CCIL Jockey Club SolarCare Programme: RE Webinar

Accelerating a Just Energy Transition in Asia: Voices from Civil Society and Business | Session 2 -
Challenges of an Energy Transition in Asia: Social, Economic and Political Issues

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CCIL:
After hearing so much about the recent progress in East Asia. The next 4 speakers will talk about the challenge ranging from social, economic and political issues. Let me first introduce the speakers.

First, we have Dr. Daphne Mah, the director of ***Asian Energy Studies Center*** and the Associate Professor of Geography at ***Hong Kong Baptist University***. Her research focuses on social aspect of smart energy transition in East Asia. She is also a co-founding editor of the journal of ***Asian Energy Studies***.

We also have Ms. Gahee Han, the researcher at ***Solutions for Our Climate*** in South Korea. Her recent project involves a resource planning analysis for the country's power system. She also previously worked at the ***United Nations Industrial Department Organisation***.

We also have another researcher from the ***Solutions for Our Climate*** that is Ms. Seukyoung Lee. Lee's research focuses mainly on coal power and her recent work includes projects on domestic and international coal phase-out policies.

Last but not least, we have Professor Jusen Auska. He is the professor of ***Center for Northeast Asian Studies*** at ***Tohoku University, Japan***. He previously worked for the ***Institute for Global Environmental Strategies*** and he is recently promoting green recovery and energy transition which Japan is lagging behind some other countries.

Now, we will have Dr. Daphne Mah to share with us on the situation in Hong Kong.

Mah:
Thanks for the very kind introduction. Now, let me share my screen first. Thanks again for inviting me to make this presentation on Just Energy Transition in Hong Kong from the theoretical perspectives. Our research team will focus actually more on energy transition in

Asia with a focus on social engagement. I actually don't have an expertise on energy justice at all and, as a team that has been working in Hong Kong, we do see that energy justice issues are here in Hong Kong. These are issues that have been very close to our heart. With that, I appreciate very much this opportunity to make some small contribution to today's discussion from a theoretical perspective.

In this presentation, I tend to firstly identify key theoretical concept concerning just energy transition. Secondly, I will try to connect these theoretical concepts and the situation in Hong Kong. Lastly, I will discuss some of these policy implications. After all, I think it's important for us to have some thoughts on how we can make some senses out of energy justice in the real-life context of Hong Kong.

(Table 1)
> We need to transform the existing fossil fuel-based and centralised energy system

Conventional (Unsustainable) Energy System		**(More) Sustainable Energy System**
Fossil fuel-based; centralised	Fuel/ Energy Mix	More renewable; diversified; decentralised
Few players; limited competition; weak market regulation	Market Conditions	Many players; market competition; competent market regulator
One-way interaction	Stakeholder Relations (e.g. utility-consumer relations)	Multi-actors; multi-directional; intensive interactions

(Fig. 2)
National and local governments ->
Corporations -> Citizens
Academic and research institute ->

The first concept that I'd like to share with you is the concept of *Citizen-centred Energy Transitions*. I noticed from Dr. Chao's presentation just now that the new ***Net-Zero Roadmap*** in Taiwan also touches upon the citizen elements in those transitions now. As you can see from this table on the left hand side (Table 1). Our existing or conventional energy system is not sustainable in many important aspects. It's a consensus that we need to transform the existing fossil fuel-based and centralised energy system to a more sustainable one. These changes would take place in at least 3 important aspects.

Firstly, in terms of fuel energy mix, we need to use more renewable energy in a more decentralised system. In terms of market conditions, as Ms. Mika mentioned, the incumbent utilities are the [main] role in renewable energy. Indeed, we need market environments which push commodities or welcome more market players that could enhance competitions. In terms of stakeholder relationship, in particular, the relationship between power companies and consumers, i.e., you and me, we see a more sustainable energy system in need. A new multi-directional relationship between power companies and end-users, in

particular, power electricity consumers, we can produce solar on our rooftop then we can sell solar electricity to the power company.

Thus, we foresee that these changes are very much needed. Not surprisingly, energy transition has to be a very long term process that involves close development of social aspects and technological advancement. This process has to be citizen-centric and in a way that is important for us to notice. Electricity consumers are needed to be the key change agents because our consumption behaviour as well as our technological preferences will define or drive the business sector and policy changes in an important way (Fig. 2).

The second concept I would like to share is about *Energy Justice*. This is a social dimension of energy transition. Unfortunately, it is often the aspect that has been overlooked. It constitutes the basic rights and entitlements of a sufficient and healthful everyday life. Thus, it is an important aspect of energy transition.

It is often difficult to deal with when we work on energy justice. Because it addresses value/conflict-laden ethical issues, and things are not straightforward [as] we're talking about values and judgement. Some specific issues include equitable access to energy, the fair distribution of costs and benefits, and the right to participate in choosing whether and how energy systems will change. Thus, difficult choices have to be made and we have to make choices about what kind of energy system we want to have, where to build them and how to distribute their benefits, costs, as well as risks.

By definition, energy justice refers to a global energy system that can fairly disseminate both the benefits and cost of energy surfaces, and this is one that can be representative, and can allow impartial energy decision-making. With this understanding in mind, we can see that energy injustice already exists in Hong Kong. I will try to put down a couple of examples.

The issue of intra-generation inequity in relation to nuclear waste - some of you, especially for those who are from Hong Kong, might already know that we have been importing nuclear electricity across the border from Guangdong to Hong Kong. The second issue is about intergenerational inequity associated with nuclear radioactive waste. Apart from nuclear [related problems], the energy poverty issue associated with poor households in Hong Kong is visible in general.

The third concept I'm going to share is about *Distributive and Procedural Justice*. In the literature of energy justice, our scholars make a very important distinction between outcome and process dimensions.

For distributive justice, it is more concerned about outcomes. Basically, it's about who gets what in energy transition. Rights and liberties, powers and opportunities, income and wealth should be distributed in an equitable manner.

There are some testing indicators for us to take stock [in] whether we have distributed justice or not. For instance, whether energy transitions benefit those who are least advantaged - here mean those beyond the middle income classes. We have to take care of the impact on the least advantaged and underprivileged group of people in the society.

Another important testing indicator is whether those transitions will lead to uneven distributional outcomes resulting from characteristics such as age and disability.

While distributive justice is about outcome dimension, procedural justice is about processes including crucially those through which unequal distributional outcomes can be resulted. The processes are very often related to lack of cultural respect, lack of involvement and influence in decision-making.

In the Hong Kong context, distributive injustice is noticeable, in particular, climate impact has worsened the living conditions of many poor families. In a study conducted by Sarah Fula who was a scholar at the City University, Hong Kong, she found that nearly 50% of flat surveyed up there had an uncomfortable indoor temperature which is around 30 degrees celsius after she visited households in public housing estate in Shek Kip Mei. In those cases, people did not have access to air conditioning or they simply chose not to switch on the air conditioning because the electricity price was too high.

In terms of procedural justice, there is another study conducted by one of my students and we managed to publish it in a channel. In the study, she found that those poor families living in subdivided flats in Hong Kong, a very tiny apartment, they kind of suffered from a situation in which their meters, instead of [being] installed by the power company, actually were not properly installed by their landlord. Those unsolicited meters can be problematic because it may come up with the issue of overcharging.

The point I want to highlight is how far or to what extent those households can bargain with the landlord, and can get in touch with the power company so as to get the meters properly installed. These are key procedural injustices here in Hong Kong.

The last concept I'd like to share with you is A Multidimensional Framework for Energy Poverty. We favour framework very much as academics because it is a useful and analytical tool for us to conceptualise key elements or linkages of elements/components of an important social phenomenon that we're studying.

This is the study done by my student, the one I just referred to. She used this integrated framework to conceptualise a set of vulnerability factors that [4] households [in general] have 2 responses in 2 energy poverty challenges which have resulted in impacts on health, education, family relationship, social respect and dignity aspect of these households. The key finding of her study is that these households actually fall into hidden energy poverty. Superficially, everyone seems to be okay with the traditional expenditure-based indicator meaning that those surveyed households actually did not use up 10% of their income expenditure on electricity. They [even] used less than 10%. Yet, in effect of their real-life living environment they actually suffer quite a lot. This is how my student captured the phenomenal hidden energy property with this framework.

To conclude, I want to have some quick discussions of the policy implications of wider awareness of energy justice concepts. We find these theoretical concepts useful because they allow us to better understand, predict, and manage what and how to bring about positive and desirable outcomes of energy transitions. This theoretical understanding also helps us to inform policymakers with a better understanding of the scale of the problems and their

occurrence and mechanisms. We can help policymakers to make more informed policy decisions and, with that, we can formulate better policies that can enable just energy transitions.

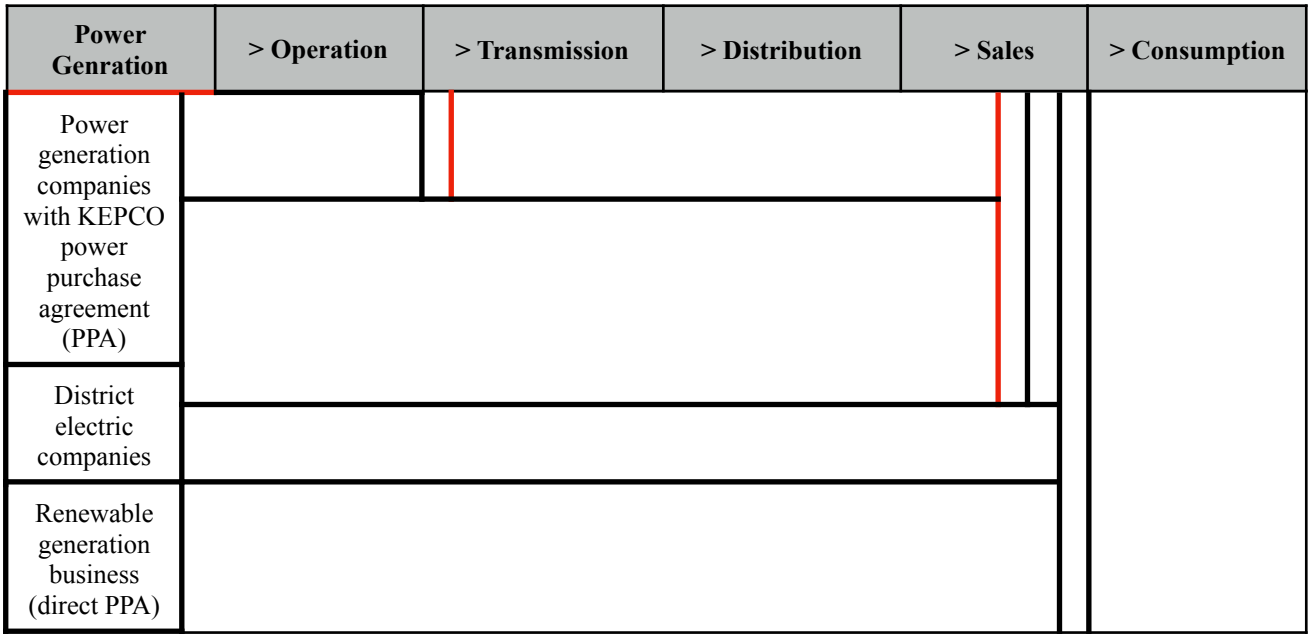
Specifically saying, like for distributional justice, when we think about how we can better develop renewable energy in Hong Kong, I think the direction could be that we place more focus on citizen-based renewable energy. Solar is for everyone rather than limited to those who have a good job. Actually it is pretty much the situation right now in Hong Kong. In Taiwan, I am aware that there is much more extensive development of citizen solar projects in which citizens can [invest] a small amount of money and take part in those citizen solar projects. In terms of procedural justice, I think we need to think more about how we can invite citizens to participate in decision-making and to have much better access to energy information. Okay, I'd like to end this sharing here. Thank you very much.

CCIL:
Thank you very much Dr. Mah for introducing the key framework and giving us a very detailed picture of the situation in Hong Kong. Next we will have Ms. Gahee Han to talk about the problems of power market in South Korea.

Han:
Thank you for the introduction. Let me share my screen, and thank you very much for inviting me to speak here today. I'm Gahee Han from ***Solutions for Our Climate***. We're a climate advocacy think tank campaign group based in Seoul, South Korea. I'm in the renewable team focused on power market and regulation issues. I'm going to present how South Korea's outdated power market system [to be] a key obstacle to renewables in Korea.

(Table 3)
Monopolisation of KEPCO in Power Market Structure

Power Genration	**> Operation**	**> Transmission**	**> Distribution**	**> Sales**	**> Consumption**
KEPCO power generation subsidiaries	System operation: Korea Power Exchange	Korea Electric Power Corporation			—> Domestic use —> Commercial use —> Industrial use
Private power generation companies	Market operation: Korea Power Exchange				



Let me briefly introduce how Korea's power market system is (Table 3). [It] is vertically integrated and dominated by a state-owned utility called ***Korea Electric Power Corporation*** aka ***KEPCO***. KEPCO owns 100% of the transmission and distribution network, which is a solar electricity set only tailored in South Korea. At the same time, there are 6 subsidiaries producing 70% of total national electricity. While retaining this outdated power market structure which can limit a fair access to the grid, we announce an ambitious target for renewables.

In October 2021, the South Korean government announced an update on its ***2030 National GHGs Reduction Goal***. The updated ***Nationally Determined Contributions*** (NDC) projected a reduction of 40% below 2018 emission level by 2030. The national plan also included the following composition of the power mix to achieve (Table 4). It shows that Korea needs to increase renewables fivefold of the current proportion by 2030. However, limitations and misguided market structures are restricting the potential of renewables in South Korea.

(Table 4)
Korea's Renewable Expansion Targets
> Composition of the Power Mix in 2018 (Unit: TW/h)

	Nuclear	Coal	LNG	New & Renewables	Oil	Pumped Storage	Total
Generation Propertion	133.5	239.0	152.9	35.6	5.7	3.9	570.7
Proportion	23.4%	41%	26.8%	6.2%	1.0%	0.7%	100%

> Composition of the Power Mix in 2030 (Unit: TW/h)

	Nuclear	Coal	LNG	New & Renewables	Oil	Pumped	Total
Generation Propertion	146.4	133.2	119.5	185.2	22.1	6.0	612.4
Proportion	23.9%	21.8%	19.5%	30.2%	3.6%	1.0%	100%

Jeju Island is a prominent example of such a contradiction. In 2012, they announced their ***Carbon Free Island 2030*** initiative. According to this plan, Jeju's target is to expand new and renewables around 1,400MW of solar power and 2,300MW of wind power, expecting to arrive at more than 100% new and renewables supplies in the island. Renewables in Jeju have undertaken an impressive development in the past few years. As of 2021, Jeju has established about 500MW of solar PV and 300MW of wind turbines. These are primarily owned by private companies. These solar and wind together occupy about 18% of the power mix now becoming the majority power source for Jeju. Yet, Jeju has already been experiencing a dramatic payment in renewable generation.

It is because Jeju still has about 900MW like the majority of gas or oil power plants on the grid. These are owned by KEPCO and of which 300MW of gas and oil power plants are considered as the must-run power plants meaning that to maintain the power system stability, this amount of fossil fuel plants must [keep operating]. Thus, system reliability is the reason for the [existence of] the must-run plants that eventually leads to renewables curtailments.

However, keeping only fossil fuels from must-run plants is not the only technical option that can ensure [system] reliability. By adopting necessary infrastructure such as batteries, synchronous condensers, and virtual power plants (VPP), we can make the grid more flexible. To accommodate more volatile renewables energy while ensuring the reliable supply of energy without such high reliance on fossil fuels. Unfortunately, these technologies have not been widely introduced yet because the pricing mechanism available for balancing services is not fair.

Korea Power Exchange (KPX) [is paying] significant capacity payments, i.e., KRW22/kW ~USD 2 cents to fossil fuels to ensure that these power plants are ready for this but only 1/4 of the capacity payment is provided by the system compared with gas power plants. No capacity payment is given to virtual power plants even if they play the same law in terms of power supply.

(Table 5)
Key Market Rules of KPX

Year	2015	2016	2017	2018	2019	2020	2021
Restriction (No. Of Times)	3	6	14	15	46	77	55

Year	2015	2016	2017	2018	2019	2020	2021
Curtailed Amt (MWh)	152	252	1,300	1,366	9,223	19,449	10,374
Curtailment ratio to total generation (%)	0.04	0.05	0.24	0.25	1.65	3.24	2.76

Who makes these market rules? And, who's the decision maker on economics investments in Korea? Technically, it's KPX. The decision on pricing mechanism, the amount of must-run fossil fuel plants and the amount of renewable curtailments all is made by KPX. KPX is Korea's national grid system operator which [is supposed to] be independent and neutral to technologies. Instead of bringing in these technologies actively to the grid, KPX has been increasingly implementing renewable curtailments as you can see in the table (Table 5).

Just in the first half of 2021, wind turbines were restricted a total of 55 times from generating, almost 3% of the regeneration. This is mainly because KPX struggles to be an independent system operator from its relationship with KEPCO. KPX is in the difficult decision-making position considering 3 out of the 11 board members of KPX, and they are from KEPCO or KEPCO's subsidiaries. KEPCO rules over 99% of KPX's member meetings for voting rights. No wonder that KEPCO was not so happy to see actively introducing batteries and renewable energy, which will probably contribute to the decline of its own gas or oil power generation in Jeju Island.

In summary, it is key to understand that, in South Korea, vertically integrated power market structure dominated by KEPCO can undermine renewables access to the grid. KEPCO, the new state-owned utility, owns the transmission, distribution network, and generates or sells electricity, at the same time even having a majority of voting rights and substantial presence in the system operator KPX program. It seems to be a high possibility that it obstructs competition access to infrastructure, and it will eventually hinder fair competition in the market and lead to higher curtailment for renewables, which can also disable the country to meet their NDC targets.

This is the conclusion for today like suggestions from my side. To accommodate 30% of renewables by 2030 and eventually carbon neutrality by 2050, South Korea needs to accelerate the power system transformation in a way to make a system more flexible and reliable to accommodate variable renewable energy. Besides, South Korea needs to increase independence of a system operator by unbundling the system for KPX so as to neutrally evaluate to reduce the amount of must-run fossil fuel plants and curtailment of renewables, and ambitiously reward infrastructure technologies such as Energy Storage System (ESS), synchronous condenser, and VPP. I think that's it for me today. Once again, thank you for having me today. Thanks for listening.

CCIL:
Thank you very much, Ms Han, and now, we will have your co-worker, Ms. Seukyoung Lee, to tell us about the coal retirement mechanism in South Korea.

Lee:
Thanks Ingrid for your introduction. Let me quickly share my slides. Can everyone see it? Perfect! Good afternoon, everyone. My name is Seukyoung Lee. I'm a researcher at ***Solutions for Our Climate***. Today I will give you an overview of the coal power generation and its issues in South Korea as well as introduce the different approaches we're taking to phase out the coal-fired power system.

(Table 6)
New plants under construction

Name	Capacity	Developer	Completion
Gangneung	2,080MW	Samsung	2023 March
Samcheok	2,100MW	POSCO, Doosan Heavy	2024 April

South Korea's dependence on coal is still high at 34% of our power mix. Even though we did announce our first ***Phase-out Year*** at ***COP26*** last year, it was a very disappointing 2050. We are campaigning to bring that forward to 2030 level. We currently have 57 units in operation. In addition to that, we have 2 plants that are currently under construction. The table on the right hand side here shows the more detailed information of the new plants under construction. Gangneung is scheduled to come online next year, and Samcheok [will be] the year after in 2024 (Table 6).

These 2 plants are privately funded which sets them apart from most of our operating plants that are KEPCO-owned. KEPCO has been explained in Han's previous talk, which is our majority state-owned utility. [Although South Korea does] not have any more plants in the pipeline after these 2 plants, we have highly organised the consistent campaigns to stop the construction of these 2 new plants.

Because the South Korea government and businesses are increasingly recognising the need for a coal phase-out, we're adding a slightly different angle to our approach this year. Yet, they [are] lack of confidence to commit to a 2030 phase-out. They are having trouble visualising how to execute that. A big part of that is our government believes that early phase-out would entail having to compensate a significant amount of money to the plant owners.

Our legislators have set down the basis to start talking about how to source these compensation funds. Yet, since then, they have not taken any meaningful actions to calculate how much that would be. So we have a bit of a blockage in our coal phase-out discussion. We have a situation where most of the discussion is centred around

compensation issues. Even though the compensation discussion has been around for a while, there has not been any real progress to figure out what we need to make an accelerated coal phase-out possible. Thus, this year, SFOC is doing the calculation that the government should have done. But [it doesn't mean] that we want to encourage the idea of compensating the plant owners. The purpose of this is more to present a practical number so we can facilitate and help coal phase-out discussions moving forward.

The approach we are talking about is a type of coal retirement mechanism. It is an umbrella term that refers to various forms of financial tools and programs that are designed to shut down coal assets ahead of their original scheduled dates of closure. There are some examples including the ***Asian Development Bank's Energy Transition Mechanism***. Here, they acquire coal plants and shut them down before their original scheduled dates. Another type is the reverse auction that Germany has been doing. In this system, plant owners enter competitive auctions and whoever submits the lowest amount of compensation wins the bid.

Of course, both of these mechanisms have their own weaknesses and shortcomings so we are not suggesting that we directly adopt these models in the same exact way. I'm sharing these examples more to help explaining the concept.

(Graph 7)
How the mechanism works
> As emissions regulation are enhanced, the return decreases.
> With CRM, plant owners can limit the risks and the government can ensure nearly closure.

SFOC is currently developing a guide mechanism to demonstrate to our government how a 2030 or 2035 coal phase-out can be implemented. So, how does it work? This line [shown] here [represents] the return that the plant owners have expected to get under the current policy environment. Yet, the emission regulations always have to continue to increase. As time goes by, the returns would actually decrease and resemble something closer to this line over here (Chart 7).

What does that mean in other words? The longer these plant owners hold on to these assets, they would be exposed to greater uncertainties and risks in the future because emission regulations are increasing. That would mean the coal plants would have to adjust accordingly and decrease their capacity factors. However, if plant owners commit to an earlier phase-out by 2030 or even earlier, the government can refer to the cash flow between the earlier phase-out date and the normal operations year that plant owners have expected to help secure that cash flow for the plant owner. Of course, the graph here represents something closer to the business perspective. The government would have to implement supplementary policy to drive down the cost and decrease this area in yellow to here over. We believe it would be an effective way to bring the government and the business back to the discussion table because it has elements that would be of interest to both parties.

(Table 8)
Gangneung

Type		Lump sum in 2024	Fixed amount/yr between 2024 and 2035
Shareholder		**633**	**75**
	SI	20	2
	Fi	613	73
Bondholder		**10,921**	**1.173**
	Higher-tiered, short-term loan	-	-
	Higher-tiered, long-term loan	10,175	1,080
	Lower-tiered, long-term loan	746	93

Samcheok

Type		Lump sum in 2024	Fixed amount/yr between 2024 and 2035
Shareholder		**3,718**	**431**
	SI	1,800	185
	FI	2,118	245
Bondholder		**10,367**	**1,075**
	Corporate bond	2,750	271
	Long-term loan	7,617	804

Here I'm going to show a preliminary result for the 2 new plants that are currently under construction that we discussed in the previous slides (Table 8). What these numbers do is that they show us the maximum amount we would need to close these plants by 2035 in this case. We do have numbers for 2030 as well. With this information, the government can now clearly see the cap level for the fund needed. It would be easier for the government to figure out a way to lower the costs from that level.

To ensure that these mechanisms can fully function to their full capacities or performance as expected, it is imperative that the reduced co-power capacity is not replaced with other fossil fuels such as gas or ammonia coal-firing. Unless the emission regulations do continue to go up, the plant owners would not be incentivised to participate in the mechanism. Thus, we must male sure that we keep making progress in that area.

Besides, transparency in the discussion and negotiation procedures are of course imperative and we must ensure that the workers' rights and the regional economic issues are made part of the discussion. Therefore, the decision made will not be just between the government and

the plant owners. With this concept, we plan to engage with all the relevant stakeholders and decision-makers throughout the year, so, hopefully, by around next year, the Korean government can start to think about designing their own mechanism for early [coal] retirement. That's it from me today and thank you for your attention.

CCIL:
Thank you very much, Ms Lee. I think we have learned a lot from South Korea today. Finally we have Professor Auska to share with us on the dynamics of just energy transition between China, Japan and South Korea.

Auska:
Hi, everyone. Can you hear me? (CCIL: Yes.) Okay. The [topic] given to me is *Dynamics of Just Energy Transition among China, Japan and South Korea*. I think it's too much for 10 minutes. So, today I'm going to focus more on Japan but, still, I [will try] to touch a little bit upon China and South Korea. I'm working for Tohoku University and doing research on environment, economy and politics. Today I'm going to talk more from the perspective of politics and economy. Thus, I will first give you some numbers about energy transition or justice in Japan, China and Korea.

(Graph 9)
Proportion of the coal industry employment

Talking about just transition is not so easy for several countries. This is the graph made by ***CSO Equity Review*** in 2021 (Graph 9). CSO Equity Reviews is a kind of association of NGOs in the world. The X-axis shows how many people were working for the coal industry and the percentage of the total employment. The Y-axis shows the GDP per capita. These countries (USA and Germany) up there [on the top left] are very rich and they have alternatives for the people working for the coal industry. But [down] here [on the bottom right], for example, in China, 3 million people were working for the coal industry. Besides they might not have so many options to just transition. That is the reality of the world.

(Chart 10)
Coal Transition Progress Ranking: OECD & EU28 Countries
> Source: Littlecott and Robert, 2021

(Chart 11)
Proportion of the renewable electricity, 1990-2020
> Source: British Petroleum, 2021

This is about coal power transition ranking made by another European NGO (Chart 10). ***Coal Transition Progress*** here ranks 28 counties out of 44 counties in total. Japan's ranking is the last. Thus, it's quite easy to see how the Japanese energy transition is lagging behind

other OECD and EU28 countries. [Another chart] is about the proportion of renewable electricity from 1990 to 2020 showing how much of that country has developed renewable electricity in the past 30 years (Chart 11). Once again, you can see Japan is lagging behind other countries. Actually the proportion of the renewable electricity [in Japan] was not that small in 1990 comparatively as a developed country. However, after 30 years, Japan hasn't done so much so they are lagging behind other [Western] countries like Denmark, Australia, Canada, Norway, etc..

As what has been discussed and explained by Ms. Ohbayashi, the reason why Japan is lagging behind the others is that the vested interest is very strong [in Japan] and it's difficult to change the policy overnight. We have to make a good argument about our own attitudes to the energy mix [that was initiated] by the current conservatives Japanese government. Last year, we published ***Report 2030*** with my colleague who has been working on an energy mixed model for many years. Maybe some of you know that there's another report by 2035, which was made by the professors of University of XXX supported by the administration's Energy and Environmental Policy; therefore, we use the name Report 2030 [rather than 2035].

Report 2030 is quite a comprehensive report showing how much and what kind of policy we need, what impact on economics in terms of job creation [in the industry] as well as how much of natural gas we could avoid using. Those kinds of numbers we put in this report and in 2030 energy mix scenario as a united to our government. Of the energy mix, we set no nuclear power plant and no coal-fired power plant in 2030.

According to the governmental energy mix, we still have a few coal-fired power plants and a lot of nuclear power plants in 2030. Instead, according to our green alternative scenario strategy, i.e., ***GR Strategy***, a name for our energy mix, we assume there will be no coal-fired plant and no nuclear power plant in 2030.

Of course, we need more investment on energy efficiency, energy conservation and neighbouring energy to do so. Yet, according to our calculation, investment for the energy transition strategy is less than reduction of the utility expenses that make a very good economic rationale for our energy transition in Japan. These kinds of numbers are calculated mainly by my colleagues, there are many similar calculations done by think tanks or governments though. I understand that the Korean government has also tried to calculate these kinds of numbers. Of course, there are so many calculations in the state.

Another result of our calculation [over the] positive impact of growing recovery strategy is orientated to our governmental current energy mix. Investment is accumulated to a total of JPY 202 trillion (TY) by 2030 and economic effect will increase to 205 TY by 2030 from official GDP estimates. For job creation, if we based on the number of investments, we can calculate how much of a job is created by using the so-called input-up table. According to the calculation, we will have about 2.54 million jobs created per year which will last for about 10 years. Cost reduction of energy will be 358 TY by 2030.

More positive impacts of our GR strategy are that fossil fuel import reduction would be 51.7TY by 2030. At this moment, we are importing almost all fossil fuel but we can reduce this kind of amount a lot. CO2 emission, according to the current government's target for

2030, is 40% compared to 1999 level. Our emission target is 15% more than that. It's more aggressive and ambitious compared to the governmental target at this moment. In 2050, 93% reduction can be achieved by using the existing technologies only and we don't need to depend on CCS or ammonia hydration so much. Of course, we thus need about 10% for those kinds of new technology, but, in return, there is 93% of emission reduction merely with the commercially existing viable technology that is the result of our calculation. Besides, air pollution deaths would be avoided by 220 deaths per year.

Let me talk about what we have to do to create job employment in Japan. Referring to that from nuclear power and the big CO2 emitters in Japan, the contribution to employment and GDP is not that big. Against a kind of intuition by many people in Japan, employment in the nuclear industry is just about 50,000. Employment of the coal power station is about 3,000 and its GDP contribution is only 0.04%. It's quite small compared to China or other countries. Employment of the 6 major CO2 emitting industries (power, iron and steel, cement, chemicals, oil refinery, and paper manufacturing) altogether is about 150,000 and the GDP contribution is even less than 1%. Current employment of the renewable energy industry in Japan is about 280,000 according to IRENA's statistics in 2021. If we compare the current situation in Japan, the renewable energy employment per capita is bigger than the current employment of nuclear power and coal-fired energy industry.

(Fig. 12)
Image of the just transition in Japan

This is the figure which shows how much of Job creation will be in 2030 and 2050 respectively, and the number of the current job in 6 major emitters. As I mentioned in previous slides, there will be 2.54 million new employment created by our GR strategy for 10 years. It's quite natural to compare 2.54 million of job creation to these 200,000 jobs currently created by 6 emitters and nuclear power plants. Because it's very difficult to make a comparison of this kind of situation, some people may argue that the number is just calculated by using 'if' and said it was just the existing number. There are many arguments. Yet, we think this kind of number can trigger the discussion among the stakeholders in Japan; besides, it is another kind of twist in the Japanese argument on just energy transition.

(Fig. 13)
Techno-Hegemony by China
> the United States and China Market shares across Cleantech Industry, i.e., Solar model manufacturing, Battery cell manufacturing, Battery cathode manufacturing, Passenger EV sales, Wind turbine manufacturing, Lithium mining, and Lithium refining capacity
> Source: BloombergNEF
> Resource: USCEA, 2021

As you know Chinese companies are dominating the global market in many areas including technology, renewable energy and energy efficiency. For example, this shows the total market shares across cleantech industries in the world (Fig. 13). The blue line represents

Chinese companies and the red one represents U.S. companies. As you can see, Chinese companies are dominating the world market in terms of the manufacture of solar module, battery cell, battery cathode, wind turbines, etc. I think this situation for Japanese industry is the same. By the way, this graph is made by the US economic counselling advisor to the president. Thus, it is from the US governmental papers and means that it's a big concern in the United States as well as in Japan regarding how much of the Chinese government and the Chinese companies dominate the field of renewable energy.

Let me conclude my presentation here. Current Japanese government is not so positive on energy transition. That's why we are ranked last in the Coal Transition Progress among OECD and EU28 Countries. It's not so easy to change [the situation] because many people in Japan want to have the status quo as long as possible and still believe in coal-power and nuclear, by which a necessity can be achieved for the Japanese economy. In Japan, renewable energy is expensive compared to the international price, for example, solar power and wind power. Of course, it will be cheaper in the future and in the near region of Japan. Yet, compared with other countries like China or the US, the Japanese renewable energy is still expensive and that kind of hinders Japan from transitioning to a new economy.

Government and industry are doubling down on Hydrogen, Ammonia, and CCUS. According to a think tank called Transition Zero, the Japanese government and the Korean government are both supporting hydrogen and ammonia for power generation. Only a few countries in the world promote hydrogen ammonia, that is China, Korea and Japan. There are 2 reasons behind it I guess. Number 1 is that they want to continue the status quo and they want to continue the power system as long as possible. Number 2 is that, as I mentioned, energy is kind of technologically dominated by Chinese industry so they want to do something different. It might be one of the big reasons why the governments in China, Japan and Korea would promote hydrogen ammonia.

Materials to discuss the energy transition are getting ready even in Japan. But some sorts of numbers, for example, how much investment we need in each area and how many jobs will be created each year, with that we need to use and make a good argument for just transition in Japan. I reckon it's happening. Beside, communication with the labour union is needed. Even if we submitted this kind of number to the stakeholders, we haven't had a good communication or conversation with the labour union yet. They understand that they should do something but, at this moment, it's not so easy. The current conservative government does not intend to talk so much about this kind of dedicated issue so I hope we can start communicating with the labour union about Just Transition for a better understanding and use with those specific numbers. Thank you very much, and that's all for my presentation today.

CCIL:
Thank you very much, Professor Auska. Let's move on to the Q&A session. I already see some questions in the Q&A box. The first question is for all speakers. To accelerate energy transition, is nuclear an option? Since it may still take some time to develop renewable energy like nowadays. See if any one of you would like to briefly answer this question.

Mah:
Maybe let me take this question. I think what this participant suggests is more like a question about promising. For renewable energy, energy efficiency and energy saving, there is still really quite a lot that we can do. Then that will help us to reduce the use of nuclear [power] if phasing out nuclear [power] is the policy direction for a country or a city. For example, the case in Hong Kong with locally produced solar for renewable energy. I think that, as Kevin just mentioned, there are already some studies suggesting that Hong Kong can produce more solar. Cross-border renewable market is also quite promising. I think it is for our region and energy saving. The experience from Japan after Fukushima shows that if there is a political commitment and social acceptance that we feel the urgency to do much better on energy saving and energy efficiency, then it actually can be done in a very short term with a visible impact. It is my short answer to this participant. Thank you.

CCIL:
Thank you, Dr. Mah. Another question for you is that could you please elaborate how cultural respect is related to procedural justice in Hong Kong.

Mah:
Yeah…I also have some thoughts about that. My first feeling is that, in Hong Kong, we don't really have the energy culture in a very clear way. The first thing is because the electricity price has been very cheap in Hong Kong and the electricity in Hong Kong is very 'invisible'. For most people [that they don't really feel it] because they cannot really see the electricity in addition to the cheap price. Even if I do good on energy saving, it doesn't really reflect on my electricity bill. There is no big impact at all. Everything is very invisible so the cultural part of energy is also weak in Hong Kong.

Besides, in terms of information, energy is a very difficult subject to work on because many energy issues are very data intensive. How we can make good use of the data and translate them into a naaman term that is difficult too. However, that is a very important part of energy literacy since it would change culture and awareness. In short, my quick response is that enhancing procedural justice in Hong Kong is particularly challenging because the energy culture in this city, I would say that, is very weak.

CCIL:
Thank you, Dr. Mah. Actually I've seen 1 more question for you but we're running out of time. Is it possible for you to type your answer there so that we can save some time for this question. We also have some other questions for all speakers. In terms of policies currently in Asia to achieve a just energy transition, do they usually focus on the rights of workers or other policies that also focus on the impacts on communities? Do you have anything in mind that you can answer?

Auska:
Can I? (CCIL: Sure.) Again, it's because of what the previous speaker talked about - the compensation. So, how much the government is ready to pay is a very difficult problem that I would say. Some people might say market mechanism or capitalism doesn't need to provide any money for the company. That it's one way of thinking. Yet, of course, in case of a climate crisis, we have to speed up the transition so we have to provide some money for the company. As I said, in Japan, we haven't studied that kind of conversation yet. I hope this year or next year we will focus more on what exactly. Specifically, we need both the government perspective and the stakeholders perspective. That's all for me.

CCIL:
Thank you, Professor Auska. I will take one last question from Ceci Ngan. It's also for all speakers. The current RE technologies require a large area to install reasonable capacity, would other densely populated cities or countries have adequate land reserved to build up the necessary capacities required for the transition? See if anyone wants to answer this question.

Auska:
Again, I can talk about Japan. [Currently,] only 10% of the rooftop of the Japanese house is solar powered. It's only 10%. So we can [certainly] increase rooftop solar power much more in Japan. We also have a lot of potential for solar sharing. In that sense, I think we [still] have a lot of potential, even before 2030, to phase out coal - no nuclear and no coal-fired power plants with a good supply of renewable energy, power generation without bad metals, and It's also cheap. That's the conclusion of our research.

CCIL:
Thank you, Professor Auska. I still see so many other questions but we're running out of time. I hope the speakers can probably spend some time typing your answer in the Q&A box so that they can also get your insight later. Before we move on to the next session, we will take a 5-minute break. So, I will see you in 5 minutes. Thank you very much for today's speakers. Thank you, Dr Mah. Thank you, Professor Auska, Ms Han and Ms Lee.

All: Thank you.