

Decarbonization Research Consortium

WELCOME

9 March 2023

nps.edu/decarb



Decarbonization Research Consortium Meeting
9 March 2023 / 3-5:30 ET / 12 – 2:30 PT
Agenda

- 3:00 – 3:05 Welcome/Updates
- 3:05 – 3:15 Briefing: Siemens
- 3:15 – 3:45 Collaborative Work/Proposals Discussion
- 3:45 – 4:45 Discussion of Navy-Specific Issues Relevant to Research
- 4:45 – 5:15 Research Roadmap
- 5:15 – 5:30 Admin/Conclusion

Events of Interest

[The Journey to Net Zero \(Webinar Series\)](#)

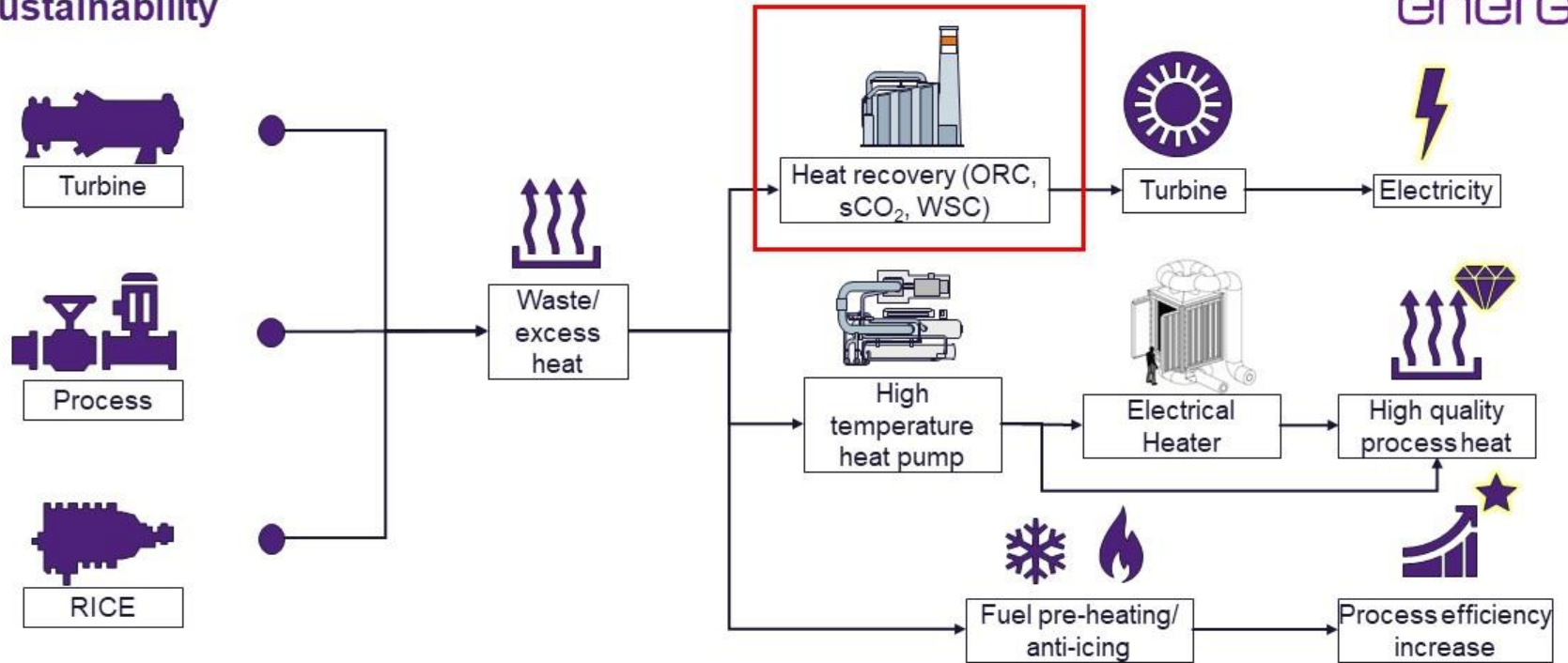
BMT / Seawork Webinar Series

- **Vessel Integration**
4 April 2023 / 10 – 11 am GMT / 5 – 6 am ET / 2 – 3 am PT
- **New Emission Regulation & Guidance**
11 May 2023 / 10 – 11 am GMT / 5 – 6 am ET / 2 – 3 am PT
- **Underwater Radiated Noise: An Unheard Emission**
6 June 2023 / 10 – 11 am GMT / 5 – 6 am ET / 2 – 3 am PT

[Alaska Sustainable Energy Conference Pre-Events](#)

- **Carbon Capture and Sequestration: The Myth and the Reality**
11 – 12 April 2023 / Virtual
- **Energy Storage: Beyond Lithium-Ion Batteries**
9 – 10 May 2023 / Virtual

Waste Heat Recovery for Improved Efficiency and Environmental Sustainability



ORC – Organic Rankine Cycle; sCO₂ – Supercritical carbon dioxide; WSC – Water Steam Cycle; RICE: Reciprocating Internal Combustion Engine
 1) derived from Bianchi et al., Estimating the waste heat recovery in the European Union Industry; 2019

2023-02-24

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Active Technology Development



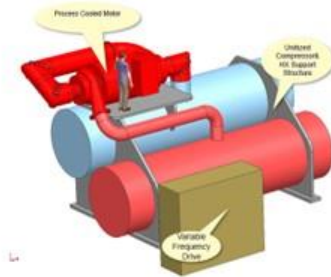
Carbon Capture

- Direct Air Capture
- Point of Combustion Capture



Heat Pumps

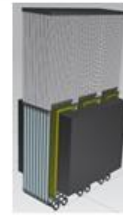
- Low temperature
- High Temperature
- High Power Density
- Hermetic



Enabling SE Technologies

- Electric Heaters: in-house
- HPD motors/generators: in-house
- Electrolyzers: partnership
- E-Fuels : partnership

SE Vision: Local/off-shore Fuel Production



E-heater →
steam/water



DAC →
CO₂



Electrolyzer
→ H₂

Electric
Reformer



Fischer-Tropsch
Reactor



- ❖ Diesel
- ❖ Jet
- ❖ Gasoline

Collaborative Work/Proposals Discussion

Broad Agency Announcement (BAA) available at:

<https://www.nre.navy.mil/work-with-us/funding-opportunities/fy23-long-range-broad-agency-announcement-baa-navy-and-marine>

White Paper & Proposal guidance/templates/forms available at:

<https://www.nre.navy.mil/work-with-us/how-to-apply/submit-contract-proposal>

Individual meetings – Week of 13 March

Doodle Poll at:

<https://doodle.com/meeting/participate/id/b46NLlke>



Platform Decarbonization Focus Areas

- 24 Feb Proposed – Old

- 1) Technology

- 1) Direct drag reduction
- 2) Propulsive loss reduction
- 3) Propulsion and power generation
- 4) Electrical energy storage
- 5) Waste heat recovery
- 6) Renewable energy

- 2) Operations

- 3) Fuels

- Current Proposed – New

- 1) Technology

- 1) Propulsive efficiency improvements and direct drag reduction
- 2) Propulsion and power generation
- 3) Electrification
- 4) Thermal management and materials
- 5) Shipboard carbon capture

- 2) Operations

- 3) Fuels

- 4) Whole ship and system level design considerations

- 5) Ship integration and technology scaling for shipboard use

- 6) Modeling, test sites and demonstration capability

Navy Specific Constraints/Considerations

Some aspects of the Navy unique mission(s) to keep in mind

- Navy platforms operate:
 - Forward presence
 - Contested logistics
 - Replenishment at sea
- Navy platforms are:
 - Space constrained
 - Often/Sometimes power constrained
 - Operated by 18-19 year old sailors
 - Long-lived \$1B+ assets

Some other Consortium considerations

- Short-, Mid- and Long-Term Horizons
- Retro-fit versus new build
- Not just an economic decision
- Potential future force structure – UxVs
- “Collaborate with the past”

Platform Decarbonization Roadmap Outline

- 1) Clear Mission Statement and Purpose**
- 2) Navy Specific Considerations and Constraints**
- 3) Alignment with Other Decarbonization Efforts**
 - Overview of USG/DoD/Navy decarbonization efforts and select relevant commercial/international efforts
 - Define timelines and targets
 - Scope of this effort, including identified gaps, relative to other efforts
- 4) Platform Decarbonization Focus Areas**
 - Develop timeline and roadmap for each, tied to specific areas of research needs, with milestones as applicable
- 5) Summary Integrated Roadmap**

Decarbonization Research Consortium

Path Forward

March 24, 2 – 5 pm ET: Hybrid

In-person RSVP by 17 March to Kristen

Individual Meetings next week

Doodle Poll: <https://doodle.com/meeting/participate/id/b46NLIke>

April Meetings:

April 13, Noon – 2:30 pm ET: Virtual (possibly in-person at Stanford)

April 24, 11 am – 1:30 pm ET: Virtual

May: Development of Draft Roadmap

