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# SE MATCH



Delft Sustainable Energy Association

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## Sustainable Energy in Developing Countries

Carlotta Ferri

One of the most challenging topics in the field of sustainable energy technologies is how to implement them in developing countries. If these energy generating sources are facing problems in the developed world, additional issues must be overcome in poorer areas.

However, the Energy Club & Delft S.E.A. aim to demonstrate that many projects are already moving in the right direction. On the 17<sup>th</sup> of October, a guest lecture entitled 'Sustainable Energy in Developing Countries' invited Dwi Sasetyaningtyas and Rob de Jeu to talk about their experiences in Indonesia and India, respectively. Both of the countries present similar poor societies and difficulties in providing electricity. In fact, many large families still live in small houses, which are not electrified and they usually meet their energy demand with kerosene. Due to the high prices of fossil fuels, they still cannot make use of electricity during the dark hours. This, for example, does not permit women to go out after sunset or to conduct any activities in the evening such as studying or household chores.

### Dwi's perspective

Dwi presented her master work about a sustainable business model for off-grid PV electrification in Sumba Island, Indonesia. She was very passionate about talking about her country because, she explained, there are still many things to improve. There are families with up to twelve persons living under the same roof in very small houses, which only in the 40% of the cases are electrified.

In fact, thanks to the program 'Sumba Iconic Island', electricity generated by renewable energy sources will be available in the villages of Sumba Island by 2020.

However, Dwi pointed out a flaw in this project: the PV technology is not known in the area of the island and has to be imported, raising many barriers. One of these are the unaffordable capital costs for the natives, who earn on average less than \$1 or \$2 per day. Hence, Dwi decided to dedicate her master thesis to the development of a business model that could function as a linking bridge between the willingness to implement renewable energy technologies and their effective operation. Dwi identified the difficulties faced by the society of the island like- the high capital cost of the infrastructures and the limited technical knowledge among the localities.

Through consulting energy companies and the people of the island, Dwi recommended two possible business models: a product-distributor and a service-distributor model.

It is possible to read more about Dwi's thesis project in TU Delft repository. The presentation and defence of the thesis took place on 27<sup>th</sup> of October. We congratulate Dwi for the great academic result and for her baby, who was born few weeks before this event.



## Real-life experience from developing countries

### Rob's perspective

The second guest was Rob, who shared his experience with Rural Spark, a company that designs and implements smart energy networks in rural areas of India. The main part of this project was to understand how to implement projects in the Indian rural society. Nowadays, the 400,000,000 people that do not have access to the electricity grid meet their demand of energy with kerosene, but they still have to save electricity in the night due to the high prices of the fossil fuels. This, for example, does not permit women to go out after sunset or to conduct any activities in the evening like studying or household chores.

Rural Spark started its entrepreneurship with a Case Study Research Design, a study method, used to analyse the customers without letting them know that they are part of an experiment. This involved allowing people to feel like they are in the real market and the system design resulting from this study will then be more realistic and adapted to the specific context.

Hence, Rural Spark passed off itself as an existing company with the aim to find entrepreneurs in the village, who were willing to invest in its smart grids.



The project consisted of electric lamps charged during the day with a PV system and rented out during the night to the other community's members.

The experiment saw enterprising individuals starting their own business, which not only produced a social benefit for the village, but led to changes in the society's structure, elevating the few entrepreneurs to relevant personalities and enhancing the interactions between different communities.

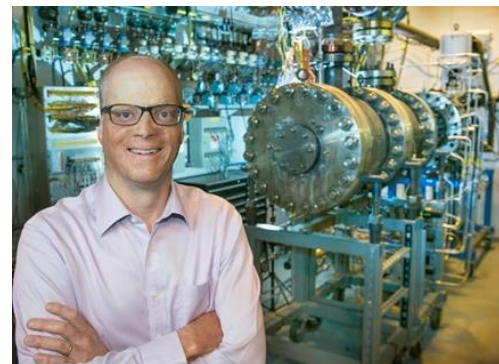
After some modifications to the existing prototype, Rural Spark introduced a new improved product sold to entrepreneurs in the villages, who actually wanted to expand their business. It was observed that decentralized electricity generation can be successfully implemented in developing communities that were found out to be very interested in decentralized energy sources. In fact, grid connection in these areas has a very low quality, even if it was an object of political overpromising. However, the implementation is not without problems. In order to reach a large scale, a significant intervention of the government is needed and cultural issues, favouritism and corruption must be faced.



## It is time to take action, rather than talk...

Kritika Karthikeyan and Karan Suresh Narayan

James Maughan, Senior Executive and General Manager Cores and Casting in GE, has developed new gas turbine, steam turbine, wind turbine, and repair and service products. This interview has as goal to bring out his experiences and view on the sustainable future of the world's industrial sector.



James Maughan

Source: <https://www.tudelft.nl/en/events>

**How was the experience of doing a PhD under Frank Incropera – the man who literally wrote the textbook on heat transfer?**

It was great working with him – he is an awesome professor. I loved learning and knew quickly that during my undergrad that I wanted a PhD. I always wanted to be a mechanical engineer – to this day I like to take things apart and fixing them.

**Why did you choose the field of heat transfer?**

I really like the equipment. They make a real impact - I can say that *that* engine or other power generating equipment was made more efficient and more people have access to power because of my work. That's a really good feeling.

**You're a 2<sup>nd</sup> generation GE employee. Was working for them part of the plan?**

Not really, they just had an opportunity when I was starting out and it fit.

I interviewed at many places but GE, especially the centre I joined, has great research which is also very applied in nature. There's a lot of freedom to work and make a difference.

**GE is one of the few companies that can manufacture high tech products at scale. Is it time for an entry into storage?**

We were in storage, working on metal hydride batteries but we simply couldn't make them competitive enough in terms of costs compared to Li-ion batteries. GE is not a low-cost company – our strength is doing things no one else can. How many companies in the world make a gas turbine that are powerful and reliable? Three. That's our specialty.

**Did you work on the GE90 (the world's most powerful gas turbine)? What are the barriers at those scales of power generation?**

No, but I did work on the problems of the GE90 and its successor, the 9X. The biggest issue is reliability. How do you make a gas turbine that works at those temperatures with negligible creep and wear and tear, day in and day out for years on end? You can always increase temperature to generate more power but balancing that with the increased damage potential is the challenge.

**What are your thoughts on micro-grids for Africa and Asia, since you touched upon power access in developing countries in your lecture?**

There are sobering facts about them. For example, only 2/3 of micro-grids remain operational after 2 years in these regions. There are issues like theft of components, for example. To give you some context, when Edison invented the bulb there were 1.5 billion people without electricity. That number is 1.2 billion. In Africa, the population growth rate is still lower than the electrification rate. Most of those who have gained power have done so through the grid. Things like having a fridge and a hot plate make a huge difference to living standards.

## Interview with James Maughan

**The energy strategy needs to be different in developing and developed worlds, since the developed world can absorb the costs of the transitions and does not need to generate much more power. How does GE plan to address this?**

Exactly, which is why we need more efficient power generation from fossil fuels – countries like India have to build coal plants to grow. This is why reason we bought Alstom, so that we now have control of the balance of plant and can maximise efficiency in all the processes.

**What is GE Power's fastest growing market? What are the kind of investments that these regions are making in energy?**

It is Asia, and the Middle East in particular. Many of these countries trying to incorporate natural gas into the energy mix because it is cleaner and now more efficient. Saudi Arabia, for instance, used to burn crude oil but now prefers gas.

**What is your take on the US not being a part of Paris Climate Accord anymore?**

My personal opinion is - talk less, do more.

**Fair enough. Do you think that the Trump administration is affecting the way climate change is being perceived, or do you still think that there is sufficient momentum in energy research?**

I think that there is enough momentum simply because of the rules of economics. For example, the economics in the US favours natural gas so much that now it just doesn't make any sense to set up a new coal plants in the US. This is irrespective of what people in Paris or Kyoto say.

**Since you are one of the few companies that can use fossil fuels efficiently, would the implementation of carbon taxes be advantageous to you?**

It probably is. If there was a reasonable price on CO<sub>2</sub> that would probably favour our expertise in natural gas, but that's live-and-die by policy, right?



We at GE would rather work to make wind turbines economically competitive through technology instead of subsidies. We have in fact for some time been recommending a 5-year phase out of production tax credits for wind energy. In the previous system, the tax credits would have to be renewed every year, which is not good long-term planning and stability. Stability is as important as subsidies, although not all of our customers agree with that.

**Solar energy was seen as the most promising and popular renewable energy source. Why do you prefer wind energy?**

Solar does dominate in capacity sales, but it has a very low capacity factor – often around 10%. So, when you sell 100MW of solar capacity, for example, you actually generate 4-5 times less than you would with wind turbines and 8 times less than with gas turbines of the same capacity. Also, the cost of PV panels has dropped so sharply mainly because China is selling them at incredibly low costs. I don't know how much longer they can sustain this.

**What is your opinion of Tesla? They are once again the talk of the town with the roadster, truck etc.**

They are certainly using a lot of US government money to drive down the cost of Li ion battery and electric cars almost single-handed. It could even lead to a big advancement in battery technology. This is good for everybody, even though they might go bankrupt doing it.

## Our events...

The annual TRACKx event, inspired by the popular TEDx events, took place on the 27<sup>th</sup> September. TRACKx was organised by Delft SEA in order to give new students an insight of each track from students already following these tracks. This event complimented the Masters Information Meeting in which professors from each track gave an overview of their courses. However, TRACKx allowed students to get a real feel for the difficulty and workload of each track as well as the opportunity to ask any questions first-hand to students in their future position. Alongside this, each presenter also gave an insight into the thesis and internship opportunities for their respective track, thus providing the students with a full overview of the course.

The presentations were followed by an overview of the honors programme at TU Delft presented by the Delft SEA founder, Ibrahim. The honors programme allows students to gain recognition for going above and beyond the core curriculum and achieving high academic success. Having taken the honors programme himself, Ibrahim was able to give first-hand experience about the requirements and benefits of undertaking this programme.



On November 22<sup>nd</sup> we had our first city/company tour in Utrecht and had the pleasure to visit Sustainer Homes, a company designing and building modular houses by generating up to 90% less CO<sub>2</sub>, compared to a regular building.

We were given a tour of their prototype in Utrecht and a detailed description of the whole idea, from the production and installation to the design and comfort of the zero energy house. They answered all of our questions, giving us a thoroughly insight of all the steps of the process and they also shared with us their future plans and ambitions in spreading their company in an international level. We also got a chance to visit the office of "Anne", who creates pleasant conditions inside energy neutral homes by with heating and insulation in a sustainable manner. So, we gained a better look of two worlds with the help of Sustainer Homes!

Our city tour was extremely pleasant and fun which was indeed lifted a notch by the superb weather and our wonderful guide on the trip Hilde Huisman who took the effort of introducing us to the beautiful city of Utrecht as we visited the Dom Tower, Botanical Gardens to name a few. We ended our tour with some quality time at a really nice café near the center, discussing about our thoughts and concerns.



Later, the event was followed by drinks at the /Pub to allow students to interact personally with their senior students. The presentations and informal chats proved very worthwhile for the students in making up their minds about their respective tracks. The presentation slides from this event are available via the Delft SEA Facebook page.

## Homosexuality in the Netherlands

Thomas Spruit & Casper Eijkens

In 2001 the Netherlands became the first country to legalize same-sex marriage after the '*paarse kabinet*' (a progressive coalition of Social Democrats and Liberals) introduced the bill in parliament. The Dutch rightfully became a beacon of tolerance, having beaten the ruling medieval dogma against homosexuality after a century long struggle. But even as the first '*homohuwelijk*' (gay wedding) was officiated by the '*burgemeester*' (mayor) of Amsterdam, the acknowledgement of homosexuality in the broader society was only in its infancy. Many clergymen refused to wed same-sex couples at the time and still have the legal right to do so. This often takes place in the region known as the '*Bijbelgordel*' or Bible Belt. Thankfully, tolerance has grown, but not universally. *Nederlanders* are often of the opinion that being gay is fine, under the condition that homosexual affection isn't conspicuous. In some extreme cases, gay couples have been subjected to violence because they held hands or kissed in public.

Ironically, some conservative politicians have embraced the struggle for gay rights formerly inimical to their views to further an anti-Islamic populist agenda, since anti-homosexual sentiments are still present in parts of Dutch Islamic communities. They do so while ignoring the hostility toward the gay population among the confessional Christians who form their traditional voter base. Apparently, Islam has become more repulsive to some than sodomy used to be. This political paradox forms the biggest obstacle for emancipation, because the underlying culture of social exclusion of gay people is not challenged.

This leads to the question how to move forward from here. Politicians should not wrongfully maintain the assumption that the Dutch have tolerated homosexuality for centuries and use this hypocrisy as an argument against people from other backgrounds. Instead, they should move away from nationalistic thought and focus on what truly furthers social acceptance of homosexuality. There are many civil organizations that have been doing great work by assisting those who face oppression against coming out from their environment. However, it would be a surprise to suddenly see support for these organizations from the very same political parties that used to oppose them. The legalization of '*het homohuwelijk*' has inspired many other countries, but this does not make the Dutch cultural tradition superior. In reality, it was not tradition that fuelled change, but the courage to be unprejudiced to the opinion of others.

## DID YOU KNOW...

Stella Chatzidakoula & Carlotta Ferri

One recycled bottle saves enough energy to run a 100-watt bulb for 4 hours? It also emits 20% less air pollution and 50% less water pollution than does making a new bottle.

Tesla motors was not the first Tesla to share patents? The inventor, Nikola Tesla, sold his AC patents for less than 2% of their value to help the buyer compete with the rival Edison.

Google searches account for about 0.013% of the world's energy usage? This equals enough electricity to power 200,000 homes continuously. The energy it takes to conduct 100 searches on Google is the equivalent of a light bulb burning for 28 minutes.

Penn State University researchers have produced a human waste-powered generator? It can produce 51 kilowatts of energy from the waste of 100,000 people. Municipal solid waste products can become an energy source if properly transformed.



Our magazine team has the pleasure to welcome six new members with new and fresh ideas about the content, the structure and the design of the magazine.



Casper and Thomas, two Dutch students, have taken over the politics section with up-to-date topics.



## Introducing ourselves...



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Designer &  
Photographer



**Casper  
Eijkens**

Political  
editor



**Carlotta  
Ferri**

Reporter



**Srinivasan  
Gopalan**

Interviewer  
& Reporter



**Kritika  
Karthikeyan**

Interviewer



**Andrew  
Keys**

Reporter



**Karan  
Narayan**

Interviewer  
& Reporter



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**Thomas  
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Political  
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