
De-Carbonizing the Campus: Planning, Tools & Technologies
CampusEnergy2023
February 27 – March 2, 2023
Gaylord Texan Resort & Convention Center | Grapevine, Texas
INTERNATIONAL
DISTRICT ENERGY
ASSOCIATION

De-carbonizing Campus with Grants and Steam as a Service

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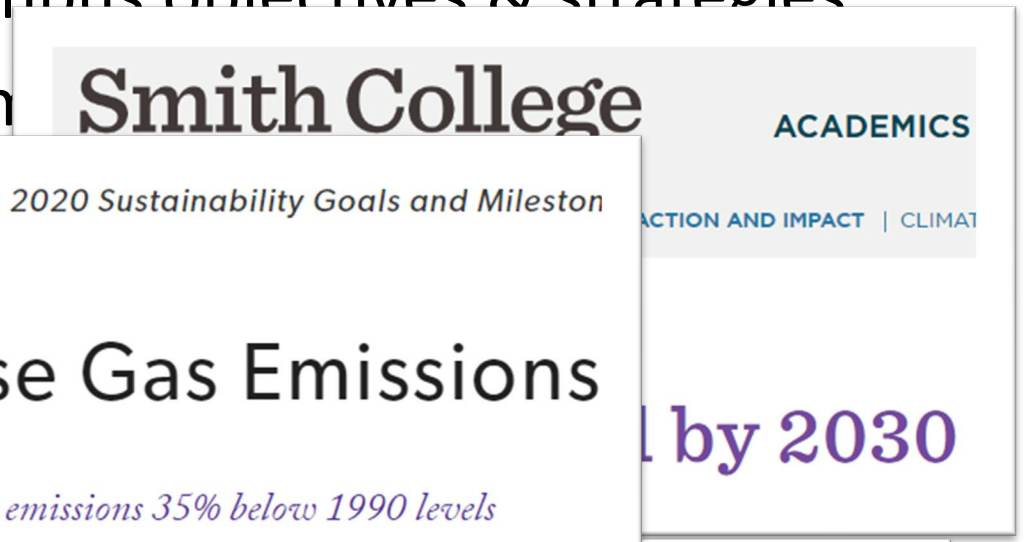
HYDROGEN TECHNOLOGIES

INTERNATIONAL DISTRICT ENERGY ASSOCIATION

Decarbonizing Campus Projects

- Competitive capital allocation across campus objectives & strategies
- Expensive projects among scarce investn
- Capital?
  - Loan
  - Endowment draw
  - State Legislative Funding
  - Operational funds



Campus Decarbonization Technologies

Thermal

- CHP (Biodiesel, Digesters, Hydrogen, Carbon Capture)
- Heating (Geo, Electric, Hydrogen Waste Heat, Solar Therm, Thermal Storage)

Transportation

- Battery Buses
- Hydrogen Buses
- Compressed Nat Gas Buses
- Biodiesel Buses

Electrification

- Wind
- Solar PV
- Hydrogen turbine
- Battery Storage
- Conservation, energy efficiencies

US Grants

- List grants in US from 2023
  - DE-FOA-0002788: Topic 1: Heating, Ventilation, AC & W
  - EPA: Pollution Prevention Grant Program
  - EPA: Source Reduction Assistance Grant Program
  - EPA: Research Program for College and Universities Req
  - IRA: ITC for solar PV, wind, geo, battery
  - IRA: PTC for hydrogen
  - DE-FOA-0002893: Mobility System Approaches Supportir
  - EPA: National Diesel Emission Reduction Act (DERA)
  - DOT: Rebuilding American Infrastructure with Sustainability & Equity (RAISE)

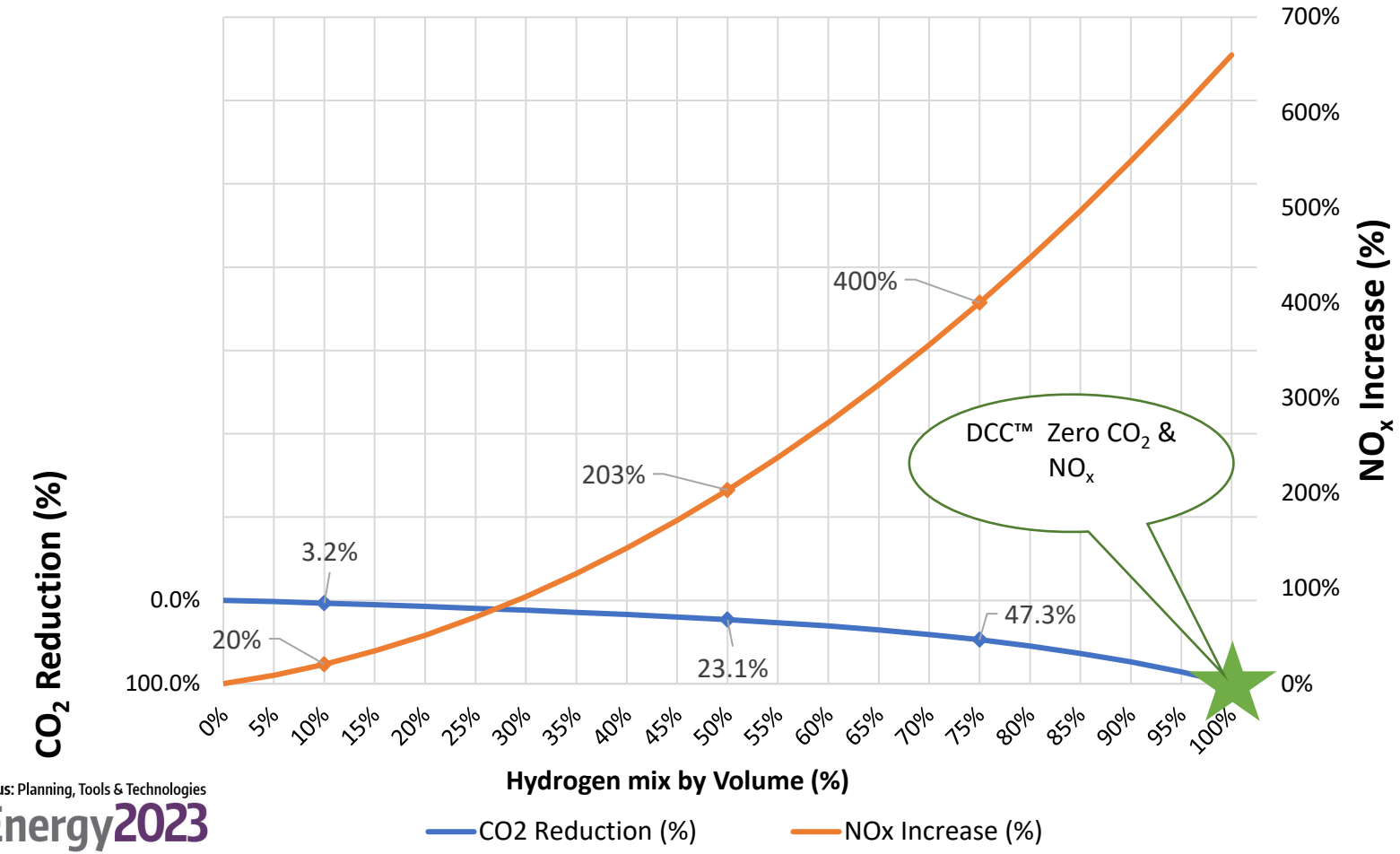
University of Birmingham
Mount San Antonio College
University of IL Champaign-Urbana
University of CA Irvine
Cal Poly Pomona U
Ohio State University
Penn State University
University of Delaware
University of South Carolina
Georgetown University
University of Queensland
University of Texas Austin
University of Queensland
Georgetown University

Hydrogen for Heat Decarbonization

1. Hydrogen blending: mixed into existing natural gas boilers
2. Hydrogen boiler using atmospheric air as oxygen source
3. Hydrogen boiler using pure hydrogen & oxygen

Emissions: Blending

Relationship between CO_2 & NO_x
when blending Hydrogen & Natural Gas



Cellek, M., Pinarbasi A. (May 2017). Investigations on performance & emission characteristics of an industrial low swirl burner while burning natural gas, methan,e hydrogen-enriched natural gas and hydrogen as fuel. Yildiz Technical University, Istanbul Turkey

DCC™ Boiler Advantages

- No CO_2, NO_x, SO_x, PM_x or other pollutants created nor emitted
- Immediate GHG emissions reduction solution
- No forced draft or induction fans (purchase, operate, maintain, noise)
- No carbon tax liability, possible carbon credit revenue
- No Flue, no flue gases
- Modular, bolt together and flange design
- Hazards Analysis Certified
- Endorsed by California's Great Basin Air Pollution Control District
- Hydrogen Economy Entry Point

Lease Boiler / Steam as a Service Contract

- Lower cost per month with FMV
  - Transfer depreciation to For-profit
- OpEx vs CapEx budgets
  - Board of Trustees
  - State Legislature
- Preservation of capital
  - No cross collateralization
- Boiler installation included
  - Infrastructure changes minimal
  - Leverage existing assets
- Risk mitigation
  - Obsolescence
  - New product: try before buy
  - Qualified people maintain
- Upgrades
  - Provides innovation opportunity
  - End of lease

Thank You!

HYDROGEN TECHNOLOGIES

SOLAR IMPULSE EFFICIENT SOLUTION DECEMBER 2022

Award Winner 2023

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