SCADA is key to PtX

PtX connects energy sectors. Therefore, the overall SCADA system should also look across energy sectors, and, in that way, form a symbiosis.

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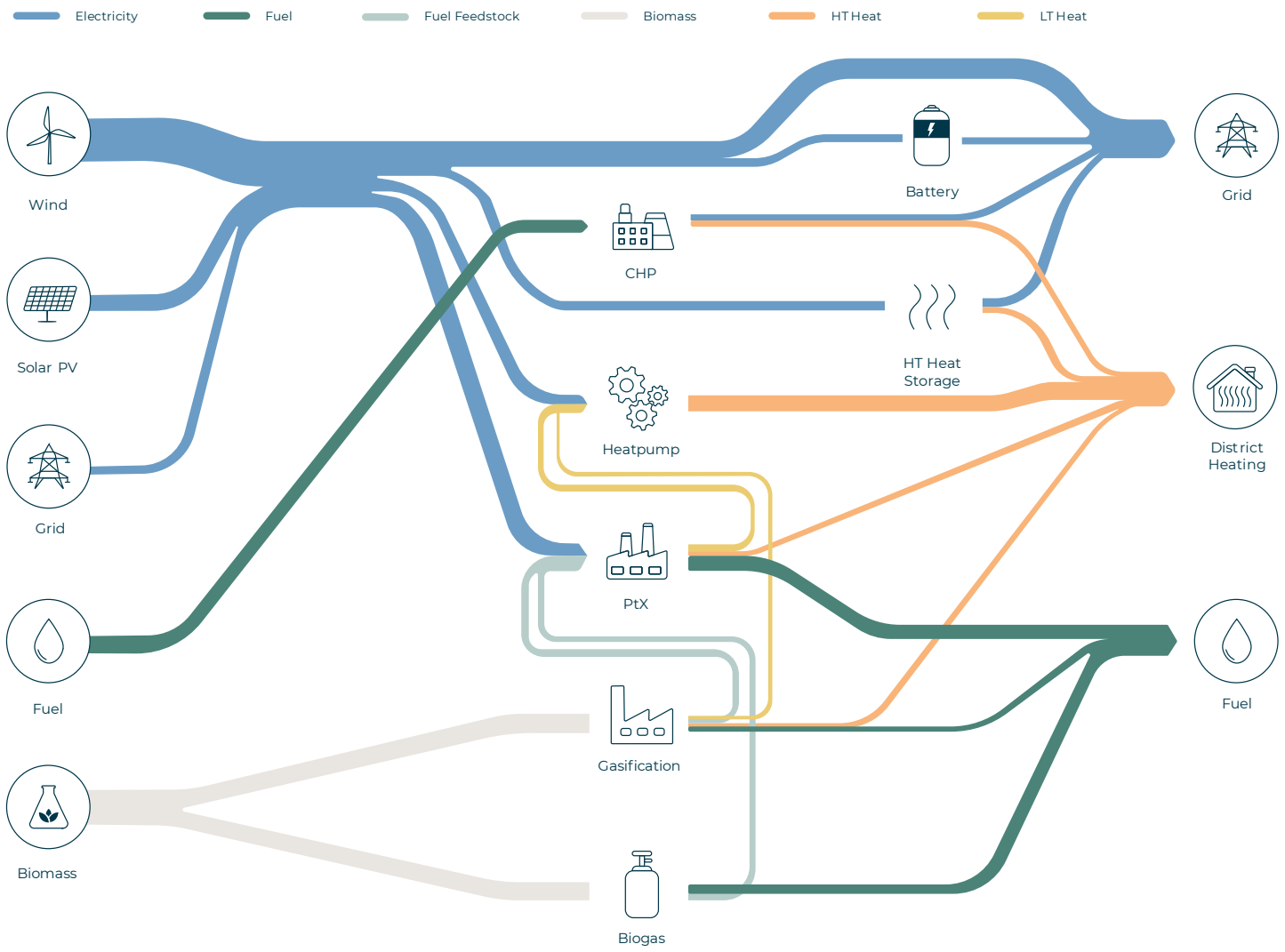
How can we transition into a 100% renewable energy system?



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Agenda

1. The challenges of becoming renewable
2. The role of PtX and SCADA in the energy system of the future

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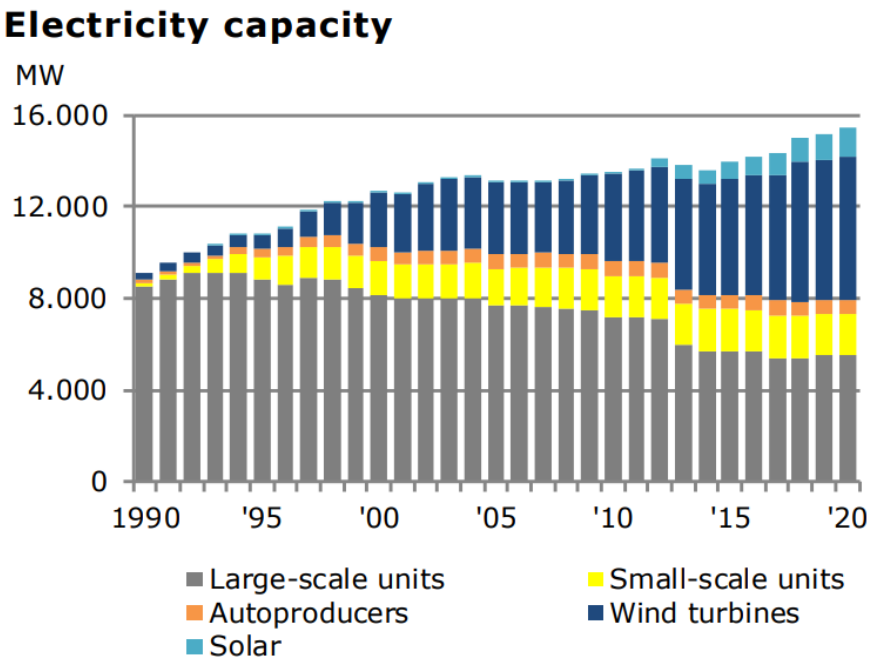
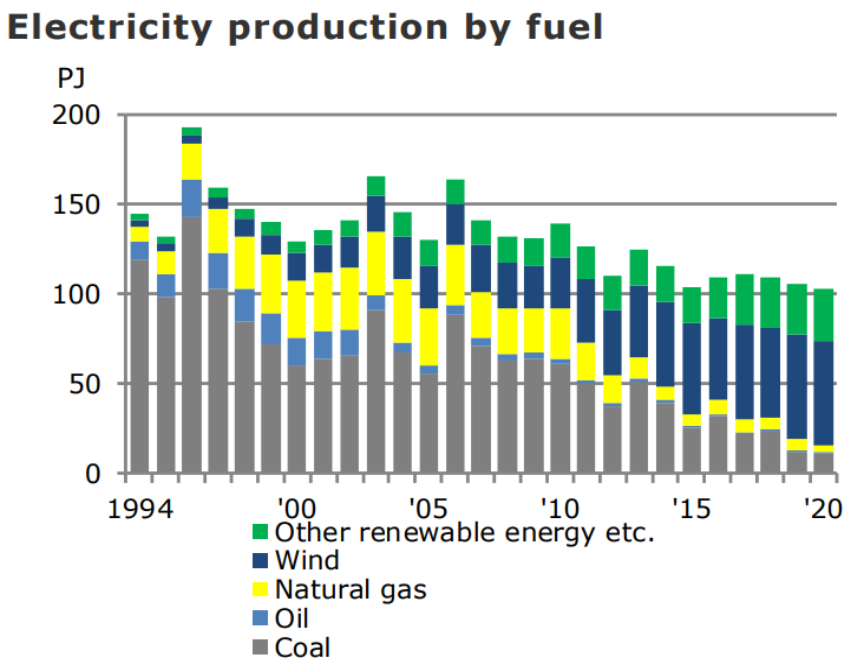
Status in Denmark: We are becoming renewable

Renewable energy movement (from 1990-2020)





Danish Energy Agency, Energy Statistics 2020

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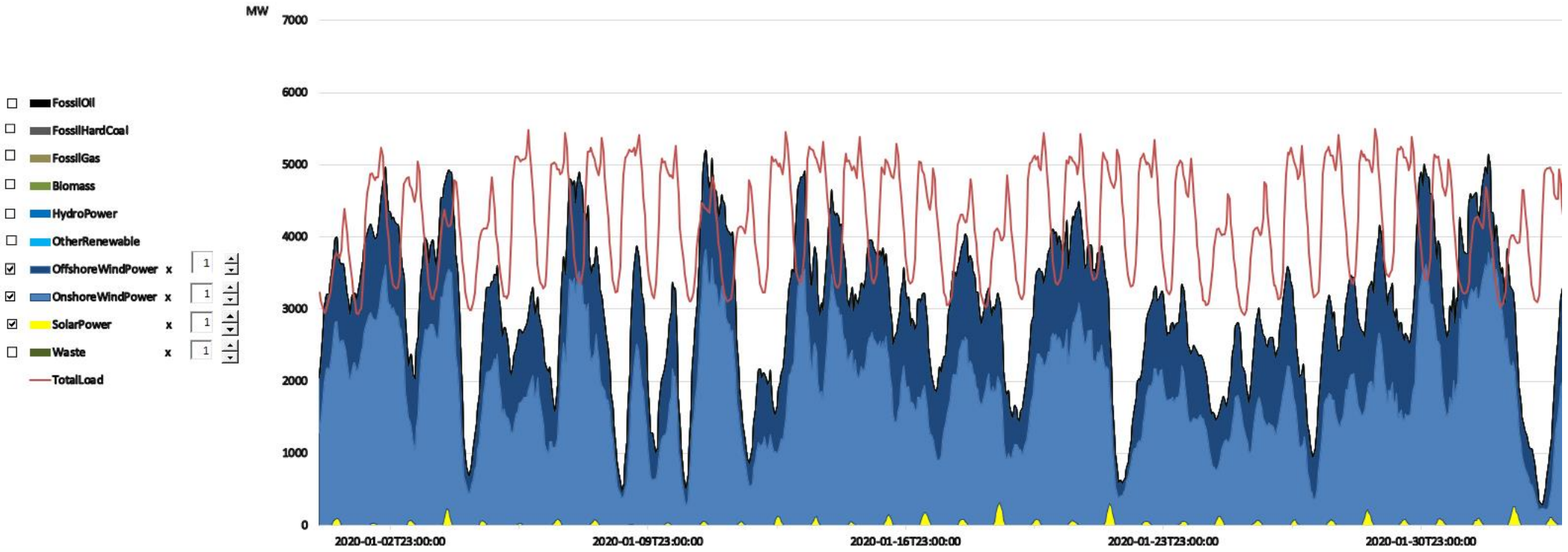
On windy days, Denmark has already reached a limit for wind capacity



Wind and Solar PV production vs electricity demand in Denmark, January 2020

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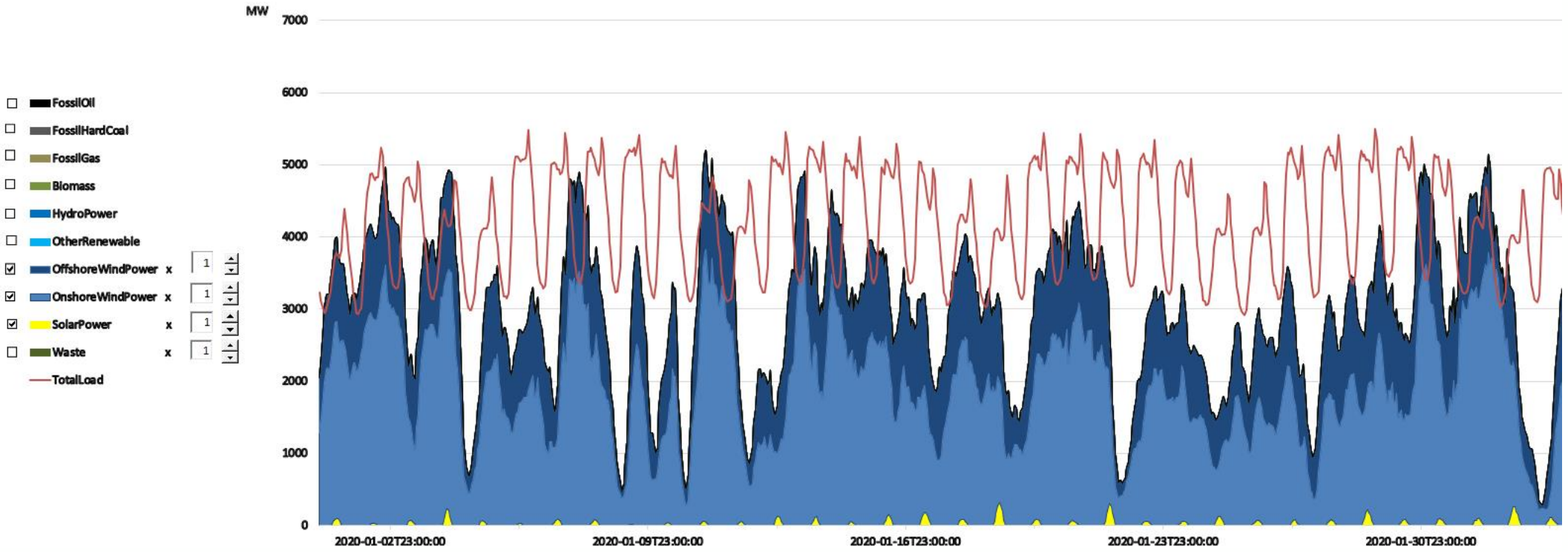
Challenge 1: We have surplus energy that we cannot use

We curtail the turbines according to demand and price

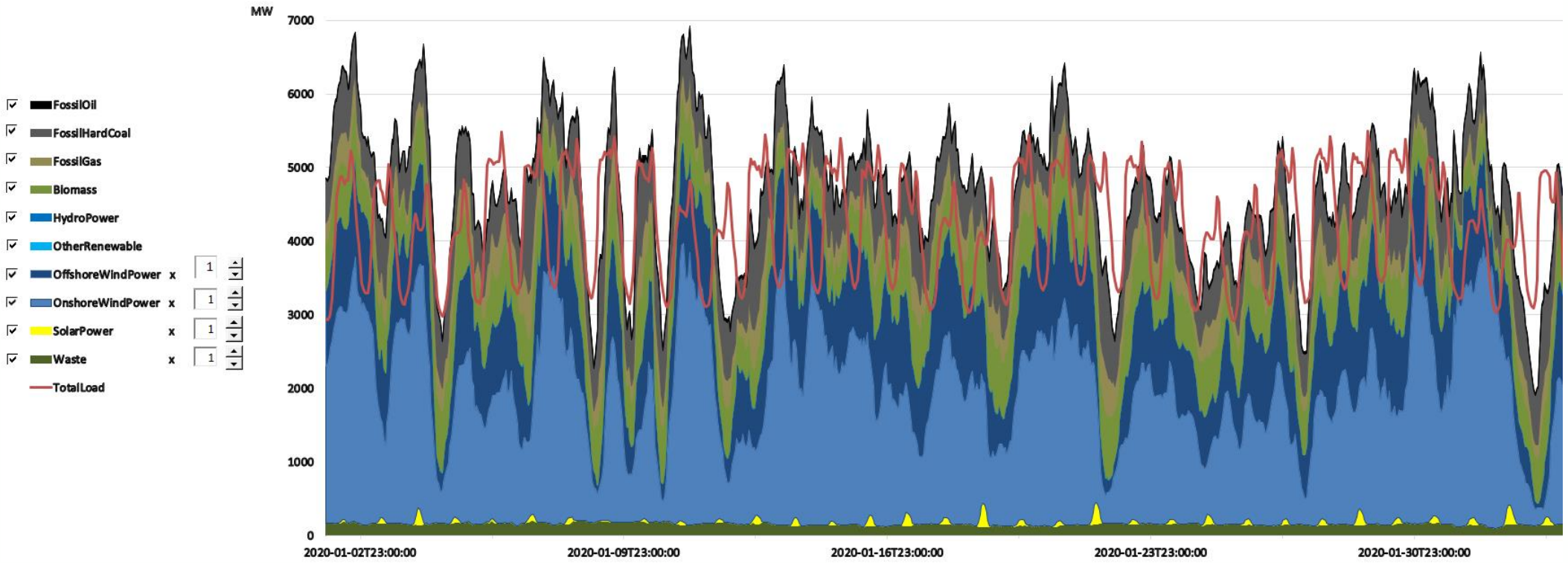


Wind and Solar PV production vs electricity demand in Denmark, January 2020

SCADA international

Challenge 2: The power supply is not stable

We need power reserves to ensure a balanced grid



Total production vs electricity demand in Denmark, January 2020

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A quick look at the goals of the future

The challenges become even more significant

2030: The Danish Government plans to increase the renewable capacity

- **x 2** Onshore wind
- **x 10** Solar PV
- **x 5** Offshore wind

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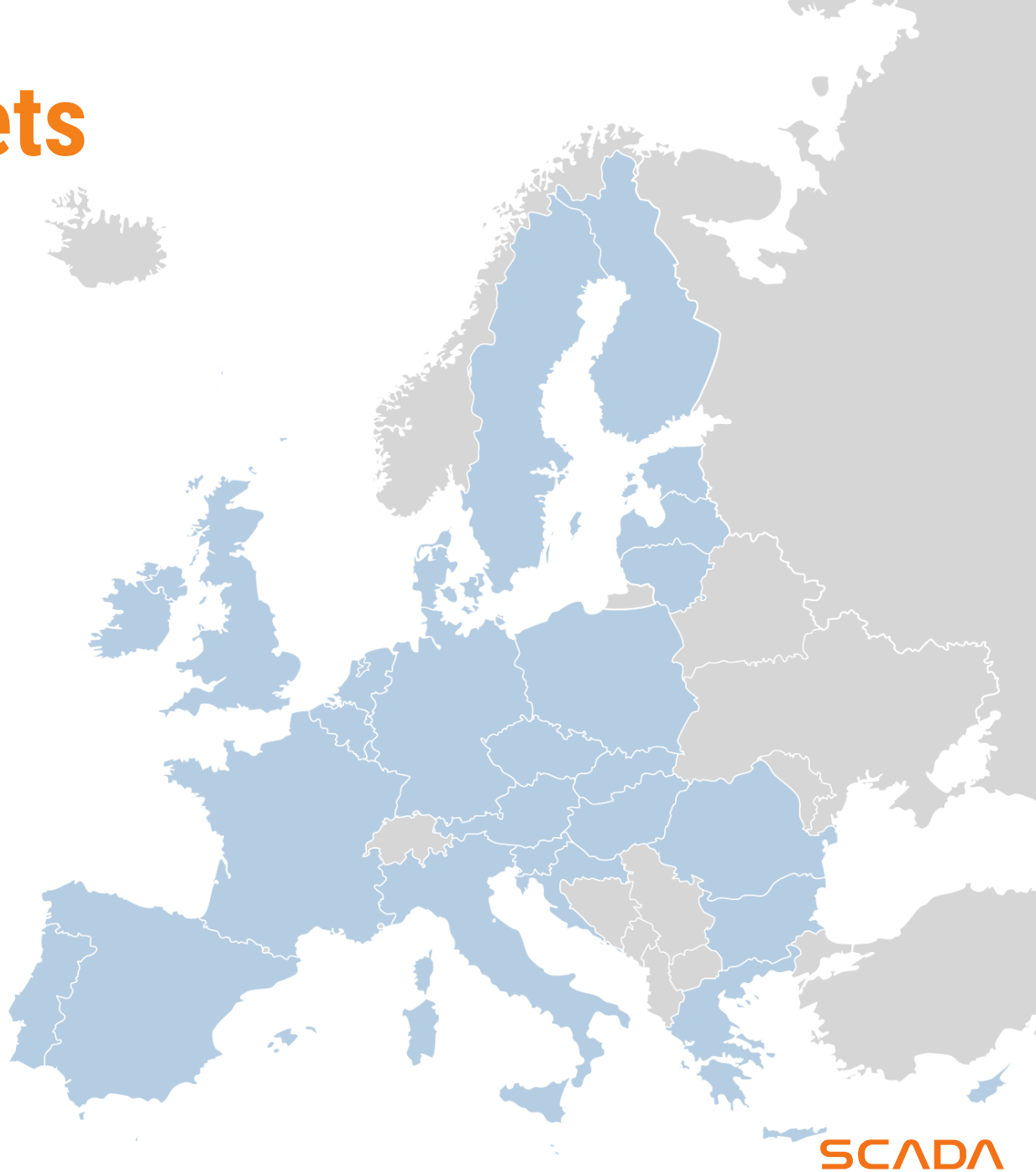
The EU has similar targets

The European Commission’s targets

60 GW
Offshore wind
2030

300 GW
Offshore wind
2050



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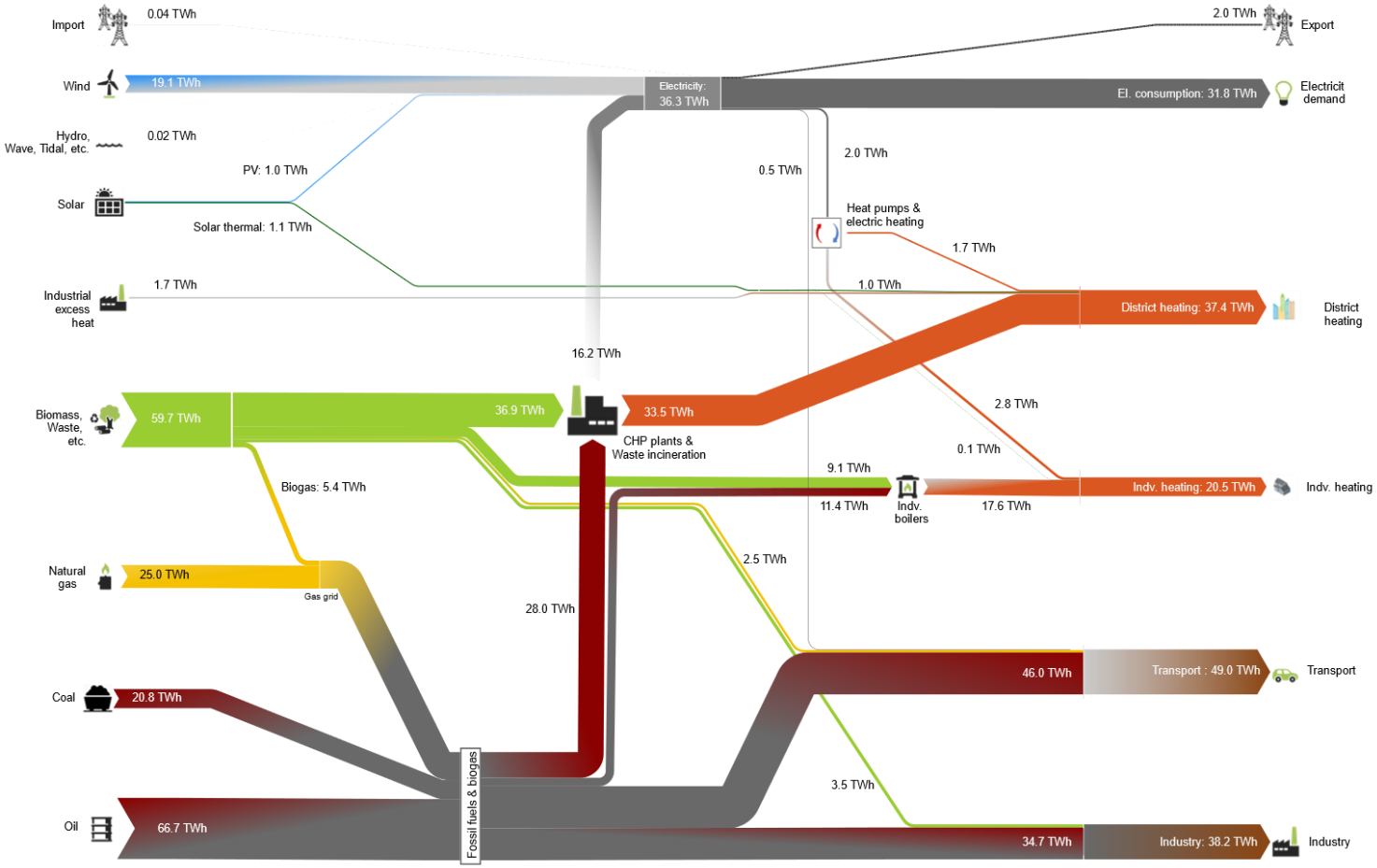
We need to utilize the potential in renewable energy



In 2020, fluctuating renewables covered **50 percent** of the electricity demand

...But around **10 percent** of the entire energy demand

IDA's Klimasvar 2045, Energy in Denmark 2020

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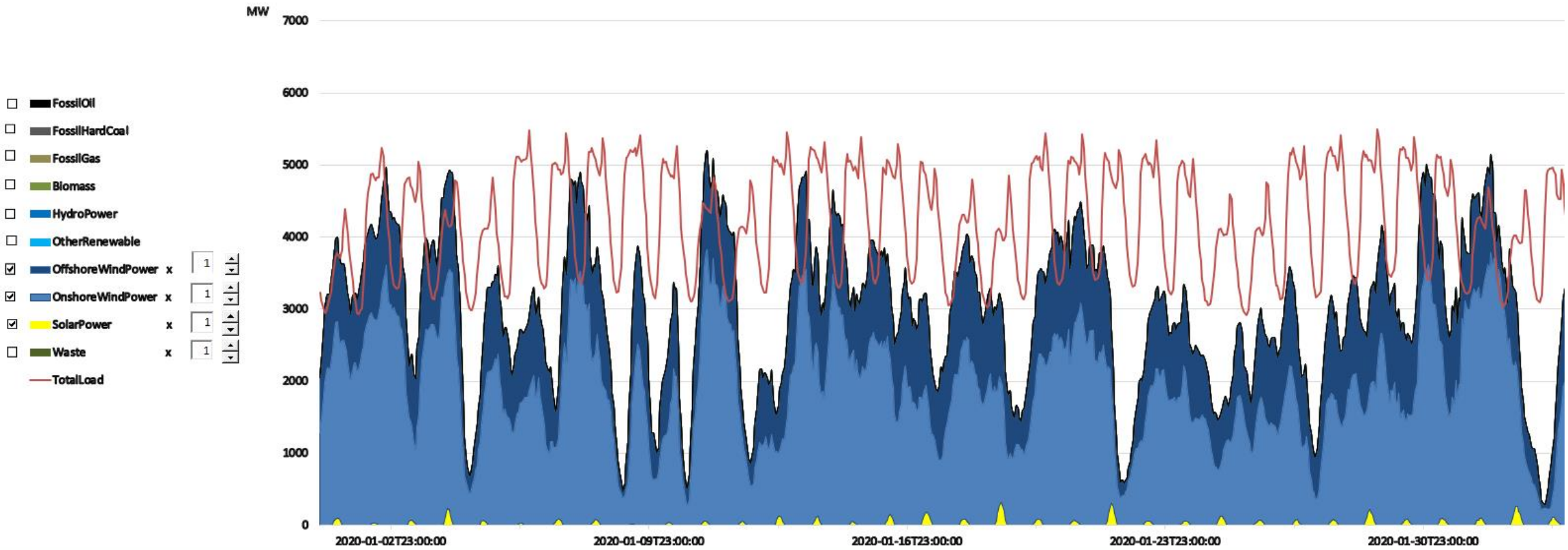
With the increase in capacity, we will go from this...



Wind and Solar PV production vs electricity demand in Denmark, January 2020

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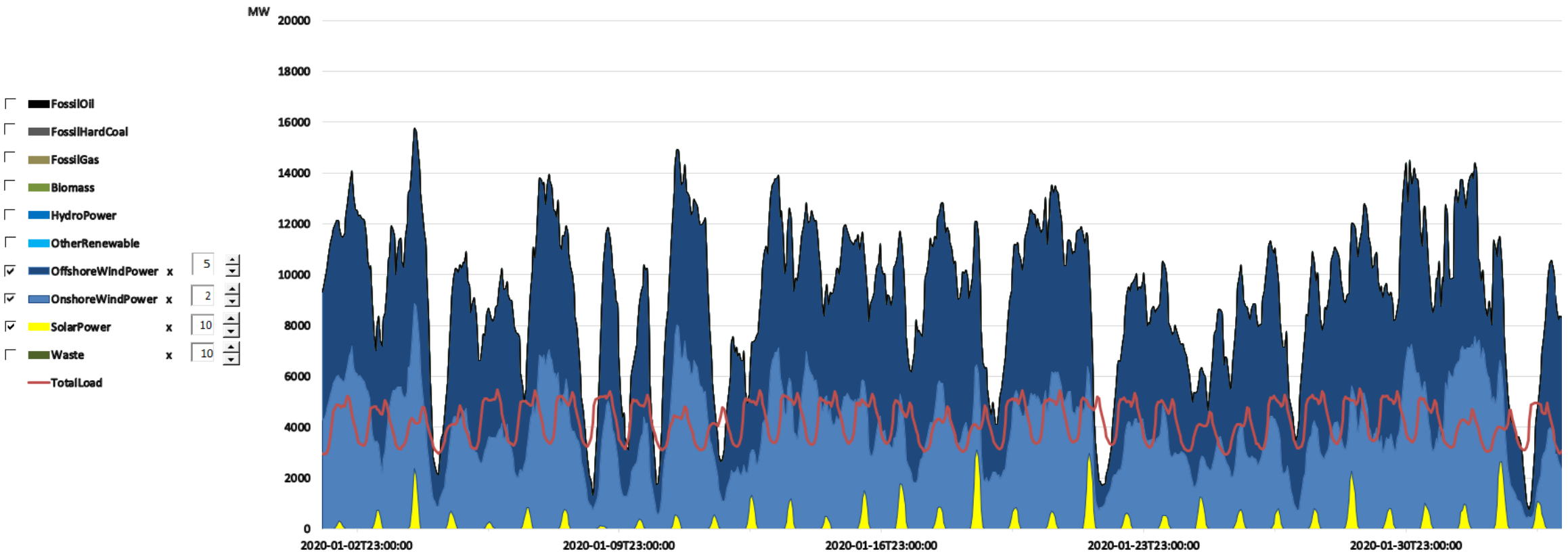
To this!



Wind and Solar PV production vs electricity demand in Denmark, January 2020 – with 2030 planned capacity increase.

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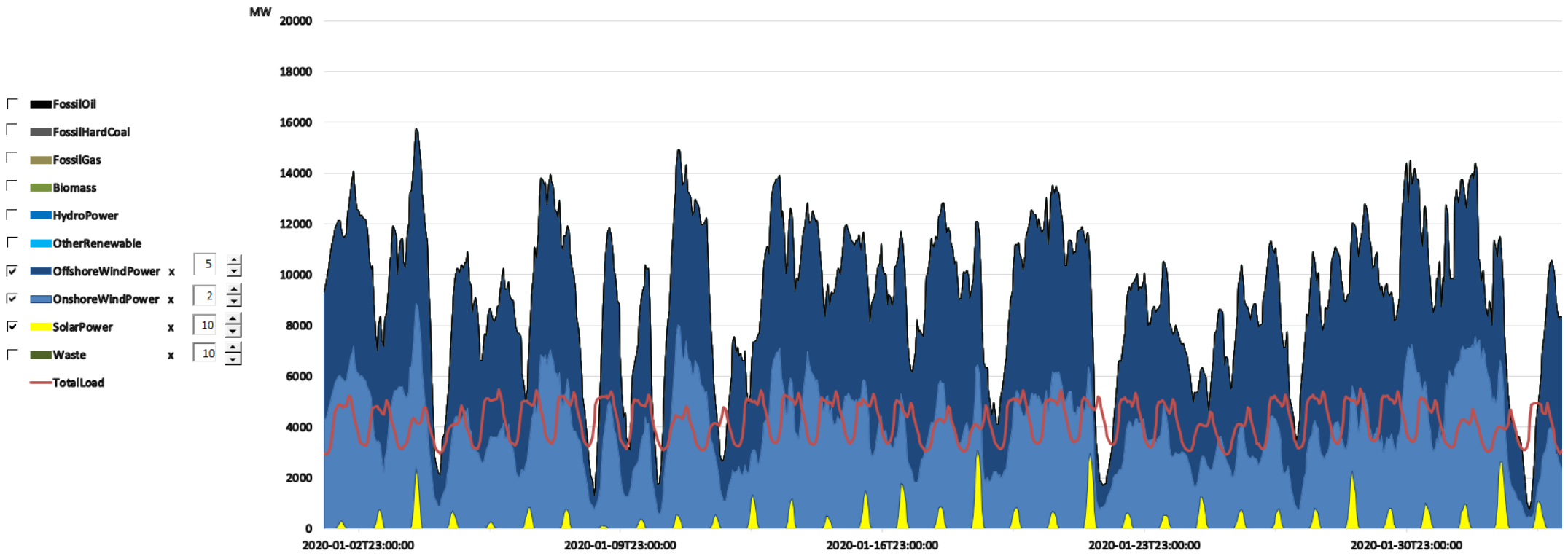
We still can’t control the weather

The power production varies according to the weather

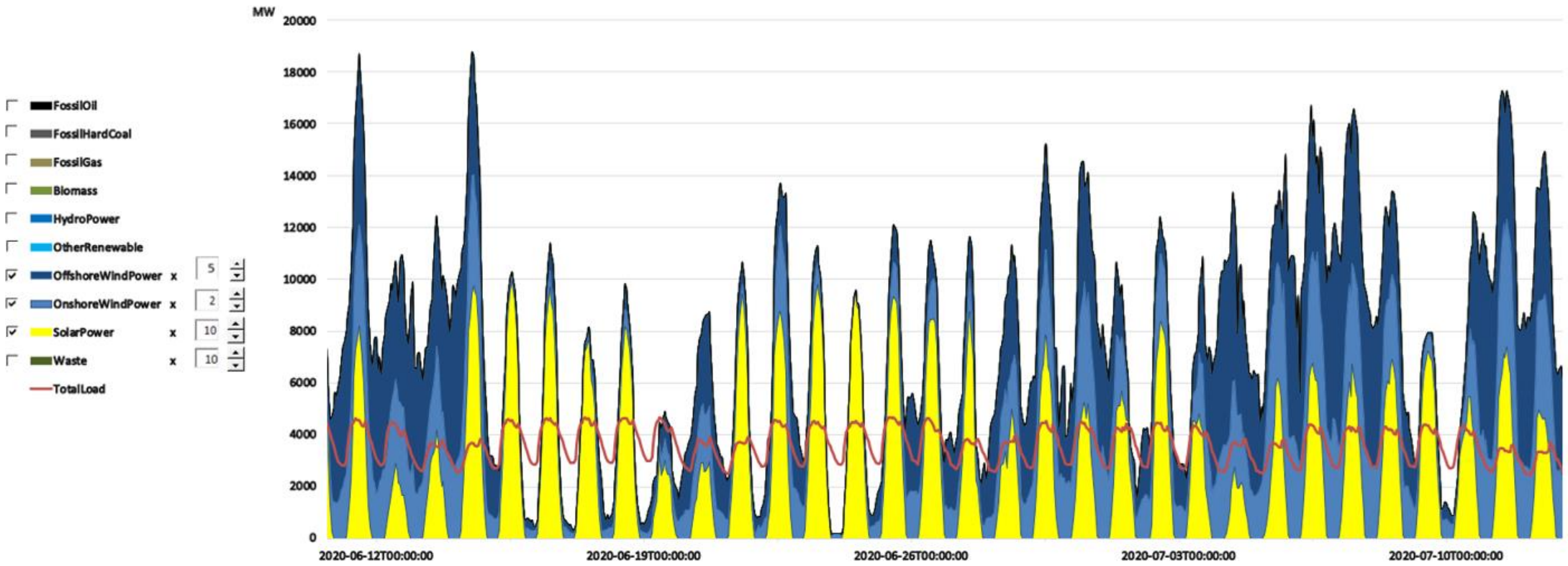


January 2020

SCADA international

We still can’t control the weather

The power production varies according to the weather



June-July 2020

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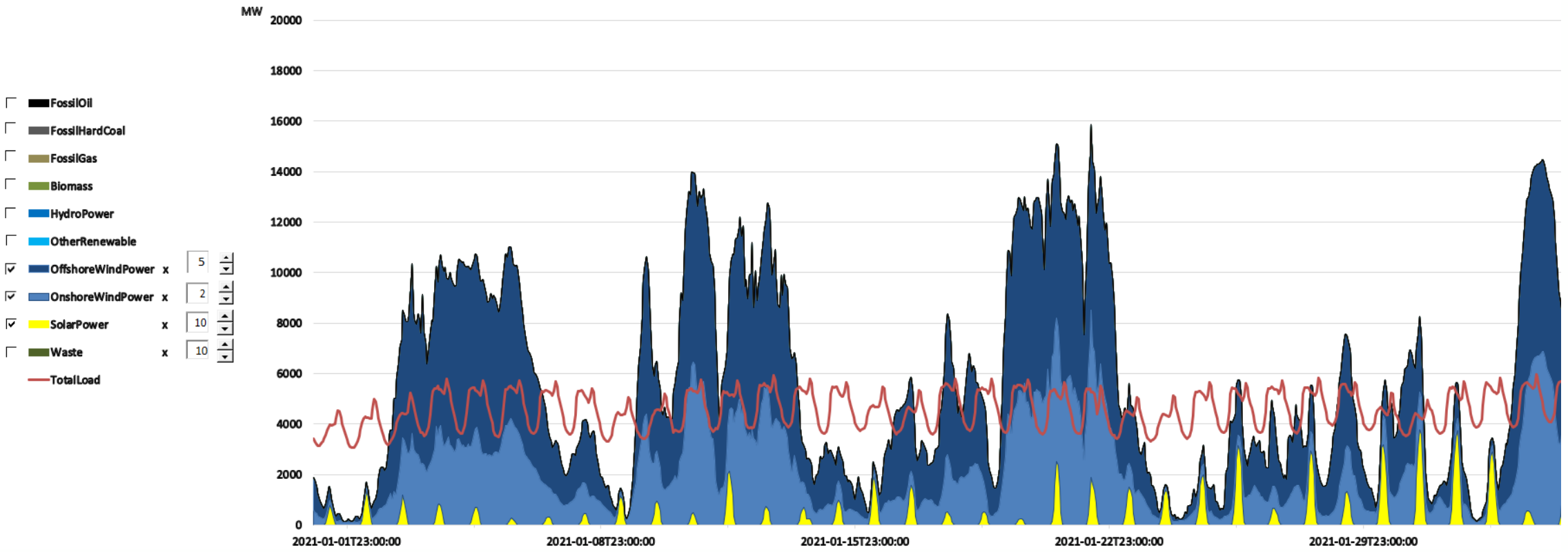
We still can’t control the weather

The power production varies according to the weather



January 2021

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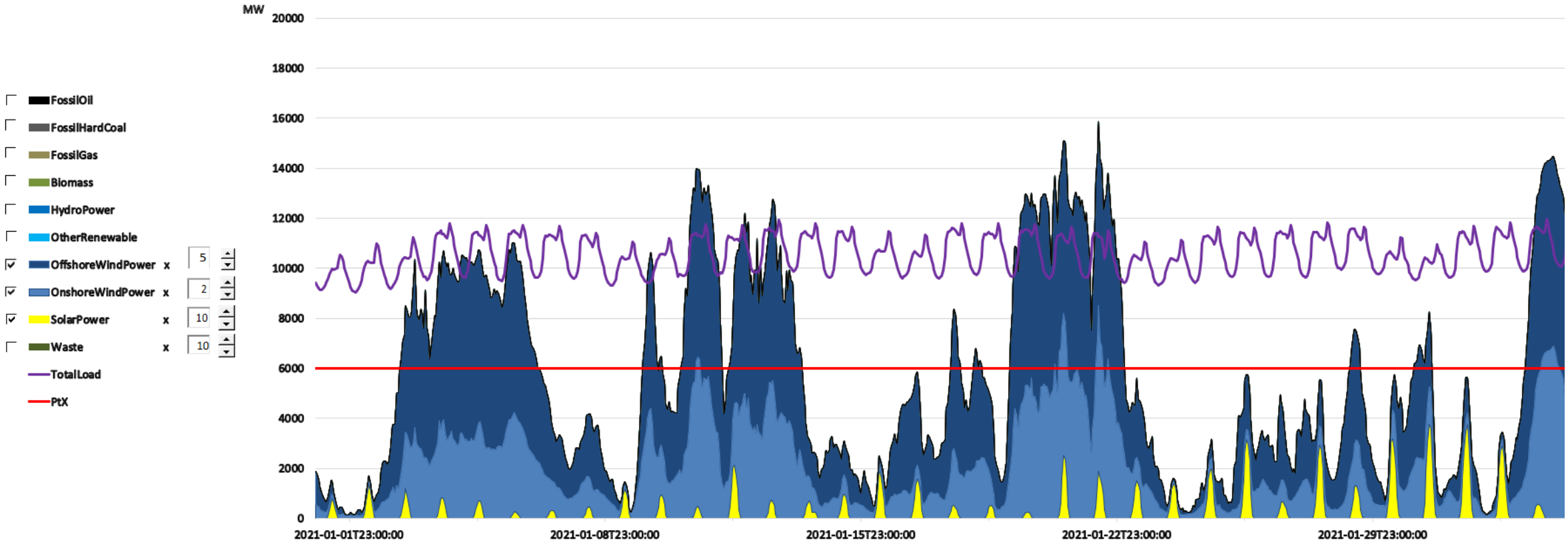
Adding PtX production will increase load

But not even out the fluctuations if added as a baseload



Wind and Solar PV production vs electricity demand in Denmark, January 2021 – with 2030 planned capacity increase and 6 GW planned PtX as continuous load.

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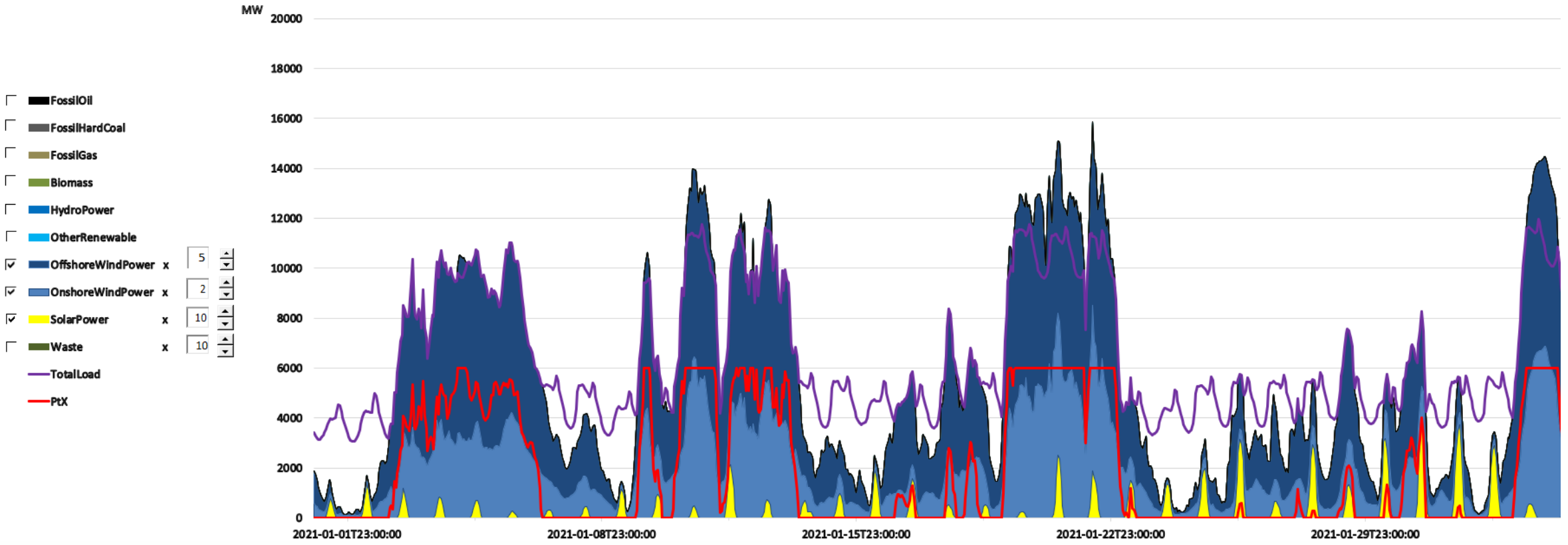
Controlling the PtX power is the solution

Below, the 6 GW of electrolyzer/PtX capacity is controlled based on available surplus electricity



Wind and Solar PV production vs electricity demand in Denmark, January 2021 – with 2030 planned capacity increase and 6 GW planned PtX as controlled load.

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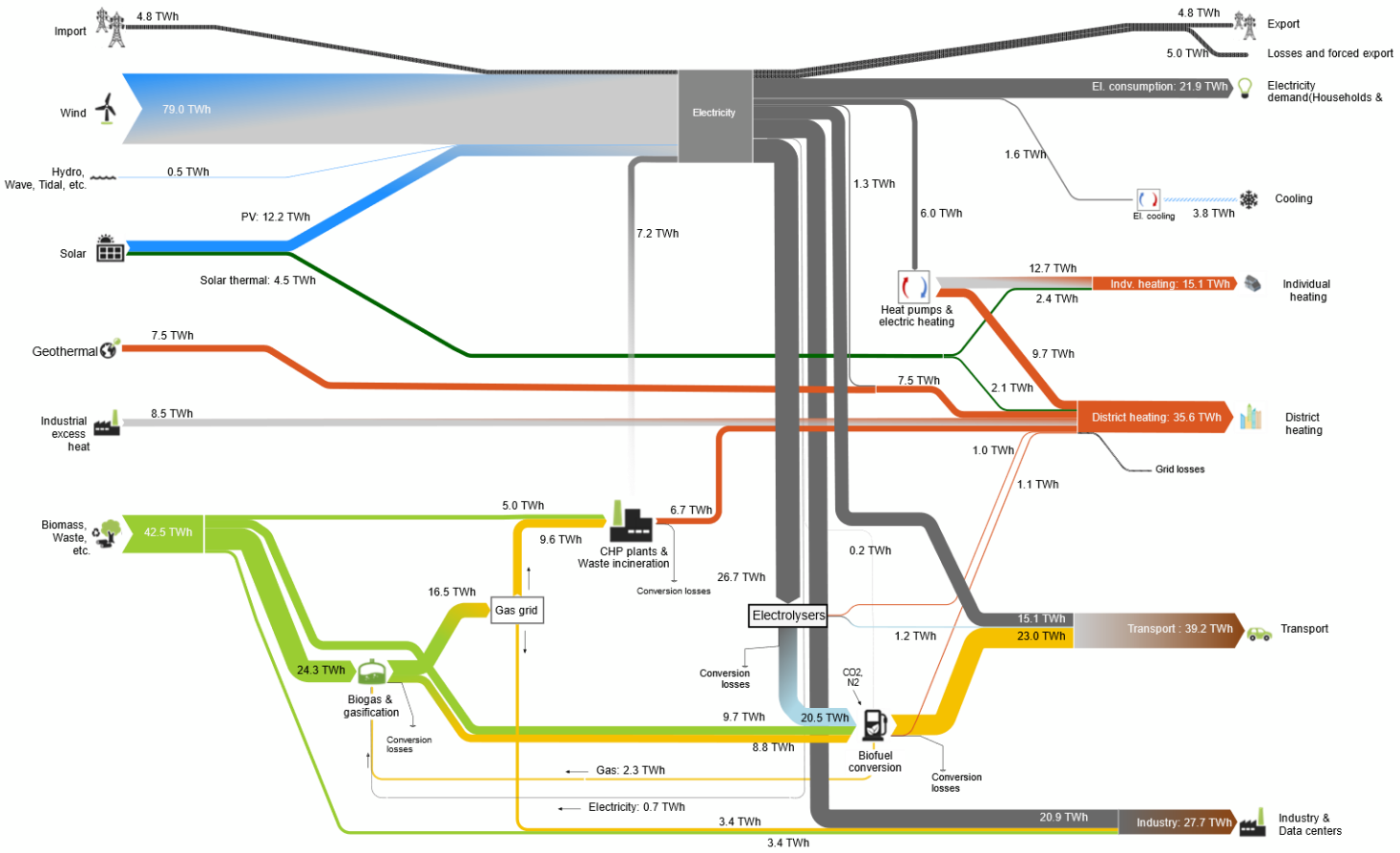
PtX can enable a scenario for a 100% renewable energy system

When it is integrated with other systems and controllable

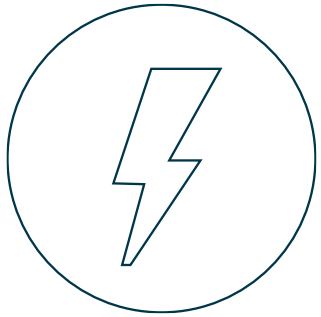
- PtX is much more than electrolysis
- Electricity can be used for heating via heat pumps
- Heat loss from various conversion technologies can be used in district heating



The solution: An integrated energy system

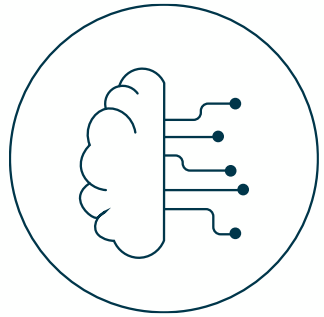
Energy efficiency

Focusing on utilizing the energy in the best possible way



Sector coupling

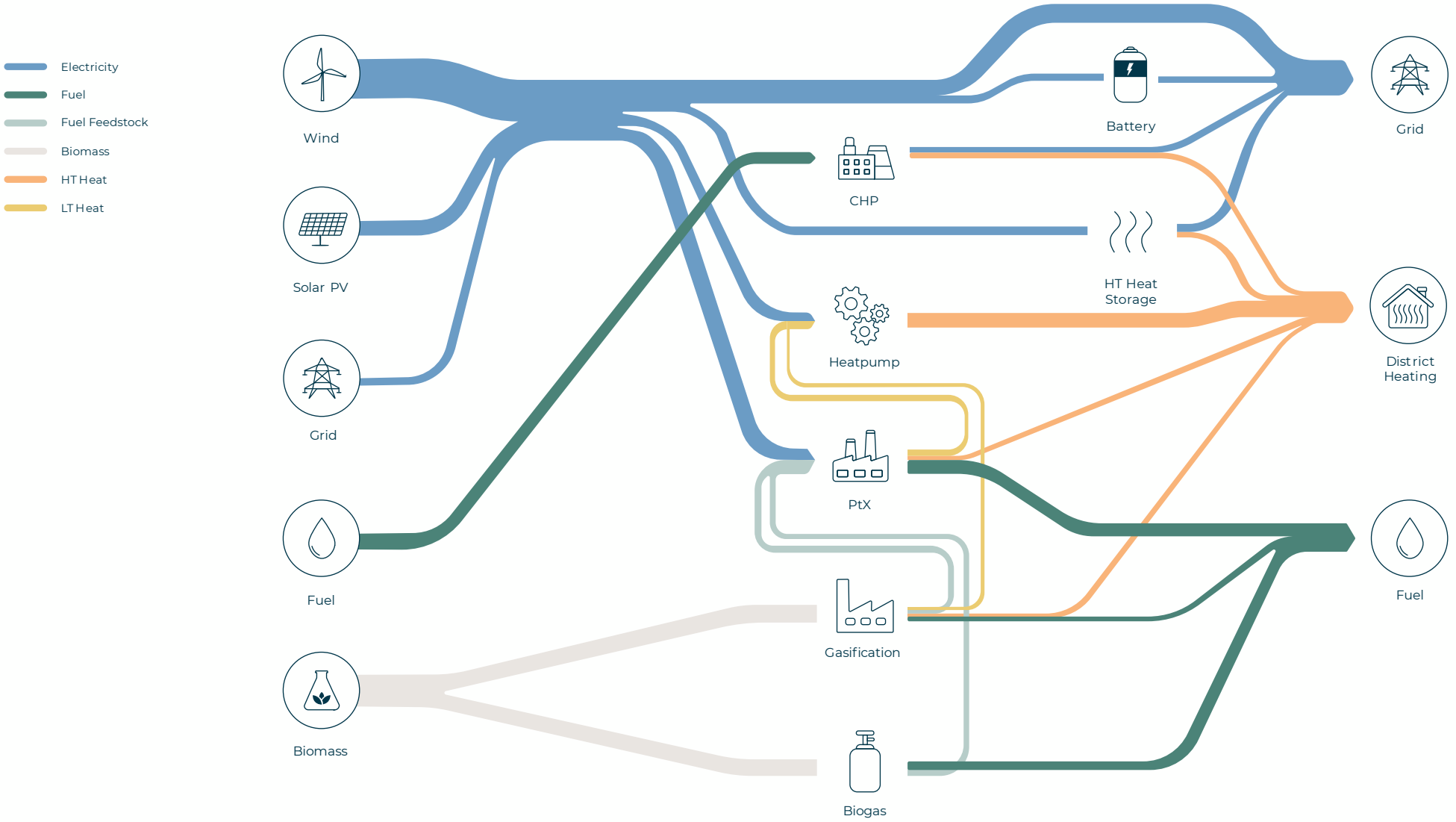
Electricity takes over the "main feedstock" role for all energy purposes from fossil fuels



Digitalization

Electricity production and consumption need to always be balanced – data and automation is the key to that

The Hybrid Energy Plant



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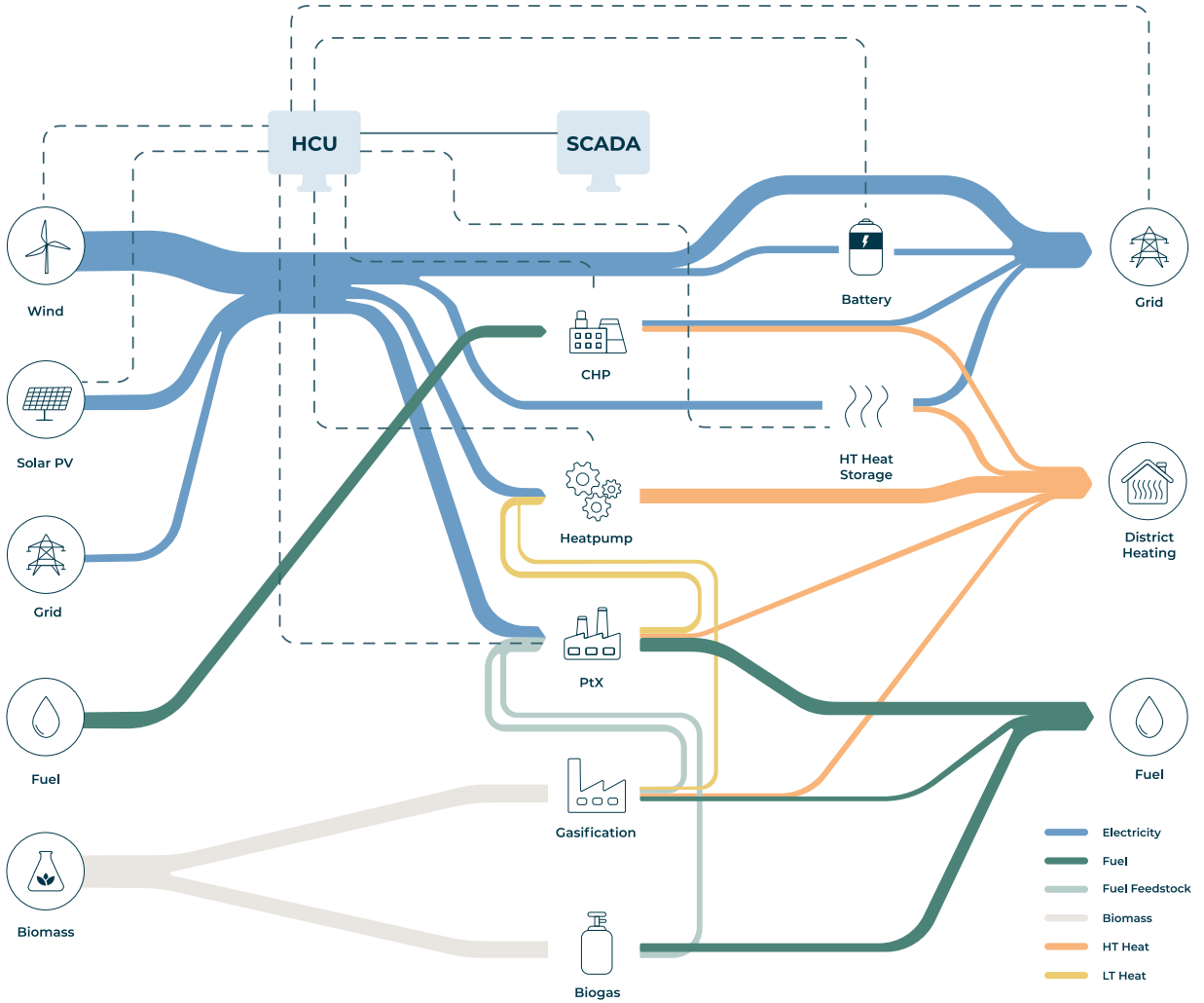
SCADA is key in an integrated energy system

- A unified SCADA system can communicate with all plant devices
- A unified hybrid control unit (HCU) can connect to the renewables and PtX plant
- Asset owners or traders can use the HCU to control the power output via the overall SCADA system



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Thank you!

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