

## Master Project:

# Fuel Cell- based Secure Power Grid Control

-Collaborated with *Energinet.dk* (TSO), *ThyMors Energi* (DSO) and *Ballard Power Systems Europe A/S* (Fuel Cell solutions)

## Project description

The project develops and demonstrates backup power solutions using hydrogen as fuel and fuel cell technology to provide reliable backup power at different substations of the distribution and transmission grid in Denmark. The project aims to create a positive business case for end users, who move from current 4 to 6 hours emergency power supply based on lead acid batteries to a 24 hour back-up solution, addressing the requirements in a new EU CODE on electricity emergency and restoration. The technical challenge is linked to the transient load of emergency power supply for activating high-voltage breakers. Two solutions will be developed and demonstrated:

- 1) Add-on solution to existing installations with batteries (e.g. lead acid batteries);
- 2) Battery-free solution for new installations.

Both solutions will be demonstrated in the field and evaluated. The project involves in EUDP SPGC Project and it is collaborated with *Energinet.dk*, *ThyMors Energi* and *Ballard Europe Power Systems Europe A/S*. The detailed project information can be found with the link here:

[https://energiforskning.dk/en/projects/detail?program=7&teknologi=All&field\\_bevillingsaar\\_value=2017&start=&slut=&field\\_status\\_value=All&keyword=SPGC&page=0](https://energiforskning.dk/en/projects/detail?program=7&teknologi=All&field_bevillingsaar_value=2017&start=&slut=&field_status_value=All&keyword=SPGC&page=0)

## Project tasks for master students:

1. To analyze general capacity requirement for power supply under different load conditions in order to meet the backup time requirement. It will include
  - Steady-state analysis for estimating the capacity requirement of the backup power supply under the normal condition (w.r.t backup time duration)
  - Transient-state analysis for estimating the capacity requirement of backup power supply under the contingency-conditions such as the best and worst scenarios (w.r.t dynamic performance requirements)
2. Case studies for test sites at Energinet-400kV substation and ThyMors Energi-60kV substation.
3. Potential setups could include hands-on related activities in PowerLabDK (<http://www.powerlab.dk/facilities>)

## Qualifications:

- Strong knowledge on power system operation, power electronics and fuel cell technology;
- Familiar with the simulation tool, e.g. Simulink, PowerFactory or other software package for substation design/model;
- Preferably experience on field test.

## Contacts

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