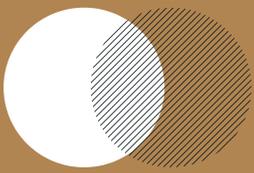


RENEWABLE ENERGY INTRODUCTION COURSE

A comprehensive path towards the understanding of the main renewable energy technologies



“Education is a fundamental aspect for the diffusion of renewable energies across the world. It is only with awareness that future leaders, activists and people can take the right decisions to live in a green and sustainable society.”



*Preben Maegaard,
Renewable Energy Pioneer and
founder of Nordic Folkecenter*



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Introduction

There are no more doubts that renewable energies will have a bright future and that most, if not all, of our future consumption will be covered by renewable energy sources: even the more skeptical people will have to surrender to the benefits that renewable energy bring to the society, both in economic -onshore wind is currently the cheapest form of electricity production in Denmark- and social terms.

Some countries understood this long time ago and became pioneers of renewables: the same countries are now benefiting of this vision by having a flourishing industry in the chosen technologies, which ensures workplaces, prosperity and welfare.

But, if both technology and economics of renewables are already mature, people's knowledge is not: too many are the prejudices on renewable energies and too little is the awareness on what the benefits, especially in terms of social impact, can be.

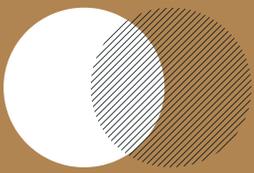
There is, therefore, a massive need of education, which should be carried out in an independent and honest way, so that people is made aware that yes, there are still some limitations to a 100% renewable energy society, but also that these barriers are not as big as one might think. In Nordic Folkecenter we are aware of the importance of education, having been providing information and training on renewable energy since 1983.

The purpose of this course is to provide the participants with a basic knowledge of renewable energy, which would help them in further understanding and researching the topic. The program is structured so that the knowledge is transferred taking in consideration the practical aspects of the single topics as well. The instructors are all experienced people in the renewable energy field.

The course, which lasts one week, will cover the essentials of wind, solar and wave energy, carrying the participants also through other related topics, like the history of renewable energy development, district heating, grid balancing, efficient buildings and policy-making aspects. The material will be presented in a clear and understandable format, so that no previous knowledge is expected.

At the end of the course Folkecenter will issue a certificate of completion, which will prove that the participants have learned and understood the fundamentals of renewable energy.

For any further information about the course, you are welcome to contact Mr. Daniele Pagani, program coordinator, at dp@folkecenter.dk.



Overall Program

Monday 28 January 2019

09:00 – 09:30: Welcome
09:30 – 11:00: Guided tour through Nordic Folkecenter
11:00 – 11:30: Coffee break
11:30 – 13:00: Guided tour – Continuation
13:00 – 14:00: Lunch
14:00 – 15:30: The development of renewable energies and the role of cooperatives
15:30 – 15:40: Coffee break
15:40 – 17:00: Renewable Energy Policy

Tuesday 29 January 2019

09:00 – 10:30: Wind energy
10:30 – 10:45: Coffee break
10:45 – 13:00: Wind energy - continuation
13:00 – 14:00: Lunch
14:00 – 15:30: Wave energy
15:30 – 15:40: Coffee break
15:40 – 17:00: Wave energy – Continuation

Wednesday 30 January 2019

09:00 – 10:30: Photovoltaics
10:30 – 10:45: Coffee break
10:45 – 13:00: Photovoltaics - Continuation

13:00 – 14:00: Lunch
14:00 – 15:30: Solar thermal
15:30 – 15:40: Coffee Break
15:40 – 17:00: Solar thermal – Continuation

Thursday 31 January 2019

09:00 – 10:30: Energy savings in Buildings
10:30 – 10:45: Coffee break
10:45 – 13:00: Energy savings in Buildings – Continuation
13:00 – 14:00: Lunch
14:00 – 15:30: The electricity grid
15:30 – 15:40: Coffee break
15:40 – 17:00: The electricity grid – Continuation

Friday 01 February 2019

09:00 – 10:30: District heating
10:30 – 10:45: Coffee break
10:45 – 13:00: District heating - continuation
13:00 – 13:30: Certificates delivery
13:30-14:30: Lunch (optional)

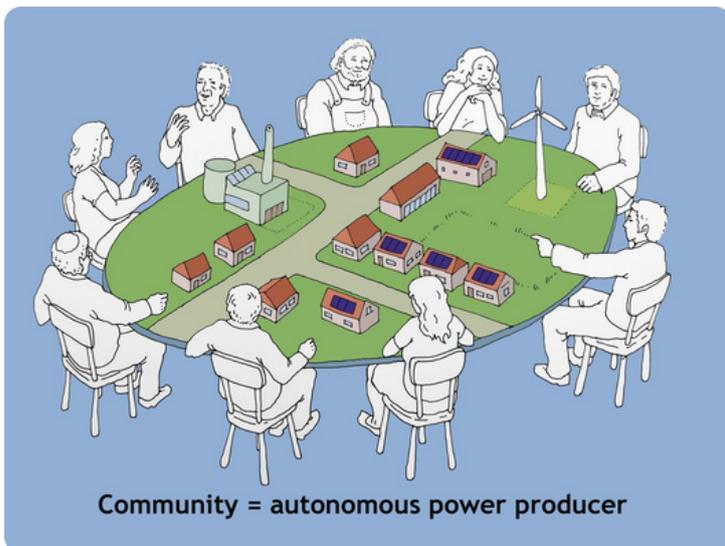




Syllabus

The development of renewable energies and the role of cooperatives

- Energy crisis and its impact on wind energy development
- Cooperatives as a tool for democratic and accepted energy development
- The power of energy cooperatives: the largest wind turbine is built



by Anna Krenz

Renewable Energy Policy

- History of Danish energy policies with focus on success factors
 - Wind turbines
 - District heating
 - Biogas
 - Solar PV
- Analysis of current energy policies and future challenges
- What role should citizens, consumers and communities play in the energy policies?



Jane Kruse

Director of Folkecenter since 2013, she has 30 years of experience in renewable energy. In the second half of 1980s she started a wind cooperative with more than 40 local families involved in it. Since 1993 she was the Head of Information and Training Programs in Folkecenter and she has been the project leader for several renewable energy projects, both in the Global North and the Global South.



Leire Gorroño Albizu

She holds a B.Eng. in Industrial Organization from Mondragon University, Spain, and a MSc. in Sustainable Energy Planning and Management from Aalborg University, Denmark. Her main field of interest is social aspects of renewable energy. She is specialized in community power, local development and local acceptance. She is taking a PhD on ownership models for smart energy systems at Aalborg University.



Syllabus

Wind Energy

- Wind: its origins and its potential
- Wind turbine: from agriculture to energy production
- Basic wind theory
 - The importance of aerodynamics
 - Main components of a wind turbine
 - Types of wind turbines
 - Production and limitations
 - Wind maps: what to look when planning a wind turbine
- Arguments against wind turbines: what is a prejudice and what should be considered?
- Economics behind a wind project: is it profitable?
 - On-grid, micro-grid or off grid?
- Environmental impact and end-of-life considerations: what happens when a wind turbine is taken down?
- Hands-on experience: identify the main components of the Folkecenter's small wind turbine



Tonny Brink

Educated as a Marine Engineer, he is Folkecenter's CTO. He has got 35 years of experience in the international wind industry, working for Vestas Wind Systems A/S and Folkecenter. This has provided him with broad knowledge in service and maintenance site management and construction and operational project management. Hold positions and responsibilities: Travel Technician, Site Manager, Logistics Coordination, Area Service Manager, Technical Support Dept., People Manager, Technical After Sales/Customer Reporting, WTG Performance and Diagnostic analysis, Communication, Planning, Controlling, Technology Transfer, Project Management and Execution Leader.



Syllabus

Wave Energy

- The history behind wave energy
- What is wave energy? The difference between wave and tidal energy
- Once Denmark was the leading country in the branch: what happened?
- Wave energy worldwide
- Wave energy is difficult, so why even do the effort?
- Different solutions of converters
- Efficiency of the converters
- When will we see it in big scale?



Christian Nereus Grant

He has an education as technical designer and have been working for long time in the wave energy field. He has been site manager for the Wavestar platform in Hanstholm and worked also for Dexawave, after which he founded OctoMar Aps, a consulting company working with wave installations.

At the moment, he collaborates with different wave projects (Nemos, Reesen Weves and Wavepiston) and is president of the Wave Energy Association and board member of the Partnership for Wave Power. With a daily work at DanWEC as a site manager, he has a unique position in understanding the challenges wave developers are in.



Syllabus

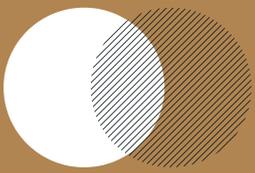
Photovoltaics

- Introduction to solar energy and photovoltaic (PV) technology
- Basic PV theory
 - Types of PV currently available and future trends
 - Main components for a PV installation
 - How should a PV installation be planned?
 - Parallel/series connections: what to use, what the benefits?
 - Temperature & shadow: two enemies for the PVs. Systems and solutions to reduce their effect
- Mounting systems: secure the PVs for a long-lasting life
- On- and off-grid installations: pros and cons
 - Basic battery theory
 - § Basic Charge controller theory
 - § Potential of off-grid solutions in developing countries
 - Inverter: turning DC to AC
 - § An alternative to the inverter: the Sun Generator
- Everything has an end: lifetime and recycling of PV
- Hands on experience: learn how to work with a PV installation with Folkecenter's training platform



Anker Mardal

Educated as an electro-mechanic, Anker Mardal has worked for most of his career in the electrical and electronic sectors. After a practical placement in Bang & Olufsen, a well know Danish company producing entertainment appliances, he was involved in the development of short-wave radio devices. Next, he designed electronic circuits and worked on the development of solar panels for Jysk Solenergi. He collaborates with THY WindPower, a local company producing small wind turbines and with Folkecenter, where he is responsible for education on solar energy. He has also invented the Sun Generator, a device which converts the DC solar energy in to AC current, without the need of a battery or of an inverter.



Syllabus

Solar Thermal

- What is solar thermal? History and physics behind the technology
- Composition of a solar thermal system
- Types of solar thermal technologies
 - Domestic installations
 - Industrial installations
- How to plan a solar thermal installation
- Current and future applications for solar thermal technology
 - Water and space heating
 - Electricity production
 - Storage
- Economics & Environmental impact
- Hands-on experience: solar thermal in practice

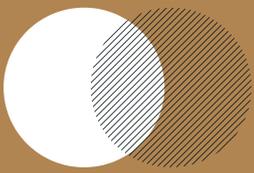


Daniele Pagani

He holds a B.Eng. in Global Business Engineering and a B.Eng. in Mechanical Engineering from VIA University College, Denmark, where he provided support teaching for younger students in various subjects.

His main research interests are related to sustainable mobility and applications of hydrogen in the industrial and agricultural sector.

Currently pursuing a MSc. in Engineering - Technology-Based Business Development from Aarhus University, he is also the responsible for education in Folkecenter.



Syllabus

Energy Savings in Buildings

- Introduction to building's energy framework
 - Energy use in buildings
 - Future scenarios and challenges
- Building and context
 - The micro-climate
 - Space and function
 - User's comfort and indoor environment
- Principles of energy efficient design
 - The Building envelope
 - Solar heating and heat control
 - Passive and natural cooling
 - Efficient windows and daylight
 - Advanced facades
- Energy efficiency for active systems
 - Heating and cooling
 - Ventilation
- Energy supply and renewable energy integration
 - Integration of renewable energy sources
 - Electricity and heat- heat pumps
 - Energy flexible buildings
- Examples
 - Folkecenter's passive house
 - Net Zero Emission Buildings and future buildings



Laia-tuixent Morgo Monne

Graduated in "Sciences and Building Technology" at the Polytechnic University of Barcelona Building (EPSEB) with diploma in "Computer tools for energy design and performance evaluation" at the Barcelona School of Architecture (ETSAB). Former trainee of the Nordic Folkecenter (FC) for 6-month project research in optimization of Passive Houses. Several years of work experience in the building sector and from 2016 specialized in energy efficiency of buildings, completing a master's degree in "Building Energy Design" at Aalborg University, Denmark.



Syllabus

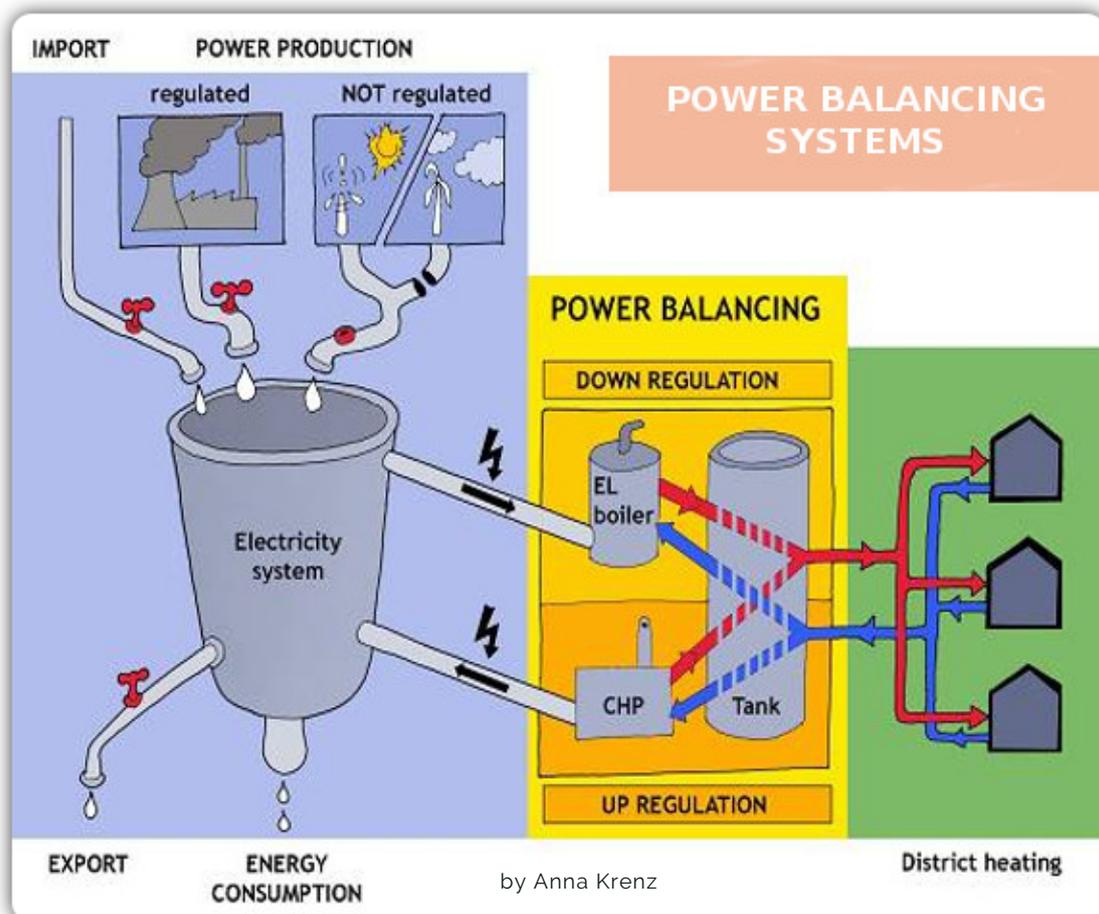
The Electricity Grid

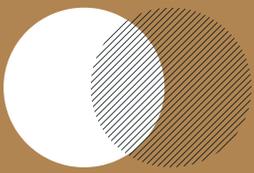
- Types of grids: power for every application
- One-way grid: an historical infrastructure and the need for a grid
- Renewable energy: a challenge and an opportunity for grid operators
- Parameters to consider when establishing and maintaining a grid
- How can we store energy? Is it necessary at all?
- Future trends: mini-grids, smart-grids and smart areas
- Necessary legislation for grid operators



Peter Melgaard

He has over 25 years of experience in power grids and was the Chief Technical Officer (CTO) of the local distribution grid company Thy-Mors Energi for 10 years. Currently he collaborates with Folkecenter for the improvement of mini-grids in Africa and other developing countries.





Syllabus



Ioannis Skondriakos

He holds a Diploma in Electrical and Computer Engineering from Aristotle University of Thessaloniki in Greece. He has worked in projects in different fields related to Renewable Energy, some of which were developed under the auspices of Nordic Folkecenter in Denmark. As part of his experience, he has also assisted a company in the test of a vertical-axis wind turbine prototype.

Currently, he is a second year MSc student in Sustainable Energy at the Danish Technical University (DTU), where he has also provided support teaching for younger students.

District Heating

- What is District Heating?
 - Basic idea
 - Why District Heating?
- Danish situation
- Let's talk about numbers (Denmark vs. the rest of the world)
- District Heating set up
 - Facilities
 - Basic components
 - Types of fuels
 - Example in Jutland
- District Heating combined with Combined Heat and Power (CHP)
 - Basic components of a CHP plant
 - How is heat produced?
 - Avedøre Power station
 - Storage facilities
- District Heating/CHP network in Copenhagen
 - Heat market
 - Optimal dispatch of Energy
- Transmission and distribution of heat
 - Direct Connections to District Heating
 - Indirect Connections to District Heating
- Environmental Impact



Enrollment Fee

The purpose of the course is to form people on renewable energies, no matter what background do they come from; for this reason, the enrollment fee is designed to be as affordable as possible. We strongly support the participation of young and senior people, but also we want to encourage the presence of women in the renewable energy field and we want to do that by making the program more accessible to them. The table below summarizes the different enrollment fees.

Category	Fee	Discount
Professionals	1375 €	-
Women	1169 €	15%
Students ¹	605 €	44%
Students (Women) ¹	550 €	60 %
Retired ²	605 €	44%

Participants joining for the January 2019 session will get an additional discount of 10% on their enrollment fee:

Category	Fee January 2019	Saving
Professionals	1250 €	125 €
Women	1063 €	106 €
Students ¹	550 €	55 €
Students (Women) ¹	500 €	50 €
Retired ²	550 €	55 €

1 A valid student card or other proof of enrollment should be provided upon registration

2 Proof or retirement should be provided upon registration



Enrollment Fee

The course fee includes:

- Access to all the lessons of the week
- Lunch
- VAT (25%)
- Shuttle service from/to Ydby Train Station to/from Folkecenter
- Invitation letter for visa application, if needed
- Final certificate
- Subscription to Folkecenter's Alumni Network

The course fee does not include:

- Board and lodging, either than lunch
- Transportation from/to home country to/from Ydby Train Station
- Alcoholic drinks during lunch

Please, note that in case the minimum number of students is not reached, the course will be cancelled and the course fee will be refunded to the participants. Please, note that Folkecenter will not refund any other expense the participant has undergone through (e.g. transportation, accommodation, etc.). In case of cancellation, participants will be informed no later than 15 days before the course starts.





Payment Options

It is also possible to pay the course fee in installments: for the first edition a two- and a three-month plan are available, while for the following ones participants have the option of dividing the amount in three-, six- or nine-month plans, based on their availability.

The following tables represent the financing plans available:

January 2019 Edition

Two-months Plan:

Category/Deadline	15 December	12 January
Professionals	688 €	688 €
Women	585 €	585 €
Students	303 €	303 €
Students (Women)	275 €	275 €
Retired	303 €	303 €

Three-months Plan:

Category/Deadline	25 November	15 December	12 January
Professionals	417 €	417 €	417 €
Women	354 €	354 €	354 €
Students	183 €	183 €	183 €
Students (Women)	167 €	167 €	167 €
Retired	183 €	183 €	183 €



Payment Options

August 2019 Edition

Three-months Plan:

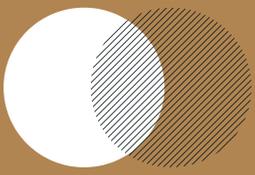
Category/Deadline	15 May	15 June	15 July
Professionals	496 €	496 €	496 €
Women	419 €	419 €	419 €
Students	223 €	223 €	223 €
Students (Women)	196 €	196 €	196 €
Retired	223 €	223 €	223 €

Six-months Plan:

Category/Deadline	15 February	15 March	15 April	15 May	15 June	15 July
Professionals	252 €	252 €	252 €	252 €	252 €	252 €
Women	214 €	214 €	214 €	214 €	214 €	214 €
Students	115 €	115 €	115 €	115 €	115 €	115 €
Students (Women)	102 €	102 €	102 €	102 €	102 €	102 €
Retired	115 €	115 €	115 €	115 €	115 €	115 €

Nine-months Plan:

Category/ Deadline	25 Nov.	15 Dec.	15 Jan.	15 Feb.	15 March	15 April	15 May	15 June	15 July
Professionals	171 €	171 €	171 €	171 €	171 €	171 €	171 €	171 €	171 €
Women	145 €	145 €	145 €	145 €	145 €	145 €	145 €	145 €	145 €
Students	80 €	80 €	80 €	80 €	80 €	80 €	80 €	80 €	80 €
Students (Women)	71 €	71 €	71 €	71 €	71 €	71 €	71 €	71 €	71 €
Retired	80 €	80 €	80 €	80 €	80 €	80 €	80 €	80 €	80 €



Registration & Cancellation

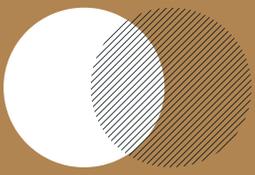
Registration to the course must be done on www.folkecenterevents.net and the deadline for it is January 12, 2019 for the first edition and July 15 for the second edition. Please, note that there is a maximum number of participants: places will be assigned based on the first come, first served policy,

In case the minimum participant number is not reached, the course will be cancelled. Participants will be notified latest 15 days before the first day of classes and the full course fee will be refunded. Please, note that Folkecenter will not refund any other expense the participant has undergone through (e.g. transportation, accommodation, etc.).

Participants can cancel their registration by writing a mail to dp@folkecenter.dk. Please, note that the following policies apply:

- Cancellation before the 28 December 2018 (winter) / 01 July 2019 (summer): full refund;
- Cancellation before the 12 January 2019 (winter) / 16 July 2019 (summer): 50 % refund;
- Cancellations from the 12 January 2019 (winter) / 16 July 2019 (summer): no refund;





Nordic Folkecenter for Renewable Energy

Our ultimate long term goal is a complete replacement of fossil fuels and atomic power with renewable energies & energy savings while promoting the sustainability, resilience and development of local communities around the world. For this purpose, we have collaborated with local civil society organizations, research and education centers, companies, professionals and governmental authorities from all over the globe for decades.

Among others, we are an active and founding member of the World Wind Energy Association (WWEA), the European Association for Renewable Energy (EUROSOLAR), the European Renewable Energies Federation (EREF) and the International Network for Sustainable Energy (INFORSE). We are also the Danish coordinator of EUROSOLAR and the European Solar Prize.

Our Activities

- Renewable energy training & information
- Transfer of Know-how and Best Practices
- Collaboration with Green Entrepreneurs and SMEs
- Testing & Demonstration
- Research & Development
- Implementation of Renewable Energy in Developing Countries

For more information visit www.folkecenter.net.



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Nordic Folkecenter
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