**SIEWCast Season 4: Episode 1**

*Interview with Puah Kok Keong, Chief Executive, EMA*

**Lynlee Foo (Money FM 89.3)** 00:00

This SIEWCast series is brought to you by Singapore International Energy Week, and MONEY FM 89.3. Singapore is gearing up for the 18th edition of the Singapore International Energy week, or SIEW, happening from 27th to the 31st of October. This year's theme is Envisioning Energy tomorrow, Building Systems Today. And that really captures where we are right now. The future of energy isn't some far off vision anymore. It's something we need to start building today, from harnessing low carbon solutions to making our grid smarter with AI and even connecting power across borders in the region. These aren't just ideas on paper. They're critical next steps. So who better to help us unpack all this than our guest today. Joining me is Puah Kok Keong, Chief Executive of the Energy Market Authority of Singapore. Kok Keong welcome, great to have you with me.

**Puah Kok Keong (EMA)** 00:55

Happy to be here.

**Lynlee Foo (Money FM 89.3)** 00:56

Now, let's start with the big picture. Singapore's energy landscape. It's at an inflection point. Demand is rising, carbon energy is accelerating, and geopolitics are adding more pressure. How are our energy systems, or how are we strengthening our energy systems to stay competitive in this environment?

**Puah Kok Keong (EMA)** 01:15

Yes, well, today Singapore, imports most of our energy for power generation. This is necessary, because Singapore as a small country, small island state, does not have significant indigenous energy sources of our own. I mean, we do have sunlight available to us, but even then, that's limited by how much space that we have. So today, we are really dependent on energy imports, and therefore to pay market prices for the energy that we consume. I would say energy costs in Singapore are comparable to some of the energy costs in other developed countries, but compared to our neighbors in Southeast Asia and other parts of Asia, our costs will be relatively high. But that said, we have been able to deliver energy at a high level of reliability. Power in Singapore, for example, we have much lower in terms of power disruptions compared to countries around this region. And I think for that, customers are also happy with quality of power. Yeah. But of course, the challenge is that the energy landscape will be required to transform Singapore. 95% of our power today is generated from fossil fuels, and of course, that produces carbon emissions. Gas is really the cleanest fossil fuel, but we are looking at further ways to decarbonise and decarbonise over the next 10, 15, 25 years, to achieve net zero by the year 2050. 2050 seems far away, but it's only 25 years away, right? So that's actually within a generation. And that really sets up the big challenge for EMA, a big challenge for the energy industry in Singapore.

**Lynlee Foo (Money FM 89.3)** 02:46

Yes, I think that balance is really critical, keeping the lights on today while preparing for tomorrow. It really shows how resilience underpins everything the Energy Market Authority is doing as well.

**Puah Kok Keong (EMA)** 02:58

Yes.

**Lynlee Foo (Money FM 89.3)** 02:59

Well, you briefly talked about it earlier, so we often hear about low carbon solutions, hydrogen, carbon capture, storage, bio energy, ammonia, the so-called fuels of the future. But in practical terms, what does readiness actually look like for Singapore? In other words, from where you stand, what's the biggest challenge standing between now and that state of readiness in steering an energy system through transition?

**Puah Kok Keong (EMA)** 03:27

Yes, when it comes to thinking about energy policy and where we should steer, where we should shift ourselves, we're always trying to grapple with what we call the energy trilemma. And what is the energy trilemma? It is to look at how we can make sure that energy is cost competitive and it's affordable. At the same time, ensuring a high level of reliability and security of supply, and also for it to be environmentally sustainable. So, a lot of our choices about what kind of energy sources we want has to be looking at how to optimise within this energy trilemma. For Singapore, our choices are limited because we are a small country, unlike big countries with big river systems that can hydropower, unlike countries with strong wind energy that can harness wind power, we don't have that in Singapore. So, when it comes to transitioning our energy systems, we are embarking on what we call the four switches strategy.

So, what are these four switches? First, we think natural gas, the first switch, will continue to be around for a while. That's because it is the cleanest fossil fuel. It is one that has a very well developed global market, and one that I think can help us see through the energy transition. So, that is the first switch. Second, we are doing what we can to harness solar energy. And today, actually, we have really done a pretty decent job. I think we have about 1.5 gigawatt peak of solar installed today in Singapore and for a small city state, that is not a small number, and we are on track to increasing that to achieve two gigawatt peak by year 2030, and we'll continue to look at ways that we can maximise solar deployment in Singapore, using available roof spaces, making creative use of space on the reservoirs, making creative use of vacant lands that we have in Singapore. But try as we may, even if we maximise solar deployment, some of the early estimates from experts show that solar may only be able to contribute up to 10% of our power supply, even in the distant future. So in this regard, solar is important, we will do what we can but it itself is not enough. So therefore we are embarking on also two other switches. So switch number three is looking at electricity imports. Singapore may be small, we may have limited renewable energy, but the good news is that actually within Southeast Asia, there's plenty of this renewable energy. They can come from solar, they can come from wind, they can come from hydropower. So Singapore is working with companies and many of our regional neighbors to look at developing renewable energy projects in Indonesia, even parts of Malaysia, China, and then building the kind of subsea power cables connections to bring the power into Singapore. We have set for ourselves a target of importing up to about six gigawatt of power by the year 2035 and if we can do so, I think that will underpin a lot of our decarbonisation in the near to medium term. So that is the third switch on regional energy imports. And then moving to the fourth switch, just to cover quite briefly, this will be referring to the other kind of low-carbon technologies, alternative energy solutions. So some of you may remember that we are trying to look at how we can harness deep geothermal energy, right. Sembawang Hot Spring, that itself is not hot enough, but we think that actually potentially going deeper into underground, 3, 4, 5, 6, kilometers, you may be able to find hot rocks that will be able to generate enough energy to produce steam that can drive steam turbines. So that's one of those alternative energies we’re looking at. Hydrogen and these other derivatives or carriers of ammonia, are also potential possibilities.

In the near term, we are looking at small pilot projects to enable some of these things to become more possible in the long term. So EMA, we are working with the Maritime Port Authority of Singapore, on what we call ammonia pathfinder project. That is to look at developing ammonia as a potential source for marine bunkering, as well as small-scale power generation. If that works, then that offers the opportunity to scale up in the future. We are also looking at potentially employing carbon capture and storage. So recently, we issued a grant call to study pre- and post- combustion carbon capture for the power sector. There are five of such grants given out to three of the GENCOs in Singapore to look at how we can enable that to happen in terms of the technical requirements, in terms of the rough cost estimates. So, carbon capture could also be one of those alternatives for the longer term .

**Lynlee Foo (Money FM 89.3)** 07:52

So if you had to pick one, which of the solutions could make the most immediate impact here in Singapore?

**Puah Kok Keong (EMA)** 07:59

In the nearer term, those that are more proven to be feasible and more easily achieved, will be maximising solar and bringing in electricity imports. For the other projects that we're talking about, alternative energy, other low carbon technologies, like geothermal, carbon capture, and we are still studying the potential deployment of nuclear energy, this will take more time to materialise for the technology to be more mature, and the development phase will also take more time.

**Lynlee Foo (Money FM 89.3)** 08:28

So how close are we to scaling those solutions in Singapore?

**Puah Kok Keong (EMA)** 08:32

It's really hard to say. We do hope that in 15 years’ time or so, many of these can be of a bigger scale that we can decarbonise quite a fair bit, but we'll take it step by step. So many of the pathfinder projects I talked about, the feasibility study for pre and post carbon capture will give us a better sense of first, the technical requirements, the space requirement, many of these projects will require new land take, and also give us a sense of the cost estimates. So, we need to make sure that, yes, these are the solutions they want to embark on, but they must also come at a certain cost that the Singapore economy, Singapore consumers, would think this is something that's within our ability to afford. And those are important factors as well.

**Lynlee Foo (Money FM 89.3)** 09:15

So not just about solutions, technology, so many considerations, including timing, scalability and, of course, cost. Now, Singapore's power grid is already one of the most reliable in the world, but it's also becoming smarter and more complex. So in order to make it more future-ready, what's being done now?

**Puah Kok Keong (EMA)** 09:35

That is a really great question, and it's quite a complicated topic. Let me try to break it down into a few parts, right? I think a key challenge that electrical power systems will face, not just in Singapore, but many parts of the world, is that we are moving away from fairly simple, you know, centrally produced power from big power stations to one that’s a lot more distributed generation. So for example, I spoke earlier about how today we have 1.5 gigawatt of solar energy in Singapore, and that is distributed all across the island. And solar is dependent on the sun, right? So, if the weather is not good, if it's raining or it's very cloudy, solar output will fall, right? So, this intermittency in solar output is something that every power system has to grapple with. In other countries, besides solar, they may also have wind power, and sometimes the wind blows, sometimes it doesn't. So, how can energy systems be able to integrate all these distributed intermittent sources? That's one challenge.

Second, there have also been recently new developments in other energy-related technologies. One development is large-scale energy storage systems, so the costs have come down tremendously. That makes battery technologies a lot more affordable. So, how can different power systems think about, what if I need to deal with intermittency from wind from solar, but I can also harness the use of energy storage systems to store energy when the sun is shining, when the wind is blowing. Then when the sun is not shining anymore, how do I use the batteries to discharge it back to the systems? So, the use of batteries actually provide a lot of flexibility to the grid.

Another development in energy technology is also demand management. When there's excess energy in the system, of course, there's not a problem right, we can just store it up using batteries. But when let’s say there is a disruption in power supply due to the wind or solar or due to disruption to other power generation, then what can we also do to adjust demand so that it keeps demand and supply in balance. A rudimentary way of trying to curb demand is to ask people to switch off their power right? But that takes time, and that's troublesome. But with advancements in information technology, with advancements in AI, having a lot more smart systems around, is there a possibility that we can have smart demand energy demand management systems in buildings, even in our homes, that can adjust the amount of power it takes based on the availability of power in the bigger system, or even based on the cost of energy that you'll be consuming. I think the opportunities are great. We are still in the early phase of looking at what we can do for smart energy demand management, but this is very promising.

**Lynlee Foo (Money FM 89.3)** 12:19

Fascinating, because AI these days is not just a buzz word anymore. Really, it's a very good tool to anticipate demand and manage supply, as you mentioned, with much more precision and with such a major transition, what's been the toughest challenge you've faced so far?

**Puah Kok Keong (EMA)** 12:35

Yeah, so to manage the energy transition, we are grappling with a number of facets of issues, right? So one is, we do need to make sure that the technology is ready, so some of the technology is still in the developmental phase. We are studying them, and we are looking at, okay, if we could deploy in Singapore. What does it take? How much cost will it take, right? So being able to get a sense of future technological development and a sense of the cost of implementation is one of the challenges that we're grappling with. Second, is that we do need to work with the energy industry to implement many of these new measures we’re talking about. So, for them, they are looking at, okay, given the trajectory of where we are going in terms of our energy policy, we're trying to just ensure reliability of supply, ensure competitiveness, at the same time decarbonise. How do I place bets in the kind of energy investments I want to undertake? And if some of the pathways are not completely known at this point, because that depends on the technological development, then there's kind of a fair bit of risk that the industry will need to undertake, because they need to make sure that investments will pay off. So how can the EMA, how can the government partner with the industry to tackle the technological developments needed, to address issue of risk, to address issue of cost, so they can move forward together.

**Lynlee Foo (Money FM 89.3)** 13:53

Partnerships, people, processes, all come to play for us to evolve.

**Puah Kok Keong (EMA)** 13:57

That's correct.

**Lynlee Foo (Money FM 89.3)** 13:58

Now one of the big opportunities ahead is cross-border power trade. You mentioned it earlier in one of your responses to my question. But tapping into renewable energy across ASEAN could give us a more resilient and sustainable regional grid, but how realistic is this? Can the region really deliver a truly connected energy future?

**Puah Kok Keong (EMA)** 14:20

Yes, the concept of a regional power grid, or the ASEAN power grid, has been around for quite a few years. A lot of discussions about the ASEAN power grid, or APG, since about 20, 30 years ago. And in the other parts of the world, it's already been proven that a big regional power grid can be developed. And in Europe, for example, there are interconnections joining all the different European countries together. They pool their resources together to be able to harness different power generation resources in different parts of Europe. And that interconnectivity also helps to build resilience across the different countries’ power systems, so that if the sun is not shining so much in Spain. Maybe there's other power sources in France that Spain can tap on, right? So, the idea is not new, and it's proven to be technically feasible.

So why hasn't it taken off in ASEAN in the same way that it has taken off in other parts of the world, which is Europe? I think we need to address technical issues, regulatory issues, policy issues, as well as commercial issues.

First, on the technical issues, I think one big challenge we have in ASEAN is that it is an archipelagic region with many, many islands, Indonesia, Philippines, Peninsular Malaysia and so on. So to be able to link up the power grids of ASEAN countries actually requires a lot of subsea cables and power interconnections to go past the waters. So, I think technically it's a bit more challenging for ASEAN compared to, say, continental setup like Europe. But advances in subsea cable technologies and interconnections over the past 10, 20, years have now allowed us to be able to manage this project on the technical front. So, the next step will be, okay, in terms of regulatory and policy, how do we make it happen? I think the governments in this part of the world now recognise that there is great advantage to facilitate power trading and connectivity. That's because, as I shared earlier, ASEAN is a region with a high level of renewable energy resources. The challenge is that where these renewable energy resources are located, may be far away from where the demand is, right. So, in order to connect the supply to the demand, you do need to build and invest in the interconnections. And now there's great awareness that indeed we can do so and allow power trading to happen.

So, we need to look at, how can we harmonise common rules and policies between ASEAN to look at securing investments for subsea cable, protecting them, allowing countries to export power and allow countries to import power. Many of these are still in a very nascent stage, but I believe that governments do see this as an important way for ASEAN as a whole to be able to level up our energy investments in renewable energy, and therefore facilitate the building of these interconnections and facilitate the trading of electricity. So, this is second part on the policy and regulation. Third is on a commercial aspect, so building a mishmash of subsea cable interconnections in this region will not be cheap. So how can we ensure that financials and investors are able to take on these projects? I think we need to make sure that the projects are bankable in a way that between the financials, developers and the consumers to reach a price point where they all agree you can vote for them, right, and therefore, to make the projects bankable and projects to investments to go ahead, we do need to look at various risks that the developers and consumers are looking at. From a developer's point of view, these projects, many of these power generation projects, bring renewable energy. The good news is that once you build the solar farms and the hydro power stations, the sunlight is free and rainfall is free, right? But these projects also incur very high upfront investments. Could be in the regions of a couple of billion dollars, and it needs to be recouped over 20, 30, years. So, from the developer point of view, they need to have long-term off-take certainty that will allow them to underpin their investments. And from a consumer point of view, consumers will need to be able to enter into long-term power purchase agreement with the supplier in order to enter the investment projects. So, to bring both the suppliers in and the consumers in to enter into long-term deals that will make the purchase bankable, I think it's the third challenge that we have to address.

**Lynlee Foo (Money FM 89.3)** 18:45

Well, among these challenges, what do you see as the biggest hurdle to deeper regional cooperation, if I may?

**Puah Kok Keong (EMA)** 18:53

Among these three, technical, policy, and commercial, I think the technical parts have been confirmed that this can be solved. Commercially, I think the cost of many renewable energy technologies have come down greatly in recent years. I believe between the investments that the developers are putting in and what consumers are willing and able to pay, we should be able to find a sweet spot. So, to me, the key is, how do we get regional governments to look at focusing on this as a key priority and telling their officials, hey, let's work on this together. We believe that by working together, we can increase sharply the amount of investments going to renewable energy and interconnection in this region, and that will benefit both the exporter countries and the importer countries. For the importer countries, it allows them to decarbonise. For the exporter countries, these investments will lead to an increase in job creation. Will lead to increase in terms of investments going into the renewable energy sector in those countries. They will eventually also allow those countries to decarbonise. So, I think countries will see that there are mutual benefits they will receive by supporting this power trading and interconnections. And I believe people are optimistic about it.

**Lynlee Foo (Money FM 89.3)** 20:08

Indeed, well, cooperation across borders, it's never simple, but if we get it right, like you mentioned, the payoff for Singapore and the region is enormous. All right, this year’s SIEW theme is “Envisioning Energy Tomorrow, Building Systems Today.” So, from your perspective, what are the must-build in our systems, whether in infrastructure, financing, or policy, that we simply cannot afford to delay?

**Puah Kok Keong (EMA)** 20:35

Today I think one of the key initiatives that we are trying to achieve in Singapore, working with our neighbors. It is indeed about electricity imports and regional interconnectivity. The technology is available, as I said, at the particular price point I think will be workable, and therefore trying to seize the momentum and start investing in this project will be important. So that will be one.

Other energy technologies may be more distant into the future. So, earlier I shared about advanced geothermal energy, I talked about carbon capture and storage. These technologies can be done, but they need more time to scale up, more time to bring down their costs. And these are the longer-term investments that we need to undertake. However, you know, as you go by the theme of the Singapore International Energy Week, yes, these are the future energy systems, but we must start building them today. So, even as we think of employing these technologies in 15, 20, years’ time, we need to start to undertake certain demonstration projects to start to prove that a technology can work. And it's only by gaining a little bit of know-how on a smaller scale, then we can plan up. Okay, we do expand it further. What are additional costs that we can take? How do we then make it work? If we don't start somewhere today, then we may never be able to reach the future in 10-20 years’ time.

**Lynlee Foo (Money FM 89.3)** 21:56

Cannot wait for the perfect moment.

**Puah Kok Keong (EMA)** 21:57

Yes.

**Lynlee Foo (Money FM 89.3)** 21:58

Okay, of course, all these issues will be front and center at Singapore International Energy Week 2025. How will this year's edition move beyond talk and foster the kind of collaboration and commitment that translates into real-world solutions?

**Puah Kok Keong (EMA)** 22:16

We are looking at undertaking specific initiatives, right? So, I shared earlier about us looking at carbon capture and storage as one of the solutions. So today, for example, we are going ahead with visibility studies for the Singapore power sector. But for the carbon capture and storage to work, you require not just the emitter companies or countries, but it also requires the building of the whole carbon capture value chain. So, how do you capture the carbon? How do you store it? How do you transport it and then eventually move it to the ultimate depository underground? So that will require looking if our neighbors develop this entire carbon capture value chain. So, apart from looking at what we can do in Singapore, studying carbon capture for the power sector, for industries, we are keen to discuss with the industry and with our neighbors. What can we do also to create a carbon capture industry in this region, including transportation to storage?

**Lynlee Foo (Money FM 89.3)** 23:19

Okay? And finally, what do you think we can expect this year that will stand out for participants?

**Puah Kok Keong (EMA)** 23:24

For this year, one of the things that we are trying to paint is that it's part of Singapore, SG60 celebrations, right? So, we want to take a little bit of a look back into the past on where we have advanced, or where we have achieved in terms of developing our energy sector, from the early days of our independence in Singapore, to right now, a very reliable grid, developing energy to support our livelihoods, and our lifestyle. And then looking into the future, possible pathways to decarbonisation, we are looking at employing a lot more renewable energy in Singapore. We are looking at enabling electricity imports and regional interconnectivity. We are looking at making our grid smarter through demand management, through looking at incorporating distributed generation, we are looking at enabling many of the low-carbon technologies and alternative energy projects to happen in Singapore. So, there are various initiatives underway in Singapore. So, working with our neighbors, and we hope that in this year's Singapore International Energy Week, we are able to give people a little bit of glimpse of what the future may look like, and that will help to spur us on to further develop the various energy pathways.

**Lynlee Foo (Money FM 89.3)** 24:39

Sounds really exciting, and I think it's going to be a pivotal year for SIEW. Thank you so much for your insights today, Kok Keong.

**Puah Kok Keong (EMA)** 24:48

Thank you very much.

**Lynlee Foo (Money FM 89.3)** 24:49

And on how we're building the energy systems tomorrow, today, Puah Kok Keong (EMA), Chief Executive of the Energy Market Authority of Singapore.