SIXTH FRAMEWORK PROGRAMME
PRIORITY 6.1, Sustainable energy systems
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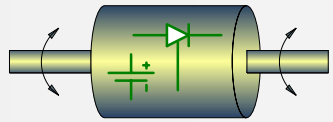
Project VSYNC - Contract no: FP6 – 038584

VSYNC-Integral field test

- Draft proposal -



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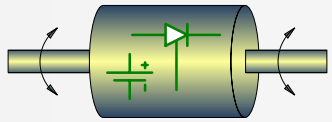
Overview



- Essence of VSG operation
- Standalone VSG in micro grid
- Micro grid operation
  VSG and SDM need each other
- ECN contribution
- Integral contribution
- Synergetic benefits
- Conditions (for Agreement)

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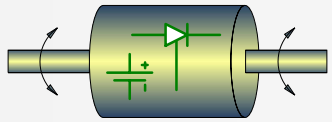
ESSENCE OF VSG OPERATION



- Virtual Synchronous Generators emulate rotating inertia for limited time intervals,
- with the aid of complementary control algorithms to sustain operation in case of faults or contingencies,
- thereby giving balancing algorithms, control and protection devices ample time to restore normal operation in the system.

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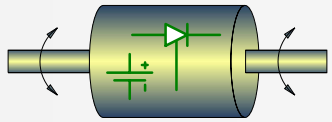
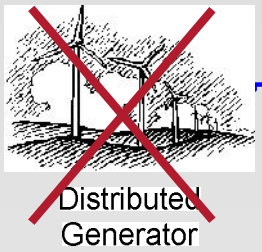
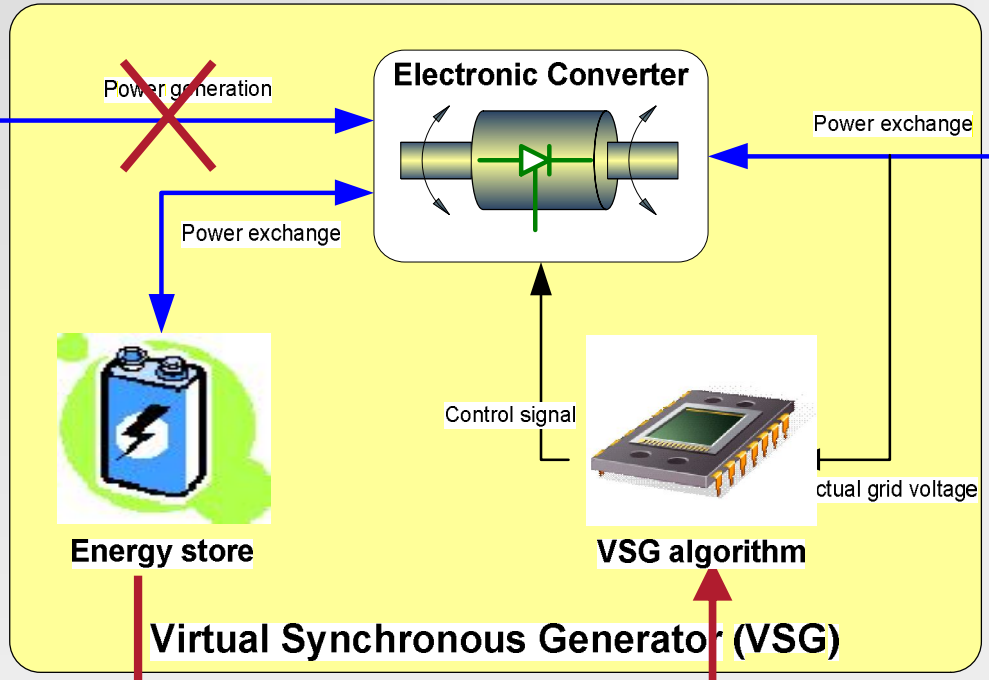
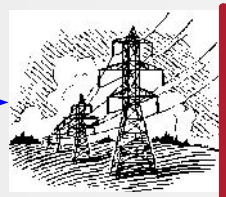
Standalone VSG in micro grid









Micro grid

Services to micro grid

Normal operation:

- Frequency stabilisation (by inertia emulation)

Plus in islanding mode:

- Frequency control
- Voltage control

State Of Charge

Islanding mode

Output to SDM algorithm:

- (SOC-50%)

(measure of system balance)

Input from SDM algorithm:

- Islanding mode on/off

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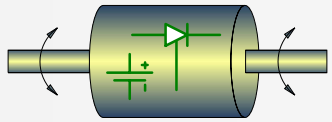
Micro grid operation

VSG and SDM need each other



Micro grid
•Normal operation

Micro grid
•Disturbance

VSG
0-15 minutes
Stabilisation of:
•Frequency
•Voltage

SDM
5-30 minutes
•Balancing

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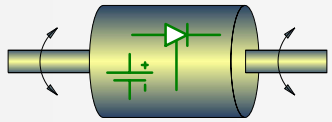
ECN contribution



- VSG converter platform (40 kEuro)
  - E.g. 20 kVA, 1 phase
  - Controlled by industrial computer
  - With UPS for black start
- Remote VSG programming and monitoring
  - Saves 40 kEuro of Matlab-Simulink software
- Provide VSG output signals suited to the needs of the SDM algorithm
  - e.g. measure of system balance (SOC-50%)

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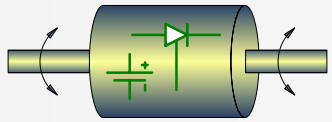
Integral contribution



- Battery set (15-25 kEuro)
  - No car batteries; these will fail within weeks
- Proper installation and housing at test site
- Continuous internet connection with the VSG control computer
- Occasional on-site assistance when things go really wrong
- Provide SDM signals for islanding mode

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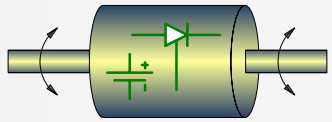
Synergetic benefits



ECN:

- Field-test of VSG in micro grid
- SDM algorithm restores long-term system balance continuously

Integral:

- Micro grid continues stable operation up to 15 minutes under unbalanced conditions
- Low bandwidth SDM system

Together:

- Build VSG+SDM business case for micro grids

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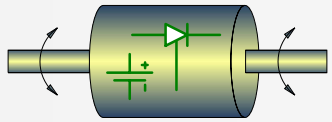
Conditions (for Agreement)



- Written consent of all parties involved
- Proper test plan considering both SDM and VSG
- Full and open exchange of measured data and results
- ECN likes to have the VSG-converter platform returned “in once piece” after the tests.
- (…)

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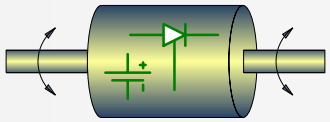

Thank you for your attention

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