"CHINA: Carbon Neutral by 2060"

- Innovation -

Day 1: Renewables

Participants

Mats Harborn - CEO, Scania China
Xing Zhang – Centre for Research on Energy and Clean Air
Zhenyu Tong – Business Development and Sales Manager, Novozymes
Mickael Naouri – Public Affairs Director, Power-to-X, Air Liquide
Matthew James (moderator) - MD, Energy Post

Highlights

Renewables growth

- In December 2020, China announced it would bring installed wind and solar capacity to over 1,200 GW by 2030.
- It aims to add at least 570 GW of wind and solar power between 2021 and 2025, more than doubling its current installed capacity.
- This will put China on track to meet its 1,200 GW target in 2026 (four years earlier than planned).
- China is developing giant clean energy bases with gigawatt-scale wind and solar parks.
- Achieving carbon neutrality before 2060 requires an annual renewables installation of 100-200 GW, so further growth will be needed after 2025.
- Hydrogen and power-to-x can absorb the intermittency of renewables and provide transport energy across China, strengthening energy supply security.
- China's power generation accounts for 50 percent or more of CO2 emissions. Hydrogen converted to ammonia can help decarbonise coal power plants.
- Solar and wind alone won't be able to sustain China's energy demand, they will need storage and other technologies such as hydrogen and biofuels.

- Hydrogen will play a key role in making use of the renewables that we can't manage in terms of intermittency, and can't manage in terms of seasonality.

Transport and heavy industry technologies

- Cutting Scope 3 emissions from heavy duty transport requires improved fuel efficiency, increased utilisation of products so that fewer engines transport more, and create low-carbon fuels.
- Scania has just launched one of the most fuel-efficient diesel engines for trucking, reducing fuel by 8 percent.
- China should revise its trucking standards to allow for fewer engines to pull more goods.
- In China, Scania is developing biogas out of sludge. It's a renewable fuel and the technology is well developed in Scandinavia.
- If the E10 fuel regulation is implemented in China, Novozymes' biofuels will help reduce CO2 emissions by 37 million tonnes – the annual emissions from roughly 15 million vehicles.
- Air Liquide plans to invest more than €8 billion in developing hydrogen by 2035.
- Air Liquide is producing about 420 tonnes per day of hydrogen in China.
- For heavy transport, well-to-wheel analysis suggests battery technology is more cost effective than hydrogen – as long as trucks can be charged within about 45 minutes.

The role of coal

- Coal power provides flexibility and backup services to the wind and solar energy.
- In 2021 wind and solar installations accounted for 27 percent of the mix, but only generated 12 percent of electricity. Coal power accounted for 46.7 percent of installations and generated 60 percent of electricity.
- Biomethane and biogas could be important in China because it imports natural gas, which is expensive.

Policy needs and challenges

- Local governments still have incentives to build more new coal power plants to improve local energy security and boost local GDP.
- Western China has more renewable energy resources, but eastern China has more demand.
- Western power producers want to send power east during low demand times, but eastern buyers want it during their peak hours.
- The central government should avoid giving provinces an excuse or reason to build new coal plants as support for big wind and solar projects.
- The NDRC should cancel local government rights to permit the construction of new coal-fired power plants.

Innovation priorities

- The key is system innovation to create cross-functional systems involving society, governance bodies, and other stakeholders.
- Policy is crucial to support investment in new business models and ensure they can compete with old. It seems like China is developing everything everywhere and creating waste in the process.
- Stable policy, stable finance for R&D and a free electricity market.

China is driving a renewable energy boom, yet the dual priorities of cutting emissions and ensuring energy supply risks keeping coal dominant in the long-term – unless other technologies step in to fill the gap.

Low- and zero-carbon technologies such as green hydrogen, power-to-x, biofuels and biogas offer the potential to decarbonise hard-to-abate sectors such as heavy duty transport and steel, can offer energy storage for intermittent renewables, and can help reduce air pollution and waste.

Hydrogen, for example, could help bridge an east-west divide that risks pushing Chinese provinces to develop new coal-fired power plants for their own energy supply security. The problem is that western China has more renewable energy resources, while eastern China has the bigger demand hubs. Hydrogen can store the clean power and be transported over long distances.

Biogas, meanwhile, offers a low-tech solution to produce renewable gas, make use of wastewater and food waste, and reduce methane emissions.

The key for China is to take a centralised and systemic approach to this transition, rather than allowing different provinces and developers to take diverging routes. The government needs to incentivise fossil fuel power plants, especially coal, to become backup suppliers for renewables, and stop provinces from building new coal plants that risk becoming stranded assets.

Opening Presentations

This is a summary, not a verbatim transcript, of the key points made during the online panel event.

Xing Zhang
Centre for Research on Energy and Clean Air

China's climate goals

- September 2020, President Xi announced China to peak carbon emission before 2030 and achieve carbon neutrality before 2060

- December 2020, President Xi further announced to bring total installed wind and solar capacity to over 1,200 GW by 2030

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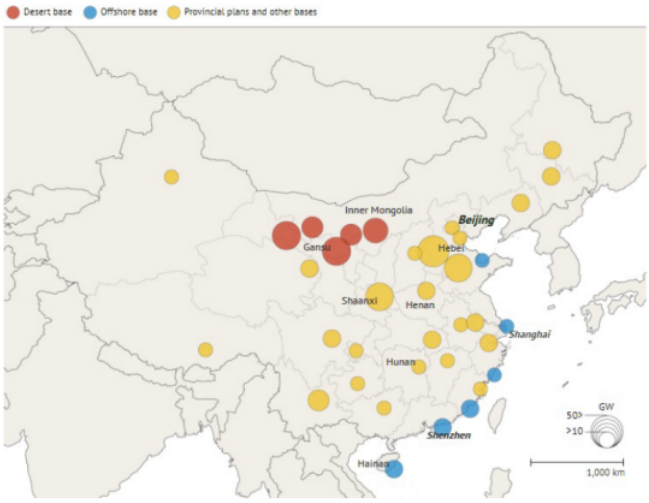
In September 2020 President Xi Jinping announced China would aim to peak carbon emissions before 2030 and achieve carbon neutrality before 2060. In December 2020, he announced China would bring installed wind and solar capacity to over 1,200 GW by 2030.

China's Clean Energy Bases

- China will add more than 570 GW of wind and solar energy in the 14th FYP period
- Gobi and desert areas in Gansu and Inner Mongolia – 169 GW
  Offshore – 58 GW
  Other areas and provincial plan – 367 GW
- Clean energy bases are designated for the simultaneous construction of numerous large wind and solar parks, each a gigawatt-scale development in its own right, combined with long-distance transmission lines to demand centres and supporting coal-fired power plants



CREA

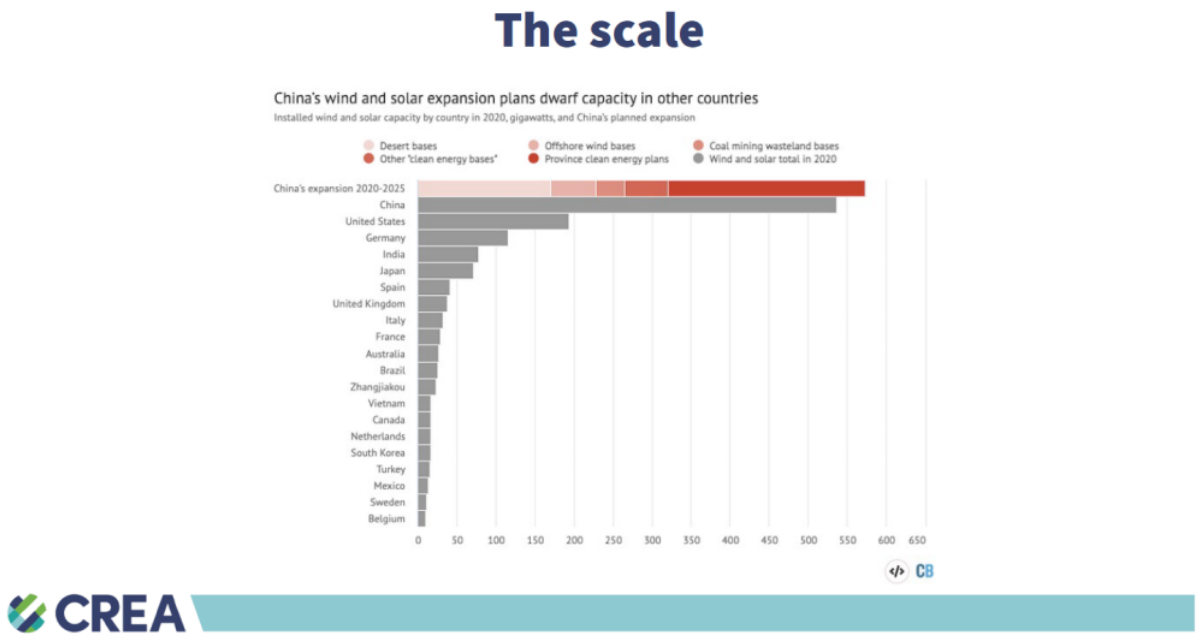
According to its 14th Five-Year Plan and the recently released and energy-related policy announcement, China is going to add at least 570 GW of wind and solar power between 2021 and 2025, more than doubling its current installed capacity in just five years.

This will put China on track to meet its 1,200 GW target in 2026 – four years earlier than planned. China is going to achieve this target through giant clean energy bases, designed for the simultaneous construction of numerous wind and solar parks. Each one is a gigawatt-

scale development, combined with long-distance transmission lines to demand centres and supporting coal-fired power plants. This is a new supply and integration system.

Coal power provides flexibility and backup services to the wind and solar energy. The most distinguished clean energy bases are two mega wind and solar projects in the Gobi and the other desert areas, announced at the end of last year and early this year.

The first list of projects contains 97 GW of wind in the desert, the second has 455 GW of wind and solar projects, primarily located in the Gobi desert. These projects utilise barren regions and will bring ecological benefits to the unused land, as well as generating green electricity.



What is the significance of these mega wind and solar clean energy bases? In 2020, China was the biggest wind and solar power installer, with a combined wind and solar installation of 536 GW. The top six countries after China had a combined installation of 537 GW for wind and solar. The two bases I mentioned have a total of 555 GW.

Clean energy projects for carbon emissions

- The clean energy expansion during the 14th FYP period will deliver around 1,500 TWh of clean power generation, which is sufficient to cover the average electricity growth of 4% without increasing fossil fuel power generation
- This would enable CO2 emissions to peak before 2025
- To achieve carbon neutrality before 2060, the annual RE installations need to reach around 150-200 GW
- However, all depend on energy demand growth and economic policy over the next few years

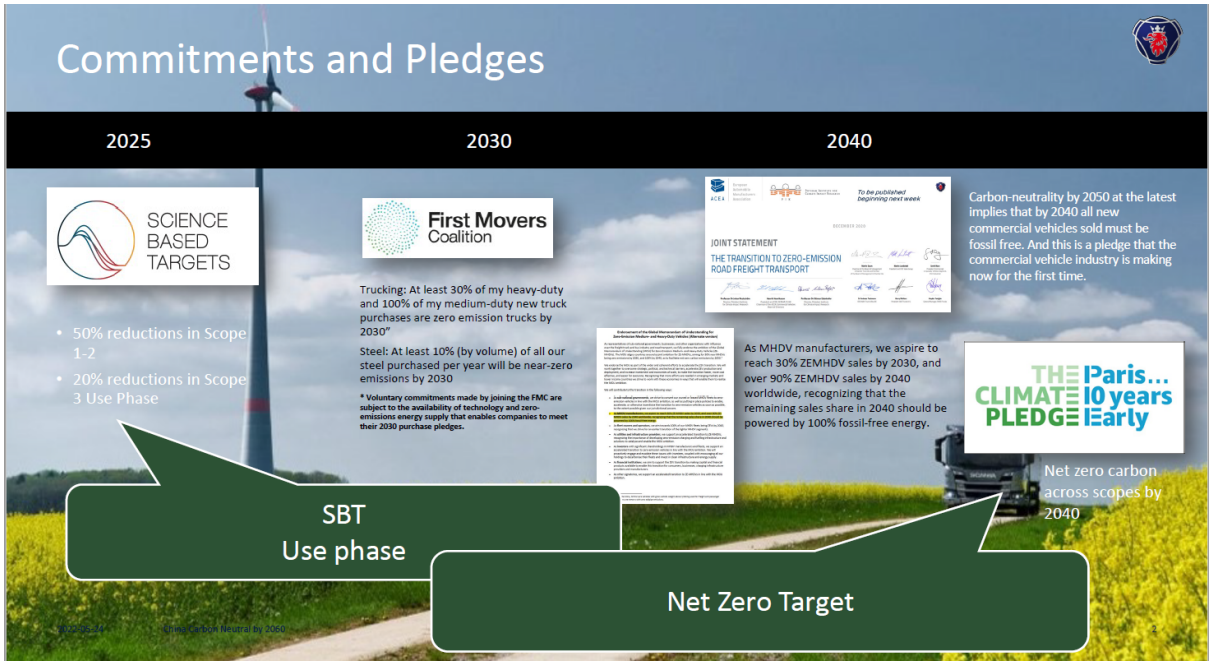
CREA

The clean energy bases will deliver around 1,500 terawatt hours of zero-carbon energy. As energy demand growth is projected to slow down and the clean energy additions accelerate, if there are no significant energy and economic policy changes over the next few years, the clean energy scale up during the 14th Five-Year Plan will put China on track to peak carbon emissions before 2030, even before 2025.

However, achieving carbon neutrality before 2060 requires an annual renewables installation of 100-200 GW, so further growth will be needed after 2025.

Mats Harborn
CEO, Scania China

Scania has taken it upon itself to drive the shift towards sustainable transport solutions.



We are committed to science-based targets for reducing emissions.

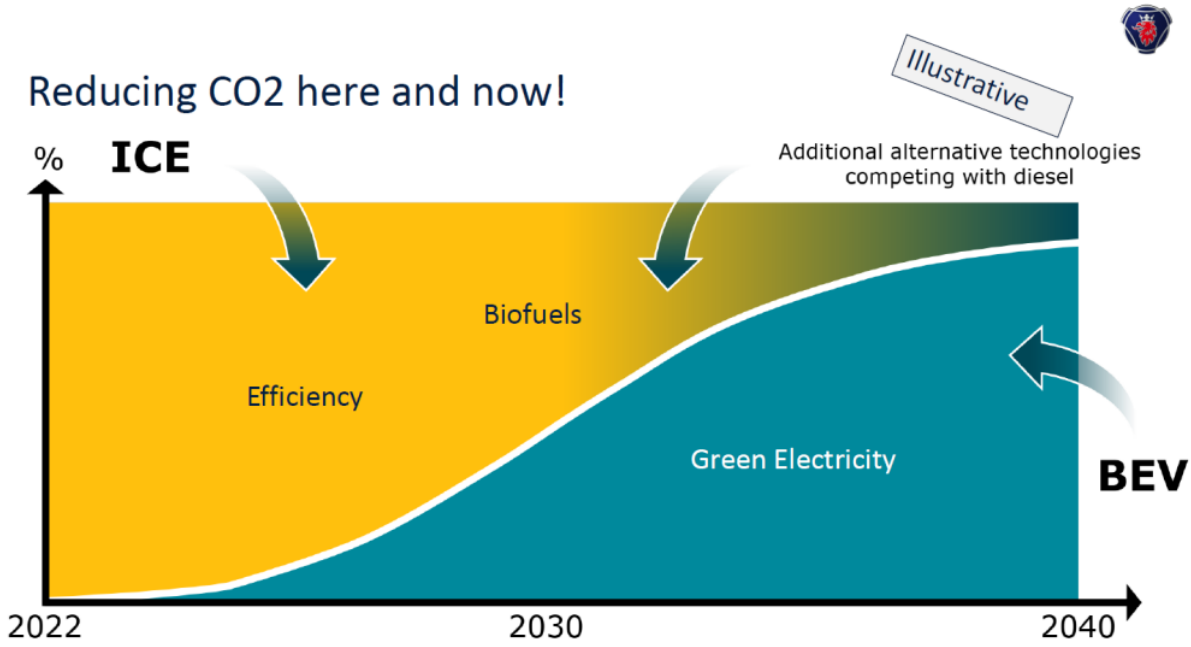
For Scope 3 emissions, from the use of our products, there is no silver bullet. We need to continuously improve the fuel efficiency of our products. We need to increase the utilisation of the product, so that fewer engines perform more transport tasks, and then it doesn't matter if the engine is combustion or electric. And we need to work with alternative low-carbon fuels. That’s the order in which we need to do it.

On fuel efficiency, I'm very proud of the new powertrain range we have just launched. It’s one of the most fuel-efficient diesel engines for trucking, reducing fuel by 8 percent, which translates immediately into CO2 reductions. This is a combination of working with the whole driveline – gearbox, engine, etc.

We also need to do more with less. In China we are trying to push for new mass and dimensions standards for commercial vehicles. We would like to see fewer engines pull more goods. We exhibited this project with a company owned by the Ministry of Railways at

the end of last year – 22 metres and 71 tonnes, which increases transport efficiency by 50 percent or more. We need to work with legislation.

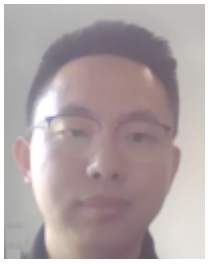
Scania is a 131-year-old company, and when we combine regulation with technology, this is the sort of development that we get over 60, 70 years. The red truck was common on the roads in Europe and Brazil in the 1960s. What we see being trialled today, for example in Sweden, is a 34-metre combination with an engine that is much more efficient. This is the first step in driving decarbonisation. In Sweden we are now also trialling long and heavy combinations with an electric driveline.



As we move to the yellow part of the curve, we want to add as many renewable fuels as possible and add new alternative technologies, and then phase in electric drivelines when we get access to green technology.

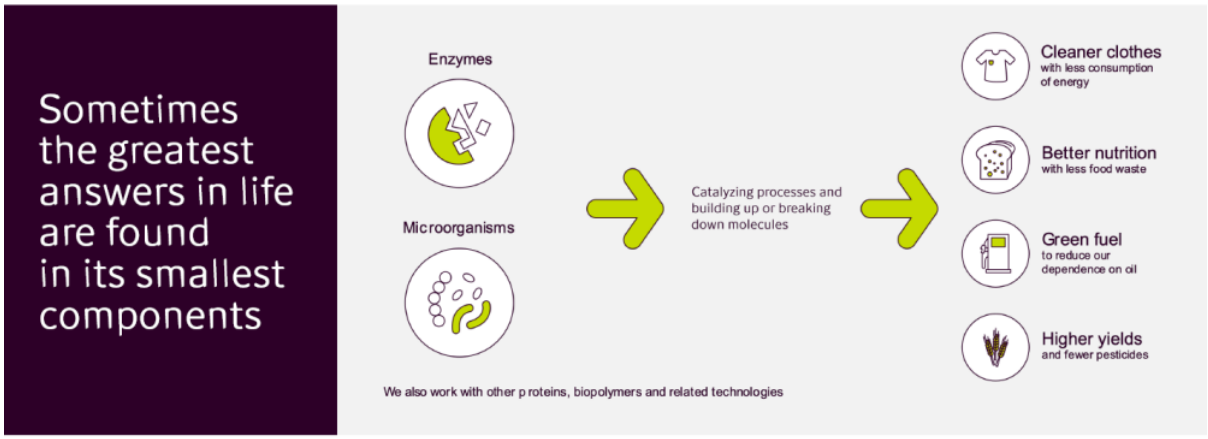
In China, we are pushing a concept that is very developed in Scandinavia – making biogas out of sludge, which is the byproduct from water treatment. This is a completely renewable fuel. We are working with the city of Rugao to set up a factory and starting a pilot phase of proving that sludge and food waste can be turned into workable biogas.

This also solves the problem of managing sludge, which is a headache for cities in China and a major pollutant of methane. We have shown in a study that it can be economically viable in China and turned into high-grade fuel gas. There is a linear correlation between the population of a city and how much public transport it needs, and all of this can be covered by biogas made from sludge from food waste.

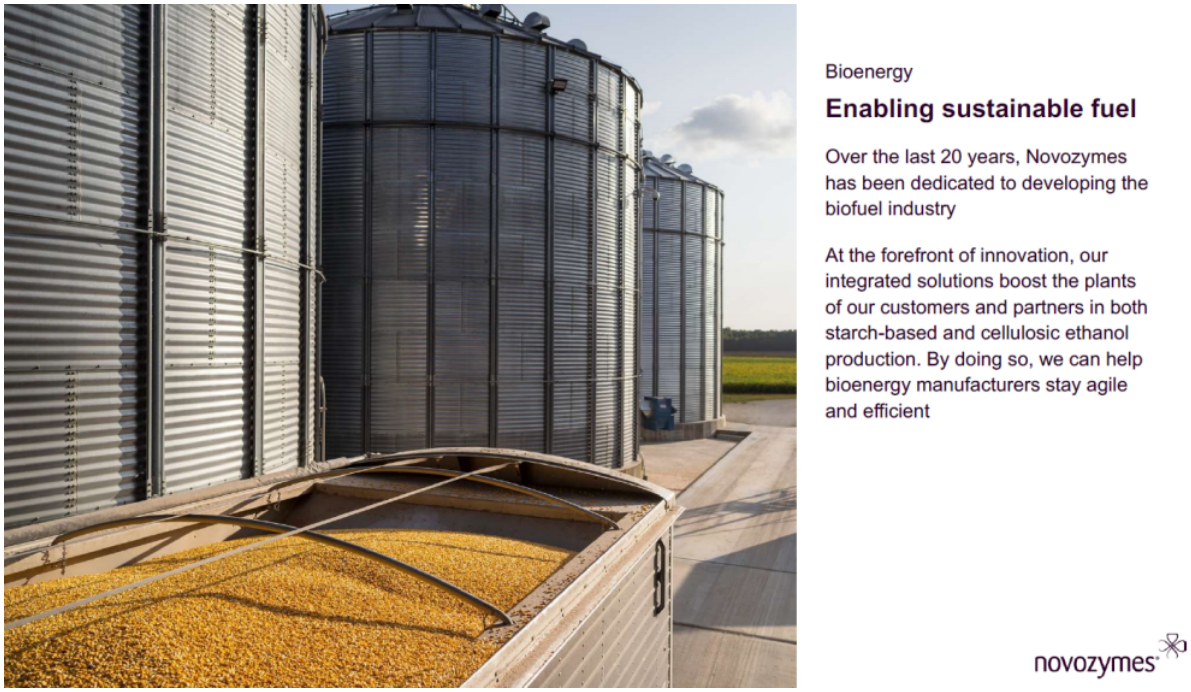


Zhenyu Tong
BD and Sales Manager, Novozymes

Introducing nature's problem solvers

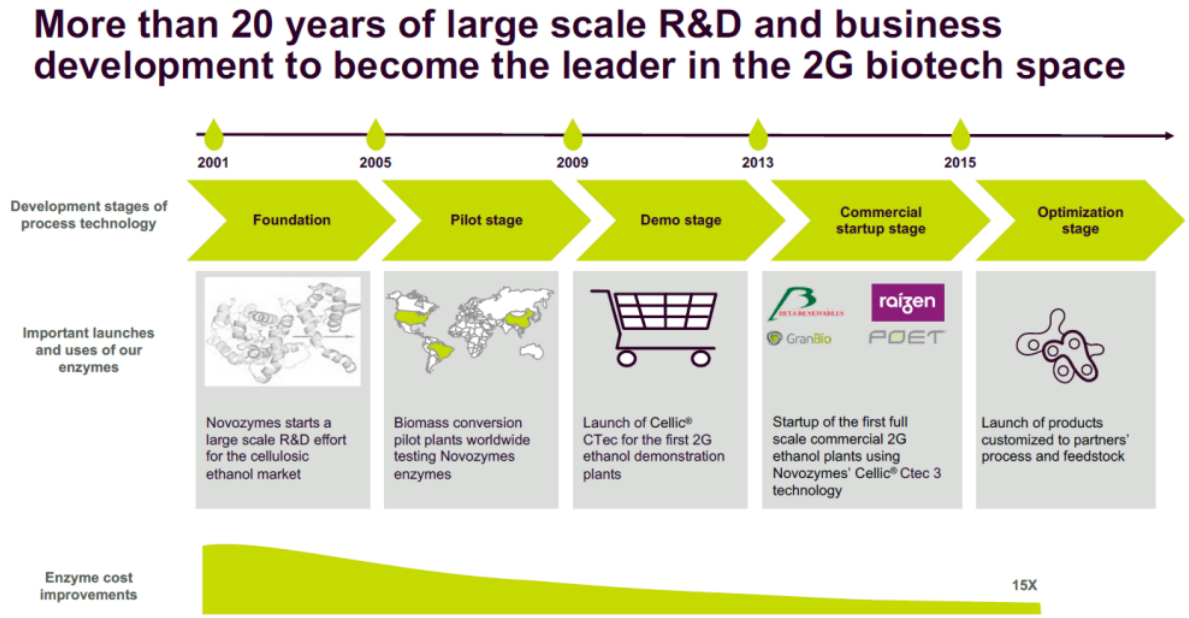


Novozymes is the largest enzyme supplier in the world. Our products can be used as a catalyst to speed up the reaction process and reduce the consumption of energy and chemicals. Our products can be used for cleaning clothes, better nutrition with less food waste, green fuel and increasing production yields.

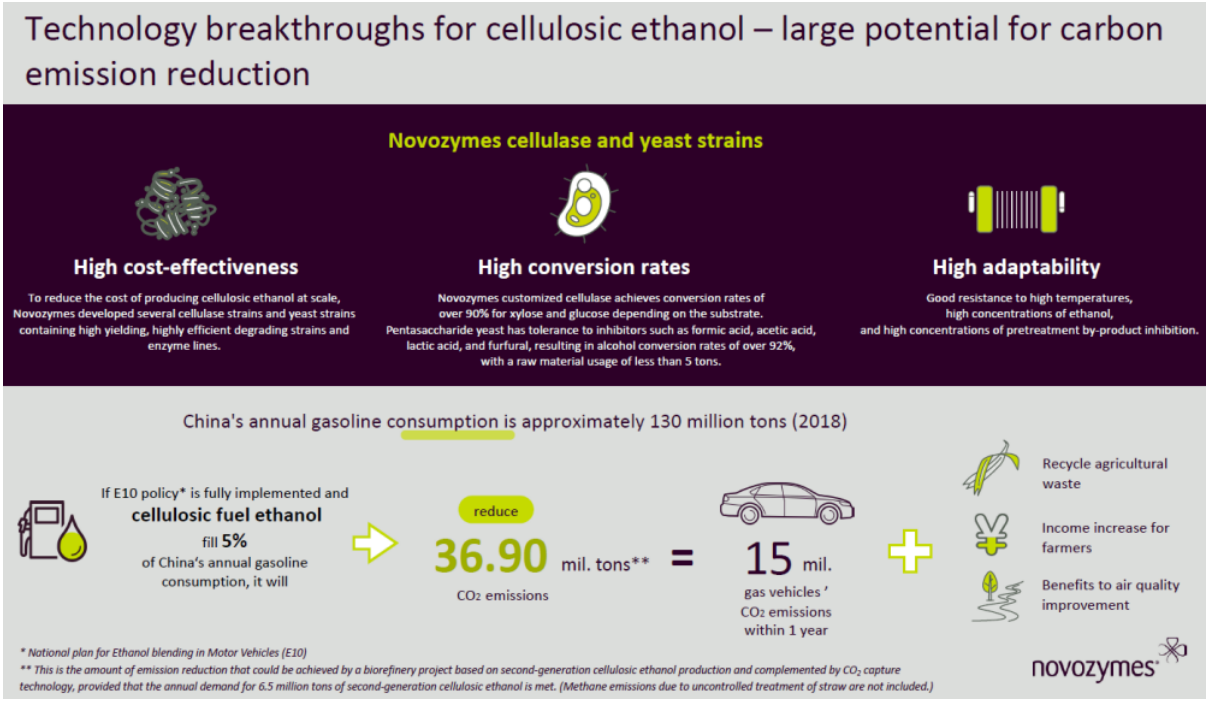


Novozymes has been working to develop biofuels products for over 20 years.

Novozymes is also committed to helping solve global climate challenges. Our solutions can have a big impact in the transportation sector, which accounts for 25 percent of total energy CO2 emissions. In 2022, our business will help the transport sector save 60 million tonnes of carbon emission by enabling the production of biofuels.



This is a roadmap of our biomass products development. We started our first pilot plant using enzymes in 2005. In 2013 we deployed the first 2G ethanol demonstration plants, which became full-scale commercial in 2015. Then we started offering customers 2G products based on their own feedstock and greatly reduced the enzyme cost.



We provide our customers with highly cost-efficient and high-yield solutions, and offer agile solutions to adapt to different production processes. If the E10 fuel regulation is implemented in China we will help reduce CO2 emissions by 37 million tonnes – the annual emissions from roughly 15 million vehicles.

Biomass renewable energy will also help with recycling agricultural waste and improve air quality by burning less cellulose.

Mickael Naouri
Public Aaffairs Director, Power-to-X, Air Liquide

2021 Key Figures

~66,400 EMPLOYEES

PRESENT IN 75 COUNTRIES

MORE THAN 3.8 MILLION CUSTOMERS & PATIENTS

REVENUE €23.3bn

NET PROFIT (GROUP SHARE) €2.6bn

INVESTMENT DECISIONS €3.6bn

ABATEMENT OF CO_2: A trajectory to reach Carbon Neutrality

Air Liquide Commitments

Air Liquide

CO_2 emissions **start decreasing** in absolute value

Reach **Carbon Neutrality** before **2050**

~2025

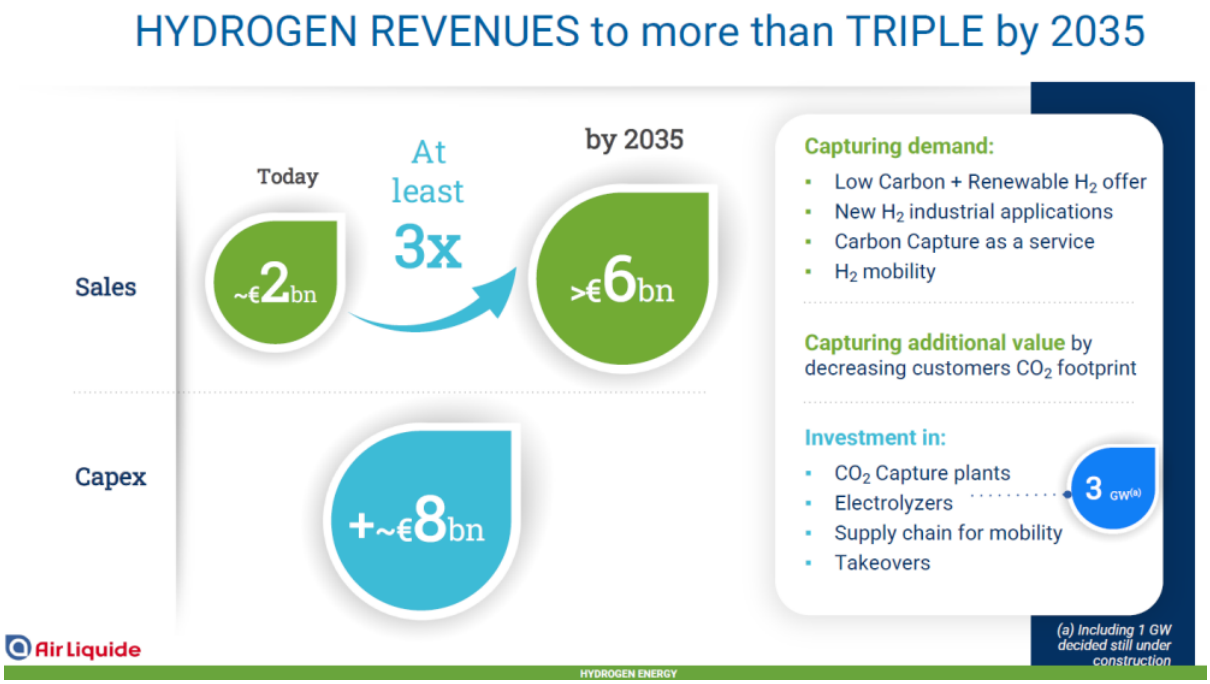
-30% Carbon intensity in kg CO_2/€ EBITDA[(a)] **vs 2015**

2035

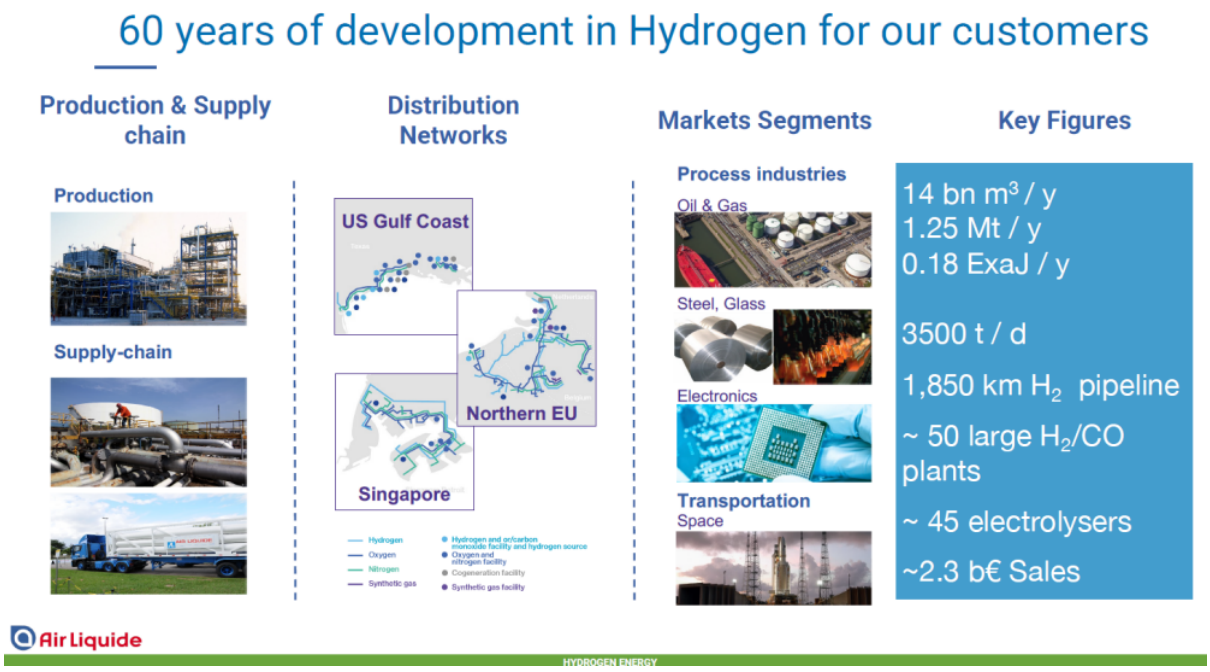
Decrease scope 1 & 2 CO_2eq emissions in **absolute value** by **-33%**[(b)]

2050

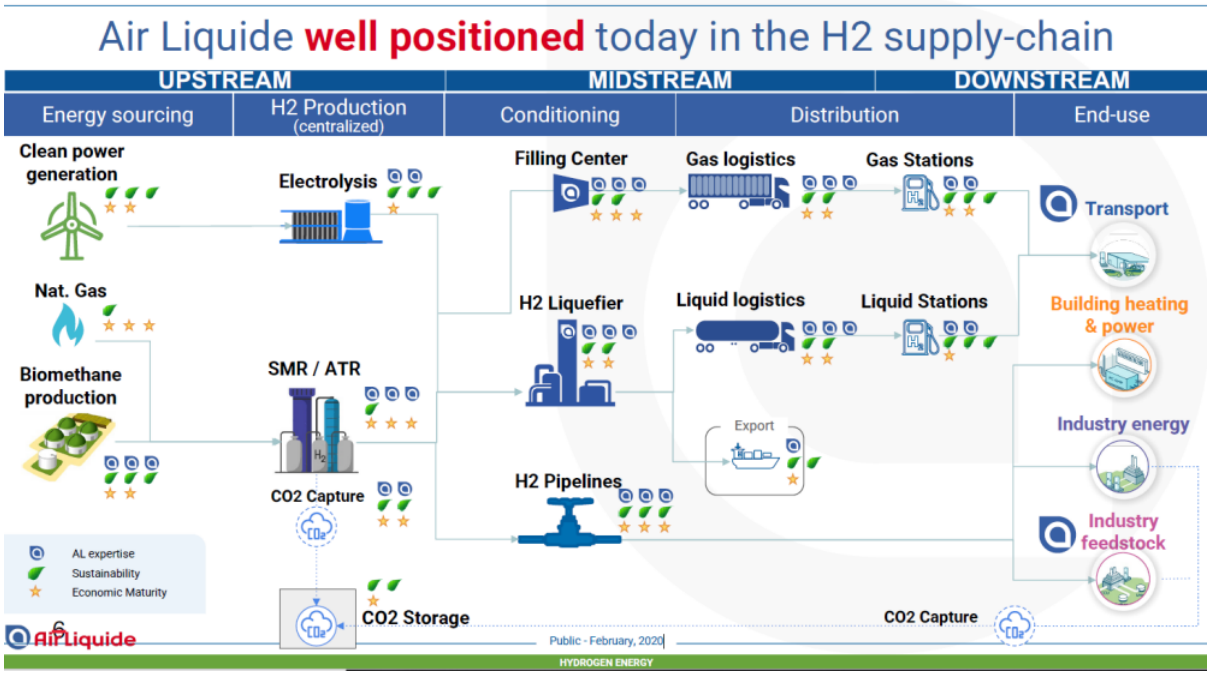
(a) at 2015 exchange rate and excluding IFRS16 for greenhouse gas emissions scopes 1 and 2
(b) from 2020 Market based emissions of 32.5 million tonnes CO2eq (Scope 1+2)



We plan to invest in the coming years more than €8 billion in developing hydrogen by 2035, which means developing electrolysers for green hydrogen and carbon capture.

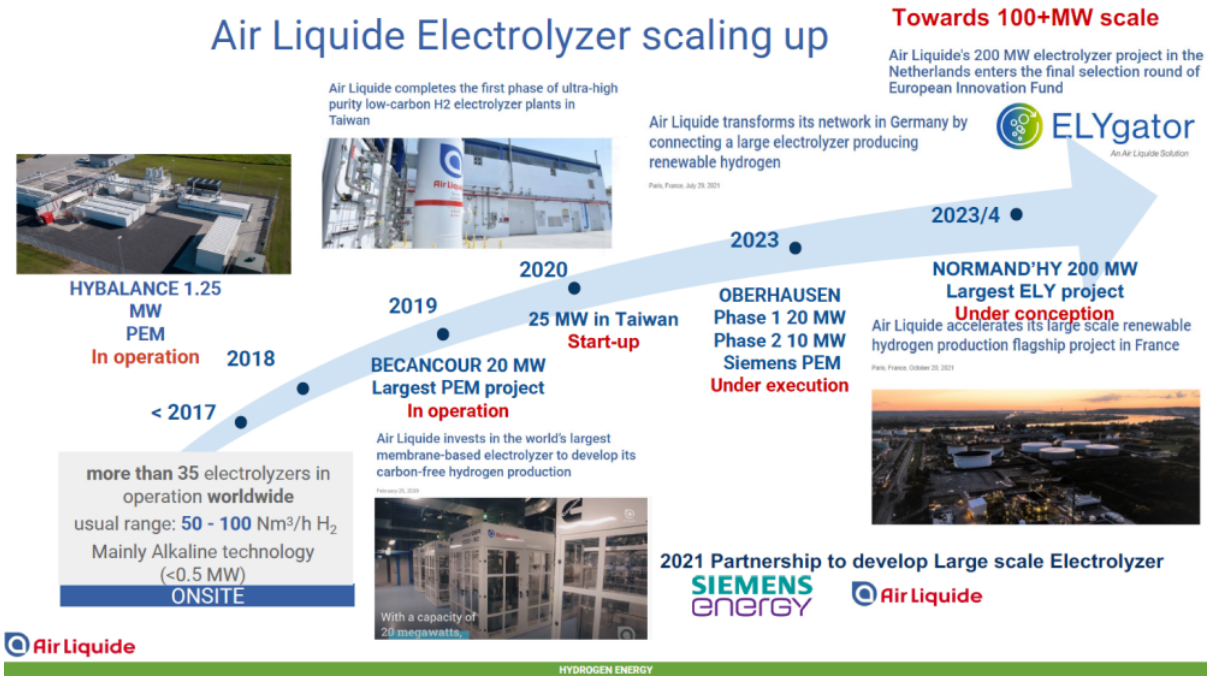


We have 60 years of experience on hydrogen and around 45 small-scale electrolysers worldwide.



We are also developing a bit of biomethane in China and around the world, have traditional technology for the production of hydrogen, and are working in midstream conditioning and the distribution of hydrogen, as well as working downstream.

We have a strong presence in China, producing about 420 tonnes per day of hydrogen and sourcing a lot of low-carbon electricity.



Power-to-X is when we convert green electricity, preferably renewable, into hydrogen and then into whatever hydrogen-based carrier we want – like ammonia or methanol. The first step is to develop the electrolyser technology, with the key to improve efficiency and scale up. We have a project with 200 MW under development. It should be ready in 2024.

Efficiency is not the important message around power-to-X. We know China wants to achieve carbon neutrality in 2060. But last year the push to achieve carbon neutrality and increase renewables led to a power shortage, so now we have a new focus on energy

security. For that, you need storage. Hydrogen can absorb the intermittency of renewables and transport energy across China.

Power to X: Usage in China

- **Power Generation => NH3 co-firing**
  - Transport energy across long distances
  - Turbines manufacturers developing co-firing from 30% to 70%
  - Utility players can maintain recently invested coal power plants while reducing emissions
  - Capacity to pilot power generation
- **Hard to abate industries:** steel, cement, etc..
  - Not ready yet, but one of the most promising solutions
- **Carbon Capture and Utilisation**
  - MeOH H2+ CO2 synthesis is scaling up
- **Mobility**

国家能源集团发布燃煤锅炉混氨燃烧技术

2022-01-25 17:24

由亚化咨询主办的**CO2 制甲醇与绿色甲醇应用论坛**将于2022年4月20-21日在苏州召开，会

Air Liquide

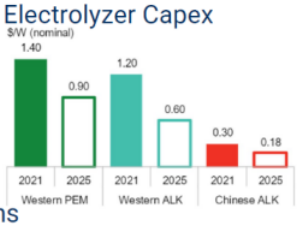
HYDROGEN ENERGY

Of course we've been focusing the discussion of hydrogen on transport, because it's the easiest one to start with. But the real game changer will be in power generation. China's power generation accounts for 50 percent or more of CO2 emissions, and with hydrogen converted to ammonia we can start to decarbonise coal power plants while maintaining new assets.

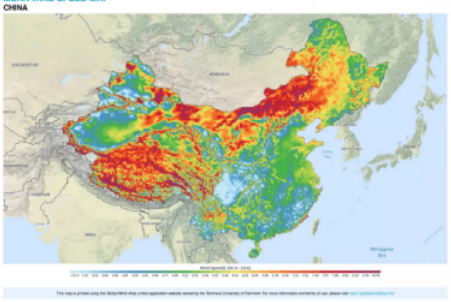
Then there is also the use of hydrogen for hard-to-abate industries. We can also use carbon capture and use (CCU) technology, using hydrogen, to produce molecules for chemical products.

China key advantages in Power to X

- Large development of REN with already very low price (0.15- 0.3rmb/kWh)
- Very competitive Alkaline Electrolyzer Capex
- Great wind/solar profile
- Strong fit within national strategy
- Interesting logistics options



=> Strong potential to achieve very competitive LCOH



Air Liquide

HYDROGEN ENERGY

China has key advantages when we talk about power-to-X, with excellent wind and solar. That's key for the electrolyser load of future large projects. But they are far from major industrial areas, so we will need to transport and store the energy and transport it.

Remaining challenges

- Optimize the load of the electrolyzer (the lower the poorer the LCOH)
- Alkaline technology while being very competitive is not the best fit for off-grid
- Off-grid electricity management
- Electrolyzer are still small scale, new challenges when scaling up => balance of plant
- Supply chain difficulties is generally overlooked in China
- Limited incentive to go green, no certification

=> Cost of Green Hydrogen is not yet competitive…but soon?

Air Liquide

HYDROGEN ENERGY

There is still a long way to go and a lot to achieve to make electrolysers more efficient and able to absorb off-grid energy. We would like to have the Gobi desert renewable energy directly absorbed by hydrogen, it makes sense and would improve the supply chain.

We still need incentives to go green, because today we know that it's not competitive. So we need certification too.

Panel Discussion

Matthew James
Managing Director, EnergyPost

Xing, what is your reaction to some of these case studies and solutions presented? How does it work alongside your picture and the issues you raised?

Xing Zhang

To achieve carbon neutrality we need efforts from every sector, because wind and solar rely heavily on the weather conditions. They will not stand alone in meeting energy demand. They need support from other technology innovations.

For example, China is heavily reliant on coal to support wind and solar, but it may be able to switch to bioenergy. Energy storage technology in the long term is also key to sustaining wind and solar energy.

Matthew James

Mats, can you be more specific about the scale of road transport's contribution to emissions and why it presents such a great opportunity?

Mats Harborn

The reason we want to be active in China is that it's the largest road transport market in the world, and heavy transport makes up most of the emissions in the automotive sector. Today's presentations show that we are all working in tandem towards decarbonisation.

Hydrogen is also part of the solution. Before it becomes freely available, we think hydrogen will make a big contribution in our Scope 1 and 2 emissions from our own production. We are keen to buy green steel, which hydrogen will help to decarbonise.

Matthew James

Are hydrogen fuel trucks part of your future?

Mats Harborn

Hydrogen will play a role, but analysis from well-to-wheel makes us inclined to invest in battery technology. In Europe, with Daimler and Volvo, we are investing in pan-European charging networks. That builds on the logic that if we can store enough energy to drive for four and a half hours and then we have the compulsory resting time of 45 minutes for the driver, we can recharge the vehicle in that period. If we can charge in 45 minutes, electricity with battery storage is a very economical and reliable solution for long-distance transport.

But of course, there will be segments of the transport market where hydrogen will increasingly play a role.

Matthew James

Xing, in your article in EnergyPost, you talked about the differences between policies at the regional and national levels, which create the possibility of divergence or loopholes. Can you talk more about that?

Also, the economics of using forward processes such as power-to-X for otherwise curtailed renewable energy.

Xing Zhang

Developing these mega wind and solar energy bases mark the first step in executing China's green energy transition. The plan is to build renewable energy first, then demolishing coal.

There is a conflict between the local governments' interests and the central government's plan. At the moment, the key challenge for China's energy sector is changing the role of coal power from the mainstay to supporting wind and solar power.

However, the local governments would still like to build more new coal-fired power plants both for local energy security and to boost the local economy and GDP. For energy supply, in western and north-western China there are more resources for renewable energy and for coal power, but less economic development. On the east coast the economy is more advanced and the population more crowded, so they need more power.

China has a policy to transfer energy from west to east, but there's a conflict between the two sides. Western power producers want to send out the power during low demand times and keep power for their peak times. But the east wants power at peak times.

The centralised government has a top-down policy for management of power, but there is a conflict between the two sides. This could result in the construction of more coal power plants.

Matthew James

Mickael, you talked about technologies where excess capacity could be used to produce gases which could help reduce emissions from coal power plants. This is an opportunity, right? The capacities are being built up at an incredible scale, so they're a way of mitigating

the effects of having that kind of mix between renewables and coal while there is economic growth.

Mickael Naouri

This is a missing piece in the Chinese system today and the development of renewables. It's really interesting and really important, but we can't pilot it. The government needs to associate renewable fuels with storage solutions. Liquid has the highest density, but there are plenty of solutions. The grid has some ways of storing electricity and transporting it over long distances, it's already happening.

Batteries are a bit more complex, even though we see the state grid investing in a lot of batteries. There's a plan for about 100 GW of battery investment in the coming years.

Hydrogen will play a key role in making use of the renewables that we can't manage in terms of intermittency, and can't manage in terms of seasonality. We need long-term storage and long-term capacity for transport. And it's not only for peak hours, if it was we could manage it with batteries.

Then there's the application of hydrogen or ammonia, but there gas is required. I agree with Mats that hydrogen is not competitive in transport compared to batteries, and as long as I can drive in the same timeframe. But when we need hydrogen directly, we don't have other choices.

We need to think of hydrogen as both a key way to manage intermittency and long-term storage, and to decarbonise fields such as heavy industry and chemicals.

Matthew James

It's clear how everything is interconnected.

Xing Zhang

Installation is the first step, but we also have to look at China's current energy mix. In 2021 wind and solar installations accounted for 27 percent of the mix, but only generated 12 percent of electricity.

On the other hand, coal power accounted for 46.7 percent of installations and generated 60 percent of electricity.

Before infrastructure is deployed and energy storage technologies and other innovations mature, we have to focus on energy supply stability, to ensure the country has enough energy to develop its economy.

Q&A

Question: Guoyi Han (senior fellow at the Stockholm Environment Institute)

There’s a worry that because last year’s power outage turned the focus onto short-term energy supply and security, there is a wind of change on energy policy and coal is pushing back. At the same time, China’s climate goals are well on track. What is often under-stressed is how fast China can accelerate.

Can Dr. Zhang share thoughts on this change, in particular in coal investment and development and the risk of undermining China’s potential for accelerating – rather than for meeting its goals?

Xing Zhang

I agree with you. China still relies on coal at the moment to provide stable energy supplies, but at the same time, we have seen a significant effort to decarbonise the energy mix.

When we analysed the energy transition plan through these big wind and solar projects, we realised there are hidden opportunities to build new coal-fired power plants. Our recommendation is to avoid giving provinces an excuse or reason to build new coal plants as support for big wind and solar projects.

To avoid it, accurate assessments and evaluations of existing coal power capacity are needed. China's coal fleet has an average age of around 12 years. Retiring these young coal-fired power plants will create a waste of assets and resources.

The second important challenge for accelerating the changing role of coal power and building more renewable energy is to create incentives for fossil fuels, especially coal, to provide flexible operations. To control the construction of new coal-fired power plants, the NDRC should cancel local government rights to permit the construction of new coal-fired power plants.

Question: Xiaobo Zhang

How does the pilot project using sludge for trucks work? Is it welcome in China? Chinese local governments are normally conservative on these kinds of matters, so what local company or city are you working with?

Mats Harborn

China is a global tech leader, and the government is supporting tech development. But when you talk about biogas, the technical level is very basic and the interest is lukewarm.

We still need incentives to achieve biogas production at the scale we hope to see. But I think with China’s emission reduction goals, the government realises it can kill two birds with one stone. First, it needs to deal with the environmental burden of unfermented sludge, because it turns into methane that goes into the atmosphere. China today uses energy to dry the sludge and reduce the volume, and then puts it into landfills.

Instead we could then digest it and make usable gas that can go straight into the gas network, or fed into factories, or upgraded to fuel gas. Interest is there because we can show that with current energy prices it's commercially viable. In Sweden, a water treatment plant takes water as a raw material to produce, gas, heat, electricity and fertilisers.

We want to see wastewater being used as a resource to be upgraded into something commercially sellable. We're on the doorstep of big developments of this seemingly simple technology.

Mickael Naouri

There is strong interest in this in China because they don't have natural gas, so they're importing it which is expensive. That makes the balance with biomethane quite good already.

The financing in China is interesting, because the fertiliser that's produced from biomethane can be used instead of chemicals. So this will be financed or supported by the government, or local governments, which will deliver the feedstock free of charge. So biomethane in China should be quite competitive.

Question: Luca Pardi (National Council of Research in Italy)

I worry when I hear people talk about biomass. Shouldn't agricultural waste be left on the field in order to maintain the fertility of the soil?

Zhenyu Tong

In China, when we harvest we collect all the corn straw or wheat straw and burn the biomass to ash, so the possibility of maintaining fertility is lost. In China, the solution is to make it too valuable to burn. By burning it you pollute the air and produce CO2.

Biomass can be turned into gas, and waste can be used to produce biogas. The technology already has its own market. I agree we could leave the straw on the land and let it decompose, it would be good for the soil, but it's not happening in China.

Question: Arno Driessen

The build-up of renewable energy is impressive. How will the Chinese electricity grid cope efficiently with this supply of green electrons, for example, the importance of storage in terms of thermal solutions brought up in the first session?

Xing Zhang

To ensure that wind and solar energy are in place and become the baseload or main power supply, we need to develop energy storage. Until adequate storage technology is in place, China is using coal power and hydro power for storage or peak shaving or to ensure energy supply.

Question: Martin Boer

Sodium borohydride – what is the possibility for usage in hydrogen storage? That's for Mickael.

What are the biological risks with the enzymes you're using? How are they addressed? That's for Zhenyu.

Mickael Naouri

Unfortunately I don't know much about sodium borohydride. The key question, when we talk about any carrier for hydrogen, or any way to store it, will be the extraction cost. Sometimes it makes sense because it's easy to store and it's easy to maintain. The problem is that extracting it uses a lot of energy, at a place where you don't have energy.

Zhenyu Tong

No, enzymes are pretty safe. We get something from nature and we convert it very naturally. It's not artificial material. The enzymes are proteins, like we eat every day. China has very strict regulations controlling anything coming into this country.

Matthew James

The umbrella theme of this session is innovation. What do you think should be the key focus of innovation?

Mats Harborn

The key is system innovation to make sure that we create cross-functional systems where each part of society, of governance bodies, and other stakeholders work towards the same goal and facilitate systemic solutions to problems.

In my country people say the reason we made breakthroughs on biogas, which we use for city bus transport, is because we created a concept called echo governance, which breaks down barriers between different stakeholders.

Zhenyu Tong

Policy, because we're talking about large-scale production that has to compete with traditional methods. A company needs to think about profits, which is hard if you're competing with traditional business models. Government policy or support can help overcome that gap.

Mickael Naouri

For China, the most important thing is to make sure that everything is integrated in its development. It seems like they're developing everything everywhere and creating waste in the process.

Xing Zhang

I agree with Mats, we need system innovation, rather than innovation in one area. We need the government body to bear innovation in its mind and provide stable policy to support it. We also need stable finance for R&D to develop innovation. And finally, we need a free market for electricity and to support the deployment of innovation.

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