CCIL Jockey Club SolarCare Programme: RE Webinar

Accelerating a Just Energy Transition in Asia: Voices from Civil Society and Business | Session 1 - Renewable Energy in Energy Transition

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Zhao: Mr. Zhao Ang (Co-director, Rock Environment and Energy Institute (REEI) in China
Chao: Dr. Chao Chia Wei (Chair, Taiwan Environment & Planning Association)
MO: Ms. Mika Ohbayashi (Director, Renewable Energy Institute (REI) in Japan
Chong: Mr. Chong Chan Yao (Co-founder and CEO of CarbonCare InnoLab) in Hong Kong
CCIL: CarbonCare InnoLab

CCIL:
Hello, everyone. I am the host of the webinar today. We are about to start the webinar in one minute. I know that we have quite a lot of participants here today. It would be really great if you can introduce yourselves briefly in the chat-box so that we can [get to] know each other better. I will see you in one minute very soon.

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CCIL:
Hello. Good afternoon, everyone. Welcome to our webinar. My name is Ingrid and I'm the MC for today's event. Today the webinar is about ***Accelerating a Just Energy Transition in Asia*** and this is organised by ***CarbonCare InnoLab*** under the ***Jockey Club SolarCare Programme***. We are very happy to announce that we have more than 100 participants in our today's webinar including people from different backgrounds and different places. Meanwhile, we are also very honoured to have 12 experts from all over Asia to share their views and knowledge on Asia's renewable energy developments. Before they share with us, I will first invite Mr. Chong Chan Yao, the co-founder and CEO of ***CarbonCare InnoLab*** to say a few words to us and introduce us to the ***Jockey Club SolarCare Programme***. I will now pass the floor to Mr. Chong.

Chong:
To join this seminar and webinar, we hope we can see everyone in person but, on the other hand with the Internet, we are glad to have speakers from Japan, Korea, Taiwan, and from other places in our city of Hong Kong. I would like to on behalf of ***CarbonCare InnoLab*** to welcome you all. ***CarbonCare InnoLab*** was founded in 2014 by myself and another like-minded advocate. We focus on Climate Justice, Carbon Reductions, Resource Conservations, and Adaptation and Resilience Building.

In this time of urgency, let me remind people of the call from the IPCC in the latest report that we are already passing through the horrible top line of 3 degrees. If we don't do anything drastic to change our way of living. We, at the same time, are talking about this long-term crisis which is now also an immediate crisis that is facing us. The war is around the world. This is also a distraction of our effort to deal with the more fatal climate crisis. Let's work hard to achieve peace as well as a sustainable world.

The ***Jockey Club SolarCare Programme*** was initiated by ***CarbonCare InnoLab*** and funded by **Hong Kong Jockey Club**. We leverage on the Feed-in Tariff Scheme of Hong Kong by which you can generate solar electricity and sell that to the power companies at different rates of $3, $4 or $5 per Kph in Hong Kong dollar. However, we [only] leverage this programme to promote NGOs to participate in the scheme. We partnered with NGOs to build solar systems on their premises making use of their Feed-in Tariff to support the NGOs' running costs as well as climate education programmes. In this way, we engage with children's homes, youth organisations & camps, and other NGOs which might not have a direct connection with climate change education in the first phase but in this programme we engage them [with].

So we build up a map of our partners and in this map you can press a button to actually identify [the] capacity of the stations. Let us try one [for you all]. For example, the ***Crossroads Foundation*** which is a global citizenship and educational organisation. When you click the dedicated button and you can see their solar systems performing there about the capacity, the electricity being generated and other information. We intend to expand this map with our partnership, ***Baptist University***, to be a community-based solar map. Okay, I won't take too much of your time today because we have eminent speakers and we should learn from them about how to accelerate just energy transition to a low carbon economy. Thank you very much.

CCIL:
Thank you, Mr. Chong. Now I will briefly go through the rundown for today's webinar. The first session will be about the recent progress of renewable energy development in Asia. The first session will last for about 1 hour, and then we will move on to the second session. The second session will focus on the challenges of an energy transition in Asia concerning social economic and political aspects. After session 2, we will have a 5-minute break. Then we will go on to the last session, i.e., the third session. This one will focus on the future and how we can work on accelerating a just energy transition, and there will be a Q&A session for all the three sessions and all the participants are very welcome to type your questions in the Q&A box. If you have any other technical problems you can also in a chat box, our colleagues will try to help. Let's start with the first session of the webinar.

For the first session, we have 4 speakers here with us today who will provide some analysis and insights of the recent progress in East Asia. Let me quickly introduce the four speakers. First, we have Mr. Kevin Li, the researcher of ***CarbonCare InnoLab***. Kevin has been working on issues concerning climate change on water and poverty reduction for more than 20 years. He also has experience in research in ground making and working with partner organisations in the Asia region.

We also have another speaker Mr. Zhao Ang, the co-founder and director of ***Rock Environment and Energy Institute (REEI)*** in Beijing. Mr. Zhao has worked on energy transition policy for more than 15 years. He has also published in various journals such as China Environment Series, International Journal of Applied Logistics and so many others.

We also have Dr. Chao Chia Wei with us today, the chair of ***Taiwan Environment and Planning Association***. Dr. Chao is also the adjunct assistant professor of ***National Taiwan University*** specialising in climate change and sustainable development. He has been very actively involved in climate and energy policy for 15 years.

Last but not least, we also have Ms. Mika Obayashi, the director of ***Renewable Energy Institute (REI)*** in Japan. Ms. Obayashi has already been working in the energy field for 30 years. She also previously worked in Abu Dhabi for the ***International Renewable Energy Agency (IRENA)***, and is one of the two founders of the ***Institute for Sustainable Energy Policies (ISEP)***.

[Kevin will be the one to share with us first], and he will be telling us some situations in Hong Kong and comparing it with other Asian cities.

Li:
Okay. Thanks Ingrid for the introduction. I'm about to share my screen, [please] wait a minute…Okay! Well, I guess you [all] are so much aware of the recent report of IPCC which actually talks about climate change mitigation. Actually I would not go into [the] details but would like to give a big highlight from this report. Basically, the report is about Global Greenhouse Gas (GHG) emissions, which will peak before 2025. [From that] urban areas actually are contributing a large amount of greenhouse gas emissions accounting for 67-72% of a global share. So you can see the role of the urban areas [in this aspect]. Without a strengthening of policy, greenhouse gas emission will actually continue to rise leading to a median global warming of 3.2 degree celsius by 2100.

The report also revealed that in the last decade the cost of solar energy, wind energy and [lithium-ion] batteries actually keep decreasing. At the same time, you can see that there's already a large increase in the deployment of this renewable energy. With all these findings, I think one of the important headlines is that we are calling on the repeat acceleration of mitigation efforts. I think this is a very important remark for us to start with all the discussion today.

For the Paris Watch report, this is actually a report initiated by us, ***CarbonCare InnoLab***, since 2018. We actually tracked the annual performance of Hong Kong and other Asian cities with regard to the Paris Agreement goals and [their] climate pledges. We tracked [it] since 2018 and a couple questions actually have been so much related to the energy transition apart from climate impasse and the adoption issues. One is about renewable energy. The other is about energy efficiency.

(Fig. 1)

What's actually going on in our cities as our cities, like the European places, are playing a very important role in energy transition? [Over] the past few years when we have been tracking [the] record, the 6 Asian cities that we are looking at including Hong Kong, Singapore, Seoul, Tokyo, Shenzhen[, and Guangzhou], some of them actually have a slightly larger share of the renewable energy. Yet at the same time Hong Kong is actually the [one which] has the smallest share [of it] as you can see from the figure in the top left hand side. On the bottom right hand side, you can see the pledges as well (Fig. 1).

Of course, some have made a very ambitious pledge of renewable energy, like Tokyo [which] is up to 50% of renewable energy by 2030. Meanwhile, as you can see some other rare not as ambitious as Tokyo, like Shenzhen and Singapore. [Compare with them,] Hong Kong is actually very moderate [in terms of] the target.

For Hong Kong, [it] so far has the least proportion of renewable energy. Only 0.3% of electricity comes from renewable energy sources. Of course, we have made a significant progress compared to 3 years ago because of the Feed-in Tariff scheme which was mentioned by Chan Yao. Actually we have a significant increase of solar PV in the rooftops of many houses starting from 1MW to 265MW. Surely, it's not efficient enough when you compare it with the target that we want to achieve. Renewable Energy Targets is actually [a] Hong Kong government's plan. From the Climate Action Plan 2050, we are looking at 7.5%-10% [by] 2035 and up to 15% [by] 2050 of renewable energy [consumption]. Yet, compared with other cities, and particularly with the reports of IPCC and the pledges of the Paris Agreement, we are actually still very far below.

(Pic. 2)
Left: Pilot Floating Solar Power System in Shek Pik Reservoir
Right: Guishan Offshore Wind Farm, Zhuhai

If we want to compare with the renewable energy potential of Hong Kong, there's basically a much larger percentage than [what] Hong Kong government claimed. For example, for offshore wind. Some scholars may say that, according to research, we can make up to 32% of offshore wind power, and about 10%-30% of solar energy. We actually have a much larger potential for renewable energy in Hong Kong. These are the examples that we are already piloting by our government. Offshore [wind farm] is being just next to us. Not far away from Hong Kong, it's actually located in Zhuhai (Pic. 2). This is about renewable energy.

For energy efficiency, basically, this is another very important sector also mentioned in the IPCC's report. Actually, there is a very high potential of saving energy in both building and transport sectors. Yet, in the past three years we made only very slight improvements [of about 1% in energy efficiency].

(Fig. 3)
Left: Building Energy Efficiency (Commercial, TJ/10,000 sq. m.)
Right: Building Energy Efficiency (Residential, TJ/1000 sq. m.)

For all the cities we are tracking, at the same time for the pledges of cities like Tokyo and Seoul, they actually have [set] very detailed targets for the buildings. They even quantify their reduction targets and make some measures mandatory such as [mandatory renewable energy installation in Tokyo] and [mandatory zero-energy buildings for new buildings in Seoul]. These are good moves but [there are] actually still a lot of things that we can improve in all the Asian cities. These are actually what we are tracking in the past few years and we are looking at very much more ambitious improvements in building energy efficient buildings (Fig. 3).

[Same case] for the transport sector. [Let's have a look at] the deployment of the electric vehicle in Hong Kong. Although Hong Kong is leading other cities yet its still extremely low [in the overall percentage] compared with the traditional vehicles. If Zero-Emission Vehicles, hybrid and Compressed Natural Gas (CNG) are all included, Tokyo actually is the highest (22.5%). However, we [realise that] people actually are moving towards electric vehicles rather than staying [with] hybrid vehicles. Let's see examples like Seoul and Tokyo, they are actually [taking] more aggressive steps by raising [either] a new registration cost or [the targeted] market share of Zero Emission Vehicles to fit up to 50%. These are truly aggressive plans but [keeping in mind that] we are still far away from there.

For my presentation today, I [tend] to highlight two things. Firstly, there's actually much room for East Asian cities to accelerate the pace of energy transition. Secondly, although we have made ambitious targets, we still need a more sensible action plan that will help stimulating the growth of the renewable energy and the improvement of energy efficiency. It's all for my presentation today. Thank you.

CCIL:
Thank you very much, Kevin. Next we will have Mr. Zhao Ang who will be sharing with us on China's energy transition policy and practice.

Zhao:
Hello, everyone. Can you hear me? I'm really pleased to join this webinar and thank you CCIL [for] inviting me to share our work. I'm from ***Rock Environment and Energy Institute (REEI)***. Let me share my screen first. In the meantime, I find this webinar is very helpful for us to understand our counterpart cities and countries to learn [from] each other. What I want to share today within the 10-minute is to review China's energy transition policy in the past 10 to 15 years and to give some observations based on the data and the analysis. We have been helping in this area [over] the past 10 years.

(Fig. 4)
China's Energy Snapshot from 2011 to 2019
IEA: Final energy consumption increases 30%
Modern RE: 5% -> 10.6%

Let us see the energy snapshot. It's about 10 years time from 2011 to 2019. 2011 was [the] time when China's economy was gradually slowing down, and 2019 was the year before the pandemic. Thus, this is an interesting time window to look through what's going on in China's energy system. According to IEA, the final energy consumption increased about 30% in this 9 years of time. [Amongst,] the modern renewable energy mainly solar, wind power and modern biomass increased double. Here come two charts and you can easily see the big difference particularly when you realise how important the Chinese energy system changes with three things over time (Fig. 4).

First is about coal. Coal's percentage of share has been declining very significantly from almost 3/4 to 2/3. The Second point is about the other major type of fossil fuel - oil. Oil increased a lot and now more than 70% of oil consumed by China is imported from other countries. Third is about renewables. You can see the wind, solar, and hydropower have been playing a very important role in recent.

Yet, China's energy transition policy is based on quite a few systematic factors from industrialisation, economic growth, climate policy as well as environmental policy. As you know when China talks about the energy transition, the top priority of course is to continually support economic growth. However, you would see in the recent years we have been talking about how China can secure carbon [neutrality] by 2060, how that pathway could be affordable, and how much will be [invested] there in order to support it.

(Fig. 5)
China's Net Zero Pathways:
Total GHG emissions across sectors (MtCO2e/year)
> How high can China's carbon emission reach?
> How fast will China's carbon emission reduce to net zero?
> Which energy transition pathways is more affordable?

This is a chart from the ***Climate Action Tracker*** (Fig. 5). You can see the trend of carbon emission and greenhouse gas emission. It's very challenging for China to [achieve] carbon neutrality within 30-40 years. Here, I will give more time to explain the shift in the role of China's energy policy in the economy. In the history of the energy policy, we mainly focus on the 2005 Renewable Energy Law which is a foundation for China to pursue the renewable energy transition. Since then, China has reduced the [energy] intensity of GDP on a large scale. In recent, particularly after 2016, China has been putting a lot of resources into the decarbonisation of the transport sector, especially for road transport.

When we talk about energy transition policy, we have to consider the context of, firstly, energy security, particularly when China still consumes oil on a very big scale. Year after

year, China has started to focus on the oil cap project and how to reduce dependence on oil imports from abroad. Secondly, the industrial policy always plays a big role in supporting China's industrialisation [concerning] many factors. Thirdly, as I mentioned before, air pollution is a big issue in the eastern part of China, in particular the metropolitan areas. This is also a big concern. Facing coal reduction has been contributing to improving air quality. The fourth one is about international climate governance. This is a big thing. China has been using this to leverage and improve its international profile [to] an important level [so as] to build up collaboration with the European Union and the United States. Lastly, let's make the ***Climate Club*** and the ***Race to Top*** an interesting perspective for us to understand how China is making moves when facing challenges. I will give a bit more information later on.

Energy transition is difficult, no doubt. Yet, it's still achievable. We have seen the model from 1980 to 2020. Here I've listed some information about the demography divided into the government investment-driven policy and growth. From now to 2060, China's development model is required to shift to a more qualified and more inclusive policy making and economic growth for the transition. I will not go into details but I still want to show how we divide it into two models of development. Although China has achieved the first 40 years of economic boom, China is still very uncertain to secure the transformation in economic and energy perspectives in the next 40 years.

(Fig. 6)
Energy transition investment
> Carbon Emission of China in 2050 from Institute of Climate Change and Sustainable Development, Tsinghua University
> China Statistics Summary 2020, McKinsey Global Institute, 2022

(Fig. 7)
Power sector investment increase gradually
Table1 : Power sector investment and share of GDP, 2011-2020 (Unit:billion Chinese yuan)

	Accumulated	**Annual investment/share of GDP on average**
1.5-degree scenario, 2021-2050	138,000	4600/over 2.5%a
2.0-degree scenario, 2021-2050	100,000	3300/1.5-2.0%a
2011-2015	3912	782/1.37%
2016-2020	4425	885/0.99%

Source: Calculated by the authors based on the data from the China Electricity Council, National Bureau of Statistics of China

According to research from ***Tsinghua University***, there is a scenario analysis on China's energy transition investment. It shows that China needs a huge amount of money to transform its energy system. Yet, I want to put this into research by the ***McKinsey Global Institute***. Although there are a lot of instrument investment in green energy, it only needs 10% additionally, apart from what we have to invest, in supporting economic development.

It implies that we actually don't need to spend USD 275 trillion but only USD 9 trillion extra more to make the transition on a global scale (Fig. 6). This is the situation in China.

China has been heavily investing in the energy system in the past 10 years. The experience can shed light on China that more resources and energy investment pathways have to be built up. This is an infographic to tell how the gap exists until the next 30-40 years. Thus, the percentage of energy investment at least needs to double up (Fig. 7).

(Fig. 8)
The New Initiative: Strategy and Overarching Policy under 30/60 climate goals
> Top 10 Policy Measures: Renewables, Electric Vehicles, Low carbon building sector, Green Industry, Carbon Market, Green Finance, Circular Economy, Nature-based solutions, etc.
Source: The Keynote Speech in Beijing Summit., Mr. Zhenhua Xie, 2021

The New Initiative is innovative under the carbon neutral strategy (Fig. 8). The government is still using its capacity and authority to lay out how China can achieve the goal in the long run. However, it's still in the process of disclosing a more detailed policy. Those measures like from renewables to secure economy to green industry are all major pillars of the strategy.

Let me conclude here. I think China is facing a very challenging situation in the current era. Energy security is regarded as the top under the [context of the] recent war in Europe. Energy transition has thus become stressful alongside the economic downturn. Last year, there was a large-scale power outage in China. Besides, the challenge of globalisation is obvious and de-globalisation has become very influential. China has the responsibility to play a big role in international climate governance; however, there is still a lot of uncertainty in the current situation. Because the country ultimately has to prioritise domestic policy and its economic growth. China is the No.1 carbon emission country, making balance between two ends is certainly a big challenge.

Climate competition is something big too. Every country in the world is building up a very powerful network to practise their commitment, and it will gradually stress China to do more for sure. I think it's overall a good thing for global climate mitigation. Okay, thank you very much. I really appreciate this opportunity.

CCIL:
Thank you very much Mr Zhao for sharing your thoughts and insights on China. Just a quick reminder for the participants. You can type your questions in the Q&A box and later in the Q&A session, I will read it out to the speakers here. Next we will have Dr. Chao Chia Wei. He will tell us about the situation in Taiwan.

Chao:
Hello, everyone! Thanks CCIL for inviting me to share about the status and the outlook about the energy transition in Taiwan. It's also an exciting time for other climate advocates in Taiwan right now. Because, just last week in Taiwan, the government announced the ***Roadmap of the Net-Zero Strategy*** for the coming 28 years. I will elaborate more on this issue and the content of the roadmap in my presentation.

(Fig. 9)
Status of RE development in Taiwan

First, let me introduce you to the status of renewable development in Taiwan. Here in the figure you can see that the overall energy transition policy started in 2016. After 6 years of implementation, the share of renewable energy has only increased [by] about 1.2% and it was only accounting for 6% by 2021. Meanwhile, the share of coal has merely diminished by 1%. Besides, total generation from coal-fire power has basically increased due to the dramatic increase of the overall power consumption which is ascribed to the repetitive growth of the electronic industry (Fig. 9).

Compared to our energy transition target by 2025, there is still a huge gap in between. We have to enhance the share of renewables from 6% to 20% in the next 4 years so as to lower the share of coal-fired power plants from 44% to 27%, and to rule out all nuclear power operations in Taiwan by 2025. Basically there is a huge gap between our current status and our target. The government thus frequently emphasises the only possibility while the target can be reached by 50% of the share of renewables. Otherwise, the share of coal cannot be reduced to 27% but possibly only to 33%. In this case, it will hinder the progress of our carbon reduction.

If we look into renewable development, you can seen the past 6 years the total power generation from PV of solar energy has increased by 9% while the power generation from wind power has only increased by about [1.5%]. Therefore, if we further look into the target by 2025, we still need to increase the PV development by 3 times and need to have a triple of the instalment of the PV panel. Besides, for offshore wind energy, we need to make sure that all the offshore wind [farms] are in the construction process right now. They can be connected to the grid on time so that there is a possibility that we can reach [the target of] our renewable energy development.

(Fig. 10)
Promises and Discontents of RE development in Taiwan

ESG investment	< >	Lower Public Trust
Job Opportunity		New NIMBY
Offshore Wind hub		Not Citizen-oriented

With 6 years of experience, we have found some positive progress. For example, we have created about 3,000 job opportunities in the renewable energy sector as well as in the other financial sectors. Most of them are now waiting for the ESG fund so as to invest in more other renewables' sectors. For offshore wind development, we are kind of like a manufacturing and installation hub in Asia right now.

Yet, we have also found some discontents. Actually, the public trust and confidence of renewables is getting lower during this time. The support of renewable energy development has even diminished from 92% to 75% in the past 5 years. We believe that it's the result of the new NIMBY (Not In My Back Yard) issue, which is serious especially in the PV sector. People think the solar panel would create the potential harm to the ecological sensitivity habitat as well as the landscape. Less than 1% of the existing donation is for the citizen centric hub and community energy project. Thus, what we're doing right now in Taiwan is not a citizen-oriented energy transition [as expected].

Thankfully, the government announced the ***Net-Zero Roadmap and Strategy*** last week. Among its roadmap, they have highlighted there are four kinds of full transition that we are looking for. They are Energy Transition, Industrial Transformation, Sustainable Lifestyle, and Societal Transformation which [would involve] public participation and issue of energy justice [during the] transition.

They have also highlighted that we need to accelerate two fundamentals to make those transitions happen which are Climate Legalisation, and Climate Research Development and Deployment. Besides, there are also some key policy milestones to achieve such as ICE Ban on the internal combustion engined vehicles by 2040, mandatory NEB (New Engineering Building) for public and new building by 2030, and the full replacement of the smart meter by 2035. Yet, the most important thing is that the government has also proposed a huge budget of around 900 billion New Taiwan Dollar for the next 9 years, which is equivalent to 3 billion in USD annually. It will [be] the very first time that Taiwan can finally get what we called it as the climate budget.

However, [for that] the share of renewables is required to increase by between 60%-70% alongside the other power coming with the hydrogen-fired (10%) and the LNG (Liquefied Natural Gas) with the CCS (Carbon Capture and Storage, 20%-27%). Basically, this kind of target for renewable energy is not ambitious enough because it means that Taiwanese [still] need to rely on low energy and allowance with CCS. If we look into the renewable target in the Net-Zero Roadmap, we will find that the government did not propose an efficient target for solar energy but for wind power, especially offshore wind. The target they have set out [for the latter] is even higher than the proposal and the research from the NGOs. [It implies that] the government is still not able to maximise the rooftop PV potential. The consideration of other renewable energy like geothermal, ocean tidal energy and biomass is also not strong enough.

The most interesting thing is that the government did not come up with a coastal examination. For that, it hinders the public confidence about the roadmap.

There are some policy mixes we need to accelerate energy transition and reach Net-Zero for Taiwan. Firstly, we need to combine the zoning process with renewable energy if we want to

deal with the issue of renewable energy development, especially for PV [solar]. Thus, we can avoid the distribution [of] ecological sensitivity and enhance social acceptance. The other thing I would like to highlight is the Demand-side Solution, which is not sufficiently addressed, so that they did not come up with an aggressive energy efficiency target in the roadmap. We need to strengthen the carbon pricing to adjust the overall energy price [so as to] create a more incentive for renewable energy development. At this moment, we still cannot see the role of the citizen in our ***Net-Zero Roadmap***. This is something we need to emphasise on lastly. Yet, as I know, the other NGOs will focus on this issue to make the overall implementation process more inclusive. It is all of my sharing and perspective. Thanks for listening.

CCIL:
Thank you very much, Dr. Chao. It's great to hear the very latest news and the roadmap from Taiwan. Let's also hear from Ms. Mika Obayashi. Just now I heard from Kevin saying that Tokyo is more ambitious in using renewable energy [compared] with other cities. Maybe you can tell us more about that.

MO:
Okay, Ingrid. Thank you very much for your introduction. It's really my honour to be one of the speakers at this panel and hearing [from] the other countries as well as other experts' initiatives in the energy transition. I just like to explain that about the advancing green energy transition in Japan, kind of a status and our challenges that we are facing. Kevin already explained about the global energy transition. I just try to recall slightly about what is happening globally.

(Fig. 11)
Energy Transition - global solar installation
> Solar is taking over everything in the world. The cost of PV solar has fallen by 90% in the last decade, and the cost of Concentrated Solar Power (CSP) has also come down.

(Fig. 12)
Energy Transition - global wind power installation
> Wind power has expanded steadily. It was already a competitive power source, but its cost has been further halved in the last decade. In recent years, a new technology, offshore wind, has expanded the market.

(Fig. 13)
Renewables-based electricity is already the cheapest power option in most regions

This is the [status] of global solar installation (Fig. 11). According to the prediction by BNEF last year, on a global solar power expansion, it showed that 193GW of [the global PV] was installed last year. It's nearly reaching 900GW [in total] but of course this is a

tentative number. Thus, we probably have to check it after 2 months or something like that when the global statistics will be available. As you might know that the cost of PV solar is declining so fast.

This is the status of global wind power capacity (Fig. 12). It was already announced by the global wind energy council, so I can say that it is one of the fixed number. At the end of last year, 837GW of wind power were installed. At the same time, wind power has been decreasing its cost. This is kind of a comparison of solar voltaic centralised the solar power onshore and offshore (Fig. 13). It is becoming cheaper [among all] the electricity sources. Renewables are now the cheapest new electricity in countries making up just under 3/4 of world GDP. So you could see that, like in many countries, renewables become the cheapest new energy sources.

(Fig. 14)

Renewables could decarbonise 90% of the power sector by 2050
> 2018 - RE: 33%, VRE: 15%
> 2030 - RE: 76%, VRE: 60%
> 2050 - RE: 92%, VRE: 73%

According to these statistics, the ending trend that renewables could decarbonise 90% of the power sector by 2050. This is the new study released by ***IRENA*** about two weeks ago (Fig. 14). Renewables will provide 65% of the total electric supply by 2030 and they step [up] respectively from over 25% in 2018. Thus, it has become doubled in the past years. After that we have to make it double again by 2030. This is a kind of our promise that we are reaching.

(Fig. 15)
National Targets - Japan in the global context

Countries / Regions	Renewable electricity Targets and simulations		Greenhouse gas reduction targets (1990 levels)		Coal-fired targets
	2030	2050 Simulation	Mid-term	2050	
EU	Fit for 55: 64.8%	At least 80%-97%	-55% by 2030	Climate neutrality	-
Germany	65%-80% ~almost 100% (2035)	Carbon neutral in power sector	65% reduction by 2030 88% reduction by 2040	Climate neutrality (2045) negative emission by 2050	~~2038~~ 2030
France	40%	-	55% reduction by 2030	Climate neutrality	2024-26

The UK	60% variable renewable energy +Other renewable energy (e.g. hydro)	80% variable renewable energy +Other renewable energy	78% reduction by 2035 Electricity decarbonisation by 2035	Climate neutrality	2025
The US	California 60% NY 70%	California Hawaii New York State 100% by 2045	50%-52% reduction by 2030 (compared to 2005) Electricity decarbonisation by 2035	Climate neutrality	-
Japan	36%-38% The 6th Basic Energy Plan	-	46% reduction (2013 vs.)	Climate neutrality	19% in 2030 41% for thermal power as a whole

According to the [national] targets for renewables of other countries, for example EU, [it aims to have an index of] 55 representing the deduction of carbon emission by 2030. If we try to reach this target, the countries of the EU have to increase renewables in the electricity mix [by] about 65% (Fig. 15).

Last year, Germany elected a new cabinet government. The new cabinet once proposed 80% of renewables by 2030 but now under this very difficult circumstance in Europe they have revised the target to almost 100% of renewables by 2035. I think it's really ambitious as a very positive response to this very difficult situation. Other countries in Europe has kind of a larger target by 2030 and some countries even aim for 100% renewables.

In the United States, they don't have the national-based target but some states are quite advanced like California and New York. They have [set the targets at] 60% and 70% by 2030 [respectively], and both even aim to reach 100% by 2045. In Japan, you can see the Japanese government [launched] a new ***Basic Energy Plan*** last year that aims 36%-38% of renewables by 2030. It's [just] the half of other countries' targets. I think we have to increase it and have a more ambitious target.

What I want to point out here is the coal-fired power plant. You can see at the right end of the table, other countries targeted zero coal-fired power [either] after 2035 or by 2050. Of course, they don't have any coal-fired problems [relative to Japan] but for Japan, we aim to have 19% of coal-fired power plants in 2030. This is kind of an official pledge by the Japanese government. If I compare the current status of Japan with other countries, I have to say that Japan's renewables are still a little bit lagging behind. The pace is still slow though Japan has doubled the percentage of renewable energy in the past decade. The speed of expansion in other countries is rapid because of the cost reduction. We have to make it [at] a more accelerated pace in Japan.

(Fig. 16)
Energy transition: Japan's RES
> PV installation (2010: 3.6GW -> 2020: 67GW)
> Wind installation (2010: 2.5GW -> 2020: 4.4GW)

The figure shows the calculation of solar and wind installation (Fig. 16). It's not the latest number but the number at the end of 2020. At that time, Japan had reached almost 70GW of PV installation. I assume that it is already more than 70GW now. One year ago, the wind installation was quite minimal. I think that the reason for its slow pacing is due to the [extent] of the onshore wind installation. [The fact that] there is a policy gap between the government's proposal and the speed of industry development in Japan. For the wind power installation, it's really important to provide the flexibility for the grid situation. In Japan, the power sector restructuring has totally been delayed. Around 5 years ago, we vertically integrated the regional enterprises into the incumbent utilities. [These enterprises] own the transmission system and the power plants as well. Thus, it is very difficult for renewables to get into the grid, and the trend is still going on in Japan.

Let's see where Japan's greenhouse gas emission are coming from. Half of Japan's GHGs come from 130 facilities and offices. It is mostly for a summer power, which is about 1/3 of Japanese emission; the factory-based emission is about 20% of Japan's total emission. [Among that, top of the] 10 emitters are coal-fired plant and steel industry. We have to make energy transition in those sectors.

Recently, the Japanese government claims that Asia is one of the decarbonised areas [in terms of] Co2, and Japan is trying to help Asian countries to convert the existing thermal power generators into zero-emission power generation [that is regarded as] a necessary path. This is kind of an announcement made by Prime Minister Kishida at the ***COP26*** last year. What does it mean? It actually implies Japan's right to export the gas turbine with the technology of CCS (Carbon Capture and Storage). Once Asian countries produce high hydrogen/ammonia, those products will then be imported to Japan. This is the concept behind the Japanese government.

(Fig. 17)
Land constraints: is Japan too small to introduce more?
In 2030
> installed solar power generation (*1): approx. 145GW
> area of introduction to degraded agricultural land (*2): 75,000 ha.
> residential and other roof-mounted: potential of approx. 210GW (Ministry of Environment estimate)

By 2030, as I said before, Japan has targeted 36% to 38%. Yet, based on our assessment, Japan can actually reach more than 45% of renewables by 2030. It is quite necessary because we have to make sure of carbon neutrality by 2050. Thus, energy transition has to be made by 2030. So, what is the problem? People are talking about land constraints - Japan doesn't have enough land. However, according to our assessment and calculations, we could

have more and more renewables, especially solar power, because it could be the cheapest energy source by making full use of abundant farmland or the rooftop scale (Fig. 17).

I just saw a question from Chris in the discussion of this panel [who is curious] about the constraint of land especially in dense areas like the city of Tokyo or somewhere like that, and she is from San Francisco. I understand that California has regulations for the new buildings, which have to install solar power on the rooftop. The Tokyo metropolitan government is also talking about that, and recognises the regulation for rooftop solar that could be utilised for dense areas like the city centre.

(Fig. 18)
Cost constraints: the current state of RE cost reduction
1. Percentage of diminishing costs of large-scale PV installation in major countries, 2010-20 (USD/kW)
> Japan: -67%
> RoK: -90%
> the UK: -86%
2. Cost of utility scale solar PV installation in various countries breakdown 2020 (USD/kW)
> Japan: 1832
> RoK: 949
> Germany: 700

Cost constraint is another concern (Fig. 18). People in Japan always said renewables were very expensive because of scarcity of land…something like that. Let's see the case of the Republic of Korea (RoK). They're also facing land constraints and not so much benefited from the previous era. Looking into the UK as well, they're favouring offshore wind but not so favouring PV solar. These 2 countries are actually quite similar to Japan in geographic context. However, these 2 countries enjoy more or less 90% of the cost reduction of solar power according to the global trend. Japan's cost reduction pace is still very slow. You can also see that Japan is the second most expensive country in the world, especially for constructions involving inverters, mechanical installation, electrical insulation, etc. Those kinds of constructions fee are huge in Japan. This is one of the barriers.

(Fig. 19)
What we need for the energy transition: flexibility and grid development
Intergraded map of Japan and Europe:
> In Europe, where the use of renewables is growing rapidly, we are simultaneously expanding our interconnection lines with neighbouring countries. This makes it possible to adjust supply and demand over a wide area and to make maximum use of low-cost renewables.
> The operation of a regional grid is one of the cheapest ways to improve the security of supply against fluctuations in the output of renewables, power drop-outs and transmission lines accidents.

> Digitisation of the grid including distribution and market integration are essential to ensure that renewables connected to the grid are given priority in the market.

What we need is flexibility in the grid [development]. Japan can be counted as the areas like Sweden, Finland, Belgium, Denmark, Norway and Germany because Japan has a huge demand in its own country (Fig. 19). We could have a smooth connection of the grid in Japan like these areas. Maybe in the future, we could even have some kind of grid connection with other countries like South Korea and China. It could be useful. Not to mention that we have a huge potential of offshore wind, which has to be constructed in the sea. Probably we can also have the inter-connector between Korea and Japan so as to provide electricity to those connectors by variable wind.

(Fig. 20)
What we need for the energy transition: flexibility and RE cost down
> Japan: New renewables vs. Existing fossil fuels necessity of meaningful carbon pricing

So, what is needed right now? I think we need the flexibility and renewable energy costing down is a must for having the best amount of renewables in Japan. Phasing out coal by 2030 and increasing RE around 50% altogether contribute to the ambitious 2030/2050 targets. We need to increase flexibility on the grid structure and operation, to take out artificial market barriers and make the market more efficient for renewables.

Besides, a meaningful carbon pricing system is what we should highlight (Fig. 20). The existing tax for ***Global Warming Countermeasures*** is [still a] very small amount for fossil fuel towards carbon pricing . Maybe we have to consider a more useful carbon pricing system in Japan in order to make renewables competitive in cost so as to stop financing fossils nationally and internationally. In Japan, this kind of carbon pricing would accelerate energy transition by lowering the cost of renewables. It is also essential to strengthen Japan's domestic power grid. In the mid- to long term, we are looking forward to practising international power transmission with the interconnected Asia.

Given that Asian countries including Japan are leading renewable energy resources, by promoting energy transition based on energy saving, efficiency and renewables, we also realise that economic development relies on prosperity and peace in Asia. One country may be able to achieve energy transition [on its own] but one country cannot build peace and decarbonisation. Energy transition is necessary and sufficient for people to live safely and happily. Thank you very much for your listening.

CCIL:
Thank you very much, Mika. Let's proceed to a short Q&A session now. You can type your question in the Q&A box. Just now actually I've already received some questions in the box and I know that some of the speakers have already replied by text. Yet, I think it's great to also discuss it publicly here. Just now I saw that there are questions concerning the situation

in Hong Kong. Maybe Kevin can tell us more about that. I saw people asking about the level of climate education in the city and how the social environment is affecting the trust in the renewable energy transition. Can you briefly tell us the situation here?

Li:
Okay. Basically, for the question about climate education, I guess I will not touch much here because it will be another big topic. But for the other question about renewable energy in Hong Kong, some people will probably say, people in Hong Kong are quite practical and return-sensitive so it's not really favouring renewable energy. I guess renewable energy is already included in the government's ***Climate Action Plan***, and the government has to fulfil their pledges. In contrast, what we are concerned about is the problem that the government or the power sector are not ambitious enough to set the target but not about whether they invest in renewable energy or not.

With the potential that researchers have found in the past few years, we could definitely do more. Just because of some technical reasons, people would think they can't really look for an ambitious renewable energy development. I think we have to look at how much Hong Kong can deliver for renewable energy development. With all the potential we have to fulfil the pledges, to all kinds of criteria and conditions, the main goal for us is to update and to raise the renewable energy target rather than repeatedly saying that Hong Kong just stays still and to be too practical to renewables. This is my short answer. Thank you.

CCIL:
Thank you, Kevin. I also received some questions for Mika. Question from Clement Leung saying that it's well known that the floating PV system has been quite proper in Japan. What do you think that such a FPV system will be further developed and expanded to meet part of the RE initiatives? He also asked in addition to offshore wind farms. Would offshore FPV farms also contribute more [to] the global RE targets?

MO:
Okay. Thank you very much for Clement's question about floating solar. Yes, in Japan, there are some places [with] floating solar. You can say that Japan is the top country to install floating solar [across the country] but I have to say, it doesn't mean that there is a little bit lagging behind this area in other countries. In Japan, there are some places like dams or agricultural ponds that we can install floating solar in. We would estimate if the location could be installed. I think we had a calculation before to show our target with that…yes, here. By 2030, it will be XXX but it's not the major one compared with the current status of other countries around. But still, [it] could be a potential [with] floating solar here in Japan. That's true. So, what is the other question, Ingrid?

CCIL:
Let me see…he also asked about the offshore wind farms.

MO:
I think that the [other] speakers already mentioned offshore wind farms. For Japan, we have a huge target for offshore wind. It [will be] 10GW by 2030 and 30GW-45GW by 2040. Yet, this is only a pipeline basis. In reality, the operation starts with 5.7GW by 2030 because it's almost none in Japan. Although the government claims that the target of 45GW is planned by 2040, it is still a very minimum target. Thus, we have to accelerate offshore wind by about 60GW by 2050. Otherwise, we cannot reach 100% renewables.

CCIL:
Thank you, Mika. I also received questions for all speakers and we will extend the Q&A session by 5 minutes. Someone asks if the speakers can also share [their] views on the development status of CCS (Carbon Capture and Storage) and green hydrogen in Asia. Will these technologies be timely and cheap enough to make meaningful contributions to the planned transition. See who would want to answer the question.

MO:
Shall I answer the question? (**CCIL:** Sure.) Japan is totally focusing on the development of CCS. Globally, CCS has already been invested a lot. Yet, it's not for the summer power plant but for oil and gas digging places. With the summer power plant, there is only one CCS plant that is now in Canada, and which is valuable. Thus, I think this technology of CCS with summer power plants is not globally mature. For green hydrogen, I think we have to make it clear the definition of green hydrogen. Even the central discourse in Japan also claims CCS type of gas as a green hydrogen. Hydrogen is not the primary energy source. So we have to make clear what kind of energy source that hydrogen will be produced.

For that, we do need a global tracking system and carbon pricing system to track which energy source(s) and energy product(s) are traded in Japan as well as in the world though I didn't say clearly. With the system, we can see what is clean and what is grey, something like that. In addition, this technology is still quite expensive. Thus, we have to produce it and [precisely] apply it in a very decarbonised area like heavy duty transportation or heavy industrial production but not for the power sector.

CCIL:
Thank you, Mika. I also found another question for all of the speakers from Taiwan. The question is about how climate [change] litigation affects your country's climate policy. See if anyone would like to answer this question as well.

Zhao:
Ingrid, can you repeat the question again, please? (**CCIL**: Sure. He asked how climate litigation affects your country's climate policy.) Let me try to answer it. Before answering it, I want to give a quick response about the CCS and the growing hydrogen. I personally think that, in terms of economic analysis, the CCS- and the green hydrogen are products mainly from renewables that may have a role in the future, particularly when the big-scale implementation and demonstration become more mature. I think, for many countries from European countries like Germany to Asian countries like Japan, China and South Korea, they do need this to support their high percentage of the secondary sector.

For climate litigation, I think China is still in the process of making climate change a law. I know there are merely few countries in the world to legalise climate commitment in their law system but China is doing more on it. China used a lot of the command control policy measures to do this kind of thing. Thus, I think different countries based on the different political systems might have quite various measures to address climate governance. Thank you.

CCIL:
Thank you, Mr. Zhao. See if there are any other answers…okay, Dr. Chao, please.

Chao:
I will just elaborate more about the CCS and hydrogen. Because, in the exiting Net-Zero roadmap just proposed by the current government, they emphasis quite much on hydrogen but they are doing that in [a] wrong way, for examples, they [plan] to use hydrogen power plant in which it will [involve] more than 20% of the CCS application. I think it's a little bit wasteful to use those available resources for that. In Taiwan, [as far as I know,] most of the hydrogen development [relies on] the offshore wind company. They are trying to do a combined project to produce hydrogen and use hydrogen for the energy-intensive industries of steel and petrochemicals. In the meantime, we're still trying to push the government to have a national strategic plan for a more comprehensive and considerate hydrogen development. As you can see, compared with other existing strategies, they are mistakenly applying hydrogen.

CCIL:
Thank you, Dr. Chao. I think that's pretty much for the first session. Thank you very much, Dr. Chao, Mika, Mr. Zhao and Kevin, for your sharing and insights today. Now, we'll move on to the next session.