

Patented Synchronous Power-train

Type 5 Grid Connection at Type 3 Cost

Executive Flyer



Recipient of the "Efficient Solution" label from the Solar Impulse Foundation.



Synchronous generation improves system stability in voltage faults and provides inertia, essential in frequency faults.

Partner with
SyncWind Power Ltd
to take this global.

- **Patented Technology**

Multiple countries, recent patents, IEC-certified technology.

- **More than 1000 turbine-years track record**

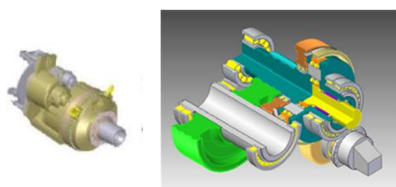
All synchronous and directly grid-connected, including 48 MW wind farm generating 10% of NZ's wind power, and boosting system strength. Proven in New Zealand and Scotland.

- **Low cost – less than a Type 3 turbine**

Additional hydraulic system handles only 5% of rated power, loses less than 1%, keeps capital and O&M cost down, easily replaced up-tower.

- **No power electronics (PEC)**

- **Scalable to 2 MW, 5 MW, 10 MW, and above**



Wind turbine grid connection types are for example explained in:

<https://www.site.uottawa.ca/~rhabash/ELG4126WindGenerators.pdf>

- ✓ Synchronous wind turbines are trusted and understood by electricity system operators.
- ✓ "Type 0" in power industry = Type 5 in wind industry (more grid-friendly than Type 4).
- ✓ Avoid the prospect of future constraints by electricity system operators.
- ✓ Avoid costs and well-known reliability issues of power electronic converters (PECs).

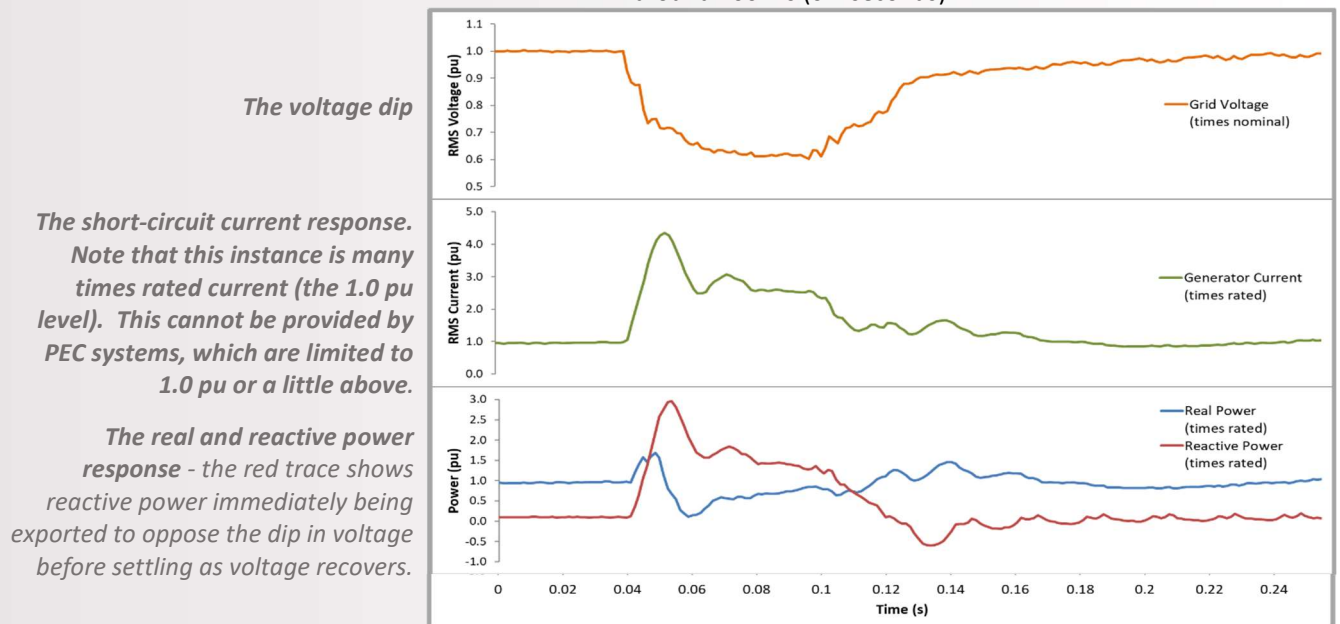


Advantages of **SyncWind**'s Synchronous Power-train:

- **Solution to gearbox reliability problems:** Torque Limiting Gearbox (TLG)
- **Excellent low wind performance:** Low variable speed (LVS) System
Typically 5% higher AEP and 4 m/s cut-in suits low wind sites (class 3&4). Patented LVS enables broad-band variable wind turbine speed. (Generator speed stays synchronous).
- **Full synchronous capabilities will lift barriers to renewable future:**

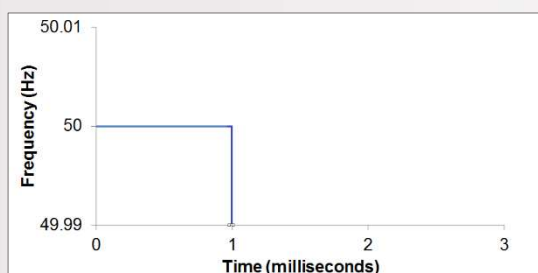
- **System strength:** Voltage stability with short-circuit current available to 1000% rated

Figure 1 - Example of fault contribution & ride-through: A system voltage dip to 60% of normal voltage that lasted around 100 ms (0.1 seconds).

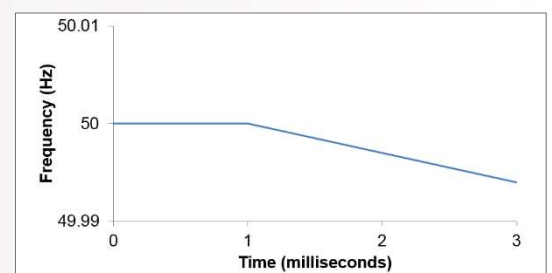


- **Reactive power capabilities:** 100% kVAr continuous rating
- **Generator is a synchronous condenser:** Can run with no wind (if small motor added)
- **Physical inertia:** Frequency stability due to generator inertias being synchronously tied

Figure 2 - The basic principles of physical inertia: Fundamental PEC versus Synchronous generator frequency response



PEC generator has no inertia so frequency could change abruptly on a millisecond timescale, destabilising grid.



Synchronous generators contribute at distance to stability by electro-magnetic sharing of inertia.

- **Very fast frequency response (FFR):** When in FFR/load-following mode, the total measurement-controller-actuator time is a few tenths of a second, uses turbine inertia.

We
'Synchronise the **Wind**'
directly into the grid.



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