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## INDONESIA NET ZERO SUMMIT 2023

*It's Now or Never!*

Saturday, 24 June 2023

Djakarta Theater XXI, Jakarta

### A3 Session

*“The Tech to Net-Zero: Which Are The True Solutions?”*

#### MODERATED DISCUSSION

**Rini Sucahyo (EMBER), Moderator:**

Throughout the day, I've heard about achieving net-zero. Achieving net zero is crucial for all countries, including Indonesia. The urgency of this goal lies in the need to limit global warming to well below 1.5 degrees Celsius, above pre-industrial levels, as outlined in the Paris Agreement. To accomplish this, technology and innovation have an important role to play for the Indonesian government – thankfully, it has begun to take steps and issue policies to encourage the use of various technologies starting from the electrification of the transportation systems, the development of smart systems and power plants to battery technologies. Indonesia's choices will also play a vital role in achieving net-zero by 2050. To succeed, we must prioritize the adoption and deployment of various solutions or through mitigation options. So, together with the initiators in this field, this session, “The Tech to Net-Zero: Which Are The True Solutions?” will discuss the various options currently available. Which of them are the true solutions to achieve net-zero and explore the opportunity for collaborations. What do you think are the best and most adaptable decarbonisation technologies for Indonesia, considering our unique landscapes?

**Prof. Tetsuya Watanabe (ERIA), Panelist:**

We all live in the region which has some of the strongest economic growth. The downside is our economy expands, but so do our energy needs, which resulted in increased emissions in Indonesia. Almost 87% of the energy mix comes from using fossil fuels, 60% comes from using coal-fired power plants. That's the reality.

Indonesia has a long way to go to achieving net-zero. But, fortunately, Indonesia has an abundance of renewable energy resources; solar, wind, geothermal. But the shifting to renewables requires a huge investment and it takes time. We have seen advances are being made on different fronts—on all fronts. However, we must start reducing emissions now, as soon as possible. Currently, there are many promising transition diagnoses. Firstly, for example, from coal to natural gas, waste to energy, and leak detection for emission reduction. Those are the number one decarbonisation transition technology. That's the first category of technology.

Number two is partial emissions. Partial emission reduction technology, such as coal combustion; mixing coal with biomass and ammonia, mixing gas with hydrogen. We also suggest electrification in gas production. That is the second category of transition technologies.

Lastly, deep decarbonisation transition technology, which can happen at any point in this country toward the net-zero pathway. This includes carbon capture, utilization and storage (CCUS), blue hydrogen, ammonia production, and also the development of smart cities and the implementation of

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the circular economy practices and social models. It is our belief that a comprehensive and a phased approach will enable Indonesia and us to navigate the complexity of the decarbonization goal effectively. Thank you very much.

**Rini Sucahyo (EMBER), Moderator:**

Thank you, Professor. So, from Professor Watanabe, we learned that Indonesia still needs to develop economically and our energy mix still consists of 60% of coal, and so we have a long way to go to shift to renewables. Shifting to renewables needs a lot of investment and also a lot of time. Some of the technologies that Professor Watanabe says that would help Indonesia to achieve decarbonization quickly would include a combination of still using coal, like mixing coal with biomass or ammonia and hydrogen. There's also CCUS, green hydrogen, and also developing smart cities. Many experts have argued that such technologies are unproven and many have actually warned against encouraging governments to become overly reliant on such technologies. I'm going to go to the expert, which is Ibu Citra. Which technologies and approaches are more inclusive, Ibu Citra? Not only that, but also easily deployable and therefore easily accessible in Indonesia.

**Dr. Marlistya Citraningrum (IESR), Panelist:**

Before answering the question, I have a confession to make. Usually, my partner picks my clothes because I have zero fashion sense. Today, he suggested that I should wear something that's more formal to respect all the panelists here, but I chose this t-shirt because I want to make a statement. We in IESR believe that we can achieve zero—not net-zero emission—by 2050 and that we have to have stronger calls on that. Techno-economically, we can achieve zero emission by 2050, of course, with a lot of requirements, thoughts, planning, and help from numerous stakeholders. Not only in the government, private sector, and CSOs, but also everyone in this room today to make the call and demand that we can have that target.

So, zero emission by 2050. Please remember that. To answer your questions about what type of technology that Indonesia can employ to achieve this target, I have to state that Indonesia's energy transition right now is not a true transition. It's more of energy addition, rather than energy transition, because we have yet to retire coal power plants and we have yet to make a lot of renewables coming to shift from that fossil fuel-based energy system. We need to think more in an ambitious way and employ a lot of technological advancements; as mentioned by the high school student previously, they want something that's really fast. There are also digital and technological advances that we can always use to make the energy transition faster.

Based on our calculation, if we want to get to zero emission by 2050, we can always employ the plentiful solar energy that we have, coupled with storage, coupled with grid integration between our archipelagic countries, and also to promote a more decentralized energy system. That's all energy transition is about. It's no longer one big power plant somewhere, but it's smaller power plants run by the community, smaller companies, cooperatives, so that we can finally fulfill the energy access needed by Indonesians. With clean energy sources, the decentralized ones are solar energy, mini-micro hydro, maybe some big geothermal as well. But we believe that Indonesia has all the resources. With all the help and cooperation that we can get, we can achieve zero emission by 2050.

**Rini Sucahyo (EMBER), Moderator:**

Thank you, Ibu Citra. Indonesia has a lot of energy sources that are renewables, one of which is solar. Of course, we don't need to be a scientist to know that. We just need to step outside and feel the sun. But, before I go to the next question, Professor Watanabe, do you want to respond to Ibu Citra?

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**Prof. Tetsuya Watanabe (ERIA), Panelist:**

I think we must also have a solution on the table; different technologies and different developments. Some technology is unproven and maybe costly, but deployment is actually happening. So the government, investors, companies, and experts come together to try different technologies in various forms. Of course, communication and engagement with various stakeholders are critical.

**Rini Sucahyo (EMBER), Moderator:**

Thank you. Ibu Citra also mentioned one important point, that we all need to collaborate and we need everyone's participation. We need everyone to be involved and contribute from all sectors and stakeholders. So, the private sector is one sector that plays a pivotal role in this case, especially in driving innovation, research, and development. My next question would be for you, Pak Anindya. Your company has been investing in and developing cutting edge technologies in the transportation sector, including battery technology. What do you think is the private sector's role in this case — in advancing technology for climate actions?

**Anindya Bakrie (VKTR), Panelist:**

Thank you very much for the opportunity and congratulations to Pak Dino. It is an honor to be here. He gave me one piece of advice before coming here, *'Don't disappoint me.'* I'll try my best.

We're all here trying to solve a 21<sup>st</sup> century problem. Climate change is not a simple thing. Nevertheless, I think Indonesia has a chance to be the Mecca of decarbonisation. I'll tell you why. So, there are challenges, for sure. For the younger generation, this is a chance to actually make a difference. Now, below the ground, Indonesia has all the critical materials we need for decarbonisation. We talked about: nickel, number one in the world; tin, number two; and copper, number seven. So we're good. Above the ground, with technology, we have renewable energy potential to the tune of 500 Giga Watt (GW)—with technology and of course money. Around us, we have biodiversity that can contribute to maybe 100 Gigatons of CO<sub>2</sub> capture. So we can be the Mecca of decarbonisation, but it's not going to be easy and we cannot do it alone. I think we should take that as a challenge and opportunity. I think this is a chance for Indonesia to have its own industrial revolution, like what we saw in the UK during the 19<sup>th</sup> century, and in the US during the 20<sup>th</sup> century. This green industrial revolution can make Indonesia the electro state, the carbon state, as opposed to the petro state like in the past.

Now, what can the private sector do about this? Many, if you want. Two things: acceleration and scalability. One, I agree with you that research and innovation is something we have to do with a lot of parties, including academia, NGO, and civil societies. Two, this is what we do as an entrepreneur — technology deployment and commercialization — because once we touch the market, we see how it is and then we improve it. Three, of course, financing and investing is very important.

Also, I think, trying to spur collaboration and partnership is very important, not only locally but internationally. Like Professor Watanabe here, he told me early this year coming in from Japan, leaving his very prestigious post to help Indonesia and ASEAN. It's a good thing because we have a lot of help. And lastly, I think all of us need to do a little bit of public advocacy or business activism. So on our part, what do we do? We are an 81-year old group. Just like anybody else, we start from somewhere and that somewhere is hydrocarbon. It's no secret, we know it. But having said that, we can actually try to do something for the future. We try to do decarbonization, in our own modest way by way of electrifying public transportation, such as buses. Why transportation? Because it

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contributes to about 23% of the whole carbon emission. Why public transportation? Because it contributes 23% of that, right? The good thing about the public is that people use it.

So our first batch of buses in Jakarta has transported 10 million people in 14 months. So we have data that there are five people per kilometer with these buses than non-electric buses. People actually wait for the buses and we reduce about 5.5 million tonnes of CO<sub>2</sub> emission which is equal to 250,000 trees being planted. And then of course, reducing the fuel subsidy from the government. We're still net oil importers, and of course for the operator of the bus rapid transit itself. So it's early days. Not many people know, in Jakarta itself, we have 10,000 buses. This is more than any city that we know. This is exciting.

Indonesia is not Jakarta, we have more. Imagine if we can process critical battery materials below the ground with green energy above the ground, then even export energy and chemical materials to the world. That's why our new venture called VKTR is *'Indonesian Pride, Global Contribution.'*

**Rini Sucahyo (EMBER), Moderator:**

So, we have heard quite a few solutions so far. Quite a few technologies from Professor Watanabe as well as from Ibu Citra. Pak Anindya focuses on the transportation sector, specifically electrification and public transportation, which is of course very important to reduce our CO<sub>2</sub> emissions. Pak Anindya mentioned that we can be the Mecca of decarbonization. So I'm really looking forward to that as well as making sure that zero emission happens by 2050, as said by Ibu Citra.

Our next panelist is Leonardo from Greenpeace Indonesia. Partly, obviously, from our discussion today, we heard that collaboration is important. We need to put all solutions on the table. But I'm just wondering, what is your take on this? Do we have a better solution, like a true solution versus false solution? And if there are some false solutions, how do we identify them and whether with the right time and more research and technology/development? Is it possible that false can become true in the future?

**Leonard Simajuntak (Greenpeace Indonesia), Panelist:**

Thank you, Ibu Rini. That's a very intriguing question, I think we need to be very clear. First, we need to achieve 1.5°C or well below 1.5°C, and our enhanced NDCs at the moment will lead us to extrapolate globally to 4°C. The aggregate of NDCs at the moment, globally, will lead us to 2.8°C, a catastrophic number. So, we know we need no less than an energy revolution, basically. In this particular conversation, we need to be very consistent on the true solutions and get rid of the false solutions. I'll start with the true solutions. We all know that it's solar. We need to do massive solarisation at a country level. But mostly I think we need to focus on the area's—the islands—that have the highest load, the peak load. They said the peak load is Java, Bali, and Sumatra. These three islands need to transform very significantly, and transition to renewables as soon as possible and as rapid as possible. We have the technologies, we have the investment for climate, which is going very well at the moment. We need the political will. The political will has been intermittent, it comes and goes, like, with PLN instructing to stop net-metering, then we're nowhere near the solution.

And as for the false solution, well, we have in our pretty controversial New and Renewable Energy bill (*RUU EBET*) with a couple of coal-based false solutions. There is coal gasification which is now being experimented in South Sumatra with the aim of replacing LPG. The cost of it is nearly twice the cost of producing LPG and it will go nowhere near the economic viability. Second, we also have, in that bill, coal liquefaction. There is no proven technology and it will be very expensive to do that.

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There is also coal bed methane. This is very old technology and it's now being labeled as new energy in that bill. We also have another experiment of carbon capture and storage. If we go to the United States who have been experimenting on this for at least a couple of decades now, it is failure after failure, and it is too expensive. If we talk about CO<sub>2</sub> emission capture—and this, if not hypocrisy, at least contradiction—when they capture the CO<sub>2</sub>, and they put it back particularly in the oil and gas industry. It's called secondary oil recovery. I graduated from petroleum engineering, so I notice that's an old technology that is now being framed as CCS. That means it will make the oil and gas industry live longer and produce even more oil, basically to produce more emission. So that's a bit probably to kick off. There's a few false and true solutions. Thank you very much.

### *Q&A SESSION*

**Bernadette, Budi Luhur University:**

We need to speed up the energy transition by using more technologies. I want to ask your opinion. Do you think fossil fuels will stay relevant until 50 or even 100 years later, even though it's not a good option because of how there are some controversies on whether to use it or not?

**Irfan Kurnia:**

On accelerating the transition process. Do you think there will be severe consequences for sudden acceleration for energy transition in transforming the economic structure from petrol-based business structure to renewable energy resource? Considering that the majority of chemical compounds are produced from the petrol industry. Has there been any advanced research for sudden change in the economical process?

**Rini Sucahyo (EMBER), Moderator:**

So it's the consequences of accelerating renewable energy and whether there's advanced research on the economic impact of acceleration. Okay, let's start with the first one first, Professor Watanabe. So the first one is whether fossil fuel will still be relevant many years into the future?

**Prof. Tetsuya Watanabe (ERIA), Panelist:**

I mean, we have a common target: net-zero 2050. But to achieve the common target, we have different pathways to achieve the common goal. For example, developed countries like Europe, their economy is sort of stable. But it's a different economic situation and the social situations are also quite different here. You have to replace this amount (re: the mission triangular economy growth); this big triangle. So, that's a challenge and we also need to reduce carbon emission from now. What can we do? Of course, we can deploy solar and wind, but still have 80% or 60% of coal fired plants.

In the transition process, we need to use those fired plants and there have been cases where they're still very young. So how can we reduce the emission from this kind of fossil fuel plants? That's a challenge and then transition technologies come in and help. I'm not saying that we should use fossil fuel forever, that's not my argument. For accelerating energy transition, it is a different technology and stays under different space and development. But we need to understand how technology works and how we can reduce the cost by inviting investors and financial institutions. Even now financial institutions are not quite familiar with these kinds of transition technology. So then we need communication and engagement with different stakeholders.



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**Rini Sucahyo (EMBER), Moderator:**

I can just summarize. So basically there are different pathways. The end goal is still phasing out fossil fuels by 2050, but there are different pathways in order to get there. And of course, we can accelerate solar and wind, but we must also consider the 60% coal base industry when we're doing the transition to make sure that there's no adverse economic impact. Alright, before I take two more questions, maybe Bapak Leo or Ibu Citra would like to respond.

**Leonard Simajuntak (Greenpeace Indonesia), Panelist:**

Prof. Watanabe, if I may challenge you on that. The increasing economic growth, actually we have been stagnant at 5% over the last 10 to 15 years. And that's the origin of all this miscalculation of electricity growth, which has led to oversupply—a very serious oversupply problem—that we are having now in Java and Bali—the islands which I earlier referred to as having the highest or the peak load of electricity—and essentially making it very difficult for renewable energy to grow and to expand. That's always been the excuse of PLN.

Going back to your earlier statement, we are actually having a pretty stagnant 5% growth over the last decade or even more. We should actually think about alternative development models based on renewable energies. There is BAPPENAS low carbon development model, which actually refers to 6.5 to 7% economic growth, if we shift radically to renewable energies and make this transition even faster. Thank you.

**Dr. Marlistya Citraningrum (IESR), Panelist:**

I will not challenge Professor Watanabe, but maybe offer a reflective question for us all. We need to rethink the economy as something solely based on energy resources. Because if we think about this it is the advantage we need; 5.000 kWh per capita to be a modern and advanced country, but right now we have all the technological advances to be more efficient; industrially and electronically efficient. We have a lot of electronics that are now using half of the energy that they used to 10 or 5 years ago. I think we need to calculate again, how much energy do we need to be an advanced country? We need to rethink whether Indonesia actually has those local wisdom about doing business, we need to think back about the environment, etc. And it's not solely measured by the GDP or the energy consumption or otherwise. It is by how we can grow together as a country that puts a lot of value into the environment and how we do economics as a way of respecting our relation with nature. Thank you.

**Anindya Bakrie (VKTR), Panelist:**

In this case, I will support you, Prof. Watanabe. Sorry, I beg to differ. I think 5% per year is very good. It is what you call compounding interest model, right? That's why we are number 16 in the world, but I agree with you on the overcapacity of electricity in Java and Bali. We have to think about what to do with it, right? So remember when I said in the beginning, maybe Indonesia can be the Mecca of decarbonization. I'm not just saying for the sake of it, but I really believe in that because if we can go through this green industrial revolution, I think equality will also happen in Indonesia, because the energy below the ground — critical materials — it's actually in the eastern part of Indonesia. And then the same thing, some of the energy above the ground for renewable energy with technology and money, it's actually mostly up there also in Sulawesi. I think it's the biggest and the most popular place, especially for wind energy.

I'm not surprised. Over there, you can have seven GW of hydro and maybe the same for wind energy based on our research. But coming back, what do we do as private sector? We have to do something and we want to do something. How do we accelerate? How do we scale this? So, I think one of the

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solutions would be to build a net-zero industrial park. Just a good name, but very simple. You build your energy to use it for your own good and to do something — hopefully with validations — that can export the materials outside. For example, in South Sulawesi, there's a place called Bantaeng. People are telling us, *'wind energy in Indonesia, forget it. Only 75 MW here, 75 MW there, that's it.'* But with technology, 5 - 6 m/s wind is good enough. We are trying to make 1 GW in South Sulawesi with wind energy. We want to use the energy to process the battery materials from nickel so that it can be basically powdered to be sent to the West.

For battery materials, you can do many other things, but the good thing about the net-zero industrial park is that we don't rely, as Bapak Leonard mentioned, on any state grid as much as we can. Constitutionally, we still have to work with them, but at the same time, you can work together while you use your own energy. I think for the young people over here, you should really be optimistic — not hopeful — optimistic because this is something that the whole world needs. How do you find nickel in copper? You have got to come here. You know, how do you find this geothermal, solar, wind? It's coming from somewhere. I think in 10 years, we can be a net exporter of energy. Last thing I'm going to say is this electrification — EV (electric vehicle) — movement is huge, not only for Indonesia, but for the world. People expect by 2030, 60% of EV will be there, and they need these powders (critical minerals). So I think I'm actually optimistic.

**Question 3; To Anindya Bakrie & Marlistya Citraningrum:**

*Bang Anindya, apakah bus-busnya di impor? Apabila iya, darimana dan kapan kita bisa membuatnya 100%? Kemudian, Kak Citra, jalan kaki, naik bus biasa, dan naik bus listrik, yang mana yang bebas emisi?*

**Question 4; Navil to Anindya Bakrie:**

I'm a concerned Gen Z and I have a question for Pak Anindya. I just want to say that it is really encouraging and very hopeful that your company actually saved 5,500 pounds of CO<sub>2</sub>e per year for 2.8 million kilometers. I guess my main concern and question is how do you account for the leakage emission or the Scope 3 emission? As far as I know lithium production is actually emitting a lot of greenhouse gas in the upper hill of your supply chain. I'm just wondering about your Scope 3 emission. If you do have that, do you have an Independent Validation and Verification (IV&V) assessment that is being conducted by a third party?

**Rini Sucahyo (EMBER), Moderator:**

So the question was about I guess zero emission? I think he is asking for you to explain a little bit more.

**Dr. Marlistya Citraningrum (IESR), Panelist:**

I will try to answer like a politician, so bear with me. Well, your question is actually very perfect for an English debate. We'll call *bebas emisi* or zero emission. If we talk about the ideal state of zero emissions, philosophically, meaning we should do nothing, because everything that we do depends on energy. We sit here with air conditioning, we come here with public transport or private transport. We use energy in all aspects of our lives even when we're sleeping under an air conditioned room or with other types that we use to sleep. So if we talk about zero emission as a system in Indonesia and what has or have been done for the past, more than 20 years, we want to create an energy system and an economic system that is sourced from the least and zero emission possible energy sources that can contribute to economic growth, but without the need to have coal or fossil fuel use in the process, and also without any harmful procedures to the environment. We also talk about critical minerals and

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everything is still something that we need to consider the adverse impact of the production to the environment as well. So you can choose philosophically if you want zero emission by doing nothing or we can use all of our efforts to make sure that our lives, all activities that we do, productive activities, leisure activities, are all done with the least or zero emission possible.

**Anindya Bakrie (VKTR), Panelist:**

I'll try my best to answer the question without being too long. So I guess the first one, if I'm not mistaken, is about the buses, are we going to localize it here? Yes. The whole idea is that in the beginning, we can use technology. In this case, we work with BYD. BYD is a company from Shenzhen, but it is the largest EV company in the world. Warren Buffett invested 25% 15 years ago, so it's an international company. So the idea to start with the *completely built up* (CBU) meaning as it is. This year, 35% of it is going to be done locally. Next year is going to be 60%. We hope starting from the following year, 75% will be done here.

The only thing we're not making yet is the batteries. So we're going to do everything except the battery for buses and trucks. Now, in Magelang, we are in the process of making one of the largest, if not *the* largest electric factory for electric buses and trucks. So yes, we're going to localize this whole thing, because I keep saying, if you look at this Indian drama from 50 years ago, you will see a lot of Indian trucks called Tata. The same Tata, 10 years ago, bought Jaguar and Land Rover. You can actually become big from making trucks. There is no OEM in Indonesia making trucks, let alone buses. Now, coming to a very good question from the gentleman. Look, you may be doing good with wind energy processing nickel-based materials, but how do you mine? Do you use ESG metrics, science base, and all that? We believe that this is something that we want to do over time, not overnight, right? It is an energy transition.

So the first thing we want to do is the end-user device. We want to try to fix that. We are trying not to be alone. We have a lot of collaborations with the electric buses and trucks because they actually matter in terms of the CO<sub>2</sub> emission, then we're going to try to solve the processing side using renewable energy because that's the one thing that a lot of people believe is needed. But the last thing we try to do is responsible mining when we have the nickel mine in the process. So the dream is — and this is not one year or two years, this is a 20 year dream — you have an end-to-end supply chain that is zero emission, even increasing export from Indonesia, to the world, whether the energy itself or the critical battery materials.

**Question 5; Patrick, FPCI Chapter Binus University to Marlistya Citraningrum:**

I know you're an avid reader of the Economist, so I will discuss a bit about a recent publication. The recent publication states that with the electricity transition, we have two trends. We also have to revolutionize our electricity grid, where the report said that we will need US\$32 trillion to revolutionize our electricity grid. You've mentioned a bit about transmission and, as we know with renewable energy intermittency in nature, how will our electricity grid look in the future? Will it be more decentralized or centralized? How can we deliver our potential which is often far away from the demand? How can we transport them? Lastly, with all of the technologies being developed, we all know there will be skepticism. As we can see with the movement of NIMBY-ism, not in my backyard, or avoiding infrastructure development, we know it is necessary for us to have this grid to have modern smart grids and in the future. How can we address the challenges?



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**Question 6; Yoga, Padjadjaran University to Prof. Watanabe:**

I would like to ask this question based on the IEA reports. There are three things that we need to pay more attention to achieve net-zero emission: efficient energy efficiency, renewable energy in electricity, and transportation electrification. So, my question is, what is the best technology for energy efficiency — or energy efficiency available in the world — and which is suited for Indonesia? How can Indonesia become an energy efficient nation?

**Rini Sucahyo (EMBER), Moderator:**

So the first question from Binus to Ibu Citra. It's about the electricity grid.

**Dr. Marlistya Citraningrum (IESR), Panelist:**

Thank you, Patrick from Binus University. So you've done your homework, you read researches and how actually there are challenges to transform our power system. So based on our study that has been done in 2021, called Deep Decarbonization of Indonesia's Energy system: A Pathway to Zero Emissions by 2050, we put together a model on how to transform the power system, including that we need inter-island connection or the high voltage connection between islands and big islands in Indonesia, also to promote a more decentralized energy system. Based on our simulations, 73% of Indonesia's power system will come from utility-scale solar — that's the big one in GW order. Thus, we need an inter-island high voltage connection to connect the production and demand or the load. Also, there are about 14% coming from rooftop solar or decentralized solar, especially for islands that are scattered across Indonesia, and it's also best for the condition that many of the productive activities are done at noon, so solar electricity can be used directly to power the activities. One of our analyses also mentioned island-based renewable energy because we are an archipelagic nation. We are now doing research on how to power Nusa Penida with 100% renewable energy. Bali is very ambitious with their net-zero emission and they wanted to be net-zero in 2045. We'll start the planning and analysis for Nusa Penida because it's quite small. It already has 3.5 MW of solar and then we will need another 7 MW of renewable energy that can be of combination between wind, solar, mini-hydro, and also storage, to make sure that maybe Nusa Penida could be 100% renewable energy by 2035. We'll see if that can be implemented into real action.

For smart grids, I think this is one of the technological advances that we need to think about demand response. Demand response means the supply of the electricity not being delivered at certain times, but it can be adjusted to when demands are of high value. For example, if a house now uses electricity, only then the electricity production will be supplied to that house. At other times, we will also need to make sure that our activities using electricity are being minimized. So that's part of the technological advances that we can use. For example, now the peak load is at night, but with demand response we can predict and even adjust the system to make the activities done at noon because a lot of solar energy is there or at an early morning when the wind power is of high production, so we can match between the supply of “intermittent energy” with the use of them for the activities that we do.

**Rini Sucahyo (EMBER), Moderator:**

All right. The next question is for Mr. Professor Watanabe. It's about energy efficiency, which is a very good question. Are there technologies available today for energy efficiency?

**Prof. Tetsuya Watanabe (ERIA), Panelist:**

In Indonesia, electrification is very promising because as Pak Anindya mentioned, Indonesia is a very resource rich country. You can build up the supply chain from nickel, battery, and transportation vehicles, starting with buses and commercial vehicles. That's very promising and it's already

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happening here. I also like the phrase he mentioned about the industrial revolution and its transformation. In Japan's case, we already have some existing industrial structures. But in Indonesia, it's quite different and challenging, but that is why the industrial revolution is happening here. I mean, the renewable Mecca. Indonesia is a renewable Mecca, I believe so. So, kind of a leapfrog. The younger entrepreneurs, social entrepreneurs and businesses, and investors are coming here to utilize its own natural resources, technologies, and the network of stakeholders. It's very promising and Indonesia can spearhead or leapfrog the endeavor, which other countries including Japan, can. In my opinion, of course, the transition process, we have to address many different things, but the target is very clear.

**Rini Sucahyo (EMBER), Moderator:**

An UNPAD University student, he read in the IEA report that there are three things to achieve a successful energy transition: energy efficiency, renewable energy especially in the electricity sector, and also electrification of the transportation system. So his question was about energy efficiency, whether there are any technologies or maybe approaches to ensure that Indonesia will become an energy efficient country.

**Leonard Simajuntak (Greenpeace Indonesia), Panelist:**

The technologies are available, but it also will need behavioral change for us to become an energy efficient society. Well, there are contradictions; there will always be. Some people say that we haven't reached a certain kWh per capita; we're still far. Citra mentioned that earlier. If we are bringing the climate crisis into the picture, we need to review whether we need to reach that level. That will need behavioral change. On the energy efficiency side, this is now almost not spoken, because we are seeing that our energy demand is still a bit low. Indonesia Emas 2045 is for us to become a developed country. As a developed country, one of the indicators is energy per capita. I think this needs to be reviewed. This needs to be rethought. I think there are ways to approach it differently. I think it needs to be for us to think together, what kind of society—in terms energy wise—that we want to aim for. Technologies are there and available. If we talk about housekeeping, there are ways to make your house or building more efficient. There are demand-side technologies or demand-side approaches. You can calculate your demand for a building and then adjust your energy supply to that. But, I think as a country, we need to re-discuss and rethink what kind of energy energy per capita level that we want to aim for.

**Anindya Bakrie (VKTR), Panelist:**

I agree with Bapak Leonard. I think on top of energy efficiency, we should also think about energy productivity when we're talking about this. It also depends on what you do with the energy. It's one thing to save energy, but as long as the energy is coming from renewable energy, what you do with it is very important. That's why when we talk a little bit about this industrialization, it looks like a big word, but it's actually just trying to be productive for the energy you use. A lot of times, you use technology to do that. What I would like to say is that this EV ecosystem is quite long and you can participate in any way. We talk a little bit from the mining, bigger corporations, and then you have the processing. Then, you have the battery technology—that's very “rocket science”—but you can have the modeling packaging, you can have the OEM recycling, and all of them you just have to use one nickel. Then we start again with copper and everything else. So I think all of you should be proud and optimistic. All of the panelists over here are here to make sure that the next generation will do it as a call to action.

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**Rini Sucahyo (EMBER), Moderator:**

Thank you. It is a very interesting and important discussion for our energy transition. The panelists have stressed out the fact that we need to collaborate, we need to work together, we need to participate and contribute. It's important for Indonesia to decide or make decisions on which technologies are the best ones for our country. So those are some of the key takeaways. And we'll see maybe we will become the Mecca of decarbonisation. We have to remain optimistic. Not hopeful, but optimistic. Despite all the different fields here, different arguments and opinions, it means that we all care, and we should remain like that. We should care about our country and how we proceed into the future, especially to achieve net-zero by 2050.