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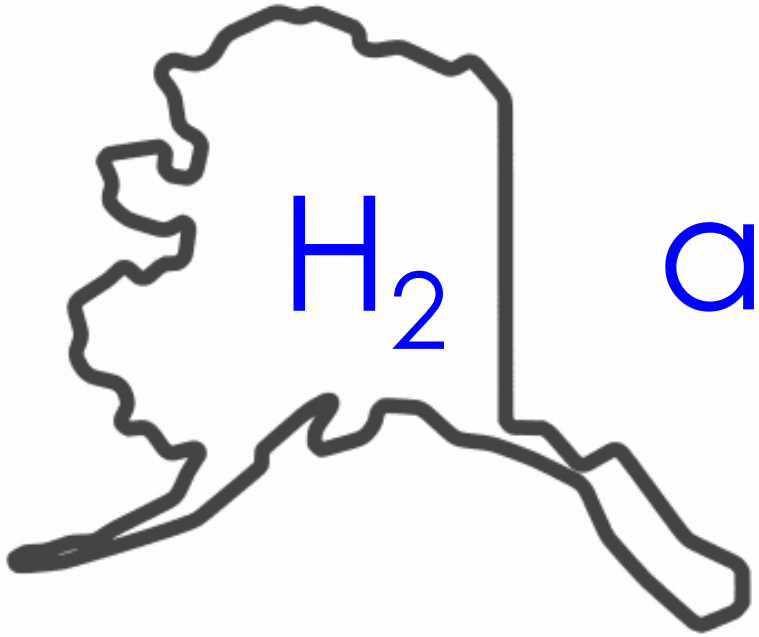
alaska marine power



alaska hydrogen
アラスカ水素

Japan/Alaska Online Arctic Symposium
日本/アラスカオンライン北極シンポジウム
January 14-15, 2025

key messages

Alaska can supply low-carbon hydrogen to Japan
- from early 2030s, phased development
- up to 8% of Japan's requirements in 2040
- Cook Inlet offshore wind

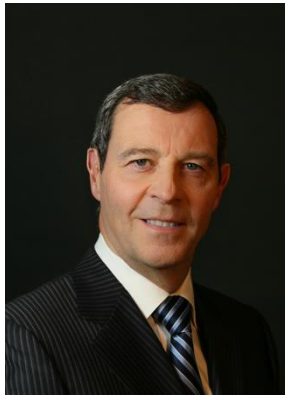
Alaska Hydrogen Project
- competitive, executable & bankable
- major opportunity for Japanese and US companies
  - hydrogen off-takers
  - investment partners
  - equipment suppliers
  - ship builders and operators

Alaska Marine Power
- project developer

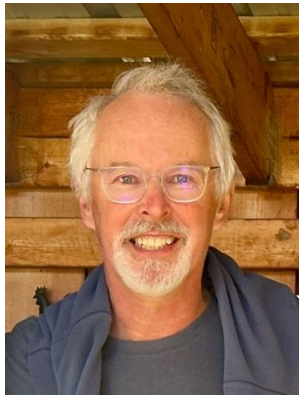
Alaska Marine Power

mission
- exporting renewable energy at scale to grow Alaska ... and cool the planet

energy & experience
- oil & gas development (US, UK, Norway, Russia, Australia)
- power generation, submarine transmission & control
- arctic, offshore & subsea engineering/construction
- mega-project economics & finance
- commercial negotiations & asset trading



<u>David Clarke</u>
engineering director
BP Exploration (36 years)
MBA (Heriot Watt, Scotland)
project management (MIT)
BSc process eng (Sheffield)



<u>Simon Harrison</u>
commercial director
BP Exploration (31 years)
MBA (Cranfield, England)
subsea engineering (North Sea)
MPhil/BSc mech eng (Nottingham)

a hydrogen primer

		$kgCO_2/kg$
white hydrogen	geologic/natural	0.0
green hydrogen	no greenhouse gas emissions	0.0
low-carbon hydrogen	Japan's Hydrogen Act definition	3.4
grey hydrogen	steam methane reforming (SMR)	11.3

production examples

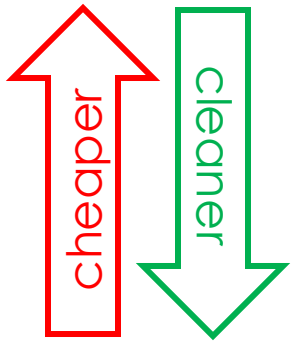
SMR

fossil fuel power + electrolysis

SMR + carbon capture utilization & storage (CCUS)

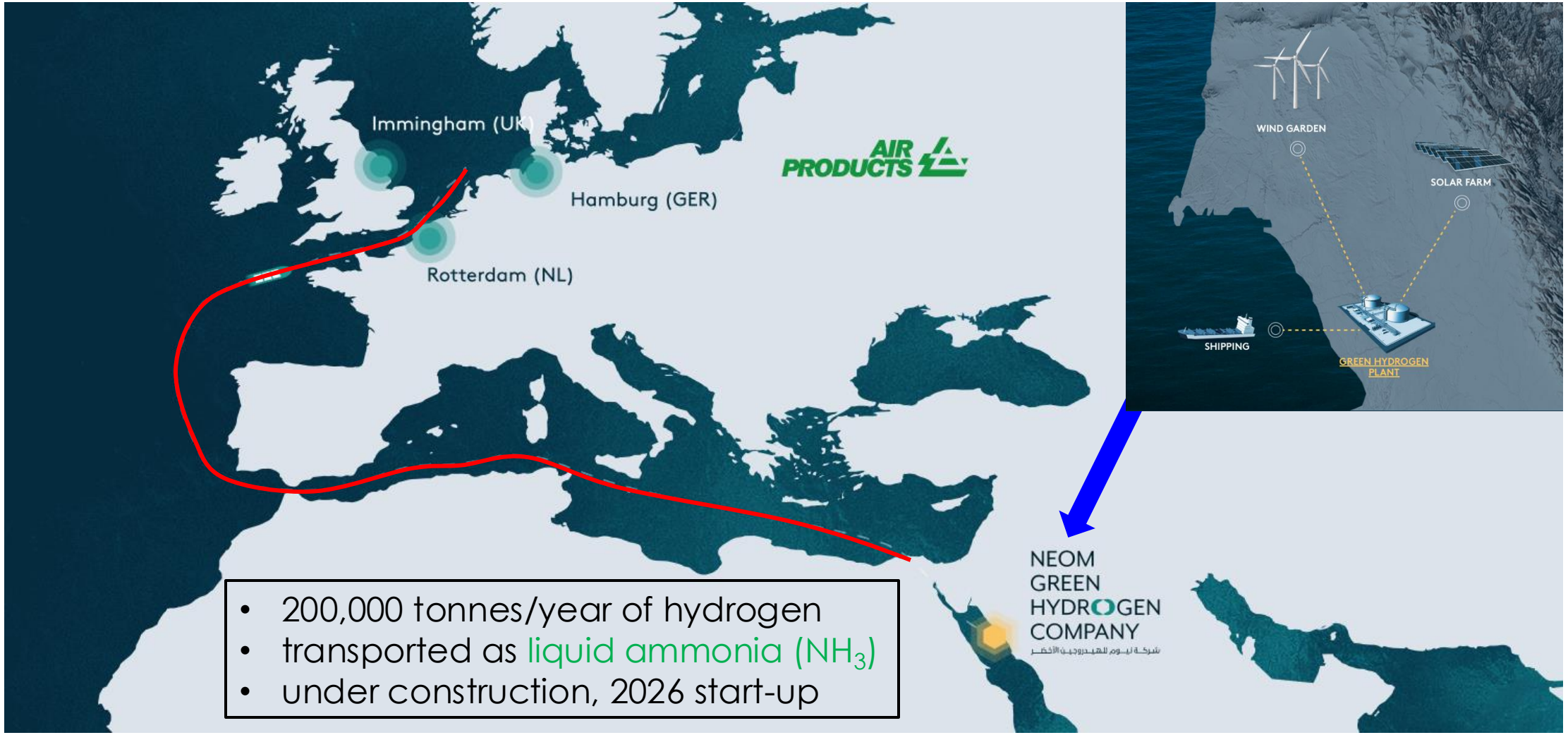
fossil fuel power + CCUS + electrolysis

renewable power + electrolysis



transportation	method
hydrogen gas	pipeline
liquid hydrogen (-253°C)	ship
liquid ammonia (NH_3) (-33°C)	ship

Europe will import low-carbon hydrogen



Japan also wants low-carbon hydrogen

Hydrogen Society Promotion Act (October 23, 2024)

why …

- climate change (60% reduction by 2035)
  - electrical power
  - transportation
  - heavy industry
- long term economic growth
  - hydrogen technology

how …

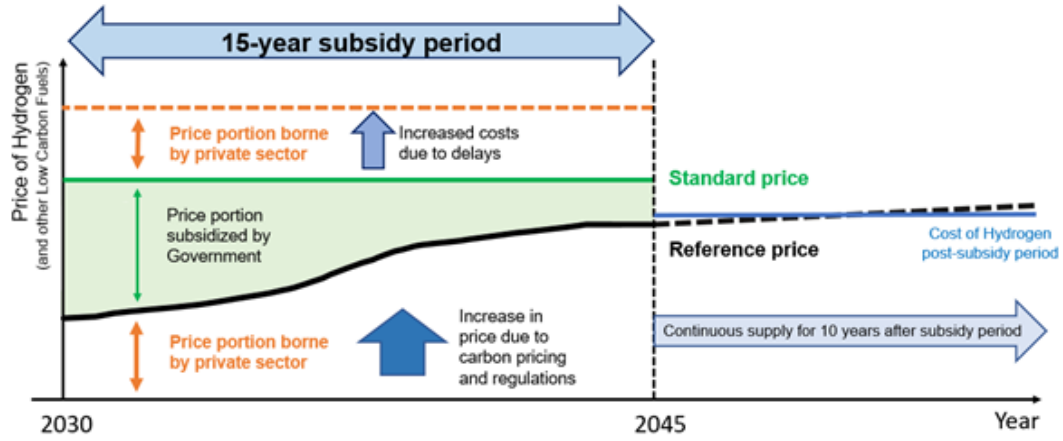
- ¥3 trillion ($20 billion) in subsidies by 2040
- ¥4 trillion ($25 billion) on R&D by 2035
- Japanese investment in supply chains

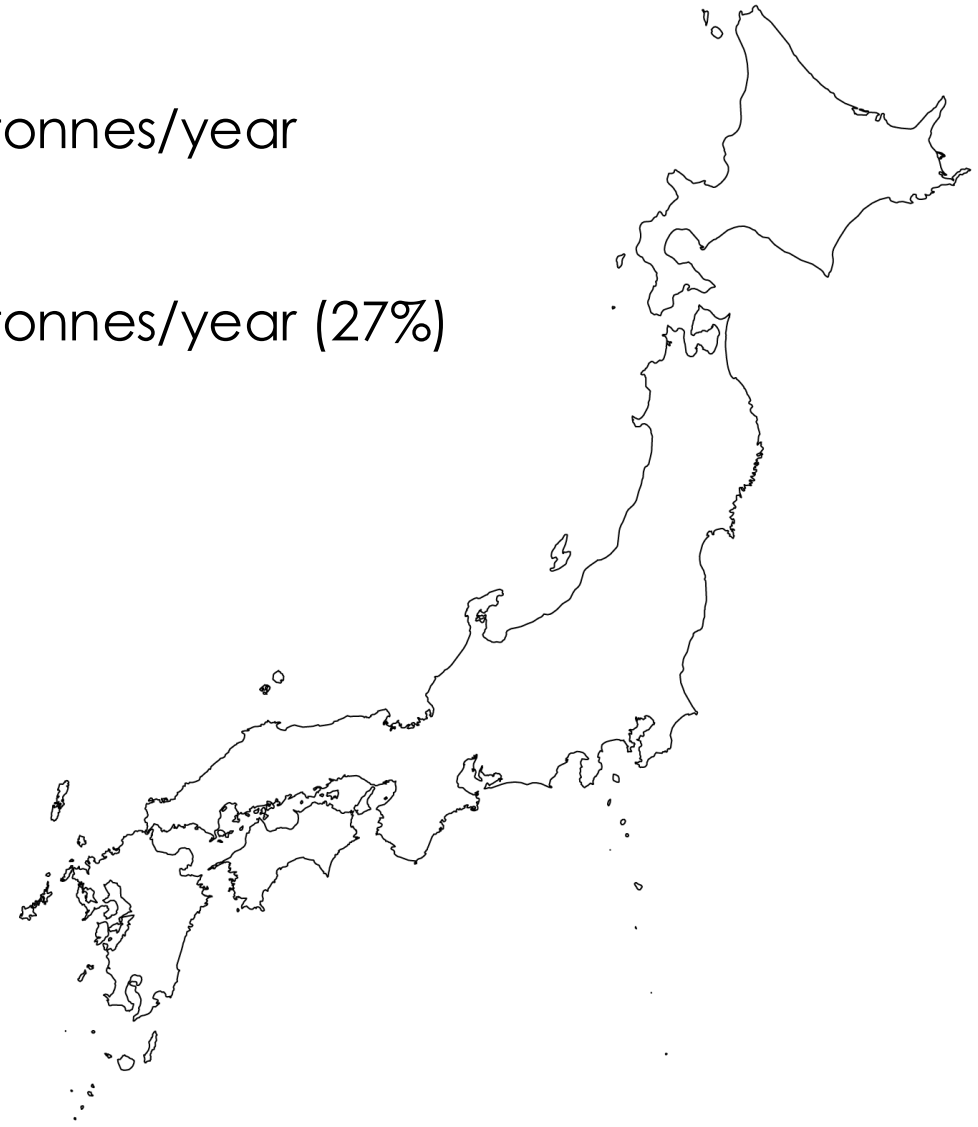
Japan's targets & tools

today
- grey hydrogen — 43 million tonnes/year

2040 target
- low-carbon hydrogen — 12 million tonnes/year (27%)

tool
- "contract for differences" (CfD) subsidy





a huge new market in the Pacific

Kawasaki's prototype 160,000 m^3 liquid hydrogen carrier

12 million tonnes/year of low-carbon hydrogen will require …

- if all produced by electrolysis
  - 700 TWh/year
    - Alaska Railbelt Grid 5 TWh/year
    - California 290 TWh/year
    - Japan 1,000 TWh/year
- if all imported
  - 1,000 cargos/year

Australia is already hard at work …

location	Queensland	Western Oz	Western Oz	Alaska
project	CQ-H_2	Murchison	WGEH	Alaska Hydrogen
• Phase 1 (H_2 kt/yr) • potential (H_2 kt/yr)	75 300	350	330 4,000	50-100 1,000
energy source	onshore wind & solar	onshore wind & solar	onshore wind & solar	offshore wind
transportation modes	liquid H_2 (LH_2) ammonia (NH_3)	NH_3	LH_2 NH_3	LH_2 NH_3
distance to market	3,900 nm	4,400 nm	5,400nm	3,300 nm
start-up date	2029	2031		early 2030s

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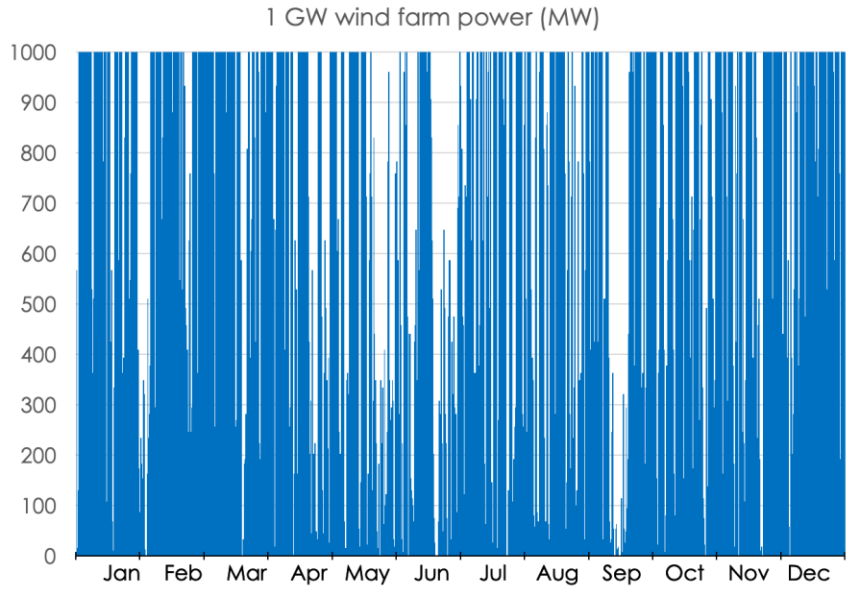
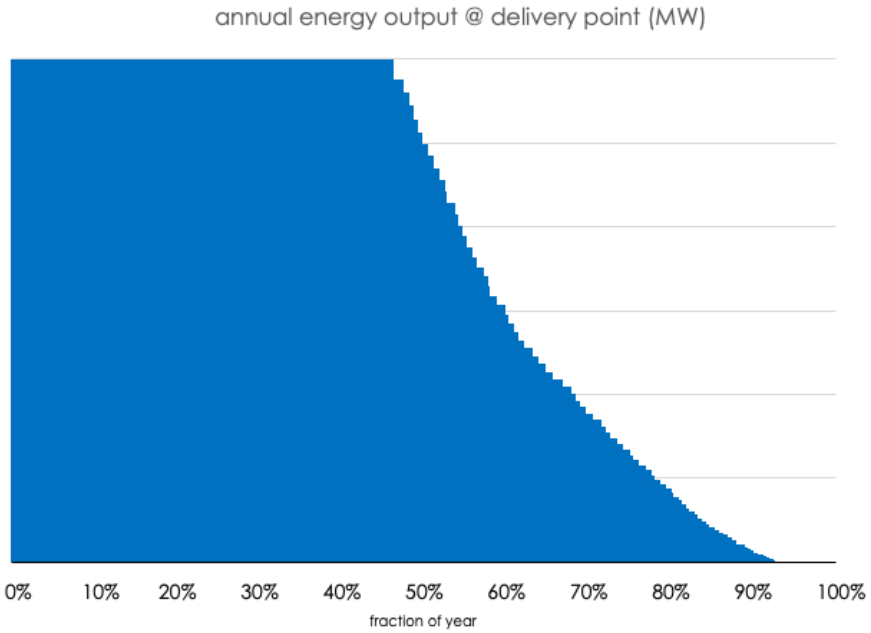
a renewable power primer



Cook Inlet
Wind Farm

NREL



Alaska Hydrogen can compete

facilities	Phase 1	potential
• offshore wind power	0.5-1.0 GW	10 GW
• hydrogen production	50-100 kt/y	1 million tonnes/year

great geography

- world-class offshore wind resource
- proximity to Japan (3,300 nautical miles)
- brownfield site & deepwater port (Nikiski)
- underground hydrogen storage potential

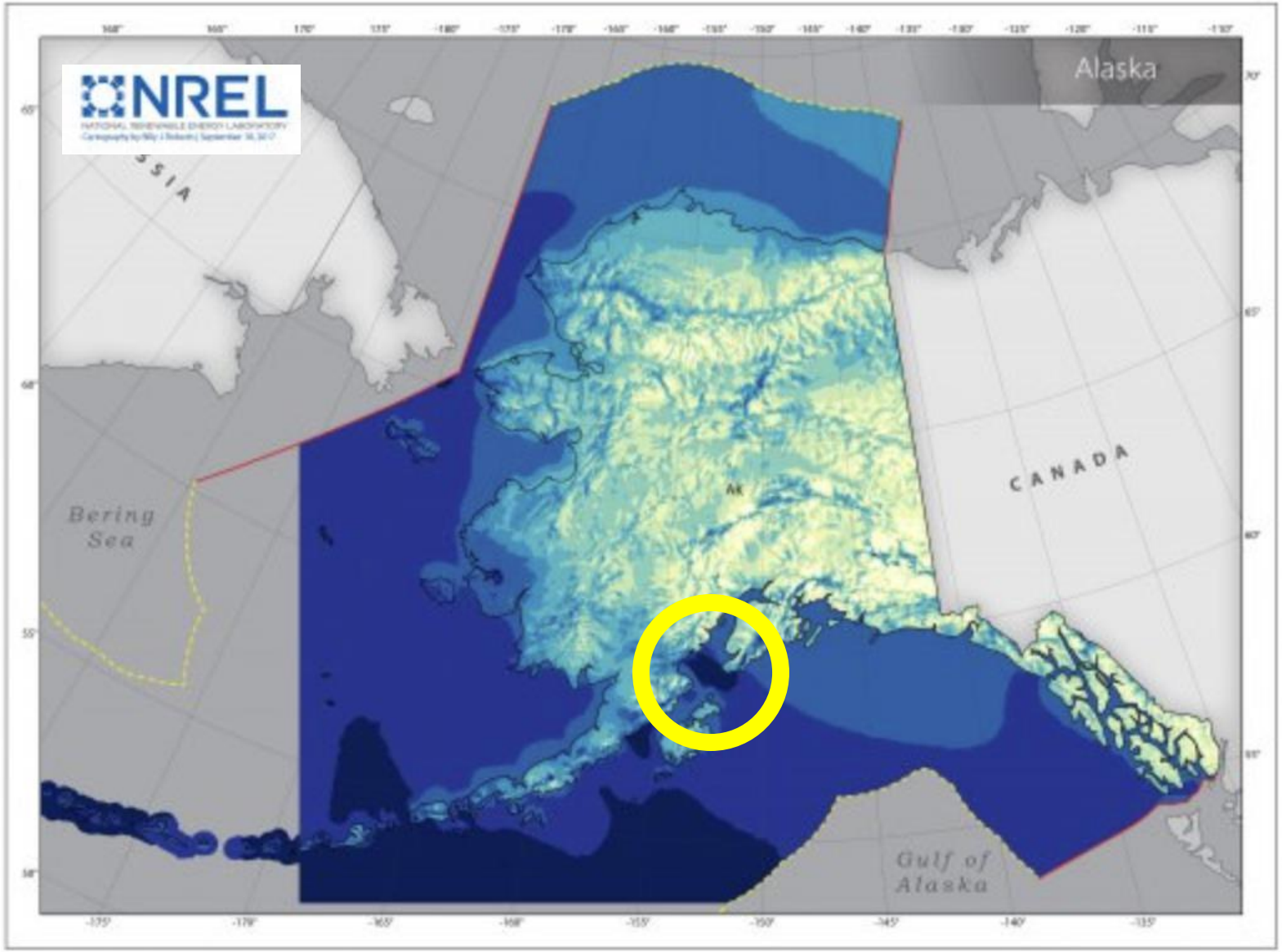
long history of exporting energy

- coal, oil & gas (ammonia & LNG)

bilateral relations

- US-Japan military alliance
- US-Japan trade ($76 bn US exports, $147 bn US imports in 2023)

Cook Inlet wind



- one of four near-shore US locations with average wind speeds > 10 m/s
- only such location
  - cold/dense wind
  - water depth < 60 m
  - energy community
- 64% gross capacity factor (NREL 2023)

Cook Inlet wind

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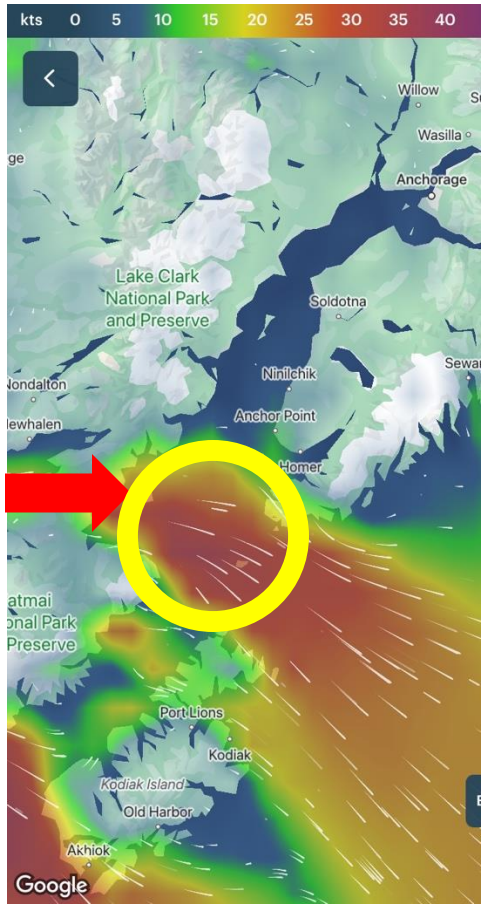
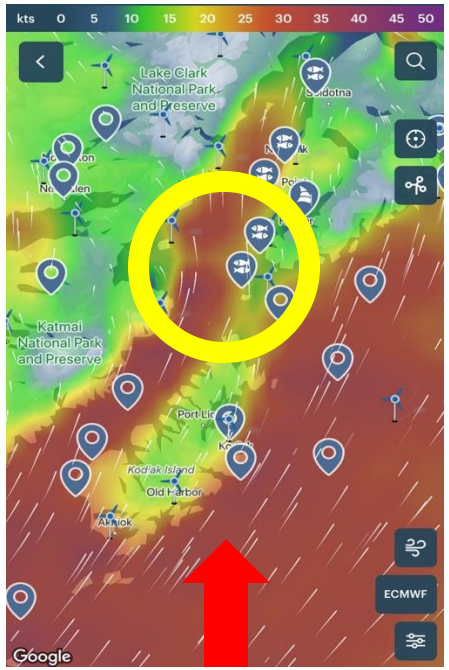
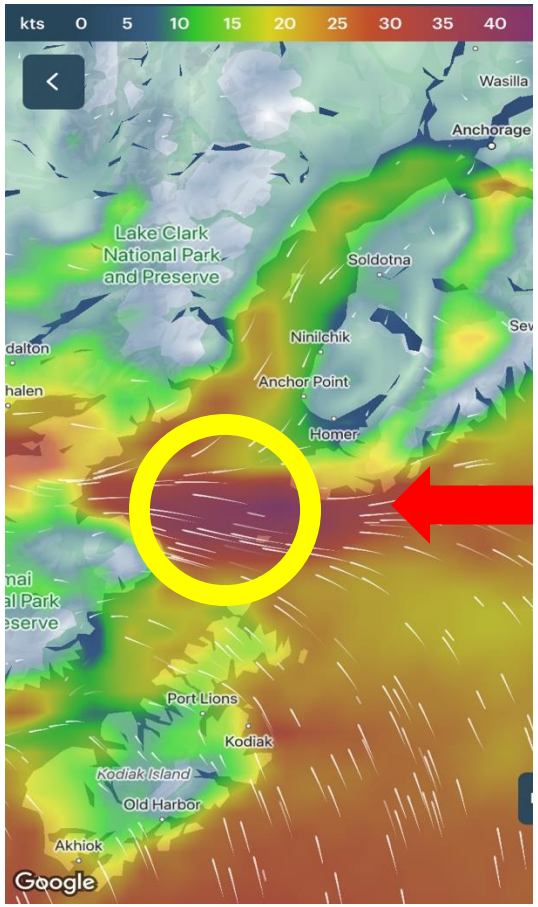
mountains funnel winds from all directions







screenshots from Windy App

Cook Inlet wind

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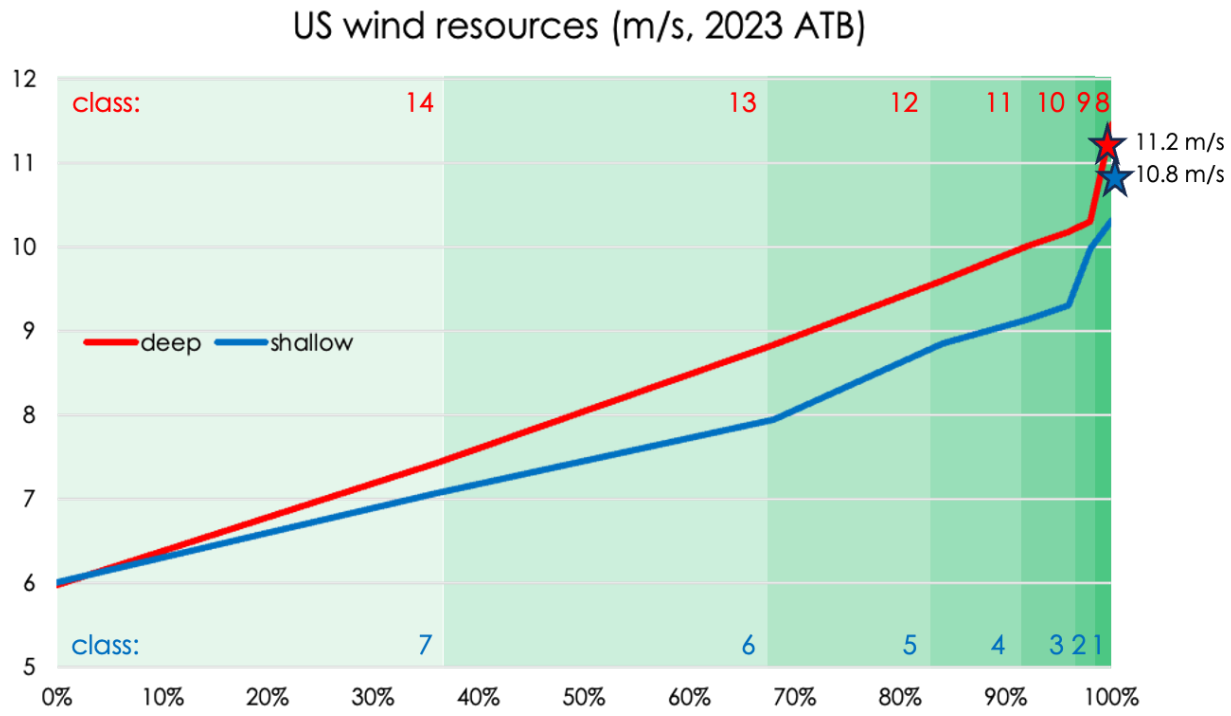

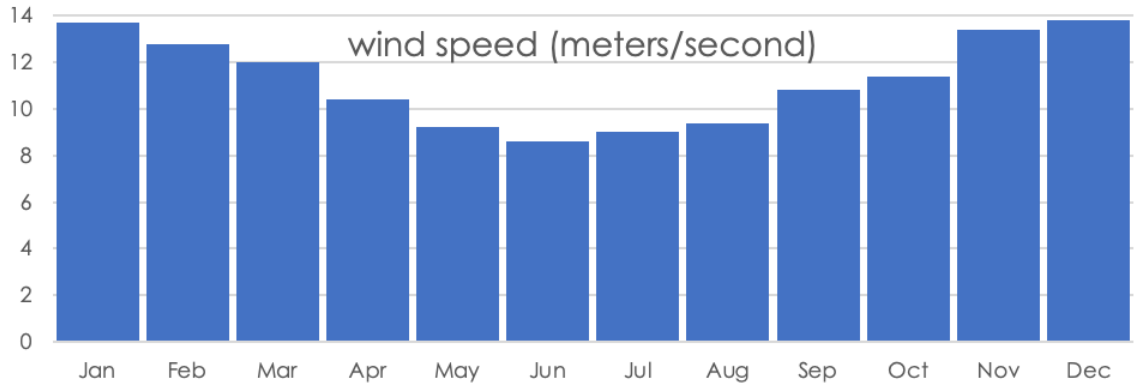

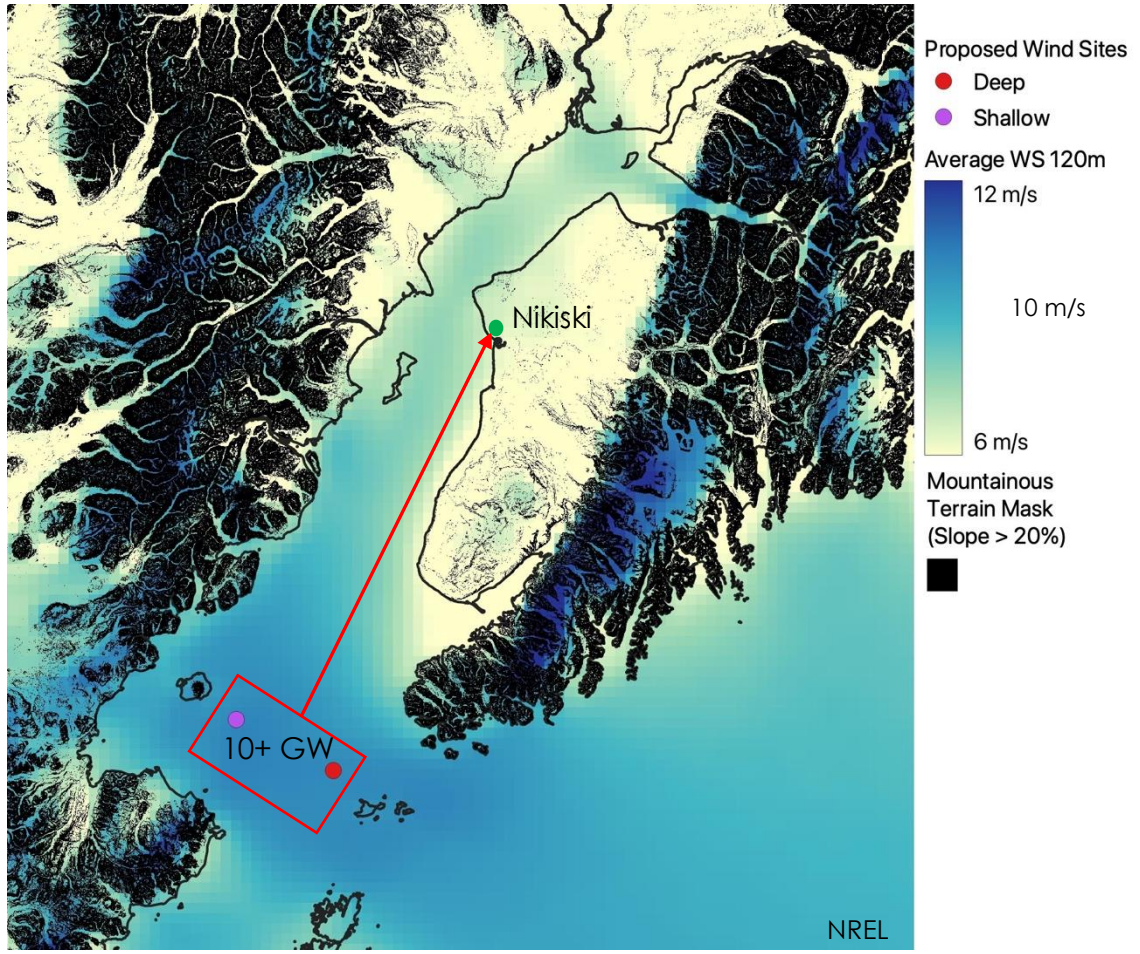

Nikiski

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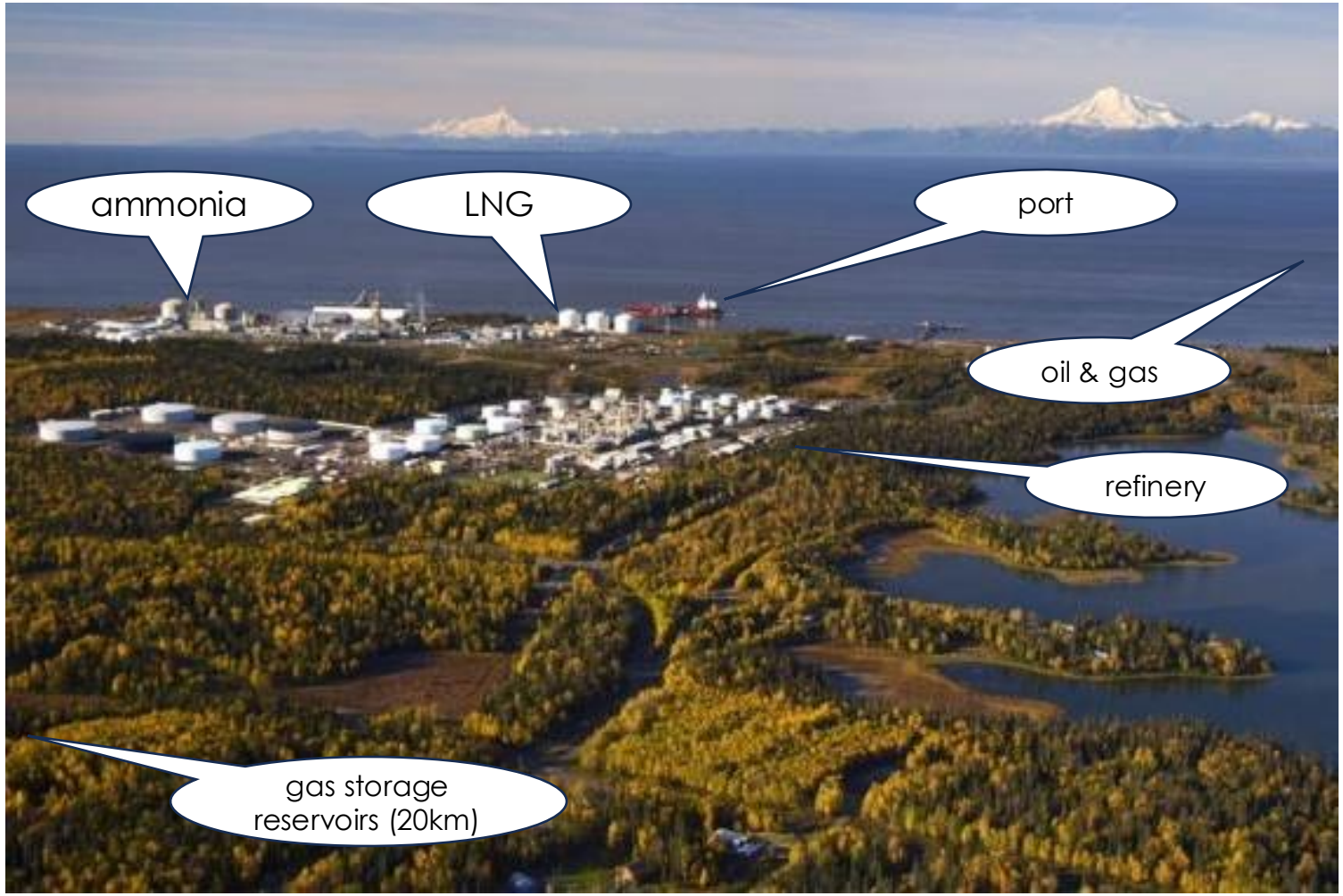


today
- deep-water port
- fossil fuel energy site
  - oil refining
  - natural gas
    - LNG
    - ammonia
    - storage

tomorrow
- deep-water port
- low-carbon energy site
  - liquid hydrogen
  - liquid ammonia
  - electro fuels

Alaska Hydrogen
in the community

amp
alaska marine power

local benefits

power grid

electricity

natural gas

hydrogen
power

fuel cells

Cook Inlet

hydrogen exports

compressed
storage

hydrogen

liquid hydrogen

reservoir
storage

liquid ammonia

offshore wind

low-carbon transport fuels

geothermal

direct air
capture

carbon dioxide

Electro fuels

reservoir
storage

CO_2 imports

intermittent

constant

benefits for Alaskans

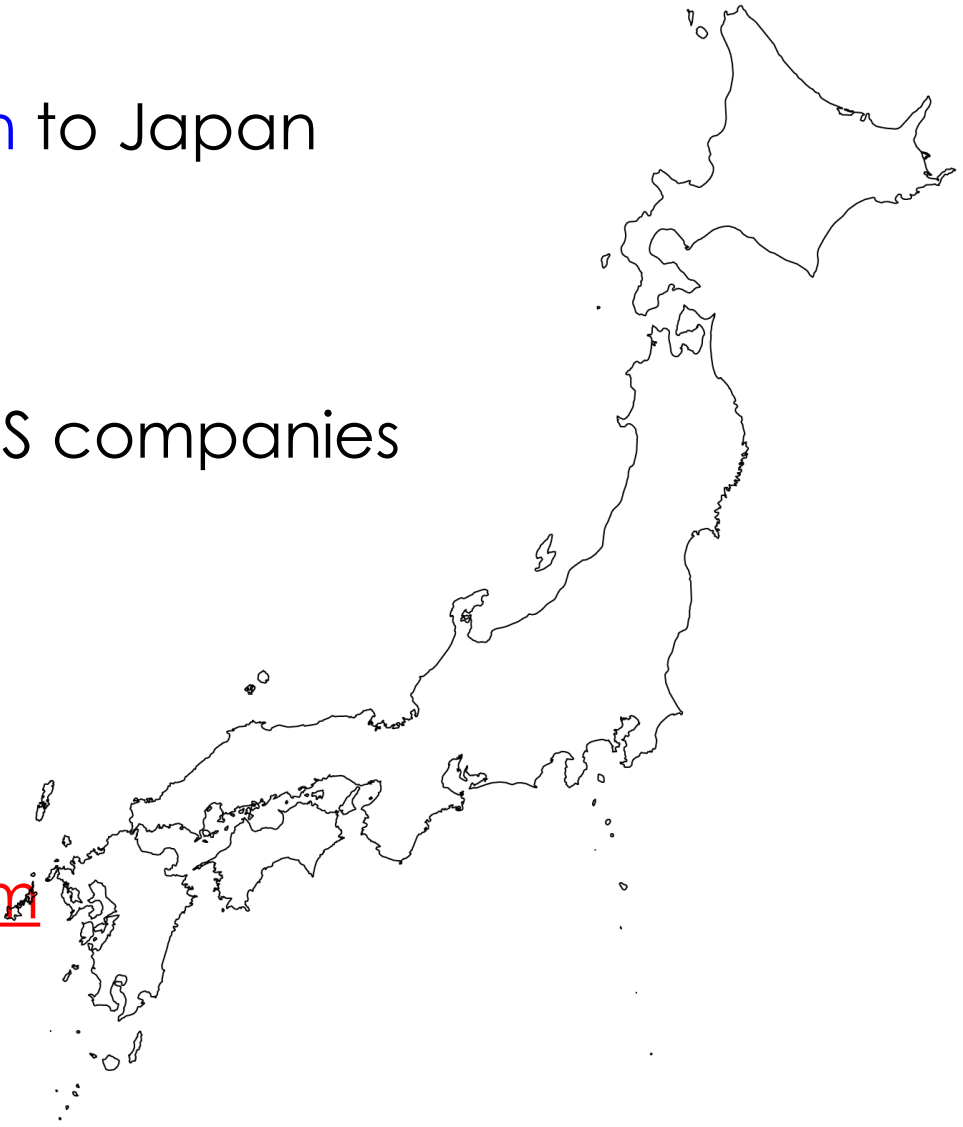
	Phase 1	potential
Kenai Peninsula		
• construction jobs (3-10 years)	1,000-2,000	2,000+
• operating jobs (30+ years)	200-300	1,000
• property tax revenue		
Alaska		
• opportunities for Alaskan companies	✅	✅
• state tax revenue	✅	✅
• renewable energy storage		✅
• hydrogen fuel for transport and heating		✅
• value-adding opportunities (manufacture & export)		✅
• low carbon electro fuels (SAF, eDiesel, eGasoline, etc)		

key messages

Alaska can supply low-carbon hydrogen to Japan

Alaska Hydrogen Project
- competitive, executable & bankable
- major opportunity for Japanese and US companies
- alaska-hydrogen.com

Alaska Marine Power
- project developer
- alaskamarinepower.com
- david.clarke@alaskamarinepower.com



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アラスカは日本に低炭素水素を供給できる
Hey! Alaska can supply low-carbon hydrogen to Japan

… 仕事に取り掛かりましょう
… let's get to work!