

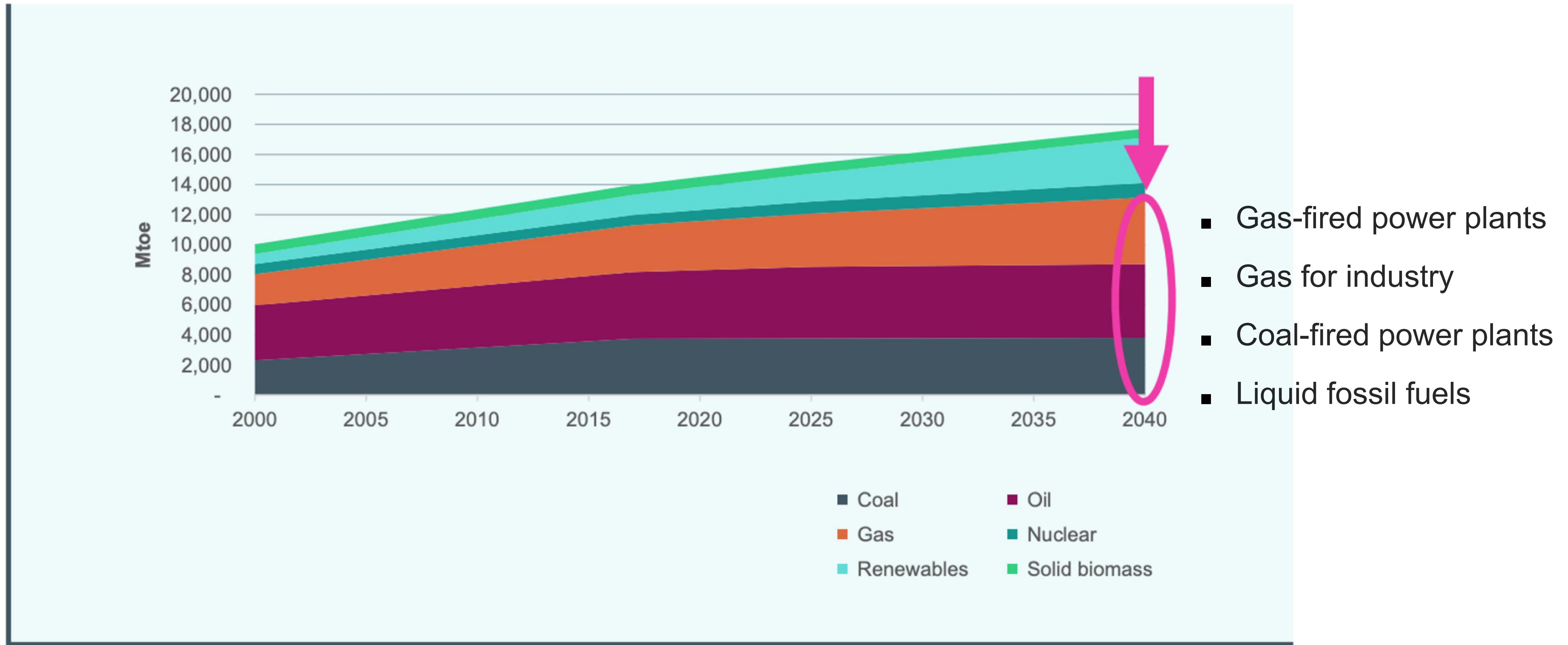
NU PRIMARY ENERGY

NEA WORKSHOP ON ADVANCED CONSTRUCTION AND MANUFACTURING METHODOLOGIES

March 2022

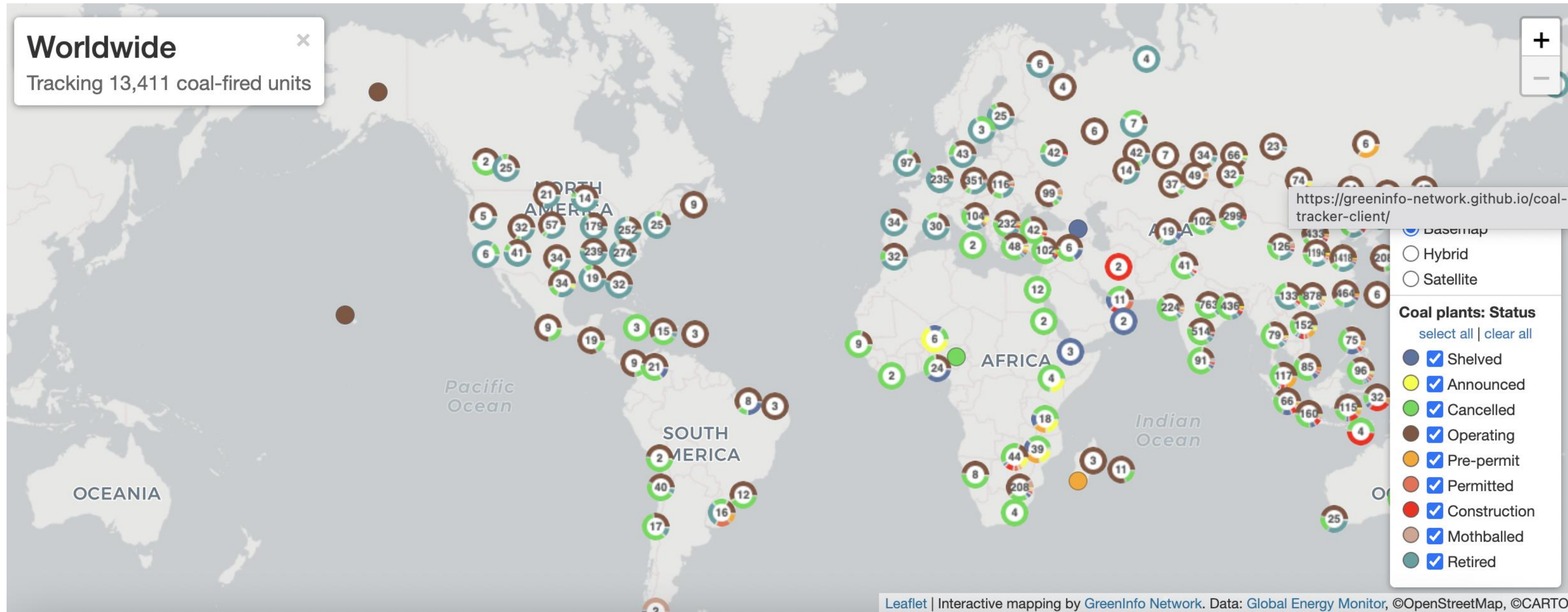
TERRA
PRAXIS

Stated Policies Scenario: World Energy by Source (IEA 2018)



The Challenge

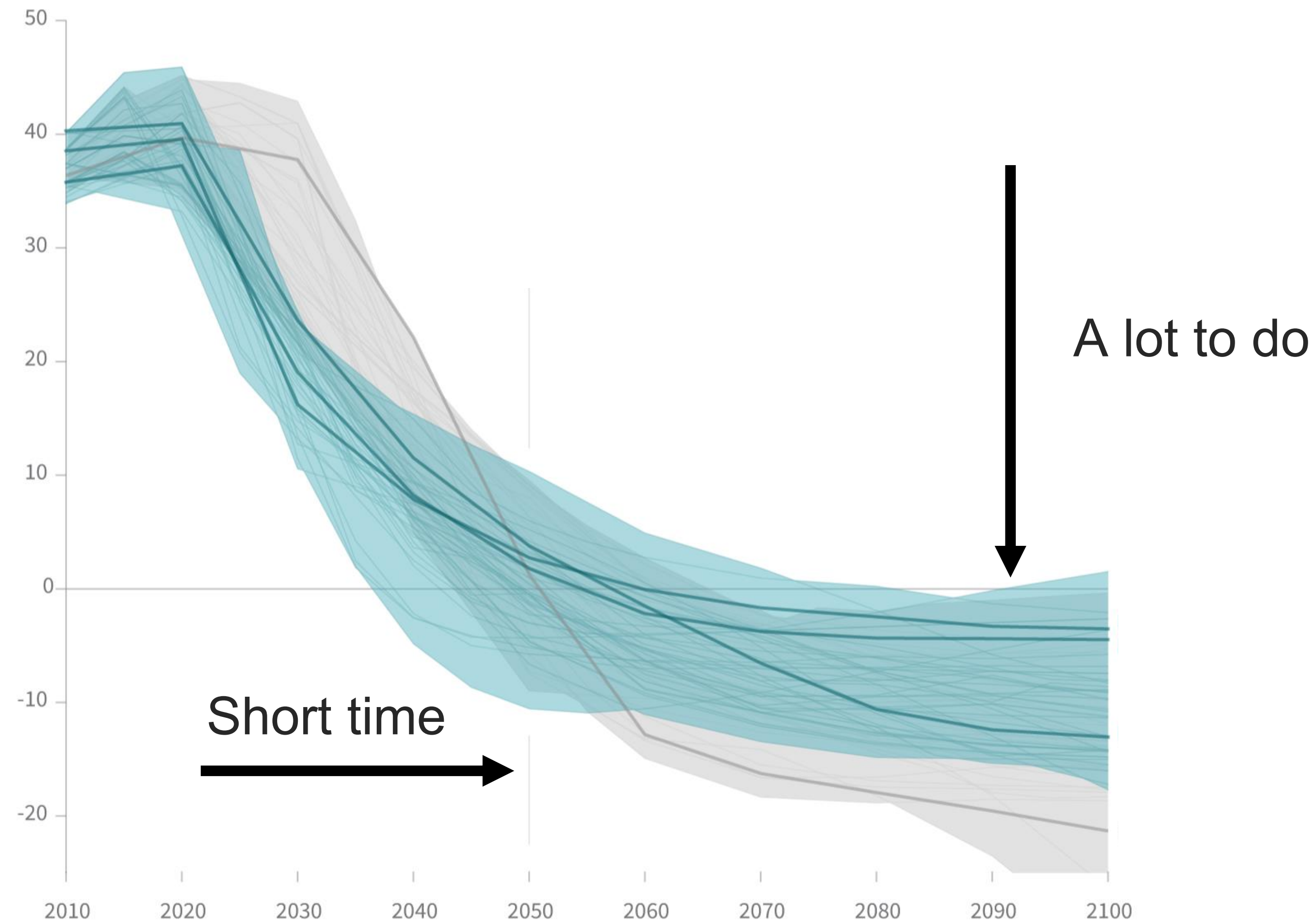
2 TW of coal operating in the world today amount to almost one third of global carbon emissions.



This is What We Need to Do

Global total net CO₂ emissions

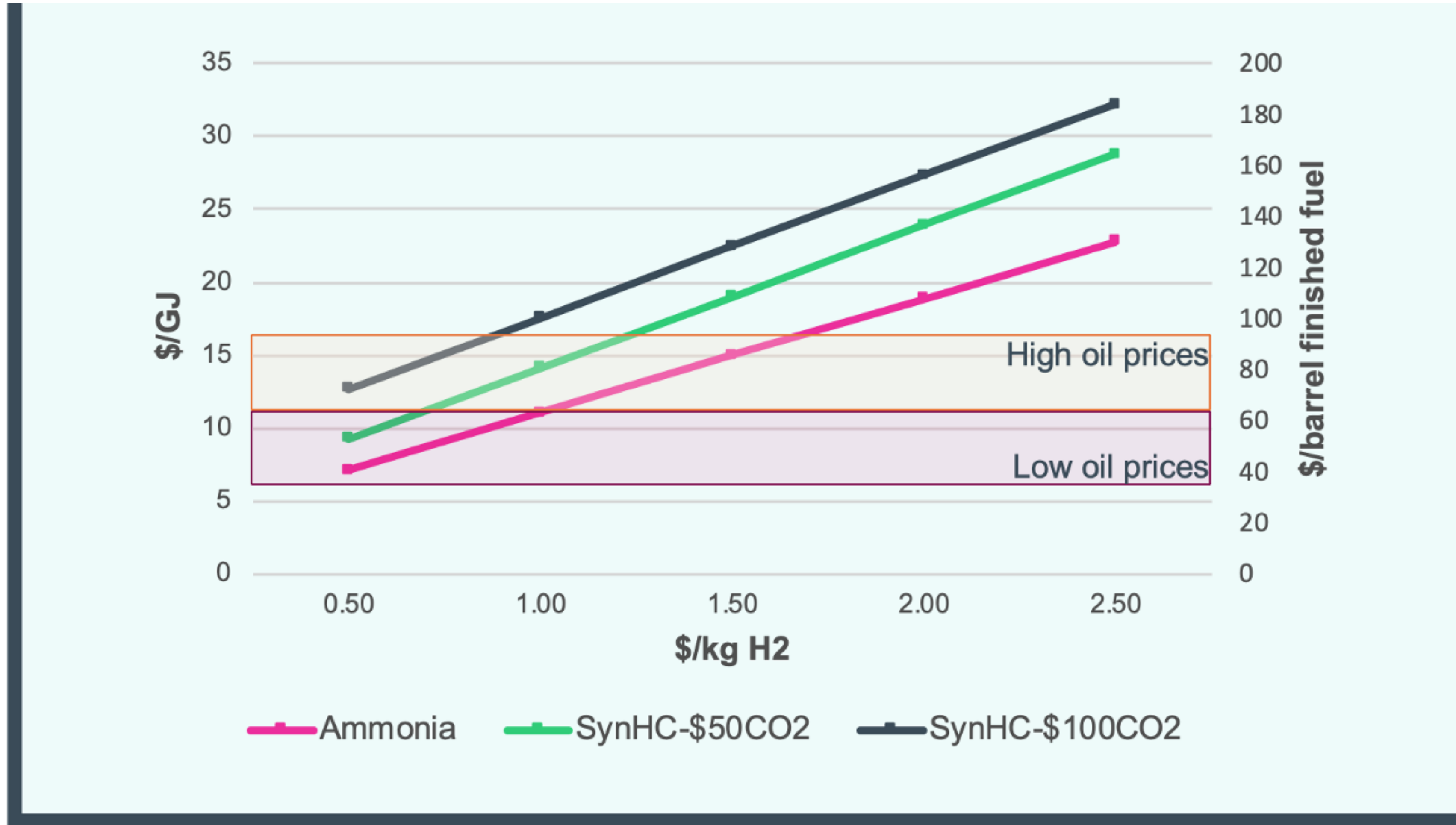
Billion tonnes of CO₂/yr



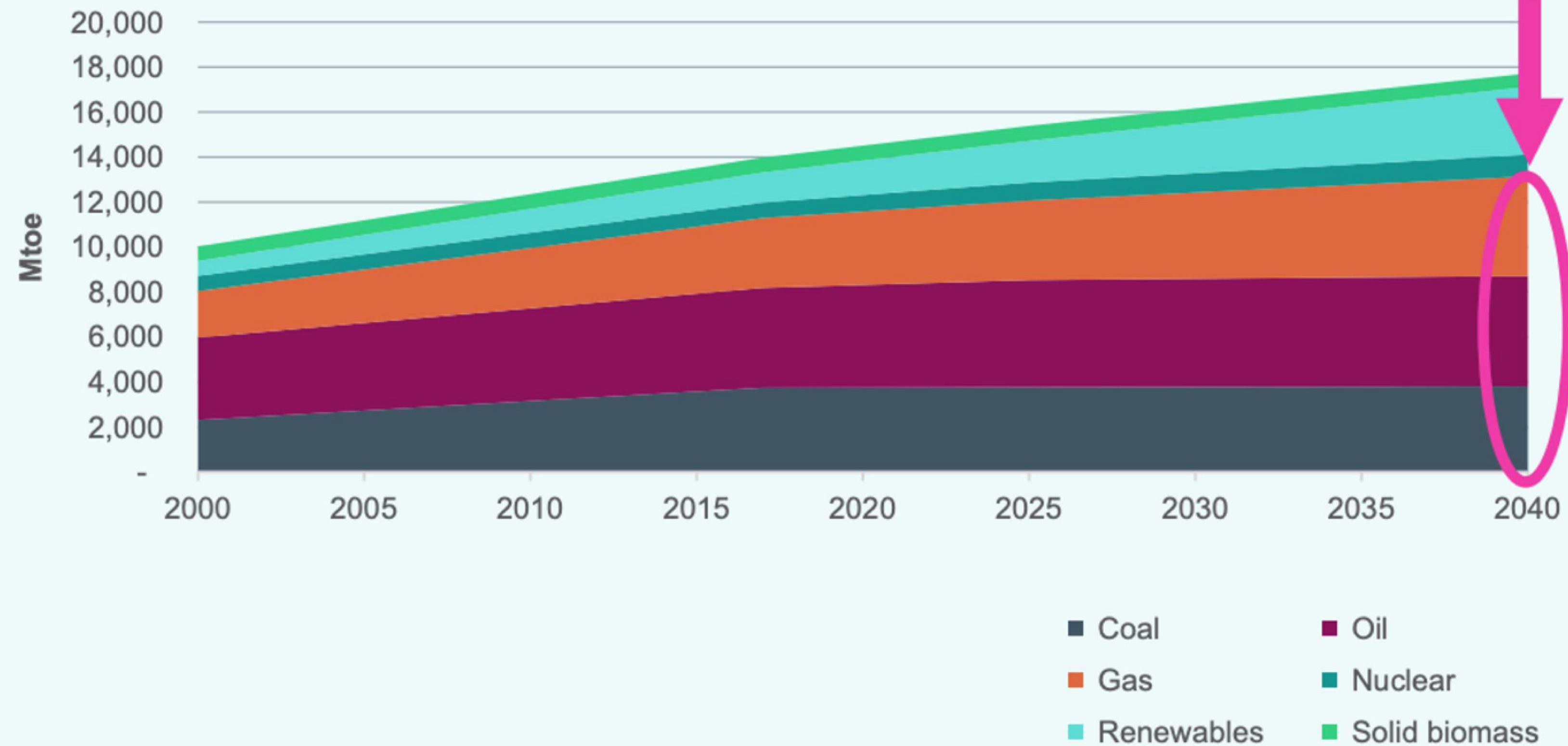
- Repower all coal plants
- Replace flexible gas plants
- Replace gas for industrial heat
- Replace liquid fossil fuels

While growing the energy system to supply the developing world

Cost: Oil price 'guardrails' of the hydrogen economy (\$0.50–\$1.50/kg)



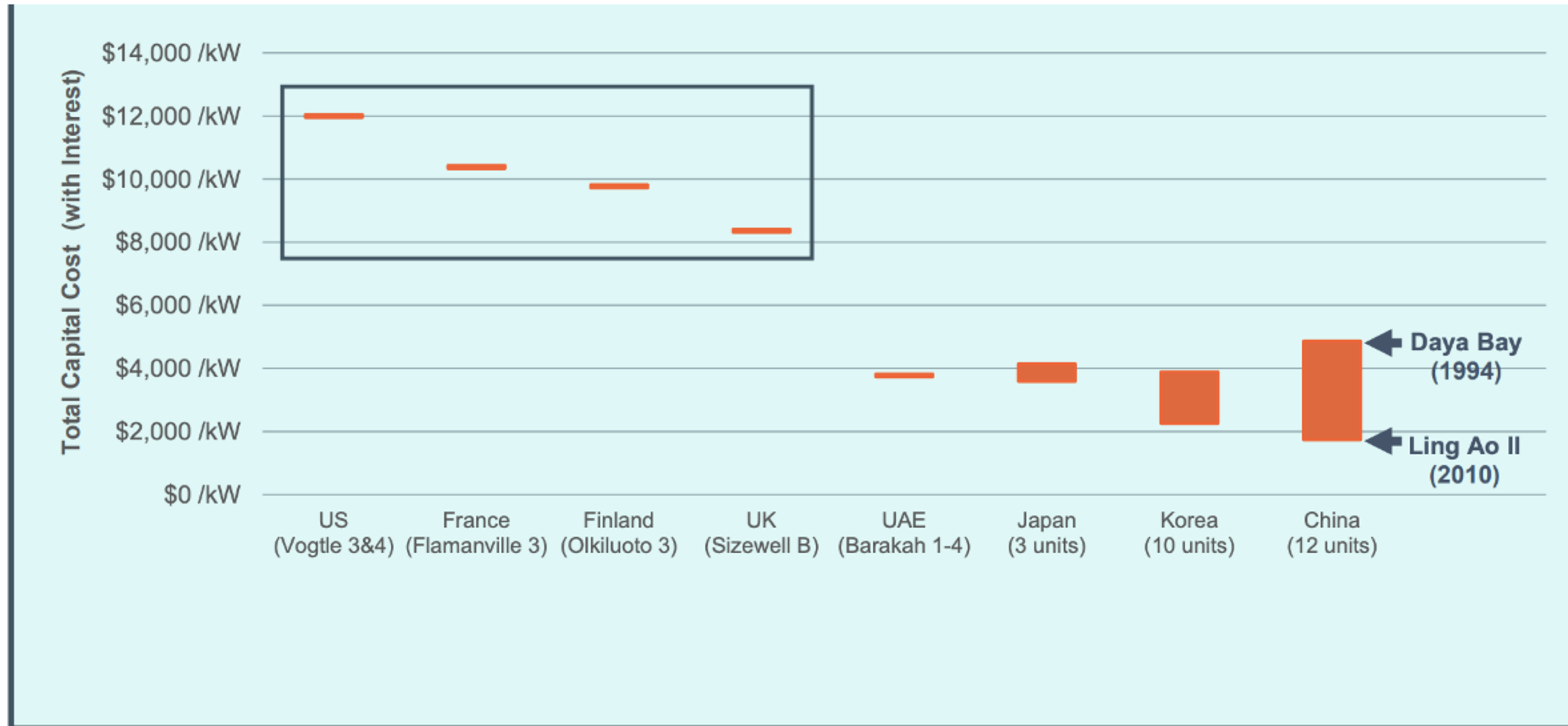
Targeted Applications for Advanced Heat Sources





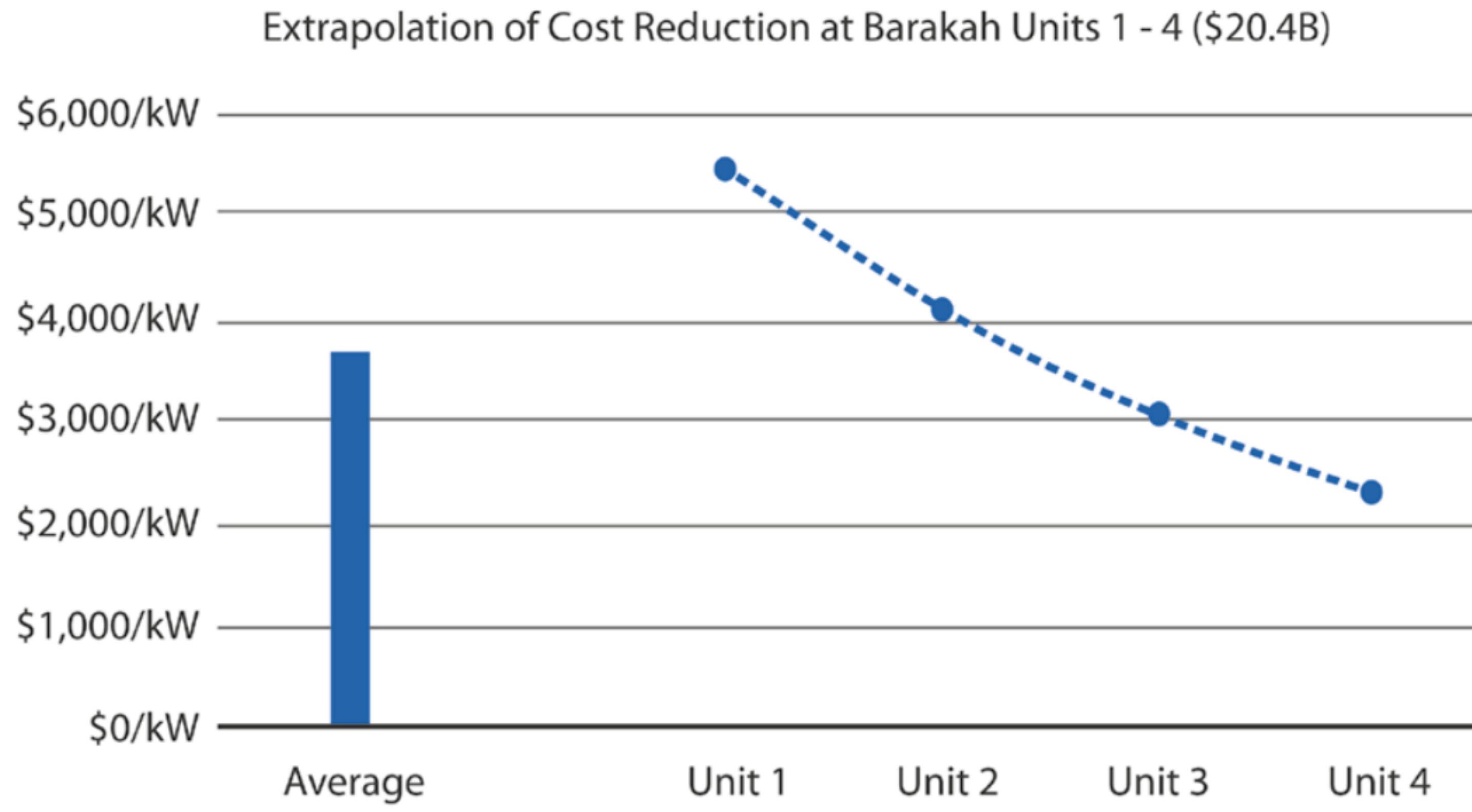
Designing for Cost, Speed, Scale, Space

Nuclear Plant Costs Around the World



Source: [LucidCatalyst](#), Eric Ingersoll, Kirsty Gogan, et al., "The ETI Nuclear Cost Drivers Project: Full Technical Report," September 2020.

Driving the Cost Reduction Curve

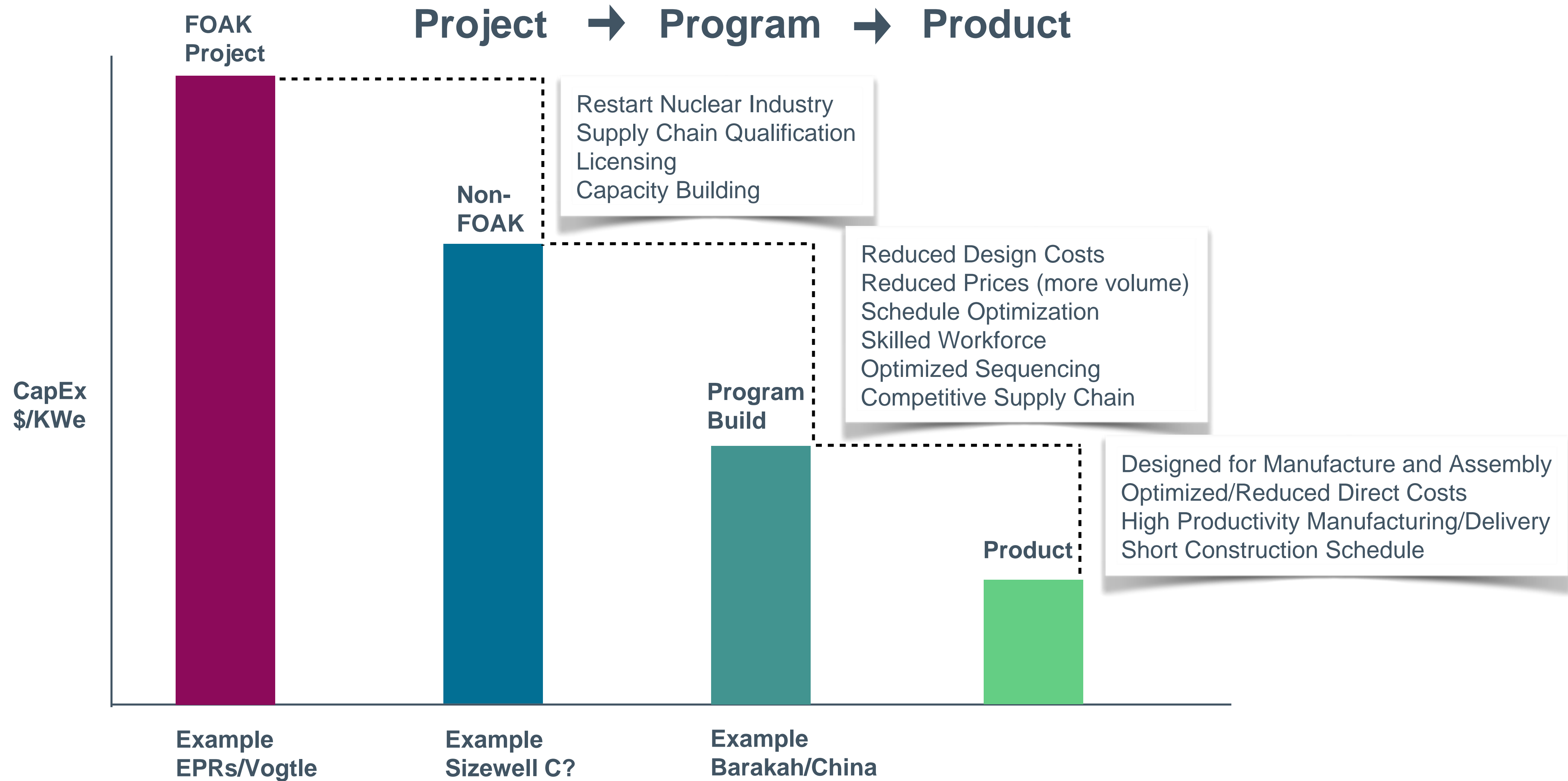


Source: ETI Nuclear Cost Drivers Study, LucidCatalyst

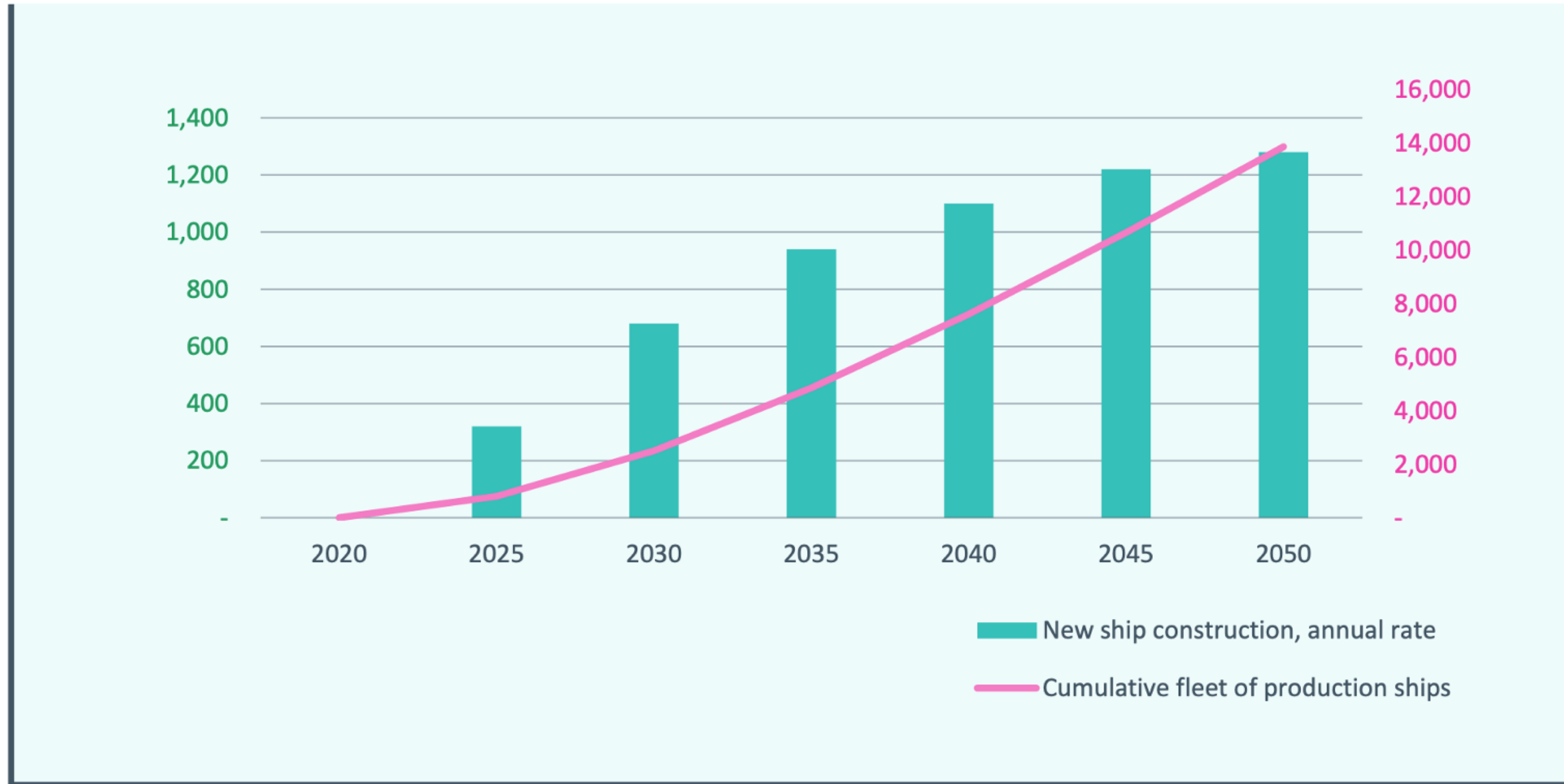
Cost reductions from one reactor to the next were significant at the UAE's Barakah nuclear power plant project.

The best way to bring the cost down is to lock in a design and then build many of these reactors, learning by repeating.

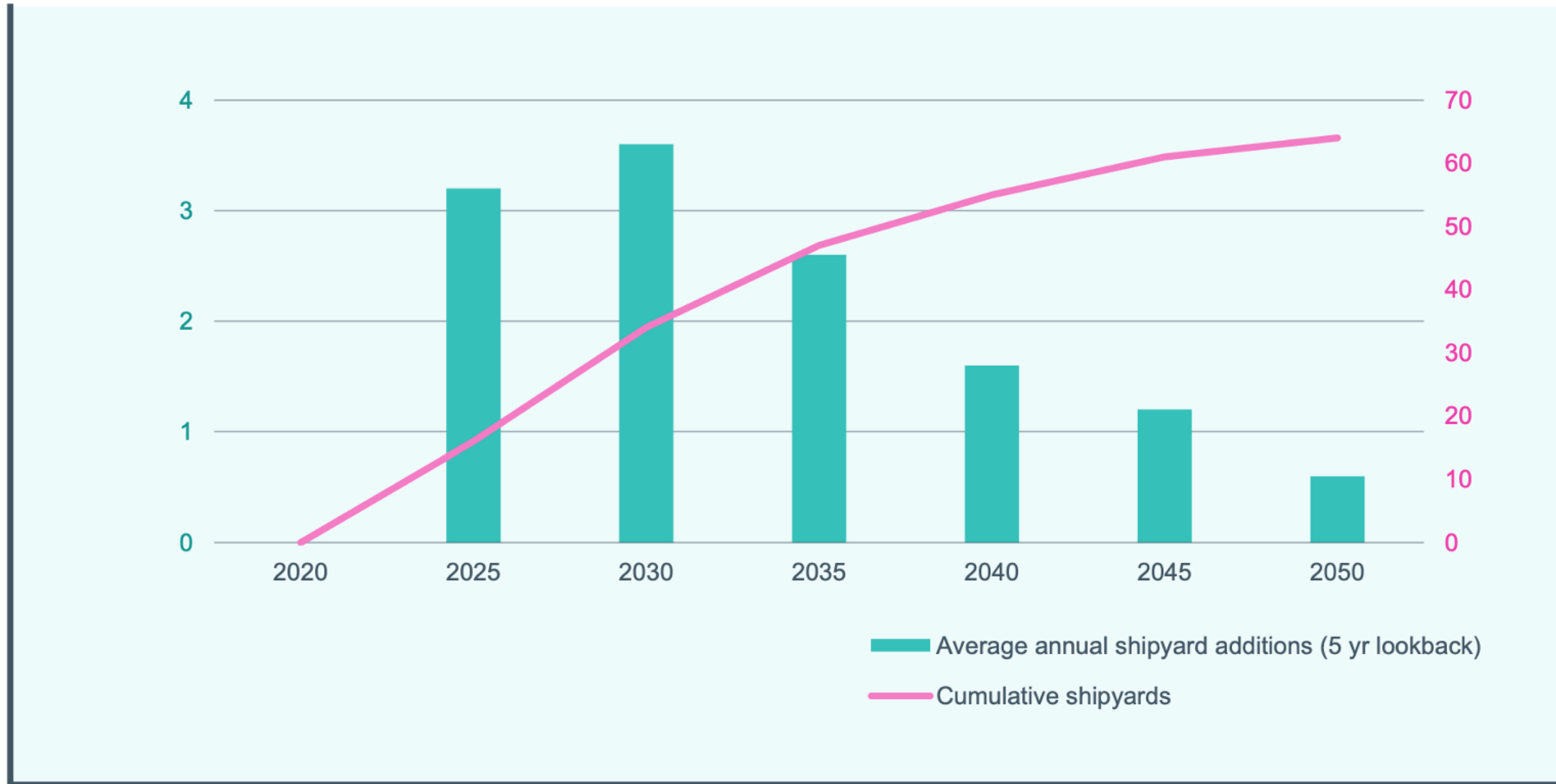
Pathway to Low Cost



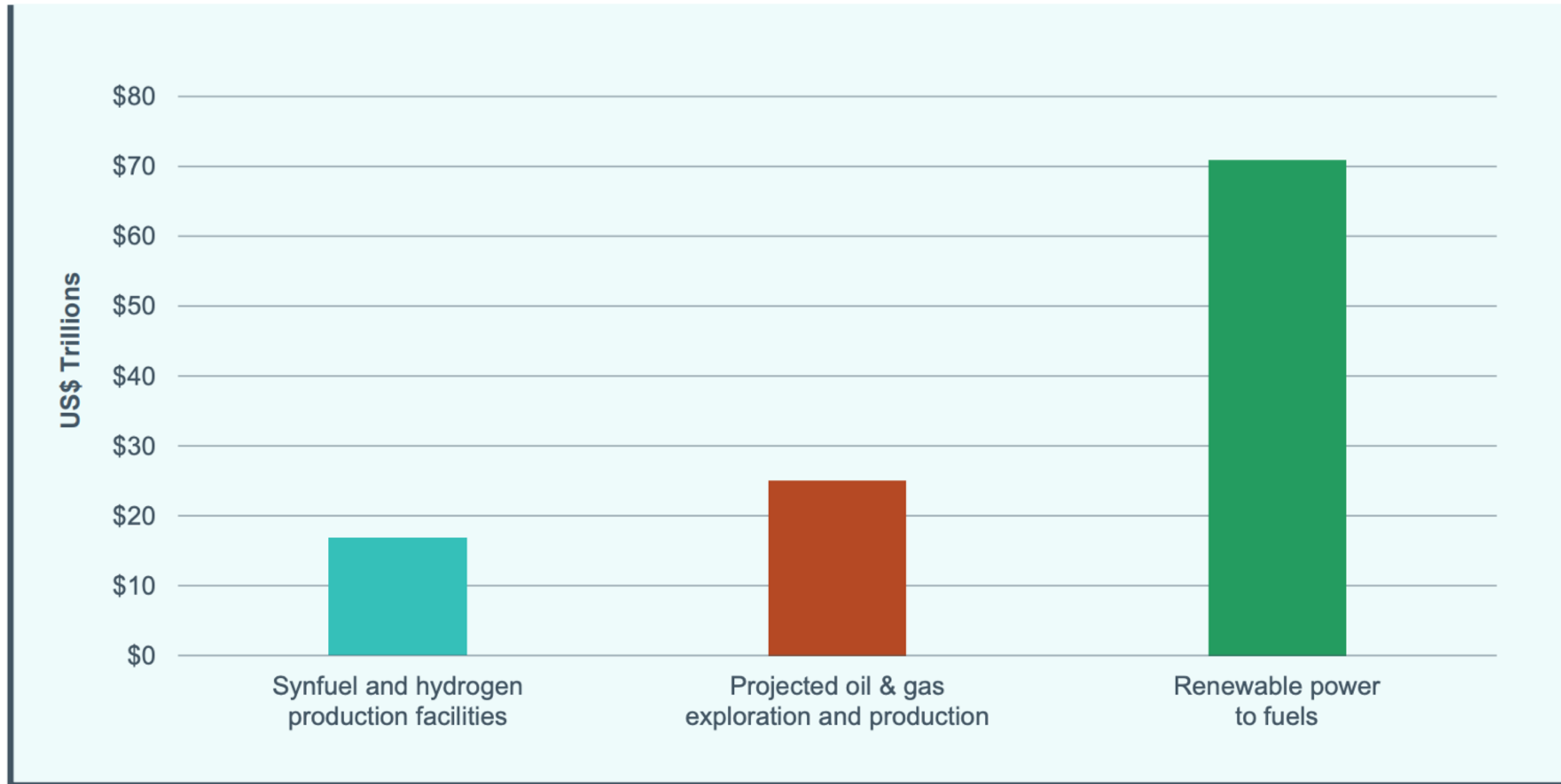
Additions and Cumulative Fuel Production Facilities



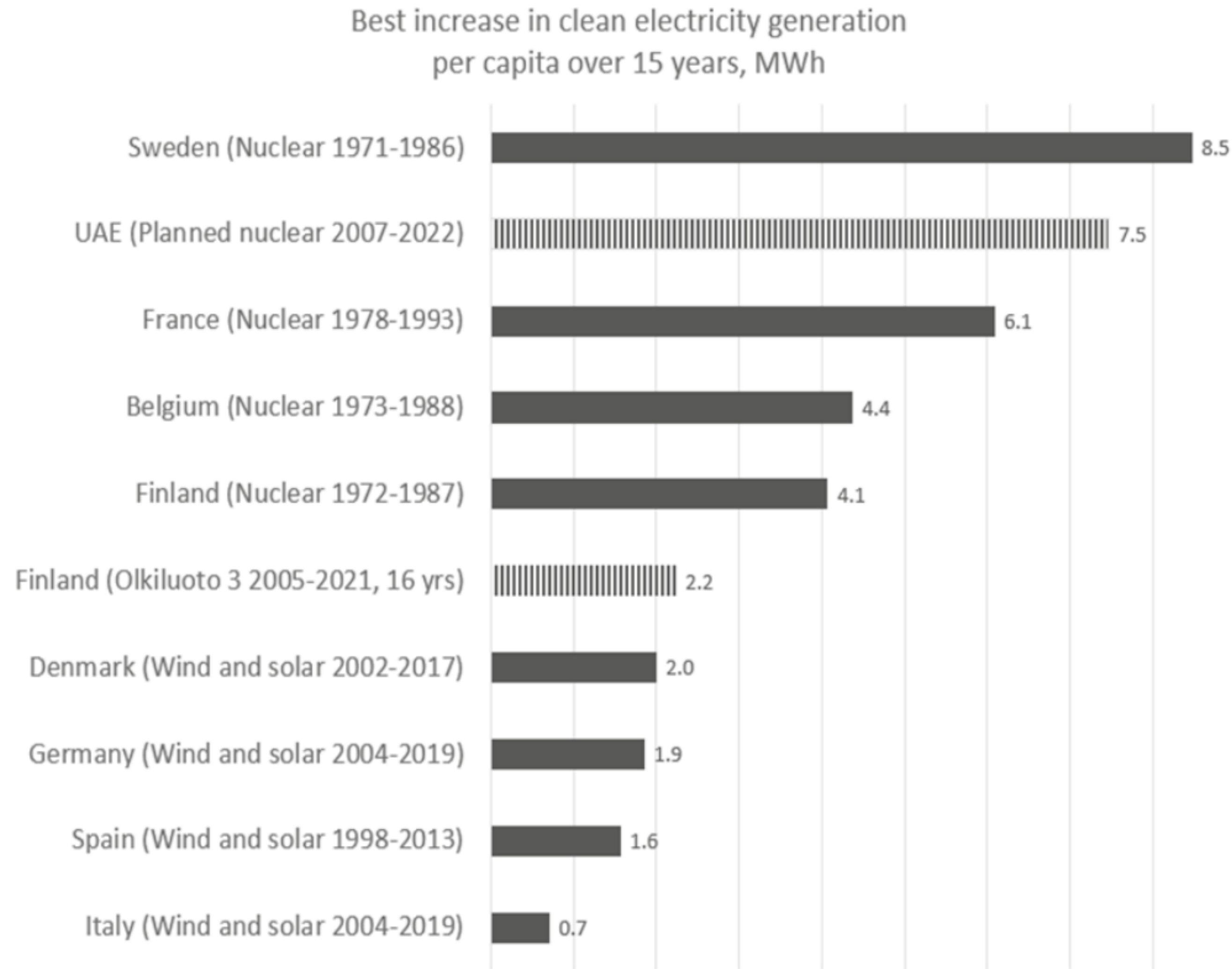
Shipyard Starts and Cumulative Operating Shipyards



Comparative Investment for Fuel Substitution by 2050

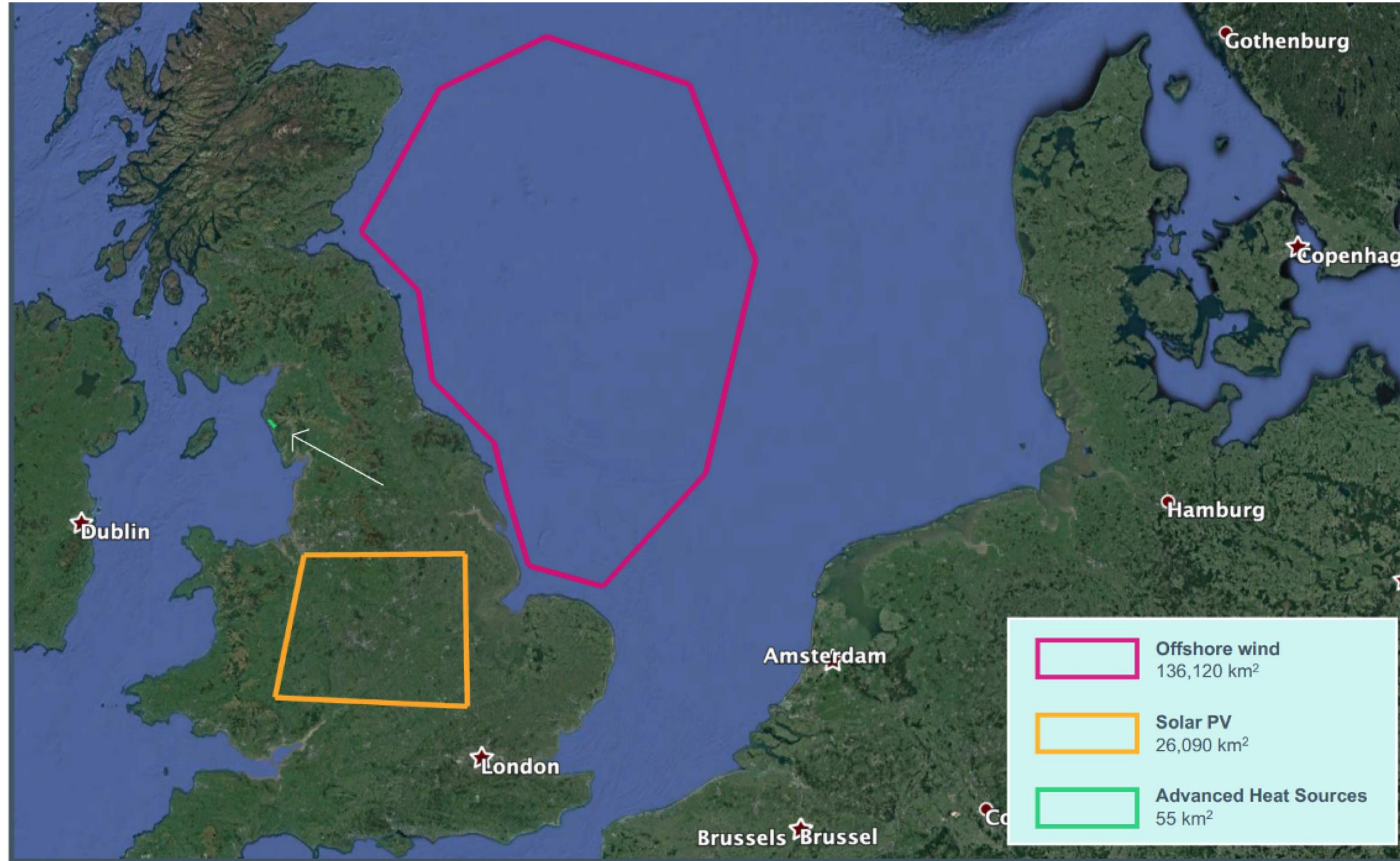


Fastest Path to Zero Carbon Electricity



Source: Onebilliontons.org

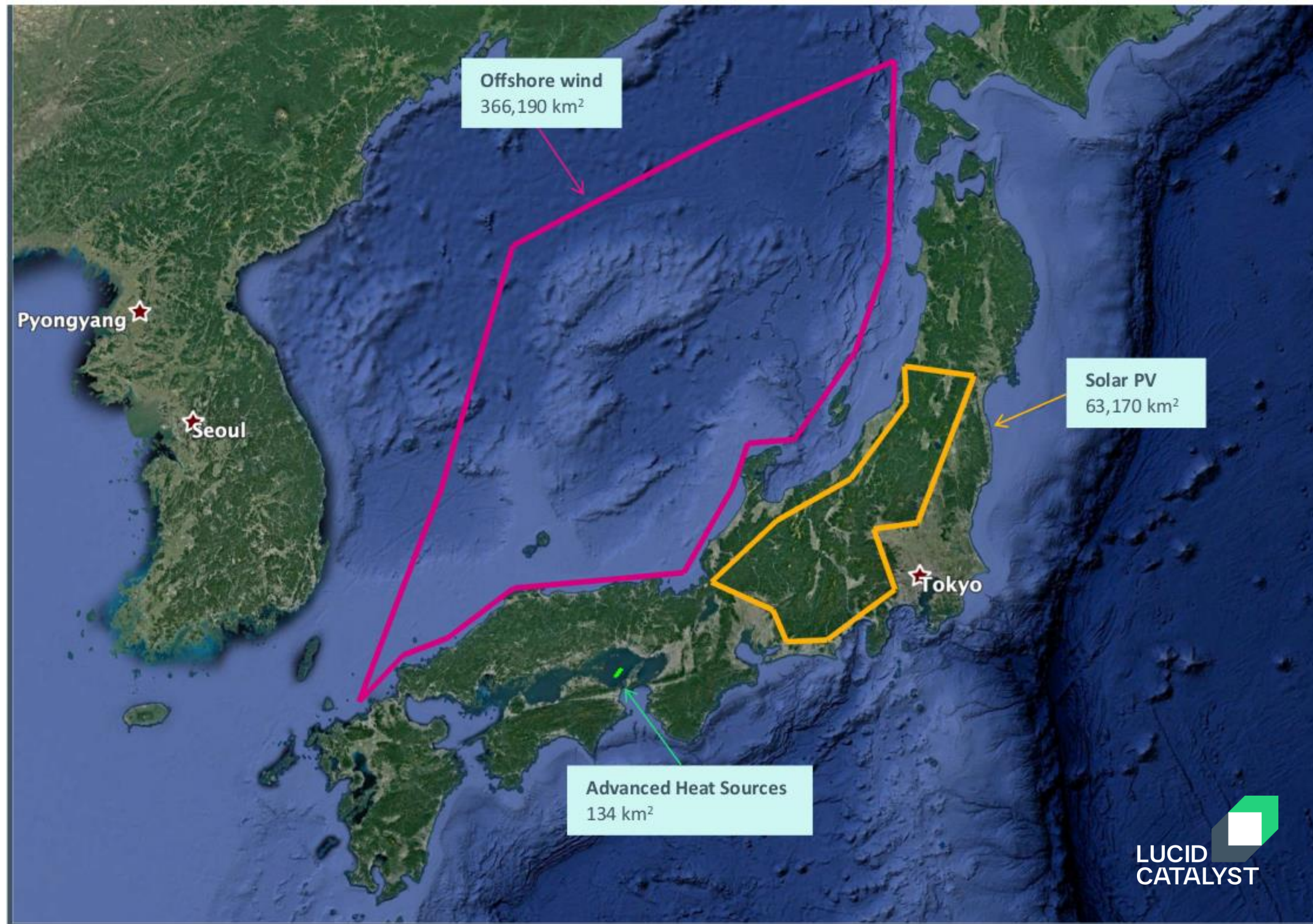
Land Area Requirements for Meeting Current UK Oil Consumption from Hydrogen



Each colored outline represents the total area that would be required for the siting of each type of resource if it were to be the only one used to generate enough hydrogen to replace current oil consumption in the UK.

Comparing area required to replace the UK's current oil consumption with hydrogen generated from either wind, solar, or advanced heat sources

Land Area Requirements for Meeting Japan's Current Oil Consumption from Hydrogen

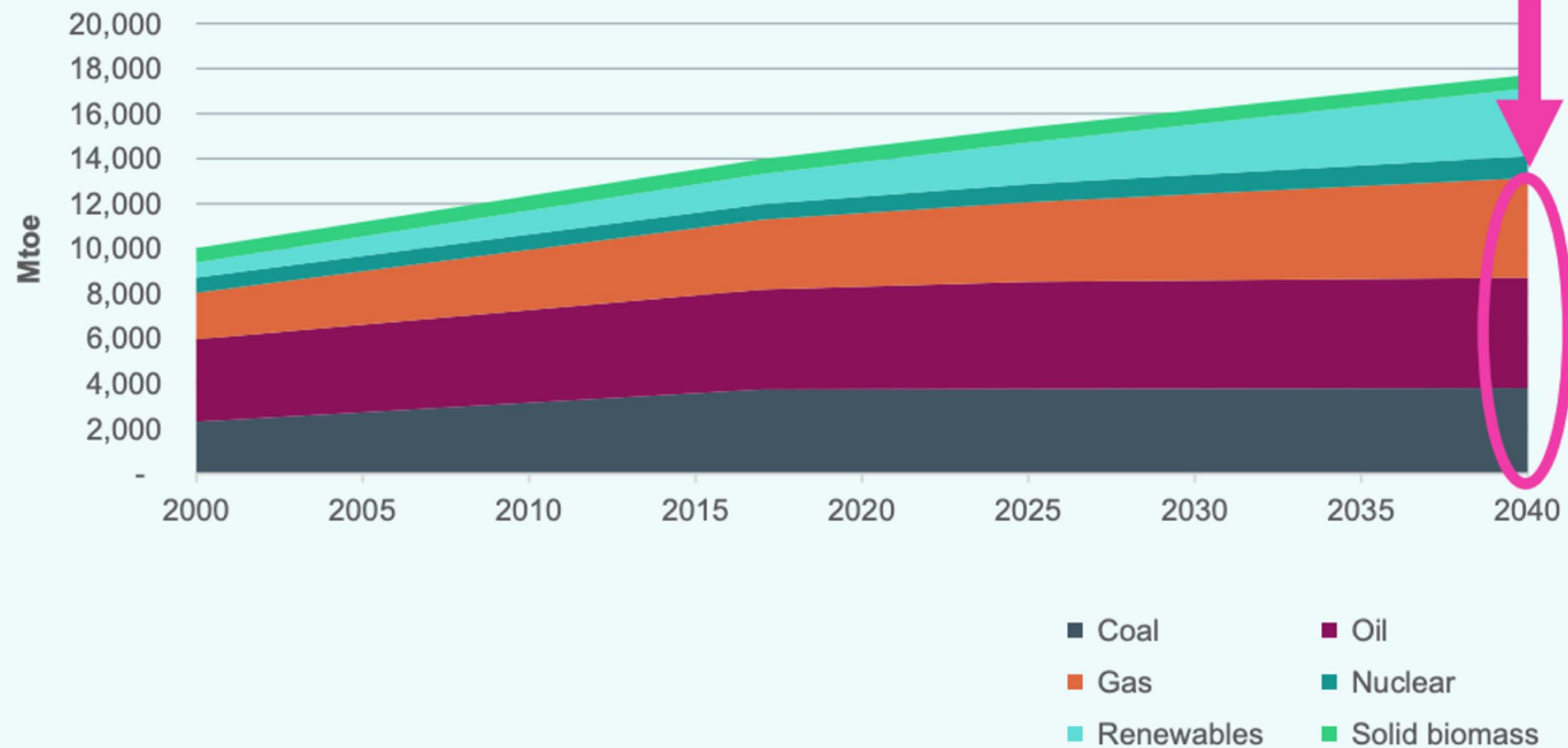


Comparing area required to replace Japan's current oil consumption with hydrogen generated from either wind, solar, or advanced heat sources



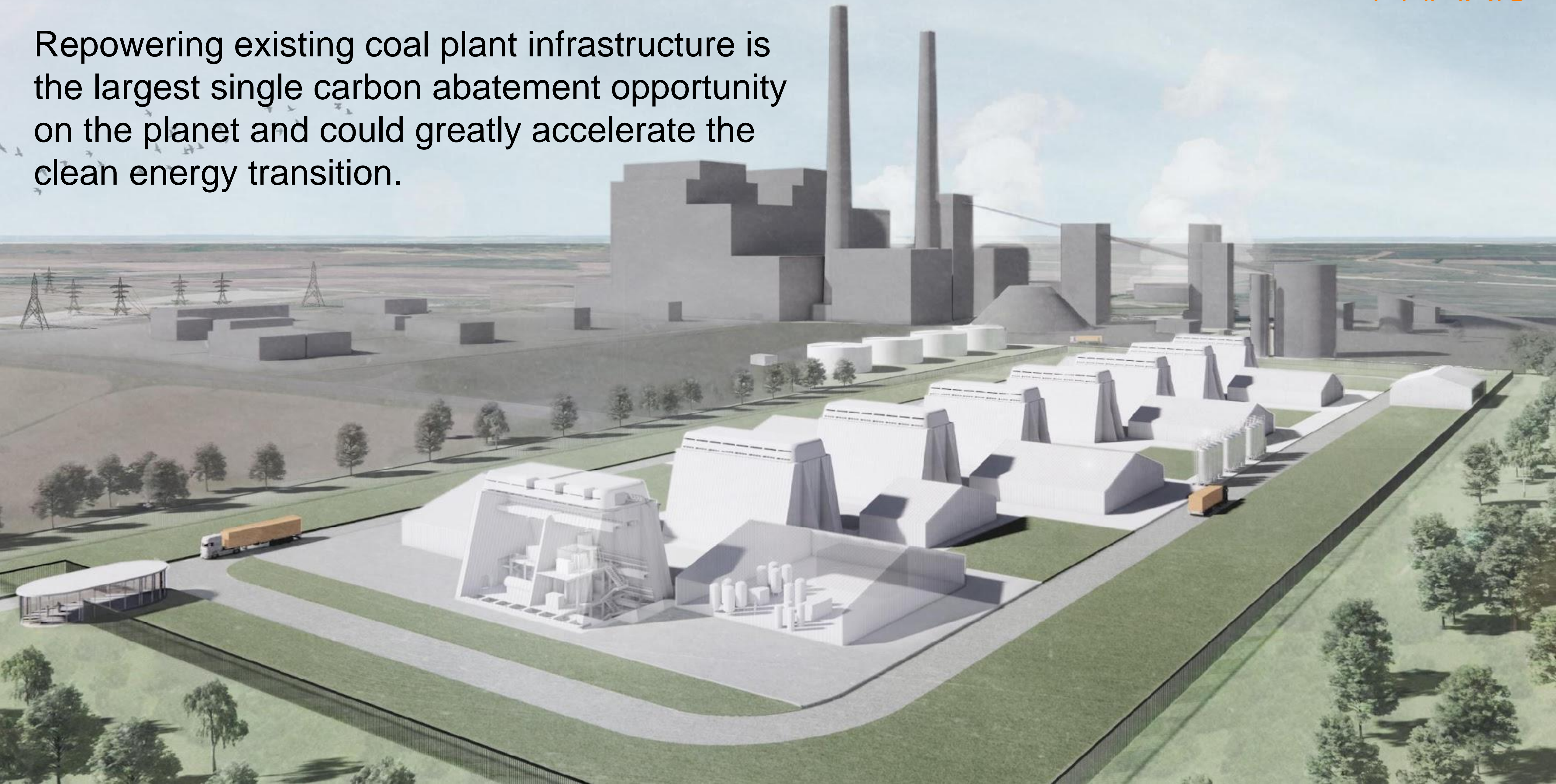
Designing for the Terawatt Transitions

Scalable models targeting the toughest-to-decarbonize sectors



THE VISION

Repowering existing coal plant infrastructure is the largest single carbon abatement opportunity on the planet and could greatly accelerate the clean energy transition.



Refinery-Scale Hydrogen/Synfuel Gigafactory



Shipyards Construction of a Power, Fuels and Desalination Plant



Modular blocks are added to an FPSO under construction in a dry dock.

Conclusion: Cost, Cost, Cost

Nu source of primary energy





ENERGY INNOVATION FOR
A PROSPEROUS PLANET