Alaska Hydrogen Hub (H2Hub)

U.S. Department of Energy Funding Opportunity

Alaska Support Industry Alliance
December 8, 2022

ALASKA GASLINE DEVELOPMENT CORP.

Alaska LNG: Gas for Alaskans & Export

ALASKA GASLINE DEVELOPMENT CORP.

North Slope Gas Supply

- 40 trillion cubic feet (tcf) of discovered, conventional, and developed North Slope associated gas from Prudhoe Bay and Point Thomson
- Gas is currently stranded

Arctic Carbon Capture (ACC) Plant

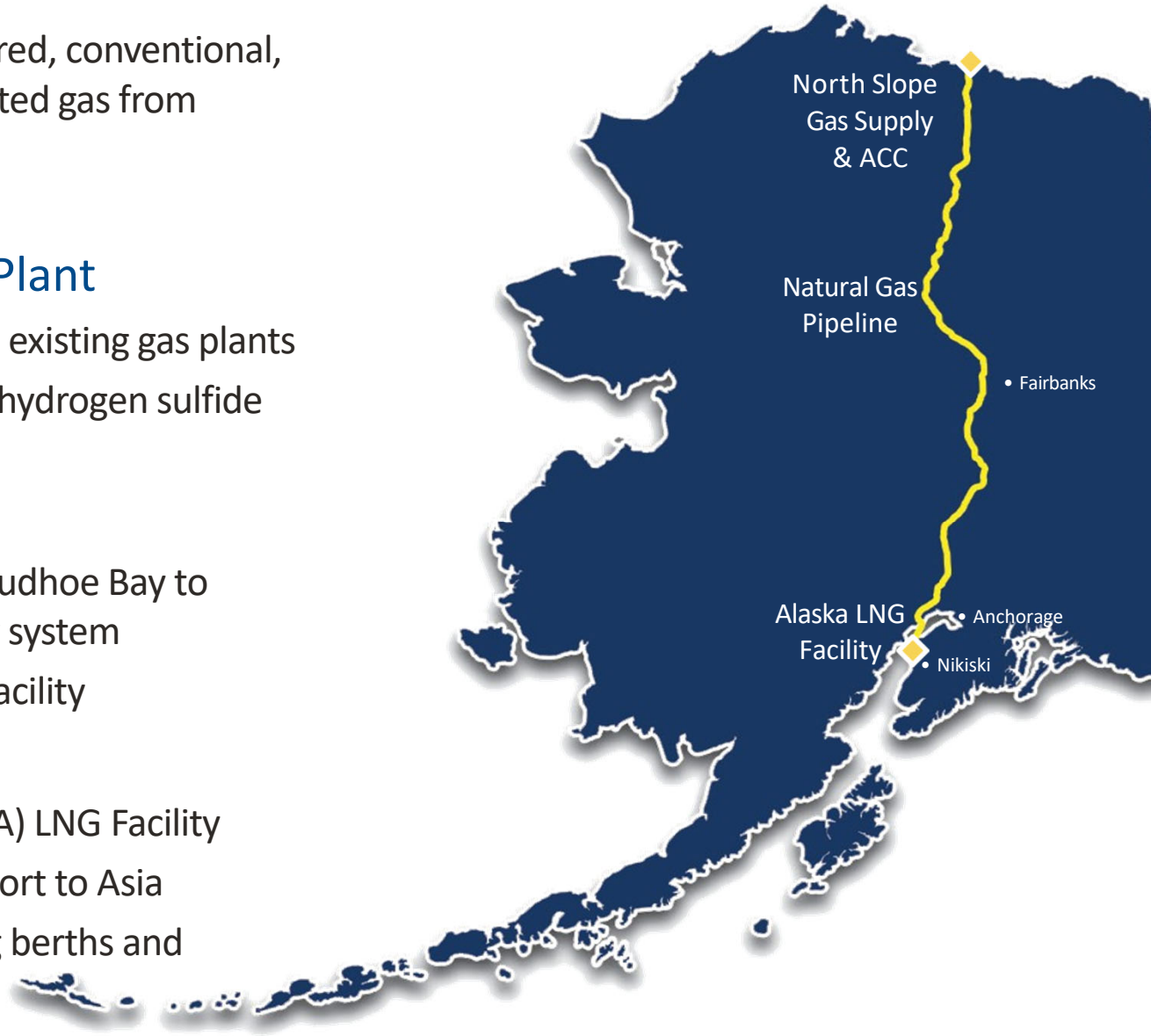
- Located in Prudhoe Bay adjacent to existing gas plants
- Removes carbon dioxide (CO_2) and hydrogen sulfide (H_2S) from raw gas stream

Natural Gas Pipeline

- 807-mile, 42" dia. Mainline from Prudhoe Bay to Nikiski, following TAPS and highway system
- Provides gas to Alaskans and LNG Facility

Alaska LNG Facility

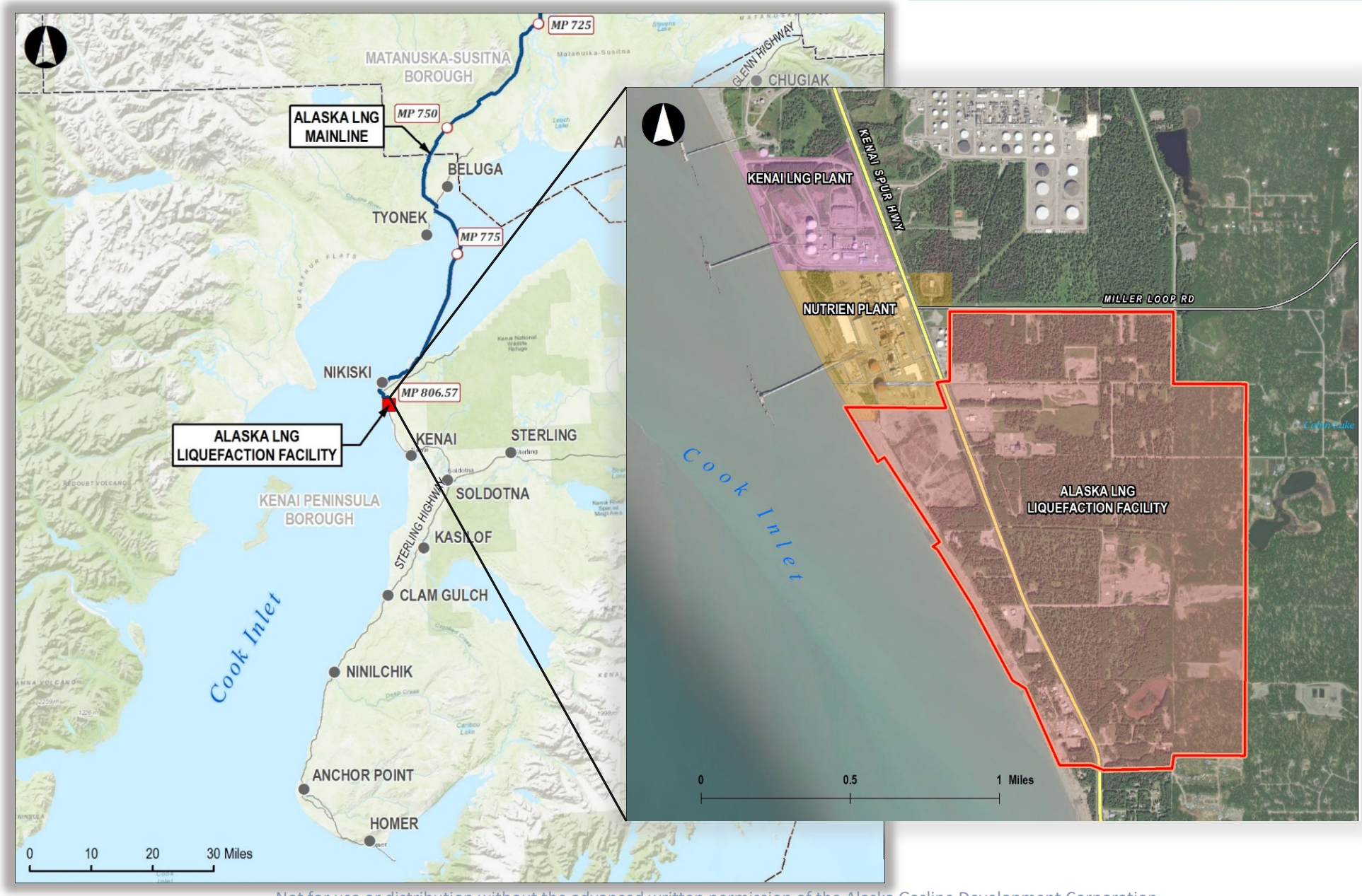
- 20-million tonnes per annum (MTPA) LNG Facility
- Converts natural gas to LNG for export to Asia
- 3 liquefaction trains, jetty, 2 loading berths and 2 x 240,000 m^3 LNG tanks



Not for use or distribution without the advanced written permission of the Alaska Gasline Development Corporation.
Disclaimer – Information contained in this document is conceptual and subject to change without notice.

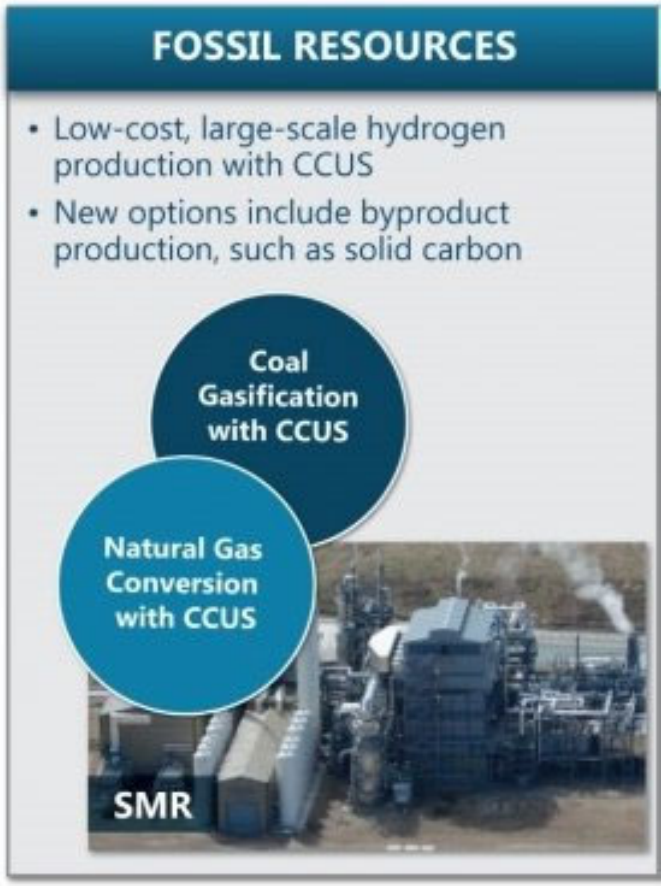
Cook Inlet Vicinity Map

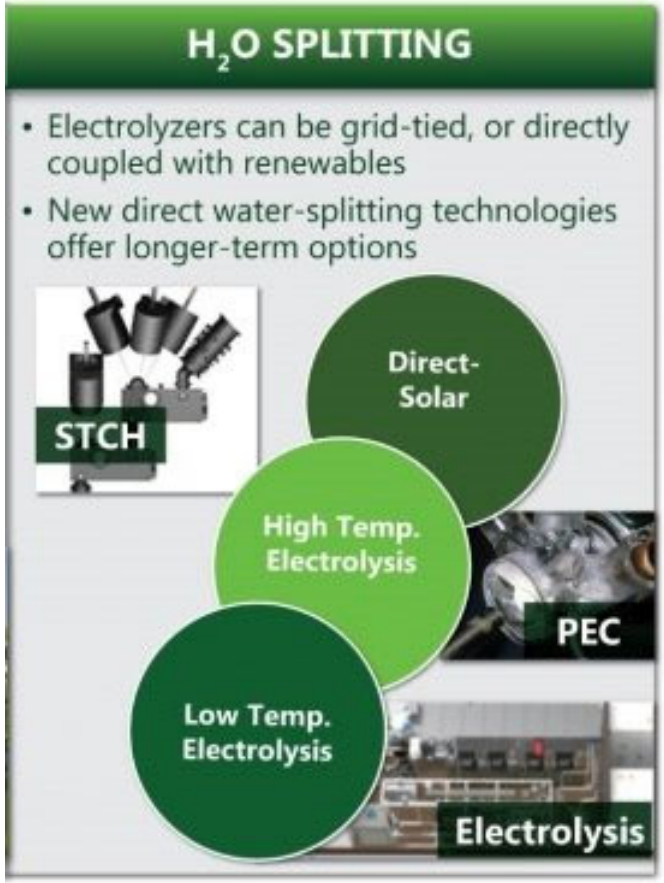
ALASKA GASLINE DEVELOPMENT CORP.



Not for use or distribution without the advanced written permission of the Alaska Gasline Development Corporation.
Disclaimer – Information contained in this document is conceptual and subject to change without notice.

Hydrogen Production



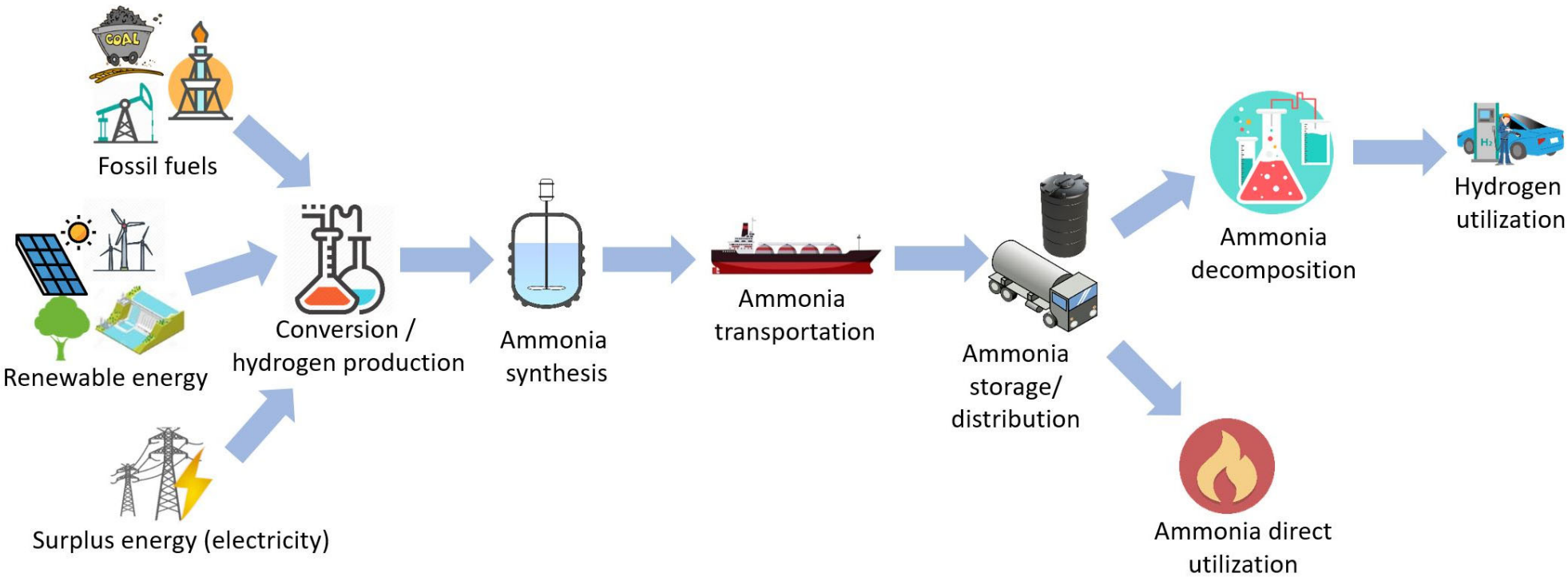


CCUS: carbon capture, utilization, and storage; SMR: steam methane reforming; STCH: solar thermochemical hydrogen; PEC: photoelectrochemical.

Source: U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Hydrogen Production Pathways
Hydrogen Production Pathways | Department of Energy

Not for use or distribution without the advanced written permission of the Alaska Gasline Development Corporation.
Disclaimer – Information contained in this document is conceptual and subject to change without notice.

Ammonia as a Hydrogen Carrier



Source: Encyclopedia.pub [Ammonia as a Hydrogen Carrier]

Not for use or distribution without the advanced written permission of the Alaska Gasline Development Corporation.
Disclaimer – Information contained in this document is conceptual and subject to change without notice.

Alaska LNG & Hydrogen

ALASKA GASLINE DEVELOPMENT CORP.

Japanese-Led Work Team

Mitsubishi Corporation

TOYO ENGINEERING

AGDC-led Alaska H2Hub

Nutrien Santos STOREGGA

ACEP Alaska Center for Energy and Power

SALAMATOF INC

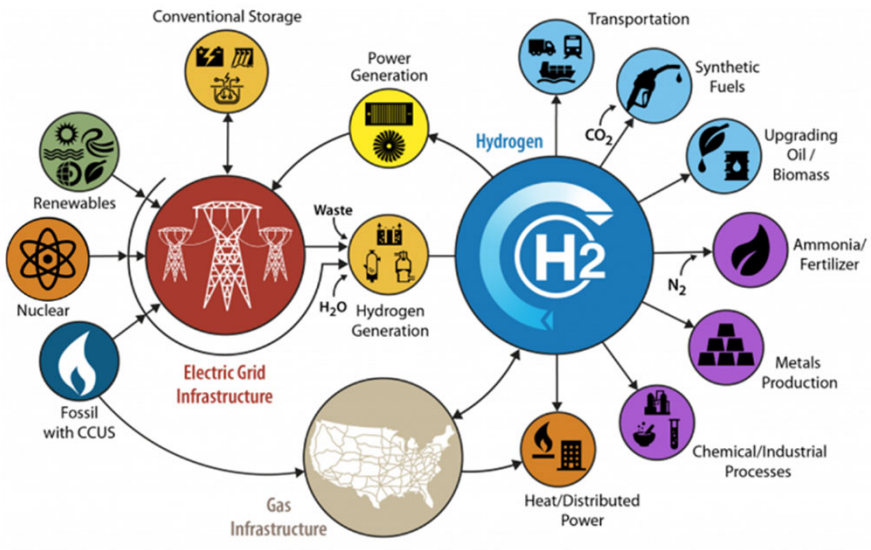
ONE CREW ONE JOURNEY

Not for use or distribution without the advanced written permission of the Alaska Gasline Development Corporation.
Disclaimer – Information contained in this document is conceptual and subject to change without notice.

U.S. DOE Hydrogen Hub Program

ALASKA GASLINE DEVELOPMENT CORP.

- Bipartisan Infrastructure Law (BIL) of 2021
  - Funding of 6 to 10 regional clean hydrogen hubs (H2Hubs)
  - $8 billion over 5 years.
- Intended to spur development of regional infrastructure leading to production, processing, delivery, storage, and end-use of clean hydrogen.
- Criteria for producing impactful, commercial-scale quantities of clean hydrogen is at least 50 – 100 tons per day.
- A single DOE H2Hub award could be up to $1 billion in direct matching grants.
- AGDC has been identified as the applicant to lead an Alaska H2Hub pursuit.



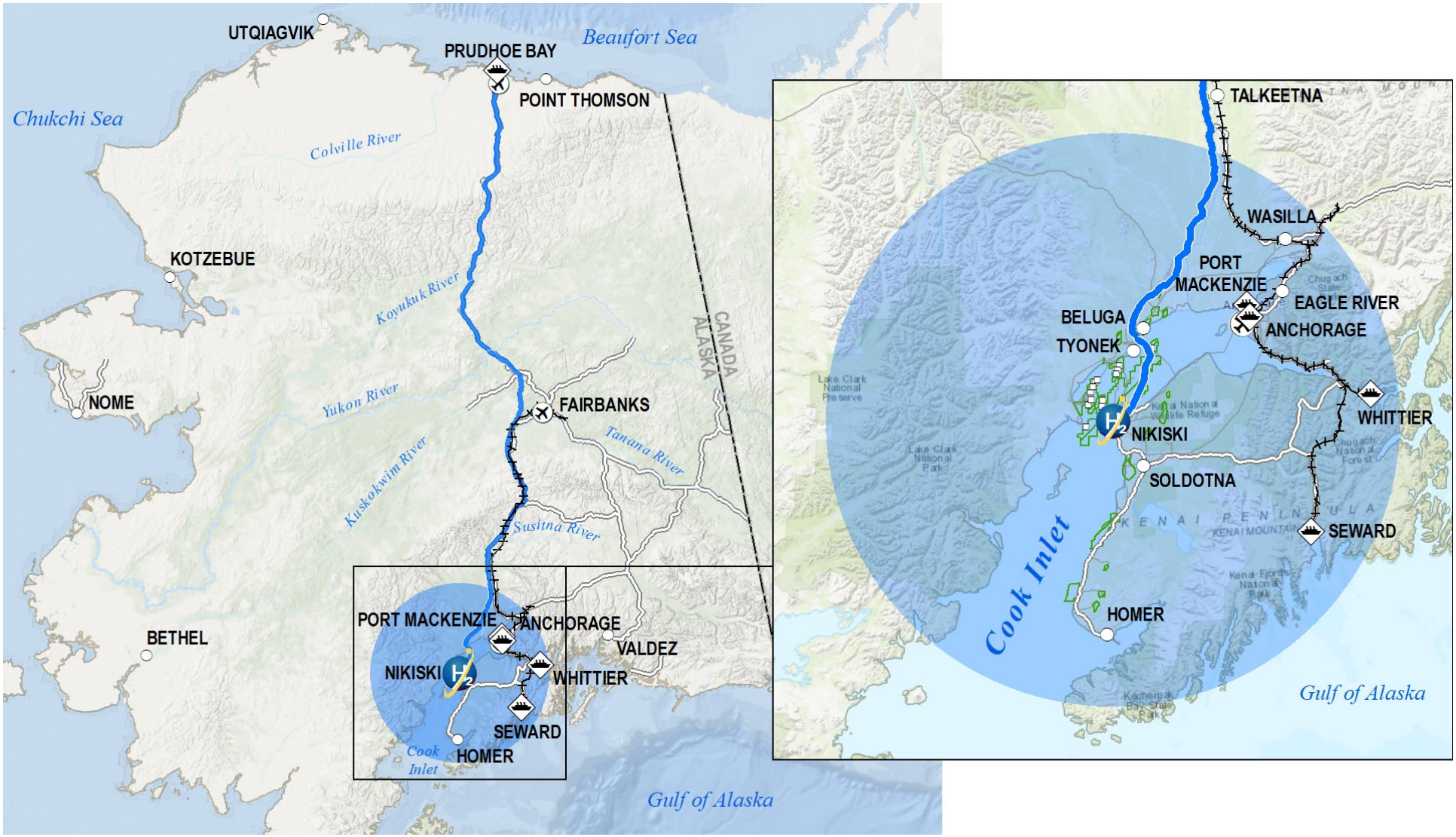
DOE's H2@Scale® initiative will enable decarbonization across sectors using clean hydrogen

U.S. DEPARTMENT OF ENERGY

Not for use or distribution without the advanced written permission of the Alaska Gasline Development Corporation.
Disclaimer – Information contained in this document is conceptual and subject to change without notice.

Alaska H2Hub Concept

ALASKA GASLINE DEVELOPMENT CORP.



Not for use or distribution without the advanced written permission of the Alaska Gasline Development Corporation.
Disclaimer – Information contained in this document is conceptual and subject to change without notice.

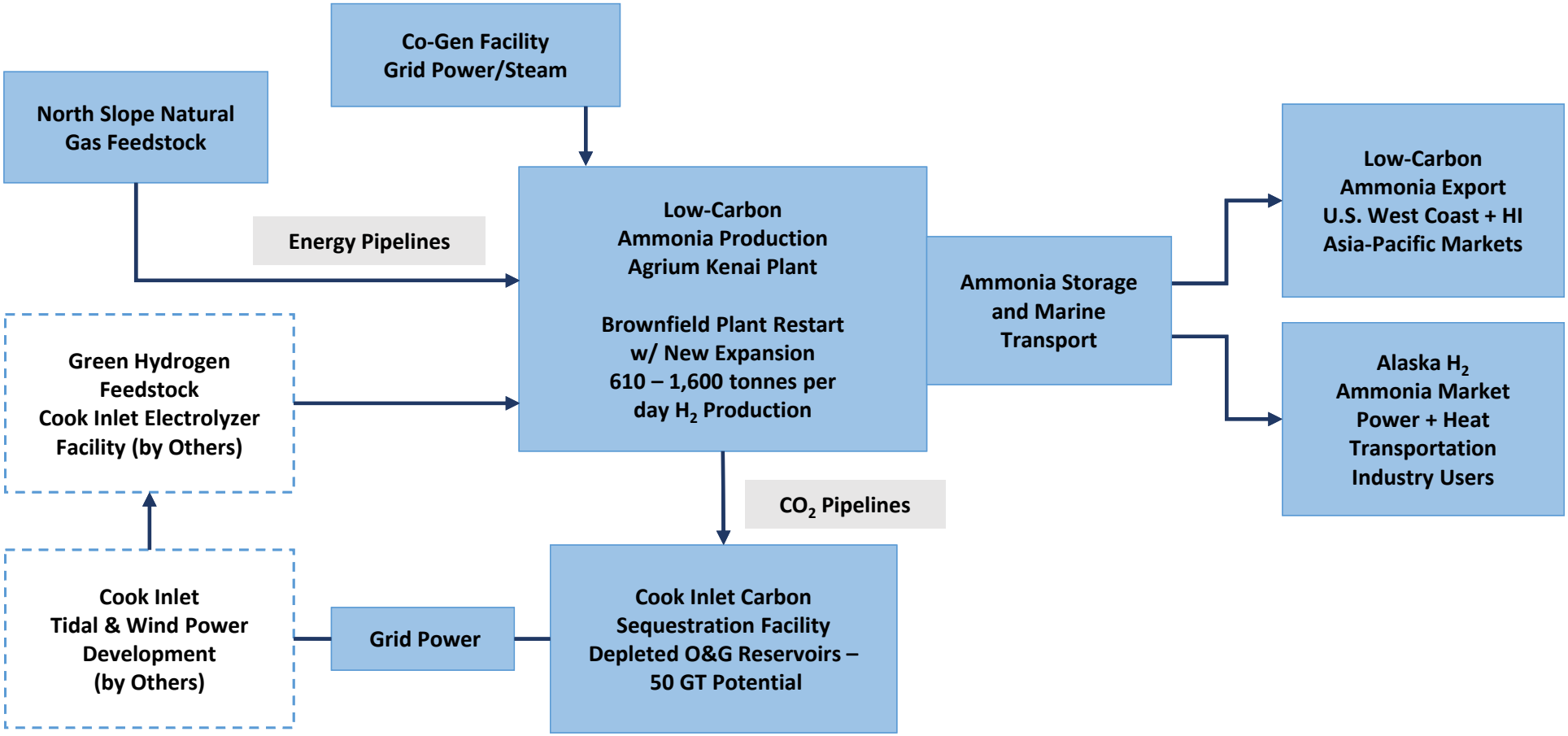
Why an Alaska H2Hub?

ALASKA GASLINE DEVELOPMENT CORP.

- ✓ Driven by market demand
- ✓ Focused and well-defined project plan
- ✓ Sustainable commercial model
- ✓ Private sector cost matching partners
- ✓ Enormous Alaska natural gas resources
- ✓ Production at world-class scale
- ✓ Significant potential for carbon sequestration
- ✓ Multimodal transportation infrastructure
- ✓ Renewable resource potential
- ✓ Economic benefits statewide

Not for use or distribution without the advanced written permission of the Alaska Gasline Development Corporation.
Disclaimer – Information contained in this document is conceptual and subject to change without notice.

Alaska H2Hub Concept



Not for use or distribution without the advanced written permission of the Alaska Gasline Development Corporation.
Disclaimer – Information contained in this document is conceptual and subject to change without notice.

Kenai Plant & Terminal

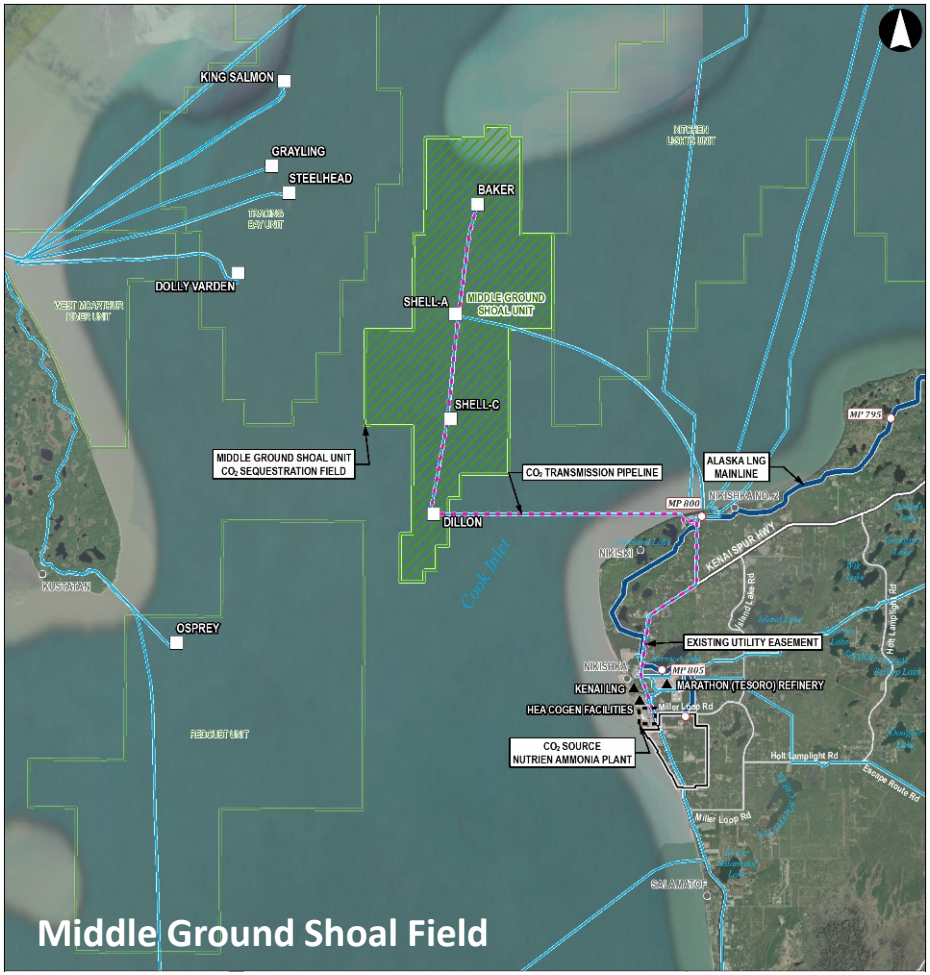
ALASKA GASLINE DEVELOPMENT CORP.

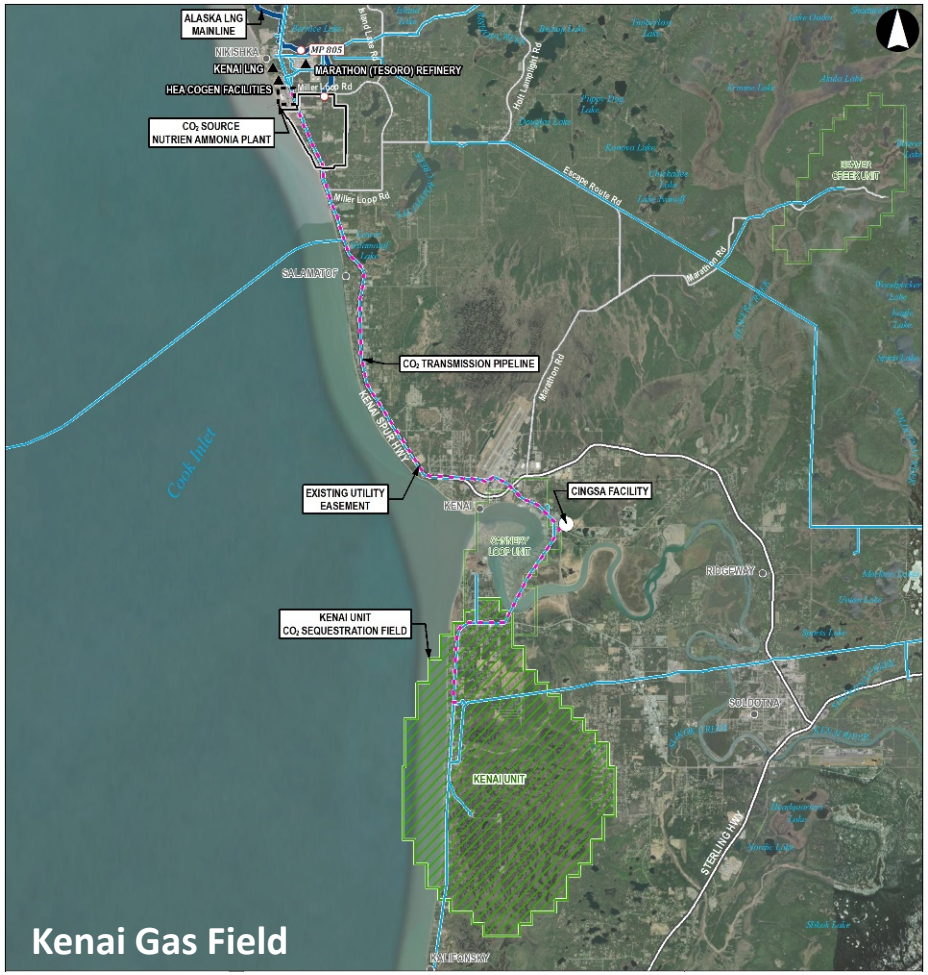
- Agrium Kenai Plant: Located in Nikiski, Alaska, and owned and operated by Agrium U.S., a subsidiary of Nutrien, and key teaming partner in the Alaska H2Hub.
- Since the 2007 shutdown, the Kenai Plant has been maintained for potential restart.
- Two anhydrous ammonia plants, power and steam plants, a docking terminal for loading cargo ships, and significant maintenance and support facilities.
- On-site 30,000-ton and 50,000-ton interconnected liquid ammonia storage tanks.
- Terminal in water 40 feet deep at MLLW and can accommodate ships 650 feet in length or 50,000 deadweight tons.

Not for use or distribution without the advanced written permission of the Alaska Gasline Development Corporation.
Disclaimer – Information contained in this document is conceptual and subject to change without notice.

Cook Inlet Carbon Capture & Sequestration

ALASKA GASLINE DEVELOPMENT CORP.

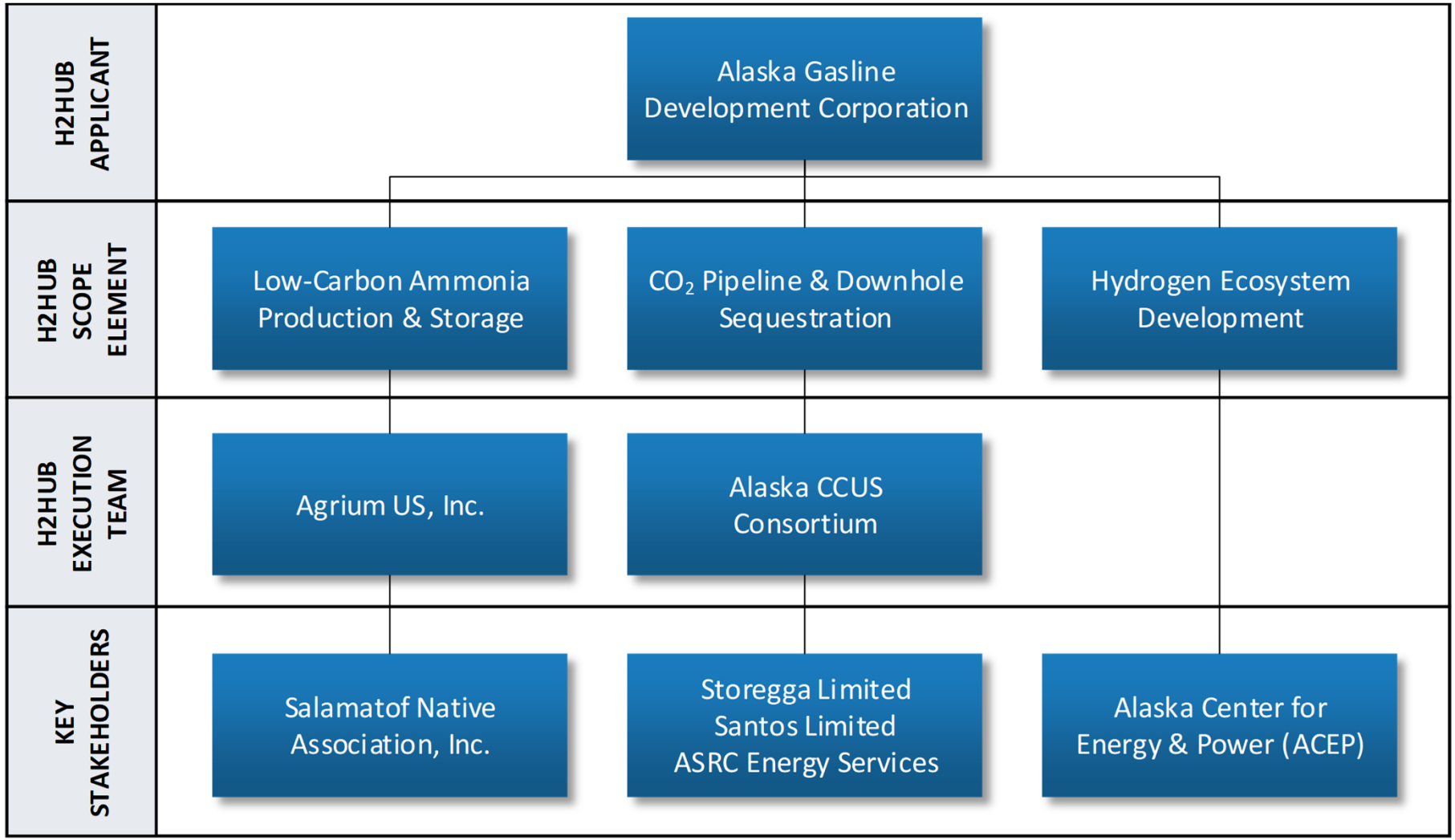




The Alaska Department of Natural Resources identified that Cook Inlet Basin has the highest CO_2 storage potential in Alaska with an estimated 50 GT in depleted reservoirs, saline aquifers, and coal beds. The Alaska H2Hub will include a transmission pipeline(s) from the CO_2 source at the Kenai Plant, to one or more of the two target CO_2 sequestration fields in Cook Inlet, including the Middle Ground Shoal Field and the Kenai Gas Field.

Not for use or distribution without the advanced written permission of the Alaska Gasline Development Corporation.
Disclaimer – Information contained in this document is conceptual and subject to change without notice.

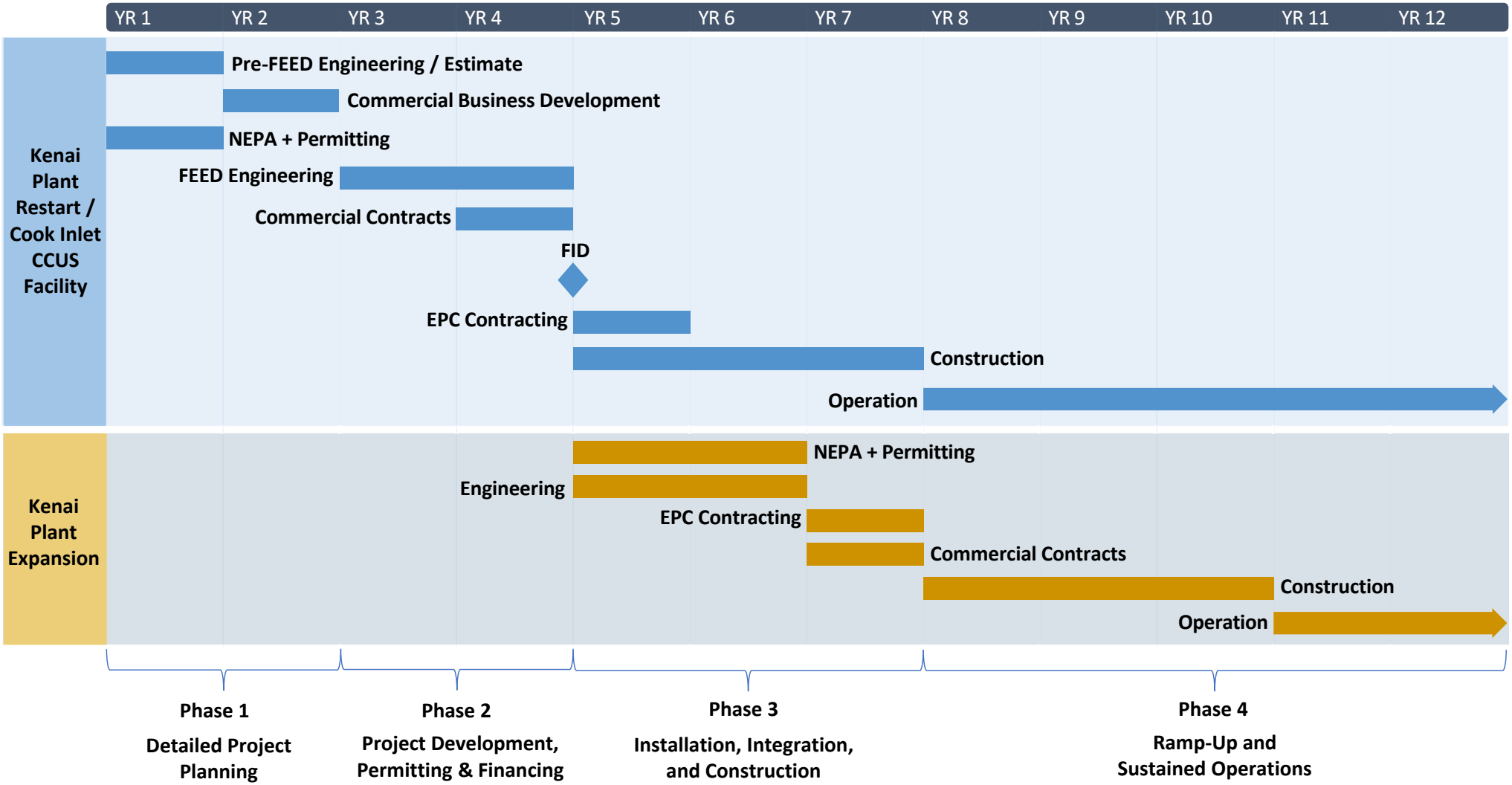
Alaska H2Hub Organization Structure



Not for use or distribution without the advanced written permission of the Alaska Gasline Development Corporation.
Disclaimer – Information contained in this document is conceptual and subject to change without notice.

Alaska H2Hub Development Plan

ALASKA GASLINE DEVELOPMENT CORP.



Not for use or distribution without the advanced written permission of the Alaska Gasline Development Corporation.
Disclaimer – Information contained in this document is conceptual and subject to change without notice.

Alaska H2Hub Pursuit

ALASKA GASLINE DEVELOPMENT CORP.

- AGDC submitted the Alaska H2Hub Concept Paper November 4, 2022 in response to DE-FOA-0002779.
- Concept focused on generation commercial-scale, low-carbon intensity hydrogen (ammonia) for domestic use and export to Asia.
- Anticipates using $850 million in DOE funding, along with $3.75 billion in private-sector funds.
- DOE review of Concept Paper will result in Encourage/Discourage notifications for submitting a Full Application in December 2022.
- The Full Application will consist of 18 discrete components that require significant details.
- Submission Deadline for Full Applications is April 7, 2023.

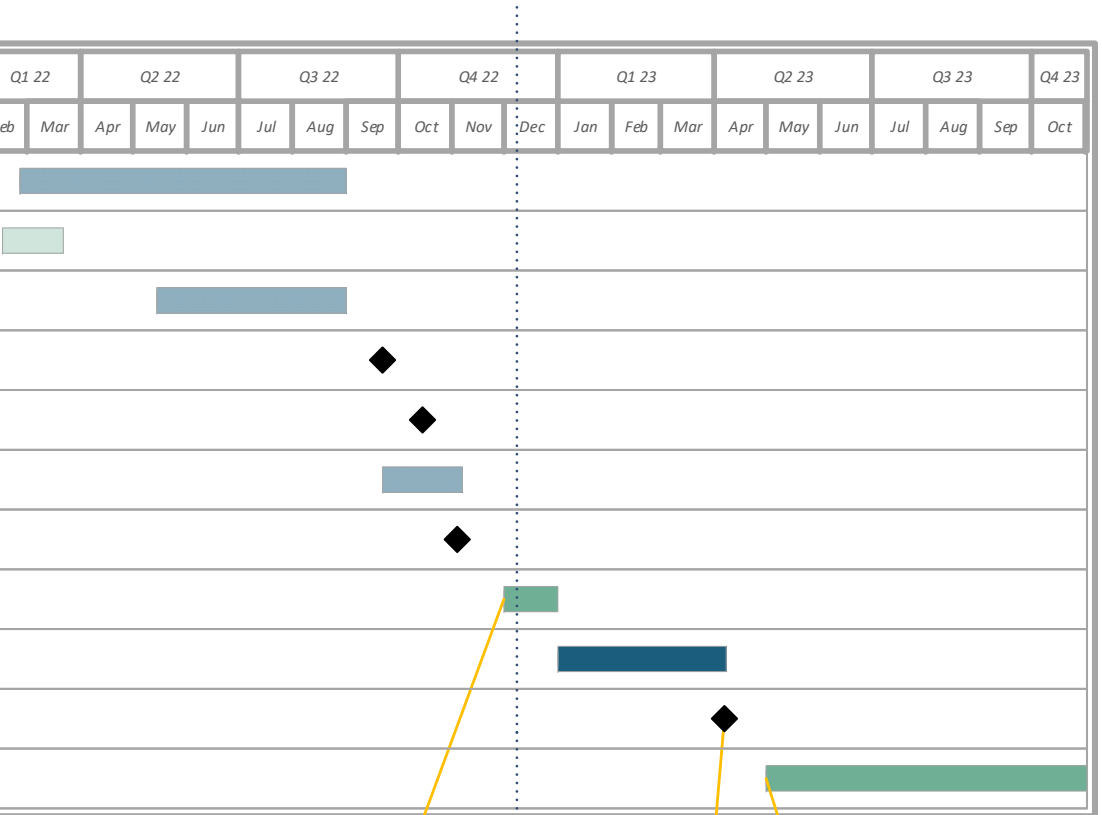
Not for use or distribution without the advanced written permission of the Alaska Gasline Development Corporation.
Disclaimer – Information contained in this document is conceptual and subject to change without notice.

Alaska H2Hub Proposal Schedule

ALASKA GASLINE DEVELOPMENT CORP.

Today

ID	Task Name	Start	Finish	Duration
1	Capture Strategy & AGDC Ramp-up	2/25/2022	8/31/2022	188d
2	DOE RFI Period	2/15/2022	3/21/2022	35d
3	Draft FOA Period – Team Development	5/15/2022	8/31/2022	109d
4	DOE FOA Release	9/22/2022	9/22/2022	0d
5	Go/No-Go Decision (Concept Paper)	10/15/2022	10/15/2022	0d
6	Concept Paper Development	9/22/2022	11/6/2022	46d
7	Alaska H2Hub Concept Paper Submitted to DOE	11/4/2022	11/4/2022	0d
8	DOE Encourage/Discourage Notifications – Go/No-Go Decision	12/1/2022	12/31/2022	31d
9	Full Application Development	1/1/2023	4/7/2023	97d
10	Full Application Submission Deadline	4/7/2023	4/7/2023	0d
11	DOE Phase 1 Award	5/1/2023	12/31/2023	245d



DOE notification encouraging or discouraging submittal of full applications.

Full applications will be followed by (1) replies to reviewer comments and (2) pre-selection interviews.

DOE selection process and award notification, followed by award negotiations.

Phase 1 – Detailed Plan
Up to $20M DOE Funding
Non-Federal Share ≥50%
12–18 Months Duration
6-10 Awards

Subsequent Phases/Awards
(Subject to DOE go/no-go decisions.)
Phase 2 – Develop, Permit, Finance
Phase 3 – Install, Integrate, Construct
Phase 4 – Ramp-Up & Operate

Not for use or distribution without the advanced written permission of the Alaska Gasline Development Corporation.
Disclaimer – Information contained in this document is conceptual and subject to change without notice.

Competitive Landscape

ALASKA GASLINE DEVELOPMENT CORP.

The Atlanta Journal-Constitution

Georgia Election 2022 | All AJC Podcasts | Opinion | Sports | AJC Events | EPaper | **Newsletters**

Stay informed and know what's really going on. **Subscribe for 99¢.**

Southern Company joins bid to land regional hydrogen hub

NEWS

By Drew Kann, The Atlanta Journal-Constitution

Nov 3, 2022

Federal government plans to fund six to 10 hubs with $8 billion from the Bipartisan Infrastructure Law

Proposals under Development for the U.S. DOE Regional Clean Hydrogen Hubs Program

*Has state emissions reduction goals				
● Targeted	– Not Targeted	? Unknown/Undefined	Initial Stages	Final Stages

			Targeted Feedstocks			Targeted End-Uses				Development Stage			
Partnership	State Partners	Hub Name	Renewables	Fossil Fuel + CCS	Nuclear	Industry	Transportation	Power	R&C Heating	Phase 1	Phase 2	Phase 3	Phase 4
Public-Private	AK, LA*, OK	HALO Hydrogen Hub	●	●	●	●	●	●	–				
	AZ	Arizona Hydrogen Hub	●	–	●	●	●	●	–				
	CA*	California Hydrogen Hub	●	–	–	●	●	●	–				
	CA*, UT	HyDeal LA (and Intermountain Power Project)	●	–	–	●	●	●	●				
	CT*, MA*, NJ*, NY*	Northeast Hydrogen Hub	●	–	–	●	●	●	●				
	GA	Georgia Hydrogen Hub	?	?	?	?	?	?	?				
	IL*, IN, MI*	Midwestern Hydrogen Partnership Hydrogen Hub	●	●	●	●	●	–	–				
	KY	Kentucky Hydrogen Hub Workgroup	?	?	?	●	●	–	–				
	MS	Mississippi Clean Hydrogen Hub	–	●	–	●	–	–	–				
	ND	Great Plains Hydrogen Hub	–	●	–	●	●	–	–				
	NE	Nebraska Hydrogen Hub	–	●	–	●	–	–	–				
	OH	Midwest Nuclear Hydrogen Hub	●	–	●	●	●	–	–				
	OH	Ohio Clean Hydrogen Hub	●	●	●	●	●	●	●				
	PA*	Pennsylvania Hub	–	●	–	●	–	–	–				
	TX	Houston Hydrogen Hub	●	●	–	●	●	●	–				
	TX	Port of Corpus Christi Hydrogen Hub	●	–	–	●	●	–	–				
Private	FL	Cavendish NextGen Hydrogen Hub	●	–	–	–	–	●	–				
	ID, OR*, WA*	Obsidian Pacific Northwest Hydrogen Hub	●	–	–	●	●	●	–				
	OH, PA*, WV	Ohio River Valley Hydrogen Hub	–	●	–	●	–	–	–				
	TX	Hydrogen City	●	–	–	●	●	●	–				
Public	CO*, NM*, UT, WY	Western Inter-States Hydrogen Hub	●	●	–	?	?	?	?				
	WV	West Virginia Hydrogen Hub	?	?	?	●	●	●	●				

For more information about the sources that inform this table, see the table documentation note below.

Source: Data compiled by CSIS staff.

CSIS | ENERGY SECURITY AND CLIMATE CHANGE PROGRAM

Not for use or distribution without the advanced written permission of the Alaska Gasline Development Corporation.
Disclaimer – Information contained in this document is conceptual and subject to change without notice.

Next Steps for the Alaska H2Hub

ALASKA GASLINE DEVELOPMENT CORP.

- DOE review of Concept Paper will result in Encourage/Discourage notifications
- Planning process for a “go/no-go” decision stage gate with private sector team members
- In the event of a “go” decision:
  - Public announcement of AGDC’s intent to pursue an Alaska H2Hub Full Application with team members
  - Commercial efforts to negotiate the terms of an Alaska H2Hub Teaming Agreement
  - Preparation of the Full Application
  - Eventually execute the scope of work and participate in the 50% cost sharing for the scope of work described in the Full Application and Teaming Agreement

Not for use or distribution without the advanced written permission of the Alaska Gasline Development Corporation.
Disclaimer – Information contained in this document is conceptual and subject to change without notice.

AGDC.us

ALASKA GASLINE DEVELOPMENT CORP.