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Welcome to the March edition of the Bergen Energy Lab Newsletter!

For the third year in a row, global energy-related carbon emissions have been flat according to the International Energy Agency. This is a result of renewables growing, coal-to-gas switching and improvements in energy efficiency. Stalling emissions are good news, but there is still a lot to do. In a Half Day seminar arranged by the Bergen Energy Lab, emerging renewable technologies that hopefully will play an important role in the energy transition were presented. Maybe in the future we will produce our electricity from raindrops and from kites several hundreds of meters up in the air. Read about our seminar on emerging technologies and their impact on the society on page 6!

During March we have also had several interesting Lunch Meetings in the Bergen Energy Lab. Read on page 3 about Lunch Meetings with Finn Gunnar Nielsen, Ignacio Herrera Anchustegui, John D. Carter, Hanne Sjøvold Hansen, Lars Egil Helseth and Hilde Holdhus.

Enjoy reading!

Hans-Kristian Ringkjøb

Upcoming Events

There are many interesting events in store for the Bergen Energy Lab. Please keep an eye on http://www.uib.no/en/energy/calendar for additional events and eventual changes in the program.

Half Day Seminar – The Norwegian Energy Market

When: 12.15 – 16.00
Where: Auditorium 105, Geophysical Institute, Jahnebakken 3

Registration: The event is free, but due to a limited number of places, registration is mandatory. Register online here.

Speakers:

- Endre Bjørndal (Associate professor, NHH) – Regulation of electricity networks and implications for integration of renewable generation
- Ørjan Mydland (PhD-student, NHH) – Economies of Scope and Scale in the Norwegian Electricity Industry - Synergies between production and distribution of electricity
- Marte Wigen Nilsson (Multiconsult) – Solar energy in Bergen
- Per Sandberg (Statoil) - The Norwegian government's expert committee for green competitiveness

Lunch Meetings

28. March — Extended Lunch Meeting (12.00-13.15)
Gunnar Eskeland (NHH): Transport and Urban Development
Malgorzata Cyndecka (Faculty of Law): EU/EEA State aid rules and energy issues
Seminarrom 1 (404), Dragefjellet, Magnus Lagabøtes pl 1

04. April – Lunch Meeting (12.00-13.00)
Birgitte Rugaard Furevik (Norwegian Meteorological Institute): The potential for wave energy in the North Sea
Helland-Hansen, GFI

18. April – Lunch Meeting (12.00-13.00)
Ida Marie Solbrekke (GFI): Electrification of the Norwegian shelf with wind energy
Venue TBC

25. April – Lunch Meeting (12.00-13.00)
Jarle Berntsen (Department of Mathematics): Tidal current energy
Helland-Hansen, GFI

Integrated 5-year Master's Programme in Energy

A new 5-year integrated Master's programme in Energy at UiB starts this fall. The programme gives insight into various energy resources, how they are transformed and used. Renewable energy sources experiencing major growth such as solar, wind and geothermal energy are covered, as well as emerging technologies such as wave energy and tidal energy. The introduction of new renewable energy sources will give challenges related to the energy system with respect to, amongst others, security of supply. The study gives insight into technological, social and environmental consequences of the use of various energy sources.

The application deadline is on the **15th of April**. The study language is Norwegian. Read more about the programme, requirements and watch a video about energy education at the University of Bergen here.

Recent Lunch Meetings

Finn Gunnar Nielsen (GFI): Wave Energy – The basic principles

On the 14th of February, professor Finn Gunnar Nielsen from GFI gave an introduction to some of the basic principles of wave energy.

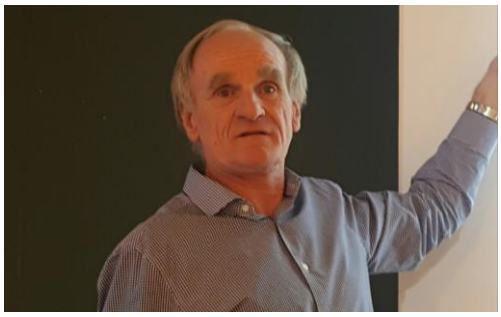
He covered ordinary gravity waves, examples of wave energy converters and how one can extract energy from an oscillating system. His presentation can be found here.

Finn Gunnar Nielsen (Photo: Marit Hommedal (NORCOWE))

Extended Lunch Meeting: Ignacio Herrera Anchustegui & Finn Gunnar Nielsen

On the 21st of February, the Bergen Energy Lab arranged an extended lunch-meeting with presentations from Ignacio Herrera Anchustegui and Finn Gunnar Nielsen. Presentations are available by clicking the titles below.

Ignacio Herrera Anchustegui (Photo: Stian Backe)



Finn Gunnar Nielsen (Photo: Stian Backe)

Ignacio Herrera Anchustegui: Role of the state in implementing renewable energy in public procurement

Ignacio is a PhD-candidate at the University of Bergen under the Faculty of Law, and he is teaching a course on EU/EEA Public Procurement Law.

His presentation was about how public procurement can legally become greener, and how environmentally friendly alternatives can be used as award winning criteria in relevant cases. The potential for funding green transition through more public participation is great and possible, and Ignacio emphasized that public procurement measure significant portion of the Union's GDP.

Finn Gunnar Nielsen: Electrification of Norwegian cars with offshore wind

This time, Finn Gunnar talked about Norwegian emission targets and alternatives on how to achieve them.

Due to high portions of hydropower, Norwegian emissions are dominated by emissions made in the transport sector and the oil & gas sector. Finn Gunnar suggested an electrification of the Norwegian car park based on offshore wind power, and he argued that the price would be competitive with the current gasoline and diesel prices. Finn Gunnar further underlined the great potential in emission reduction through electrification of oil and gas platforms with offshore wind.

John Carter (Seattle University): Designing a course on Wave Energy

John D. Carter held a presentation for the Bergen Energy Lab on 28. February 2017. He is a Professor at Seattle University, and teaches an international course on wave-energy extraction.

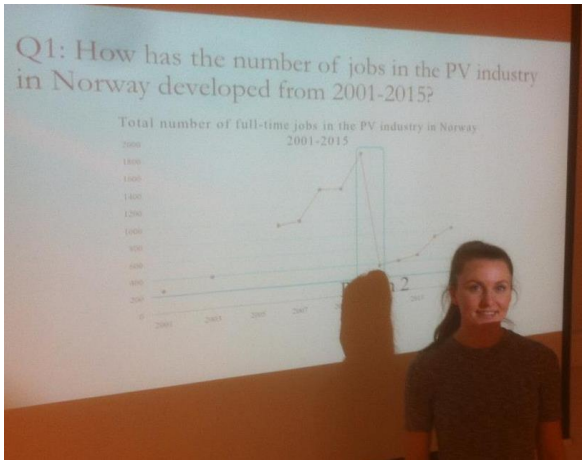
John presented an overview of his course, where students not only learn basic principles of wave energy, but also get the opportunity to travel a week to Chile. By learning from Chilean experts in the field, the wave course promotes a better understanding of international research communities and global collaboration.

See John's presentation here.

John D. Carter (Photo: Stian Backe)

Hanne Sjøvold Hansen (HVL) - Jobs in the solar energy business in Germany and Norway

Hanne Sjøvold Hansen from HVL held an Energy Lab lunch seminar on the 7th of March on creation of jobs in the solar cell industry. The work was based on a master thesis at HVL in 2016 and is now submitted for publication. See her presentation here.



Hanne Sjøvold Hansen (Photo: Peter M. Haugan)

The study focused on the Norway with comparison to Germany and covering the upstream part of the value chain dealing with materials and equipment, and excluded application, installation etc. (the downstream part) which anyway has been rather small in Norway until now.

The period 2001-2015 can be divided into three phases; a rise until 2010, then rather dramatic decrease in 2011 and a gradual growth again since then. In Germany the decrease was not as rapid. On the other hand the growth in Norway since 2011 has not been seen in Germany. Incentive-aided Chinese producers (and not the financial crisis) was the main reason for the drop in 2011 while prior R&D knowledge, community spirit and varying degrees of diversification were among several factors explaining other aspects of the patterns. Also the downstream parts of the industry may become more important.

Lars Egil Helseth (Department of Physics & Technology) – Electric production from raindrops

Lars Egil Helseth from the department of Physics and Technology explained how electricity can be produced directly from raindrops. By using an energy conversion unit in the form of a triboelectric or piezoelectric transducer, the mechanical energy of raindrops can be converted into electrical energy.

It is also an idea to use this technology together with solar cells: Improving today's solar cells using a transparent thin film of polymer covering the solar cell, you could use the same device to produce energy while it is raining.

Read his presentation here.

Hilde Holdhus: GreenSight

GreenSight is a subsidiary of Greenstat, and was founded in 2016 with Hilde Holdhus as the manager. She visited the Bergen Energy Lab on the 21st of March.

GreenSight works for a faster green energy transition through knowledge and competence. They offer several services such as aiding municipalities, industries or companies with their energy strategy, publishing up to date reports and analysis on the rapidly changing energy sector, consulting, communication etc.

GreenSight recently published the first edition of "Grønn Innsikt", a report (in Norwegian) that keeps you updated on what is happening in the energy sector.

Read more about GreenSight here, and see Hilde's presentation here.

Hilde Holdhus (Photo: GreenSight)

Floating Solar Photovoltaics (Illustration: www.colourbox.com)

Seminar: Emerging technologies and their impact on the society

On the 9th of March, the Bergen Energy Lab arranged a half-day seminar on emerging technologies and their impact on the society. Both current technology and technology on a very early stage/concept stage were presented, together with the challenges and opportunities posed by technological development.

Kjetil Rommetveit, associate professor at the centre for the study of the sciences and the humanities opened the seminar, speaking about responsible energy transition.

The first session was devoted to currently available technologies. Kristin Guldbrandsen Frøysa, director of NORCOWE and associate professor II at UiB, presented wind turbines for use in urban environments. Small-scale wind turbines can be used to harvest wind energy within cities and on top of buildings, but face challenges related to resource assessment, complicated wind conditions, visual impacts and economic aspects.

Simona Petroncini, founder of the Bergen-based solar photovoltaic company Solbære, explained why solar cells in Bergen is a good idea. A lot of wind and rain helps holding the solar panels clean, they function best with cold temperatures, and contrary to many people's beliefs there is a lot of sun in Bergen.

Småkraft was founded in 2002, and builds and owns small hydropower plants. Currently they have 92 plants in operation, with a total of 900 GWh in their portfolio. According to a study from the Norwegian Water Resources and Energy Directorate, the Norwegian potential of small-hydro is as high as 25 TWh. In addition to building small hydropower plants, Halvard Tesdal also pointed out that Småkraft gives added value that lasts for generations to the local society through improved infrastructure and wealth generation.

After lunch it was time to look ten years into the future, and the technologies of tomorrow. Lars Egil Helseth from the department of Physics and

Technology explained how electricity can be produced directly from raindrops. By using an energy conversion unit in the form of a triboelectric or piezoelectric transducer, the mechanical energy of raindrops can be converted into electrical energy.

86 % of solar cells on the market today are made from crystalline materials. Dhayalan Velauthapillai from HVL presented some of the emerging solar cell technologies. For example dye sensitized solar cells, perovskite solar cells, quantum dots sensitized solar cells and so on. At HVL, Dhayalan and his colleagues are doing computer simulations, characterization studies and fabrication of the next generation of solar cells.

Thomas Hårklau from Kitemill presented a new concept for harvesting wind energy at very high altitudes. By using kites, Kitemill can take advantage of the strong and more stable winds at 500 – 1500 meters over the ground.

The last session concerned the social and legal impacts of new and emerging technologies. Helge L. Tvedt, PhD-Student at the department of Geography, spoke about social perspectives on the commercialization of green technologies and Professor Ernst Nordtveit from the faculty of law explained the transformation of Energy Laws.

The presentations are available online by clicking the names of the speakers or on the online version here.

The seminar dealt with legal and social aspects of new and emerging technologies (Illustration: www.colourbox.com)