SEEEP

Sino-EU Engineering Education Platform
High Level Summer School

"Energy Transitions"

Europe CO2 free by 2040

August 14 – August 28 2016
Stockholm & Eindhoven

Introduction: The SEEEP High Level Summer School

The CLUSTER Doctoral Schools are organized within the Sino-EU Engineering Education Platform and SESE Doctoral Schools for Sustainability Engineering. The High Level Summer School on Energy bring professors & PhD candidates from the highest level together to come up with solutions to the grant societal challenges, such as sustainable energy, energy transitions, health or active aging.
The High Level Summer Schools are big schools, lasting for two weeks, and consisting of multiple universities from China and Europe. Aim is to have 15-18 professors from European & Chinese partners, teaching up to 70 PhD's from both sides. Active participation from Industry and Municipalities is required for assignments which will be solved by PhD's in multidisciplinary and multinational teams.
The High Level Summer Schools take place every year, alternately in China and Europe. The first one was organized in March 2015 in China.

Summer School on Energy Transitions

Topic of the school is 'Energy Transitions' and follows up the Spring School organized in March 2016 in Shanghai and Hangzhou. The Summer PhD school is planned to run for two weeks, one week in Stockholm and one in Eindhoven. The school will combine technologies and systems concerning the energy transition design pathways of 'Europe CO2 neutral 2040'.
The format of the school would be starting lectures by well-known scientist from our community. During the first week the PhD candidates work in groups on concepts/challenges to a specified assignment. At the end of the week the concept will be presented to design critics. The concepts will be studied on feasibility the 2nd week, leading to the final presentation.
The organizing partners will invite public and private stakeholders to pose challenges that will be turned into assignments to student teams of the workshop. Problems can be related to smart and strong grid, self-supporting systems, waste to energy, energy transition enablers like ICT, photonics, materials, etc. System studies for the entire energy system will be carried out, based on back casting and different scenarios.
The PhD school aims at developing multi-disciplinary skills of PhD students related to system engineering, design thinking, team working, presentation skills, and peer learning. One expects to form 8-10 student teams that will work on a challenge and present results at the end of the workshop. The student teams are expected to work as team with guidance. The first days lectures will introduce design thinking and basics of project management.
The School will render 4ECTS credits to participating PhD students.

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Organization Partners

The workshop will be organized by four partner universities, represented by:

- Royal Institute of Technology Stockholm: Prof. Per Alvfors
- Eindhoven University of Technology: Prof. David Smeulders
- Zhejiang University: Prof. Zitao Yu
- Shanghai Jiao Tong University: Prof. DAI Yanjun

Participants

Aim is to have 15-18 participating professor and approx. 60 PhD's from different Chinese and European Universities. The school will be part of the cooperation of the European network of technical universities, CLUSTER and the Chinese Network, called the Sino European Engineering Education Platform. The school will be advertised through our networks. The organizing universities have 10 seats each for PhD students. Other Universities of the networks, both European and Chinese, are cordially invited to send in professors and students.

Learning Outcomes

Intended learning outcomes:

- Provide understanding of the energy transition from a global context,
- Deep insight into the energy system of the world, in particular in the context of emerging economies.
- Provide insight into the scale of the energy transition in a country like China that depends largely on coal.
- Get insight into system modelling and back casting methodology

The PhD-candidates will be assessed on skills to independently penetrate a complex challenge in a team and provide a solution. Additional assessed skills:

- teamwork in transdisciplinary context
- teamwork in multicultural context
- presentation skills
- design

Venue & dates

KTH Royal Institute of Technology
Stockholm, Sweden
Saturday 13 August – Saturday 20 August 2016

Eindhoven University of Technology
Eindhoven, The Netherlands
Sunday 21 August – Sunday 28 August 2016

Contact & more information

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Annex 1: Assignments challenge and idea driven

This annex describes the ***structure*** for the projects and group formation that will fulfill the various demands of the participants and create great flexibility for all partners. Since the students are coming from ***several different disciplines*** we have created two distinct classes of projects to be run in parallel: *challenge-driven projects* and *idea-driven projects*.

> ***Challenge-driven projects*** start out in broad general societal or even global challenges with relevance to China as formulated in advance (for ex: How to increase the amount of renewable energy in Cities). Each student groups should gradually narrow down the problem and search for possible combinations of new innovative technologies, methods and/or policies. Preferable combined. These projects are suited for broad students groups ranging from architecture, city planning, various branches of engineering (mechanical, electrical, chemical) and social science. The final product should be an analysis of the problem, a clear problem formulation, a comprehensive systems analysis (cause-effect), identified challenges and possible solutions and a proposed way forwards. The group should spend a relatively long phase in problem formulation mode for problem definition and data retrieval.
>
> **Idea-driven projects,** on the contrary, start from a more-or-less clearly proposed new idea (maybe rather loosely formulated) or technology and explore the possibilities in the Chinese energy system. What R&D is needed and which modifications are needed? What are the design challenges? These projects may require a more coherent team, possible with students from neighboring disciplines, for example computer science, electrical engineering and information and communication technology. The final product should be a description of the possibilities for the proposed idea/technology to become a game-changer the Chinese energy system. Proposed modifications and possible design changes should be presented. New ideas and combinations are a bonus here.

The structure enables us to distribute the students and supervisors based on preferences to both types of projects without losing the overall picture. This process will be done in two steps:

First step is to ask the students for a preliminary priority list. Group division will be finalized the first day based on student preferences. Here is the list of proposed projects (next pages):

Challenge-driven projects:

1. How can the amount of renewable electric energy increase significantly in the European power system? What could/should the balance between local solar energy (PV) and large scale Wind power look like in the future? Is there a difference to the Chinese power system?
2. Transport and mobility. What should a smart transport strategy for Europe look like to mitigate air pollution, increase energy efficiency, and increase energy security? Parameters of interest are fuel (renewable, bio-based, electricity etc), road type (electric highways, rail systems, waterways etc) drive-line (powertrain) in vehicles (conventional, hybrid, battery electric, fuel cell electric etc). An interesting option for at least one group is to explore the whole carbon-free conversion change based on renewable electricity, hydrogen and fuel cells.
3. Energy efficiency, smart heating and cooling systems are a requisite for future cities. How should these technologies be integrated in to the design process for the built environment

together with other possibilities such as better controls, new types of building designs, growth of cities etc.?

4. Asset management challenges are obvious after rapid growth of EU Smart Energy Grid. A smart grid should not only focus on smart usage but also contain active diagnostics and maintenance. How could these strategies be developed? What kind of sensors and diagnostics are needed? What types of energy, gas, electricity, even hydrogen?

Idea-driven projects:

5. Smart micro grids can offer more rapid integration of renewable energy technology such as solar PV, solar thermal collector, and wind turbine etc. How can this technology be utilized in the urbanization process? New cities? Etc. Is a mix of centralized and micro grids the way forward for resilience and security of supply?
6. Utilization of big data and smart controls in cities for improved energy system integration and efficient service production and intelligent use of so called demand side management to support large scale integration of sustainable energy technology (like solar power generation(including solar PV and solar thermal utility), wind turbine, biomass, hydrogen etc.) and clean utilities of fossil energy.
7. Energy Storage. How can existing technologies be adapted and utilized in a grid context consisting of different kind of grids, e.g. electric, gas - methane, gas - hydrogen, district heating, and possibly other media.
8. “Power to gas” is an interesting concept to combine (excess) electricity production with biogas production to enable both production of fuel for car, trucks and possibly ships and simultaneously be a tool for energy storage.
9. How could energy efficiency be brought into European and Chinese households and industry? Could the “internet of things” revolution bring new possibilities for smart low energy homes, offices and public buildings. And what are the options for the renovation of old buildings?
10. Nanogrids are modular building blocks for energy services that support applications ranging from emergency power for commercial buildings to the provision of basic electricity services for people living in extreme poverty. In many ways, nanogrids are just small microgrids, typically serving a single building or a single load. The less complex technology can provide new opportunities for the EU electric system. Examples for these grid solutions can be found in Southern Europe, where solar power is a good opportunity.
11. Management and politic boundary conditions form an important aspect of the European Energy market. Reliability and Power Quality, what is the optimum service level in terms of performance, costs and public acceptability?

Further Background Reading

http://www.worldenergyoutlook.org/weo2015/
http://www.cerre.eu/publications/energy-transition-europe-initial-lessons-germany-uk-and-france
http://www.ipcc.ch/report/ar5/index.shtml
http://ec.europa.eu/eurostat/statistics-explained/index.php/Energy_production_and_imports

Annex 2: Preliminary Program

WEEK 1/2

Day	*Morning*	*Afternoon*	*Evening*
Sunday August 14	Arrival in Stockholm, Sweden		
Monday August 15	Introductory Key-note Presentation of Assignments	Introduction to international and intercultural collaboration	KTH reception and opening ceremony
Tuesday August 16	Key-Notes	Workshops & Work Sessions	Poster presentations
Wednesday August 17	Key-Notes	Working Sessions	Poster presentations
Thursday August 18	Key-Notes	Working Sessions	Poster presentations
Friday August 19	'Kryssning' boat conference		
Saturday August 20	Cultural Program		

WEEK 2/2

Day	*Morning*	*Afternoon*	*Evening*
Sunday August 21	Travel to Eindhoven		
Monday August 22	Welcome program Eindhoven University of Technology	Workshops & Key-note lectures	Working Sessions
Tuesday August 23	Key-Notes	Working Sessions	Working Sessions
Wednesday August 24	Visit High Tech Campus Entrepreneurship workshop		Working Sessions
Thursday August 25	Working Sessions	Working Sessions	Working Sessions
Friday August 26	Final presentations to Chinese & European representatives	Certificate Ceremony	TU/e Festive Closing Ceremony
Saturday August 27	Cultural Program		
Sunday August 28	Departure		

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Annex 3: Participating professors

Eindhoven University of Technology
prof.dr.ir. D.M.J. (David) Smeulders
Engineering Thermodynamics for Energy Systems
prof.dr.ir. G.P.J. (Geert) Verbong
System Innovations & Sustainability Transitions
dr. P.A.A.F. (Peter) Wouters
Diagnostic techniques in high-voltage systems
prof.dr.ir. J.L.M. (Jan) Hensen
Building Performance

KTH Royal Institute of Technology
Prof. Dr. Per Alvfors
Professor in Chemical and Energy Engineering
Prof. Per Lundqvist
Applied Thermodynamics and Refrigeration
Prof. Ramon Wyss
Professor in Theoretical Nuclear Physics

Zhejiang University
Prof. Dr. Zitao Yu,
Professor and Director, Institute of Thermal Science and Power Systems, College of Energy Engineering, Zhejiang University
Prof. Dr. Gang Xiao
Professor and Director Assistant, Institute of Thermal Power Engineering, College of Energy Engineering, Zhejiang University
Prof. Dr. Ziyuan Wang
Office manager of Master Program, College of Energy Engineering, Zhejiang University.

Shanghai Jiao Tong University
Prof. DAI Yanjun (TBD)
Department of Power and Energy Engineering, Head Solar energy research center, Vice Director
Prof. Dr. WANG Ruzhu (WANG R.Z.)
Chair professor of Shanghai Jiao Tong University, Director, Institute of Refrigeration & Cryogenics, Director, Engineering Research Center of Solar Energy, MOE China, School of Mechanical Engineering, Shanghai Jiao Tong University
Prof. LI Yong
Institute of Refrigeration & Cryogenics School of Mechanical Engineering Shanghai Jiao Tong University
Prof.ZHU Miao
Power Electronics, Hybrid AC/DC Power System, Wind Power, Renewable Energy and Distributed Generation, Switched-Mode Power Supply

Annex 4: Planning

February	Draft Program available List of Assignments known
March	Launch School: applications opened 22 April: Deadline applications
May	2 May: Participants announced Invitaiton Letters send Full Program available
August	Final Program Available **14 August - 28 August High Level School Stockholm / Eindhoven**
September	Reimbursement of costs
October	Final Report Published