REpowering Schools Student Presentations

Moderator: Remy Pangle, Executive Director

Jack Eberl, James Madison University

Adam Wagih, Wilbur Wright College

Bushra Alkarmi, Harry S Truman College

Kobe Williams, Harry S Truman College

Strengthening the clean energy industry
by growing a skilled and prepared workforce

REpowering Schools

Remy Pangle
Executive Director
remy@repoweringschools.org

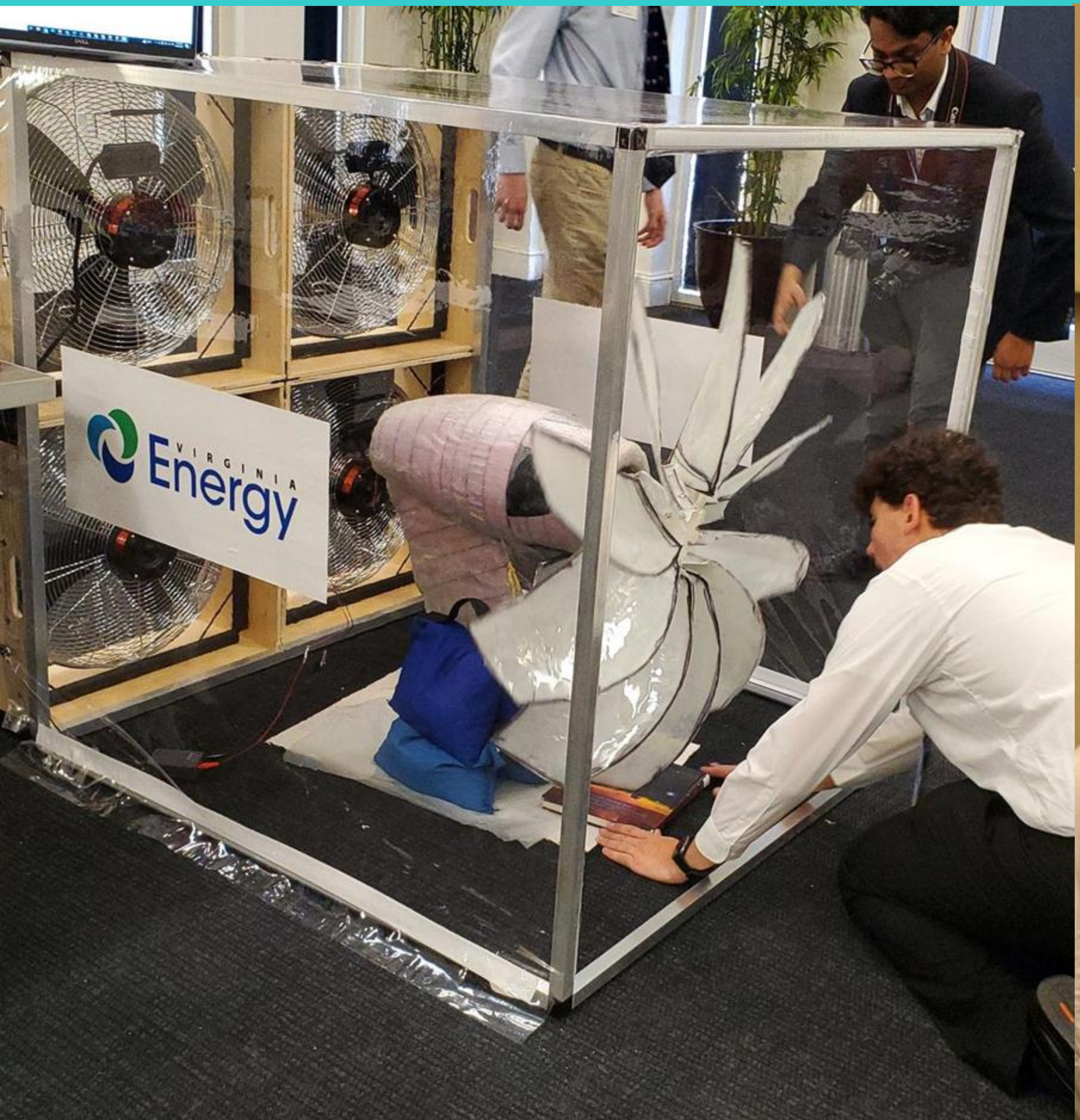
www.repoweringschools.org

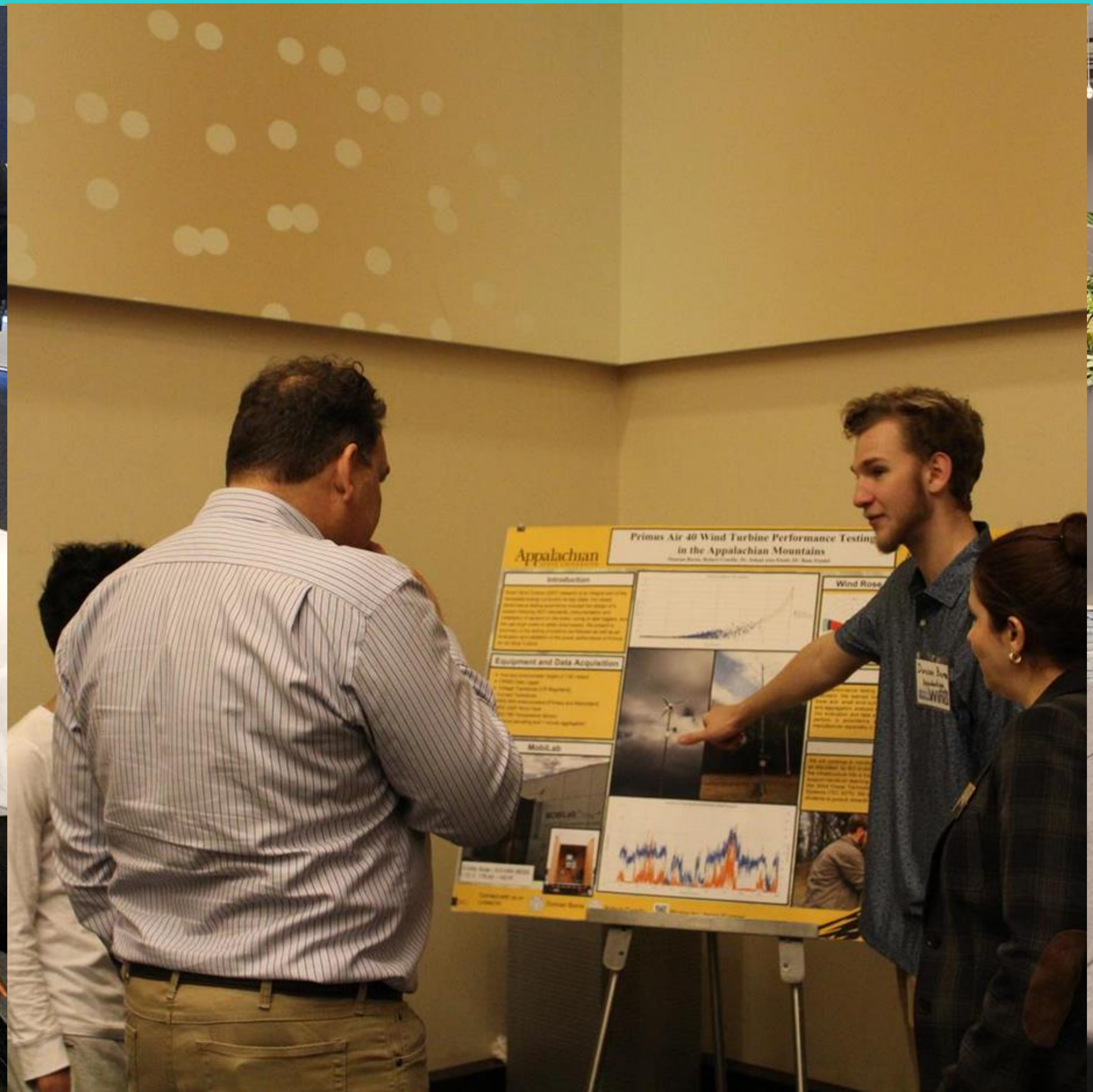
OUR PROGRAMS SERVE

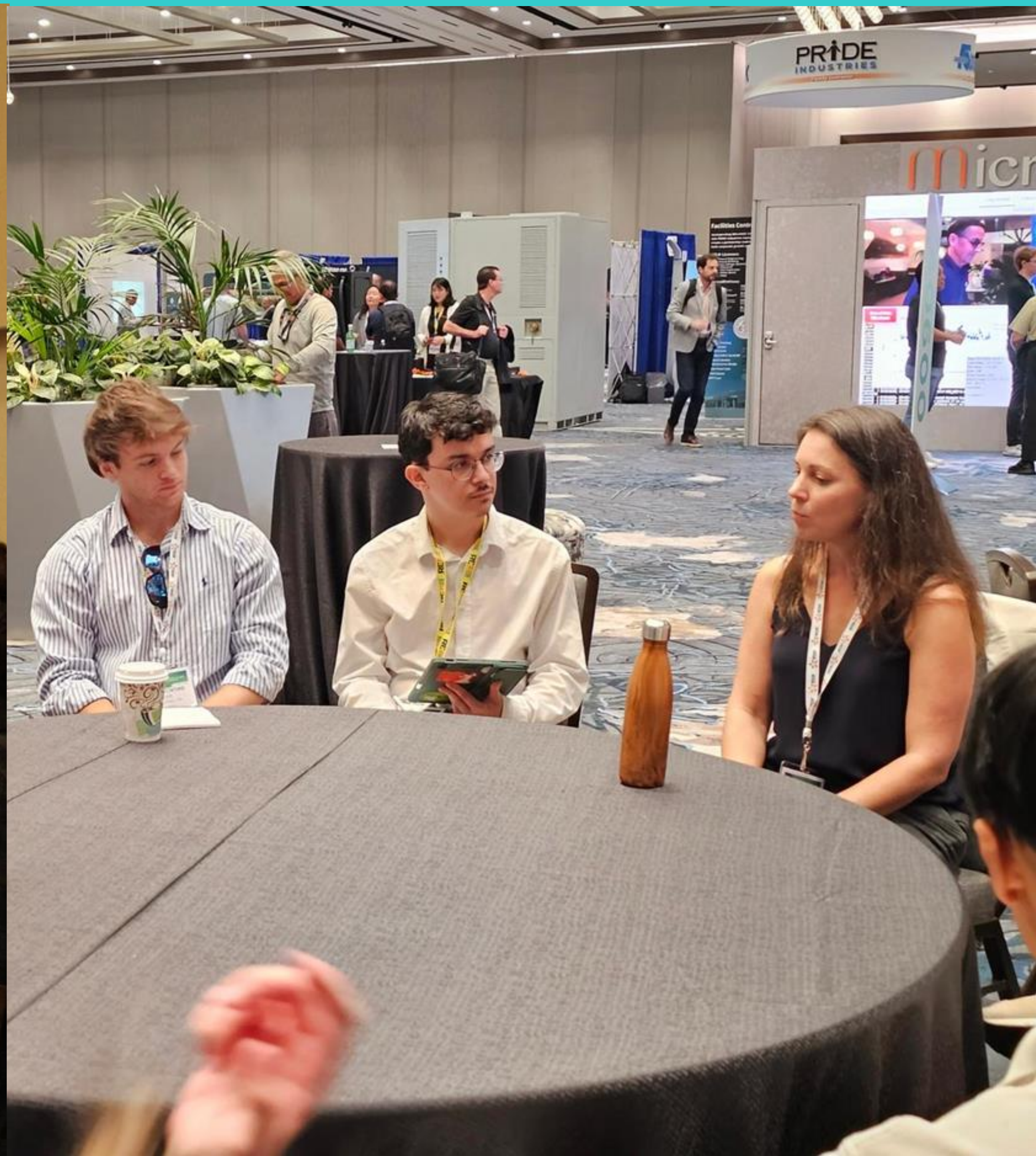
K12 & Community

Colleges & Universities

Industry







Project-Based Funding
Financial support for hands-on projects

Conference Experiences
Opportunities for real-world exposure and networking

Awards Program
Recognizing achievements and sharing stories

REpowering Forward
Engaging alumni and ambassadors

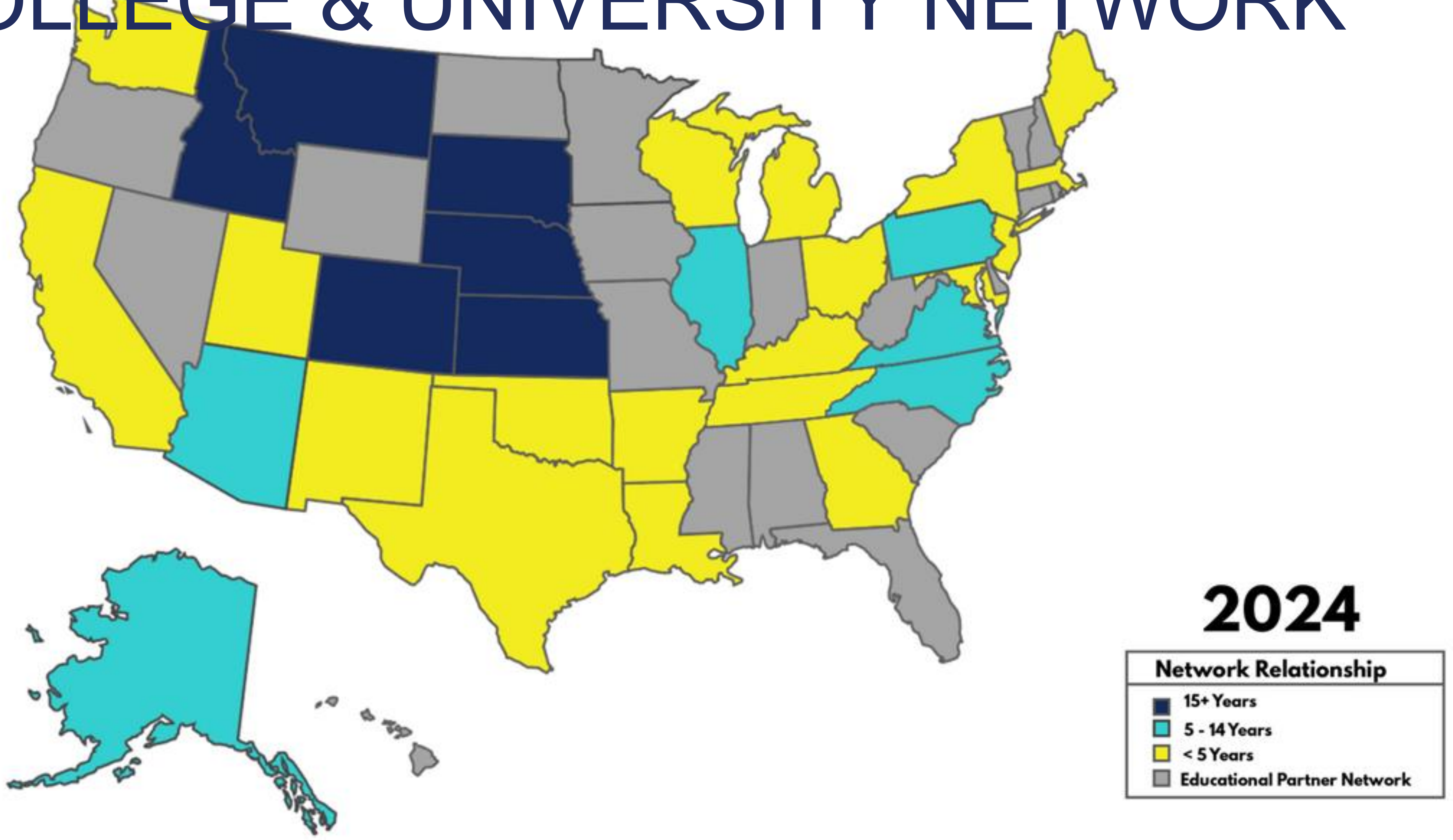
Energy Academy
Intensive learning through webinars and courses

Creating Community
Building networks among faculty and students

CXC ? (future)

REpowering Careers
Career assistance and internship pathways

COLLEGE & UNIVERSITY NETWORK



JMU
MONTANA STATE UNIVERSITY
COLORADO STATE UNIVERSITY
BOISE STATE UNIVERSITY
UNIVERSITY OF Nebraska Lincoln
KANSAS STATE UNIVERSITY
ECU
SOUTH DAKOTA STATE UNIVERSITY
MOTLOW STATE
NOC
NAU NORTHERN ARIZONA UNIVERSITY
W
UTAH VALLEY UVU UNIVERSITY
UMASS LOWELL
CUNY THE CITY UNIVERSITY OF NEW YORK
OBERLIN COLLEGE & CONSERVATORY
ILLINOIS STATE
ATI
THE UNIVERSITY OF THE WEST INDIES
SFCC
Berkeley UNIVERSITY OF CALIFORNIA
WESTERN MICHIGAN UNIVERSITY
University of Massachusetts Amherst
COLUMBIA UNIVERSITY
TIDEWATER COMMUNITY COLLEGE
WISCONSIN
California State University SAN MARCOS
FRESNO STATE
THE UNIVERSITY of NEW ORLEANS

2025 IMPACT

Support grants

$70,000

11 wind and solar seed funding awards

over 4,000 students and faculty impacted (projected)

Conference Experiences

4 events

39 students and faculty supported

28 schools participated

19 industry involved

Networks

26 industry speakers

145 students

43 Fellows

121 faculty

Awards

38 nominees

5 award categories

10 award winners

REpowering Schools SPONSORS

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APEX
CLEAN ENERGY

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Streamlining REAP : A Framework for Small Business and Agricultural Energy Projects

Jack Eberl

Advisor : Jonathan Miles Ph.D.

Previous Research

- USDA Rural Energy Development Assistance (REDA) program identified regions in the state with elevated wind resources. Program also identified 150 “clients” who were potential adopters of distributed wind in the future. Long term goal for project was to assist in the installation of distributed wind throughout Virginia.
- Virginia Economically Disadvantaged Communities Energy Resilience Study (RACER) aimed to develop community-based energy resilience metrics for Historically Economically Disadvantaged Communities (HEDC)
- State Based Anemometer Loan Program (SBALP) provided landowners with wind-measuring equipment to assess wind characteristics of their land.

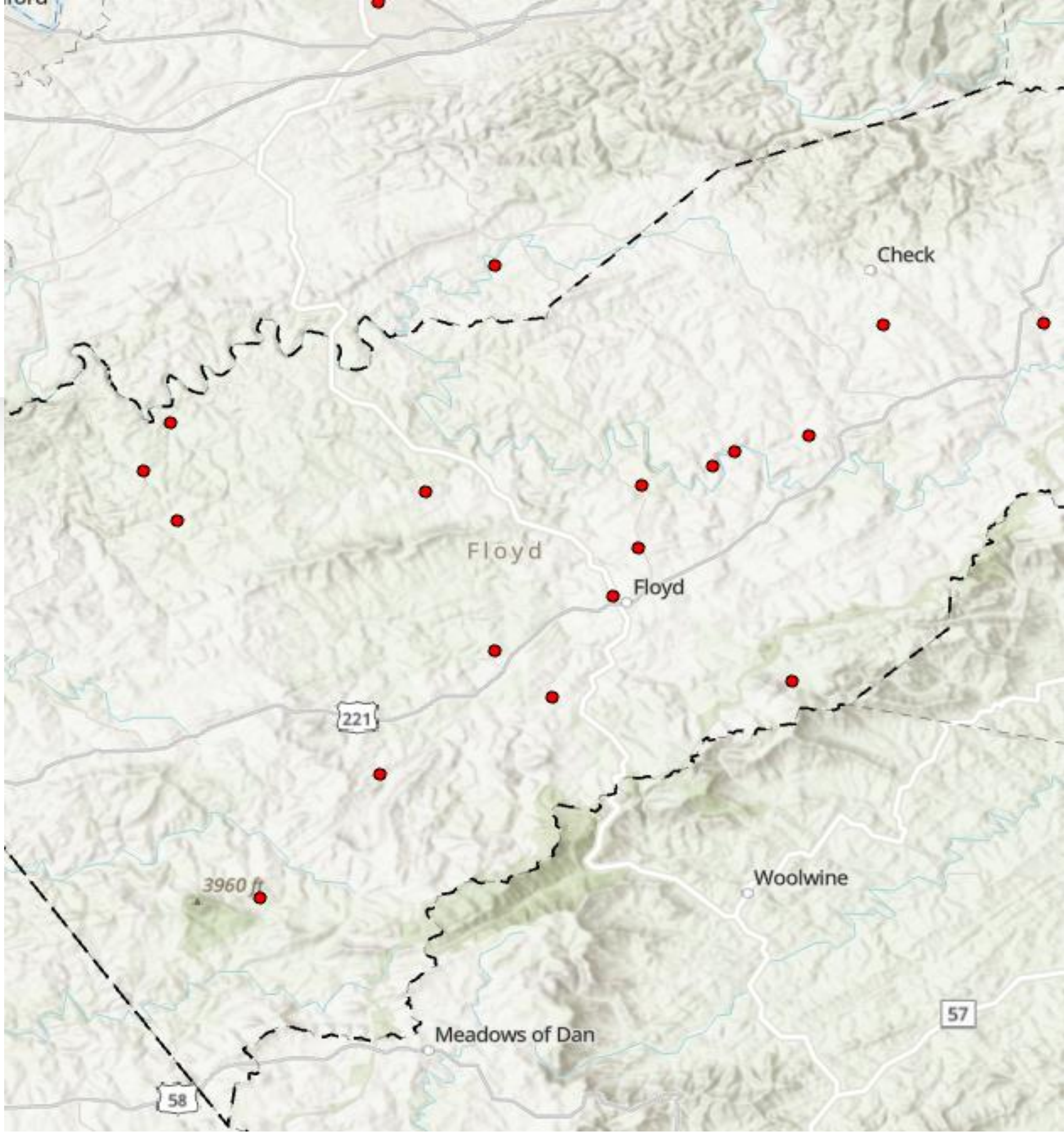
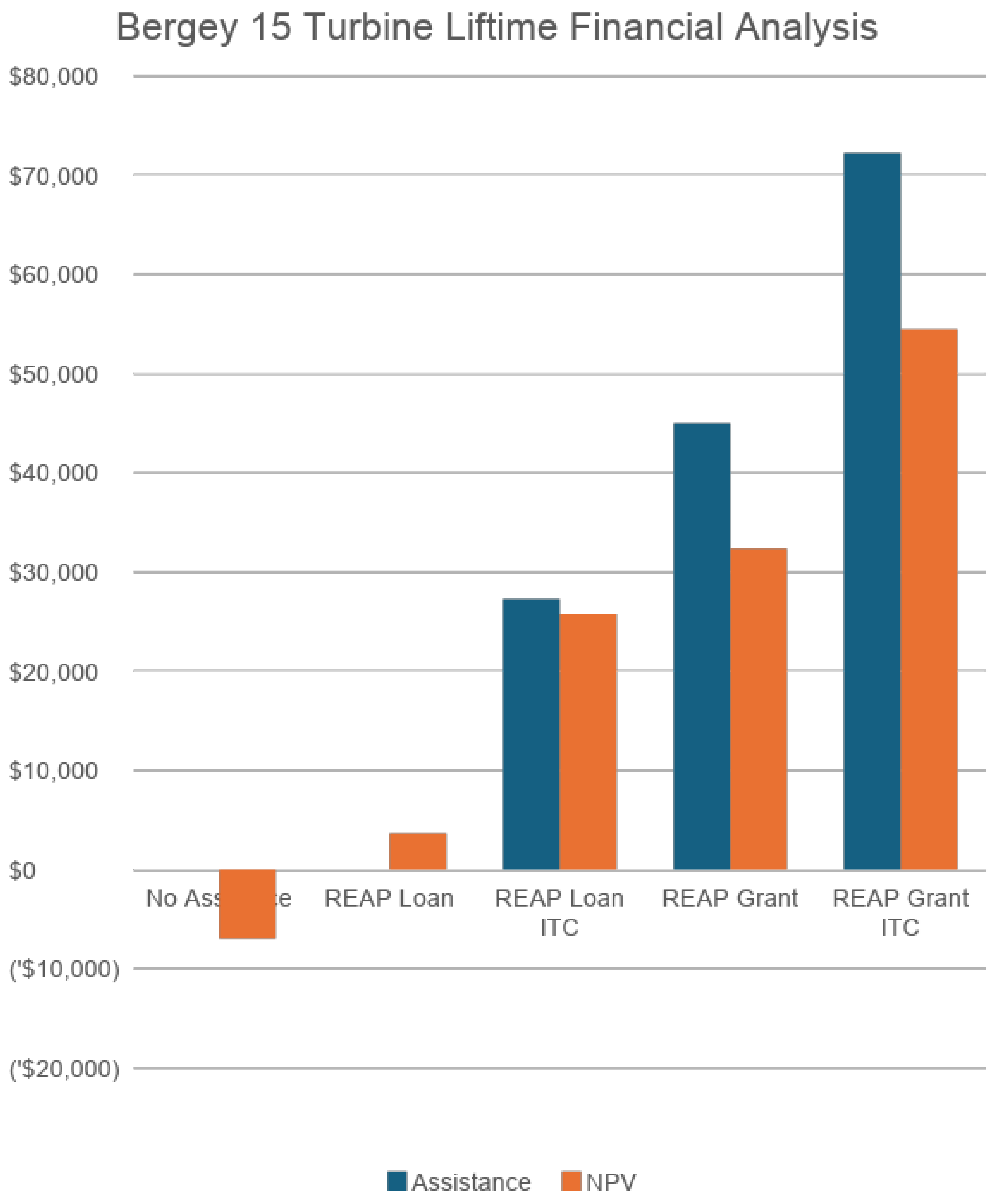


Figure 1 : Location of anemometers in Floyd County, VA from SBALP

Project Goals

- Develop a REAP Pre-Application Screening and Sizing Tool that enables agricultural producers and small business owners to quickly assess program eligibility, preliminary system sizing, and financial feasibility, while also supporting completion of key REAP application components.
- Complete 2-3 case studies utilizing screening tool and compare estimates with System Advisor Model (SAM)
- Create accompanying document/tutorial that walks user through utilizing tool and completing the official REAP application



System Advisor Model Financial Modeling – Floyd County Location
Assumptions : 6.27 m/s AVG Wind Speed, $0.14/kWh, $91,000 Installation Cost, 30-yr Lifespan

Capstone Justification

- REAP can be complex for those not well versed in energy technology & terminology.
- Takes times and effort for agricultural producers and small businesses to determine if they have good location and resources for DER project.
- Increasing retail electricity costs due to rising demand
- Challenges in utility scale wind

Future Research

- Future capstone group will utilize REAP Application Tool along with previously acquired data from REDA, RACER, and SBALP to get into communities and interact with landowners and businesses.
- This will hopefully result in the identification of potential sites and spur distributed wind development by removing barriers.

Thank You

Enhancing Clean Renewable Energy Research through Hands-On Solar Energy System Design and Analysis

Adam Wagih, Kobe Williams, and Bushra Alkarmi

City Colleges of Chicago

Global Energy

- Rising global energy demand
- Environmental impact of fossil fuels
- Urgent need for scalable renewable solutions
- Solar energy as a leading clean technology

The Real Cost of Energy

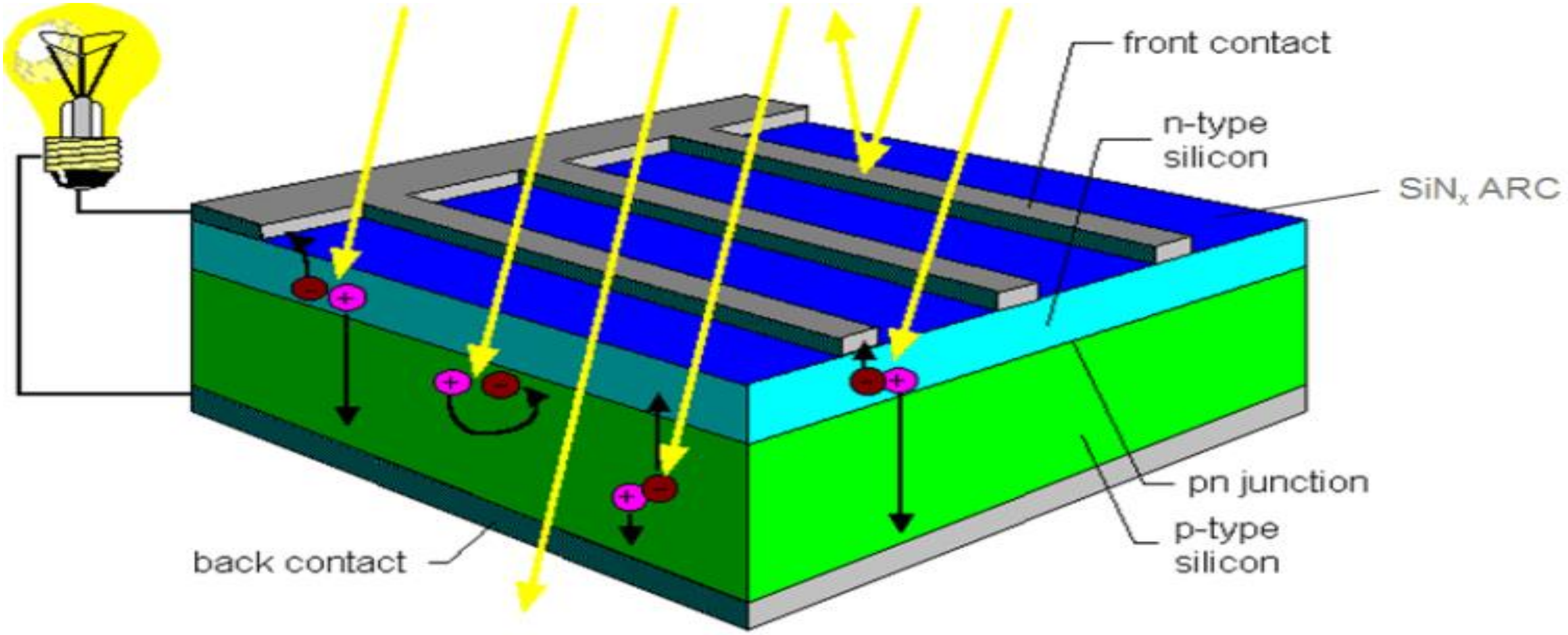
- **The Chicago/Illinois region relies predominantly on nonrenewable energy sources, with only about 15% of electricity generated from renewable energy.**

Resource Fuel:	Renewable **[R]** or Nonrenewable **[NR]**	My eGRID Subregion Average %:	National Average %:
Biomass	[R]	0.3 % [top 5]	1.1 %
Coal	[NR]	25.0 % [bottom 5]	16.1 %
Gas (Natural Gas)	[NR]	37.8 % [bottom 5]	43.2 %
Geothermal	[R]	0%	0.4 %
Hydroelectric	[R]	1.0 % [bottom 5]	5.7 %
Nuclear	[NR]	28.4 % [bottom 5]	18.5 %
Oil	[NR]	0.3 % [top 5]	0.5 %
Other Fossil Fuel	[NR]	0.7 % [top 5]	0.5 %
Other Unknown	[NR]	0.1 [top 5]	0 %
Solar	[R]	0.8 % [top 5]	3.9 %
Wind	[R]	5.5 % [bottom 5]	10.0 %

Waste gas emission:	My eGRID Subregion Average lbs./KWH:	National Average lbs./KWH:
CO_2	0.9114	0.7672
SO_2	0.000412	0.000359
NO_X	0.000422	0.000452

Background: How PV Works

- PV converts sunlight into electricity
- Influenced by irradiance, angle, shading, temperature



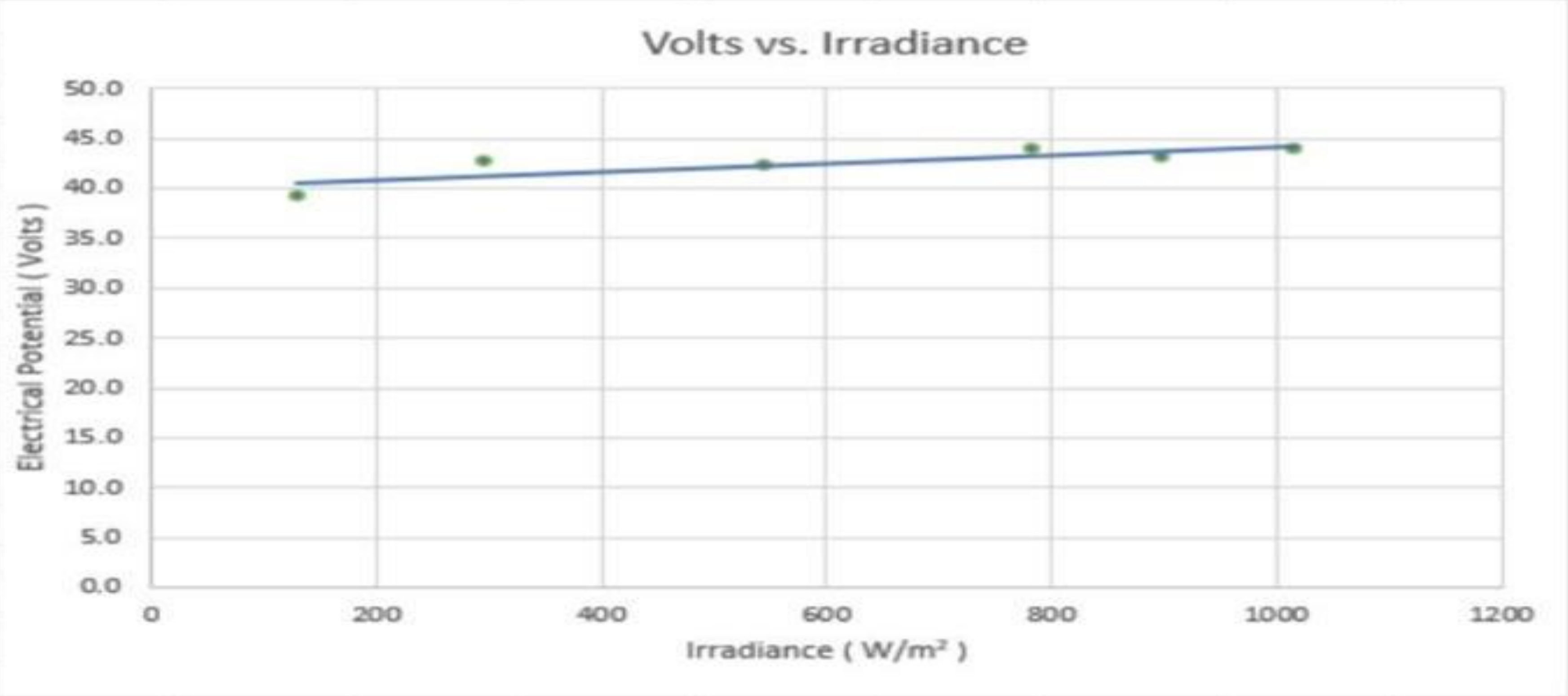
Experimental Setup

- Measured V and I
- Varied irradiance
- Tested shading patterns
- Controlled temperature conditions

Irradiance vs Current & Voltage

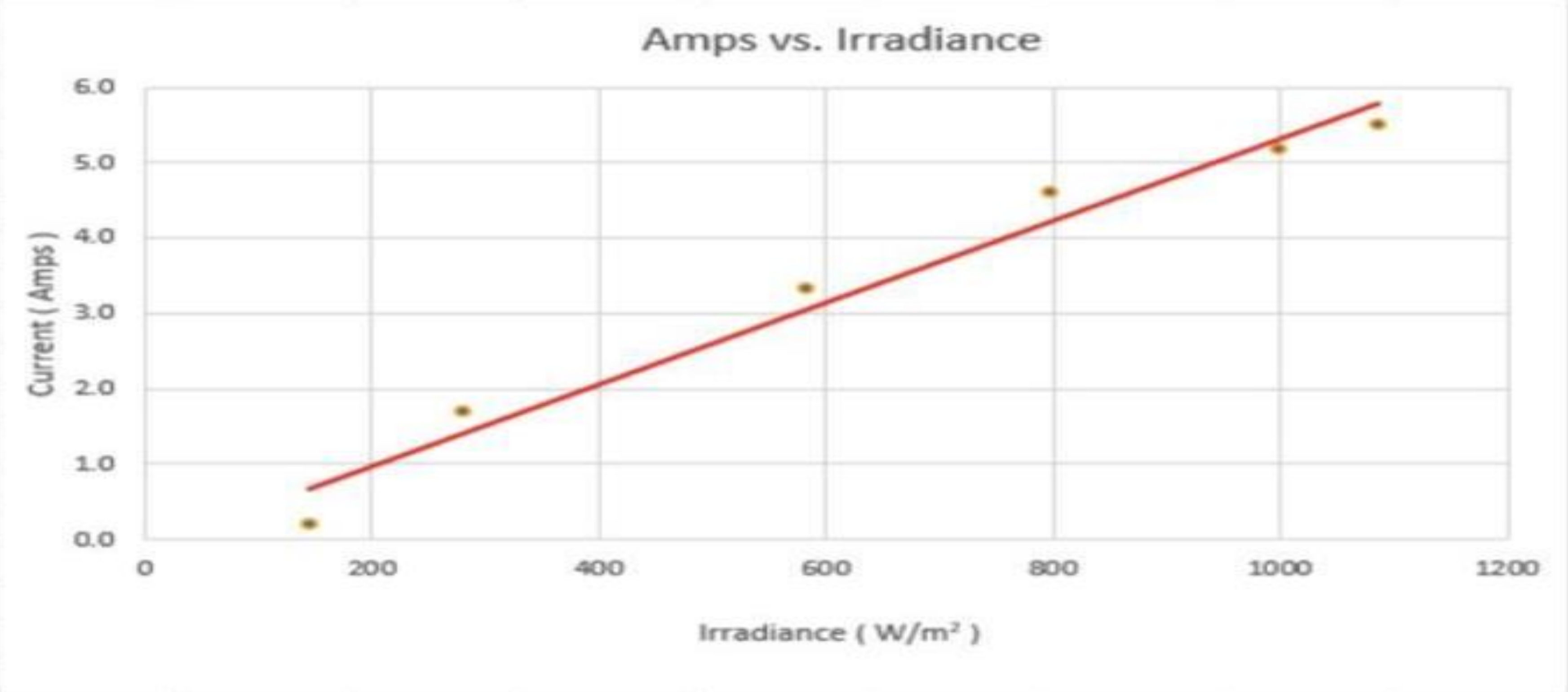
- Amps increased by 1560%
- Volts increased by 8%

Tilt Angle	Irradiance	Volts
150°	130	39.2
130°	296	42.7
90°	784	43.9
60°	1017	43.9
30°	898	43.1
0°	546	42.3



Volts % Increase
8%

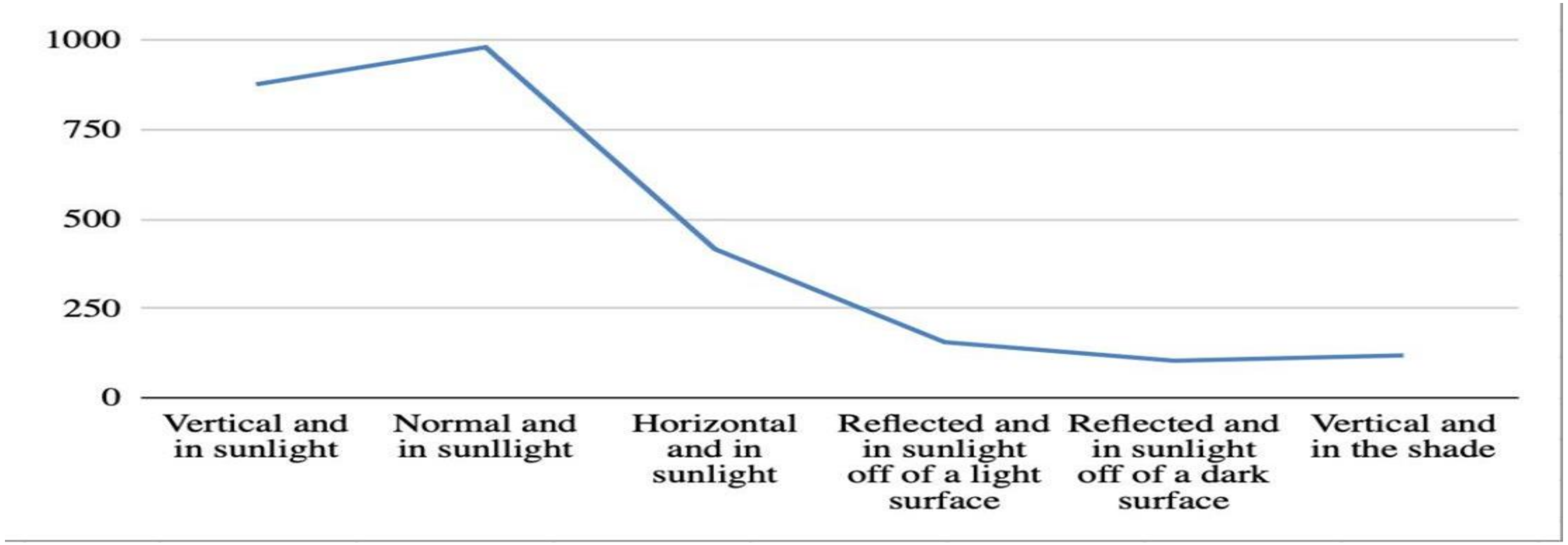
Tilt Angle	Irradiance	Amps
150°	145	0.2
120°	280	1.7
90°	797	4.6
60°	1086	5.5
30°	1000	5.2
0°	583	3.3



Amps % Increase
1560%

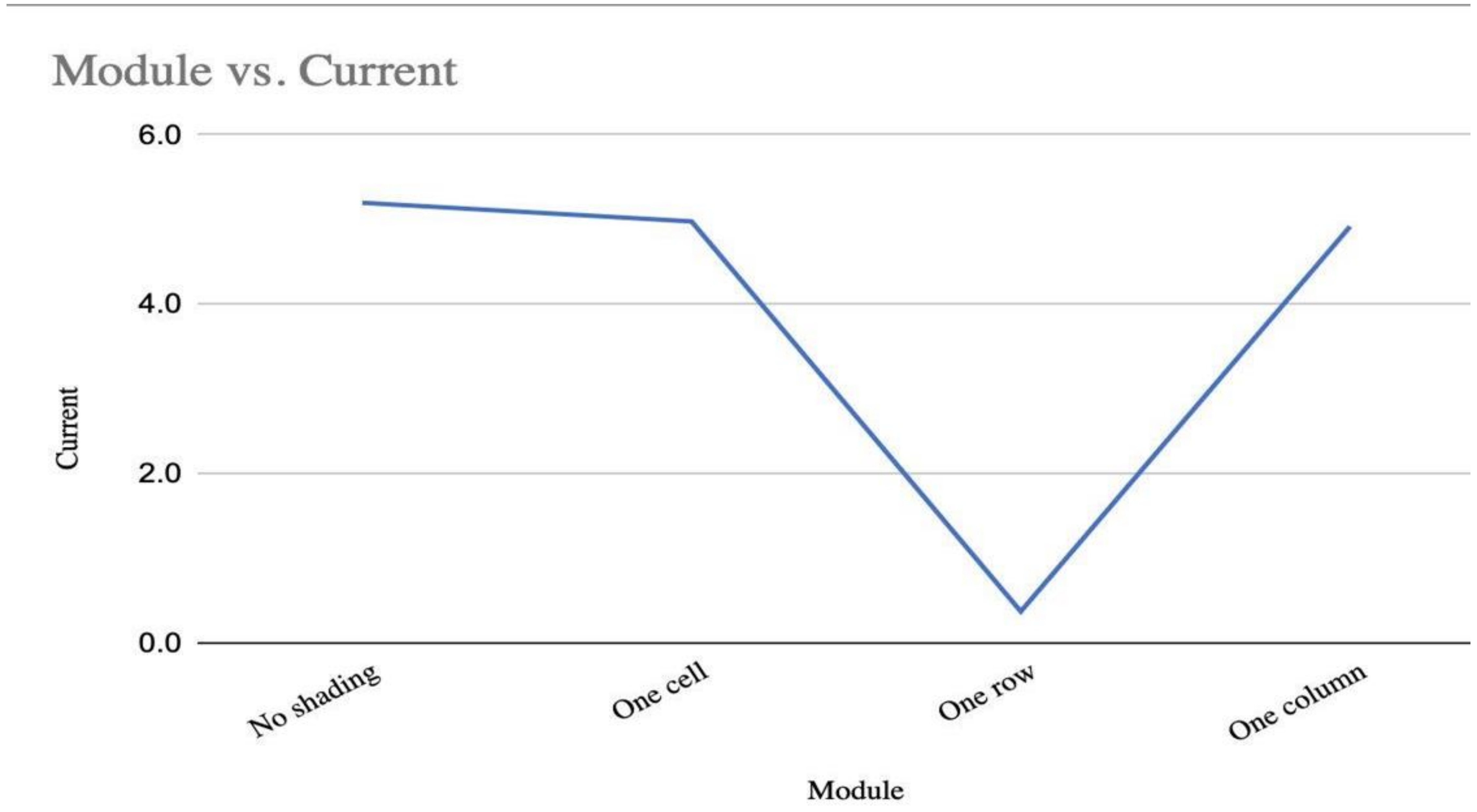
Panel Angle & Alignment

- Highest near 30°–60°
- Lowest when vertical in shade



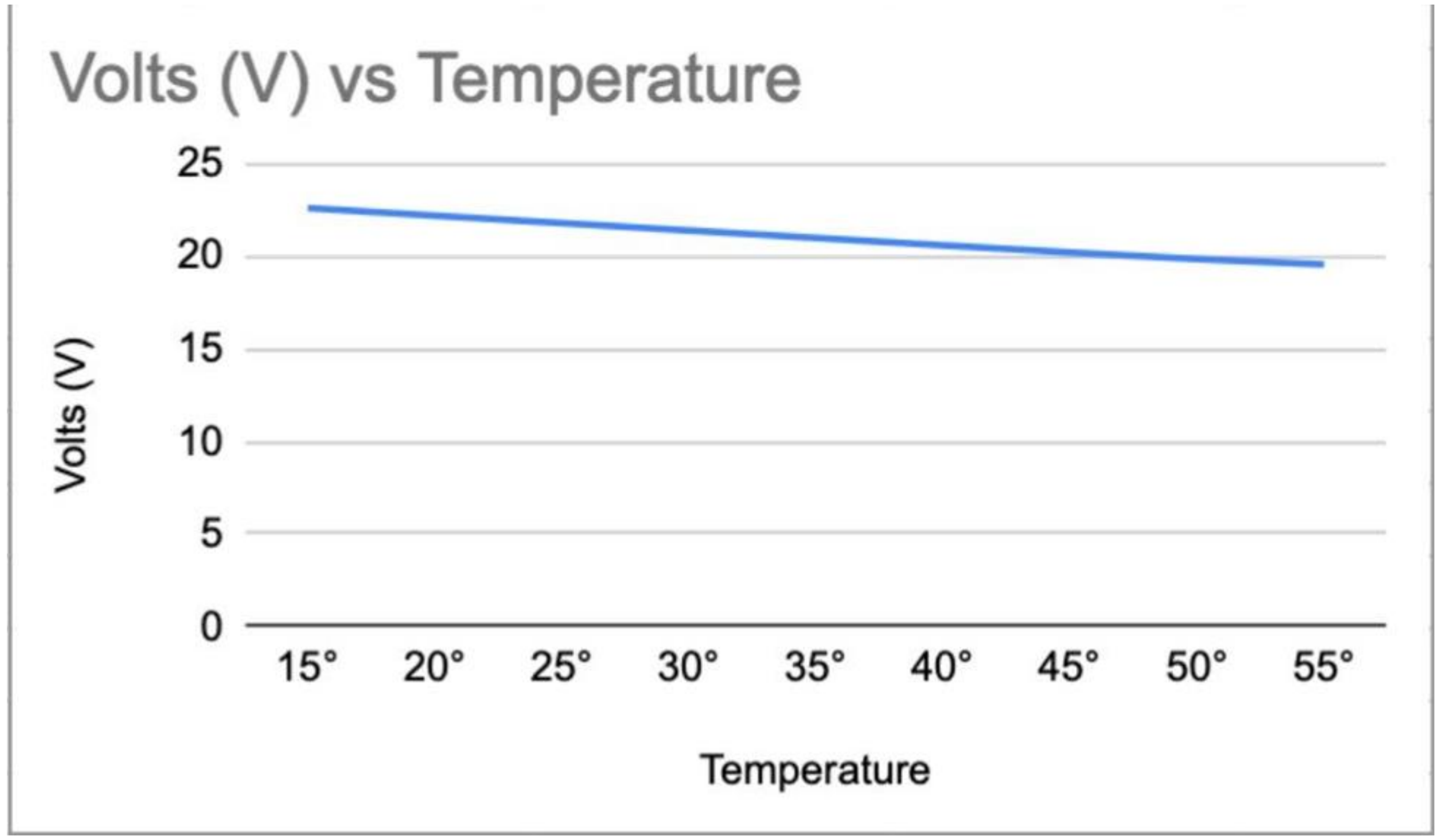
Shading Effects

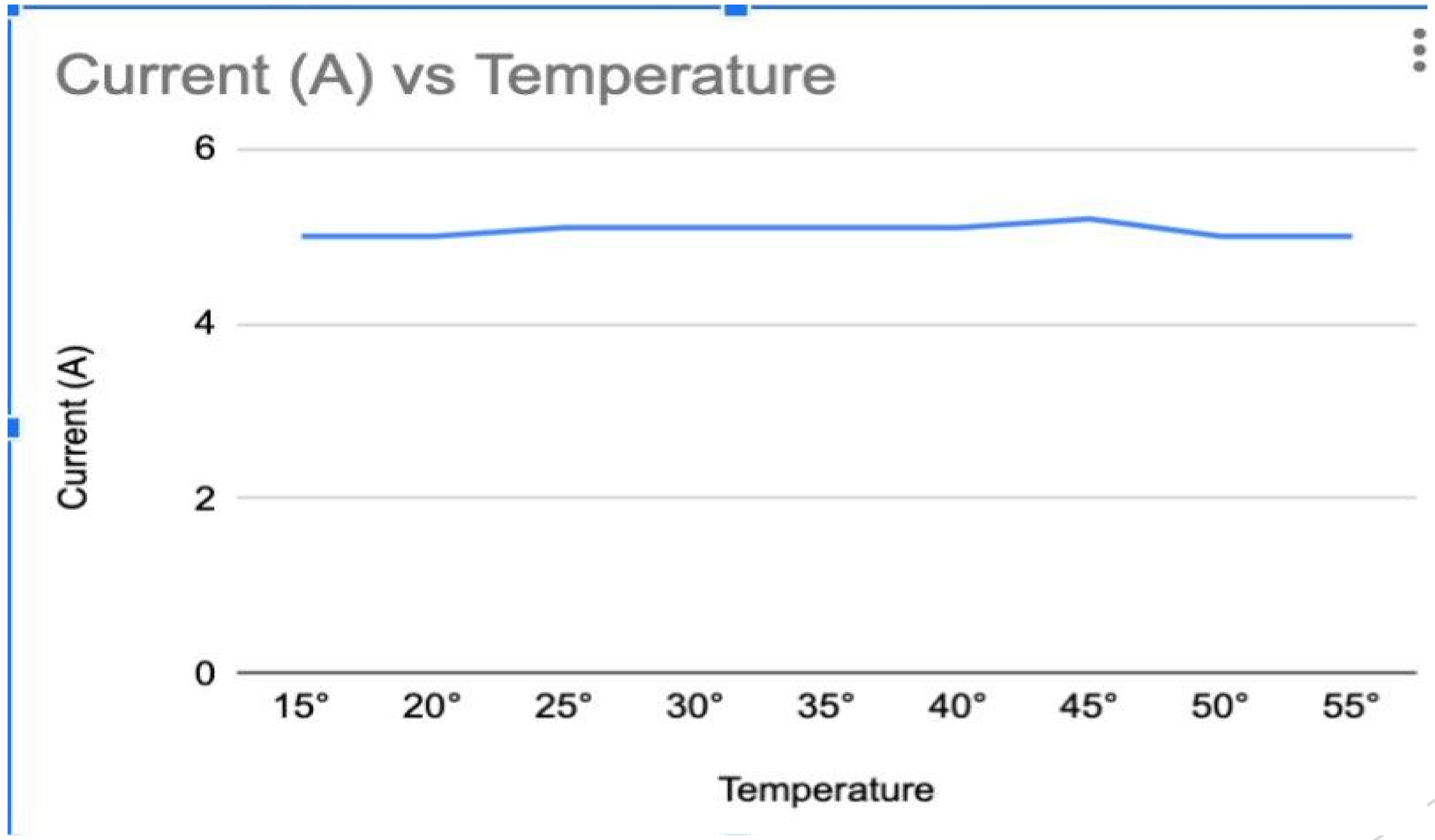
- 4–5% drop for column shading
- 93% drop for row shading



Temperature Effects

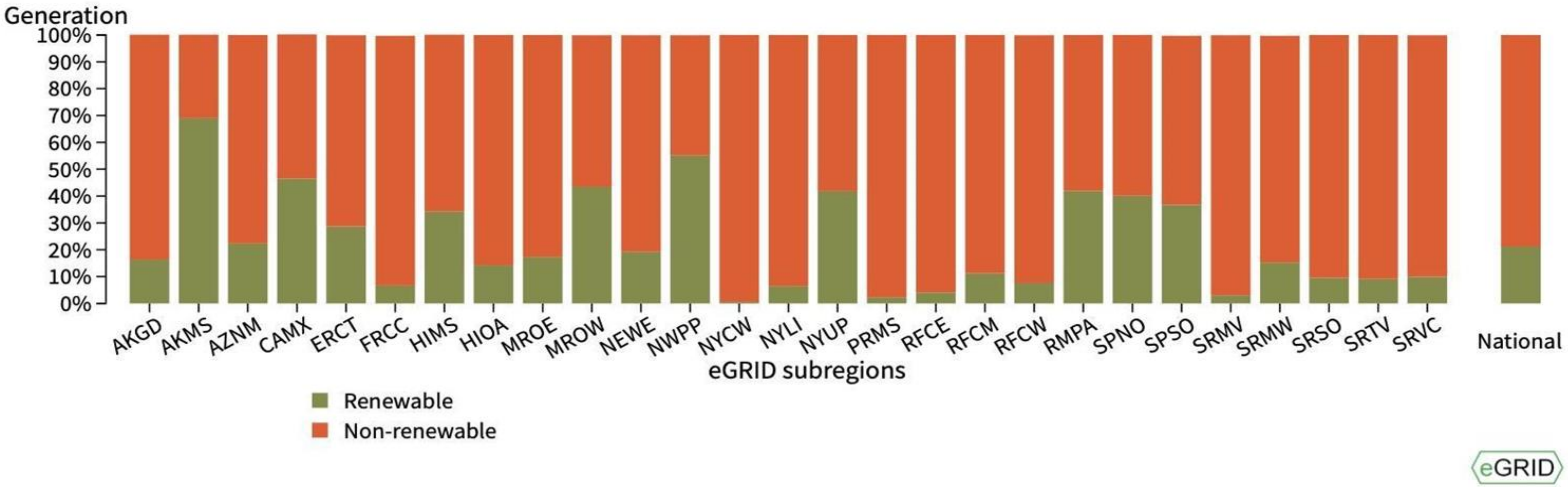
- Voltage drops from 22.6V → 19.5V
- Current remains ~5.0–5.2 A
- Temperature loss is voltage-driven





Why This Research Matters

- Global renewable transition
- Only 7.6% renewable in RCF/West region
- Need optimization, not just adoption



Engineering Implications

- Avoid row shading in array design
- Optimize tilt angle
- Account for temperature coefficient
- Use data-driven residential modeling

Summary & Next Steps

- Irradiance strongly controls current and overall power
- Row shading causes catastrophic performance loss
- Temperature reduces voltage, lowering total output

- Extract and validate performance coefficients
- Develop predictive residential energy model
- Expand to array-level and system-level optimization

REpowering Schools

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QUESTIONS?

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