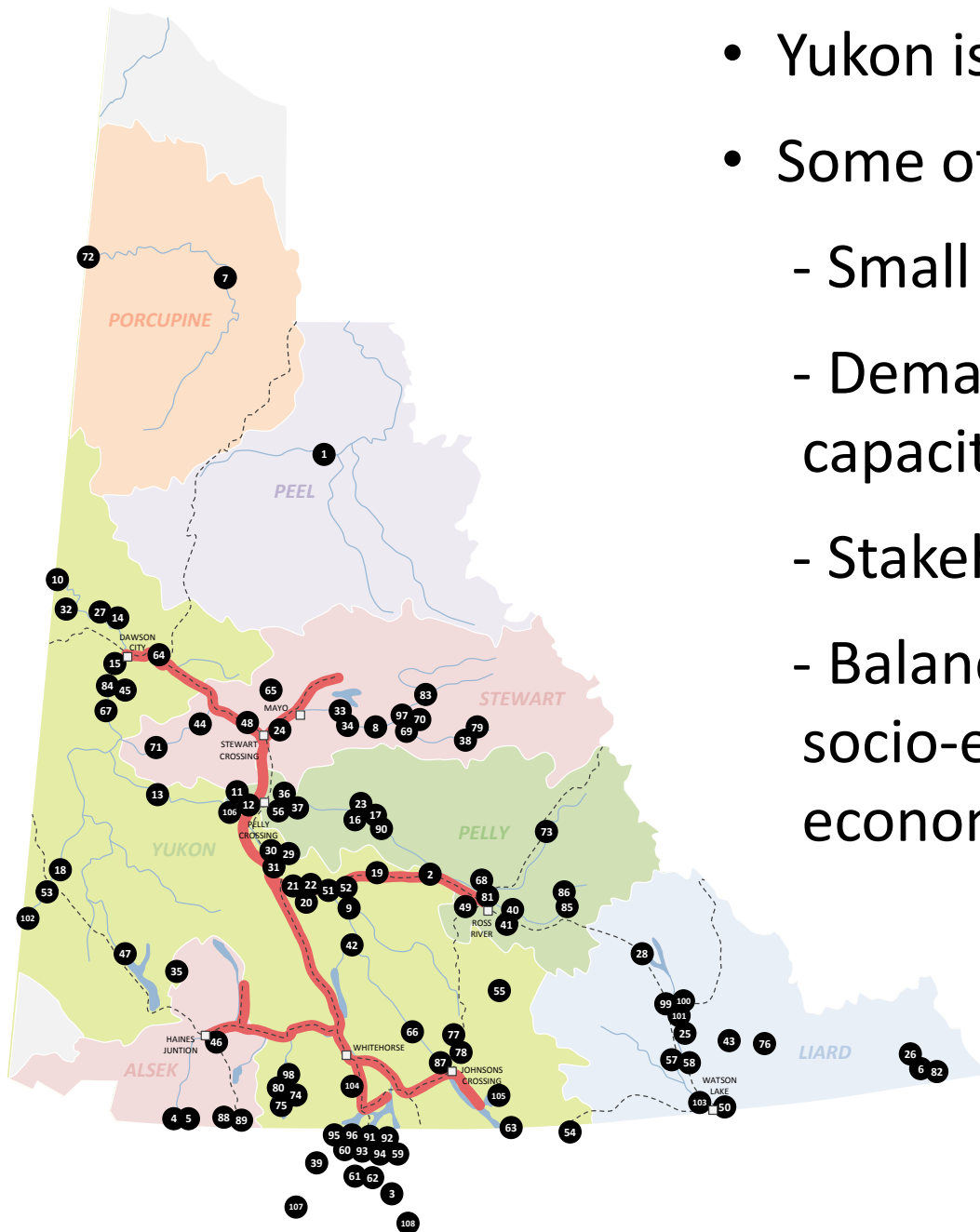


# **Next Generation Hydroelectric & Transmission Viability Study: Site Screening Inventory (Part 2 of 2)**

January 2015



- Yukon is facing a difficult decision
- Some of the key challenges include:
  - Small islanded grid
  - Demand for winter energy and peaking capacity
  - Stakeholder and First Nation concerns
  - Balancing environmental, cultural and socio-economic impacts with technical & economic constraints

# Gap Analysis: Findings



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

1

Takeaway

Islanded Grid: must meet monthly energy & capacity gaps

2

Takeaway

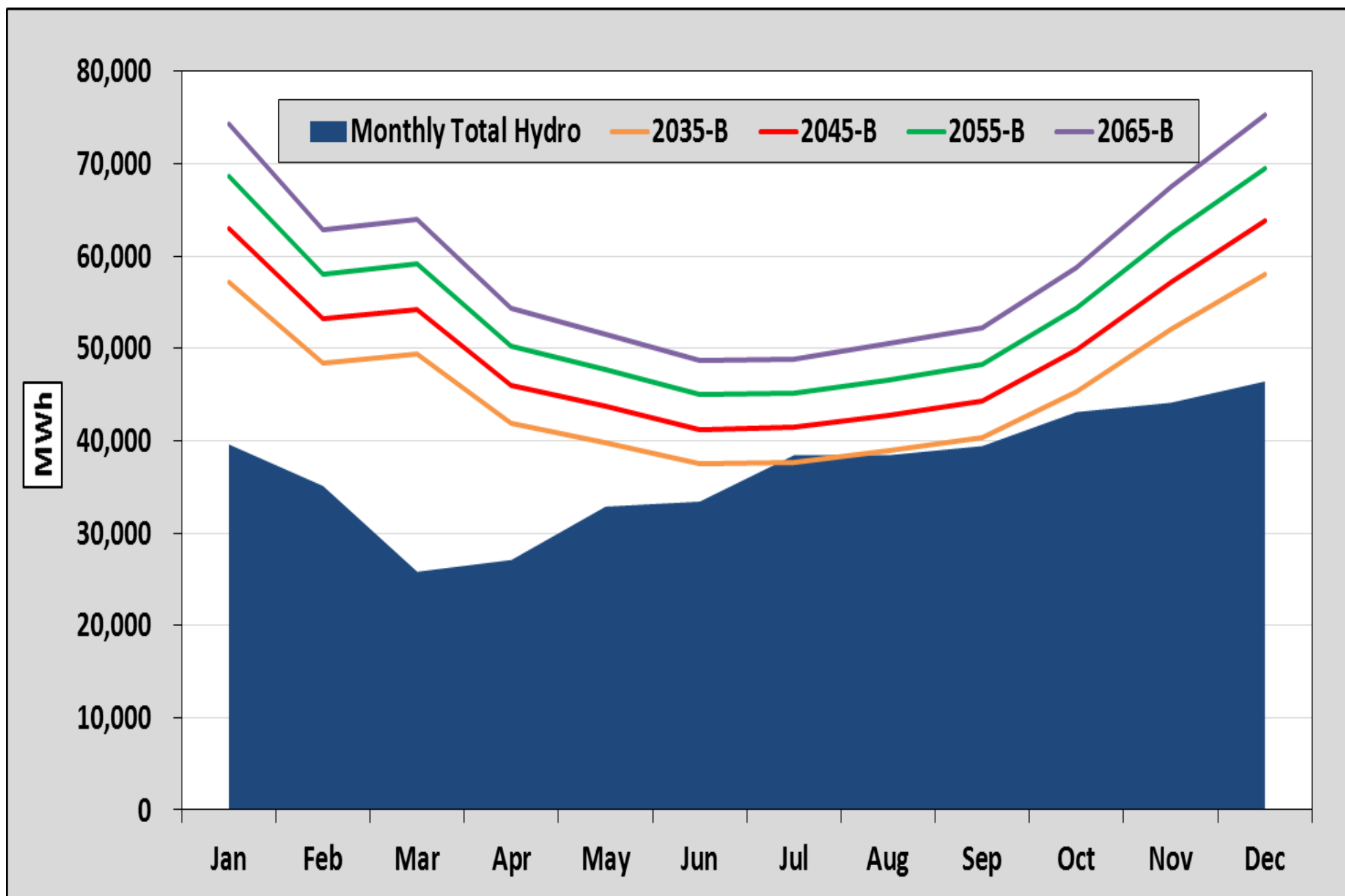
Winter Months : largest requirement

3

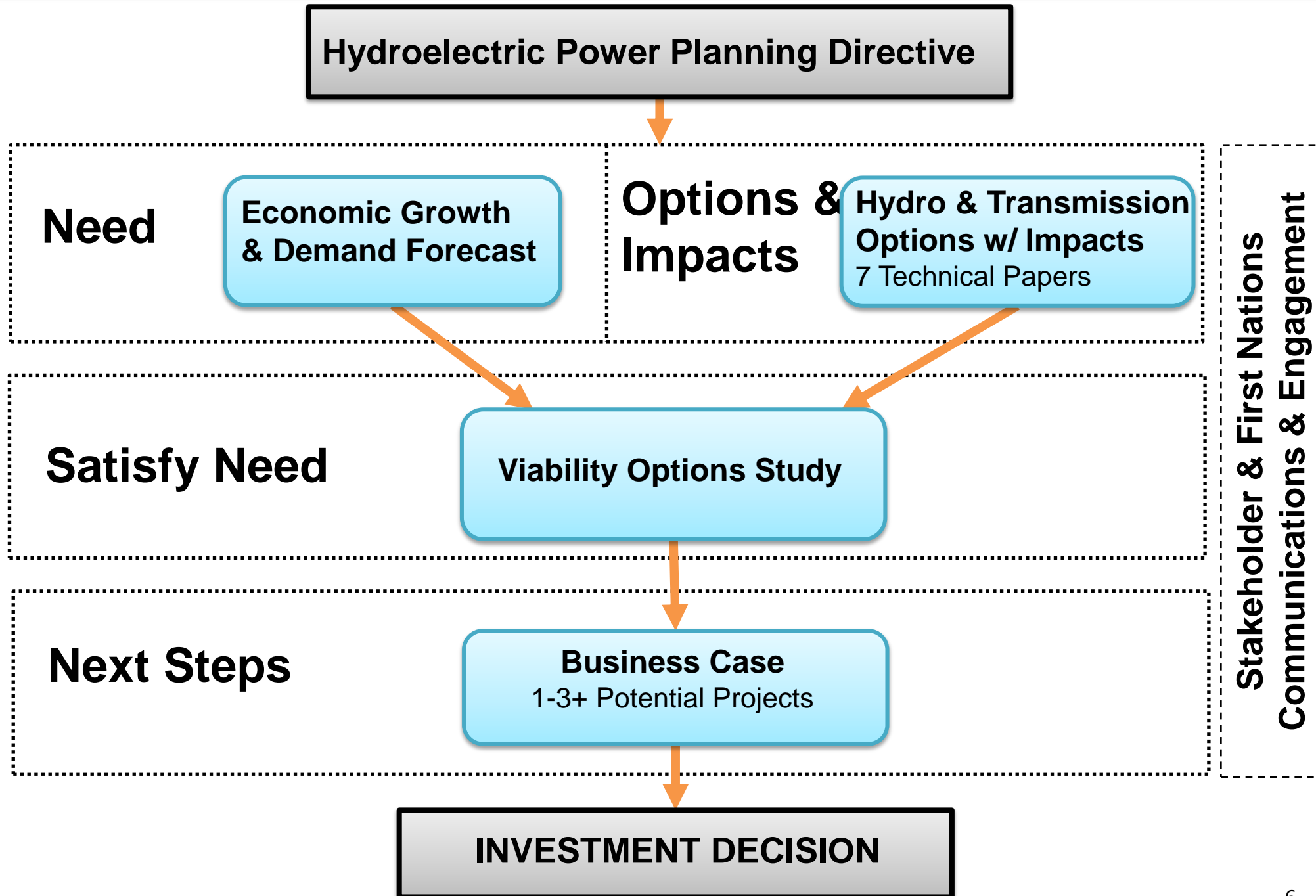
Takeaway

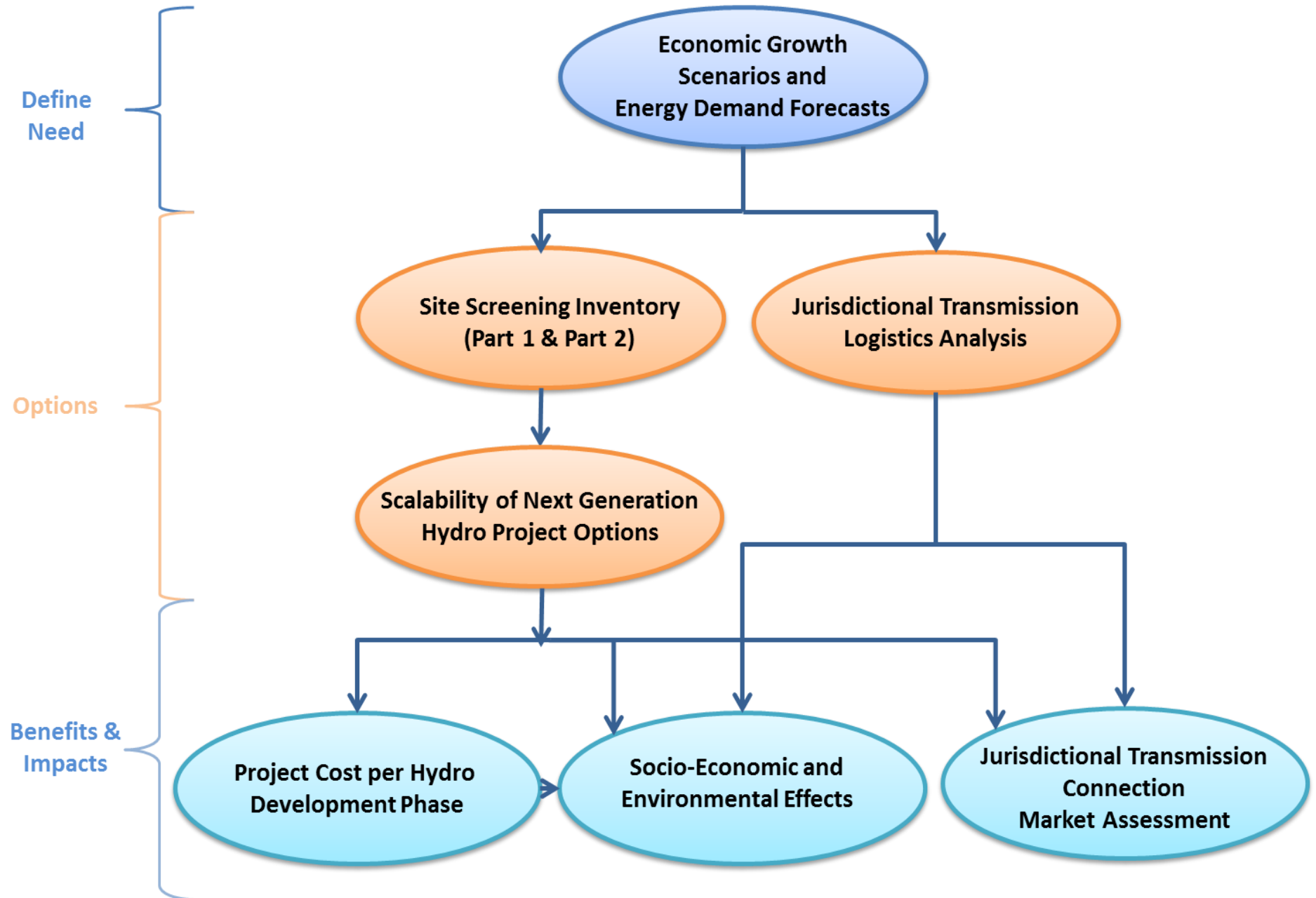
Plan : for addition generation to address these gaps

# Baseline Case Monthly Energy Shape



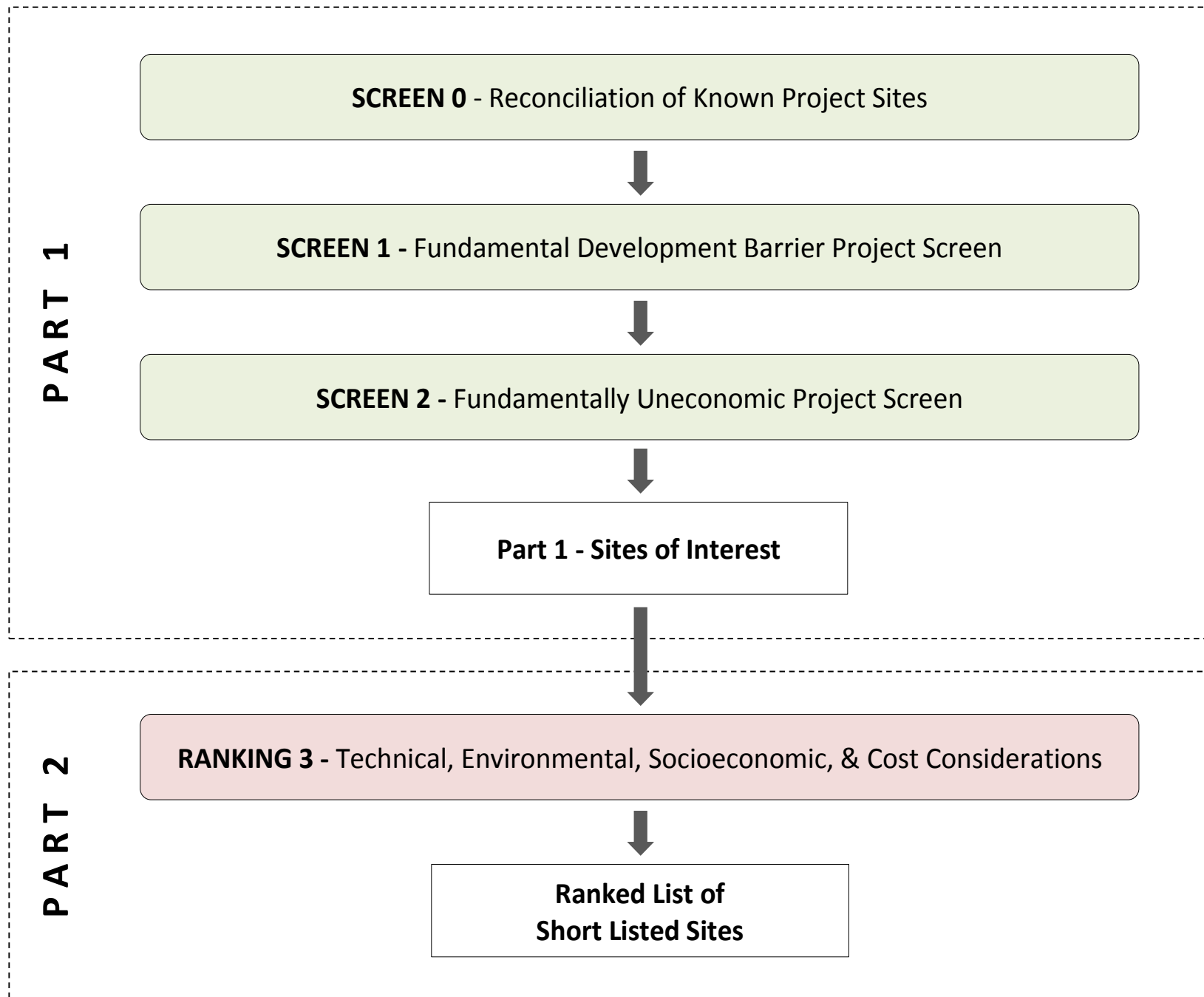
# **Approach & Methodology**





# **Site Screening Inventory (Part 1): Brief Recap**



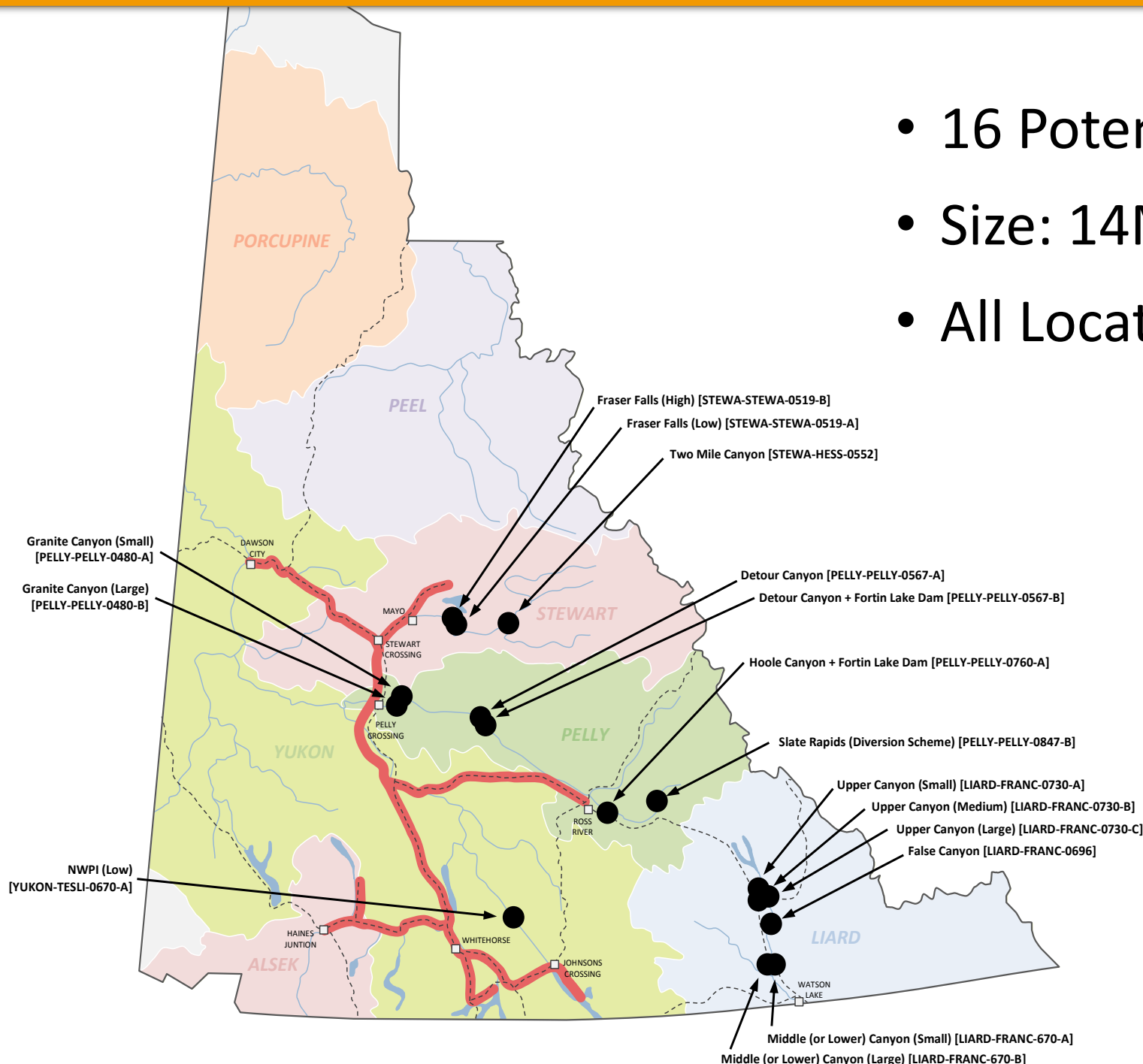


Part	Description	Refinement
1	Screen 0: Reconciliation of Known Project Sites	200+ → 108
	Screen 1: Fundamental Development Barrier Project Screen	108 → 47
	Screen 2: Fundamentally Uneconomic Project Screen	47 → 16
2	Ranking 3: Initial Project Ranking & Variation Consolidation	

# Site Screening Inventory (Part 1): Results



- 16 Potential Projects
- Size: 14MW to 300MW
- All Located in Yukon

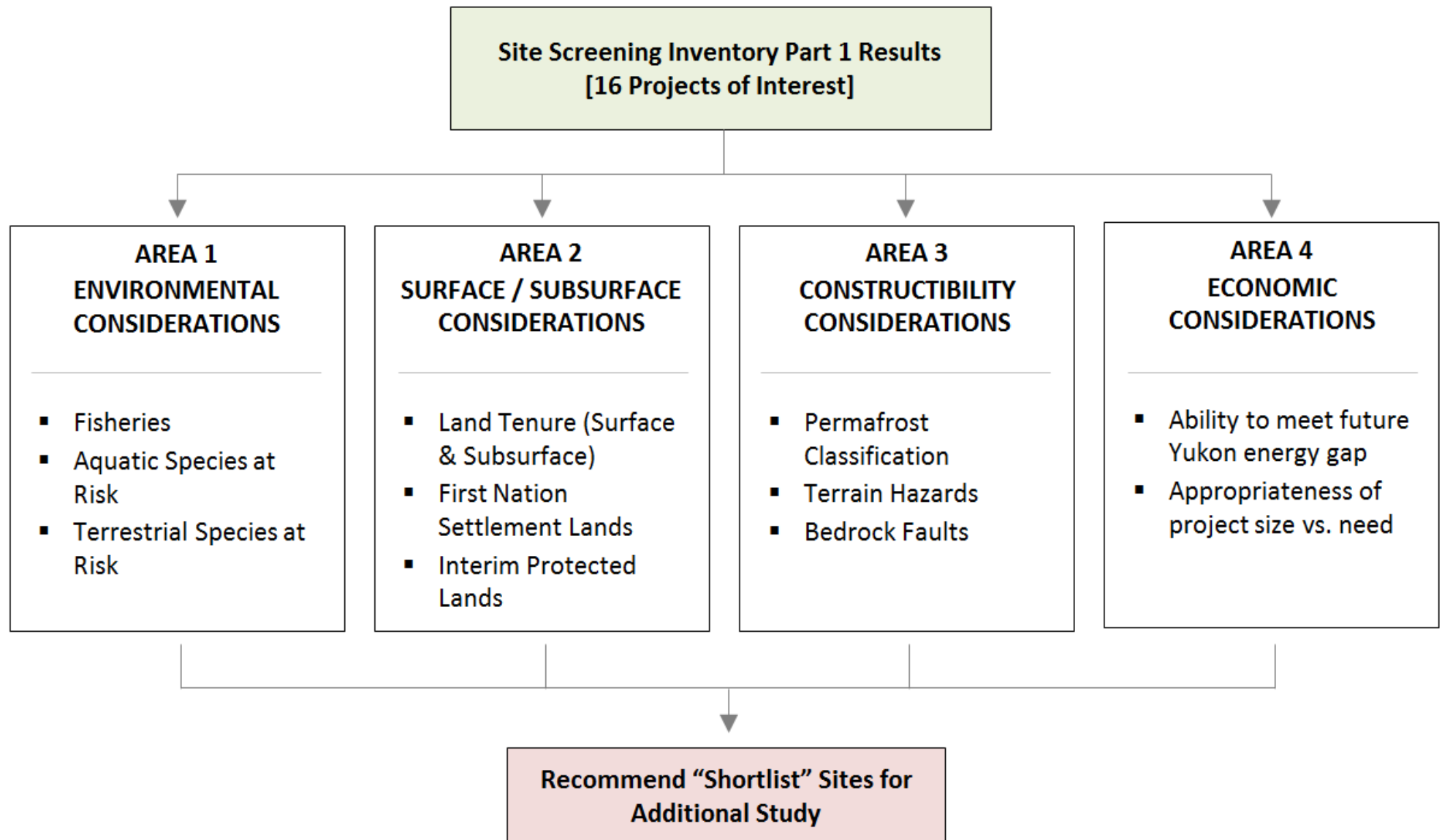


## **Site Screening Inventory (Part 2)**

***OBJECTIVE: Identify a group of hydroelectric sites that represent the best potential for hydroelectric development in the Yukon Territory so that through further study project sizing can be matched to balance the need for electricity with project impacts.***

### Notes:

- No perfect project
- Part 2 project designs based on historic designs
  - Balancing modern needs & impacts has not been completed
  - Upcoming studies to balance need & impacts



Evaluation based on identification of development constraints:

Score	Description
<b>H</b>	Parameter poses significant development constraint
<b>M</b>	Parameter poses moderate development constraint
<b>L</b>	Parameter poses no/minor development constraint

# **Area 1: Environmental Considerations**



### Fisheries

- Constraints based on fish habitat suitability and special areas
  - Rating streams in terms of their quality, sensitivity, productive capacity, and suitability for fish
  - Salmon, Bull Trout, Rainbow Trout, Dolly Varden, Whitefish, Northern Pike, Longnose Sucker
- Trans-boundary issues
  - Pacific Salmon Treaty (Annex IV, Chapter 8), BC & NWT Agreements

Fisheries pose a significant constraint for all projects:

Score	Projects
H	All Projects

### Aquatic Species at Risk

- Bull Trout, Dolly Varden Western Arctic Population

Score	Project
H	False Canyon, Fraser Falls (High, Low), Middle Canyon (Small, Large), Upper Canyon (Small Medium, Large)
M	NWPI (Low – On Teslin River)
L	Detour Canyon (+Fortin Lake), Houle Canyon (+Fortin Lake), Granite Canyon, Slate Rapids, Two Mile Canyon

### Terrestrial Species at Risk

- 68 species (3 amphibians, 46 birds, and 19 mammals)

Score	Description
H	Granite Canyon (Small, Large), NWPI (Low), Upper Canyon (Small, Medium, Large)
M	Detour Canyon + Fortin Lake, Houle Canyon + Fortin Lake, False Canyon, Fraser Falls (High & Low), Slate Rapids
L	Detour Canyon, Middle Canyon (Small, Large), Two Mile Canyon

## **Area 2: Surface / Subsurface Tenure Considerations**

- ***Land Tenure:***
  - Surface: Land Leases, Private Land, Land Licenses and Other Disposition Easements
  - Subsurface: Quartz leases & claims; Placer claims, leases & operations; Coal leases, licenses, exploration licenses; and Quarry permits
- ***First Nations Settlement Lands:***
  - Category A: Complete ownership of surface and subsurface
  - Category B: Complete ownership of surface only
  - Fee Simple: Private ownership
- ***Interim Protected Lands:*** Lands within the traditional territory of First Nations that have not yet concluded and ratified a final land claim agreement.

## Area 2: Surface / Subsurface Considerations



Project Name	Land Tenure	Interim Protected	Settlement Lands	Score
Detour Canyon	Present	Present	Present	H
Detour Canyon + Fortin Lake Dam	Present	Present	Present	H
False Canyon	Present	Present	-	H
Fraser Falls (High)	Present	-	Present	H
Fraser Falls (Low)	-	-	Present	H
Granite Canyon (Large)	Present	-	Present	H
Granite Canyon (Small)	Present	-	Present	H
Hoole Canyon + Fortin Lake Dam	Present	Present	-	H
Middle (or Lower) Canyon (Large)	-	Present	-	H
Middle (or Lower) Canyon (Small)	-	Present	-	H
NWPI (Low)	Present	-	Present	H
Slate Rapids (Diversion Scheme)	Present	Present	-	H
Two Mile Canyon	Present	-	Present	H
Upper Canyon (Large)	Present	Present	-	H
Upper Canyon (Medium)	Present	Present	-	H

## **Area 3: Constructability Considerations**

- Terrain issues that may affect “constructability”
- Does not preclude construction, indicates increased risk
- Constructability characteristics include
  - Permafrost, terrain hazards, and bedrock faulting.

Score	Description
H	Detour Canyon + Fortin Lake Dam, Fraser Falls (Low, High), Granite Canyon (Small, Large), Hoole Canyon + Fortin Lake, Slate Rapids, Upper Canyon (Small, Medium, Large)
M	Detour Canyon, NWPI (Low), Two Mile Canyon
L	False Canyon, Middle Canyon (Small, Large)



## **Area 4: Economic Considerations**

- Metric 1: Ability to Meet Future Energy Gap (Baseline 2065)

Month	Energy Gap (GWh)
Jan	35
Feb	28
Mar	38
Apr	27
May	19
Jun	15

Month	Energy Gap (GWh)
Jul	11
Aug	12
Sep	13
Oct	16
Nov	23
Dec	29

- Metric 2: Project Size vs. Need

## Area 4: Economic Considerations



Project Name	% of 2065 Energy Gap	Score	Utilization	Score
Detour Canyon	100%	L	47%	M
Detour Canyon + Fortin Lake Dam	100%	L	30%	H
False Canyon	100%	L	36%	M
Fraser Falls (High)	100%	L	10%	H
Fraser Falls (Low)	100%	L	30%	H
Granite Canyon (Large)	100%	L	10%	H
Granite Canyon (Small)	100%	L	25%	H
Hoole Canyon + Fortin Lake Dam	72%	M	51%	M
Middle (or Lower) Canyon (Large)	100%	L	40%	M
Middle (or Lower) Canyon (Small)	38%	H	84%	L
NWPI (Low)	82%	L	45%	M
Slate Rapids (Diversion Scheme)	94%	L	69%	L
Two Mile Canyon	100%	L	57%	M
Upper Canyon (Large)	100%	L	40%	M
Upper Canyon (Medium)	100%	L	53%	M
Upper Canyon (Small)	74%	M	88%	L

# Summary

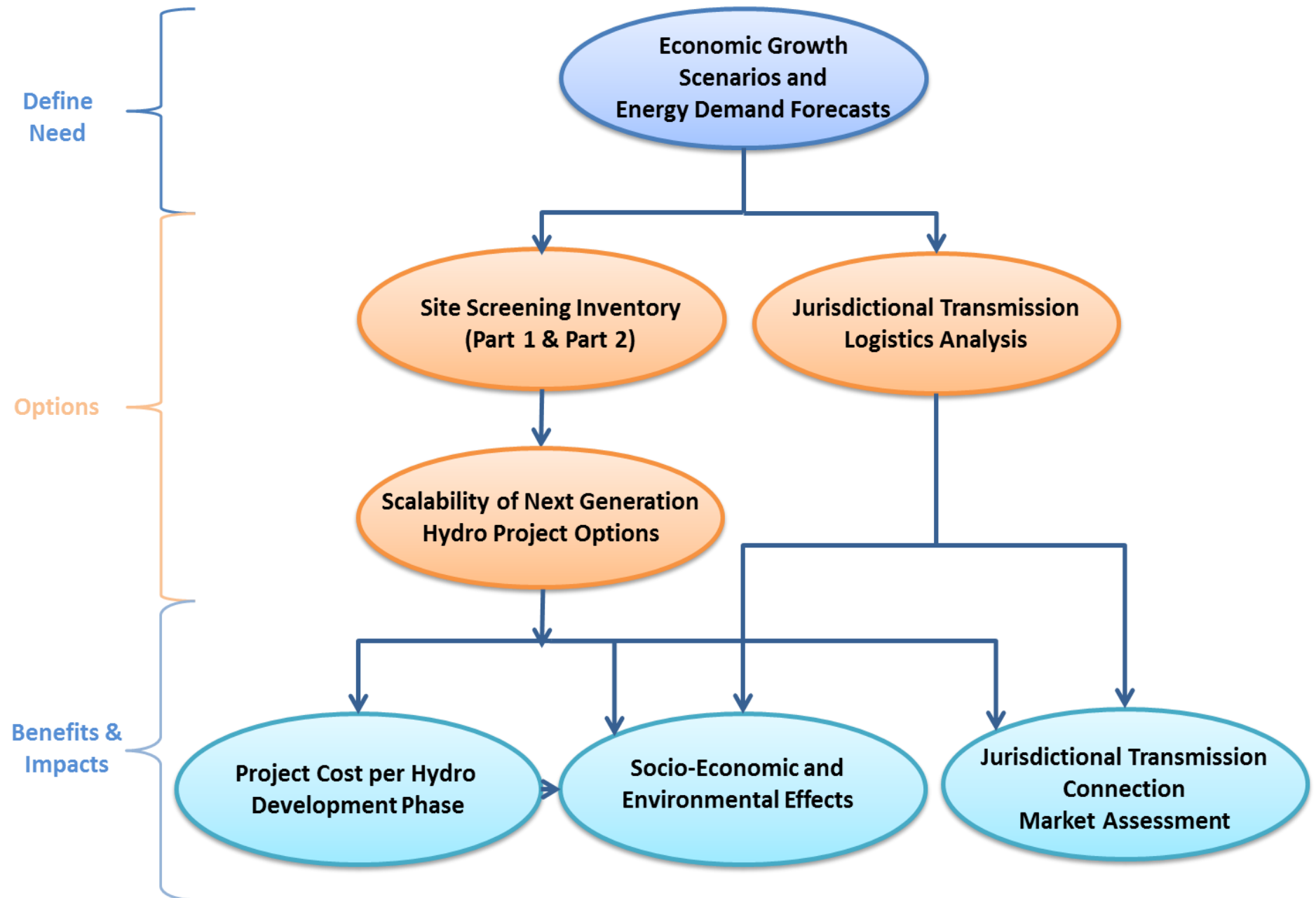
- No perfect project, but historic designs tend to be too large
- Next steps to balance need vs. impacts for 10 sites

Area of Study		Detour Canyon		False Canyon	Fraser Falls	
		<i>Without Fortin Dam</i>	<i>With Fortin Dam</i>		<i>Low Version</i>	<i>High Version</i>
1	Enviro. (Fisheries)	H	H	H	H	H
	Enviro. (Aquatic SAR)	L	L	H	H	H
	Enviro. (Terrestrial SAR)	L	M	M	M	M
2	Surface/Subsurface Tenure	H	H	H	H	H
3	Constructability	M	H	L	H	H
4	Economic (Meeting Gap)	L	L	L	L	L
	Economic (Size vs. Need)	M	H	M	H	H

Area of Study		Granite Canyon		Hoole Canyon + Fortin Lake Dam	Middle (or Lower) Canyon	
		<i>Small Version</i>	<i>Large Version</i>		<i>Low Version</i>	<i>High Version</i>
1	Enviro. (Fisheries)	H	H	H	H	H
	Enviro. (Aquatic SAR)	L	L	L	H	H
	Enviro. (Terrestrial SAR)	H	H	M	L	L
2	Surface/Subsurface Tenure	H	H	H	H	H
3	Constructability	H	H	H	L	L
4	Economic (Meeting Gap)	L	L	M	H	L
	Economic (Size vs. Need)	H	H	M	L	M

Area of Study		NWPI (Low)	Slate Rapids (Diversion Scheme)	Two Mile Canyon	Upper Canyon		
					<i>Small</i>	<i>Med</i>	Large
1	Enviro. (Fisheries)	H	H	H	H	H	H
	Enviro. (Aquatic SAR)	M	L	L	H	H	H
	Enviro. (Terrestrial SAR)	H	M	L	H	H	H
2	Surface/Subsurface Tenure	H	H	H	H	H	H
3	Constructability	L	H	M	H	H	H
4	Economic (Meeting Gap)	L	L	L	M	L	L
	Economic (Size vs. Need)	M	L	M	L	M	M

# Next Steps: 10 Sites







## ***Peter Helland***

Midgard Consulting Incorporated

Email: [phelland@midgard-consulting.com](mailto:phelland@midgard-consulting.com)

Phone: 604.298.4997