The AndaSol Project

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Workshop on Thermal Storage for Trough Power Systems

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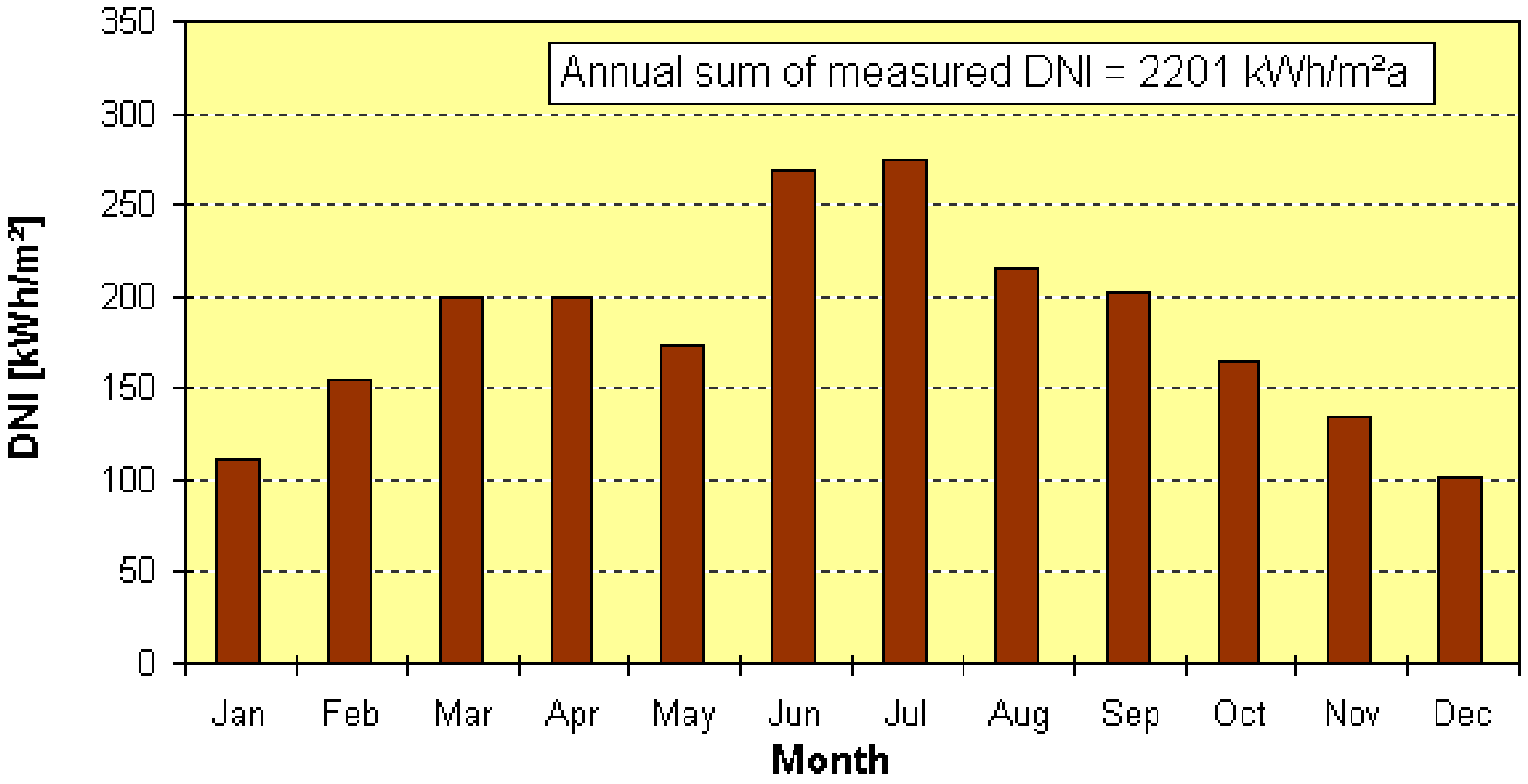
FLABEG Solar International GmbH

The Royal Decree 2818 / 841

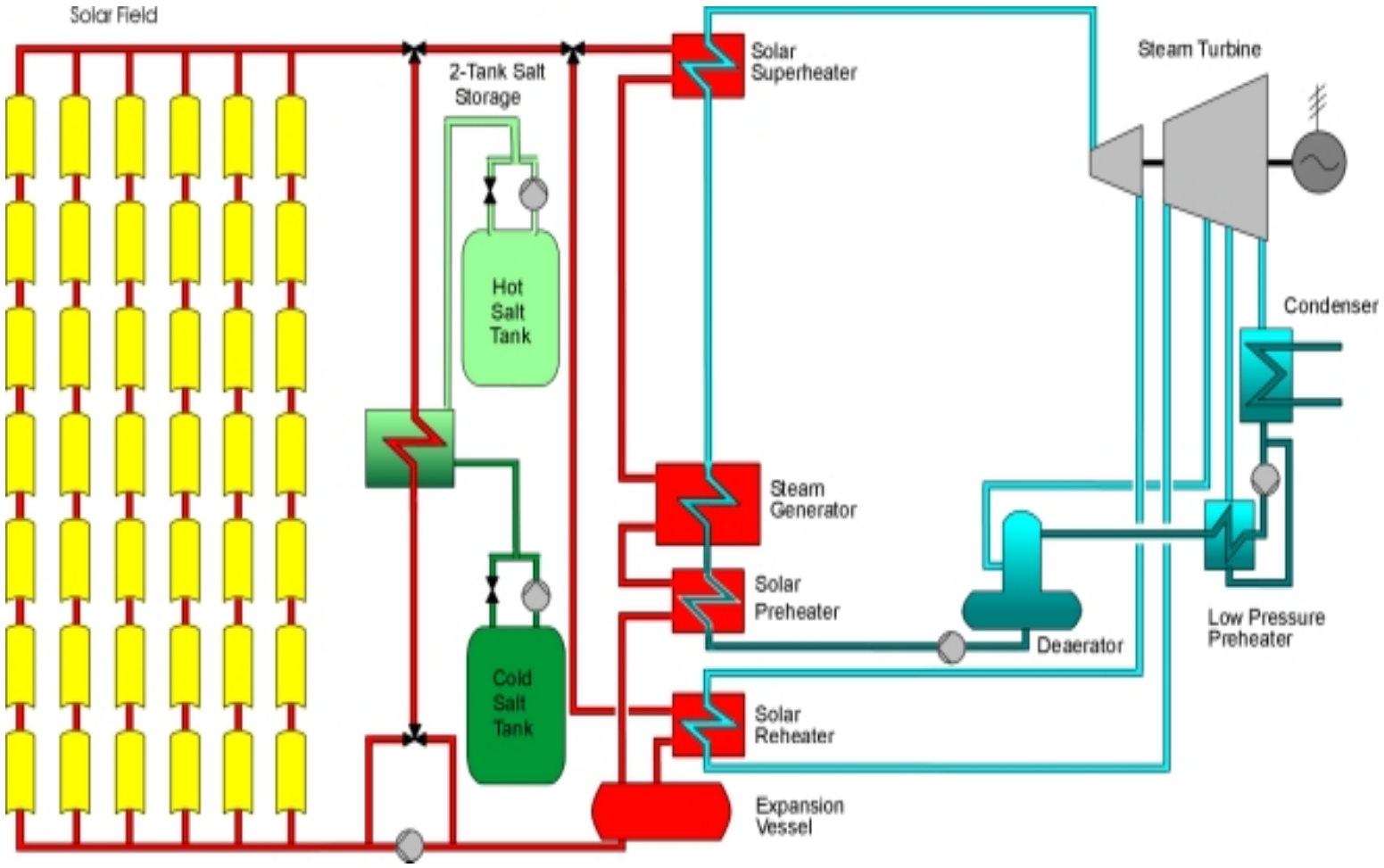
- The Royal Decree 841/2002 published in September 2002
- 12 €cent/kWh will be paid for solar thermal generated electricity + market price

Meteostation was set up in February 1999

Monthly Total DNI in First Year



Process Scheme



EuroTrough Collector Design

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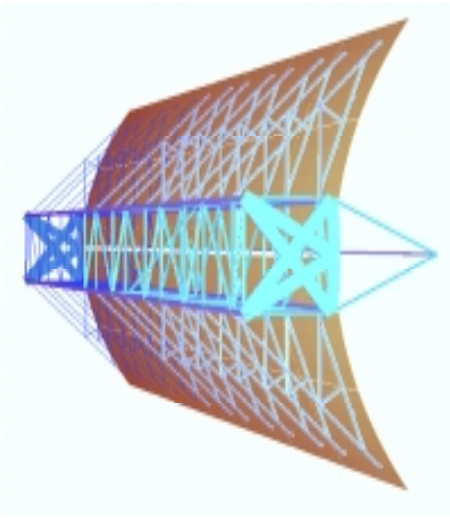

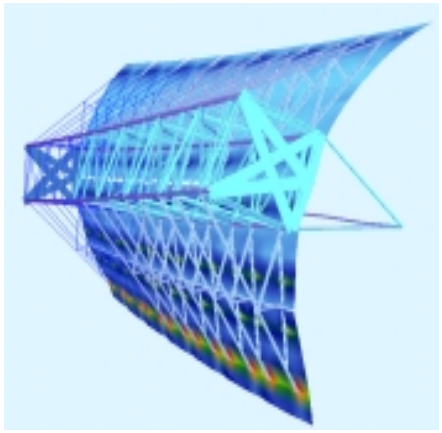

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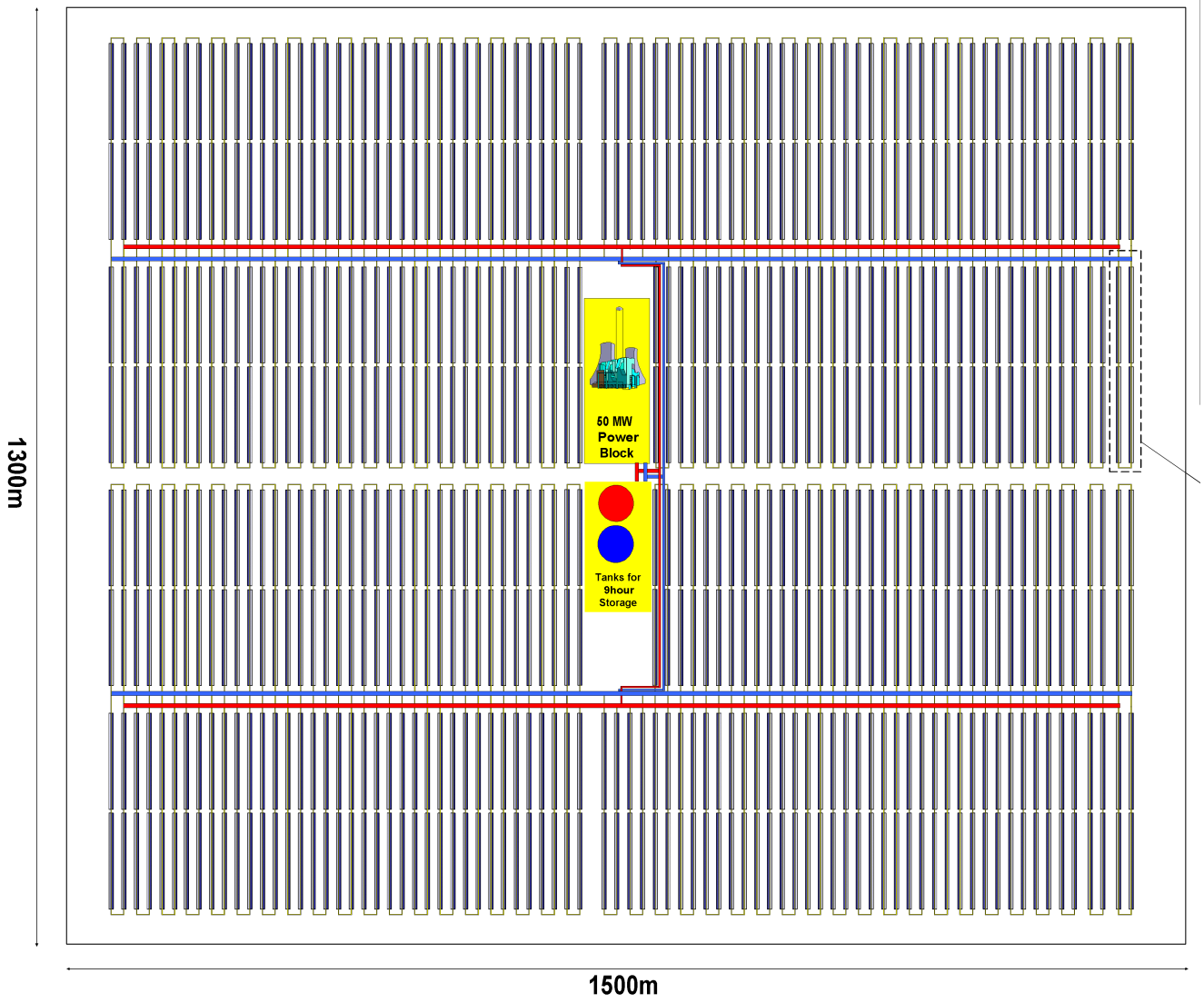
Solar Field Layout



- 624 Collectors
- Collector length: 148.5 m
- 4 Collectors per Loop
- 156 Loop
- Total Collector area of 510.120 m²

Power Block Parameter

• Turbine Type	Condensing turbine single reheat and six steam extractions
• Nominal Capacity	49.9 MW
• Total Parasitcs	5.0 MW
• Plant efficiency	37.5%
• Turbine Inlet Conditions	100 bar 370°C
reheat	16.5 bar 370°C
• Nominal Steam Flow	59 kg/s
• Design Back Pressure	0.08 bar

2-Tank Molten Salt Storage

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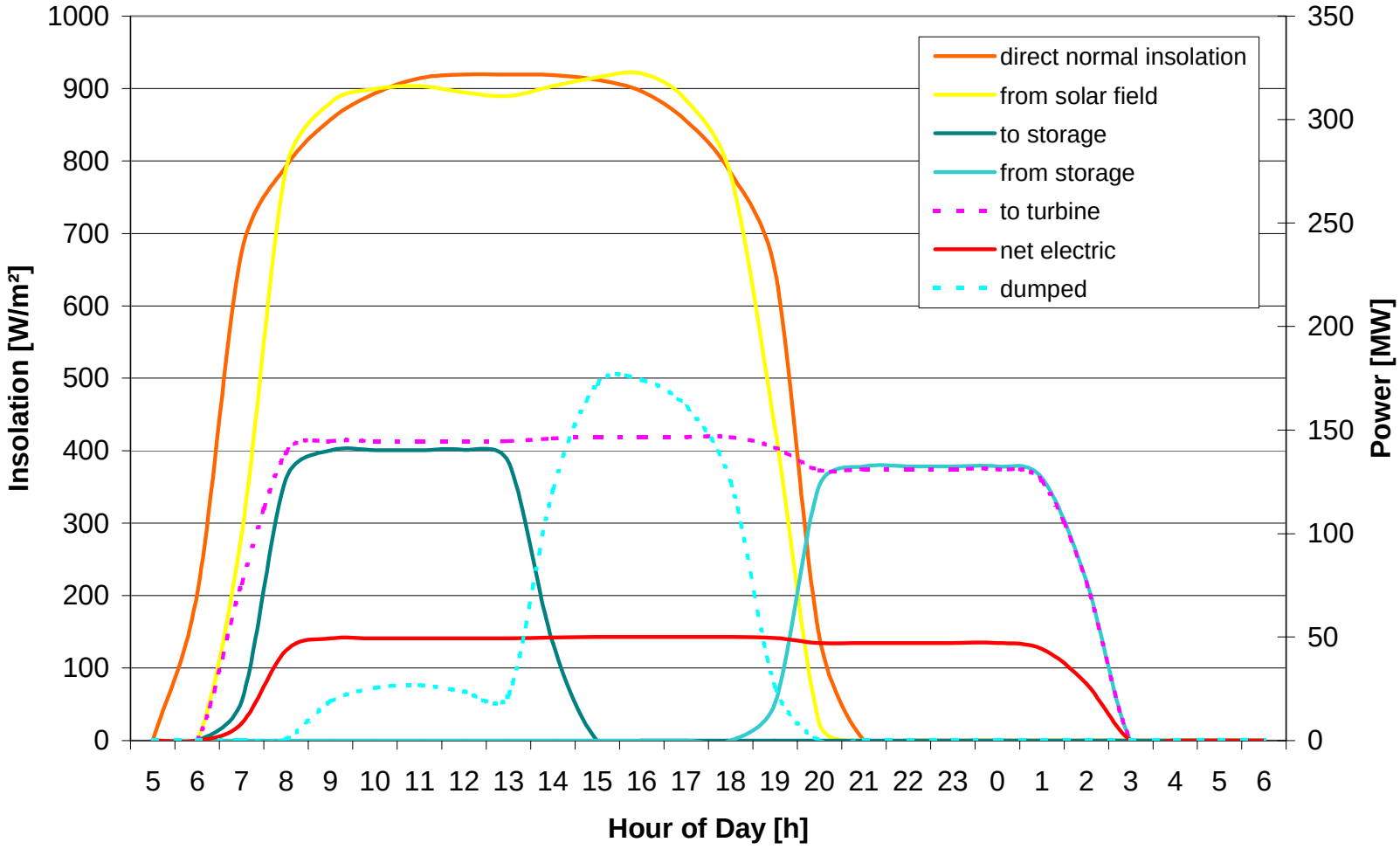
Storage Parameter

- Type: 2-Tank Molten Salt Storage
- Storage Fluid: Nitrate salt mixture ($60\%\ NaNO_3$ and $40\%\ KNO_3$)
- Melting Point of Fluid: 221°C
- Storage Capacity: 880 MWh
- Storage Tank Size: 13 m hight, 38 m diameter
- Salt Mass: 25 000 tons
- Flow Rate: 948 kg/s
- Cold Tank Temperature: 292°C
- Hot Tank Temperature: 384°C

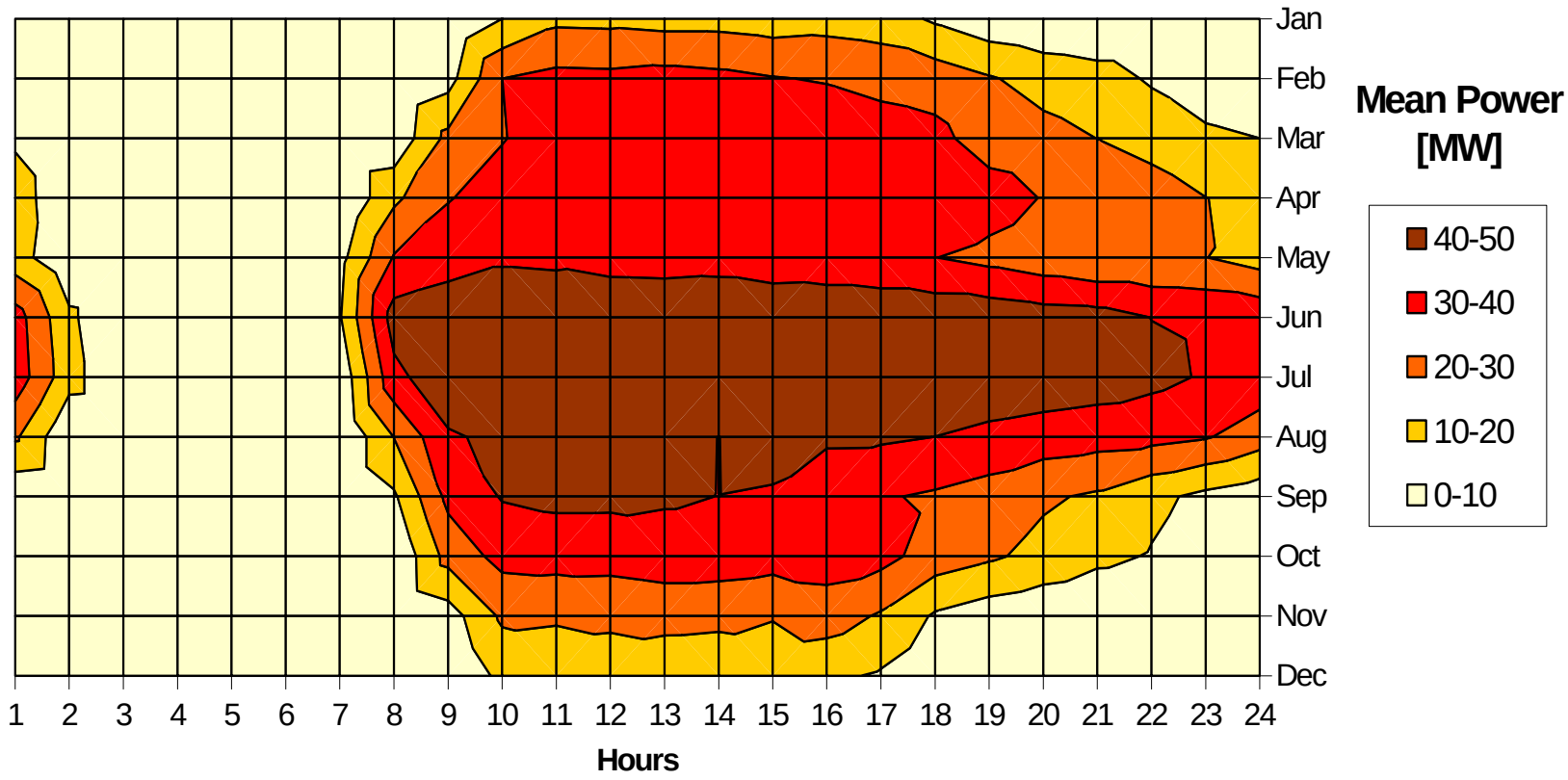
Status of Storage System

- Subontract was given to Nexant
  - Optimitzation of storage parameter
    (Results will be presented by Bruce Kelly)
  - Support of specifying the EPC bid package
- Next step: Getting EPC quotes for storage system

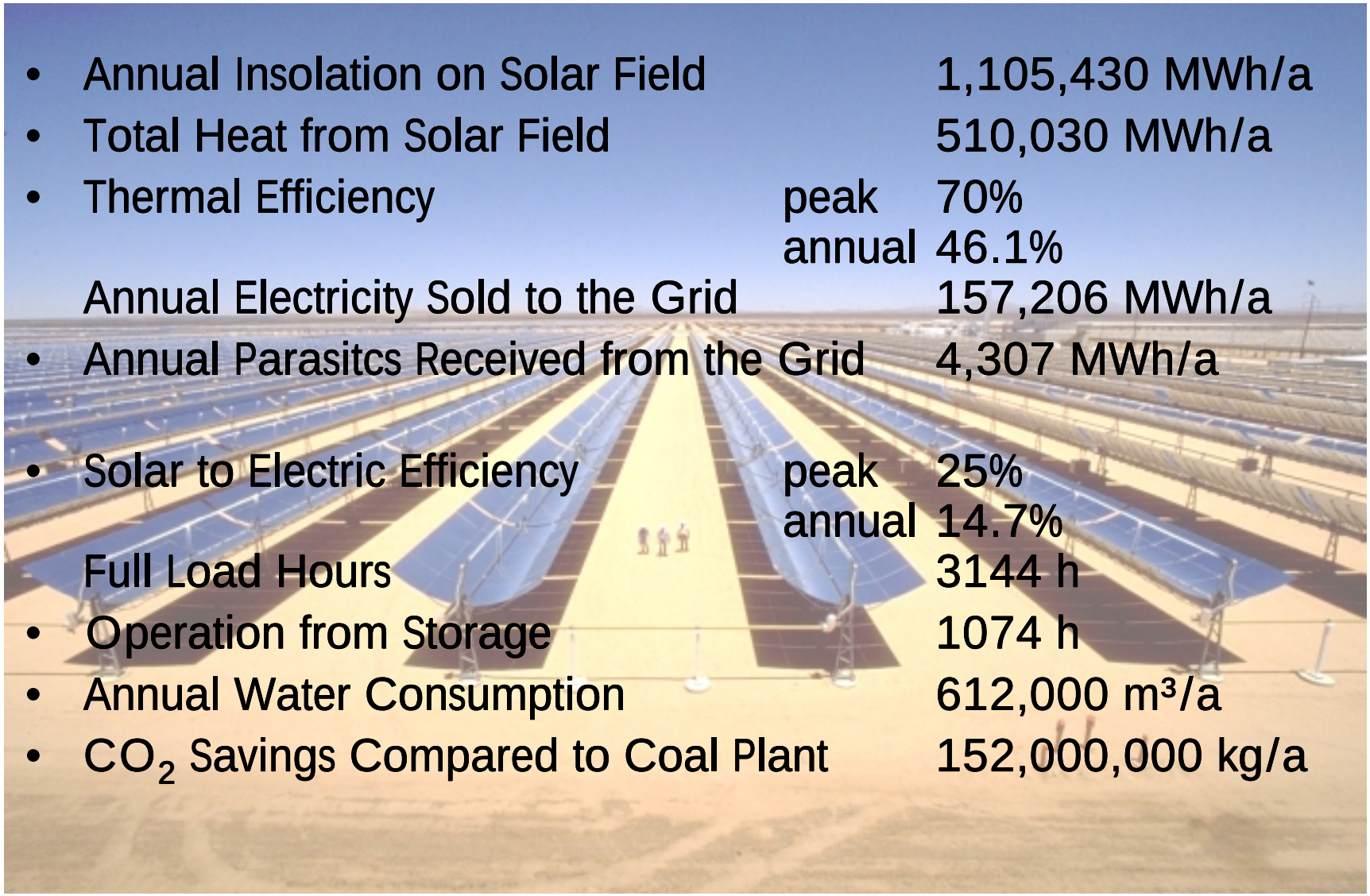
Performance on a Clear Summer Day



Annual Distribution of Electricity Output



Annual Performance Data



• Annual Insolation on Solar Field		1,105,430 MWh/a
• Total Heat from Solar Field		510,030 MWh/a
• Thermal Efficiency	peak	70%
	annual	46.1%
Annual Electricity Sold to the Grid		157,206 MWh/a
• Annual Parasitcs Received from the Grid		4,307 MWh/a
• Solar to Electric Efficiency	peak	25%
	annual	14.7%
Full Load Hours		3144 h
• Operation from Storage		1074 h
• Annual Water Consumption		612,000 m³/a
• CO_2 Savings Compared to Coal Plant		152,000,000 kg/a