MAASTRICHT AACHEN AIRPORT

An introduction to… Developments in energy demand and production

Maastricht Aachen Airport

Sustainability & Innovation

February 2023

Introduction – Sustainability ambitions

- Maastricht Aachen Airport aims to achieve net-zero carbon emissions by 2030

Sustainability ambitions

- ACA (Airport Carbon Accreditation)
- CO_2 ceiling for aviation
- Severe nuisance decrease
- Emission fine particles

Legislations / prerequisites

- Civil aviation policy
- EU green deal (Fit for 55)
- Licence to operate

Analysis – Current Situation

Maastricht Aachen Airport is a regional airport in the Netherlands

- Maastricht Aachen Airport is a regional airport in the Netherlands with a strong focus on handling cargo flights. In 2019, the airport handled over 110.000 tons of cargo and 450.000 passengers. Besides these operations, MAA also offers an aircraft maintenance boulevard and a general aviation FBO. All flights at MAA were operated by conventional aircraft.
- In terms of electricity, the operation of Maastricht Aachen Airport is supported by multiple grid connections. In the current situation, MAA is only a **consumer** of electricity and **only limited supplier**.
- The energy demand of MAA is split over these connections, with the internal “high voltage grid” being the largest consumer.
- Other real estate managed by MAA are the passenger terminal and buildings located on the alpha apron, which are connected to the high voltage grid, Cargo Terminal East, Cargo Terminal North, *overslagloods, Horse Hotel, Vista College, Jet Center and the Aviation House*.

Developments in electricity demand

Internal developments

- Energy demand is decreasing at first, due to technological adjustments. This includes replacing the lighting by LED lighting and other more efficient systems. Using the electricity more efficiently is another way to decrease the demand.
- At a later stage, the energy demand will increase, due to electrification of fossil fuel powered equipment. This includes replacing GSE with e-GSE or rethinking the method of heating.
- The third development is the production of renewable energy at MAA. By placing solar PV panels, the of grid energy consumption can be reduced. In 2021, the solar PV panels on the roof of Cargo Terminal East reduced the off-grid energy consumption of the building by 40%.

Developments in aviation tech:

- Towards 2035, electric aircraft are expected to enter commercial service.
- These electric aircraft are powered by alternative power sources, such as battery-electric, hybrid-electric of hydrogen-electric.
- Battery-electric aircraft have to be recharged at the airport during the turn-around process. The expectation is that, due to short turn-around times and high-capacity batteries, the peak demand for recharging these batteries is high.

Assumed Situation 2035

Assumptions for energy calculation

- All energy demand is summed up in this calculation, neglecting separate grid connections
- Electricity demand buildings/lighting equal to 2020
- Fuel demand (ground-) vehicles equal to 2020, but 100% electric
- Natural gas demand heating buildings equal to 2020, but 100% electric
- Scenario electric aviation at MAA as included in business case:
  - Approx. 50.000 movements e-aviation
- Conventional aviation remains equal to 2020 in volume and movements

Assumed energy demand MAA 2035

Energy demand ground operation MAA

For this calculation, the energy demand of buildings is assumed to remain equal in this scenario. The key figures for this equation are:

- Electricity demand: 4.000.000 kWh
- Natural gas demand: 600.000 m^3, equalling 1.600.000 kWh
- Fuel demand: 250.000 liters of Diesel, equalling 3.000.000 kWh
- Total demand: 8.600.000 kWh annually (8.6 GWh)

Energy demand electric aviation

- Assuming full (re-) charges of 820 kWh batteries in 30 minutes for eCTOL and eCargo and 300 kWh batteries for eVTOL.
- The total energy demand for recharging the electric airplanes would sum up to 16.480.000 kWh (16.5 GWh)

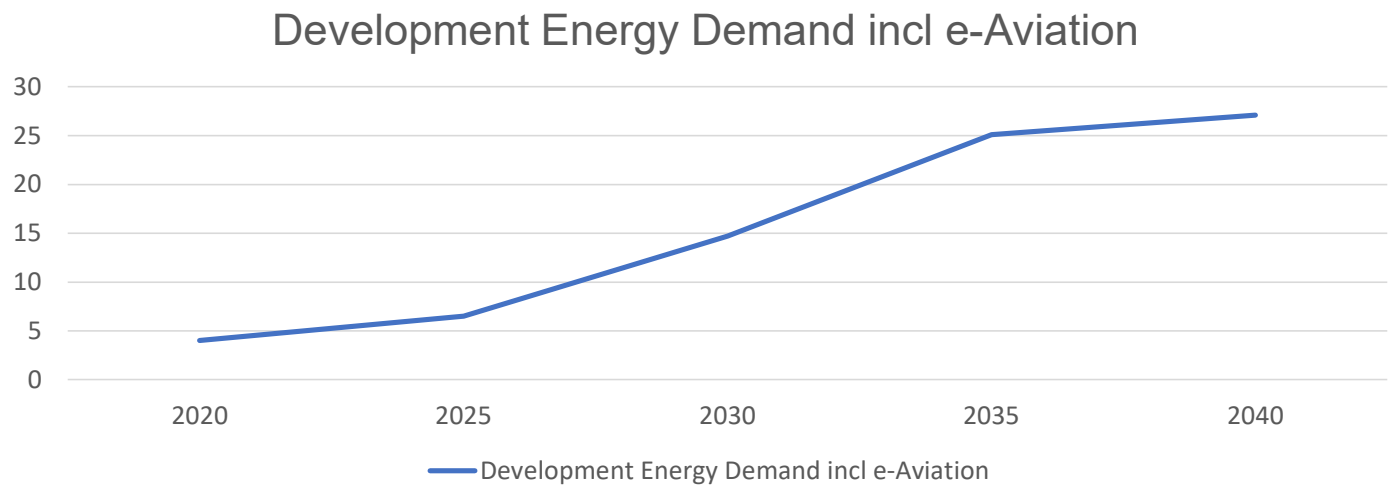
Total energy demand 2035

Taking into account assumptions

- Buildings & lighting: 8.6 GWh
- Electric aviation: 16.48 GWh
- **Total: 25.08 GWh**

Energy demand GWh MAA 2020-2040

The scenario for the implementation of low-carbon emission aviation is presented; resulting in a potential energy demand as visualized in the graph below.



How to go from the current situation to 2035?

Assumed that all e-aircraft are recharged through the high voltage grid

- Assuming that all electric aircraft are recharged through the high voltage grid, the remaining connections only serve the buildings they currently serve. Research is needed to identify which measures are needed at these locations (replacing natural gas consumption)
- This means the gird connection of the high voltage grid **has to** be enlarged to facilitate enough energy through this connection.
- It is feasible to support the connection with renewable energy production on-site and battery storage?

Solar PV required to generate demand MAA 2035

Assuming that all energy demand is generated with solar PV.

- Required energy: 25.08 GWh
- Solar MWp required: 26.4 MWp
- # solar PV panels required: 75.400
- Solar PV m^2 required: 128.200 m^2

- Key figures:
- Production hours PV: 950 h/year
- Solar PV kWp/panel: 0.35 kWp
- Solar PV m^2/panel: 1.7 m^2

However, the renewable energy production via solar PV curve and energy demand curve are different

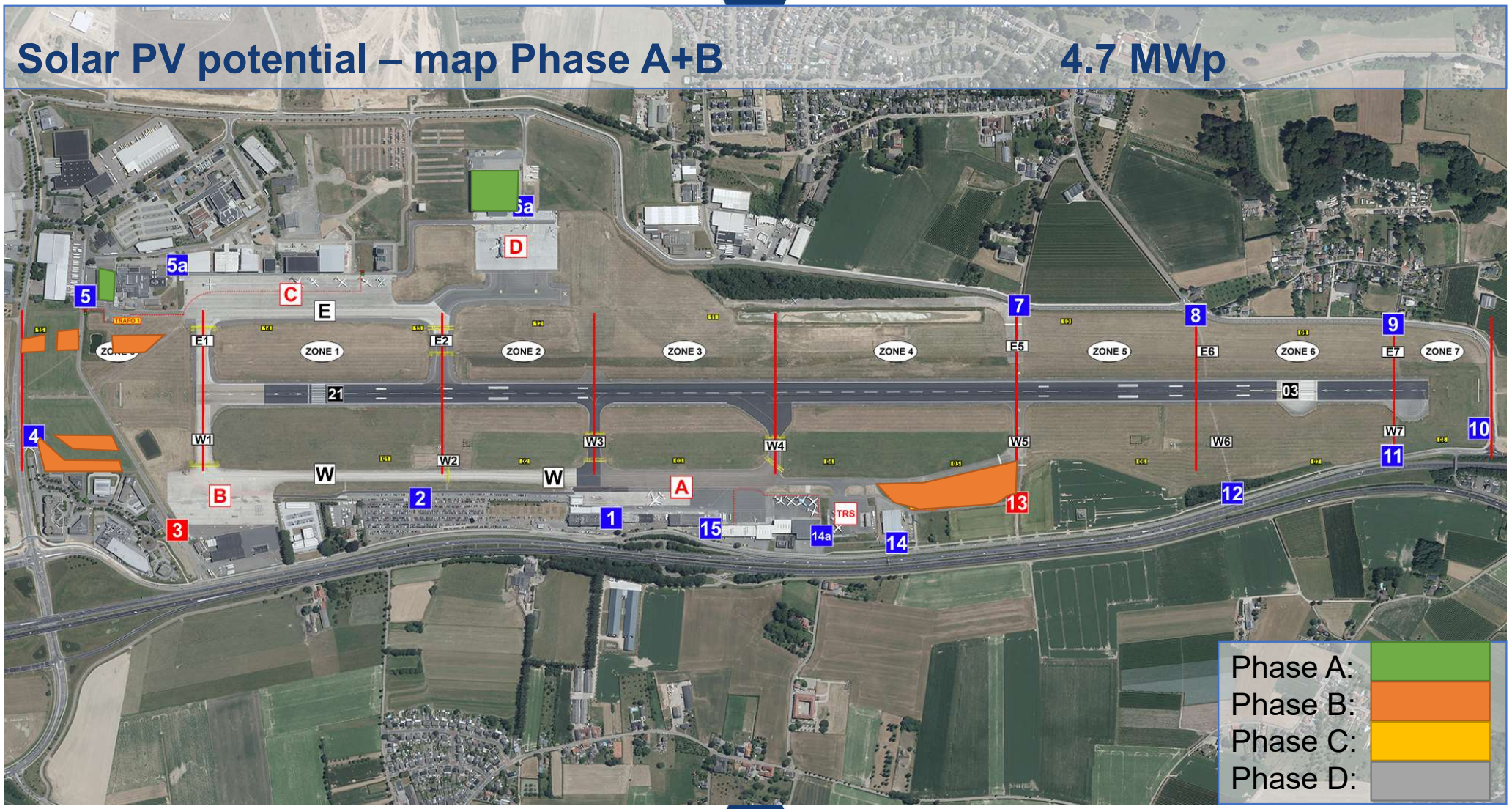
During summer, peaks in energy production will be higher than energy demand

Current Solar PV projects

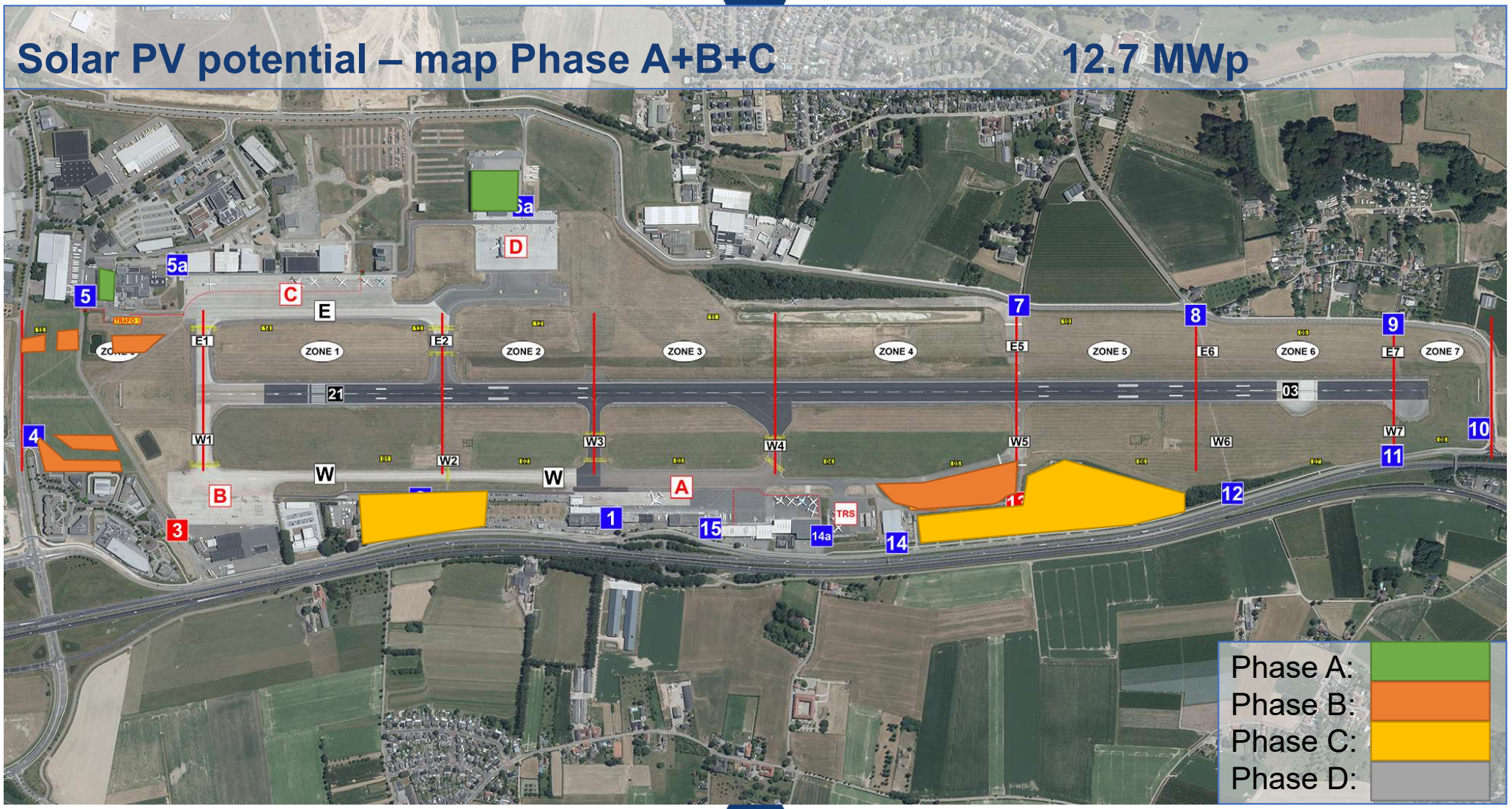
			Status:
Phase A:			*Realised / tendered*
1.	Roof top Cargo Terminal East:	0.6 MWp	
2.	Roof top Overslagloods:	0.4 MWp	
Phase B:			*Exploring tender options*
3.	Solar Park North:	1.7 MWp	
4.	Solar Park South (P7):	2.0 MWp	
Phase C:			*Near-future development options*
5.	Solar Parking P1:	2.0 MWp	
6.	Solar Parking P7:	6.0 MWp	
Phase D:			*Indicative locations for further development*
7.	Other indicative locations:	13.3 MWp	

11.7 MWp Solar PV production on high voltage grid

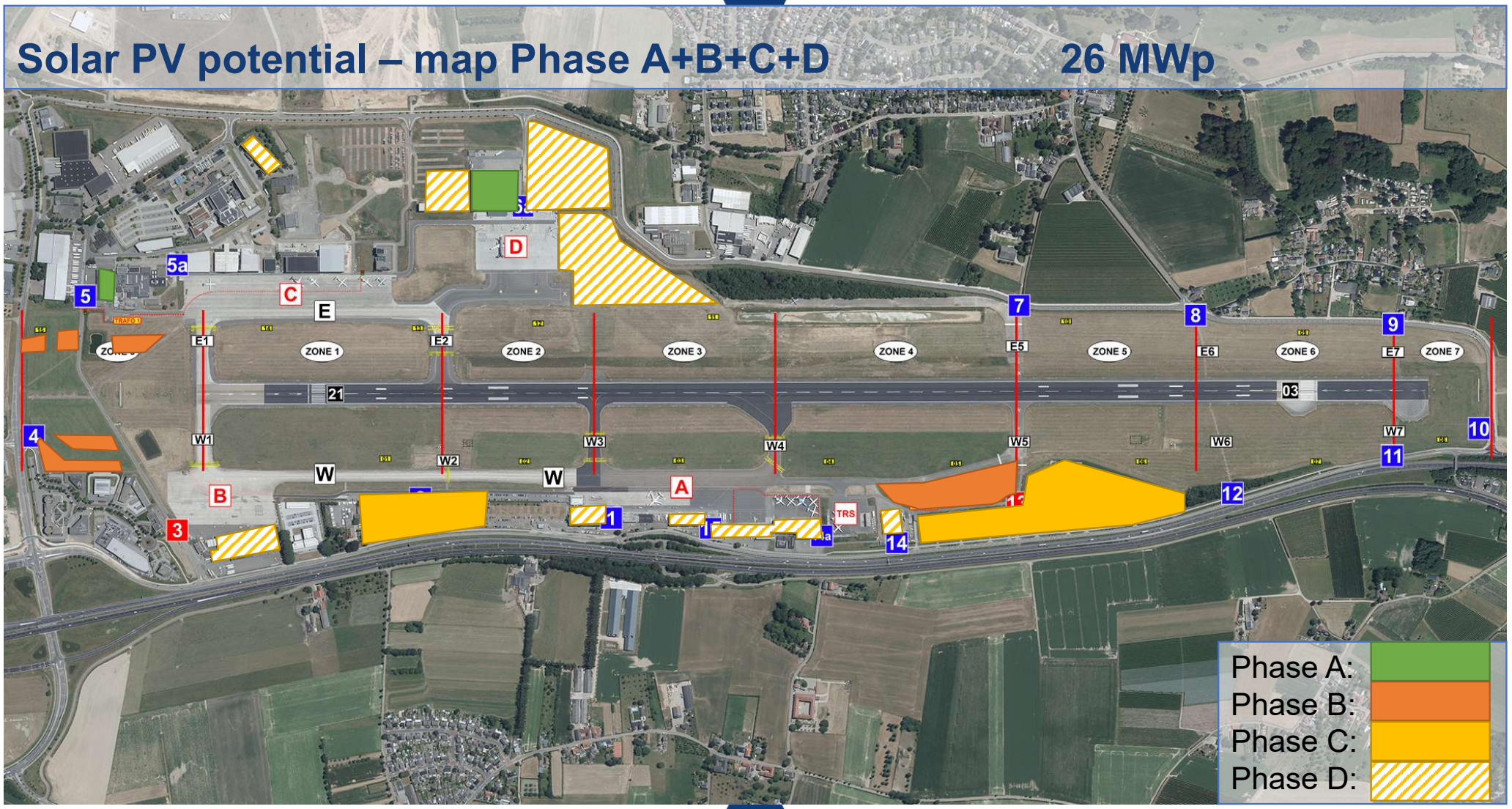
Solar PV potential – map Phase A+B 4.7 MWp



Solar PV potential – map Phase A+B+C 12.7 MWp

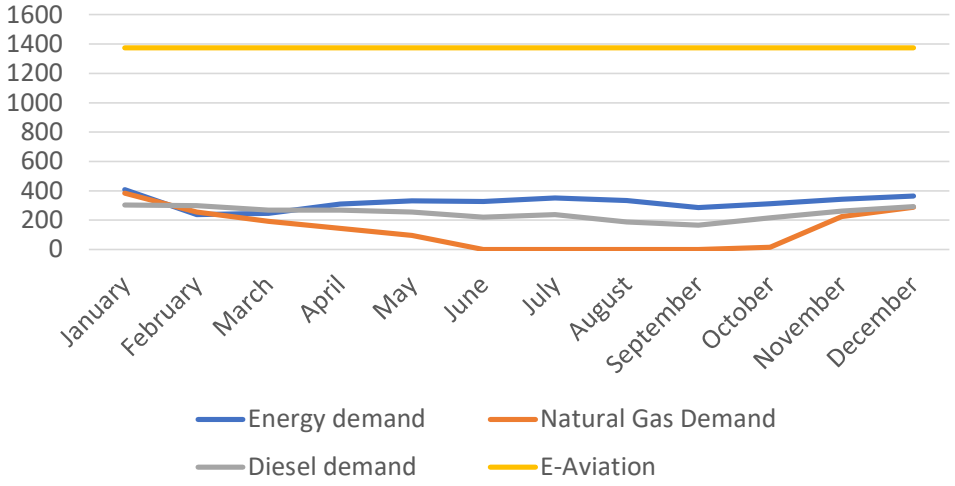


Solar PV potential – map Phase A+B+C+D 26 MWp

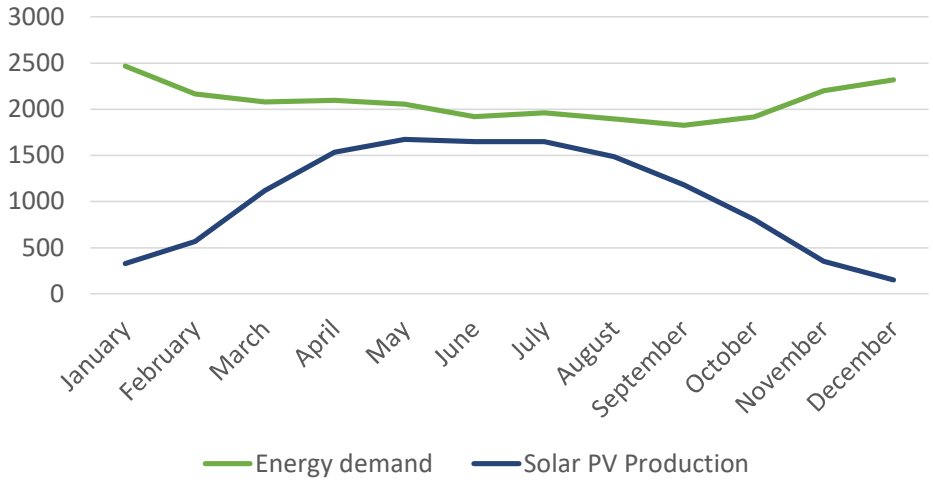


Annual energy demand curve

Estimated energy demand 2035 per source (MWh)

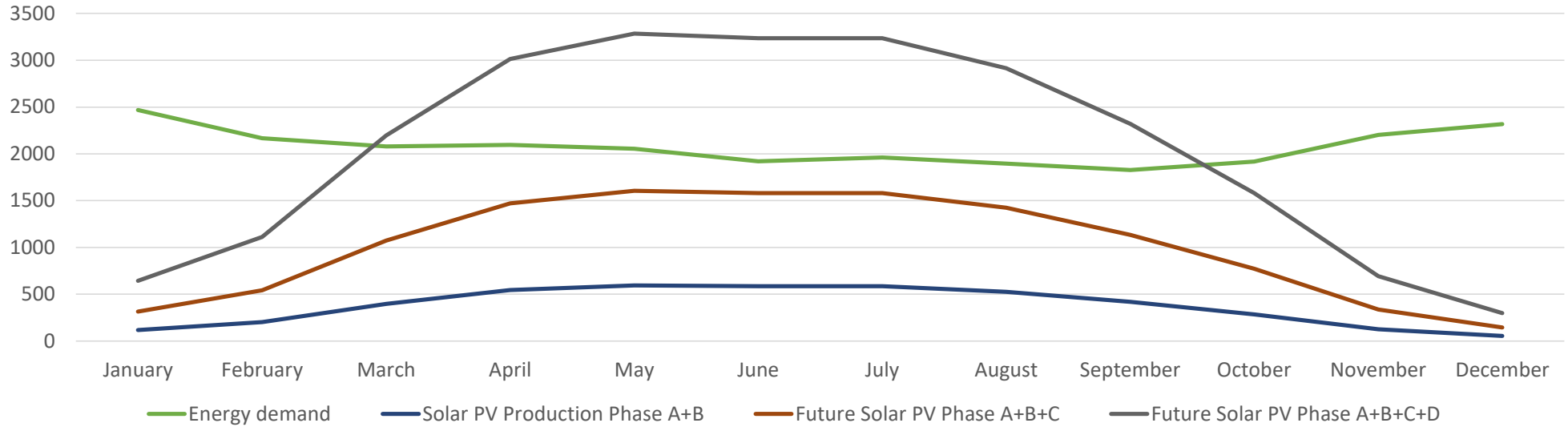


Estimated energy demand 2035 stacked + solar PV production curve Phase A+B+C (MWh)



Annual energy demand curve

Estimated energy demand 2035 stacked + solar PV production curve current & future projects (MWh)



Considerations

- Daily demand curve vs daily PV production curve
- Grid stability and grid congestion
- Peak loads on grid connection
- Energy storage – day-night
- Financing & cost-benefit analysis