U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

Advanced Manufacturing Office

Securing a Decarbonized Future

Bob Gemmer, CHP Program Lead

March 9, 2022

OE Priorities: Catalyze Economy-Wide ecarbonization

BIDEN MINISTRATION MATE GOALS

A carbon pollution-free power sector by 2035

Net-zero emissions by 2050

Make basic and applied research breakthroughs

Turn that research into deployable technologies

Catalyze deploymer of clean energy and decarbonization tec

CREATE GOOD-PAYING JOBS

associated with the fast-growing global market for products that reduce carbon emissions

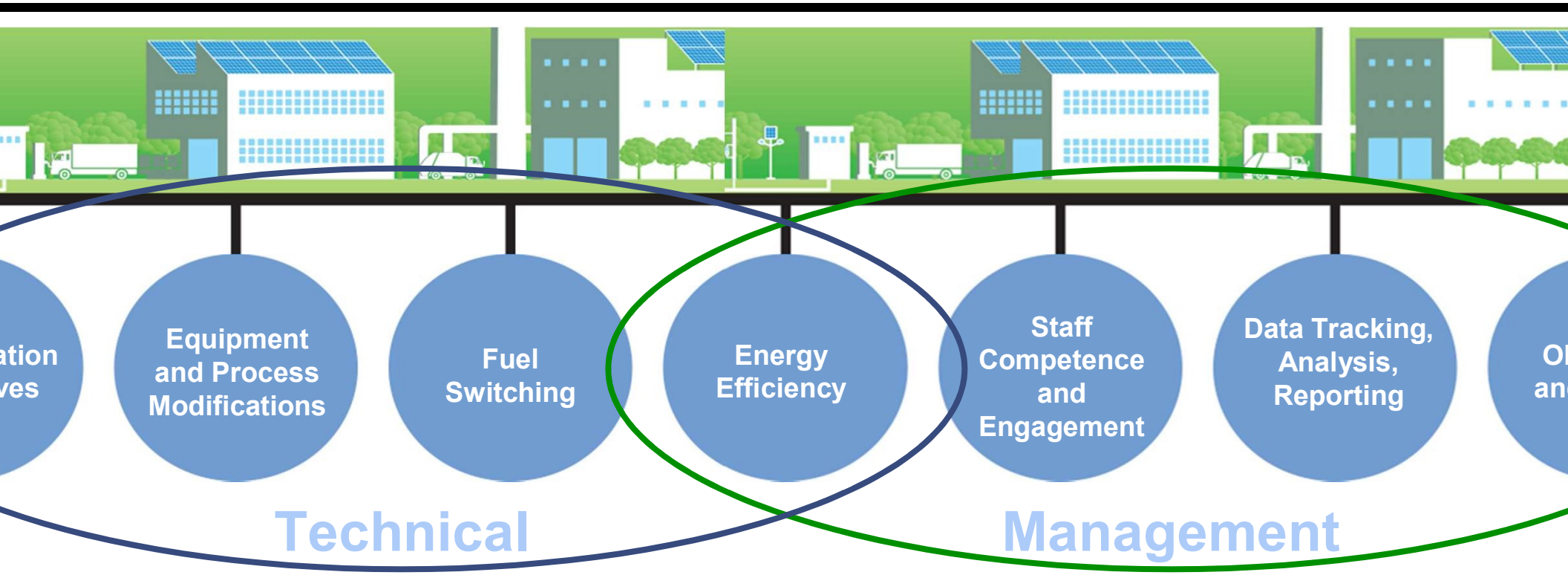
PURSUE ENVIRONMENAL AND ENERGY JUSTICE

and target disadvantaged communities for new clean energy investments, jobs, and business

COLLABORATE ROBUSTLY

across the federal government, the fifty states, and the private sector

arbonization requires technical and management chang



bon targets to meet global, regulatory, and corporate goals

GLOBAL

- **Reduce emissions by 7.6% annually for the next 10 years** to meet th 1.5° C ceiling on temperature rise.
  – United Nations Environment Programme

IATIONAL

- 2015 Paris Agreement
- Goal of **Net-zero carbon emissions by 2050**
  - US, President Joe Biden's EO directs agency pursuit of this goal

CORPORATE

- "Limiting global warming to well-below 2°C above pre-industrial levels."
  - More than 500 companies established these Science Based Targets
- Zero carbon and Zero net carbon

FACILITY and SITE

- Regulatory
- Corporate
- Science based

ISO 50001
EnMS

SO 50001 business practice is:

mework for continual improvement of energy performance

bal standard developed by 56 countries with US leadership

xible roadmap used by over 42,000 sites

001's data-driven, flexible design helps nizations of all kinds and sizes to achieve tent energy and cost savings over the long term

50001 Saves Energy

50001 Drives Decarbonization

50001 Builds Resilience

50001 Promotes Efficiency

Technical Assistance: Tools and Resources

MEASUR Tools Suite

https://www.energy.gov/eere/amo/measur

- User friendly
- Open source
- Developed by subject matter experts
- Coming in 2022: VERIFI (dashboard)

Steam/Boiler Systems

Pumping Systems

Fan Systems

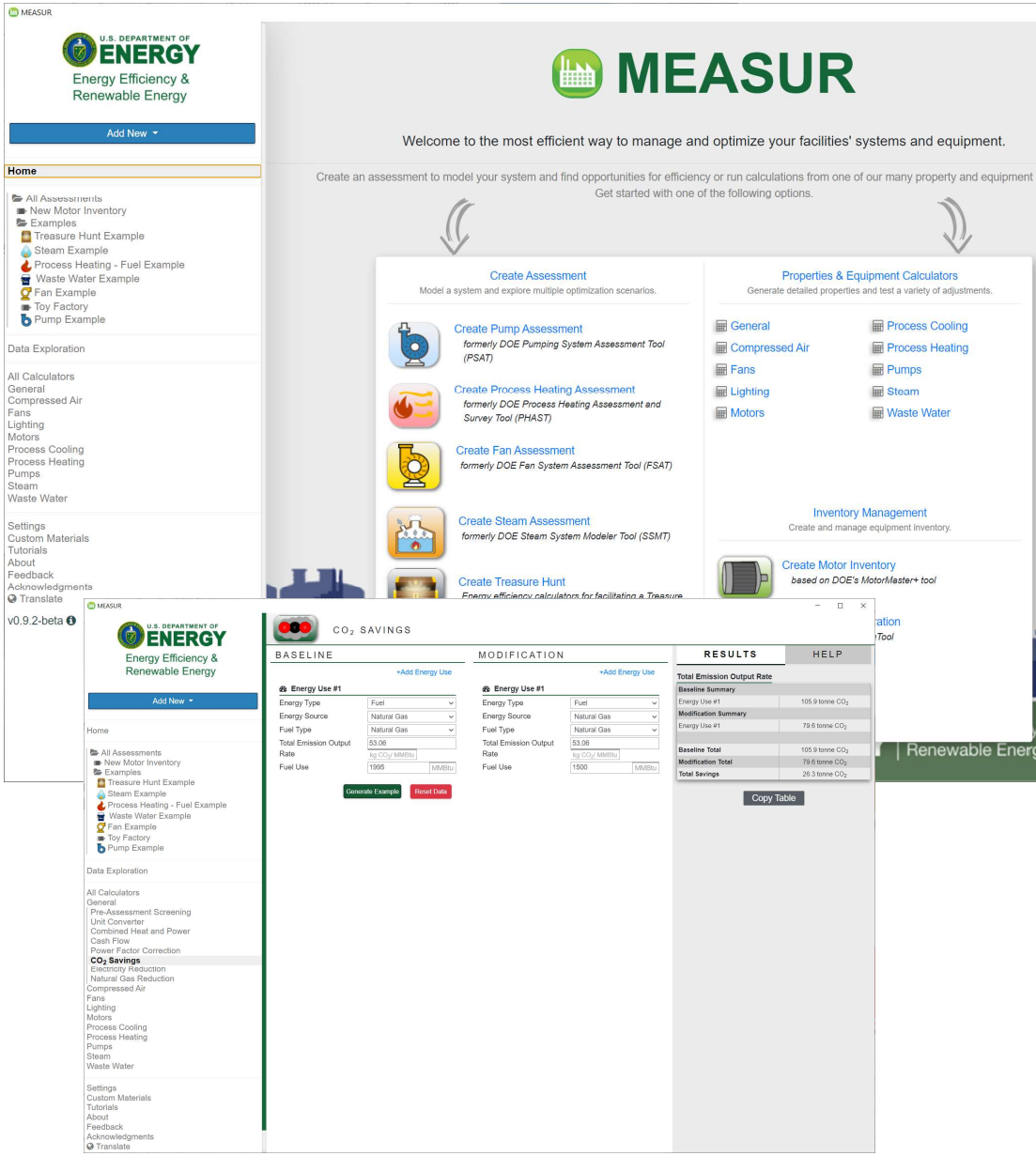
Motor Systems

Compressed Air

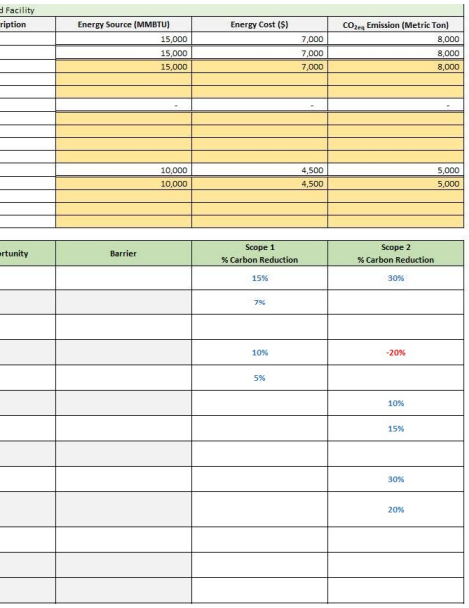
Process Heating/Furnace Systems

ding Carbon in MEASUR Tool Suite

- dding carbon mitigation etermination to the energy avings calculations in xisting tools in MEASUR
- MEASUR tools and alculators are useful for erforming ground-up nalysis of energy saving pportunities
- lew decarbonization tools
  - Some are already in MEASUR
  - Some are standalone
  - More in development

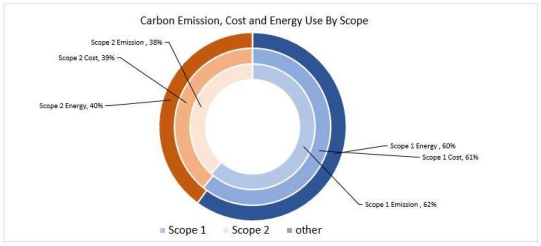


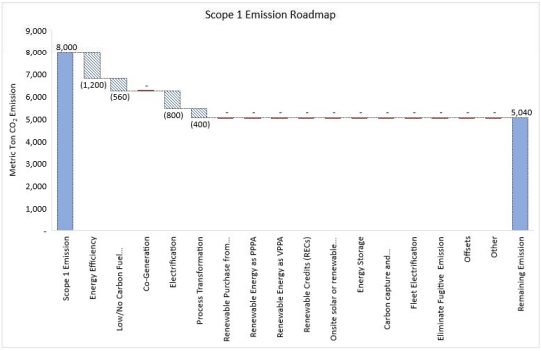
ndustrial Action Plan Tool

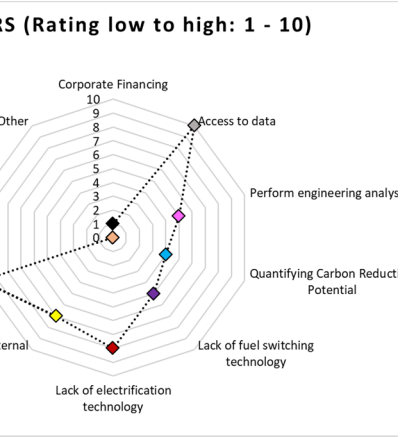


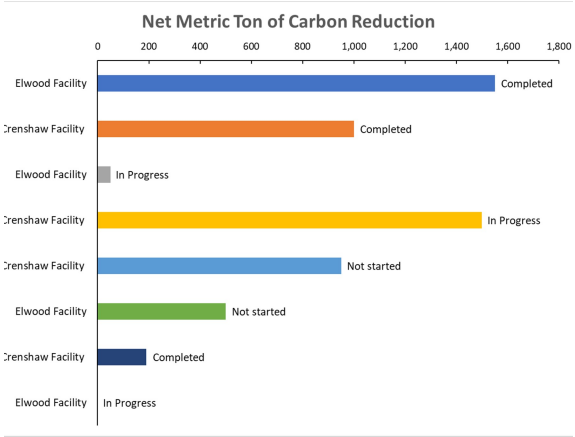
Energy Source (MMBTU)	Energy Cost ($)	CO_{2eq} Emission (Metric Ton)
15,000	7,000	8,000
15,000	7,000	8,000
15,000	7,000	8,000
-	-	-
10,000	4,500	5,000
10,000	4,500	5,000

Barrier	Scope 1 % Carbon Reduction	Scope 2 % Carbon Reduction
	15%	30%
	7%	
	10%	-20%
	5%	
		10%
		15%
		30%
		20%









- The Action Plan Tool developed for industrial L partners
- Aids in reporting and visualizing their scope 1 a scope 2 carbon emission both at the corporate and facility levels
- Helps partners create/evaluate high-lev roadmaps to decarbonization

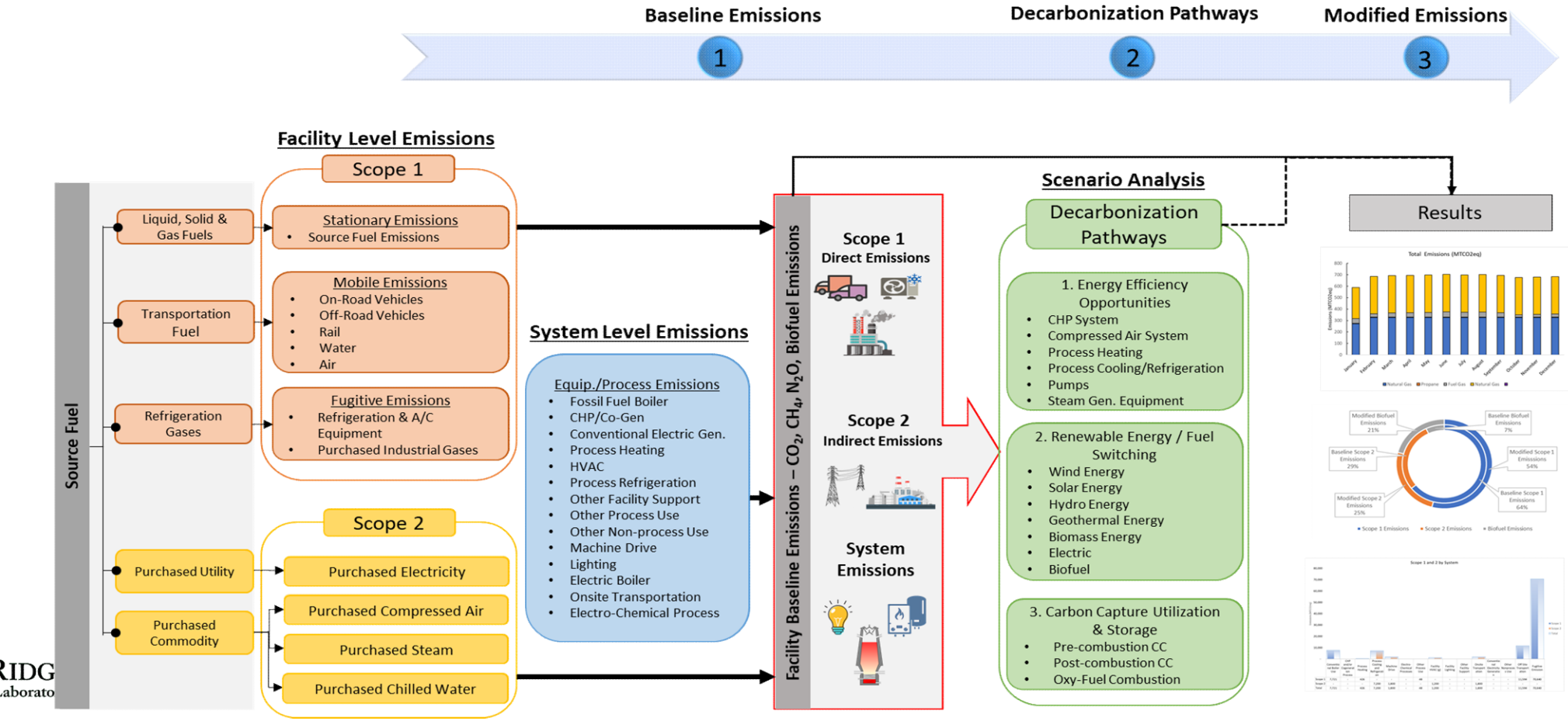
RIDGE | BUILDING TECHNOLOGIES RESEARCH AND INTEGRATION CENTER
Laboratory

bon Footprint and Decarbonization Scenario Analysis Tool

nables users to create and analyze baseline emissions

ovides users the ability to evaluate decarbonization scenarios and perform techno conomic analyses (in development)

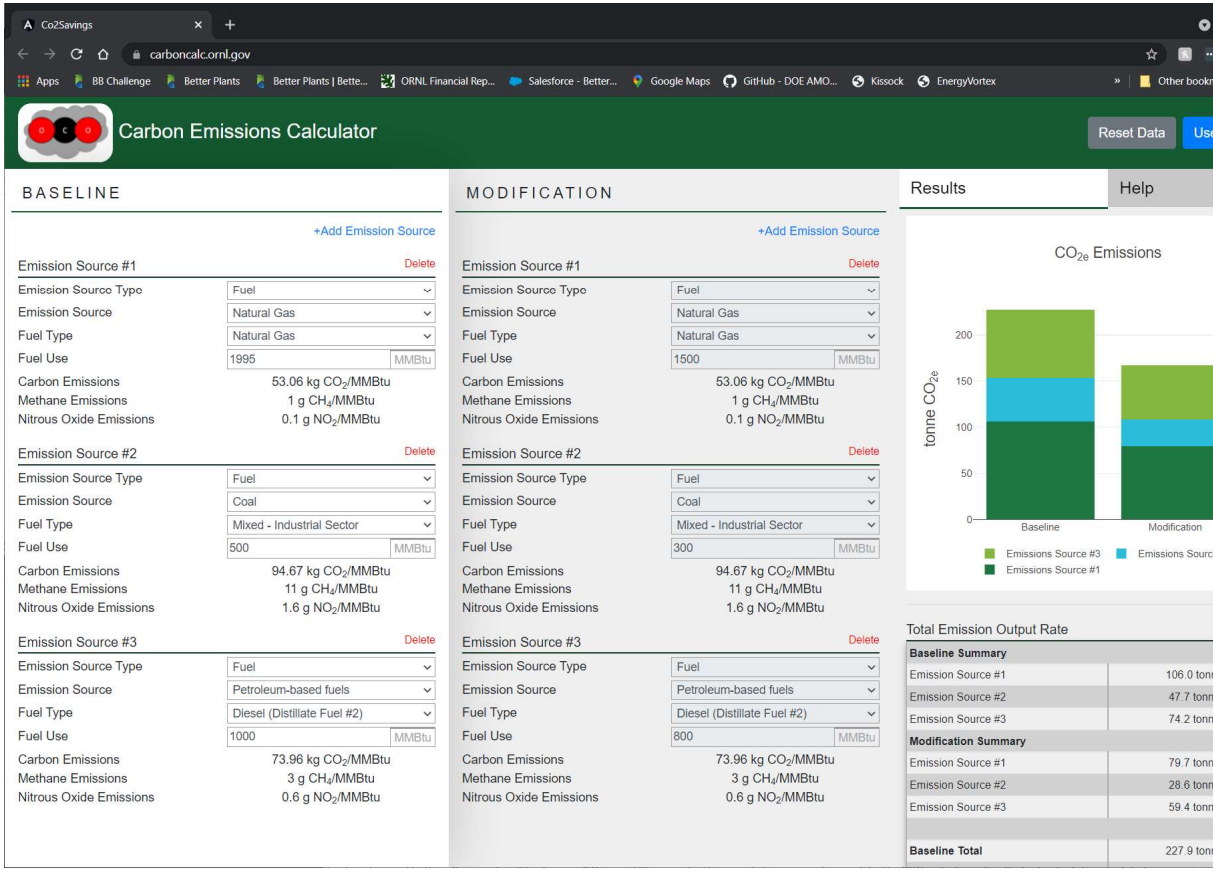
e baseline analysis part is going through Beta testing with few Better Plants partner



on Emissions Inventory Calculator

arboncalc.ORNL.gov

- Allows users to quickly calculate carbon emissions based on various fuel sources
- Includes built-in carbon conversion factors for fossil fuels and the various electric grid regions

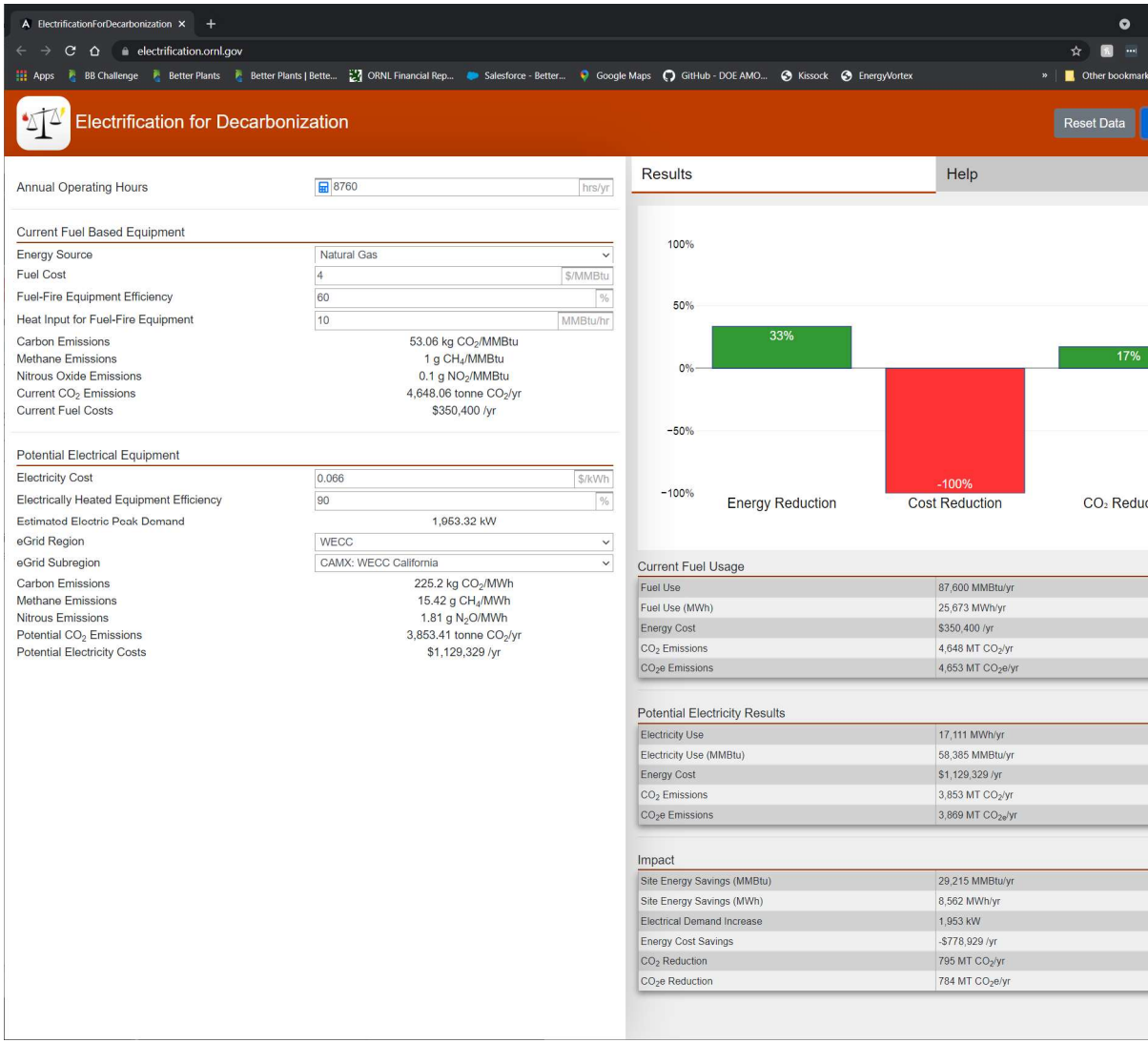


rification for Decarbonization

lectrification.ORNL.gov

rovides users with a quick ay to estimate the mpacts of electrifying a ossil fuel process

- Emissions impact
- Cost impact
- Consumption impact
- Demand Impact



rification Bottom-up Analysis Tool: Cost Comparison Calculator

Excel-based calculator to compare total process heating cost betwe fired heating system and electrotechnology (ET).

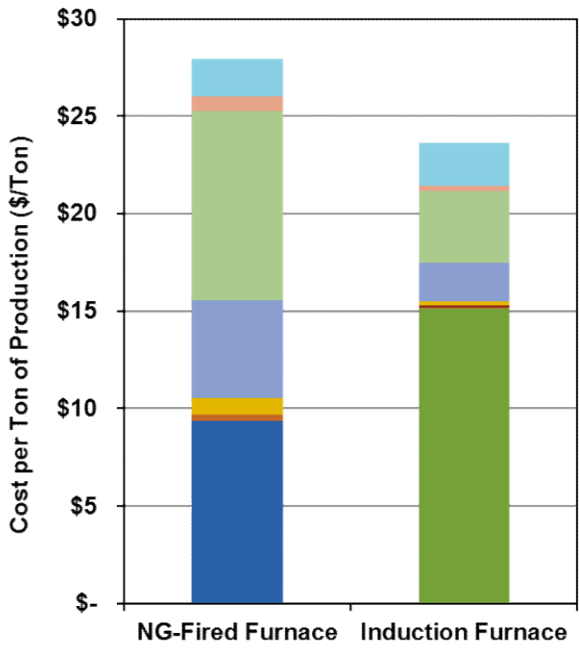
Inputs

nergy use data for fuel fired and ET based tems. (electricity, natural gas ,steam usage)

perational data including hours, production e, product yield (reject rate), product losses e to thermal processing (i.e. oxidation, inkage etc.).

ost data for utilities (i.e. fuel, electricity, water, c.), product loss cost, labor cost, O & M cost, nortization cost and other costs related to the tem operation.

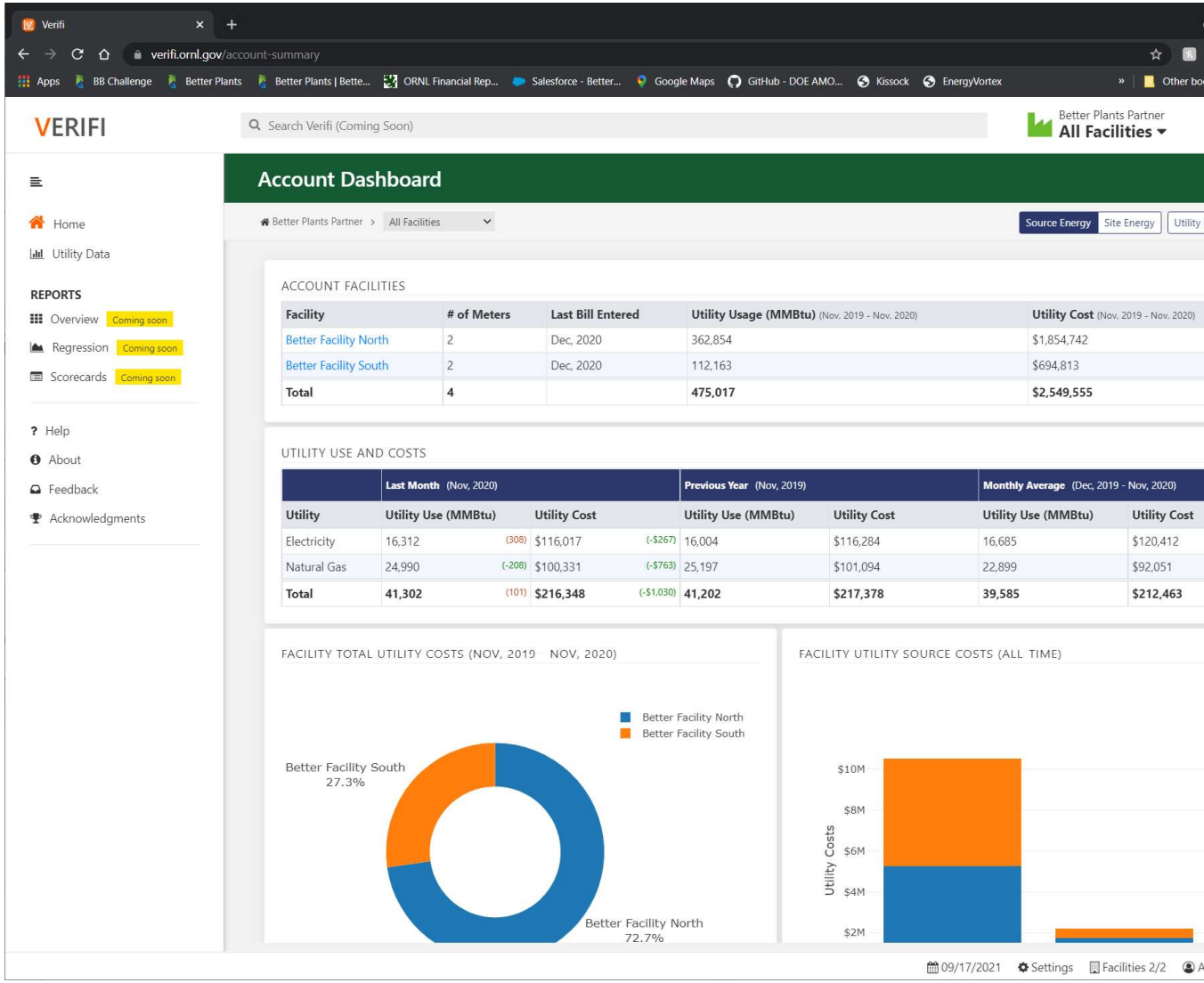
Output



From case study on NG-Fired Furnace vs Induction Furnace Forging Plant

FI (aiming to release beta version in several months)

- he future iteration of he EnPI tool
- llows users to manage ll energy and carbon tility-level data
- sers can create facility r corporate level ashboards
- Will provide users with a ariety of customizable eporting options (Better lants, 50001 Ready, EP, etc)
- Will incorporate smaller OE tools (PEPEx, PWP, ootprint Tool, etc)



More Information?

See Technical Partnerships | Department of Energy