

# Ashalim Thermosolar – Plot A



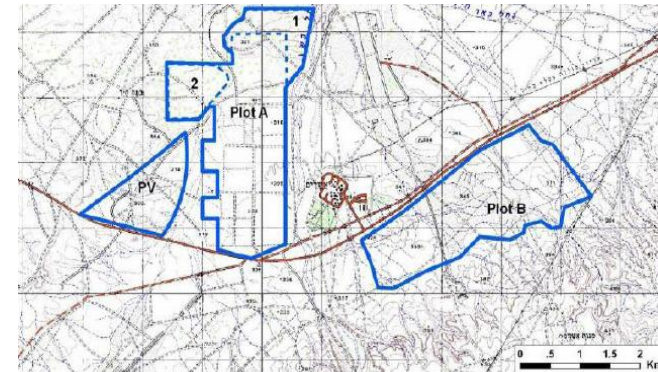
**Present by:**  
**Boaz Yishai**  
**Sollel Bone – EPC division**

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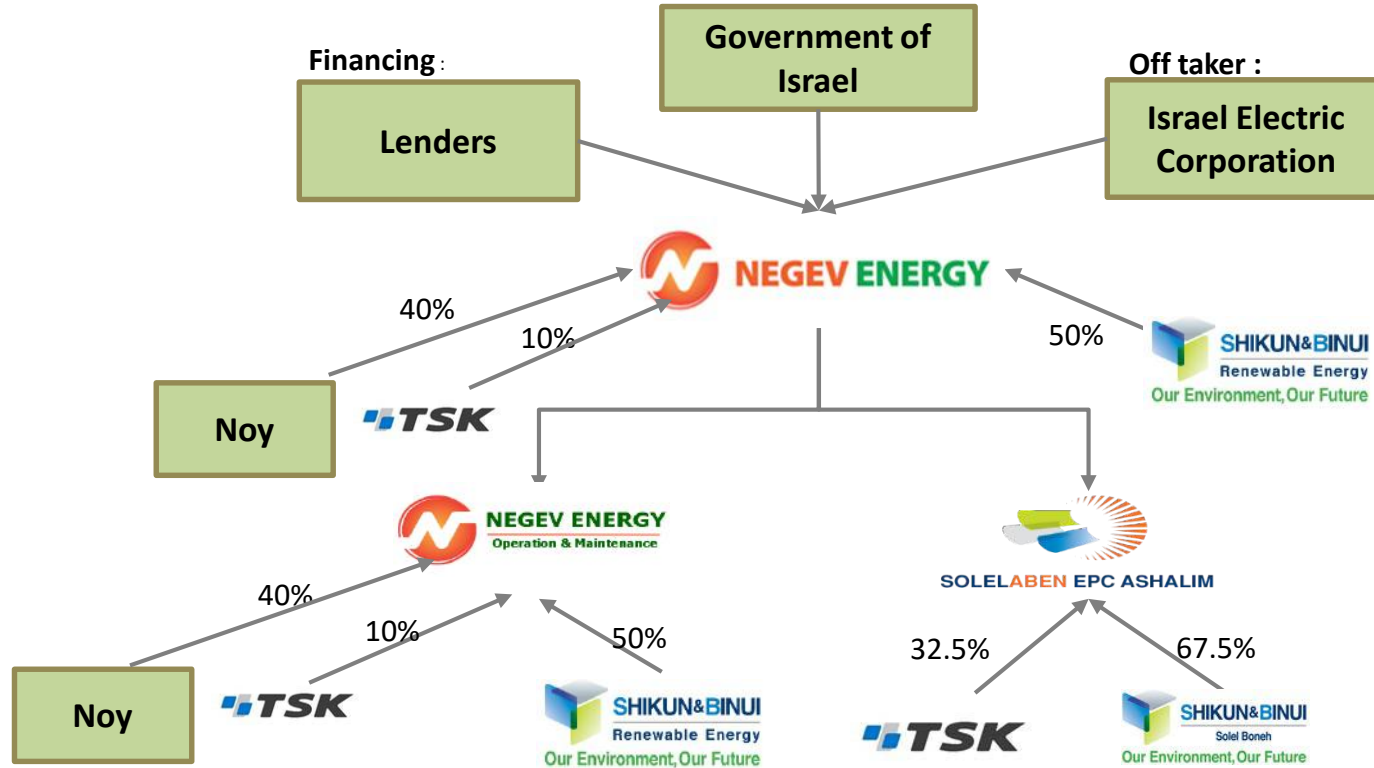
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  - Solar field + Thermal Energy Storage (TES)
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# Project Overview

- Ashalim Plot A is a build-operate-transfer (BOT) project issued by the government of Israel
- The project is part of Israel's national target of 10% electricity production from renewable sources by 2020
- Ashalim plot A is part of three power plants based on renewable energy located near Ashalim on the Negev desert
  - Plot A – Thermo Solar plant in concentrated solar power (CSP) technology, 121MW
  - Plot B – Thermo Solar plant in Tower technology, 121MW
  - Plot C – PV plant, 50MW
- Initiator - Negev Energy The
- EPC contractor - Solel Aben



# Project Structure



# EPC – Projects

Solel Boneh EPC Division - execution of Multi Discipline Industrial Lamp Sum EPC Projects for Shikun & Binui Group and for local and global markets

## Energy

- Conventional Power Plants (Open Cycle, Combine Cycle, Cogeneration)
- Renewable Energy- CSP, PSP, PV, Hydro.
- Oil & Gas

## Environmental

- Industrial Waste Treatment.
- Municipality Waste Water Treatment.
- Municipality Solid Waste Treatment.

## Water

- Potable Water Treatment, Water Desalination, Purification.

Ashalim CSP, Israel



Etgal -Gas Power Plant



Intel Industrial Waste Water Treatment



Zeelim PV 120MW Power Plant



Solid Waste Treatment



Gilboa Pumped Storage



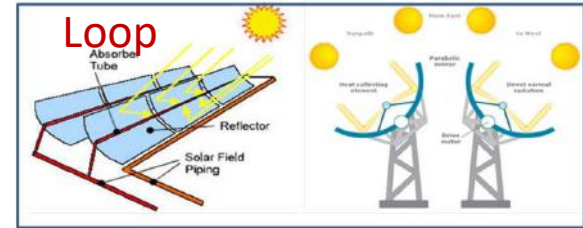
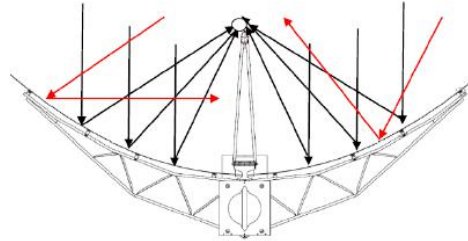


# Technology - Solar filed (SF)

## CSP – Concentrated Solar Power

### SF structure

- 28 mirrors -> Parabola
- 12 parabolas -> Solar Collector Assembly (SCA) – קולט
- 4 SCA -> Loop (2 Rows )
- 338 loops -> Solar field (SF)
- Total collector area – 1,100,000 m<sup>2</sup>
- SF area – 3880 dunam



### Control

Every SCA is control by local controller

- Control level
  - SCA
  - Loop
  - SF

All the SF control by DCS

Mirror



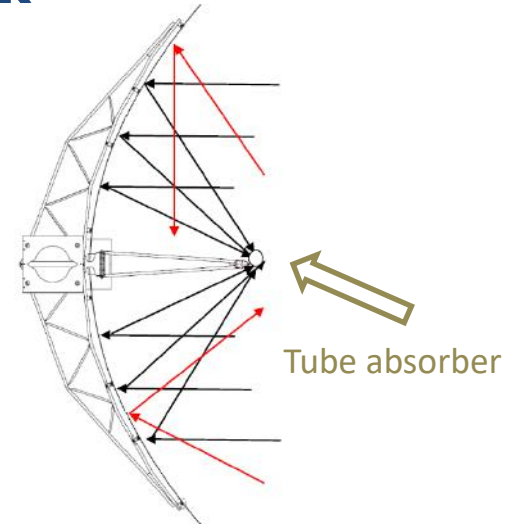
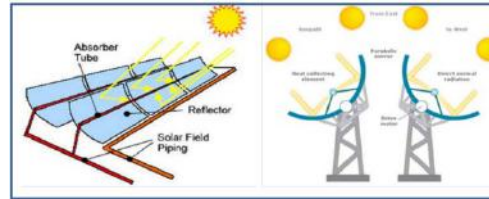
SCA

Parabola

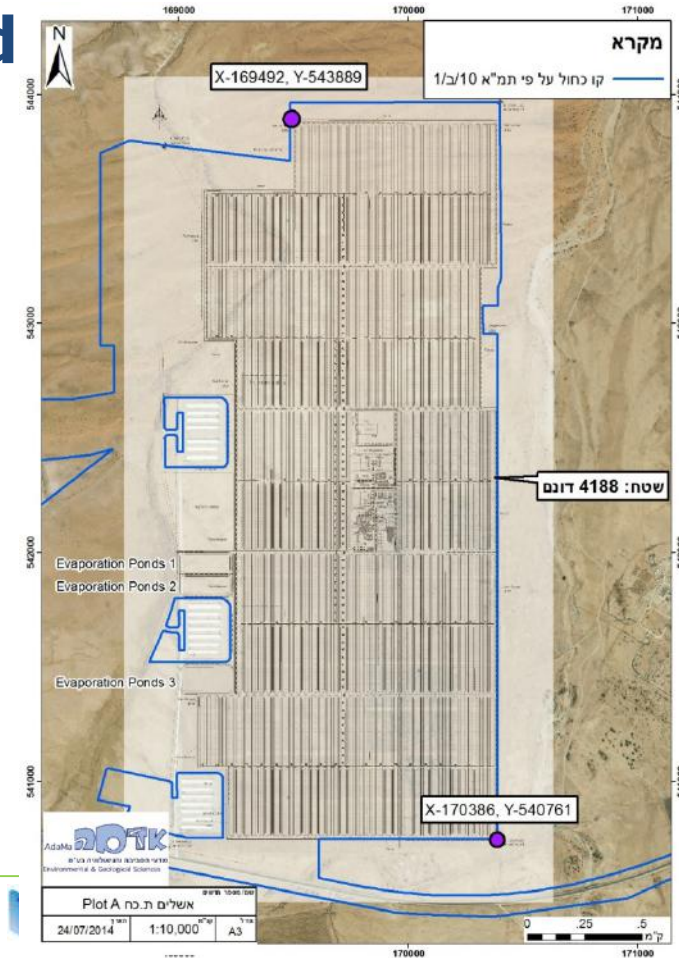
# Technology -Solar filed (SF) HTF – Heat transfer fluid

- HTF temp.
  - Working -  $+390^{\circ}\text{C}$
  - Freezing -  $+12^{\circ}\text{C}$
  - Maintain -  $+50^{\circ}\text{C}$
- Quantity –  $6200\text{m}^3$

From the SF the HTF arrive to  
the PB area

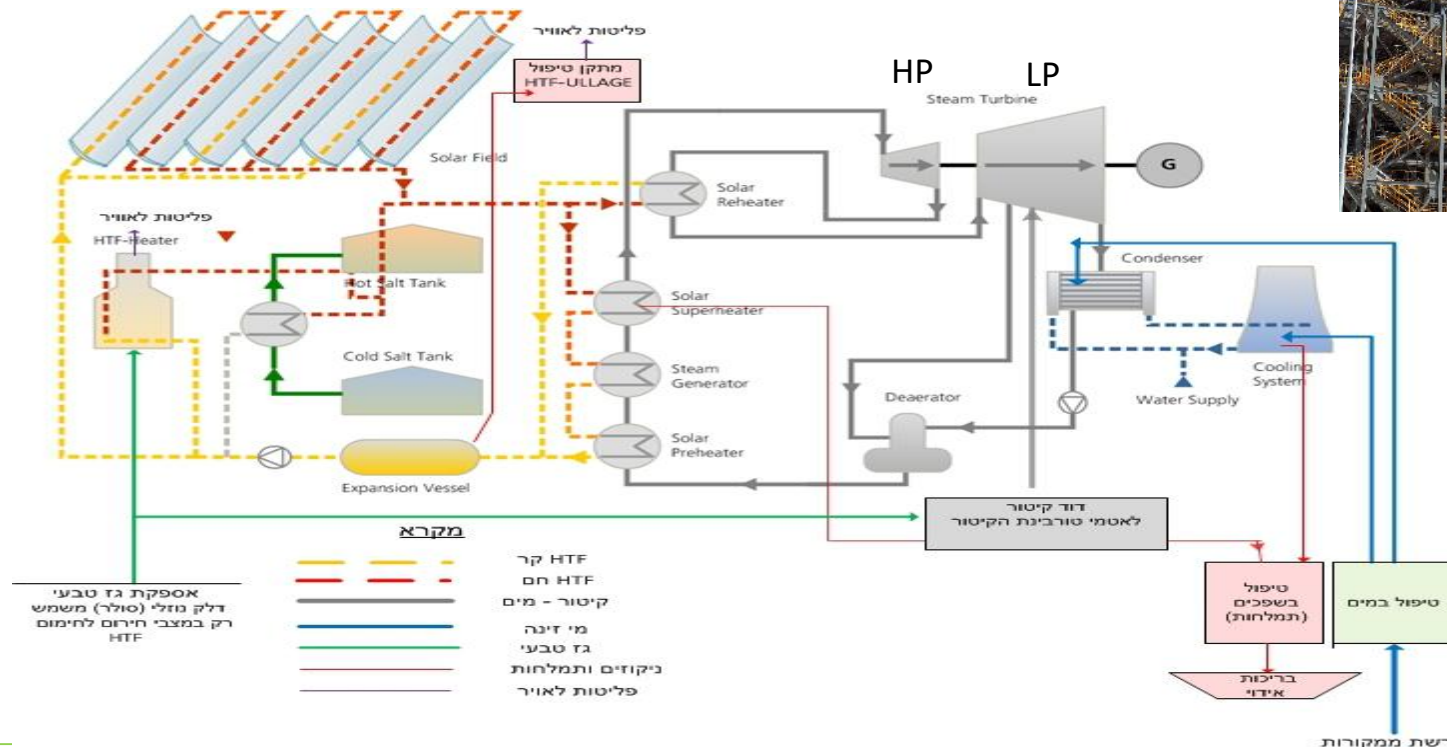


# Technology -Solar filed Layout

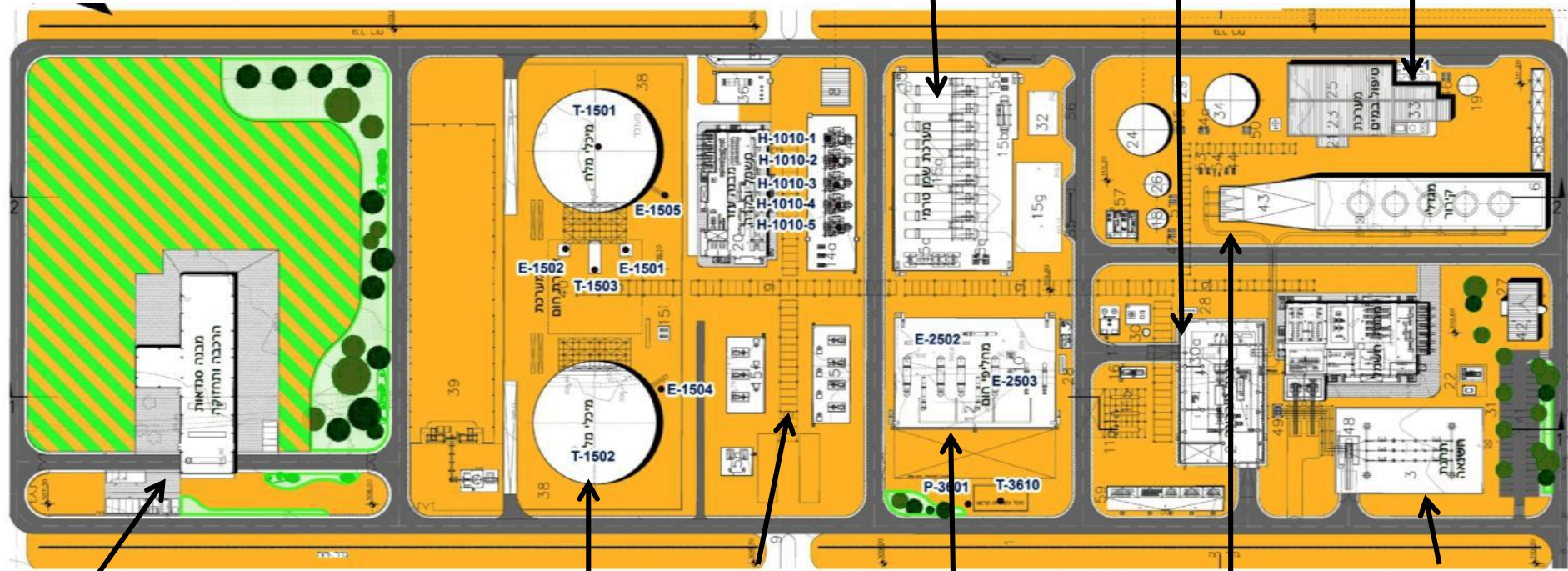




# Technology -Power Block (PB)



## Power Block (PB) Layout



HTF storage  
and expansion  
vessels

Steam turbine  
generator

Water and  
effluent  
treatment

Thermal energy storage system

## Water-steam system

Cooling tower

## HV substation



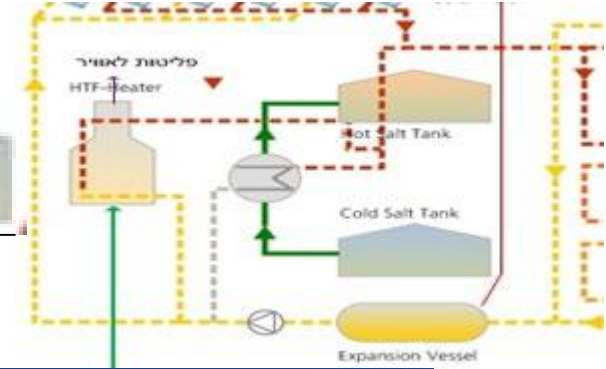
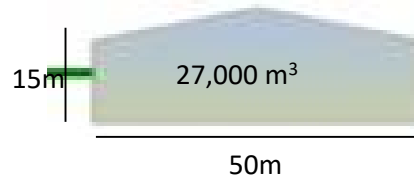
SOLELABEN EPC ASHALIM

SHIKUN & BINUA  
Solel Boneh  
Our Environment, Our Future

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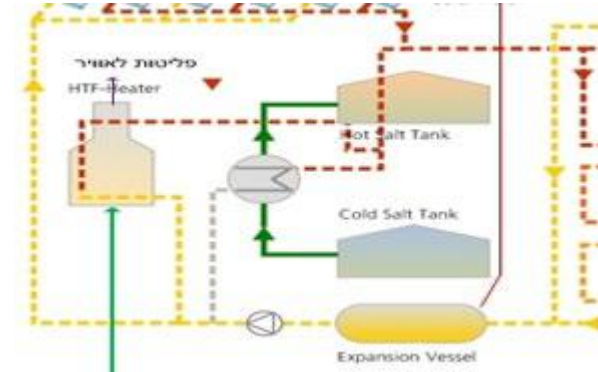
# Technology -Power Block (PB)

- Salt Tanks -
  - Salt - 40%  $\text{KNO}_3$  + 60%  $\text{NaNO}_3$
  - Quantity – 45,000 ton
  - Temp.
    - Cold tank – +285 $^{\circ}\text{C}$
    - Hot tank - +385 $^{\circ}\text{C}$
    - Freezing – +260 $^{\circ}\text{C}$
    - Maintain - +285 $^{\circ}\text{C}$
    - Decreasing temp. 1 $^{\circ}\text{C}$  /day
  - Produce of electrical energy till 4.5 hours in full capacity



# Technology -Power Block (PB)

- NG
  - Connection to Negev gas
  - The NG used for pre-heating and to boost the energy producing along in different modes
  - Contractual restriction
    - Max 15% from annual production
    - Max 50% from daily production
    - Producing energy only with NG is not allowed



## Tie points

- Water

By Mekorot , annual consumption - 1.4M m<sup>3</sup>

- Natural Gas - NG

By Negev gas annual consumption – 20M m<sup>3</sup>

- Electrical

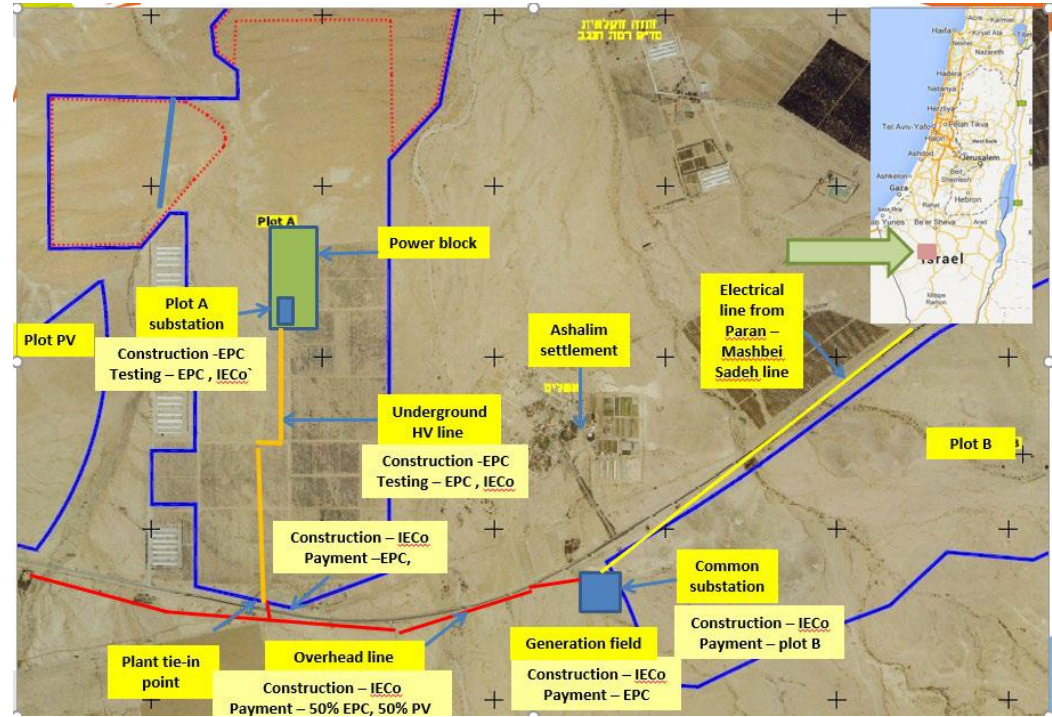
Connection to IECo grid 161kv



# Tie points

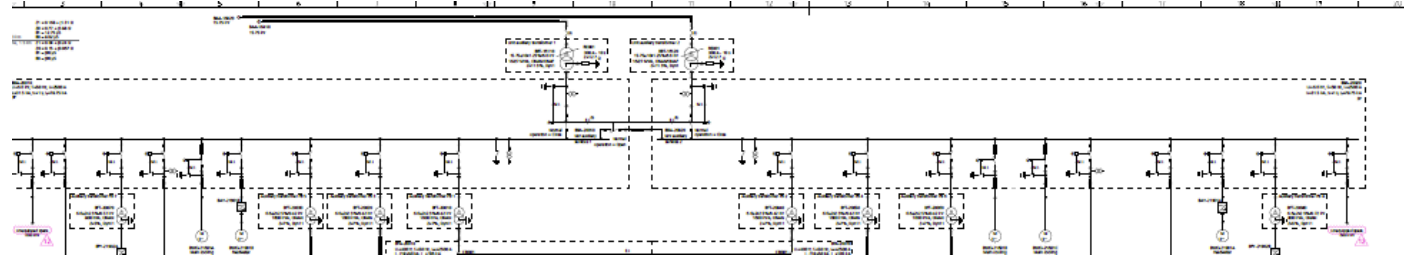
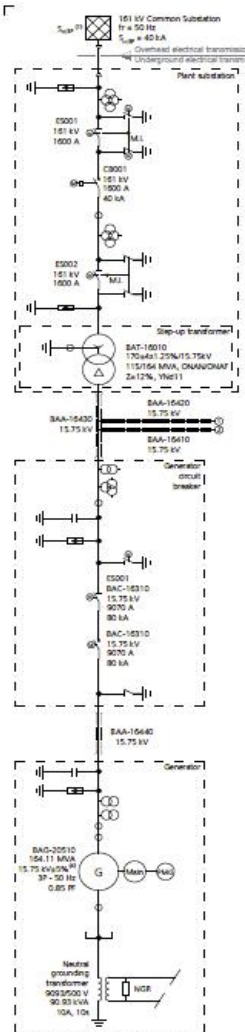
## Connection to IECo grid

- Unique solution
- Over head line – 3.5km
- Under ground cable – 1.5km
- Private substation with one field
- Unique Technical and Operation agreements with IECo







# Tie points

## Single line diagram – SLD

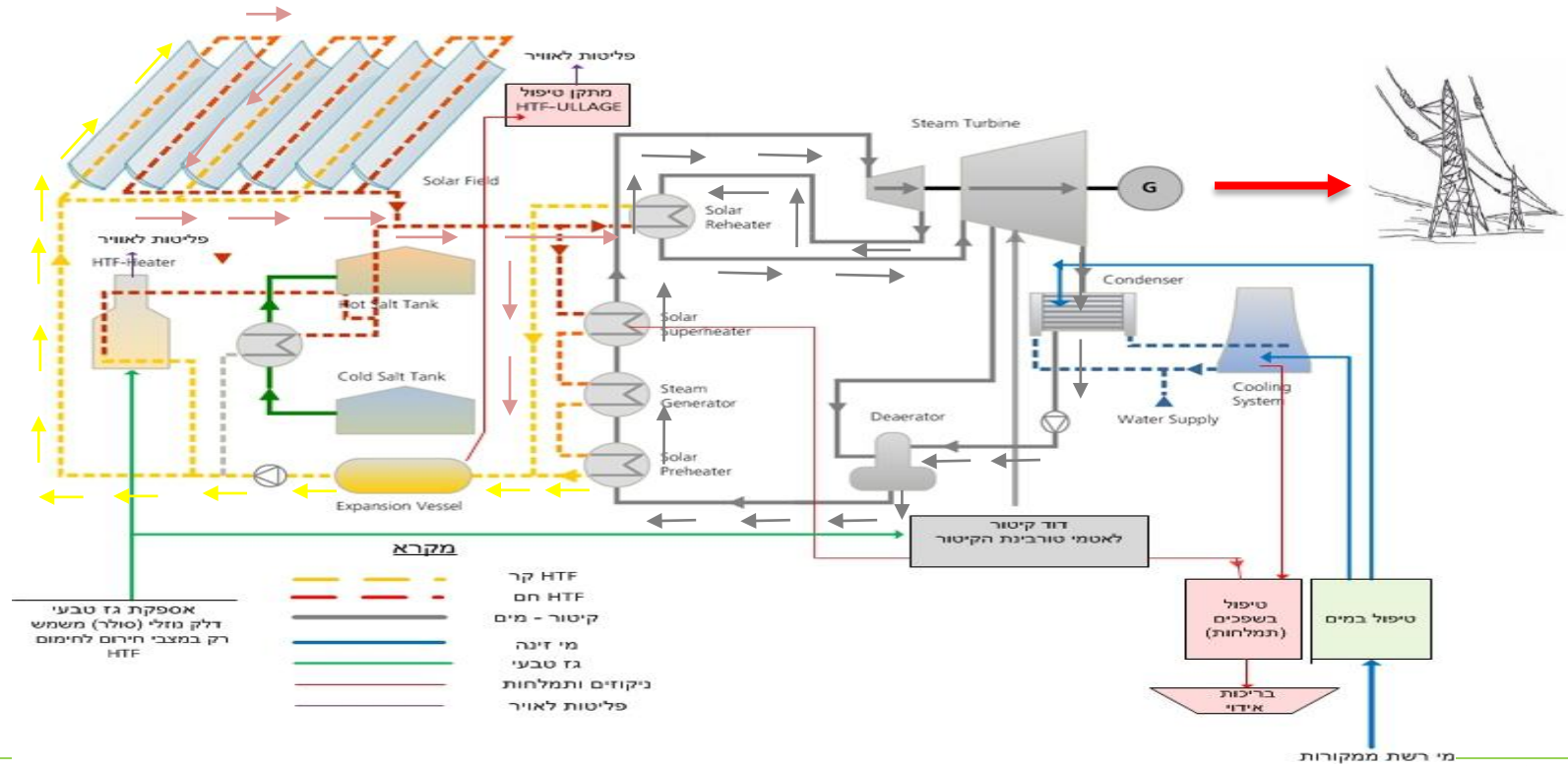


# Operation Modes

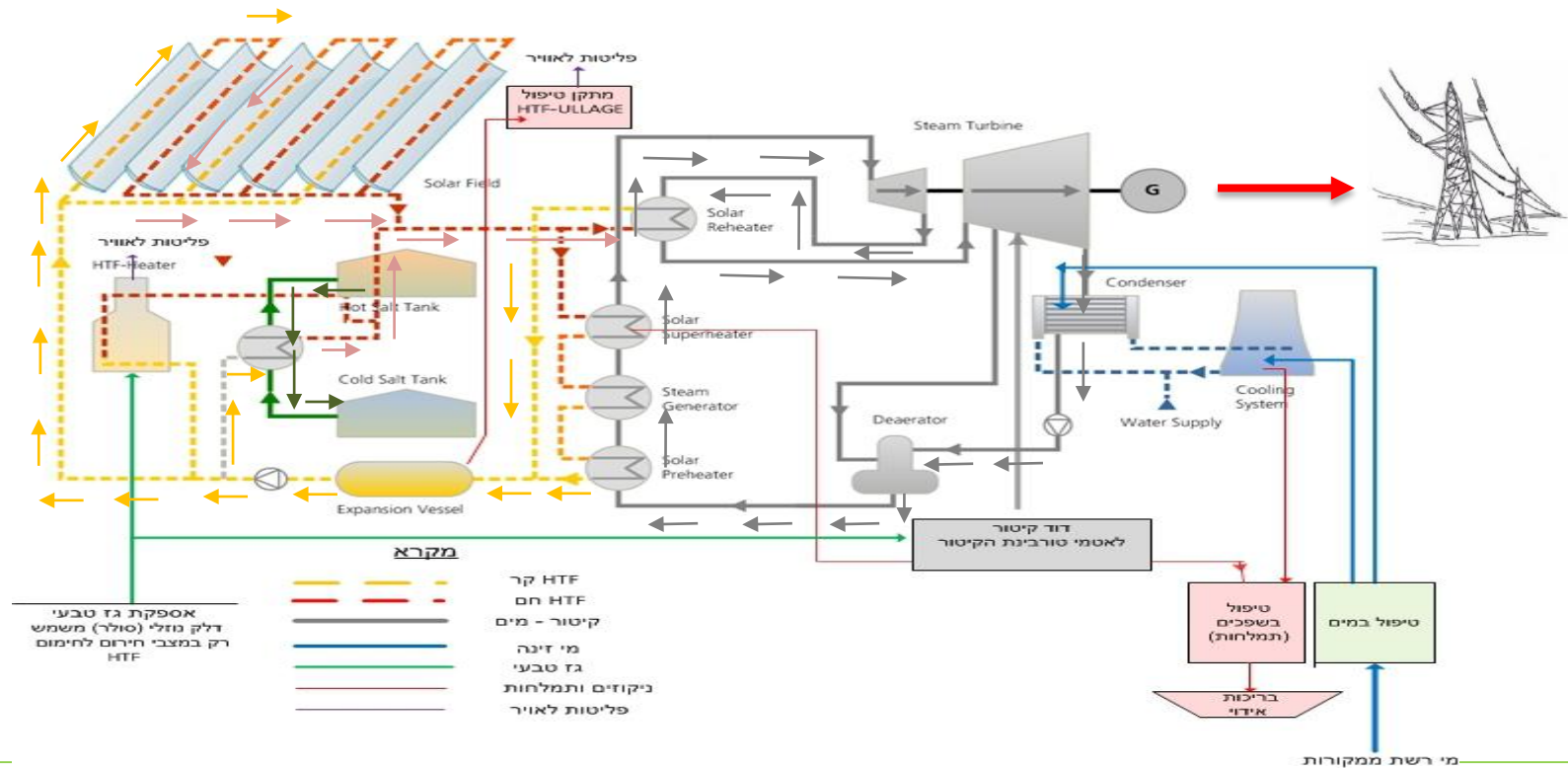
HTF	Only production	1		EP with SF only
		3		EP with (SF+TES Discharge)
		4		EP with (SF+TES Discharge+Heaters)
		5		EP with (SF+Heaters)
		7.1		EP with TES+SF rec with aux pumps
		7.2		EP with TES+SF rec with main pumps
		8.1		EP with (TES Disch+Heater)+SF rec with aux pumps
		8.2		EP with (TES Disch+Heater)+SF rec with main pumps
	Only TES	9		TES Charge with SF
		13		(TES Charge with HTF Heater+ PB rec) with main pumps and SF rec aux pumps
	Production + Charge	2		EP with SF+TES Charge
		6		EP with (SF+HTF Heaters)+TES Charge
	Antifreeze/rec	14		(SF + PB) recirculation with main pumps
		15		SF antifreeze with heaters
		16		(TES + PB) antifreeze Heaters and main pumps + SF rec with aux pumps
		17		(SF + PB + TES) antifreeze with Heaters and main pumps.

Aux: Auxiliary  
EP: Electric  
production  
PB: Power block  
Rec: Recirculation

# Mode 1: SF only

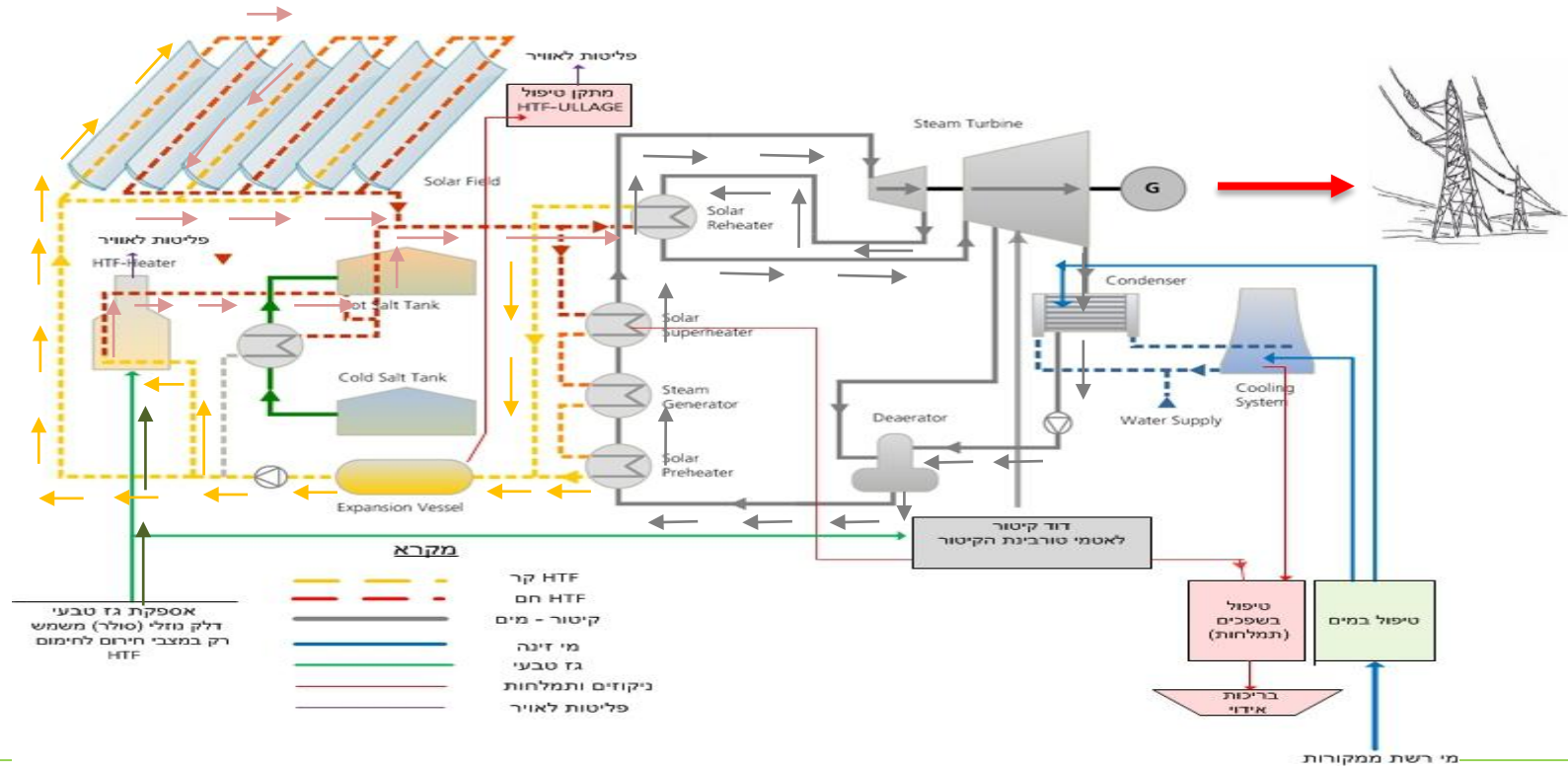


# Mode 3: SF + TES discharge

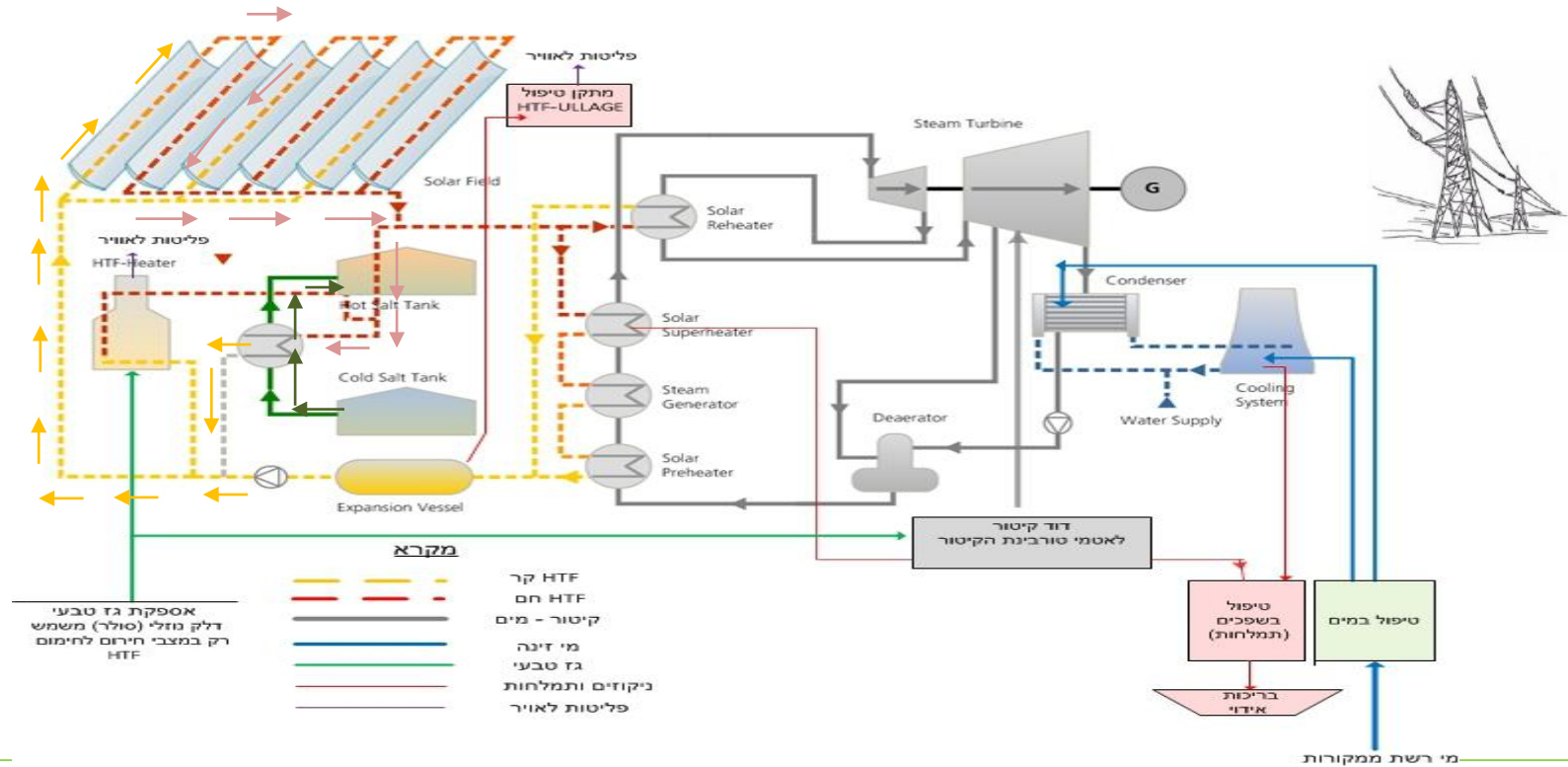




# Mode : SF + NG

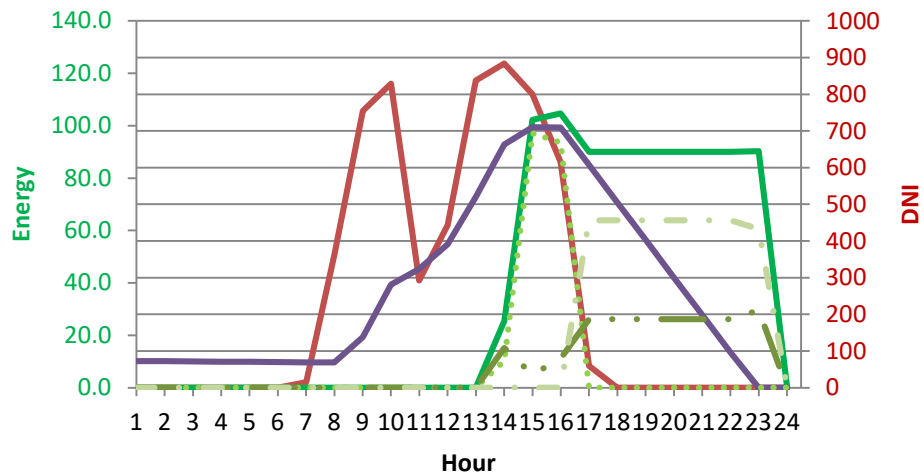


# Mode 9: TES charge



# January

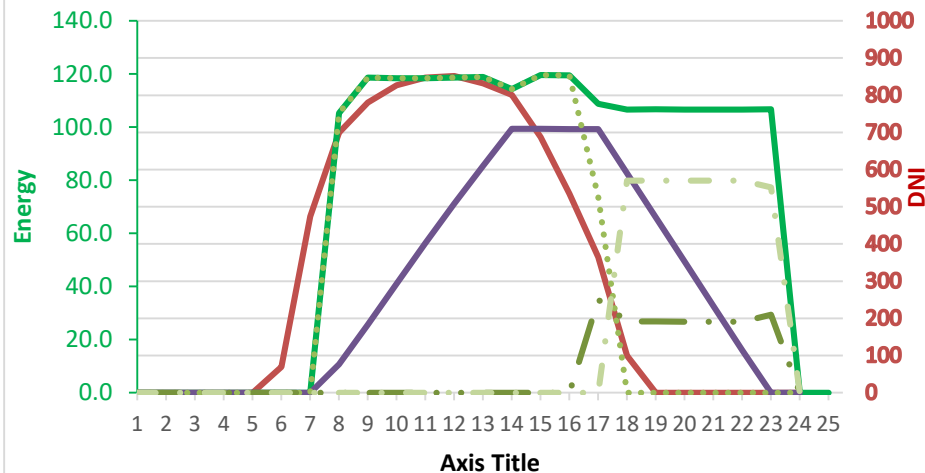
Day of the year #2



- Direct Normal Irradiation
- Net Energy Output
- Charging Level
- from Solar Section
- from use of Natural Gas
- from Thermal Energy Storage

# September

Day of the year #250



- Direct Normal Irradiation
- Net Energy Output
- Charging Level
- from Solar Section
- from use of Natural Gas
- from Thermal Energy Storage

# Main Milestone

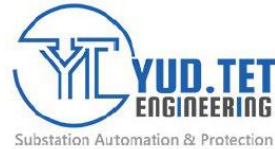
- PQ and Tender – 2008 – 2009
- Publish of the successful bidder (Negev Energy) – 6/2013
- Early works – 08/2014
- Notice To Proceed (NTP) – 7/2015
- Abengoa bankruptcy -11/2015
- Second Financial closer – 8/2016
- Seam Turbine supply – 6/2016
- Substation energize – 11/2017
- Steam blowing – 7/2018
- First synchronization – 9/2018
- Starting acceptance test – 11/2018
- Practical completion (PAC) – 12/2018

## Project in numbers

- SF area – 4000 Dunam
- BP area – 120 Dunam
- Earth works – 2,000,000 m<sup>3</sup>
- Concrete – 80,000 m<sup>3</sup>
- Piles – 40,000
- Cables – 330 km
- Pipes – 82km
- Welding – 390,000 inch/dimeter



# Thanks to all our Partners



Honeywell

