

Chromasun Micro-Concentrator



CHROMASUN

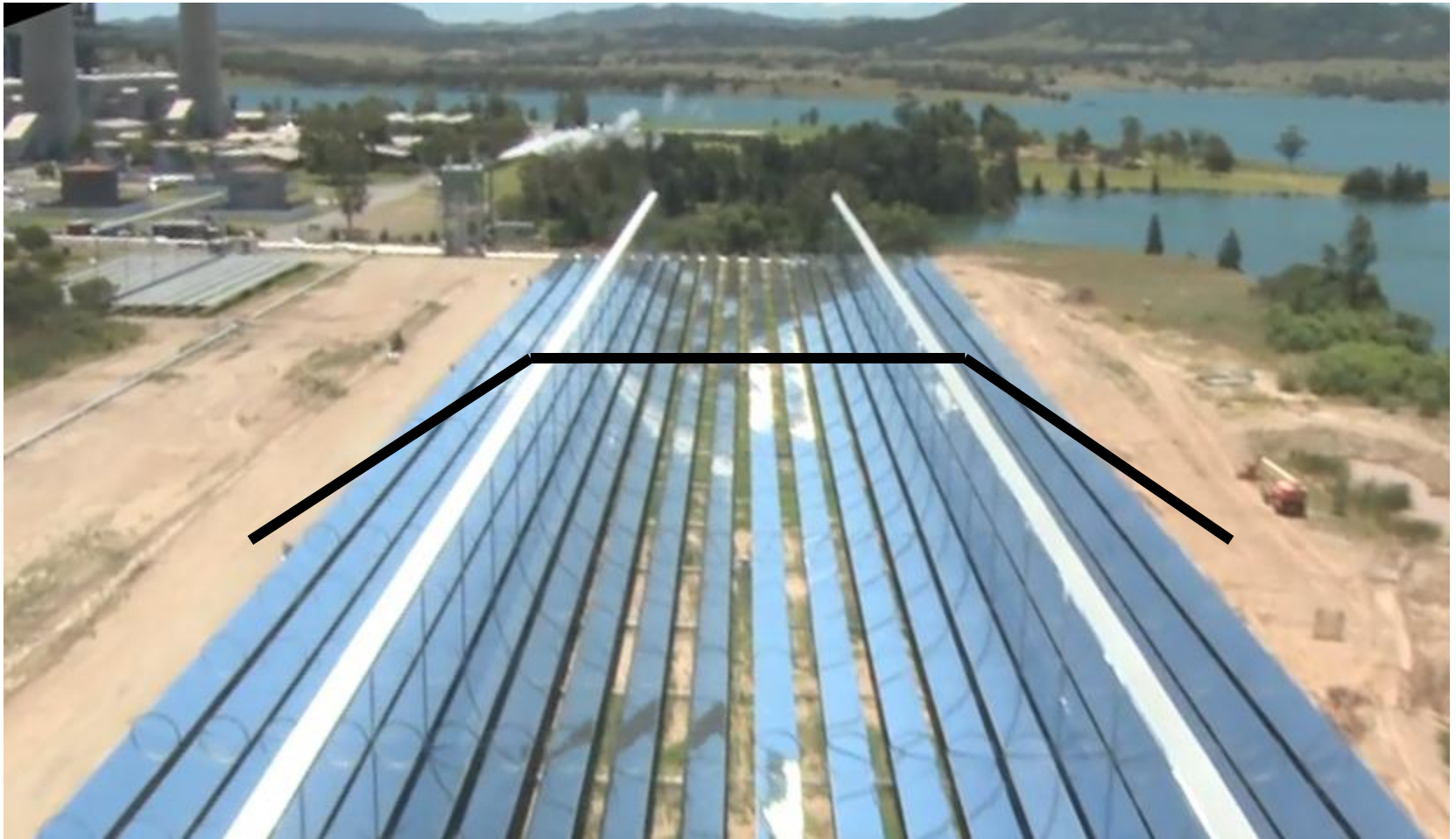
Chromasun Background



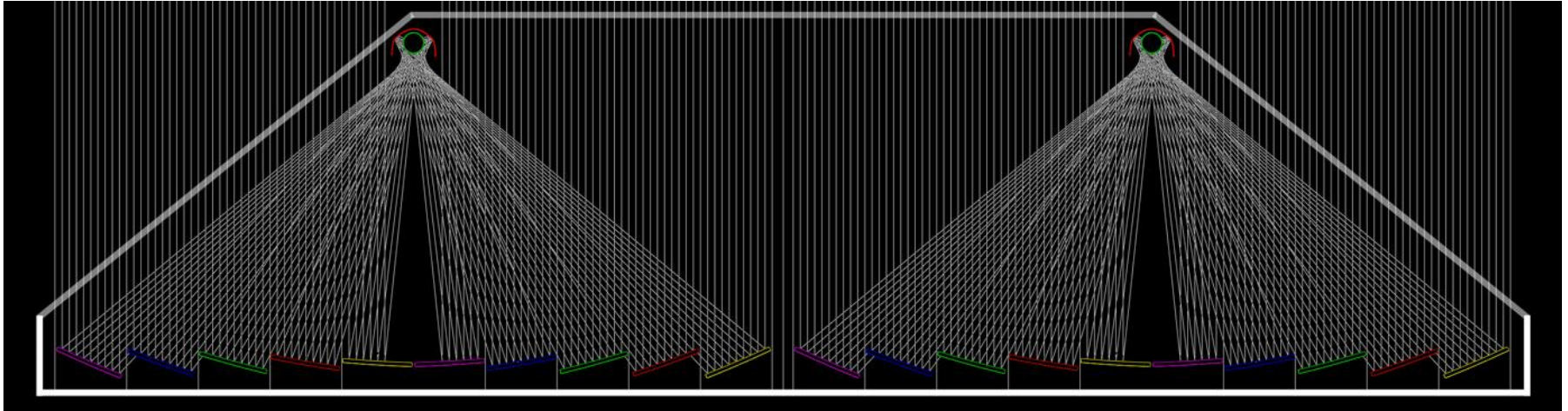
Chromasun's founders designed and installed the Linear Fresnel Solar Array at Liddell Power Station in the Hunter Valley. This array still stands as Australia's largest solar thermal installation



Fresnel Reflector Optic



Chromasun Micro-Concentrator



The MCT is fixed on a rooftop however it has an array of mirrors within the unit that rotate and track the sun to provide 25X sun concentration onto two parallel pipes inside.

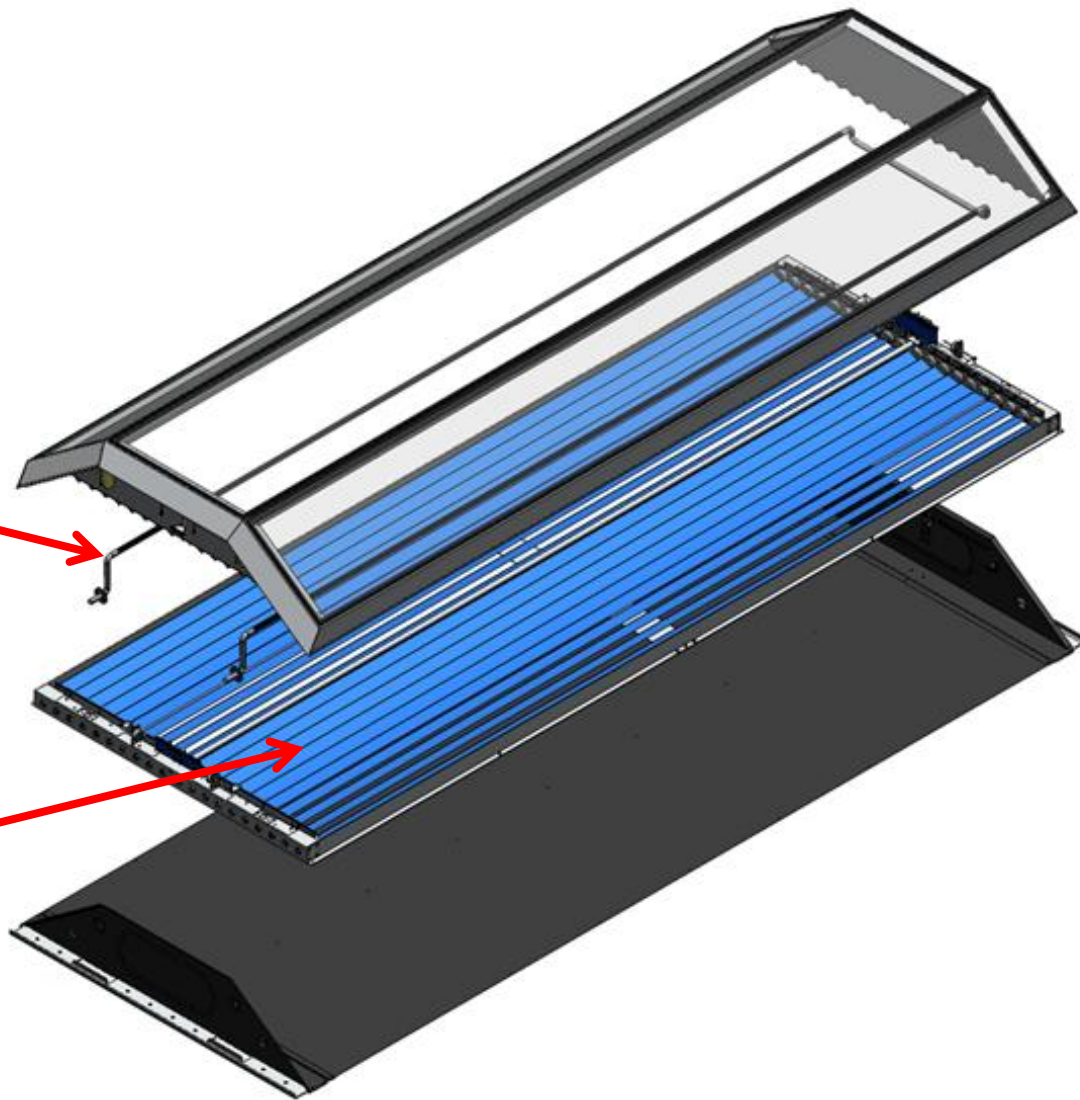
The result is an industrial grade solar product that is able to efficiently generate steam up to 200°C,



MCT Exploded View

Receiver Pipe
(SS 304 A213 Tube)

Parallel Mirrors



Micro-Concentrator (MCT)

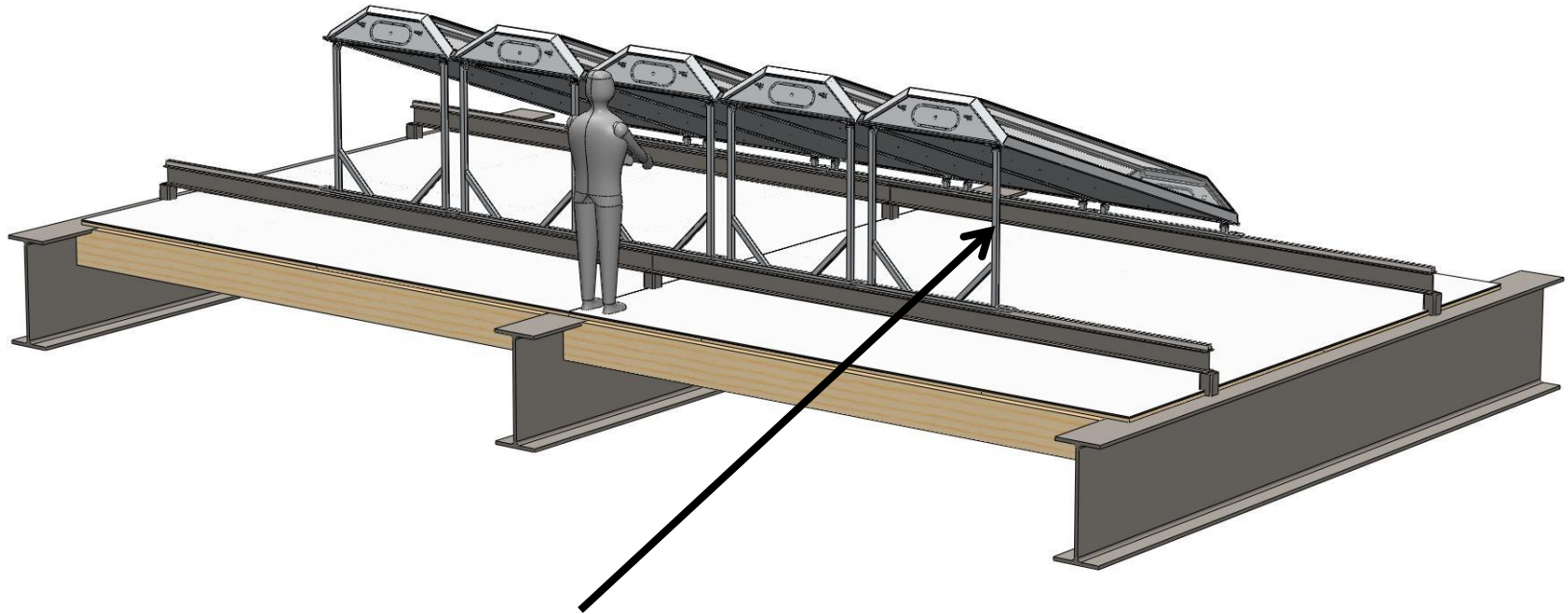


MCT Tracking

- Closed loop tracking
- Autonomous Plug-and-play
- No need for any optical alignment
- Integrated output temperature sensing
- Solar field can be turned off (no stagnation issues)



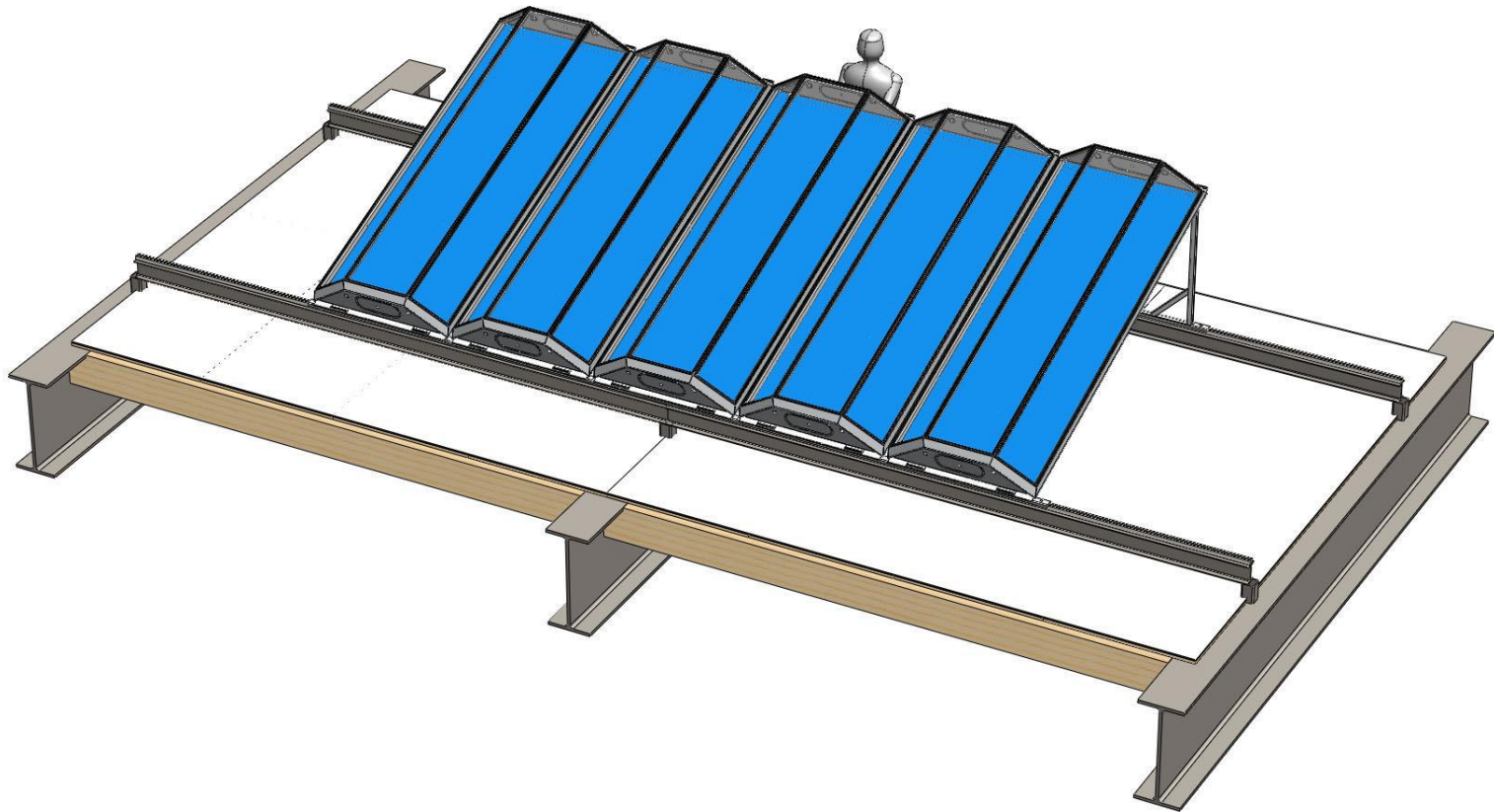
Chromasun MCT Installation – Simple!



MCT is self-supporting and has an integrated rack.



Chromasun MCT Installation – Simple!



The MCT product is a modular plug-and-play concentrator. Installation and execution of the solar array without the complexities that come with other concentrator systems.



First look! 2010 Alanod - Intersolar Munich



MCT Testing: Santa Clara University Solar House



Santa Clara University Solar House – Yazaki 3 ton.



SRCC Testing in Menlo Park, California

OG600 / EN 12975 Completed December 2010



SRCC= Solar Rating & Certification Corporation



Testing in Bangalore, India (General Electric)



Testing in Munich, Germany (General Electric)

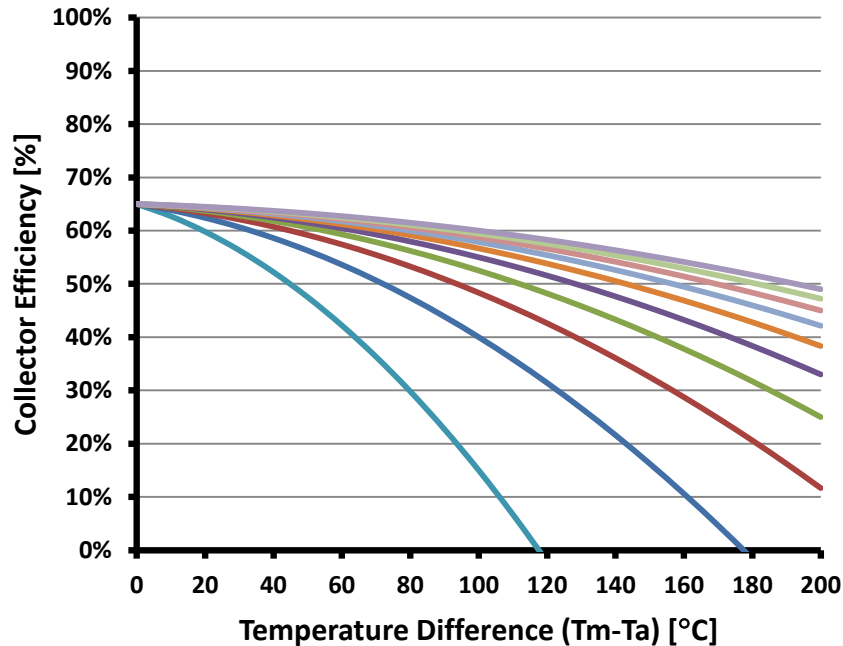


Testing Los Angeles, USA (Southern California Gas Company)



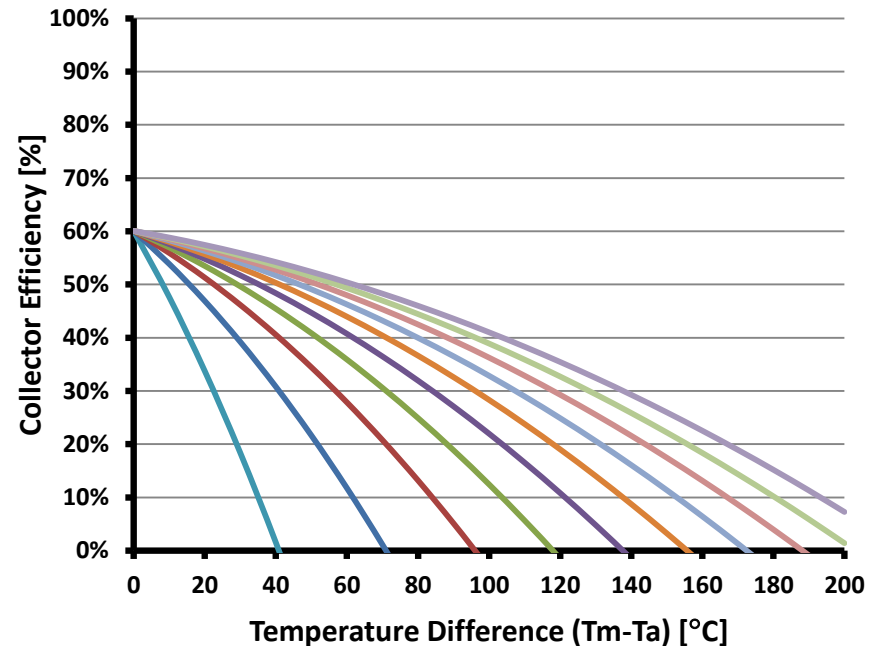
Solar Concentrators vs Evacuated Tubes

Solar Concentrator Efficiency (with varying DNI)



100 200 300 400 500
600 700 800 900 1000

Evacuated Tube Efficiency (with varying global radiation)

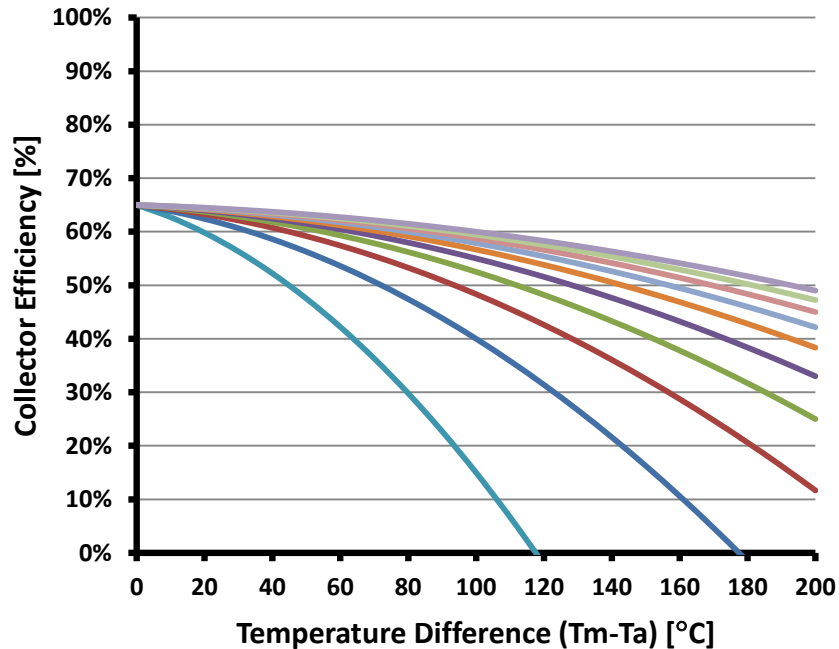


100 200 300 400 500
600 700 800 900 1000



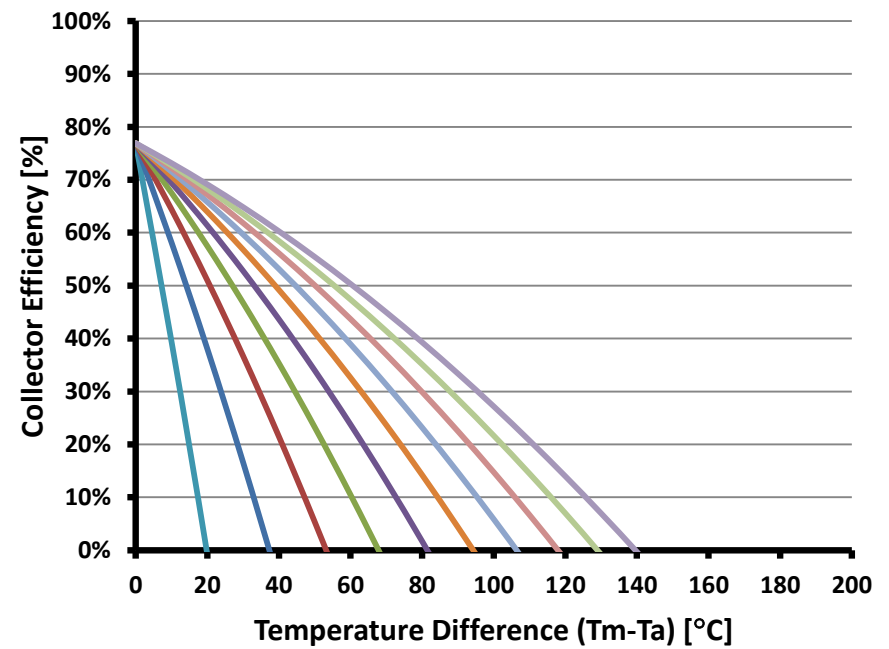
Solar Concentrators vs Evacuated Tubes

Solar Concentrator Efficiency



100 200 300 400 500
600 700 800 900 1000

Flat Plate Collector Efficiency



100 200 300 400 500
600 700 800 900 1000



MCT vs Evacuated Tubes

MCT

- Non-Evacuated Receiver for 20 year lifetime
- Stainless-steel boiler tube as receiver. Rated >100bar
- Capacity to throttle array and stow at any stage.
- Hail/snow resistant

Evacuated Tube

- Vacuum
- Not high pressure rated
- Array cannot be turned off. Safeguarding against stagnation required
- Limited hail resistance



MCT vs Evacuated Tubes

MCT

- More efficient at higher temperatures/ low DNI
- Direct Steam Generation capability
- Able to be integrated with two-stage absorption chillers. Less roof, less water.

Evacuated Tube

- Increased emissivity
- HX required
- Limited to single-effect applications



Solar Cooling 101



Sunlight



Concentrator Panels



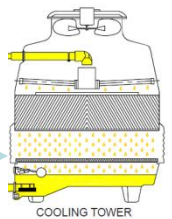
Hot Fluid



Cool Building



Absorption Chiller



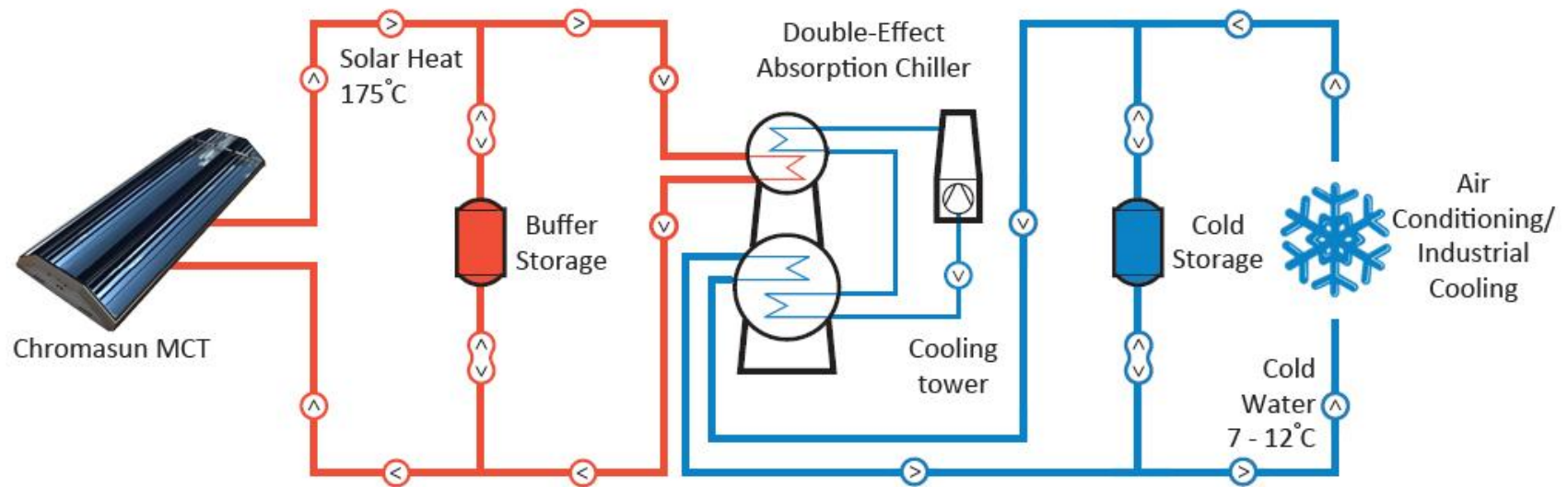
COOLING TOWER

Heat Rejection



LiBr Double Effect Absorption Chiller

Double Effect (or Two-Stage) Chillers are twice as efficient as single effect. i.e. COP = 1.35



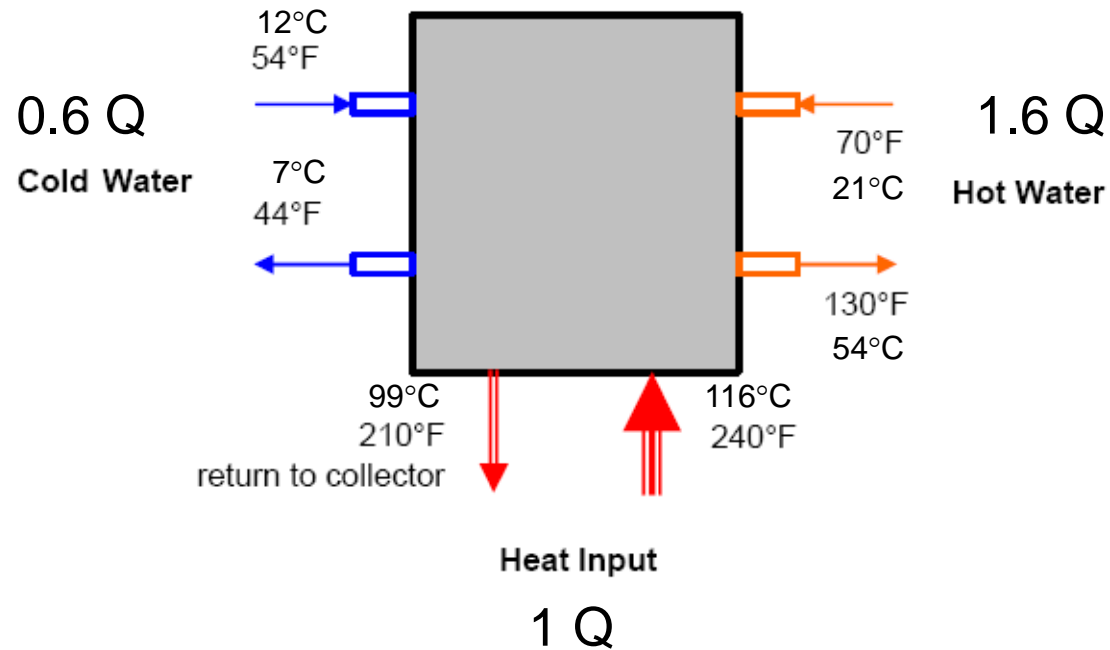
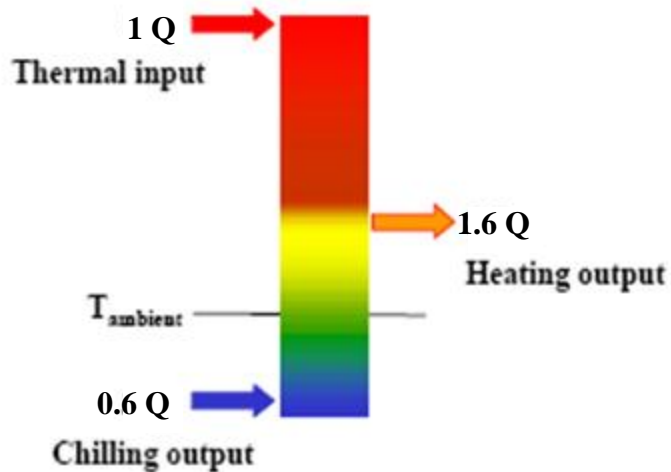
Generator temperatures above 165°C/ 330°F are required which is well above what flat plate / evacuated tubes can consistently supply



NH3 Single Effect Chiller / Thermally Driven Heat Pump

Equivalent to a Vapour Compression Cycle with Heat Recovery

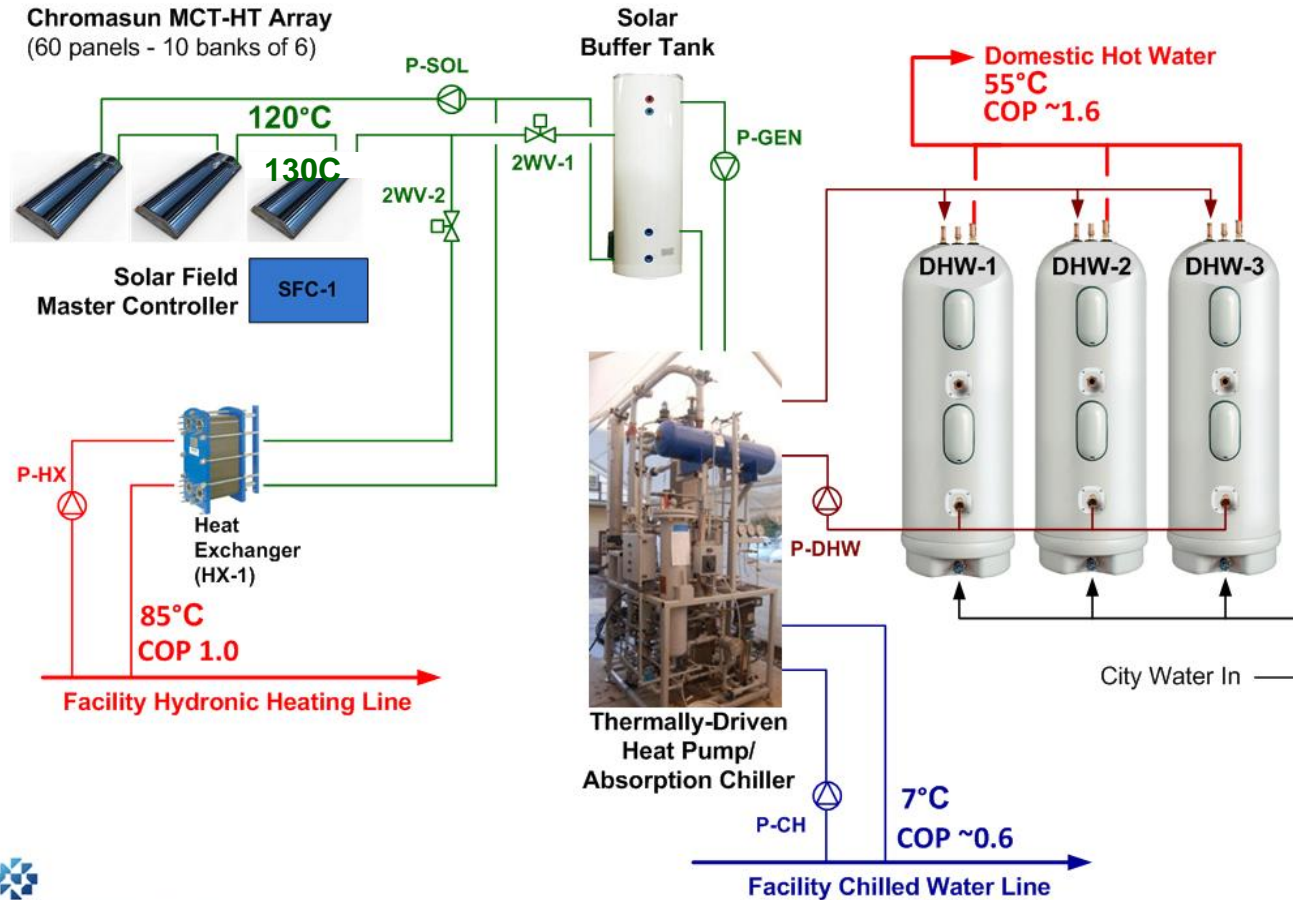
Simultaneous Heat Pumping and Chilling
Input/Output Black Box Representation



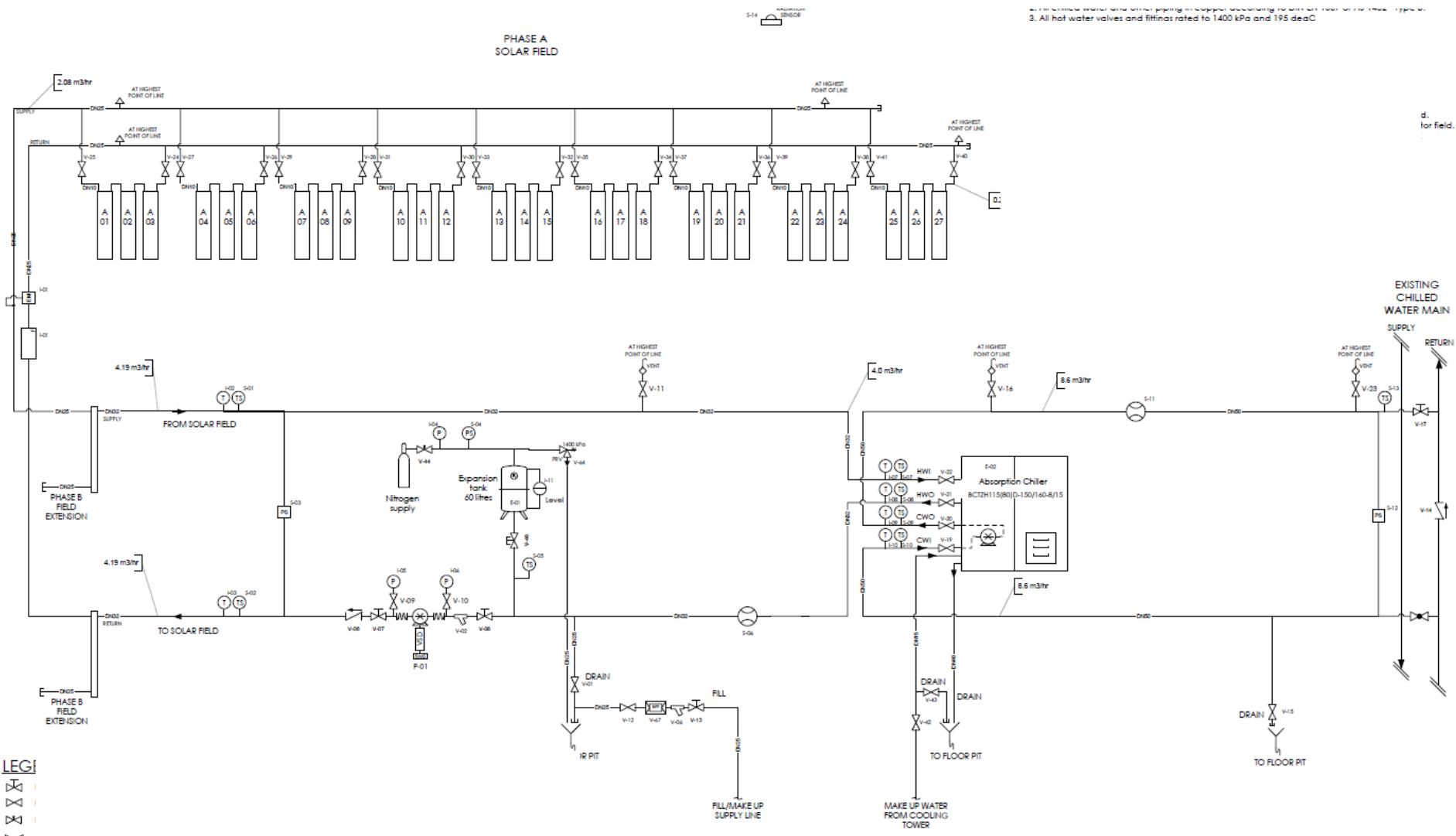
Combined COP of 2.2!



Application for Advanced Heating & Cooling (Benson)



Solar Cooling Schematic – 25 ton DMS Showcase Abu Dhabi

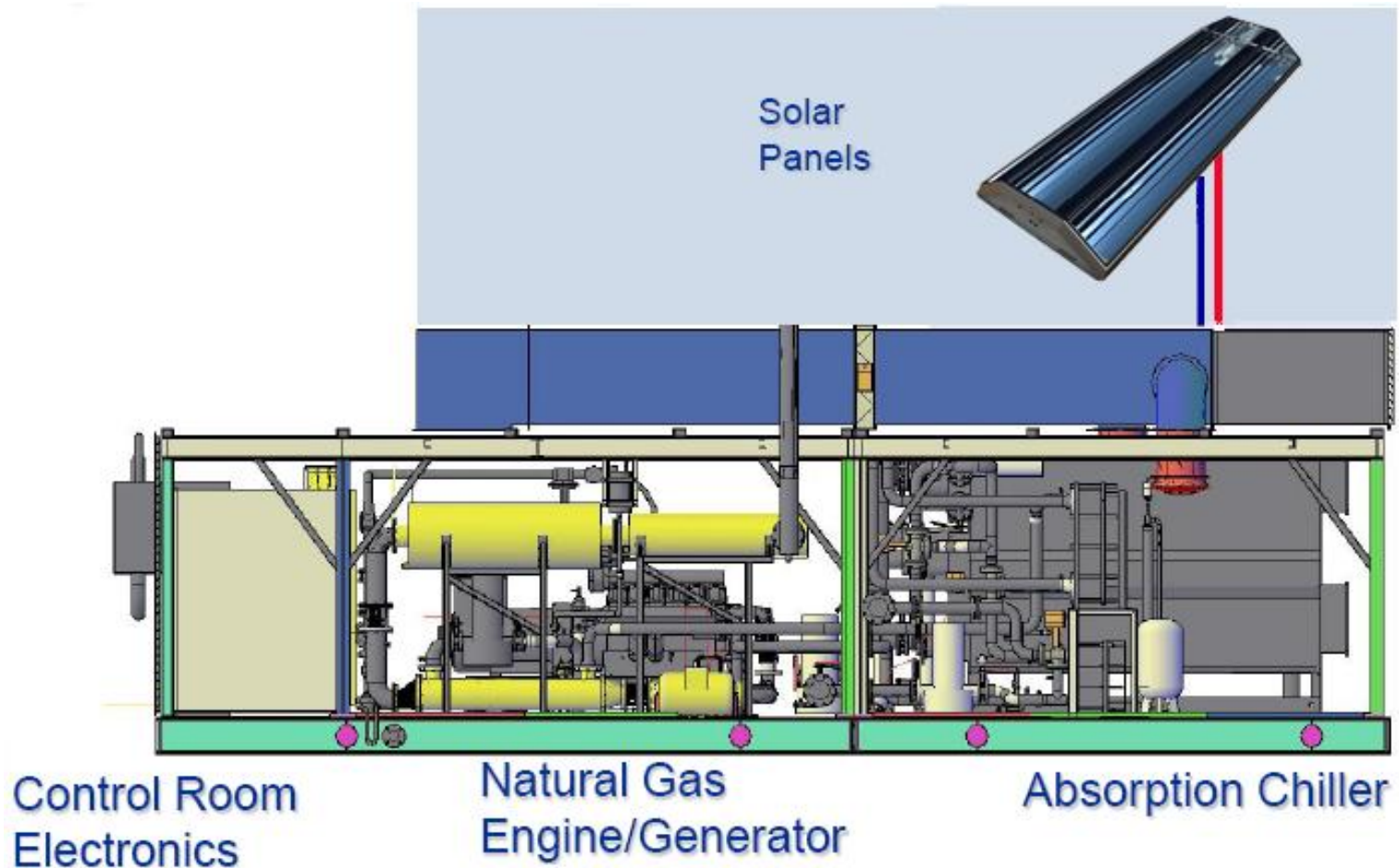


3. All hot water valves and fittings rated to 1400 kPa and 195 degC

d. for field.



Trigeneration Supplementation



Incremental cost of oversizing absorption chiller is marginal for large trigeneration systems



Chromasun 40MW annum San Jose facility



First OG600 certificated deliveries – 232KW Benson Project



Benson first lift





Summary

- Chromasun background in large-scale solar
- MCT = ~220 Celsius.
- MCT = rooftop flat panel simplicity
- MCT = utility scale capability
- Now certified to SRCC OG600
- Showcase projects in build
- Widely available in 2011



THANK YOU



CHROMASUN

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