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AMPS CONFERENCE AND LUNCHEON 2019

ENERGY SYSTEMS CATAPULT

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The Challenge of the Future Load Curve

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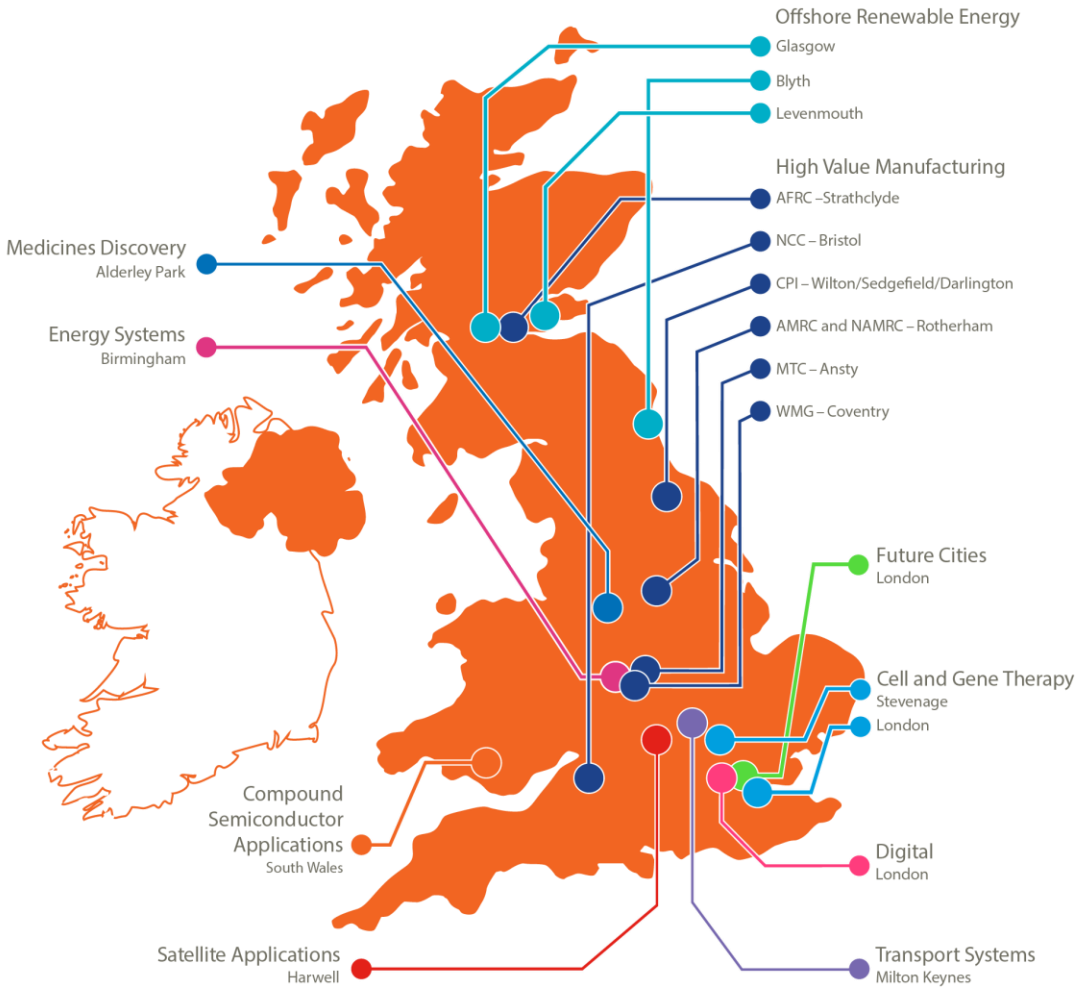
13th March 2019

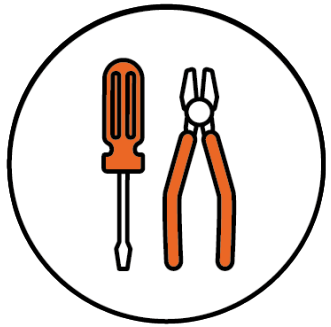
@EnergySysCat LinkedIn

What is a Catapult?

CATAPULT Energy Systems

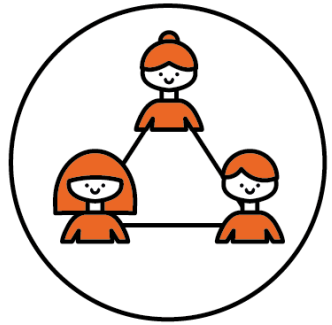


Established and overseen by Innovate UK



Technical capabilities, equipment, and other resources

Solve key problems and develop new products and services



Bridge the gap between stakeholders in the sector

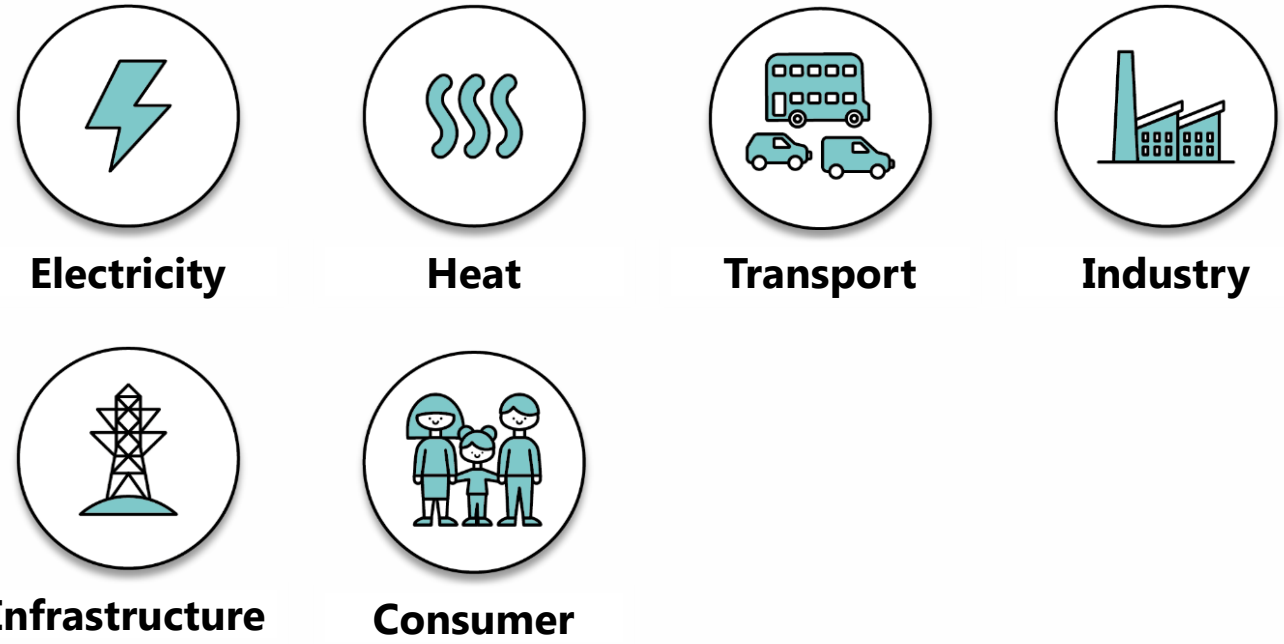
Open up opportunities for innovators, in the UK and globally

About us

MISSION

Unleash innovation and open new markets that capture the clean growth.

WHOLE SYSTEM EXPERTISE AND APPROACH



What is Energy Systems Catapult?

Mission: Unleash innovation and open new markets to capture the clean growth opportunity

170 Innovation experts

Hubs in Birmingham and Derby

We work with Innovate UK

Established and overseen by Innovate UK. Independent from Government. Not for profit

Bridge the gap between stakeholders in the sector

A place to develop and test new ideas

Supporting innovators

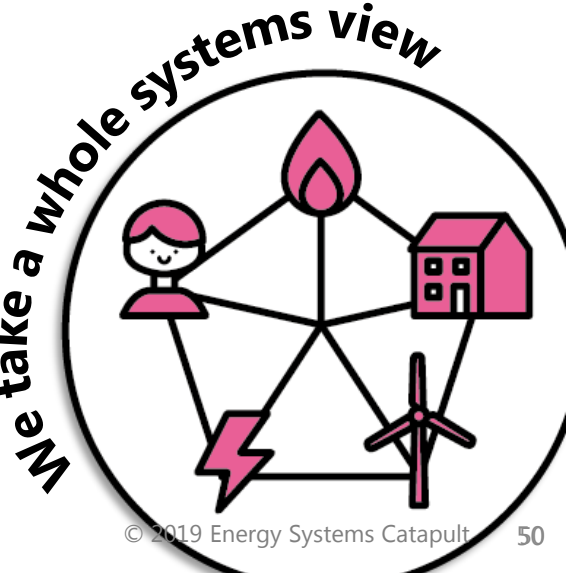
Research

Trials

Systems engineering

Digital

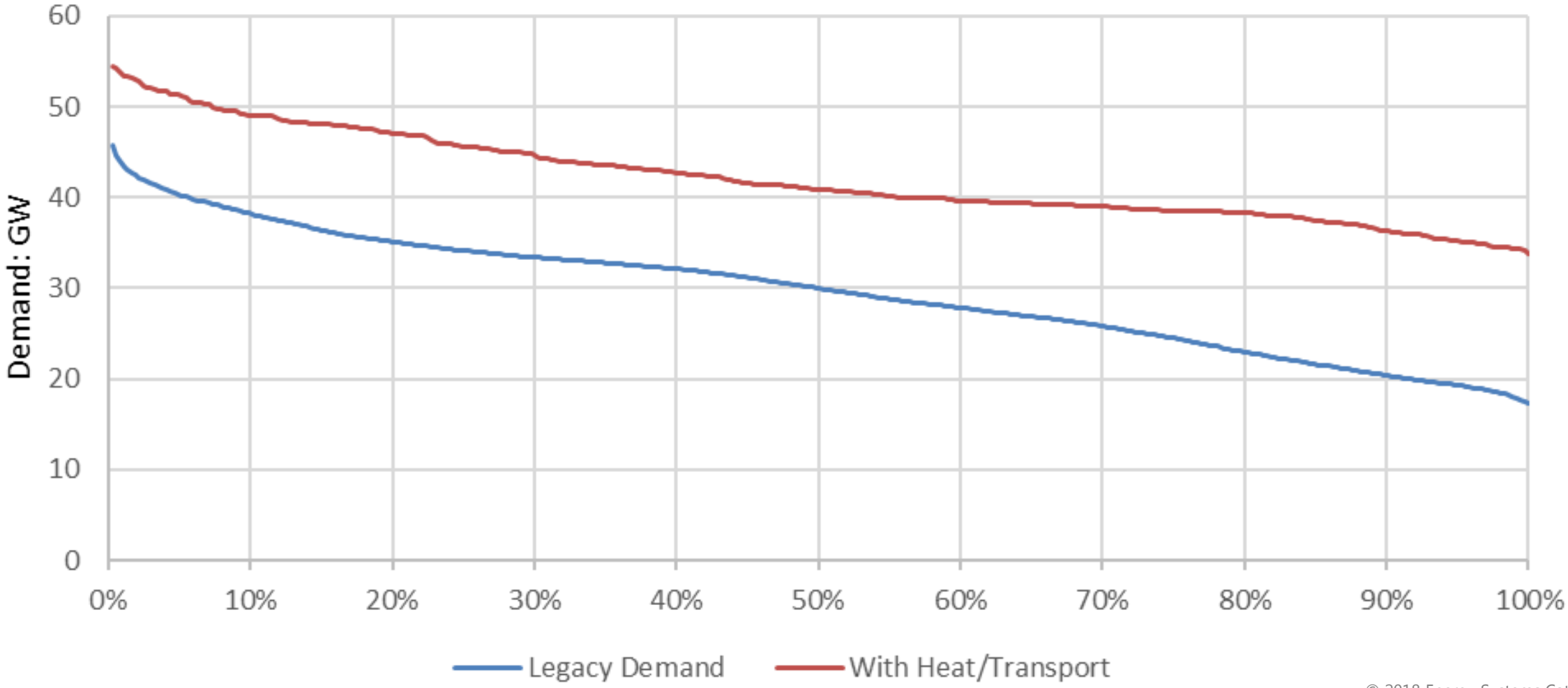
Modelling and simulation



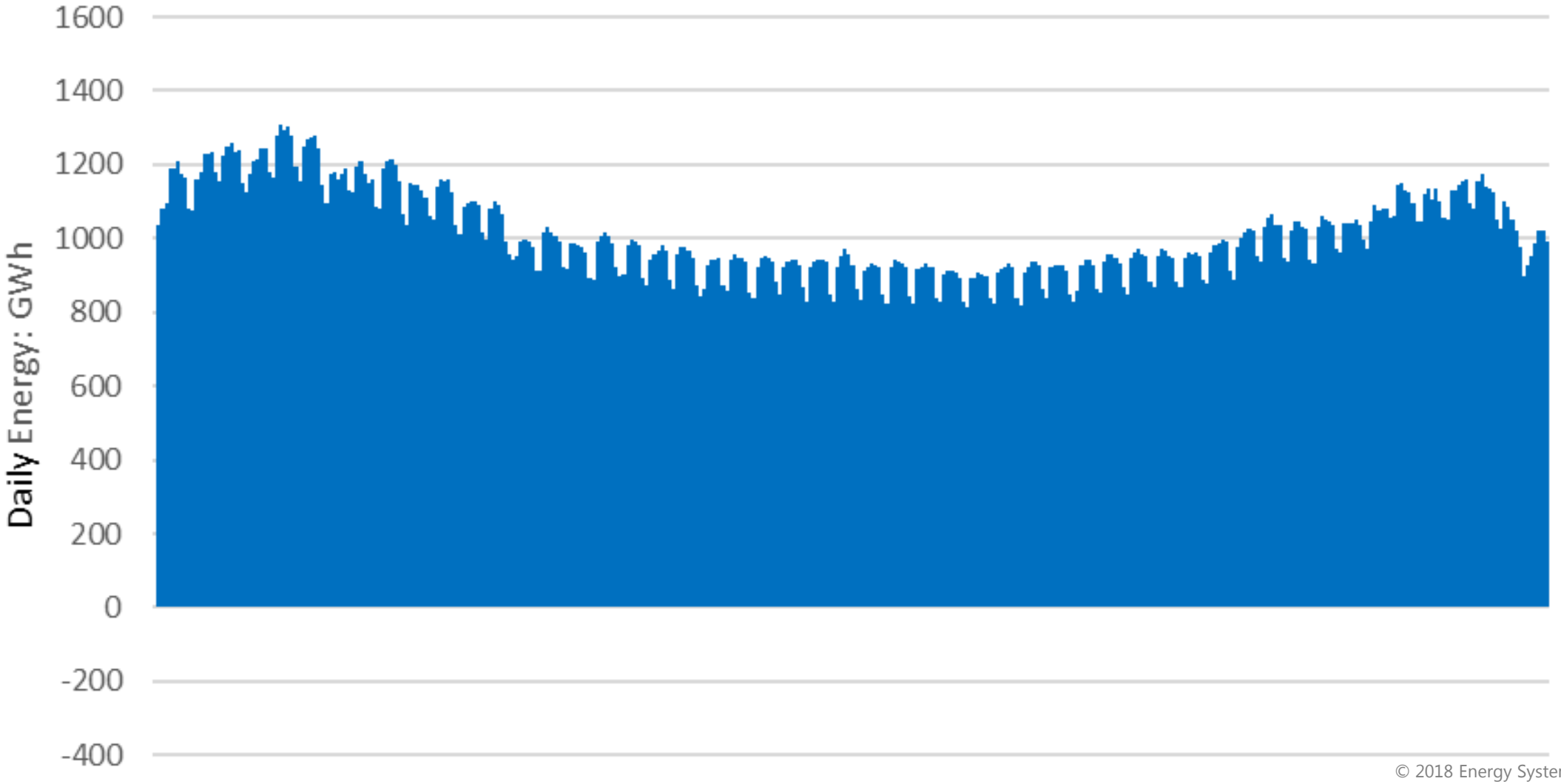
2050 Load Curve: Very Broad Brush Analysis

- Start with an historic load curve
- Scale to give the same energy as National Grid's Future Energy Scenario (FES): 2 Degrees, 2050
- Assume load for Electric Vehicles and Heat is used to "flatten the load curve"
  - Allows you to think in terms of energy provided per day (with some vehicle to grid)
- Ignored Interconnection
- Deliberately making the assumption that within day demand flexibility will be used to:
  - Limit the volume of generation needed
  - Increase its load factor

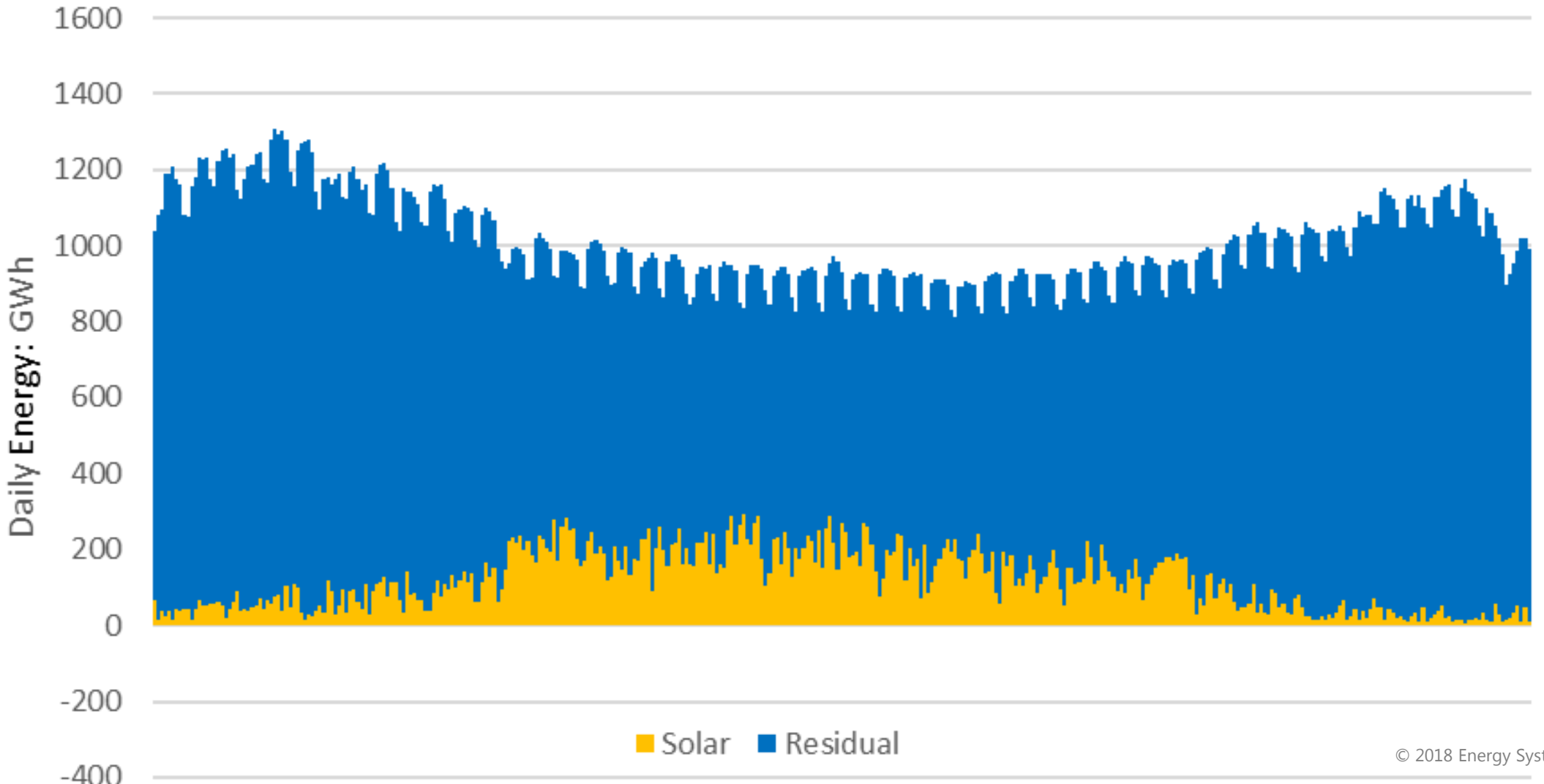
Load Duration Curve with & without Transport and Heat



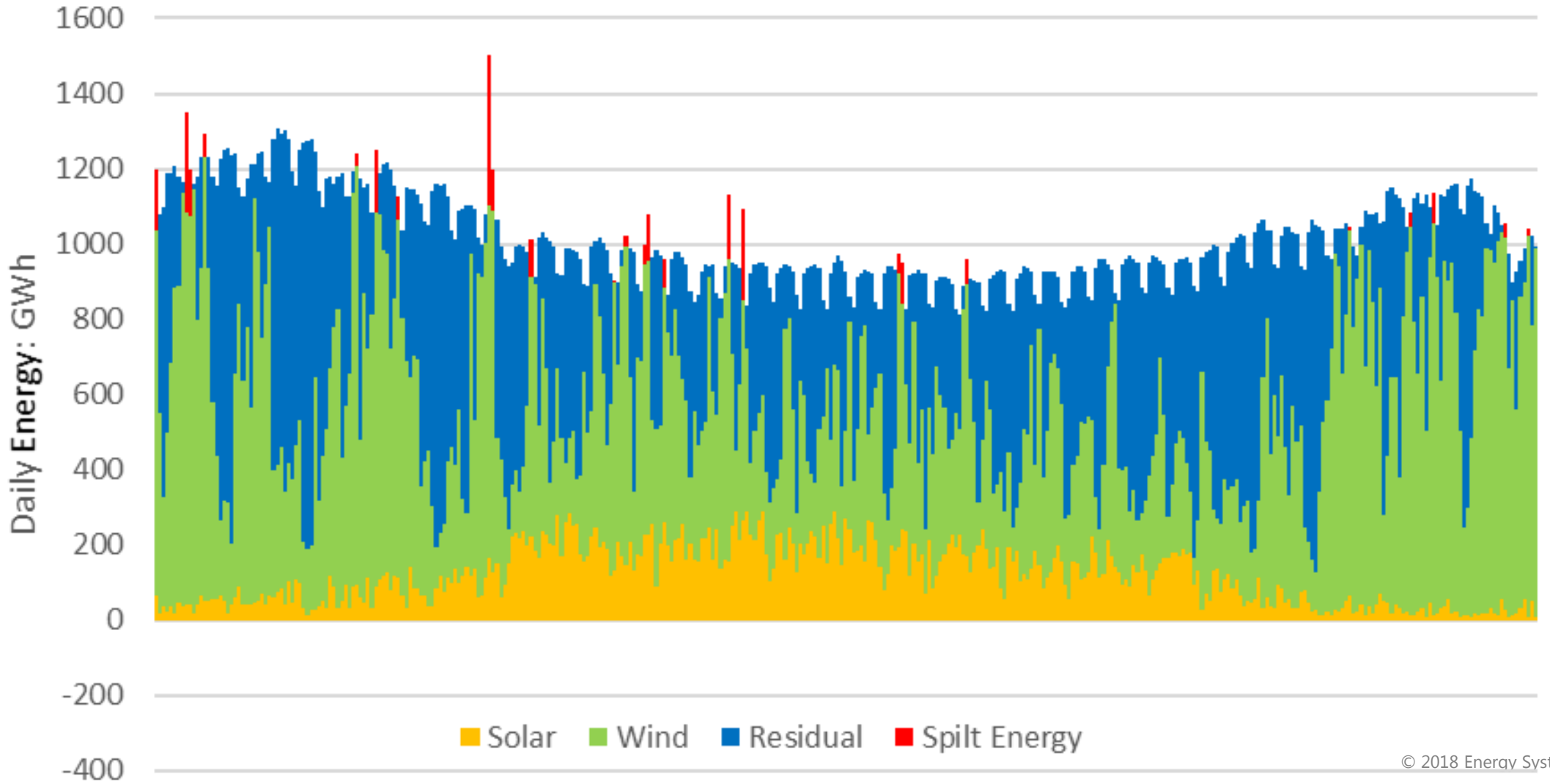
Daily Electricity Consumption for 2050



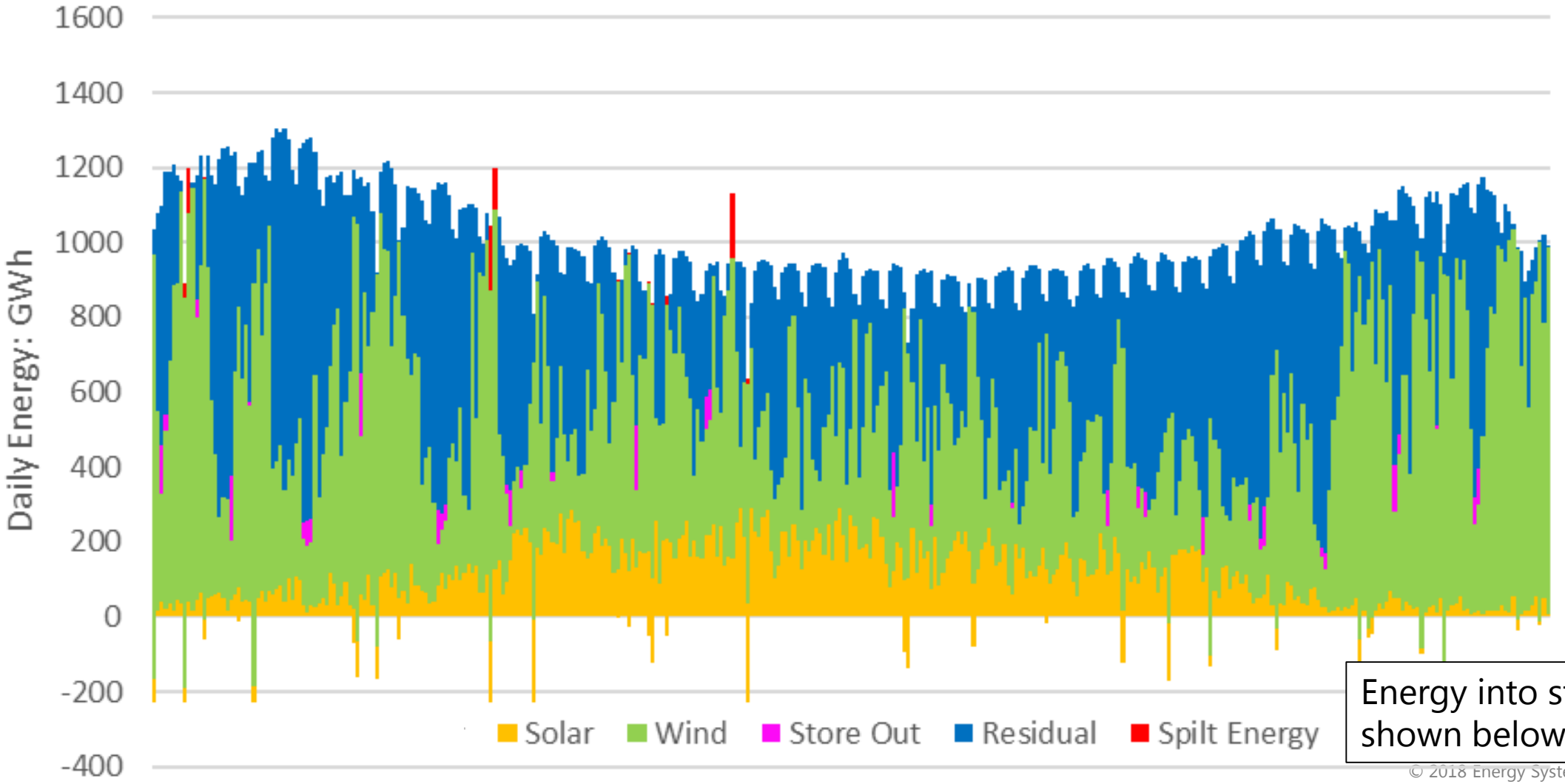
Add In FES 43.7GW Solar



And 65.7 GW Wind

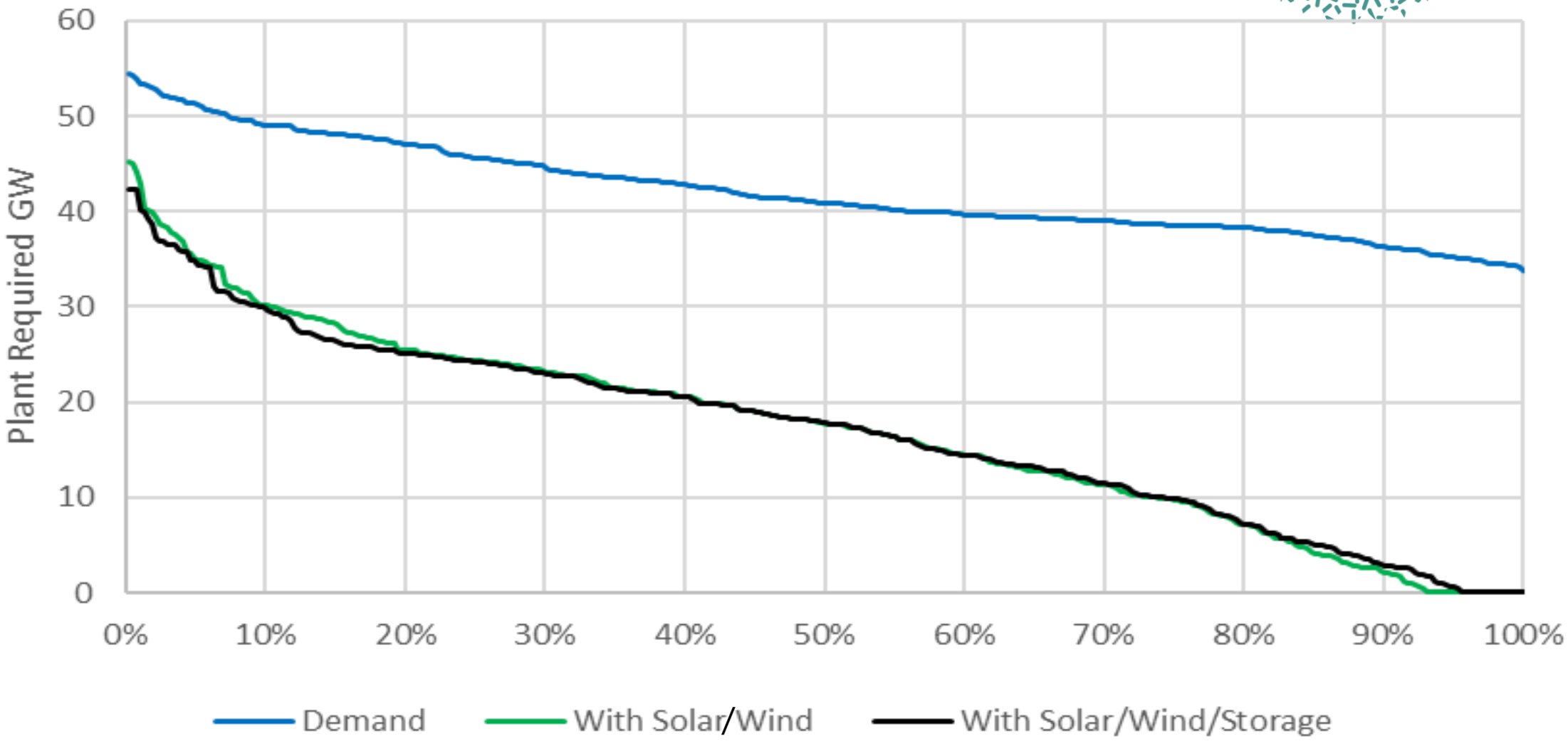


What About Storage: 17.3 GW (173 GWh)

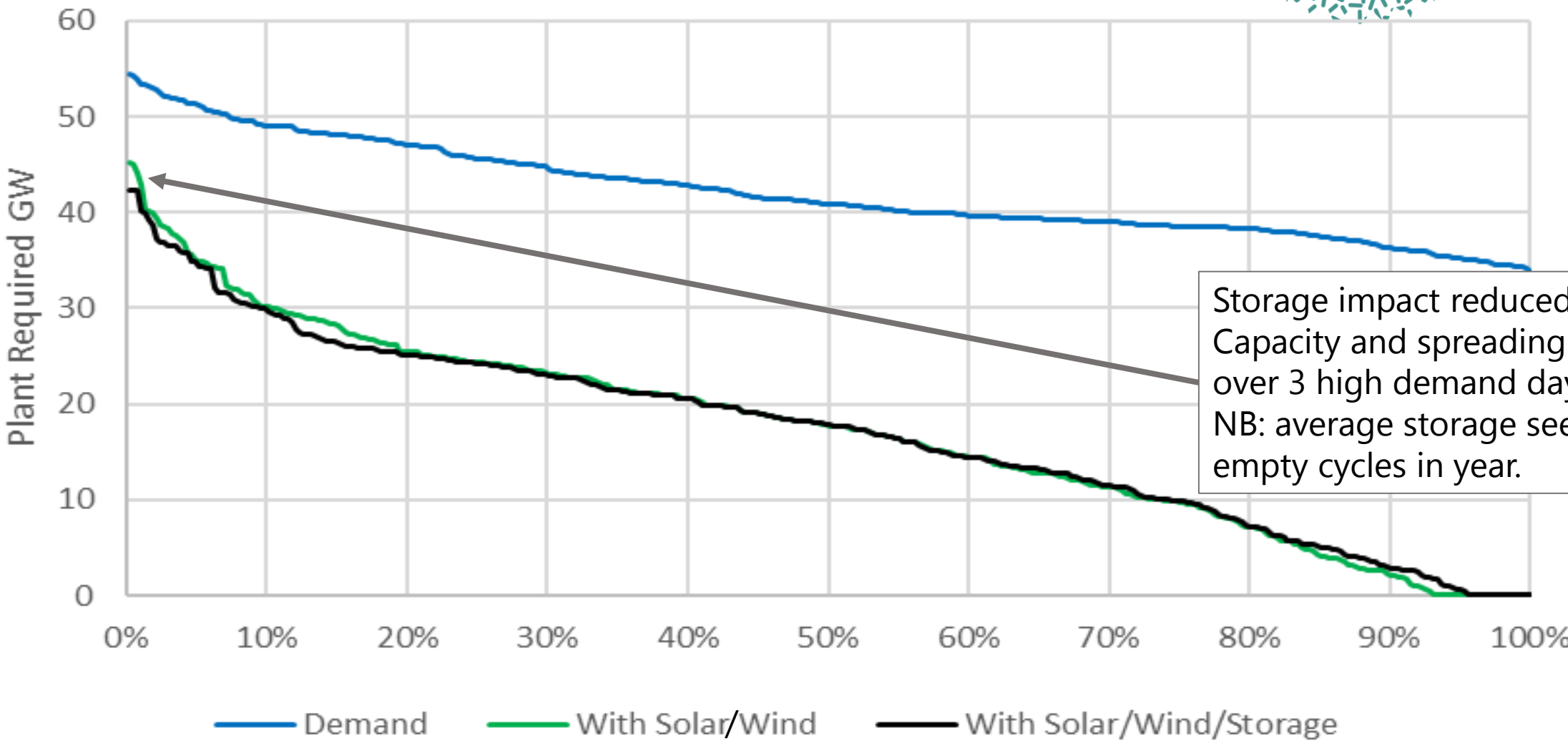


Energy into storage shown below x-axis

Convert to GW Load Duration Curve

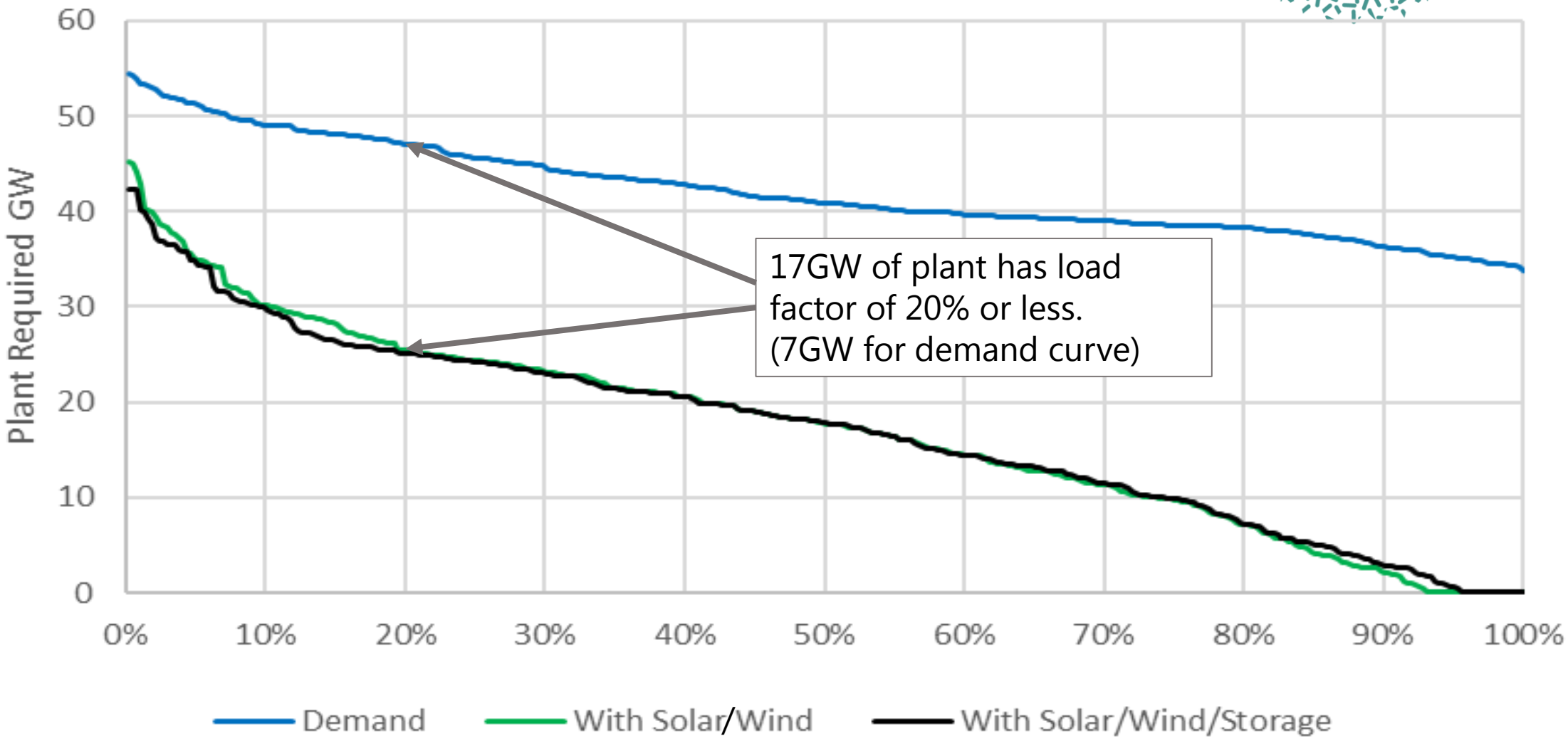


Convert to GW Load Duration Curve (Ignoring Interconnection)

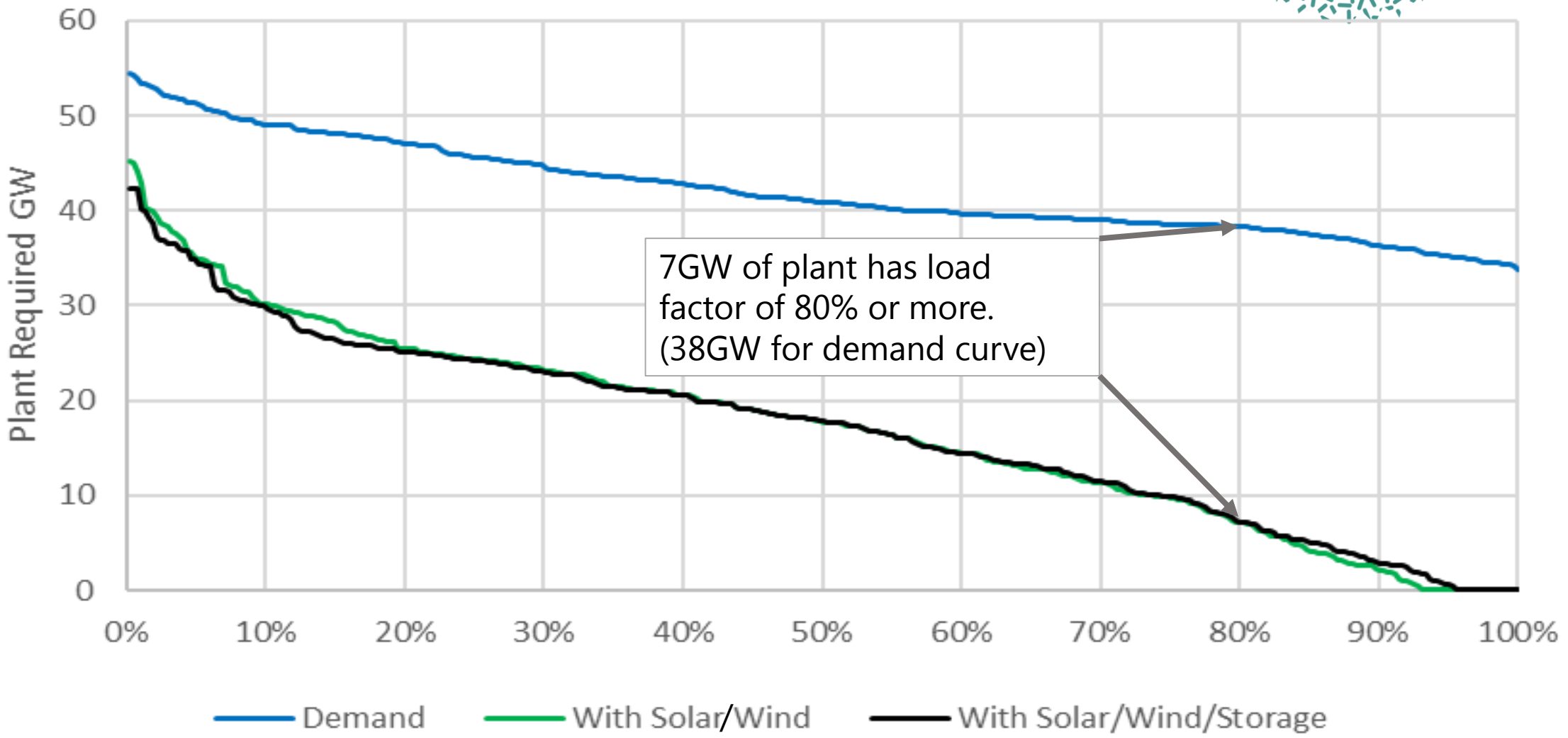


Storage impact reduced by GWh Capacity and spreading output over 3 high demand days.
NB: average storage sees 15 fill empty cycles in year.

Convert to GW Load Duration Curve (Ignoring Interconnection)



Convert to GW Load Duration Curve (Ignoring Interconnection)



Conclusions About 2050 Load Curve

- Demand Management of Electric Vehicles and Heat can significantly flatten the within day load curve
- Much harder to use storage to flatten the inter-day load curve
- Wind and Solar will drive down the load factor of other forms of generation:
  - Much more generation with low load factors
  - Much less base load generation – implications for nuclear
- Impact of Wind and Solar will be greater if we fail to manage EV/Heat demand

Relevant ESC Work

- Energy Data and EV Energy Taskforces
- Future Power System Architecture Programme (FPSA)
- Modern Energy Partners/Energy Revolution Integration Service (MEP/ERIS)
- Modelling Capabilities
- Living Lab Programme

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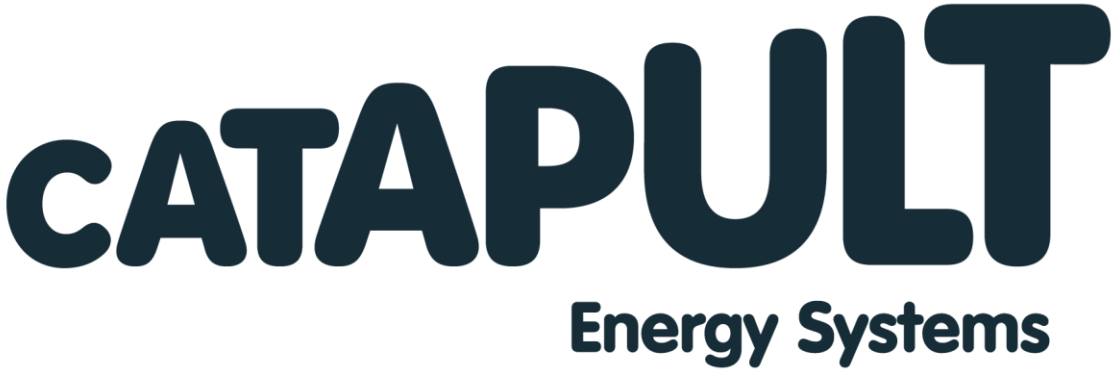
Please get in touch and get involved!



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