

4 PHYSICS AND SUSTAINABLE ENERGY

Monday, 21.06.2010, Room 114

Time	ID	PHYSICS AND SUSTAINABLE ENERGY <i>Chair: K. Hencken, ABB Baden</i>
15:30		Coffee Break
16:00	401	<p style="text-align: center;">Sustainability Assessment of Energy Systems</p> <p style="text-align: center;"><i>Stefan Hirschberg, Laboratory for Energy Systems Analysis, Paul Scherrer Institut</i></p> <p>Comprehensive assessments of the sustainability of energy systems are carried out based on a wide range of economic, environmental and social criteria. For each criterion the associated representative quantitative indicators are derived, using a variety of methods including Life Cycle Assessment, Environmental Impact Assessment and Probabilistic Safety Assessment. Aggregated measures of sustainability based on total costs (internal plus external) or on Multi-criteria Decision Analysis (MCDA) are generated. MCDA may involve direct or indirect engagement of stakeholders.</p> <p>The overall methodological evaluation framework developed, implemented and applied by the Paul Scherrer Institut (PSI) is supported by comprehensive databases addressing environmental inventories and risks of severe accidents. The comparative results are available for a broad spectrum of current and future electricity supply technologies with the associated fuel cycles. Recent applications cover countries such as France, Germany, Italy, Switzerland and China and originate from projects conducted for the industry, international organisations, regulators and the EU. In this context also some decision support tools were developed.</p>
16:30	402	<p style="text-align: center;">Defying the Challenges of Modern Power Systems Operation: Physical Constraints and Beyond</p> <p style="text-align: center;"><i>Cherry Yuen, ABB Baden-Dättwil</i></p> <p>The most important aspect of power systems management is that of reliability and security of supply. With global warming, political push on CO₂ emission reduction and oil crisis, new rules and criteria on electricity transmission and distribution emerge. While securing supply, the system operators must also consider the environmental and economic aspects. On one hand, many electricity transmission infrastructures worldwide are aging while the demand has grown. On the other hand, the location of renewable resources such as wind farms is usually far away from the load centers. Therefore, operators must make use of their assets together with the available system services to transmit the energy over their capacity-limited facilities. Under deregulation, system or ancillary services are to be purchased through market mechanisms, which must be designed to avoid market power. This presentation is an introduction of these various challenges and some of the possible solutions.</p>

17:00	403	<p style="text-align: center;">The Swiss Master in Nuclear Engineering: an EPFL-ETHZ-PSI-industry collaboration</p> <p style="text-align: center;"><i>Rakesh Chawla^{1,2}, J. P. Ansermet¹, J. M. Cavedon², P. Hirt³, W. Kröger⁴, H. M. Prasser^{4,2}, M. Q. Tran¹</i></p> <p style="text-align: center;">¹ Ecole Polytechnique Fédérale de Lausanne (EPFL) ² Paul Scherrer Institut (PSI), Villigen ³ Swiss Nuclear Utilities (swissnuclear), Olten ⁴ Eidg. Technische Hochschule Zürich (ETHZ), Zürich</p> <p>Driven by the concomitant concerns on climate change and our planet's continually growing energy hunger, nuclear power has been undergoing a worldwide renaissance as a potentially strong contributor to sustainable energy supply. It is in this broader context that the concerns in Switzerland about having an adequately qualified workforce in the field have, as elsewhere, become even more urgent. Responding to the need, the four key players in nuclear engineering related teaching and research in the country – EPFL, ETHZ, PSI and the nuclear utilities – have pooled resources into the launching, in September 2008, of a new Master of Science degree in Nuclear Engineering (NE). The present paper describes the main features and experience acquired to date in the running of this, first-ever, common degree offered jointly by the two Swiss Federal Institutes of Technology. Future prospects, in terms of the foreseen upgrading of the current curriculum, are also briefly sketched.</p>
17:30		
18:30		Postersession, Apéro, Barbecue

Tuesday, 22.06.2010, Room 114

Time	ID	<p style="text-align: center;">PHYSICS AND SUSTAINABLE ENERGY <i>Chair: K. Hencken, ABB Baden</i></p>
13:15	404	<p style="text-align: center;">Das Desertec-Konzept - ein Baustein für die Energieversorgung Europas</p> <p style="text-align: center;"><i>Jochen Kreusel, Desertec</i></p> <p>Europa hat sich auf den Weg begeben, seine Energieversorgung in den kommenden Jahrzehnten auf erneuerbare Quellen umzustellen. Neben den offensichtlichen Vorteilen für die Umwelt und der Unabhängigkeit von Primärenergieimporten bringt diese Umstellung eine Reihe großer Herausforderungen mit sich. U.a. zeichnen sich die wesentlichen "neuen" erneuerbaren Quellen, Sonne und Wind, durch ein stark schwankendes Primärenergiedargebot aus. Die Durchmischung unterschiedlicher Quellen und Regionen bietet eine Möglichkeit, die Auswirkungen zu mindern. In diesem Zusammenhang könnte das Desertec-Konzept, das vorzieht, erneuerbare Energiequellen in Wüsten zu nutzen, ein wichtiger Baustein werden. Deshalb haben sich im Sommer 2009 zunächst zwölf Industrieunternehmen aus Europa und Nordafrika sowie die Desertec Foundation zusammengeschlossen. Sie wollen gemeinsam die technischen und politischen Rahmenbedingungen untersuchen, die erforderlich sind, um bis zum Jahr 2050 bis zu 15 % des europäischen Elektrizitätsbedarfs aus nordafrikanischen, erneuerbaren Quellen zu decken.</p>

13:45	405	<p style="text-align: center;">The self sufficient home</p> <p style="text-align: center;"><i>Mark Zimmermann, EMPA</i></p> <p>self is a space unit independent from any external energy supply for heating, cooling, ventilation, hot water and all general electricity in moderate or hot climates. Furthermore, is also independent regarding water. Due to the light weight of the structure, self can be easily transported by truck or helicopter. The independence was achieved by integrating a number of advanced building technologies: high performance insulation, solar electricity, seasonal energy storage with lithium ion batteries, a hydrogen system for peak loads and cooking, intelligent electricity management, passive cooling/heating, switchable glazing and a water treatment, purification and recycling system. self is used as a demonstration unit, a research platform for future energy systems and as a temporary housing for living and work for two persons.</p>
14:15	406	<p style="text-align: center;">The Role of Nuclear Power in the (Future) Energy Supply of Switzerland</p> <p style="text-align: center;"><i>Edwin Kolbe</i> <i>Departement für Physik, Universität Basel, Klingelbergstrasse 82, CH-4056 Basel</i></p> <p>In the last decades approximately 40 percent of the electricity consumed in Switzerland was generated by nuclear power and the remaining 60 percent by hydro. Therewith the electricity production in Switzerland has been and is at the moment essentially CO₂-free. In the first part of the talk the sustainability of nuclear power generation will be discussed based on the standard three pillars ecology, economy, and social dimensions, and a comparison with other sources of electricity will be made. Of course, in order to be fair, sustainability must be assessed over the full fuel cycles.</p> <p>In the second part future developments in the nuclear field (Generation IV reactor systems) will be outlined and their potential will be discussed. Here the focus will be put on the challenges with respect to physics.</p>
14:45		END