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THE NEED FOR ADDITIONAL INERTIA IN THE EUROPEAN POWER SYSTEM UNTIL 2050 AND THE CONTRIBUTION OF WIND POWER

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MOTIVATION

- More and more renewables in the production mix
- Less nuclear and thermal

  => Less inertia
- But we do not know how much we will be missing and how to cover it.
- Wind power can provide

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AIM OF THE STUDY

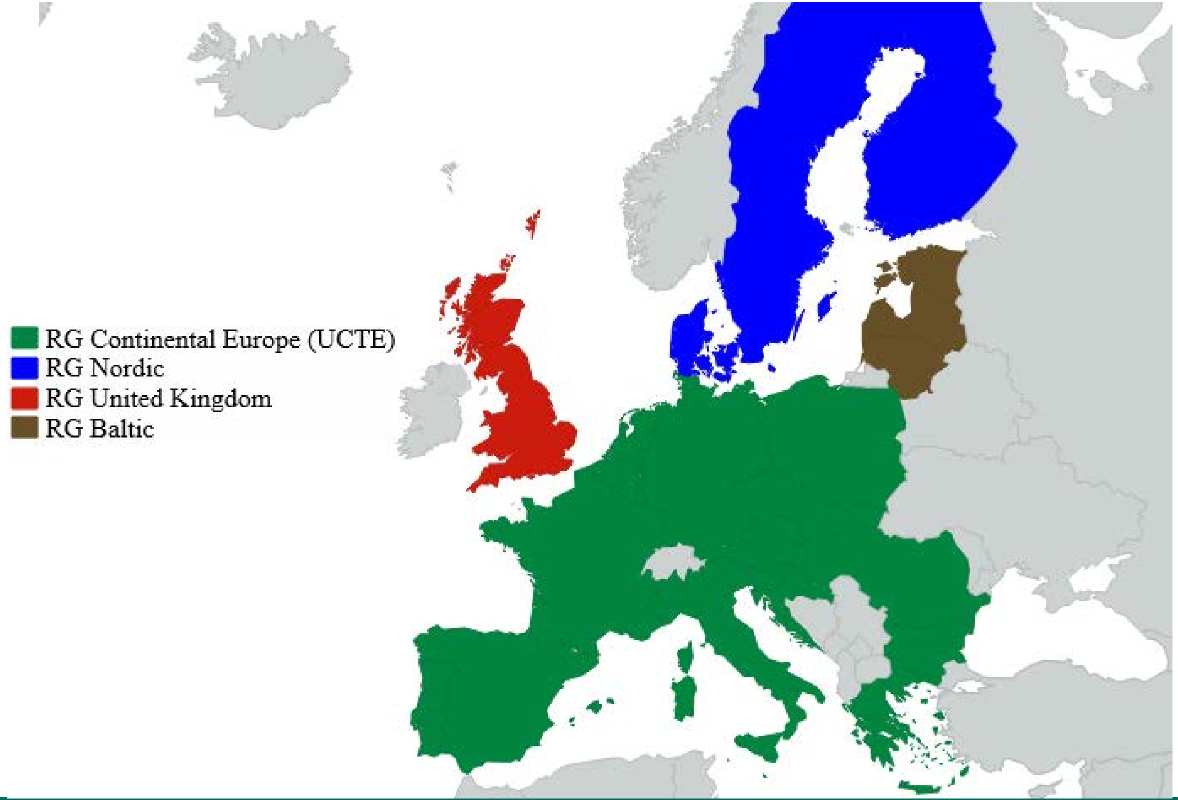
What is the need for additional inertia in the European system up to 2050?

To what extent will wind power be able to contribute by providing emulated inertia into the system?

SCENARIOS (by European Commission, DNV-GL, McKinsey & Company)

Provider of Scenario	Name	Time Horizon	Total Installed Capacity (GW)	Comments
EU	EU2030	2030	1057	-
	EU2050	2050	1279	More wind & solar
DNV-GL	1	2030	1089	High RES intergration
	1-DG	2030	1217	More DG (solar), less wind
	1a	2030	1198	High demand
	1a-DG	2030	1352	More DG (solar), less wind
	1b	2030	1019	High efficiency
	1b-DG	2030	1137	More DG (solar), less wind
	2	2030	1006	Middle RES intergration
	3	2030	908	Low RES intergration
McKinsey	Green	2050	2000	More renewables than Clean
	Clean	2050	1237	More fossil & nuclear than Green

CASE STUDY SET-UP



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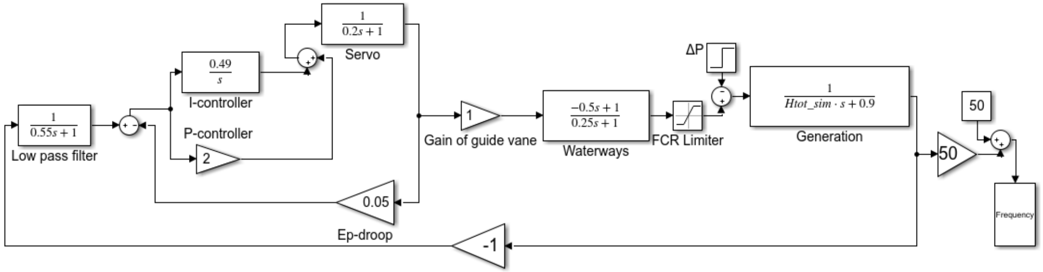
CASE STUDY SET-UP

- Worst case
- The units are dispatching in the following priority. Solar > Wind > Biomass > Hydro > Nuclear > Gas > Fossil
- Modelled with hydro power characteristics. The frequency limit is set **49,5 Hz** according to ENTSO-E.



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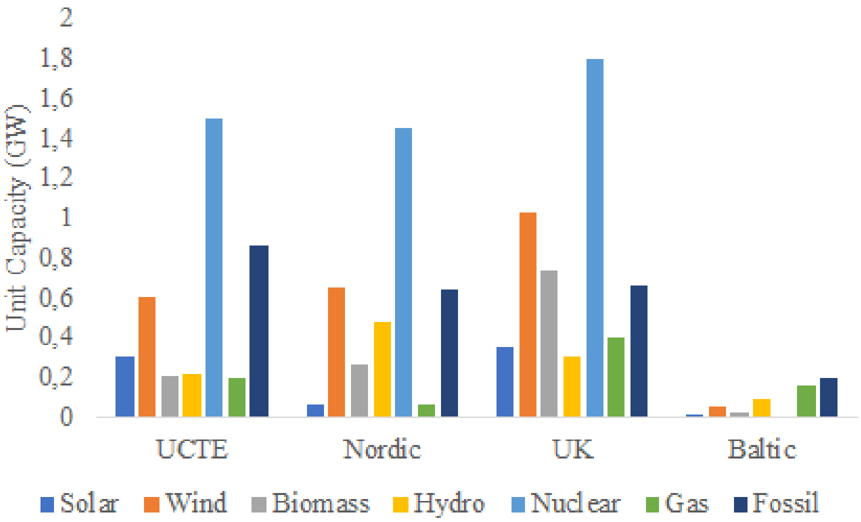
CASE STUDY SET-UP



Largest production units per type and each grid.

Considered inertia values

Type of electricity production	Inertia constant H (s)
Nuclear	6,4
Hydro	3,4
Thermal	2,7
Wind	0 (0 – 6)
Solar	0

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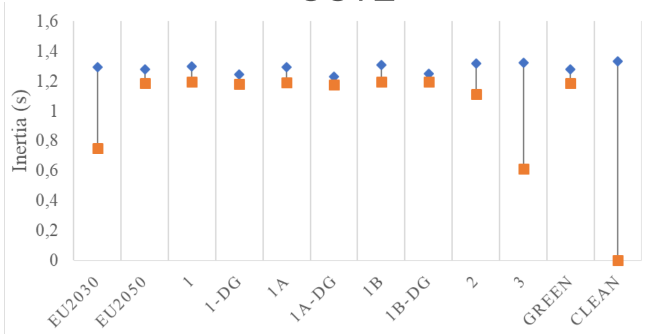
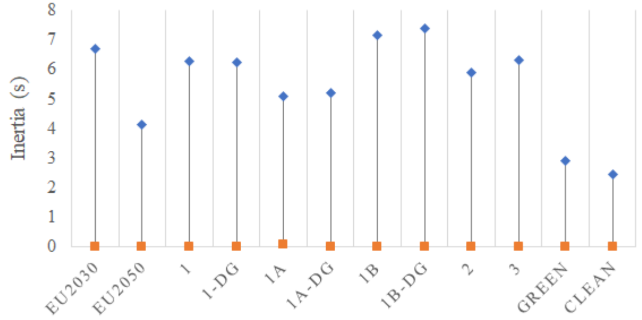
ADDITIONAL INERTIA REQUIREMENT UNTIL 2050

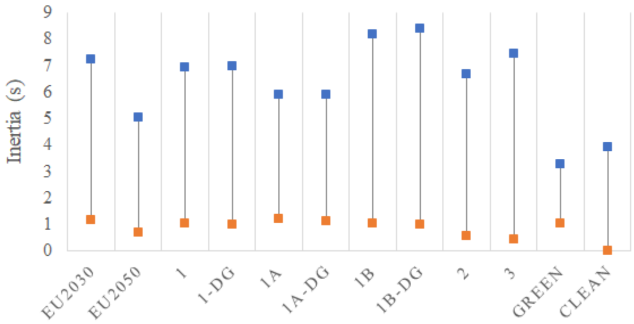
UCTE

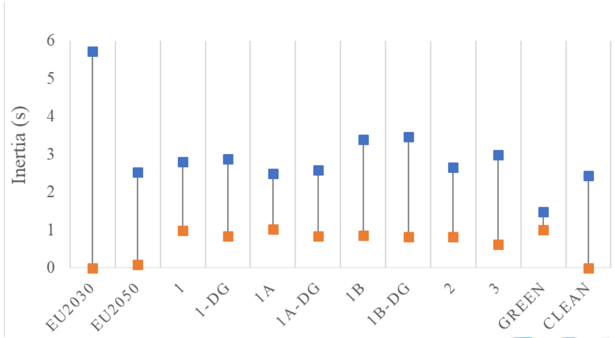




Nordic

UK





Baltic

No wind considered

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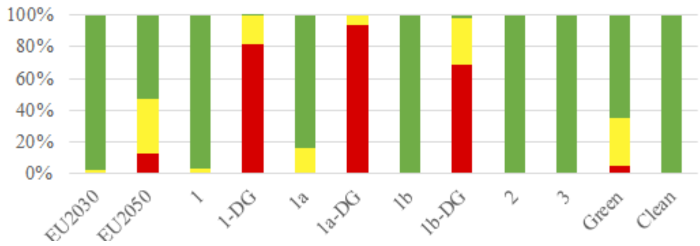
WIND POWER CONTRIBUTION ON INERTIA SUPPORT

*Wind inertia is considered equal to 6.

UCTE



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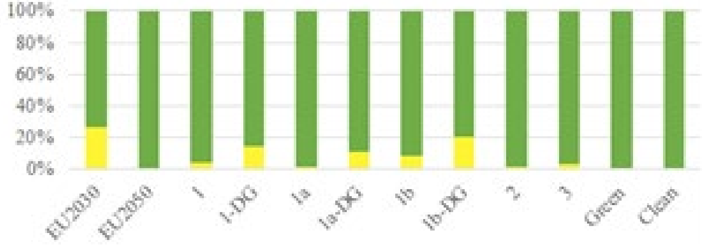

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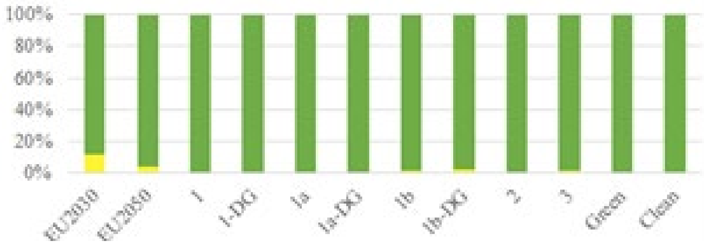

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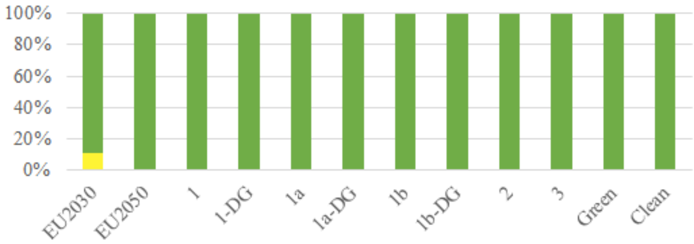

■ No support ■ Partially support ■ Full support

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ENOUGH INERTIA

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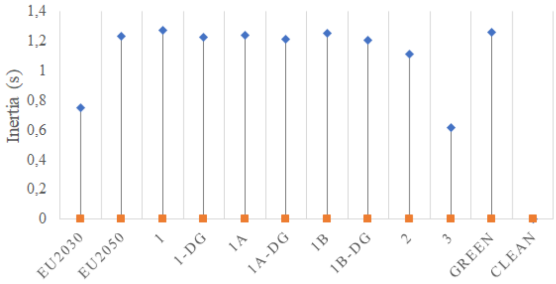

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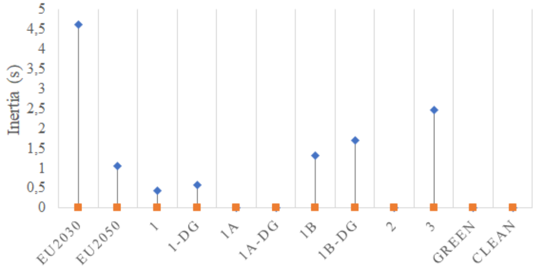

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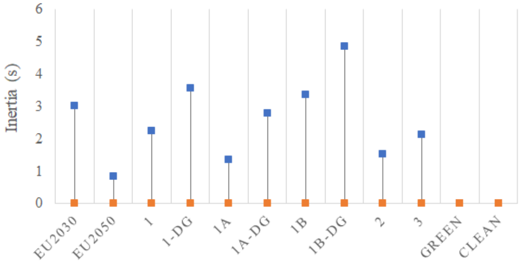

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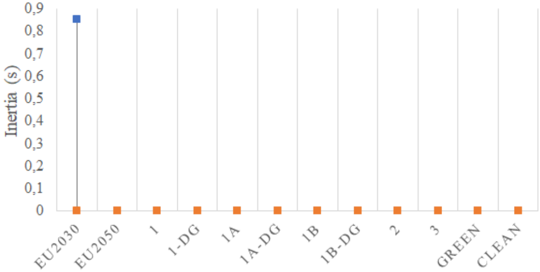

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HOW TO SOLVE THE REST

- Battery energy system
- Flywheel
- Synchronous condensers
- VSC-HVDC
- Loads
  - Electrolysers
- Or change dispatch ☹

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