

Steering the Energy Sector towards a Net Zero Future

Balancing traditional operations with emerging sustainability demands.



Tengku Muhammad Taufik, President and Group CEO of PETRONAS, shares how the global energy company is navigating an increasingly volatile energy market even as it pushes ahead with its commitment to a Net Zero future. While striking a delicate balance between delivering energy to those it serves and rising to the expectations of accomplishing an accelerated energy transition, PETRONAS remains steadfast in the strategy it has set out, adopting frontier technology and Artificial Intelligence (AI) to forge its path forward.

You started your career at PETRONAS in 2002, then ventured into entrepreneurship and consultancy before returning as Chief Financial Officer in 2018 and becoming Group CEO in July 2020. In your view, what are the most significant changes you have witnessed in PETRONAS and the energy sector in your second stint with the company?

When I first joined PETRONAS, we were coming off the Asian Financial Crisis. There was a great deal of optimism that Asia would recover from it. Globalisation was almost in full swing at that point in time, so energy consumption was on the rise, but that did not stop the structural corrections that were taking place.

Given the nature of commodities, cyclicity is inevitable. We've seen periods where businesses in the oil and gas industry have had to respond to troughs when the price of a barrel of oil fell to as low as US\$20 in the early 2000s. But the dynamics of the market completely changed with the advent of fracking in the US. What was previously a market guided almost entirely by OPEC (Organization of the Petroleum Exporting Countries), where interventions helped to stabilise production volumes—and thus, prices—has evolved over time to one where influence is more widely distributed among more nations. As this slowly unfolded over the course of a decade, players today are contending with a much more volatile market than in the past.

The swings in dynamics are now characterised by huge shocks. Contrary to popular belief, the expectation that spare capacity can be easily unlocked by the pressing of a button is no longer the case. The reality is that oil and gas are depleting resources. We are approaching the end of what I call 'Big Elephant Oil

Fields', which are large oil fields that hold 500 million barrels of oil or more. Multibillion-barrel discoveries are few and far between these days, and the fields we do find are smaller and more difficult to manage in an efficient and cost-effective manner. They are either in deeper waters with more contaminants, or they are further from sources of demand. Producers extracting the oil are facing challenges in managing the operations, and the recovery rates are not going to be as good as they were in the past.

Coupled with the accelerated energy transition and the greater push for decarbonisation which have come to the fore in recent times, many oil and gas players have had to conduct their business in a different way. This means straddling the fine line between taking positions in 'System A', the 'primary system' that still powers most of the world's energy needs, or 'System B', which focuses on establishing a presence in renewables and hydrogen.

Some have continued to invest in System A, where they contend with the needs of today, even as they put in place the foundations of System B in preparation for the inevitable transition. The other path one could take is to run System A in a markedly different way—sticking to the familiar chemistry and complementing it with solutions such as carbon capture and sequestration, electrification, and zero venting and flaring to deliver much-needed energy in a safe, efficient, and emissions-abated manner.

PETRONAS announced in 2022 its aspiration to achieve Net Zero carbon emissions by 2050. How did this come about, and how does PETRONAS plan to attain this?

Shortly after I made that announcement, I attended a function with oil and gas service providers and marine operators where a member of the audience asked me to take out my business card and read it out loud. If memory serves, he exclaimed something along the lines of, "You're the President and Chief Executive Officer of PETROLIAM Nasional Berhad—'petroleum' is literally in the name of the company!" The implication was that the aspiration to achieve Net Zero by 2050 was unrealistic.

The fact of the matter is, PETRONAS started its sustainability journey even before it came under my watch. I have two predecessors to thank for the

rigorous environmental compliance philosophy and principles that have been put in place. Our sustainability reporting had been proceeding as planned, which gave me the comfort that the building blocks were always there. These building blocks address the removal of carbon dioxide or CO₂, the reduction of flaring, and our push for energy efficiency because the largest culprit is excessive and wasteful processes that consume more energy and cause more combustion.

The target that I eventually presented to the public—capping emissions at 49.5 million tonnes of CO₂ equivalent by this year—was not in the realm of impossibility when we examined the underlying blocks that we had to achieve it. It's admittedly a stretch, but it's not impossible. What we now see as a challenge going into a Net Zero future is deriving the hard metrics that people can embrace and convert the 'what?' to a 'how to?'. We have broken this down to more specific and tangible targets that the Group can work towards together.

Methane is a far more potent GHG (greenhouse gas) emissions agent that worsens global warming. By 2025, we're aiming for a 50-percent reduction in methane emissions from our Group-wide natural gas operations. By 2030, we will amp that up to 70 percent. By that time, according to the roadmap that we have embraced and committed to, we would have reduced Group-wide GHG emissions by 25 percent. I trust that by then, long after I've retired, there will be a reduction map every five years,

and ultimately the aim is to get to Net Zero carbon emissions by 2050.

In my view, the goal of attaining Net Zero is not one borne of a flight of fancy, neither is it one that is unattainable. My mandate still stands—I still have to monetise and maximise the value of hydrocarbons within Malaysia, and offer secure, reliable, affordable, and sustainable energy solutions to our customers and stakeholders. That doesn't change, but the preparation for this new energy system—where we will be compelled to deliver reductions in GHG emissions resulting from our activities—has to be consciously woven into our day-to-day work. This also means seriously pursuing solutions based on hydrogen, green mobility, and renewables.

In your view, does sustainability pay off? And renewable energy has been widely touted as the energy source for the future, but financially, what is the cost-benefit analysis?

I love this question. This always crops up when I engage with staff, regardless of age, experience, or tenure. Thankfully I get a lot of practice by debating with my own daughters!

The nature of the energy business and infrastructure is such that they're long-term. The inherent problem is the conflict between the types of capital and the outcomes that they have subscribed to. For instance, our LNG (liquefied natural gas) ventures were originally intended to last only 20 years, but some of our facilities in Malaysia have now operated north of 41 years.

At their inception, they were such a big capital outlay. Thus, they needed to be seen as being robust and cost-competitive, and now more than ever, sustainably operated over long periods of time. If the capital that is put into these long-term undertakings has a short-term outlook, you are not going to attract investments.

I've had the opportunity to attend many thought leadership conferences, not least of all the World Economic Forum in Davos, where the conversation has always revolved around how we've got the wrong type of capital matched against the kind of investments we need. Power grids are a case in point. Grids are huge undertakings. There is a prevailing misconception that once solar and renewables are in place, eventually the electricity tariffs will come to a point where energy can be made accessible to all, because the source is free. The part of the jigsaw puzzle that's often forgotten is that there's a degree of intermittency in renewables which requires a huge improvement in storage, grids, and connectivity.

That kind of infrastructure spending is not small. Since it is by and large seen as a utility, it's also not going to attract the kind of returns that oil and gas investors are used to. People who are used to seeing IRR (internal rate of return) in the mid-teens to defray the cost of equity will not be attracted at all to enter this space. What some players have decided is that on a portfolio basis, they can commit to their shareholders that they will give them a return of say X percent,

but the shareholders need to allow the management team and the board to take positions in System B solutions. Now these players can choose the more profitable, viable, near-term ventures within their core oil and gas business because that's what they are good at, but they also need to take positions in longer-term portfolio switches, such as what is being done by a few of the well-known oil majors.

Many listed European oil and gas companies have taken a radical step by preparing themselves more for systems of the future. As a result, their near-term returns have suffered, and their shareholders immediately saw that the PEs (price-to-earnings ratio) lagged behind peer groups in the US. This has prompted vociferous debates around why oil and gas companies should take such positions, given that investments are singularly motivated by returns and dividends. This is the dynamic that I think the providers of capital have not fully settled into.

For example, if a pension fund has taken a position in some of the top oil majors, it would want steady dividends. That comes from doing what you're good at, rather than taking a wide capital base and possibly suffering some near-term dips in returns. So, the right investors must be convinced to measure the portfolio performance as a whole, rather than decide based on the short-term positions taken. Companies also need to match the investment horizon accordingly to avoid unnecessarily penalising many NOCs (national oil companies) and oil companies in

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general that are seriously trying to pivot. Some have gone too far and too fast while some have not done enough, depending on which end of the spectrum you sit.

To critics, oil and gas companies remain cast in a negative light. But if these critics can act more responsibly and be more measured in their judgement of what we can and cannot do in the near term, they should hold us accountable today not only for our emissions, but also for delivering energy cleanly, securely, and affordably. They should also measure and judge us on whether we fulfil or deliver what we've committed to, which is taking clear, measurable positions in undertakings that move us towards a decarbonised system.

PETRONAS has invested in AI by establishing an AI Centre of Excellence. What role do you envision AI playing in PETRONAS' business operations and processes?

We'll start with refining operations. A refinery may be understood as a

big distillation column where you crack hydrocarbons at different temperatures to extract various products. In reality, refineries today have grown to be far more complex. There are many modules which extract, refine, hydrogenate, upgrade, and value-add to products, as well as form the start of another value chain into chemicals.

The diversity of modules and pieces of equipment that are assembled in a complex set-up are often challenged when refining margins take a beating. The margins that you make out of cracking a barrel of crude oil can dip to a point where it is difficult for the simpler refineries that can crack and deliver only two or three products to survive. On many occasions, they run at negative margins, so refinery operators need to think about two competing issues: running their business reliably and getting to the right product slate from a given barrel of crude oil.

In a live situation with operating parameters and tons of data being churned, what's the best way to run a refinery so that, from a

maintenance perspective, there is minimum downtime which would keep unit costs low and yet maintain reliability and contain the costs of running operations? In this respect, AI has helped us with predictive maintenance and asset management by identifying the modules that tend to be the ‘bad actors’, to use an industry term. We can then plan their shutdowns and maintenance proactively, so that we know what we’re contending with over an operating period, and it becomes far more predictable.

PETRONAS is one of the world’s largest LNG exporters with a strong reputation for reliability. Among the biggest challenges in running an LNG facility is figuring out how quickly we can liquefy gas after restarting a module. In this aspect, AI has helped us map out the processes and sequences to shorten the time between the module being shut down or being put under maintenance and when it is running again.

AI has also helped in churning petabytes (millions of gigabytes) of subsurface data to enable our drilling to become more accurate. The longer we keep a rig out in the ocean, the higher the costs—with the daily charges reaching exorbitantly high levels. Also, the longer we run our operations out there, the bigger our carbon footprint.

AI also helps us in the office by facilitating customer relationship management, for instance. Additionally, it helps our green mobility initiatives and planning for infrastructure where utilisation rates are better. I think the applications for AI are yet to be fully exhausted.

But the other side of the coin is, “What will happen to jobs?” That’s a question we cannot duck. Yes, it will make some jobs less necessary, but it will also make other jobs far more enriching and multi-dimensional. We need to ask: What do you displace? Is it the roles that can now be AI-enabled? Or are you displacing routines which can be completely taken over by AI or something more automated?

Depending on how mature an organisation is, the embracing and use of AI may be vastly different. As for whether there’s an impact on jobs, there is indeed a real risk for economies, not just companies, where AI is gaining traction faster. The more advanced economies will potentially experience inequity between the employee sets that are AI-ready and those that are not. Despite all the brickbats and the bouquets that are associated with AI, we must be cognisant of the larger gap between those comfortable

working with AI and others who have yet to access AI or fully unleash its capacity. So, the short answer is: Proceed with caution, but the promise is there.

To what extent do you find the energy sector experiencing difficulty hiring talent to replace existing executives who might be retiring soon? One observation is that the skills required to run a 21st century energy company are different from those that make existing energy executives valuable. How is PETRONAS addressing this perceived talent gap?

PETRONAS has already taken some very conscious steps to hire people with different skillsets to complement its natural orientation to hiring engineers. We also need to have people who are familiar with carbon and carbon

markets, and those equipped with environmental sciences expertise. We will further see a larger push for participants in the energy markets who are oriented towards solutions that help current models remain a little more robust.

Some may think that geologists and their jobs are approaching their expiry dates—I’d say it’s the complete opposite. Those who understand geography, geology, and petroleum engineering probably have an extended job lifespan now because if we were to continue production, we would have to also arm ourselves with the solutions to capture and sequester CO₂.

There may be graduates who go into the workplace with a mindset of resignation, thinking, “Wow, this is the economy I’ve inherited. It’s an all-consuming, extractive economy.” To them, I say, “It’s your time now to start thinking how to flip the equation and start thinking about more circularity, more decarbonised systems, more energy efficiency.” The oil and gas space is rich with opportunities and it’s a fertile space for engineers and, to some extent, financiers and businesspeople too to thrive.

We’re looking for solutions that are going to be quite transformative. If we ever get to the degree of penetration into electrification that we envisage, transport systems are going to be completely transformed. For instance, if ride-sharing goes off at a tangent and becomes autonomous later on, then the concept of vehicle ownership gets thrown out the window. We would no longer be talking about engineers having to rethink what they put on the roads

but would instead be discussing the financial models that can complement this. Can financial institutions accept that a car is not owned by any one person but rather by cities or a residential development? We’d be looking at all of these possibilities in a very exciting phase.

Given today’s geopolitical environment, how is the workplace different from when you first started out? What advice would you have for youth today?

This is going to be one of those difficult questions where there is no one right answer, but if I were to lean onto one aspect that has helped a lot of the people I work with, the younger graduates whom I see coming up through the ranks, and members of teams that I enjoy working with, my advice is this: Stay curious.

I think if the youth of today believe that the degree that they walked out of university with is enough to arm them for life, they’re going to discover this belief to be wrong very quickly. If they’re hunting for a job, qualifications may be great—but if they’re hunting for a career, curiosity will be key.

I see in many of our youngsters a degree of not only resignation, but also cynicism, because they think it’s the earlier generations that have brought us to where we are now. We’ve become debt-laden societies leveraged to the hilt, contending with a cost of living that has escalated beyond our means. If they go into the job market thinking that it’s going to be almost always an

uphill battle, they are going to wear themselves out fast.

Instead, the way this next generation should look at it is that this life will be a series of peaks that they’d have to contend with, but the journey to scale each one is well worth it. This may be even more pronounced given the threat of climate change, energy transition, and our economic models being overturned. But on the flip side of the equation, there is also a huge world of opportunities. Educational institutions would do well to spread this message far and wide. [AM](#)

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