

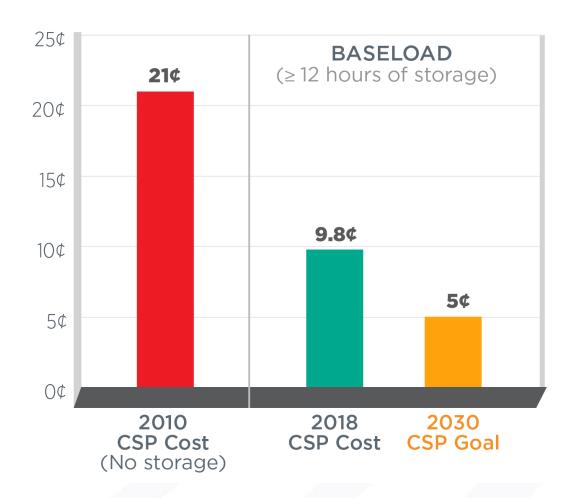
# **Unlocking Solar Thermochemical Potential:**

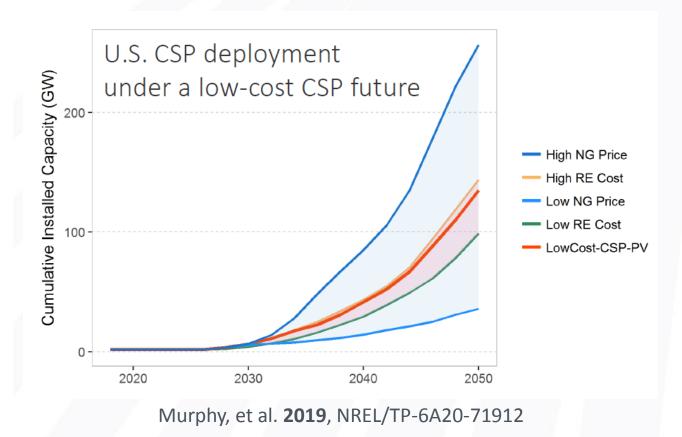
Markets, Opportunities, and Challenges

R&D Virtual Workshop Series
Concentrating Solar Power Program

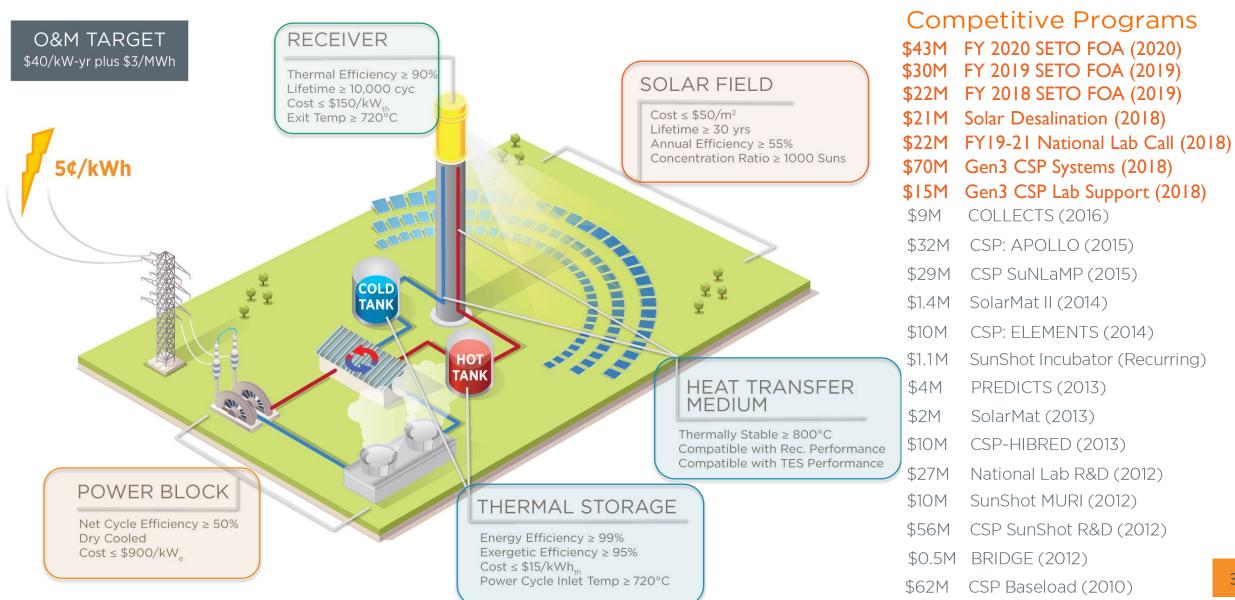
Avi Shultz, CSP Program Manager, US DOE Levi Irwin, CSP Technology Manager, Contractor to US DOE Levi.Irwin@ee.doe.gov

## **Progress and Goals: 2030 LCOE Goals**





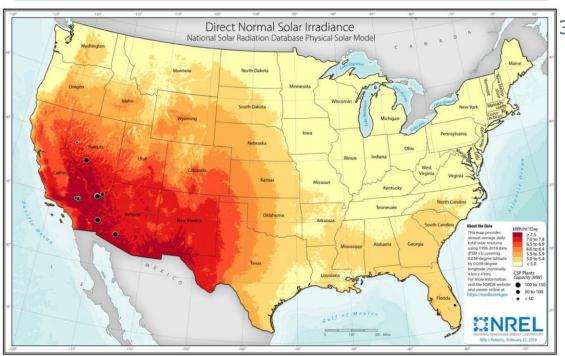
# **CSP Technical Targets**

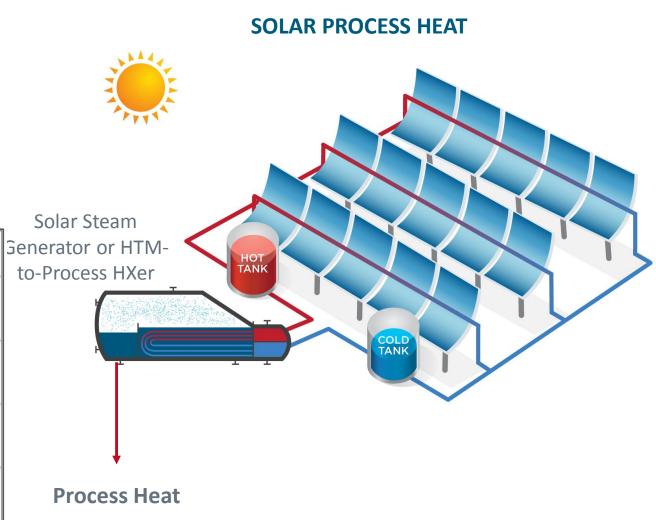


### **Solar Thermal Industrial Process Heat**

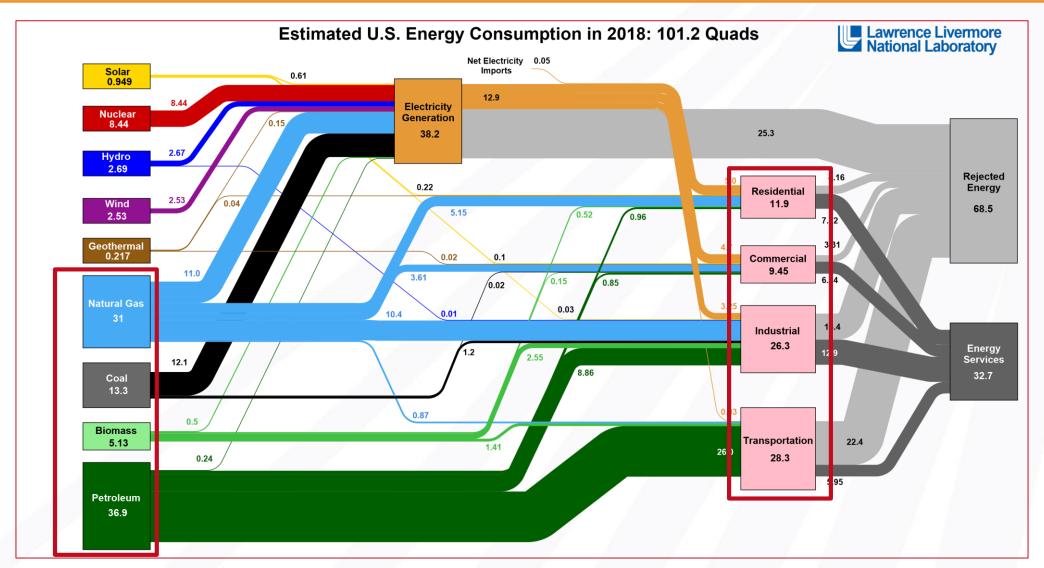
#### **Thermally-Driven Industrial Processes:**

- Desalination
- Enhanced Oil Recovery
- Agriculture and Food Processing
- Fuel and Chemicals Production
- Mining and Metals Processing





## Solar Thermal can Integrate with the Existing Energy System



# SOLAR ENERGY TECHNOLOGIES OFFICE

# CSP R&D Virtual Workshop Series

### **UPCOMING WEBINARS:**

- Pumped Thermal Energy Storage Innovations
   November 17 | 1:00 p.m. to 5:00 p.m. ET
- Unlocking Solar Thermochemical Potential: Leveraging CSP Experience for Solar Thermochemistry November 19 11:00 a.m. to 2:00 p.m. ET
- Unlocking Solar Thermochemical Potential: Receivers, Reactors, and Heat Exchangers
   December 3 | 11:00 a.m. to 2:00 p.m. ET

CSP Performance and Reliability Innovations
December 10 | 11:00 a.m. to 2:00 p.m. ET



#### SOLAR ENERGY TECHNOLOGIES OFFICE



energy.gov/solar-office

# **Unlocking Solar Thermochemical Potential:**

Markets, Opportunities, and Challenges

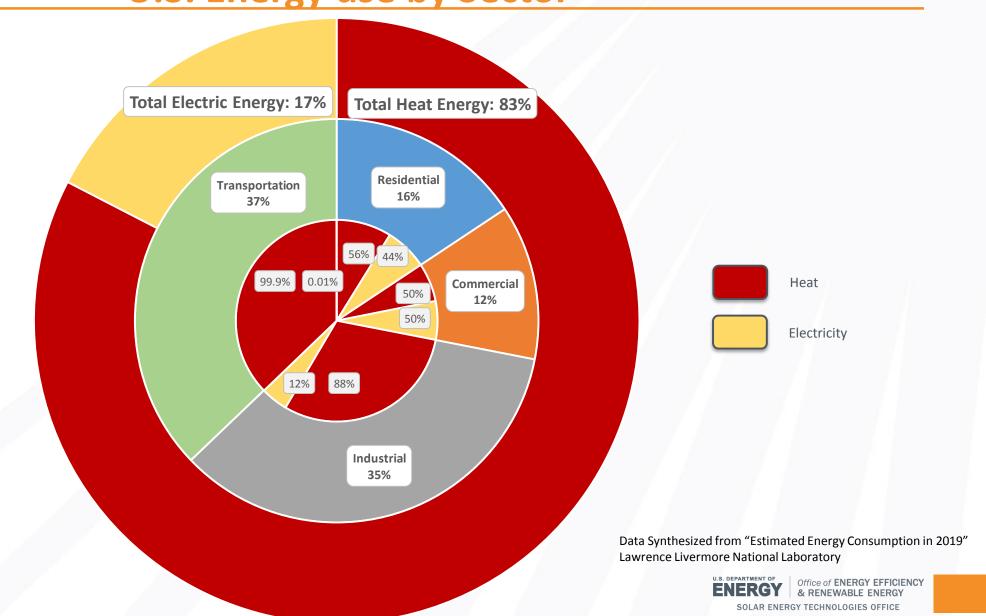
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Levi Irwin, CSP Technology Manager, Contractor to US DOE Levi.Irwin@ee.doe.gov

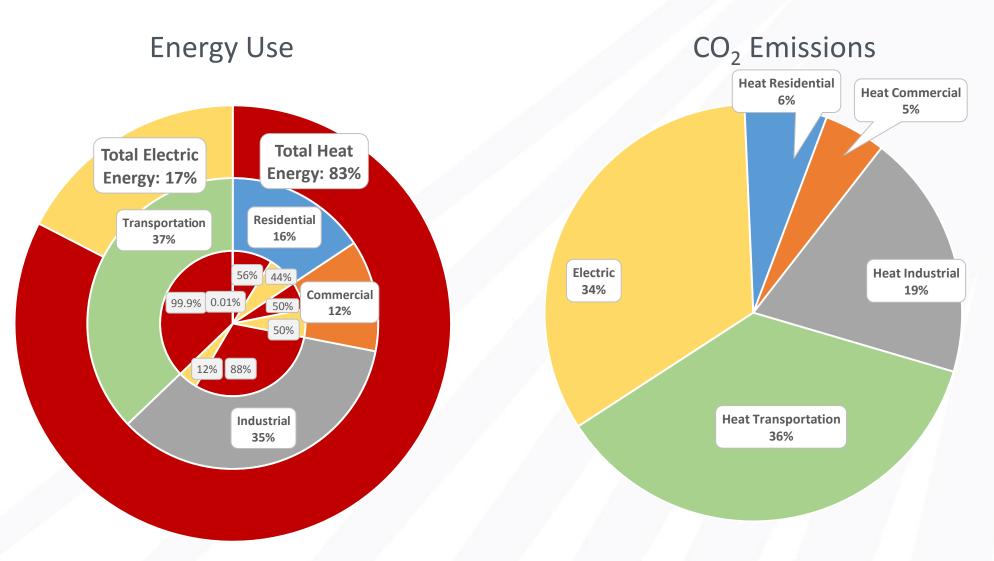
## Solar Thermochemical Systems – What Are They?

- Being a Concentrating Solar Thermal Facility and a Chemical Processing Facility
  - May or may not also produce power (electricity)
- The chemical may be stored and re-used on site or shipped off-site as a finished product
  - Includes the preparation of fuels, commodity chemicals
- Green field or brown field?
  - New infrastructure; new process
  - Append to existing infrastructure; (slight) mod to process

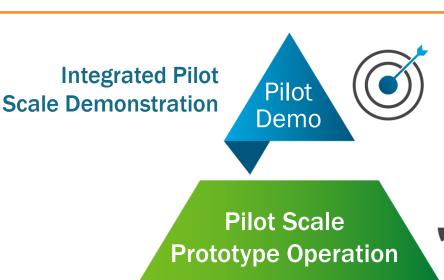
# Why Concentrating Solar *Thermal* in Addition to Power U.S. Energy use by Sector



# Why Concentrating Solar *Thermal* in Addition to Power U.S. Carbon Dioxide Emissions by Sector



# Thinking through Risk within Tiers of Technology Maturity



- 10 MW +
- System level Risk Retirement



- 1-10 MW
- Prove well understood models at commercial relevant scale

Design Refinement,
Respond to identified Challenges



- 100-1,000 kW
- Validation and Isolated Risk Retirement

Innovation Discovery, Viability Realization



- 10-100 kW
- Conclusion Driven Research

### **Workshop Goals**

#### For both Panel 1 and Panel 2:

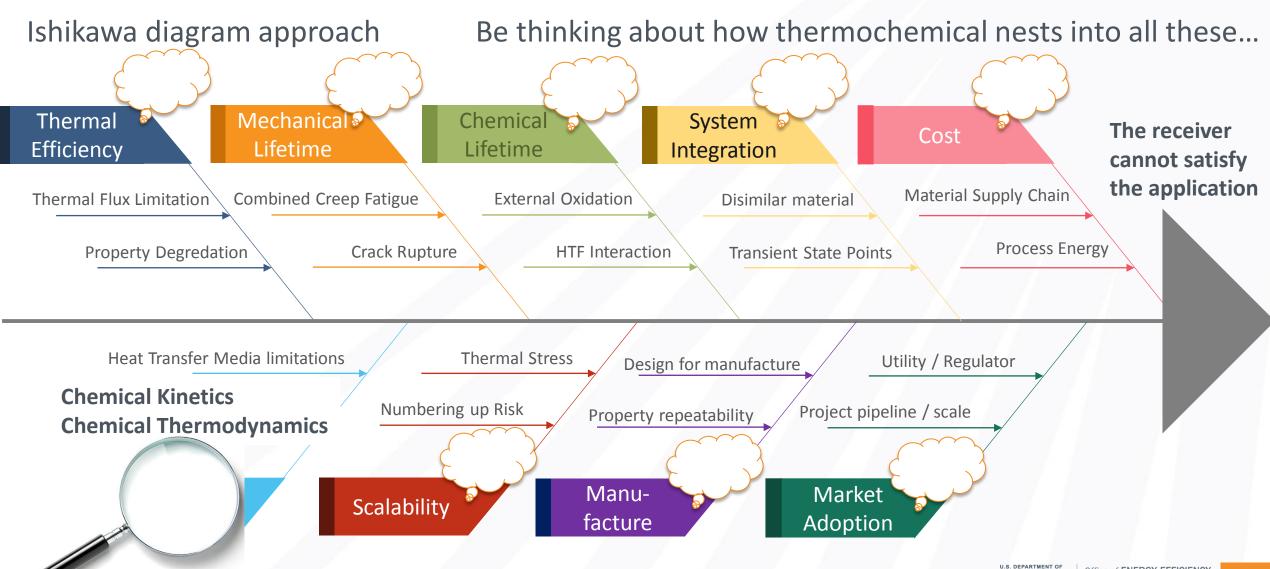
How can systems-level analysis direct innovation from lab-scale research to on-sun demonstration to commercial deployments?

- What are key risks that are often overlooked early in the development process?
- How should testing campaigns be designed to manage those risks?
- What are overlooked technical metrics/objectives that should be considered at both early and late stages?
- How do you approach balancing constraints between the solar component and the remainder of the system?

How should research outcomes be packaged so as to draw attention from industry and other private sponsors?

# Thermochemical Concerns Compound with Innovative

**Receivers** 



# **Agenda**

	Time	Session
	11:00AM- 11:20AM	Introduction and Workshop Overview Avi Shultz, DOE Program Manager, Concentrating Solar Power Levi Irwin, Technology Manager, Concentrating Solar Power
	11:20AM- 12:30PM	Panel – Systems in the Solar Thermochemical Context Joseph Cresko, DOE Advanced Manufacturing Office Ellen Stechel, Arizona State University Davide Zampini, Cemex Peter Pfromm, Washington State University
	12:30PM- 1:30PM	Panel – A Systems Look at Solar Thermochemical Hydrogen Ron Kent, SoCal Gas Vikas Tuteja, Heliogen Philipp Furler, Synhelion
nergy.gov/s	1:30 PM	Closing Remarks Avi Shultz, Department of Energy

# **Systems in the Solar Thermochemical Context**

### ~Our Panelists~



Joseph Cresko

DOE Advanced

Manufacturing Office



Ellen Stechel

Arizona State University



Davide Zampini

Cemex



Peter Pfromm
Washington State
University

### **Workshop Goals**

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# A Systems Look at Solar Thermochemical Hydrogen

## ~Our Panelists~



Ron Kent SoCal Gas



Vikas Tuteja Heliogen



Philipp Furler
Synhelion

### **Workshop Goals**

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