

Ph.D. School in Smart Electricity Grid and Storage



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to educate and develop entrepreneurial people able to work across
stakeholder boundaries

General Features



- Strong coupling to Innovation – EIT label
- World-wide recruitment of best talents
- Mostly industry owned Ph.D. research problems (IPR rights)
- Actual Ph.D. project (student) can be located at any partner university in InnoEnergy. Degree issued by that university subjected to its regulations
- Value added activities from EIT finances
- Compulsory 6 – 12 months mobility at another country
- Increased mobility between university and industry
- Common summer school every year jointly with other CC's
- Additional Course modules in entrepreneurship and Management
- 4 year Ph.D. (1 year courses + 3 year research)

Procedure for student selection



- Selection committee composed of project sponsors and universities
- Internationally competitive application process
- Academic records, Standardised tests, Telephone interview to Assess engineering/scientific /entrepreneurial aptitudes
- Face-to-face interview of shortlisted candidates
- Project fair for selected students/introductory summer program

Course modules



Introductory courses block (15 ects) – Common for Grid and Storage?

- Overview course on Energy systems 5 ects
- Power transmission and distribution 5 ects (how the electric grid works?)
- Renewable electric energy generation and storage technologies 5 ects

Entrepreneurship and Management course block (25 ects)

- Courses – **ESADE, Barcelona as part of summer schools**

Area specific course block in Electric Grid (20 ects)

- A selection of courses on specific areas from which students can select based on their needs

(No tuition fees for courses, Financed by Partners and EIT)

Supporting student progress



- Joint advisory team between university and industry – Industrial mentorship
- Committed reference group (for student+advisors)
- Master thesis project students in the project team
- Regular student seminars and workshops
- Journal manuscripts/white paper on innovative ideas
- Assessment of scientific quality by supervisory team and reference group
- Create a free and innovative culture

Coupling innovation and Ph.D. projects



- PhD projects are part of larger projects in the business plan
- Team work with industry and other cooperating partners
- Innovation oriented
- Help with patents and possible startups

Keywords describing Smart Grid and Storage area



- **Keywords:** Static and dynamic network modelling and simulation, Network monitoring and control technologies, Next generations and integrated operation systems (SCADA, DMS, NIS, MDMS, OMS, PMU etc), New grid structures e.g. SuperGrids, Transmission security and redundancy , Components for new grid control technologies e.g. HVDC, FACTS, Controllable electric power components, High-speed breakers and switches, Better insulating materials, High voltage technology, Smart city distribution, Smart rural distribution, Asset management systems, New sensors and methods for monitoring, On-line diagnostic methods for power components, Rapid fault detection methods, Cost efficient connection of offshore renewable generation, Grid interface for renewable generation, Substation design and hardware, Short term forecasting of variable power sources, Short term storage for transient mitigation in milli-seconds to seconds scale, Medium term storage for managing generation fluctuations in seconds to minutes scale, Hybrid electric vehicles as a system resource, Storage – Transmission interaction, Supercapacitors and batteries, Communication standards for the grid, Efficient ICT systems for increased power quality, Smart protection and control systems, Electromagnetic compatibility – EMC, Islanding possibilities, Smart substations and power components, International trading, Daily and intraday markets, Impact of fluctuating prices, Handling of bottlenecks, Efficient grid tariffs, Pricing of ancillary services, Internalization of externalities on the electricity market, Customer impact on the market, Imbalance pricing, customer behavior etc....