

## Developing a Biogas-Supplemented Hybrid Heat Pump System to transition National Register of Historic Places Properties away from Oil-Fired Steam Boiler Systems; ProjectQRSargasso, Inc.

### Background:

- Conventional heat pumps offer many U.S. consumer segments a cheaper alternative to fossil fuel boilers as they increase heat efficiency and use thermal and pressure-based gradients to heat buildings.
- Majority of conventional heat pumps (ASHPs, Ductless Mini-Split, Geothermal) require drilling and extensive installation processes.
- Buildings on the NRHP registry cannot undergo drilling, as per Section 14.09, Article 426.1(e) of NYS Historic Preservation Act of 1980.

### Concept/Solution:

- Manufacture a hybrid heat pump system capable of being driven by combustion of biomethane, modularly supplied to avoid need for ducts.
- Utilize biomethane from the bioprocessing of sargassum, bio-based algal feedstock vetted as an S.A.F. precursor in FY'22 D.O.E. BETO: "SWAG"
- Utilize biogas-supplemented hybrid heat pump system as novel baseline, with original oil-fired steam boiler system as back-up

### Scope:

- Integrate **adsorption heat pump + gas furnace** system to develop hybrid heat pump system for Historically Black Church project site.
- Conduct construction management and risk mitigation for project site
- Iterate ProjectQRSargasso's proprietary biomass-to-biogas process for hybrid heat pump gas furnace use
- Benchmark performance of hybrid heat pump system alongside established D.O.E. technology, i.e. 10 kW PEM fuel cell

### Benefits:

- This project will decrease energy burden, increase energy parity in clean energy tech access, and fulfill energy resiliency for Disadvantaged Census Tract #36083051500.
- There exist more than 95,000 properties on NRHP's registry
- Many of these facilities use pre-war energy infrastructure or fossil fuel systems that precede even pre-war architecture.
- Working through this project helps prevent these facilities from being left behind by the energy transition mandates, starting with Wilborn Temple First Church of Christ in God.
- The utilization of sargassum algal feedstock as the source for biomethane to power heat pumps constitutes a new **decarbonized** energy pathway for NRHP properties.

