FortisBC Inc.
Resource Planning Advisory Group Meeting

November 25, 2020

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

- We will be taking notes and distributing them later – we will not identify individuals or organizations
- Agenda in meeting request includes a glossary
- Feel free to return the feedback form

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

Agenda

8:30 am – 8:45 am	**Introductions**	**Mike Hopkins** – Senior Manager, Price Risk & Resource Planning
8:45 am – 9:15 am	**Stakeholder Load Scenarios**	**David Bailey** – Customer Energy & Forecasting Manager
9:15 am – 9:45 am	**Market Price and Rate Forecasts**	**Jassi Randhawa** – Price Risk & Market Specialist
9:45 am – 10:00 am	**Break**	
10:00 am – 10:30 am	**Supply-Side Resource Options**	**Ron Zeilstra –** Resource Development Manager
10:30 am – 11:00 am	**Demand-Side Management Update**	**Steven Groves** – Engineer, Conservation & Energy Management
11:00 am – 11:15 am	**Break**	
11:15 am – 11:45 pm	**Portfolio Analysis**	**Ryan Steele** – Power Supply Planning Specialist
11:45 am – 12:00 pm	**Wrap-Up and Next Steps**	**Mike Hopkins**

Introductions

RPAG Members

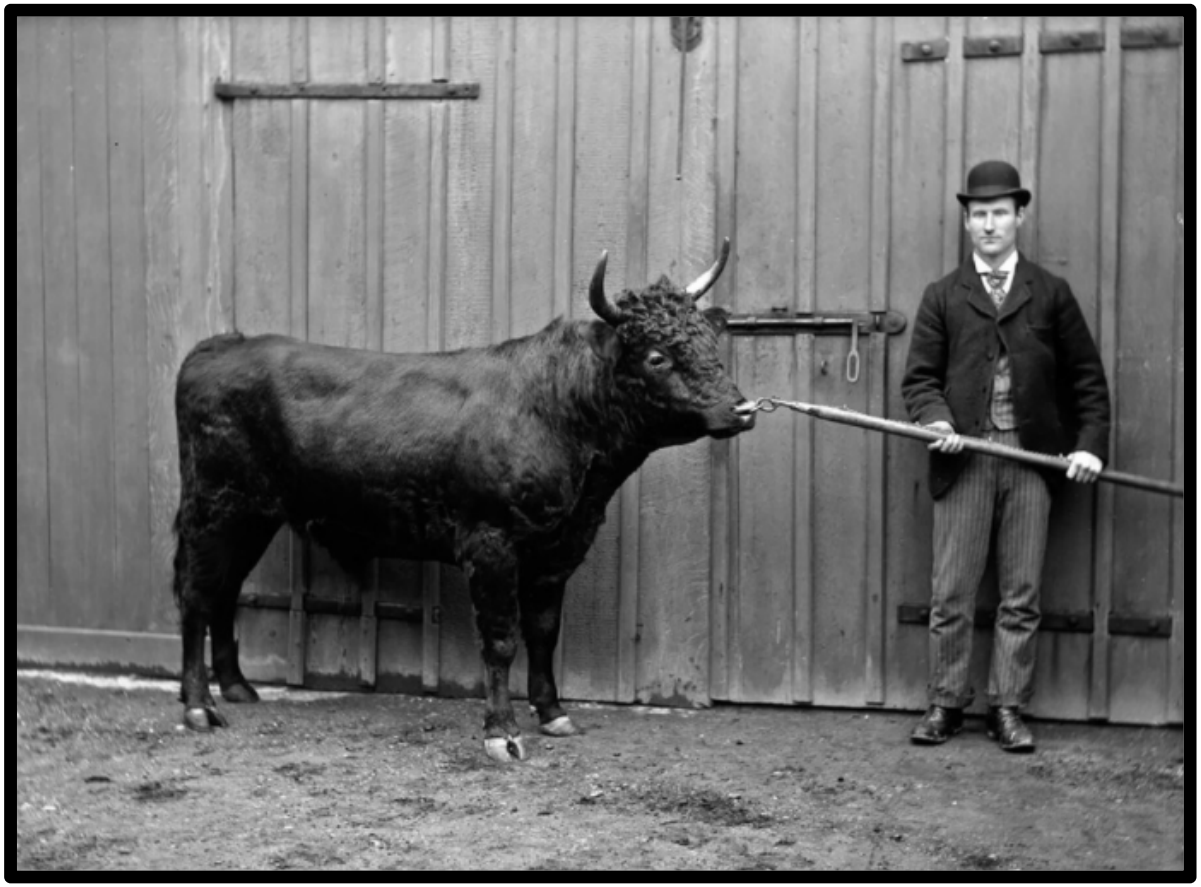
Affiliation	Contact	Title
B.C. Ministry of Energy & Mines - Electricity and Alternate Energy Division	Jack Buchanan	Senior Policy Advisor
B.C. Municipal Electric Utilities (BCMEU)	Carmen Proctor	EcoSave Program Manager, Nelson Hydro
B.C. Public Interest Advocacy Centre (BCPIAC)	Leigha Worth	Executive 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
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	Joyce Martin	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

Stakeholder Load Scenarios

Scenario Analysis

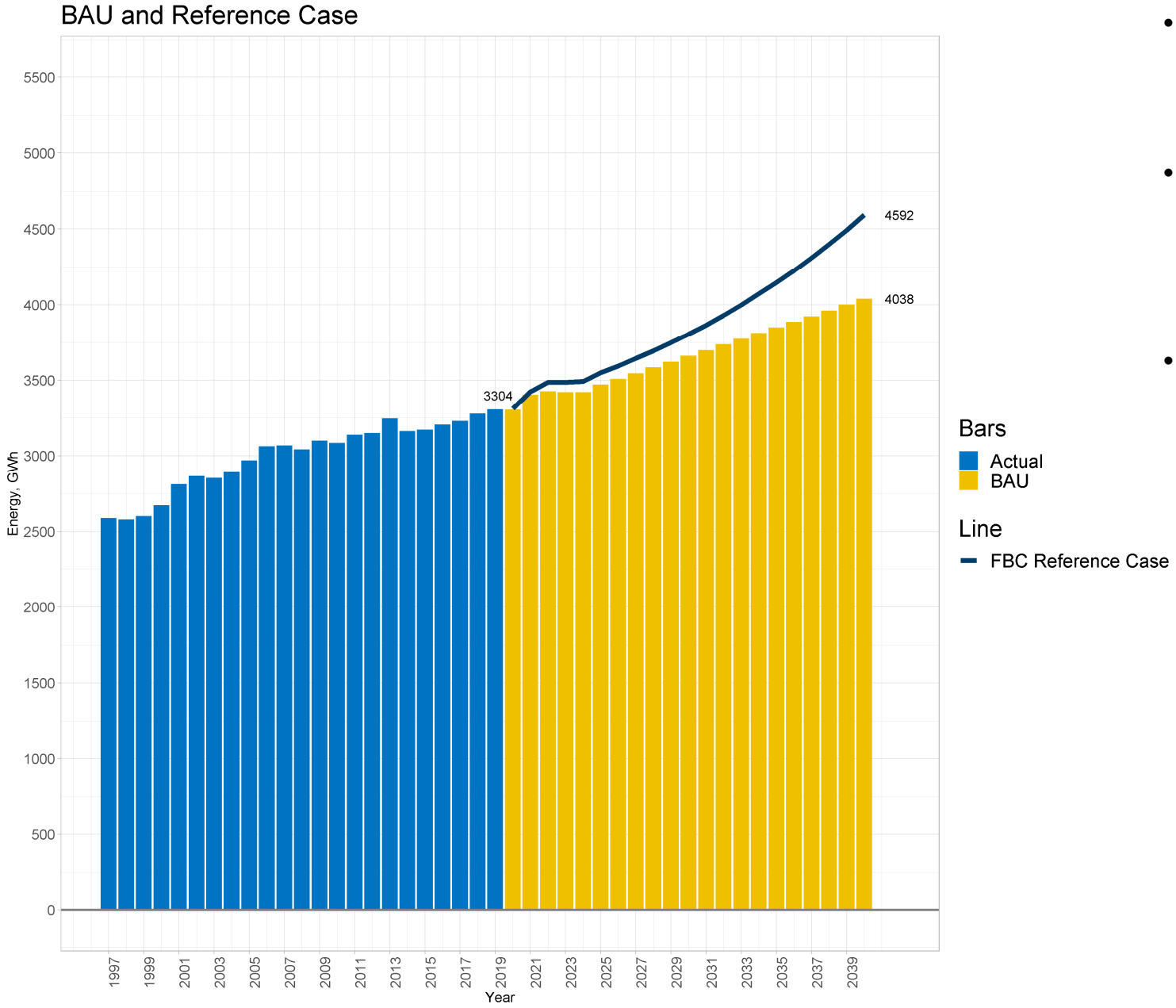
- The Business as Usual forecast is a simple extension of current trends.
- The Reference Case forecast contains additional loads that we are certain of.
- Scenario analysis is used to identify and account for uncertainties in our long term resource planning.
- There are six scenarios:
  - Navigant provided five scenarios that model potential future states of the world.
  - The Crowd Forecast scenario uses the “Slider” exercise to gather stakeholder views of what the future holds for electricity use.

Collective Intelligence

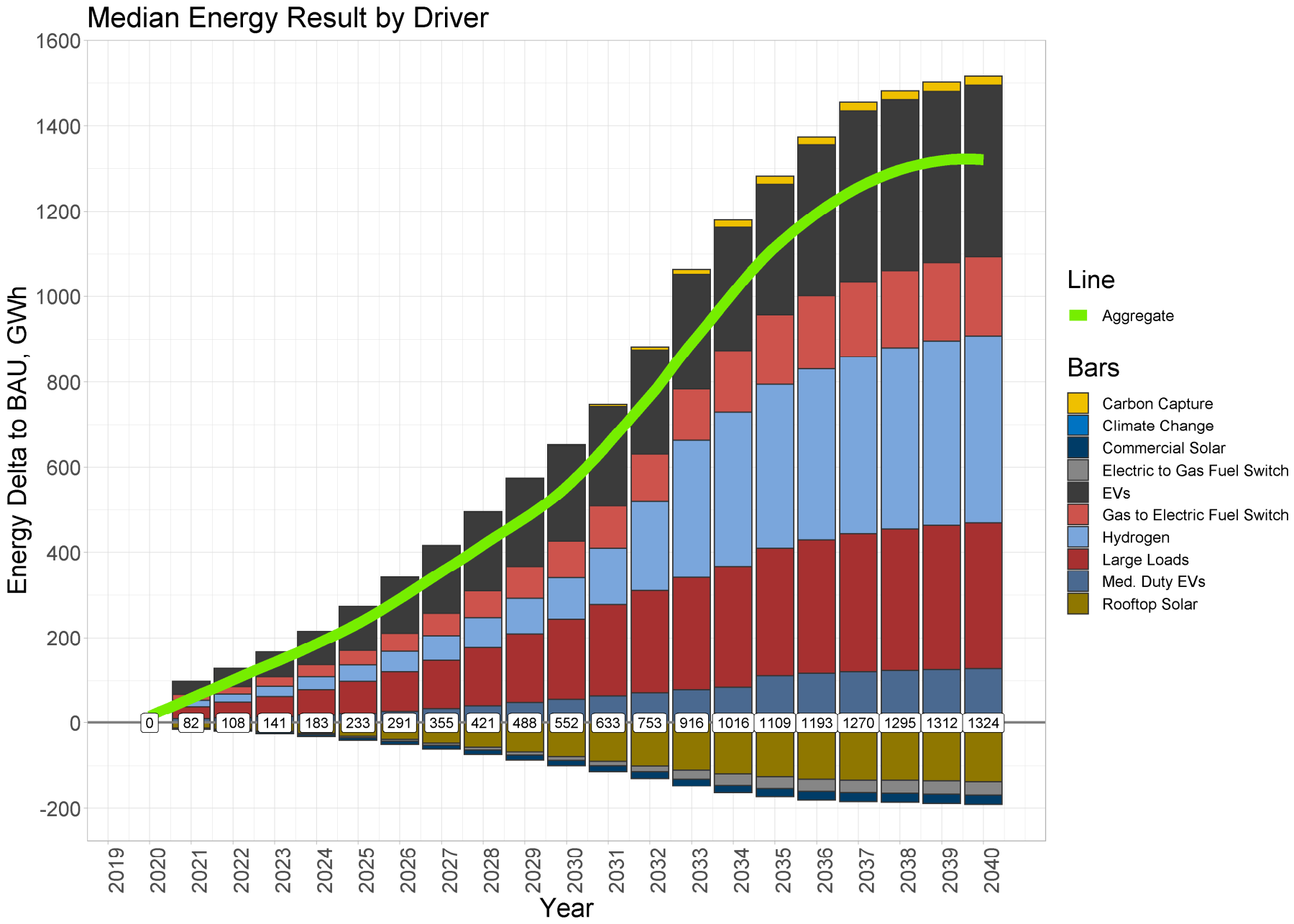


The Exercise

- We identified 10 drivers not intrinsic in the historic data.
  - Navigant provided upper and lower estimates of the load and peak impact of each driver through 2040.
- Users used the FBC Slider tool to provide their opinions of where each driver would end up, and how we would get there.
- The Crowd Forecast scenario is the result of 18 responses.
  - 9 Fortis staff
  - 9 RPAG members



- We use the actuals to create the BAU.
- The BAU is accurate as long as there are no new drivers.
- The Reference Case reflects things not “baked in” like the ZEV Act and highly probable new loads.


Median Energy Result by Driver
Energy Delta to BAU, GWh
1600
1400
1200
1000
800
600
400
200
0
-200
0
82
108
141
183
233
291
355
421
488
552
633
753
916
1016
1109
1193
1270
1295
1312
1324
2019
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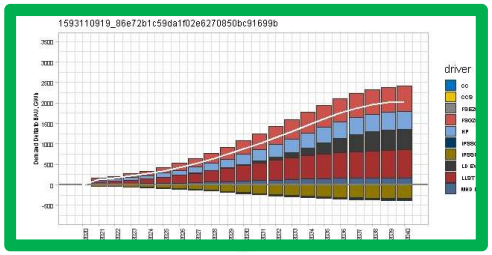
Year
Line
Aggregate
Bars
Carbon Capture
Climate Change
Commercial Solar
Electric to Gas Fuel Switch
EVs
Gas to Electric Fuel Switch
Hydrogen
Large Loads
Med. Duty EVs
Rooftop Solar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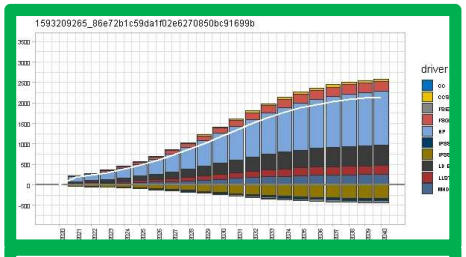
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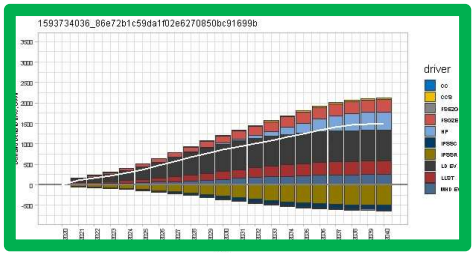
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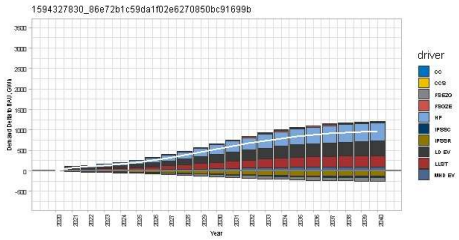
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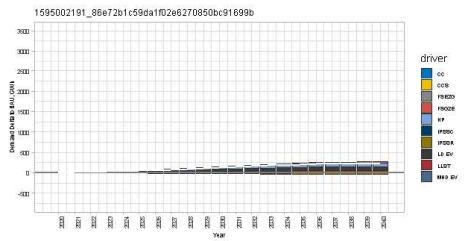
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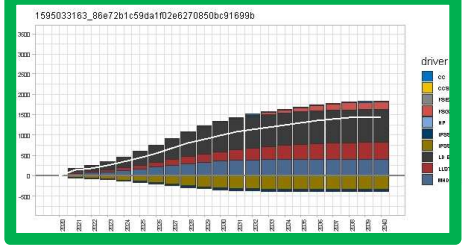
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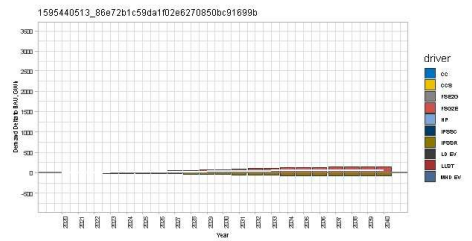
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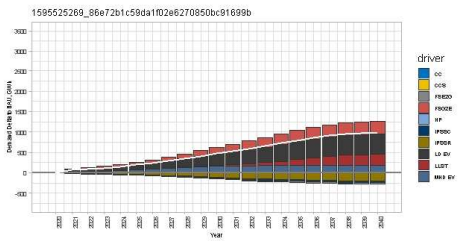
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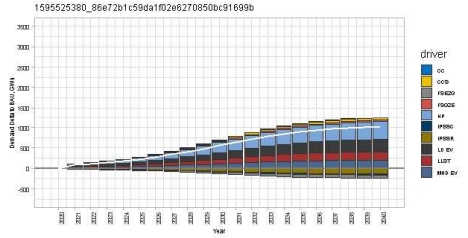
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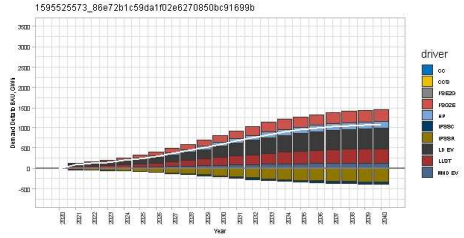
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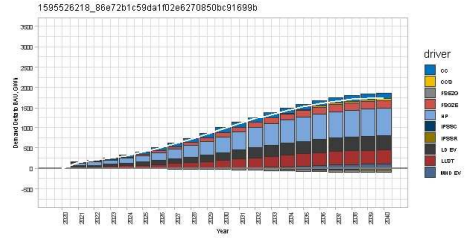
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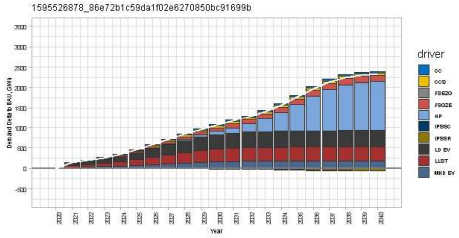
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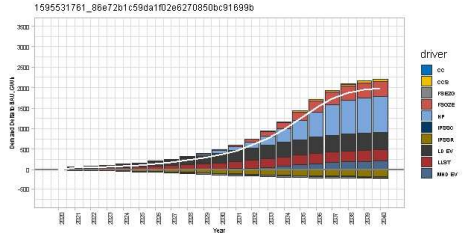
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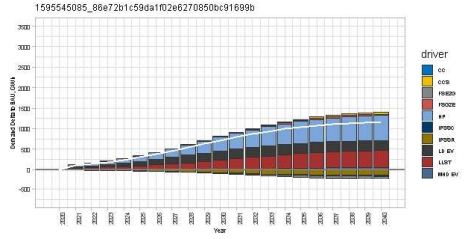
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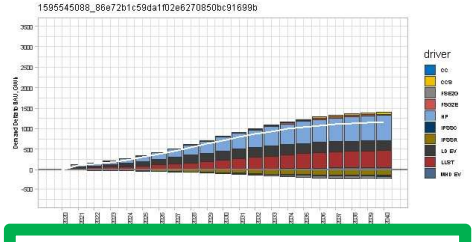
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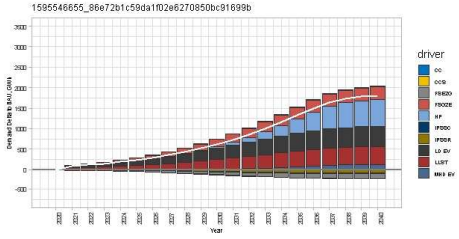
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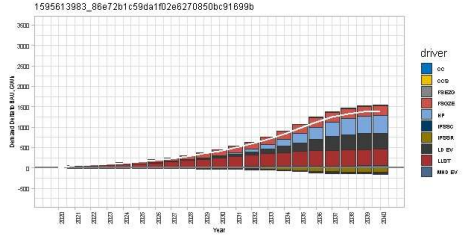
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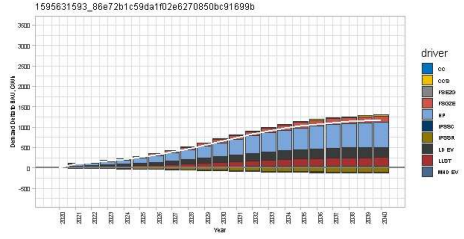
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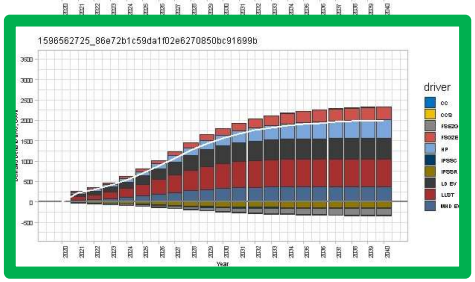
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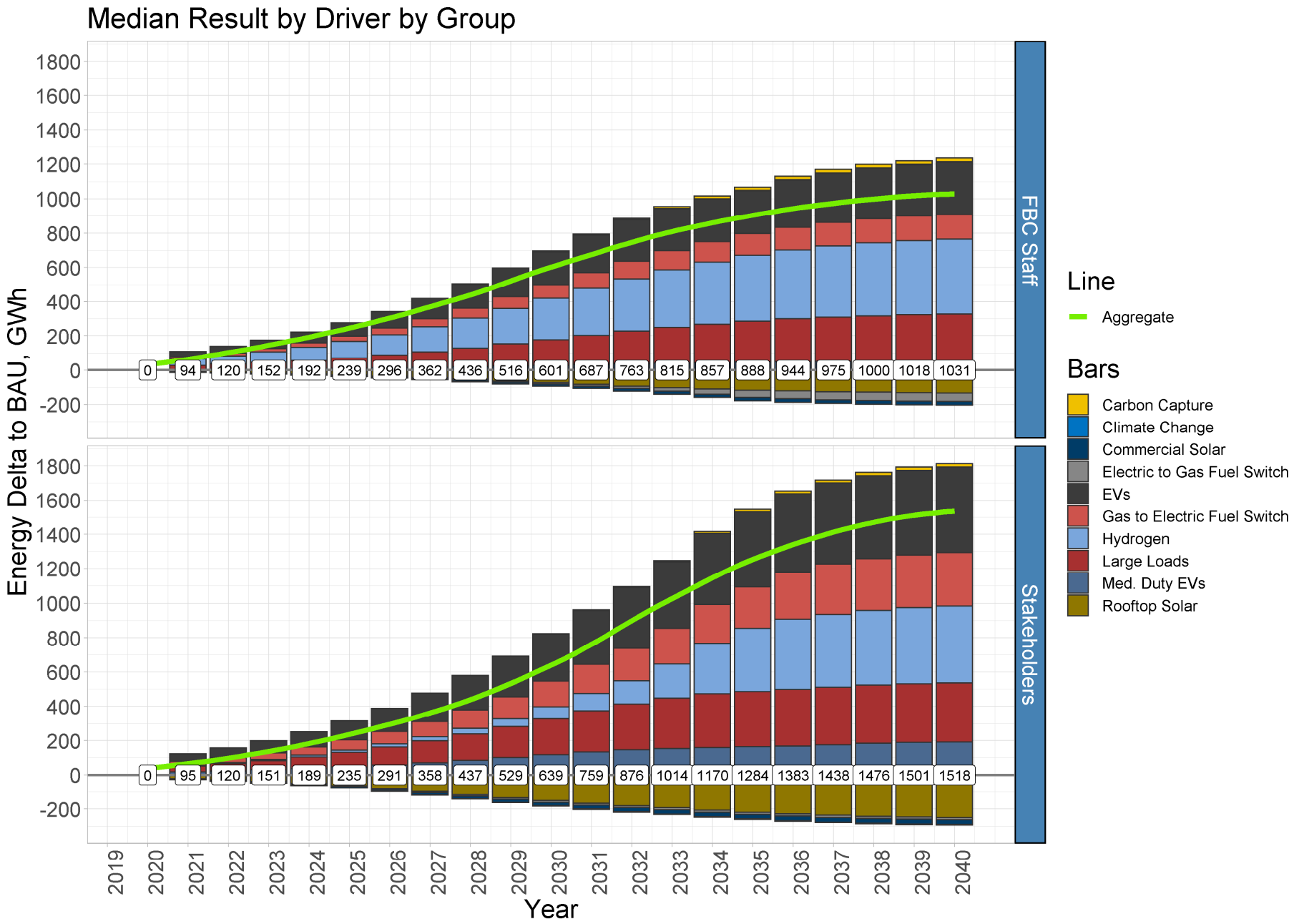
Median Result by Driver by Group
Energy Delta to BAU, GWh
1800
1600
1400
1200
1000
800
600
400
200
0
-200
0
94
120
152
192
239
296
362
436
516
601
687
763
815
857
888
944
975
1000
1018
1031
FBC Staff
0
95
120
151
189
235
291
358
437
529
639
759
876
1014
1170
1284
1383
1438
1476
1501
1518
Stakeholders
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
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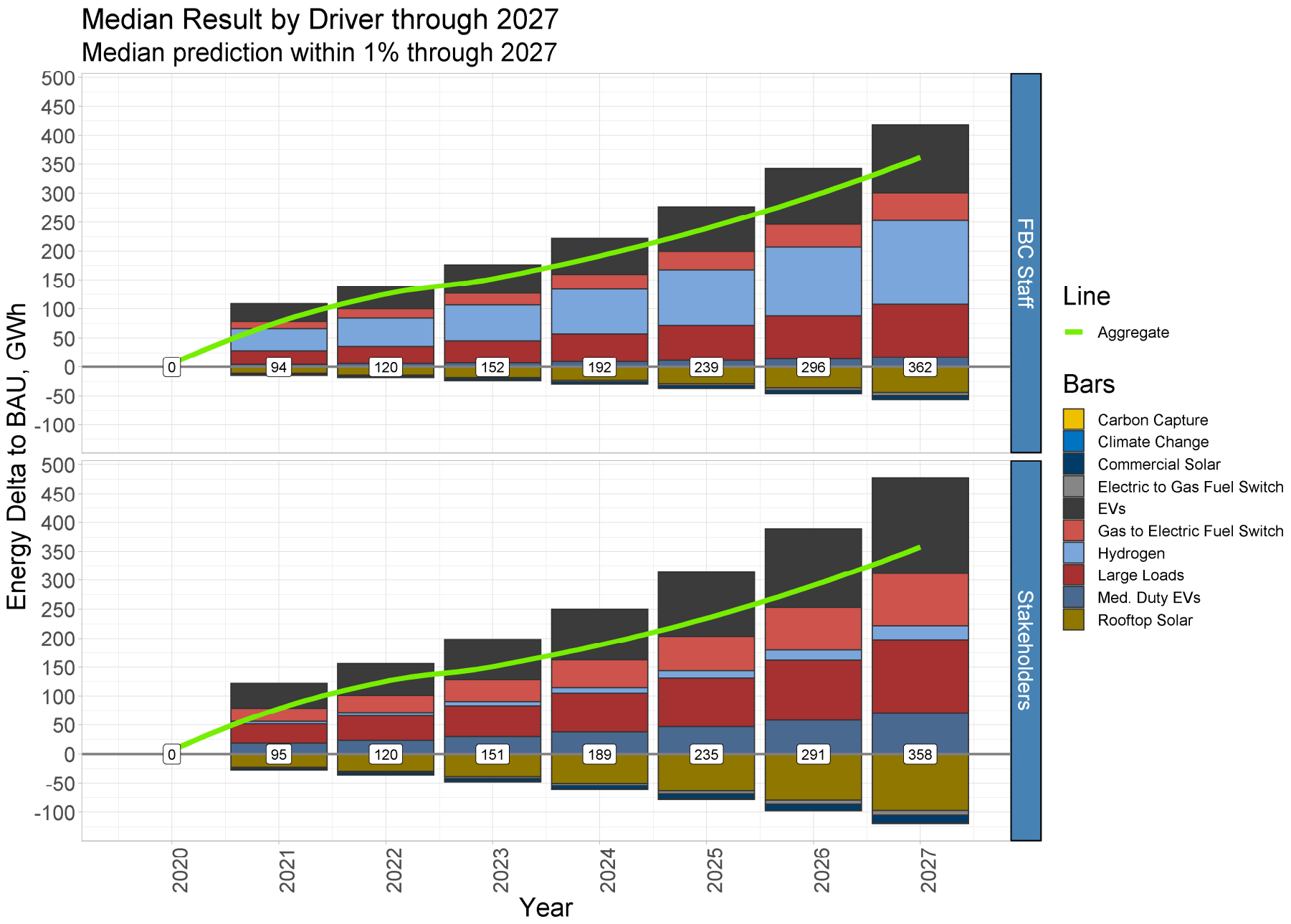
2038
2039
2040
Year
Line
Aggregate
Bars
Carbon Capture
Climate Change
Commercial Solar
Electric to Gas Fuel Switch
EVs
Gas to Electric Fuel Switch
Hydrogen
Large Loads
Med. Duty EVs
Rooftop Solar


Median Result by Driver through 2027
Median prediction within 1% through 2027
Energy Delta to BAU, GWh
500
450
400
350
300
250
200
150
100
50
0
-50
-100
FBC Staff
0
94
120
152
192
239
296
362
Stakeholders
0
95
120
151
189
235
291
358
2020
2021
2022
2023
2024
2025
2026
2027
Year
Line
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EVs
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Large Loads
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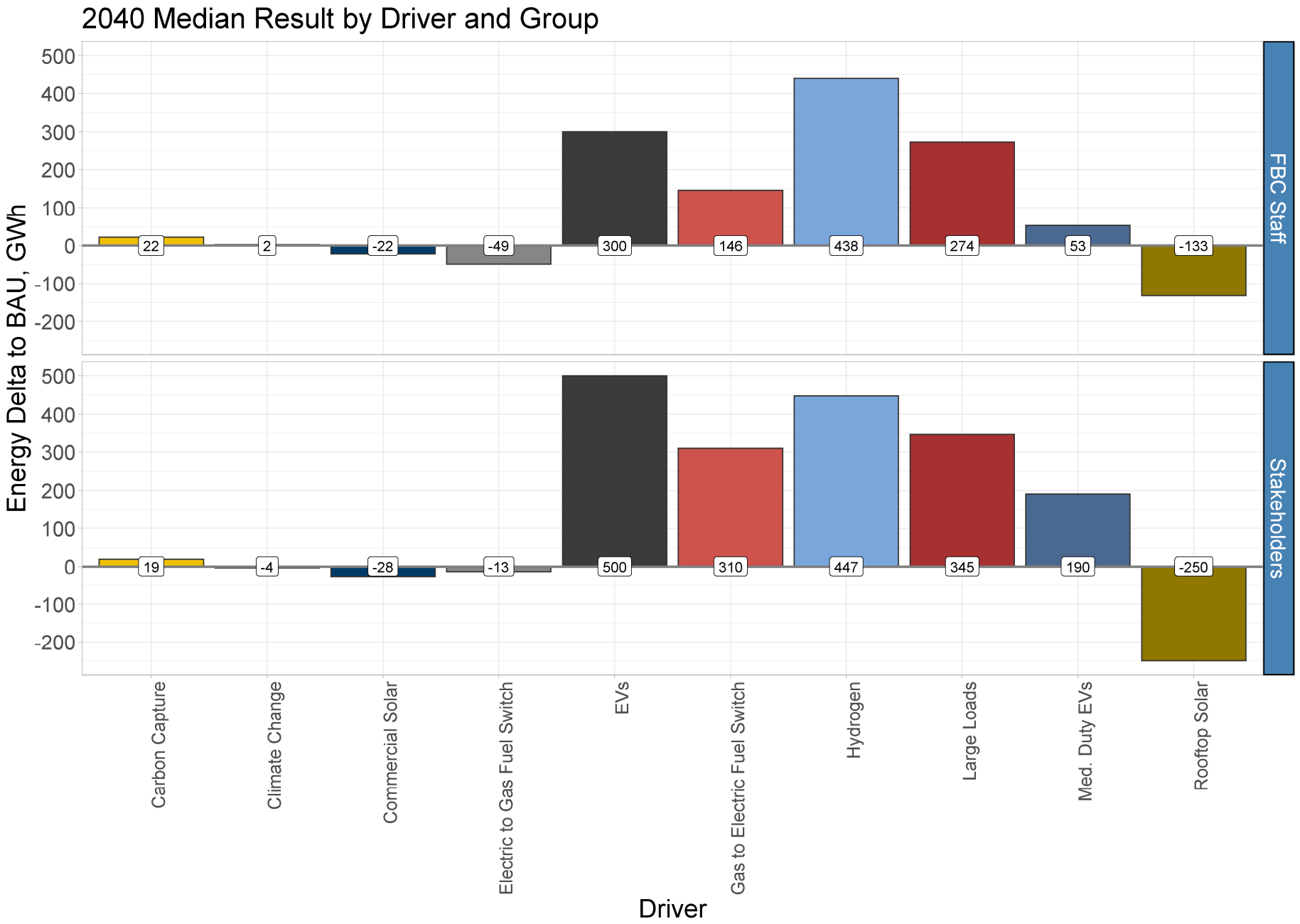
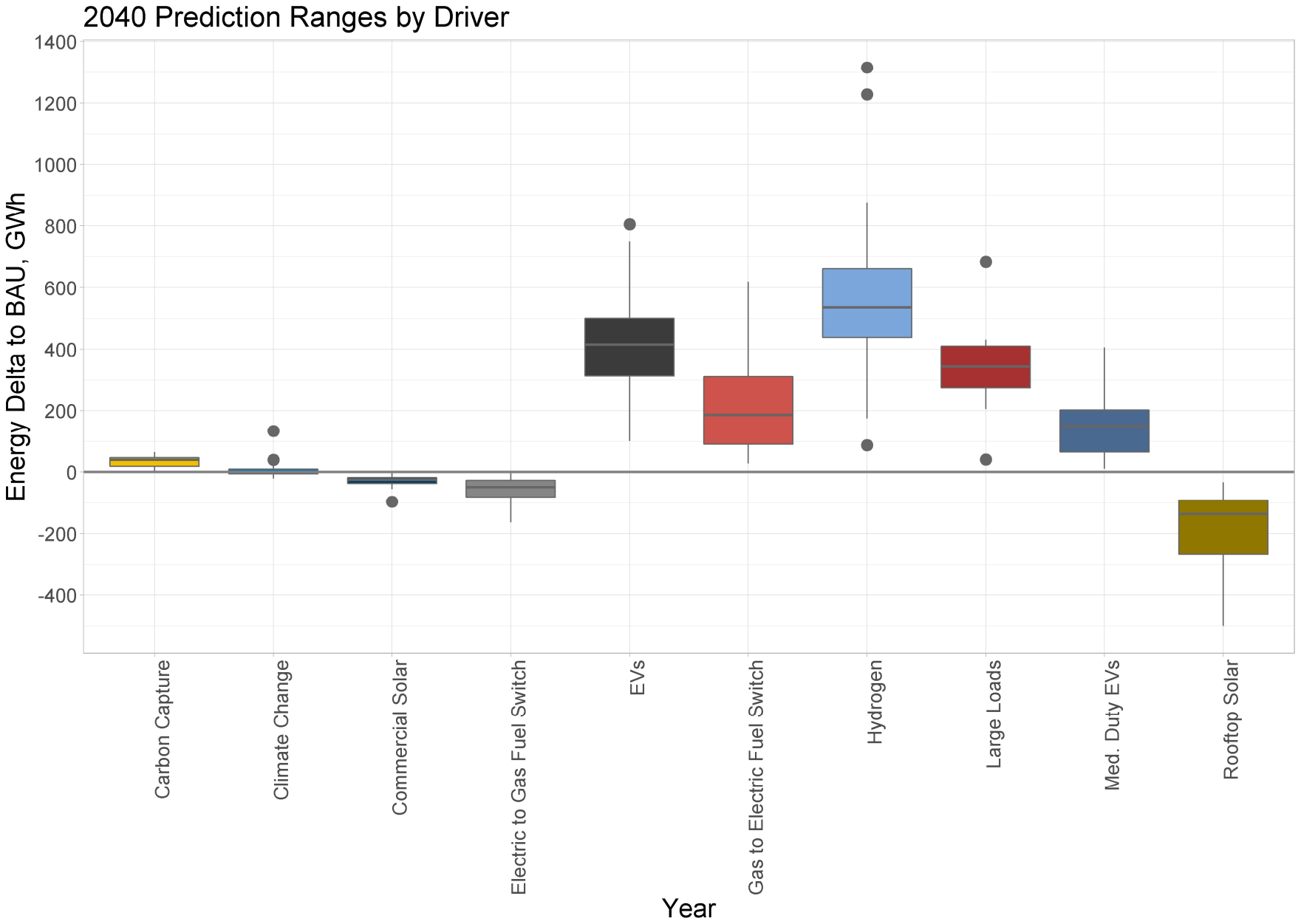
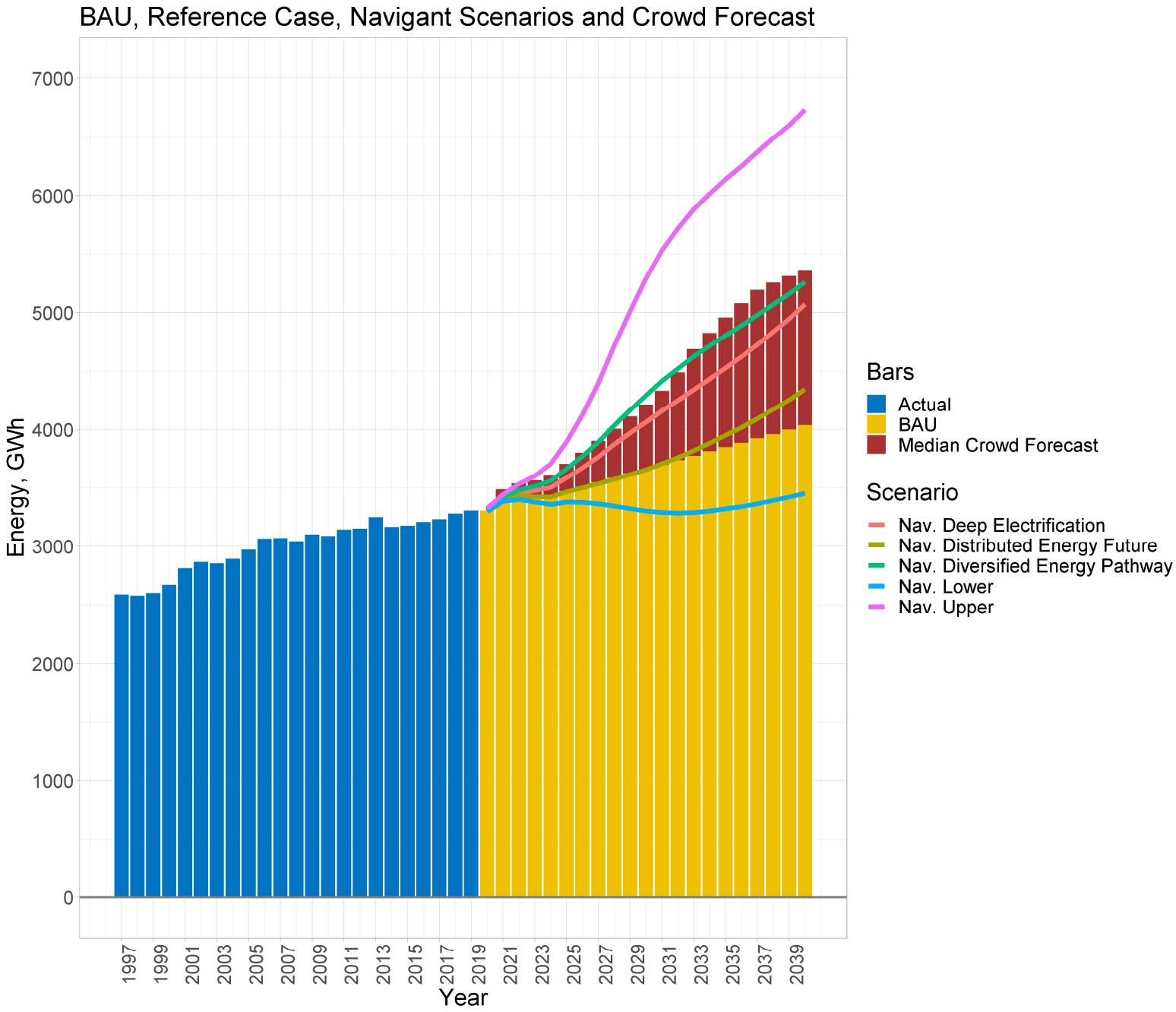
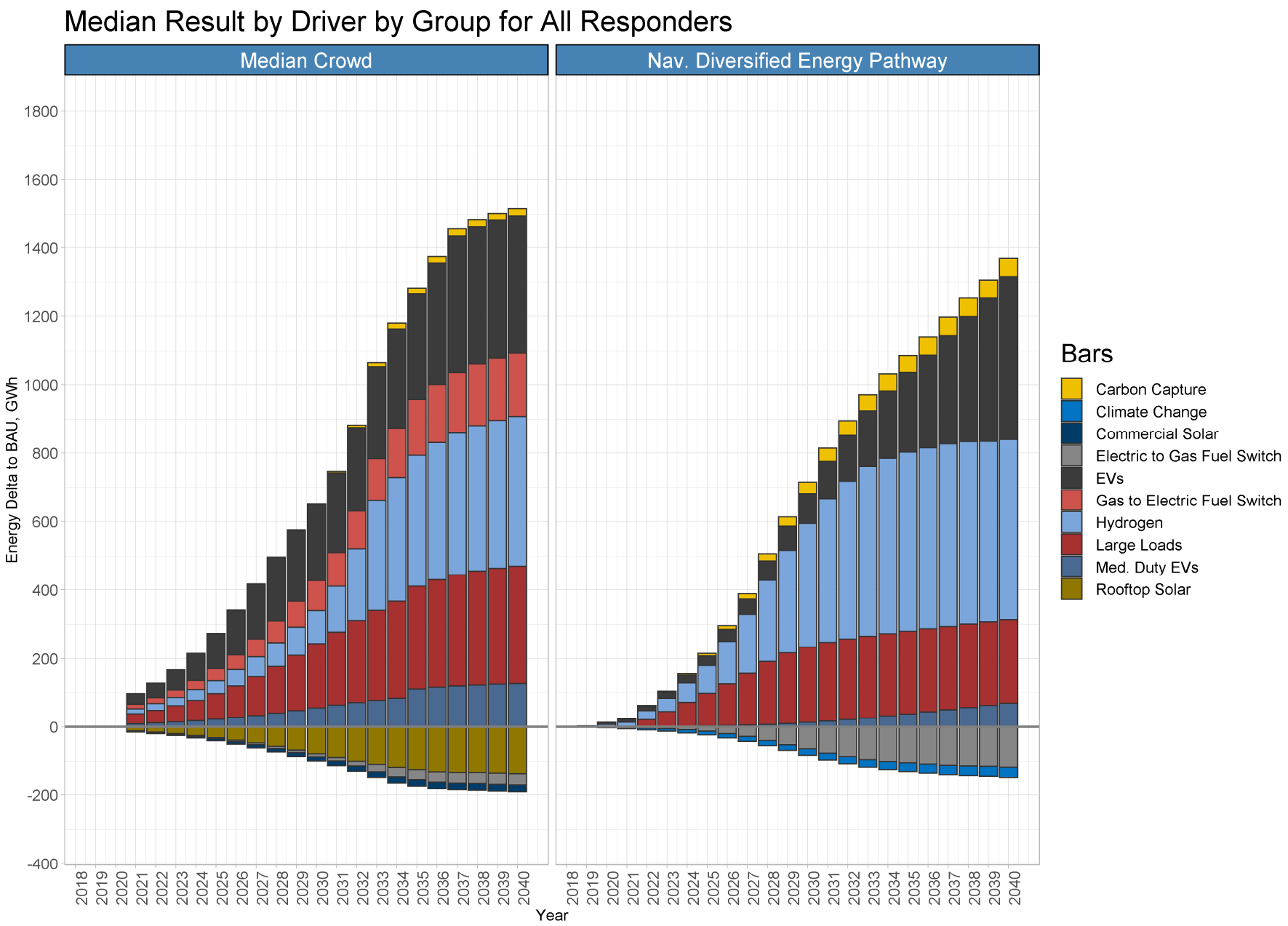
Rooftop Solar


2040 Median Result by Driver and Group
Energy Delta to BAU, GWh
500
400
300
200
100
0
-100
-200
22
2
-22
-49
300
146
438
274
53
-133
FBC Staff
19
-4
-28
-13
500
310
447
345
190
-250
Stakeholders
Carbon Capture
Climate Change
Commercial Solar
Electric to Gas Fuel Switch
EVs
Gas to Electric Fuel Switch
Hydrogen
Large Loads
Med. Duty EVs
Rooftop Solar
Driver


2040 Prediction Ranges by Driver
Energy Delta to BAU, GWh
1400
1200
1000
800
600
400
200
0
-200
-400
Carbon Capture
Climate Change
Commercial Solar
Electric to Gas Fuel Switch
EVs
Gas to Electric Fuel Switch
Hydrogen
Large Loads
Med. Duty EVs
Rooftop Solar
Year


BAU, Reference Case, Navigant Scenarios and Crowd Forecast
Energy, GWh
7000
6000
5000
4000
3000
2000
1000
0
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
2023
2025
2027
2029
2031
2033
2035
2037
2039
Year
Bars
Actual
BAU
Median Crowd Forecast
Scenario
Nav. Deep Electrification
Nav. Distributed Energy Future
Nav. Diversified Energy Pathway
Nav. Lower
Nav. Upper


Median Result by Driver by Group for All Responders
Median Crowd
Nav. Diversified Energy Pathway
Energy Delta to BAU, GWh
1800
1600
1400
1200
1000
800
600
400
200
0
-200
-400
2018
2019
2020
2021
2022
2023
2024
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Year
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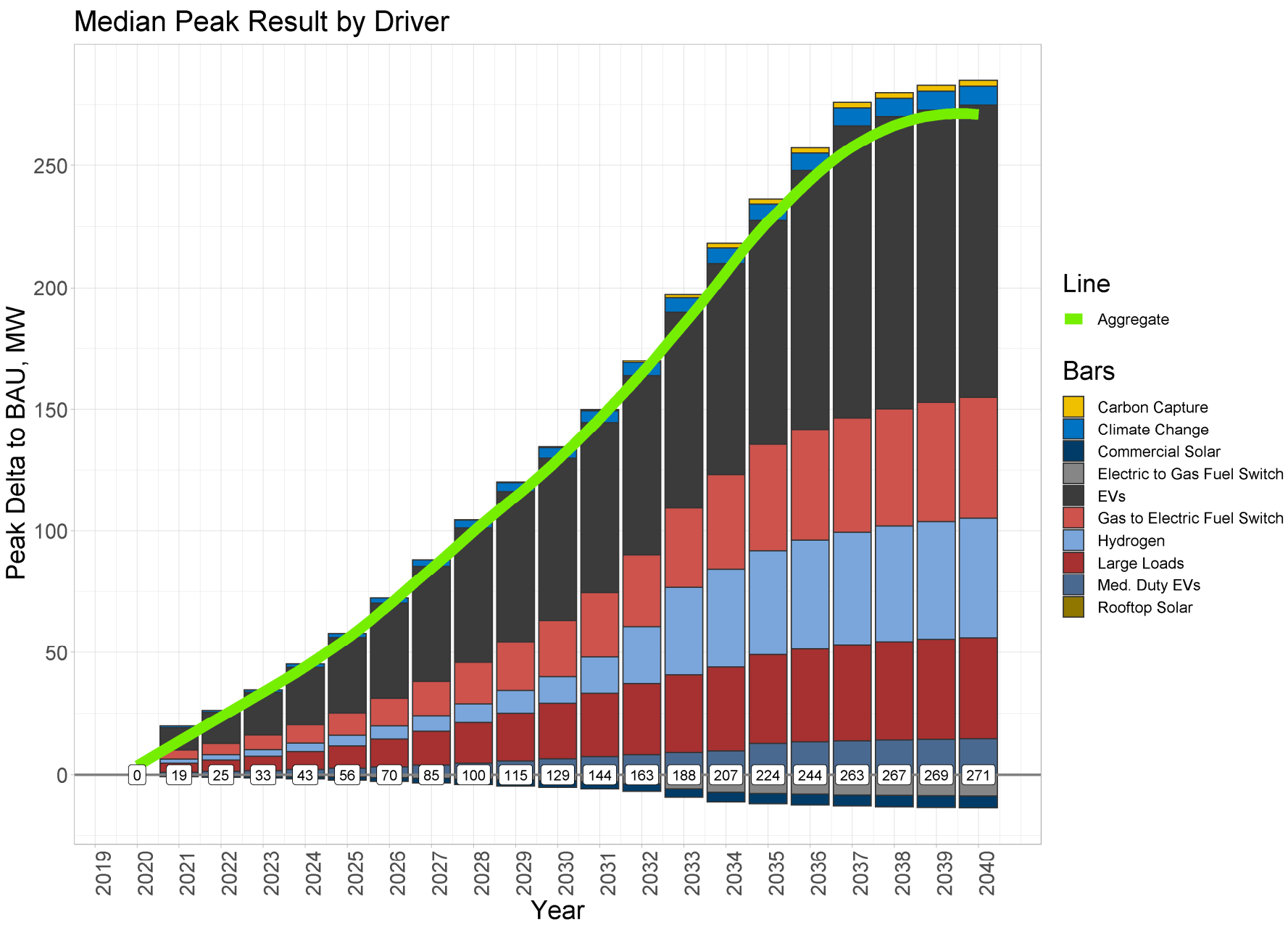
Median Peak Result by Driver
Peak Delta to BAU, MW
250
200
150
100
50
0
0
19
25
33
43
56
70
85
100
115
129
144
163
188
207
224
244
263
267
269
271
2019
2020
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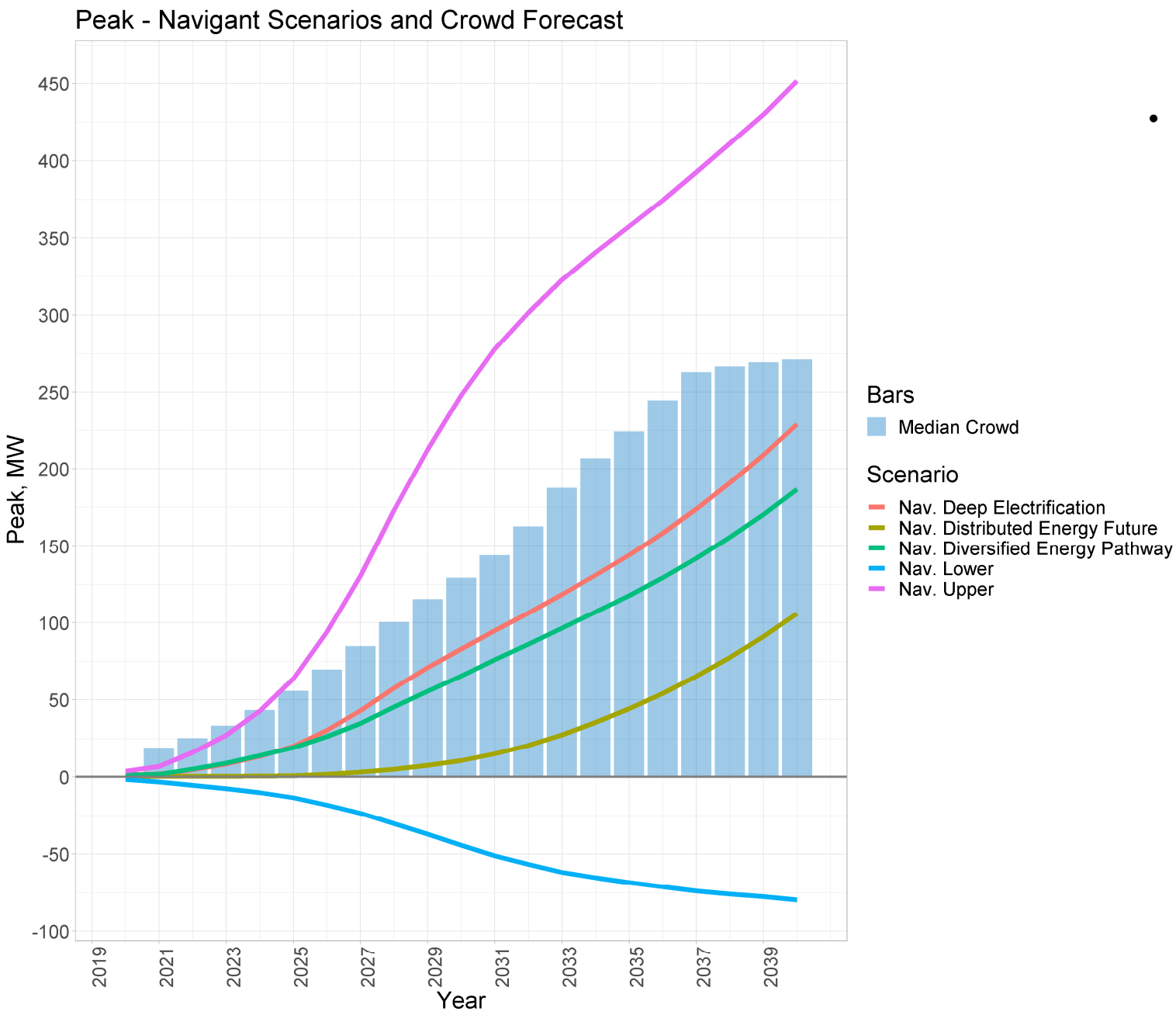
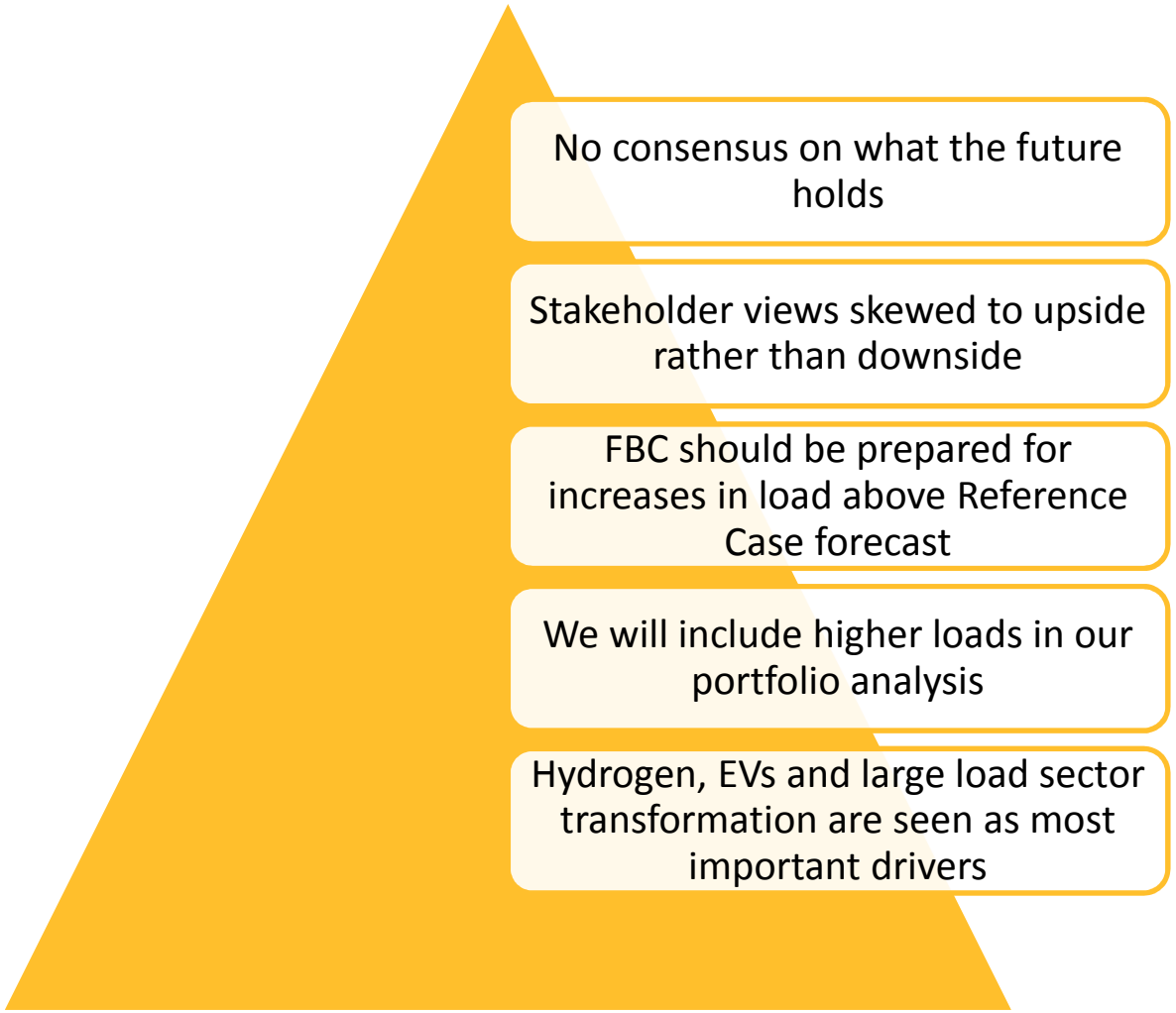


- Median crowd forecast peak impact significantly higher than Diversified Energy Pathway

Conclusions



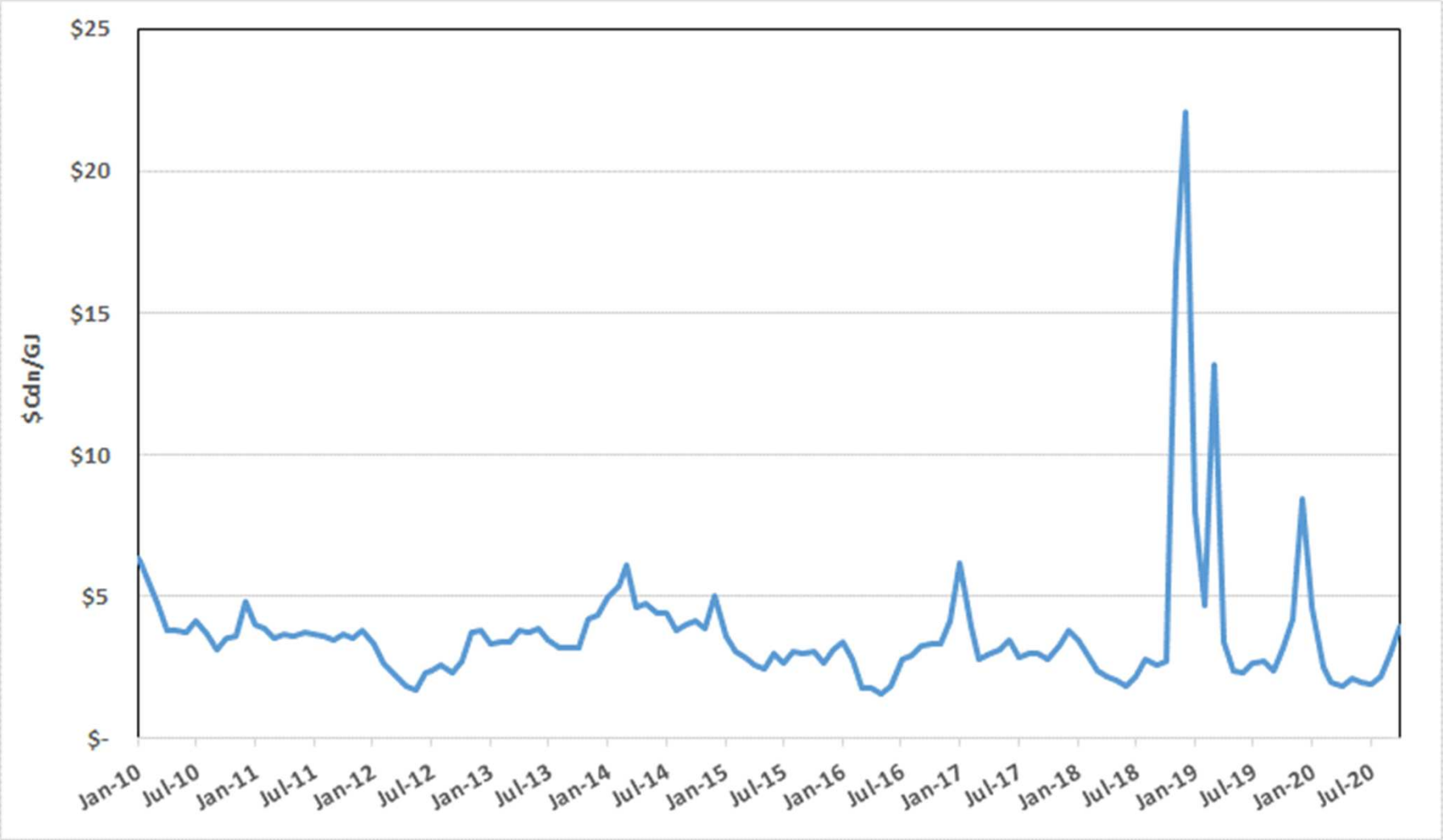
Market Price and Rate Forecasts and Scenarios

Inputs for Supply-Side Resource Options

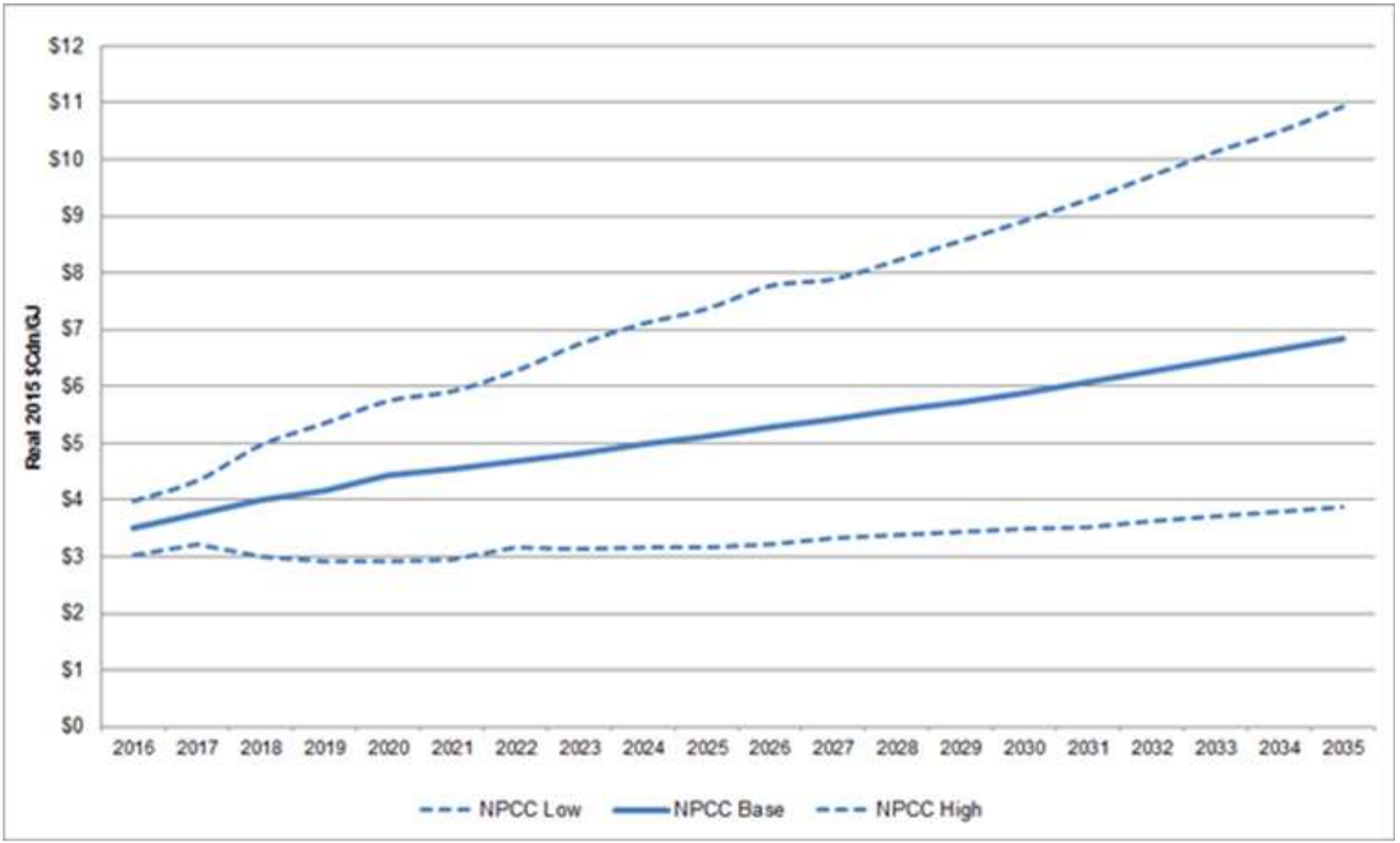
- Sumas gas prices: variable fuel costs for gas-fired generation
- RNG prices: variable fuel costs for gas-fired generation using RNG
- Mid-C power prices: cost of market purchases
- Carbon prices: cost of carbon applied to fuel cost of gas-fired generation and non-clean market purchases
- PPA rates: cost of PPA Tranche 1 and 2 energy and capacity

Sumas Gas Price Forecasts (Preliminary)

Historical Sumas Prices

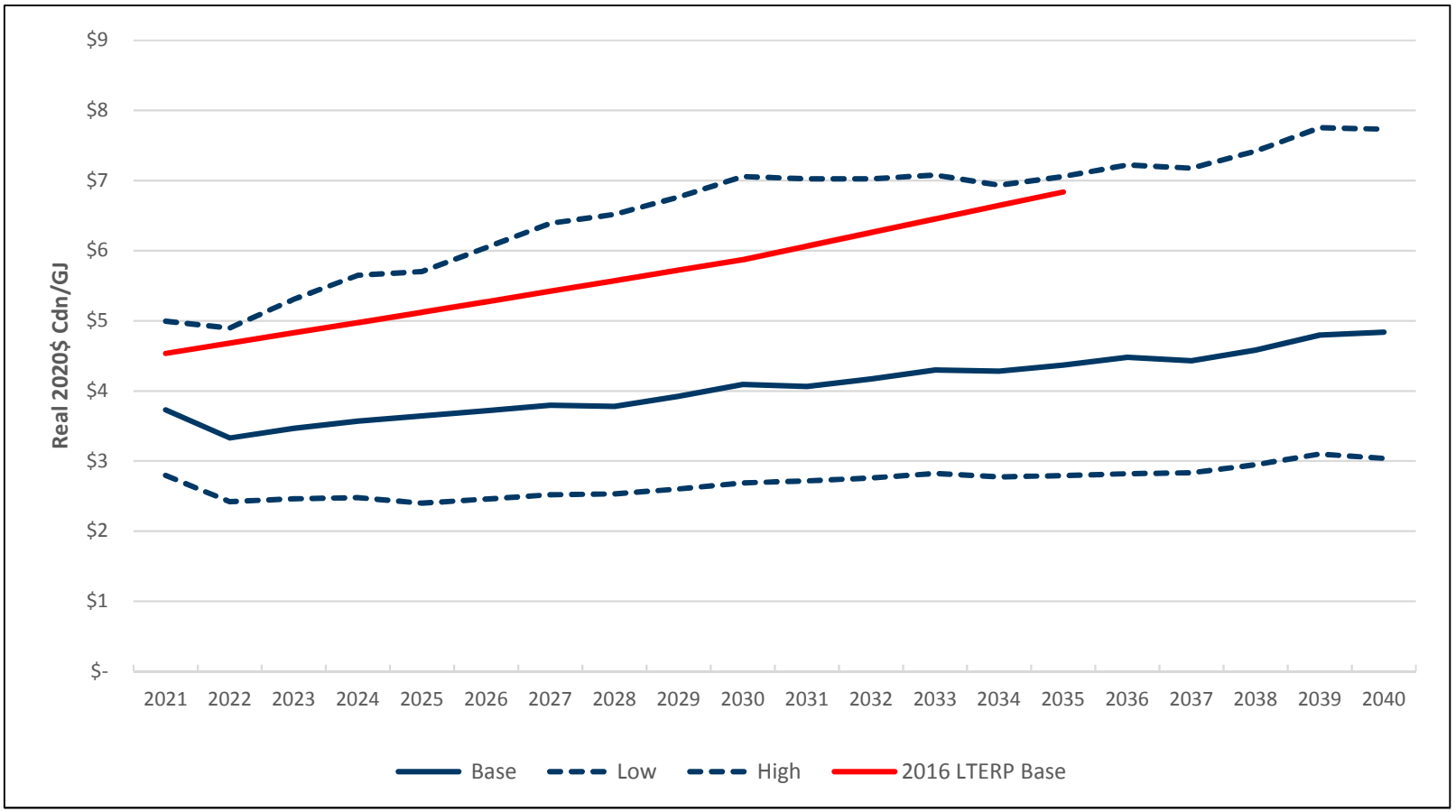


2016 LTERP Sumas Price Forecast



Source : NPCC 7th Power Plan

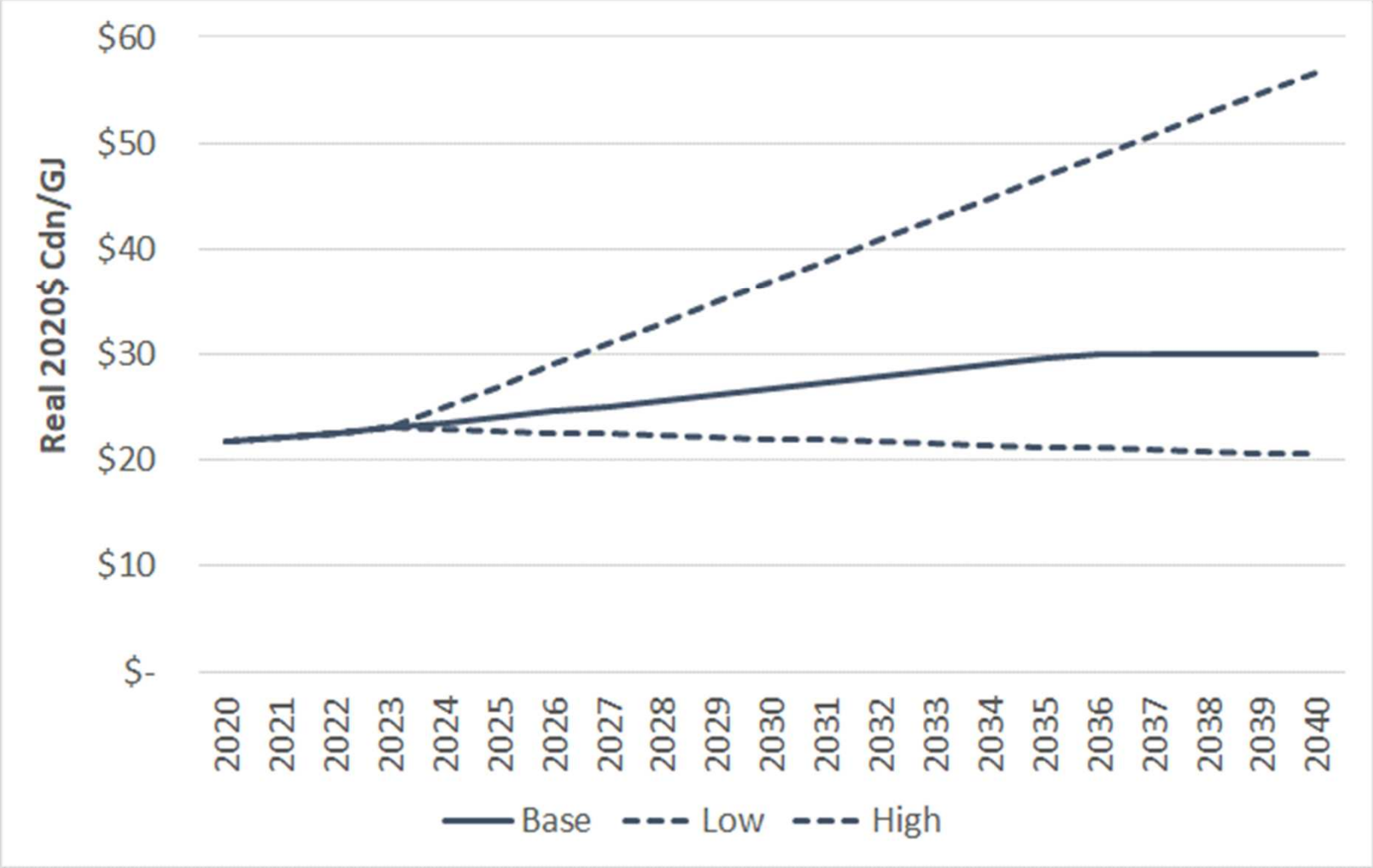
2021 LTERP Sumas Price Forecast



- Prices trending up due to increasing Regional Demand and Constrained Infrastructure

Renewable Natural Gas (RNG) Price Forecasts

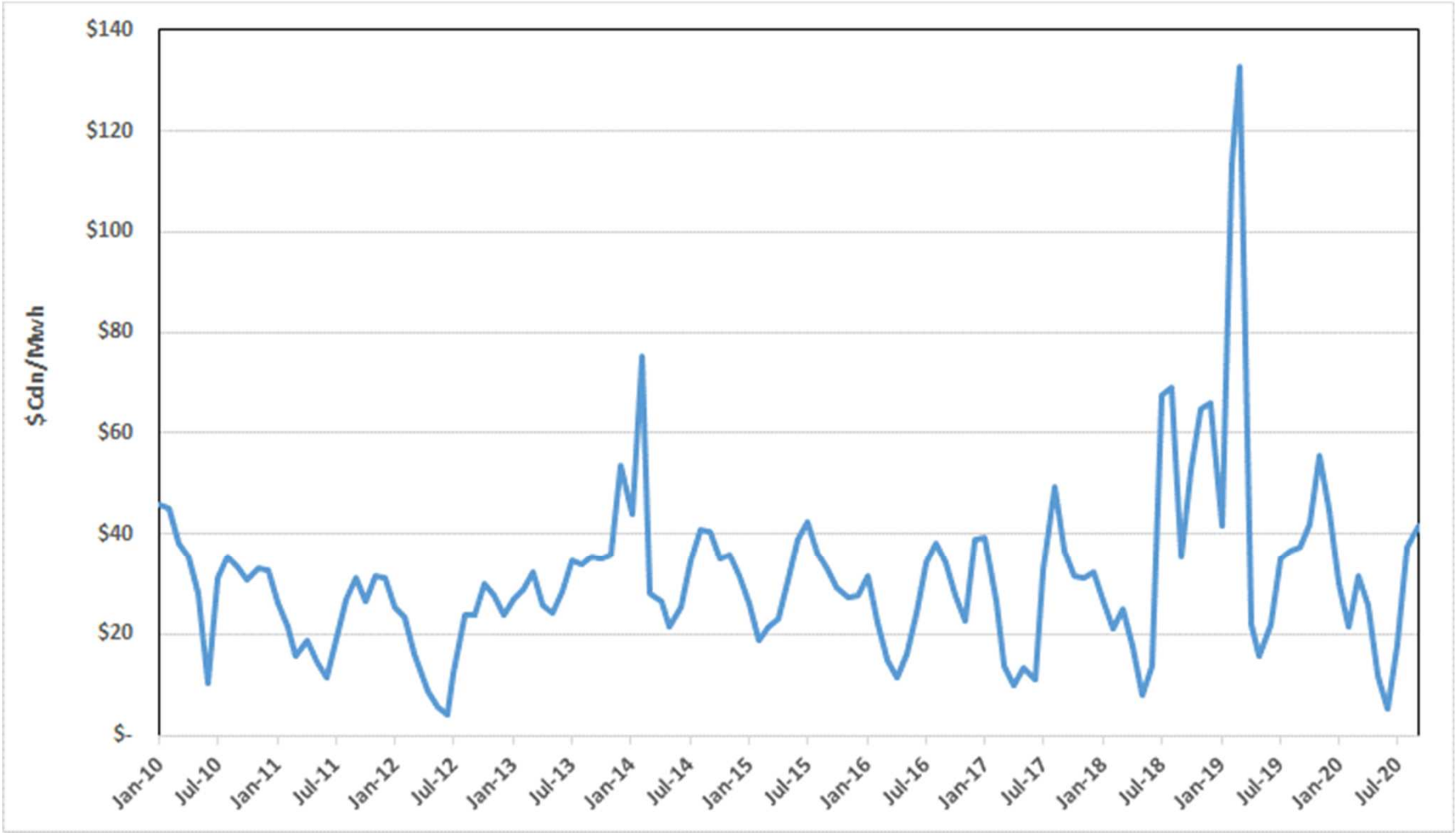
RNG Price Forecast



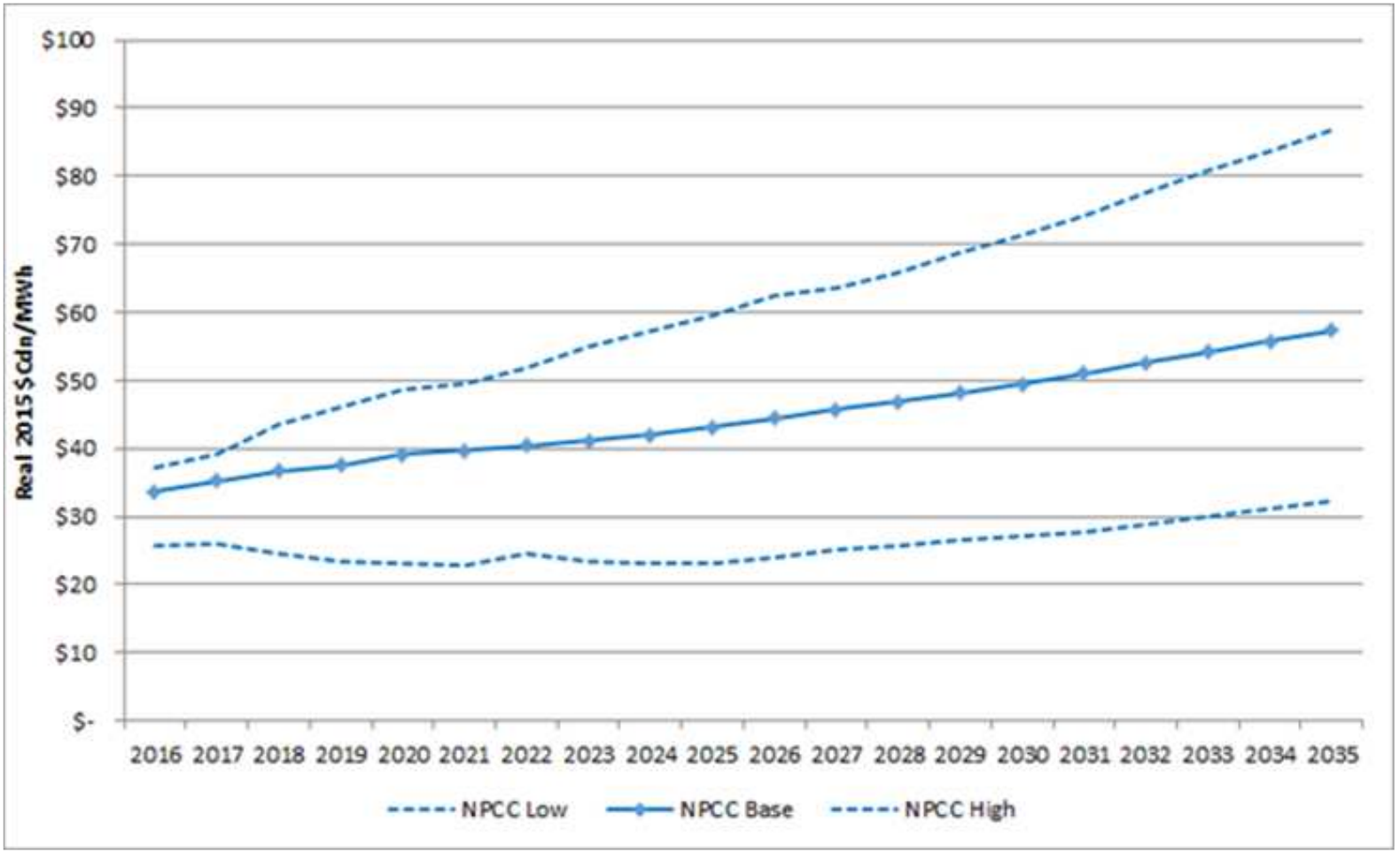
- Bulk of the Supply Contracts are in place until 2023; less certainty going forward

Mid-C Power Price Forecasts (Preliminary)

Historical Mid-C Prices



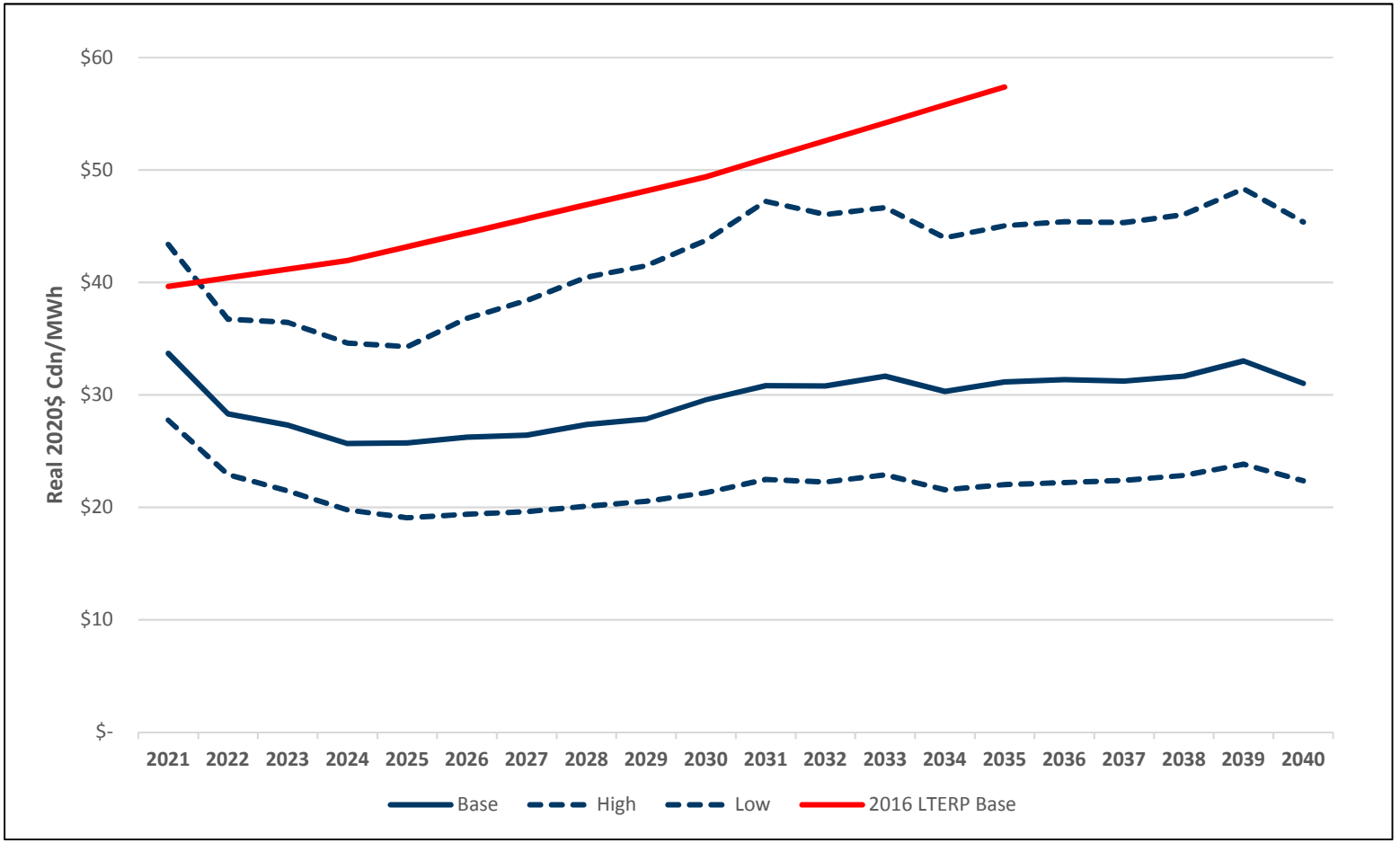
2016 LTERP Mid-C Price Forecast



Source : NPCC 7th Power Plan

- Largely based on Sumas price forecast as gas-fired plants are often the marginal generating resource to meet regional peak load requirements

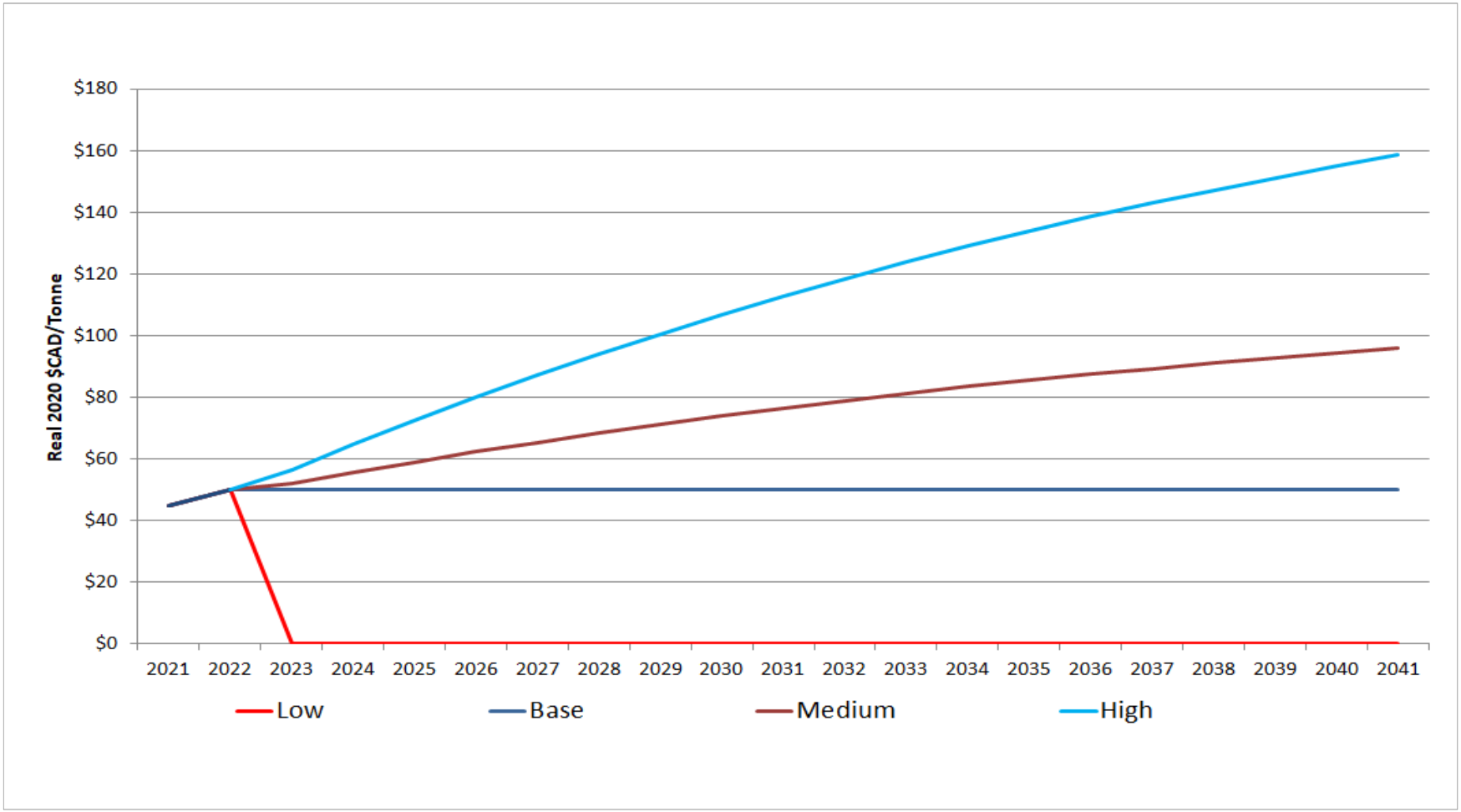
2021 LTERP Mid-C Price Forecast



- Mid-C prices are disassociating from Sumas gas prices due to increased renewable generation

BC Carbon Price Scenarios

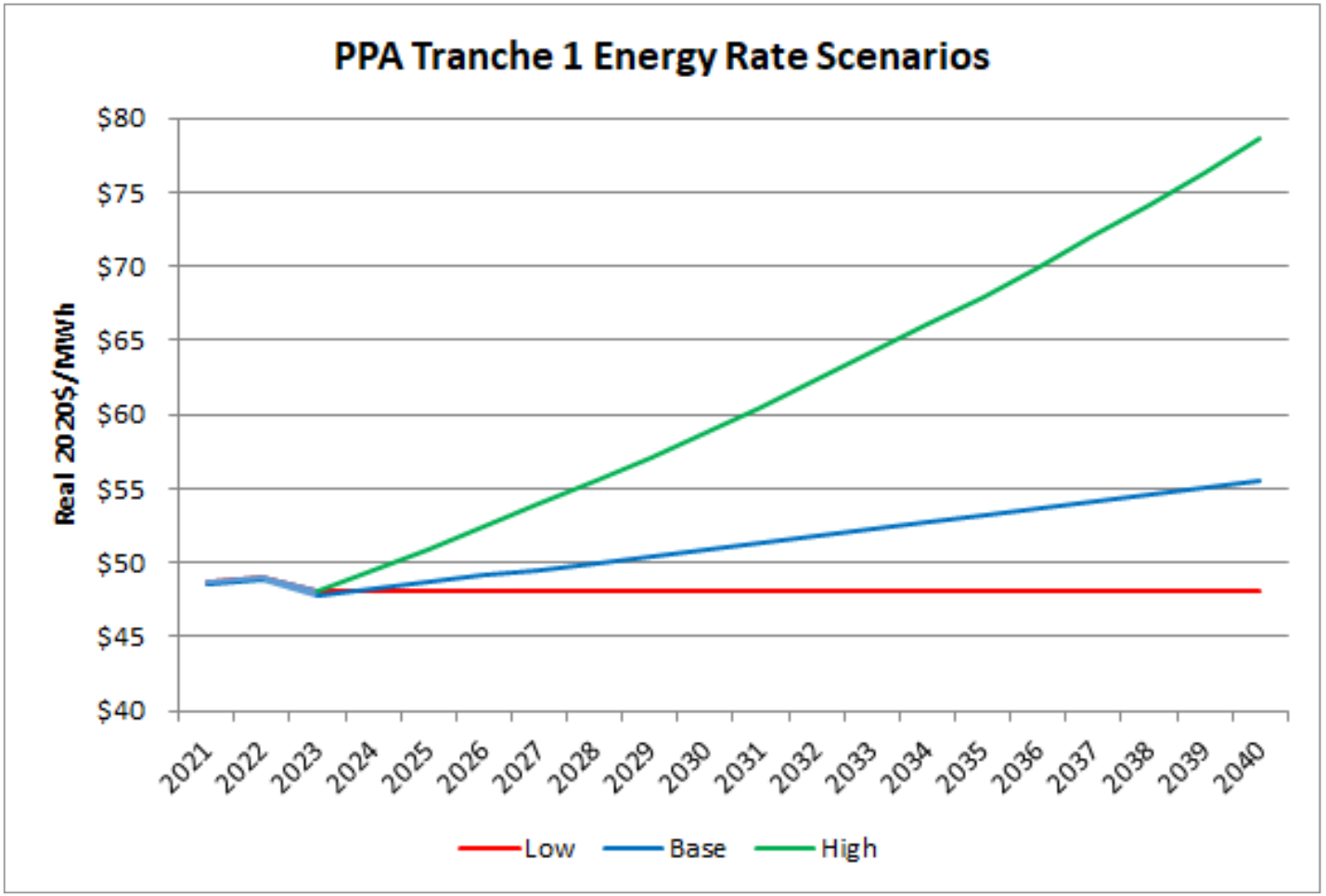
B.C. Carbon Price Scenarios



- Current rate at $40/Tonne.
- Carbon Tax Forecasted Increases :
  - 2021 +$5/Tonne ($45/Tonne)
  - 2022 +$5/Tonne ($50/Tonne)

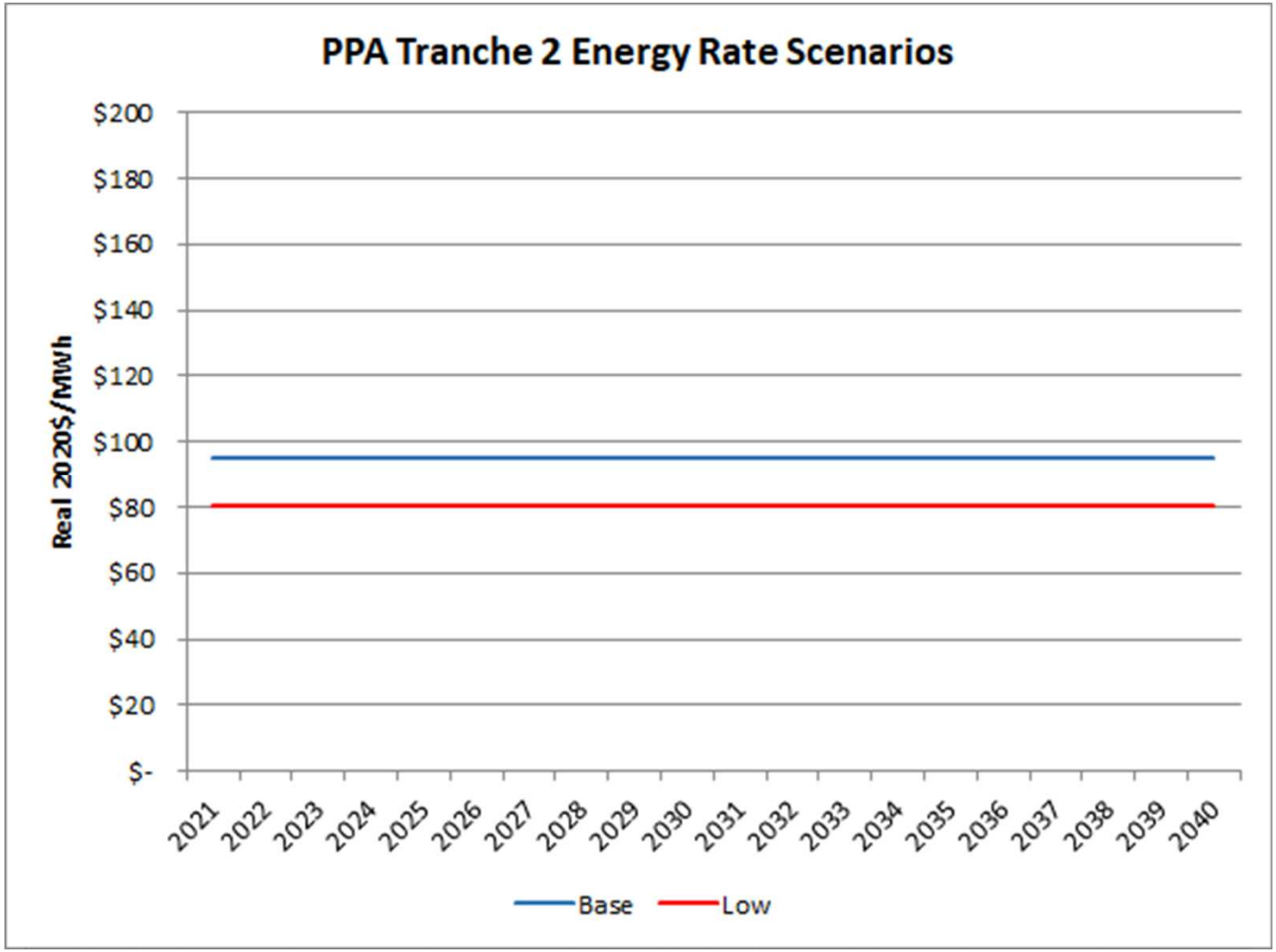
BC Hydro PPA Rate Scenarios

PPA Tranche 1 Energy Rate Scenarios



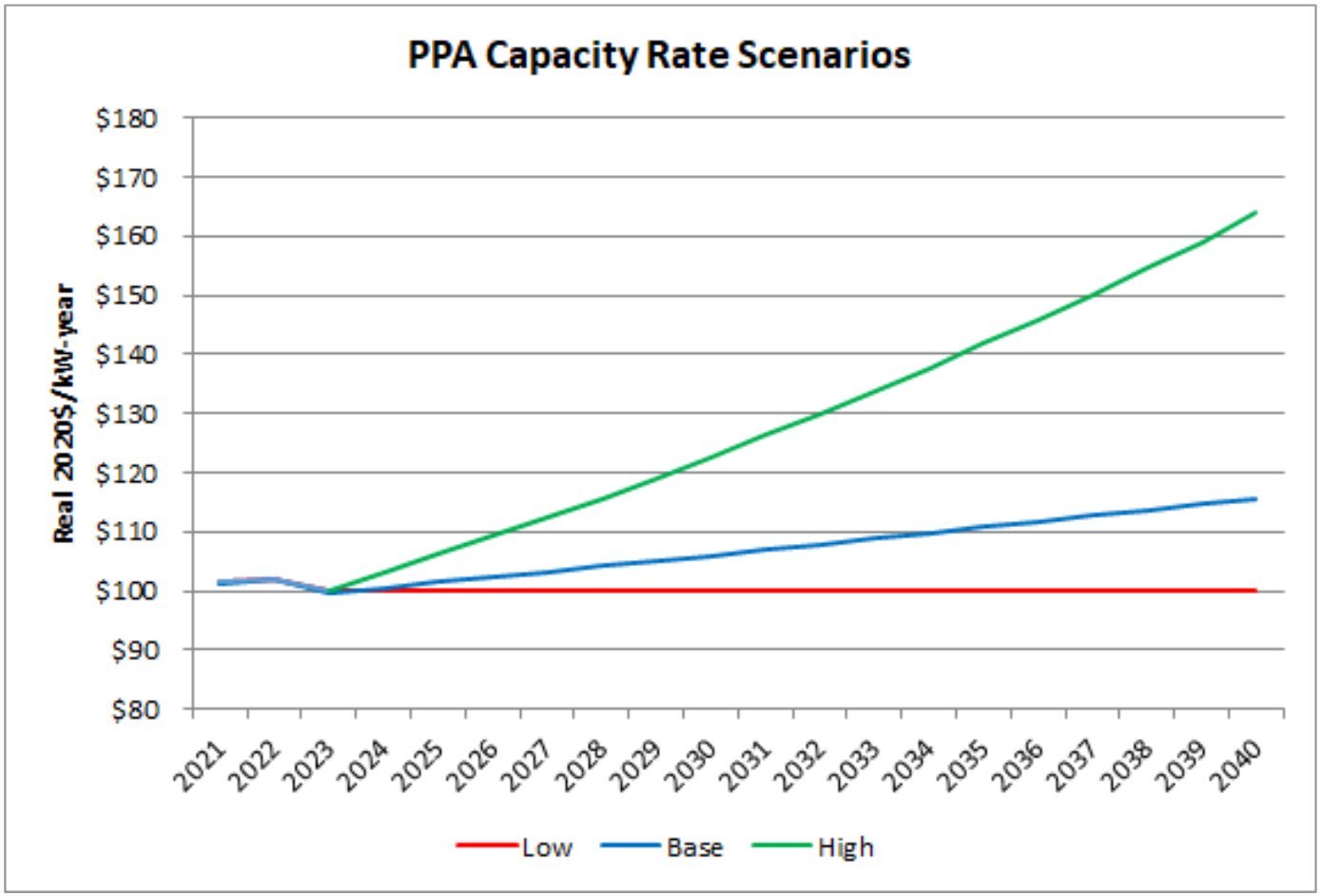
- Current Tranche 1 Energy rate is $50.07/MWh (Energy up to 1041 GWh)
- BCH Rate Change Forecast :
  - 2021 -0.99%
  - 2022 +2.7%
  - 2023 -0.30%
  - 2024 +3.0%

PPA Tranche 2 Energy Rate Scenarios



- Current Tranche 2 Energy rate is $95.09/MWh (based on BC Hydro LRMC)
- Energy above Tranche 1 up to 1752 GWh
- Low rate set just above Tranche 1 Energy rate high scenario

PPA Capacity Rate Scenarios



- Current Rate Capacity rate is $104/kW-year
- Same assumptions for increases as Tranche 1 Energy

Break

Supply-Side Resource Options

FORTIS BC

FORTISBC INC.

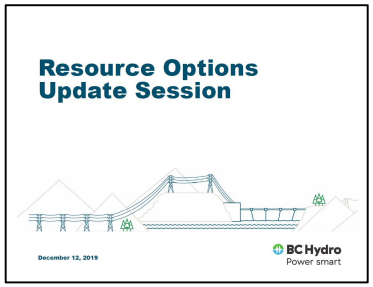
Appendix J

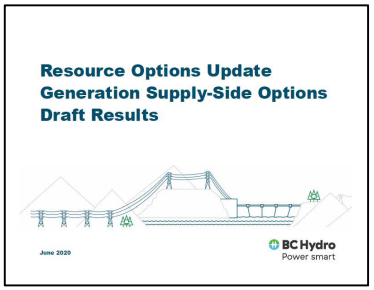
2016 Long Term Electric Resource Plan

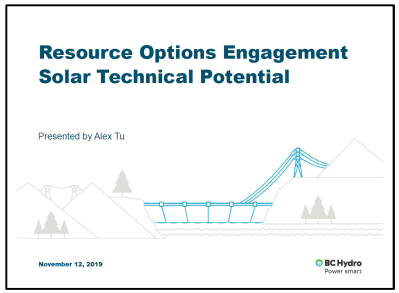
Supply-Side

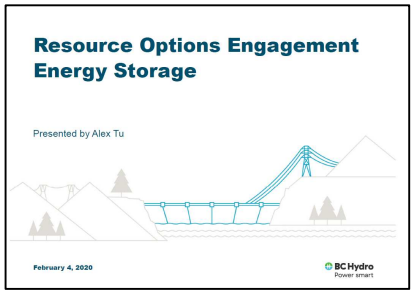
Resource Options Report

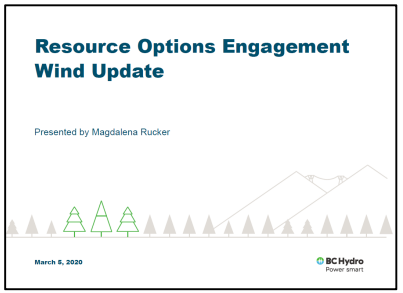
Resource Options Update





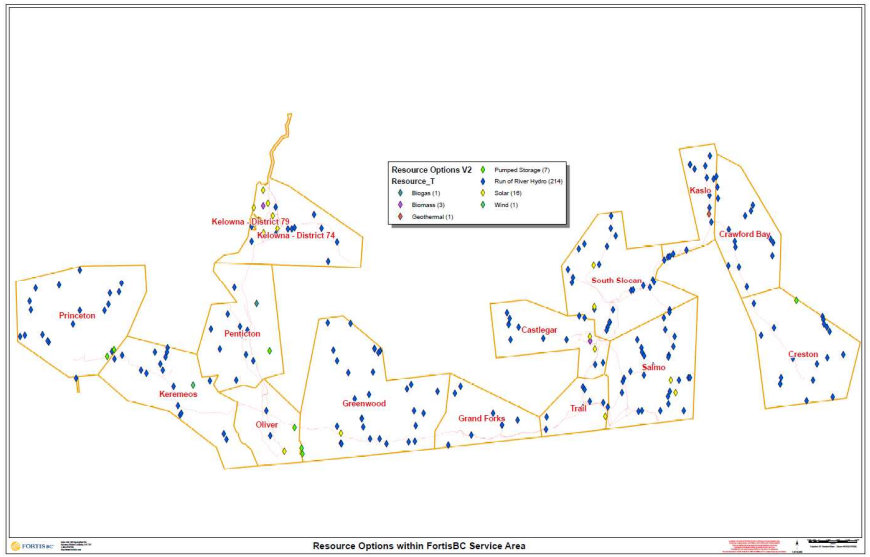




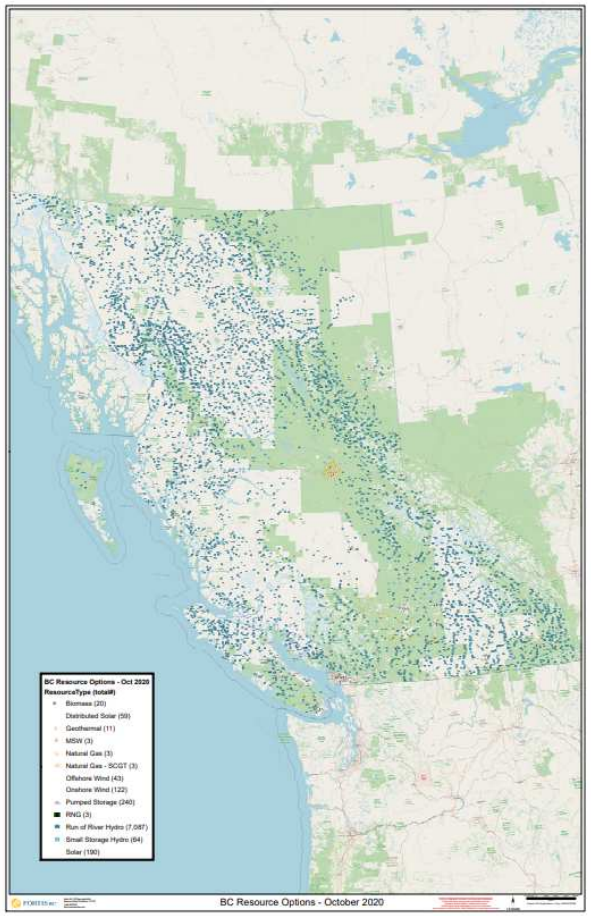


Resource Options

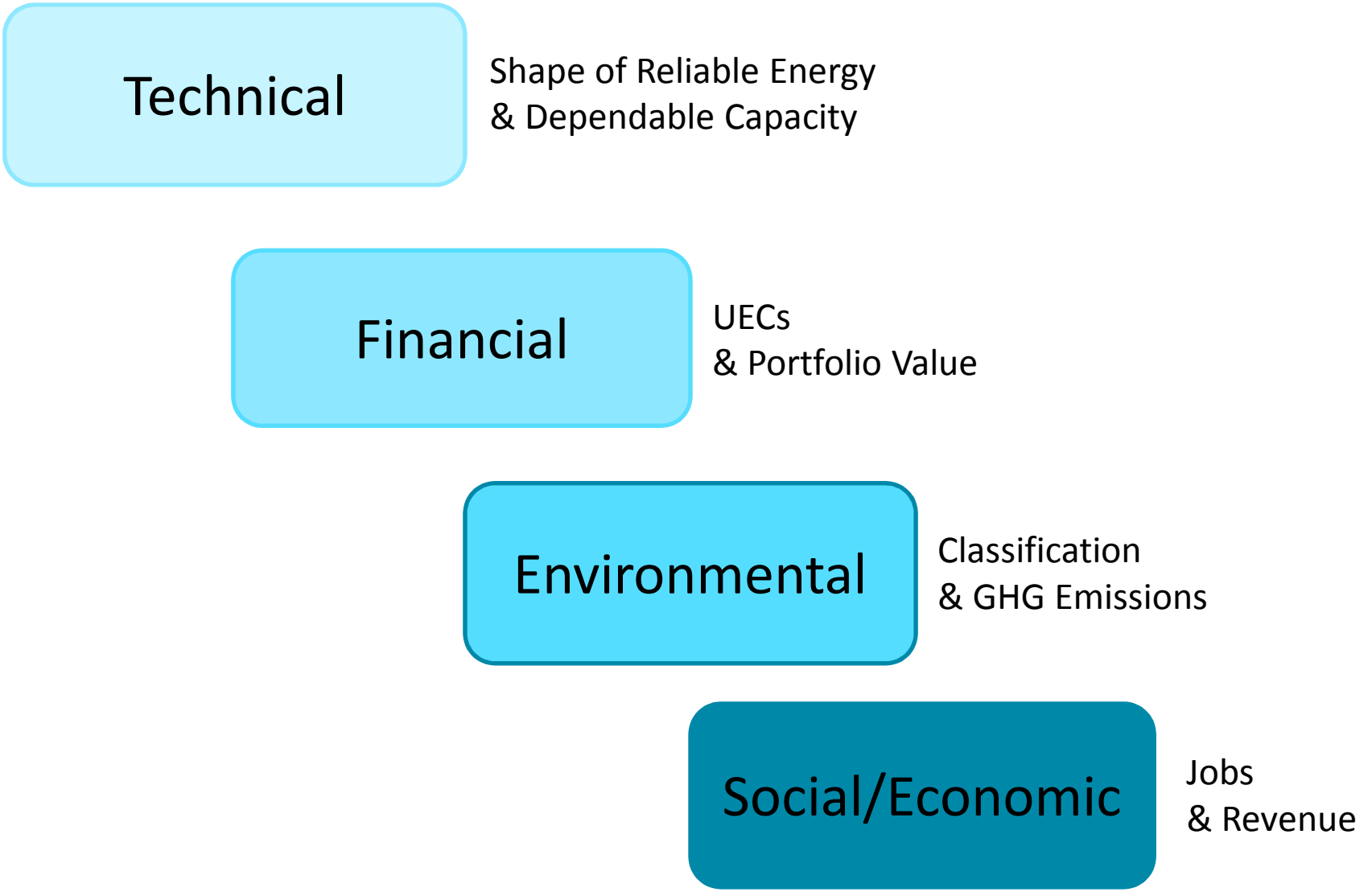
FBC Electric Service Territory
Resource Projects



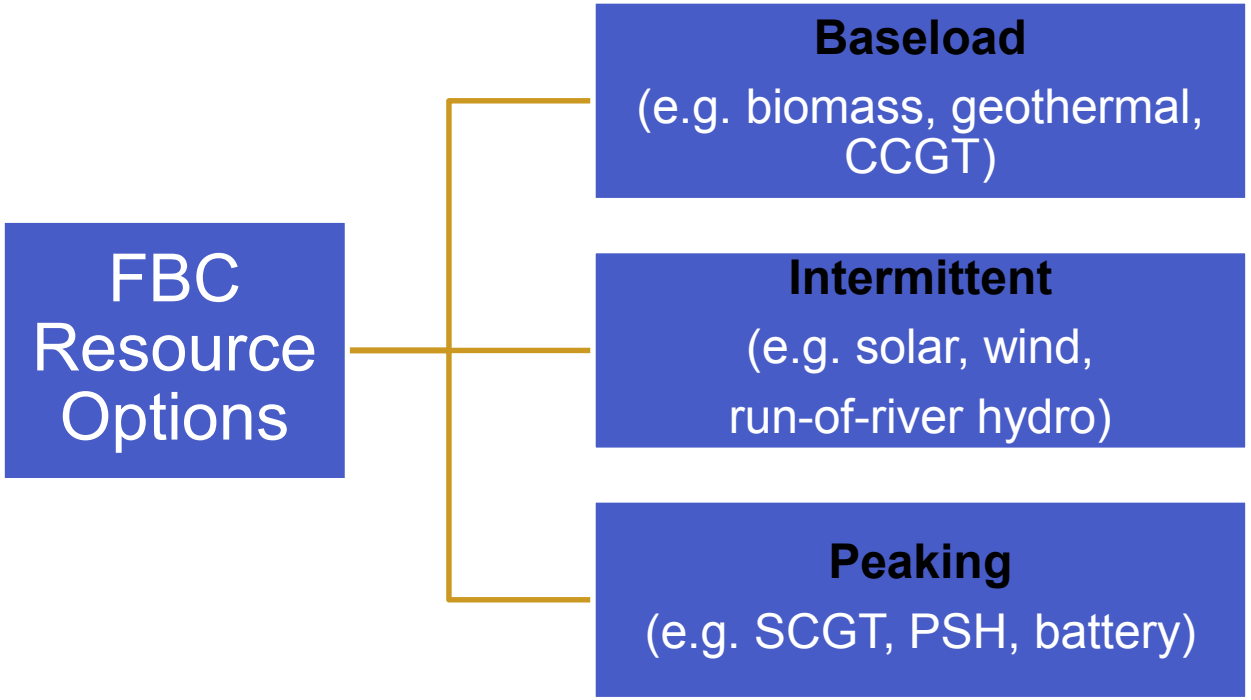
BC Resource Projects



Resource Attributes in Portfolio



Supply-Side Resource Types



- FBC options selections based on least-cost and variety of types and sizes

Comparing Resource Costs

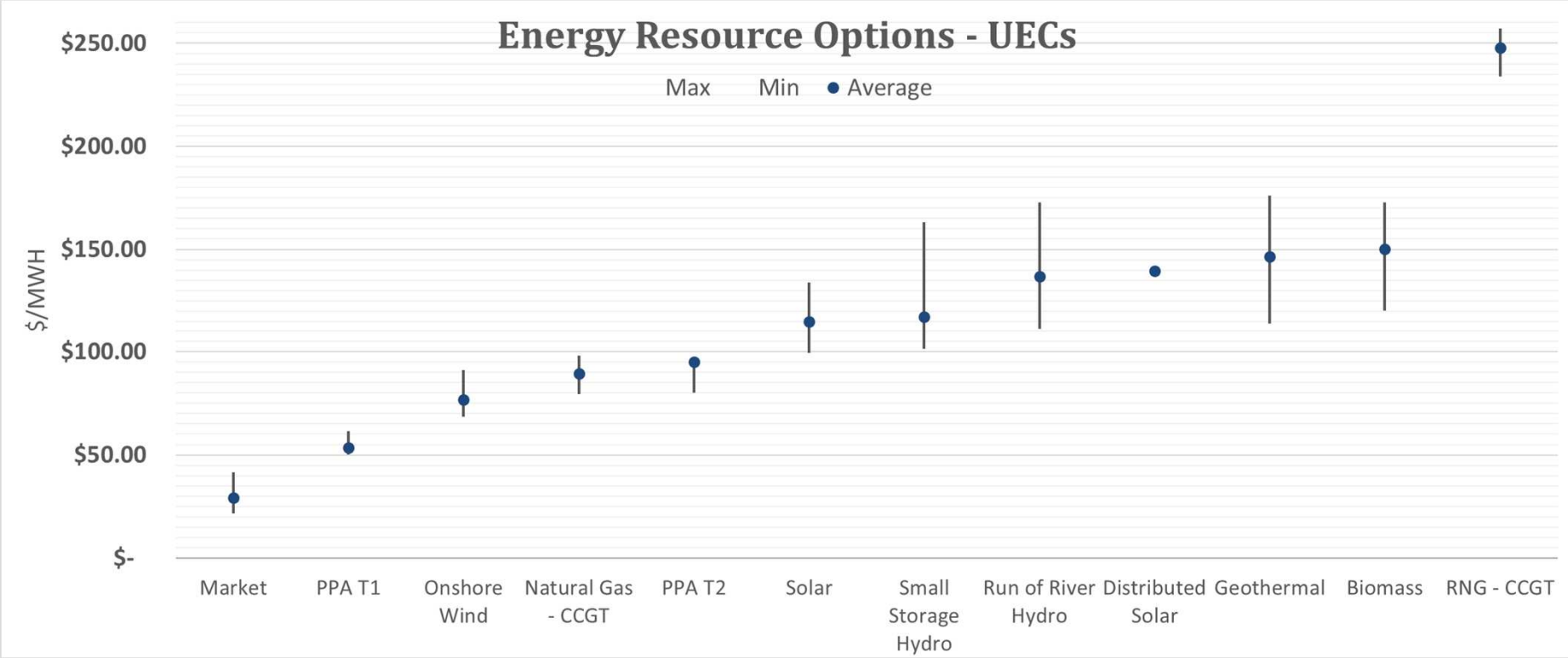
Unit Energy Cost (UEC)

- Present value of the total annual cost of an energy resource divided by the present value of its annual average energy benefit
- Measured in $/MWh

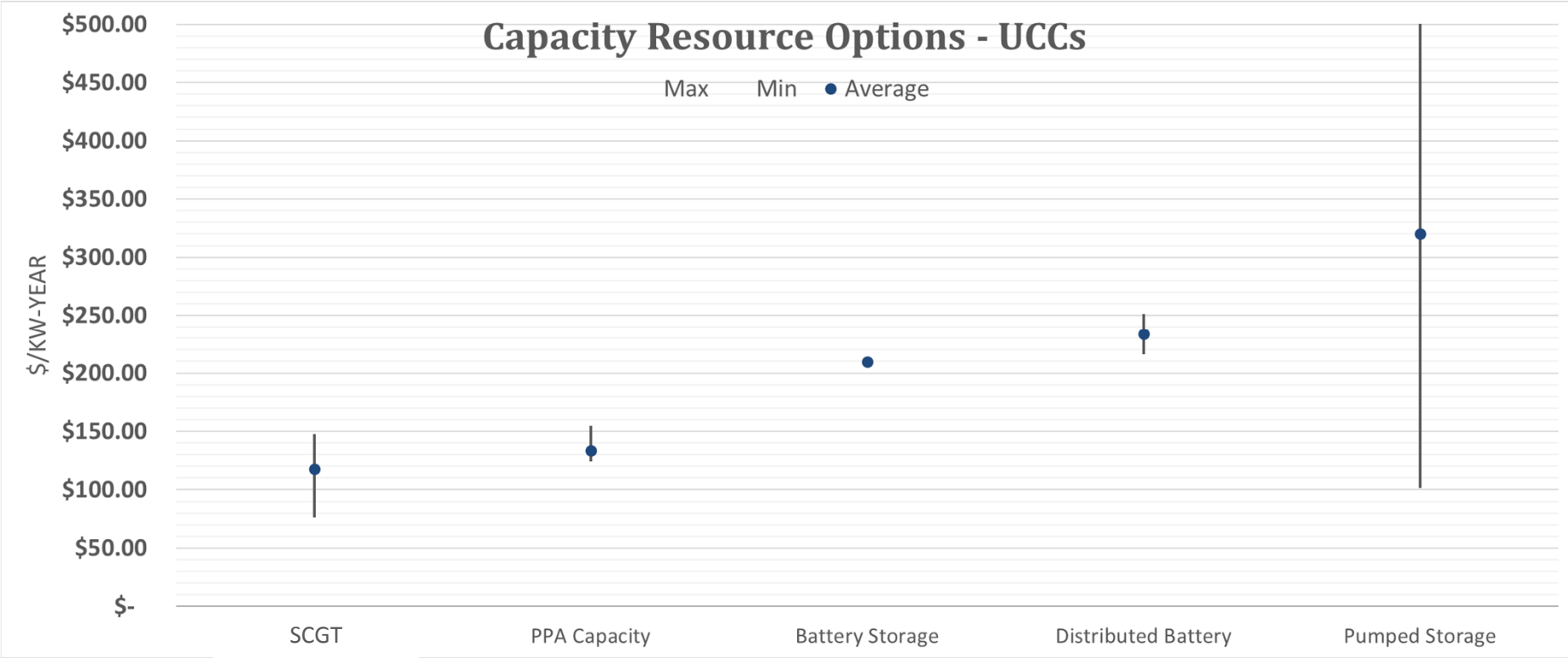
Unit Capacity Cost (UCC)

- Present value of the total annual cost of a capacity resource divided by the resource's dependable capacity
- Measured in $/kW-year

Unit Energy Cost Summary



Unit Capacity Cost Summary

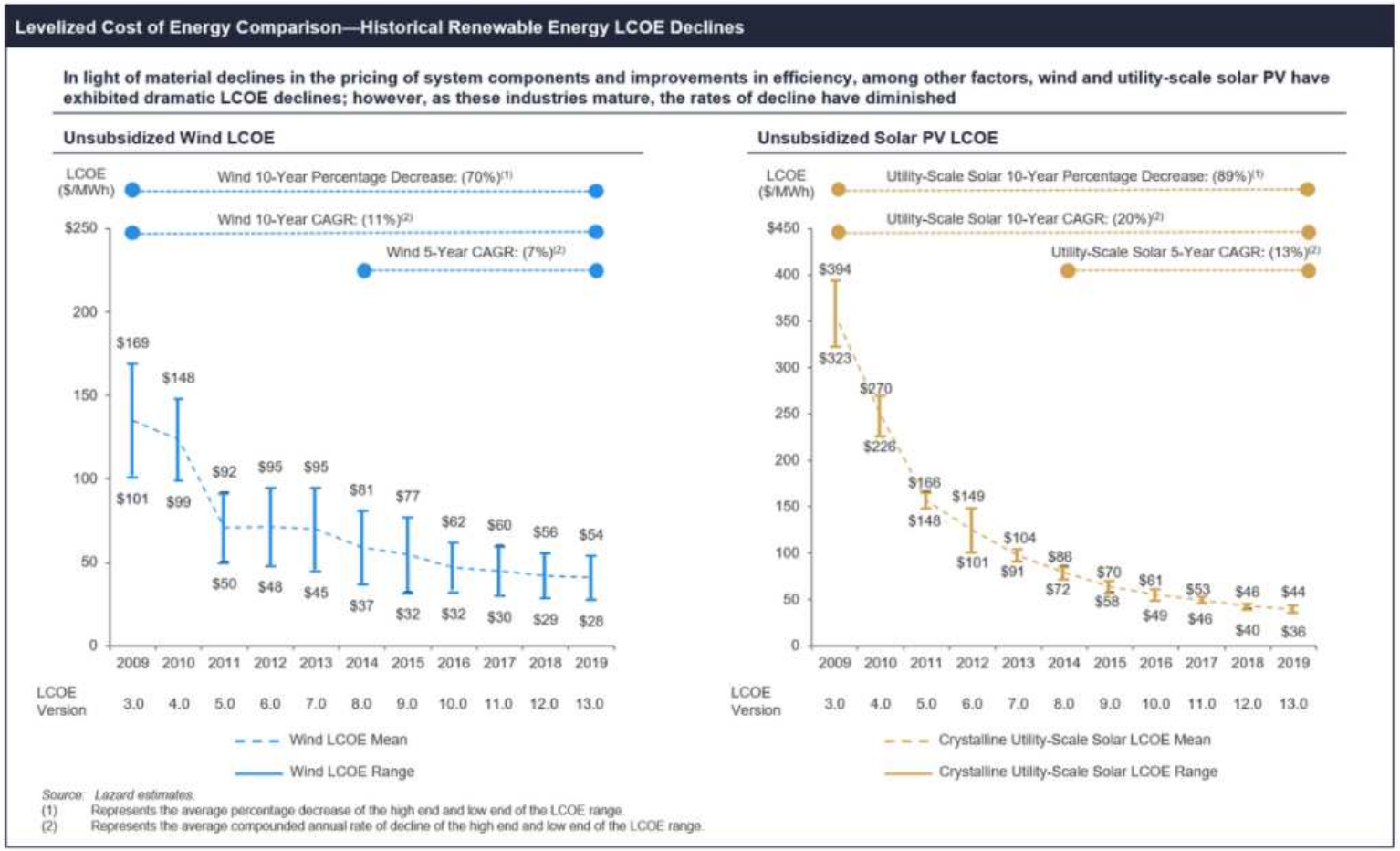


Key Differences between FBC & BCH UECs

- Different Discount Rates
- Inclusion of GHG costs
  - Direct Emissions
- Different commodities forecasts
  - Natural gas, RNG, Mid-C Market
- Inclusion of Wheeling (BCH to FBC)

Focus on Wind and Solar Cost Updates

Lazard Levelized Cost of Energy and Levelized Cost of Storage 2019

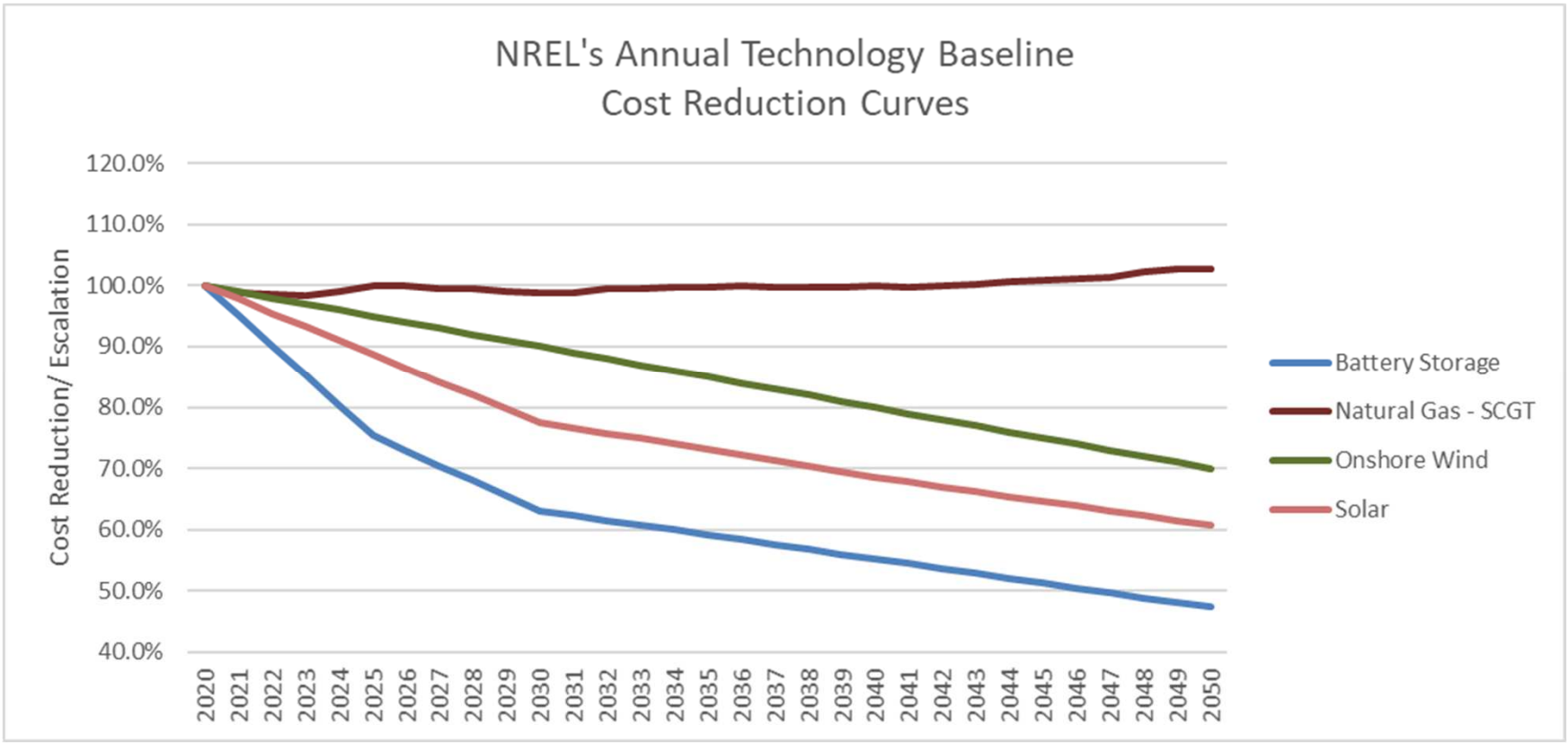


Projection of Decreasing Resource Costs

NREL Annual Technology Baseline

- NREL: https://atb.nrel.gov/electricity/2020/

Similar assumptions suggested by BC Hydro



Other Supply-Side Resource Options

- Market Imports (carbon content)
- Specified source (clean and renewable) imports
- Renewal of expiring FBC contracts (Brilliant Expansion capacity contact)
- Incremental BC Hydro power supply agreement
- Self-generation supply from commercial/industrial third party
- *Distributed Generation included in load scenarios rather than as a resource option*

Self-Sufficiency?

- BC Clean Energy Act (Section 6):

  (2) The authority must achieve electricity self-sufficiency

  (4) A public utility…must consider British Columbia's energy objective to achieve electricity self-sufficiency.

- BCUC 2016 LTERP decision (Order G-117-18):

  …the Panel finds that FBC's objective of achieving electricity self- sufficiency is not in the public interest…

- Clean Energy Act Amendments per Bill 17 (proposed June 2020):

  The following comprise British Columbia's energy objectives:

  ~~*(a) to achieve electricity self-sufficiency;*~~

- On July 15, 2020 Independent MLA Andrew Weaver proposed the following amendments to Bill 17:

  Maintaining the province's energy objectives of electricity self-sufficiency…

DSM Update

DSM Timelines

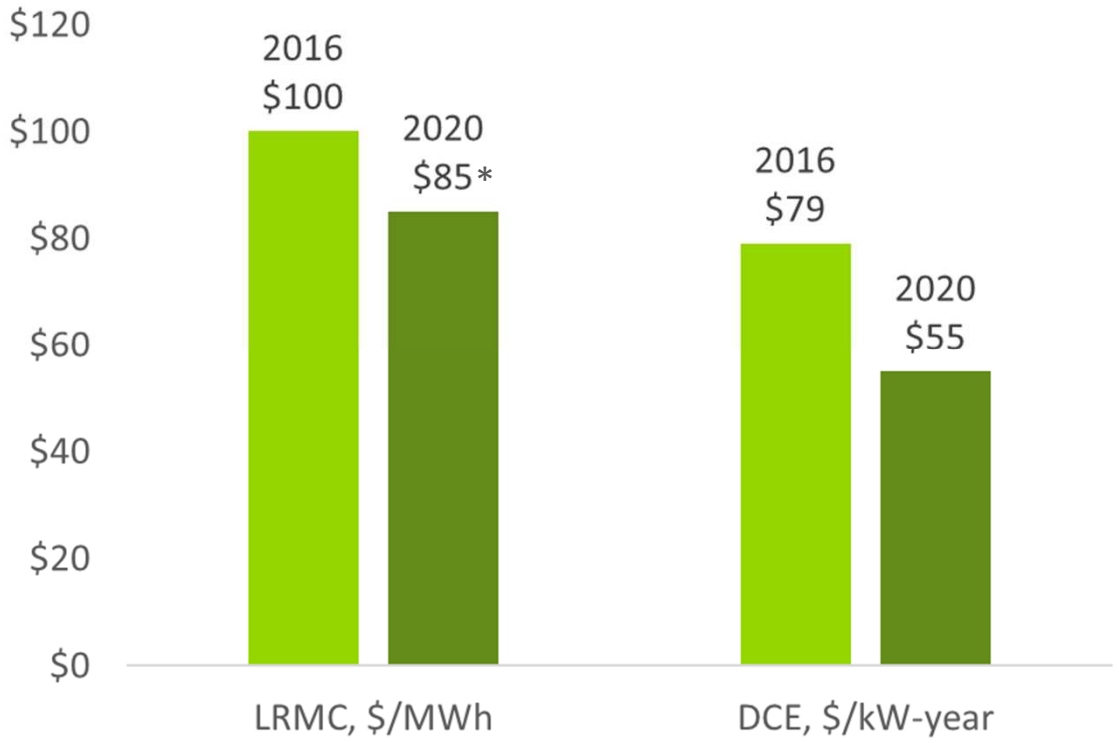
- CPR Results: preliminary results out now, finalized in Dec 2020
- LT DSM Plan: filed with LTERP in 2021
- DSM Expenditure Plan for 2023-2027: based on LT DSM Plan and filed in 2022

CPR Update

- Conservation Potential Review assesses the amount of conservation potential left in the “cupboard”
- 2020 CPR is considered an update
  - Uses the same methodology and DSMSim model used in previous CPR
  - Covers technical, economic, and achievable potential in the residential, commercial, industrial sectors
  - Updated measures where costs and savings have changed and added several, including steps of the BC Energy Step Code

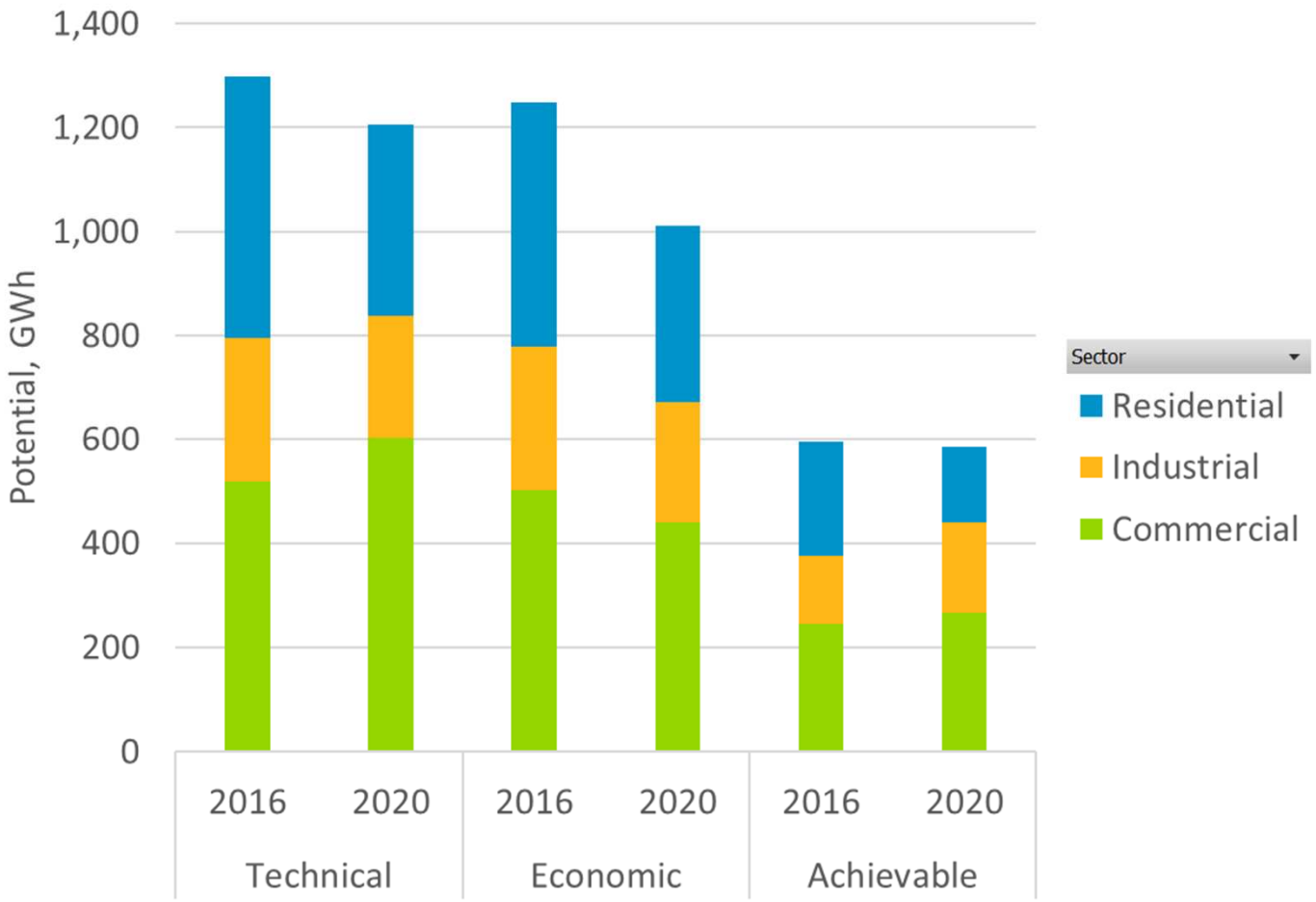
Updated Avoided Costs

- Update Long Run Marginal Cost (LRMC) & Deferred Capital Expenditure (DCE)

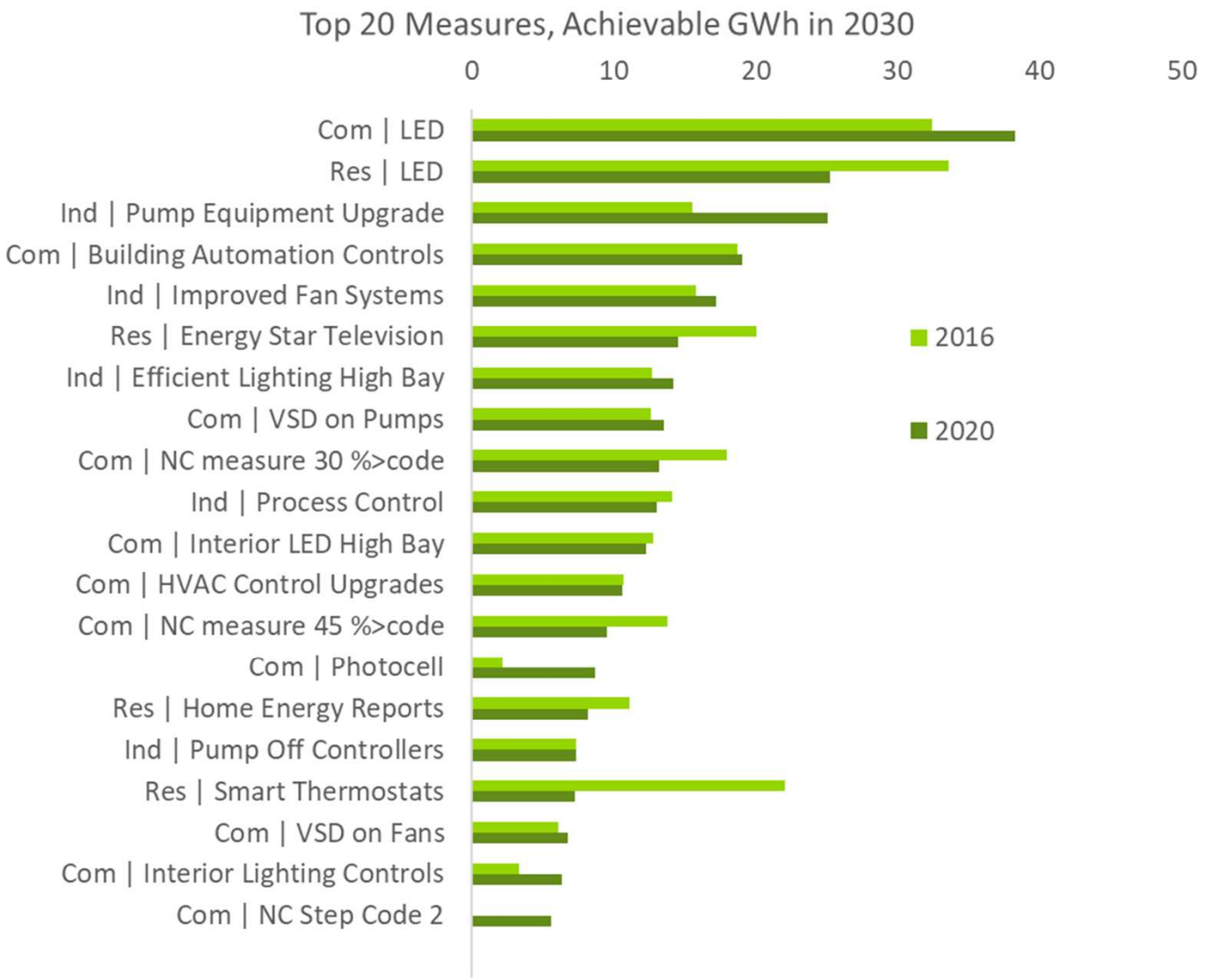


*Preliminary value for CPR only. FBC's portfolio analysis will determine final LRMC value

Preliminary CPR Results

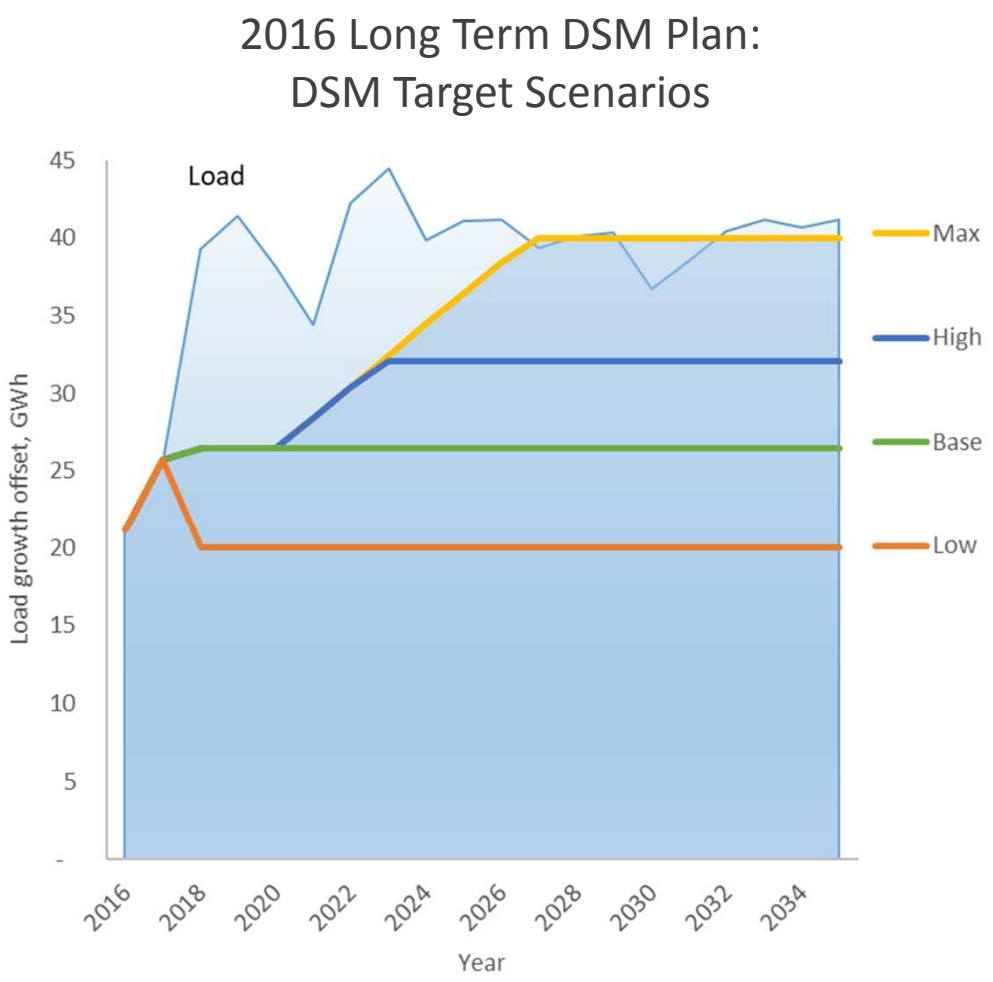


Top DSM Measures



DSM Targets

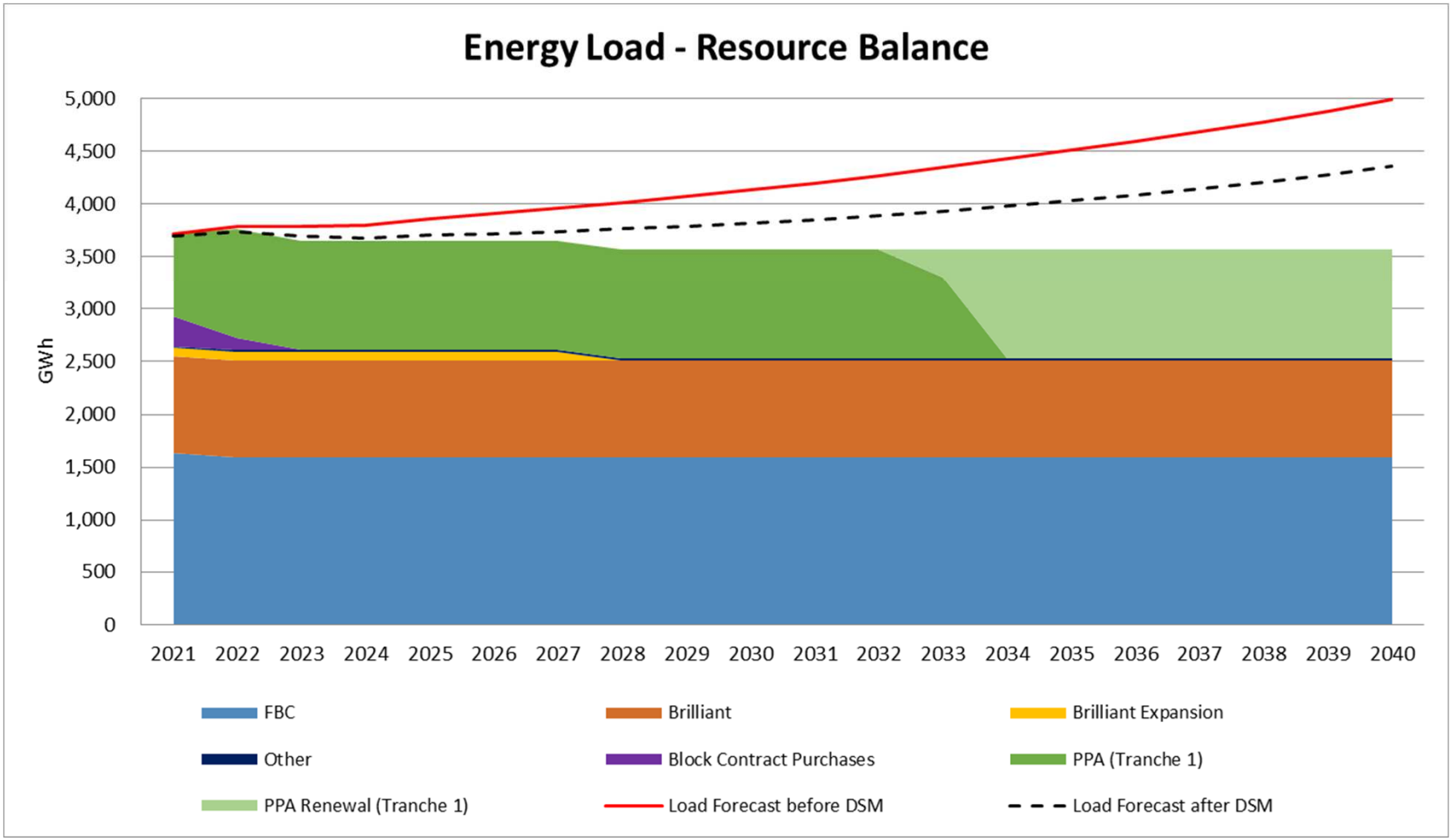
- Previously used load growth offset
- Alternatives for consideration
  - load growth offset
  - % of sales
  - Include EV load?
    - DSM vs. rates



Break

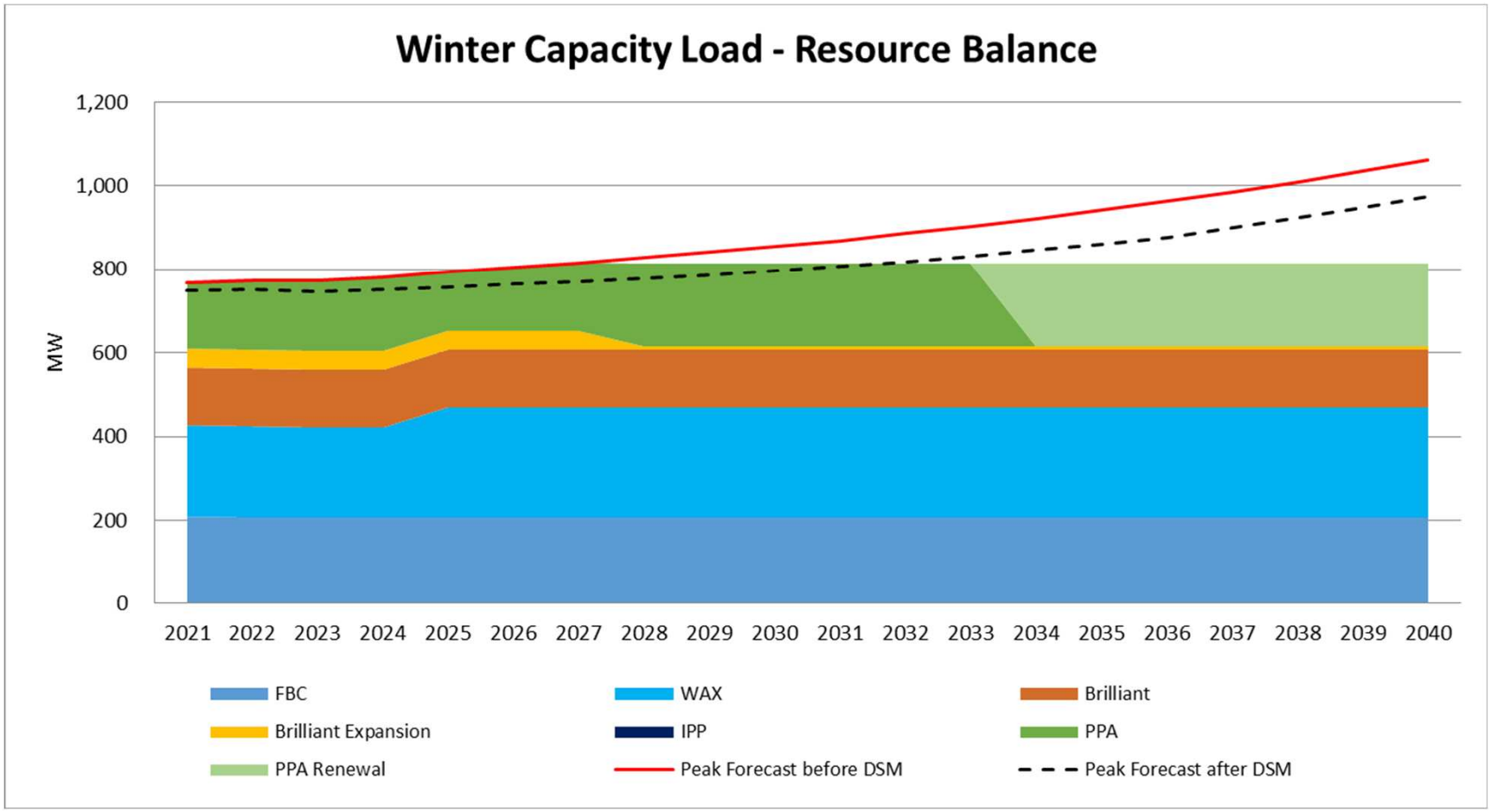
Portfolio Analysis

2021 LTERP LRB – Annual Energy



- 2021 LT DSM Plan to be determined

2021 LTERP LRB – Winter Peak Demand



- 2021 LT DSM Plan to be determined
- Excludes any initiatives to shift home EV charging off peak demand times

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

Portfolio Modelling

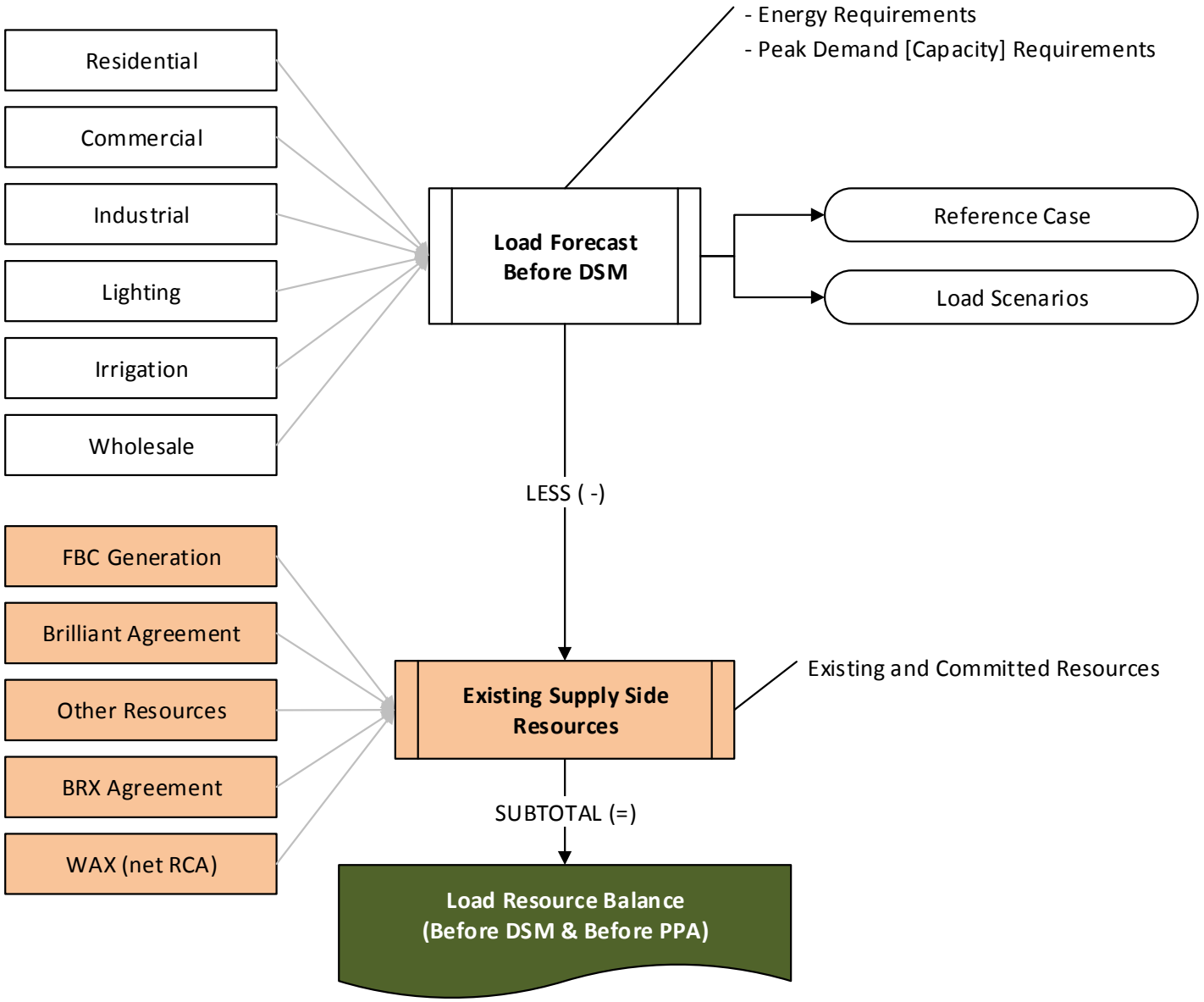
Resource Portfolio

- Optimization model to find the lowest cost of meeting the reference case load forecast - given a set of constraints

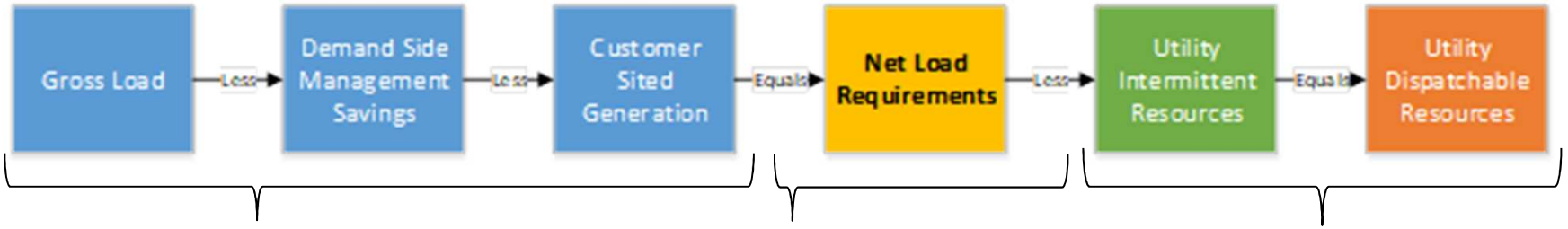
FBC Marginal Decisions

- What is the optimum utilization of PPA?
- When and what new resources should be acquired?
  - Once a new resource is acquired, how much energy should it generate?
- What is the optimum utilization of the Wholesale Energy Market?

Load Requirements & Standing Resources



Resource Classification for Modelling Purposes



Demand Side Load Drivers

Customer controls marginal investment decision

DSM Measures

- Decrease Energy Consumption
- Shift time of Demand

Distributed Generation

- Net metering

Rates

Price Signal to balance supply and demand

- Marginal Costs
- Cost of Service
- Behavior Change

Utility can incent action through rebates and rates

Supply Side Resources

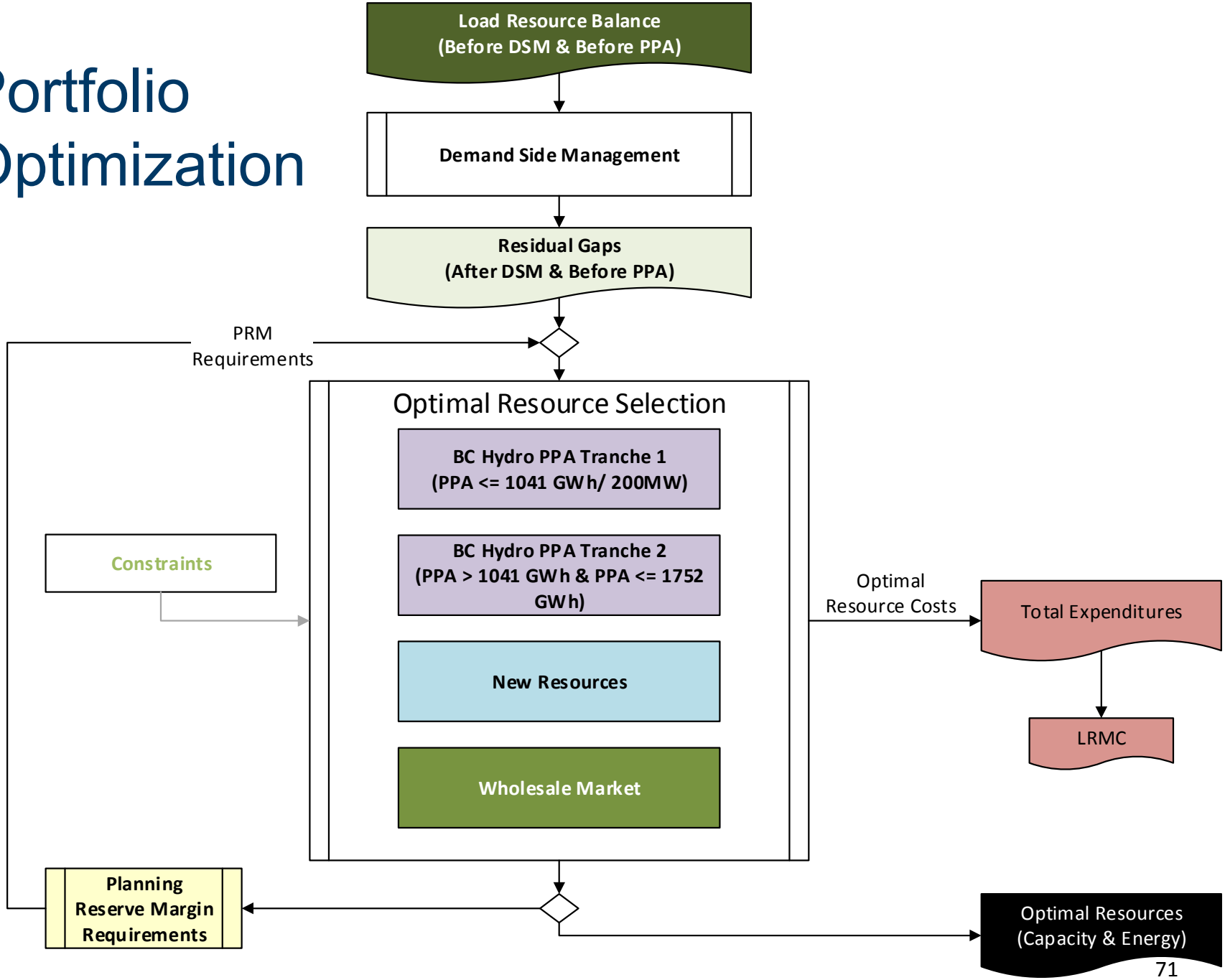
Utility controls marginal investment decision

- Selection made with considerations for size, location, and load shape
- Set expectations of monthly energy and capacity
- Dispatch can be **scheduled**

Available Resources in Portfolio

- **Demand Side Management**
  - Varying DSM portfolios
- **BC Hydro PPA (RS3808)**
  - Capacity (200MW)
  - Tranche 1 Energy & Tranche 2 Energy
- **New Resources**
  - Resource Options Update
- **Wholesale Market**
  - Energy vs Capacity

Portfolio Optimization



Portfolio Characteristics & Investigations

'Base' Characteristics	Investigations
Load Requirements	• Reference Case Forecast • Load Scenarios • Reference Case with EV charging shifted
DSM Level	• DSM Portfolios (TBD) • No DSM*
% Clean or Renewable Energy	• Natural Gas Permitted • Only Clean or Renewable Resources** • RNG Gas Permitted • High Carbon & Commodity Prices
Access to Wholesale Market	• No Self-Sufficiency • Capacity Self-Sufficient by 2030 • Capacity & Energy Self Sufficient by 2030 • High Carbon & Commodity Prices
PPA Renewal	• PPA renewed in 2033 • PPA not renewed in 2033

* For purposes of determining a LRMC value for DSM Regulation Only

** as defined by the CEA

Portfolio Evaluation Framework

Portfolio Categories Examples	Portfolio	Resource Mix	Portfolio Attributes							
			Cost		Environment			Resiliency		Economic
			LRMC	Rate Impacts	% Non-Clean Resources	GHG Emissions	Footprint	Operational Flexibility	Geographic Diversity	BC Employment
Clean vs. non-clean										
PPA vs. no PPA renewal										
Self-sufficiency vs. market										
High load scenarios										

Pillars

- Cost
- Environment
- Resiliency
- Support for Economy

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)

Wrap Up & Next Steps

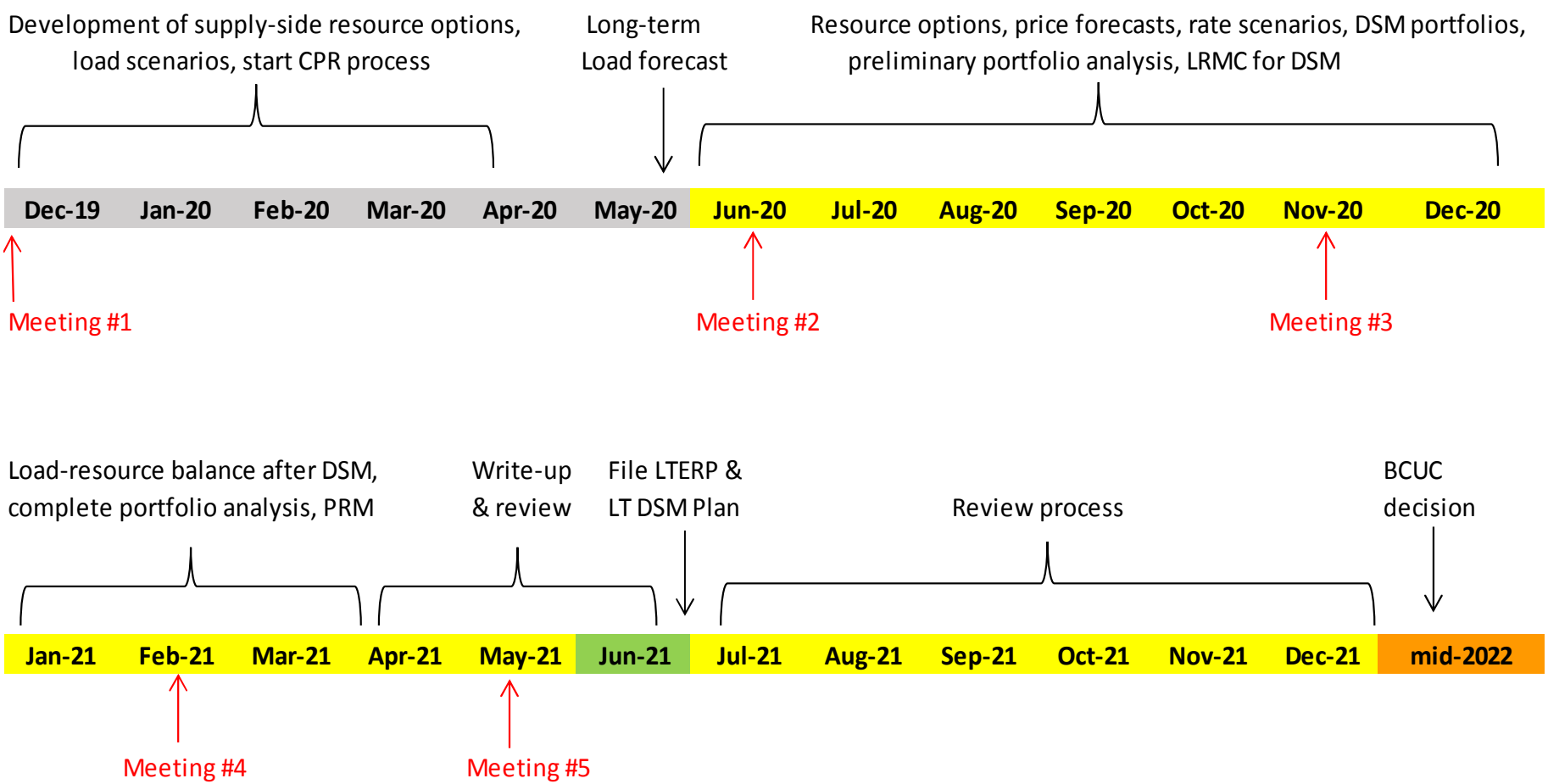
FBC Next Steps

- Upload presentation and meeting notes to FortisBC website
- Review and consider feedback
- Community and Indigenous consultation
- Direct customer surveys
- Determine DSM portfolios
- Portfolio analysis including LRMC
- Schedule Guidehouse Pathways presentation meeting Q1 2021
- Plan next RPAG meeting – Q1 2021

Next Meeting Topics

- DSM portfolios
- Load-Resource balance after DSM
- Preliminary portfolio analysis results including LRMC

LTERP Development Timeline



Feedback and Questions

- Please fill out the Feedback form
- Feel free to email any questions, comments

For further information, please contact:

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604-592-7842

www.fortisbc.com/about-us/projects-planning/electricity-projects-planning/electricity-resource-planning

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