SET MATCH
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Interview with Prof. Dr. Arno Smets: "Sometimes you have to be Superman..." - page 4

SHELL AND IEA: GAS IS NEEDED IN TRANSITION TOWARDS SUSTAINABILITY

Francisco Galnares & Bas Buise

DELFT - On September 22, The Energy Club organized a debate regarding the role of gas in the energy transition at the TU Delft Culture Building. This debate brought together three economists: Maarten Wetselaar, Integrated Gas and New Energies Director from Shell, Laszlo Varro, Chief Economist from the International Energy Agency (IEA), and in order to put some comments (if needed) Dr. Aad Correlje, Associate Professor of Economics of Infrastructures from TU Delft.

Powerplant of RWE and windmills in Eemshaven - Photo: Koos Boertjens

Shell's perspective was clear, a partnership between gas and renewables is of crucial importance as the energy system will be doubled in the future and at the same time the environmental footprint has to be decreased. Wetselaar said that solar and wind will always need a partner because when the wind does not blow or the sun does not shine, there is still the need to equilibrate the demand, and gas is the perfect partner in his opinion. He then added that in The Netherlands, the future is about a partnership between wind energy and gas. Wetselaar also pointed out that something we as a society underestimate is electrification, and that there are many things that cannot be electrified: "You cannot electrify air travel or marine shipping (..) or steel production or fertilizer production." According to Wetselaar,

"You cannot electrify air travel or marine shipping (...), or steel production, or fertilizer production" – Wetselaar

the 2-degree threshold will certainly not be fulfilled if our chemical and biochemical processes are kept the same. To put things into perspective, in TU Delft there is one of the most renowned people in Process Intensification: Andrzej Stankiewicz. One of the pillars of Process Intensification is the thermodynamic domain, where there is research going on in the use of alternative energy sources, such as: light, microwave and plasma, ultrasound, supersonic shockwaves, etc., to have more efficient and safer processes.

Both Varro and Wetselaar agreed that carbon capture storage (CCS) will play a significant role to have a net zero carbon economy; however, it has to be further developed. Varro: "(...) the only practical application to reduce carbon dioxide emissions which is currently technologically feasible is carbon capture storage and that technology is unfortunately falling behind."

"If everybody keeps every promise that they made (...), then by the end of the 21st century the carbon emissions are still 10 billion tons higher than what they would need to be for a general climate stabilization." – Varro

Nevertheless, according to Varro, we don't just have to cut carbon dioxide emissions a little bit, but in a really sustainable and radical fashion. "If everybody keeps every promise that they made (...), then by the end of the 21st century the carbon emissions are still 10 billion tons higher than what they would need to be for a general climate stabilization," he explained on the Paris agreement. He added that even though we usually think of gas fed power generation when we think of gas, heating buildings in Europe and Russia is actually a larger component than gas fed power generation would ever be. In order to make these systems more efficient, the gas fed boilers can be replaced by electrical ones according to Varro, in order to save on CO_2 emissions.

Varro also seemed enthusiastic that due to the decreasing prices for solar and wind energy (80% and 50% respectively) in the past five years, those renewable energy sources are now outcompeting fossil fuel energy without any subsidies or carbon pricing. Due to this, he is not immediately in favor of gas fed power generation: "In Vietnam I wouldn't bother building a brand new gas infrastructure so that they switch from coal to gas. If the infrastructure does not yet exist, then going from coal to renewables in one step is far more efficient in my view then trying to build a new gas system." •

CHANGES IN THE DUTCH/EUROPEAN ENERGY MARKET

Putting Shell's policy into perspective, two enormous German energy utilities that own various power plants all over Europe announced a division too in 2016 , they decided to split their companies in a renewable part and a nonrenewable part. Eon, among other things owner of coal and gas fired power plants in The Netherlands, goes further as a full renewable company and puts the non-renewables in a new company from 2016. The opposite is done by RWE, which goes further as a full non-renewable supplier, and founds a new full renewable supplier. Both companies did this in order to find an answer to the dramatically changing energy market in Germany and Europe, it is their strategy to survive in this century. •

The Great SET Study Tour Berlin 2016

Joanne Siccama

BERLIN - After one week of lectures it was obviously time to think of a nice trip. Well, luckily something like Study Tours exists, so you can still travel and not feel guilty about missing a few days of lectures! Since Germany is on top ranking when it comes to renewable energy, it was a well-chosen destination. From Wednesday to Sunday we, a group of around 20 SET students, went off for this both 'educational sound' and awesome fun trip.

To cover most tracks: we visited a large variety of companies. We made the first stop for some fresh (and powerful) air in Hannover at the test centre for support structures for offshore windmills. On Day 2 we visited ATB Potsdam, an institute for agricultural engineering, where it became clear that wood is not very sustainable energy source. But luckily there was also manure, which can be fed to a fermenter to produce bio-methane, plus, its residues were used for the production of biochar which can be used as a fertilizer, very sustainable!! After this visit, we headed back to Berlin go to GTEC which stands for German Tech Entrepreneurship Centre to accommodate and support startups. Here we worked on a case of "über energy", a startup that develops a smart meter which uses GPS-tracking.

In the evening, an award was handed to the person that paid the least attention during the company visits. I won't call names but after this day two people were on the run for the 'trophy': one fell asleep during the presentations and the other one was playing Pokémon Go between the trees at ATB.

For our last company visits we first drove to Feldheim Village: the energy self-sufficient village. With 120 inhabitants, 42 wind turbines and a CHP biogas plant they manage to generate their own energy and sell their surplus. The last company we visited was Helmholtz Berlin (HZB): a research centre for materials, with a focus on the energy transition, "Energiewende". Examples of their research are on materials for thin-film photovoltaics and for the conversion of solar energy into chemical energy carriers. The presentation and tour we got was detailed and specific, and to speak for myself was challenging to keep up.

Friday evening was perfect for some exploring of Berlin's nightlife. This is pretty good I can tell! On Saturday, there was time to sleep in and have some free time to walk around the city or relax a little. In the evening, the whole group joined for the Fork & Walk tour with an enthusiastic Aussie who showed us some nice places to eat. Part of the group stayed afterwards to drink a shot or two offered by the guide (I wonder if he made profit on the tour that day..) the others went home to get some rest for the long journey back on Sunday.

"the whole group joined for the Fork & Walk tour with an enthusiastic Aussie who showed us some nice places to eat."

Thank you Yvo, Irma, Adriana, Ivan, Rik, and Stephanie for the organisation! •

Want to organise SET TOUR 2017? Contact DelftSEA, details on the last page/colofon.

"Olindo, this is the new SET glossy!"

Srinivasan Gopalan & Joanne Siccama

We were walking towards LB 03.420 when a man emerged out of the room with a thin film PV in his hand. "Good Morning", he said. "Good Morning", we responded. He went inside the Secretariats office for a few seconds and came out with a bright smile. "What would you like to have on this beautiful Friday morning?" he asked, walking us to the coffee machine. We asked for a coffee and a cappuccino. "Olindo, this is the new SET glossy!", he said to the man standing beside him. "We are from the SET magazine", we explained to Prof. Isabella, who appreciated us for our endeavours. With our beverages in hand, we entered the room of Prof. Dr. Arno Smets, who on 28th September became a professor at TU Delft, to interview him.

SET MATCH: Can you explain about the place you grew up at?

Prof. Dr. Smets: "I was born in a small village, Venlo in Limburg, close to the German border. I was really a village boy, very involved in all the local activities- the sport clubs. In primary school I did not really express myself but then when I went for the first year in high school I broke every record on that school. Then I decided to underperform because otherwise you will be this crazy kid. So there is this moment where they ask you the question in high school around the fourth year like 'What would you like to do?' 'Which study?'.You're in the high school and you don't know what you're going to like. So then you have to make a choice and then I was like yeah, I like all the technical topics and street physics and stuff like that. Applied physics was the most difficult studies that existed. So I went and did it."

"Sometimes you have to be Superman; you have to be basically good at everything."

You did your PhD in a fundamental research field but now you are working in an application oriented research field. How did this transition happen?

"I must say that I've been very lucky. That's all by accident. I started from an area like processing of materials. Step by step my mind became more applied. The nice thing is that you have to full overview from plasma processing to the end of the device and not of many people have these brought expertise. The broadness gives you also more opportunities to get nice results."

Do you have time for hobbies? How are your weekends?

"I had a horrible summer with deadlines for research proposals, oral speech, new edX MOOC and master students graduating. It's quite busy and the pressure is quite high. You see the amount of students we supervise per staff member. That's already a lot of work. You know, I easily do seventy hours a week. That's a way of life and you have to be a little bit crazy but then this craziness is something you enjoy."

Recently, a debate was conducted on the role of natural gas post the Paris Climate Summit. What do you think what role does natural gas play in the energy transition, like converting solar energy to methane?

Interview with the new Professor Dr. Arno Smets

"There is a lot of discussion in the USA on the use of methane, since leakage tends to happen, which is very harmful for the environment because of its high carbon footprint. Batteries are possible for daily or hourly fluctuation. On longer timescales we only have chemical energy, it's the only form. Then we need a liquid fuel or methane gas. If the leakage problem is a real issue, a smart design to prevent leakage into the atmosphere should be developed."

What does a normal day at the university look like?

"Usually I arrive around 8 o'clock. I have one hour to quickly do stuff before everybody arrives. My office is a central station, the phone is ringing, there are a lot of activities going on. Every day is different, from meetings for bureaucratic stuff to teaching, from discussing research to writing proposals, from correcting papers to discussions with master thesis students, from going to conferences to organizing them yourself, from interviews with newspaper 'Trouw' to having primary school kids asking you questions (this appointment was set during the interview). Sometimes you have to be Superman; you have to be basically good at everything."

"Students believe that there's only one correct decision in life and only one path to get there. That's not how life works"

What would you suggest SET students if they are in doubt of their specialization track?

"The curriculum of SET will change next year and will have more structure, which could make it easier. For orientation look at the different topics available, type of work and also at the people within the university where you'll have to work with. It's almost impossible to make a wrong decision. Students believe that there's only one correct decision in life and only one path to get there. That's not how life works. You have many possible paths and they all will lead to a nice career and success. Don't be scared of making a choice. You cannot make a wrong decision."•

Prof. Dr. Smets in his office

ALUMNI: Rob de Jeu

Rob de Jeu

I loved the international interaction during SET. I was impressed by the adaptive abilities of my international friends in that structured, efficient and cold country called The Netherlands. Their struggles inspired me to do something similar; living in another country with a culture diametrically opposed to mine. Since my interest in India was already sparked by my Indian friends, it didn't take long to figure out the subcontinent fitted best.

Using my network I got a job offer at Rural Spark. A Dutch company creating smart grids for rural India. The grid in India is highly unreliable or unavailable for remote parts. So Rural Spark enables village entrepreneurs with renewable energy options to have access to energy. As management assistant I look in the operations, logistic processes, team coaching, sales and maintaining relationships with the off-grid sector. For me this is the perfect starting point since it gives me room to explore what I like to do and what I am good at while I am understanding, experiencing and integrating in an alien country. I like the cultural component a lot, and I think it is an opportunity to be able to communicate and work with cultural-diverse teams.

For the SET students, I strongly recommend to dive into the tremendous amount of culture your fellow students have to offer, especially the Dutch students. I felt enriched by taking parts of different cultural events, creating long lasting friendships around the globe and receiving a different perspective on the world and simple daily habits. Also, they are able to help you later in your life, which I experienced multiple times already. Networking is key. Furthermore, the barriers, turmoil, changing energy policies, extensive list of renewable technologies available and so much work still to do in the energy sector is analogous to the SET program; frustrating homologation courses, a yearly changing curriculum, a daunting infinite list of possible electives and a workload like there is no tomorrow. The SET program not only offered me a great understanding of renewable energy, but also how to navigate in every changing challenging systems. Whether the latter is done on purpose is something you can question of course.

To conclude, I believe experiencing new exciting environments while studying is a great thing. This environment can be next door or at the other side of the world. Just make sure you do not become bored in your studies or job, do come regularly out of your comfort zone and keep exploring what the world i.e. other students at TU Delft have to offer and teach you. These lessons are exactly what the SET program taught me.•

Gaya (Bihar), inside a warehouse of our rural field agents storing solar panels. - Photo; Rob de Jeu

OPINION: Is Sustainable Energy Enough?

Hemant Sharma

Perspective on climate change is primarily focused on CO_2 emissions from electricity and heat production, especially in technical universities. But it is interesting to note that these emissions only comprise 25% of the total greenhouse gas emissions (1). Other major contributors include agriculture, industry and transportation. We are still pumping petrochemicals for plastic and fertilizer production. There is some progress made but we are no closer in making these processes sustainable in the long term. And certainly the advances we have made so far are not as impressive as in sustainable energy, where we have a clear vision of what we want, and it is just a matter of time before we actually achieve it. For example, if we look at plastics, we do not know if we want to make biodegradable plastics or substitute them altogether.

Some have proposed to have a high recycle rate of plastics but when the demand grows and we lose some in the loop, do we still continue to use crude oil? Same goes for agriculture and livestock farming. We simply cannot sustain our growing population with the same eating habits (2). There is a global movement of veganism which many believe promise will solve this problem. If we keep the discussion about animal cruelty out of this and adopt a strict anthropogenic view, the underlying principle is that 'we share whatever we have' (in other words: by decreasing the amount of meat you consume, there is in total more food for everyone and you reduce the total emissions). Which makes complete sense because a vegan requires many times less resources than a meat eater, significantly reducing our emissions (2). We can solve some of our problems in the short term. However, we cannot adopt this view in the long term as we will merely shift the problem rather than solving the issue. For example, once everyone has become vegan and we still cannot control our emissions, do we move to soya plant which owing to its high protein content also consumes a lot of resources? Or do we stop having hot showers because it is too energy intensive?

The 'developing' world is looking to reach a comfort level at which the 'western' world currently resides. And they have every right to do so. But the issue is, It is impossible to do this with the current number of people we have on this planet given the problems mentioned above. Rather than having a philosophy of "sharing what we have", we should have a philosophy of "making sure that every single person leads a comfortable life while ensuring continuity of our civilisation". Hence, we should emphasize much more on population control than what we are currently doing. Currently, it is not even included as one of the millennium goals defined by UN (3). I'm not saying we should pay less attention to sustainable energy but make an equivalent effort towards population control. Western world should help ensure development by at least promoting appropriate technology transfer. Since the reduction in population growth is directly proportional to development. On the other hand, developing world apart from development should emphasize on population control measures. •

1: US Environmental Protection Agency, 2016; 2: FAO.org, 2014; 3: UN Foundation, 2016

Would you like to write us too about your opinion? Mail us at setmatch-etv@tudelft.nl

Did You Know...

Francisco Galnares

Google emits, in average, about 8 grams of CO2 per day to serve one user. In other words, serving a Google user for a month is like driving a car one mile.(1)

It would take a person to yell for over 1 year and 7 months to heat up 250 ml of coffee to 50C. (2)

Using the latent heat of condensation, the amount of rain produced by an average hurricane is 6.0 x 10^14 Watts, which is equivalent to 200 times the world-wide electrical generating capacity. (3)

A single lightning bolt unleashes the same energy as blowing a ton of TNT. (4) •

1: Google (2016)
2: Physicscentral (2016)
3: AOML (2014)
4: British Gas (2016)

Polder Politics

Bas Buise

Although the powers within The Netherlands are not as separated as Montesquieu (France, 1689 – 1755) prescribed when writing his ideas on "Trias Politica", the Dutch politics, and many other Western politics, are based on his model. It means that the state is divided into three branches: legislature, executive and judiciary. The legislature has the authority to make laws for a political entity, like the country or a city. In The Netherlands this is the parliament on a national level, consisting of the Eerste Kamer and the Tweede Kamer. The Eerste Kamer is our Senate and the Tweede Kamer is our House of Representatives. Next to the parliament it's the government, consisting of the Minister President (the head of Government), the ministers and undersecretaries of state.

The executive has the power to enforce laws, so to bring new laws in practice. This is done by the civil servants, the clerks, officers, teachers, public servants, etc. It should be noted that these servants work for their ministries (like TU teachers work for the Ministry of Culture and Education). Those ministries are controlled by ministers which are in the government, making the idea of Trias Politica not fully implemented. Finally the judiciary are the courts and the Public Prosecutor, they have the power to judge and doing so, they apply the law that has been prescribed by the legislature.

To make it even more complex, there is also a King somewhere and we have the Waterschappen, our polder boards or regional water authorities. How all these parts of the Dutch State work will be discussed throughout the year. In the next volume we will start by explaining on the national parliament, the Eerste and Tweede Kamer der Statengeneraal. •

COLOFON

First edition of the first volume.
50 prints
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