



U.S. DEPARTMENT OF ENERGY

SOLAR DISTRICT CUP

COLLEGIATE DESIGN COMPETITION

Warmup Workshop

PROGRAM TO BEGIN AT 8:30 A.M.

SOLAR POWER
INTERNATIONAL



U.S. DEPARTMENT OF
ENERGY | Office of ENERGY EFFICIENCY
& RENEWABLE ENERGY
SOLAR ENERGY TECHNOLOGIES OFFICE





U.S. DEPARTMENT OF ENERGY

SOLAR DISTRICT CUP

COLLEGIATE DESIGN COMPETITION

WELCOME



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& RENEWABLE ENERGY
SOLAR ENERGY TECHNOLOGIES OFFICE



Warmup Workshop Agenda

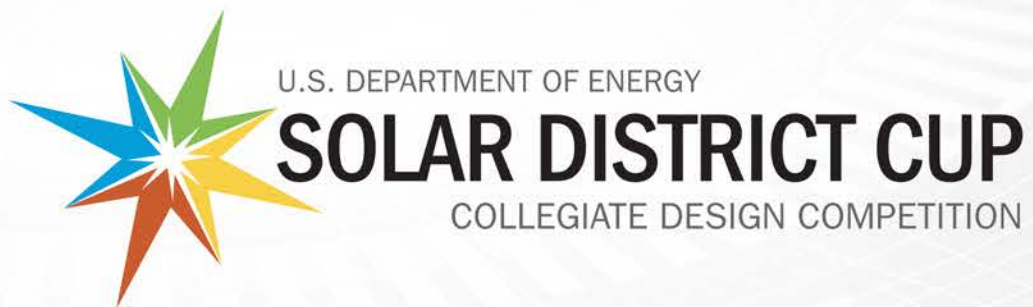


NOW

8:45 a.m.	Introduction to the Solar District Cup
9:15 a.m.	Know Your Division: District Use Case Review
9:30 a.m.	Starting Lineups: Team Introductions
10:15 a.m.	BREAK
10:30 a.m.	Top 10 Tips to Take Home Glory
11:00 a.m.	Learning from the Pros: District Example
12 – 1 p.m.	Lunch on your own
1 – 3 p.m.	Baseline Knowledge Interviews (Optional)
3 – 4:30 p.m.	SPI First-Time Attendee Roadmap (Optional)

Welcome





Dr. Becca Jones-Albertus

Deputy Director, Solar Energy Technologies Office





NORTH AMERICA SMART ENERGY WEEK



Aimee Gabel

Chief Experience Officer, Solar Energy Trade Shows





U.S. DEPARTMENT OF ENERGY

SOLAR DISTRICT CUP

COLLEGIATE DESIGN COMPETITION

Who We Are: Meet the Solar District Cup Organizers



Shamara Collins
DOE



Joe Simon
NREL



Sara Farrar
NREL



Travis Lowder
NREL



Aadil Latif
NREL



Jackie Petre
NREL



Warmup Workshop Agenda



NOW

9:15 a.m.

9:30 a.m.

10:15 a.m.

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11:00 a.m.

12 – 1 p.m.

1 – 3 p.m.

3 – 4:30 p.m.

Introduction to the Solar District Cup

Know Your Division: District Use Case Review

Starting Lineups: Team Introductions

BREAK

Top 10 Tips to Take Home Glory

Learning from the Pros: District Example

Lunch on your own

Baseline Knowledge Interviews (Optional)

SPI First-Time Attendee Roadmap (Optional)





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SOLAR DISTRICT CUP

COLLEGIATE DESIGN COMPETITION

A new competition challenging student teams to design and model solar + storage systems for a campus or urban district.



Solar District Cup Overview

- Goal: to prepare students for the renewable energy workforce.
- Develop forward-thinking designs for optimized campus or urban district distributed energy systems.
- Engage students across engineering, finance, urban planning, sustainability, and other disciplines.
- Reimagine how electric energy is generated, managed, and used in urban areas.



Introduction

WHO
is competing

WHAT
you'll do



WHY
we're hosting this
competition

HOW
and what you win



Who You Are

- Several schools have multiple teams
- Some teams have multiple schools
- Many teams are multidisciplinary:
 - Engineering
 - Finance
 - Urban Planning
 - Sustainability
 - Environmental Policy
 - Others
- Many types of college students
- Many faculty advisors and industry partners



61 Teams from All Across the Country!

Alfred University
Appalachian State University
Arizona State University
Brown University
California Polytechnic State University
California State University, Fresno
California State University, Los Angeles
Case Western Reserve University
Clemson University
Colorado School of Mines
Cornell University
Creighton University
Dartmouth College
Embry-Riddle Aeronautical University
Florida International University
Georgia Institute of Technology
Hampton University
Hanover College
Illinois Institute of Technology
Indiana University--Purdue University Indianapolis
Kettering University
Little Big Horn College

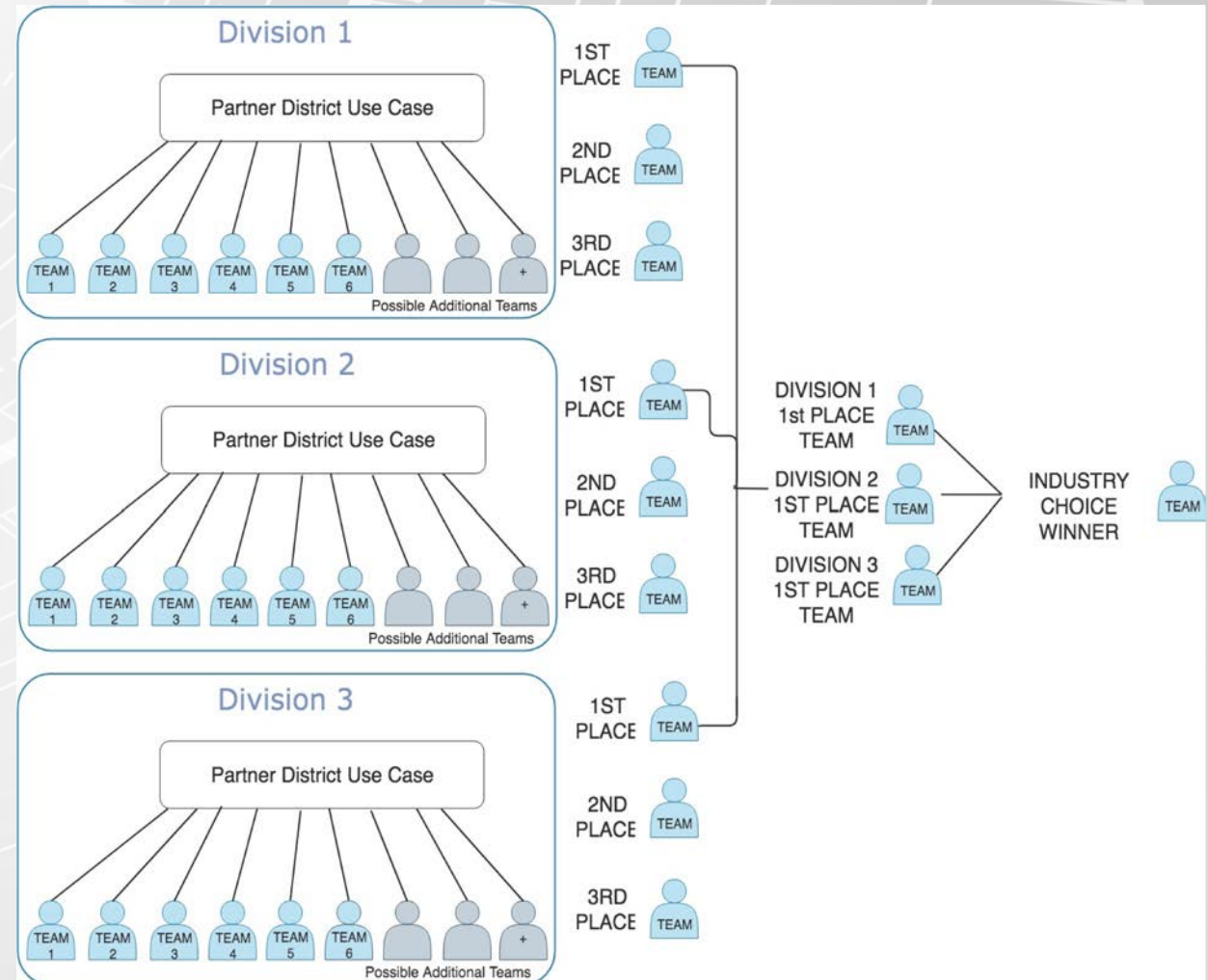
Marquette University
Missouri University of Science and Technology
Montana State University
Morgan State University
New Mexico State University
Northern Arizona University
Northwestern University
Ohio Northern University
Prairie View A&M University
Rose-Hulman Institute of Technology
Santa Clara University
The Ohio State University
The University of Akron
The University of Arkansas
The University of Massachusetts Lowell
The University of Texas at Austin
The University of Virginia
United Tribes Technical College
University at Buffalo, The State University of New York
University of Central Florida
University of Cincinnati
University of Colorado Boulder

University of Illinois Urbana-Champaign
University of North Florida
University of South Florida
University of Washington
Valencia College
West Virginia University
Western Washington University
Yale University



How you compete

- 3 divisions
- Progress report submission
- Finalists identified
- Winners of each division selected by judges
- One industry choice winner selected at Solar Power Southeast





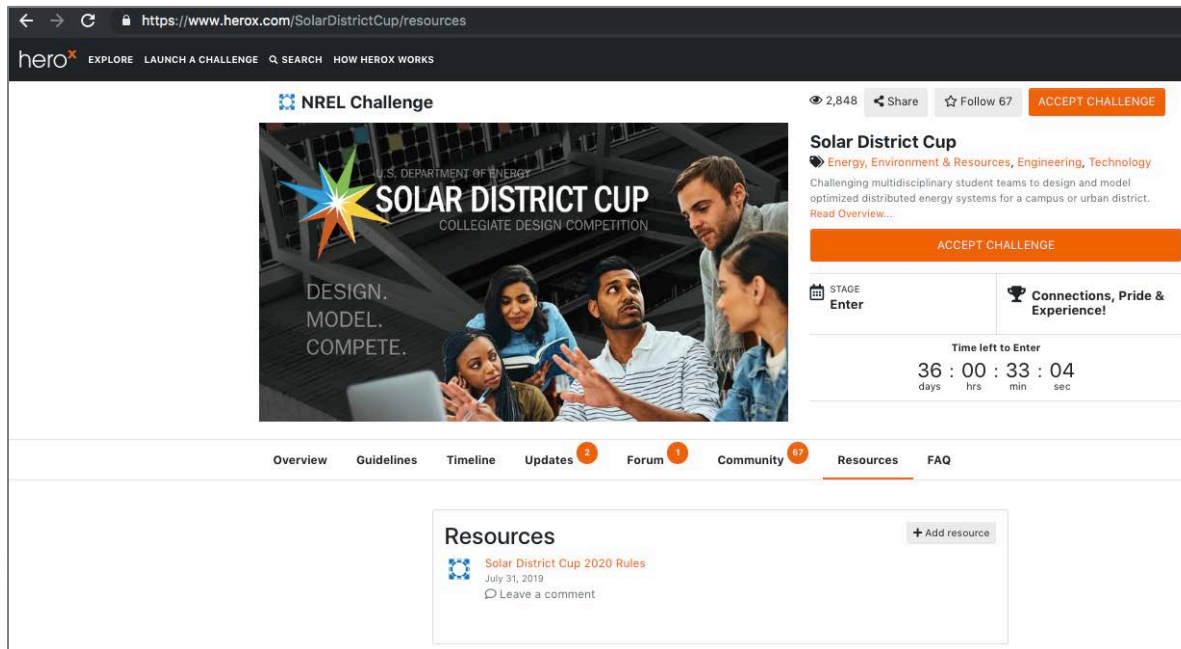
What You'll Do

- Assume the role of a solar + storage developer to produce a proposal and analyze electric distribution grid interactions for a district use case
- Learn about the development of distributed energy + storage systems
- Present your solution to judges and industry



You'll Read the Rules

- 1st release available now on HeroX platform
- 2nd release planned for January 2020 with minor revisions



You'll Participate in Training and Ask Questions

Training Topic
Solar District Cup Deep Dive
Conceptual System Design
Distribution System Impact Analysis
Financial Model
Development Plan

Training on Tools
System Advisor Model (SAM)
Aurora Solar
OpenDSS
REOpt Lite
Savings Model Building

- “Office Hours”:
 - Open to all registered teams
 - Held September through November and again January through February



You'll Design Your Solution and Submit Deliverables

- **Deliverable Packages:**

- Progress Deliverable Package – Solar PV System
- Final Deliverable Package – Solar PV + Battery Electric Storage System

- **Content:**

- Conceptual System Design
- Distribution System Impact Analysis
- Financial Analysis
- Development Plan
- Optimization Strategy
- Instructions in the appendices of the Rules

- **Evaluation Process:**

- Evaluation Statements vs. Judging Statements for Evaluation

You'll Compete to Win

1. Judges review Final Deliverable Packages
2. Judges witness a 10- to 25-minute live presentation
3. Judging panel convenes to determine division winners
4. 1st-, 2nd-, and 3rd-place winners are identified and announced
5. 1st-place winner of each division presents to Solar Power Southeast conference attendees and an industry choice winner is selected and announced

Table 3. Scoring Scale

1	2	3	4	5	6
Strongly disagree	Disagree	Slightly disagree	Slightly agree	Agree	Strongly agree

Excerpt from Rules, page 9



Why We're Hosting This Competition

- Help address workforce gaps for professionals in the energy industry
- Showcase innovative solutions for increased penetration of distributed energy generation at the campus or district scale
- Inspire industry to think differently about optimized district energy systems





Why Participate?

- Build experience with innovative renewable energy design
- Develop real-world solutions that shape the future of solar energy
- Network with industry for jobs
- Enhance education and build resume
 - Senior design/capstone project
 - Elective or independent study credit
 - Part of class or thesis
 - Extracurricular activity





How and What You Win

- Evaluation Statements:
Progress Deliverable Package
- Judging Statements for Evaluation:
Final Deliverable Package
 - *Excerpt from Rules, page 6*
- Win a trophy and national recognition
- Gain valuable experience with real-life examples of innovative renewable energy design and engagement with industry





What's Next: Summary Timeline 2019 – 2020

- **Nov. 21**, 5:00 p.m. ET — Deadline to submit Progress Deliverable Package for all participating teams
- **Dec. 12** — Finalist teams announced
- **April 11**, 5:00 p.m. ET — Deadline to submit Final Deliverable Package for finalist teams
- **April 19–20** — Finalists present projects at Solar Power Southeast in Atlanta, GA; winners announced



April 2020

S	M	T	W	T	F	S
29	30	31	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	1	2

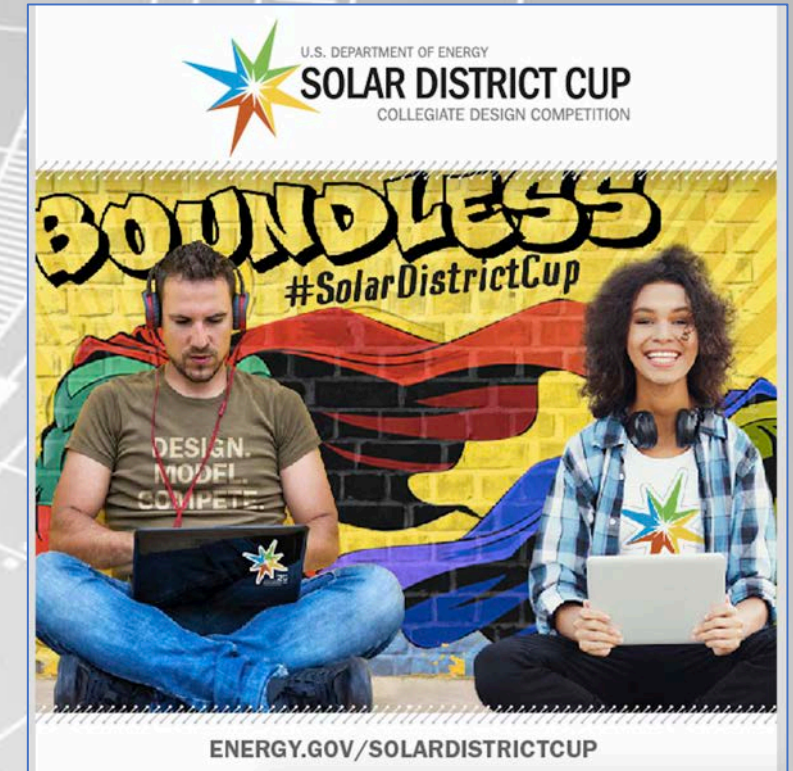
Solar Power Southeast: April 20 – 21, 2020

Solar District Cup 2020 Competition: April 19 – 20

- Student teams travel on Saturday, April 18
- Present to division judges on Sunday, April 19
- Winners announced and plenary presentation by division 1st-place teams on Monday, April 20
- Student teams travel home Monday night or optionally attend more of conference

How we'll communicate

- Competition overview: www.energy.gov/solardistrictcup
- Competition details and participation: www.herox.com/solardistrictcup
 - Updates
 - Notifications
 - Submissions
 - Forum
- General announcements: Mailchimp newsletter
- Webinars: webinars and Office Hours
- Direct contact: solardistrictcup@nrel.gov





Questions?

Tag and follow on social:

#SolarDistrictCup

Learn more, sign up for our newsletter, and register a team at:

energy.gov/solardistrictcup

solardistrictcup@nrel.gov



Warmup Workshop Agenda



NOW

9:30 a.m.

Know Your Division: District Use Case Review

Starting Lineups: Team Introductions

10:15 a.m.

BREAK

10:30 a.m.

Top 10 Tips to Take Home Glory

11:00 a.m.

Learning from the Pros: District Example

12 – 1 p.m.

Lunch on your own

1 – 3 p.m.

Baseline Knowledge Interviews (Optional)

3 – 4:30 p.m.

SPI First-Time Attendee Roadmap (Optional)





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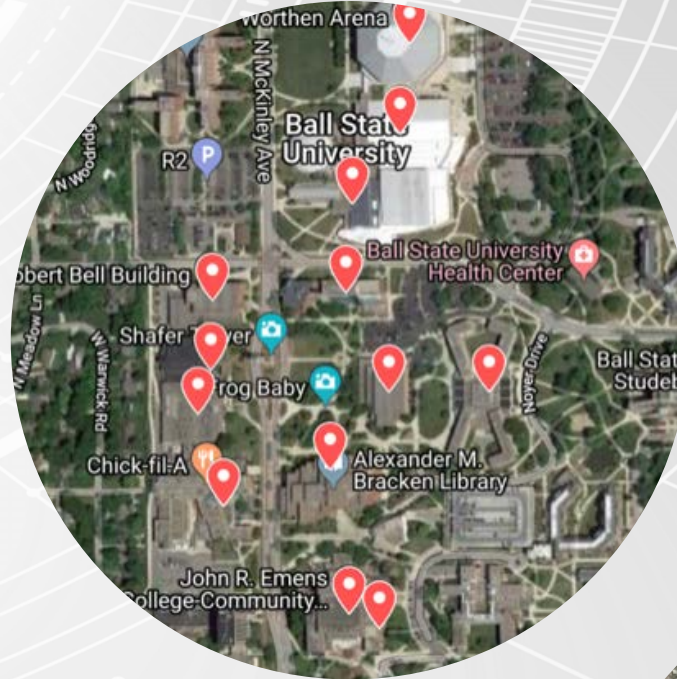
COLLEGIATE DESIGN COMPETITION

District Use Cases

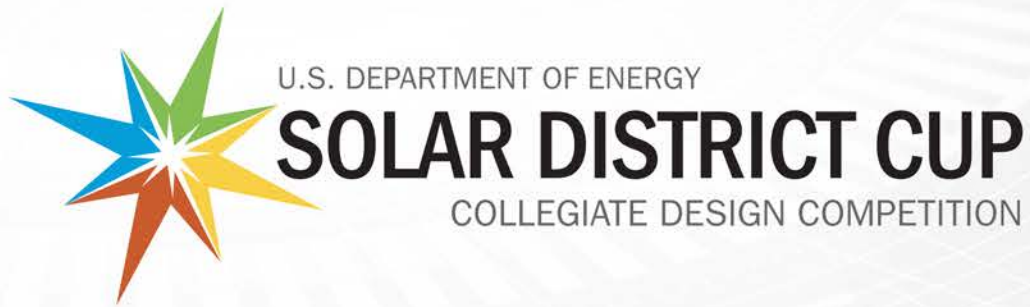
Ball State University

New Mexico State University

Crystal Parks



SOLAR DISTRICT CUP



**BALL STATE
UNIVERSITY**

UNIVERSITY
BALL STATE



Ball State

A public research institution in Muncie, IN with 21,800 students and sitting atop more than 700 acres of land



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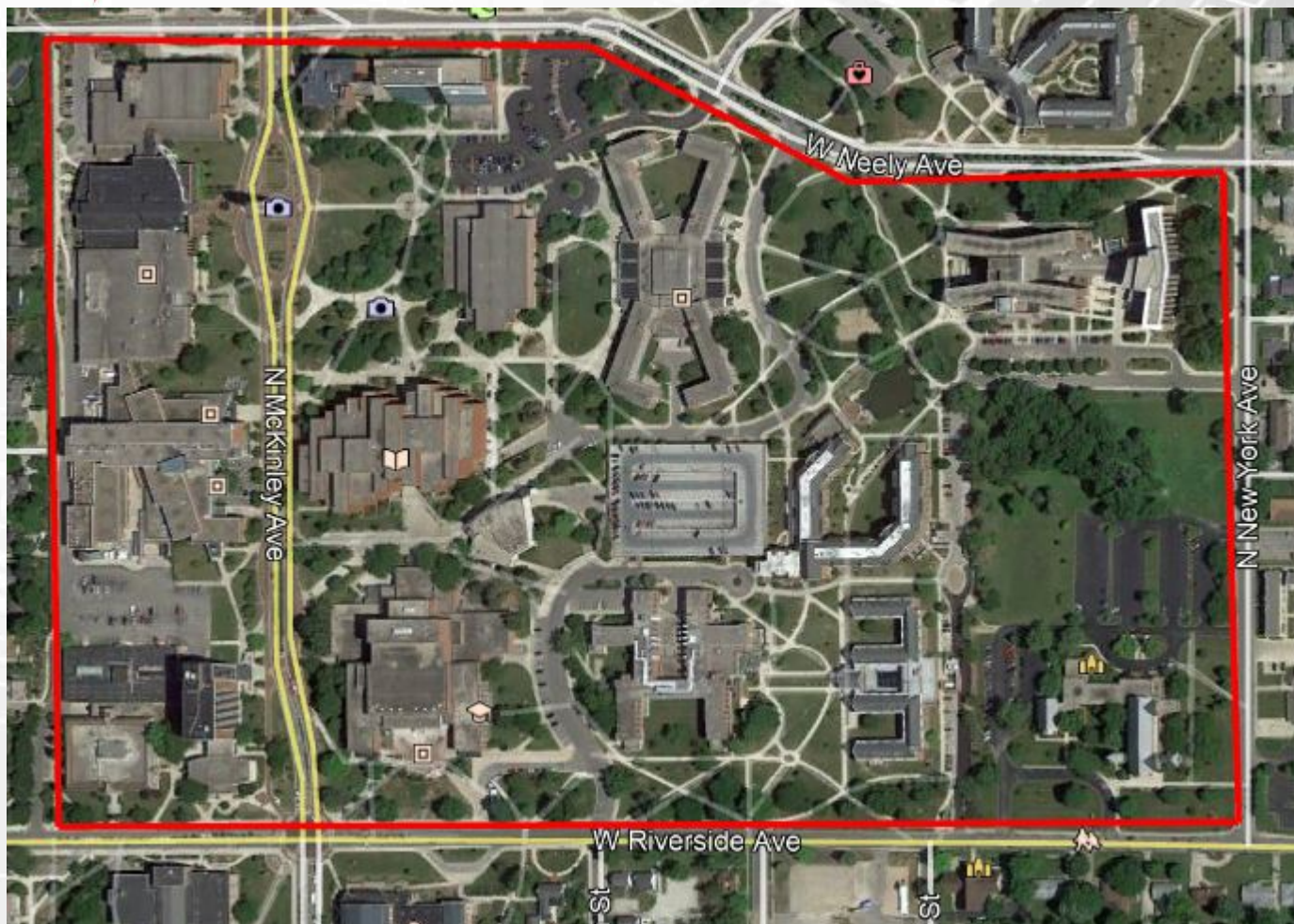




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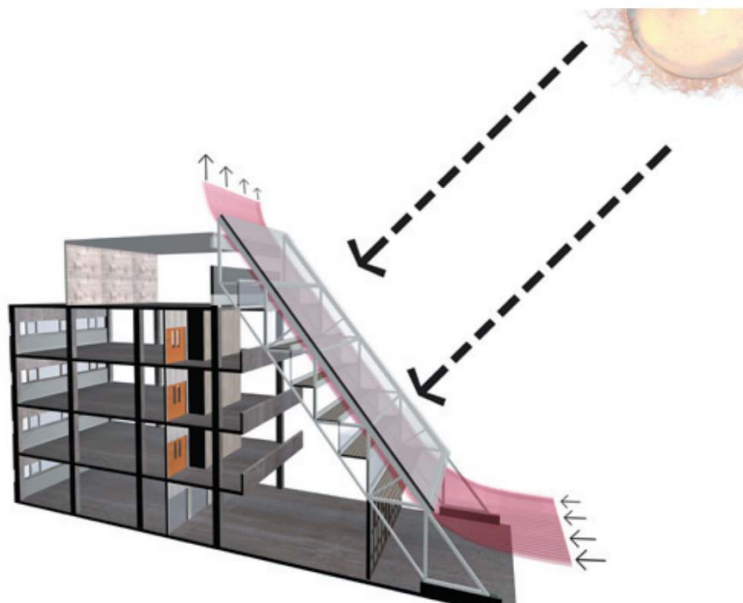


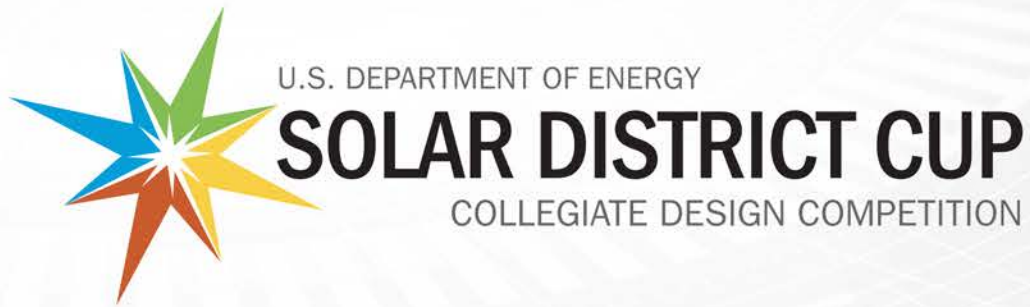


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NMSU

A public research institution in Las Cruces, NM with more than 16,000 students and sitting atop 900 acres of land





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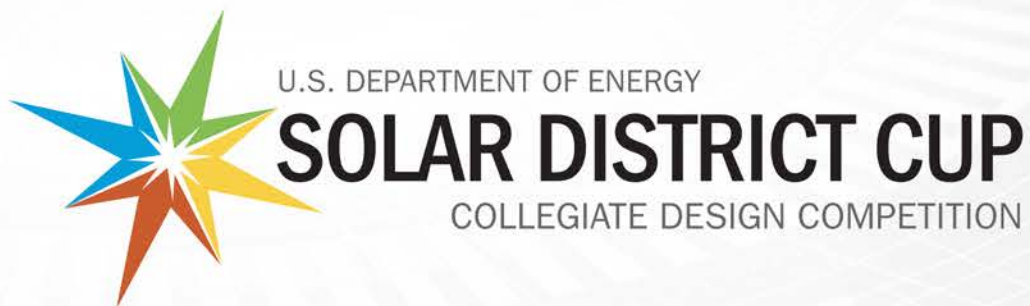


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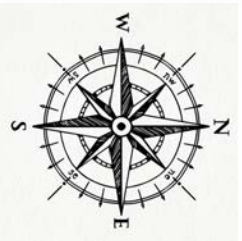


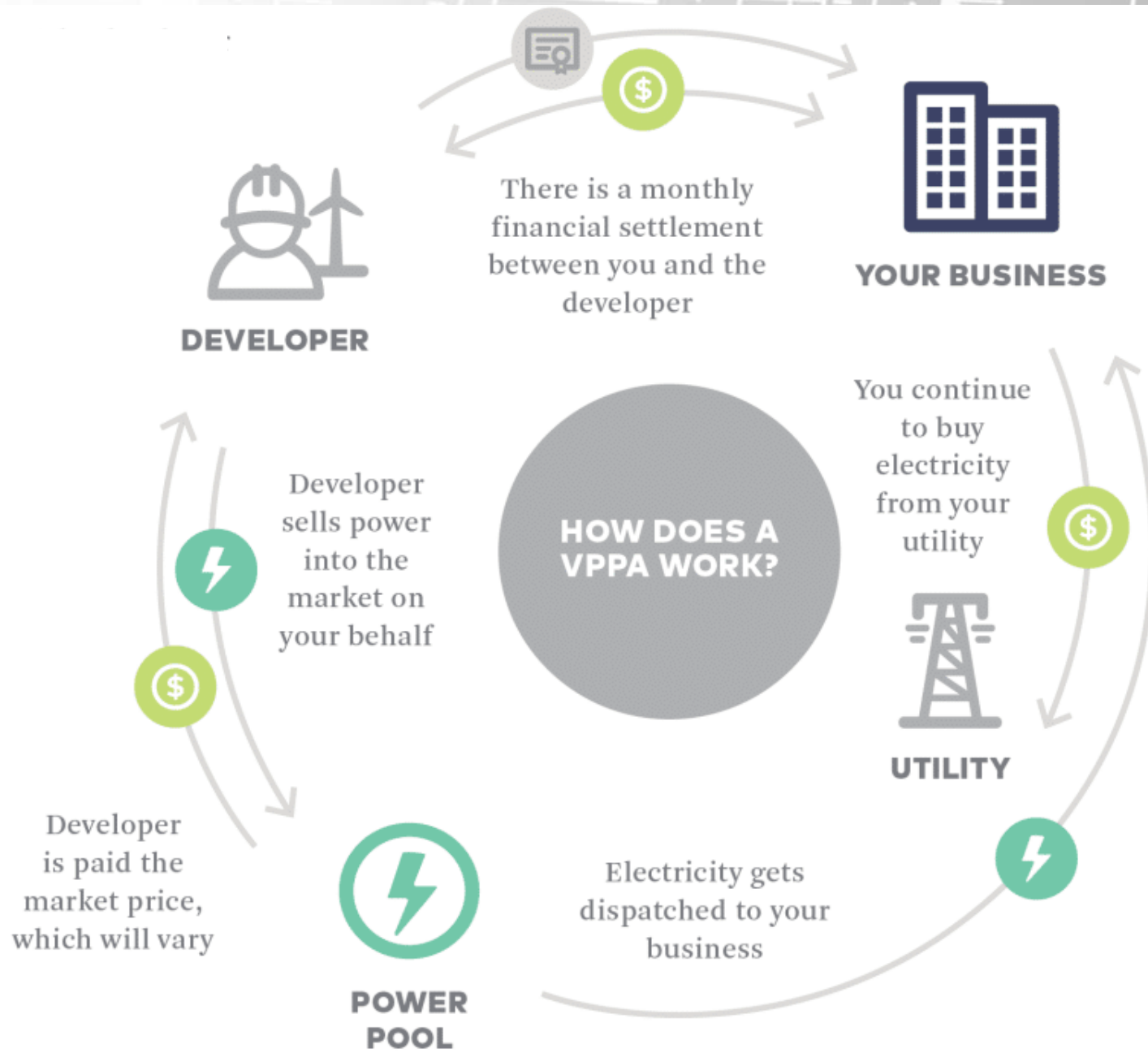
JBG SMITH



Crystal Parks

A commercial office development with ground-floor retail in five buildings across from Reagan Airport in Crystal City, VA





Questions?

Email us anytime Solar.DistrictCup@nrel.gov

Reminder: Please do not contact any entities associated with the districts!!!



Warmup Workshop Agenda



NOW

10:15 a.m.

10:30 a.m.

11:00 a.m.

12 – 1 p.m.

1 – 3 p.m.

3 – 4:30 p.m.

Starting Lineups: Team Introductions

BREAK

Top 10 Tips to Take Home Glory

Learning from the Pros: District Example

Lunch on your own

Baseline Knowledge Interviews (Optional)

SPI First-Time Attendee Roadmap (Optional)





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Starting Lineups

T e a m I n t r o d u c t i o n s



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**What would
your
superpower be?**



BREAK: RETURN AT 10:30 A.M.

Warmup Workshop Agenda



NOW

11:00 a.m.

12 – 1 p.m.

1 – 3 p.m.

3 – 4:30 p.m.

Top 10 Tips to Take Home Glory

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Top 10 Tips

to take home glory



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A series of cheesy photos & sports idioms...
.... followed by advice for your consideration!









NO DIVING





1.

**Get your feet wet
Dive in head-first
Jump off the deep end**



- This is a big, audacious project – industry hasn't solved it yet
- Get started early
- Don't shy away from what is difficult or unknown









2. Practice, practice, practice – and more practice!



- Success is 1% inspiration and 99% perspiration
- Your first solution won't be your best solution
- Keep iterating









3. Don't jump the gun Don't get a red card Don't go out of bounds



- Read the Rules of the competition
- Know what is allowed and what is not allowed
- Ask questions for clarification









4. Know your role Pass the ball Work as a team



- Good teams have varied skillsets
- Know your roles & responsibilities
- Be willing to help someone out when needed
- But pass responsibility to others when appropriate











5. Have a game plan Work as a team Strategize



- Know how you'll finish the project successfully
- Create a plan for success
- Keep the judging criteria and process in mind











6. Listen to your coach Learn from the pros Find a training partner



- Ask your faculty advisor for advice
- Reach out to industry for guidance and support
- Use the resources provided by the organizers
- Seek constructive criticism and feedback
- Learn from the efforts of others in the past









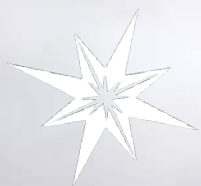


7. Tell a story Reach out to the community Serve your fans



- Tell a story through your work
- Think of how your efforts benefit society
- Give back and teach others what you learn
- Participate in the community of the entire competition







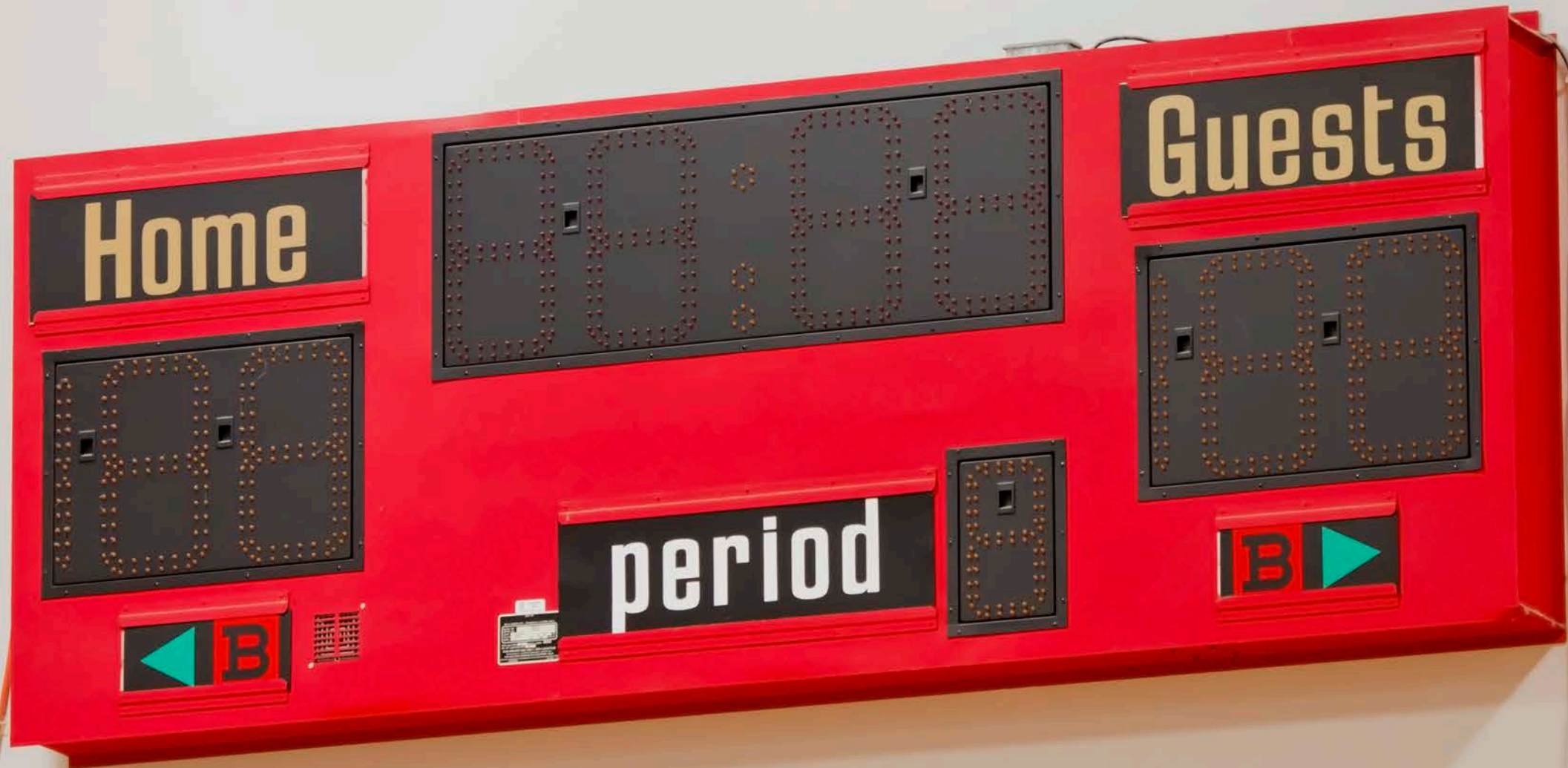


8. Join the community Help each other Practice good sportsmanship



- Get to know the other competitors and create a network
- Know your weaknesses and work to address them
- Share how you improved over time and what changed
- Ask tough questions but learn along the way





Home

00

◀ B

00

period

00

Guests

00

B ▶

TIMING

00:00



9. Plan your time wisely Don't shoot after the buzzer Watch the clock



- Don't run out of time to do your best work
- Finish and submit your project before deadlines
- You can't win if you're disqualified

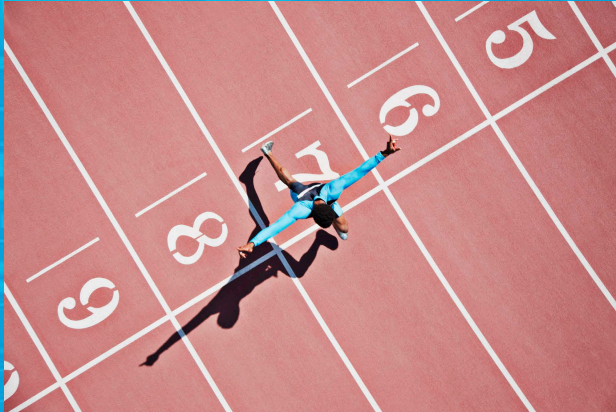








10. Finish Strong Be in it to win it Everyone is a winner!



- Network with other participants
- Learn through the process and use skills to your advantage
- Have fun!



Top 10 Tips to Take Home Glory



1. Jump in!

2. Practice!

3. Rules!

4. Teamwork!

5. Game plan!

6. Use coaches!

7. Tell a Story!

8. Sportsmanship!

9. Timing!

10. Win!





Warmup Workshop Agenda



NOW

12 – 1 p.m.

1 – 3 p.m.

3 – 4:30 p.m.

Learning from the Pros: District Example

Lunch on your own

Baseline Knowledge Interviews (Optional)

SPI First-Time Attendee Roadmap (Optional)





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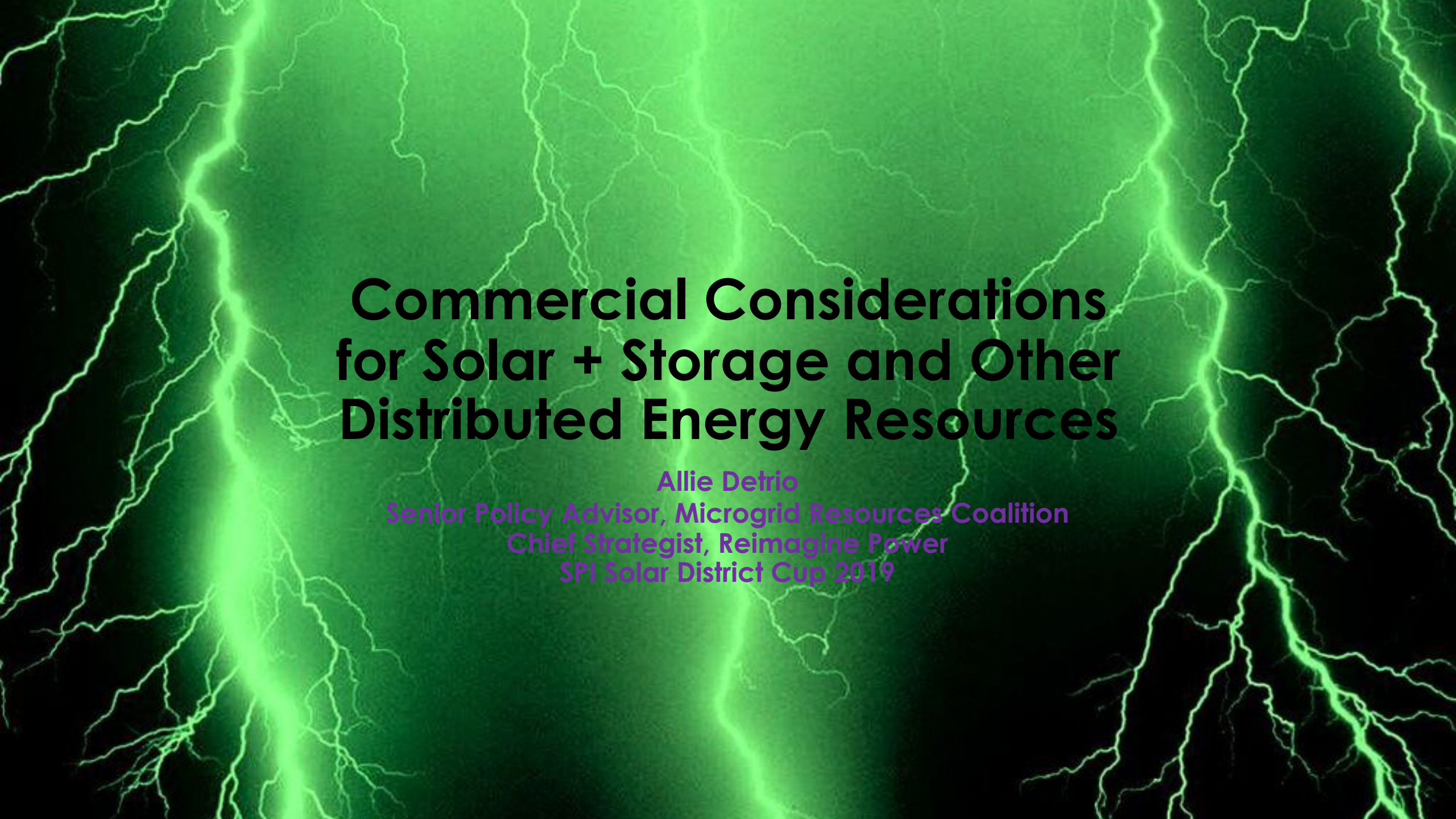
ALLIE DETRIO

CHIEF STRATEGIST
REIMAGINE POWER



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Commercial Considerations for Solar + Storage and Other Distributed Energy Resources

Allie Detrio

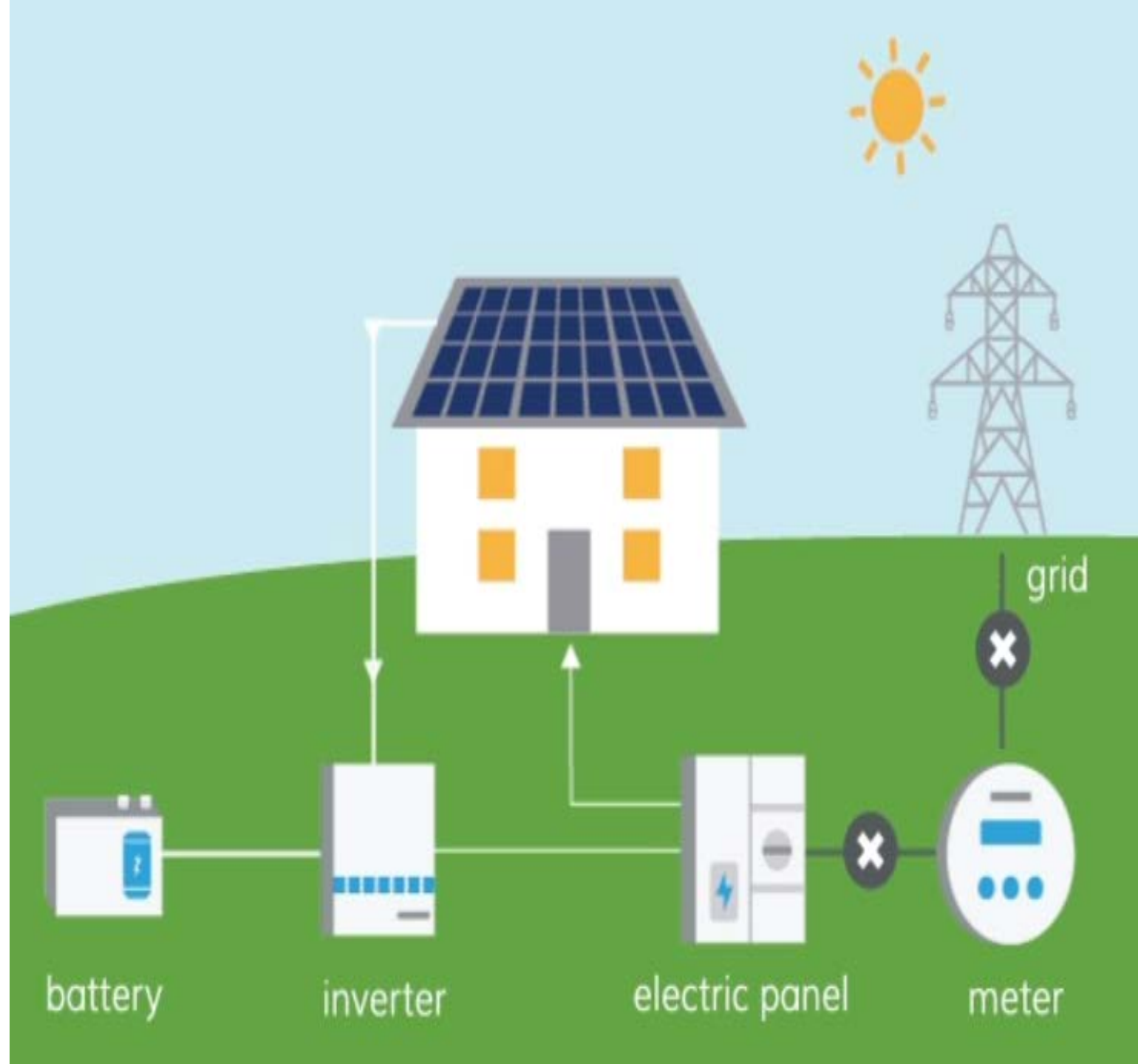
Senior Policy Advisor, Microgrid Resources Coalition

Chief Strategist, Reimagine Power

SPI Solar District Cup 2019

Agenda

- Value of DERs and customer motivations
- Solar + Storage in San Diego
- Project development
- Making projects pencil
- The role of policy
- The next frontier of DER advancement
- Q&A



DER Value Drivers

Solar + Storage Capabilities

- Solar produces clean energy during the day and batteries store solar energy for use during non-production hours
- Storage can discharge excess solar energy when rates are higher through energy arbitrage/peak demand shaving
- Battery storage can support intermittency in solar generation or in event of emergency, ensuring customers avoid costly usage peaks not under their control

Benefits

- Significant utility bill reduction and cost savings
- Reduces facility operating costs and increases operational efficiency
- Resiliency and emergency backup power
- Clean energy generation, pollution mitigation and reduced greenhouse gas emissions

An aerial photograph of the San Diego International Airport. The main terminal building is prominent, featuring a large array of solar panels on its roof. To the right of the terminal is a large parking lot filled with cars. In the background, the city of San Diego is visible, including the downtown skyline and the San Diego Bay. The sky is clear and blue.

Technical Scope

- 5.5 MW Solar PV
- 2 MW/4 MWh Battery Storage
- Energy efficiency retrofits
 - Lighting, HVAC, controls

Customer Motivation

- Utility bill reduction
- Demand charge management
- Increased operational efficiency
- Sustainability leadership
 - Commitment to carbon reduction
- Socioeconomic benefits
 - Local job creation
 - Community pride

San Diego International Airport
Multi-phase Comprehensive Strategic Energy Plan

S+S Project Development Process

Project Origination

- Initial customer engagement
- Determine interest

Feasibility assessment

- Prelim analysis
- Evaluate opportunity

Project Development

- Design & engineering
- Finalize scope

Project Implementation

- Finalize legal/financial
- Build it

Project Closeout

- Complete construction
- Final permits
- Utility PTO

Post-construction

- Operations & Maintenance
- Monitoring

Making Projects Pencil: Financing S+S

- **PPA**
- **Lease**
- **Purchase**
- **Energy Savings Performance Contract**
- **Grants**
- **Rebates**
- **Price Signals**
- **Others**

Policy: The Driving Force for Business

Legislation

- Establishes high level policy goals at the state and passes laws that will achieve those goals and direct market activity
 - SB 700 (CA) – authorizes extension of energy storage incentive program

Regulation

- Interpretation of the law at state and local agencies – hash out the technical details
- Specific market rules and regulations related to s+s are developed and implemented that will govern market activity
 - Rule 21 (CA) - Establishes rules for inverter settings, rate schedules that solar can service under, rules for the utilities and developers to follow
 - SGIP (CA) – Program to administer energy storage funds authorized from SB 700

Market Development & Transformation

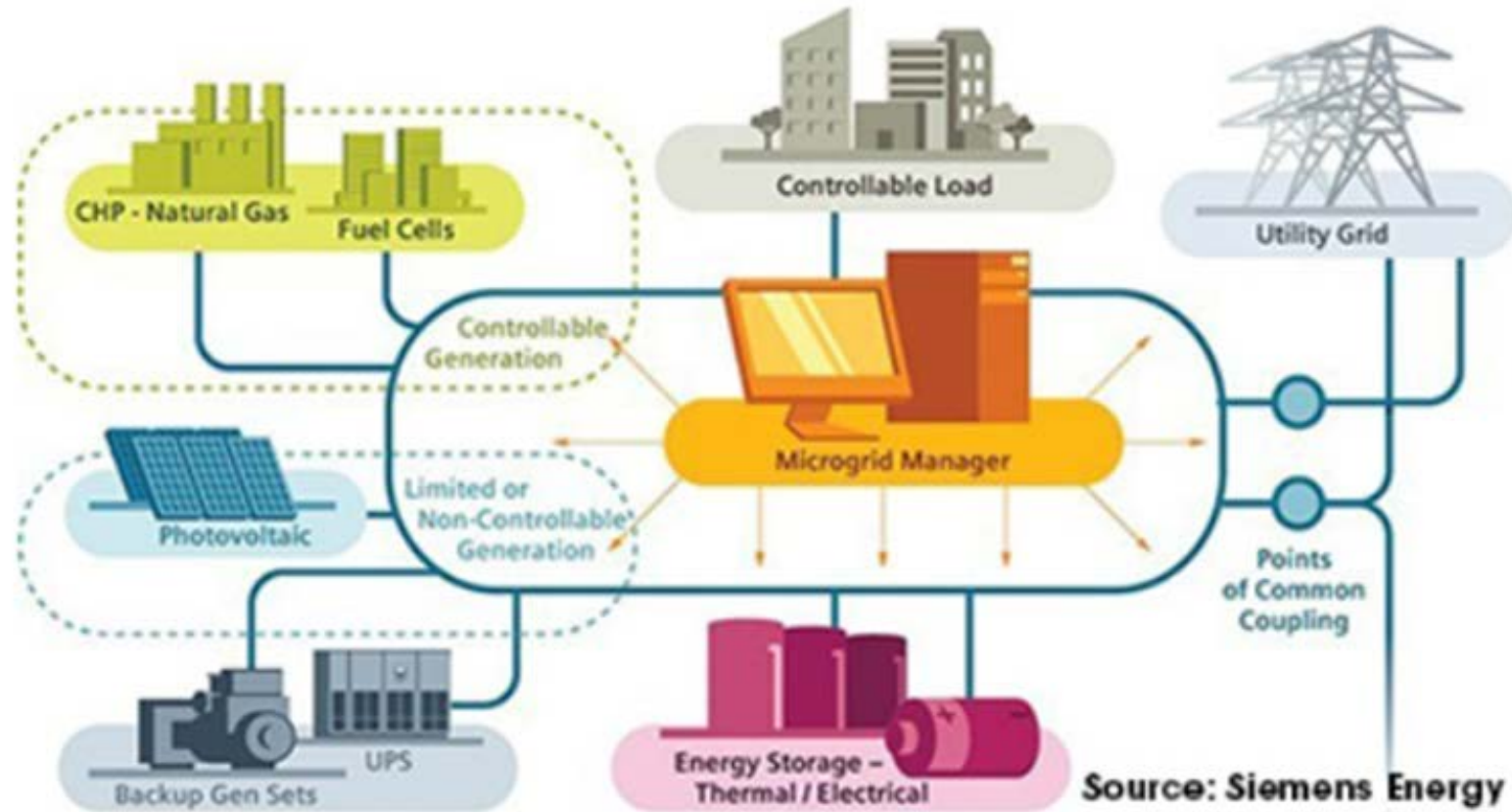
Development

- Customers and developers collaborate to build solar + storage in response to incentives and price signals that will provide benefits to them
 - Cost-savings, resiliency, socioeconomic, environmental benefits

Transformation

- Customers widely adopt solar + storage technologies that contribute to achieving policy goals (state and local)
 - Customers lower their energy bills, have backup power for resiliency,
 - Projects are built locally with labor in the community boosting economy
 - Projects use clean technologies that can respond to grid needs

Microgrids: The Next Frontier of DERs



Microgrids demystified

Microgrids are defined as a group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity with respect to the larger grid

- Typical components of microgrids
 - Renewable generation (solar, wind, biomass, etc.)
 - Baseload generation (diesel, natural gas)
 - Energy storage (battery storage, fuel cells, thermal storage)
 - Advanced controls (automated or mechanical switchgears, transfer switches)

Las Positas College Grid

PG&E Utility



Electrical Flow

Electrical Flow

Switch



500kW PV

Switch



Flow Battery

Electrical Flow



Chiller Plant



Ice Storage

Cooling Flow

Campus Building Cooling Loads



500kW PV



1300kW PV



Campus Building Electrical Loads



PG&E Utility Interconnection
or "Point of Common Coupling"
and Static Disconnect Switch



Five 2.3 kW Wind Turbines

1.2 MW Rooftop
Solar Photovoltaic System



Two 1.2 MW Backup
Diesel Generators



Distributed Energy
Resources Management
System (DERMS)



1 MW Fuel Cell
Power Plant



2 MW
Advanced
Energy Storage
System



What do you think the grid of the future will look like?

Q&A – Thank You!

Allie Detrio

Senior Policy Advisor, Microgrid Resources Coalition

Chief Strategist, Reimagine Power

allie@reimagine-power.com

Warmup Workshop Agenda



12 – 1 p.m.

Lunch on your own

1 – 3 p.m.

Baseline Knowledge Interviews (Optional)

- 15-minute time slots
- Sign up at: www.shorturl.at/imqX1
- Conducted by NREL staff, just to get to know you all and have a baseline understanding of our competitors

3 – 4:30 p.m.

SPI First-Time Attendee Roadmap (Optional)

- Room 250E



Sign Up for a Baseline Knowledge Interview



Solar District Cup

Baseline Knowledge Interviews

Please review the available slots below and click on the button to sign up. Thank you!

Date: 09/23/2019 (Mon.)

Location: ROOM 254C, SALT PALACE CONVENTION CENTER

Created by: JS Joseph Simon ✉

Time (MDT)	Available Slot
1:00pm - 1:15pm	Baseline Knowledge Interview with Organizers (3) Sign Up
1:15pm - 1:30pm	Baseline Knowledge Interview with Organizers (3) Sign Up
1:30pm - 1:45pm	Baseline Knowledge Interview with Organizers (3) Sign Up

Sign Me Up

Available Slot	Date (mm/dd/yyyy - MDT)	Collegiate Institution Name	Quantity
Baseline Knowledge Interview with Organizers	Mon., 09/23/2019 1:00pm - 1:15pm		1

Name

Email

Already have a SignUpGenius account? [Login](#)

By signing up, you agree to the SignUpGenius [Terms of Service](#) and [Privacy Policy](#).

Sign Up Now

Cancel

www.shorturl.at/imgqX1

Now What?

LEARN
at the technical
symposium

NETWORK
with industry

ASK
us questions

START
working





Questions?

Tag and follow on social:

#SolarDistrictCup

Learn more, sign up for our newsletter, and register a team at:

energy.gov/solardistrictcup

solardistrictcup@nrel.gov



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