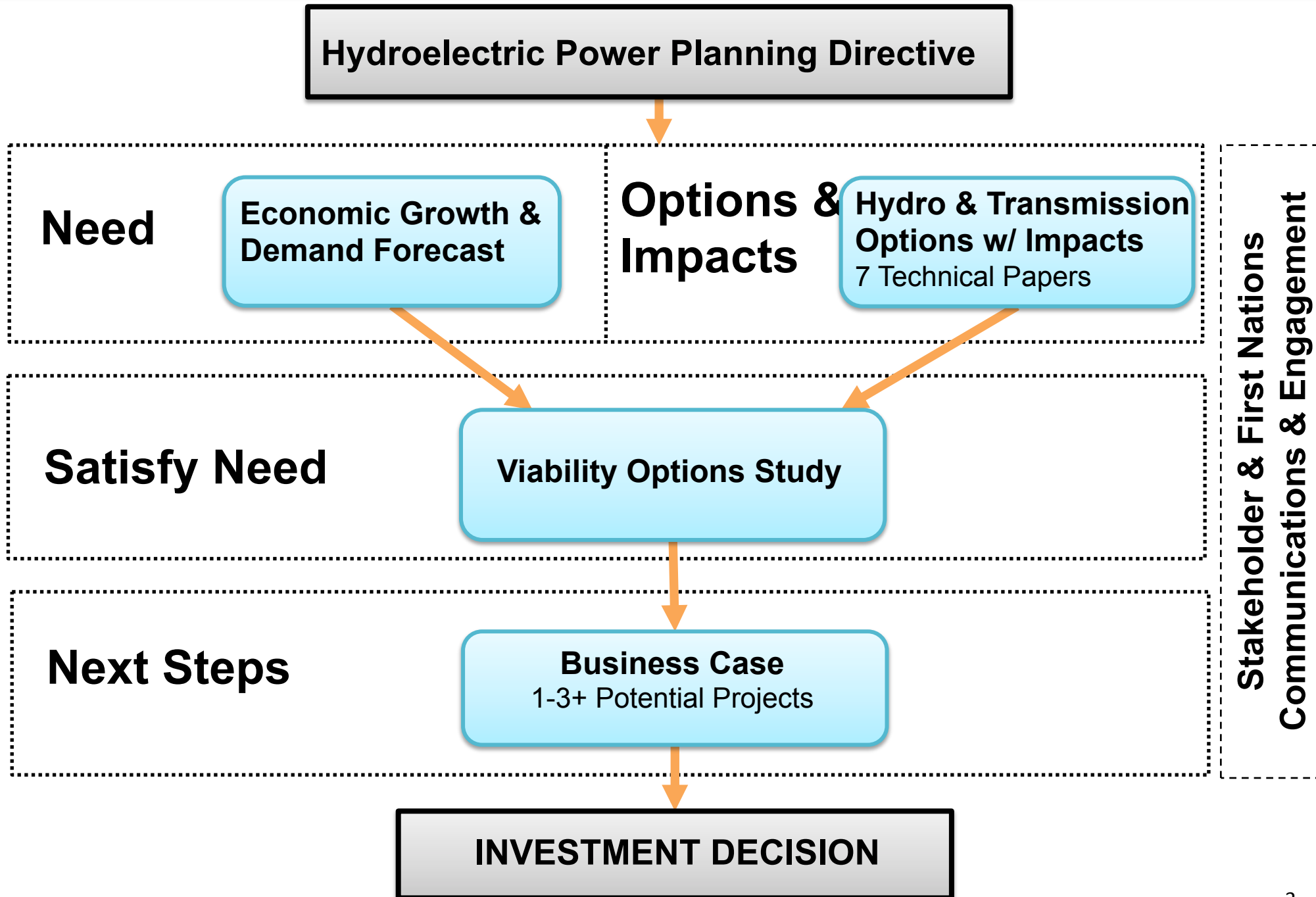
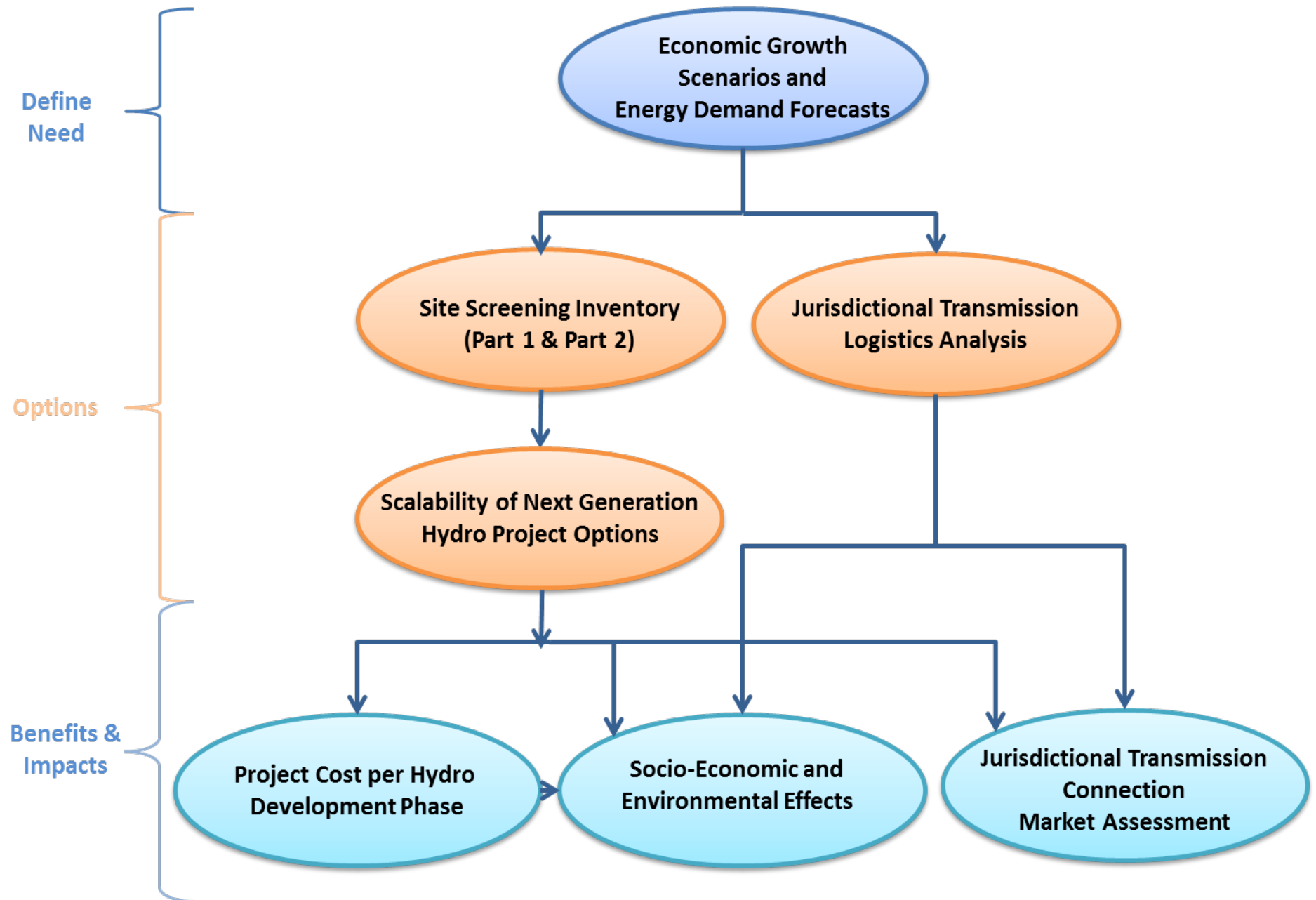


Yukon Electrical Energy and Capacity Need

January 29, 2015

BACKGROUND & MANDATE

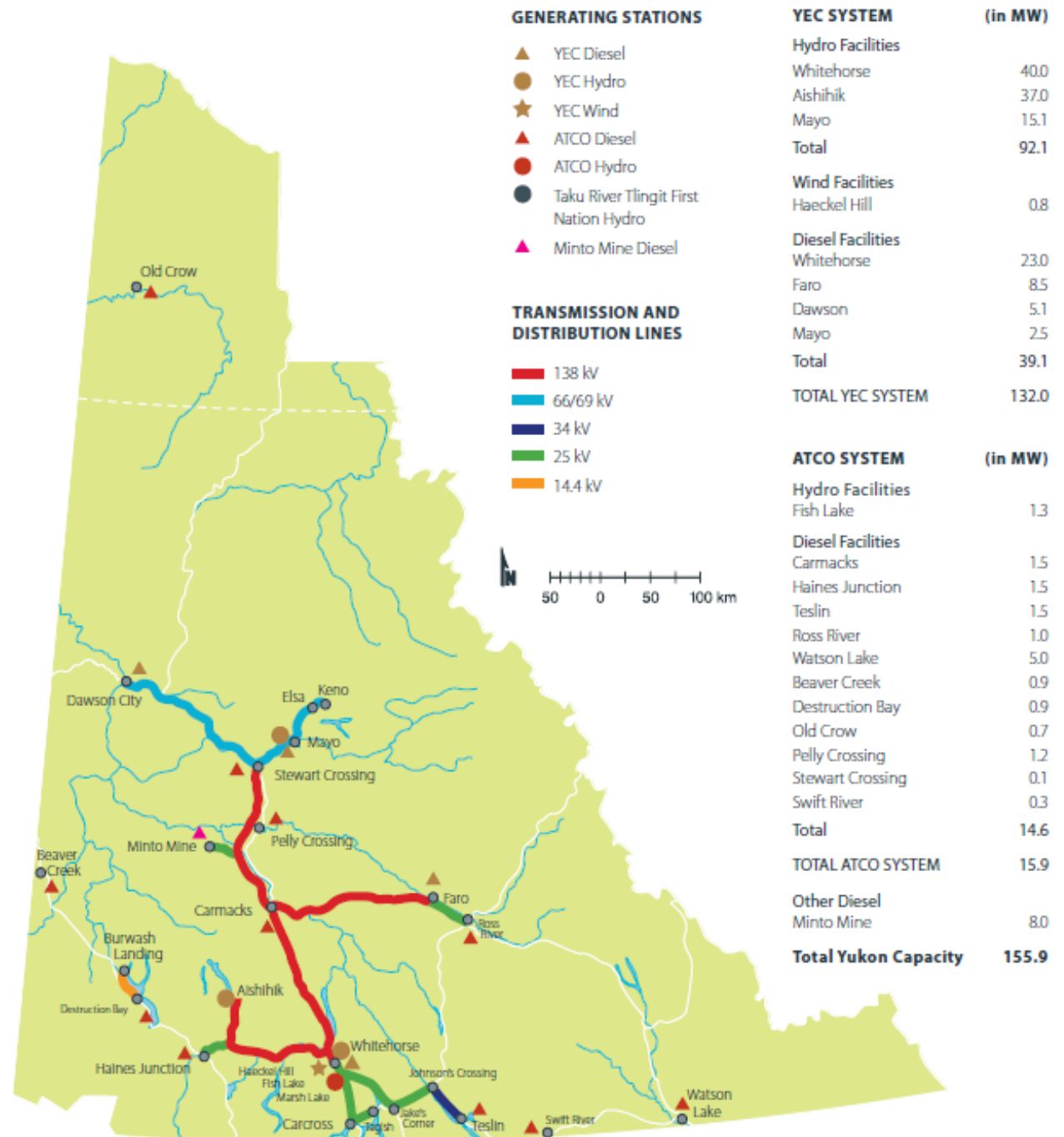




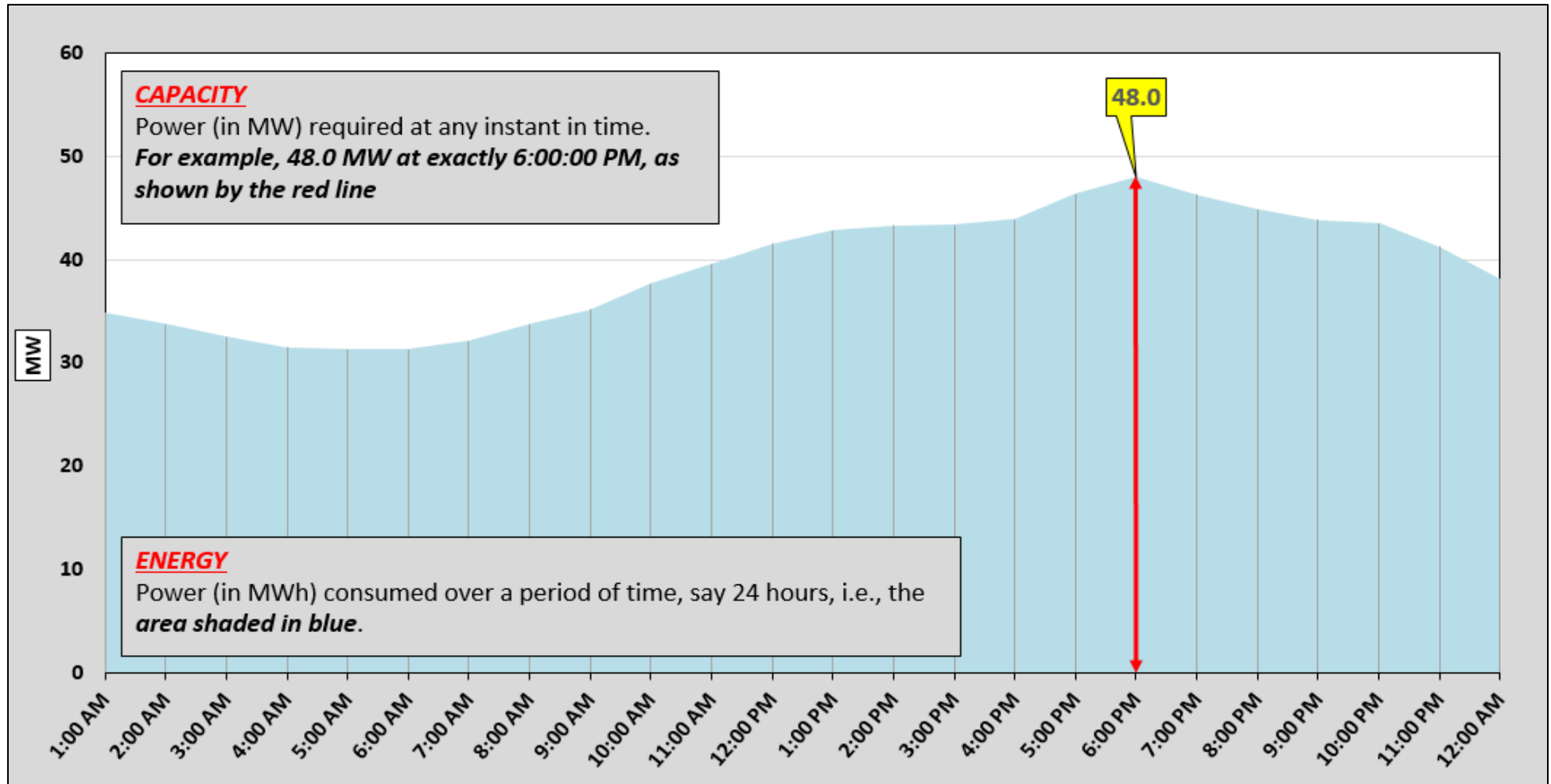
Mandate

Forecast Yukon's electricity need 20 to 50 years from today :

- Quantity of electrical energy gap by month for the years 2035 through 2065
- Quantity of annual capacity gap for the years 2035 through 2065
- On-Grid only



Understanding Energy & Capacity



- **Capacity** = Instantaneous need. It is measured in Watts (W)
- **Energy** = Amount of electricity used over a period of time. It is measured in Watt Hours (Wh)

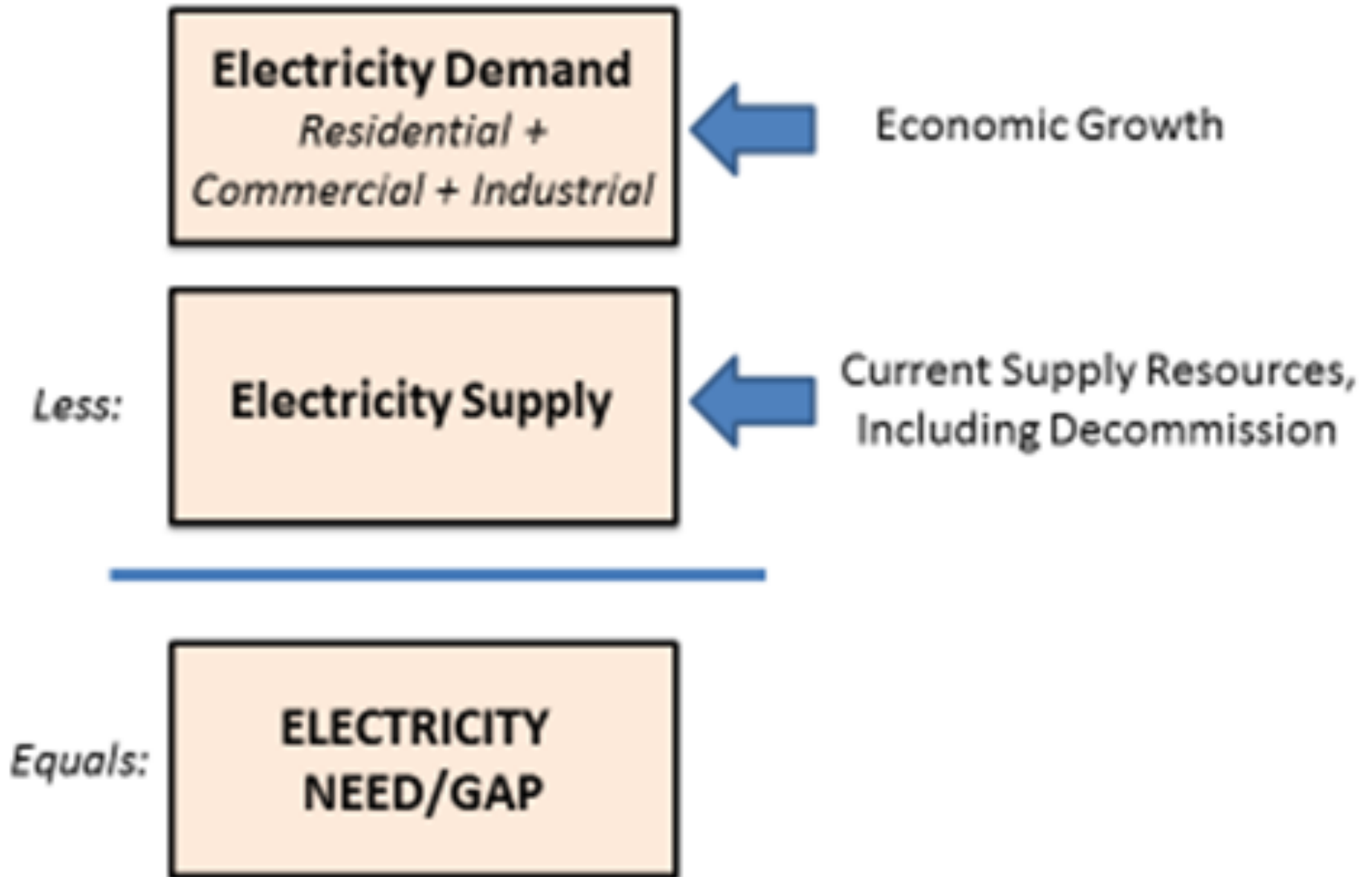


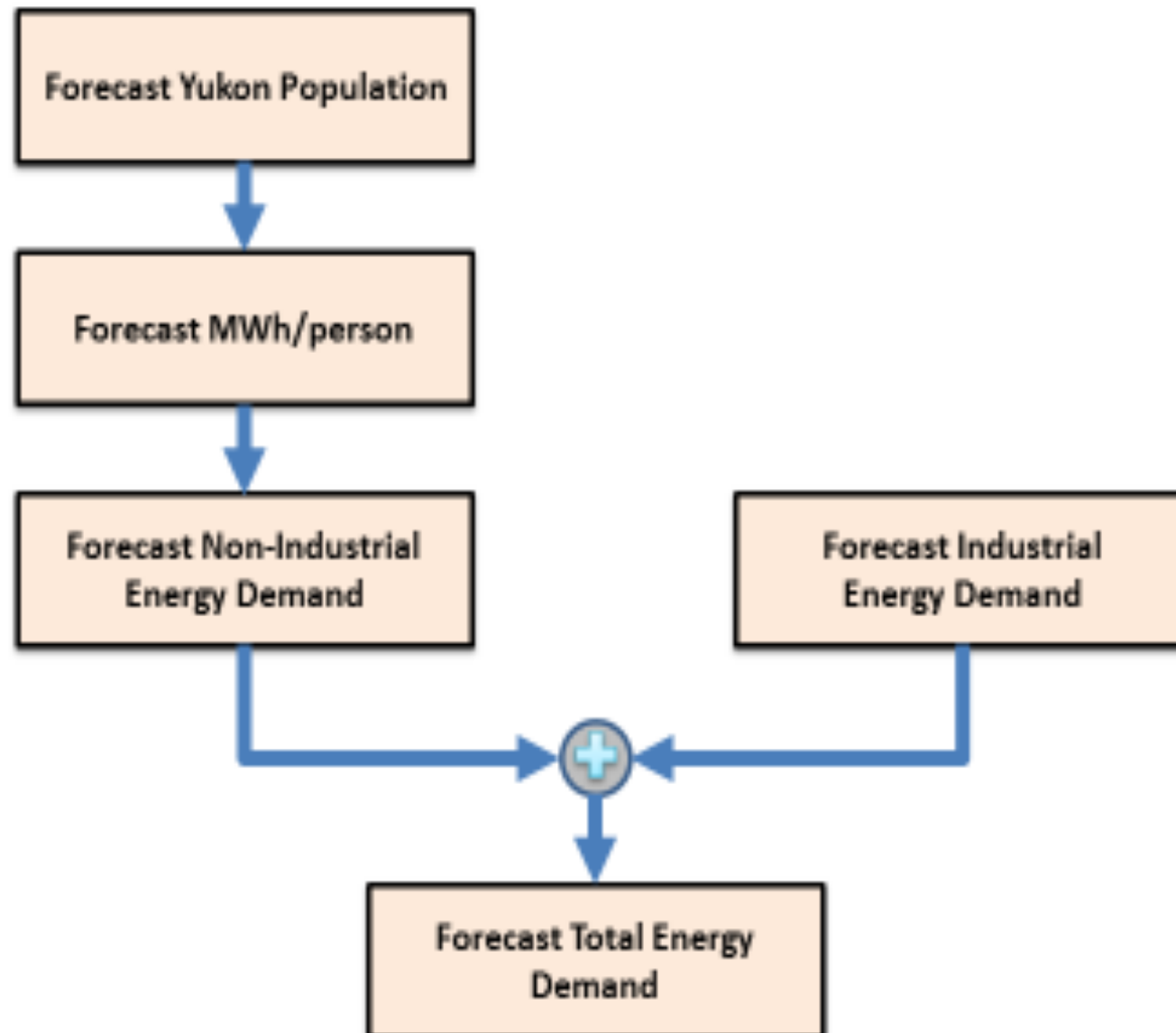
- The future is unknowable.
- Forecasting facilitates **planning**
 - Options?
- Planning facilitates **analysis**
 - Costs & Benefits?
- Analysis facilitates **decision-making**

Given what we know today, what is the most reasonable course of action?

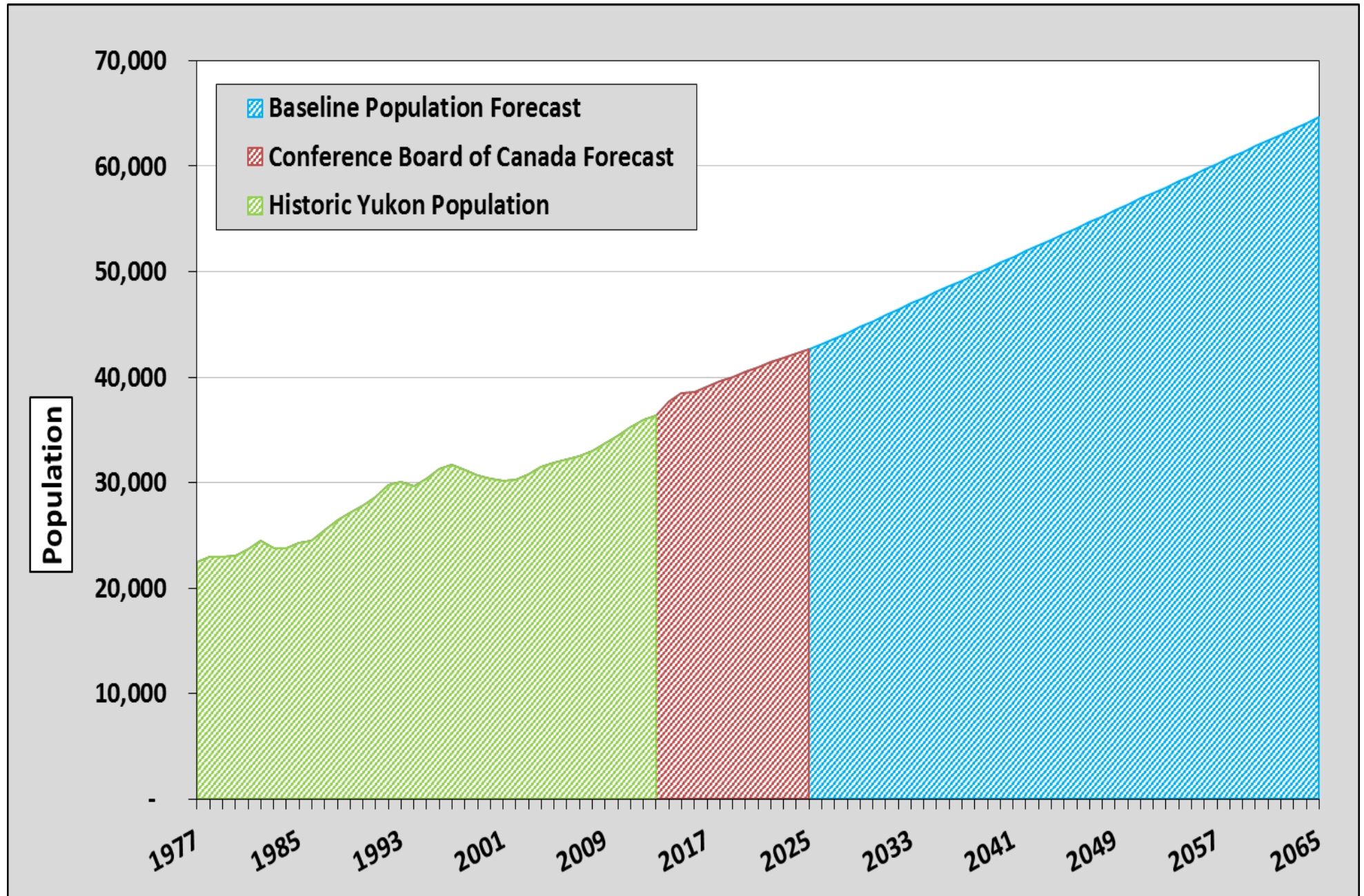
What is known with high certainty:	What is <u>not</u> known with high certainty:
<ul style="list-style-type: none">• Past• Yukon's population will grow• Yukoners will continue to use electricity• Mining will play a role in Yukon's economy	<ul style="list-style-type: none">• Future• How quickly and by how much Yukon's population will grow?• How Yukoner's electricity demand – per person – will change:<ul style="list-style-type: none">• For example, will it increase due to more electrical heating in the homes, OR will it decrease due to energy efficiency• Timing, size, and number of future Yukon mines

ENERGY

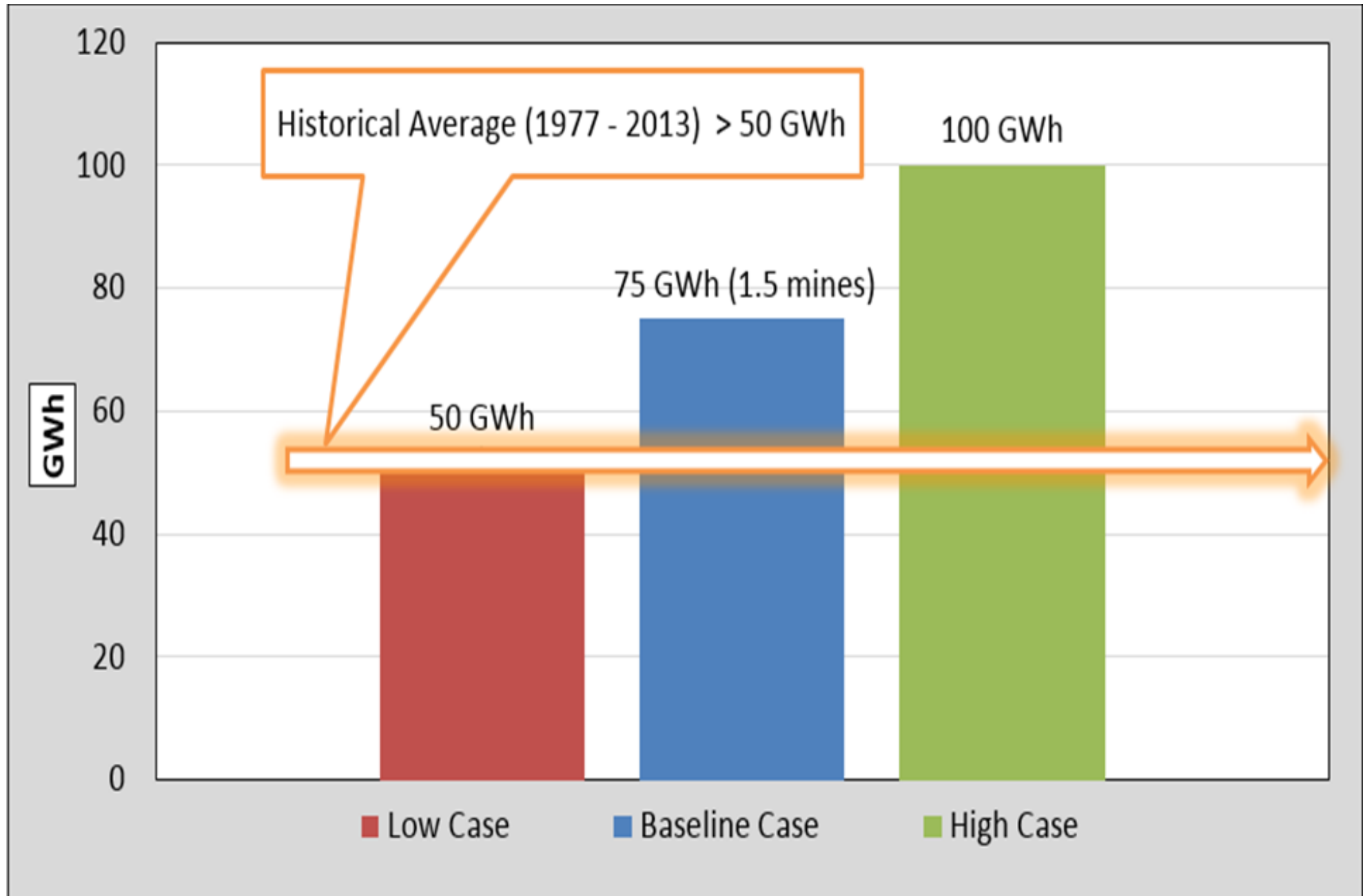




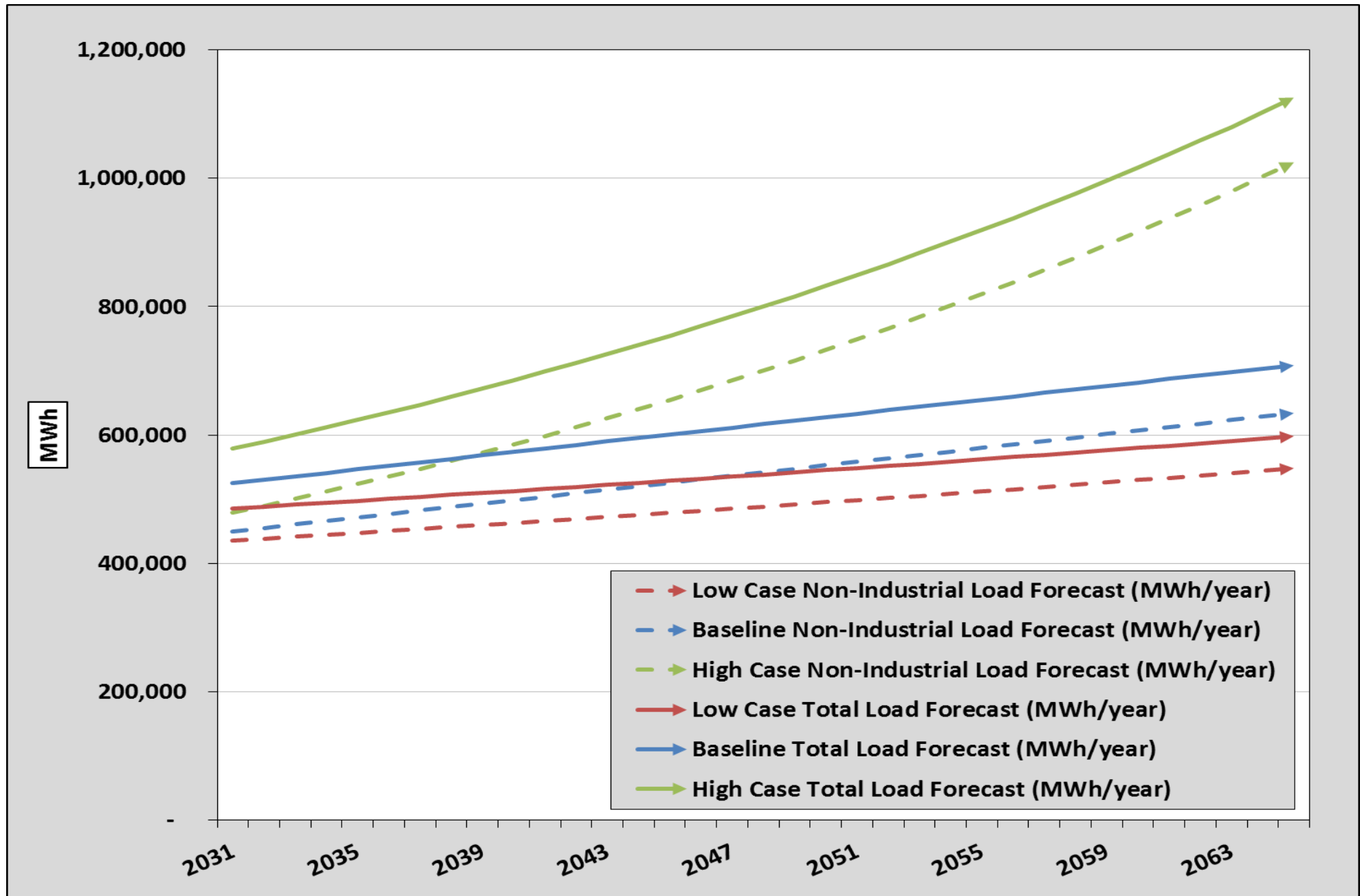
Population Forecast Results



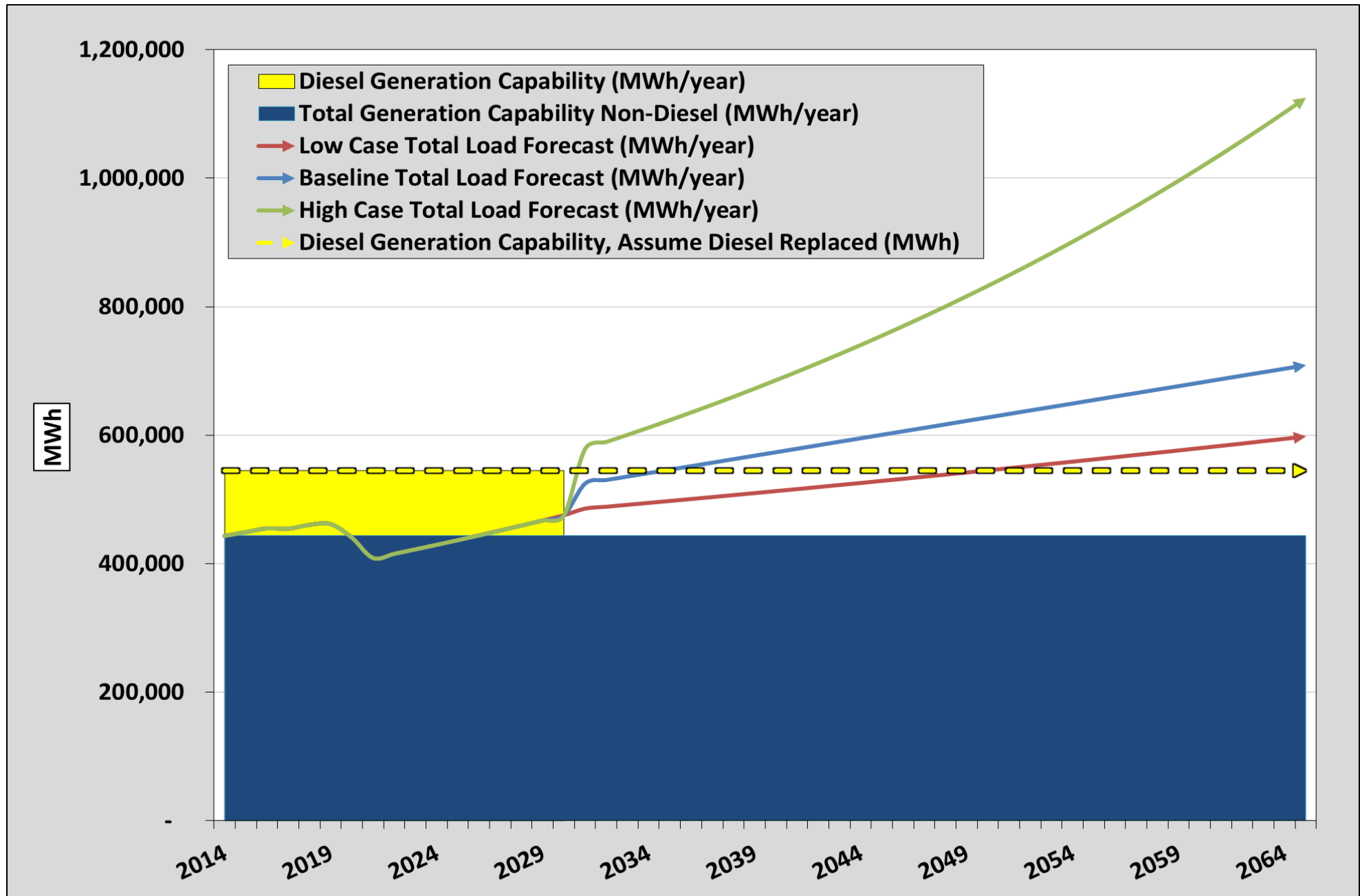
Industrial Energy Forecast



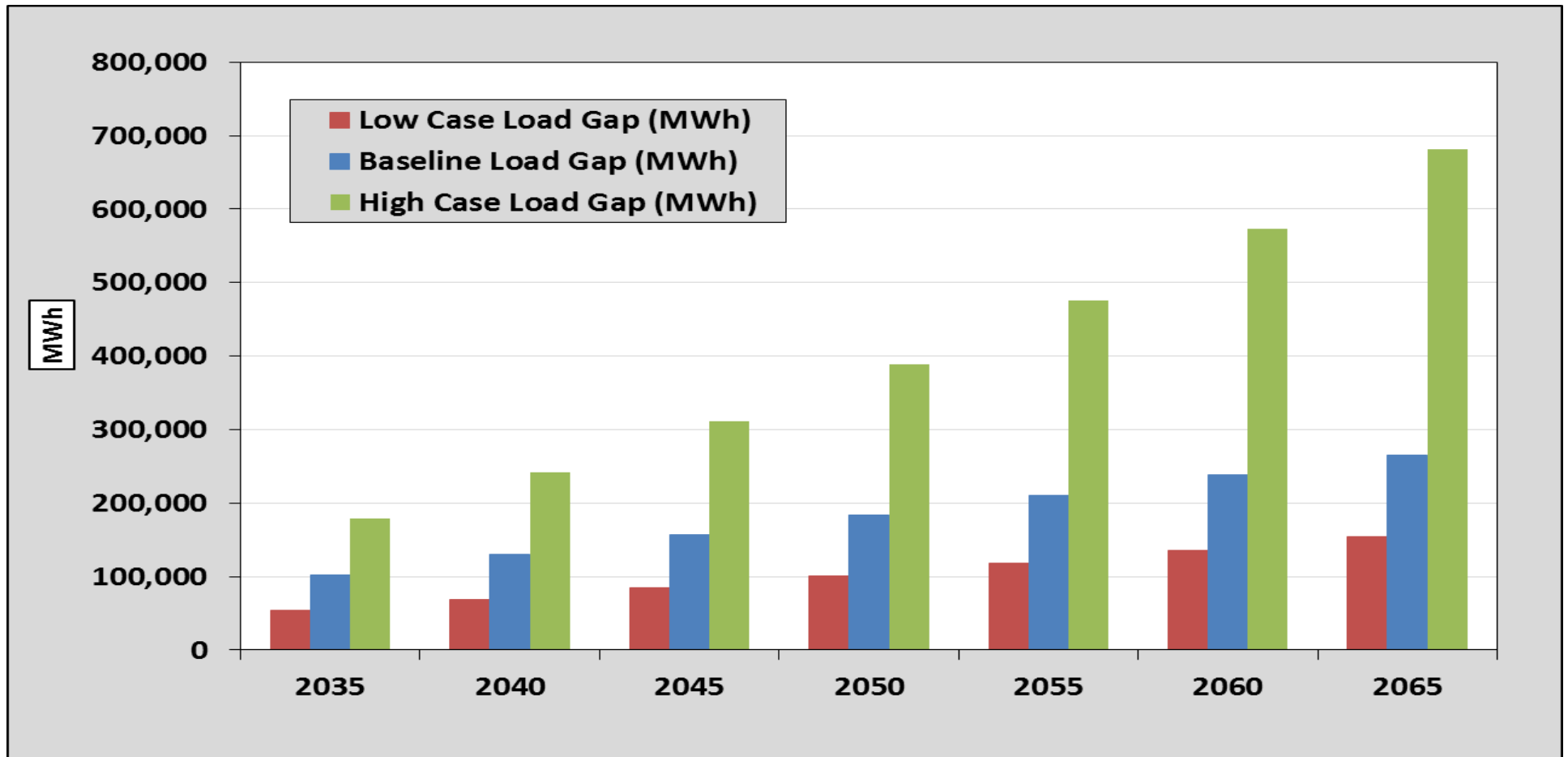
Total Electrical Energy Forecast



Annual Energy Supply & Demand

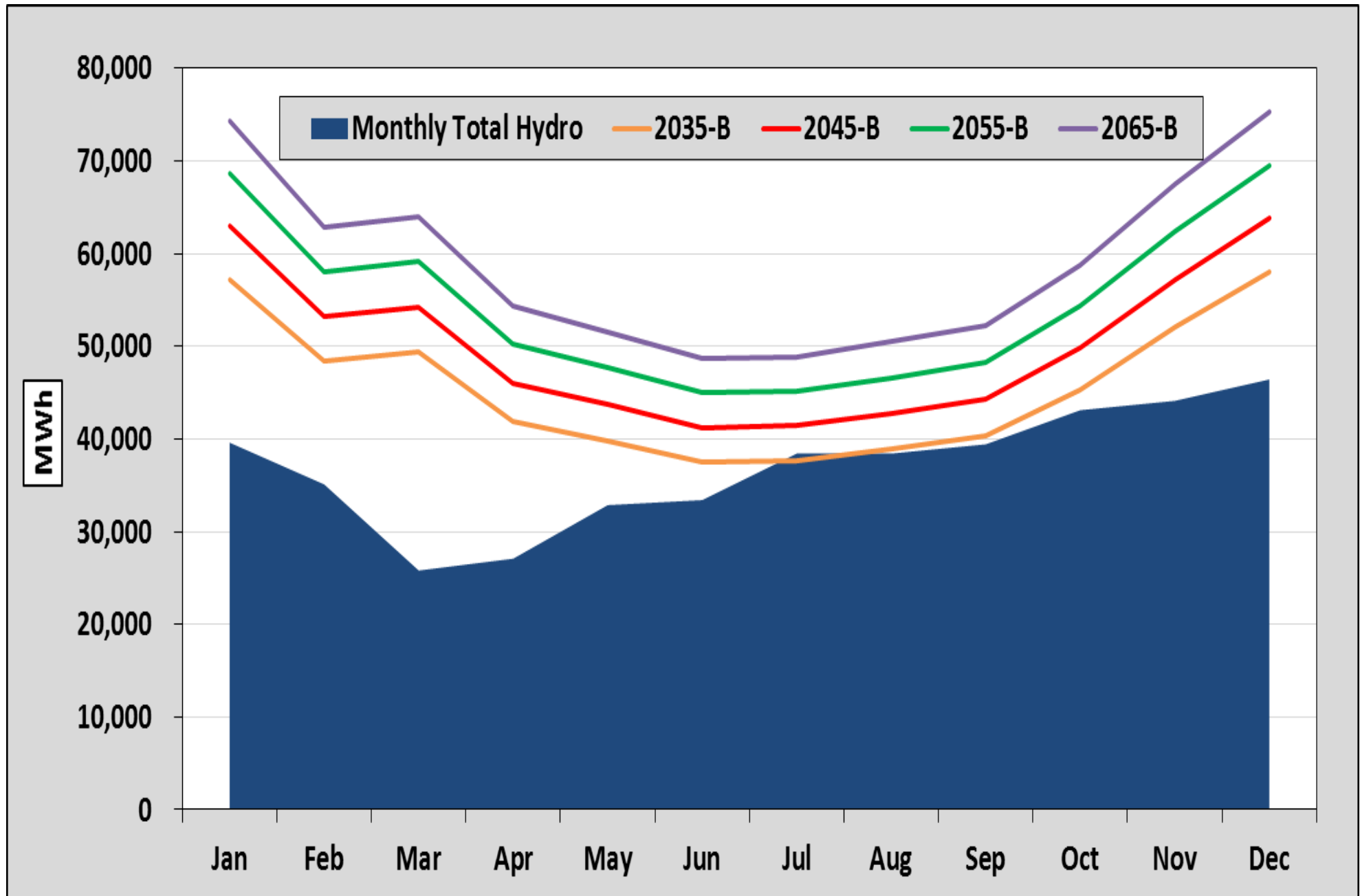


Annual Energy Gap

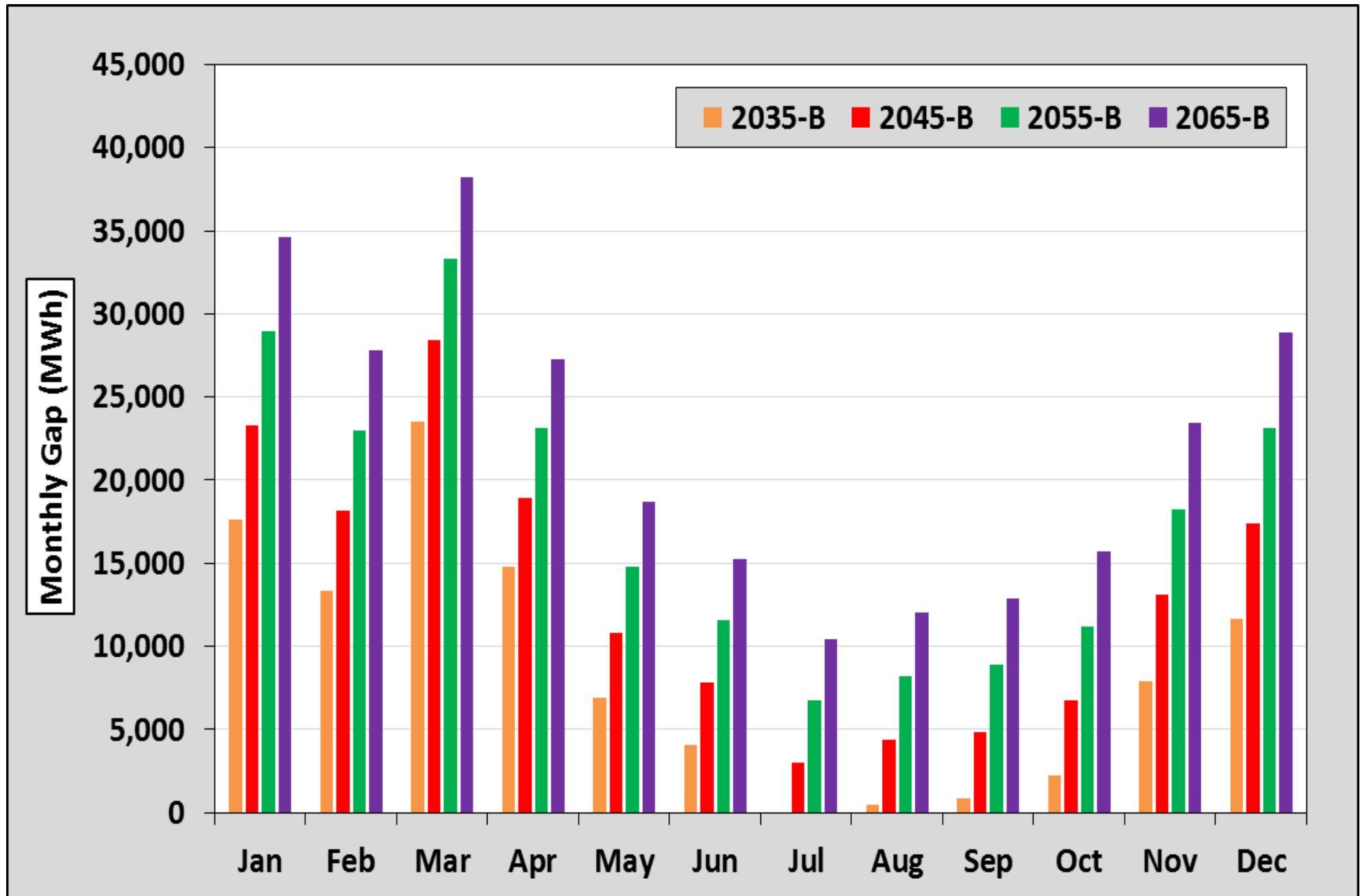


Load Gap Scenario	2035	2040	2045	2050	2055	2060	2065
Low Scenario (MWh)	54,000	69,000	85,000	101,000	118,000	136,000	154,000
Baseline Scenario (MWh)	103,000	130,000	157,000	184,000	211,000	238,000	265,000
High Scenario (MWh)	180,000	242,000	311,000	389,000	476,000	573,000	682,000

Baseline Case Monthly Energy Shape

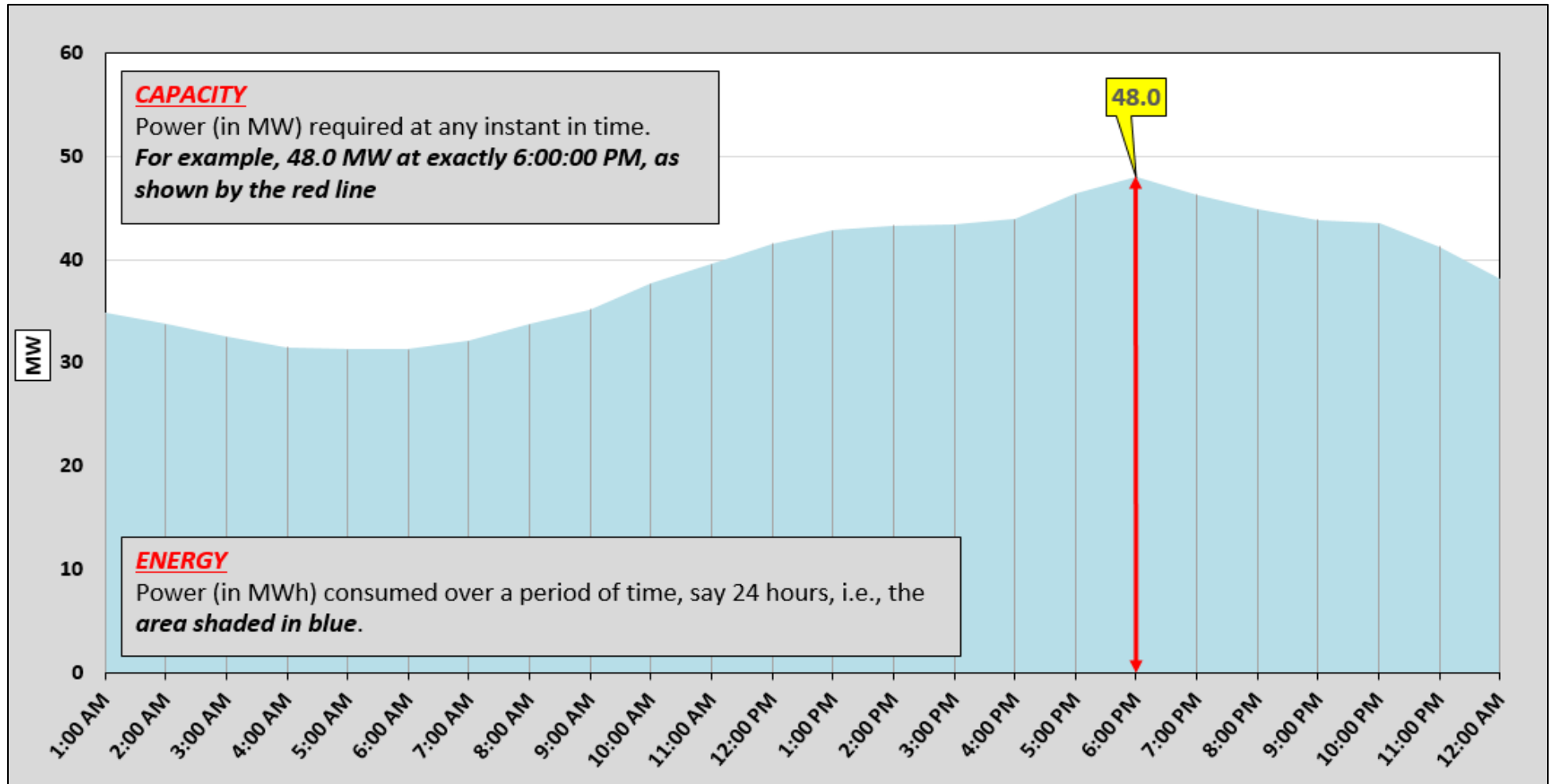


Baseline Case Monthly Energy Gap

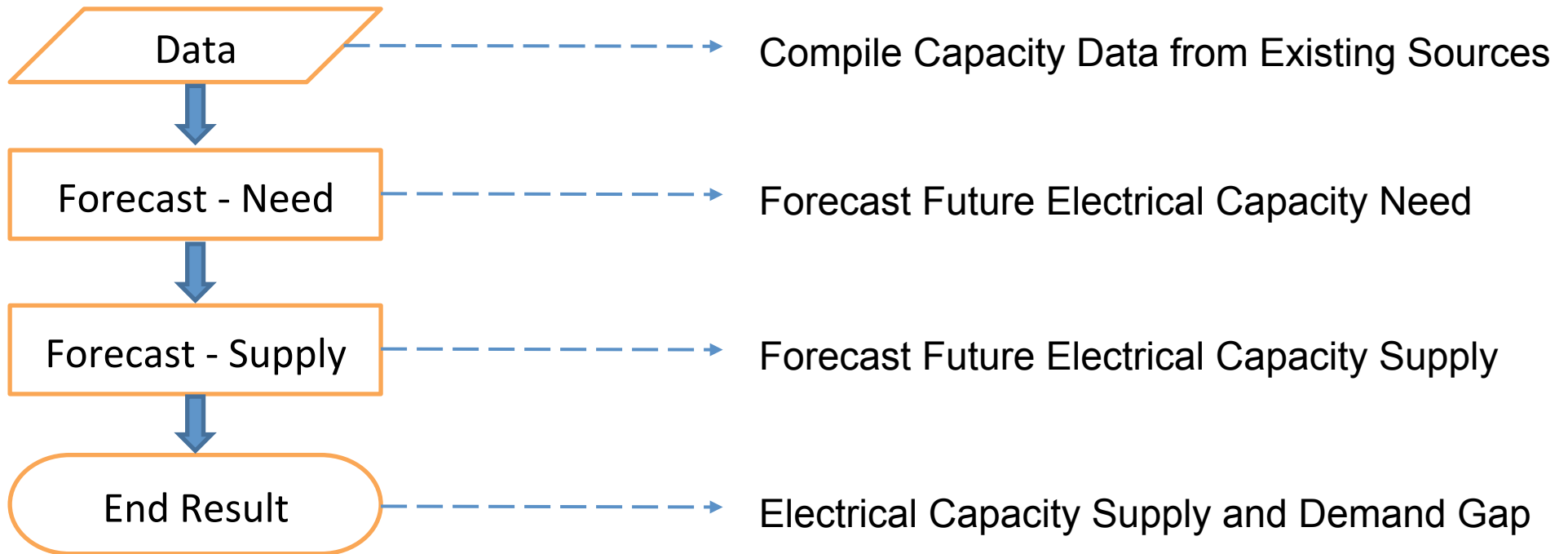


CAPACITY

Understanding Energy & Capacity



- **Capacity** = Instantaneous need. It is measured in Watts (W)
- **Energy** = Amount of electricity used over a period of time. It is measured in Watt Hours (Wh)



- **Capacity Forecast Growth rate** : assumed to be same as the forecast demand for electrical energy

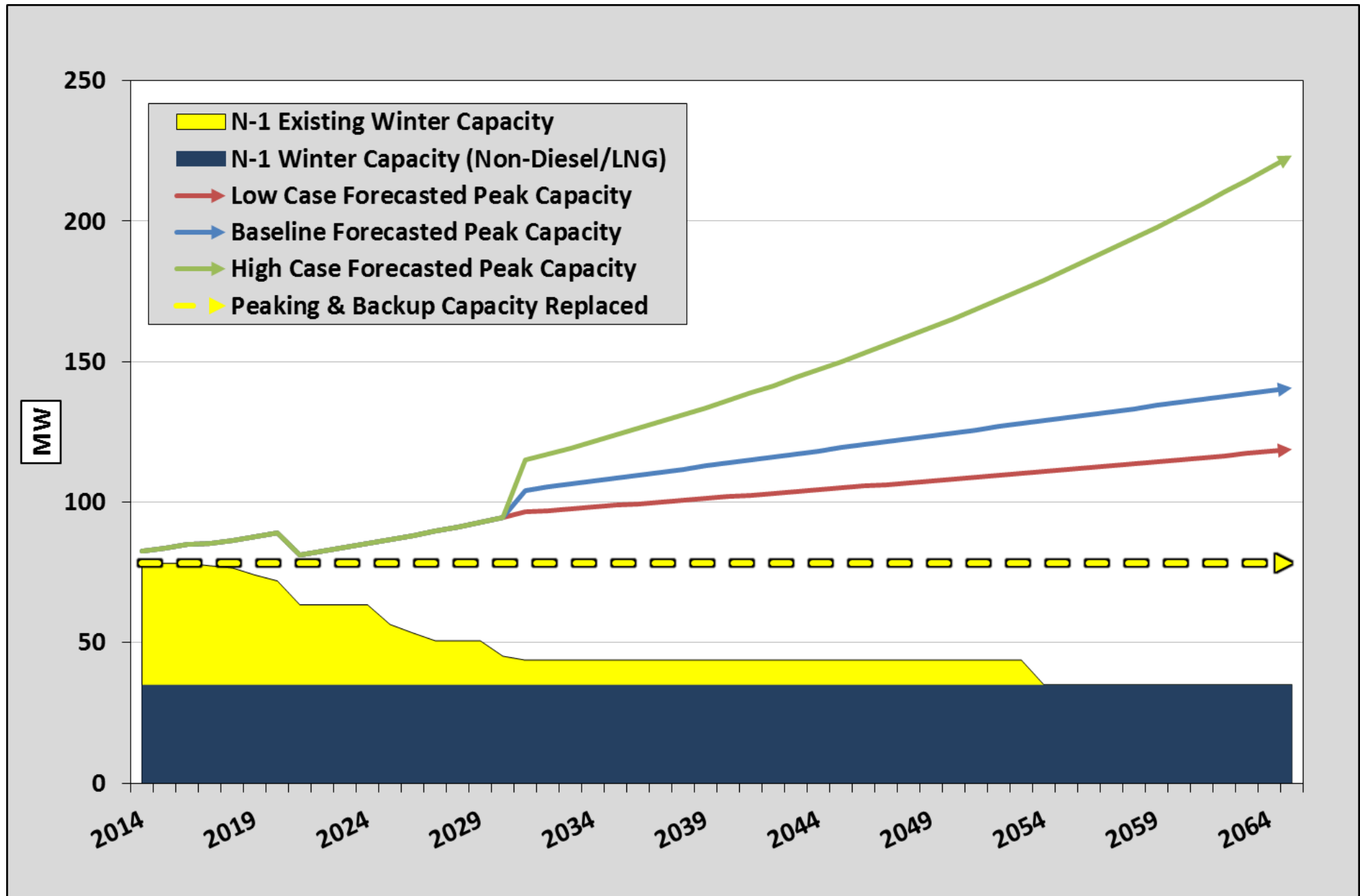
Installed Vs Reliable Winter Capacity



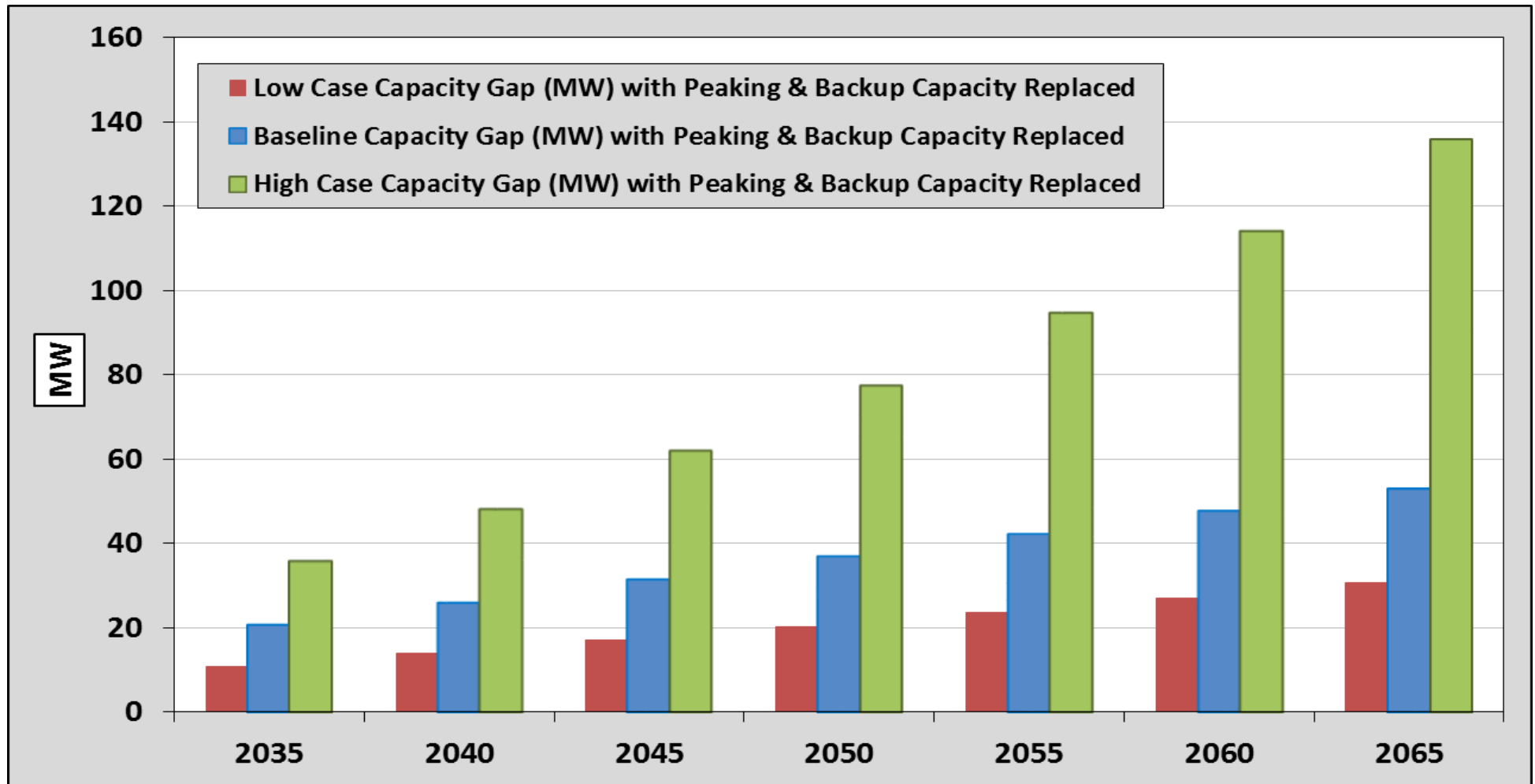
Installed Capacity	Reliable Winter Capacity
<ul style="list-style-type: none">Rated Capacity / maximum achievableFor diesel generators, installed capacity equals reliable winter capacity	<ul style="list-style-type: none">Based on the availability of fuelAmount of water (fuel) available to pass through the turbines is less during winter

Hydroelectric Facility	Installed Capacity (MW)	Reliable Winter Capacity (MW)	Reliable Capacity as % of Installed Capacity
Whitehorse Hydro Facility	40	24	60%
Aishihik Hydro Facility	37	37	100%
Mayo Hydro Facility	15.5	11	71%
Total	92.5	72	78%

Capacity Supply & Demand Forecast



Capacity Gap



	2035	2040	2045	2050	2055	2060	2065
Low Case Capacity Gap (MW)	11	14	17	20	24	27	31
Baseline Capacity Gap (MW)	21	26	31	37	42	47	53
High Case Capacity Gap (MW)	36	48	62	77	95	114	136

Conclusion



	2035	2045	2055	2065
Low Case Scenario	11 MW	17 MW	24 MW	31 MW
	54 GWh	85 GWh	118 GWh	154 GWh
Baseline Case Scenario	21 MW	31 MW	42 MW	53 MW
	103 GWh	157 GWh	211 GWh	265 GWh
High Case Scenario	36 MW	62 MW	95 MW	136 MW
	180 GWh	311 GWh	476 GWh	682 GWh

1

Takeaway

Islanded Grid: must meet monthly energy & capacity gaps

2

Takeaway

Winter Months : largest requirement

3

Takeaway

Plan : for addition generation to address these gaps

Thank you & Questions...



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