STandUP for Energy – summary of research proposal

This response to the government's call in the strategic research field of Energy is unique not only in scope, size and strength, but also since it marks the first step in the creation of a Swedish Energy Research Organization that can compete on the highest international level in terms of volume, quality and impact. Given the global challenges of climate change mitigation and the transformation to a sustainable energy system, focused university and industry R&D is essential to reach ambitious national and global targets for the reduction of climate impact and increased renewable energy production.

An Energy research alliance for the future

Uppsala University (UU) and the Royal Institute of Technology (KTH) in Stockholm both have very broad and strong - often world leading - energy research capacities ranging from basic long-term studies to applied research and commercialization in intimate collaboration with industry. The Swedish University of Agricultural Sciences (SLU), also based in Uppsala, is leading in many areas of bio-fuel production and use. Together these three universities, hereafter referred to as **STandUP** (see Fig. 1), form by far the most significant cluster of energy research in the country. University management at all three STandUP universities are committed to building an alliance within Energy research that reaches beyond this particular call, and into all Energy-relevant areas.

STandUP aims to create an environment fertilizing interaction between researchers within STandUP and with industry in order to address today's most critical energy problems. The geographical vicinity of the universities allows for mobility of personnel, collaboration such as joint positions and courses, and sharing of laboratory facilities. The many strong industries within energy and transportation also present in the region add a further dimension for interaction and mobility. New ideas, new technologies and short lead times for commercialization of the results in new or existing industries are equally important as enhanced academic knowledge, competence and skills for the future.

The STandUP proposal

The expressed primary aims of this proposal, which covers a large subset of STandUP's total energy activities, are to reinforce research on large-scale renewable electricity production and its integration into the electricity network, and electric (including hybrid) vehicles – which will be a major future component of the electricity system. In addition, the contribution of biomass to sustainable and cost efficient production of transport fuels and electricity is a key focus area.

Within the STandUP group, UU has a strong profile in terms of the generation, storage, and use of energy. New and mature technologies are studied at both the basic and applied level, as is their interplay with the grid. At KTH, research is focused within electrical engineering on integration of renewable electricity into the grid and hybrid and electric propulsion systems. SLU's focus lies within plant biotechnology, plant production systems, ecology and environmental assessment. All three universities also have strong and unique competence on the Energy system *per se,* with research on systems analysis, environmental assessment, decision making and socio-technical issues. To optimize the response to the current call the STandUP group is complemented by *Luleå University of Technology* (LTU) with expertise in hydro power, by *Halmstad University College* (HIH) with expertise in wind power demonstrators, and a number of research institutes: IVL, STRI AB, SICS, Skogforsk and JTI.

The STandUP proposal is divided into distinct though strongly coupled research themes. All themes will be addressed from a systems perspective where our competence and research within *Systems analysis, environmental assessment and decision making* will act as a platform for all our activities to ensure that the most relevant issues are addressed in their true practical context. For each of the themes we have identified the most important critical problems to solve:

For **Renewable electricity generation:** To reduce the cost per kWh for the consumer through development of new technologies and the optimisation of existing technologies.

For **Integration into and management of the Electricity Grid:** To enable cost-efficient transformation of the grid to accommodate large scale variable production of electricity from intermittent sources such as the wind while retaining high levels of reliability.

For **Electric Propulsion and Hybrid Vehicles:** To develop technologies and optimized systems for hybrid and electric vehicles integrating solutions for energy storage, the grid supply interface, and propulsion systems.

Size, focus and management of STandUP

The proposal covers activities amounting to 100 MSEK in annual funding from 2012 and onwards, primarily for research on renewable production of electricity and its integration into the grid, but with the other components still being very significant.

An organisation as wide and deep as STandUP needs an effective organisation. The collaboration will be managed by a program coordinator with a reference council at their disposal. The STandUP concept is designed to support and develop focused and complementary research profiles within the collaborating universities, to enhance collaboration between these, and to optimize interaction with industry. Reporting to the university management on a regular basis is therefore important to ensure alignment in strategic issues. Within STandUP, forums for collaboration will be created on several planes ranging from university level to the individual research group. A central management target is that the integrated STandUP environment will ensure new and exciting merit-based career paths for promising younger researchers, both towards academia and industry. Proactive treatment of gender and equality issues will remove undesirable career hinders.

The European Institute of Technology

STandUP is participating as a core member in a European consortium led by Karlsruhe Institute of Technology vying for a KIC (Knowledge and Innovation Centre) focused on grid integration in the coming European Institute of Innovation and Technology. Such a KIC would further enhance the strong university and industry educational, research and innovation node in the Stockholm-Uppsala region. The activities described in this proposal would form an important component in such a KIC, and enhance the chances of successfully building a KIC in Sweden.