Pathways to Net Zero

Priorities for Governments

WORLD GOVERNMENT SUMMIT 2022

in collaboration with

ARTHUR D LITTLE

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1. Context and Introduction

Net zero and decarbonization have evolved from plain slogans for both governments and companies worldwide into signed-off commitments by the highest authorities in each sector. There is simply no going back. The task in hand is immense, but with the will, the technologies and the strategies all developing apace, there has never been a better time for governments to turn the tide on climate change and realize their own national ambitions for the future.

Commitments to achieving net-zero emissions were made by over 130 countries by the end of the 26th UN Climate Change Conference of the Parties (COP26) held in Glasgow in late 2021 (COP26, 2021)[1]. The pledges followed the earlier COP25 call for all countries to update their Nationally Determined Contributions (NDCs) for 2030 in a concerted effort to curb the global temperature increase to 1.5°C (COP25, 2019)[2].

At COP 26, countries were also compelled to set their net-zero targets for 2050, with a clear stipulation that developed countries and the largest greenhouse gas (GHG) emitters take the lead (COP26, 2021)[3]. The call was well-founded: some 68% of global emissions are generated by 10 countries or blocs, including China, the US, EU countries, India, the Russian Federation, Japan, Brazil, Indonesia, Iran and Canada.

On the private sector front, at COP26, the Global Financial Alliance for Net Zero (GFANZ) announced that its participants had committed $130 trillion of private capital to transform the economy to net-zero (GFANZ, 2021)[4]. Beyond this climate finance and investment pledge, the private sector has also taken responsibility for supporting climate governance to inform national net-zero commitment programs and securing carbon credits in order to comply with mandatory requirements to achieve net-zero targets. Hence, there is resolve by companies to support nations on their respective 'road to zero' journeys.

Given these promising developments, it is imperative that governments have a well-defined roadmap for their net-zero commitments based on country-specific priorities and supported by a robust implementation framework. This framework should ensure (i) pan-country planning (broadness), (ii) timely involvement of concerned stakeholders (inclusiveness), (iii) constant provisioning and development of required financial and human resources (sustainability), (iv) effective and trusted progress monitoring and reporting (credibility), and last but certainly not least, (v) current continuous improvement measures (excellence). Guaranteeing these implementation elements will allow countries to avoid unwarranted challenges while spearheading a collective national effort to advance towards a net-zero state by the committed date.

2. Country Priorities and Approaches

More than 130 countries have now set or are considering a target of reducing emissions to net zero by 2050 - and with good reason. Global CO2 emissions reached 35.962 G tons in 2021, according to the European Union's Joint Research Centre, with 80% of these emissions generated by ~ 20 countries (OECD, 2021)[5]. The G20 economies of the world account for around 80% of global GHG emissions.

Against this challenging backdrop, there is no immediate respite in sight with respect to major emissions reduction. In fact, the recent 'Emissions Gap Report 2021' from the United Nations Environment Programme (UNEP) indicates that even after considering all new national climate pledges, the world is racing towards a temperature rise of 2.7°C by the turn of the century, which, in a best-case scenario, could be further reduced to 1.8°C if nations truly deliver on their pledges and fulfill all related national long-term strategies (UNEP, 2021)[6]. To reach the aspirational goal of the Paris Agreement to keep global warming below 1.5°C this century, the world needs to halve annual greenhouse gas emissions in the next eight years (UNEP, 2021)[6]. There is a mammoth task ahead.

Different countries have outlined their priorities, programs and mechanisms according to the structures of their economies and the objectives they have set. We have evaluated a few of these countries' efforts - including a mix of developed, resource-rich and service economies - to draw key lessons that other countries may learn from as they embark on their respective net-zero journeys.

2.1 Country Priorities and Approaches

United Kingdom

The UK has almost halved its GHG emissions since 1990. In fact, in 2019, it became the first major economy in the world to legislate with a binding target to reach net-zero emissions by 2050. As the UK makes swift progress and stays ahead of the curve, it is aiming to become the home of the new 'Green Industrial Revolution' and play a leading role in making the new, clean machinery of the net-zero future. The country has adopted an approach that is designed to enable the private sector through investments and to share the risks of pioneering new industries and regulation, which will ensure a shift in consumer demand for green products. But it comes at a cost: the UK government acknowledges it will require a lot of investment to steer this transition through a four-pronged approach:

1. **Work with the grain of consumer choice:** No one will be forced to replace/scrap their existing furnace or car
2. **Ensure the biggest polluters pay the most** for the transition through fair carbon pricing
3. **Protect the most vulnerable** through government support in the form of energy bill discounts, energy efficiency upgrades and more
4. **Work with businesses to deliver deep cost reductions** in low-carbon technology through support for the latest state-of-the-art kit to bring down costs for consumers and deliver benefits for businesses

In order to meet its net-zero objectives, the UK has set out a delivery pathway showing indicative emissions reductions across sectors to meet targets up to its sixth carbon budget (2033-2037). The government kick-started its mission to get ahead of the pack by setting out 'The Ten Point Plan for a Green Industrial Revolution,' with clear and measurable targets set against each point. The ten points include increased adoption of clean energy technologies to support offshore wind, nuclear, carbon capture, zero emission vehicles, green public transport, greener buildings, and green finance, amongst others (UK Net-Zero Strategy, 2021)[7].

2.2 Country Priorities and Approaches

Australia

Australia has managed to reduce its emissions by 20% since 2005 and as it embarks on its ambition to reduce emissions to net zero by 2050 while growing its economy and jobs, the country has developed a plan built on five key principles:

1. **Technology not taxes:** No new costs for households or businesses
2. **Expand choices, not mandates:** Work to expand consumer choice, both domestically and with trading partners
3. **Drive down the cost of a range of new energy technologies:** Bring a portfolio of technologies in line with Australia's Technology Investment Roadmap
4. **Keep energy prices down with affordable and reliable power:** Affordable and reliable energy will protect jobs and the competitiveness of industries
5. **Be accountable for progress:** Transparency is essential to ensure effective execution

Australia has prioritized low-emission technologies that will enable it to reduce emissions by 85% by 2050. Over time, the country expects that emerging technologies will deliver the remaining emission reduction necessary to reach net zero without hurting the economy and jobs. In order to lower its emissions, Australia has identified five sectors with significant improvement potential, namely (1) Electricity, (2) Transport, (3) Industry, Mining, and Manufacturing, (4) Agriculture and (5) Real Estate.

Australia plans to adopt a robust review cycle to ensure full transparency and accountability. Towards this objective, the government intends to maintain a five-yearly 'review and refine' cycle for the plan. This will ensure Australia's policies are calibrated to reflect the latest technology advances, international developments and other factors relevant to its national circumstances. These reviews will report against a range of key economic indicators such as energy prices, employment (particularly regional employment), export volumes and trends, investment trends and growth in national income. In addition, Australia will provide annual and quarterly emissions reporting and annual projections (Australia LTER Plan, 2021)[8].

United States

The US has set a goal to achieve net-zero GHG emissions by no later than 2050. Towards this objective, it has also committed to reducing net GHG emissions to 50%-52% below 2005 levels by 2030. There are various ways the US can achieve this ambition; however, it requires five key transformations:

1. **Decarbonize electricity:** With the rapid adoption of clean energy (solar and wind) driven by technological innovation and plummeting costs, the US is aiming to generate 100% clean electricity by 2035
2. **Electrify end uses and switch to other clean fuels:** Electrify most of the economy where possible and encourage remaining areas such as aviation, industry, etc to switch to cleaner fuels such as hydrogen
3. **Cut energy waste:** Improve energy efficiency through better technology and use less for the same or more output
4. **Reduce methane and other non-CO2 emissions:** Non-CO2 gases such as methane and nitrous oxide are contributing significantly to global warming. The US aims to use substitutes or plug leakages as applicable
5. **Scale up CO2 renewal:** Certain CO2 emissions are difficult to eliminate by 2050 and, hence, it is important to deploy technologies to remove CO2 from the atmosphere to reach the net zero ambition

The US acknowledges that federal leadership is critical to achieving this ambition. The US Government will help with investment support to manage the risk of investing in new and sometimes unproven technologies. It will also provide incentives to industries to adopt cleaner technologies and to customers to shift to green products. Innovation is the second most important pillar for this transformation and will also help spur the local green economy resulting in significant socioeconomic benefits. Lastly, it will require united action and engagement from public, private, and societal actors to bring this ambition to fruition (THE LONG-TERM STRATEGY OF THE UNITED STATES, 2021)[9].

The roadmaps adopted by the above three country-case examples and many others like them, point to several similar as well as unique underlying themes as countries world-wide race to meet the net-zero holy grail. These underlying themes include:

Government as a facilitator: As the road to net zero is filled with uncertainties and risks, businesses require support to transform their business models. To facilitate this, support from government could come in the form of investments, green finance, incentives, etc

Governance and transparency: It is important to plan a high-level emissions reduction roadmap with clear targets to provide visibility and put in a place a clear governance mechanism to ensure periodic reporting and review

Opportunity to spur socioeconomic growth: While the transition carries obvious risks, countries can look at it as an economic opportunity which can spur the clean economy and provide new opportunities to local industry

Choice vs mandate: Some countries are approaching the transition by offering it as a choice to businesses and customers alike, while others are mandating that businesses and customers adopt clean products and technologies

3. The UAE's Net-Zero Pledge: A New Paradigm

The United Arab Emirates (UAE) recently declared its ambition and commitment to achieving net-zero emissions by 2050, becoming one of the few top 10 oil-producing countries and the first country in MENA to make such a bold pledge. Another of the top 10 oil-producing countries, Canada has enshrined its commitment to reach net zero by 2050 in law, while China has set policy commitments for attaining net zero by 2060 (Canadian Net-Zero Emissions Accountability Act, 2021)[10] and (China Net-Zero Policy, 2021)[11].

For its part, the UAE updated its NDC in Dec 2020, committing to reduce its carbon footprint by 23.4% versus the business-as-usual case by 2030 (Second NDC of the UAE, 2020)[12]. As a growing nation, whose national emissions have not yet peaked, committing to net zero by 2050 truly demonstrates the resolve of the leadership across the Emirates, be it that of the rulers or government. This ambitious commitment is particularly laudable as it also sets a new paradigm of growth and sustainability.

Equally commendable is that the UAE has rationalized this commitment in a very innovative, economically sustainable and inclusive manner. Of particular note is the Government Accelerators, a UAE cross-sectoral government teams platform established by the Ministry of Climate Change and Environment (MOCCAE) in conjunction with the Ministry of Industry and Advanced Technology (MOIAT) and the Ministry of Energy and Infrastructure (MOEI) (UAE Government Accelerators, 2016)[13].

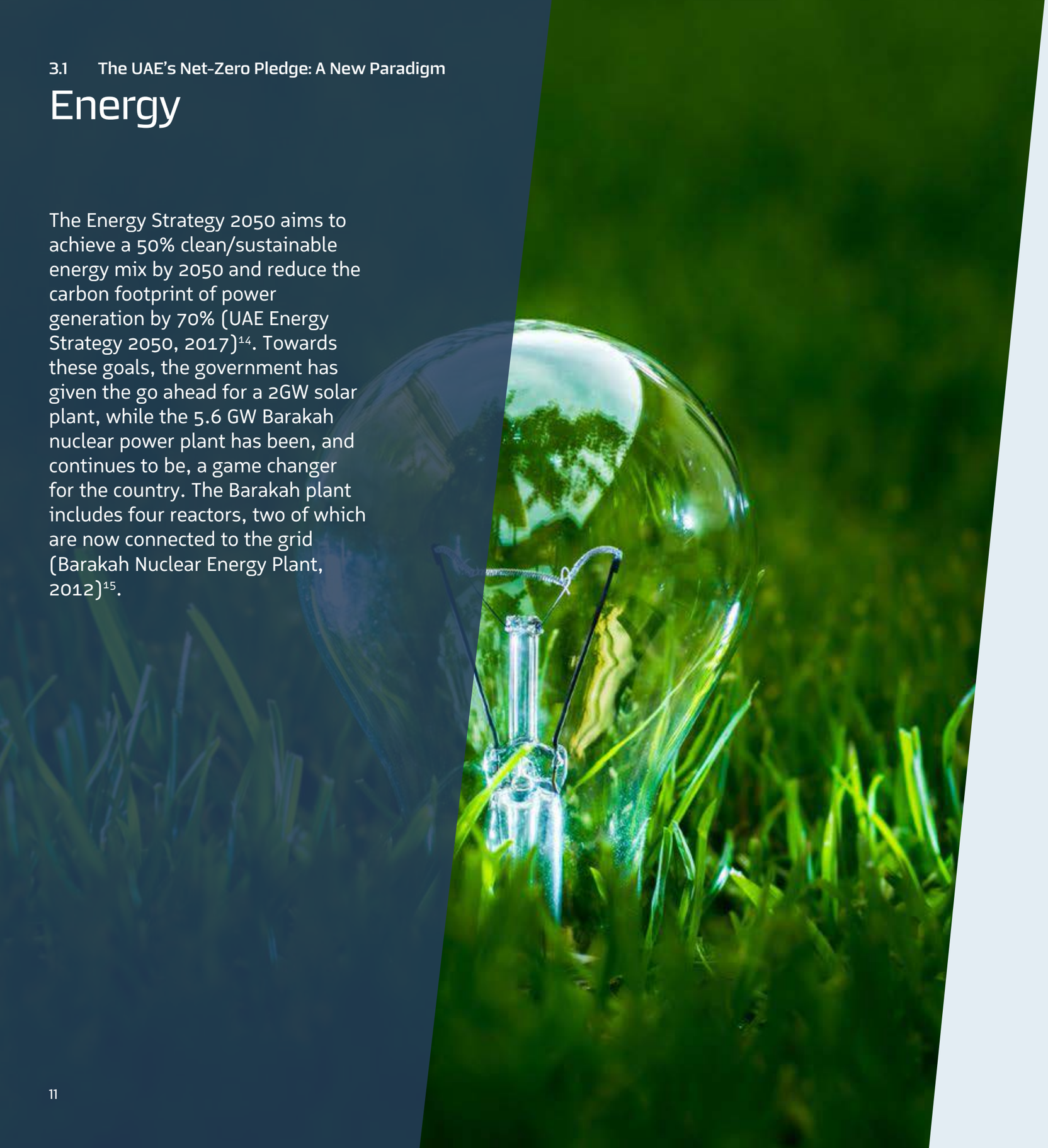
On the topic of climate action, Government Accelerators brought together over 40 entities (from government and the private sector) and 140 participants to generate future economic growth ideas, while identifying green growth pathways to net-zero. The resulting growth ideas formed a set of integrated national programs, which were officially launched in October 2021 at Expo 2020 Dubai.

Over the past 15 years, the UAE has been making advances in reducing emissions and providing sustainable solutions across key national sectors, as outlined next.

3.1 The UAE's Net-Zero Pledge: A New Paradigm

Energy

The Energy Strategy 2050 aims to achieve a 50% clean/sustainable energy mix by 2050 and reduce the carbon footprint of power generation by 70% (UAE Energy Strategy 2050, 2017)[14]. Towards these goals, the government has given the go ahead for a 2GW solar plant, while the 5.6 GW Barakah nuclear power plant has been, and continues to be, a game changer for the country. The Barakah plant includes four reactors, two of which are now connected to the grid (Barakah Nuclear Energy Plant, 2012)[15].



More broadly, countries making advances towards decarbonizing the energy sector have successfully tackled both the demand and supply sides of the equation, ensuring the right enablers are put in place. Such enablers include holistic and integrated energy sector strategies and renewables acceleration incentives and mechanisms.

Putting the right foundations in place will allow the UAE to explore current and future technology solutions to accelerate the transition. Already, the Emirates is one of the major producers of desalinated water globally, accounting for 14% of the world's water desalination. The country uses thermal desalination as the main technology, and with the advent of advanced reverse osmosis technology and the use of renewable energy input, the whole desalination process is set to become more sustainable (Masdar Institute, 2018)[16]. Looking ahead, as innovation grows, the UAE has the potential to spearhead development in this area.

Industrials

The UAE also aims to boost its industrial sector through The Industrial Strategy, or 'Operation 300bn.' The strategy aims to develop the industrial sector into the driving force of a sustainable economy, increasing its GDP contribution to AED300 billion by 2031, up from the current contribution of AED133 billion.

One of the goals of Operation 300bn is to increase the competitiveness of the industrial sector, which can be done by deploying process technology innovations. Globally, industry players have explored the use of clinker substitutions and kiln-efficient methods in cement production, alternative green solutions and waste recycling methods in steel production, and the use of innovative carbon anode baking furnaces in aluminum production. Meanwhile, green cement and green steel production are gathering momentum, with companies such as Lafarge Holcim (ECOPACT, 2020)[17] and ArcelorMittal leading the way (Green Steel, 2020)[18].

With innovations underway, there are many areas where UAE companies can create new national economic opportunities in the future as well as help to decarbonize the sectors.

Mobility

In the mobility sector, the UAE has been charting its journey to bring in cutting-edge mobility technology and solutions. Among the key steps, the country has recently kicked off the execution of its 2030 National Smart Mobility Strategy, which is a collaborative effort between all seven emirates (UAE NMS, 2020)[19]. The strategy will push toward policies enabling a safer, greener, and seamless mobility ecosystem.

Dubai, in particular, has recently cemented its position as a frontrunner in the field of future mobility, with an aggressive roadmap towards achieving 25% autonomous travel by 2030. Abu Dhabi has also launched several initiatives to drive the future of mobility in the Emirate, with autonomous and electric mobility services currently being piloted. More broadly, across the Emirates, the government is supporting a transformation of the taxi and bus sectors designed to make the services more green-friendly (Dubai Taxi Sector, 2022)[20], (Abu Dhabi Taxi Sector, 2018)[21], (Dubai Bus Sector, 2021)[22] and (Abu Dhabi Bus Sector, 2022)[23].

Accelerating some of these initiatives through the adoption of electric vehicles and execution of the National Smart Mobility Strategy has the potential to bring in services and solutions that will make living in the UAE more sustainable and further enhance quality of life.

The Environment

Across sectors, the UAE has been progressing its effort on the environmental front, through strategies and initiatives such as the UAE's National Biodiversity Strategy, the City Biodiversity Index in Abu Dhabi, and laws relating to marine conservation (Life on Land, 2021)[24]. Moving forward, advancing waste-to-energy and circularity-related initiatives, natural habitat rejuvenation and sustainable agriculture programs have the potential to significantly add to the country's environmental efforts.

Without a doubt, the UAE's announcement to reach net zero by 2050 will usher in a new paradigm of economic growth and management, and complement its 10 principles for governing the country for the next 50 years. As the UAE charts its course to net zero, all major businesses and organizations will also need to fully align and join forces for the greater good of the people of the nation and the world at large.

Advanced Technologies Facilitating Net-Zero Commitments and Growth

Countries should closely follow, and leverage where possible, technological advancements such as hydrogen, energy storage technologies and carbon capture utilization and storage (CCUS) technology. Proliferation of these technologies can help facilitate realization of net-zero commitments while at the same time generating local jobs, contributing to national GDP, and supporting national objectives.

When it comes to global energy storage, countries can ride the wave of growth, with the market expected to exceed a CAGR of 12% (2018 – 2025). In fact, batteries are expected to witness a CAGR of more than 30% and fuel cells more than 17%. These storage technologies are enablers to decarbonize many end applications in mobility, industrial and residential sectors (Coherent Market Insights, 2018)[25].

Furthermore, in the long-run, new national economic opportunities can be created by deploying blue and green hydrogen, along with CCUS technologies. This will require an ecosystem play, supported by the right regulatory and policy frameworks.

The concept of a CCUS hub is also gaining traction in the world. Such a hub captures CO2 from different sources and provides shared CO2 transport and storage infrastructure for various end use sectors. An example here is the Northern Lights/Longship CCUS hub in Norway. The offshore facility has 1.5 million tons of CO2 savings capacity from cement, biomass, steel, waste incineration and steel plants across Europe (Northern Lights, 2020)[26]. Also, the Smart Delta Resources project in the Netherlands is progressing well. The project involves a regional consortium that includes government entities as well as large chemical, petrochemicals, and steel companies.

4. Net-Zero Implementation Framework for Governments

In order to deliver on their net-zero promises, governments will need to chart – and deliver on – detailed, sector-specific action plans. These efforts will be supported by enabling strategy, policy and regulatory frameworks, as well as R&D investments and funding.

Net-Zero Framework

Governance

A national governance model will need to ensure inclusiveness so that everyone from different walks of life is benefitting from this shift in the future, while being accountable to their contributions for success.

Based on a country's context and governmental structure, one can adopt a centralized, overarching body to shape and be accountable for the delivery of planned programs and initiatives to achieve net zero.

In the UK, the Business, Energy and Industrial Strategy (BEIS) Committee is examining the role of the government's Department for Business, Energy & Industrial Strategy in driving coordinated action (UK BEIS Committee, 2022)[27]. It is also examining the role that devolved administrations and local and regional authorities can play in delivering net zero.

Indonesia, meanwhile, has established a Directorate General of Climate Change, under the Ministry of Environment and Forestry (Indonesia DGCC, 2021)[28]. This directorate general will serve as the national focal point for the country to facilitate ongoing programs and processes across different sectors and stakeholders.

For its part, Canada, where net zero commitment is enshrined in law through The Canadian Net-Zero Emissions Accountability Act, has set up an independent net zero advisory body (Canadian Net-Zero Emissions Accountability Act, 2021)[10]. Members possess diverse experience and hail from a wide variety of fields including science, business, labor, policymaking, rural economic development and indigenous governance. The advisory body will provide advice to the government and consult Canadians on the execution aspects of the net-zero plan.

There are also other models of governance – e.g., a more decentralized approach – where the onus for net-zero plan execution falls to states or territories under a federal government. Under such a governance model, the federal government can take the role of ambition-setter and reporting consolidator, as well as funding provider, depending on the scope/jurisdiction of the federal

Net-Zero Policy and Regulations

Governments will need to deliver sound, integrated and holistic policies and instruments to ensure that all sectors marshal together in the right direction. For example, an integrated energy sector policy is necessary to ensure that renewables and any technology strategies (e.g., hydrogen) are consistent with each other.

These policies will need to be based on available scientific knowledge on climate change and emissions globally. Having a clear policy, along with incentives and tools, will allow investments to flow into the country.

R&D and Innovation

R&D and innovation will be essential to delivering on emissions reduction. As such, countries will need to embolden and double down on their policy, framework and spending on R&D for net zero. Governments will not only need to develop their plans for government-funded R&D and innovation programs, but they will also need to stimulate private sector R&D and innovation. These will also need appropriate policy and regulatory support.

As part of the UK net-zero strategy, the country indicated that research and innovation funding would amount to 2.4% of its GDP by 2027. Many applications were highlighted, such as natural resources, waste, aerospace, airport infrastructure and hydrogen (UK Net-Zero Strategy, 2021)[7].

The UK then developed its Net Zero Research and Innovation Framework and outlined the research and innovation priories by sector and cross cutting initiatives for the next two decades (UK Net-Zero R&I Framework, 2021)[29].

Singapore has also put initiatives in place as it aims to achieve its net zero goals. While being a city state, it developed its Low-Carbon Energy Research Funding Initiative, jointly organized by five agencies in the country, and committed $55 million in funding for two focused areas: hydrogen and CCUS technologies (ENA, 2020)[30]. Depending on the country's context and priorities, governments will need to develop their own R&D and innovation strategies, policies and funding envelopes.

Collaboration and Ecosystem

Equally important, collaboration will have to take center-stage. Achieving the net-zero target will require the private sector, government organizations and civil society to come together to find creative, sustainable and inclusive solutions. Here, intra-sector and cross-sector collaboration will be key, as the prevailing issues of climate change and energy transition have brought about convergence between sectors and created inter-dependencies.

Collaboration will also need to take place across countries through joint programs and investments to tackle some of the more difficult areas, including the monitoring and control of cross-border emissions.

Technology

The technological breakthroughs progressively helping planned programs and initiatives to achieve net-zero targets will need to be constantly monitored and investigated to ensure economic viability and a reduction in market and technology scale up risks.

Looking further ahead, any future green growth pathway opportunities beyond the 2030 horizon will come from the adaptation of emerging technologies or even technological concepts still on the drawing board.

Funding and Incentives

The International Energy Agency (IEA) has estimated that global energy investment will have to reach around $4 trillion per year by 2030 – a significant increase on the $1.5 trillion global energy investment recorded in 2020 (IEA, 2021)[31]. Given such a huge investment requirement, governments' balance sheets will have to be the primary source of funding.

In October 2021, the USA announced the biggest climate investment in its history – the $555 billion Bipartisan Infrastructure Deal (US Congress, 2021)[32]. The investment will provide funding for clean energy, legacy pollution, infrastructure, electric vehicle infrastructure, transportation, school buses and drinking water, among other areas.

China also recognizes that to reach its commitment of net zero by 2060, a huge amount of funding will be required. The China Council for the Promotion of International Trade (CCPIT), the country's national foreign trade and investment promotion agency, has indicated that the country will require $21.3 trillion in investment by 2060 (China CCPIT, 2021)[33]. While the government may have to play a key role in funding, much of the capital is also expected to come from financial institutions.

For example, China Development Bank will be granting $78 billion in loans to finance green energy projects between 2021 and 2026 (China DB, 2021)[34]. In addition, the country expects its recently introduced national carbon emissions trading scheme (ETS) to play a key role in the future.

Similarly, Canada announced a Net Zero Accelerator (NZA) initiative with CAD $8 billion funding under its Strategic Innovation Fund to support projects to reduce the country's emissions (Canada NZA, 2022)[35].

Each government will have to navigate the funding need to realize its net-zero commitment and come up with the right mix and mechanism, including private sector participation. Integrated, long-range cross-sector planning will be needed, as well as new models for funding, such as green/clean energy funds, incentives and partnerships, including public-private-partnerships and joint ventures.

Carbon Pricing and ETS

Many countries or federations are reverting to carbon pricing as one of the key regulatory instruments to curb emissions and drive the deployment of environmentally-friendly technologies. The concept of carbon pricing follows the 'polluter pays' principle as it aims to charge polluters with an amount that, in theory, covers the negative externalities they have caused to the public and environment.

Currently, over 20% of global emissions are covered by a kind of carbon pricing scheme which may vary between emissions trading schemes (ETS), carbon tax regimes and voluntary markets (The Economist, May 23rd, 2020)[36]. ETS represents the largest portion of these schemes (70%) and currently has different forms (Baseline & Credit vs. Cap & Trade) and sectorial coverage. The most prominent and established of the global ETS schemes is the EU ETS, which was founded in 2005 and currently poses an emission cap of 1,572 MtCO2e.

Recently, as reported by S&P Global, the EU ETS carbon price surged to an all-time high of Eur90.75/mt ($102.34/mt) on December 8, 2021, and European Union Allowance (EUA) prices are expected to average Eur65.80/mt in 2022, compared with an average of just under Eur53/mt in 2021 (Reuters, 2021)[37]. The EU also plans to bolster its current ETS mechanism with a carbon border adjustment mechanism to eliminate unfair advantage for polluters outside Europe.

In Europe and under schemes elsewhere, the caps, baselines or taxes are expected to further tighten as we approach 2030 and, at the same time, sectorial coverage of these schemes is expected to increase. More pressures are also expected on the demand side from speculative investors such as hedge funds. Furthermore, more countries are increasingly considering, and even planning to launch, similar schemes to cover parts of the remaining 75%+ of global emissions. These factors are expected to further increase carbon prices, thus creating more demand for green technologies such as energy storage, green hydrogen, and CCUs (EU ETS, 2021)[38].

Consumer Awareness Building

Residents of a country need to be brought along on the journey of decarbonization. To this end, governments can play an important role in raising awareness and understanding of climate change and how it impacts everyday life and health. This will help to encourage society's support for climate change actions and much needed behavioral change in areas such as energy use and the buying and consumption of goods and services.

For example, for consumers to make an informed decision about the goods and services they purchase, government can introduce requirements for labelling to include emissions-related information.

Capability Building

Delivering on the net-zero promise will require an economy-wide transformation, shaped by government, led and supported by businesses, and – just as importantly – embraced by communities and individuals. This will call for multi-dimensional capability building over the long term. Many government agencies and departments are not equipped with the necessary skills and ways of working required to operate effectively and efficiently. For example, departmental work is often carried out in silos rather than through cross-agency collaboration.

Governments cannot impose top-down solutions on their populations. Rather, they will need to consult and work with society to encourage people to accept any potential changes in their lives (e.g., behavior relating to travel, goods purchasing, and energy usage). While government agencies have typically been used to engaging in stakeholder consultations, influencing populations or bringing them along on the journey will require fundamentally different approaches and skills sets. Governments will therefore need to rethink a whole-of-government approach to capability building for its agencies.

5. Implications and Focus Areas for Governments

Governments have their work cut out to transform the economic structure of their countries while working with a wide range of stakeholders and bringing along the population at large along the decarbonization journey. In particular, there are five key areas where governments may need to remain vigilant.

1 Robust and broad planning: Net zero will create new government planning processes.

- How will the government set the budget?
- How will it interact internally with different government administration layers, (e.g., federal, state, municipal)?
- How will it interact externally with the private sector and residents?
- How will key performance indicators be qualified and quantified, and how/when will they be reported?

2 Stakeholder inclusiveness: The execution of a transformative net zero plan will need to be inclusive.

- How will the government make sure that no one in society is left behind?
- Will the increased costs be passed on to consumers? Will this be sustainable?
- How will the government account for views from the private sector and residents for a more inclusive way forward?
- How will the government make the right and balanced call when conflicting views of stakeholders arise?

3 Sustainable financing and capacity building: Securing the needed financing and building capability are musts and will take time.

- How will the government ensure that the financing needed to advance a net-zero agenda is secured in a constant manner, and from which sources? What incentive schemes will be followed?
- Where will the country find qualified talent to shape and execute the net-zero journey?
- How will knowledge sharing be achieved so that required capabilities are broadened?
- Which national educational and training programs in support of relevant R&D and innovation should be developed and implemented? And from which educational level?

4 Effective monitoring and reporting: It is critical that governments are able to measure, monitor, and report back on their countries' progress.

- How will progress and successful outcomes be measured across the different dimensions of the net-zero plan?
- How will the government ensure that the reporting on progress is holistic and represents the single source of truth for the country to announce to the world?
- Which government entity will be entrusted with this reporting and how can it best establish a relationship with the global community?

5 Continuous improvement: Countries will need a continuous improvement mindset and an approach that brings in learning in a constantly changing landscape.

- How will national net-zero commitment plans remain current with national and global developments, advances in facilitating technologies, and new process inventions, etc.?
- How will monitoring feedback be incorporated into these national plans to ensure that lessons learned can inform the way forward more effectively, with the right corrective measures?
- What form of national repository or knowledge base for these continuous improvement measures will best serve the nation, both in advancing its plans and in sharing them with other countries through established global forums?

Conclusion

In closing, net zero is a global sustainability goal and it is upon each country and its government to deliver on the pledge made for realizing the emissions reduction targets across key national sectors. For sure, the government cannot succeed on its own, and needs to ensure the proper and timely involvement of all stakeholders with the right enabling environment. In this context, we hope that through this report we have highlighted a clear set of guidelines for this national success to be attained.

About Arthur D. Little

Arthur D. Little has been at the forefront of innovation since 1886. We are an acknowledged thought leader in linking strategy, innovation and transformation in technology-intensive and converging industries. We navigate our clients through changing business ecosystems to uncover new growth opportunities. We enable our clients to build innovation capabilities and transform their organizations. Our consultants have strong practical industry experience combined with excellent knowledge of key trends and dynamics. ADL is present in the most important business centers around the world. We are proud to serve most of the Fortune 1000 companies, in addition to other leading firms and public sector organizations. For further information please visit www.adlittle.com or www.adl.com.

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