E-LAND

MULTI VECTOR SIMULATION - REPORT SHEET

Information

MVS Release: 0.5.6dev (2021-03-04)

Simulation date: 2021-04-28

Project name : Test simulation (ID: 1)

Scenario name : Test scenario (ID: 1)

Scenario description : {'unit': 'Test scenario for test simulations with the MVS', 'value': nan}

The energy system with the *Test simulation (ID: 1)* for the scenario *Test scenario (ID: 1)* was simulated with the Multi-Vector simulation tool MVS 0.0x developed from the E-LAND toolbox developed in the scope of the Horizon 2020 European research project. The tool was developed by Reiner Lemoine Institute and utilizes the OEMOF framework.

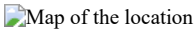
Input Data

Project Data

The most important simulation data will be presented below. Detailed settings, costs, and technological parameters can be found in the appendix.

Project Location

The blue dot in the below map indicates the location of the project.



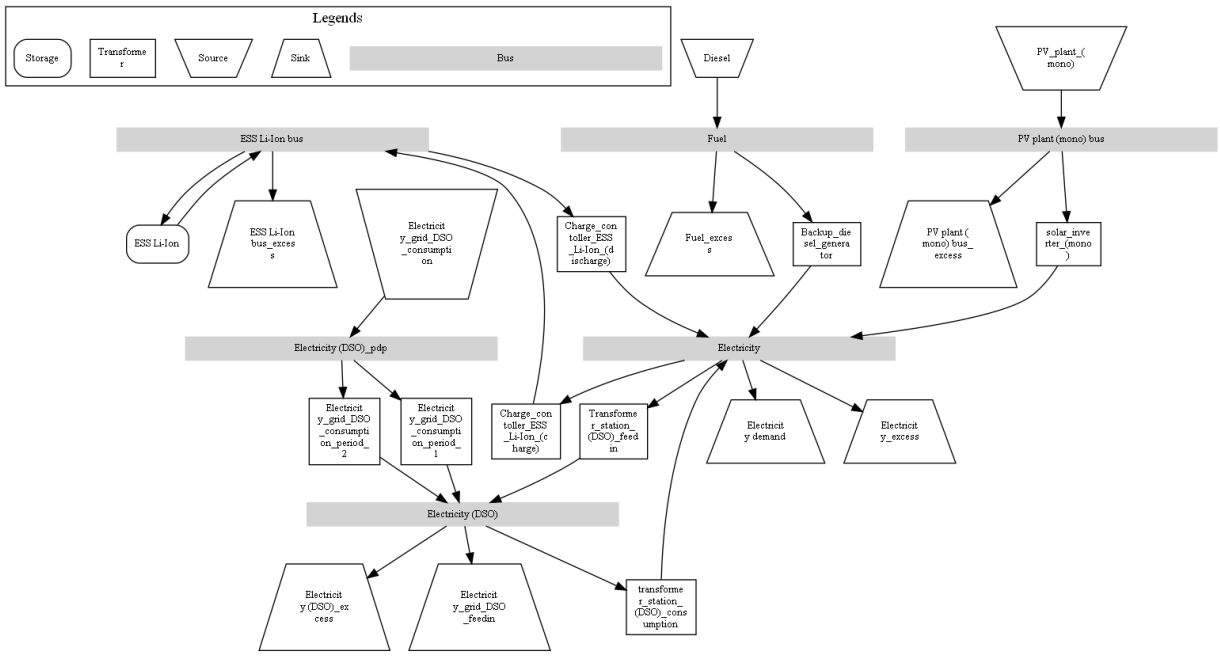
Project at a Glance

Label	Value
Country	Test country
Project ID	1
Scenario ID	1
Currency	NOK
Project Location	Pale
Discount Factor	0.06
Tax	0

Simulation Settings

Setting	Value
Evaluated period	1
Start date	2018-01-01T00:00:00
Timestep length	60

Energy system



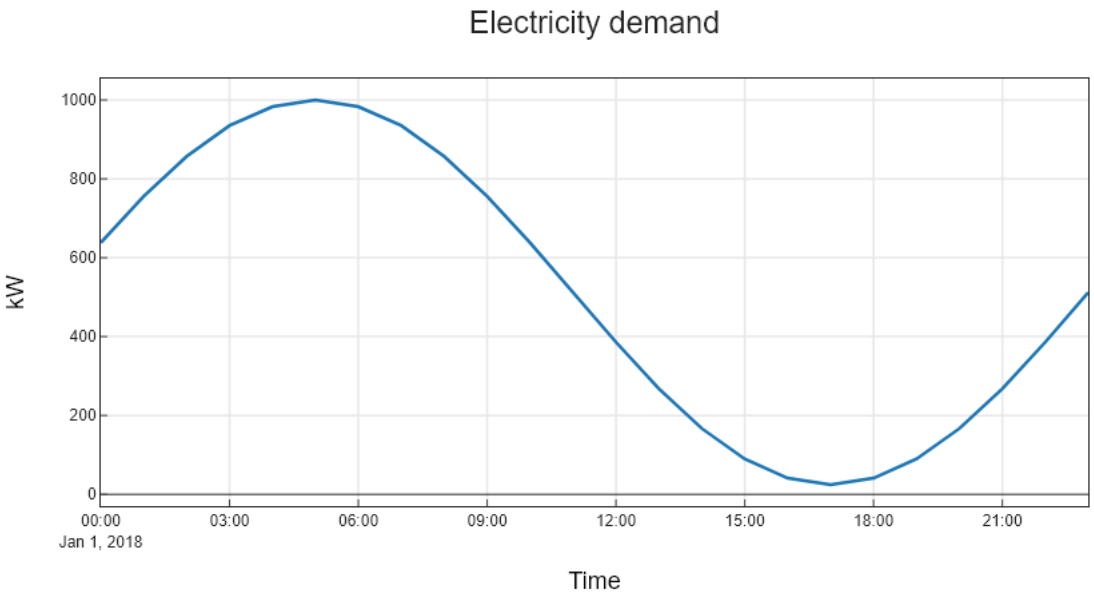
Energy Demands

The simulation was performed for the energy system covering the following sectors:

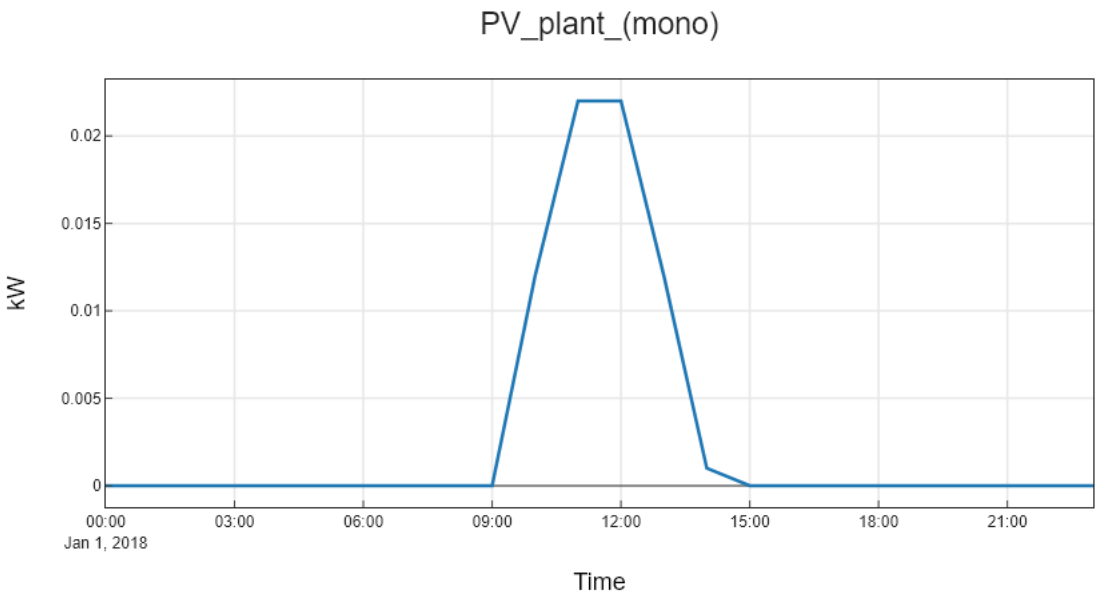
• ELECTRICITY

Electricity Demands

Demands	unit	Type of Demand	Peak Demand	Mean Demand	Total Annual Demand
Electricity demand	kW	Electricity	1000	512.08	12289.8



Resources



Energy System Components

The energy system is comprised of the following components:

Component	Type of Component	Energy Vector	unit	Installed Capacity	Capacity optimization
Diesel	source	Electricity	l	0	No
PV_plant_(mono)	source	Electricity	kWp	50	Yes
Electricity_grid_DSO_consumption	source	Electricity	?	0	Yes
Backup_diesel_generator	transformer	Electricity	kW	0	Yes
Charge_contoller_ESS_Li-Ion_(charge)	transformer	Electricity	kW	0.5	Yes
Charge_contoller_ESS_Li-Ion_(discharge)	transformer	Electricity	kW	0.5	Yes
Transformer_station_(DSO)_feedin	transformer	Electricity	kVA	1250	No
solar_inverter_(mono)	transformer	Electricity	kW	0	Yes
transformer_station_(DSO)_consumption	transformer	Electricity	kVA	1250	No
Electricity_grid_DSO_consumption_period_1	transformer	Electricity	?	0	Yes
Electricity_grid_DSO_consumption_period_2	transformer	Electricity	?	0	Yes
ESS Li-Ion input power	storage	Electricity	kWh	1	No
ESS Li-Ion storage capacity	storage	Electricity	kWh	10	No
ESS Li-Ion output power	storage	Electricity	kWh	1	No

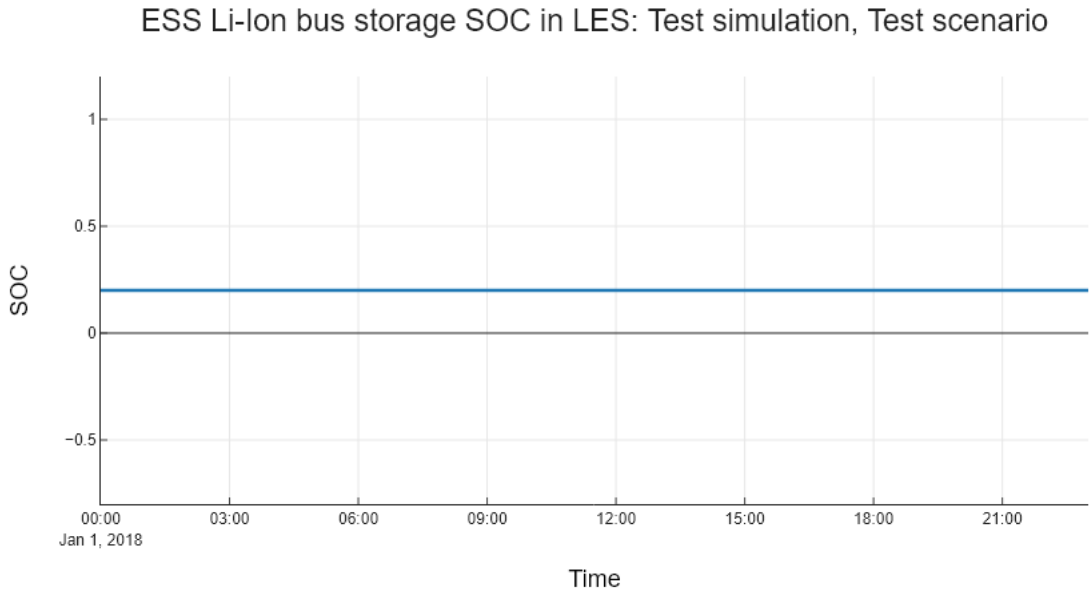
Simulation Results

Dispatch & Energy Flows

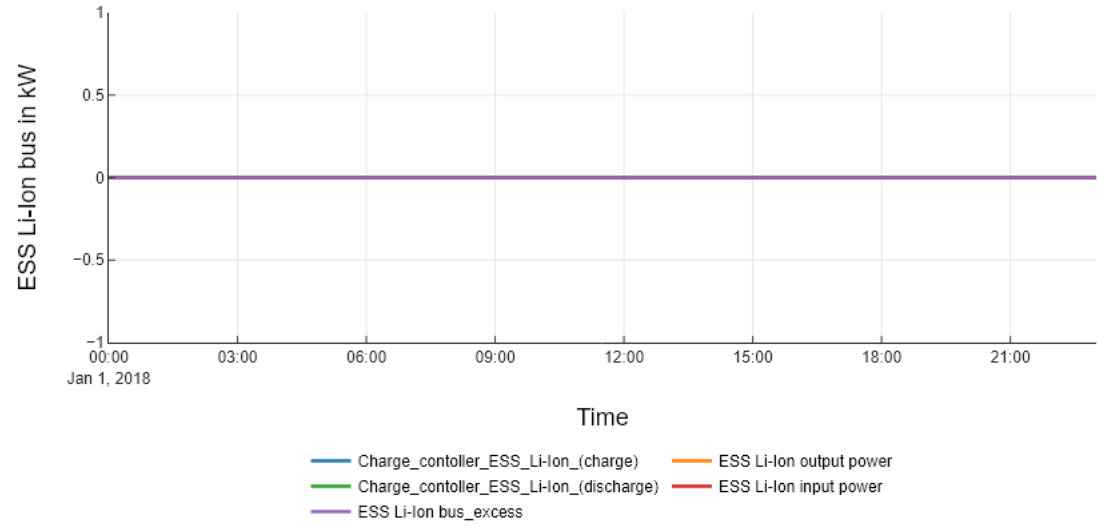
The capacity optimization of components that were to be used resulted in:

Component/Parameter	unit	installedCap	CAP	Aggregated Flow	total_emissions
ESS Li-Ion storage capacity	kWh	10	0		
ESS Li-Ion input power	kW	1	9	0	
ESS Li-Ion output power	kW	1	9	0	
Backup_diesel_generator	kW	0	1	8760	
Charge_contoller_ESS_Li-Ion_(charge)	kW	0.5	0	0	
Charge_contoller_ESS_Li-Ion_(discharge)	kW	0.5	0	0	
Transformer_station_(DSO)_feedin	kVA	1250	0	0	
solar_inverter_(mono)	kW	0	186.7	213734.53953	
transformer_station_(DSO)_consumption	kVA	1250	0	4263282.4608	
Electricity_grid_DSO_consumption_period_1	?	0	1040.62	4440919.26285	
Electricity_grid_DSO_consumption_period_2	?	0	0	0	
Diesel	l	0	3.03	26545.45428	196.36363
PV_plant_(mono)	kWp	50	6213.85	213734.53953	0
Electricity_grid_DSO_consumption	?	0	1040.62	4440919.26285	231.17114
Electricity demand	kW	0	0	4485777	
ESS Li-Ion bus_excess	?	0	0	0	
Electricity_excess	?	0	0	0	
Electricity (DSO)_excess	?	0	0	0	
Fuel_excess	?	0	0	0	
PV plant (mono) bus_excess	?	0	0	0	
Electricity_grid_DSO_feedin	?	0	0	0	

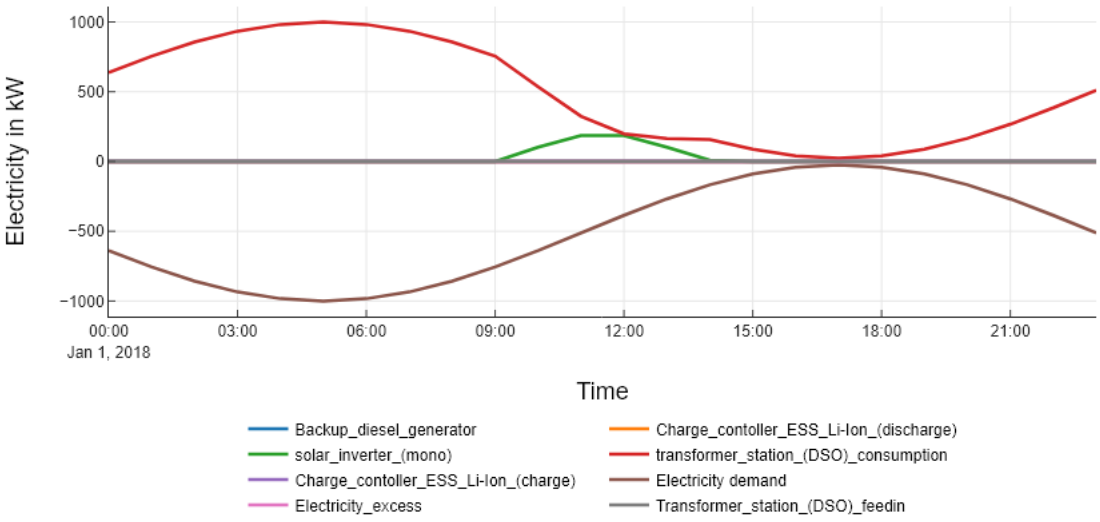
With this, the demands are met with the following dispatch schedules:



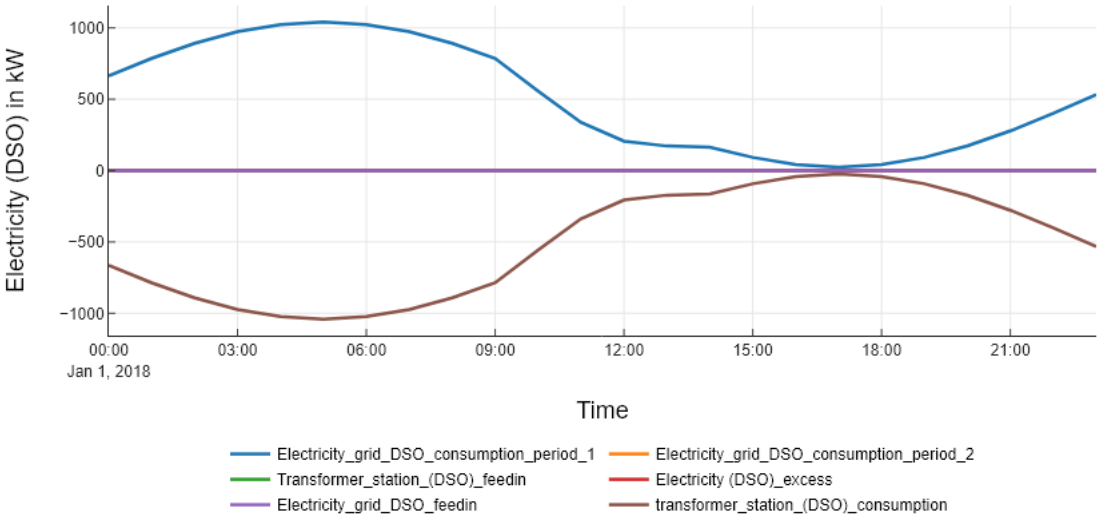
ESS Li-Ion bus power in LES: Test simulation, Test scenario



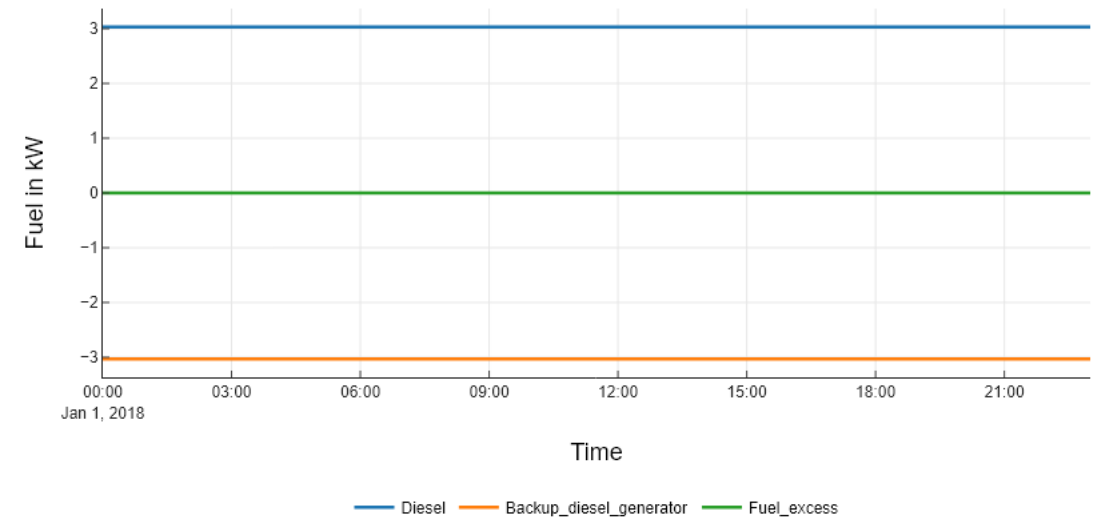
Electricity power in LES: Test simulation, Test scenario



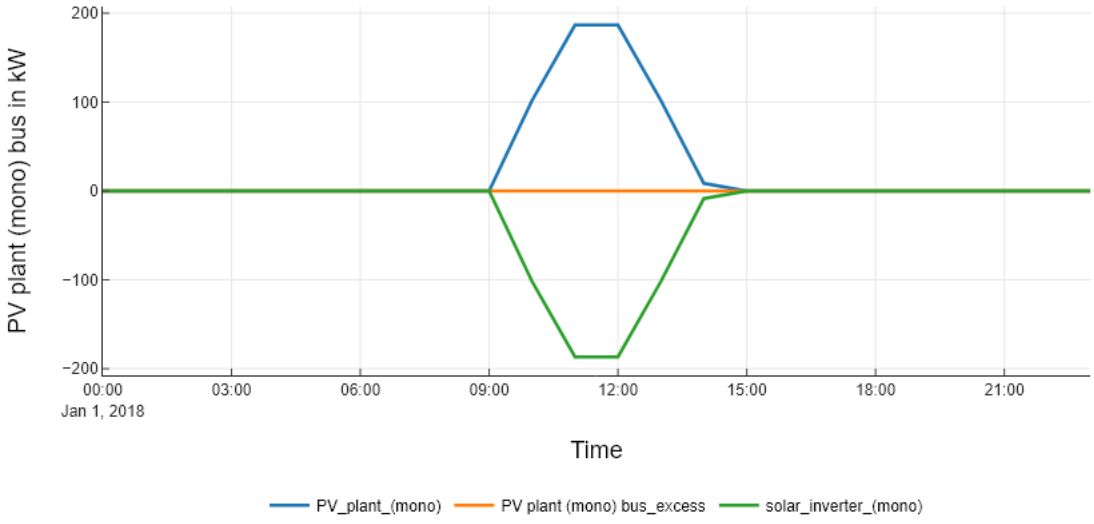
Electricity (DSO) power in LES: Test simulation, Test scenario



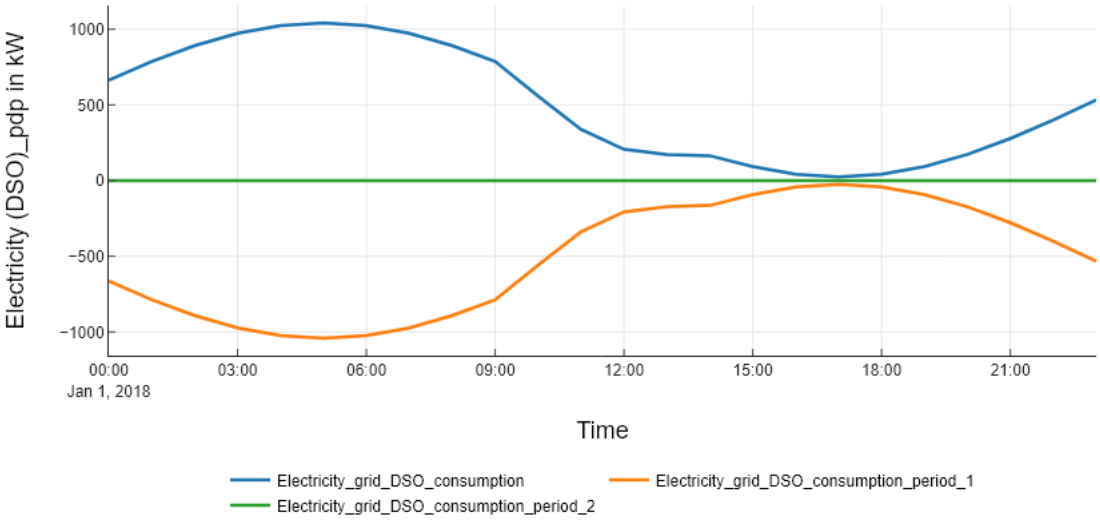
Fuel power in LES: Test simulation, Test scenario

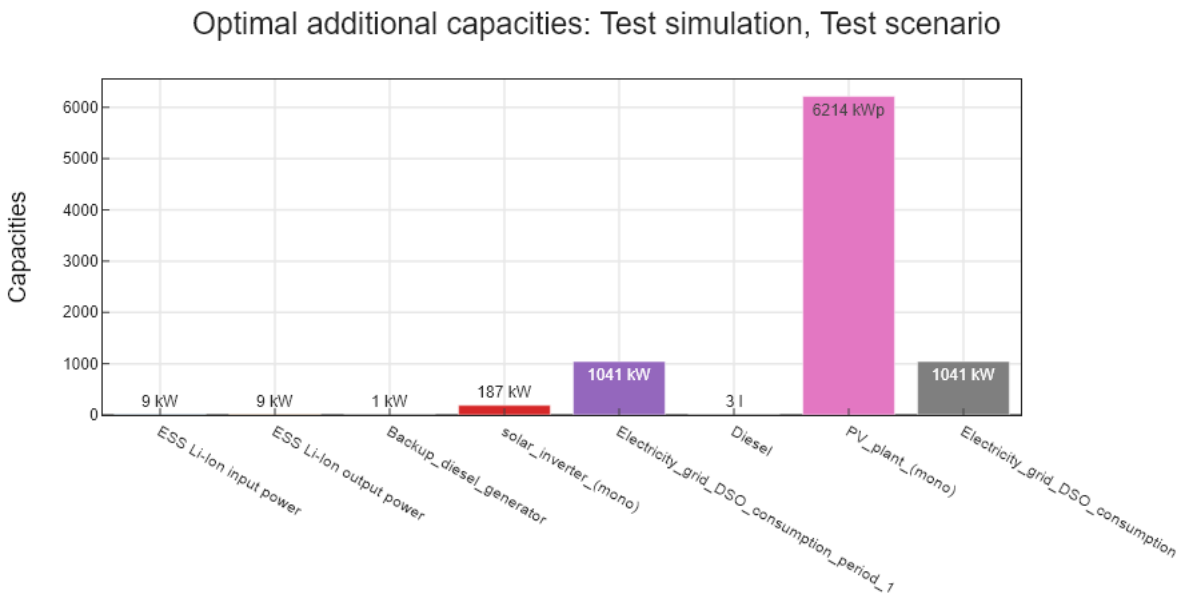


PV plant (mono) bus power in LES: Test simulation, Test scenario



Electricity (DSO)_pdp power in LES: Test simulation, Test scenario





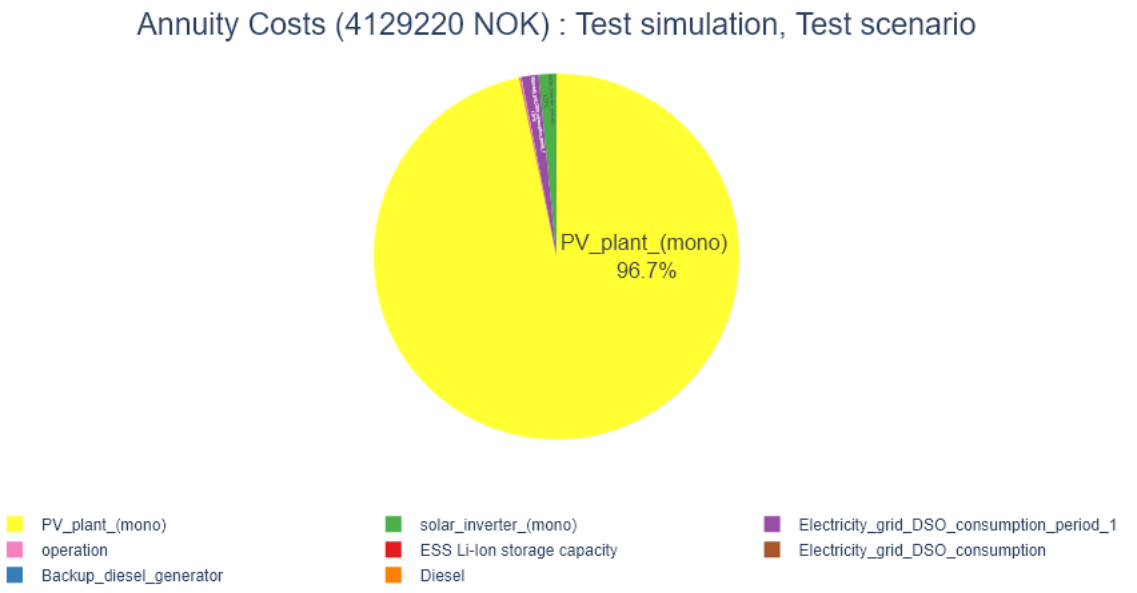
This results in the following KPI of the dispatch per energy sector:

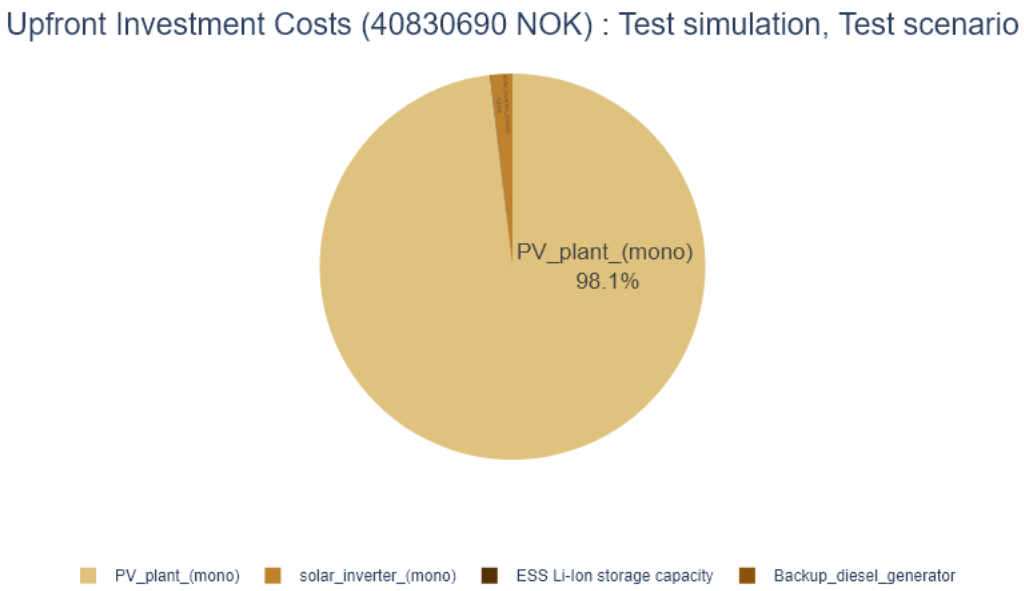
KPI	Electricity
renewable_factor	0.14052520086125644
renewable_share_of_local_generation	0.8895228276842874
total_internal_non-renewable_generation	72.72727200000004
total_internal_non-renewable_generation_electricity_equivalent	72.72727200000004
total_internal_renewable_generation	585.5740809
total_internal_renewable_generation_electricity_equivalent	585.5740809
total_non-renewable_energy_use	11022.939153000001
total_non-renewable_energy_use_electricity_equivalent	11022.939153000001
total_renewable_energy_use	1802.2642899000002
total_renewable_energy_use_electricity_equivalent	1802.2642899000002

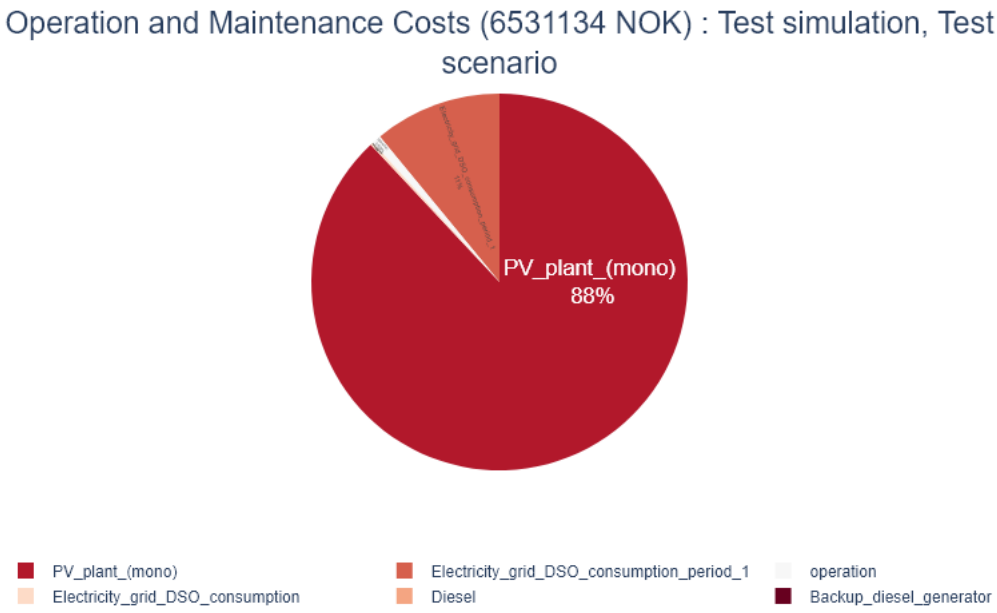
Economic Evaluation

The following installation and operation costs result from capacity and dispatch optimization:

Component	Total costs	Upfront Investment Costs	replacement_costs_during_project_lifetime	annuity_t
ESS Li-Ion storage capacity	22335.79	0	22335.79	1947.3
ESS Li-Ion input power	0	0	0	0
ESS Li-Ion output power	0	0	0	0
Backup_diesel_generator	855.67	600	198.32	74.6
Charge_contoller_ESS_Li-Ion_(charge)	0	0	0	0
Charge_contoller_ESS_Li-Ion_(discharge)	0	0	0	0
Transformer_station_(DSO)_feedin	0	0	0	0
solar_inverter_(mono)	745247.95	560114.34	185133.61	64974.
transformer_station_(DSO)_consumption	0	0	0	0
Electricity_grid_DSO_consumption_period_1	716153.21	0	0	62437.
Electricity_grid_DSO_consumption_period_2	0	0	0	0
Diesel	533.87	0	0	46.55
PV_plant_(mono)	45809980.79	44749746.18	-4687438.01	3993922
Electricity_grid_DSO_consumption	13955.34	0	0	1216.6
Electricity demand	0	0	0	0
ESS Li-Ion bus_excess	0	0	0	0
Electricity_excess	0	0	0	0
Electricity (DSO)_excess	0	0	0	0
Fuel_excess	0	0	0	0
PV plant (mono) bus_excess	0	0	0	0
Electricity_grid_DSO_feedin	0	0	0	0
distribution_grid	0	0	0	0
engineering	0	0	0	0
operation	52761.64	0	0	4600







Energy System: Key Performance Indicators (KPIs)

In the following the key performance indicators of the of Test simulation (ID: 1), scenario Test scenario (ID: 1) are displayed. For more information on their definition, please reference `mvs-eland.readthedocs.io`.

kpi	unit	value
costs_total	NOK	47361824.253539994
costs_om_total	NOK	6531134.02553
costs_investment_over_lifetime	NOK	40830690.22801
costs_upfront_in_year_zero	NOK	45310460.52182
replacement_costs_during_project_lifetime	NA	-4479770.293810001
costs_dispatch	NOK	14489.21353
costs_cost_om	NOK	6516644.812
annuity_total	NOK/year	4129219.6651500002
annuity_om	NOK/year	569414.02657
total_demandElectricity	NA	12289.800000000001
total_demandElectricity_electricity_equivalent	NA	12289.800000000001
total_demand_electricity_equivalent	NA	12289.800000000001
total_excessElectricity	NA	0
total_excessElectricity_electricity_equivalent	NA	0
total_excess_electricity_equivalent	NA	0
total_feedinElectricity	NA	0
total_feedinElectricity_electricity_equivalent	NA	0
total_feedin_electricity_equivalent	NA	0
total_consumption_from_energy_providerElectricity	NA	12166.902090000001
total_consumption_from_energy_providerElectricity_electricity_equivalent	NA	12166.902090000001
total_consumption_from_energy_provider_electricity_equivalent	NA	12166.902090000001
attributed_costsElectricity	NA	47361824.253539994
levelized_costs_of_electricity_equivalentElectricity	NA	335.9875396800908
levelized_costs_of_electricity_equivalent	NA	335.9875396800908
total_internal_renewable_generation	NA	585.5740809
total_internal_non-renewable_generation	NA	72.72727200000004
total_renewable_energy_use	NA	1802.2642899000002
total_non-renewable_energy_use	NA	11022.939153000001
total_internal_generation	NA	658.3013529000001
renewable_share_of_local_generation	NA	0.8895228276842874
renewable_factor	NA	0.14052520086125644
onsite_energy_fraction	NA	1
onsite_energy_matching	NA	0.05356485483083533
degree_of_autonomy	NA	0.00999999267685395
degree_of_NZE	NA	0.00999999267685392
total_emissions	NA	427.53477
specific_emissions_per_electricity_equivalent	NA	0.03478777278718937

Logging Messages

Warning Messages

- The parameter type_asset in the file tests/inputs\csv_elements\energyConsumption.csv is not expected. Expected parameters are: file_name, type_oemof, energyVector, inflow_direction, unit
- You have chosen a number of peak demand pricing periods > 1.Please be advised that if you are not simulating for a year (365d)an possibly unexpected number of periods will be considered.
- When the maximum emissions constraint is used and no production asset with zero emissions is optimized without maximum capacity this could result into an unbound problem. If this happens you can either raise the allowed maximum emissions or make sure you have enough production capacity with low emissions to cover the demand.

- minimal_degree_of_autonomy constraint strictly not fulfilled, but deviation is less then e6.
- Attention, on bus ESS Li-Ion bus there is excessive excess generation, totalling up to 100% of the inflows. The total inflows are 5 and outflows 0 It seems to be cheaper to have this excess generation than to install more capacities that forward the energy carrier to other busses (if those assets can be optimized).

Error Messages

- Parameter scenario_description of asset project_data (group: project_data) is missing. The simulation may continue, but errors during execution or in the results can be expected.