

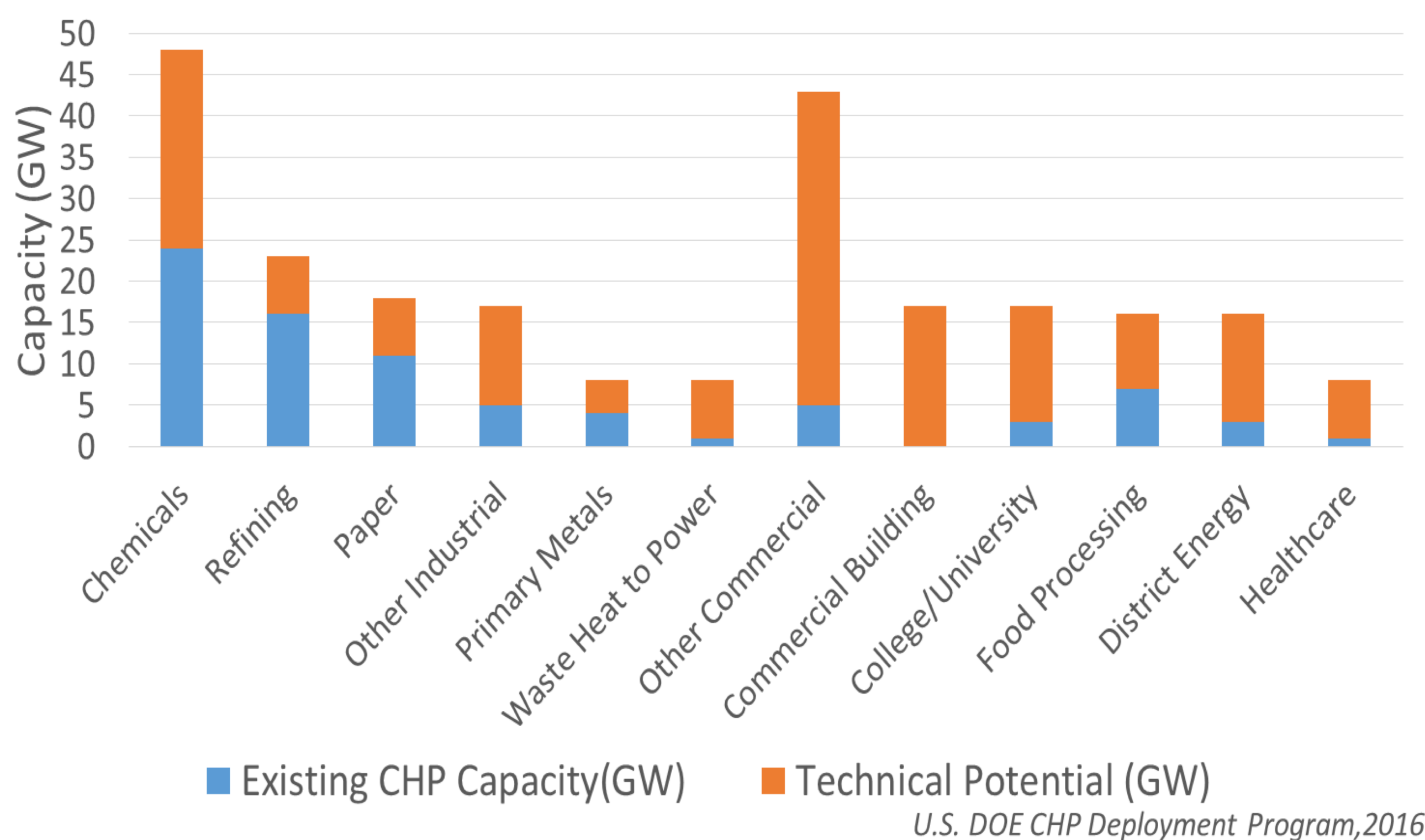
Hybrid Solar Energy Converter for Low Cost Electricity and Process Heat

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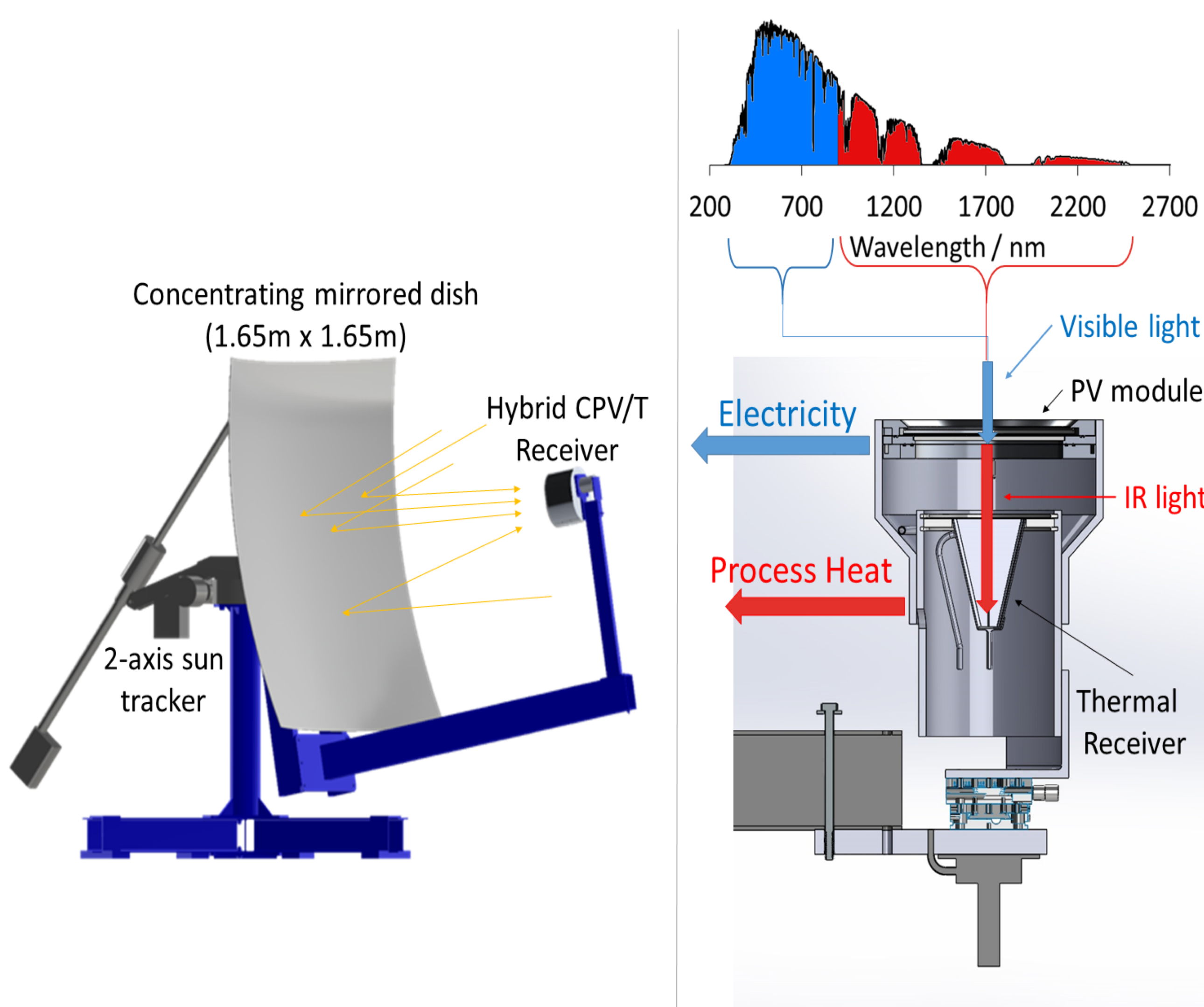
Project Motivation

- Commercial and industrial heating applications make up 30% of energy consumption within the U.S., energy which is mainly provided by natural gas boilers.
- Despite this, little work has been done in the renewable energy sector to find distributed-scale sustainable solutions to medium-temperature (100 to 600°C) Industrial Process Heat (IPH) applications.

Existing Combined Heat and Power (CHP) Compared to On-site Technical Potential by Sector

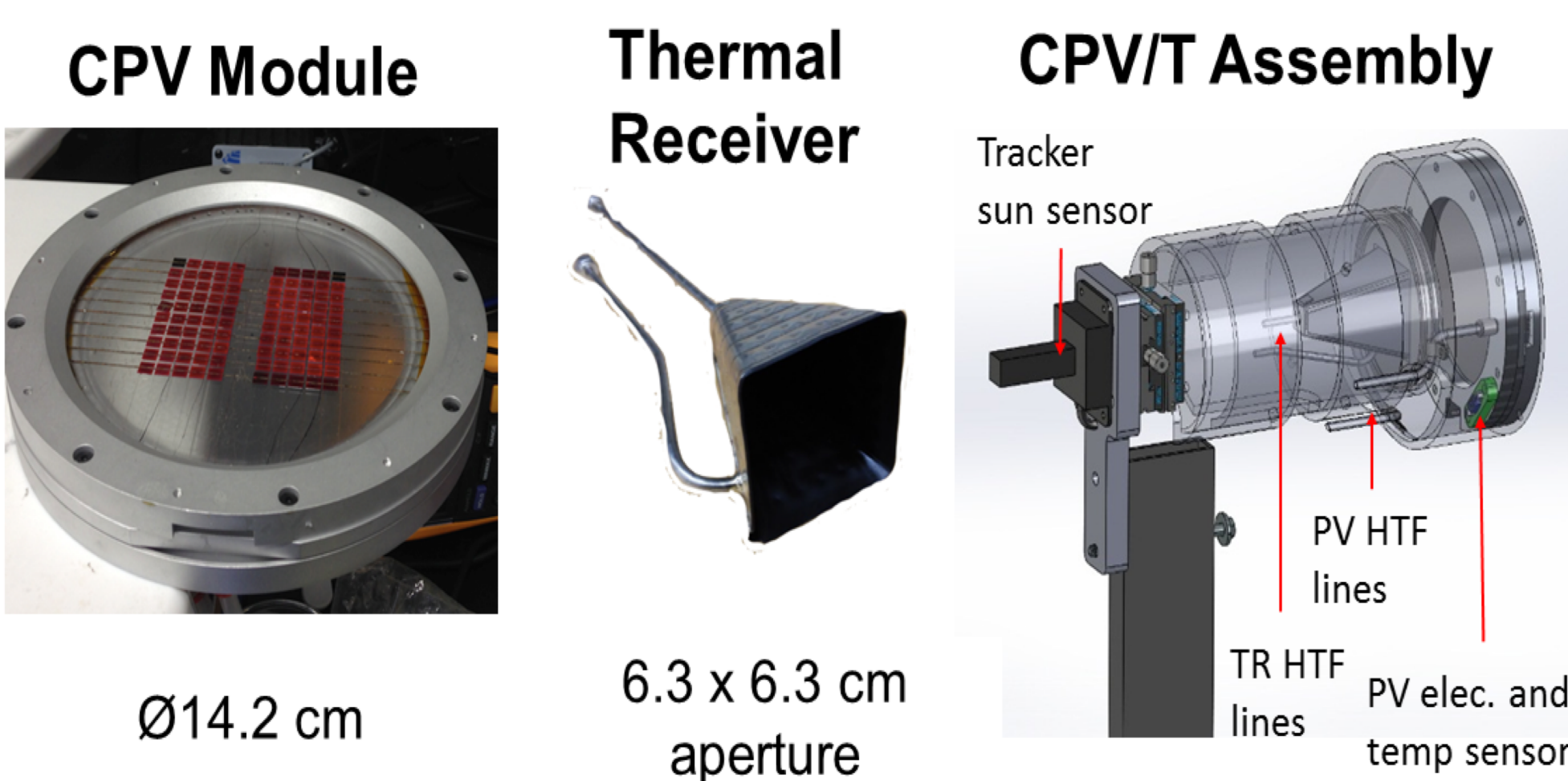
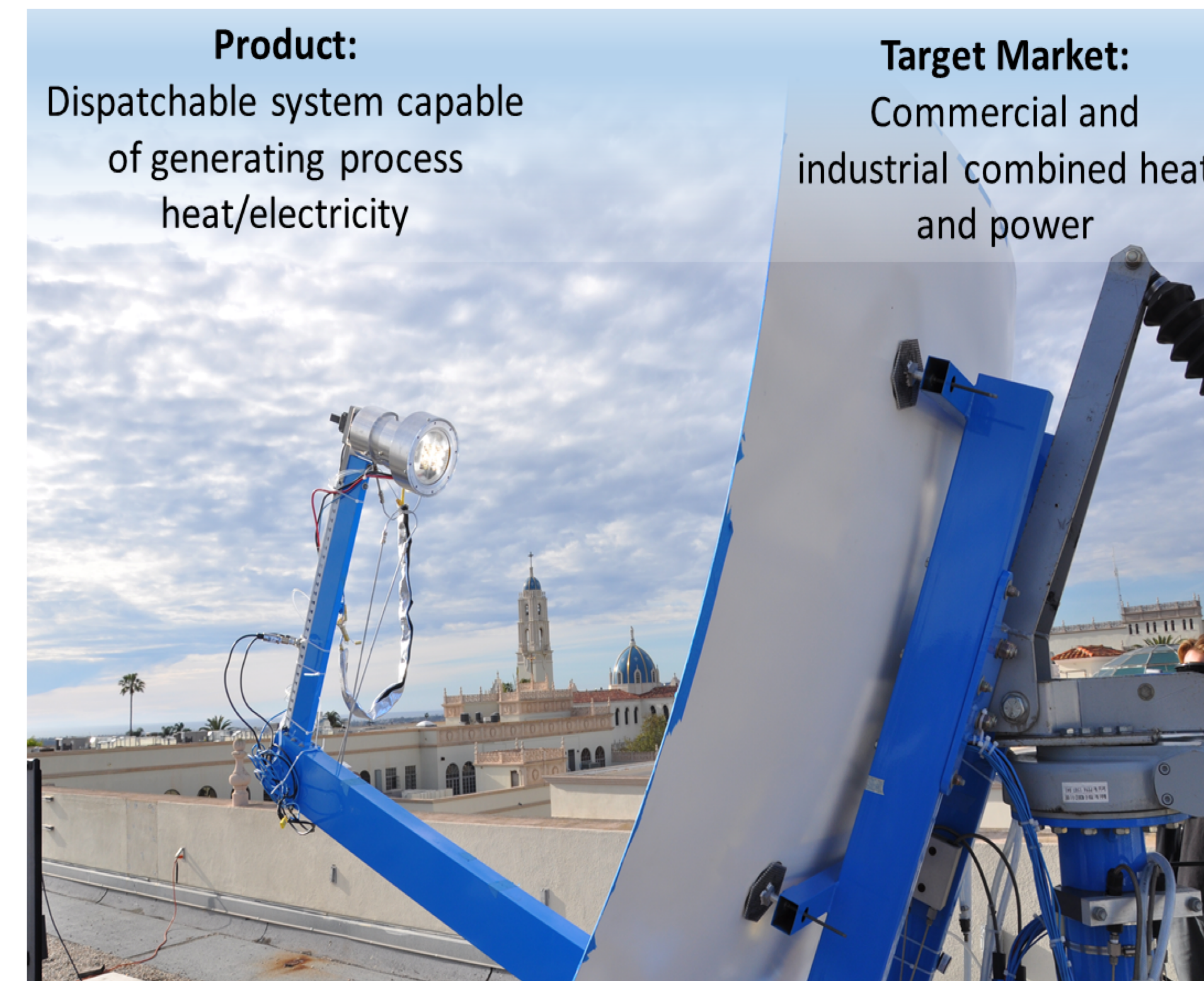


System Overview



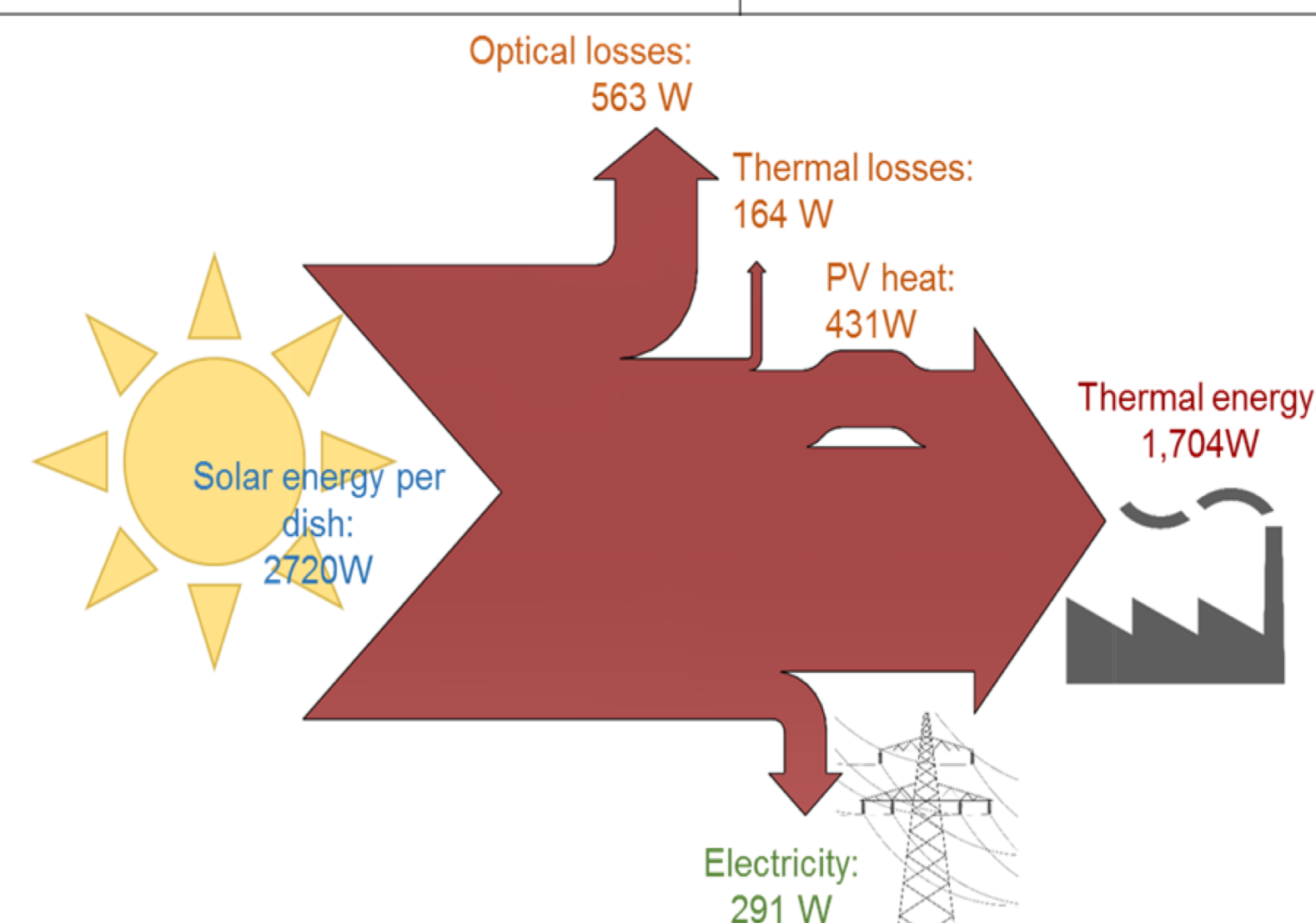
Key Technology: A hybrid receiver featuring transmissive photovoltaics, which split the solar spectrum to efficiently generate electricity and attain high temperature (up to 590°C) process heat.

Hybrid CPV/T Receiver

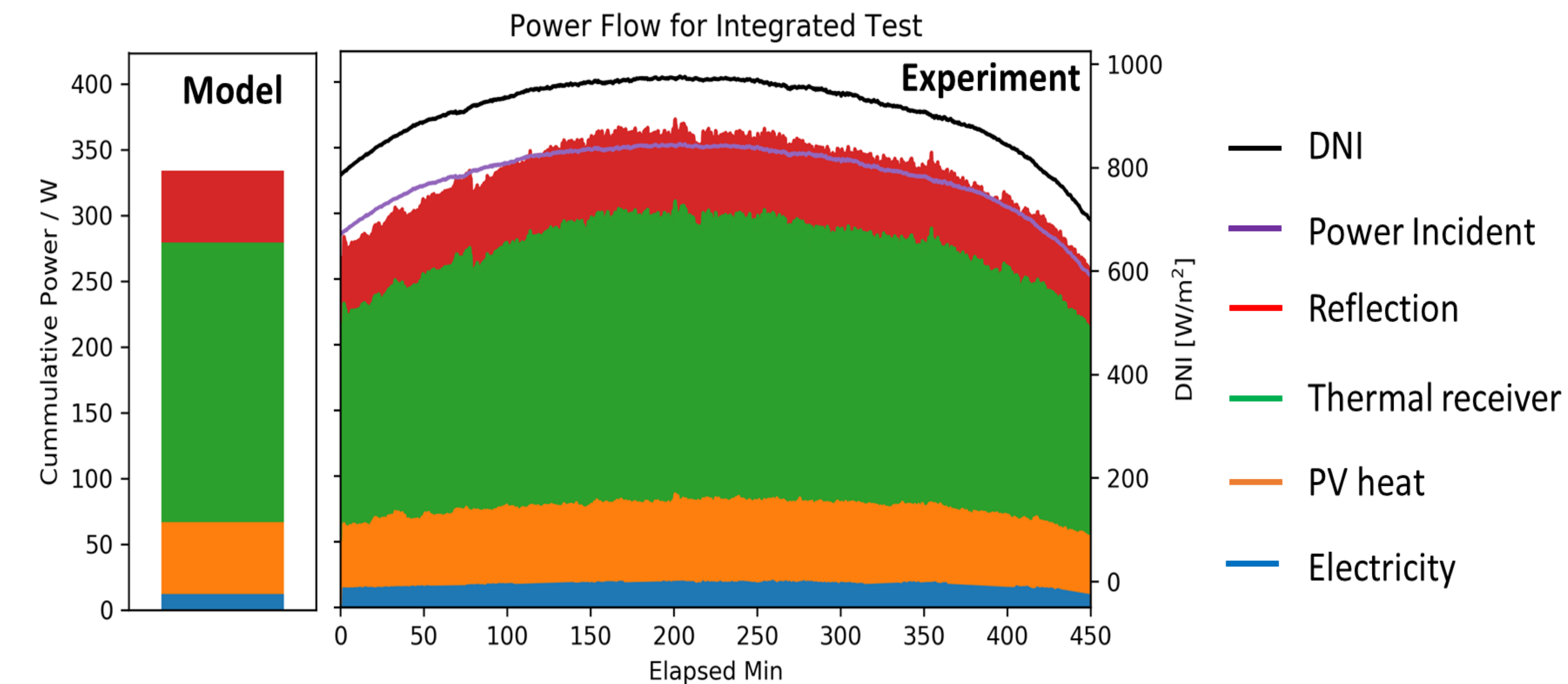


System Specifications Per Dish

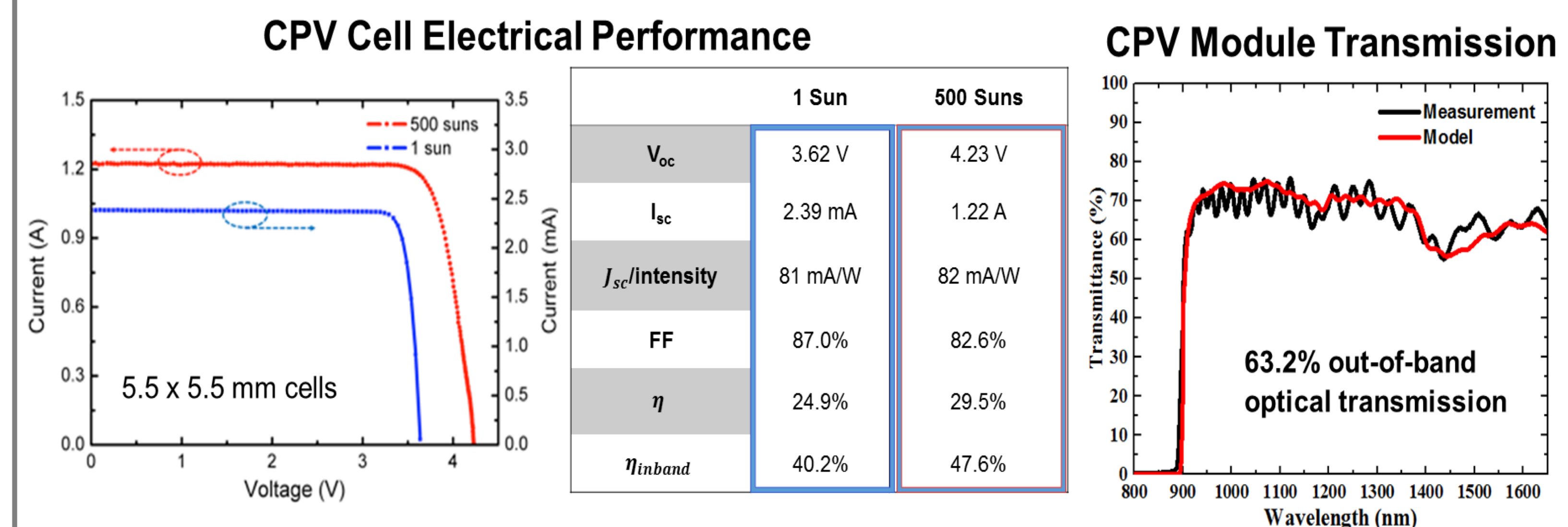
Collector Area:	2.7 m ² (29 ft ²)
Efficiency:	73% (Sun to elec. & heat)
Thermal System	
Peak Temperature:	590 °C (1100 °F)
Peak Thermal Power:	1704 W (5,800 Btu/hr)
Electrical System	
Peak Solar Concentration:	1070 suns
Peak Electrical Power:	291 W
Output Voltage:	120 VAC
Techno-Economic Data – LCOH (¢/kWh_{th})	
1.2-3.0 (<250°C)	1.3-3.2 (nat. gas)



Outdoor On-Sun Integrated Performance



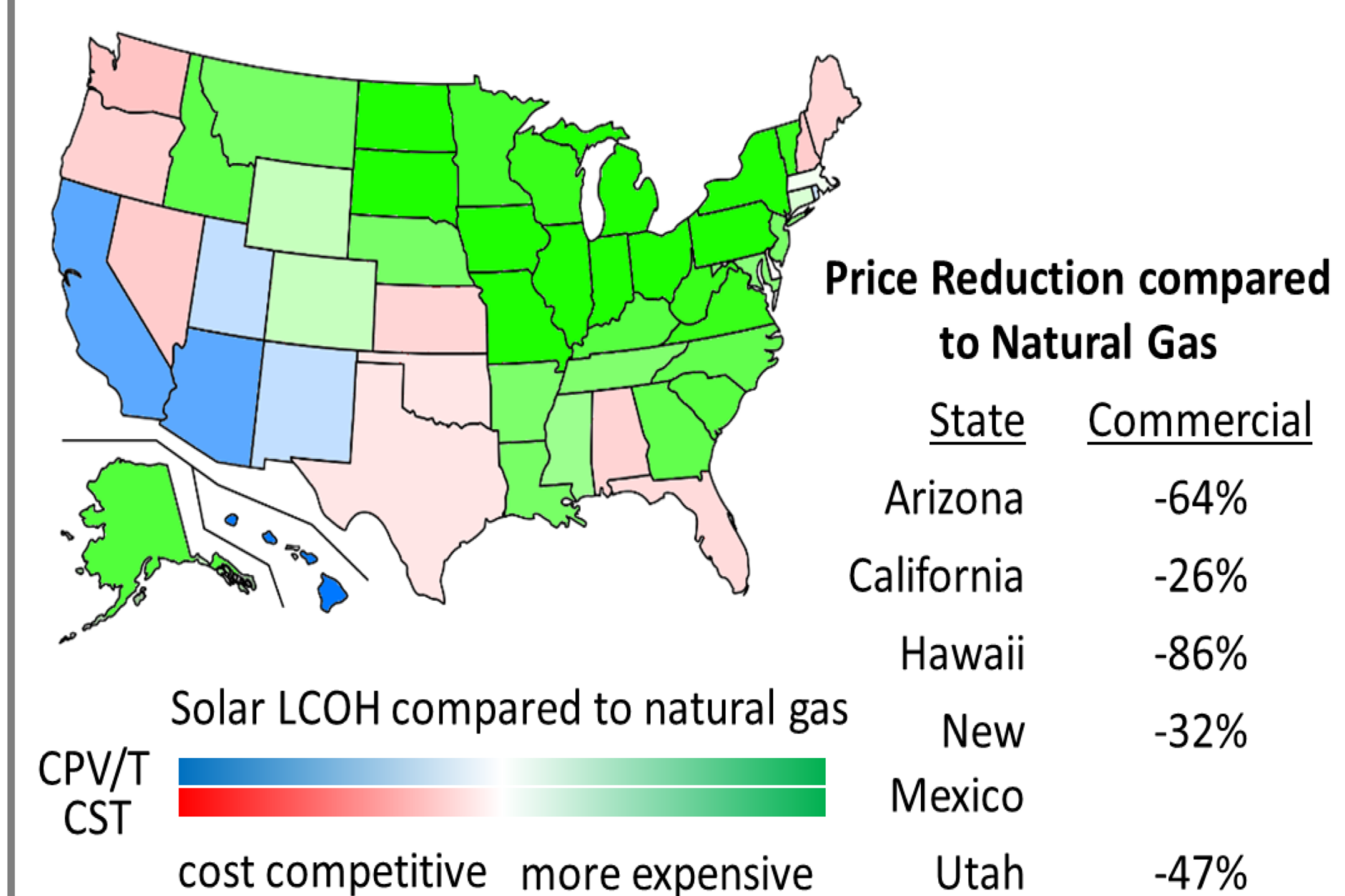
Infrared-Transmissive CPV Performance



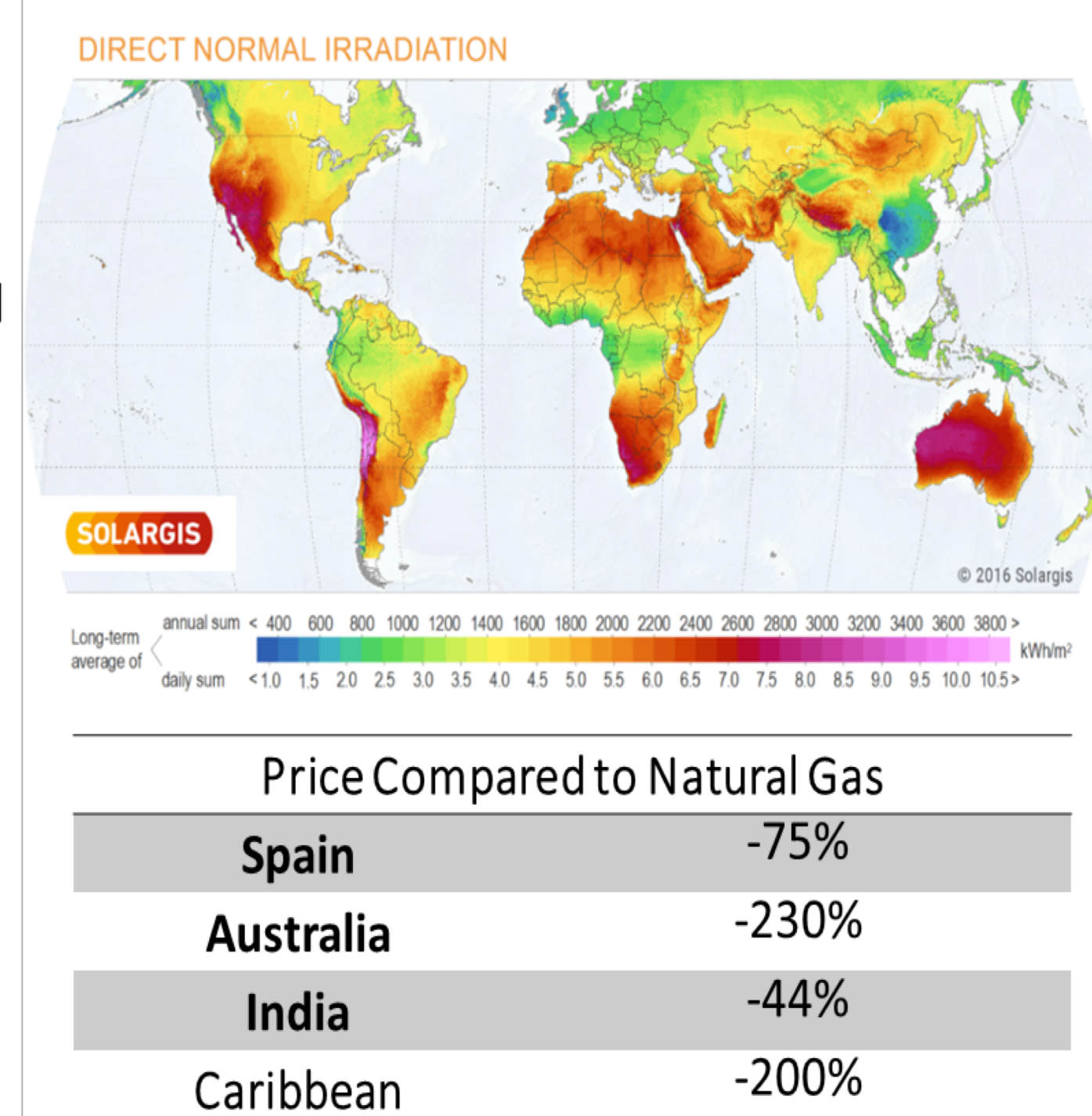
Market Analysis

- Target IPH markets: food/chemical processing, agriculture, hospitals, prisons, universities, military bases, data centers, and enhanced oil recovery.
- Technoeconomic analysis shows thermal-only or hybrid systems are cost competitive with natural gas in select regions.

Domestic Markets



International Markets



Ongoing Work

- Extensive field testing of full-scale CPV/T receiver prototypes, with emphasis on improving efficiency and reliability
- Seeking commercialization partners for pilot scale installations!

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