



NASEO 2020 Energy Policy Outlook

Brent Rice, Exec. Mgr. for Strategic Partnerships
NREL



National Energy Technology Laboratory

Pacific Northwest National Laboratory

Ames Laboratory

Argonne National Laboratory

Brookhaven Laboratory

Lawrence Berkeley National Laboratory

Idaho National Laboratory

National Renewable Energy Laboratory

Fermilab

National Energy Technology Laboratory

Princeton Plasma Physics Laboratory

SLAC National Accelerator Laboratory

Lawrence Livermore National Laboratory

Sandia National Laboratories

Jefferson Lab

Los Alamos National Laboratory

Oak Ridge National Laboratory

Savannah River National Laboratory

Sandia National Laboratories

Coast to Coast

The **17** National Laboratories have served as the leading institutions for scientific innovation in the United States for more than seventy years.

NREL's world-class research and cutting-edge innovations:



Create
American jobs



Boost U.S.
economic growth



Strengthen our
energy security

NREL Science Drives Innovation



Renewable Power

Solar
Wind
Water
Geothermal



Sustainable Transportation

Bioenergy
Vehicle Technologies
Hydrogen



Energy Efficiency

Buildings
Advanced Manufacturing
Government Energy
Management



Energy Systems Integration

High-Performance
Computing
Data and
Visualizations

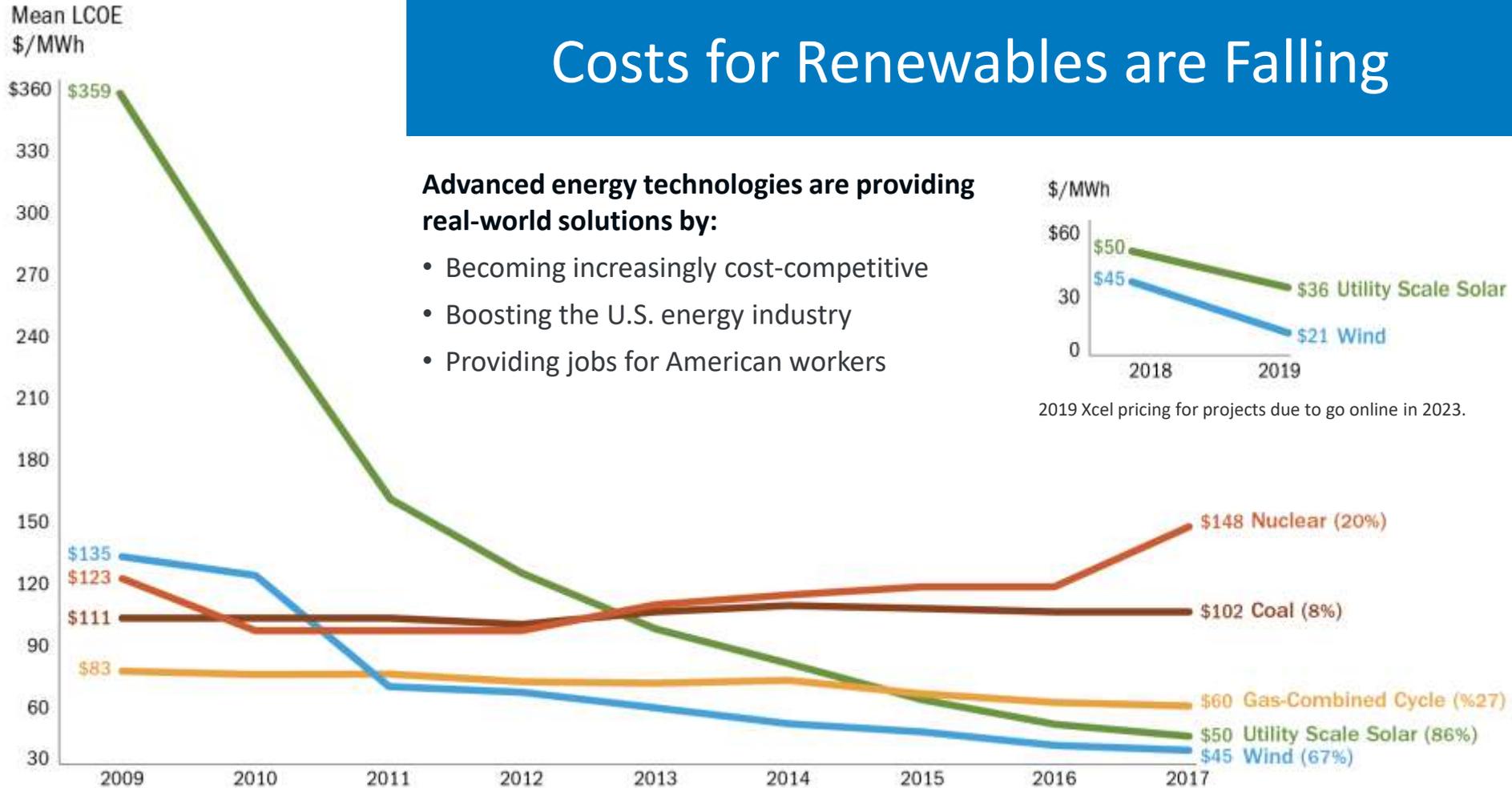
Costs for Renewables are Falling

Advanced energy technologies are providing real-world solutions by:

- Becoming increasingly cost-competitive
- Boosting the U.S. energy industry
- Providing jobs for American workers

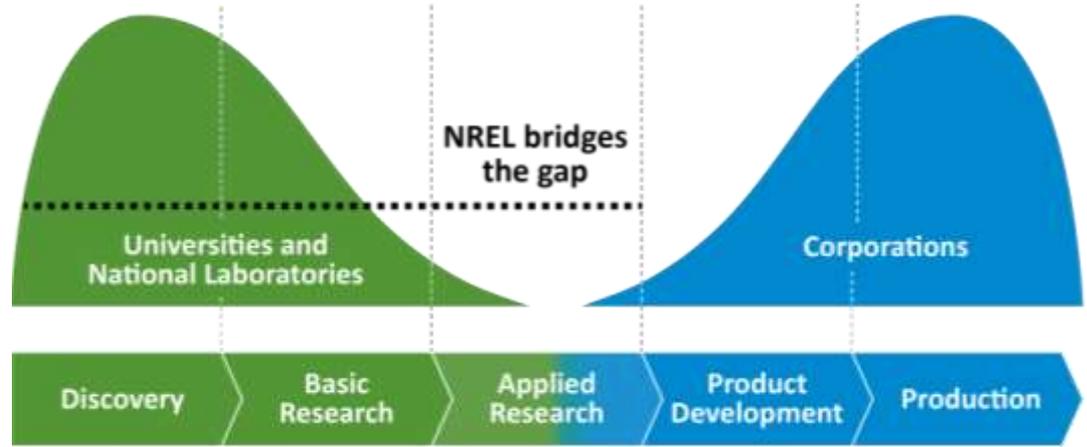


2019 Xcel pricing for projects due to go online in 2023.



At NREL, we Reduce Risk in Bringing Innovations to Market

- NREL helps bridge the gap from basic science to commercial application
- Forward-thinking innovation yields disruptive and impactful results to benefit the entire U.S. economy
- Accelerated time to market delivers advantages to American businesses and consumers



Industry invests in short-term R&D where they are confident in a return on investment.

- We take a longer, broader view
- We take on early-stage, high-risk R&D
- NREL's research makes it possible for industry to bring important new solutions to the market



Why Can't Industry Do What We're Doing?

Industry invests in short-term R&D when they are confident about a return on investment. NREL:

- Assumes a longer, broader view.
- Takes on early-stage, high-risk R&D.
- Conducts research that makes it possible for industry to bring important new solutions to the market.

“It is often too risky for the private sector to be on that bleeding edge of research where profits are years and years away.”

Venkatesh Narayanamurti, Harvard Kennedy School professor of science and technology policy, told *The Washington Post*

Partnering for Market Impact

Nearly **900** active partnerships with industry, academia, and government

In **2019** NREL had:

299

new
partnership
agreements

\$74.0M
value

of new
partnership
agreements

255

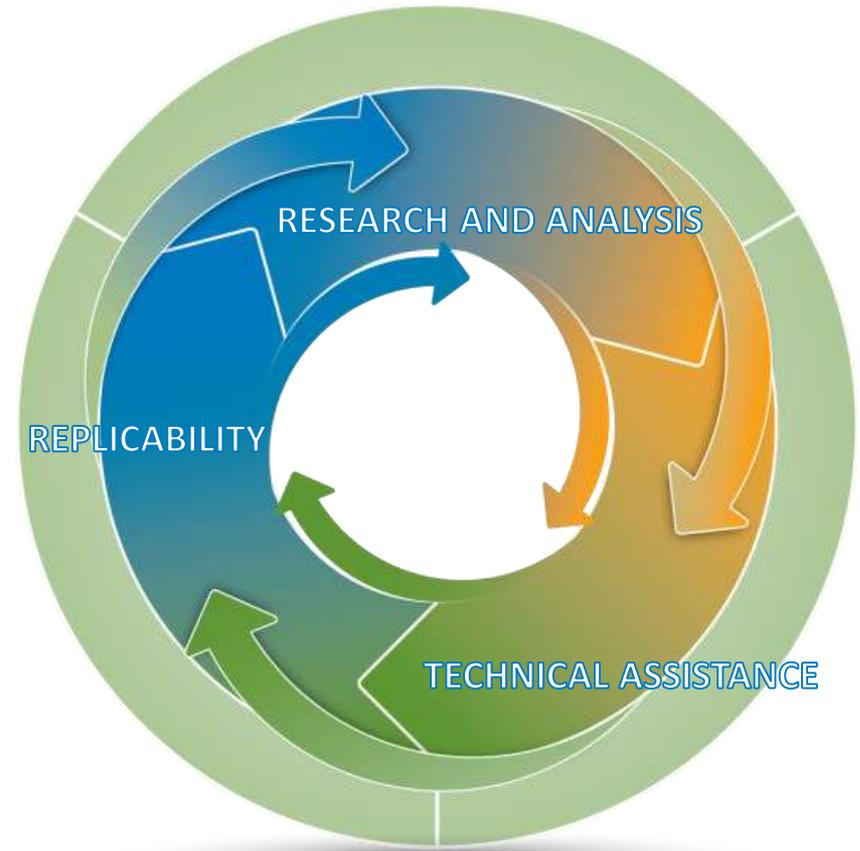
unique
new partners

587

unique
active partners

Three Key Ways NREL Engages for Sustainable Energy Impact at Scale

- DOE Partnerships
- Strategic Partnerships
- Technology Incubation





DOE Partnerships



State and Local Energy Transitions as a Market Driver

100% Renewable energy commitments in:
137 U.S. cities, 11 counties, 7 states, DC, and Puerto Rico*

Where We are Working



300 US Communities



Training

Consultation

Approach

On-Site Assistance

In Depth Analytics



ATHENA: Advancing Transportation Hubs Efficiency with Novel Analytics

ATHENA will leverage data streams to model and optimize integration of new technologies at Dallas-Fort Worth Airport and other hubs.



+ American Airlines, Hitachi, Toyota, FAA, NASA, and an Advisory Board of multiple airports and ports

National Alliance for Water Innovation (NAWI)

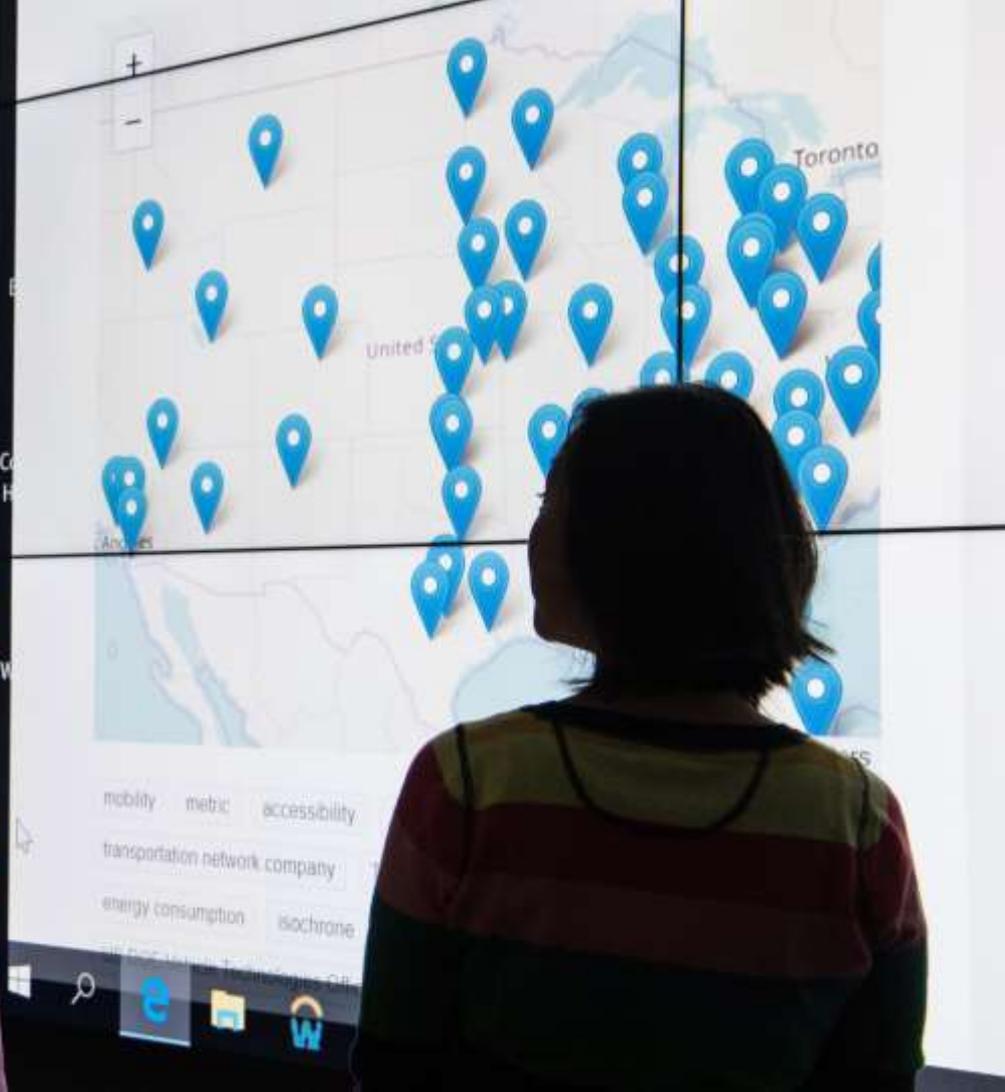


Three DOE Labs – Partnered to Drive Technical Innovation in Clean Water

- The Opportunity: First large, coordinated federal investment in water research since the 1970s
- The Why: Created in response to DOE's new water hub which will drive pipe parity from different feed sources
- The Team: NAWI, led by LBNL in partnership with ORNL and NREL, encompasses the best science, manufacturing, and renewable energy/energy efficiency research across the United States
- The Technical Engine: Key university and industry partners are driving Hub innovations
- Success Measures:
 - A circular water economy secured by desalination of non-traditional water sources
 - Benefits to utilities; oil and gas; municipal, industrial, agricultural, and mining sectors; and more!



```
1 "identifier": "tsdc",
2
3 "referenceTitle": "NREL Transportation Secure Data",
4 "shortName": "NREL TSDC Cleared & Spatial Data",
5 "description": "The U.S. Department of Energy's National Renewable Energy Laboratory's 2",
6
7 "contactPoint": {
8   "to": "TSDC Team",
9   "mailto": "mailto:TSDC@nrel.gov",
10  "org": "National Renewable Energy Laboratory",
11
12  "participatingOrganizations": [
13    { "name": "U.S. Department of Energy (DOE)",
14      "shortName": "U.S. Department of Energy (DOE)",
15      "description": "U.S. Department of Energy (DOE)" },
16    { "name": "National Renewable Energy Laboratory (NREL)",
17      "shortName": "National Renewable Energy Laboratory (NREL)",
18      "description": "National Renewable Energy Laboratory (NREL)" } ]
19
20 "dataset": [
21   { "identifier": "tsdc",
22     "title": "National Renewable Energy Laboratory's 2",
23     "shortName": "National Renewable Energy Laboratory's 2",
24     "description": "National Renewable Energy Laboratory's 2" } ]
25
26 "dataset": [
27   { "identifier": "tsdc",
28     "title": "National Renewable Energy Laboratory's 2",
29     "shortName": "National Renewable Energy Laboratory's 2",
30     "description": "National Renewable Energy Laboratory's 2" } ]
31
32 "dataset": [
33   { "identifier": "tsdc",
34     "title": "National Renewable Energy Laboratory's 2",
35     "shortName": "National Renewable Energy Laboratory's 2",
36     "description": "National Renewable Energy Laboratory's 2" } ]
37
38 "dataset": [
39   { "identifier": "tsdc",
40     "title": "National Renewable Energy Laboratory's 2",
41     "shortName": "National Renewable Energy Laboratory's 2",
42     "description": "National Renewable Energy Laboratory's 2" } ]
43
44 "dataset": [
45   { "identifier": "tsdc",
46     "title": "National Renewable Energy Laboratory's 2",
47     "shortName": "National Renewable Energy Laboratory's 2",
48     "description": "National Renewable Energy Laboratory's 2" } ]
49
50 "dataset": [
51   { "identifier": "tsdc",
52     "title": "National Renewable Energy Laboratory's 2",
53     "shortName": "National Renewable Energy Laboratory's 2",
54     "description": "National Renewable Energy Laboratory's 2" } ]
55
56 "dataset": [
57   { "identifier": "tsdc",
58     "title": "National Renewable Energy Laboratory's 2",
59     "shortName": "National Renewable Energy Laboratory's 2",
60     "description": "National Renewable Energy Laboratory's 2" } ]
61
62 "dataset": [
63   { "identifier": "tsdc",
64     "title": "National Renewable Energy Laboratory's 2",
65     "shortName": "National Renewable Energy Laboratory's 2",
66     "description": "National Renewable Energy Laboratory's 2" } ]
67
68 "dataset": [
69   { "identifier": "tsdc",
70     "title": "National Renewable Energy Laboratory's 2",
71     "shortName": "National Renewable Energy Laboratory's 2",
72     "description": "National Renewable Energy Laboratory's 2" } ]
73
74 "dataset": [
75   { "identifier": "tsdc",
76     "title": "National Renewable Energy Laboratory's 2",
77     "shortName": "National Renewable Energy Laboratory's 2",
78     "description": "National Renewable Energy Laboratory's 2" } ]
79
80 "dataset": [
81   { "identifier": "tsdc",
82     "title": "National Renewable Energy Laboratory's 2",
83     "shortName": "National Renewable Energy Laboratory's 2",
84     "description": "National Renewable Energy Laboratory's 2" } ]
85
86 "dataset": [
87   { "identifier": "tsdc",
88     "title": "National Renewable Energy Laboratory's 2",
89     "shortName": "National Renewable Energy Laboratory's 2",
90     "description": "National Renewable Energy Laboratory's 2" } ]
91
92 "dataset": [
93   { "identifier": "tsdc",
94     "title": "National Renewable Energy Laboratory's 2",
95     "shortName": "National Renewable Energy Laboratory's 2",
96     "description": "National Renewable Energy Laboratory's 2" } ]
97
98 "dataset": [
99   { "identifier": "tsdc",
100    "title": "National Renewable Energy Laboratory's 2",
101    "shortName": "National Renewable Energy Laboratory's 2",
102    "description": "National Renewable Energy Laboratory's 2" } ]
```



Strategic Partnerships

FY20 Partnerships



Defense

Emphasize energy security and resiliency at installations.



Federal

Expand access to broader NREL capabilities.



International

Develop initiatives to scale-up markets for advanced energy technologies and systems.



State and Local

Help states and cities meet geographically focused energy goals.



Power

Expand work on PV materials, device, and reliability research and grid estimation.



Universities

For example, researching advanced wide bandgap technologies used for electrical power transfer applications with Georgia Tech.



Foundations

Partner to support the incubation and maturation of new energy innovations.



Manufacturing

Grow existing partnerships and execute work focused on high-impact and long-term projects.



Los Angeles - LA100 Study Objectives

- What are the **pathways** and **costs** to achieve 100% RE while maintaining current reliability?
- What is the impact on the **environment**?
- What are the potential for **high quality careers** and **local economic development**?
- How can **environmental justice** communities be part of the solution?
- In coordination with Ratepayer Advocate: What are impacts to **electricity rates**?

New York State Energy Research and Development Authority (NYSERDA)

Technical, Financial, Regulatory, and Policy Analysis:



1. Sector-based resource mix
2. Operational requirements
3. Information, data, analytics, and control requirements for such resource mix
4. System resiliency implications and requirements
3. Cyber-security implications and requirements



Powering Business Worldwide

Eaton and NREL Researchers Working Side-by-Side at the ESIF

- Distributed Energy Resource Management
- Grid intelligence
- Advanced energy storage systems
- Electrical load identification
- Techno-economic analyses
- Virtual modeling and analysis
- High-performance computing





\$100M, \$10-year, NREL-led partnership with ExxonMobil executed through CRADA and ACT, to conceive and create solutions for today's energy challenges and fill gaps in traditional energy development approaches.

“We’re focusing on advancing fundamental science to develop breakthrough solutions that can make a difference on a global basis in emissions reduction,” said Darren W. Woods, chairman and chief executive officer of ExxonMobil.





Technology Incubation



Shell Gamechanger Accelerator Powered by NREL

GCxN will overcome market gaps by providing access to technical assistance and business development support for early-stage clean energy technologies and services.

Targeted technology areas:

- Long-life battery storage
- Grid of the future
- Fast charging

First cohort:

- 3 companies
- Up to \$250,000 per company

A photograph of three people standing in front of a blue backdrop. The backdrop has the text 'tation Showcase' in white. From left to right: a man in a dark suit and light blue shirt, a woman in a light grey blazer and dark blue top, and a man in a dark suit and white shirt. They are all smiling and looking towards the camera.

tation Showcase



Wells Fargo Innovation Incubator
advances clean energy and agricultural
technologies and accelerates their
path to market

30

PORTFOLIO COMPANIES

30 portfolio companies to date have each received up to \$250,000 in technical assistance from the laboratory and project-related support

55+

CHANNEL PARTNERS

Channel Partners refer early-stage companies to the program, and provide critical business mentoring and support to IN² portfolio companies

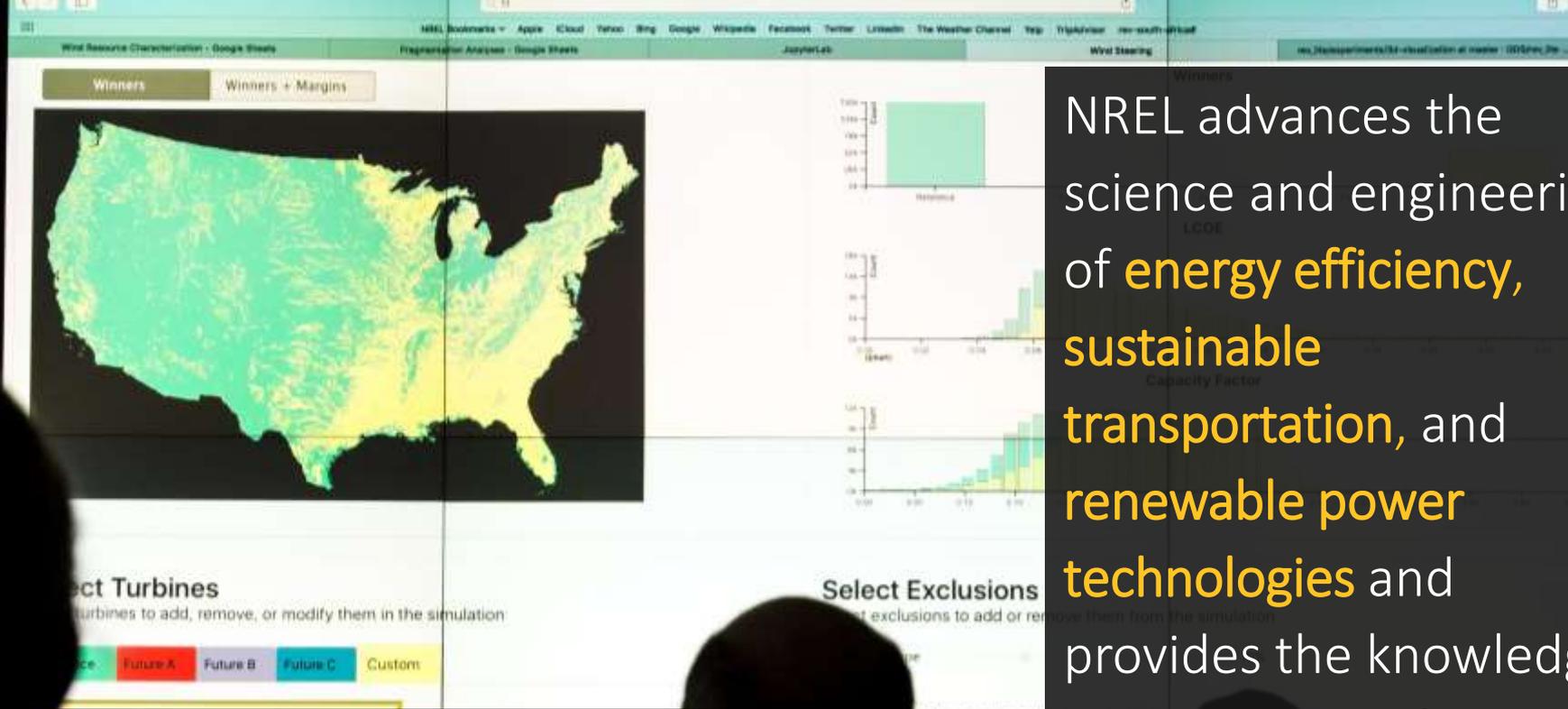
\$142M

EXTERNAL FUNDING RAISED

For every IN² program dollar awarded, on average, IN² companies raise nearly 20 dollars in external follow-on funding. IN² portfolio companies have gone to raise \$142 million from external follow-on funding

Founded by:





NREL's energy research
is making an **impact**

NREL advances the science and engineering of **energy efficiency, sustainable transportation, and renewable power technologies** and provides the knowledge to **integrate and optimize energy systems**

NREL Looks Ahead ...

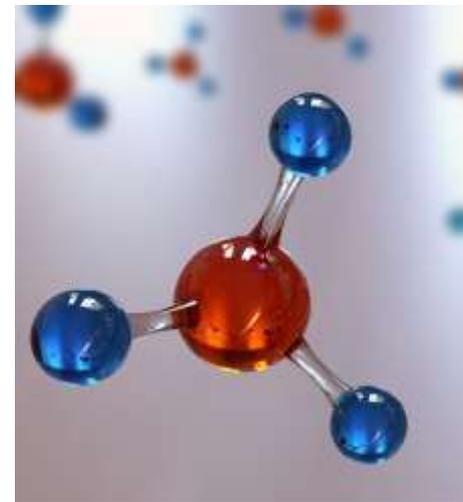
Three critical research areas respond to existing energy challenges and will increase our impact.



Circular Economy for Energy Materials



Integrated Energy Pathways



Electrons to Molecules

Thank You

www.nrel.gov

