

Clean Energy Institute

Dan Schwartz, Director



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INSTITUTE**

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Climate: A Global Grand Challenge



Images: NASA

Access: A Global Grand Challenge



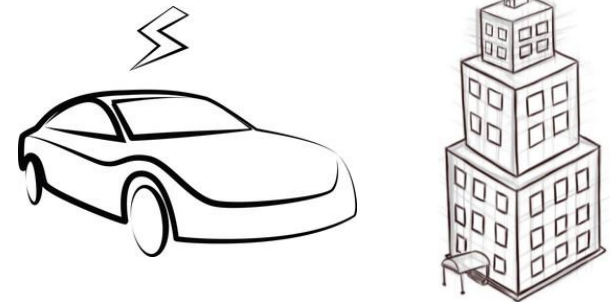
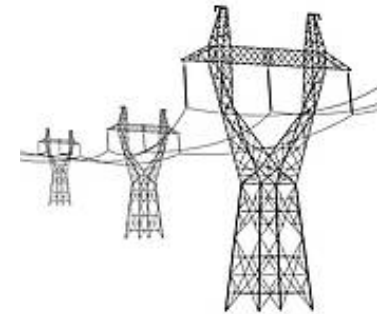
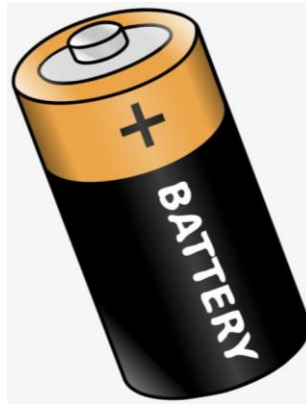
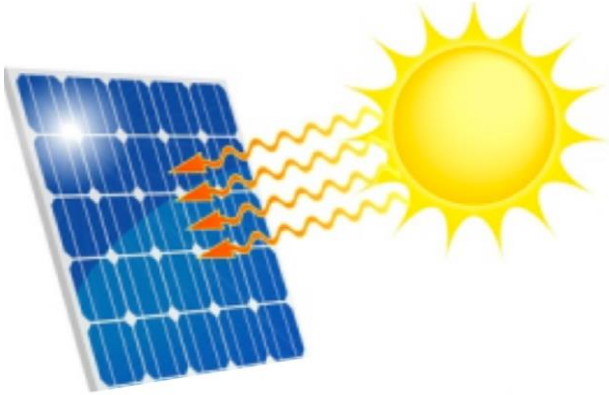
Image: *The Economist*



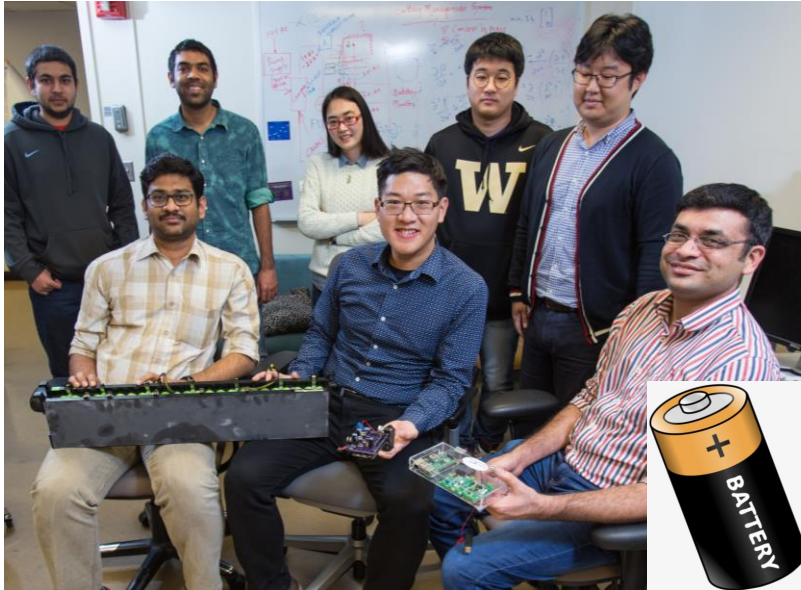
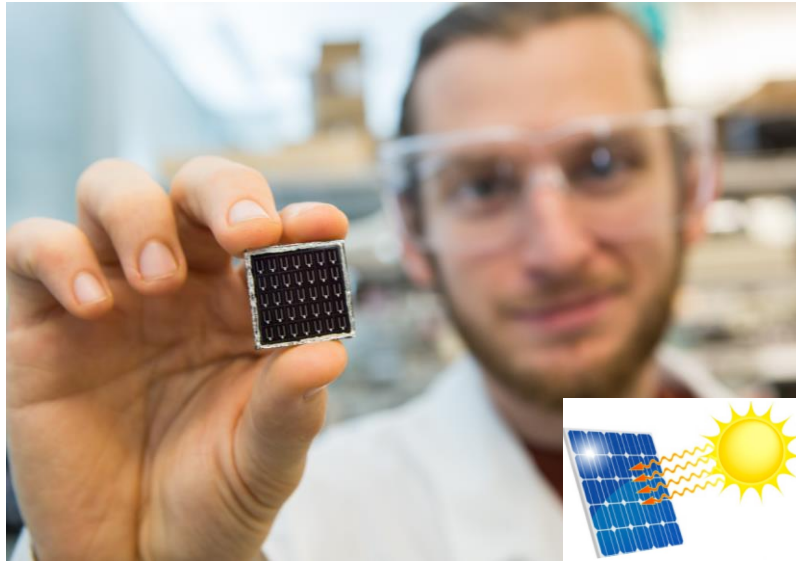
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CEI Mission



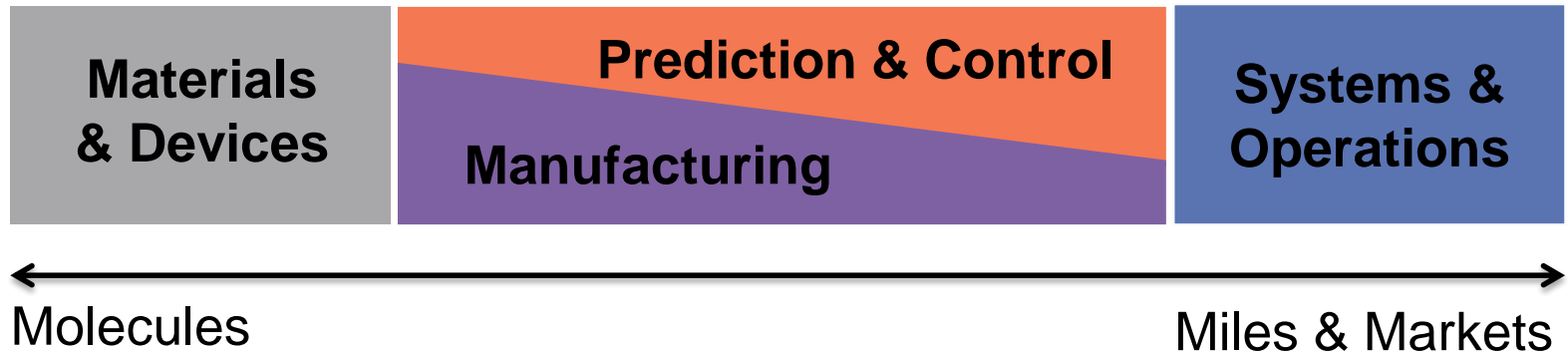
CEI Mission



Framework for Research & Education



Framework for Research & Education





Chu
Physics



Subramanian
ChemE/PNNL



Johnson
EE



Zhang
EE



Holmberg
ChemE



Cobb
ME



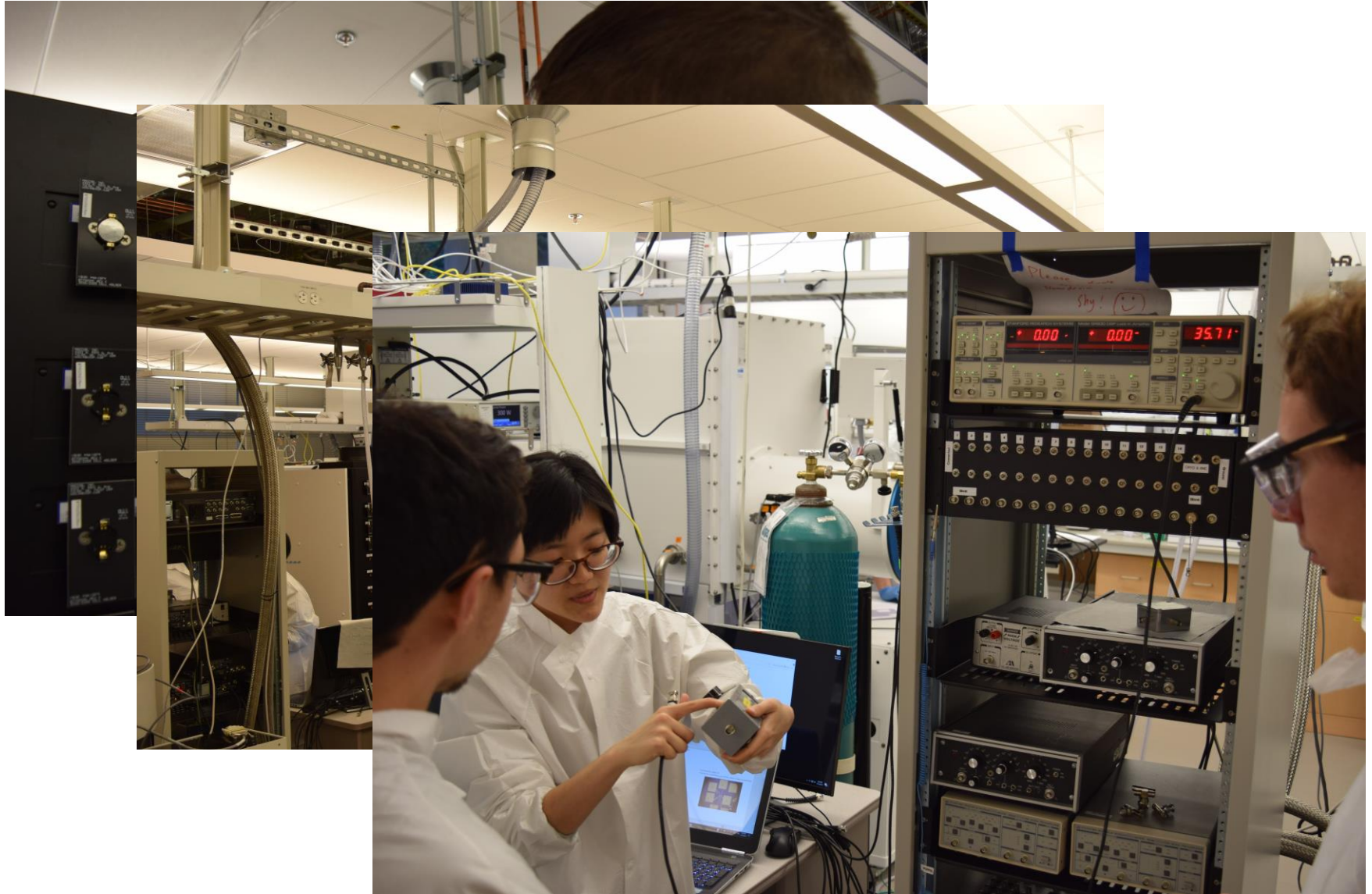
MacKenzie
MSE/ME



Education: Research Training Testbed

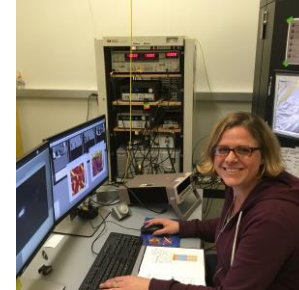


Research Training Testbed



Education: Seeding the Doers

- CEI and WRF Fellowships



- DIRECT Fellowships



DIRECT
Data Intensive Research
Enabling Clean Technologies

- Encouraging Entrepreneurship

Alaska Airlines

ENVIRONMENTAL INNOVATION CHALLENGE



Torrance Tech Due Diligence Fellows



Materials & Devices

A \$1 Billion synchrotron lets us study the molecular traits of real operating devices



Seidler



Access is extremely limited



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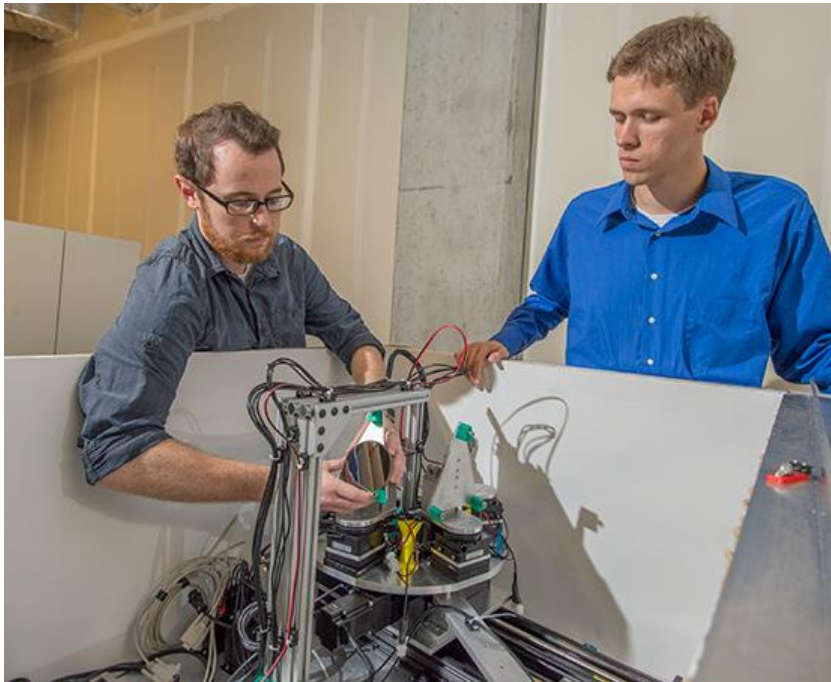
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Materials & Devices

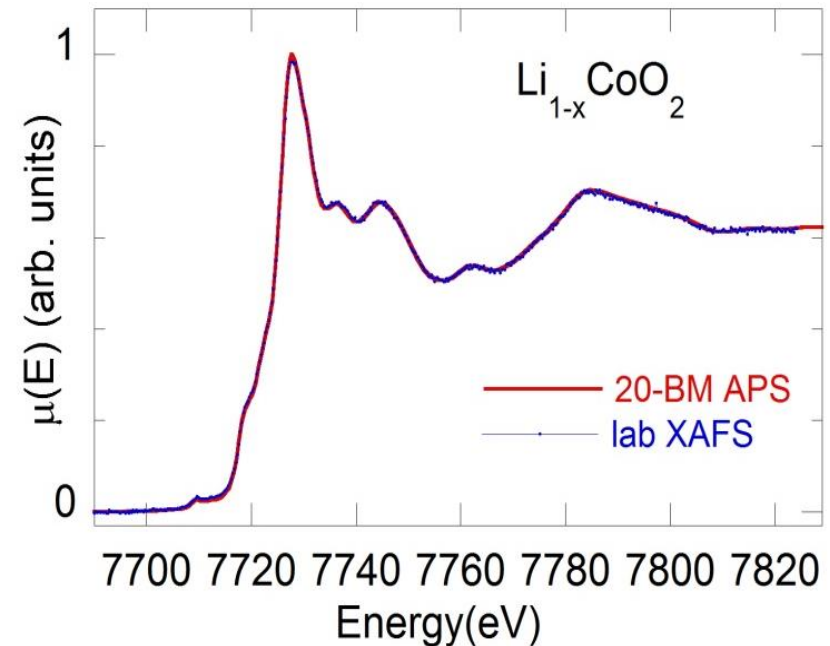


Seidler

UW researchers drop cost and size by 1/1000th



Li-ion Battery (+) electrode



easyXAFS



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Manufacturing

Dramatically lower CAPEX and higher productivity is possible with ink-based manufacturing.



MacKenzie



IMPRINT
energy

NEXT FLEX

Prediction & Control

Batteries charge too slowly, die unexpectedly, or burn because they lack sophisticated control



Subramanian



Boeing 787 battery fires grounded the fleet for months.



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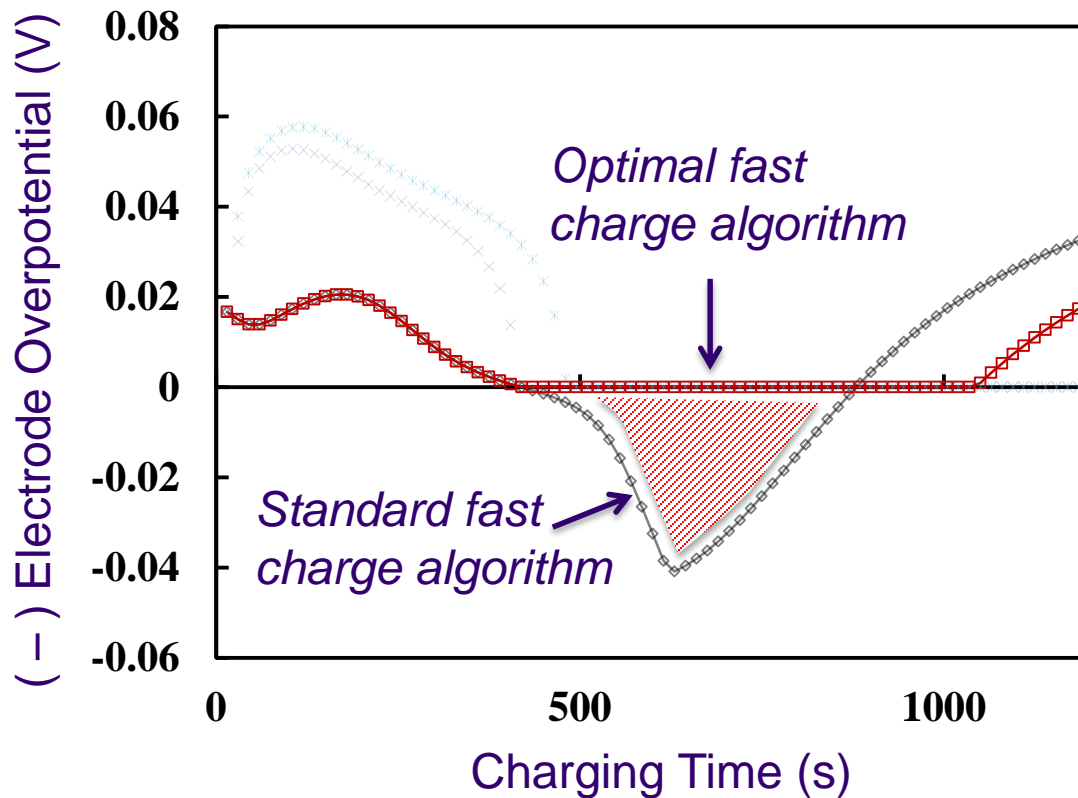
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Prediction & Control

Physics-based model predictive control schemes avoid dangerous internal states.



Subramanian

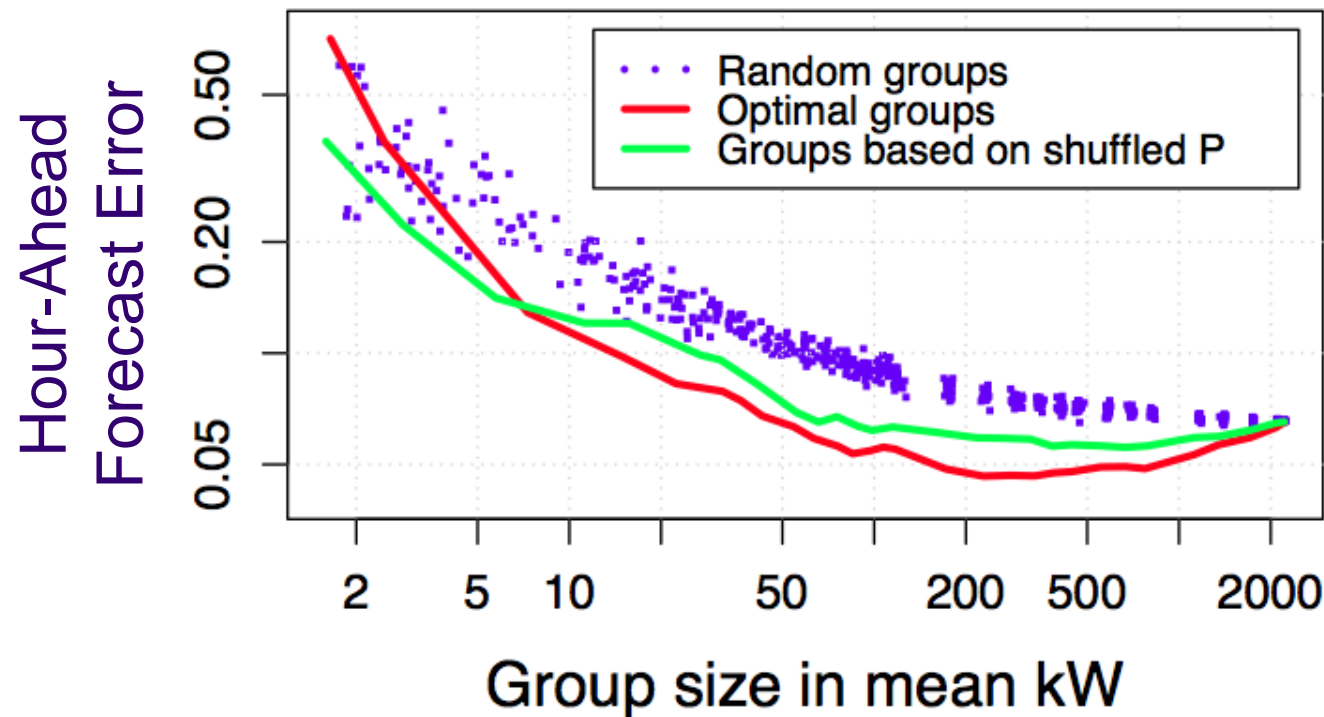


Prediction & Control

Optimal groupings of energy users by their use behavior leads to a minima in forecasting error



Zhang

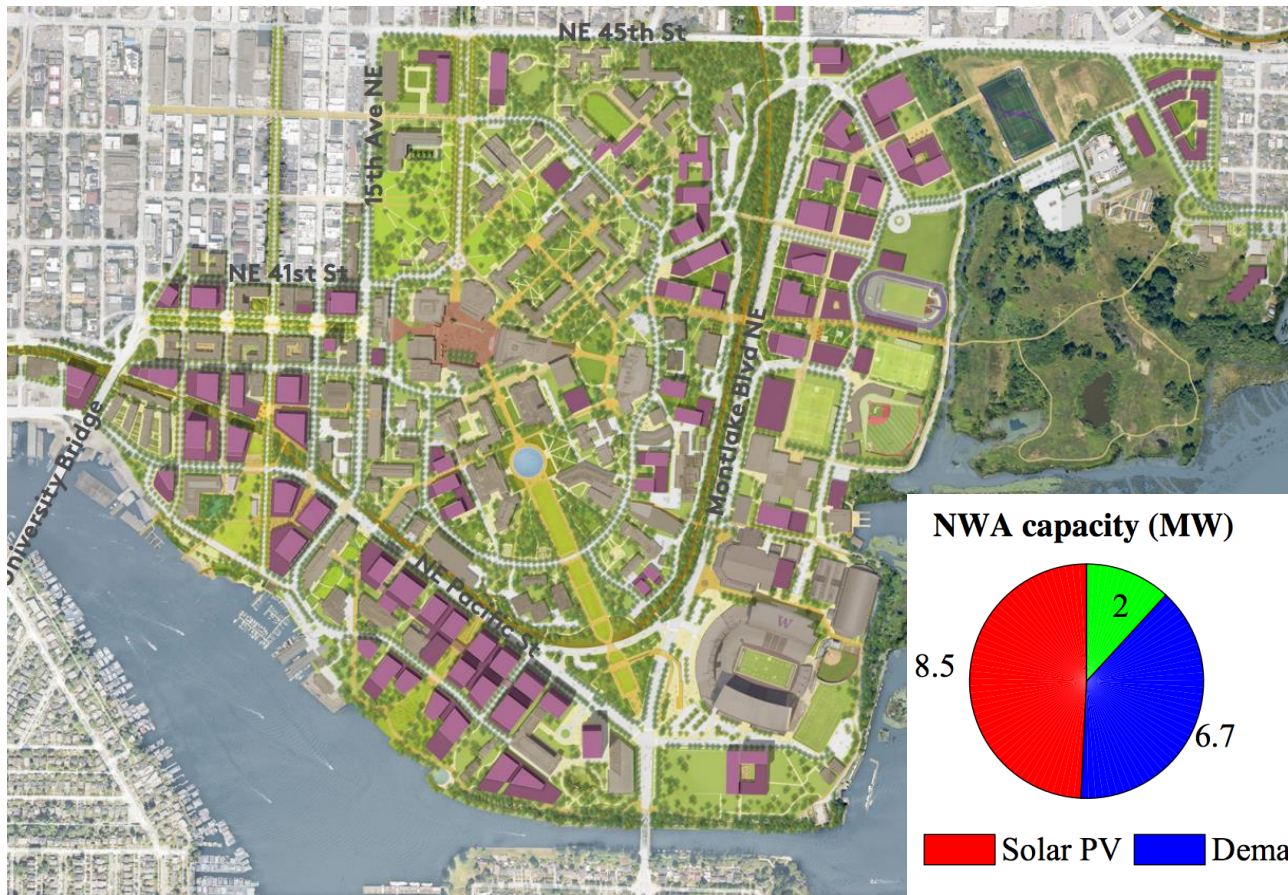


Systems & Operations

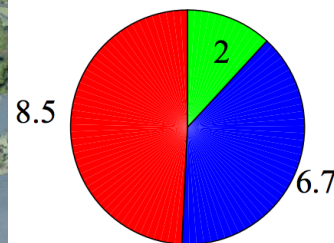
Non-wire alternatives will save 6-15% vs. business as usual capacity expansion for UW facilities plan



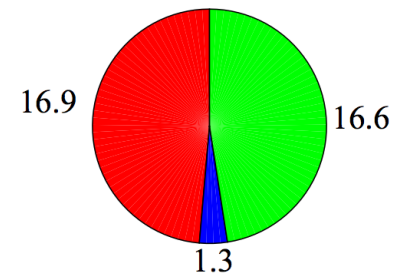
Zhang



NWA capacity (MW)



NWA investment cost (millions USD)



■ Solar PV ■ Demand response ■ Energy efficiency

How Can We Accelerate Clean Energy Innovation?

Barriers to early-stage startup successes in cleantech:

- Ability to test, validate, and demonstrate new technologies
- Access to industry collaborations
- Access to capital



Washington Clean Energy Testbeds



Microsoft



Drift

Battery
Informatics, Inc.



DEMAND
energy

An Enel Green Power Company

FOM
TECHNOLOGIES

Pacific Northwest
NATIONAL LABORATORY



MicroConnex
High Density Interconnect Solutions

Washington Clean Energy Testbeds



GE Energy



ELECTRONIC INK® Pacific Northwest
NATIONAL LABORATORY



Department of Commerce
Innovation is in our nature.

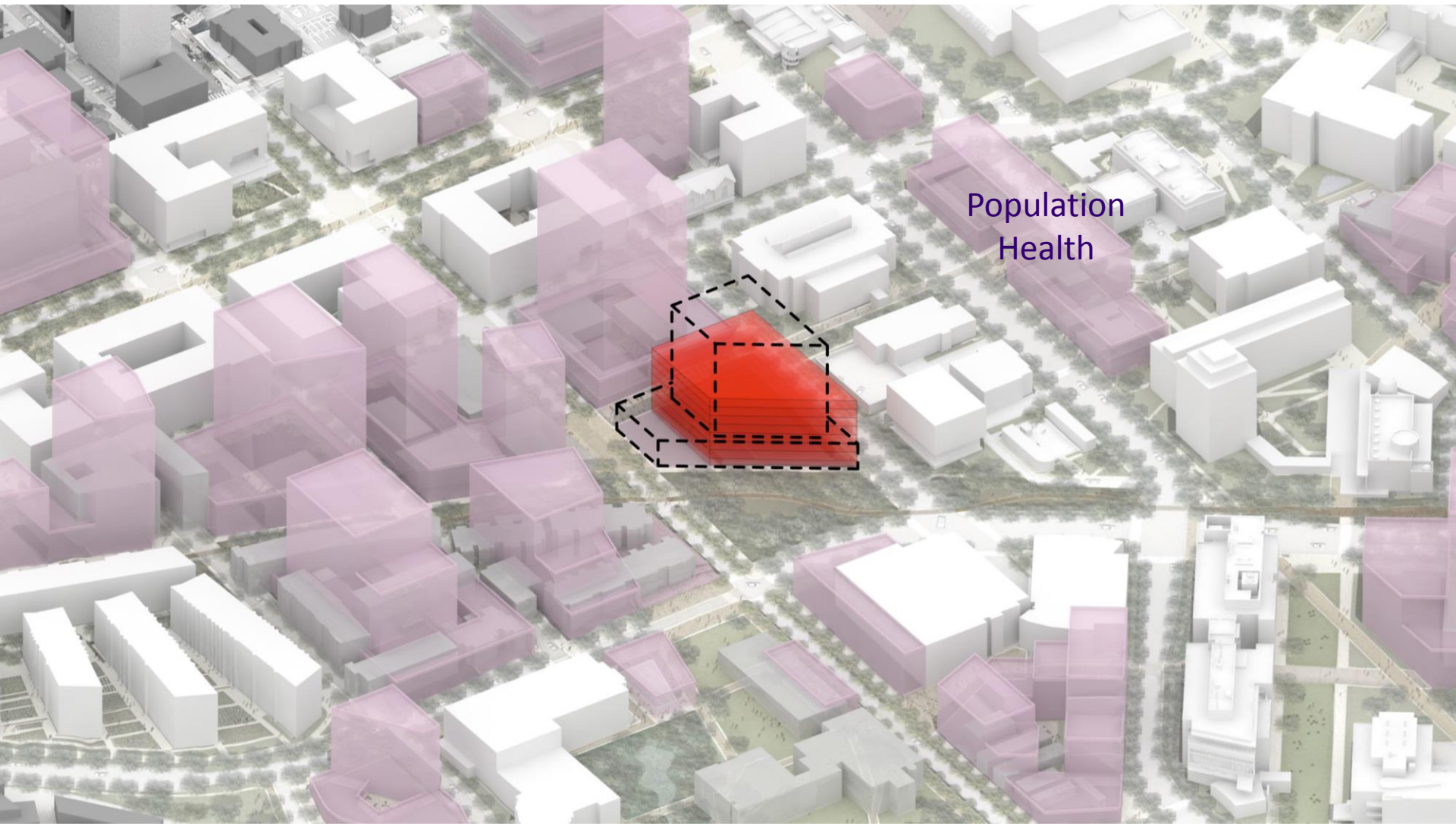


Center for Advanced Materials & Clean Energy Technologies (CAMCET)



CAMCET:

Heart of the “Innovation District”



Our Mission

CEI accelerate the adoption of a scalable clean energy future through the people we train, the ideas we explore, and the open access testbed facilities we support.

Keep in Touch

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- **Facebook:** @CleanEnergyInstitute