

# Software-in-Loop (SIL) Shetland Use Case

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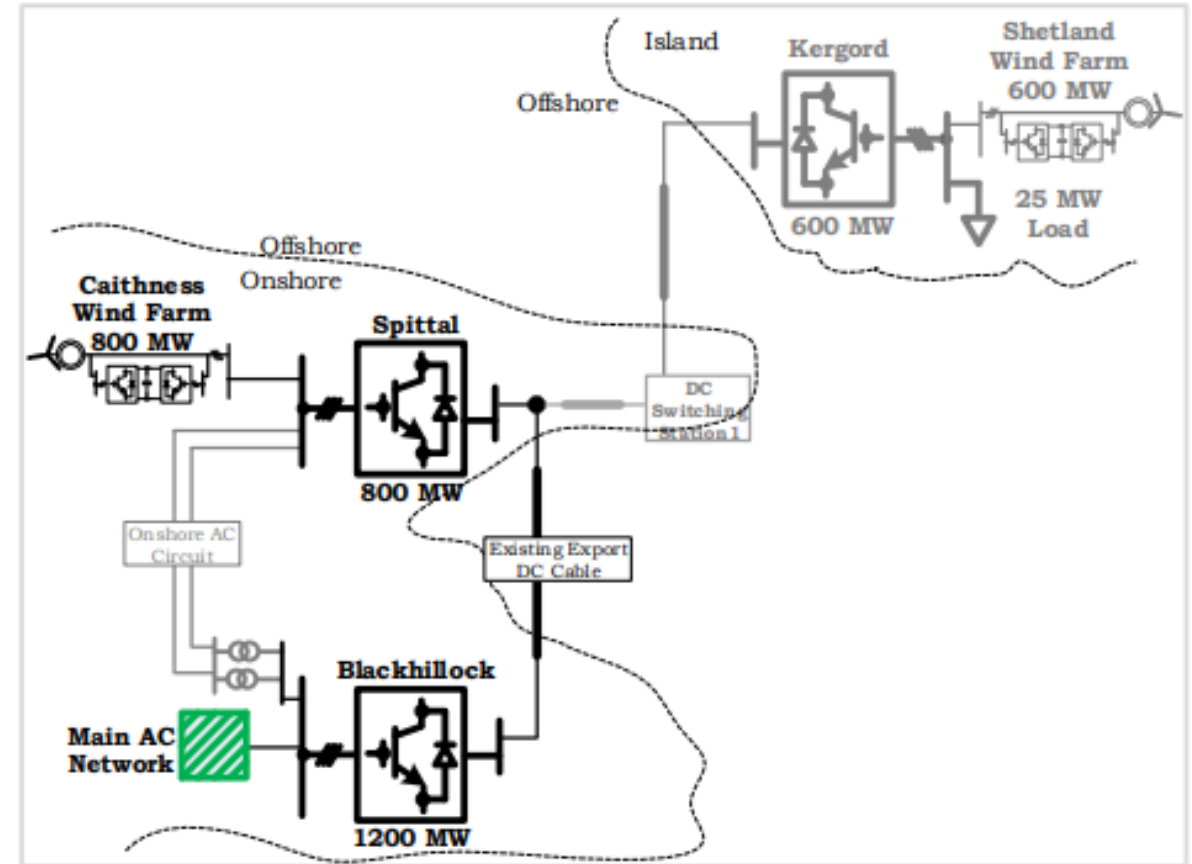
## Shetland

- Small Island distribution network with  $\approx 30\text{MW}$  load
- Several wind farms are connecting:
  - Largest is Viking wind farm ( $443\text{MW}$ )
  - But with other wind farms export required is  $\approx 600\text{MW}$
- To be connected to mainland via  $600\text{MW}$  VSC Link (CMS)

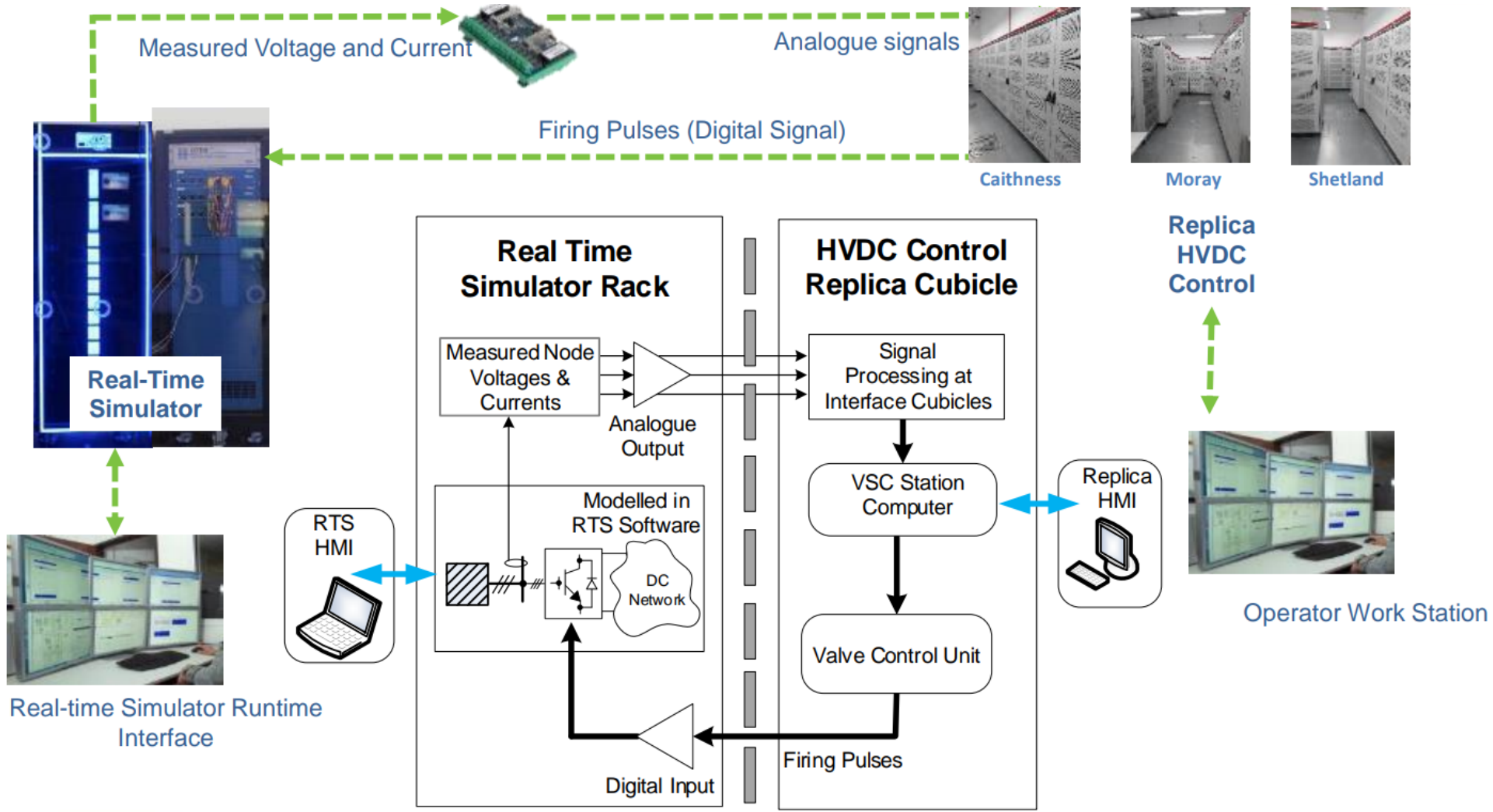
Network will be dominated by power electronics

HVDC Centre aim to de-risk the project by carrying out studies with real control behaviour, using:

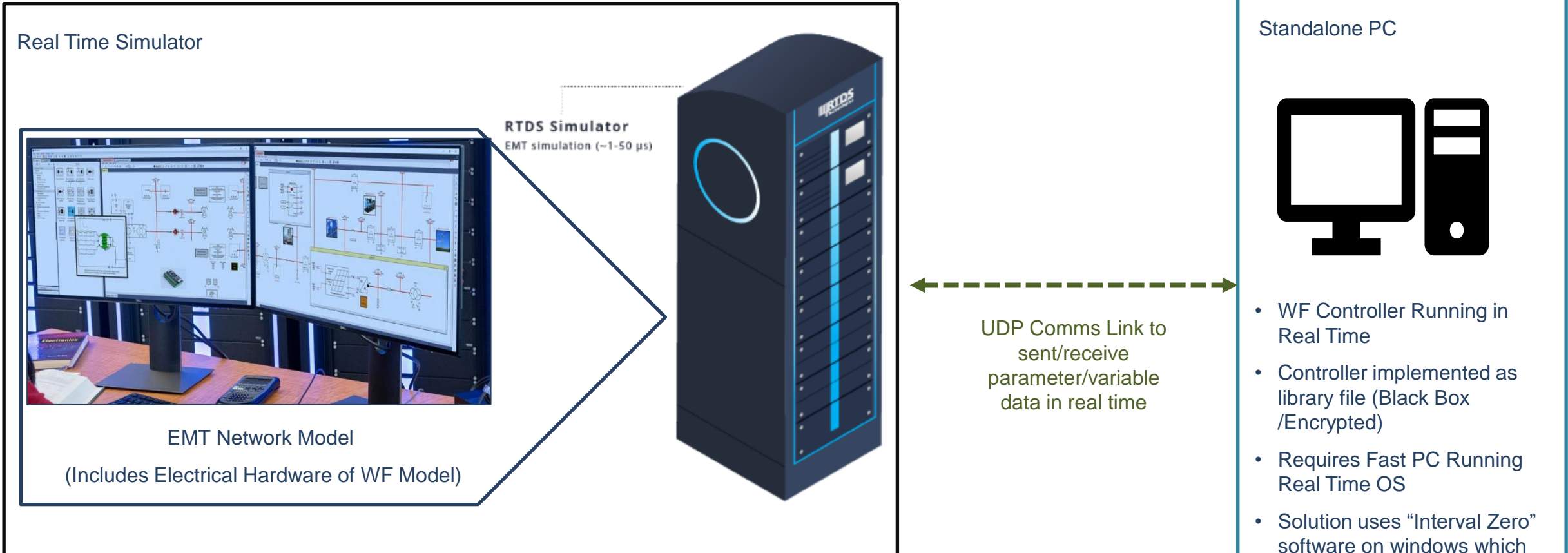
- Replica of CMS control hardware
- Software in Loop model of Viking wind farm



# Study Setup – CMS Replica



# Study Setup – SiL for Viking WF Controller



## Pros

- Allows use of real control algorithms
- Allows use in real-time for testing against specific control hardware (HiL)
- Avoids the need for bespoke hardware set up (rooms full of hardware)
- Flexible
- Potential to use earlier in the design cycle?
- limited physical space required

## Cons

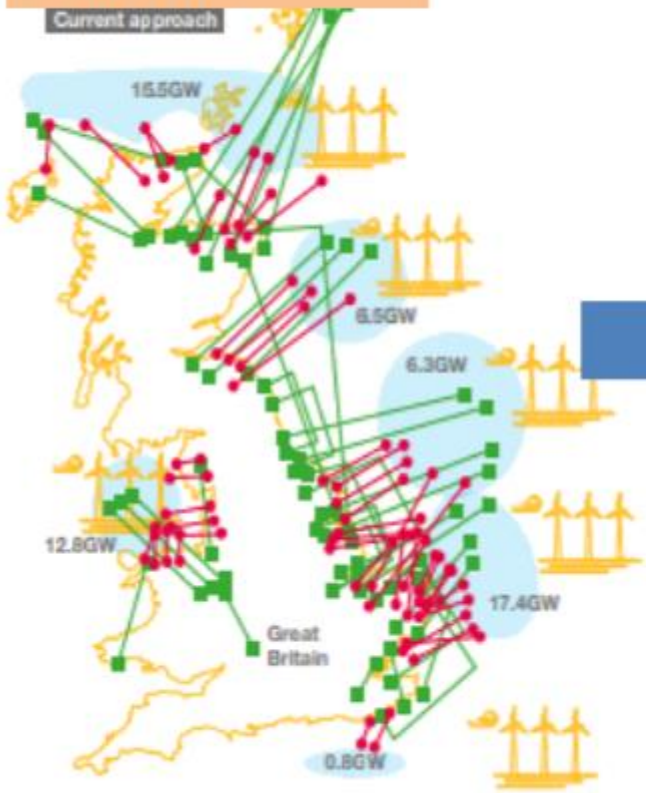
- Limit to Real Time processing power of PC hardware (Or any generic hardware!)
- Compromise between controller complexity & timestep achievable
- Lack of standardisation to approach (Interval Zero, GTSOC, What next!?)
- Different controllers tend to require different time steps, which makes integrating several controllers in one model hard



# Where else can we expect different controllers interacting?

Status Quo

Current approach



Integration from 2030

Integrated approach 2030



Integration from 2025

Integrated approach 2025

