

greenius User Day

31. October 2014

Load profile and operating strategy definition



Knowledge for Tomorrow

Load Curve versus Operating Strategies

- **Load curve** means:
The user defines a predefined electrical output at a certain time of the year. For CSP plants often an auxiliary system is necessary to follow a load profile.
- **Operating strategy** means:
The user defines a priority of specific parts of the CSP plant over others or suppresses the utilization of parts until certain preconditions are fulfilled
- Thus operation strategies offer higher flexibility but are more complicated to define.



Load curve definition

- **Greenius** comes with some predefined load curves
- Users may load one of the and manipulate it to their needs
- Load curves are using relative values for each period and one input for the nominal output. Actual output for each period is calculated from the product of relative and nominal value.
- For CSP systems this nominal values represents the **net** electricity output.
 - User have to take care that the power block will be large enough to deliver this net output!
 - Typically the relevant project file will have an auxiliary firing in order to fulfill the load curve during times when solar field and storage cannot provide sufficient heat.
 - If no auxiliary firing is defined, **greenius** will calculate the demand fraction satisfied by solar



Load curve input form in greenius

6_to_6_workingdays

File Edit View Help

Load Curve

Load Curve Data Operating Strategy

General

Name: 6_to_6_workingdays

Year sum: 12528000 MWh Average: 1430137 kW
Minimum: 0 kW Maximum: 4000000 kW

Nominal output: kW

1. Jan. is: Monday

Temporal Resolution
Step Length: 60min

View Graph

Edit Table

Copy horizontal Copy vertical
Interpolate hori. Interpolate vert.
Fill grid with data of first week

Factor: Multiply

Value: Set All Set Selection

electr.	day	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	00:00
01. Jan	Mon	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
02. Jan	Tue	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
03. Jan	Wed	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
04. Jan	Thu	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
05. Jan	Fri	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
06. Jan	Sat	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
07. Jan	Sun	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
08. Jan	Mon	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
09. Jan	Tue	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
10. Jan	Wed	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
11. Jan	Thu	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
12. Jan	Fri	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
13. Jan	Sat	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

OK Apply Cancel



Definition of the auxiliary boiler (HTF-heater)

130 MW_th

File Edit Costs Help

Auxiliary Boiler

Aux Boiler

General Information

Name: 130 MW_th

Technical Data

Fuel: Natural Gas

Nomial Power: 130000 kW

Efficiency: 90.0 %

Net calorific value: 43500 kJ/kg

Fuel

Price of kWh: 0.050 €/kWh

Emissions of CO2: 0.215 kg/kWh

Emissions of SO2: 0.000 kg/kWh

Parasitic Modifiers

Spec. parasitics: 0.010 W_{el}/W_{th}

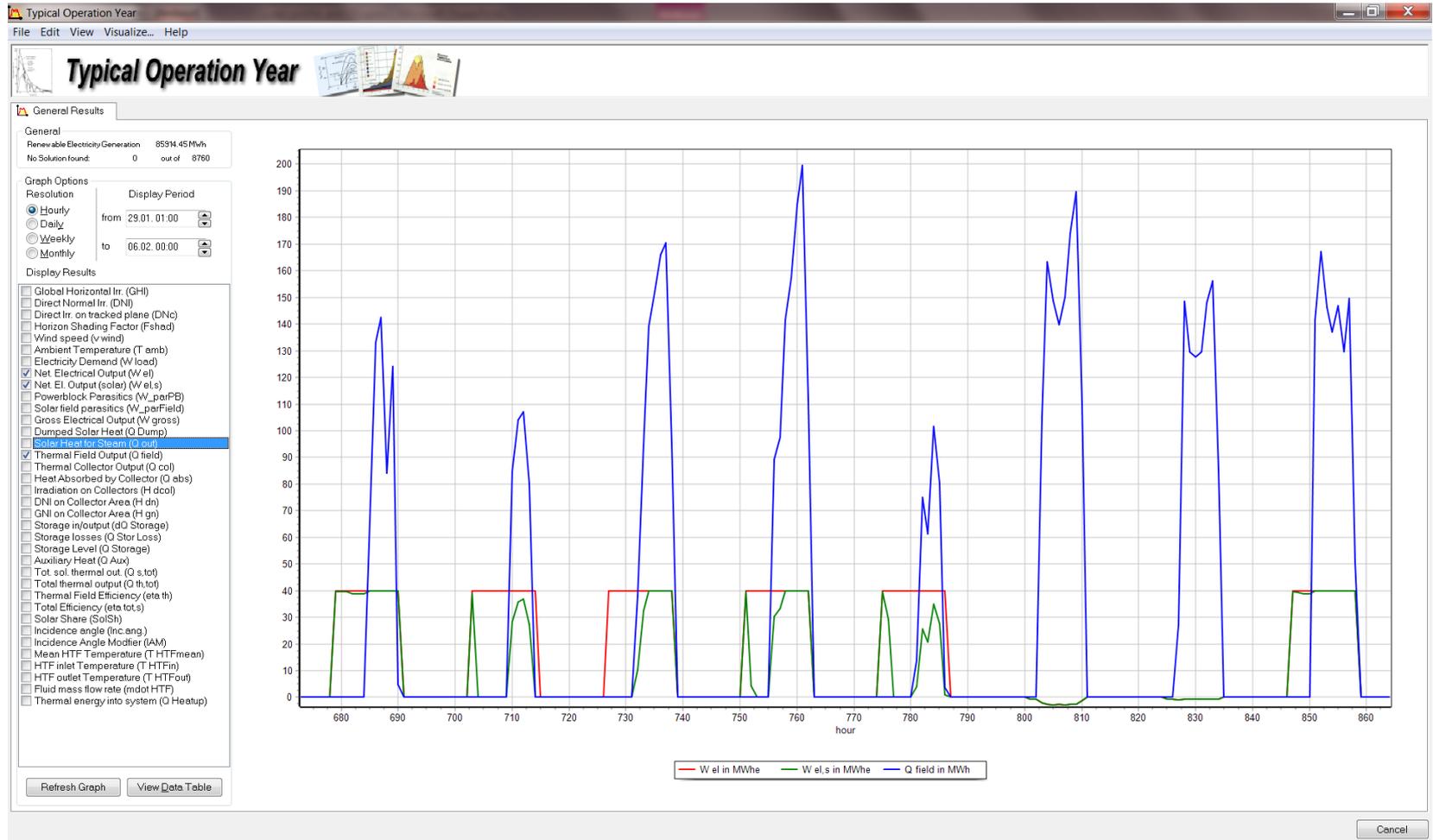
OK Apply Cancel

Important:

The nominal thermal power of the boiler should be sufficient to deliver the heat required by the power block in order to produce the electricity demand in fossil mode.



Results of the simulation using a load curve



Implementation of operating strategies in greenius

- Defining an OS in words or in a higher programming language is quite easy
- User defined OS in a software tool means that actually multiple OS must be considered in the code
- In CSP plants with thermal storage (TES) the operators have some degrees of freedom for the plant operation:
 - Send the available heat to the power block or to the TES
 - Run the power block at full load or at reduced load
 - Use heat from the TES to operate the power block even during periods with no heat from the solar field
 - Use additional heat from fossil fired auxiliary heaters (if the plant has such devices) to run the power block



Solar only operating strategy

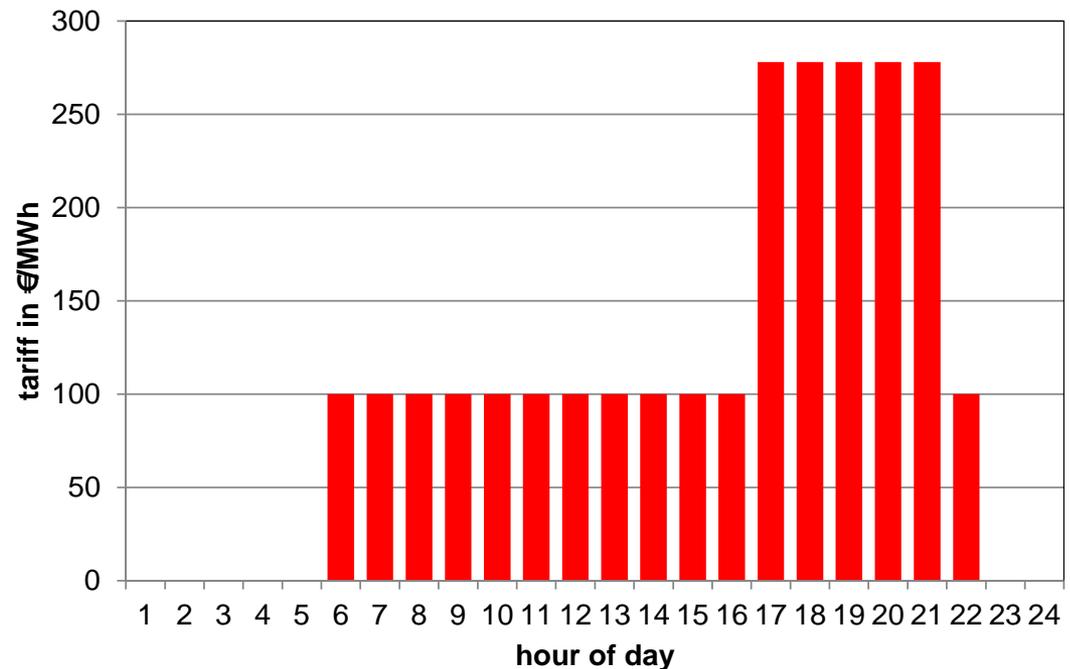
This is the “natural” OS for CSP plants

- Operate the solar field at maximum possible heat production
- Use the heat from the solar field to operate the power block at maximum possible load
- When the heat delivered by the solar field exceeds the maximum power block input, use this surplus heat to charge the TES
- If the TES is totally charged, defocus parts of the solar field until the heat output matches the maximum power block input
- If the heat delivered by the solar field decreases in late afternoon, discharge the TES to run the power block at maximum possible load and continue discharging of TES in the evening until the storage is empty.



Example for an operating strategy

- This example has been used for a paper published at the International SolarPACES 2014 conference (Beijing, 14.-18. Sept. 2014)
- The idea was to develop an OS in greenius which considers a certain feed-in-tariff structure (fictive but not unrealistic)
- 285 €/MWh during peak hours, 100 €/MWh during off-peak hours, no payment during night
- Maximize revenues rather than electricity production (like for a flat feed-in-tariff)



OS determined by a feed-in-tariff system

1. Try to run the power block at maximal load between 16:00 and 21:00
 2. Don't run the power block between 21:00 and 5:00
 3. Try to use the remaining heat from solar field and storage to produce electricity during the remaining hours of the day
- The plant has no auxiliary firing!



Definition of the OS

Further considerations from this rules:

- Fill the storage before 16:00 up to a level that condition 1. could be satisfied
- Use 3 different periods according the different feed-in-tariff periods as first approach



OS with 3 periods

OS_3_Periods

File Edit View Help

Operating Strategy

Load Curve Data Operating Strategy

Edit

Copy horizontal Copy vertical

Value Set All Set Selection

	day	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	00:00
01. Jan	Mon	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	3	3
02. Jan	Tue	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	3	3
03. Jan	Wed	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	3	3
04. Jan	Thu	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	3	3
05. Jan	Fri	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	3	3
06. Jan	Sat	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	3	3
07. Jan	Sun	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	3	3
08. Jan	Mon	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	3	3
09. Jan	Tue	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	3	3
10. Jan	Wed	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	3	3

Strategy	Discharge THR	Discharge >THR	Discharge <THR	Charge THR	Charge prio. until	Min PB Input	Max PB Input	Gas support up to	Storage Loss Comp.	Fossil Storage Loss	Gas: Gapfill	Gas: Only boost
1	0.00	1.00	1.00	0.00	0.00	0.00	1.00	0.00	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	0.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

OK Apply Cancel



Definition of the FiT in greenius

Go to the “Nation” form, choose variable electricity tariff and press the arrow button to open the tariff creator form.

The screenshot shows the 'Nation' configuration window. The 'Remuneration Tariffs' section is highlighted with a red box. It contains the following fields:

- Electricity: 0.000 €/kWh (radio button selected for 'variable', arrow button to the right)
- Heat/Cooling: 0.000 €/kWh

Other visible sections include:

- General:** Name: Default
- Taxes:** Income tax rate: 30.00 %, Property tax rate: 0.00 %, Tax holidays: 0.00 years, Loss forwarded: 0.00 years
- Prices of Delivery:** Fuel price: 0.050 €/kWh, Water price: 0.050 €/m³, Purchased from the grid: 0.150 €/kWh
- Specific Reference Values:** Levelized generation costs: 0.050 €/kWh, CO₂ emissions: 0.600 kg/kWh

The screenshot shows the 'Tariff Creator' window. It displays a grid of electricity prices (€/kWh) for each day of the week (01:00 to 23:00). The grid shows a constant price of 0.285 €/kWh for all days and times.

€/kWh	day	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	00:00	
01.	Mon	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.285	0.285	0.285	0.285	0.285	0.1	0	0	
02.	Tue	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.285	0.285	0.285	0.285	0.285	0.1	0	0
03.	Wed	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.285	0.285	0.285	0.285	0.285	0.1	0	0
04.	Thu	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.285	0.285	0.285	0.285	0.285	0.1	0	0
05.	Fri	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.285	0.285	0.285	0.285	0.285	0.1	0	0
06.	Sat	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.285	0.285	0.285	0.285	0.285	0.1	0	0
07.	Sun	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.285	0.285	0.285	0.285	0.285	0.1	0	0
08.	Mon	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.285	0.285	0.285	0.285	0.285	0.1	0	0
09.	Tue	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.285	0.285	0.285	0.285	0.285	0.1	0	0
10.	Wed	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.285	0.285	0.285	0.285	0.285	0.1	0	0
11.	Thu	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.285	0.285	0.285	0.285	0.285	0.1	0	0
12.	Fri	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.285	0.285	0.285	0.285	0.285	0.1	0	0
13.	Sat	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.285	0.285	0.285	0.285	0.285	0.1	0	0
14.	Sun	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.285	0.285	0.285	0.285	0.285	0.1	0	0
15.	Mon	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.285	0.285	0.285	0.285	0.285	0.1	0	0
16.	Tue	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.285	0.285	0.285	0.285	0.285	0.1	0	0
17.	Wed	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.285	0.285	0.285	0.285	0.285	0.1	0	0
18.	Thu	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.285	0.285	0.285	0.285	0.285	0.1	0	0
19.	Fri	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.285	0.285	0.285	0.285	0.285	0.1	0	0
20.	Sat	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.285	0.285	0.285	0.285	0.285	0.1	0	0
21.	Sun	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.285	0.285	0.285	0.285	0.285	0.1	0	0
22.	Mon	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.285	0.285	0.285	0.285	0.285	0.1	0	0
23.	Tue	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.285	0.285	0.285	0.285	0.285	0.1	0	0
24.	Wed	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.285	0.285	0.285	0.285	0.285	0.1	0	0
25.	Thu	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.285	0.285	0.285	0.285	0.285	0.1	0	0
26.	Fri	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.285	0.285	0.285	0.285	0.285	0.1	0	0

Parameters and Operations:

- 1. January is a: Monday
- one Period (selected), two different Periods
- 2nd Period starts at op. year: -1
- Factor: 1
- Resolution: Daily (selected), Edit Period: First day: 01.01, Last day: 31.12, Temp. Resolution: 60min



Result analysis of the 3 periods OS

- Storage has the highest priority during period 2 but during summer the first hours of the day were used to charge the storage.
- PB is only started after the storage is completely filled up. At this time the solar field often delivers heat in excess to the maximum PB input and this must be dumped (the storage is already fully charged).
- Finally this first OS was not optimal since it produces a lot of dumping and the revenue is not optimal.
- A better OS would be to set the storage priority only until a certain fraction of the total storage capacity (we have about 7 h of capacity but for most of the time, we don't need 7 h for the peak time). Therefore I reduced the value of "Charge prio. until" to about 0.3. Actually I played around with this parameter.
- The next step was that I realized that in winter time we should have a higher value of "Charge prio. until" since the sunset is earlier and we have more peak hours without DNI. That was the reason to introduce a 4th period.



OS with 4 periods

Spain_2014_4Periods
File Edit View Help

Operating Strategy

Load Curve Data | Operating Strategy

Edit

Copy horizontal | Copy vertical

Value: | Set All | Set Selection

Allocation table

		01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	00:00
01. Jan	Mon	4	4	4	4	4	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	4	4
02. Jan	Tue	4	4	4	4	4	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	4	4
03. Jan	Wed	4	4	4	4	4	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	4	4
04. Jan	Thu	4	4	4	4	4	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	4	4
05. Jan	Fri	4	4	4	4	4	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	4	4
06. Jan	Sat	4	4	4	4	4	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	4	4
07. Jan	Sun	4	4	4	4	4	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	4	4
08. Jan	Mon	4	4	4	4	4	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	4	4
09. Jan	Tue	4	4	4	4	4	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	4	4

Strategy	Discharge THR	Discharge >THR	Discharge <THR	Charge THR	Charge prio. until	Min PB Input	Max PB Input	Gas support up to	Storage Loss Comp.	Fossil Storage Loss	Gas: Gapfill	Gas: Only boost
1	0.00	1.00	1.00	0.00	0.00	0.00	1.00	0.00	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	0.00	1.00	1.00	0.00	0.60	0.00	1.00	0.00	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	0.00	1.00	1.00	0.00	0.40	0.00	1.00	0.00	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Strategy definition table

OK | Apply | Cancel



Comparison of annual revenues

Feed-in-tariff	OS	Net electricity	Revenues
Flat 285 €/MW	Solar-only	146.7 GWh	41.8 Mio.€
New FiT	Solar-only	146.7 GWh	20.1 Mio.€
New FiT	4 periods	137.6 GWh	23.9 Mio.€

New FiT means: 285 €/MWh during peak time, 100 €/MWh during normal time and no payment during night time as shown on slide 9



Final remarks

- The ultimate mathematical solution would be an optimizer running **greenius** and varying the OS parameter to find the optimum. This is currently not possible and the user has to do this manually.
- Finally the proposed OS with 4 periods might be optimized further (e.g. by introducing more periods). Another period in the afternoon (just 2 or 3 hours prior to the peak time) when no storage discharge will be allowed could be an idea to keep the storage full until the peak time starts.
- Using a predefined OS does not mean the same as optimizing the day-by-day operation with consideration of weather forecasts. The latter procedure will be done by plant operators in different forms. They will at least consider the normal weather forecast from radio or TV or in a more sophisticated scheme; or alternatively they will use a computer system proposing a certain strategy with frequently updated DNI forecasts.

