



Masdar Solar Hub's R&D activity in the CSP field

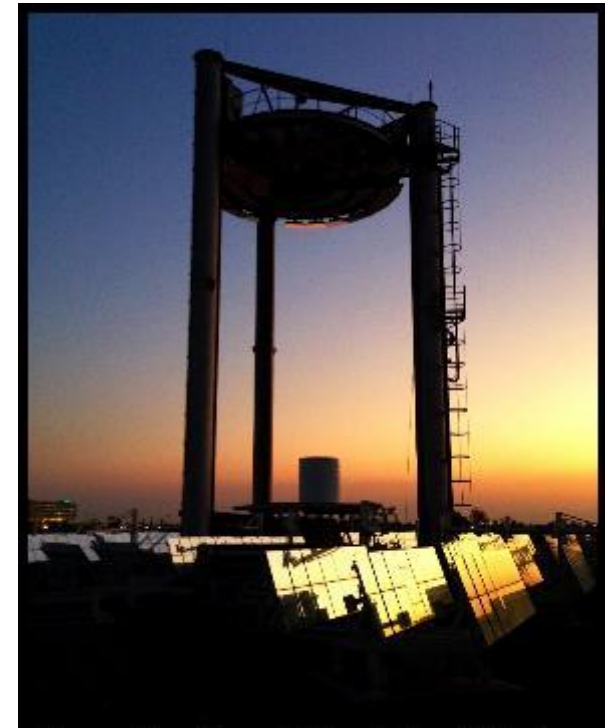
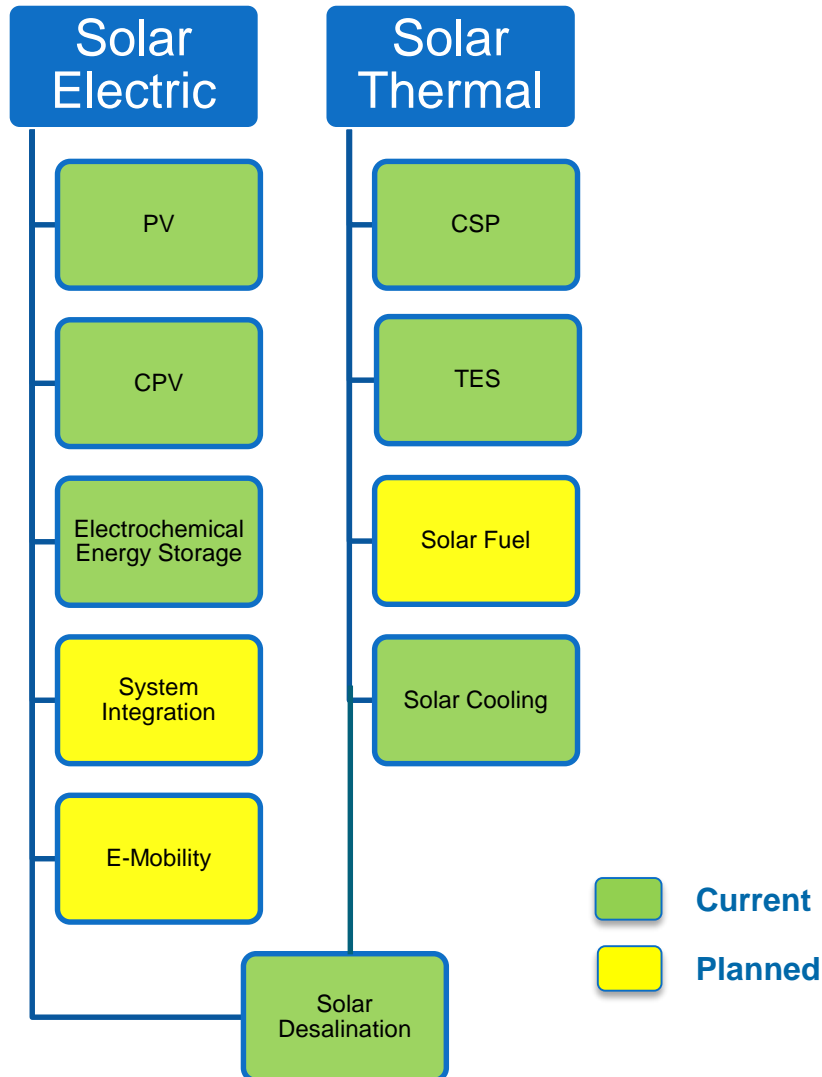
Dr. Nicolas Calvet

Assistant Professor

Chair of the Masdar Institute Solar Platform

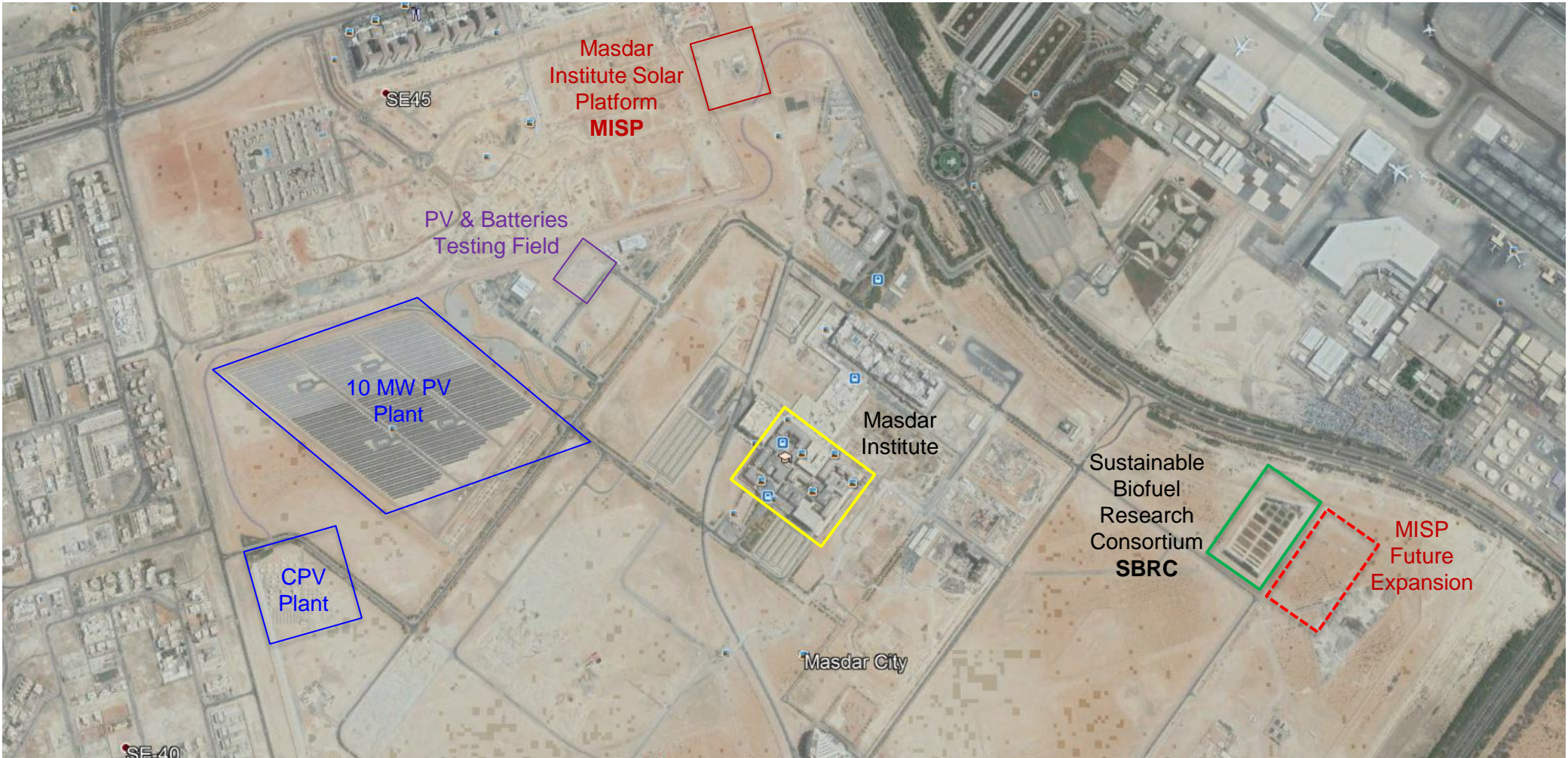
*Institute Center for Energy, Department of Mechanical and Materials Engineering
Masdar Institute, a part of Khalifa University of Science and Technology,
P.O. Box 54224, Abu Dhabi, United Arab Emirates.*

Masdar Solar Hub's Capability Areas



The Masdar Solar Hub was created in 2015

Masdar Solar Hub's Facility Locations



Masdar's Water Desalination Program

- 5 pilot plants located in Abu Dhabi (Ghantoot)
- Each pilot plant operated over 18 months
- Masdar implements the program in close collaboration with the Abu Dhabi governmental agencies in the water sector
- The pilot plants demonstrate different advanced and innovative desalination technologies.

ABENGOA 
Reverse Osmosis
+ Membrane Distillation 1,000 m³/d
ABENGOA



SIDEM/VEOLIA 
Reverse Osmosis
300 m³/d
SIDEM VEOLIA



SUEZ 
Reverse Osmosis
+ Ion Exchange
100 m³/d
SUEZ



TREVI SYSTEMS 
Forward Osmosis
50 m³/d
TREVI SYSTEMS



MASCARA 
Off-grid Solar Powered
Reverse Osmosis
30 m³/d
Mascara
ΕΠΙΧΕΙΡΗΣΙΑΚΗ



The Masdar Institute Solar Platform (MISP)

First Solar Platform in the UAE fully dedicated to R&D on CSP and TES

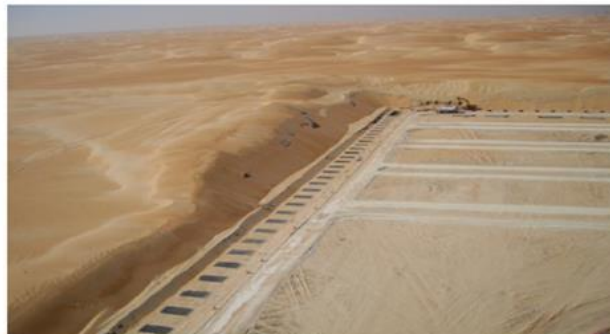


Objectives:

- ✓ Test and validate new technologies at the pre-commercial scale with interest for Masdar's future tenders
- ✓ in UAE harsh environment (dust, sand storm, humidity, corrosion, temperature, etc.) and adapt it if necessary
- ✓ Attract International Collaborations/Investors
- ✓ Decrease the cost of CSP & Increase efficiency



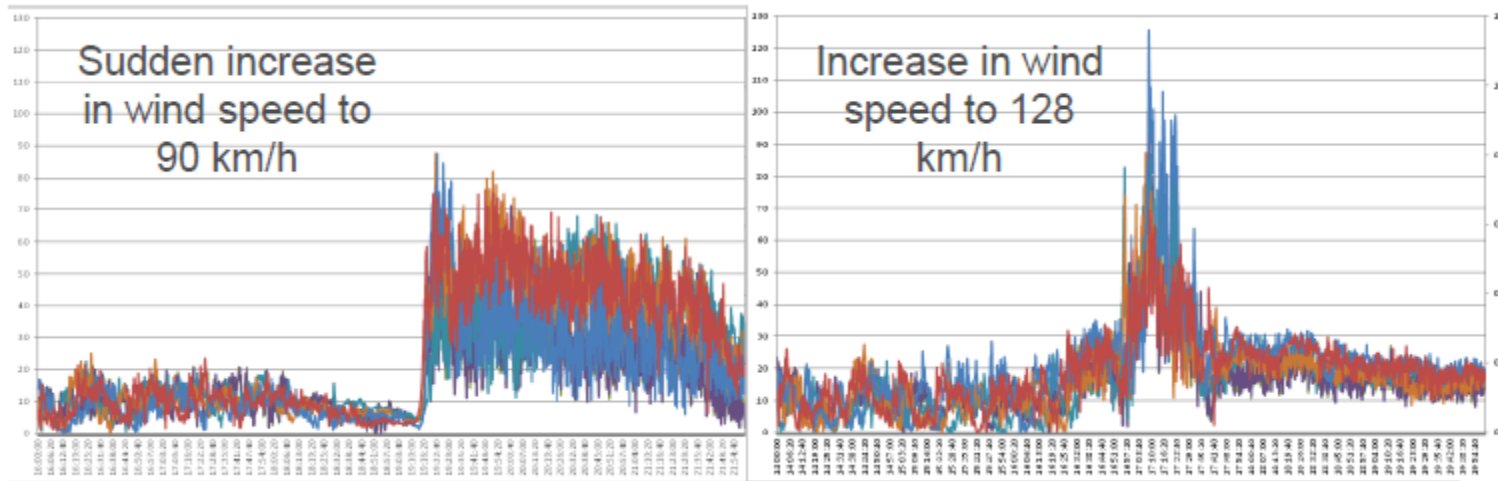
5 Mm³ of sand displaced



Shams 7 m high Wind Break Barriers

Facing Desert Challenges in the UAE

Example of Shams 1



- ✓ Wind Speed during Sand Storms
- ✓ Water consumption for cleaning is 8M Gallons/year



Collaboration with Industry



EnergyNest (Norway)



EnergyNest's Concrete Storage Pilot 2 x 500 kWh



Objectives:

- Test solid state storage for parabolic trough or waste heat recovery, etc.
- > 280 cycles completed

Partners:

SIEMENS

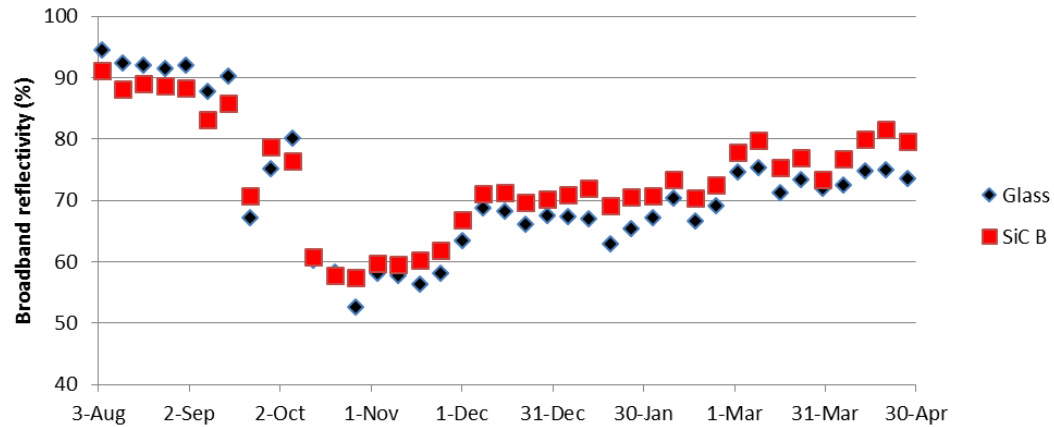


HEIDELBERGCEMENT

Supported by



Ibiden SiC Mirrors



Objective:

- ✓ Test new SiC Mirrors & Cleaning Methods in Humid Desert Conditions



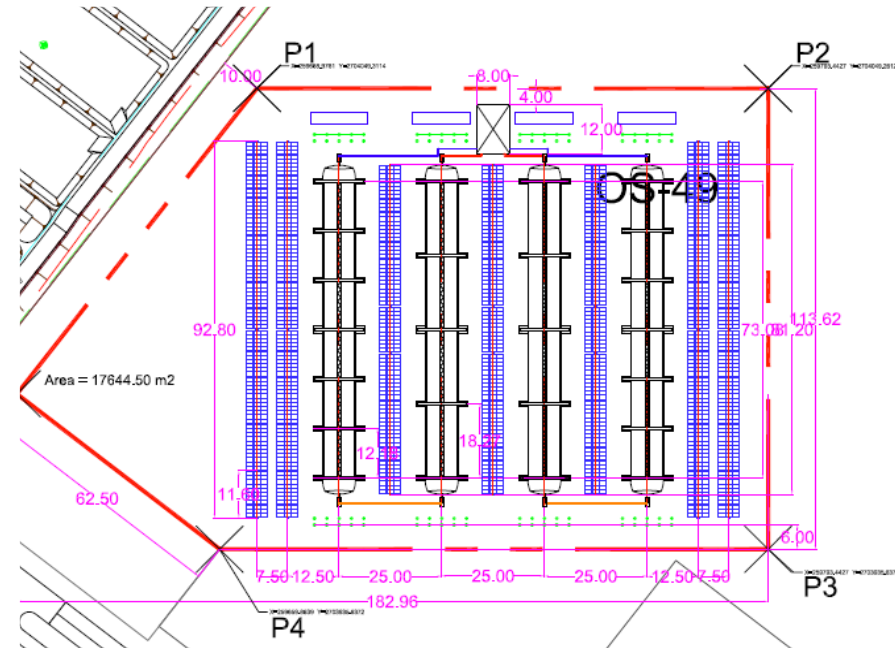
Japanese Delegation visiting the MISF in November 2014

Combined CSP/PV (1.3 MW_{th} + 472 kW_e)



Objectives:

- Test inflatable parabolic trough collectors in harsh environment
- Test PV trackers as wind deflectors
- Test operation maintenance and cleaning methods

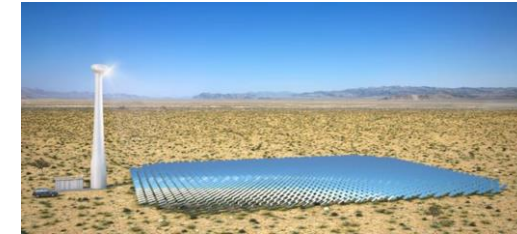
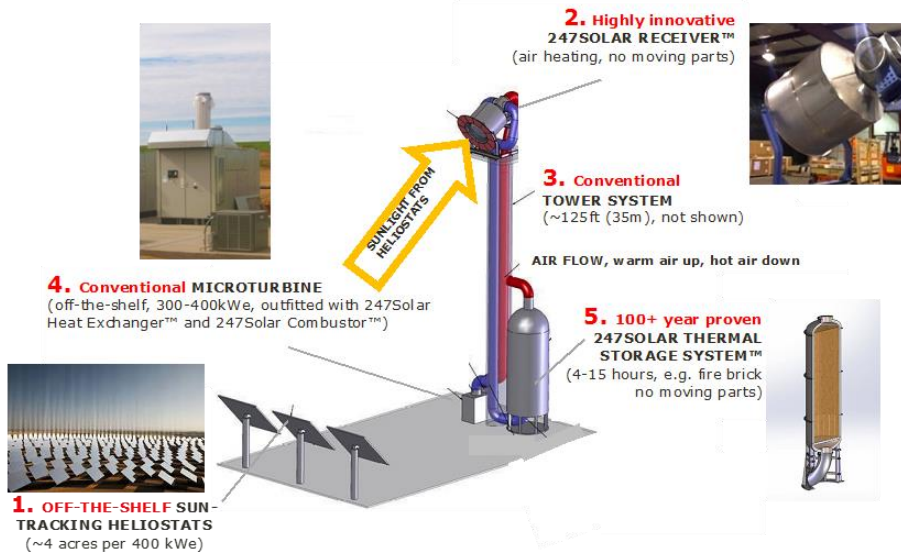


Project Cost: 5.5 M€ (Private Inv.)

Timeline: February/March 2018

Duration: 4 years

CSP with TES (300 kW_e)



Objectives:

- Build and test the 1st demo plant using 24/7Solar concept
- Produce 300 kW_e 24/7

Project Cost: 10 M\$ (Private Inv.)

Timeline: January 2018

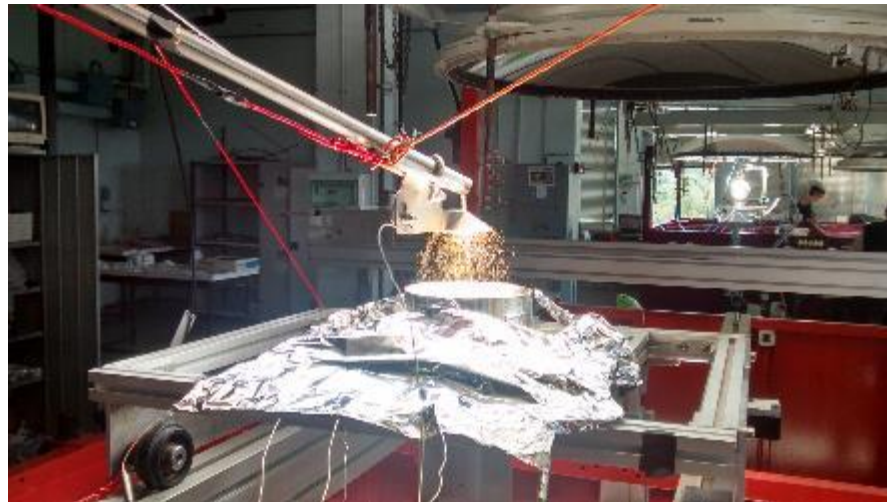
Duration: 5 years

Collaboration with Academia/Research Institute

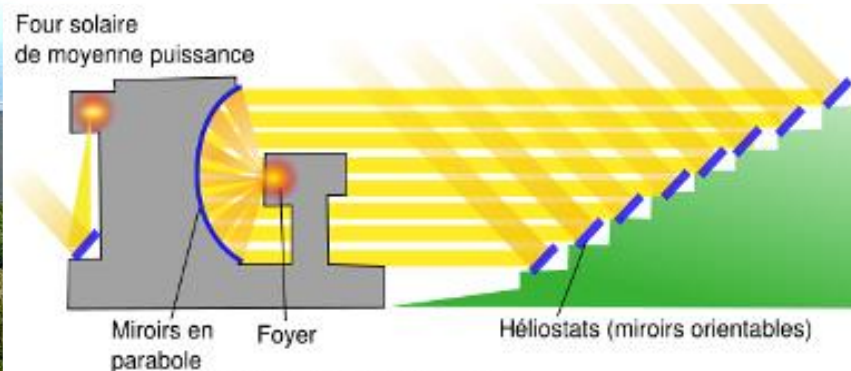
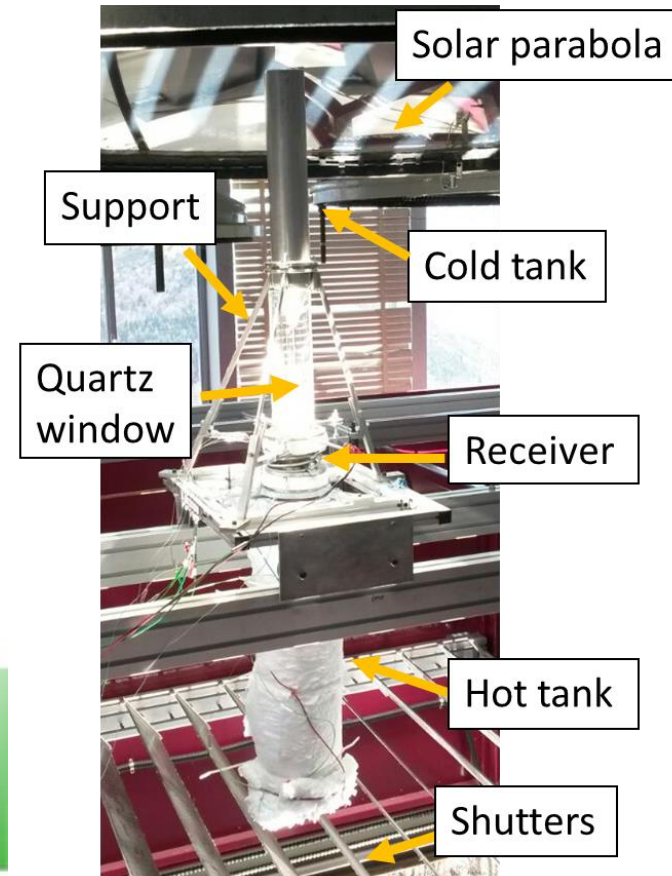


SandStock Project (Particle Receiver)

1st Prototype (Summer 2014)



2nd Prototype (Summer 2015)



Mirrors Degradation



Corroded facet selected for analysis
Installed in 2009



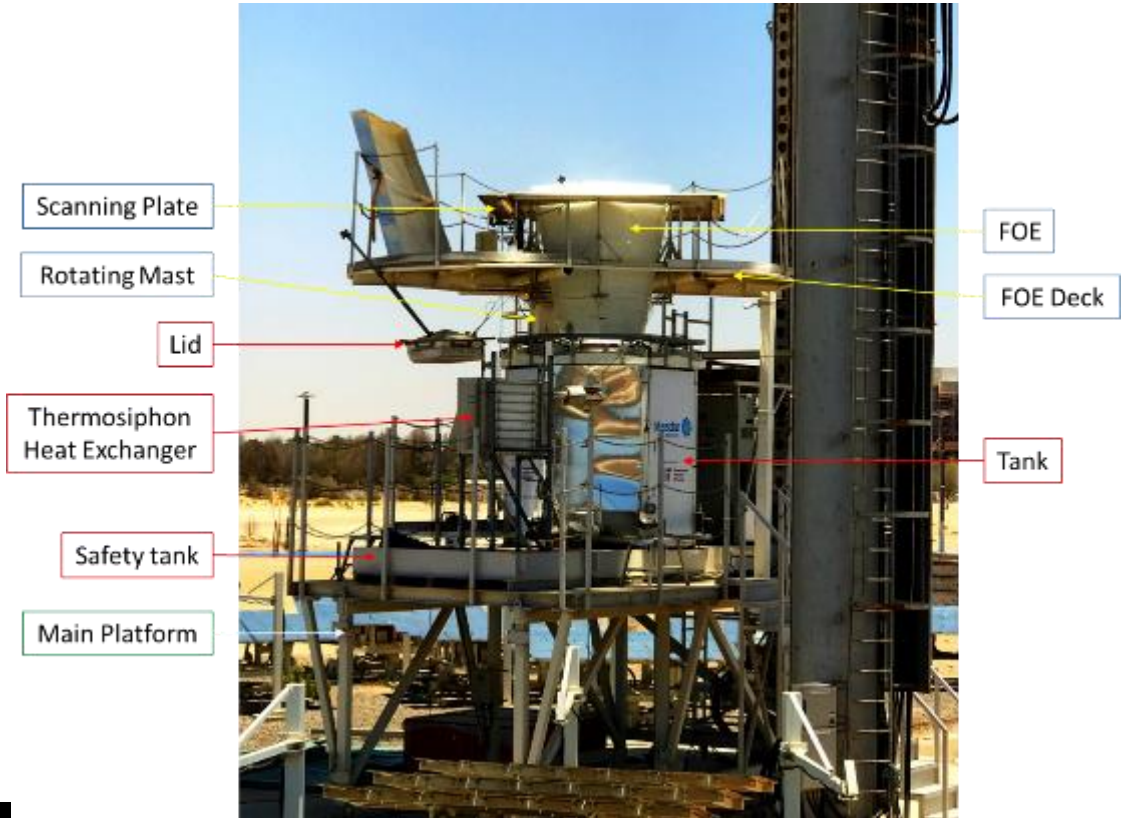
Comparison of samples under accelerated aging and “naturally”-aged ones:
Allows evaluation of accelerated-aging protocols
=> 2 Conference Papers + 1 Journal Paper

Concentrated Solar Power on Demand Demonstration (CSPonD Demo)



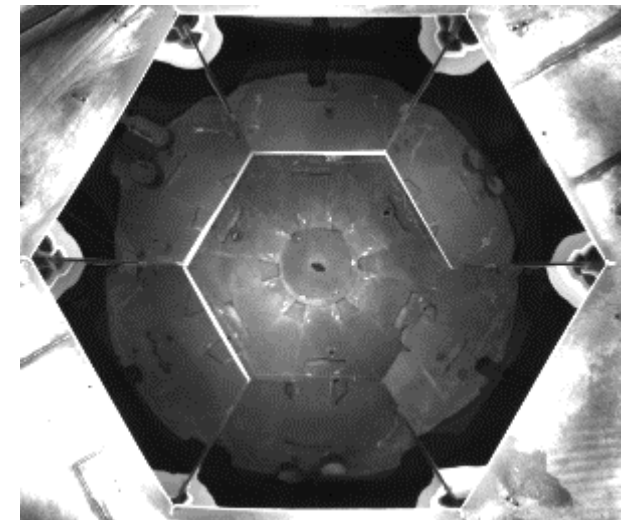
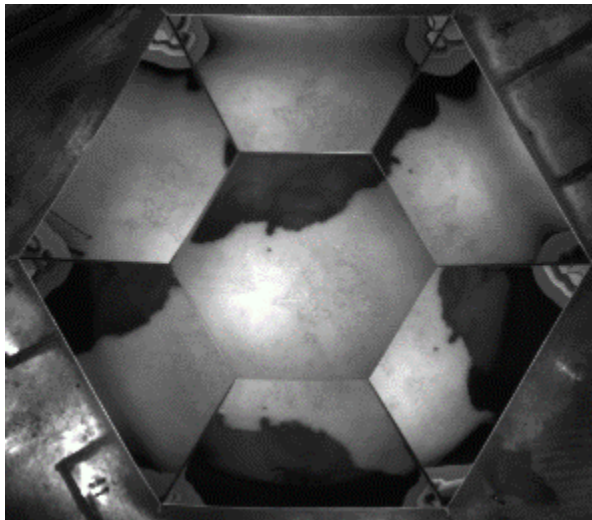
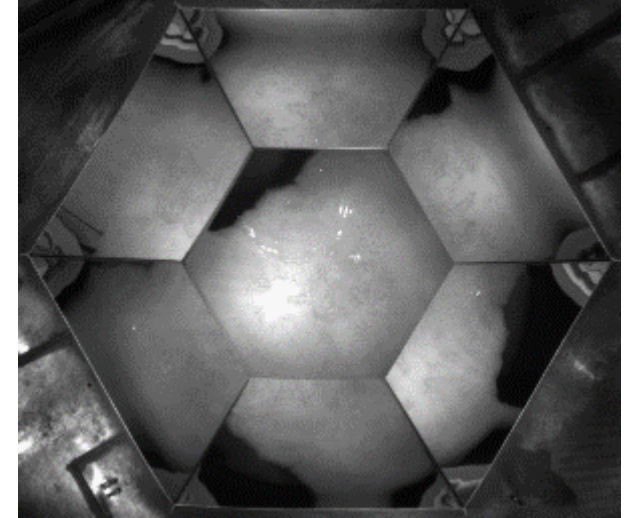
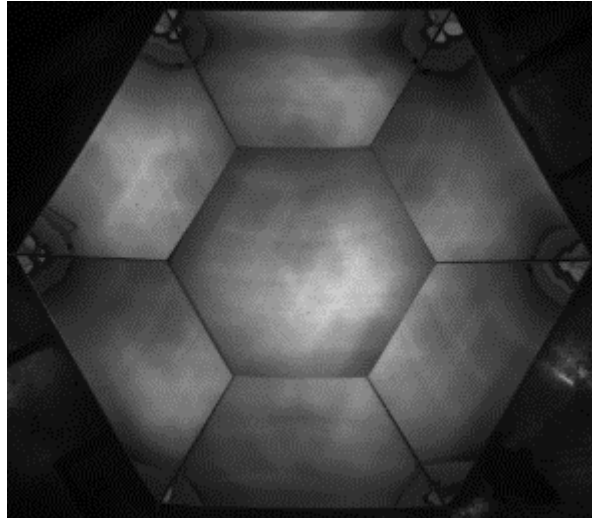
CSPonD Demo during operation in June 2017

Partners:

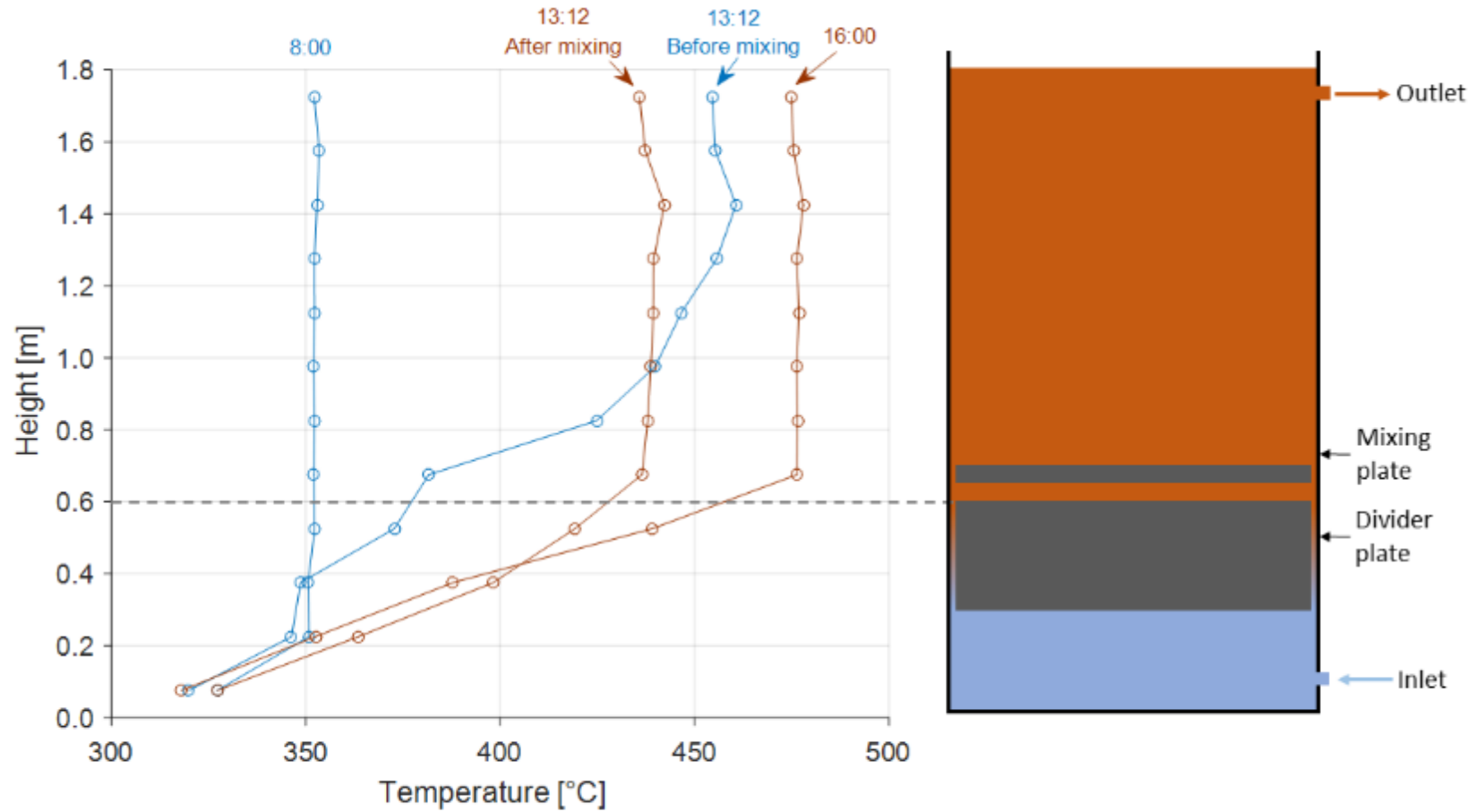


Project Cost: 3 M\$ (Internal Grant)

CSPonD Demo Pilot (Re-melting)



Experimental Results



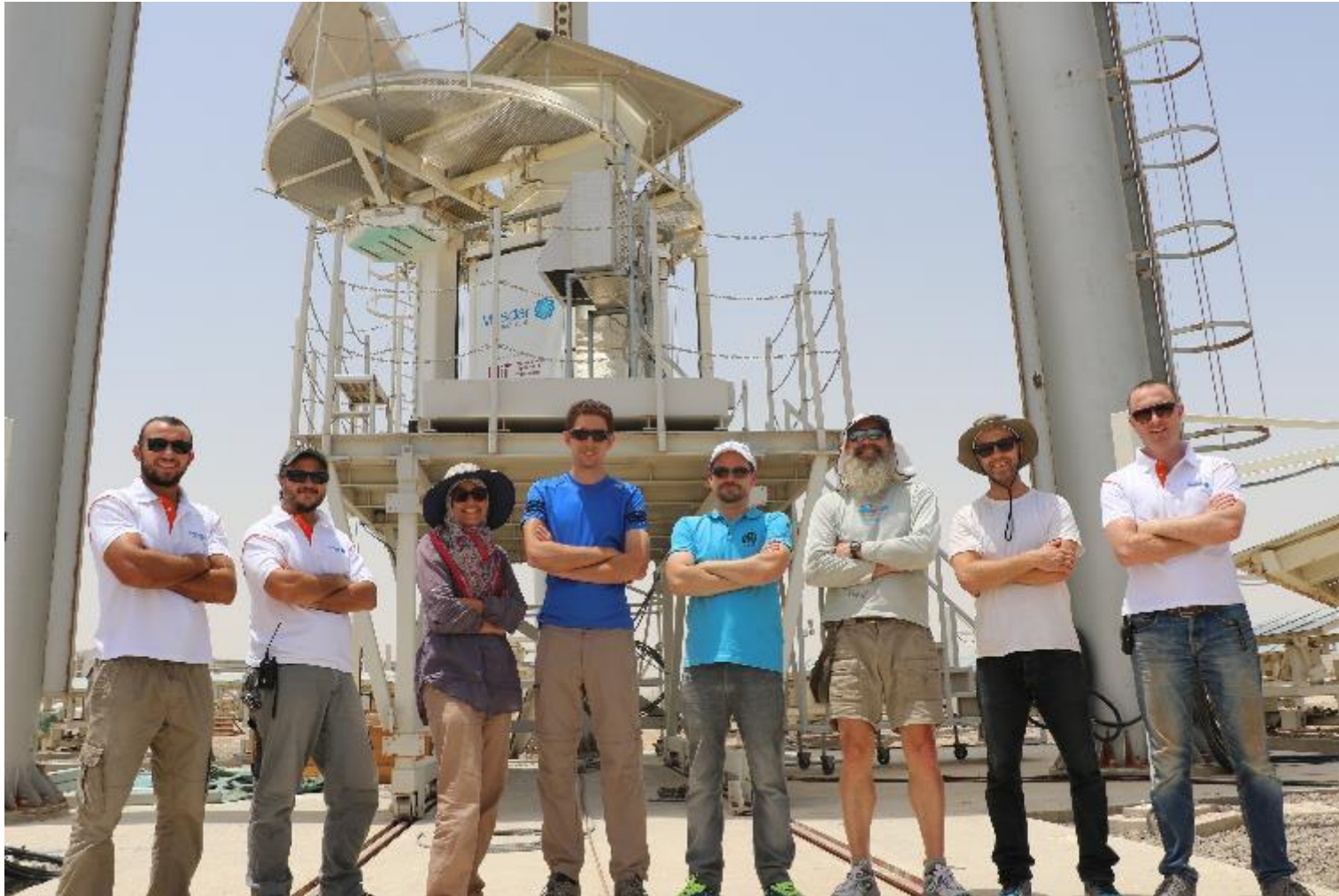
✓ Tank fully charged at a constant temperature

- ✓ Collaboration doesn't always mean money!
 - free access to facility
 - exchange of data (e.g. Shams 1)
 - joint publications, etc.
- ✓ Exchange of students/staff as a starting point to collaborate
- ✓ Participation to EU projects (EU entity will cover its own cost in GCC)
- ✓ Organize Workshops to plan research activity (EU GCC Clean Energy Network?) and prepare proposals

“Research was key to the low price record of 6 cents for dispatchable solar thermal energy at Port Augusta”

Kevin Smith, the CEO of California-based SolarReserve

Thanks to all the Team



Research at Masdar Institute is supported by the Government of Abu Dhabi to help fulfil the vision of the late President Sheikh Zayed Bin Sultan Al Nayhan for sustainable development and empowerment of the UAE and humankind.

Special thanks to



Thank You

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