

2019

GRØN DYSTTM

Green Challenge

Student conference on sustainability,
the environment and climate technology.



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LUNCH:

TIME: FROM 12.35 TO 13.35
PLACE: 1ST FLOOR - DTU LIBRARY
MENU: SANDWICH

BBQ:

TIME: FROM 17.30
PLACE: GRØNNEGÅRDEN
MENU: BURGER
CHICKEN BREAST FILET
GRILLED SAUSAGE
MIXED SALAD
VEGETARIAN ALTERNATIVES WILL BE AVAILABLE
BEER OR SOFT DRINKS

Welcome

Dear participant,

Welcome to DTU and to the Green Challenge (GRØN DYST) Student Conference 2019.

Climate change, deteriorating ecosystems, decreasing biodiversity, poverty, and a continuously growing population are among the global challenges that may have catastrophic implications for humanity. To reverse this development the world needs new and innovative technical solutions, which can change the global market towards a sustainable future.

Sustainability is also one of the key drivers for innovation and for turning ideas into business solutions. Companies today need to develop sustainable operations and products in order to innovate and be successful in the business world of tomorrow. Engineers are becoming increasingly important in contributing to designing sustainable products and services. They play an active role in bridging the gap between innovative ideas and sustainable development strategies.

At DTU, we take our commitments very seriously, which is why the university incorporates sustainability, environmental issues, and climate technology as fundamental aspects in all of our engineering programmes and our research.

Green Challenge promote and incorporate the UN Sustainable Development Goals into the conference. The Sustainable Development Goals are a global call to action to end poverty, protect the planet, and ensure that all people enjoy peace and prosperity.

The Green Challenge Student Conference is an annual and unique opportunity for participating students to present their projects to their peers and professors as well as invited guests and DTU alumni. The projects presented at this conference make a difference and sow seeds for new sustainable start-ups, business ideas and green solutions.

We are delighted that the minister of higher education and science has agreed to open the Green Challenge Student Conference 2019.

Welcome to a day of discovery and eye-opening sustainable solutions.



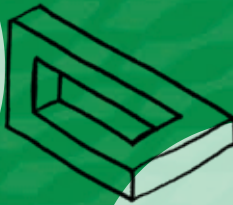
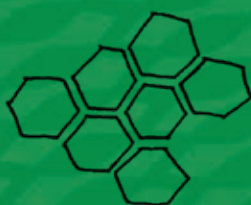
Marianne Thellersen
Senior Vice President - Innovation and Entrepreneurship

PROGRAMME



9.30 - 10.00:
Registration

10.00:
Welcome by the
minister of higher
education and
science




10.45:
Judging the
projects



12.35:
Lunch

13.35:
Judging the
projects




15.20:
Deliberation of
the projects




15.45:
Entertainment
by comedian
and script
writer
Brian Mørk



16.15:
Award ceremony by
Marianne Thellersen,
Senior Vice President
Innovation and
Entrepreneurship
assisted by
Brian Mørk



17.30:
BBQ and Jazz
concert in
Grønnegården

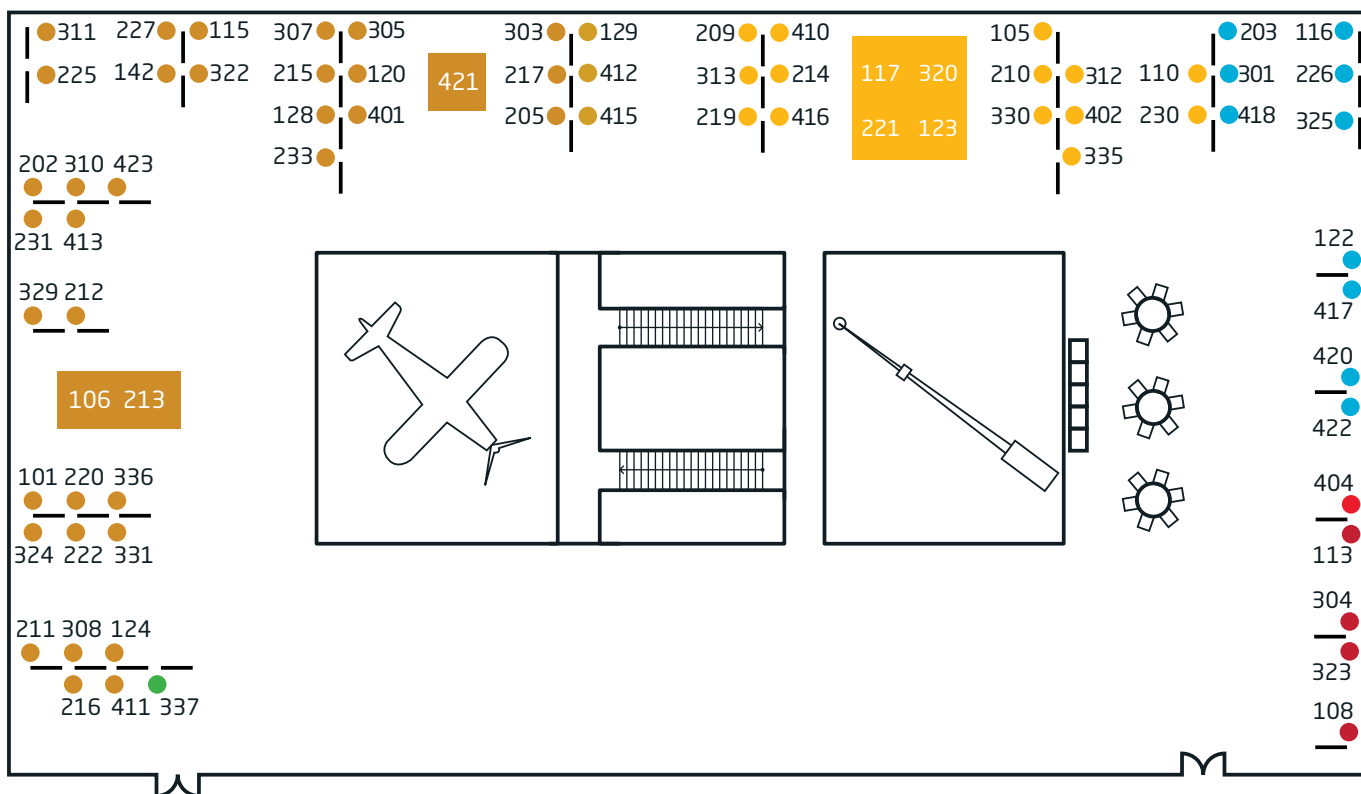


Find your way around

Ground Floor, DTU Library



Second floor, DTU Library



- #13 CLIMATE ACTION
- #14 LIFE BELOW WATER
- #15 LIFE ON LAND
- #16 PEACE AND JUSTICE STRONG INSTITUTIONS
- #17 PARTNERSHIPS FOR THE GOALS

To ensure a fair assessment projects are assessed in four categories:

- 1XX Bachelor course
- 2XX Bachelor final assignment
- 3XX Master course
- 4XX Master thesis

(e.g. Project starting with 100 is bachelor course level and compete against all other bachelor course projects).

**Clean drinking water
is the salt
of life**





Start-up company has developed a low-tech solution to a critical problem with the desalination of groundwater in developing countries. There is an increasing interest in social and sustainable innovation.

☰ Søren Ravnsborg

📷 Mikal Schlosser

A Danish company is building a desalination plant close to a refugee camp in Kenya, so refugees and inhabitants from the surrounding villages can use the salty water as drinking water. The company still needs to handle the toxic waste product brine, a result of the desalination process. To find a solution, they turned to DTU and a team of five students at HardTech Entrepreneurship.

One of them is Anne Sofie Larsen, whose desire to work with social innovation and the UN Sustainable Development Goals was a significant part of her motivation for choosing the HardTech-programme focusing on entrepreneurship.

"I would like to work on a project that can make a difference. Our research showed us that salty groundwater is a large and growing problem in many parts of the world, especially in the climatic zone below the equator. At the coasts, you use wastewater treatment plants to deal with the problem, but this is not possible further inland in a country with virtually no infrastructure. 80 per cent of water drillings result in the water's content being too salty to be used for drinking. And the Danish company is unable to build a desalination plant before the waste problem has been solved," she explains.

We will return to the team's suggested solution. The course is part of the newly established centre DTU Entrepreneurship, which aims to gather DTU's research and teaching activities with a focus on technological entrepreneurship and boost the start-up ecosystem at DTU.

Mads Rømer Svendsen is employed as project manager at the Centre. He explains that students are showing increasing interest in entrepreneurship with a sustainable focus.

"The project with the desalination plant in Kenya is an example of a classic engineering approach, where you find a tech solution to a specific problem. We will undoubtedly see more of that type of projects in the future. Many students relate to social issues. We will collaborate more with NGOs to bring our knowledge of technology and business development into play in relation to the specific problems the students encounter in the field," he says.

Anne Sofie Larsen and her team were faced with a double challenge. They needed to solve the brine issue while also integrating a sustainable local economy into the solution. They developed a pump, an industrial spray-fan, which pumps the brine through a propeller and out onto e.g. a tarpaulin. The brine then evaporates in the sun and only the salt remains. The pump optimises the evaporation process. The preliminary experiments show that the resulting salt is of such good quality that it can be used in the household.

"Our solution is low-tech and portable. Essentially, we get the waste product for free and turn it into a resource. We have come a long way in our 'proof of concept' with the DTU Environment's support, but the goal of creating sustainable businesses, where the locals can collect, package and sell the salt, is still some distance away," she says.

Anne Sofie Larsen has, together with another team member, formed the company NoBriner. The objective is to enter into partnerships. If the pilot project is successful, they and the Danish company will apply for funding for a further 120 of their plants, in order to provide clean drinking water and cooking salt for the inhabitants of a Kenyan village.

Anne Sofie Larsen is about to complete her dissertation in Design and Innovation at DTU. While studying, she also works 20 hours a week as a programme manager at the Centre for Entrepreneurship. Her ambition is for the Centre to focus particularly on humanitarian projects over time.

HardTech is a course that takes place over 13 weeks, where the students get access to DTU's prototype facilities, DKK 5,000 for purchasing components as well as access to DTU's experts in the field of entrepreneurship and business development.

Allison's Growing Garden

Growing urbanization is a key world challenge. A multi-storey vertical garden structure developed by a team of students may be the solution to secure sustainable nutrition and reduce CO₂ emission. The low-tech modular solution developed for protracted refugee communities is now tested in low-income neighbourhoods in Canada.

≡ Mette M. Christensen

📷 Allison Gacad

A year ago Allison Gacad found herself in an unfamiliar town outside of Copenhagen, surrounded by young people preparing for one of their biggest moments during their course of education. That day they were all gathered in the library at the Technical University of Denmark wearing their white and green t-shirts with the same goal in mind: to compete for the best sustainable project. Allison had come all the way from British Columbia, Canada, to compete in DTU's greenest conference, Green Challenge.

"My project is a multi-storey vertical garden structure for protracted refugee communities – refugees who remain in impermanent, unstable housing situations for long periods of time. The garden structure would



contain modular components, which are designed to grow micronutrient-rich produce to supplement existing food rations. In addition, the produce chosen would be culturally appropriate and support existing refugee skills in agriculture. The motivation was to come up with well-designed, low-cost technology that refugees in these communities can adopt", Allison explains.

For Allison, the desire is to apply the multi-storey garden in a meaningful way. Since she started on the project she has continually acquired knowledge, taking her closer to this goal. Allison was prior to Green Challenge a finalist in the international World's Challenge in London, Ontario. With her participation, Allison collaborated, prototyped and consulted with experts across the fields of design, agriculture, and sociology and acquired knowledge to improve her multi-storey garden. But her garden was not yet feasible and with Green Challenge, Allison's knowledge continued growing.

"The judges' feedback at Green Challenge really put my project to the test of financial viability and realistic feasibility. As a result, my team has taken the time to pursue individual research and projects before feeling confident enough to circle back and continue with the project", she says.

Green Challenge altered the direction of the project. Following the conference, Allison's team recognized that it was essential to develop an even better understanding



of the contributors to food insecurity in protracted refugee situations:


"I have taken initiative to gain knowledge about alternative methods of sustainable agriculture, particularly those that are low-cost and efficient in settings with limited resources. Over the past school year, I have taken coursework in integrated crop-livestock systems and projects in aquaponics, and currently I am an intern at a hydroponics facility."

Allison's desire to apply her multi-storey garden in a meaningful way is still in process, but to grow her garden in refugee communities her knowledge has to grow as well. Allison is today collaborating with a rooftop garden at the University of British Columbia and a low-income urban neighbourhood in Vancouver. Green Challenge has been a steppingstone in Allison's growing adventure, and we hope soon to see her garden contribute to a better and more sustainable world.

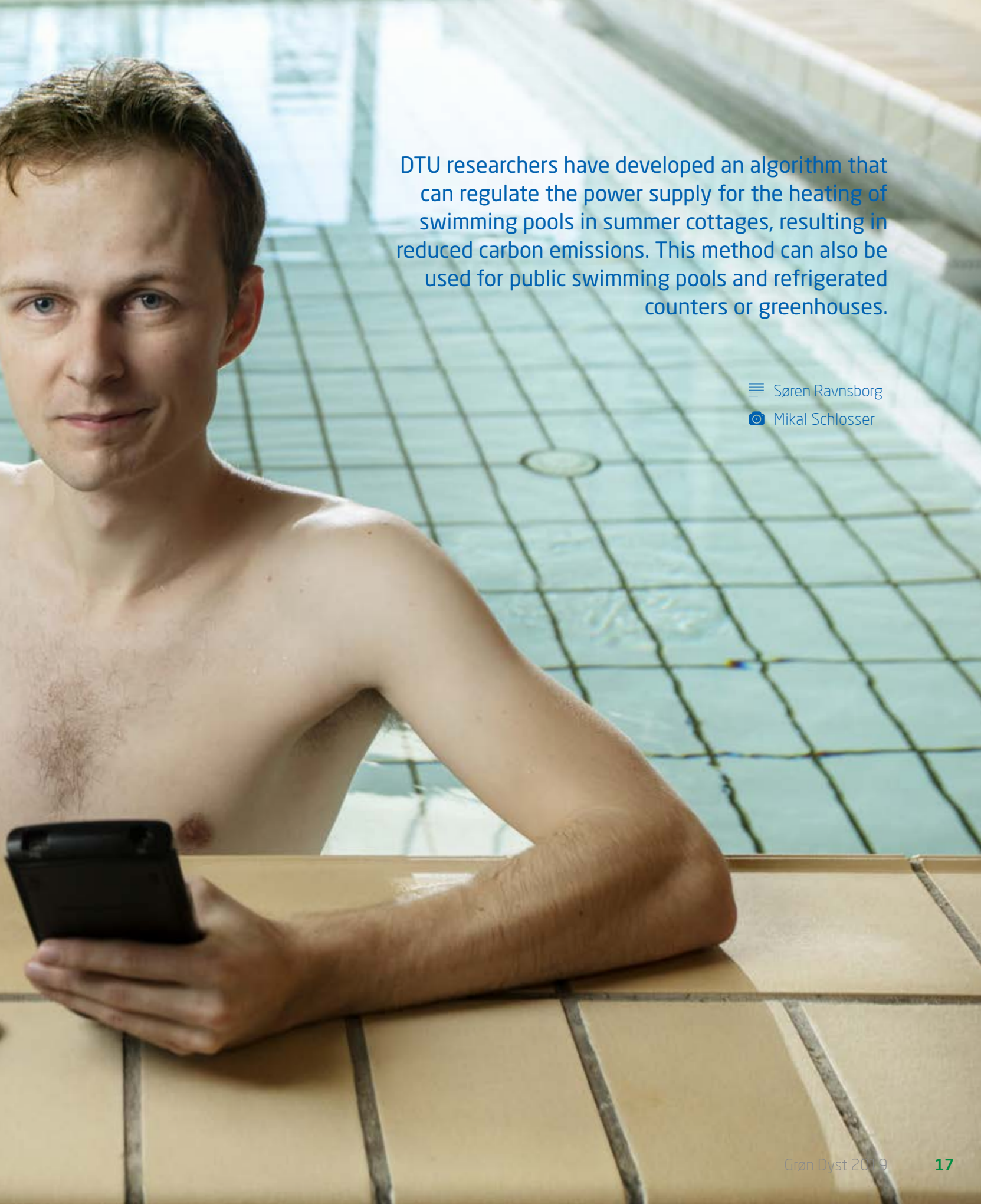






A photograph of a person's arm and hand typing on a black laptop. The laptop is open and sits on a light-colored tiled surface. In the background, a swimming pool with blue tiles and water is visible. The text 'Smart algorithm controls power consumption and strengthens the climate' is overlaid in blue on the upper part of the image.

Smart algorithm controls power consumption and strengthens the climate

A photograph of a man with short brown hair and blue eyes, shirtless, sitting at a light-colored wooden table. He is holding a black smartphone in his right hand. The background shows a swimming pool with blue tiles and a white building in the distance.

DTU researchers have developed an algorithm that can regulate the power supply for the heating of swimming pools in summer cottages, resulting in reduced carbon emissions. This method can also be used for public swimming pools and refrigerated counters or greenhouses.

☰ Søren Ravnsborg

📷 Mikal Schlosser

Although the coasts and sea water are often close to the summer cottage areas in Denmark, indoor swimming pools are an additional comfort demanded by many visitors all year round.

It is expensive and energy-consuming to heat these pools to about 25–30 degrees Celsius, which is the temperature required for health-related reasons and for general comfort.

There is not much to be done about the power prices for the summer cottage owners and visitors yet. But thanks to an algorithm developed at DTU, the energy flexibility will be utilised and the level of carbon emissions will be reduced by means of a modest investment.

This requires an explanation, and Rune Grønborg Junker, PhD student at DTU Compute, is just the man to deliver it:

"Using the information contained in the energy network, the algorithm continuously predicts how much CO₂ is emitted per kilowatt hour in the next 24 hours, thereby also predicting when the carbon emission level is at its lowest. The algorithm will then ensure that power is supplied to the summer cottages—and that their swimming pools will be heated—at times where less energy comes from coal-fired power stations and more green power can be obtained, especially since the share of production created by wind turbines naturally varies," he explains.

The technology consists of a small box, which is installed in the summer cottage and connected to the main meter, in order to track the power consumption. Its calculations will be made on a server that sends information to the box, which in turn tells the heat pump or electric cartridge to turn on or off. The algorithm works as a kind of price agent, but with carbon emissions in mind instead.

The boxes with the algorithm have been installed in 30 summer cottages during the trial period. There have been

The Danish demo case is part of the research projects smartnet and CITIES, both of which examine the potentials of energy flexibility. The latter sponsors Rune Grønborg Junker's work. They are both a part of the EU research





different kinds of difficulties, but the basic principle works, says Rune Grønborg Junker.

"Our results show that we can reduce carbon emissions by ten per cent. And the comfort will not suffer from it, as the water temperature only fluctuates very little. The installation does what it needs to do, but we expect to save even more when the algorithm is improved. Just how much is difficult to say, but up to 30 per cent is not impossible," he says.

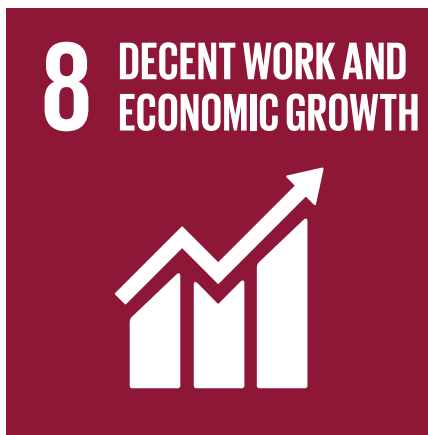
One difficulty is that the box communicates via the 3G network, resulting in outages in areas with poor coverage, which is where summer cottages are typically located. In the future, it must communicate through Wi-Fi or be able to store more knowledge and save updates, so that it can remember what to do several hours in advance and therefore won't be vulnerable in case of a lost connection.

"Through the booking system, the equipment knows when the guests arrive and adjusts the temperature accordingly. It also knows how long it will take to heat the pool and will not turn on until the right moment. This reduction is added to the 10 per cent coming from the energy flexibility," he says.

The algorithm has the potential to be distributed. The price is roughly the same regardless of how big a subject the equipment must monitor. It could be public swimming pools, for example, and the team behind the equipment is already working on a project with refrigerated counters in supermarkets and a wastewater treatment plant.

"In the future, the power cost may reflect how much CO₂ is used to produce a certain amount of electricity. This would give people an additional incentive to use the algorithm. They can save money and benefit the climate at the same time", says Rune Grønborg Junker.

programme Horizon 2020. When the programme ends, the Danish part carries on in Flexible Energy Denmark and in the collaboration with Novasol, who manages the renting out of holiday homes.



Sustainable **Development** Goals

Engineers play an essential role in ensuring sustainable development. Engineers can and must continue contributing towards developing technological solutions and address global challenges.

United Nation has on September 25th 2015 adopted 17 goals to end poverty, protect the planet, and ensure prosperity for all as



part of a new global and sustainable development agenda. Each goal has specific targets to be achieved over the next 15 years.

The 17 Sustainable Development Goals are now incorporated in the framework of Green Challenge, because Green Challenge needs to address global Challenges. Read about each of the 17 SDGs on United Nations website: www.un.org

Universities

that have participated in Green Challenge





Chalmers

Aalto University

Lund University

Politecnico di Milano

Aristotle University
of Thessaloniki

Università di Bologna

Sino-Danish Center for
Education and Research

Korea Advanced Institute
of Science and Technology

Hong Kong University of
Science and Technology

University of
Nottingham
Ningbo China

Nanyang Technological
University Singapore

Assessment criteria

1. Is the project well-structured and clearly communicated?

Is there a clear thread running throughout the presentation, does the presentation stay within the allotted time frame, is there cohesion between the visual and oral presentation and is the message clear.

2. To what extent is the positive impact on the UN Sustainable Development goals made probable?

Which goal or goals does the project refer to? Does the project demonstrate how it impacts the SDG's?

3. To what extent is the project technically applicable and likely to be realized?

Is the project realizable and can it be implemented within a reasonable time frame? How probable is it that the technology can be applied in the desired manner?

4. To what extent is it visionary and/or innovative?

Is the project innovative? Are the findings surprising?



Judging panels 2019

Panel 1



Jan B. Lillelund
CTO, Executive Architect
IBM



Anne Ehrenreich
Member of the Regional Council
Venstre



Axel Grøndahl Kristiansen
Deputy Head of Department
DTU Diplom



Kurt Engelbrecht
Associate Professor
DTU Energy



Markus Duus Kristensen
Winner of GRØN DYST 2018

Panel 2



Jesper Lomborg Manigoff
Vice President
3Shape A/S



Flemming Pless
Member of the Regional Council
Socialdemokratiet



Mette Wier
Head of Department
DTU Management Engineering



Brian Seger
Associate Professor
DTU Physics



Søren Anton Steffenson
President of Polyteknisk Forening

Panel 3



Brian Thomsen
Director
Dansk Akvakultur



Jacob Wøhler Jørgensen
City Councillor, Ballerup
Venstre



Per B. Brockhoff
Head of Department
DTU Compute



Gisle Alberg Vestergaard
Associate Professor
DTU Health Tech



Andreas Goll Rosseau
Vice President of Polyteknisk
Forening



Panel 4



Jørgen S. Christensen
CTO
Dansk Energi



Johan Müller
City Councillor, Ballerup
Socialdemokratiet



Søren Linderøth
Head of Department
DTU Energy



Anders Andersen
Associate Professor
DTU Physics



Lau Halkier Wandall
Coordinator of Academic Affairs, PF

Panel 5



Jens Brandt Bering
Business Unit Director,
Water & Utilities
NIRAS A/S



Jan Rytkjær Callesen
Member of Parliament
Dansk Folkeparti



Claus Hélix-Nielsen
Head of Department
DTU Environmental Engineering



Mads Rømer Svendsen
Entrepreneurship Agent
DTU Entrepreneurship



Jacob Grau Thisted
Winner of GRØN DYST 2018

Panel 6



To be announced



Marianne Frederik
Member of the Regional Council
Enhedslisten



Hans Nørgaard Hansen
Head of Department
DTU Mechanical Engineering



Martin Sørensen
Project Consultant
DTU Diplom



Mine Lisberg
Winner of GRØN DYST 2018

Panel 7



Mads Blumensaat
Cluster Lead
Vestas Wind Systems A/S



Julie Skovsby
Member of Parliament
Socialdemokratiet



Jörg Hübner
Director
DTU Nanolab



Preben Morth
Professor
DTU Bioengineering



Asta Trøjgaard Thøgersen
Coordinator of Social Politics, PF

Panel 8



Nina Movin
CEO
Otto Mønsted



Kåre Harder Olsen
2nd deputy mayor, Ballerup
Venstre



Jes Broeng
Director
DTU Technology Entrepreneurship



Jeamin Koo
Assistant Professor K-School
Korea Advanced Institute of
Science and Technology



João Antonio Basso Rezende
SDG Ambassador

Panel 9



Otto L. Frederiksen
Funding administrator
Otto Mønsted



Kim Rockhill
Member of the Regional Council
Socialdemokratiet



Anne Hauch
Head of Study Board
DTU Energy



Rune Helgesen
Associate Professor
DTU Diplom



Marcus Frøelund Schmidt
Chief Financial Officer, PF

Panel 10



Henrik Toft

Transformation Architect,
CTO
IBM



Martin Baden

Member of the Reginal Council
Socialdemokratiet



Lars Urheim

Community Manager for LevelUp
University of Stavanger



Tiberiu-Gabriel Zsurzsan

Assistant Professor
DTU Electrical Engineering



Kirstine Krøyer Rasmussen

Coordinator of Internal Matters
and PR, PF

Panel 11



Michael Svane

Director, Transportation &
Infrastructure
Dansk Industri



Magnus von Dreierager

City Councillor, Lyngby-Taarbæk
Konservative



Per Goltermann

Head of Study Board
DTU Civil Engineering



Gitte Mellemegaard

Associate Professor
DTU Diplom



Mikkel Elvebakken

Winner of GRØN DYST 2018

Panel 12



Søren Helmuth Jensen

Senior Vice President,
Head of Technical Office
Alfa Laval Marine Division



Martin Schepelern

Member of the Reginal Council
Alternativet



Lars-Ulrik Aaen Andersen

Head of Department
DTU Fotonik



Bastian Epp

Associate Professor
DTU Health Tech



Kristoffer Rander

Winner of GRØN DYST 2018

Panel 13



Lars Hauge

Executive Vice President
Bridge, Tunnel and Marine
Structures, COWI A/S



Laura Kramer Fisker

Consultant
Deloitte Consulting



Audrey Soric

Associate Professor
Ecole Centrale de Marseille



Sara Grex

Associate Professor
DTU Diplom



Elena Olivera Begué

SDG Ambassador

Panel 14



Helle Olund Villumsen

Chief Technology Officer
DBI Plastics A/S



Niels Høiby

Member of the Reginal Council
Liberal Alliance



Eric Rice

Director of the Professional
Development Program
John Hopkins University



Günther H.J. Peters

Associate Professor DTU
Chemistry



Malene Hovgaard Vested

SDG Ambassador

Panel 15



Roger Courage Matthisen

CEO
European Diversity Summit



Peter Westermann

Member of the Reginal Council
Socialistisk Folkeparti



Pamela Sheff

Director of the center for
Leadership Education
John Hopkins University



Michael Deininger

Associate Professor
DTU Mechanical Engineering



Anant Atul Visaria

SDG Ambassador

Panel 16



Niels Peter Nørring
Director of Environment
Landbrug & Fødevarer



Susanne Due Kristensen
Member of the Regional Council
Socialdemokratiet



Stijn De Jonge
Head of Chemical Engineering
Master Programme
KU Leuven



Borja Valverde-Perez
Assistant Professor
DTU Enviroment



Astrid Kjeldgaard
Winner of GRØN DYST 2018

Panel 17



Peter Ulrik Scheel
Owner
Scheel Management Consulting



Camilla Bjerg Pedersen
Department Manager, Consultant
Vestforbrænding



Martin Widden
Senior Lecturer Engineering
Lancaster University



Manuel Pinelo
Associate Professor
DTU Chemical Engineering



August Zachariae
Winner of GRØN DYST 2018

Panel 18



Anna-Mette Monnelly
Head of Sustainability
NCC



Michael Nielsen
Cofounder & Partner
ForNAV



Laetitia Ouillet
Director of the Strategic Area Energy
TU/e



Vassilios Agelidis
Professor
DTU Electrical Engineering



Ipek Altay
Winner of GRØN DYST 2018

Panel 19



Christine Brænder Almstrup
M.Sc., Project Officer, Head of
Biotech LIFE



Sofia Osmani
Mayor, Lyngby-Taarbæk
Konservative



Steve Sung Tae Ahn
Director
Korea Advanced Institute of
Science and Techonology



Massimo Rolle
Associate Professor
DTU Enviroment



Mathias Ankjær
Winner of GRØN DYST 2018

Panel 20



Tue Johannessen
CTO
Amminex A/S



Torben Kjær
Member of the Reginal Council
Enhedslisten



Lars Bogø Jensen
Head of study board
DTU Food



Paul Michael Petersen
Professor
DTU Fotonik



Louise Jensen Hamre
Winner of GRØN DYST 2018

Panel 21



Mikkel Leihardt
Debuty Director General
Danish Agency for Institutions
and Educational Grants



Thomas Schäfer
Executive Vice President og CSO
Chr. Hansen



Lasse Engbo Christiansen
Head of study board
DTU Compute



Ole Schultz
Associate Professor
DTU Diplom



Amalie Avnborg
Member of PF Acedemic Committee

Panel 22



Rune Domsten
Co-Founder
Indesmatech



Mathias Wever Larsen
Business Development &
Marketing Manager
Novozymes



Finn Larsen
Senior researcher
DTU Aqua



Søren Juhl Andersen
Assistant Professor
DTU Wind Energy



Freja Karoline Weber Jørgensen
Member of PF Academic Committee

Panel 24



Simon Bull
Digital Specialist
McKinsey & Company



John Åge Lazar
Managing Director
Betech A/S



Jane Hvolbæk Nielsen
Head of Department
DTU Physics



Lisbeth M. Ottosen
Professor
DTU Civil Engineering



Henrik Wessing
Head of Studies
DTU Fotonik
DTU Student



Benjamin Büll Elsholm
Member of PF Academic
Committee

Panel 23



Anette Priess Gade
Forretningsudvikler
innovationlab.dk



Thomas Sture Rasmussen
Innovation and strategy developer
bib:ballerup



Jacob Berg
Associate Professor
DTU Wind Energy



Kirsten From
Assistant Professor
DTU Diplom



Simon Svane Lundorf
Member of PF Academic Committee

Panel 25



Line Kolling
Management consultant
McKinsey & Company



Esben Jørgensen Bager
Consultant
McKinsey & Company



Nina Bengtsson
Member of
Ungeklimarådet



Jens Christian Andersen
Head of study board
DTU Electrical Engineering



Winnie Edith Svendsen
Associate Professor
DTU Bioengineering



Vinh Duy Nguyen
Member of PF Academic
Committee

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Mikal Schlosser
Ulrik M. Nielsen
Allison Gacad
DTU photos

The event is sponsored by:



Sustainability and climate change are high on the global agenda. Engineers play a central part in a sustainable development of society. Engineers from DTU can and must continue to contribute to the development of technological solutions that respond to the global challenges. Therefore DTU has initiated

GRØN DYST 