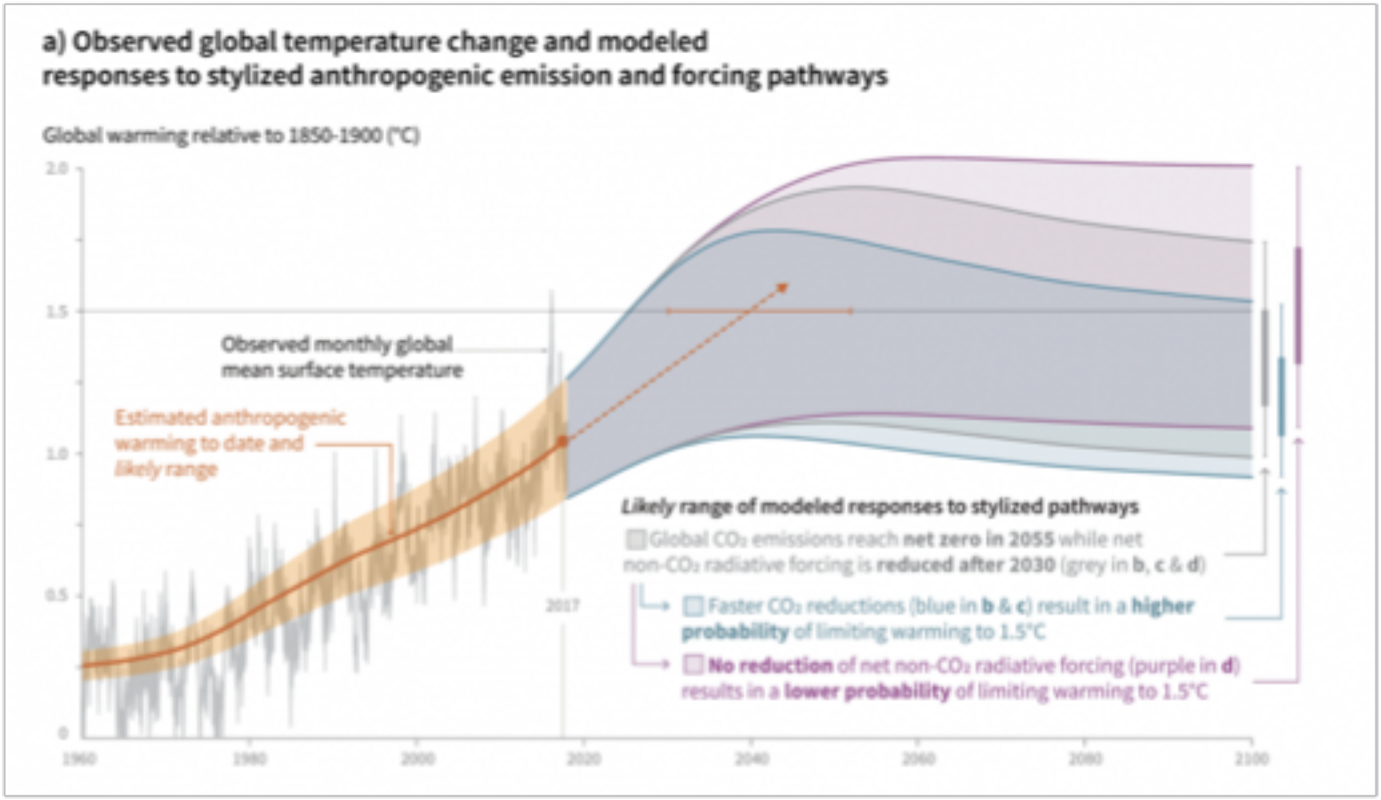
Nuevas perspectivas en Energía Solar Térmica Residencial y Comercial

Gerardo Diaz
Department of Mechanical Engineering,
University of California, Merced

Universidad de Chile, Diciembre 7, 2018

1.5 ºC

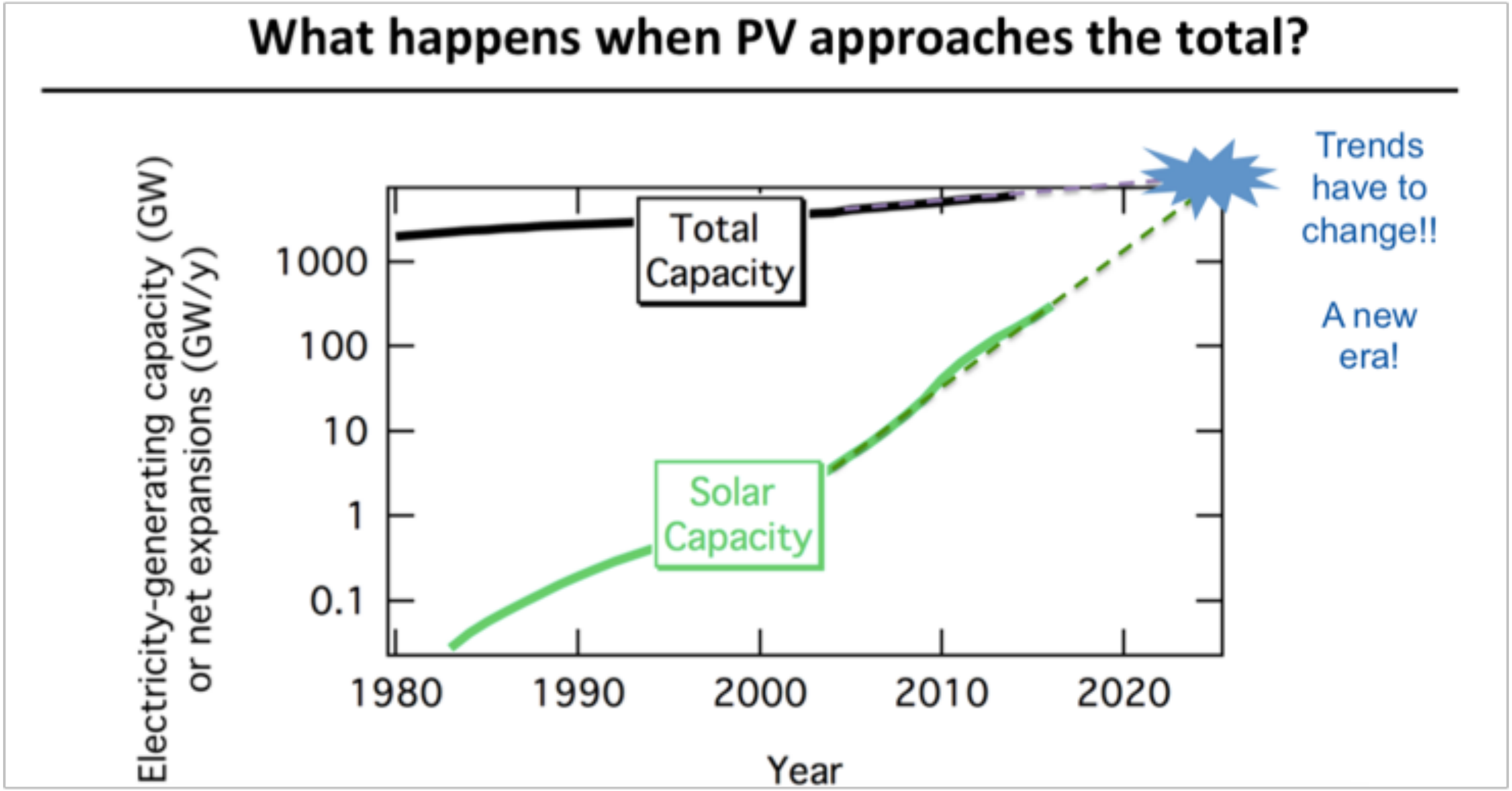


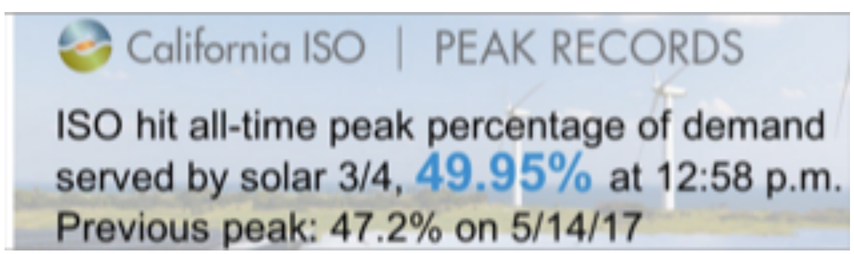
1.5 grados Celsius podrían alcanzarse en 12 años y con seguridad dentro de 20 años, si es que no hay reducciones significativas en las emisiones de CO_2

Cumplir con este objetivo exige transformaciones extraordinarias en transporte, energía, use del suelo, infraestructura y sistemas industriales.

También exige una gran escala de tecnologías emergentes, como las que eliminan el dióxido de carbono directamente del aire.

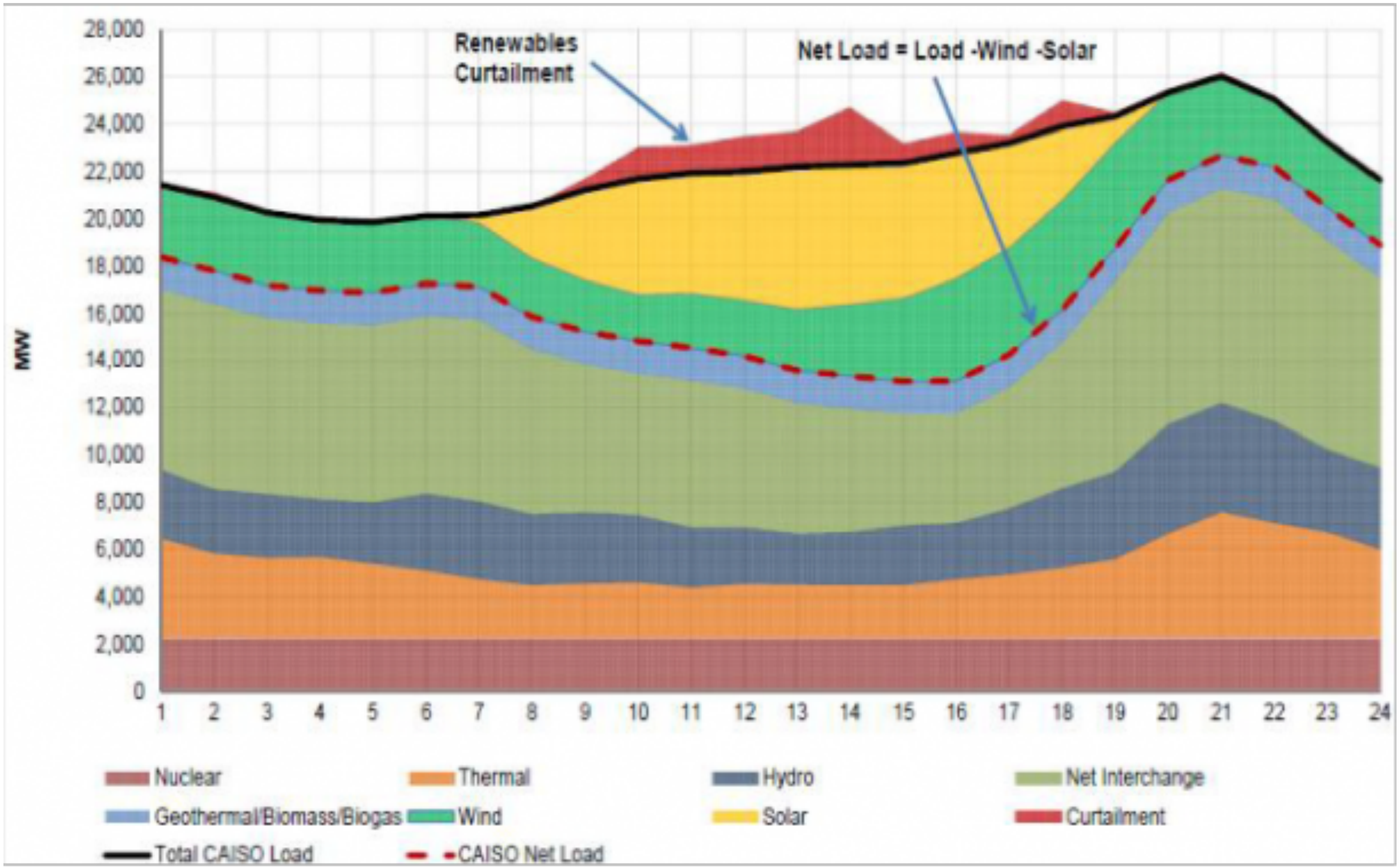
Una Nueva Era en Energía Solar





Sarah Kurtz, A New Era for Solar. UC Solar Symposium Oct. 13, 2017 San Francisco, CA

Reducción de Capacidad de Energías Renovables



BRIEF

CAISO: California curtailed 80 GWh of renewables in March

Prácticamente Inevitable

-Aumento de Temperaturas.

-Mayor incidencia de incendios forestales.

-Aumento del nivel del mar y eventos climáticos severos.

Energy Research and Development Division
FINAL PROJECT REPORT

ASSESSMENT OF CALIFORNIA'S NATURAL GAS PIPELINE VULNERABILITY TO CLIMATE CHANGE

White Paper from the California Energy Commission's Climate Change Center

Prepared for: California Energy Commission
Prepared by: University of California, Berkeley

JANUARY 2017
CEC-500-2017-008

LBNL-Report

BERKELEY LAB

ERNEST ORLANDO LAWRENCE
BERKELEY NATIONAL LABORATORY

ESTIMATING RISK TO CALIFORNIA ENERGY INFRASTRUCTURE FROM PROJECTED CLIMATE CHANGE

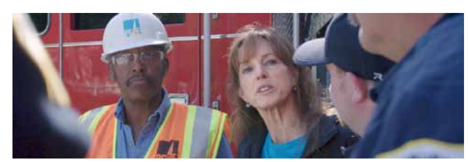
Jayant Sathaye, Larry Dale, Peter Larsen, Gary Fitts,
Lawrence Berkeley National Laboratory (LBNL)

Kevin Koy and Sarah Lewis,
Geospatial Innovation Facility, University of California at Berkeley

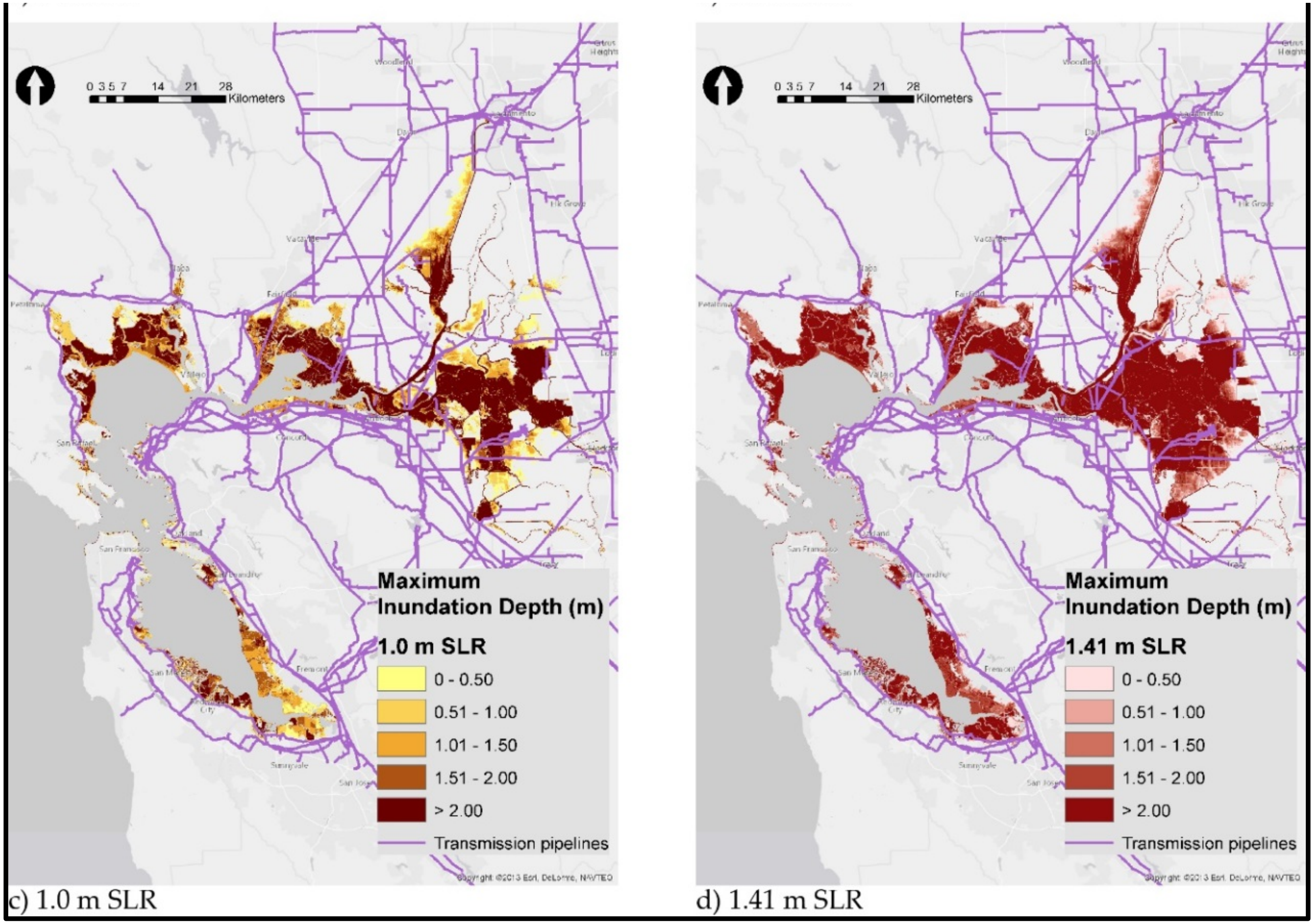
Andre Lucena, Federal University of Rio de Janeiro

Pacific Gas and Electric Company

Climate Change Vulnerability
Assessment and Resilience Strategies



Ejemplo: Cañerías de Gas Natural

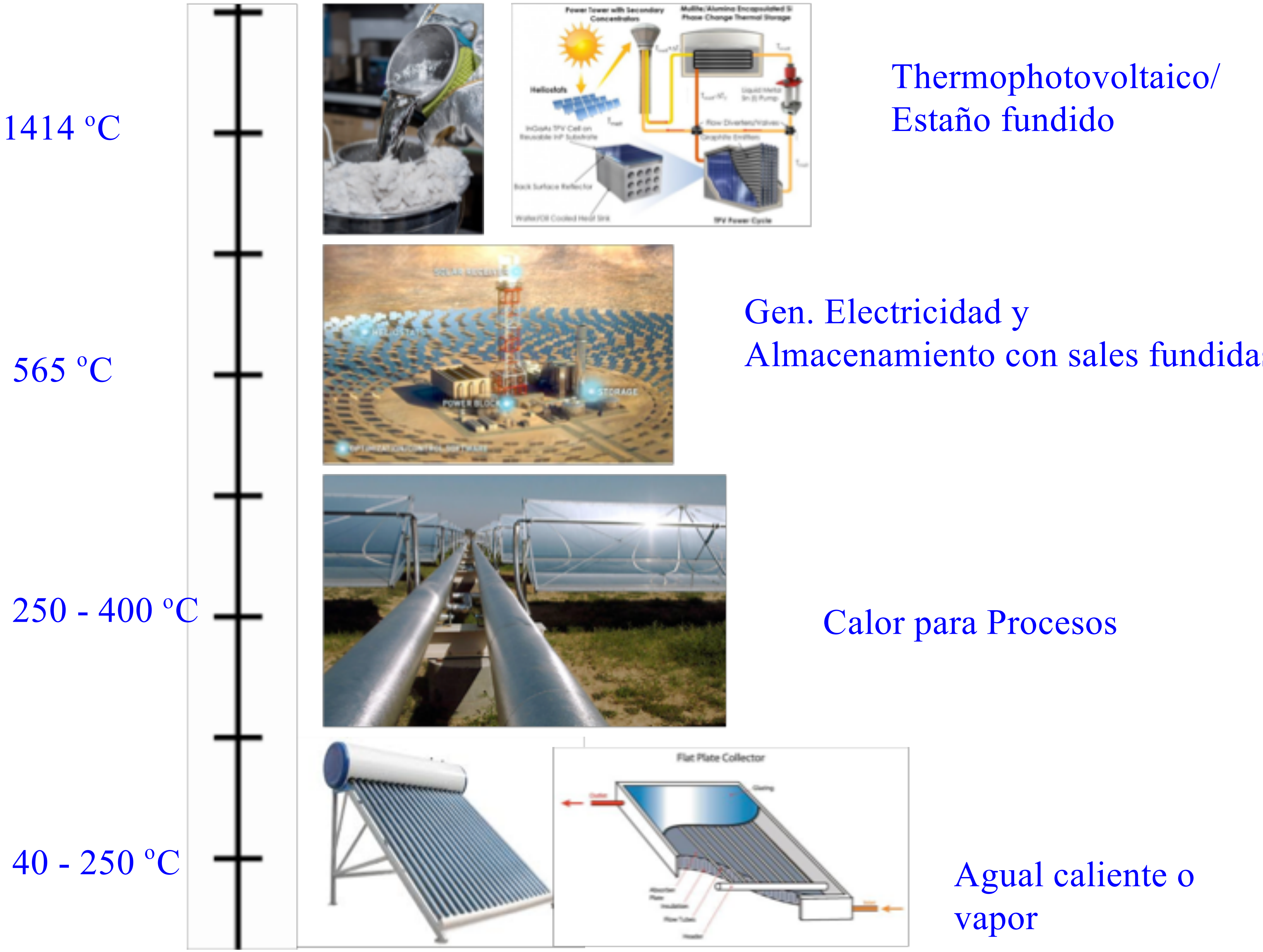


Cañerías de GN afectadas por máxima inundación o peor tormenta en 100 años

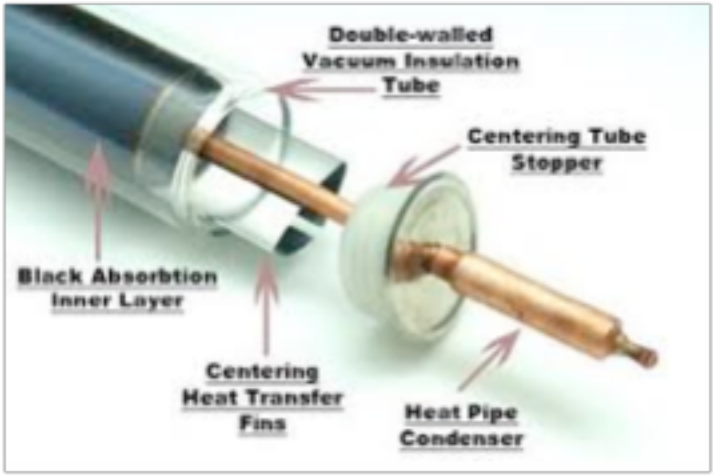
Falla en Cañerías de GN

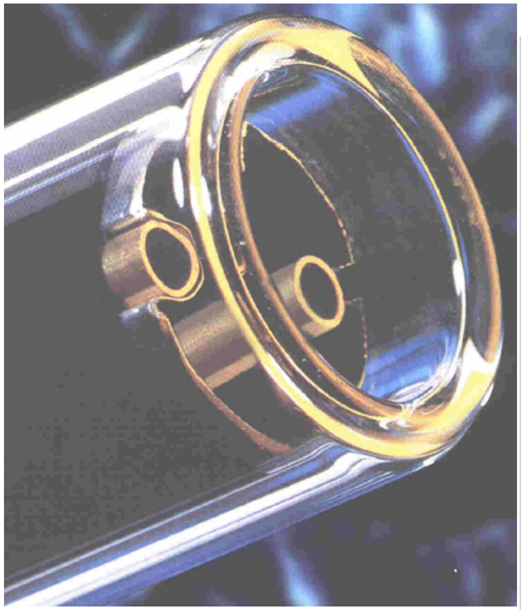
San Bruno (2010)

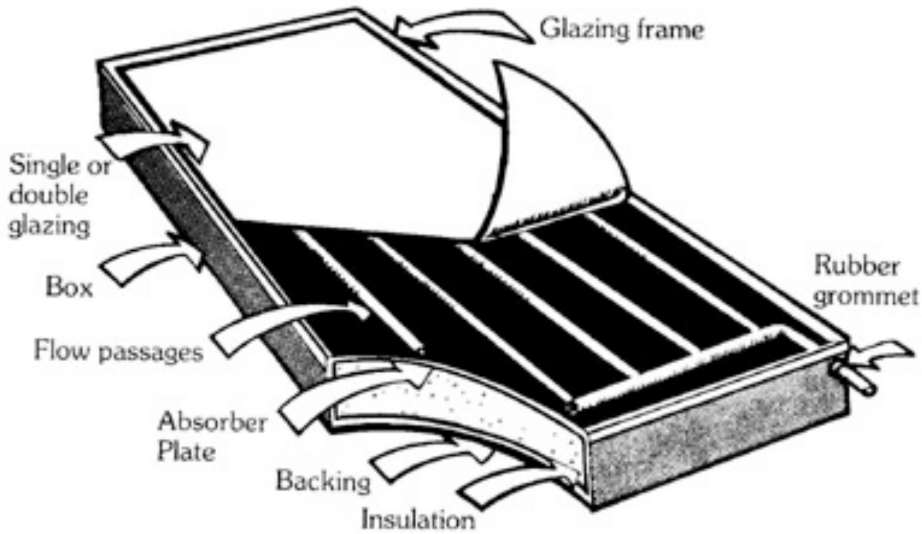
Fuga de GN Aliso Canyon (2015)


1414 °C
565 °C
250 - 400 °C
40 - 250 °C
Thermophotovoltaico/
Estaño fundido
Gen. Electricidad y
Almacenamiento con sales fundidas
Calor para Procesos
Agual caliente o
vapor
Flat Plate Collector

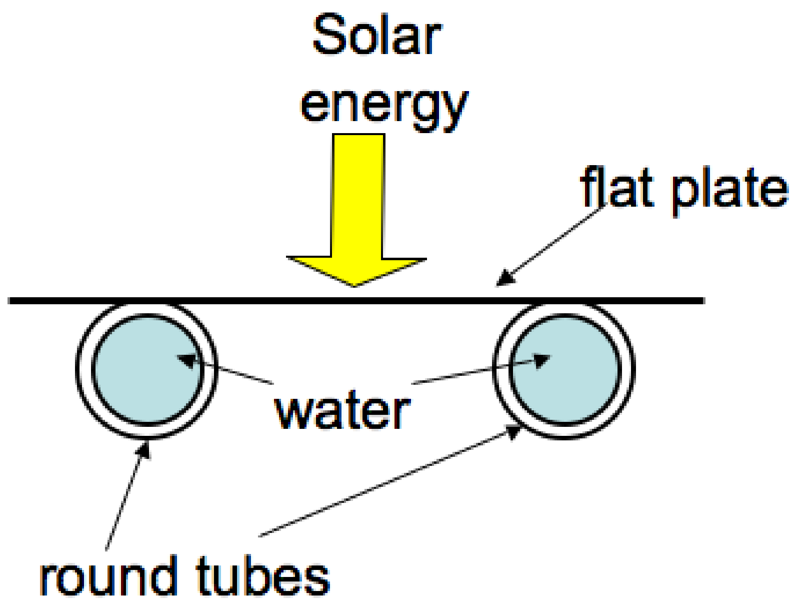
Configuraciones

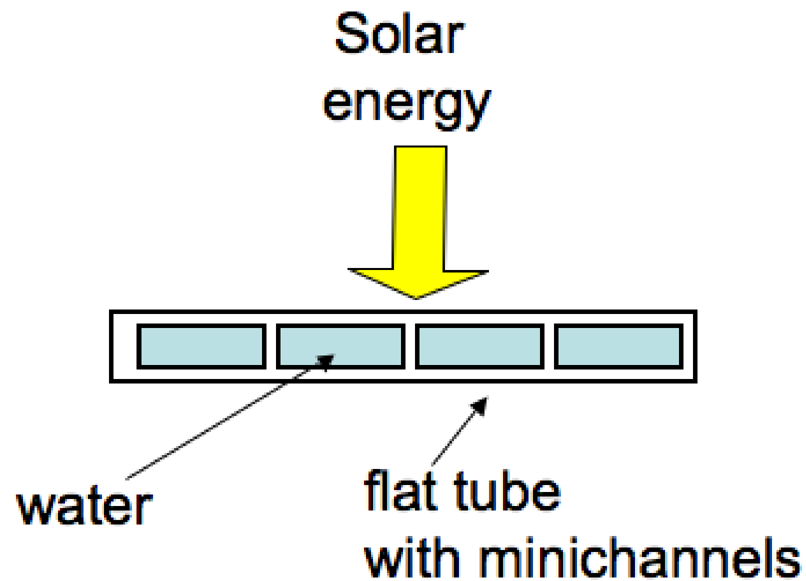


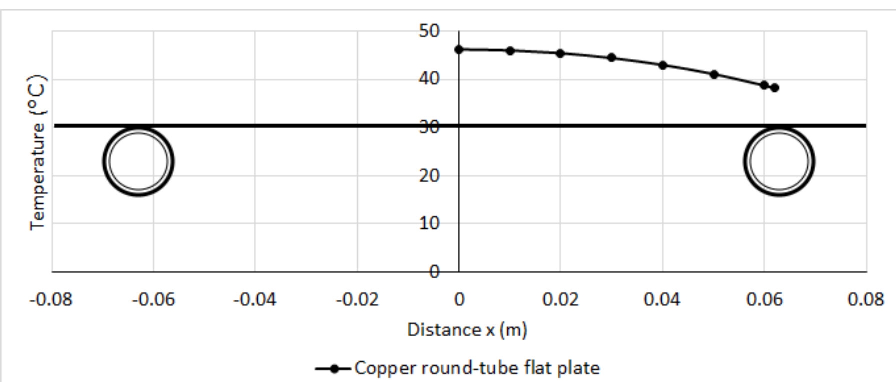


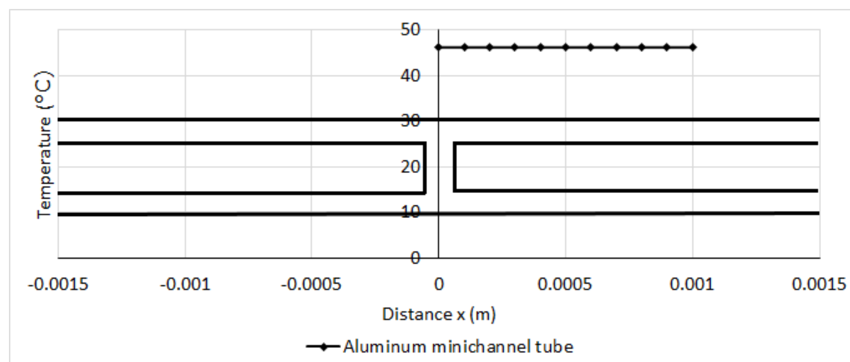


Tubos de Minicanal

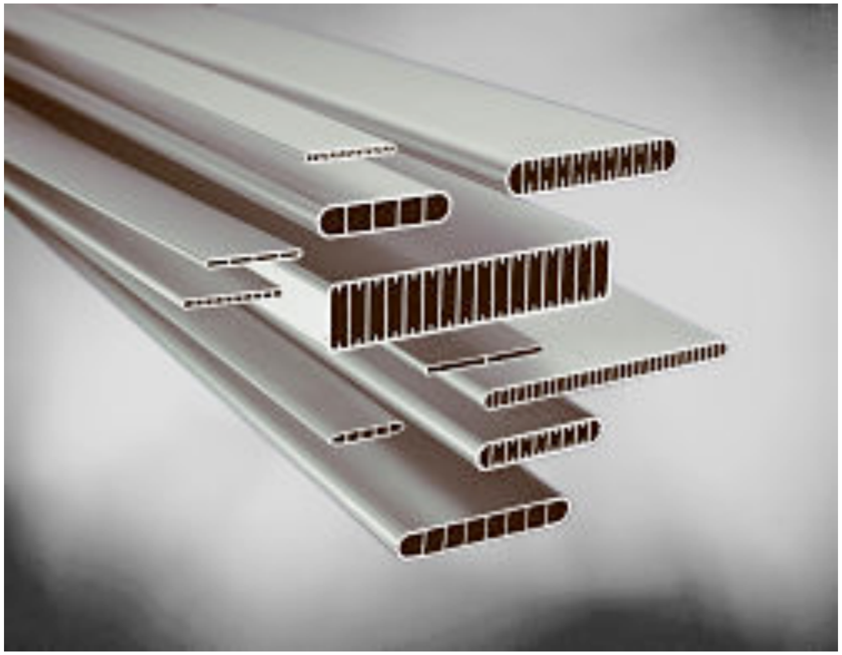


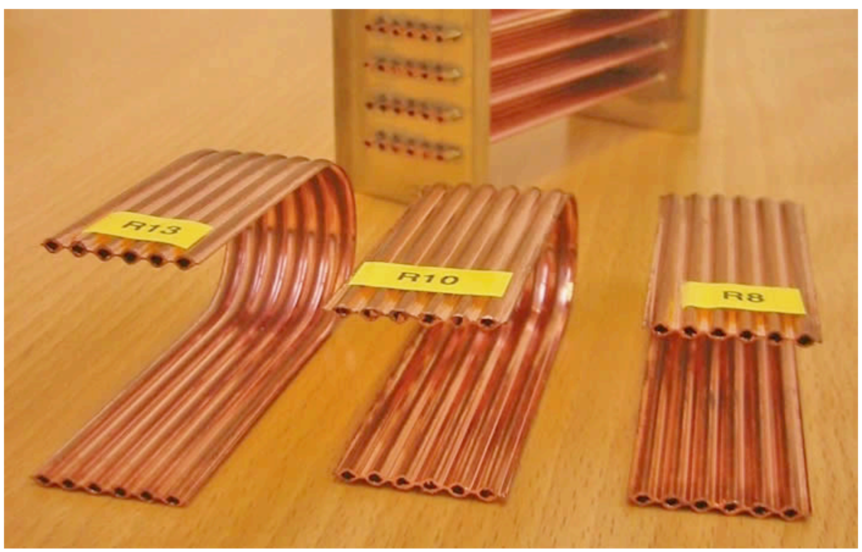






Tipos de Tubo de Minicanal

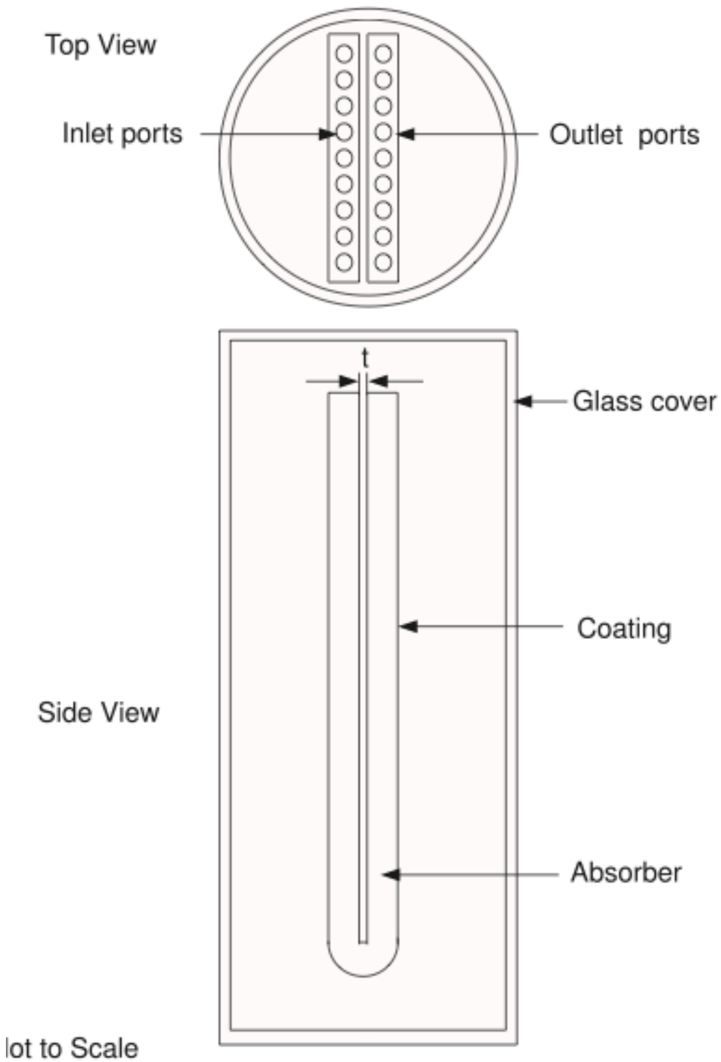




Condensador Minicanal versus
Condensador RTPF

Capacidad: 7 kW

Mejor Eficiencia Termal



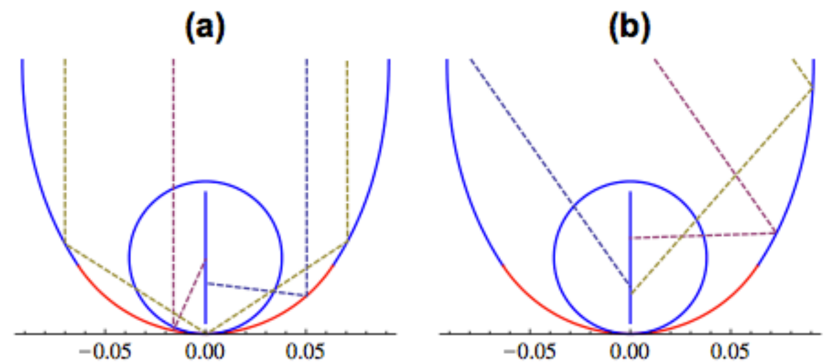
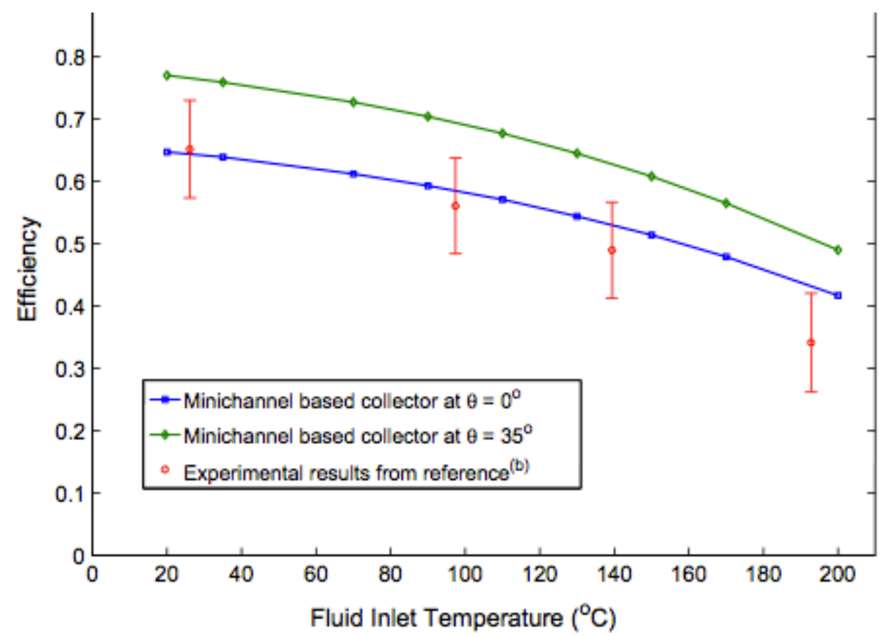


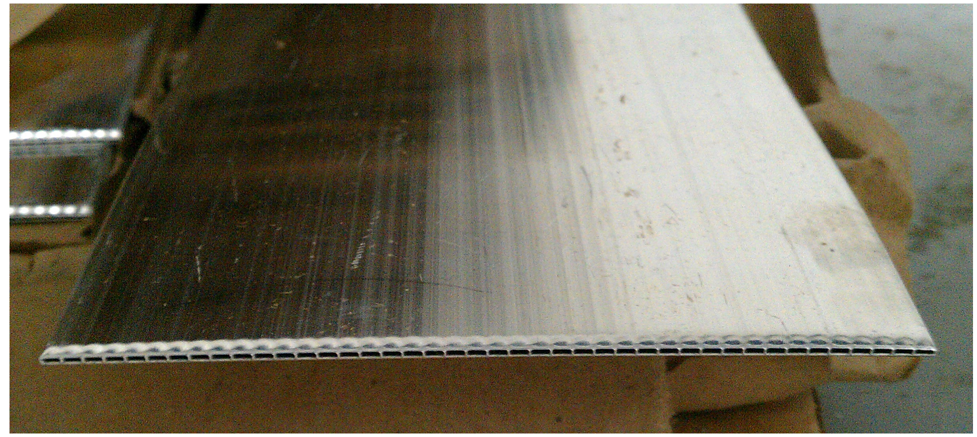
Fig. 10. Cross-section profile of the CPC concentrator for the minichannel-based solar collector. Three sample rays out of 50,000 are shown for (a) $\theta = 0°$ and (b) $\theta = 35°$.



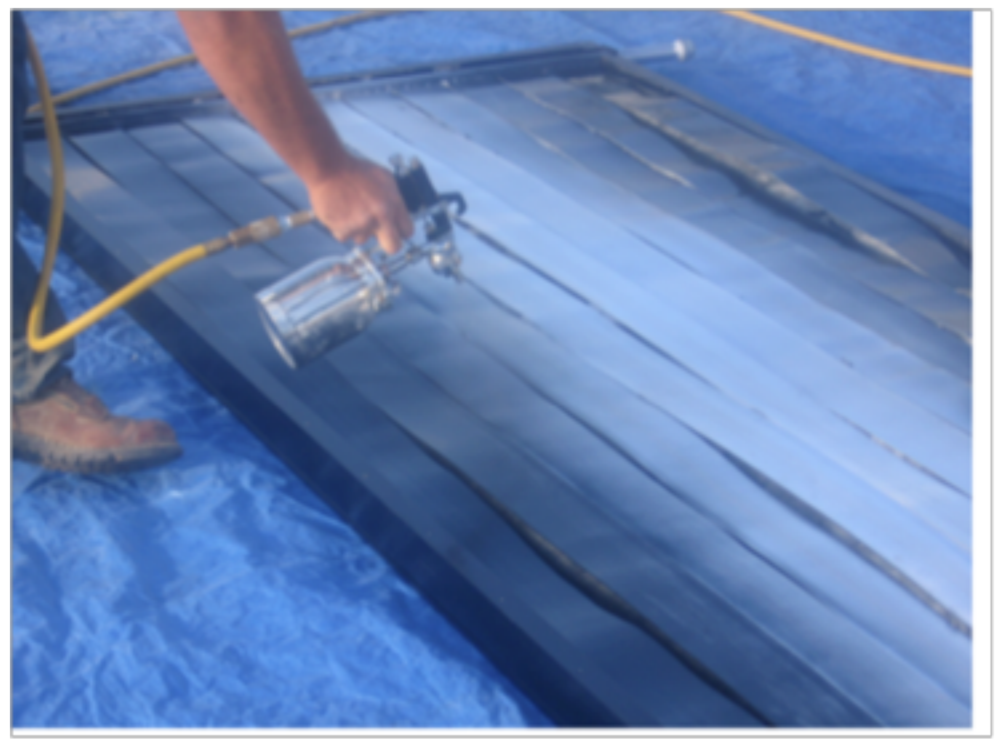
N. Sharma, G. Diaz, Solar Energy, 85 (2011) 881-890

Diaz G., Sharma N. US 2011/0186043 A1, 2011

Colector de Aluminio de Minicanal

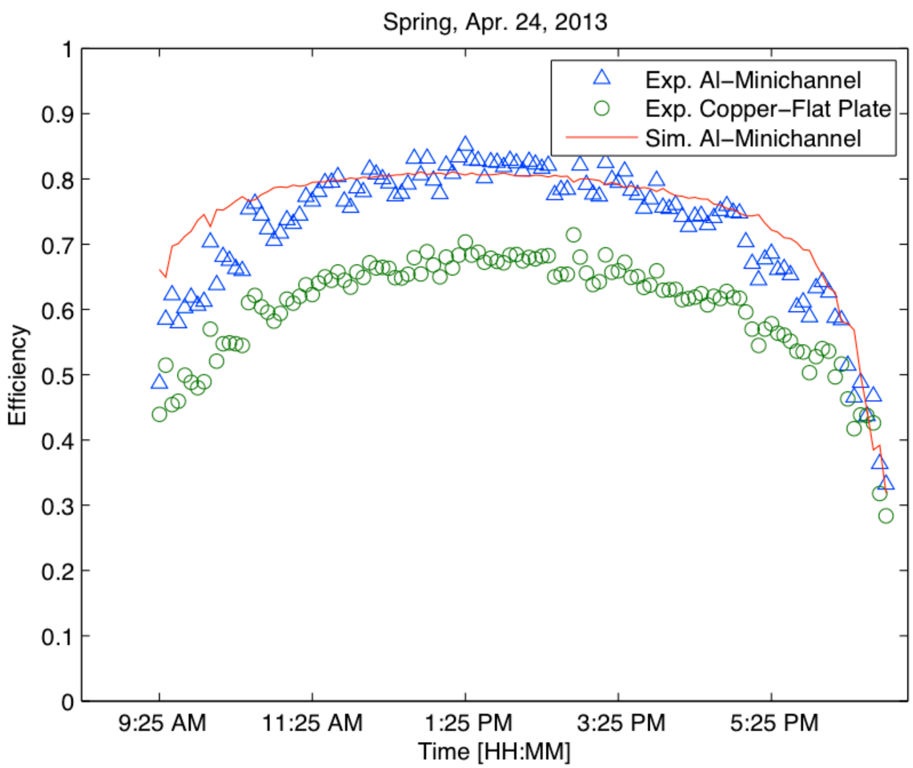


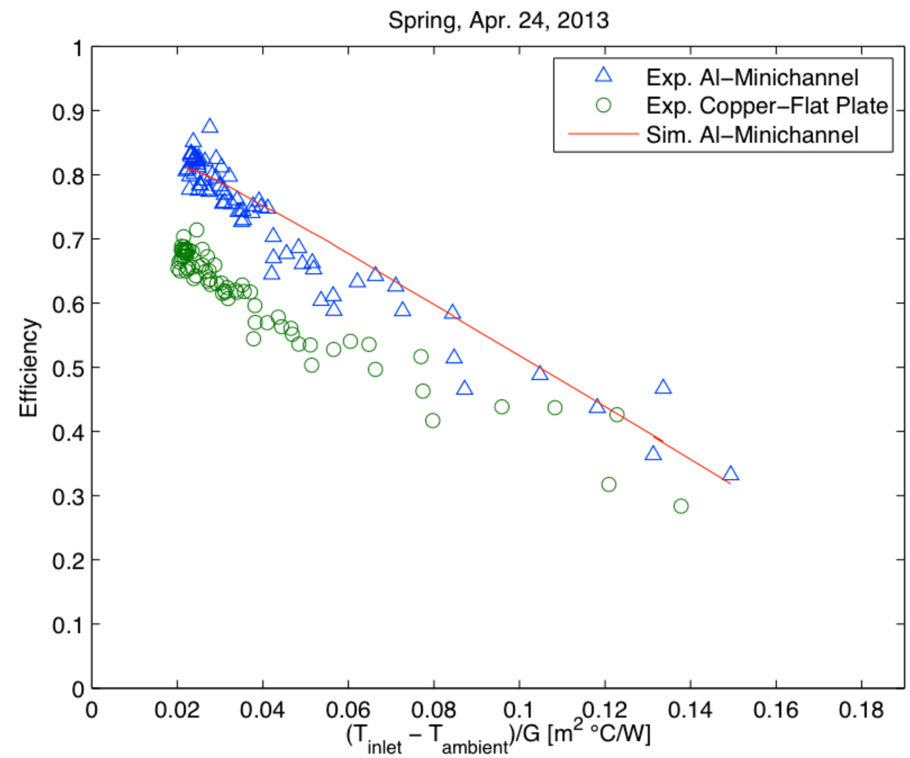
Tubo Minicanal by Hydro



Capa Selectiva: Black chrome (EC series): α=.95, ε = .12

Thermal Efficiency





Mejora en Efficiency Thermal > 10%, aproximadamente

Robles et al., Solar Energy, 110 (2014) 356-364

Costo de Colector Prototipo

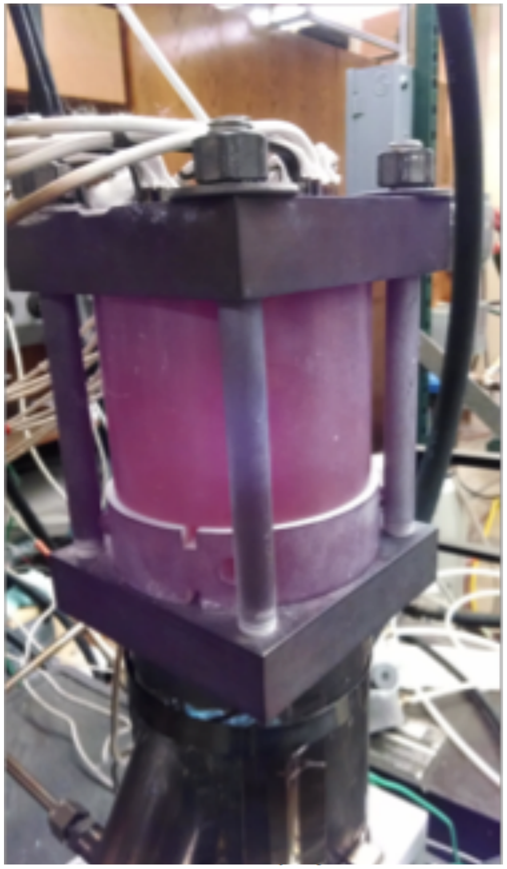
10 ft. by 4 ft. (3.7 m^2) collector solar de minicanal de aluminio

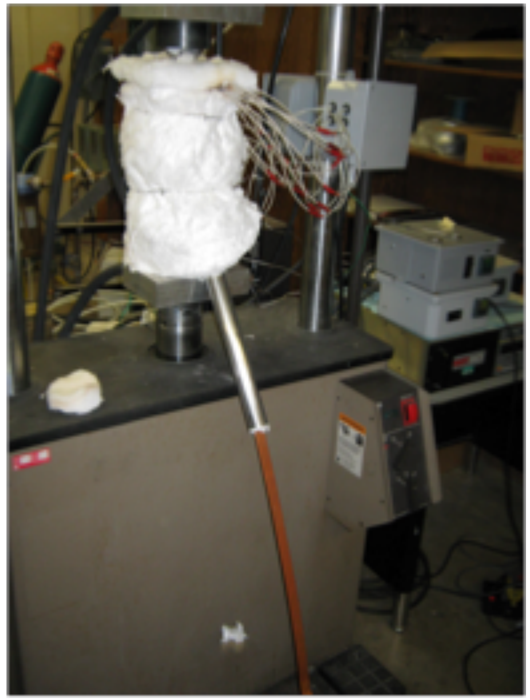
- Aluminum minichannel tubes = $440
- Headers = $28
- Collector frame and glass purchased = $500
- TIG welding = $1056
- Total = $2024, **$544.65/m^2**
- Estimated cost for mass produced unit: **$155.32/$m^2$**

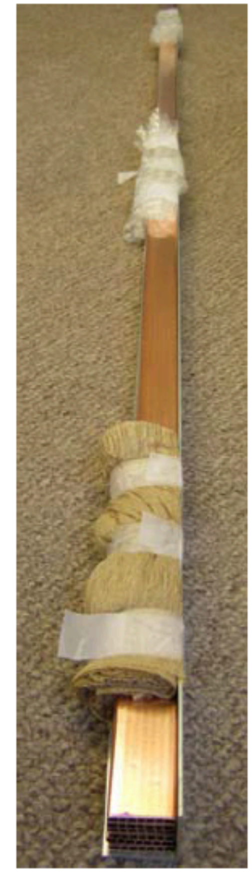
Average conventional collector **$553.50/$m^2$**

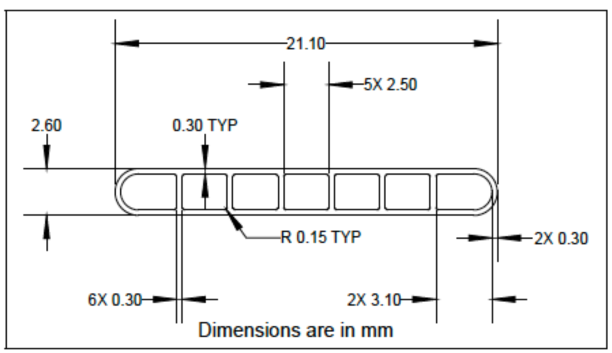
* GTM Research and SEIA, 2011

Extrusion de Cobre









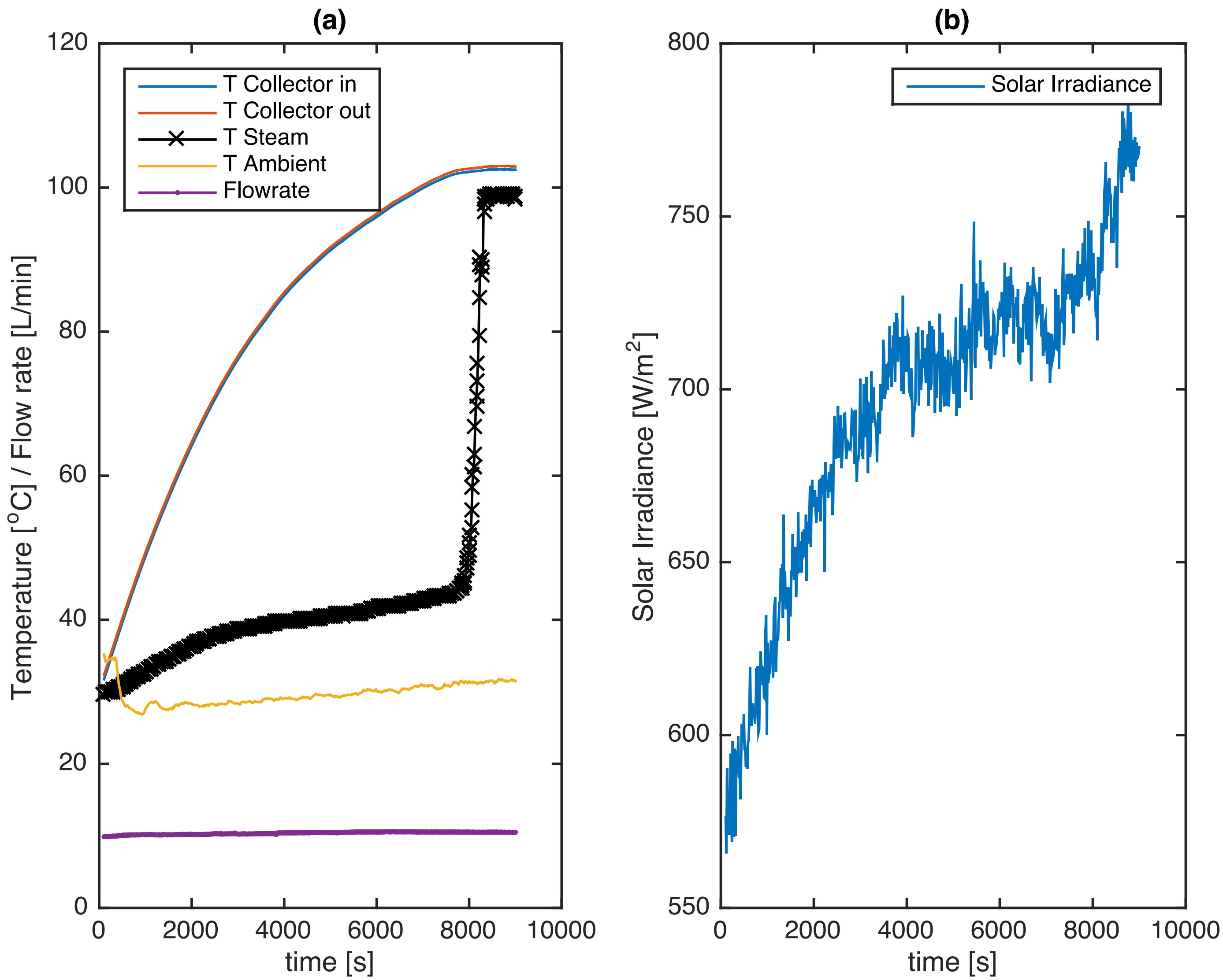
Copper minichannel tubes manufactured by Prof. Kraft, at Ohio University

Generación de Vapor de Bajo Grado

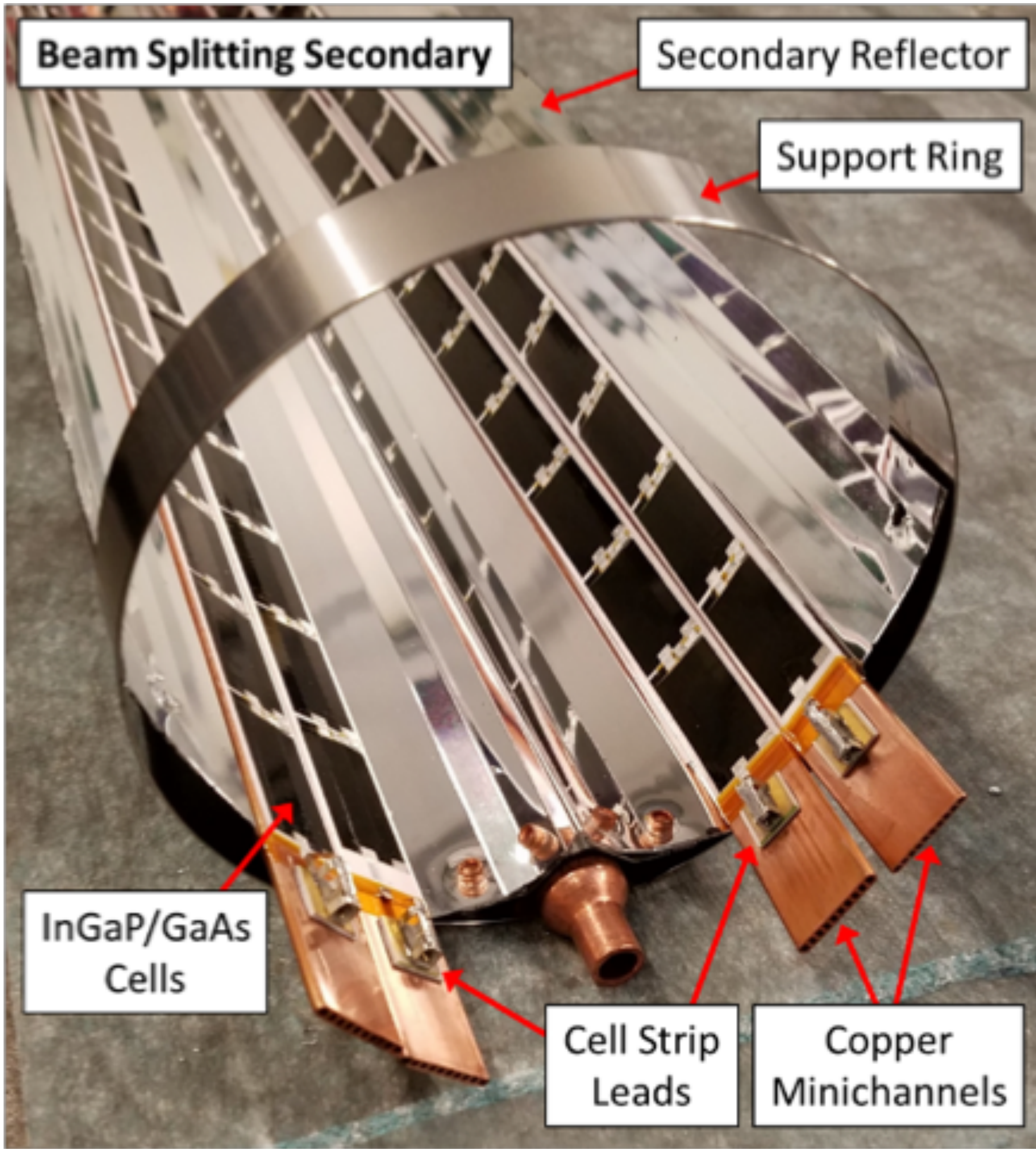
Angulo Variable de Inclinación

Generador de vapor

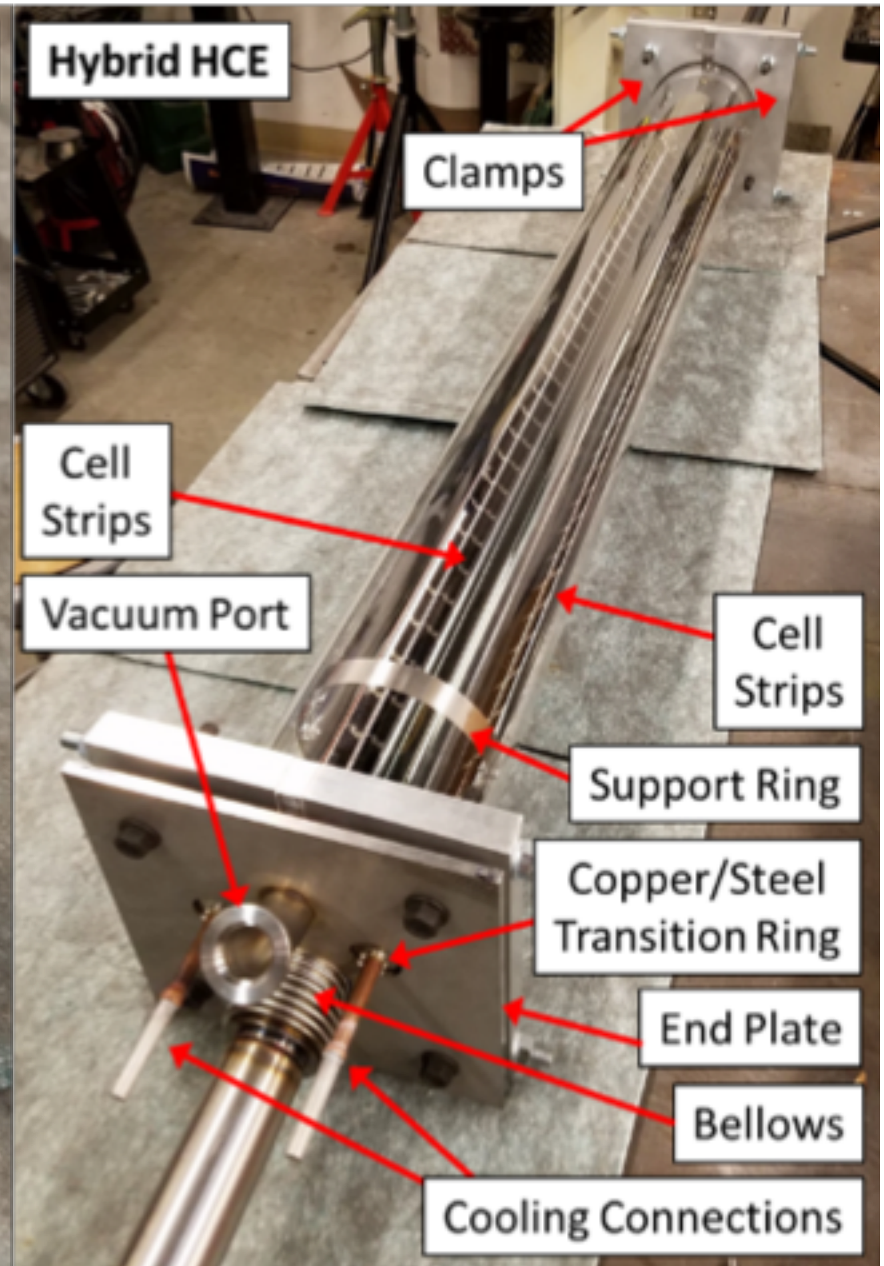
Generation de Vapor de Bajo Grado



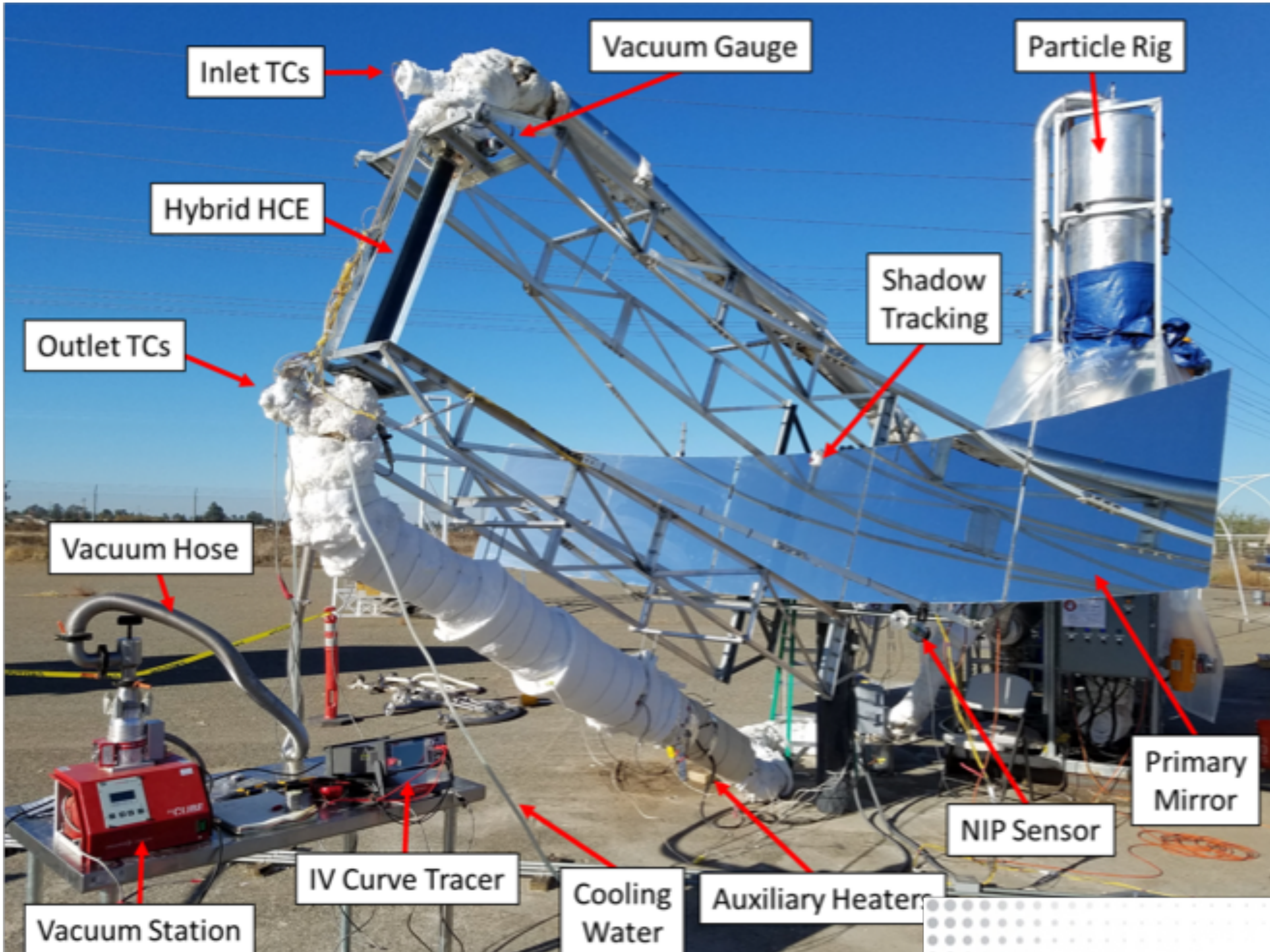
Alta Temperatura + Electricidad



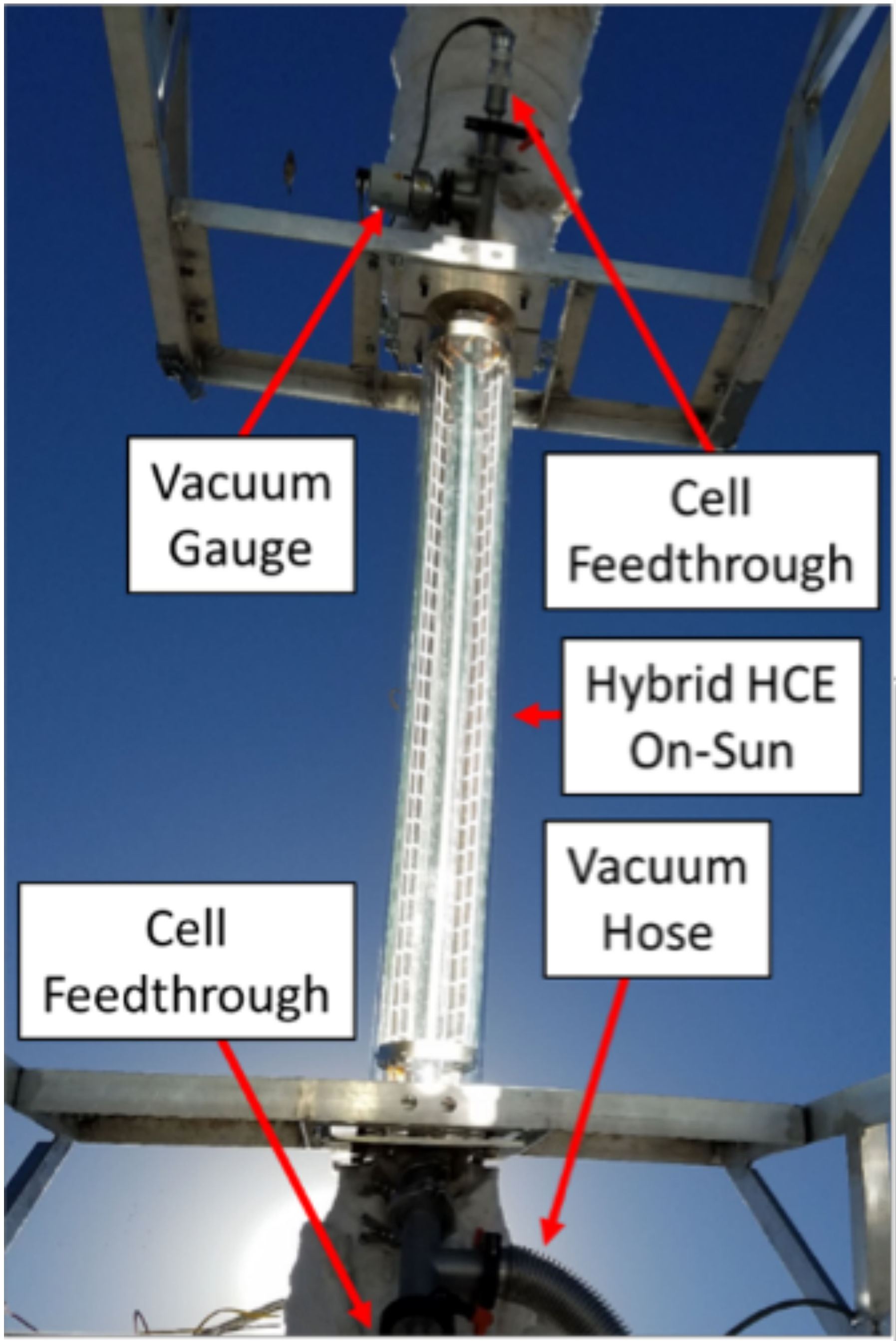
650 Celsius

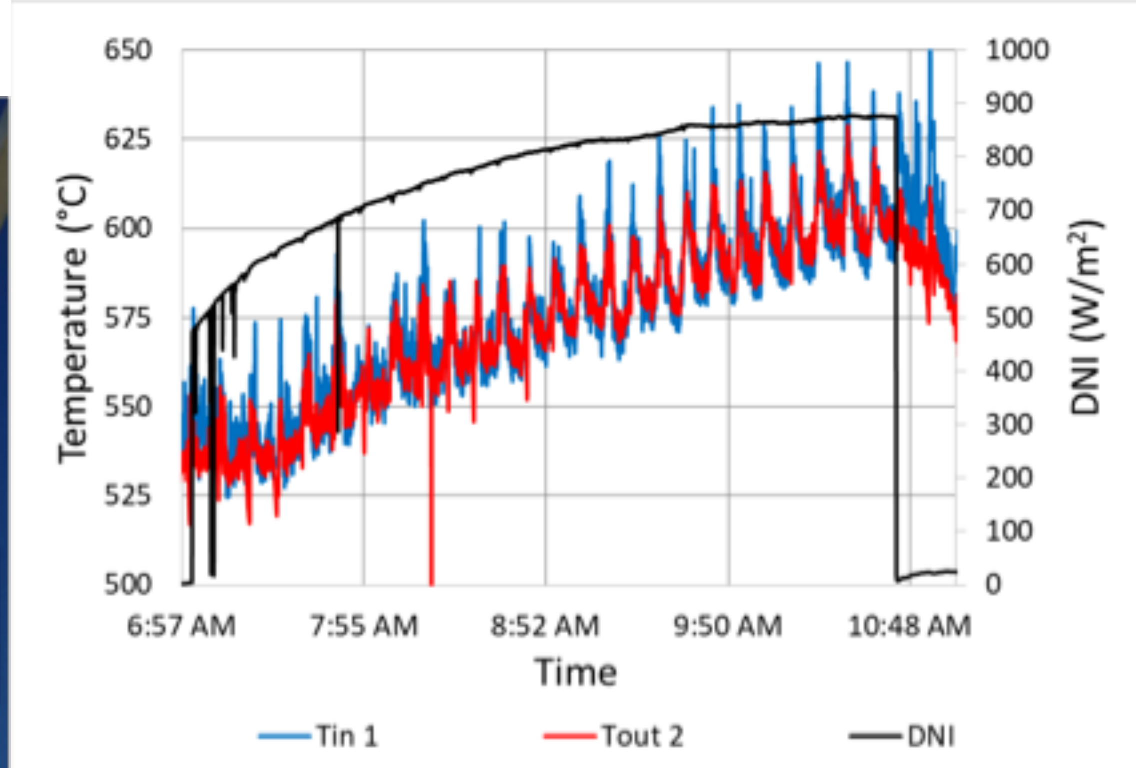


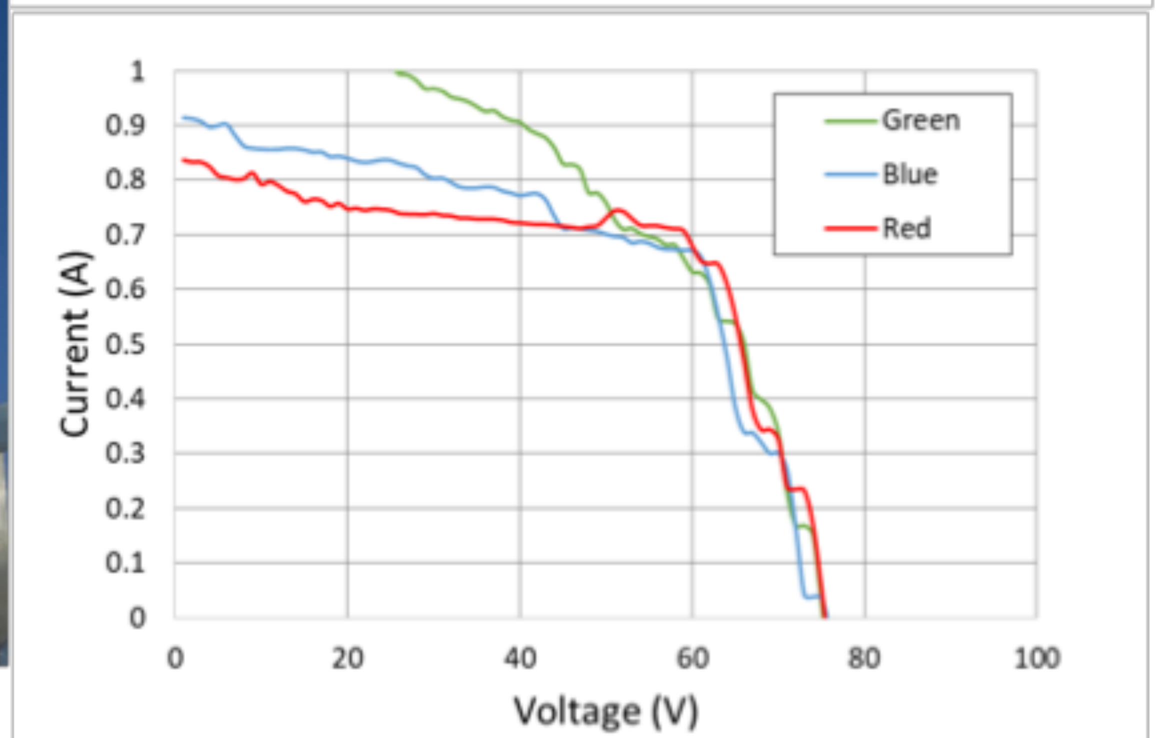
arpa-e



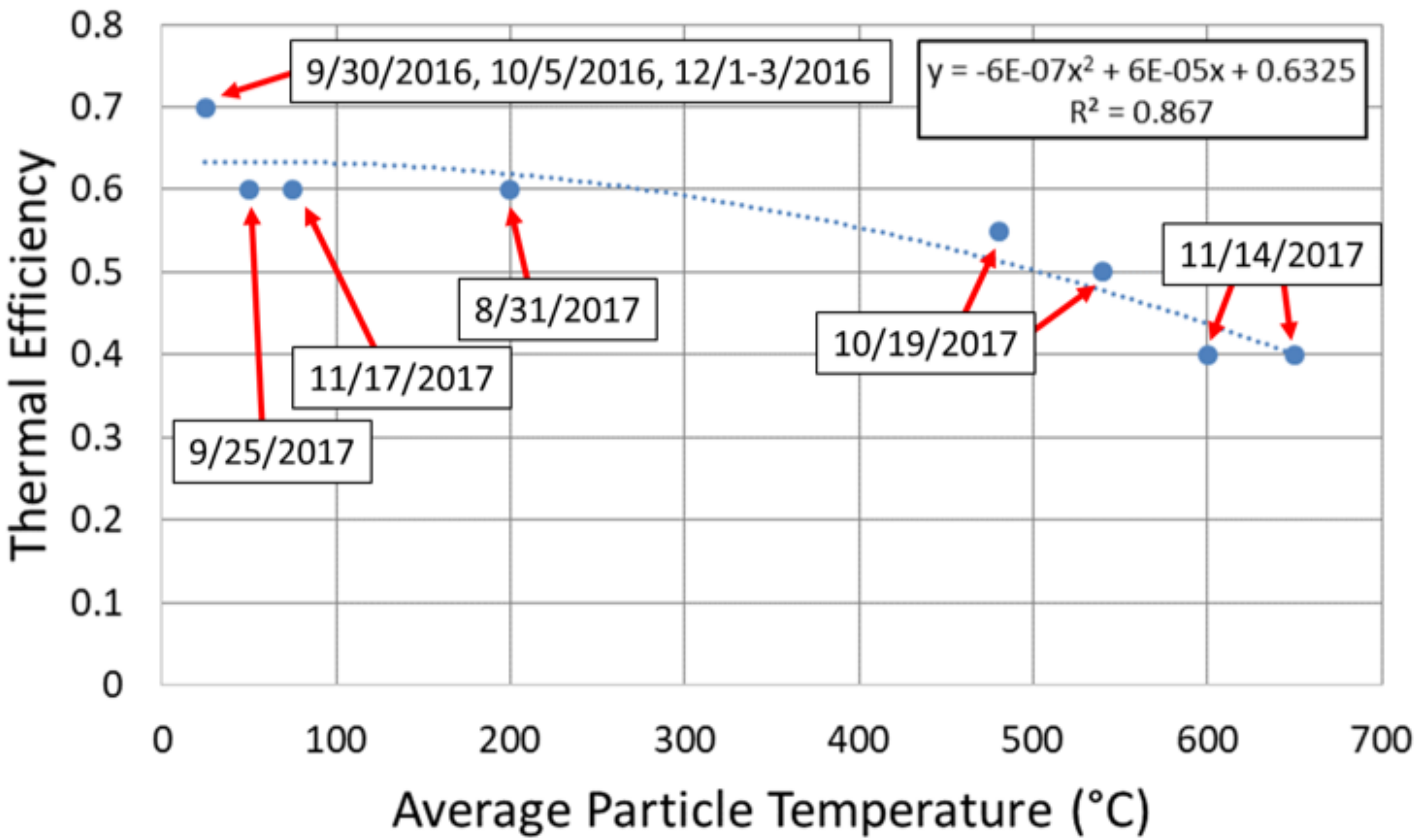
Winston's group and GTI


Vacuum Gauge
Cell Feedthrough
Hybrid HCE On-Sun
Vacuum Hose
Cell Feedthrough

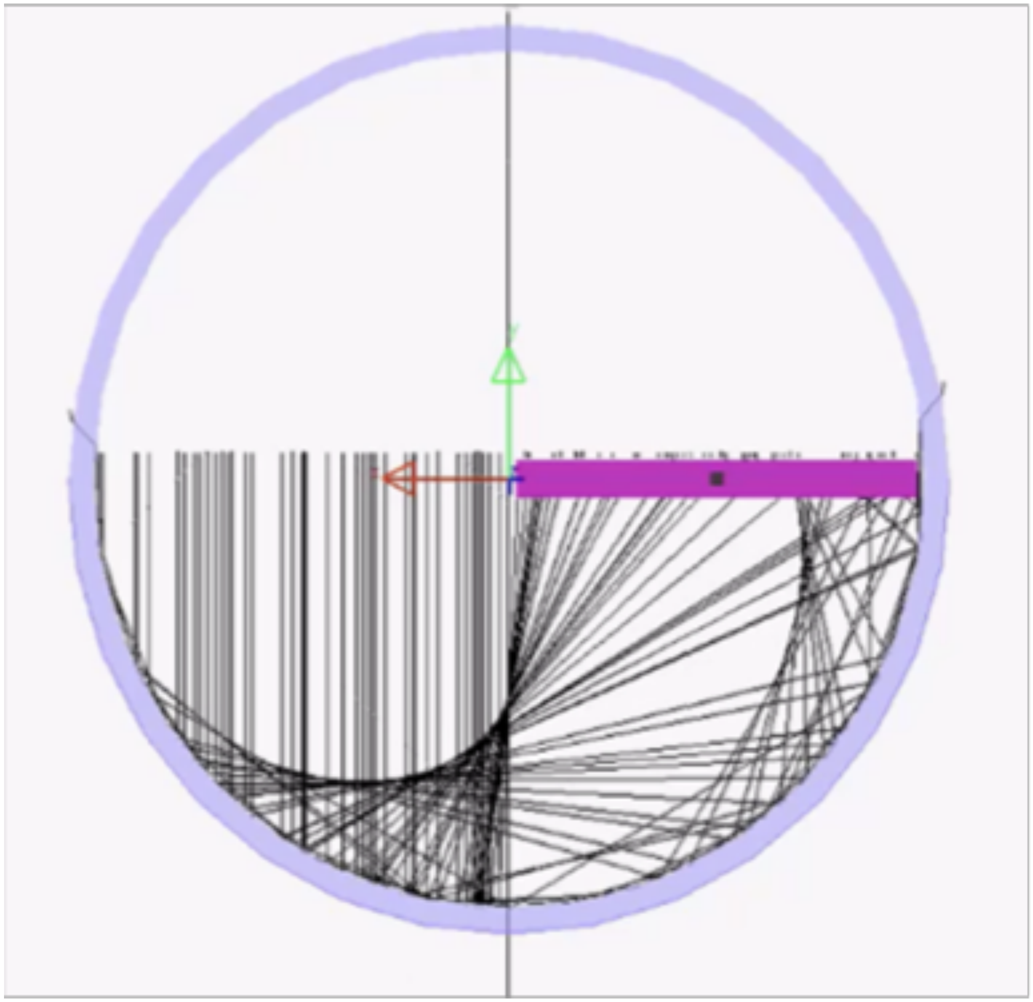

650
625
600
575
550
525
500
Temperature (°C)
1000
900
800
700
600
500
400
300
200
100
0
DNI (W/m²)
6:57 AM
7:55 AM
8:52 AM
9:50 AM
10:48 AM
Time
Tin 1
Tout 2
DNI


1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Current (A)
0
20
40
60
80
100
Voltage (V)
Green
Blue
Red

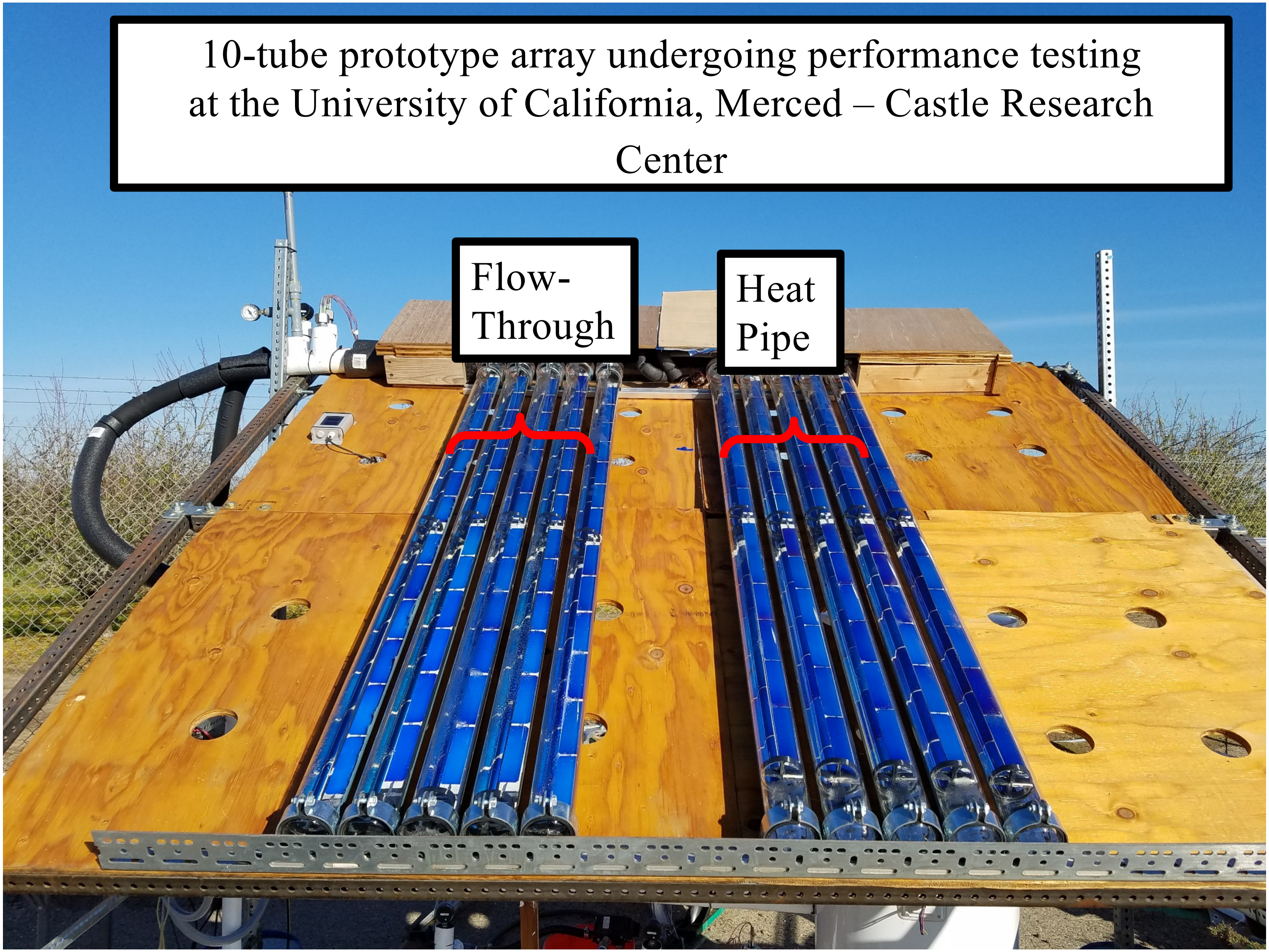
Two-Stage Beam Splitting Collector



Colector Híbrido

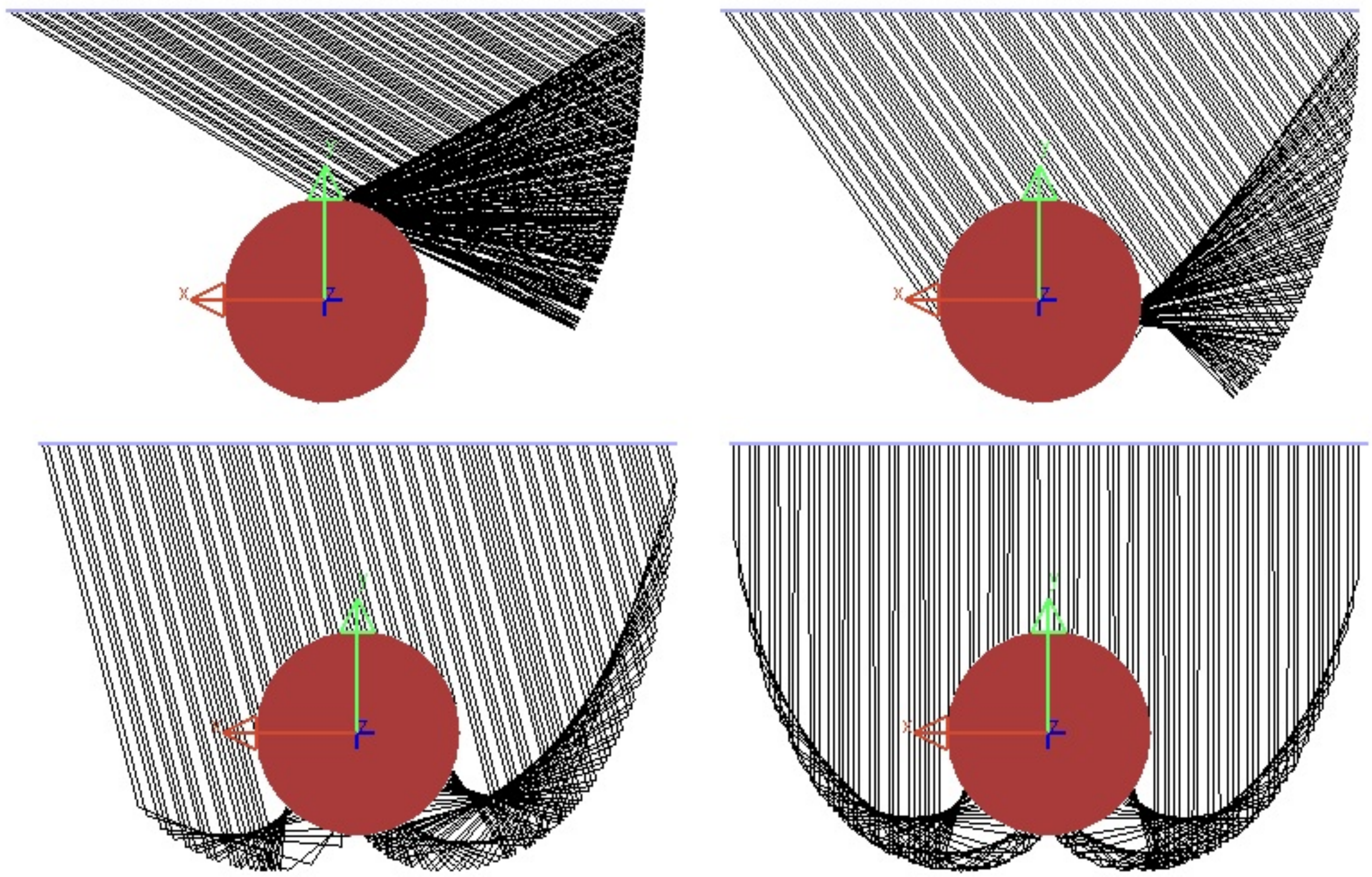


Sistema Híbrido



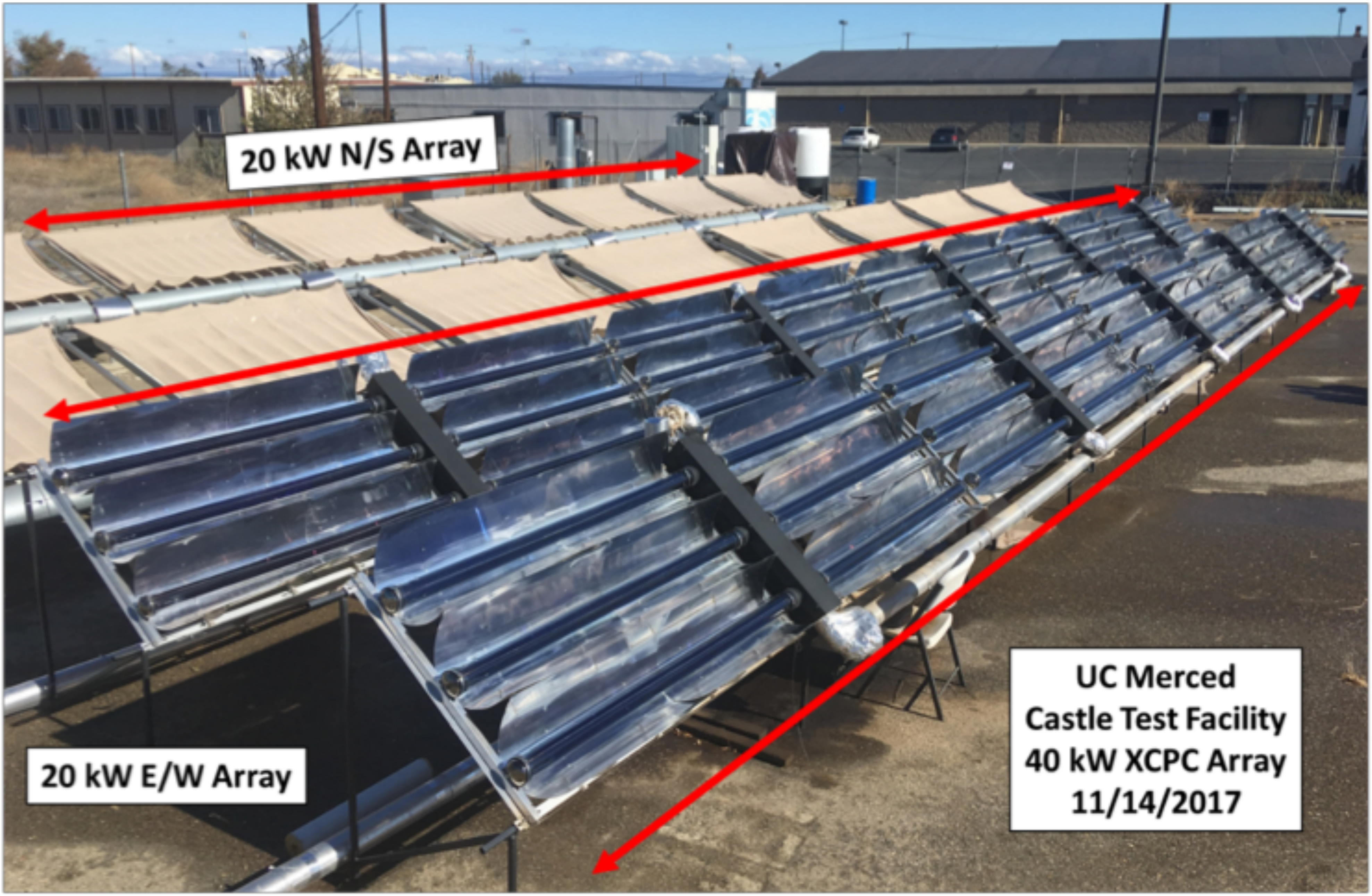
55 Celsius

Medium Temperature Industrial Process Heat (200 ° C)



The XCPC uses non-imaging optics to track the sun, while the XCPC hardware remains stationary

UC Solar XCPC Arrays



Agradecimientos

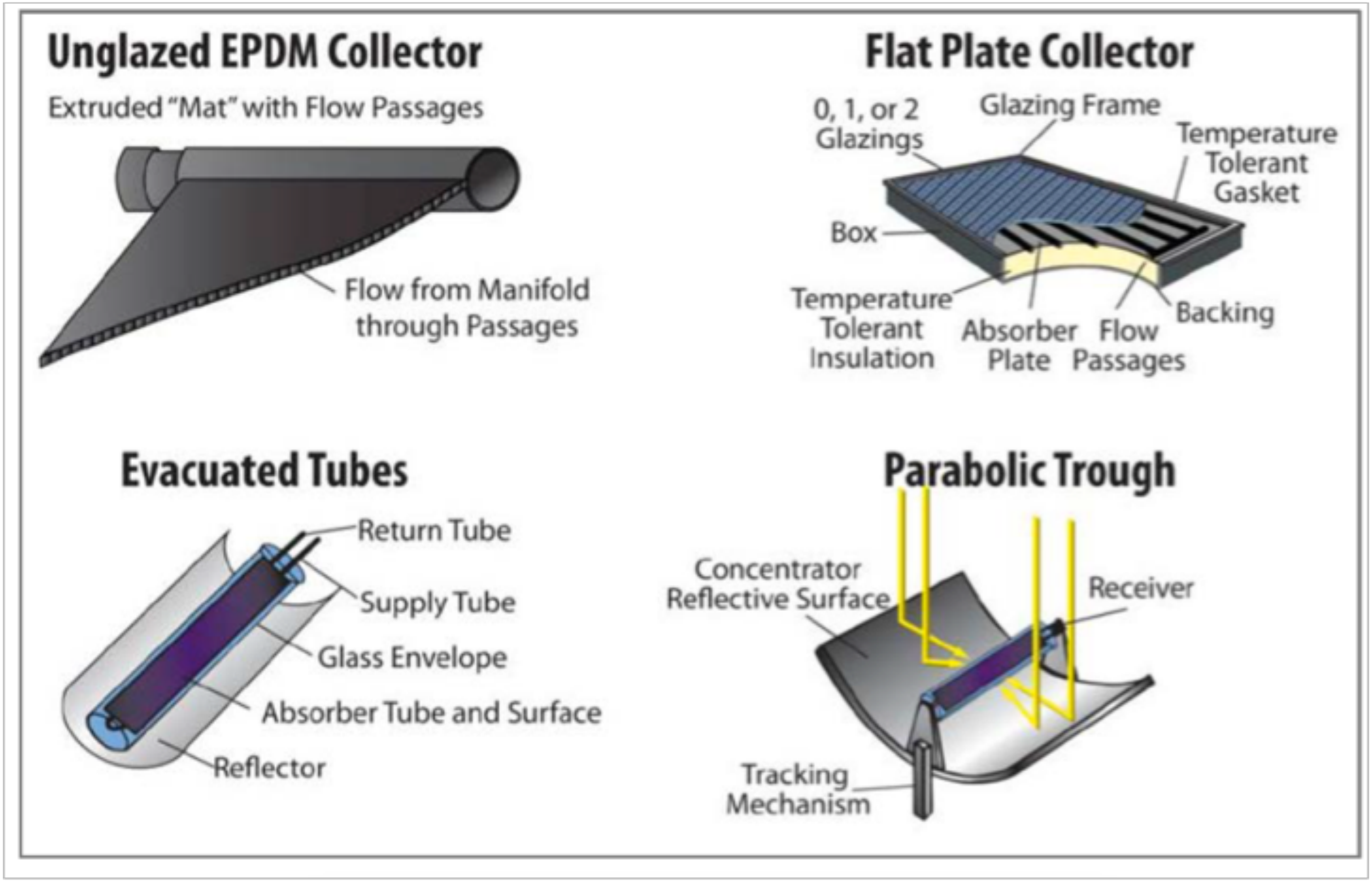
We would like to thank the California Energy Commission for providing the funding for some of these projects (Contract # POEF01-M04). We also thank ARPA-E for funding provided to UC Solar.

and students:

Azucena Robles, Adam Martin, Jose Guadarrama, Van Duong, Keith Saechao, Neeraj Sharma, Andres Munoz-Hernandez, Sai Kiran Hota, and Julio Pere

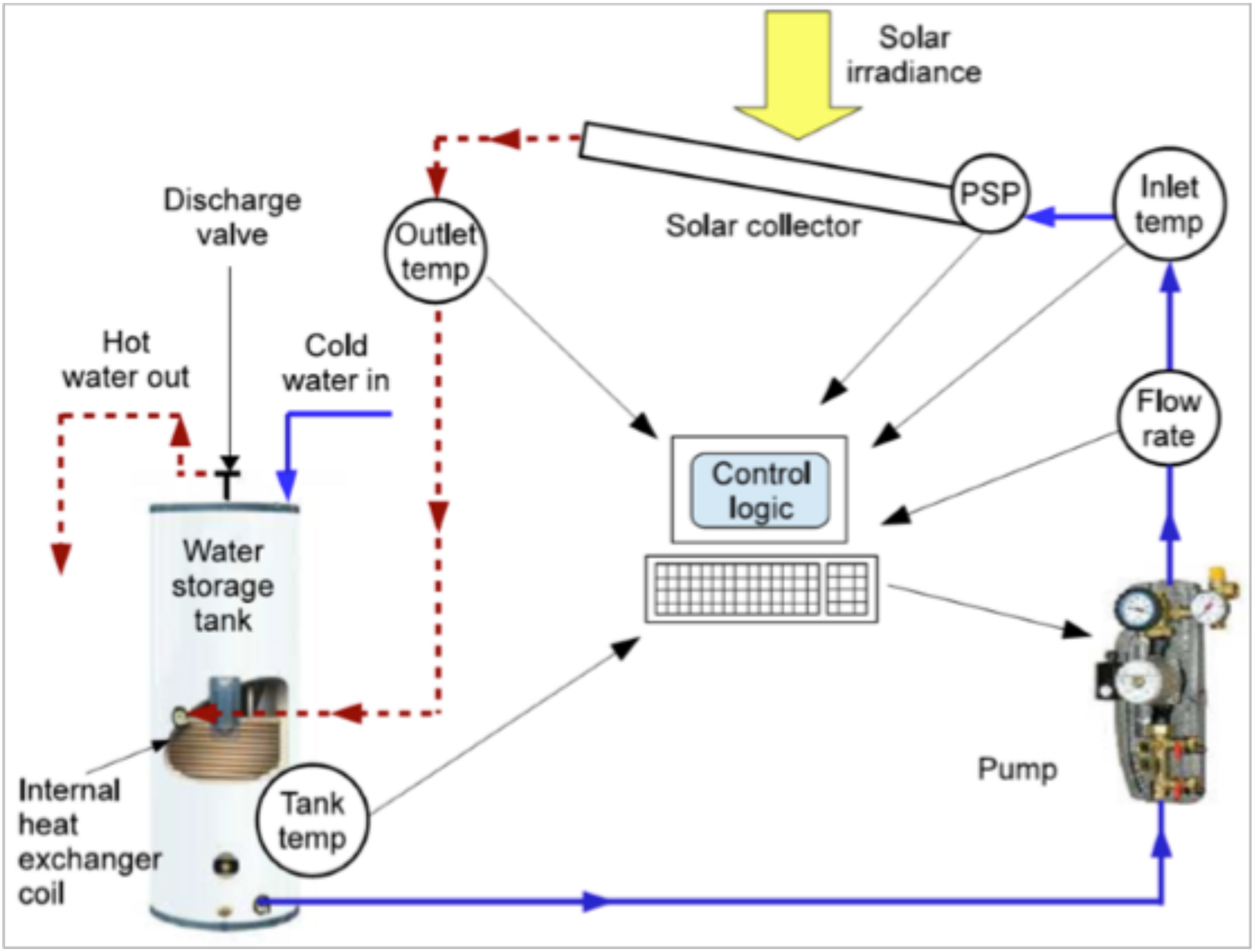
And Prof. Roland Winston's for his slides on evacuated tube collectors

Absorbedores



High Performance Flat Plate Solar Thermal Collector Evaluation, NREL, (IAG) 14-1947

Closed-Loop System



Changes in Incentives

CPUC approved Advice No. 4953 (April 29, 2016)

SoCalGas:

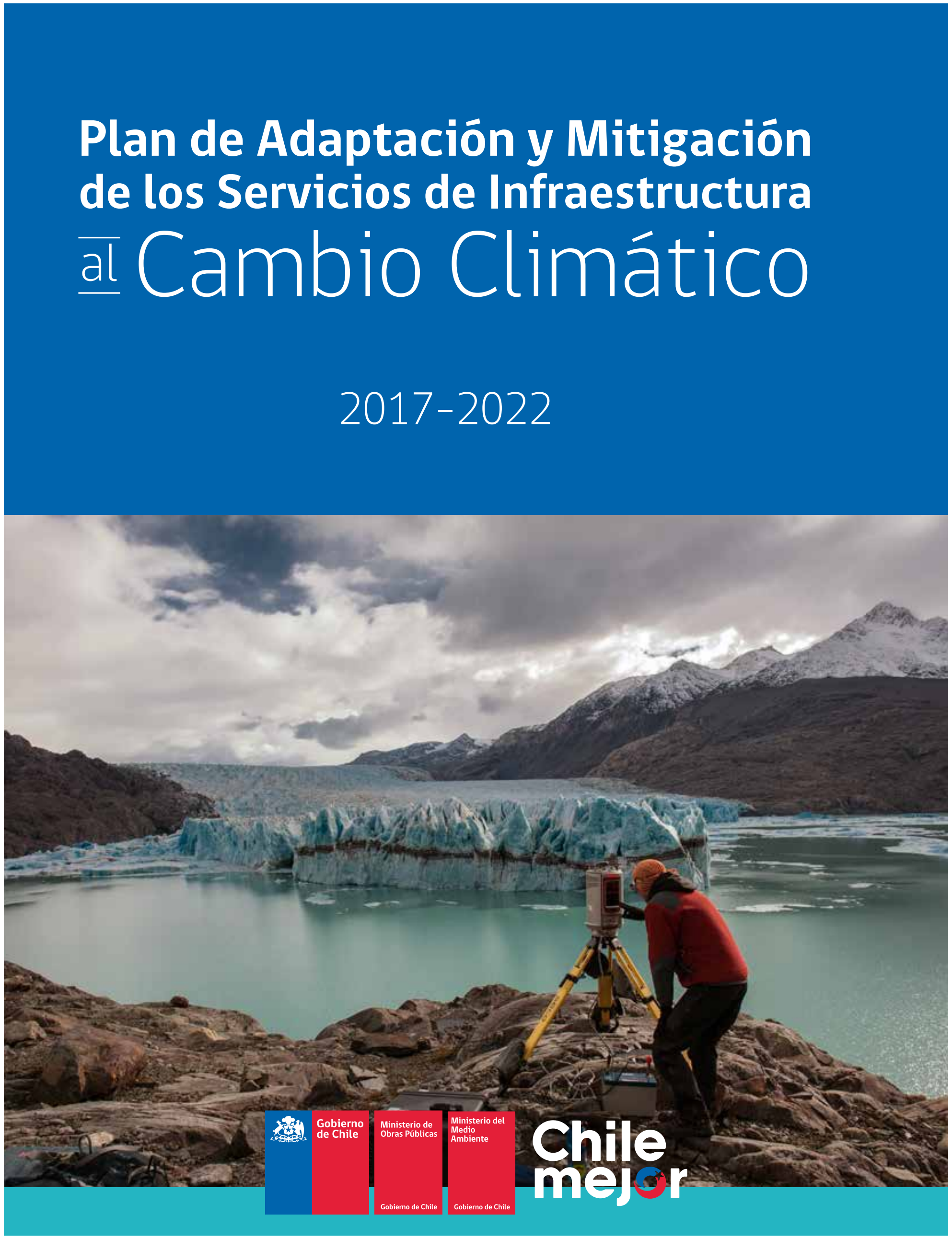
Step 1 incentive level of $70/therm for Single Family

$25/therm for Commercial/Multifamily applications.

Natural Gas-Displacing Single-Family System Incentive Steps

Step	Incentive per annual therm displaced ()For SoCalGas only	Maximum Incentive Single-Family Residential Projects ()For SoCalGas only	Budget Allocation (in millions)
1	$29.85 ($70.00)	$4,366 ($10,238)	$7,907,636
2	$25.37	$3,710	$4,900,000
3	$14.30 ($0)	$2,091	$784,000
4	$3.23 ($0)	$472	$1,323,000

Plan B en Chile



|EURE vol 42 | nº 125 | enero 2016 | pp. 251-272 | artículos | ©EURE

Vulnerabilidad frente al cambio climático en la Región Metropolitana de Santiago de Chile: posiciones teóricas versus evidencias empíricas

Juliane Welz. Helmholtz Centre for Environmental Research (UFZ), Department of Urban and Environmental Sociology, Leipzig, Alemania.
Kerstin Krellenberg. Centre for Environmental Research (UFZ), Department of Urban and Environmental Sociology, Leipzig, Alemania.

RESUMEN | Para la Región Metropolitana de Santiago de Chile (RMS), el cambio climático implica diferentes impactos que se suman a la continua expansión urbana y a cambios en los patrones de uso del suelo, los cuales a su vez acrecientan las amenazas hidroclimáticas, como las inundaciones y el calor extremo. En general, estos cambios tendrán notables consecuencias para la vulnerabilidad residencial. Especialmente las familias de bajos recursos y los asentamientos ilegales en grandes ciudades con crecimiento acelerado suelen ser los más vulnerables, debido a una mayor exposición y a una limitada capacidad de respuesta. Este artículo contrasta posiciones teóricas sobre las dimensiones socioeconómicas, físico-constructivas y urbano-rurales de la vulnerabilidad con evidencias empíricas, para entender quiénes son los más afectados por las inundaciones y el calor extremo en la RMS. Como muestran los resultados del estudio, las posiciones teóricas no se reflejan en los análisis cuantitativos. La vulnerabilidad depende de cada contexto y requiere políticas adecuadas para distintos territorios.

PALABRAS CLAVE | vulnerabilidad, riesgos naturales, medioambiente urbano.

ABSTRACT | *For the Metropolitan Region of Santiago de Chile (RMS), climate change implies different impacts adding to continuous urban growth and changes in land-use patterns, which in turn reinforce hydro-meteorological hazards such as floods and heat waves. At large, these changes are expected to have significant implications for residents' vulnerability. Particularly, marginalized families living in informal settlements of rapidly growing cities are often highly vulnerable to hazards due to their high exposure and limited coping capacities. This article seeks to contrast theoretical assumptions regarding the socio-economic, the physicalstructural and the urban-rural dimensions of vulnerability with empirical data in order to illuminate what groups are likely to be affected. As the research results show, general theoretical arguments are not reflected in the empirical data analysis. In contrast, residents' vulnerability to climate change is context-specific and requires appropriate policy strategies for differing areas.*

KEYWORDS | vulnerability, natural risks, urban environment.

Recibido el 6 de abril de 2014, aprobado el 9 de abril de 2015
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ISSN IMPRESO 0250-7161 | ISSN DIGITAL 0717-6236