



# **THE PATH FORWARD FOR ALASKA LNG**

## ***UAA COLLEGE OF ENGINEERING PROFESSIONAL DEVELOPMENT SEMINAR***

**FEBRUARY 24, 2017**



**[www.agdc.us](http://www.agdc.us)**

- **Project Overview and Big-Picture Commercial Setting**
- Gas Treatment Plant Overview
- Pipeline Overview
- LNG Plant Overview
- Regulatory Overview
- Execution Aspects and Project Management
- Benefits to Alaskans

# AGDC'S PROJECT HISTORY

**2009:** Legislature begins taking deliberate steps to develop an in-state pipeline, independent of other producer led North Slope commercialization efforts.



**2011:** **Alaska Stand Alone Pipeline (ASAP)** plan developed and delivered to the Legislature. Plan further optimized during 2012.



**2013:** **Alaska Gasline Development Corporation (AGDC)** established as an independent, public corporation - \$355+ million investment towards **ASAP (HB 4)**.



**2014:** State participation in **Alaska LNG** project authorized (*SB 138*), **Joint Venture Agreement** executed and Pre-Front End Engineering and Design (**Pre-FEED**) begins.



2017: AGDC progressing the Alaska Liquefied Natural Gas (LNG) Project.



# ALASKA LNG PROJECT

- **Integrated Gas Infrastructure Project.**

- ✓ **Gas Treatment Plant:**

- 200 acre site at Prudhoe Bay
- Deliver up to 3.5 Bcf/d

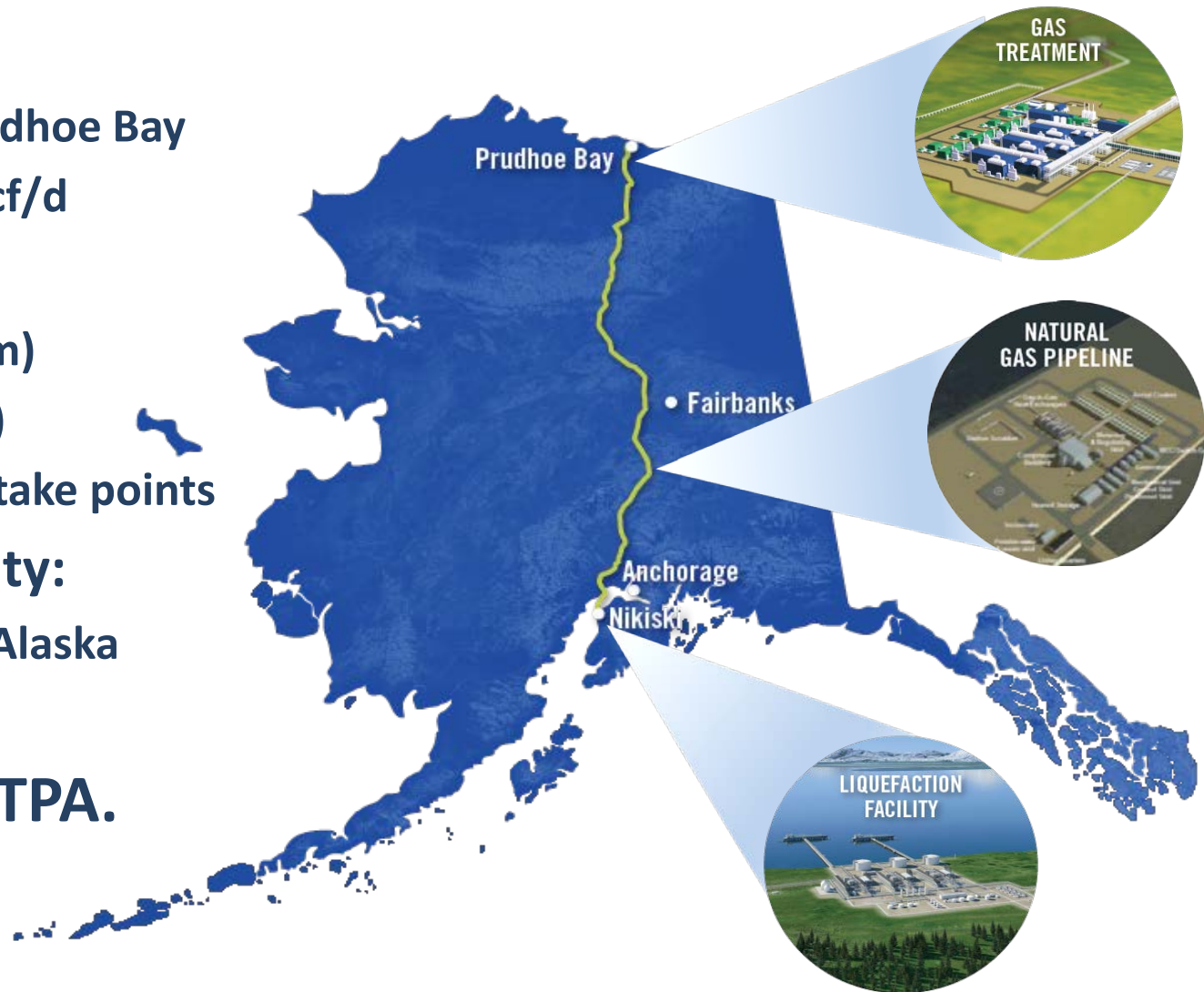
- ✓ **Pipeline:**

- 800-miles (1,287 km)
- 42-inch pipe (1.1m)
- Several in-state offtake points

- ✓ **LNG Production Facility:**

- Located in Nikiski, Alaska
- 600 – 900 acre site

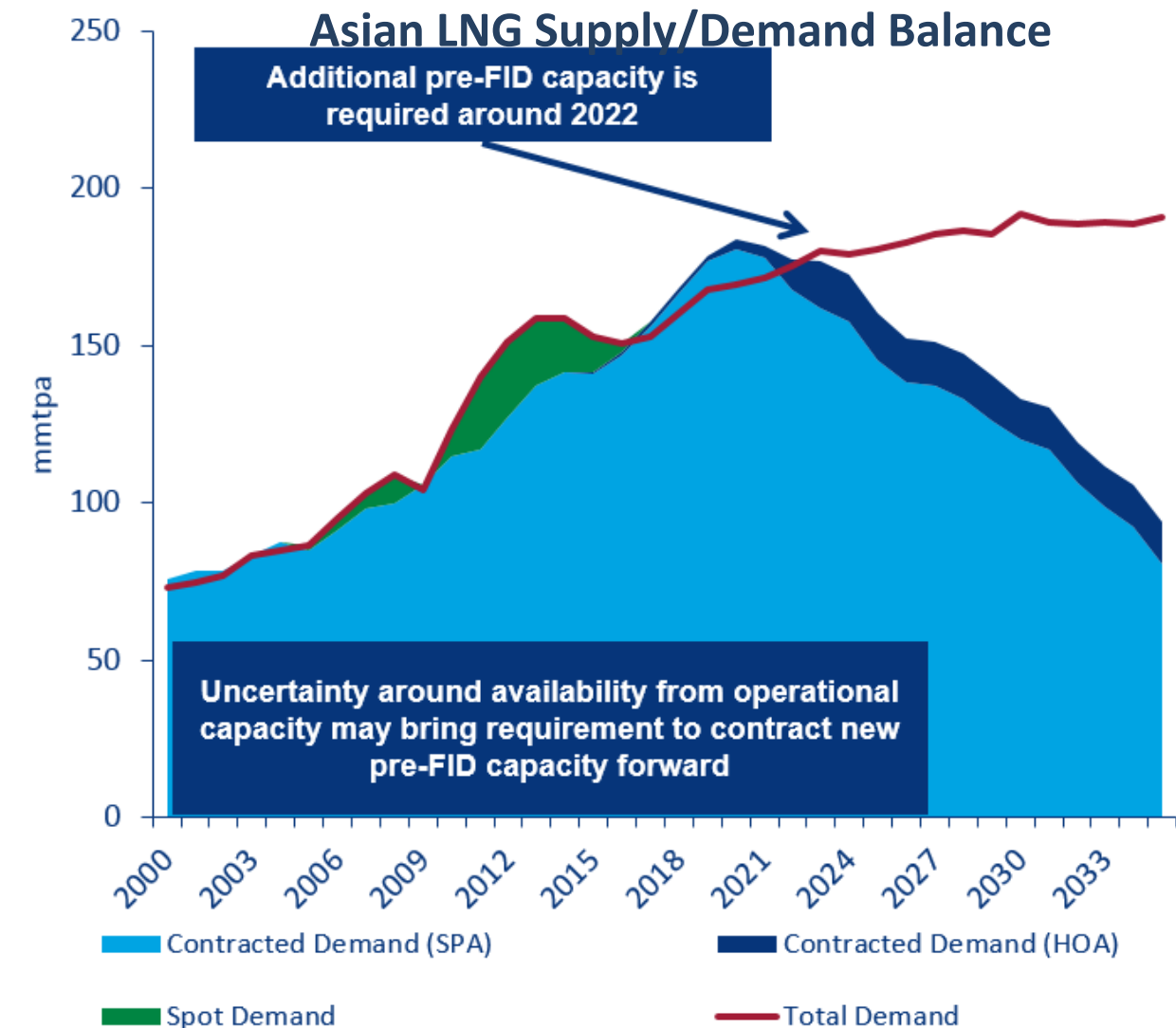
- **Produce up to 20 MMTPA.**



Bcf = Billion cubic feet    MMTPA = Million Metric Tons Per Annum

# GLOBAL LNG SUPPLY-DEMAND BALANCE

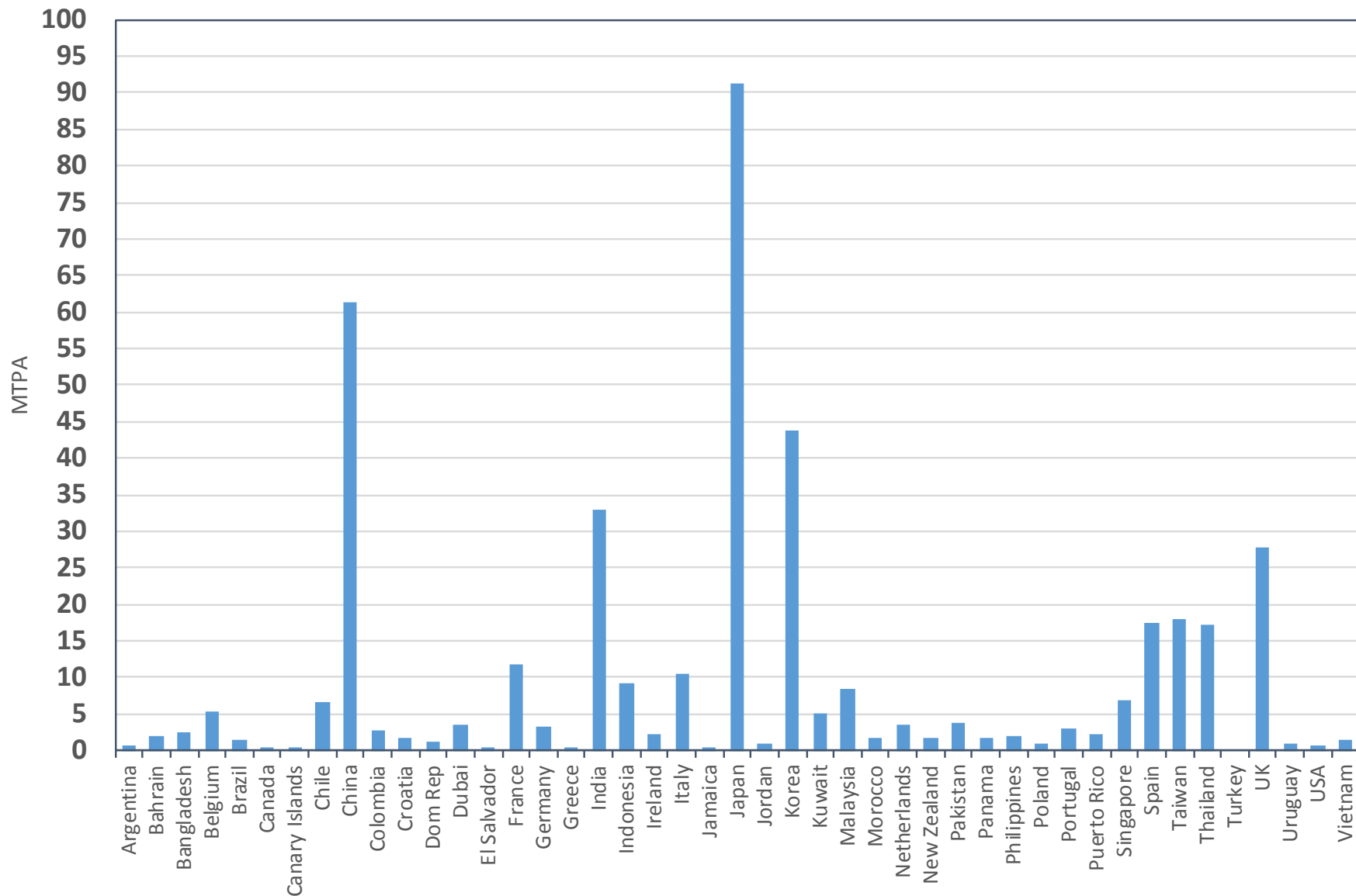
- Current global surplus.
- Equilibrium in early 2020's; new supply needed 2021-2025.
- Many supply projects chasing demand.
  - Brownfield
  - Greenfield
- Sellers must compete on more than just price.



Source: Wood Mackenzie

# GLOBAL LNG DEMAND

LNG Demand in 2025 by Country



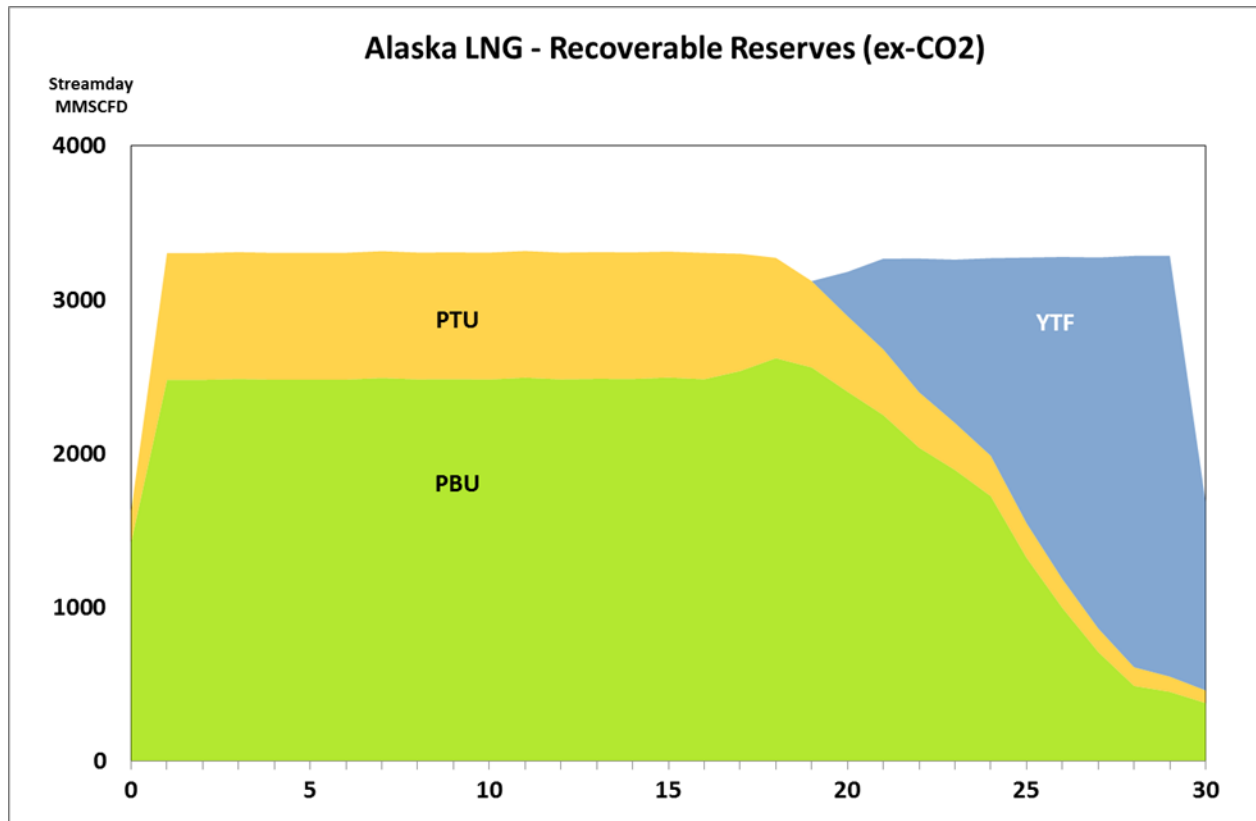
# ALASKA'S STRATEGIC ADVANTAGE

- Location advantage: 7 to 9 days to market.
- Temperature advantage: Cold temperature provides efficient LNG production.
- Political stability.
- Proven conventional resource.



A position in Alaska provides for optimized logistics

# North Slope Gas Resources



## Development Concept

- ✧ Gas sourced from PBU / PTU
- ✧ Gas Treatment Plant (GTP) near Prudhoe Bay
  - ✧ 3 trains to process 3.9 BCFD
- ✧ 800 Mile 42 inch dense phase gas pipeline
  - ✧ Transport 3.3 Bscfd
  - ✧ Multiple in-state off-takes
- ✧ LNG Plant and Marine Terminal at Nikiski
  - ✧ 3 trains capable of producing up to 20 MTPA

***Note: Volumes depicted above from the integrated Alaska LNG project are notional and subject to assumed in-state deliveries, composition, etc***



# ALASKA LNG TOLLING PROJECT STRUCTURE



SPA – Sales and Purchase Agreement

# ALASKA LNG PROJECT STATUS



- Pre-Front-End Engineering & Design (Pre-FEED) is formally complete, Pre-FEED Joint Venture Agreement (JVA) was terminated effective December 31, 2016.
- Deliverables are complete and were accepted by co-venture parties.
- Technical and Regulatory transition to State-led project complete and project data transferred to AGDC systems.
- LNG plant site transition negotiations are advancing.
- Other venture parties have withdrawn but are supporting AGDC as sole project applicant for the Federal Energy Regulatory Commission (FERC) filing.

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# GTP Overview

## Summary:

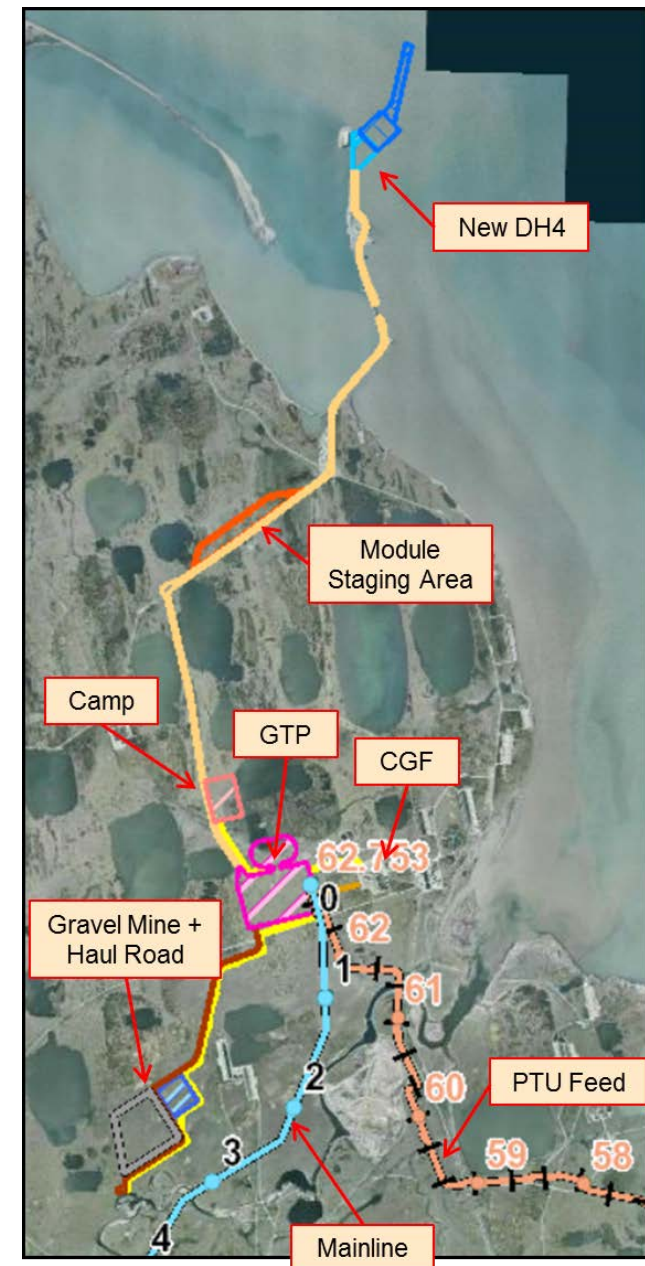
- 8 year execution phase schedule, with 4 major sealifts
- Highly Modularized – Max weight about 9400T – Max dimensions 300ft x 90ft wide
- About 200 acres of land required

## Design Basis:

- 3 Trains totaling 3.3 BSCFD (winter) and 2.8 BSCFD (summer)
- Inlet feed 75% PBU, 25% PTU; Assumed 11% CO<sub>2</sub> with small amounts of H<sub>2</sub>S
- Amine treating to remove CO<sub>2</sub> and H<sub>2</sub>S to LNG spec
- Glycol dehydration to remove water from CO<sub>2</sub> and treated gas to PL spec
- Power plant (220-MW total) decentralized distribution system optimized to reduce capex and increase uptime, Black-Start inter-tie to PBU
- CO<sub>2</sub> Compression and Treated Gas Compression optimized to reduce capex and increase uptime
- Waste heat recovered from gas turbines to regenerate amine
- Common propane refrigeration system to chill treated gas for permafrost protection
- 60 inch X 1 mile above ground PL to transport feed gas from existing PBU Central Gas Facility
- 28" X 63 mile above-ground PL to transport feed gas from new PTU Gas Expansion Facility (PL scope)

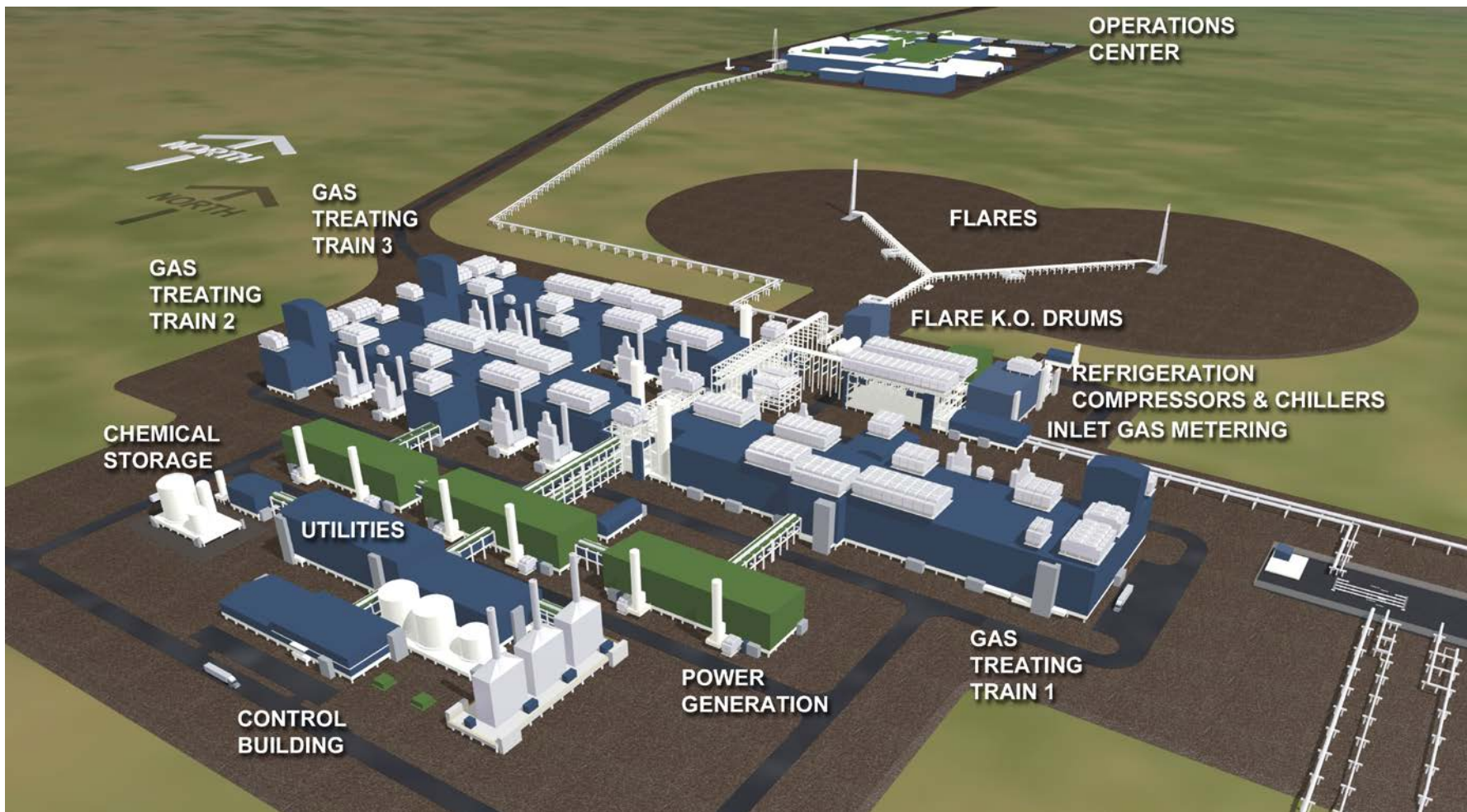
## Execution Basis:

- Gravel sourced from dedicated GTP mine; Dedicated haul road to avoid PBU traffic
- Integrated Fabrication Study results incorporated into GTP plans
- Module delivery via ocean going tug / barge; Offload at new DH4 (to minimize dredging) and transport to site via SPMT
- Primarily hook-up of large modules, but field erect when identified as lowest cost option, e.g. camps, warehouse, flare rack, cable rack and AGRU Absorber vessel
- SIMOPS after Train 1 start-up due to flammable gas and high pressure CO<sub>2</sub>; Camp off-pad location due to process safety considerations



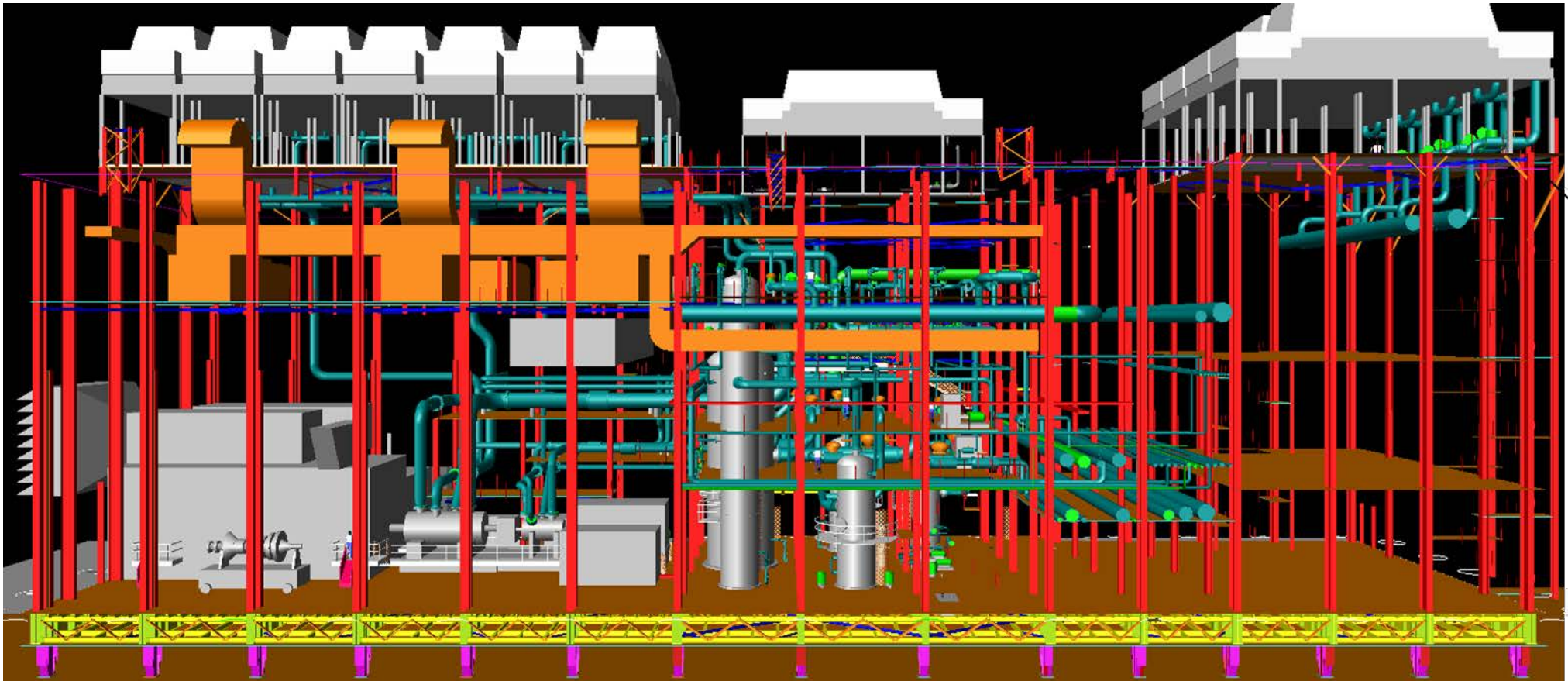


# GTP Overview





# 3D Rendering of CO2 Compression Module

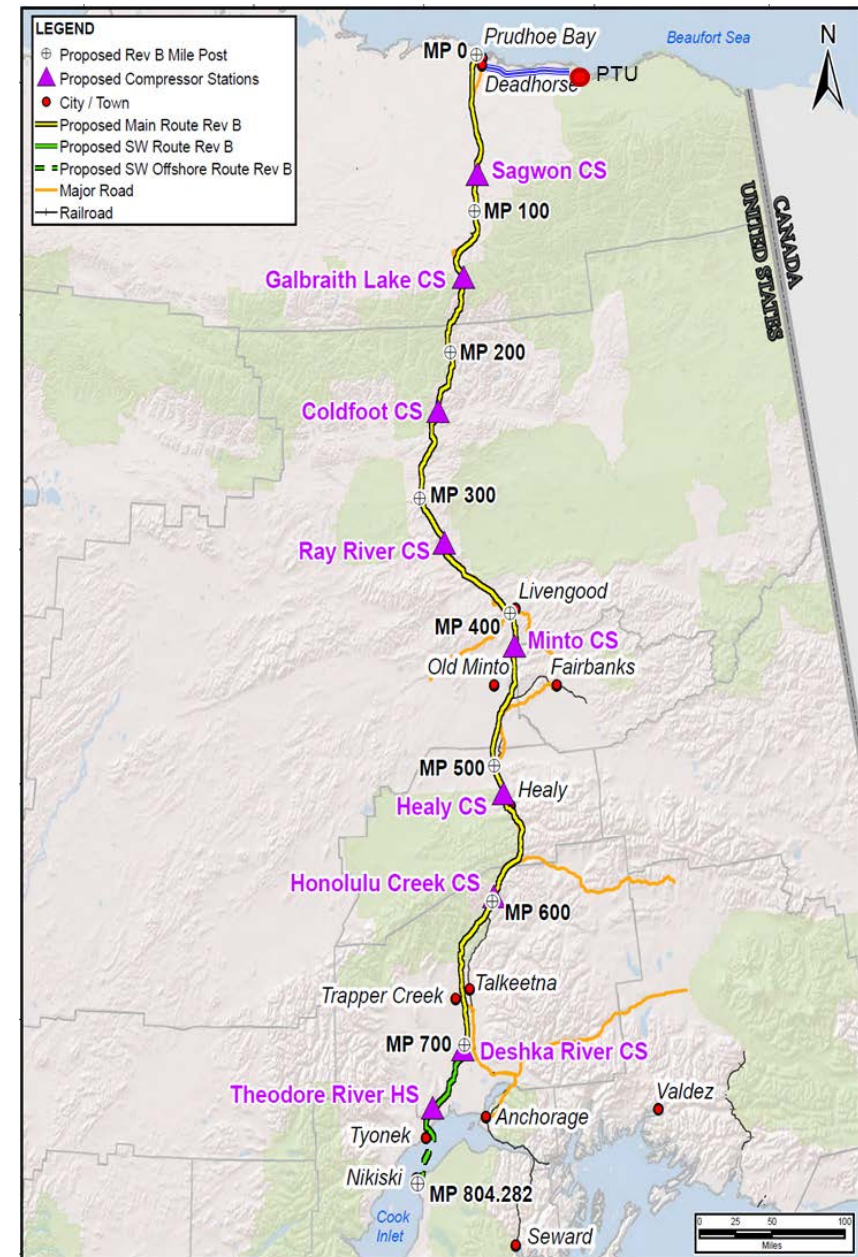


GTP Byproduct Module Elevation Looking West  
Footprint: 285 feet x 80 feet

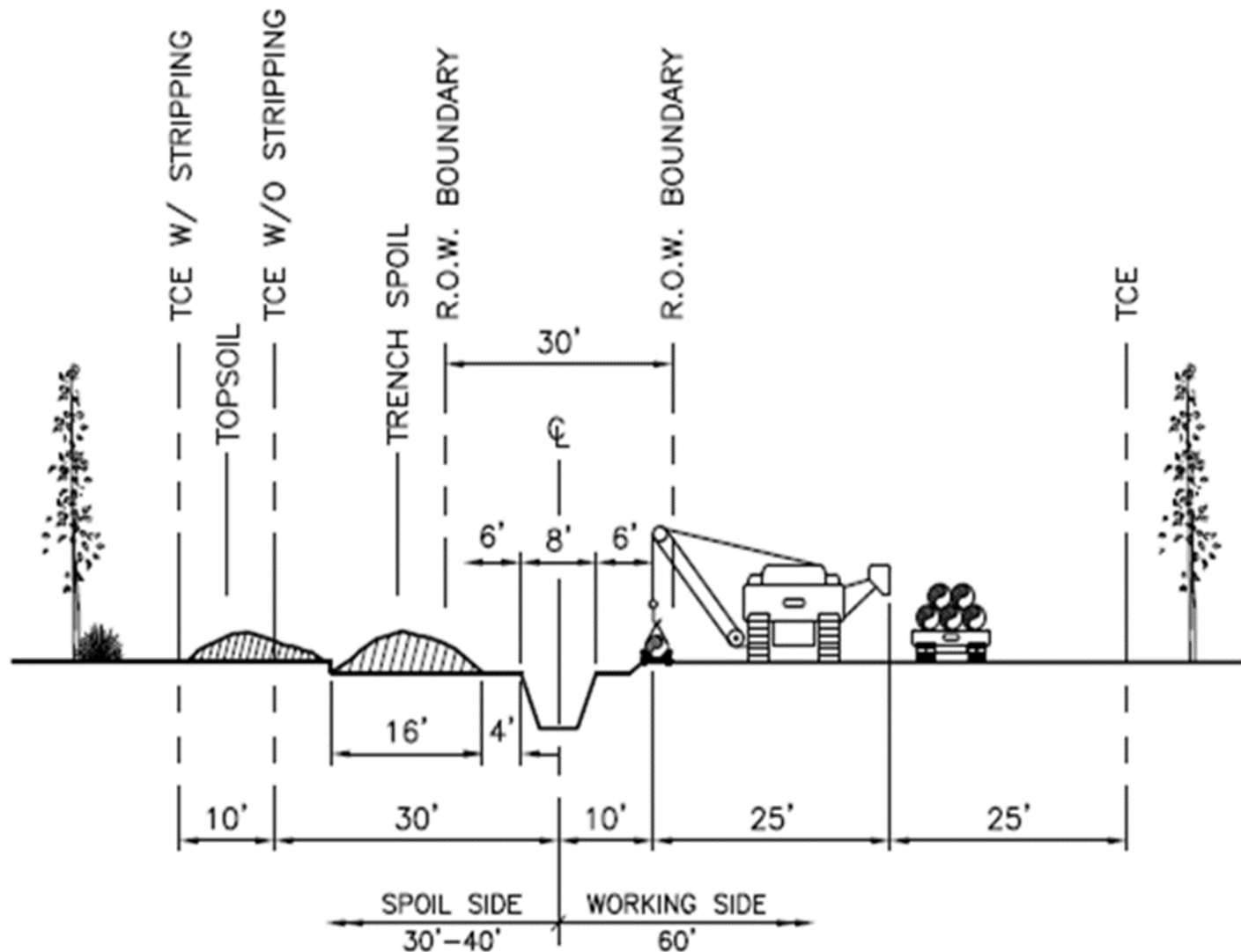
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# Pipeline Design Basis

- **Point Thomson Transmission Line**
  - 63 miles from PTU to GTP (above-ground)
  - 32" OD, MAOP 1130 psig
- **Onshore Mainline & Facilities**
  - ~780 miles from GTP to LNG Plant
    - Buried except at fault crossings, etc
  - 42" OD, MAOP 2075 psig
  - Eight compressor stations, one heater stations
    - Gas to gas exchangers
    - Airfin coolers
  - Meter stations
  - 31 mainline block valve stations
  - Offtake valves for in-state supply
    - 3 currently denoted in Resource Reports
  - Common routing with ASAP to Trapper Creek
- **Offshore Mainline**
  - ~28 miles across Cook Inlet
  - 42" OD, MAOP 2075 psig
  - Heavy-wall pipe and concrete weight-coated



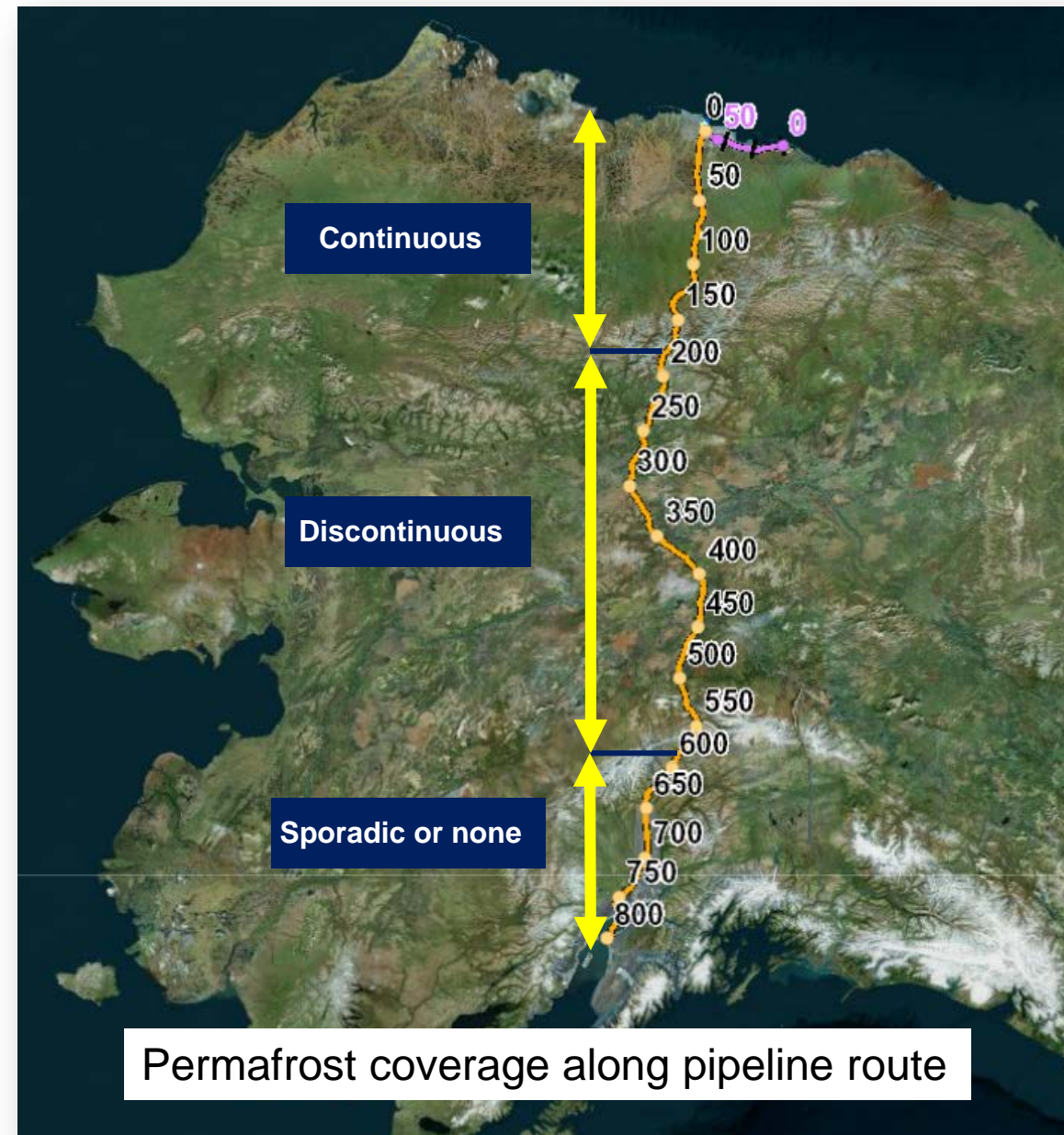
# PIPELINE – TYPICAL CONSTRUCTION





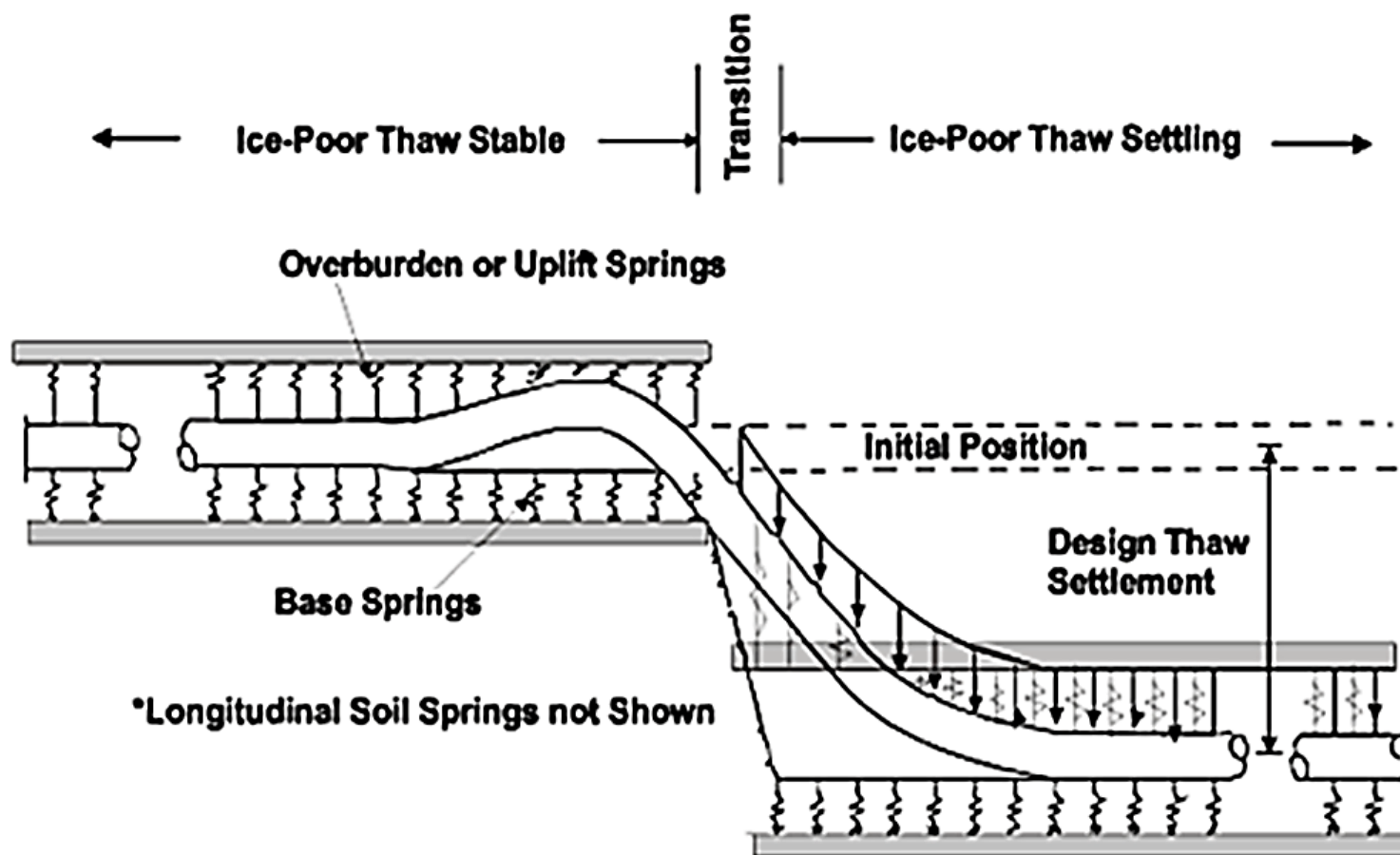
# PIPELINE STRAIN BASED DESIGN

- The pipeline will traverse both frozen and unfrozen terrain
- Changes in thermal state of this terrain over Project life may result in gradual, ***slow-moving*** ground movement
- Strain Based Design (SBD) allows pipeline to safely withstand this ground movement
- SBD works in concert with Allowable Stress Design (pressure containment)





# PIPELINE – ARCTIC GEOHAZARDS

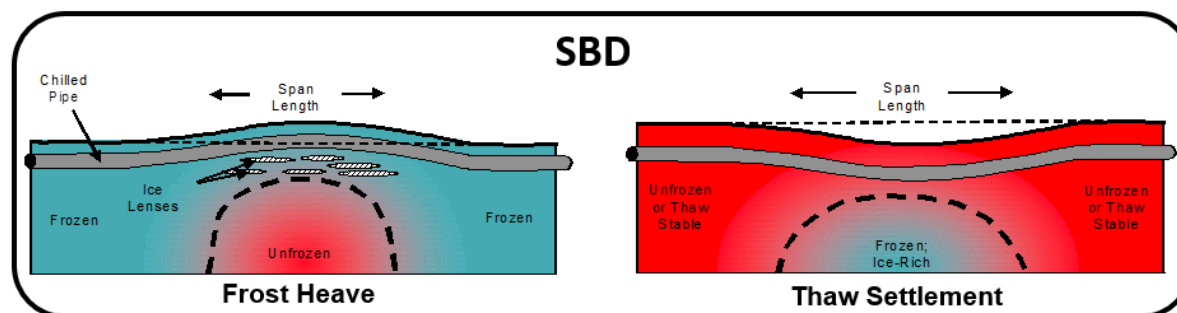


Classical model for soil-structure interaction analysis

# PHMSA SPECIAL PERMITS OVERVIEW

## Alaska LNG Project Pursuing Special Permits in Three Technical Areas

Technical Area	Relief from CFR 192	Affected Pipeline Length
Strain Based Design	External loads that result in axial strains $> 0.5\%$ (49 CFR §§ 192.103 and 192.317)	34 miles (total)
Main Line Block Valve	20 mile spacing in Class 1 (49 CFR § 192.179)	Class 1: ~99% of total length
Crack Arrestor Spacing	8 pipe length spacing (49 CFR § 192.112)	Majority of length, except proximity to key infrastructure: <ul style="list-style-type: none"> <li>• TAPS and FGL</li> <li>• Designated Bridges</li> <li>• High Consequence Areas</li> </ul>



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# LNG Plant Overview

## Summary

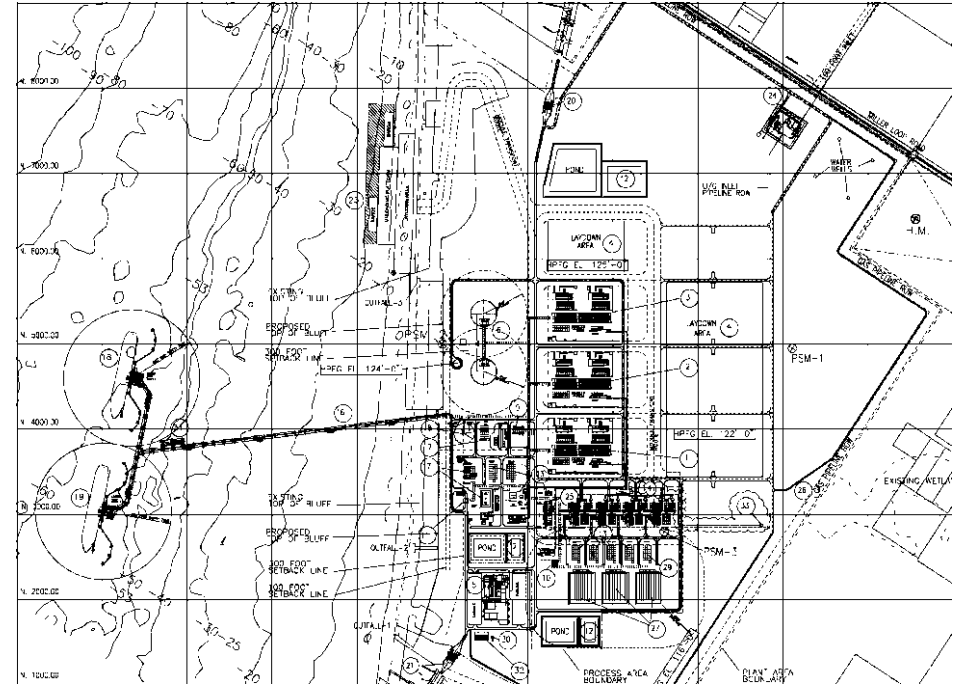
- Highly modularized – max weight about 6400T
- 3 train liquefaction plant - 6.7 MTA each
- About 900 acres of land required

## Design Basis

- APCI –C3MR™ process
- Power plant (combined cycle), with distribution system optimized to reduce capex; Black-Start tie in to local utility
- 2 x 240,000 m<sup>3</sup> LNG storage tanks
- Marine jetty with 2 loading berths, LNG loading rate 12,500 m<sup>3</sup>/hr

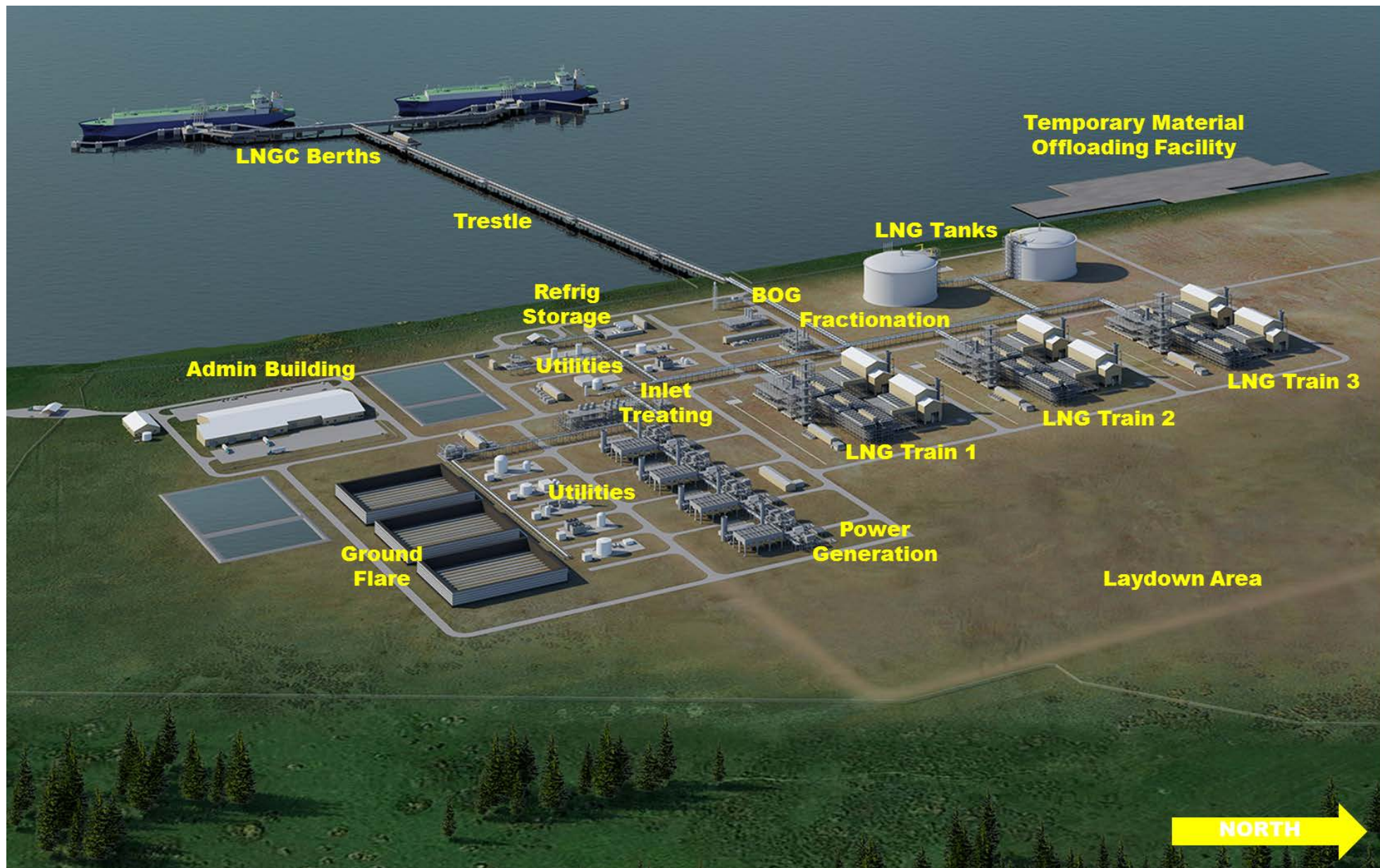
## Execution Basis

- Material Offloading Facility (MOF) to support the unloading of bulk materials, modules, and construction equipment; Temporary facility





# LNG Plant Facilities



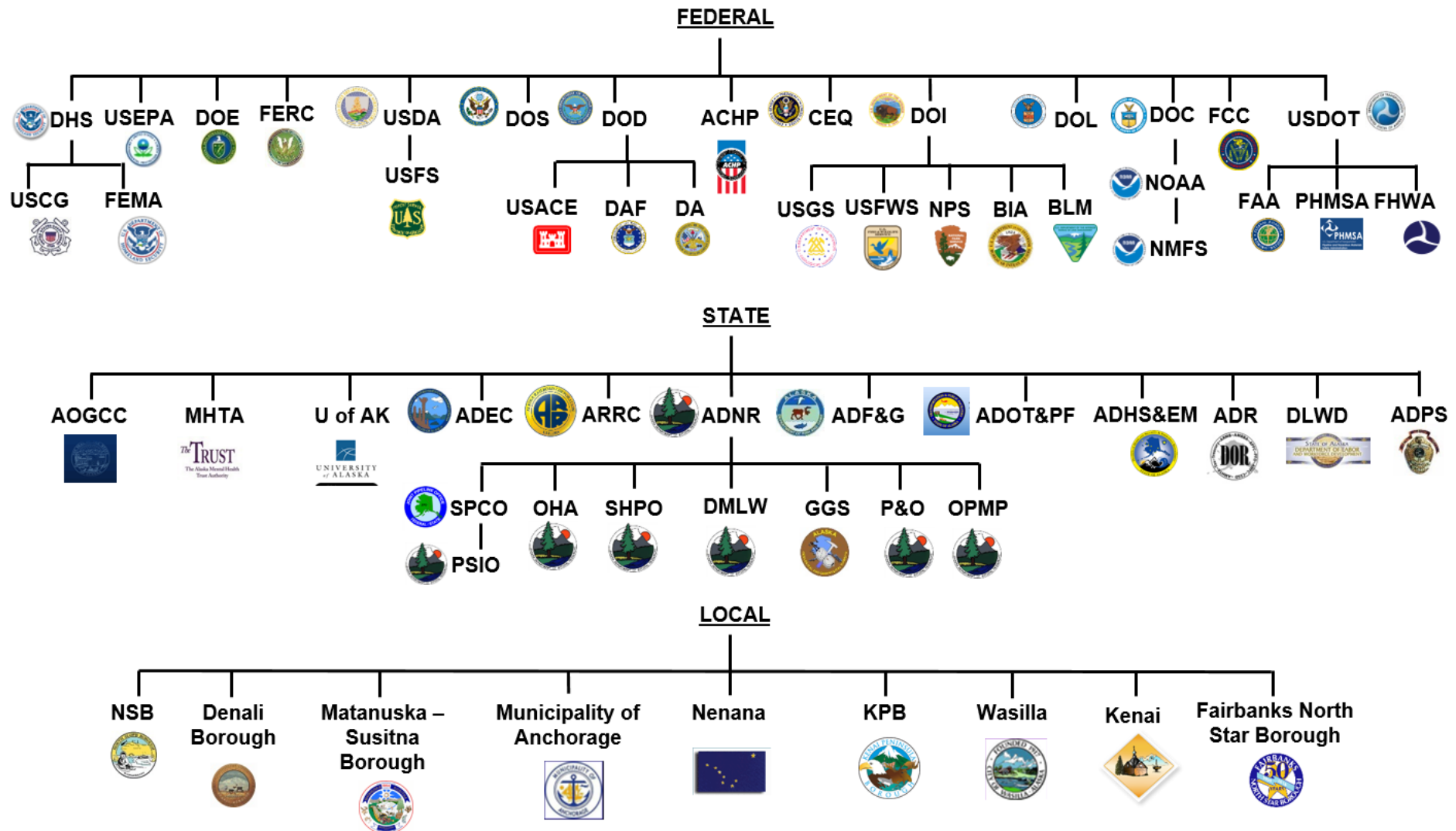


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- FERC ensures the safe operation and reliability of LNG terminals in the U.S.
- FERC comprehensive siting process requires close collaboration between Federal, State, and local regulatory agencies.
- FERC review process ensures LNG terminals and associated LNG vessel traffic meet safety and environmental requirements during construction and operation.
- FERC is the lead federal agency that will prepare an Environmental Impact Statement (EIS) for the integrated Alaska LNG project.

# REGULATORY PROCESS - FERC

FERC leads NEPA process – umbrella for creation of all other permit applications; Requires collaboration with cooperating and reviewing federal, state, Alaska Native and local entities



# REGULATORY PROCESS - FERC

- **Pre-Filing**
  - ✓ Used to ensure project information will be acceptable to FERC.
  - ✓ Draft Resource Report are modified in response to agency comments.
  - ✓ No set timeframe required.
- **Draft EIS**
  - ✓ FERC reviews NGA Section 3 application.
  - ✓ 3<sup>rd</sup>-party contractor drafts EIS document.
  - ✓ 18 months from application submittal.
- **6 months to Final EIS**
  - ✓ 3<sup>rd</sup>-party contractor drafts EIS document.
  - ✓ FERC approves application and issues Record of Decision (ROD).
  - ✓ 6 months from issuing the Draft EIS.



# REGULATORY PROCESS – STATUS

- Rev. 2 of Draft Resource Reports were submitted in 2016, FERC/Agencies returned about 3000 comments in 4Q2016.
- AGDC are addressing the issues raised in the comments; most before filing, some after.
- AGDC have funded FERC's 3<sup>rd</sup> Party Contractor (ERM), used during Pre-FEED, for continuity during remainder of Pre-File and after filing.
- Targeting NGA Section 3 application to FERC well before 30 June, 2017.



## Draft FERC Resource Reports become Exhibit F of the Section 3 Application:

1. Project Description
2. Water Use and Quality
3. Vegetation and Wildlife
4. Cultural Resources
5. Socioeconomics
6. Geological Resources
7. Soils
8. Land Use, Recreation, and Aesthetics
9. Air and Noise Quality
10. Alternatives
11. Reliability and Safety
12. PCB Contamination
13. LNG Information

- **Resource Reports identify environmental, technical, and economic factors contributing to environmental and social impacts.**
- **Used by FERC and other agencies for National Environmental Policy Act (NEPA) review and development of the EIS.**

<b>Exhibit A</b>	Articles of incorporation and bylaws
<b>Exhibit B</b>	Statement of corporate and financial relationships
<b>Exhibit C</b>	State authorization
<b>Exhibit D</b>	Agreement between the applicant and border facilities
<b>Exhibit E</b>	Safety and reliability statement
<b>Exhibit E-1</b>	Earthquake hazards and engineering
<b>Exhibit F</b>	Final Resource Reports
<b>Exhibit G</b>	Location of facilities
<b>Exhibit H</b>	Statement regarding additional federal authorizations

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# Project Labor

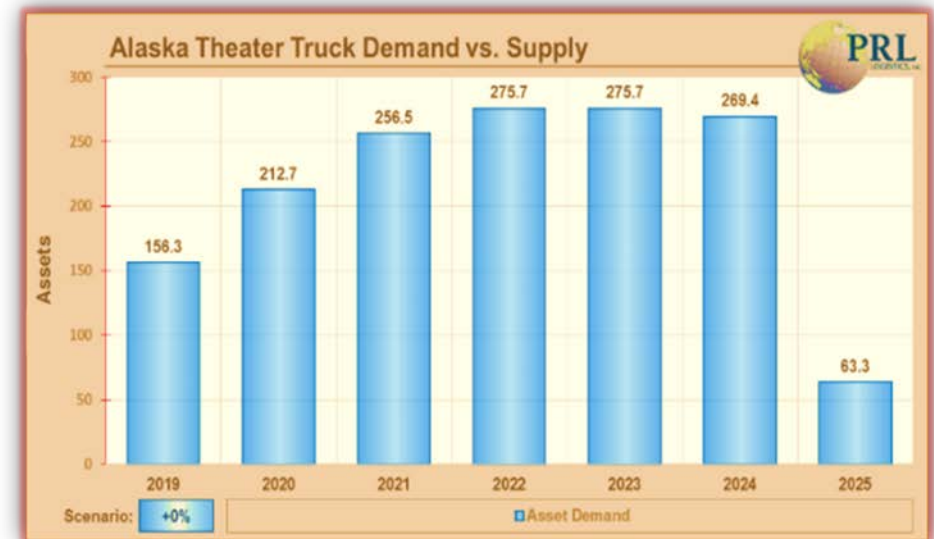
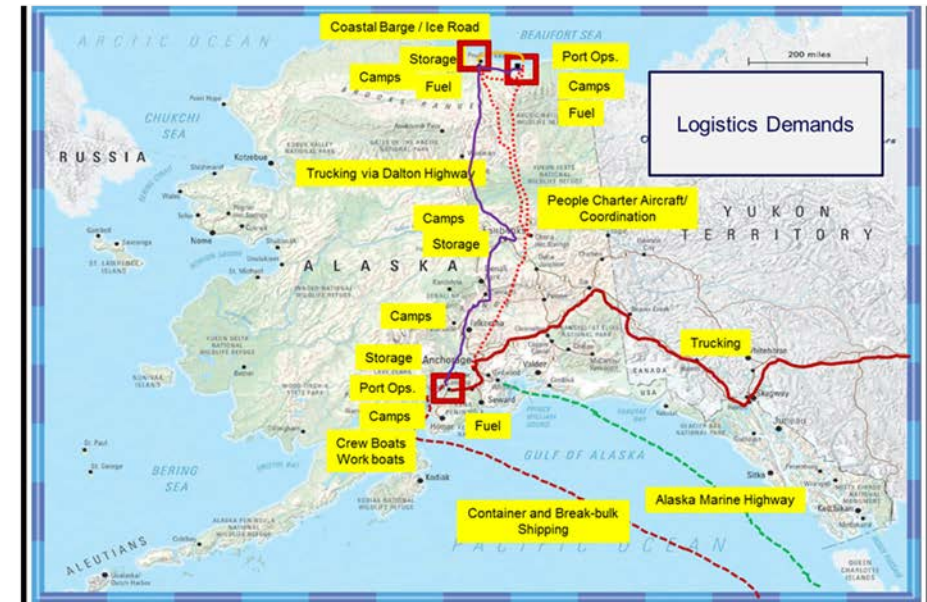
## Alaska LNG Labor Study

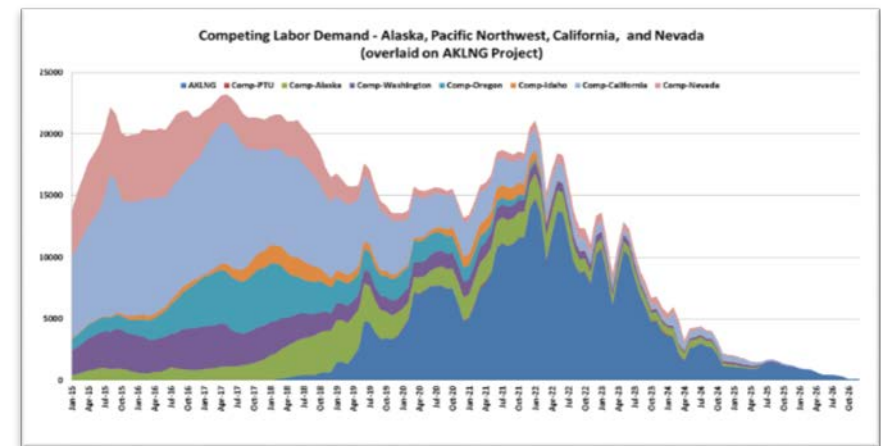
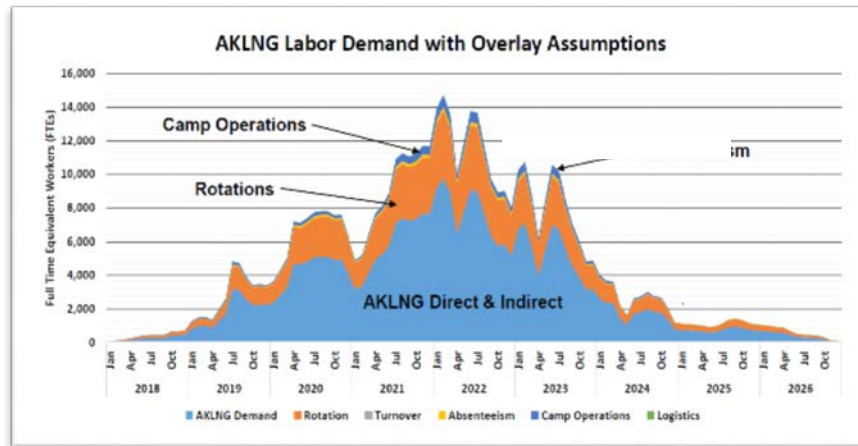
- ✧ Sharing results with key stakeholders / Alaska Dept. of Labor
- ✧ Incorporated into Alaska LNG labor strategy

## Key Findings

- ✧ Project labor demand exceeds current Alaska capacity
- ✧ Competing global projects will challenge labor acquisition
- ✧ Maximize use of Alaskans / focus on workforce development
- ✧ Project Labor Agreements can minimize contingency and risk impacts to EPC bidding

**Strong coordination with AK Dept. of Labor & Workforce Development, Alaska Native corporations, training providers**

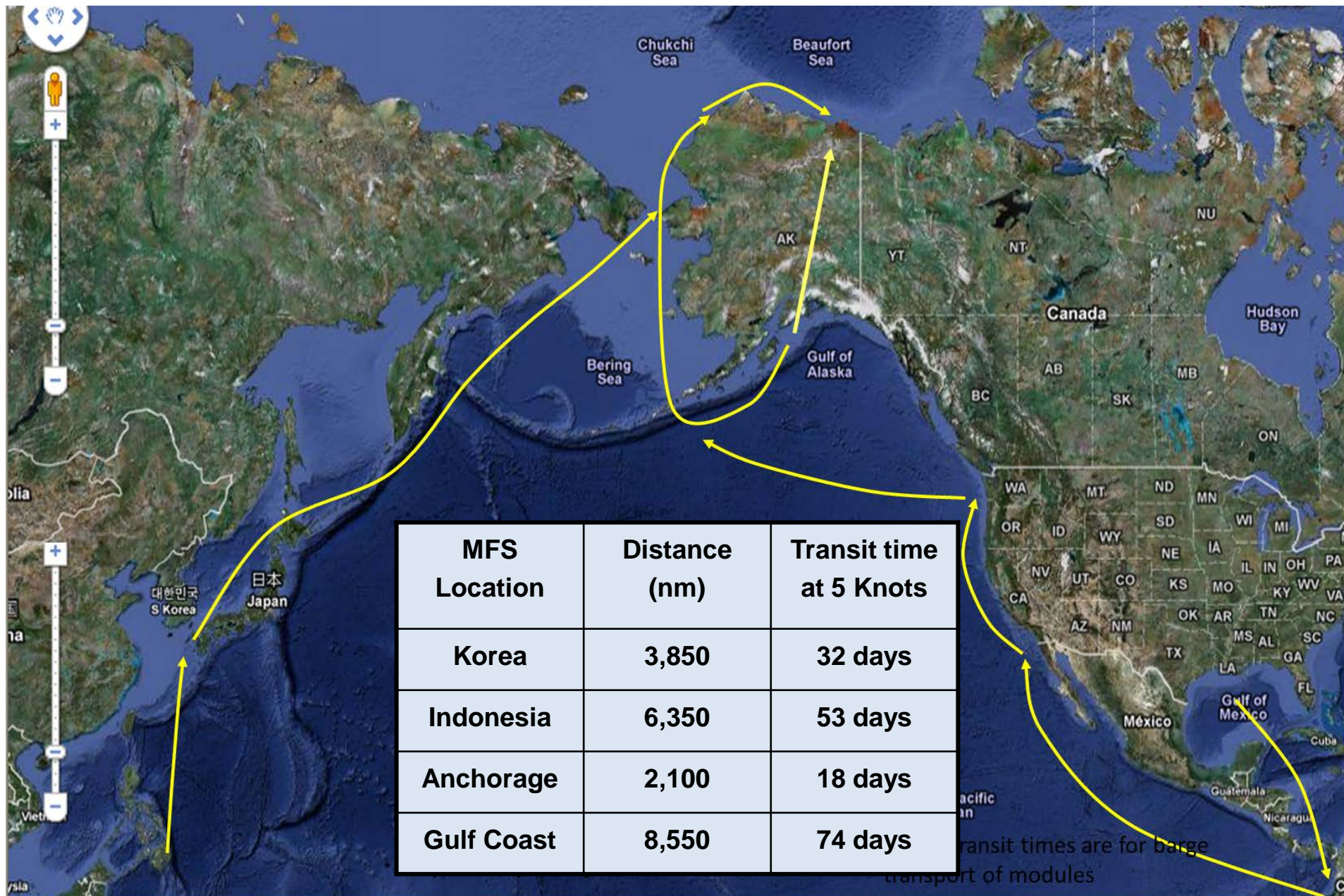




AGDC and Department of Labor initiative: Develop construction workers, who are so inclined, for the legacy O&M jobs (about 1000 total, including engineering and other support staff)



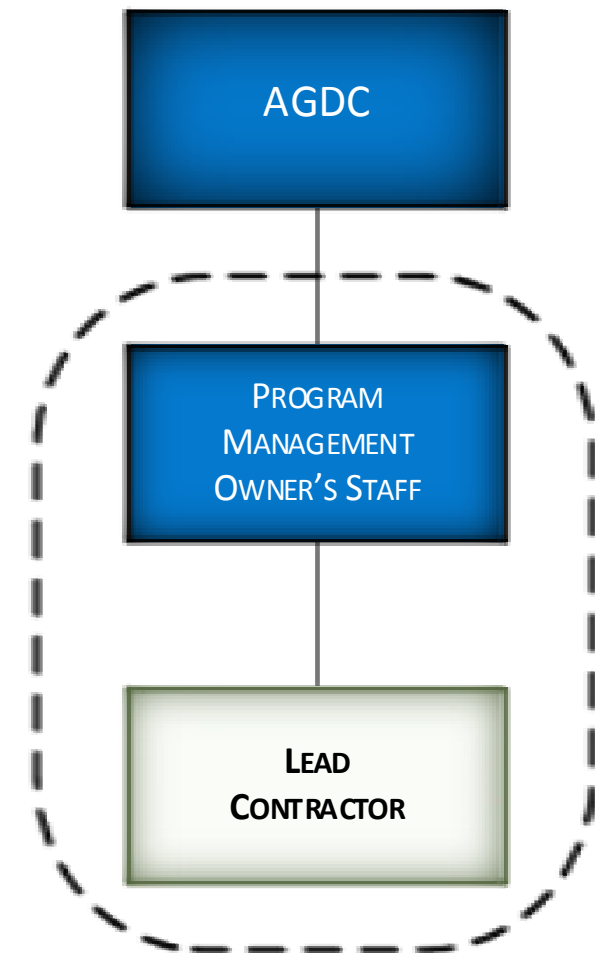
# Project Logistics



*AGDC is Alaska's natural gas infrastructure development company.*

- **AGDC Project Management Team (PMT).**
  - AGDC staff provide owner's oversight.
  - Lead Contractor provides bulk of resources in an integrated team.

Project Management Team  
(PMT)





# PROJECT MANAGEMENT APPROACH

**AGDC will provide owner's oversight and seek strategic partnership with Lead Contractor, who will:**

- Support FERC NGA Section 3 application.
- Complete Class 3 and Class 2 cost estimates.
- Provide project management systems and controls.
- Manage sub-project Engineering, Procurement, & Construction (EPC) contractors.
- Assume and allocate appropriate cost & schedule risks; Wrap sub-project lump-sum, turn-key (LSTK) contracts.



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# ALASKA LNG: BENEFITS TO ALASKA

## Creates construction and long-term jobs

- During the peak of construction Alaska LNG could create over 8,000 direct jobs.
- 1,000 long term jobs created during the operating of the project.

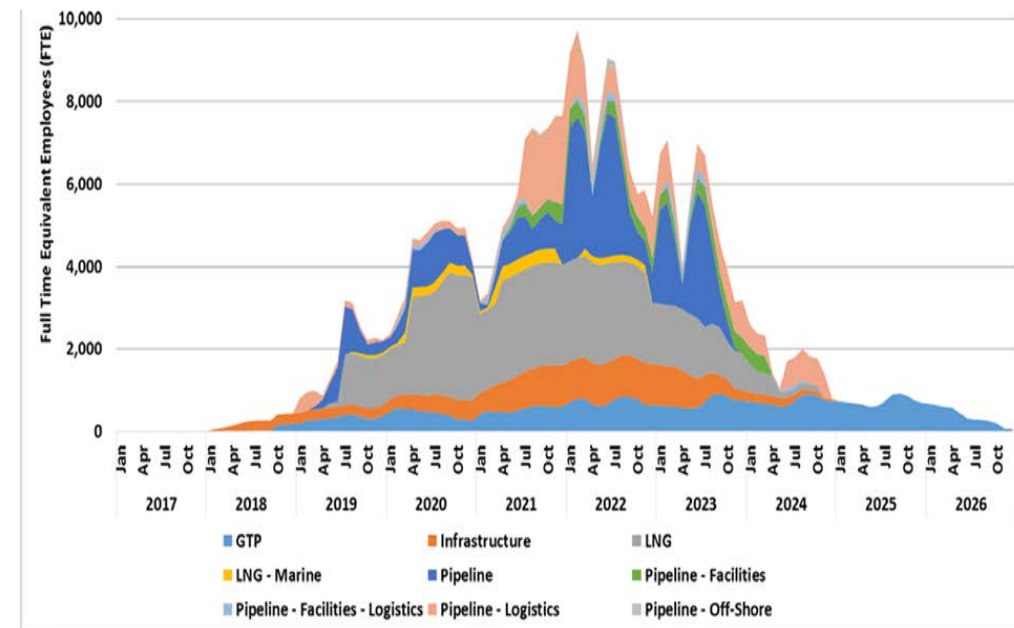
## Long-term secure source of natural gas for in-state demand

- Alaska LNG can supply stable, low price natural gas for all current and future Alaska demand.
- Mitigates risk of Cook Inlet decline.
- Allows new communities and industries to use natural gas.

## Increase North Slope oil production

- Extends the period Prudhoe Bay is economic to operate.
- Gas sales an additional source of revenue for new fields, improving their economics.
- Gasline will increase the probability of finding oil while exploring for gas that can be monetized.

## Increase revenue to the State of Alaska



# CONTACT AGDC:

## HOW TO CONTACT AGDC:

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# ALASKA MOVING FORWARD



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