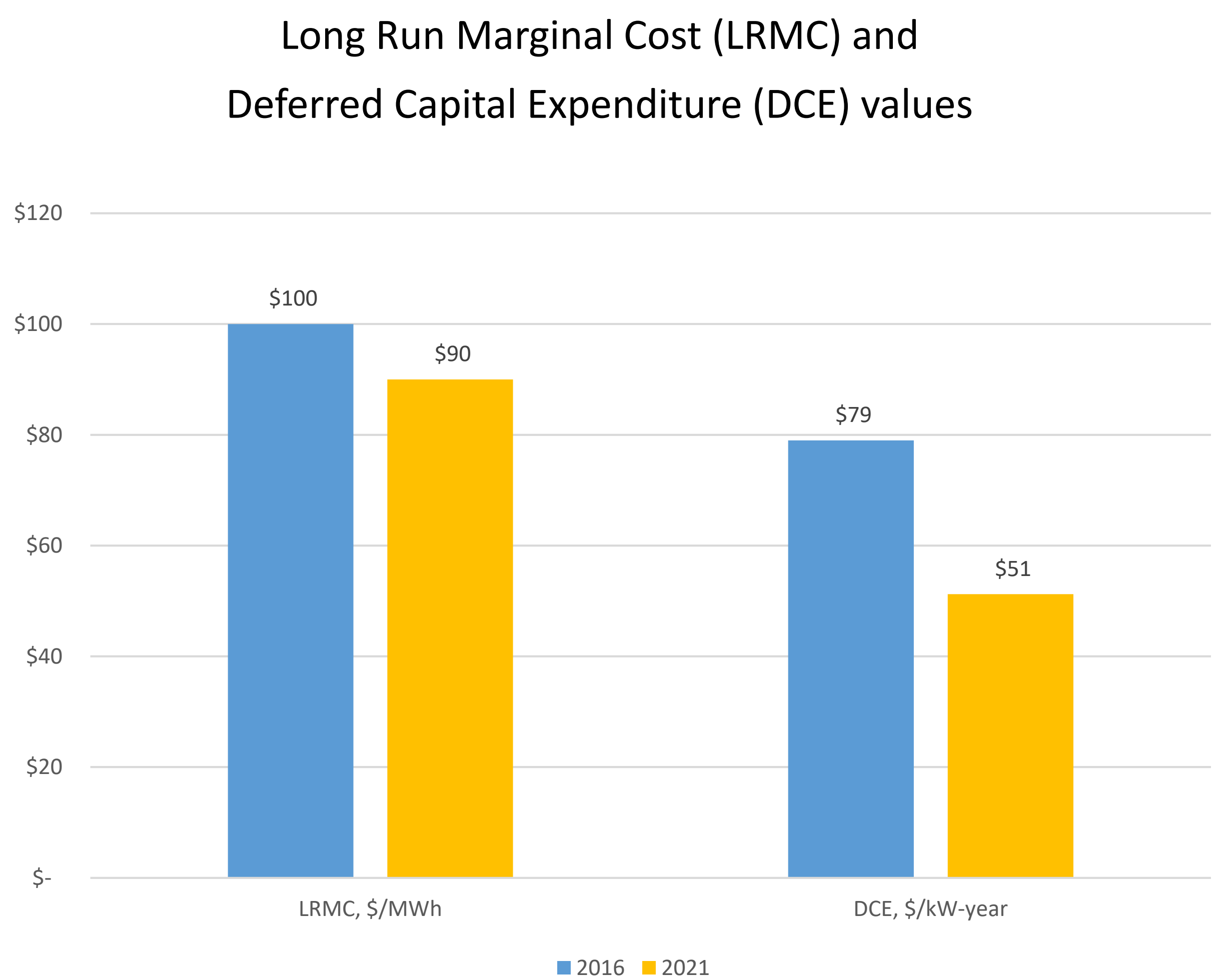
Introductions

RPAG Members

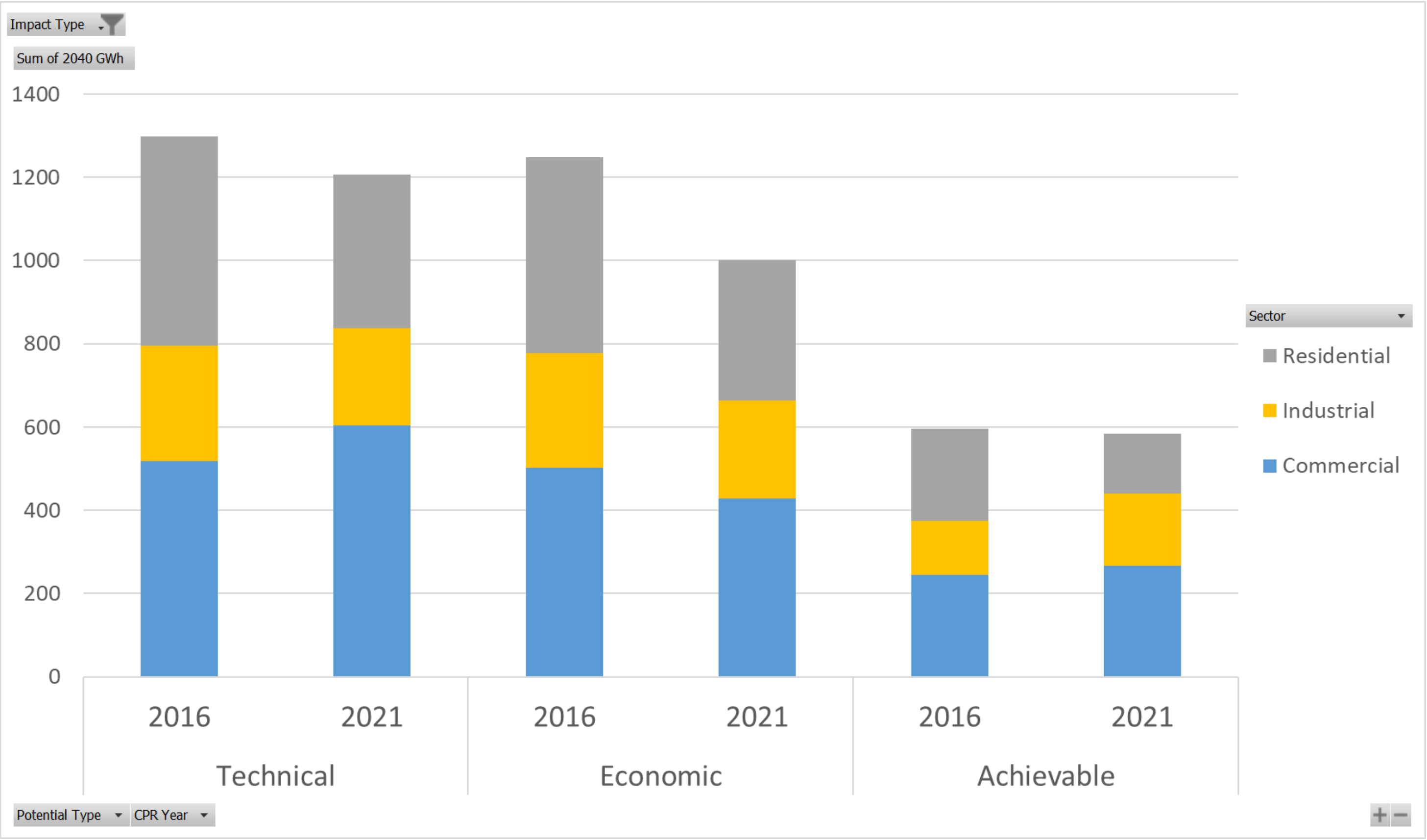
Affiliation	Contact	Title
B.C. Ministry of Energy & Mines - Electricity and Alternate Energy Division	Jack Buchanan	Senior Policy Advisor
Nelson Hydro	Carmen Proctor	EcoSave Program Manager, Nelson Hydro
Nelson Hydro and B.C. Municipal Electric Utilities (BCMEU)	Scott Spencer	Nelson Hydro General Manager
B.C. Public Interest Advocacy Centre (BCPIAC)	Leigha Worth	Executive Director & General Counsel
B.C. Sustainable Energy Association (BCSEA)	Tom Hackney	Policy Analyst
B.C. Utilities Commission (BCUC)	Nicola Simon	Executive Director, Facilities and Planning
BC Hydro	Kathy Lee	Resource Planning Specialist
Clean Energy Association of B.C.	Laureen Whyte	Executive Director
Commercial Energy Consumers Association of B.C. (CEC)	David Craig	Executive Director
B.C. First Nations Energy and Mining Council	Paul Blom	Executive Director
Friends of Kootenay Lake Stewardship Society	Camille Leblanc	Assistant Environmental Manager
Industrial Customers Group (ICG)	Robert Hobbs	Council for the ICG
Residential Consumer Intervener Association	Peter Helland	Principal - Midgard Consulting
Irrigation Rate Payers Group	Brian Mennell	Chairman, Fairview Heights Irrigation District
Penticton Indian Band	Jonathan Baynes	CEO, K'ul Management Group
Lower Similkameen Indian Band	Trudy Peterson	Team Lead Capital Housing and Public Works
Okanagan Indian Band	Sammy Louie	Communications and Special Events Coordinator
Pembina Institute	Tom-Pierre Frappé-Sénéclauze	Director, Buildings and Urban Solutions
MoveUp	Jim Quail	Legal Director
FortisBC	Mike Hopkins	Senior Manager, Price Risk & Resource Planning
FortisBC	Dan Egolf	Senior Manager, Power Supply & Planning
FortisBC	Keith Veerman	Manager, Conservation & Energy Management
FortisBC	David Bailey	Customer Energy & Forecasting Manager
FortisBC	Corey Sinclair	Manager, Regulatory Affairs
FortisBC	Ryan Steele	Power Supply Planning Specialist
FortisBC	Ron Zeilstra	Resource Development Manager
FortisBC	Ken Ross	Manager, Integrated Resource Planning & DSM Reporting

DSM Scenarios

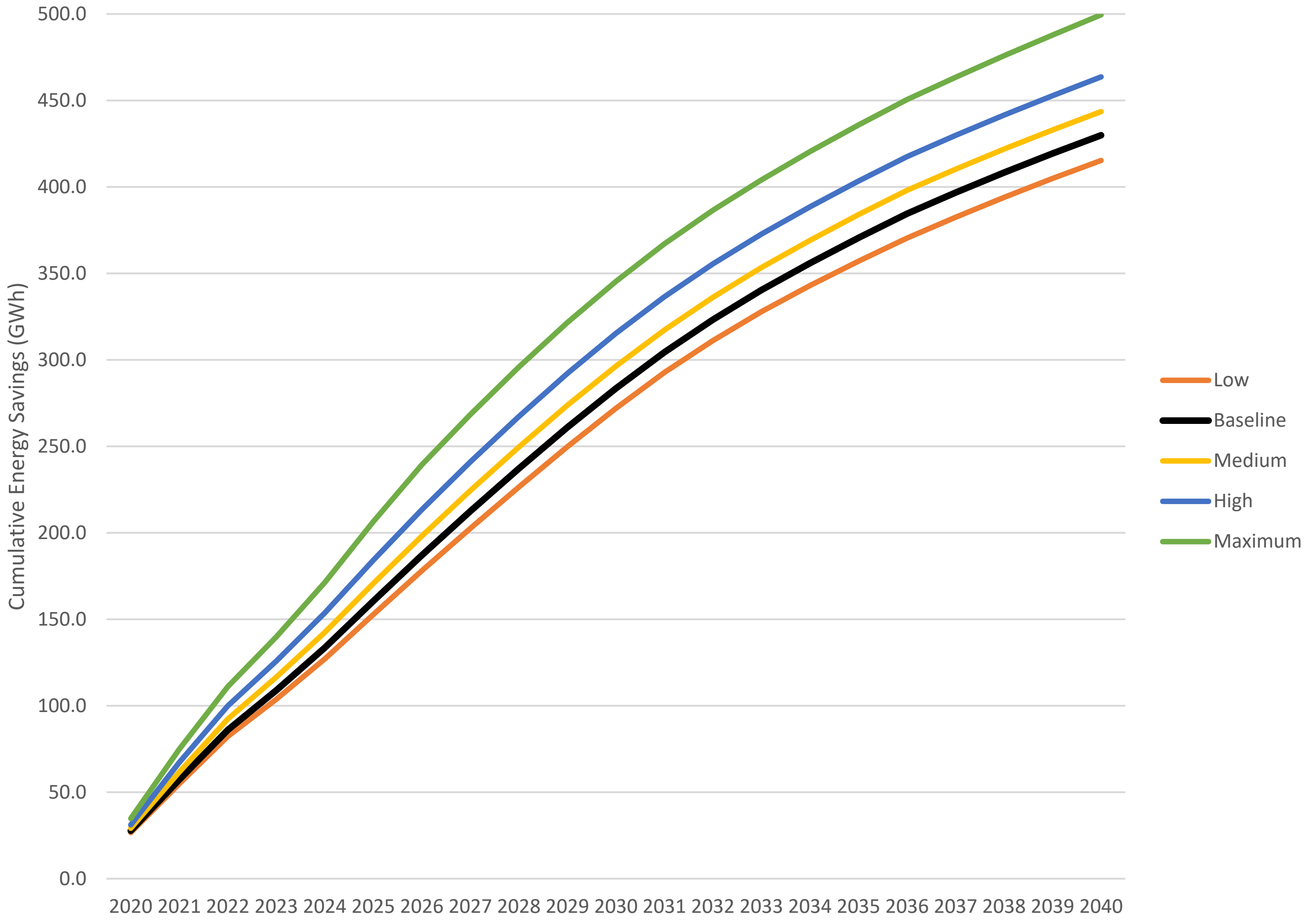
2021 DSM Avoided Costs



2021 CPR Results



Cumulative DSM Program Scenarios

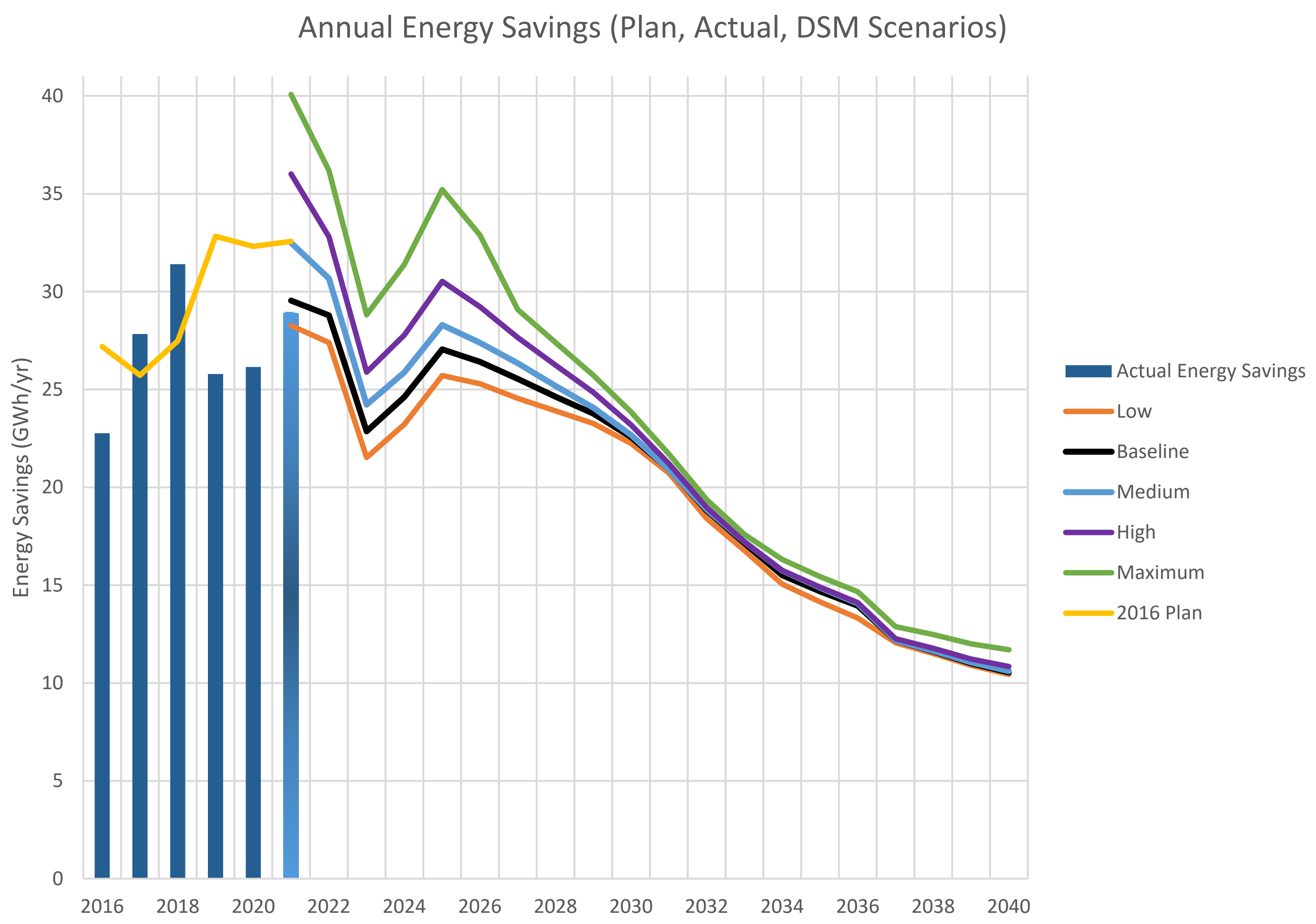


Cumulative DSM Scenarios
Projected Savings and Costs

Program Scenario		Savings (GWh)	$2020 ($m) 2021-40
Low	@50%	415	140
Base	*@62%*	*430*	*170*
Med	@74%	444	190
High	@84%	464	220
Max	@100%	500	290

- Base scenario (62% incentive) is proposed level

Annual DSM Program Scenarios



Proforma 2021 Program Costs & Savings

Scenario:	Low - 50%	Base - 62%	Med - 72%	High - 84%	Max - 100%
Cost ($000)	$8,800	$10,600	$12,400	$15,100	$21,500
Savings (GWh)	30.6	32.0	35.2	39.0	43.4
Savings (MW)	4.7	4.9	5.3	5.8	6.4
Average Cost ($/MWh)	$33	$38	$40	$45	$58
Incremental Cost ($/MWh)	n/a	-	$65	$82	$169

Demand-Response Pilots

Commercial/Industrial pilot phase 2019-20 complete

- Ten participants at 12 sites
- 1.3 MW Summer peak reduction

Residential pilot target end-uses:

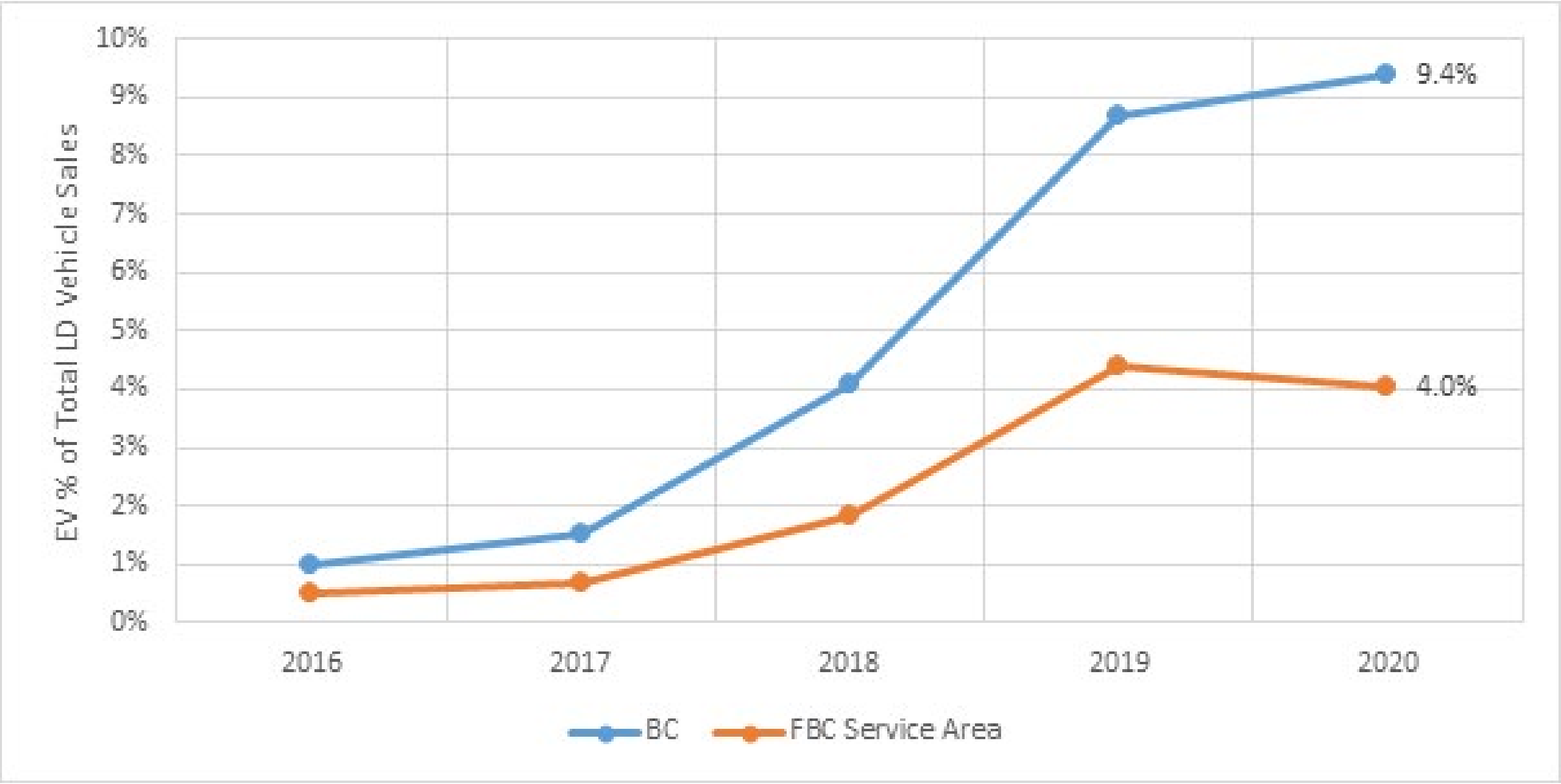
- Air Conditioning, or Heat Pumps
- Domestic hot water
- Pool pumps
- Electric vehicle charging

Next Steps

- CPR Update results now completed
- Finalize DSM level after RPAG feedback
- File LT DSM Plan with LTERP mid-2021
  - Review process and IRs begins fall 2021
  - BCUC decision Q1 2022(?)
- Next DSM Expenditure Plan filed in Q2 2022

EV Charging Mitigation

Estimated Light-Duty EV Sales



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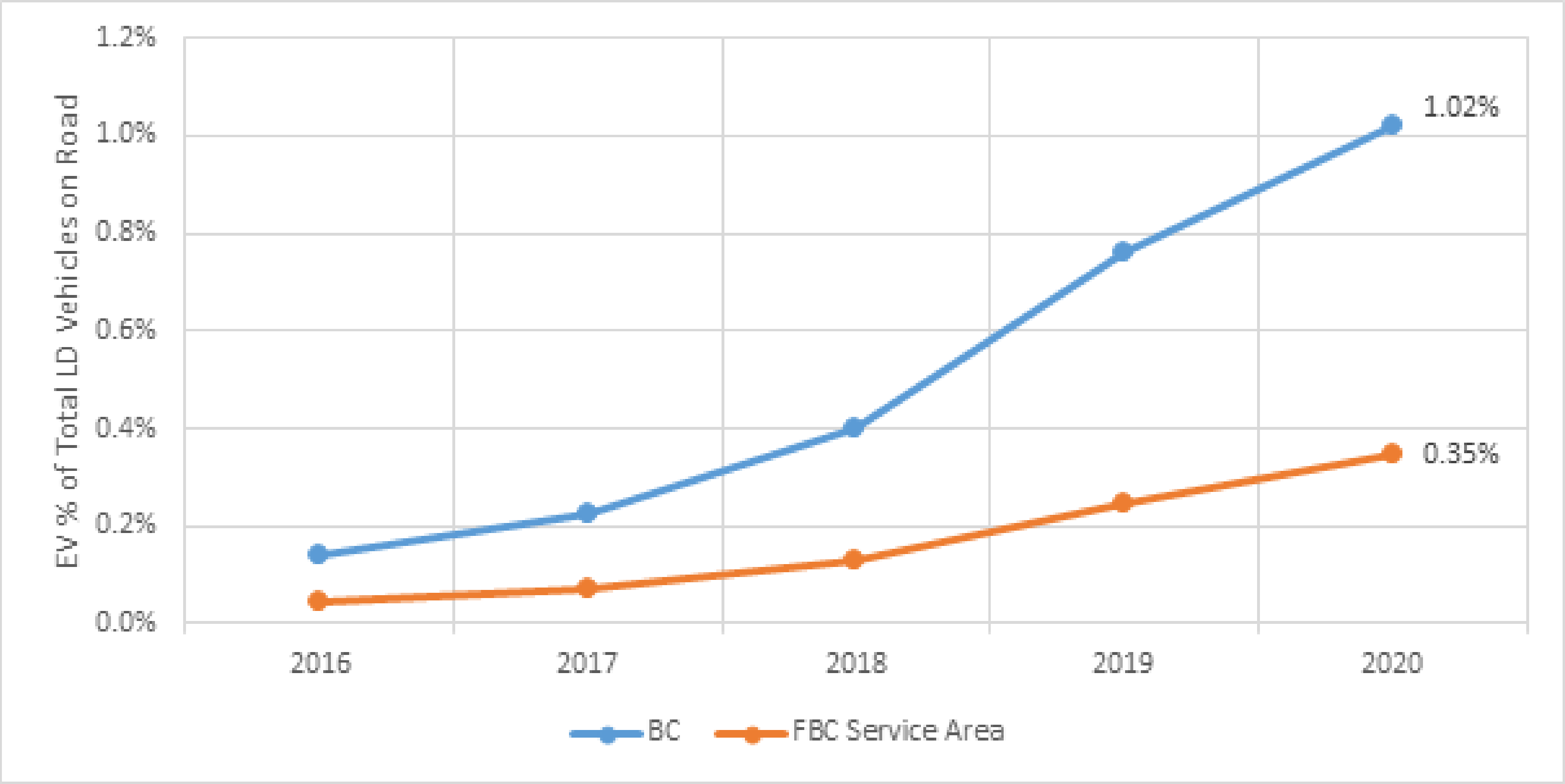
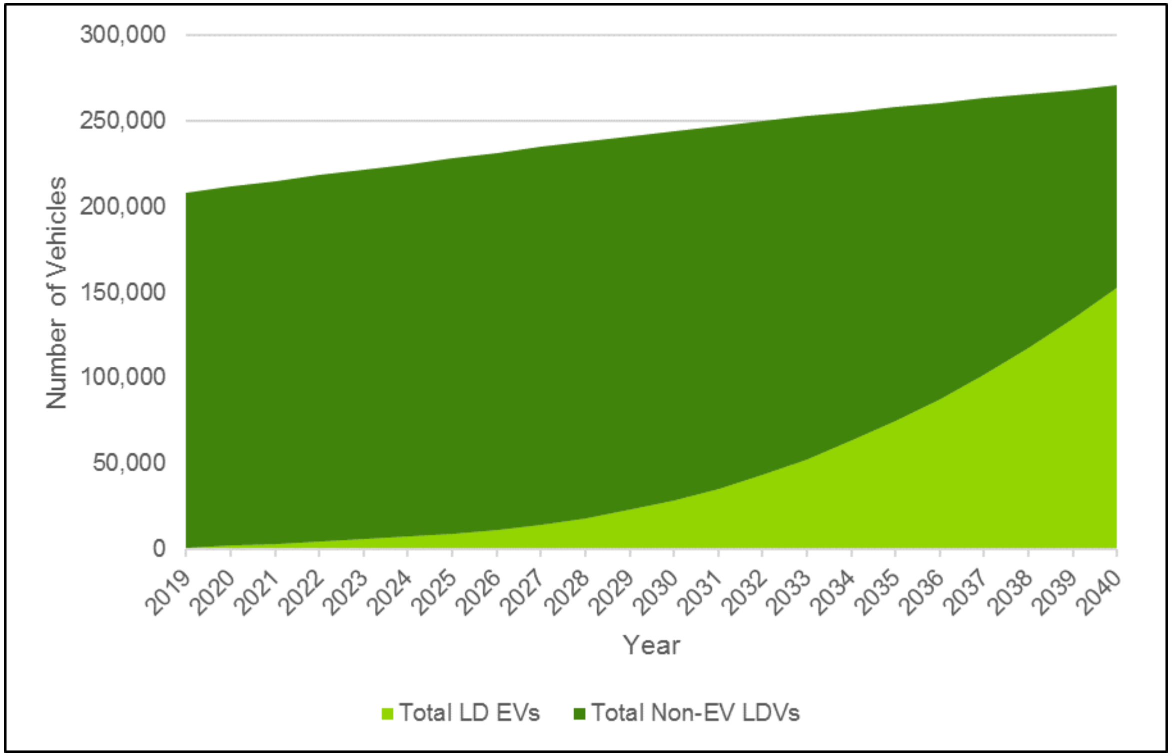
Estimated Light-Duty EV Registration

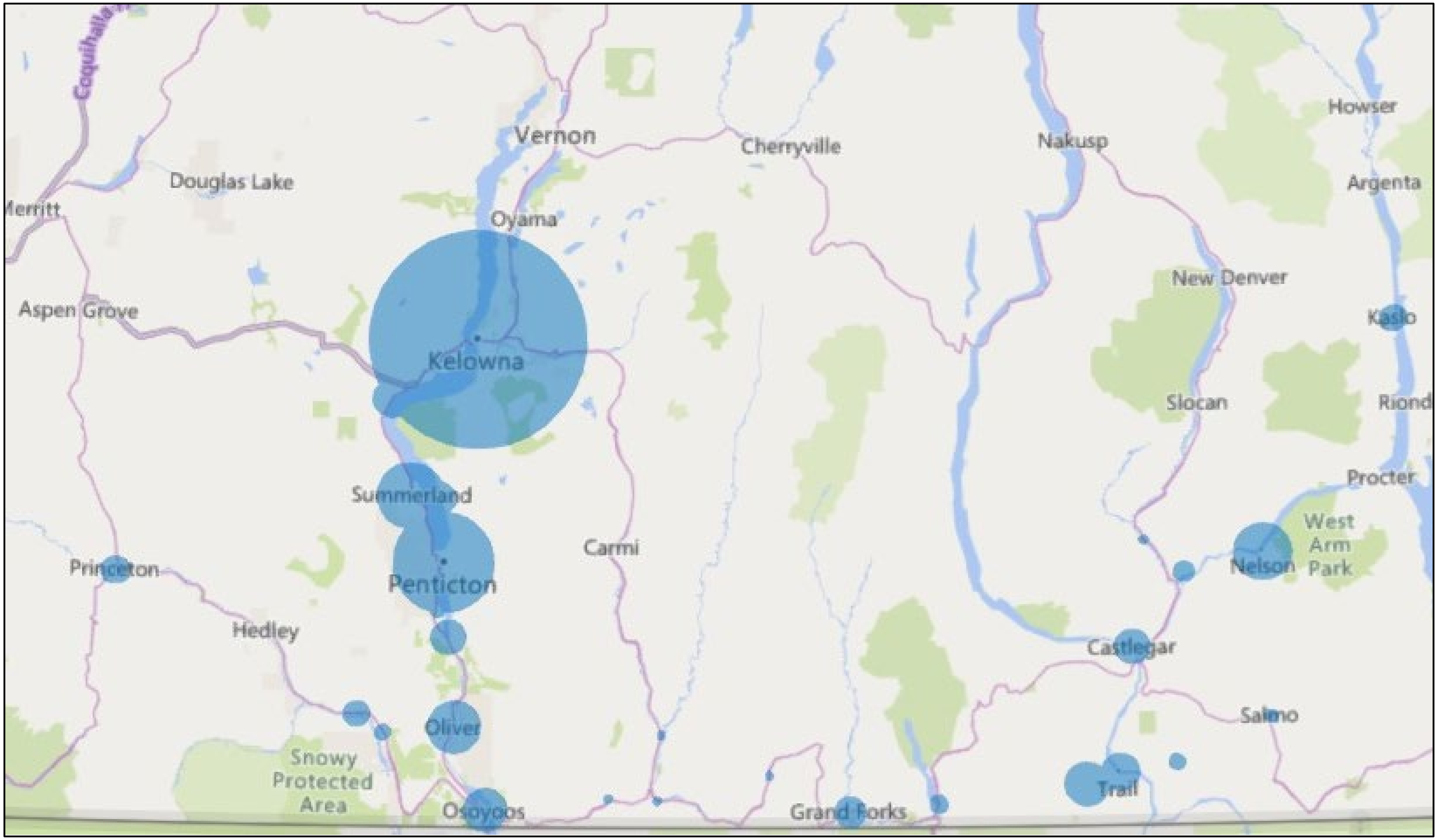


Forecast EVs in FBC Service Area

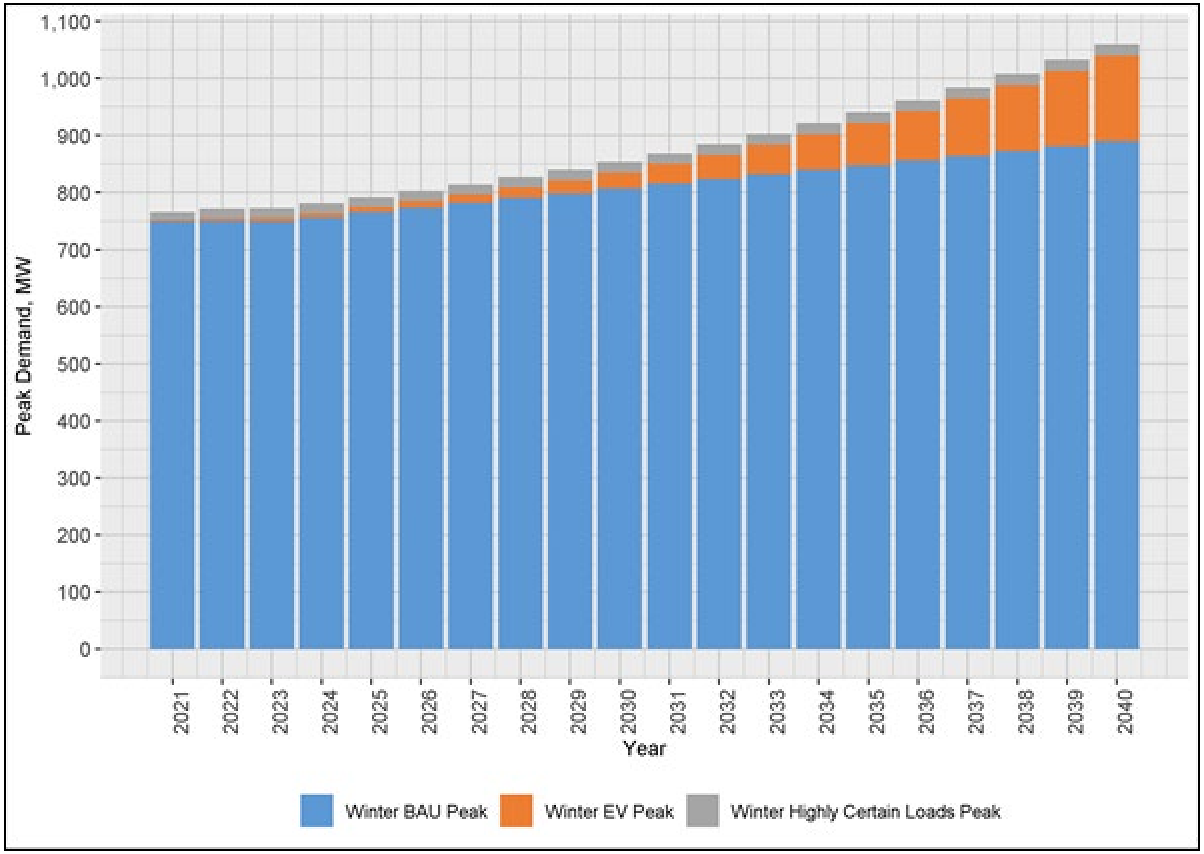


- Based on ZEV Act light-duty sales targets:
  - 10% by 2025, 30% by 2030 and 100% by 2040

EV Registration Density

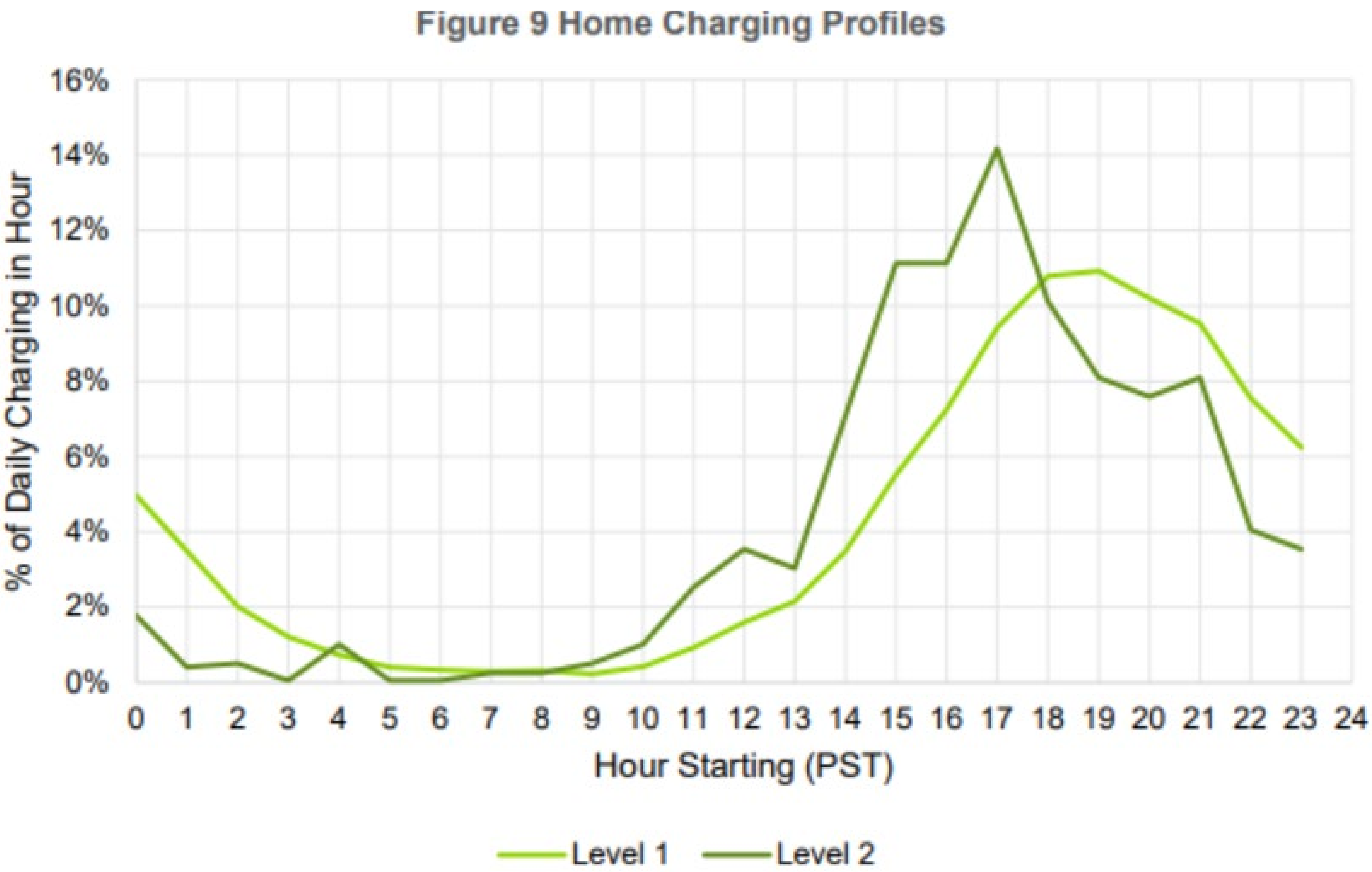


EV Charging Impacts on Peak Demand



- Adds 150 MW peak demand by 2040 (about 50% of the peak demand increase from 2021)
- Could assume max shifting is about 75% due to some public, workplace and level 1 charging

EV Charging Impact on Peak Demand



EV Charging Mitigation Options

Rate-based approach	
Description	- Shift loads via opt-in time-based rates
Pros	- Widely used by other utilities - Easy to administer once implemented
Cons	- Low adoption rates at some utilities - Only moderate results on effectiveness (e.g. 50% load shifted) - Utility has no direct control over charging behaviour

EV Charging Mitigation Options

	Hardware-based approach
Description	- Shift loads via hardware such as smart charger - Utility provides rebate for purchase of hardware, as well as continued participation
Pros	- Utility can control directly (with customer override) - Increases load-shifting effectiveness; enables demand response
Cons	- High cost of equipment - Limited number of chargers are compatible with utility control - Equipment may become obsolete

EV Charging Mitigation Options

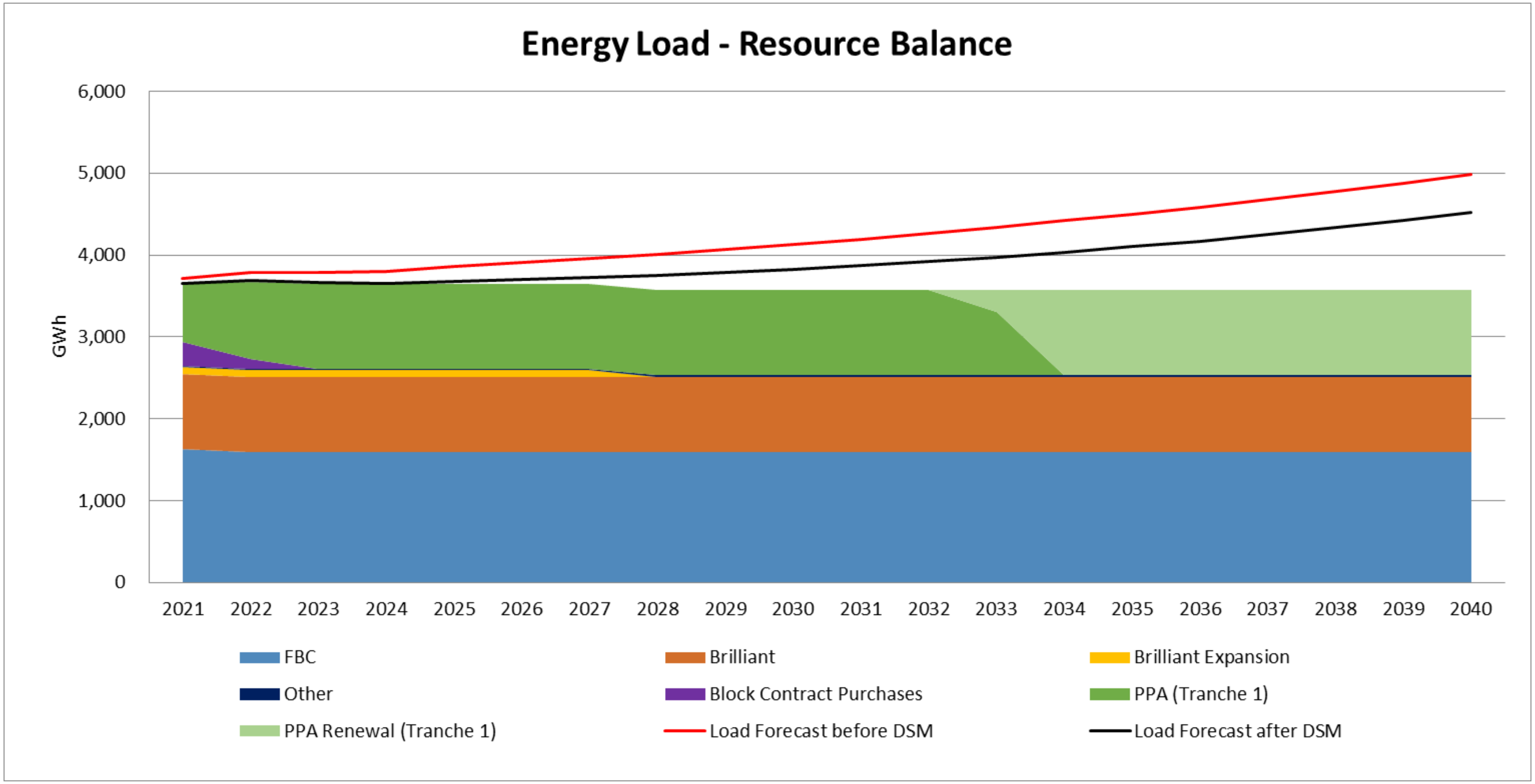
	Software-based approach
Description	- Shift loads via software that controls charging directly through vehicle or through EV charger - Utility provides rebate or bill credit
Pros	- Utility can control directly (with customer override) - Ease of implementation = higher adoption rate ○ No hardware to purchase/install ○ Software works with multiple chargers/vehicles
Cons	- Not yet widely used by utilities in North America

EV Charging Mitigation

- Software-based incentive approach is recommended
  - Could use other options if become necessary
- Next steps
  - Include discussion in 2021 LTERP and LT DSM Plan
  - Pilot project in 2021 to help inform effectiveness
  - Include in next DSM Expenditure filing if successful

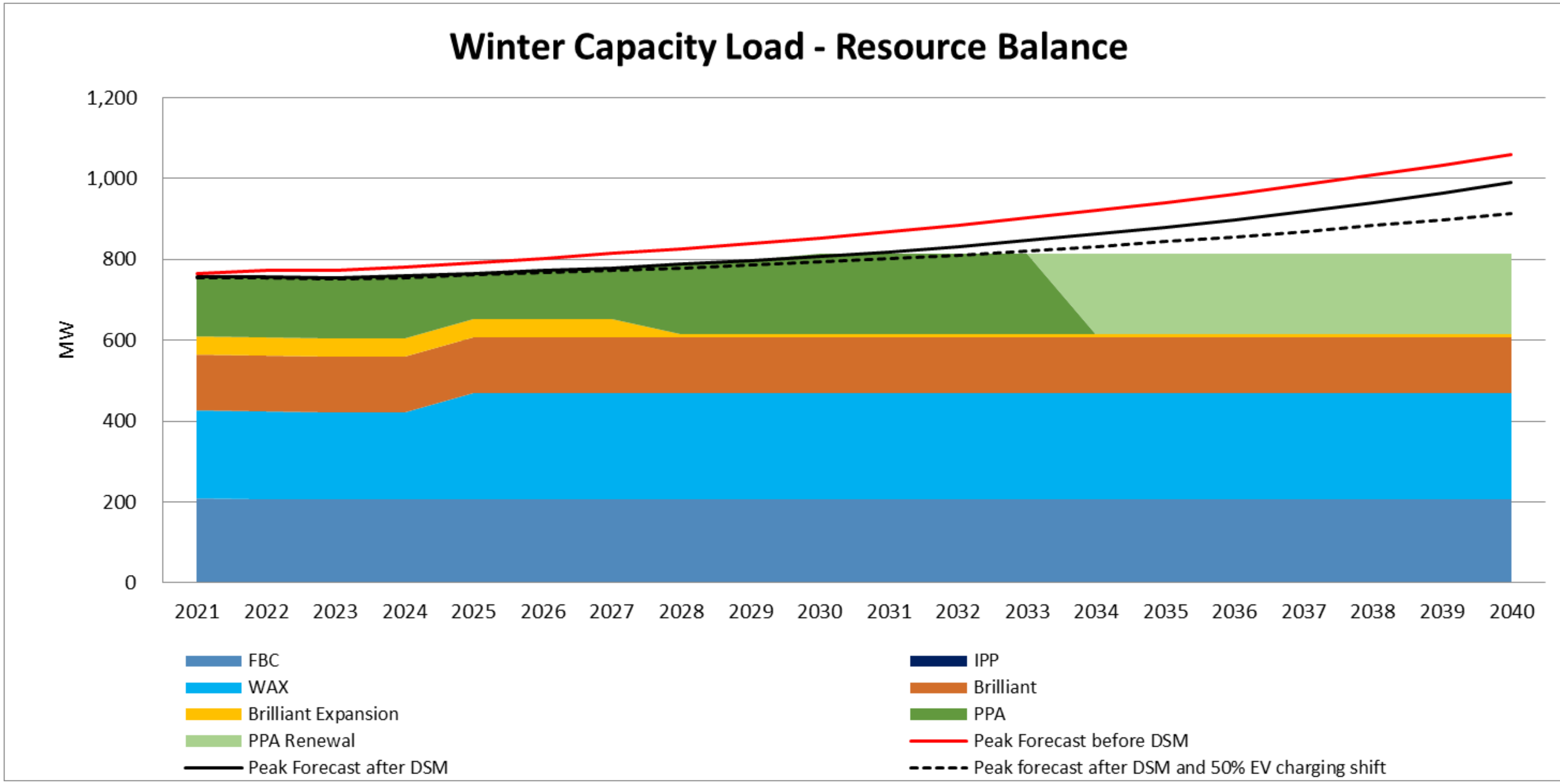
Load-Resource Balance

Annual Energy Load-Resource Balance



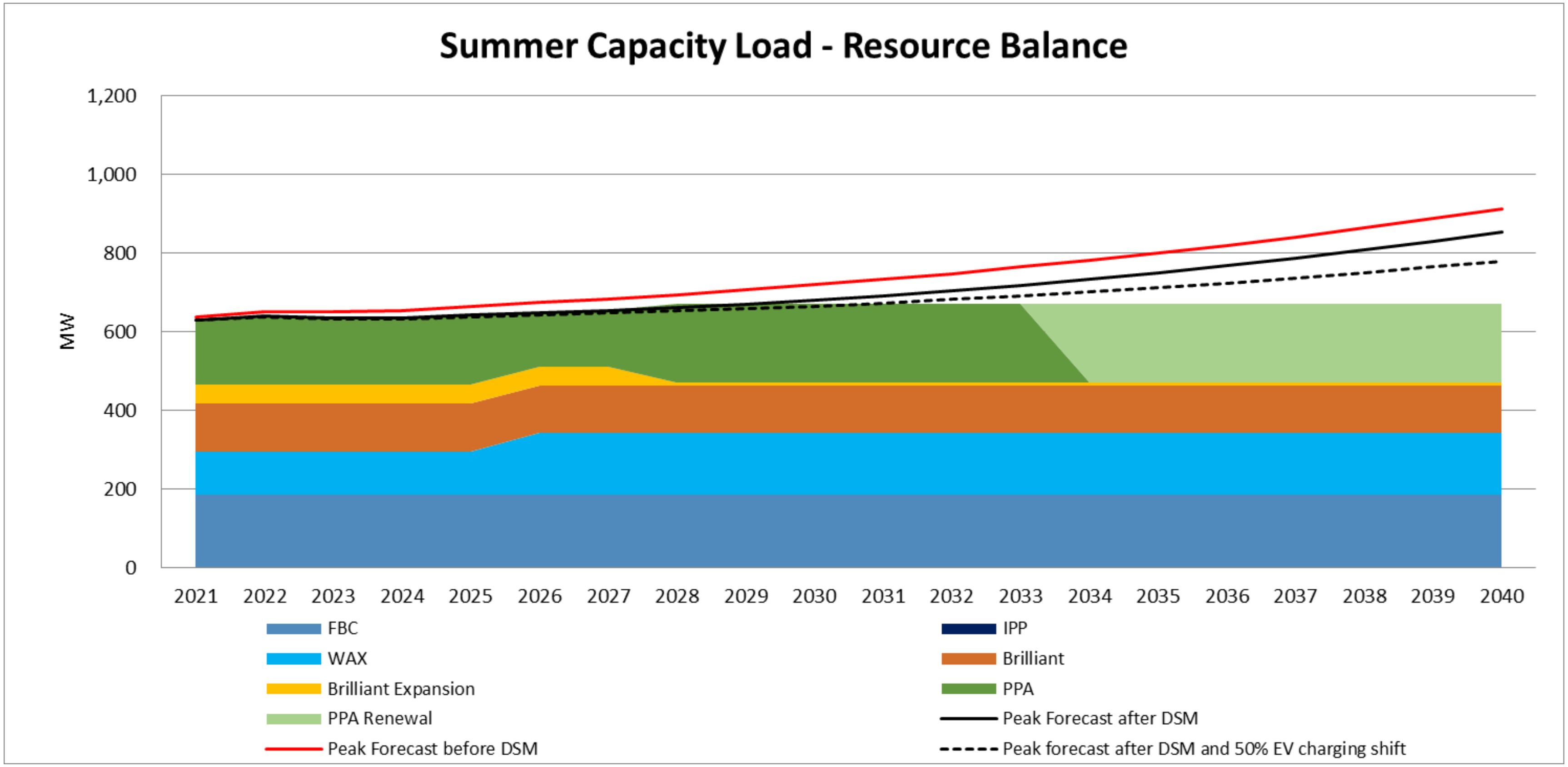
- Minor gaps start in 2023

Winter Peak Load-Resource Balance



- Without EV charging shift, gaps start in 2031
- With EV charging shift of 50%, gaps start in 2033

Summer Peak Load-Resource Balance



- Without EV charging shift, gaps start in 2030
- With EV charging shift of 50%, gaps start in 2031

Break

Portfolio Analysis – Preliminary Results

What is Portfolio Analysis?

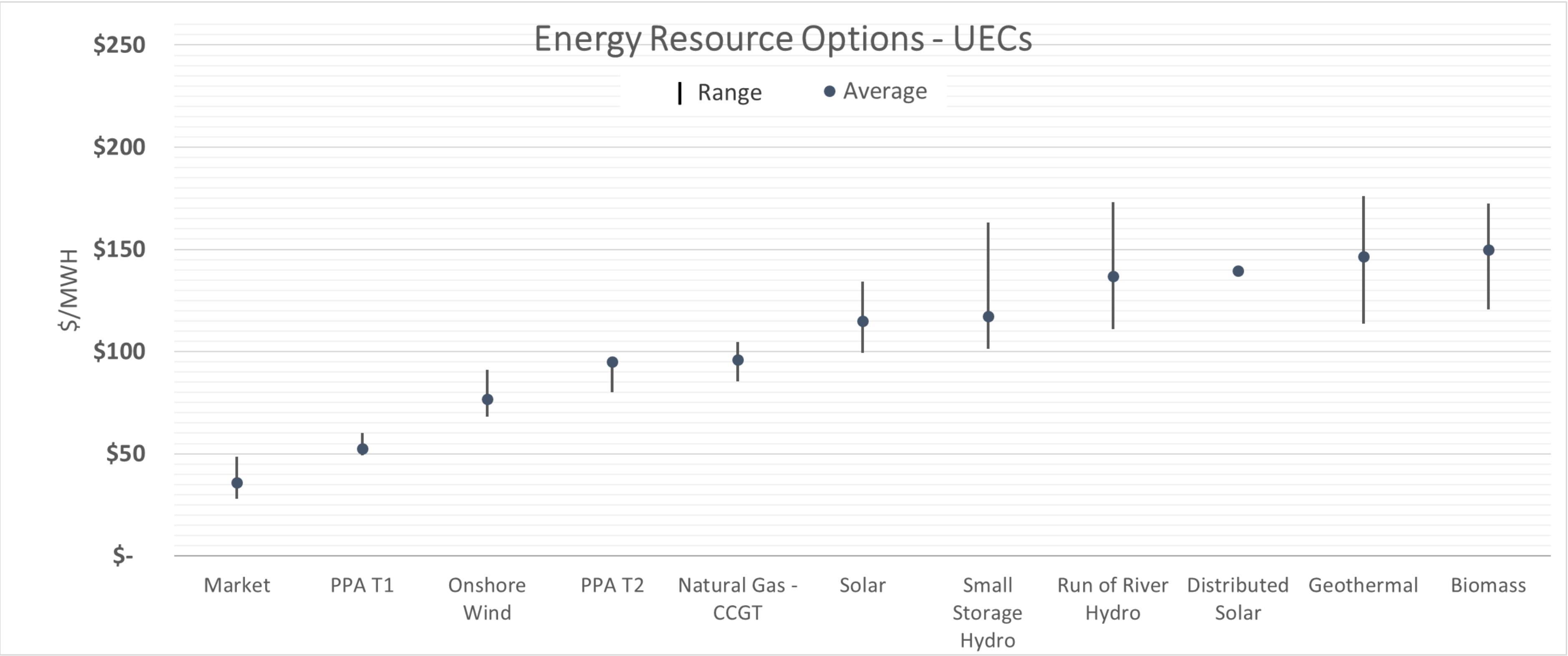
- Evaluation of different groupings of demand-side and supply-side resources to meet load-resource balance gaps
  - Considers both monthly energy and capacity requirements
- Insight into how portfolios perform under changing conditions
- Assessment of tradeoffs between different portfolios
- Helps to inform the selection of preferred portfolio to meet the objectives

Notable Variables Influencing Results

- Forecasted price of market vs. cost of new resources
- Market energy permitted throughout planning horizon
- Need for capacity self-sufficiency*
  - Volatile day-time market prices, uncertainty in net load requirements and intermittent renewables
- Capacity gaps and the dependable capacity of resource options vary by month
  - Portfolio include various resource types & sizes
  - e.g. SCGT’s 48-100 MW, Wind/Solar 4-133 MW
- GHG mitigation
  - Clean market adder
  - RNG fuel for gas plants

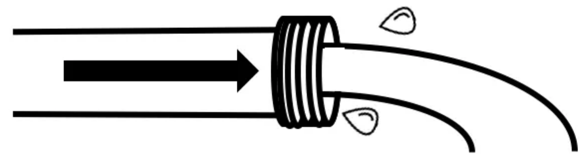
* with the exception of June

Resource Options - Unit Energy Costs



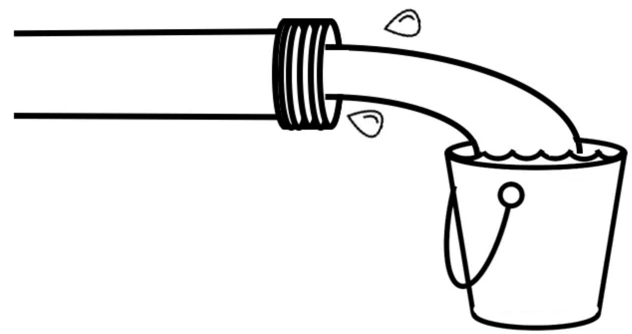
Energy vs. Capacity Self-Sufficiency

- Capacity (MW)
  - Maximum output a generator can physically produce



...is like the flow rate of the water

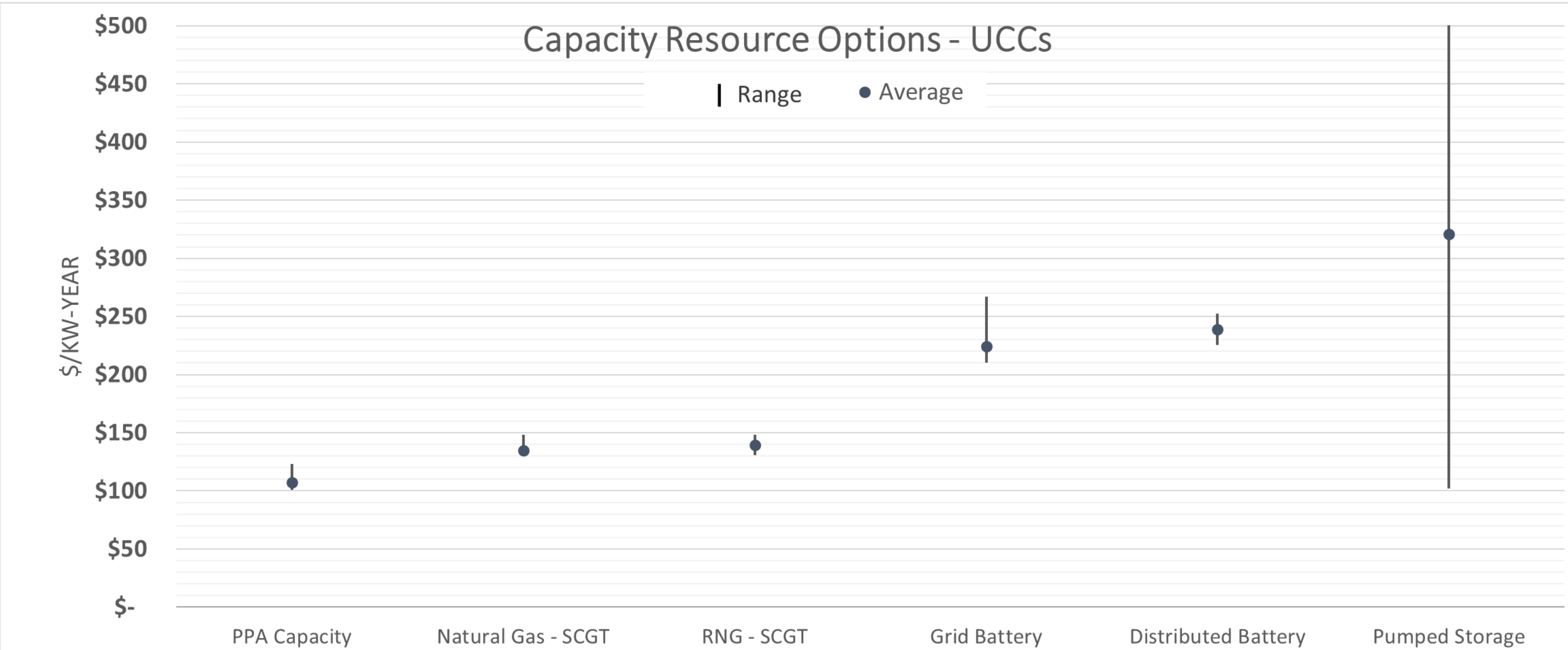
- Energy (GWh)
  - amount of electricity produced over a period of time
  - Many generators do not operate at full capacity all the time
  - Intermittent resources may generate out of sync with demand



...is like the the amount of water that ends up in the bucket

- **Regional resource adequacy concerns**
  - Forecasted capacity shortfalls in U.S. (NWPP, E3)

Resource Options - Unit Capacity Costs



Key Observations of Resource Portfolio Results

- Higher DSM than current levels not cost effective
- Market purchases are lowest cost energy option and pushes need for new energy resources until end of planning horizon

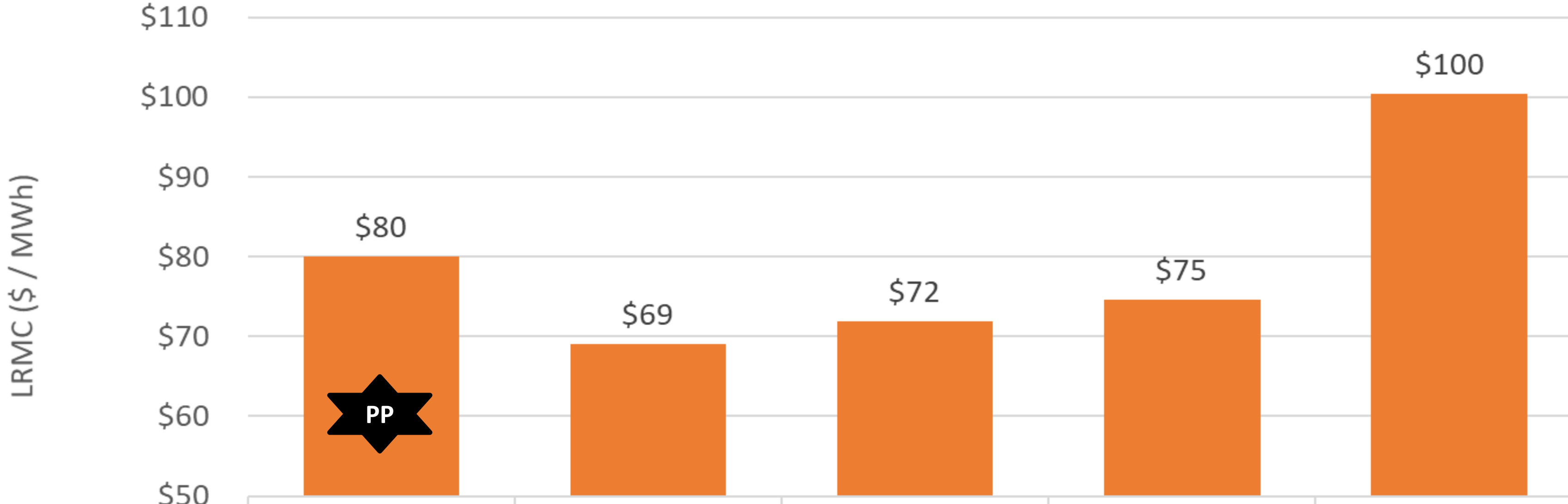
- No new capacity resources needed until 2030+
- Shifting EV charging would delay capacity requirements and costs
- SCGT and batteries are optimal capacity resources in terms of cost-size balance
  - SCGT would be planned to be **run minimally** over the 20 year period

- Replacing market energy and/or PPA with intermittent resources requires a large and diverse portfolio of renewables

Portfolio Characteristics & Investigations

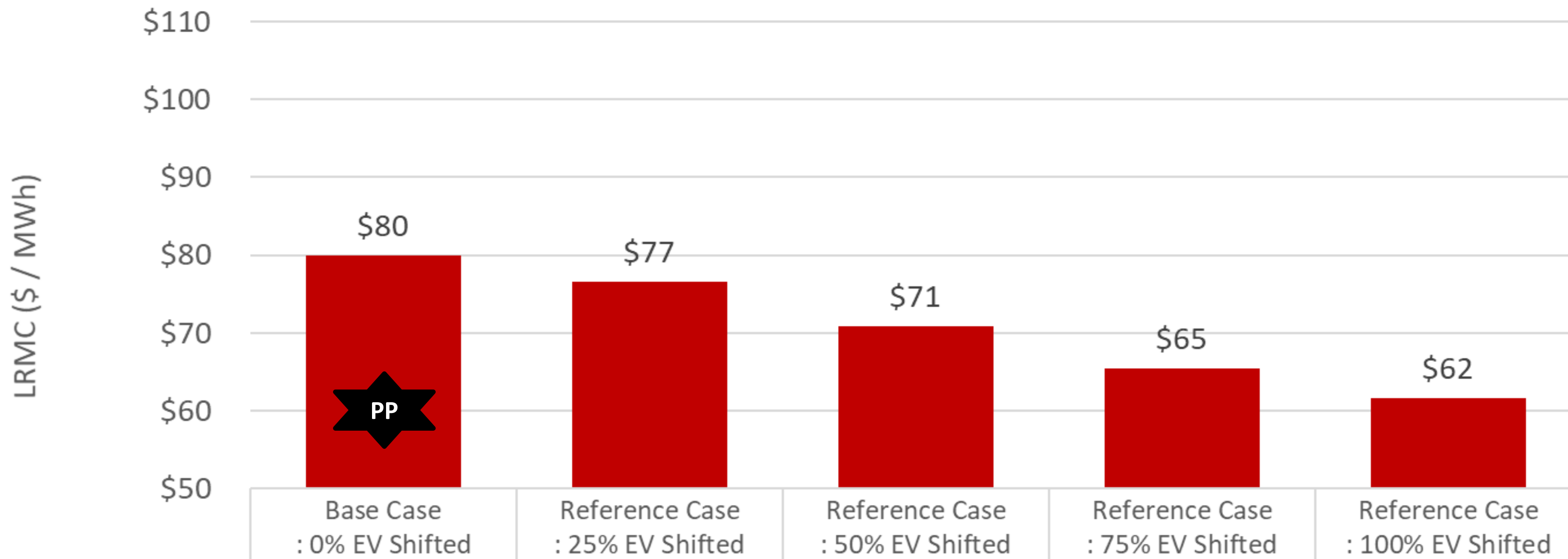
Portfolio Base Characteristics	Sensitivity Cases
Load Requirements • Reference case load forecast • No EV charging load shifted off peak	• Navigant load scenarios • Stakeholder average scenario • EV charging load shifted off-peak (25, 50, 75 and 100% shifted)
DSM Level • Proposed Base level (62%)	• No DSM (for DSM cost-effectiveness per regulations) • Low (50%), Medium (72%), High (84%), Max (100%)
Market Purchases • Capacity Self-sufficiency starting 2021 • No energy self-sufficiency	• High market and carbon prices and no clean adder • Energy self-sufficiency by 2030 • Capacity Self-sufficiency by 2030 • No energy or capacity self-sufficiency
Percent Clean or Renewable • Minimum 93% clean or renewable	• 100% clean or renewable including SCGT using RNG • 100% clean or renewable with no SCGT using RNG • High Fuel Costs
PPA Renewal • PPA renewed in 2033	• PPA prices (Tranche 1, Tranche 2) • PPA not renewed, replaced with clean resources • PPA not renewed, replaced with clean resources and excluding SCGT using RNG

Load Scenarios

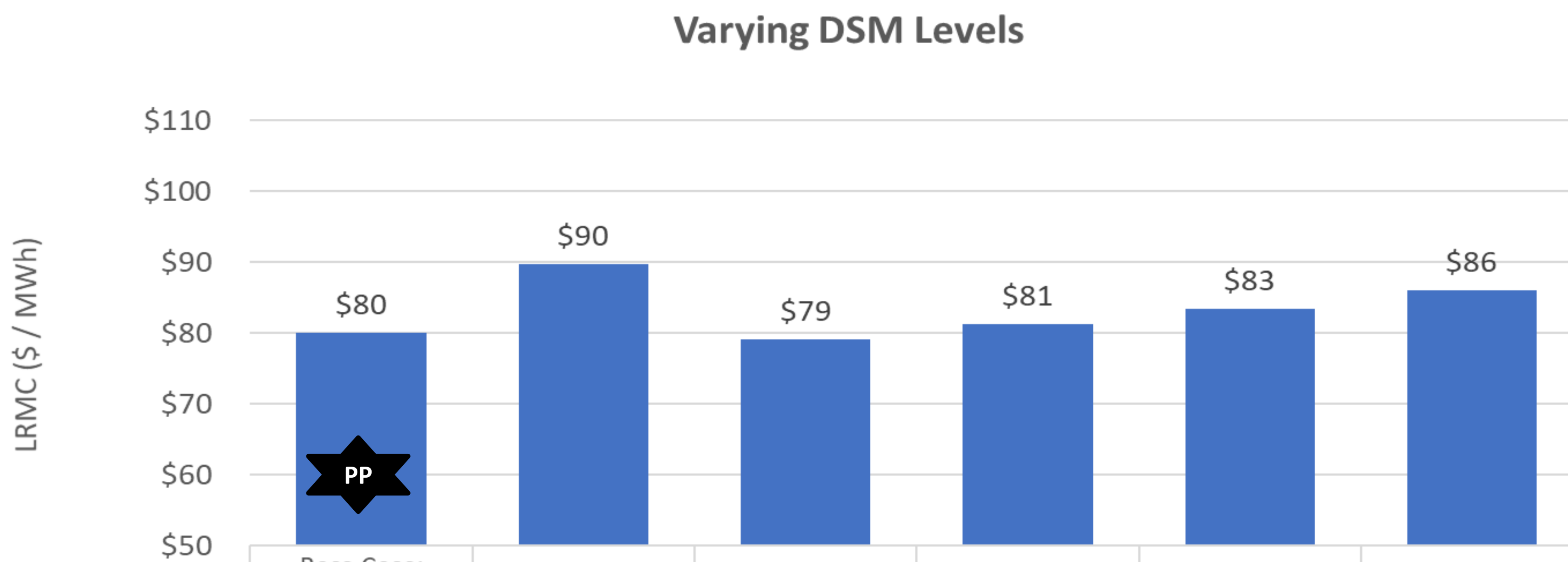


Resources [Year]	Base Case : Reference Case	Diversified Energy Pathway	Stakeholder Average	Deep Electrification	Distributed Energy Future
	Battery6 [2030]	SCGT3 [2028]	SCGT1 [2025]	SCGT3 [2028]	Battery4 [2033]
	SCGT2 [2032]	Battery1 [2031]	SCGT2 [2028]	Battery4 [2033]	DistSolar2 [2035]
	SCGT1 [2038]	SCGT2 [2032]	Battery4 [2031]	SCGT1 [2035]	SCGT1 [2036]
	RNG_SCGT1 [2040]	SCGT1 [2036]	SCGT3 [2033]	RNG_SCGT1 [2037]	RNG_SCGT1 [2038]
		Solar2 [2038]	RNG_SCGT1 [2036]	Wind1 [2039]	DistSolar3 [2040]
		RNG_SCGT1 [2039]	Wind1 [2038]	Wind2 [2040]	Wind1 [2040]
		DistSolar2 [2040]			
		DistSolar3 [2040]			

EV Capacity Shifting



Resources [Year]	Base Case : 0% EV Shifted	Reference Case : 25% EV Shifted	Reference Case : 50% EV Shifted	Reference Case : 75% EV Shifted	Reference Case : 100% EV Shifted
	Battery6 [2030]	Battery6 [2030]	Battery6 [2031]	DistSolar1 [2032]	Battery6 [2035]
	SCGT2 [2032]	SCGT1 [2033]	SCGT1 [2034]	Battery6 [2033]	DistSolar3 [2039]
	SCGT1 [2038]	RNG_SCGT1 [2036]	RNG_SCGT1 [2038]	SCGT1 [2036]	RoR3 [2040]
	RNG_SCGT1 [2040]	DistSolar2 [2039]		DistSolar3 [2040]	
		Wind1 [2039]			
		RoR1 [2040]			
		Solar3 [2040]			



	Base Case: Base DSM	DSM LRMC	DSM Low	DSM Med	DSM High	DSM Maximum
Resources [Year]	Battery6 [2030] SCGT2 [2032] SCGT1 [2038] RNG_SCGT1 [2040]	Wind5 [2026] Solar7 [2028] Solar2 [2030] Solar3 [2032] Wind7 [2033] Solar4 [2036] Hydro2 [2038] DistSolar2[2038] RoR3 [2038] RoR2 [2039] Biomass2 [2039] DistSolar3 [2040] Biomass1 [2040] Wind1 [2040]	Battery6 [2030] SCGT3 [2032] DistSolar2 [2037] SCGT1 [2038] RNG_SCGT1 [2040]	Battery6 [2030] SCGT3 [2032] SCGT1 [2038] RNG_SCGT1 [2040]	SCGT1 [2030] Battery6 [2034] RNG_SCGT1 [2035] SCGT2 [2038]	Battery6 [2031] SCGT1 [2033] DistSolar2 [2035] SCGT2 [2036] RNG_SCGT1 [2040]

Clean Attributes

Resources [Year]	Base Case	Gas Permitted : High Fuel Costs	Clean	Clean : No RNG	High Resource Costs : Clean : No RNG
	Battery6 [2030]	Battery6 [2030]	Battery6 [2030]	Battery4 [2030]	Battery4 [2030]
	SCGT2 [2032]	SCGT3 [2032]	RNG_SCGT3 [2032]	Solar2 [2033]	Solar2 [2033]
	SCGT1 [2038]	SCGT1 [2038]	RNG_SCGT1 [2038]	Wind5 [2034]	Wind5 [2034]
	RNG_SCGT1 [2040]	RNG_SCGT1 [2040]	DistSolar3 [2040]	Solar7 [2037]	Solar7 [2037]
			Solar1 [2040]	RoR3 [2038]	RoR3 [2038]
			Wind1 [2040]	Wind1 [2039]	Wind1 [2039]
				DistSolar1 [2040]	DistSolar1 [2040]
				DistSolar2 [2040]	DistSolar2 [2040]
				Wind3 [2040]	Wind3 [2040]

Market Related

	Base Case : Capacity 2021 : Energy Reliant	Self Sufficiency : Capacity 2021 : Energy 2030	Market Energy : No Clean Adder	Market Energy : No Clean Adder : High Prices : High GHG Costs
Resources [Year]	Battery6 [2030] SCGT2 [2032] SCGT1 [2038] RNG_SCGT1 [2040]	SCGT1 [2030] Wind5 [2031] DistSolar2 [2032] RNG_SCGT1 [2033] Solar2 [2036] Battery6 [2037] Solar7 [2038] Wind1 [2040]	Battery6 [2030] SCGT3 [2032] SCGT1 [2038] RNG_SCGT1 [2040]	Battery6 [2030] SCGT1 [2032] RNG_SCGT1 [2035] DistSolar1 [2037] DistSolar3 [2037] Wind5 [2038] DistSolar2 [2040] Solar1 [2040] Solar3 [2040]

* does NOT reflect additional costs to serve *existing* load

Preferred Portfolios

	Base Case	Clean	Self Sufficiency : Capacity 2021 : Energy 2030	Clean : No RNG
Resources [Year]	Battery6 [2030] SCGT2 [2032] SCGT1 [2038] RNG_SCGT1 [2040]	Battery6 [2030] RNG_SCGT3 [2032] RNG_SCGT1 [2038] DistSolar3 [2040] Solar1 [2040] Wind1 [2040]	SCGT1 [2030] Wind5 [2031] DistSolar2 [2032] RNG_SCGT1 [2033] Solar2 [2036] Battery6 [2037] Solar7 [2038] Wind1 [2040]	Battery4 [2030] Solar2 [2033] Wind5 [2034] Solar7 [2037] RoR3 [2038] Wind1 [2039] DistSolar1 [2040] DistSolar2 [2040] Wind3 [2040]

* does NOT reflect additional costs to serve *existing* load

2021 LTERP Overarching Objectives

- Ensure cost-effective, secure and reliable power for customers

- Provide cost-effective demand-side management and cleaner customer solutions

- Consistency with provincial energy objectives
  - e.g. applicable *Clean Energy Act* objectives, CleanBC plan

Stakeholder Energy Priorities

- Communities:
  - reliable and affordable electricity
  - energy efficiency
  - reducing GHG emissions
- Indigenous communities:
  - reliable and affordable electricity
  - energy efficiency
  - protecting the environment
  - economic growth
- Customer survey:
  - reliable and affordable electricity
  - reducing GHG emissions

Portfolio Evaluation Framework

Portfolios	Resource Mix	Portfolio Attributes								
		Cost			Environment			Resiliency		Economic
		LRMC ($/MWh)	Average Cost ($/MWh)	Rate Impacts (CAGR)	% Clean Resources	GHG Emissions (tCO2e)	Footprint (Hectares)	Operational Flexibility	Geographic Diversity	BC Employment (Job Persons)
Base Case	Battery6 [2030] SCGT2 [2032] SCGT1 [2038] RNG_SCGT1 [2040]	$80	$74	1.38%	99%	Scope 1: 24,011 Scope 3: 330,860	31	High	High	410
Clean	Battery6 [2030] RNG_SCGT3 [2032] RNG_SCGT1 [2038] DistSolar3 [2040] Solar1 [2040] Wind1 [2040]	$82	$75	1.42%	99%	Scope 1: 88 Scope 3: 330,922	95	High	High	725
Energy Self Sufficiency 2030	SCGT1 [2030] Wind5 [2031] DistSolar2 [2032] RNG_SCGT1 [2033] Solar2 [2036] Battery6 [2037] Solar7 [2038] Wind1 [2040]	$84 *	$79	1.93%	98%	Scope 1: 45,253 Scope 3: 384,829	467	Medium	High	1503
Clean No RNG SCGT	Battery4 [2030] Solar2 [2033] Wind5 [2034] Solar7 [2037] RoR3 [2038] Wind1 [2039] DistSolar1 [2040] DistSolar2 [2040] Wind3 [2040]	$94	$76	1.90%	99%	Scope 1: 0 Scope 3: 329,428	516	Low	Medium	1644

* does NOT reflect additional costs to serve *existing* load; Average Costs encompass existing and incremental load

Proposed Action Plan

- Continue with similar levels of DSM (Base - 62% incentive)
- Pursue an EV charging (capacity) mitigation program
- Rely on market for energy
  - Negotiate and adopt a Clean Market Adder
  - Monitor risks of depending on the market for energy purposes
- Maintain capacity self-sufficiency*
  - Investigate how to acquire dependable capacity (e.g. SCGT or intermittent)
- Monitor load drivers
- Next resource plan filing date ~ 2026
  - Timing on need for new resources (2030+)

* with the exception of June

Portfolio Analysis feedback

- Please provide any additional feedback up to end of June 22

Transmission & Distribution

Planned Transmission Projects

Time Frame	Project	Purpose	Primary Driver	
			Capacity	Reliability
2021-2022	Kelowna Bulk Transformer Capacity Addition	Add additional 230/138 kV transformation capacity in Kelowna to adequately supply area load	X	X
2027-2028	Lines 52L & 53L Reconductoring	To provide adequate capacity during single contingency	X	X
2024-2025	Replace AS Mawdsley (ASM) Transformer T1	To provide adequate transformation capacity during normal and contingency conditions	X	X
2028-2029	Replace AS Mawdsley (ASM) Transformer T2	To provide adequate transformation capacity during normal and contingency conditions	X	X
2028-2029	Lines 60L & 51L Reconductoring	To provide required capacity when either LEE T3, T4 or T5 is out of service and there is an outage of another LEE transformer		X
2028-2029	Line 20L Reconductoring	To provide adequate capacity during normal and single contingency conditions	X	X

- Based on Reference load forecast
- $128 million capital investment 2021 - 2040

Illustrative Case Study - Kelowna Peak Demand Scenarios

2040 Peak Demand (MW)	Deep Electrification	Diversified Energy Pathway	Distributed Energy Future	Alternate Scenario
Reference Peak	428	428	428	428
Additional Scenario peak	141	136	74	144
Total Peak	569	564	502	572
Large Load Curtailment	-23	-49	-16	0
Net Peak after curtailment	546	515	486	572
LD EV charging 50% shift	-41	-39	-36	-41
Net Peak after EV charging shift	505	476	450	531

- 550 MW Kelowna peak triggers requirement for large transmission project
- Large loads include data centres, cannabis, carbon capture, hydrogen production

Additional Projects to meet 550 MW Peak

Project	Cost ($millions)
New Distribution Stations	60
New Distribution feeders	40
Meshing Kelowna 138 kV Transmission System	20
138kV Transmission Line Reconductor	40
138kV Transmission Line Addition	30
Ashton Creek to Vaseux Lake (ACK-VAS) 500 kV Transmission Line	500
DG Bell Second 230/138 kV Transformer Addition	20
Total	710

- FBC 2021 approved rate base ~ $1.5 billion

T&D Considerations

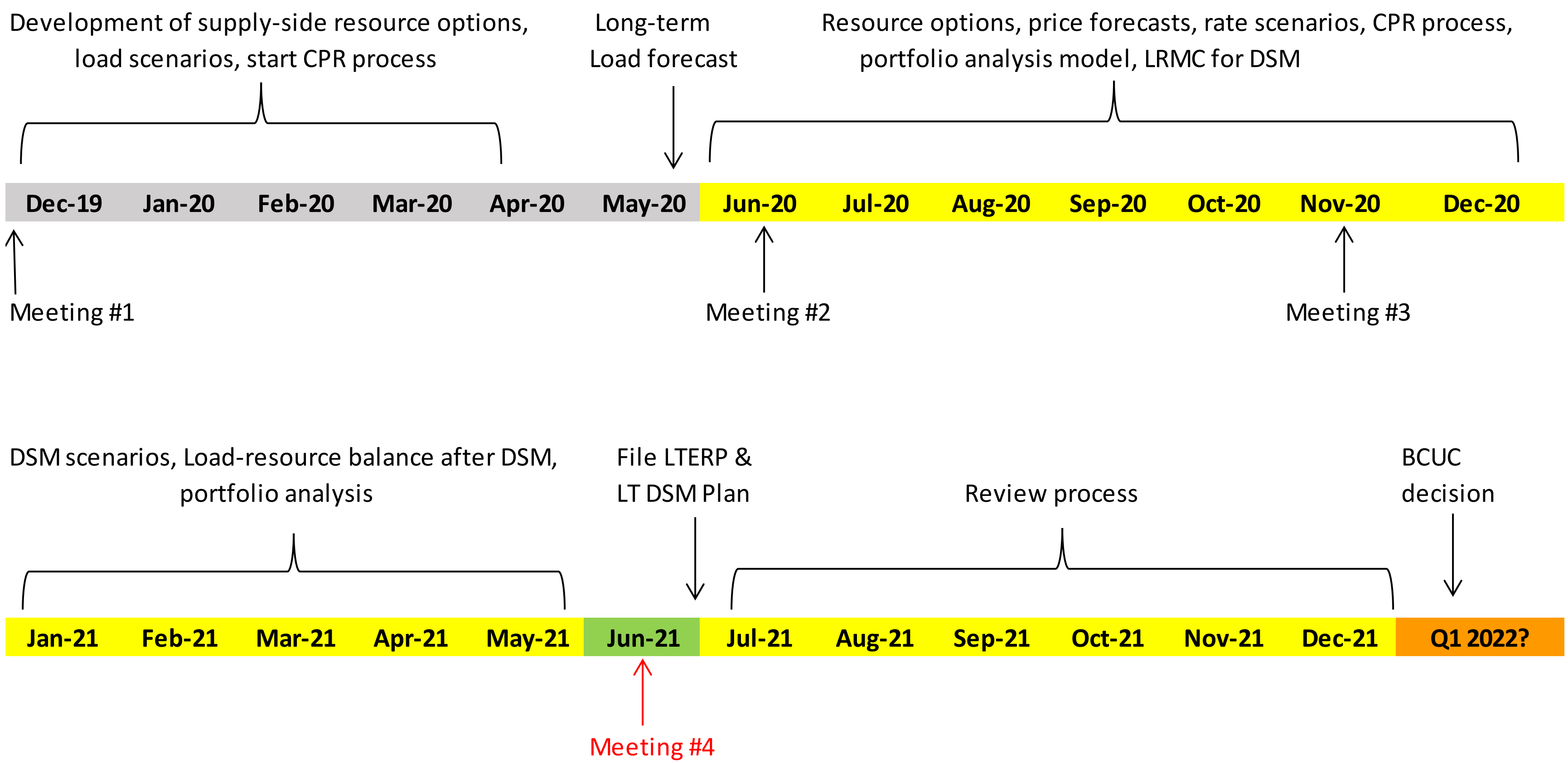
- Electrification could significantly increase peak demand requirements and system costs
  - Gas-to-electric fuel switching for home heating not under FBC’s control
- Managing EV charging and large load impacts on peak demand could avoid/defer additional T&D projects
- Generation resources could avoid/defer need for additional T&D projects

Wrap Up & Next Steps

FBC Next Steps

- Upload presentation and meeting notes to FortisBC website
- Review and consider meeting feedback
- Finalize DSM portfolios
- Complete Portfolio analysis
- File LTERP and LT DSM Plan mid-2021

LTERP Development Timeline



Feedback and Questions

- Feel free to email any questions, comments
- Portfolio analysis feedback due by **June 22**

For further information, please contact:

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