

NRIC Tech Talk:

Maritime

- Nuclear power was first developed for use by the U.S. Navy at sea. Today, advanced reactors provide the opportunity to use nuclear power in a broad range of commercial applications within the maritime industry.
- Maritime professionals and advanced reactor vendors will learn more about each other's industries: both the market opportunities for advanced reactors and the technical progress being made by reactor vendors.

How to Participate

- For the best experience, we recommend turning off VPN connections.
- Submit any questions you might have by typing the question into the Q&A section. We will address them at the end.
- If you have any technical problems, please put them in the Q&A.
- If you have programmatic questions, email us at NRIC@inl.gov.
- This event is being recorded and will be posted on the NRIC website. Your attendance is consent to that recording.

NRIC is a DOE-NE center, launched in FY2020

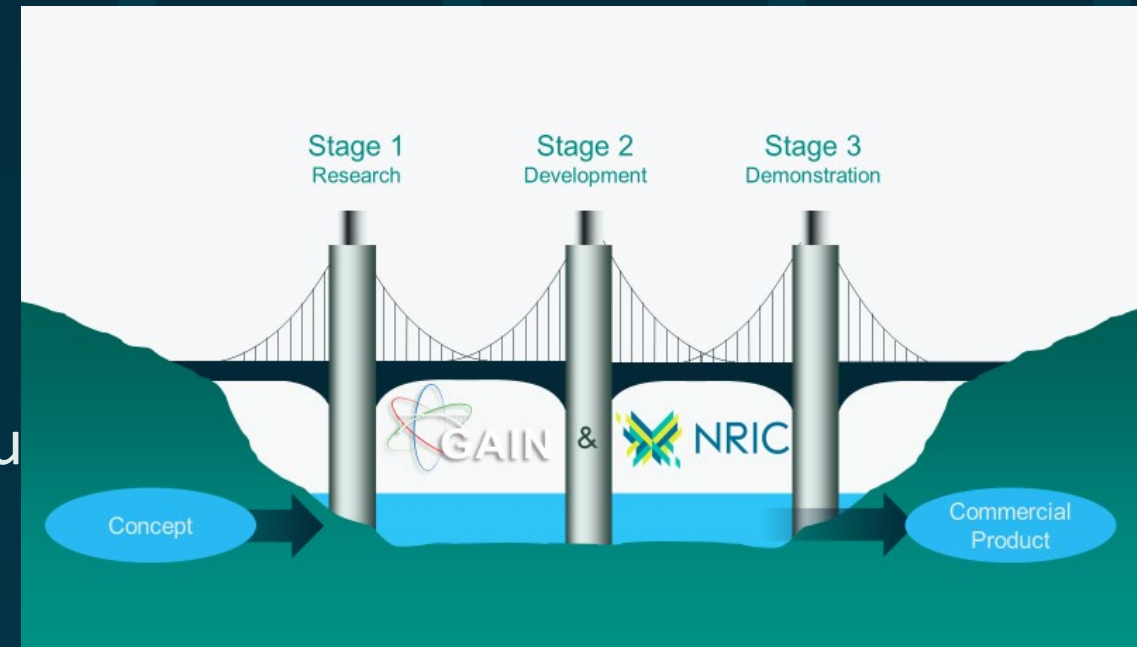


NRIC

National
Reactor
Innovation
Center

NRIC Accelerates Nuclear Reactor Demonstrations

- Authorized by the Nuclear Energy Innovation Capabilities Act (NEICA)
- Partner with industry to bridge the gap between research and commercial deployment
- Leverage national lab expertise and infrastructure
- Manage demonstrations to success



NRIC Vision



Commercial Advanced Nuclear by 2030

inspire

empower

deliver



NRIC

NRIC is partnering regionally and nationally to support demonstrations



Speakers



River Bennett

Graduate Researcher, National Reactor
Innovation Center



Meg Dowling

Nuclear Programs Lead Engineer,
American Bureau of Shipping



Arunava Sengupta

Managing Director, Anglo-Eastern
Technical Services



Ioannis Kourasis

Nuclear Engineer, COREPOWER

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Classification for Nuclear Maritime Applications

NRIC Tech Talk

Meg Dowling | February 23rd, 2023



Introduction

American Bureau of Shipping (ABS)

- Classification Society
- Global Offices
- 5,000+ Worldwide Personnel

The ABS Mission:

To serve the public interest as well as the needs of our members and clients by promoting the security of life and property, and preserving the natural environment.



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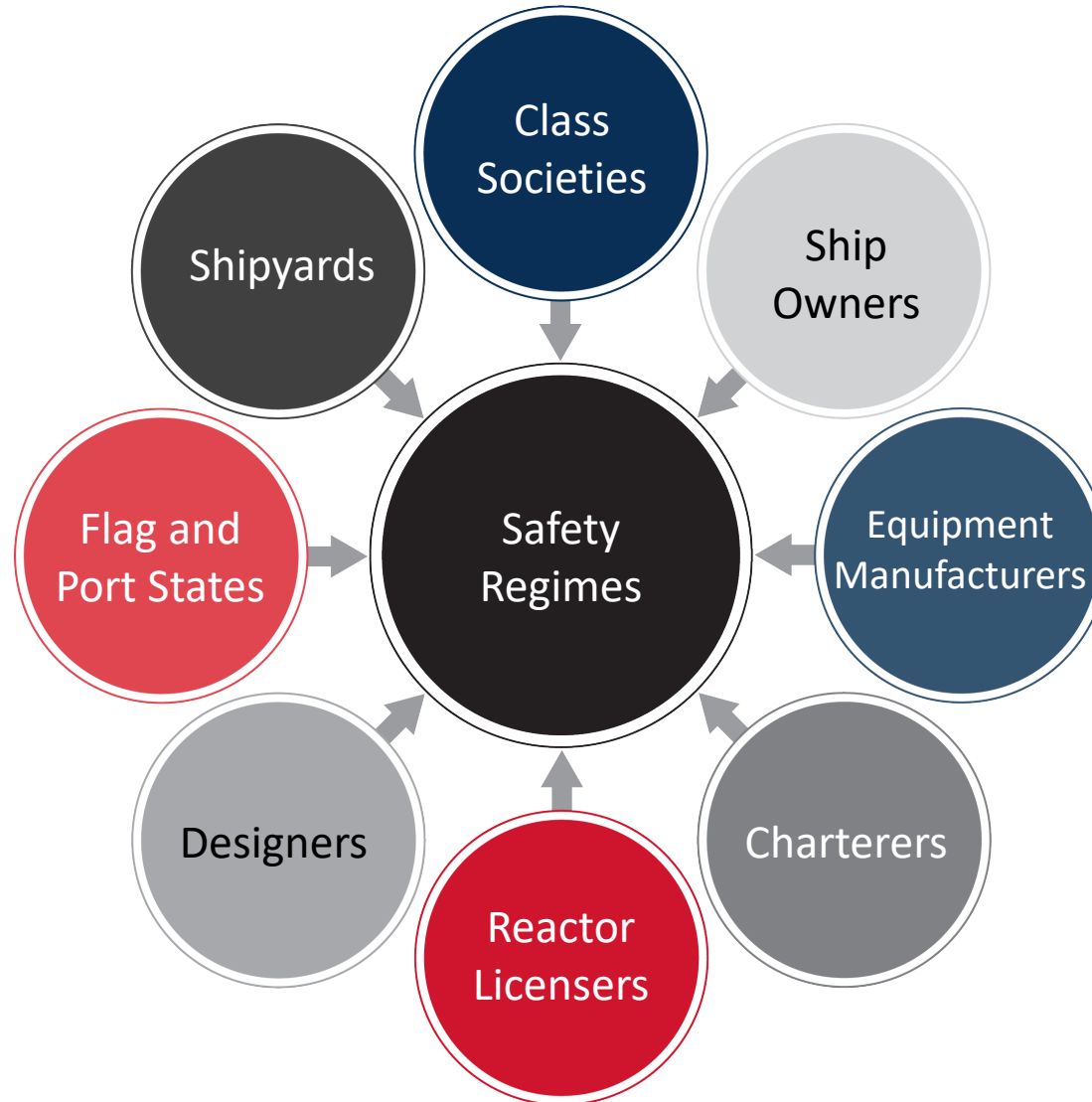
Technology Engineer,
Nuclear Programs

American Bureau of
Shipping

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What is Classification?



ABS and Nuclear Power



History & Experience

NS (Nuclear Ship) Savannah, enroute to the World's Fair in Seattle, 1962

- ABS Class



ABS Supporting Services

- Advisory / Publications
- New Technology Qualifications
- Concept & Feasibility Studies
- ABS Group Consulting



Industry & Academic Partners

Engaged in research and development solutions

- Government Agencies
- Standards Associations
- Scientific Institutes
- Universities

Project Announcement

Office of Nuclear Energy

DOE Awards \$8.5 Million to Advance Promising Nuclear Technologies

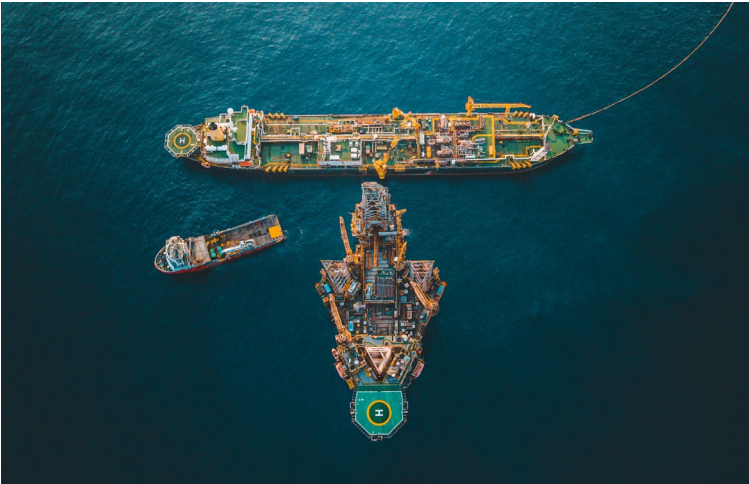
NOVEMBER 18, 2021

Accelerating Commercial Maritime Demonstration Projects for Advanced Nuclear Reactor Technologies -

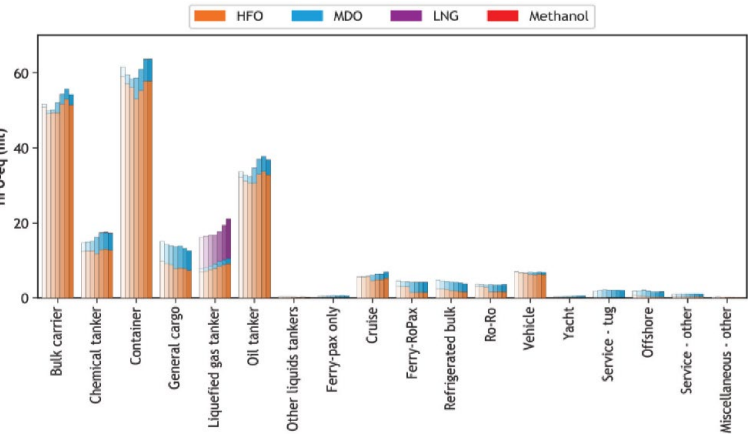
American Bureau of Shipping (Spring, TX) will focus on addressing hurdles in the maritime domain so that new reactor technology can be rapidly deployed for commercial applications. Advanced nuclear technology is well-positioned to be one of the strongest tools available to help the industry achieve its aggressive decarbonization goals.

Total Award Value: \$793,999

Nuclear – Maritime Use Cases

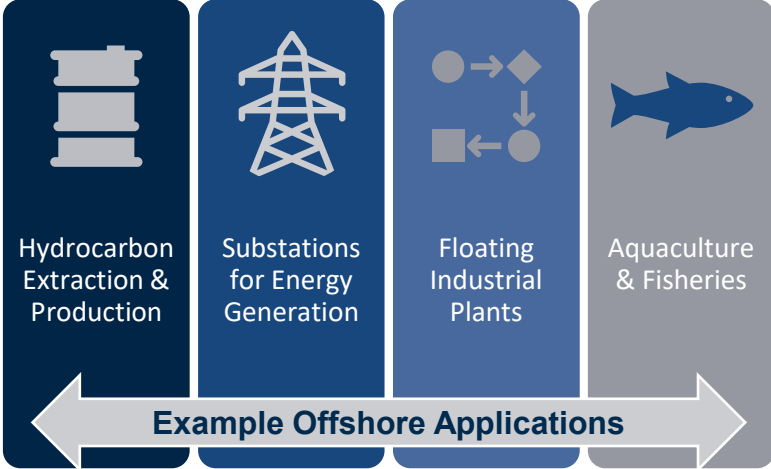


Vessel Propulsion



Source: Forth IMO GHG Study, 2020

Offshore Industry



Coastal and Other Support



Thank You

www.eagle.org



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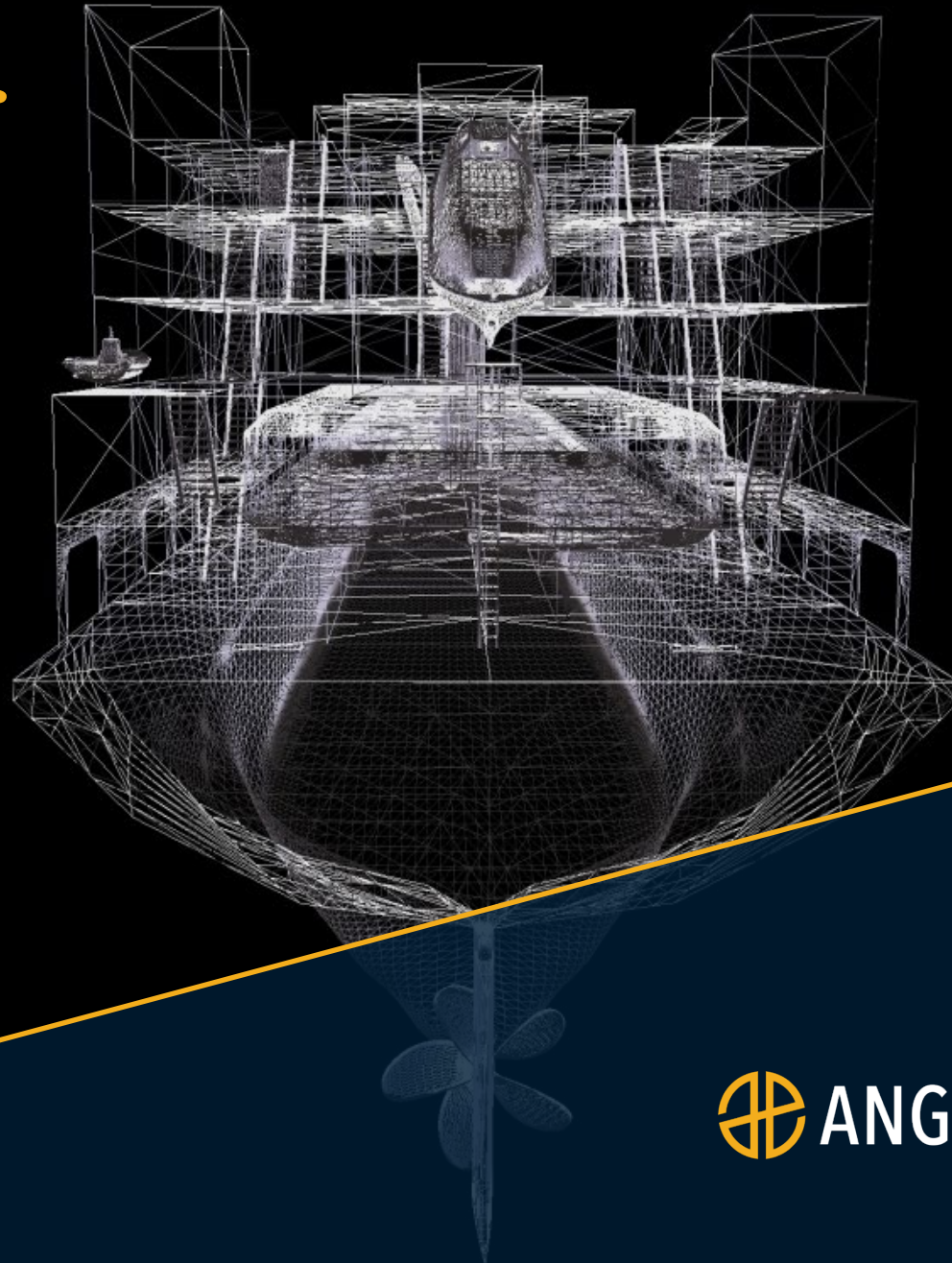
Managing Director, Anglo-Eastern
Technical Services



Ioannis Kourasis

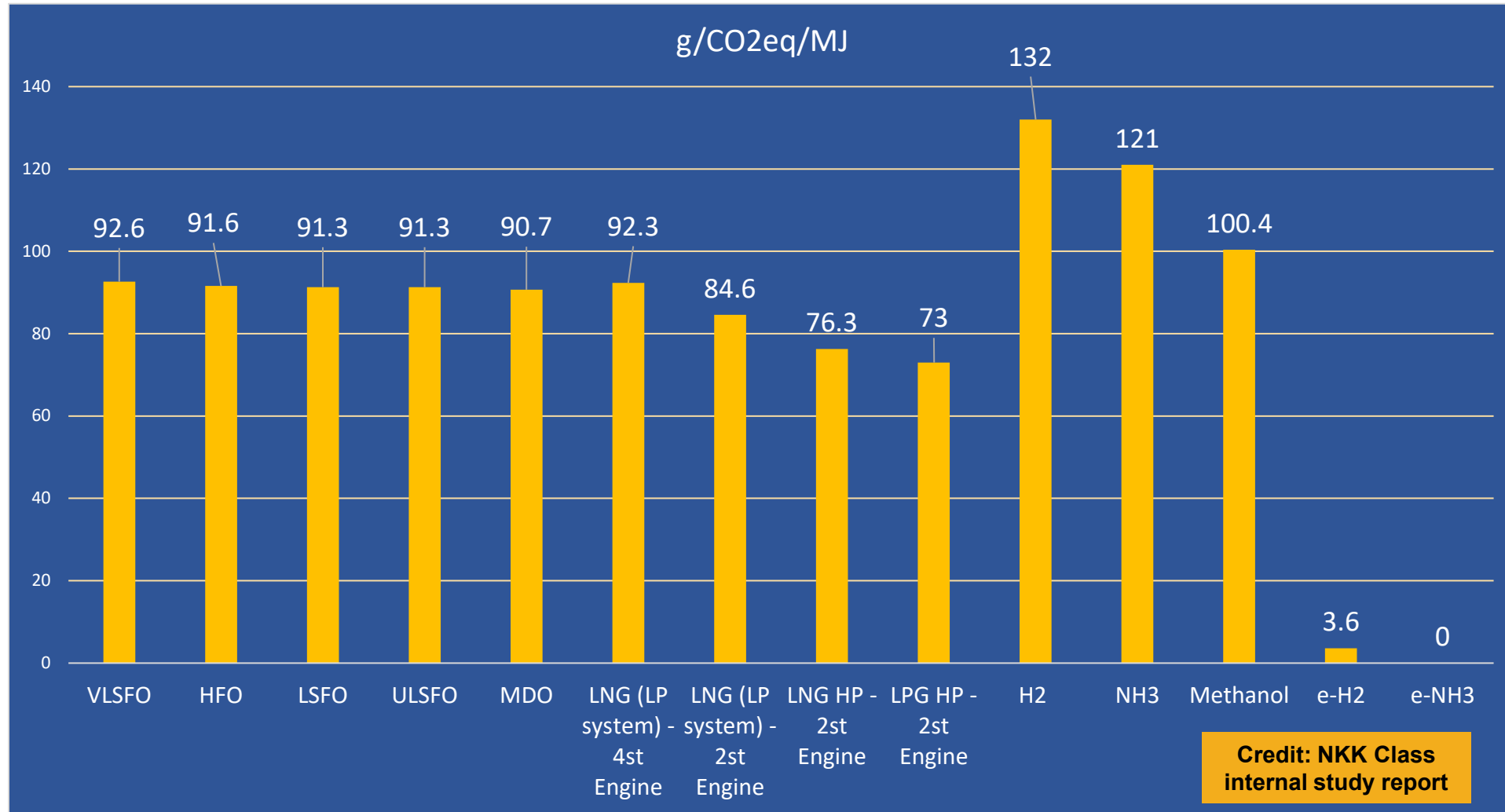
Nuclear Engineer, COREPOWER

AETS

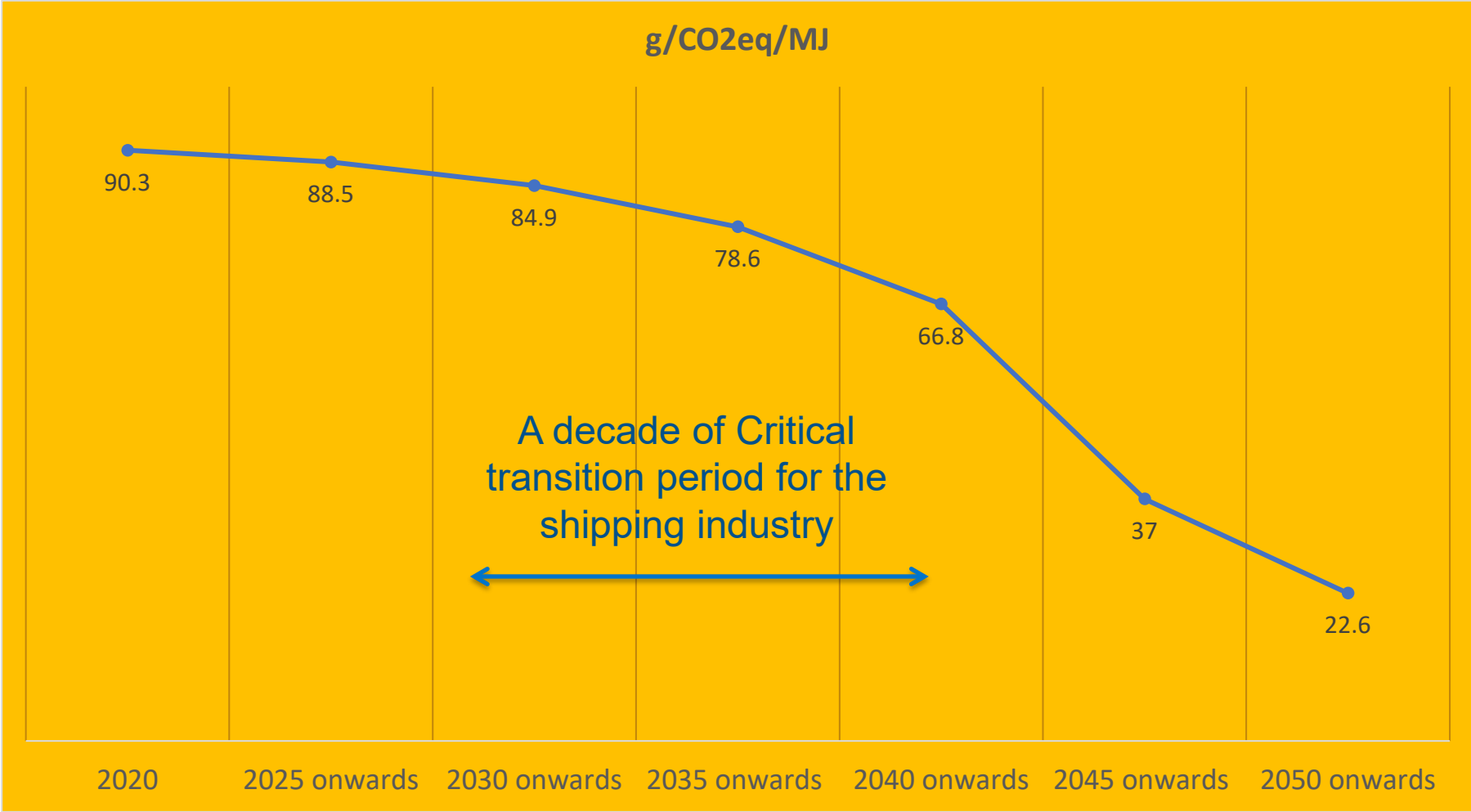


 ANGLO-EASTERN ERN

GHG (Well to wake) emission for known fuels

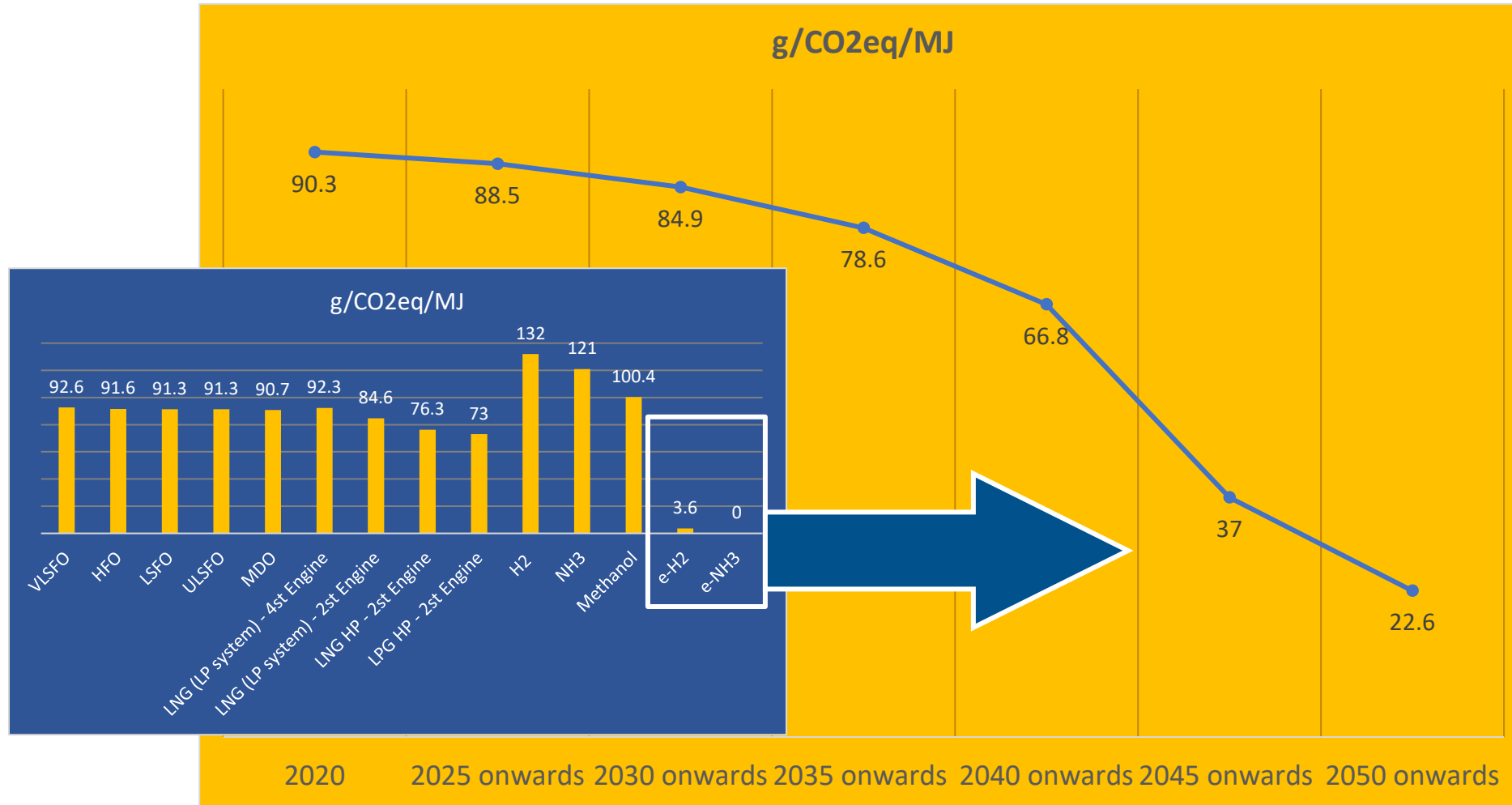


Projected Regulatory GHG emission reduction requirements (Well to wake outlook)





Risk of known fuels not complying with future Regulatory Requirements beyond 2038



SHIP DESIGN ENSURING FUTURE COMPATIBILITY



SHIP LIFECYCLE



20 YEARS

TRADING 2045

ANY SHIP under construction today must be



SYNTHETIC DIESEL

eMethanol

CARBON CAPTURE

e-ammonia

AMMONIA DUAL FUEL SHIP DESIGNS ensure ZERO CARGO VOLUME LOSS

Zero cargo volume loss
Zero venting of ammonia

LR & ABS

LOWEST EMISSION FOOTPRINT





Sustainable?



Are alternative fuels sustainable?



Availability of sustainable energy source to produce green fuel for 60,000 ships on water?



Can we reach Net Zero by just by switching to alternative fuel?



Nuclear the easy pathway

We have ship designs; we have ships under construction, and we will have the engines to propel these ships on clean fuel before the turn of this decade.

But will clean fuel be available to run these engines???

Clean Energy = Nuclear
Energy to produce green fuel



**Anglo-Eastern
Technical Services
Ltd.**

Thank You

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Ioannis Kourasis

Nuclear Engineer, COREPOWER



Enhanced national security • Global technology leadership • True-zero emission power

Advanced Nuclear Applications at Sea



Ioannis Kourasis Nuclear Engineer

23st February 2023

Confidential and Proprietary



CORE POWER

Co-develop and finance advanced reactors for marine industrial applications

Create new markets for competitive & sustainable 'true-zero emission' power

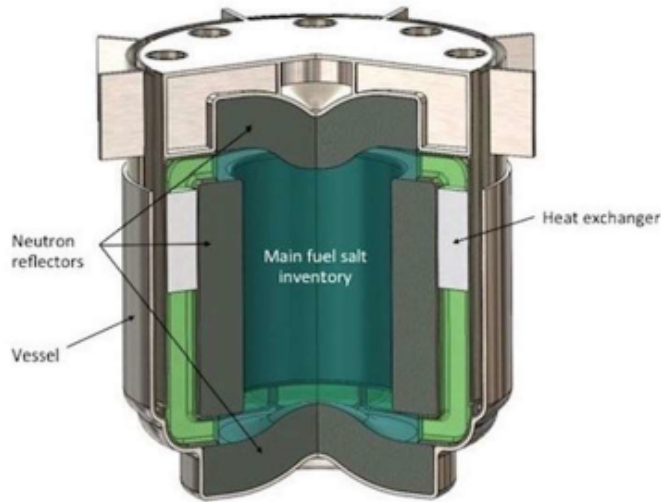
Engineer the nuclear electric "power package"

Lead modernization of marine and nuclear regulations

Build quality training and management systems

3 Key criteria for marine applications

Acceptance of advanced nuclear in a maritime environment, means:



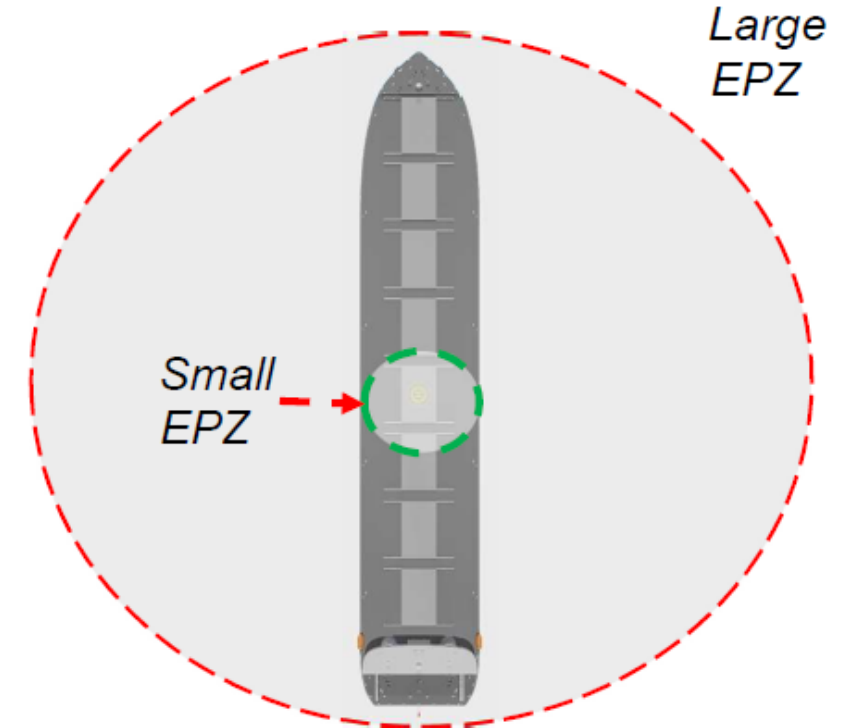
Exceptional fuel efficiency of 'new nuclear'

= Long fuel cycle



Manufacturing, modular design and construction

= Affordable, mass assembled product



Ambient or unpressurized core

= Small 'Emergency Planning Zone' (EPZ)

Molten Chloride Fast Reactor - MCFR

30 - 180 MWt Demo

Power ≤ 300 MWe Mid Scale

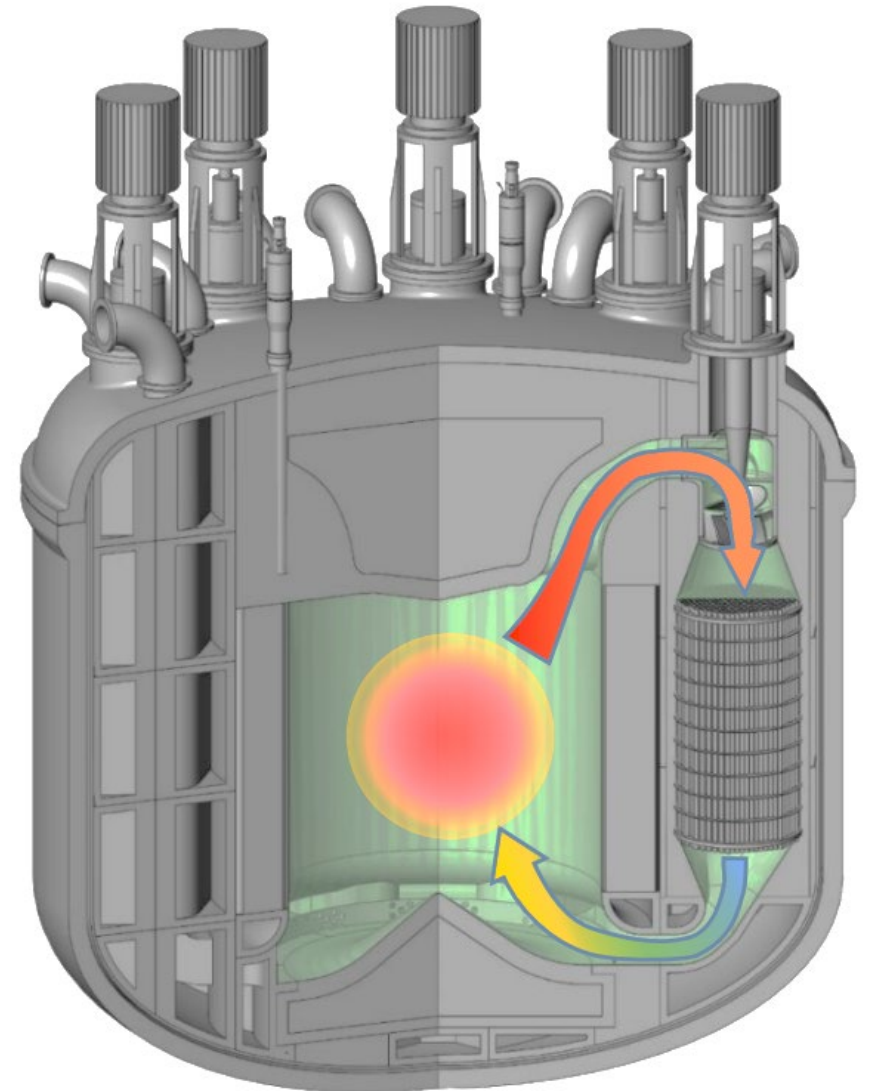
≤ 1.2 GWe Grid Scale

Fuel Salt NaCl - UCl₃

Temperature 450° - 650°+ C

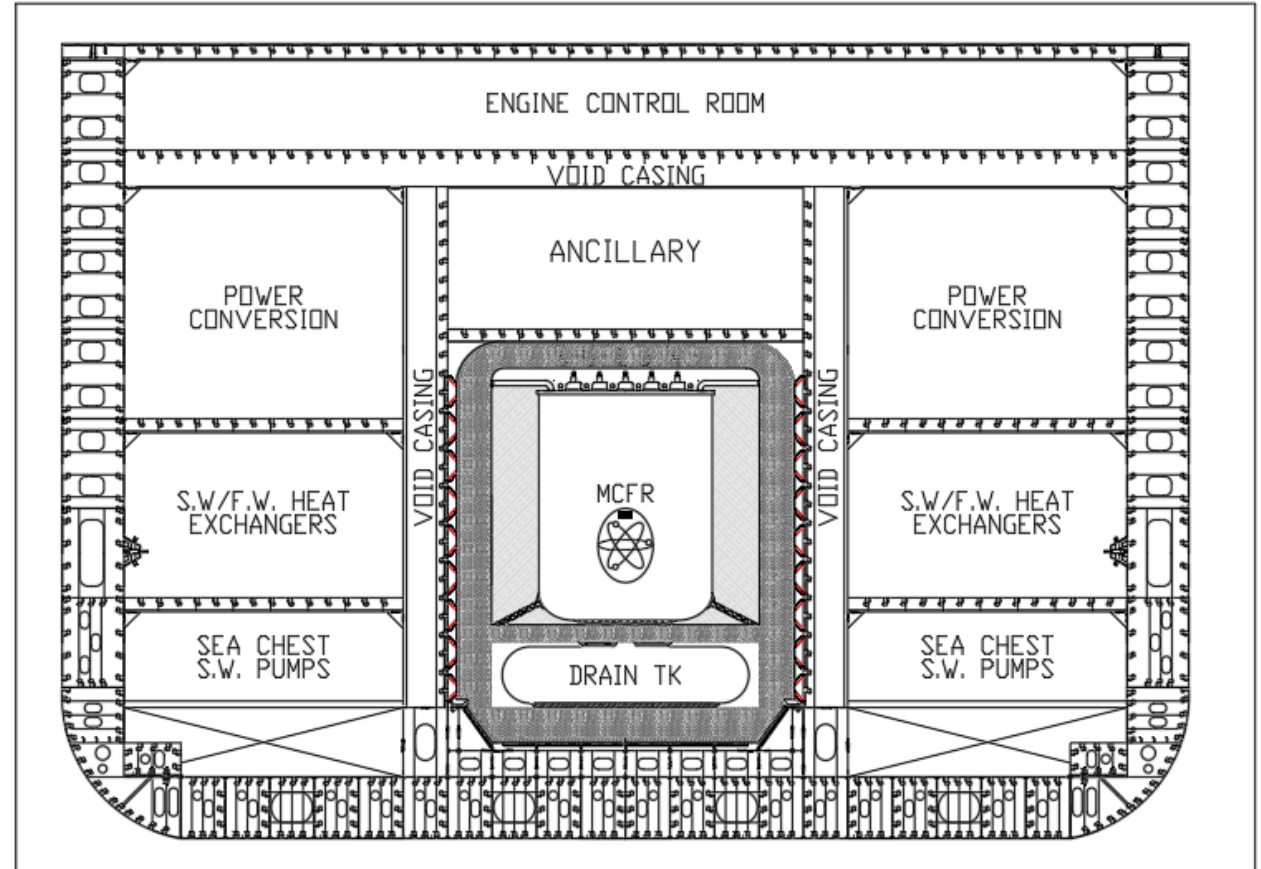
Energy Spectrum Fast

Operating Pressure ~0.1 MPa



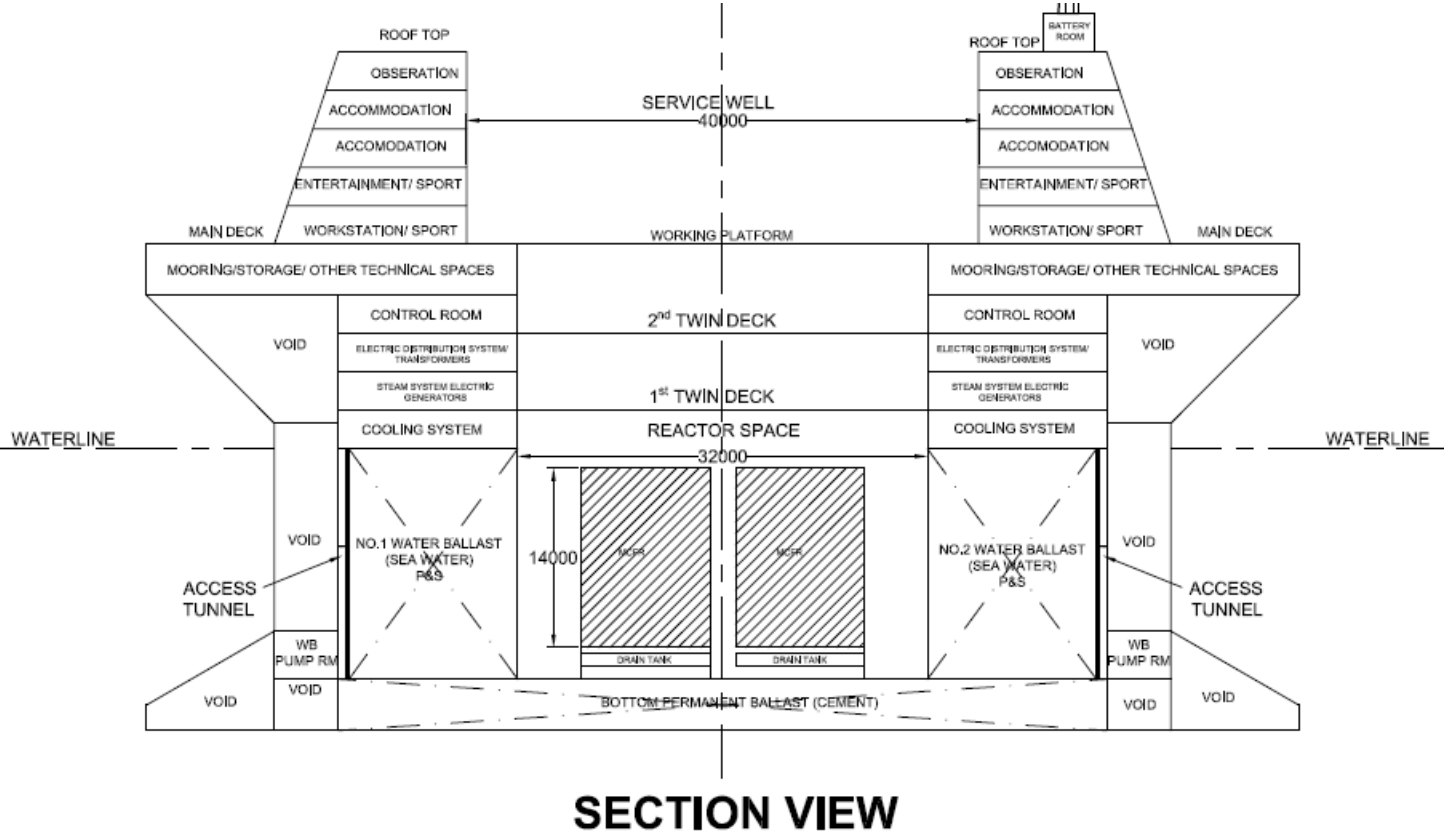
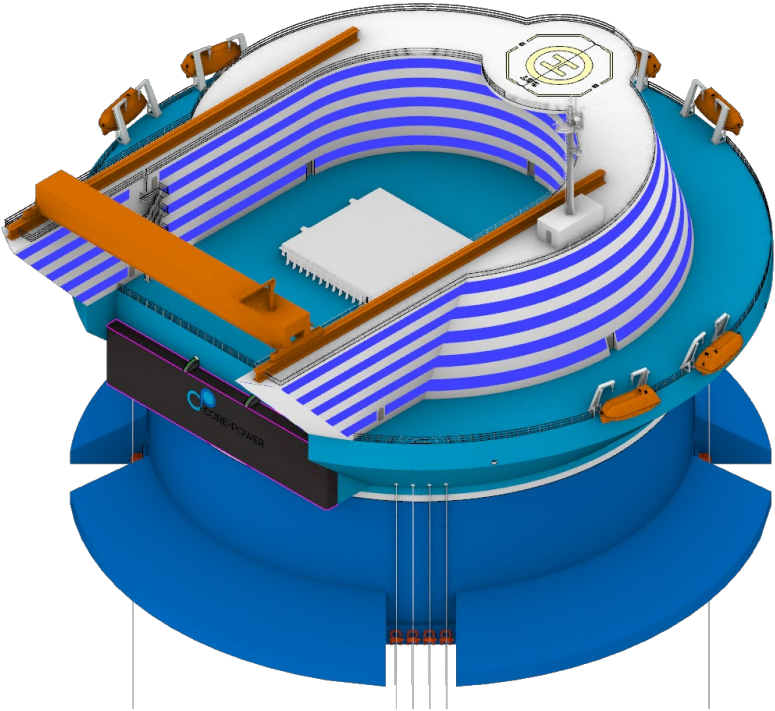
Application: Nuclear - Electric Ships

- 390K DW VLOC
- Zero emissions
- Zero stops for refueling
- Speed ≤ 20 knots



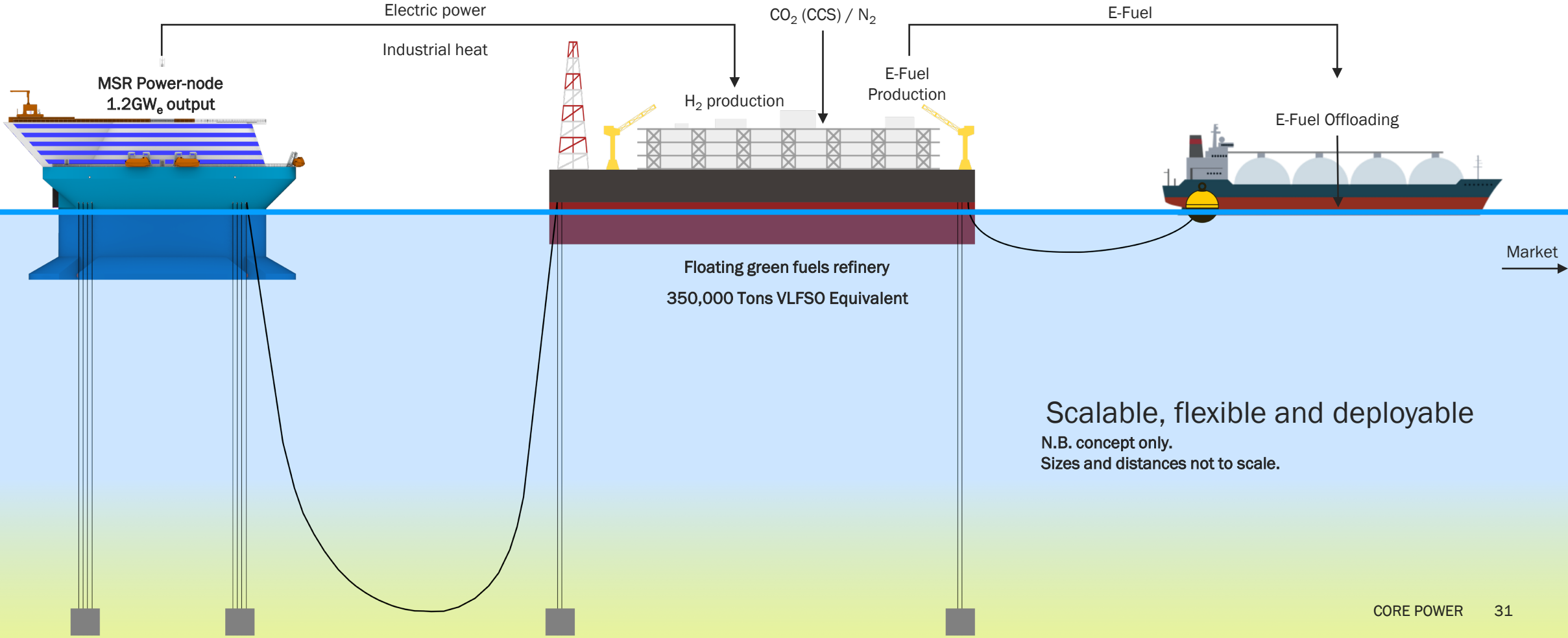
Application: Floating Power Plants

- 1.2 GWe Offshore Platform
- Cheaper and Safer than Land NPP
- Mobile and Flexible energy source



The Core Power Solution

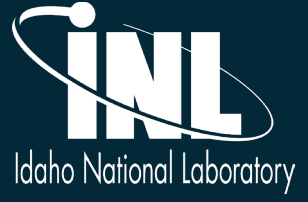
Integrated power, production, and delivery system with true-zero emissions







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Idaho National Laboratory

Questions?