POLICY PAPER

ADDRESSING CAMBODIA'S REGULATORY GAPS FOR A SUSTAINABLE ENERGY TRANSITION

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Part 1: Introduction

Since the industrialisation, fossil sources such as coal, oil and gas have become the main source of energy. However, with the costs of renewable energy technologies declining rapidly, a transition toward a low-carbon economy appears feasible. In light of global climate change and the need for sustainable energy, the "energy transition" has become a major challenge and a focus point for almost all developed and emerging countries.

In many countries across Asia, nuclear energy was conceived as a "green" option to span the transition without compromising energy security. However, the devastating catastrophy at the Fukushima power plant in Japan in 2011 as well as rising commercial costs of nuclear energy have led to a reassessment and broader public discussion of this technology.

Electricity is only one part of this transition, but a crucial one, as its share in energy production and consumption will significantly grow. An energy transition in the transportation sector is also key, but difficult due to its large dependency on petroleum and the slow progress towards electrification. Whilst electric vehicles will increase the demand for electricity, the overall consumption of the transport sector will decline relatively as electric vehicles are around three times more efficient than burning petrol, diesel or gas (Fullbrook 2017).

As the global energy sector starts moving along this energy transition, investment decisions play a critical role for energy security and environmental sustainability. The last few years have seen a great many improvements in technology and rapid decline in costs of solar PV and wind energy, leading to a major shift in investment towards low-carbon sources of power generation. In 2015, almost USD 290 billion was invested globally into renewable power generation (IEA 2016). This is not only to limit environmental impacts and to reduce emissions, but also for the economic gains that sustainable energy technologies offer.

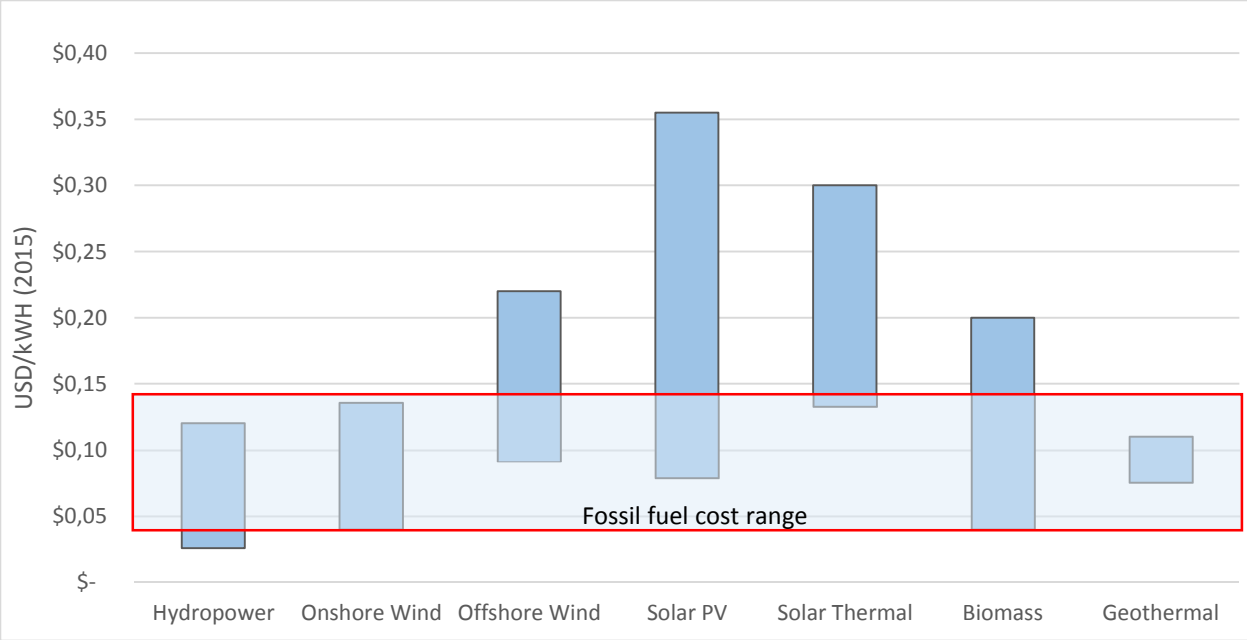

Figure 1 Renewable energy LCOE prices for 2015. Data from IRENA (2017).

Across the world, a low-carbon energy transition is now becoming more and more accessible, due to common availability and low costs of solar PV modules for on and off-grid solar systems. This solar powered take-off can also turn energy consumers into "prosumers" – the term is coined for "active" energy consumers, particularly those who produce surplus solar energy at home, or at their business. This gives individuals and businesses the opportunity not only to reduce climate and environmental impacts, but also to generate additional sources of income. With the rise of small-scale (household) solar systems, the awareness of energy use and its impacts and opportunities also increase, leading to new investment strategies by the consumers both in producing electricity and increasing energy efficiency.

In places with a high uptake of solar, we are starting to see the emergence of *virtual generators*, where household and commercial solar systems provide energy to the grid, their combined output determined and forecast using software platforms so as to provide better predictability and integration into existing energy systems. As the cost of energy storage systems fall, possibilities for this type of production system will expand.

The transition that is occurring across the globe is a change from the pattern of using the limited stocks of fossil fuels to the unlimited renewable resources – the energy transition.

The need for an energy transition in Cambodia

There are several reasons for an energy transition in Cambodia, and to do so now. From a global perspective, there is the need of combating global warming. There is an overwhelming body of research conducted by

scientists from around the world that further burning of coal, oil and gas will be the main contributor to a rising temperature causing disastrous effects on the natural environment and human societies (IPCC 2014).

Cambodia has to play its part in meeting greenhouse emission reduction targets to combat climate change. Whilst not a major contributor of global greenhouse gas (GHC) emissions, the country is already feeling the negative effects of climate change through increased drought and flooding and is ranked one of the countries most vulnerable to climate change (Hatfield 2013). Through supporting an energy transition, Cambodia can send a strong signal to larger emitters that an energy transition is needed and possible. Showing its own willingness to act, it will hopefully catalyse increased climate change adaption and mitigation measures supported by industrialized nations whose carbon emissions are leading contributors to global warming.

As the world begins to aprpreciate the need for this energy transition, the financial risks of investment into long term traditional energy projects are increased. These risks are increasingly unpalatable to investors, leading to stagnation in investment in coal supply and traditional power plants (Figure 2).

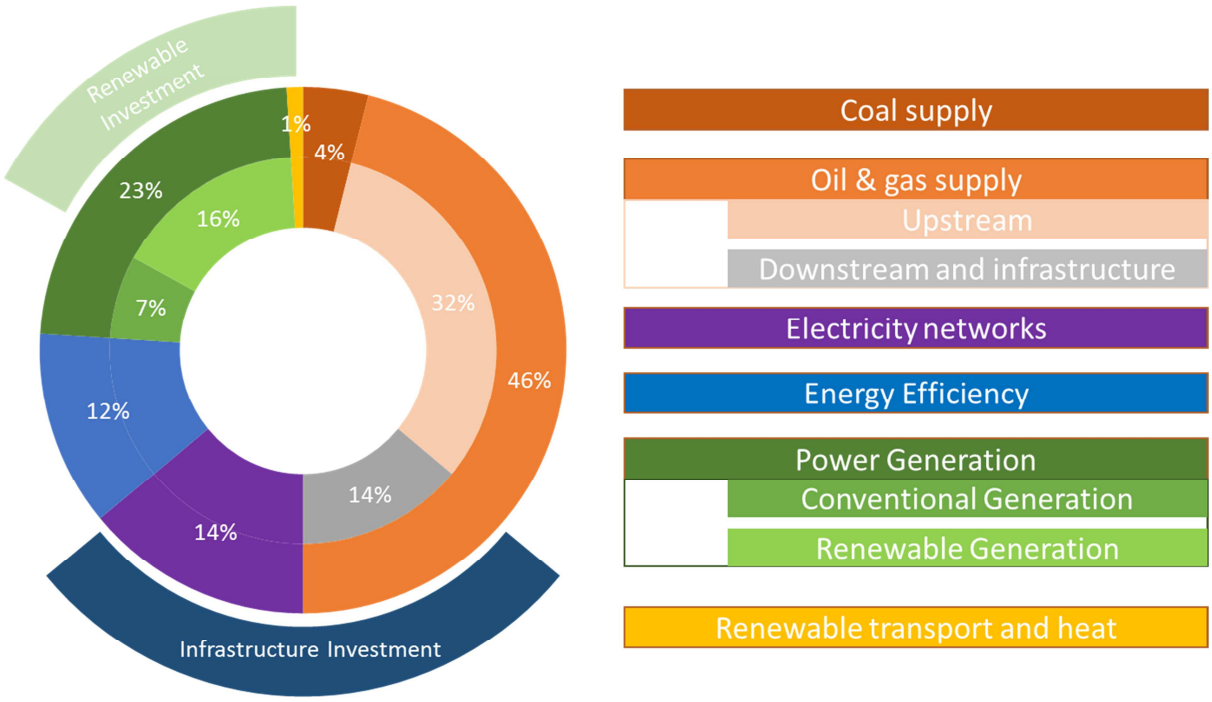

Figure 2 Global energy investment in 2015. Data & design from OECD/IEA and IRENA (2017).

From the national perspective, the need for Cambodia's energy transition is about a change to a system that is:

- increasingly more cost efficient.
- laying the foundations to cleaner, more livable cities.
- reducing dependency on energy imports.
- improving energy security.

- upgrading the economy.
- contributing to the achievement of the "Intended Nationally Determined Contributions (INDCs)" in order to mitigate and adaptate to climate change.
- improve environmental condititions and prevent serious consequences on health due to air pollution.

Over 50% of Cambodia´s primary energy is imported, primarily petroleum products, coal and electricity (ERIA 2016). Thus, investing in renewable energy and energy efficiency can reduce the reliance on imports. Energy security is also closely related to energy imports and affordable energy. Increasing energy demand in emerging economies – such as China and India, but also South-East-Asia – outpaces supply, this will lead to considerable price hikes and volatility. Further political reasons can create the risk of sudden supply changes almost overnight. Renewable technologies and energy efficiency gains can therefore reduce the dependence of Cambodia and increase its energy security. A diverse energy mix is also important. According to EdC (Electricity du Cambodge) in March 2013, the Kamchay hydroelectric dam was reportedly operating at 10% of its total 190MW capacity due to a water shortage (Poch 2013). Dry season water shortages for hydroelectric dams have also been observed in other nearby countries, such as Vietnam and Myanmar (Nam, Cham et al. 2015).

One important and positive impact of renewable energy is that local communities can directly invest into their own energy production with the economic payback directly supporting the community and the local economy. This local investment also reduces money leaving the country for imports. This supports the local economy through creating jobs – in 2012, 5.7 million people were employed in the renewable energy industry worldwide (IRENA 2013) – with a large potential for Cambodia to access this opportunity and create jobs. Renewable energy also protects individual consumers from long-term price volatility of carbon-based energy sources. With the price of renewable technology rapidly decreasing, energy can be delivered to households and businesses at cheaper rates than the cost of grid electricity (Aderson, Garbaczewski et al. 2015).

The role of the regulatory environment for an effective energy transition

The regulatory environment of a country is extremely important for an effective energy transition. It sends clear signals to investors and educators of the direction for the country. Thus, the government has to enable a sound environment to attract investment to this sector.

A significant challenge for actors in the field of renewable energy and energy efficiency is policy consistency. If the future of related policies is uncertain, risk margins will increase and attracting capital will be more difficult. Thus, a key part in the creation of a regulatory environment for an effective energy transition is clarity and consistency. Investments into renewable energy and energy efficiency face unique barriers, often specific to local conditions, such as the existing regulation for connecting generators to the local grid, and public per-

ceptions of different technologies. Thus, policy measures must be designed to overcome these barriers (White, Lunnah et al. 2013).

There are three forms in which an energy transition can happen (World Bank 2013):

- **Demand pull** policy includes regulation that supports renewable energy and energy efficiency to become financially viable (support schemes); power market rules that facilitate the entry of renewable and energy efficiency technologies; and environmental regulations and enforcement that increase the cost of fossil fuel based energy.
- **Technology-push** policy includes those measures that help to reduce the technologies costs (such as through reduced import taxes); through improving the supply chain; through ensuring the availability of quality components; and through information campaigns to improve consumer awareness.
- **Finance-push** instruments are those that increase the supply of private finance through improving liquidity, and reducing investor risks and bank transactions. These instruments include refinancing lines; financial sector regulations that facilitate renewable energy and energy efficiency finance; sharing of lending risks; assistance in establishing new financing lines; and public cofinancing of project preparation and due diligence costs.

A recent report by WWF/WRI (2013) concludes that there are a set of attributes which policy makers should pay particular attention to when planning renewable energy and energy efficiency policies. The *four key recommendations* for policy makers given in the report are:

1. *Clearly defined policy objectives* and targets that have wide public support and flexibility, combined with renewable energy promotion mechanisms.
2. Institutional frameworks that foster *good governance principles* in order to ensure that policy frameworks are well managed and outcomes are achieved.
3. *Enabling industry structures* and having infrastructure and technical requirements made available.
4. *Enhanced institutional and human capacity* that will be able to manage complex technical and regulatory systems, and portfolios of projects in the short, medium and long term.

The International Energy Association, as part of their Renewable Energy Technology Deployment program, have developed *six key categories of policy actions* for accelerated deployment of renewable technologies (IEA 2012):

- *Alliance building*: Build alliances and reach agreements among policy makers and with relevant stakeholders.
- *Communicating*: Communicate knowledge about renewable energy resources, technologies and issues.
- *Target setting*: Integrate renewables into policy making (mainstreaming renewables and energy efficiency).

- *Optimising*: Optimise policy frameworks by building on existing policies or proven policy mechanisms and adopting them to the local context.
- *Neutralising*: Neutralise disadvantages in the marketplace (such as lack of an even playing field).

Part 2: Review of the enabling regulatory environment: regional experiences

Cambodia is in the early stages compared to other countries in the region when it comes to the adoption of policies to support the uptake of renewable energy technologies through the creation of an enabling environment. This means that Cambodia can look to other countries to see what renewable energy policies and regulations they have implemented. As such, this section provides a review of the regulatory environment for three countries within the region – the Philippines, Malaysia and Vietnam – chosen for their broad and comprehensive renewable energy policies and successful renewable energy deployment (ACE 2016).

Philippines

The Philippines have one of Asia's highest electricity rates, partly attributed to the high costs of importing fossil fuels. Increasing energy security and reducing power costs have been key drivers in supporting renewable energy, with the country setting a renewable energy target of 15,304 MW by 2030 – triple its 2010 capacities.

Figure 3 shows the generation by fuel type for the Philippines in the previous decades and provides the baseline for renewable energy policy changes. The geothermal/solar/wind category is almost entirely geothermal. The figure shows that the renewable energy contributions are approximately equally from hydropower and geothermal.

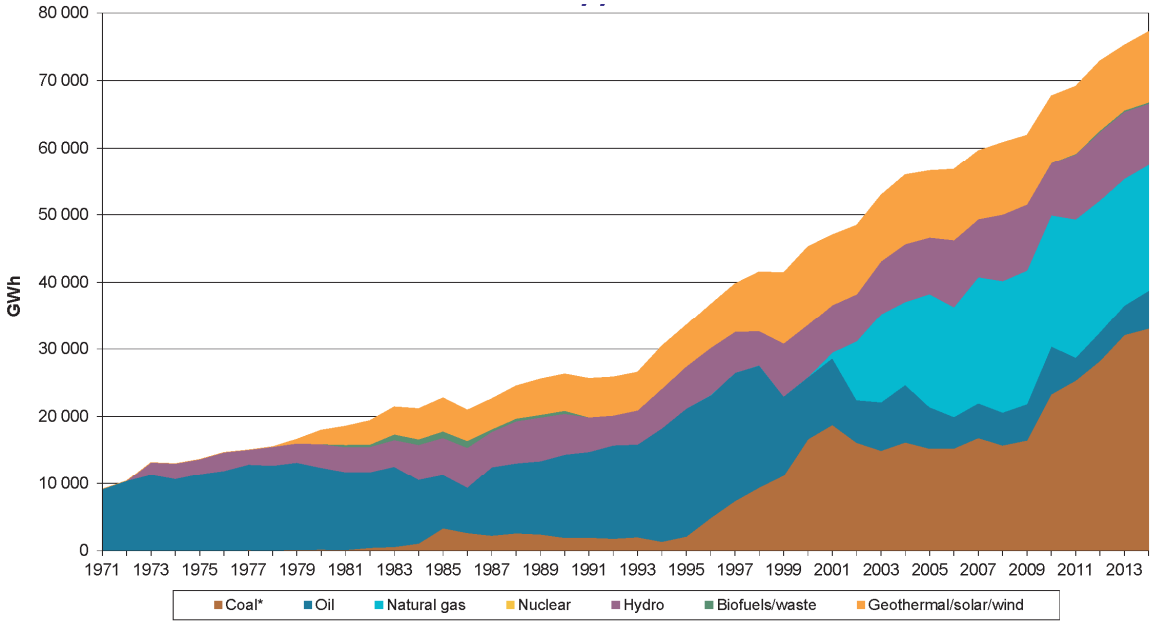

Figure 3 Philippines electricity generation by fuel type. Figure from OECD/IEA (2016).

The Philippines has seen approximately 20 key policies specific to renewable energy brought in over the last 20 years. Two important legislations enacted to promote renewable energy were the Renewable Energy Act of 2008 and the Biofuels Act of 2006. In terms of energy efficiency, the Energy Efficiency and Conservation Act was introduced in 2012 (Rosellon 2017). These acts are supported by the Philippines Energy Plan.

The Renewable Energy Act provides the legal and institutional framework necessary for harmonising policies on the development of renewable energy technologies, to accelerate the exploration and development of renewable resources as well as to increase the utilization of renewable energies. A key component to develop capabilities in the use of renewable energy systems and promote its efficient and cost-effective commercial application are fiscal and non-fiscal incentives (IEA 2017).

In 2011 the government launched the National Renewable Energy Program, the "Green Energy Roadmap" for the Philippines. The program is set upon the Department of Energy's energy reform agenda, which aims to ensure greater energy supply and security for the country. The roadmap sets the target of 15,304 MW of installed renewable energy capacity by 2030, with the program including further policy mechanisms to achieve this. These include renewable portfolio standards, feed-in tariffs, green energy option program, and net metering for renewable energy (ERIA 2016). The feed-in-tariff (FiT), introduced in 2012 (updated 2015), provides a priority for grid connection of renewable technologies; prioritises the purchase of the renewable energy generated; and provides a fixed tariff for energy fed into the grid for a fixed period of time (IEA 2017). Renewable energy targets for the Philippines can be seen in Figure 4. The figure shows that the majority of the target capacity addition for renewable energy will be hydropower, wind farms and geothermal.

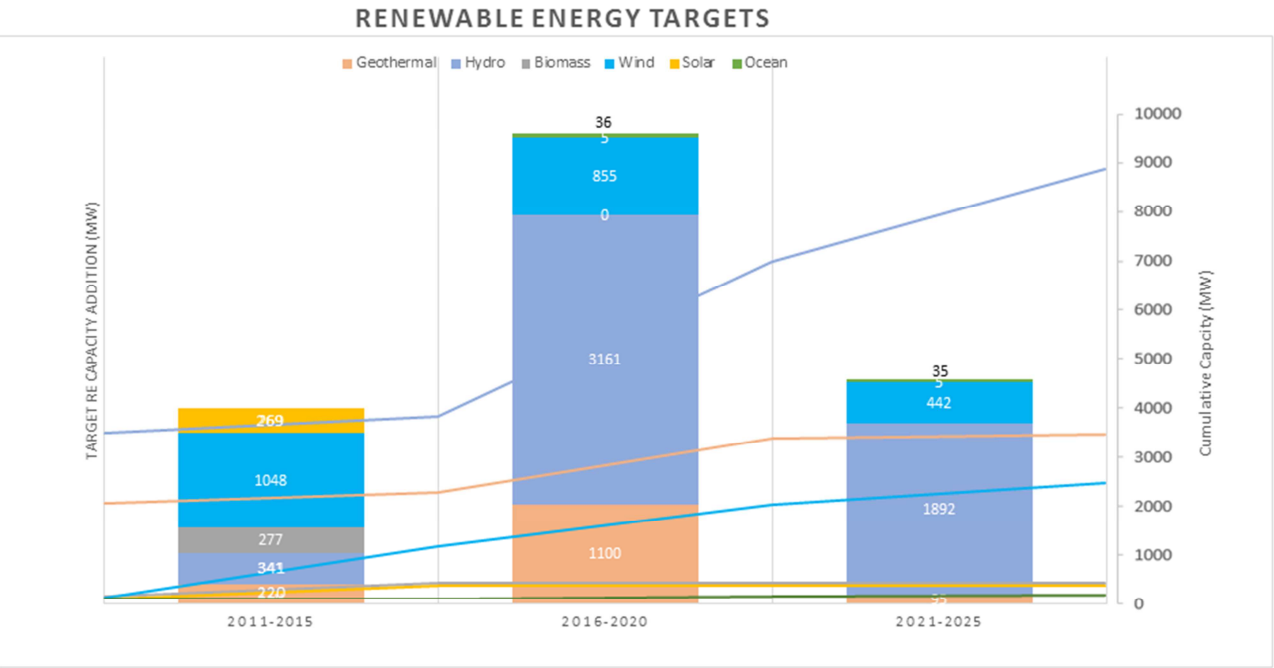

Figure 4 Renewable Energy Targets- Philippines (DOE 2011).

The Biofuels Act mandates a minimum of 2% of locally sourced biofuels to be blended into diesel fuels. Fiscal incentives are used to incentivize this change, including the exemption of the biofuels from value added tax (VAT) (IEA 2017).

The Energy Efficiency and Conservation Act institutionalize energy efficiency and conservation, and provides (fiscal) incentives to energy efficiency conservation projects. The country also developed an energy efficiency roadmap and an energy efficiency program. The roadmap to 2030 sets a goal of energy saving equal to 10% of the annual final energy demand outlook. The program includes information, education and communication campaigns; standards and labelling for household appliances; and support for energy efficiency projects (Reyes 2013).

To date the majority of installed renewable energy in the Philippines is geothethermal and large scale hydro-power. The feed-in-tariffs and regulation changes are contributing to a greater increase in wind, biomass and solar as can be seen in Figure 5. Whilst new renewable energy generation capacity (wind, solar, biomass) makes up only a small percentage of overall generation capacity (<5% in 2015, <7% in 2016), of the newly installed generation capacity approximately 50% is from these technologies in 2015. In 2016, a large amount of coal (1450 MW) and solar PV (600 MW) came online. This increase in the new renewables demonstrates the start of a shift towards renewable energy. We can also see the total installed capacity of solar PV over-take wind in 2016, resulting from a combination of the feed-in-tariff and the cost reduction of solar PV tech-nology. The installed capacity of solar in 2016 also exceeds all targets set out to 2030.

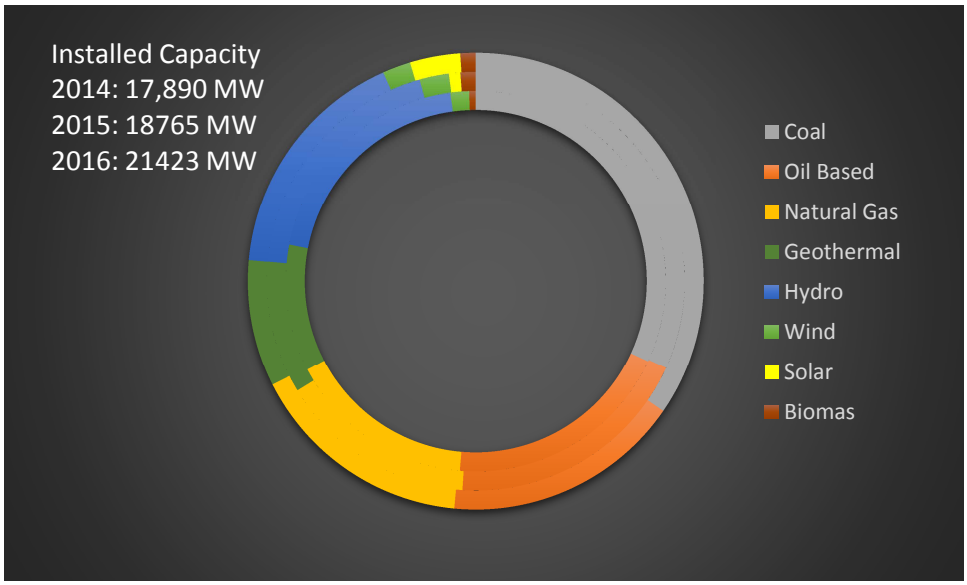

Figure 5 Philippines 2016 vs 2015 Vs 2014 Installed Capacity (MW). The figure shows that new generation was fairly evenly split between fossil fuel and new renewable resources for 2014-2015, whilst a large amount of coal (1450 MW) and solar (600 MW) came online in 2016 (DOE 2016).

Malaysia

Malaysia has high reserves of conventional energy resources such as oil, coal and gas, helping the country to be a net energy exporter. Malaysia has, however, introduced several policies to support the uptake of renewable energy and energy efficiency.

Figure 6 shows the historic generation by fuel type for Malaysia. The figure shows that installed generation capacity is growing rapidly year to year, with increased generation using natural gas.

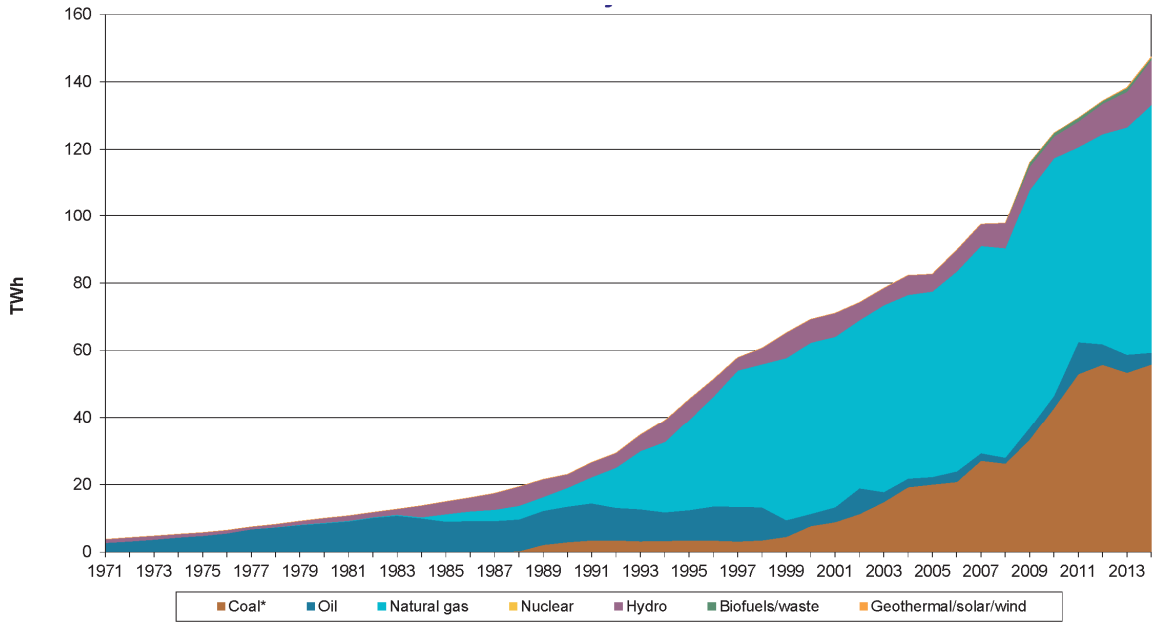

Figure 6 Malaysia historic electricity generation by fuel type. Figure from OECD/IEA (2016).

The National Biofuel Policy (2006) is the main policy to support the Malaysian biodiesel industry. The policy has a focus on research, development and commercialization of the biofuel sector. The policy aims to increase the use of palm oil in combination with other fuels.

Malaysia's main renewable energy policy, the "Renewable Energy Policy and Action Plan" introduced in 2010, seeks to increase the use of local renewable energy sources contributing to electricity supply and fuel supply (Kettha 2008). The action plan established generation targets to 2050, when renewable energy is set to contribute 24% of the total energy mix – from 1% in 2011 and an expected 9% by 2020 (IEA 2017). A feed-in tariff for renewable energy also introduced in 2011, is designed to support the uptake of renewable technologies for electricity generation. Additional costs are transferred forward to electricity consumers who must pay an additional 1% surcharge on their electricity bills. Those with a consumption of less than 300 kWh/month, equaling approximately 75% of the domestic electricity consumers, will be exempted from this surcharge (IEA 2017, SEDA 2017). As can be seen in Figure 7, installed capacity for non-large scale hydropower remains quite low in Malaysia until around 2030, when targets for solar PV capacity start to rapidly increase.

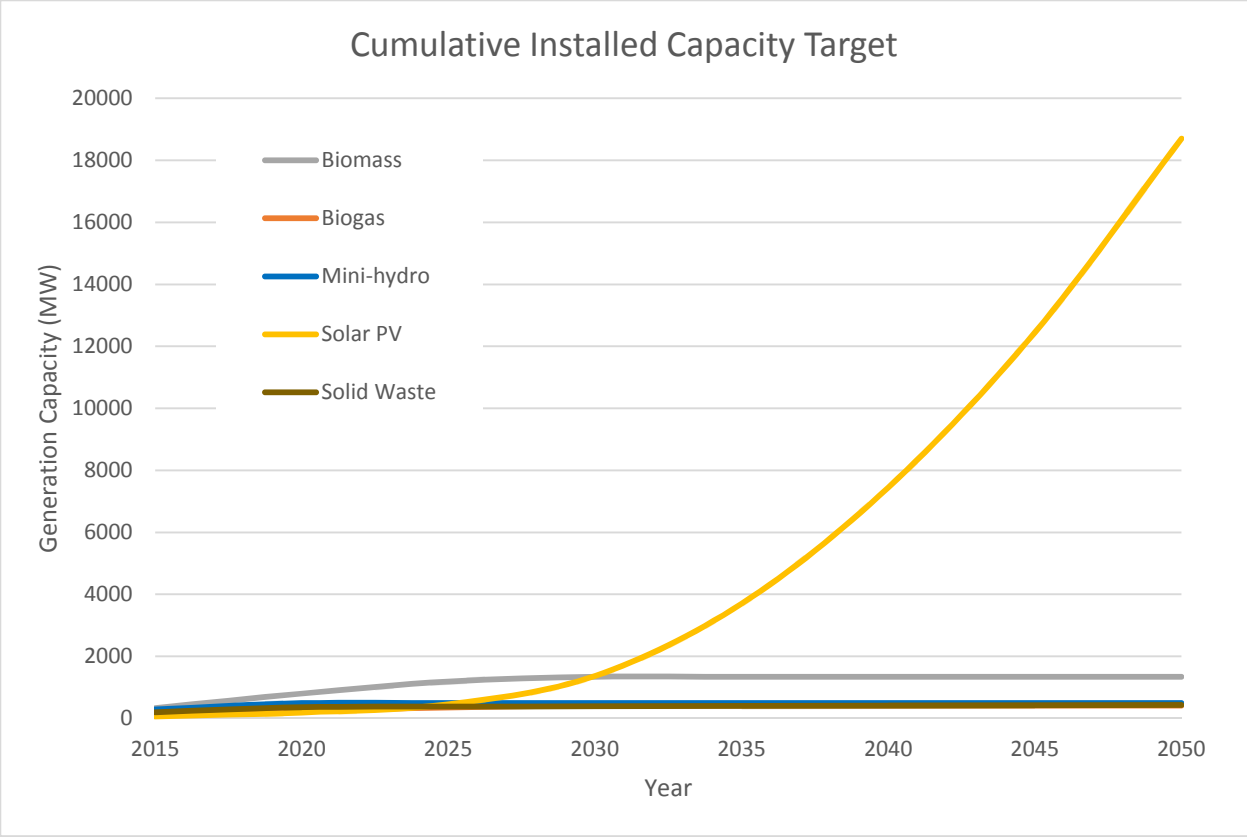

Figure 7 Cumulative installed capacity targets (MW) of renewable energy technologies in Malaysia from 2015 to 2050 (ACE 2016).

In 2010, Malaysia also introduced the "Green Technology Financing Scheme", created to help incorporate energy efficiency and renewable energy technology into projects related to specific industries through the provision of financing. The four applicable sectors are energy, water & waste, building & township, and transport. The scheme provides a guarantee of 60% of the approved financing amount and the government takes on 2% of the interest rate or profit charged by participating financial institutions. The scheme has been extended to 2022 with a further RM5 billion (USD 1.15 billion) allocated from 2018 (GTFS 2017).

Large scale hydropower still represents the majority of installed renewable energy generation. However, at the end of 2015, the other renewables had approximately 320 MW of capacity that had achieved commercial operations under the feed-in-tariff, with 1138 MW of approved feed-in-tariff projects. Of this approved projects about 28% is solar PV. Whilst this is small compared to a total installed capacity of approximately 26,500 MW, it represents a shift towards a higher percentage of new generation capacity being renewable energy (SEDA 2016).

Whilst Malaysia's renewable energy policies are quite mature, the abundance of fossil fuel resources and the developed nature of this industry in Malaysia, is leading to a continual focus on these energy sources and a lower relative contribution from renewable resources.

Vietnam

The historic electricity generation by fuel type for Vietnam can be seen in Figure 8. The figure shows that hydropower, coal and natural gas generation have been the main contributors to exponential generation increases.

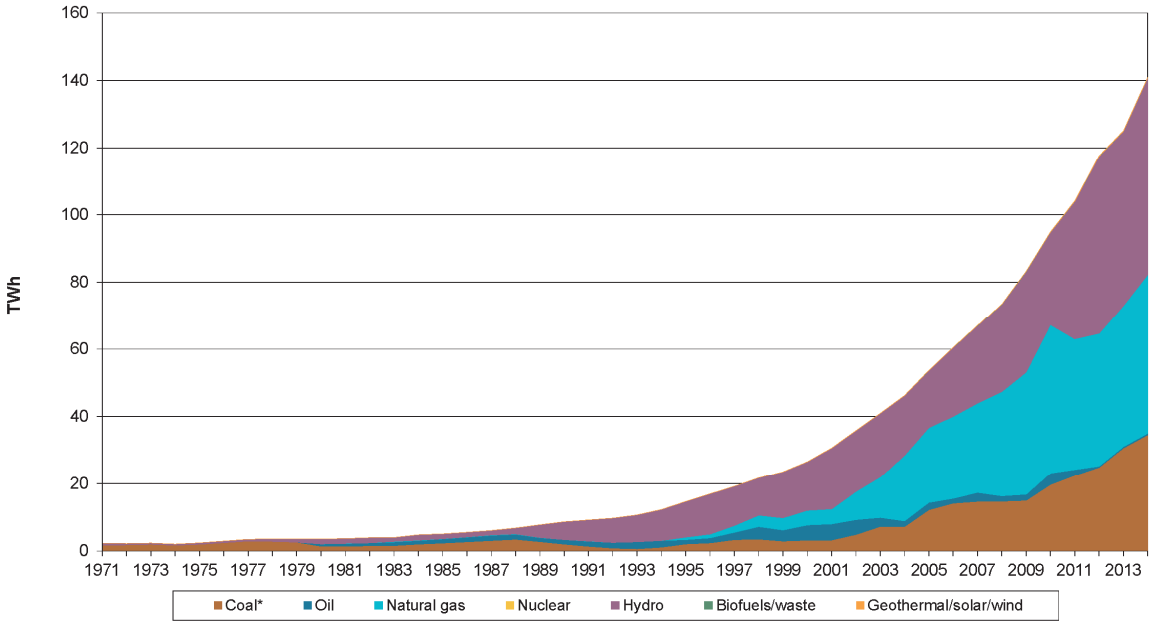

Figure 8 Vietnam historic electricity generation by fuel type. Figure from OECD/IEA (2016).

Vietnam has established the "Vietnam Renewable Energy Development Strategy 2016–2030 with outlook until 2050", which set the target of 7% of total generation from renewable energy by 2020 and 10% by 2030. Targets for solar, wind and hydropower can be seen in Figure 9. This strategy is also part of the National Power Development Plan (2016), with both legislations aiming to increase renewable energy generation, diversify energy sources and limit greenhouse gas emissions. Targets set are to reduce greenhouse gas emissions by 5% by 2020, 25% by 2030 and 45% by 2050 respectively (IEA 2017). Another strategy in line with these motivations are the Sustainable Development Strategy 2011–2030, the National Action Plan on Green Growth 2014–2020, and the National Strategy on Climate Change. Both of these strategies identify the need for renewable energy to provide a growing share in Vietnam's energy consumption mix. A national program on energy saving and efficiency has been introduced to save approximately 8% of the total energy consumption of the country in the period of 2016–2020 (Phuc 2016).

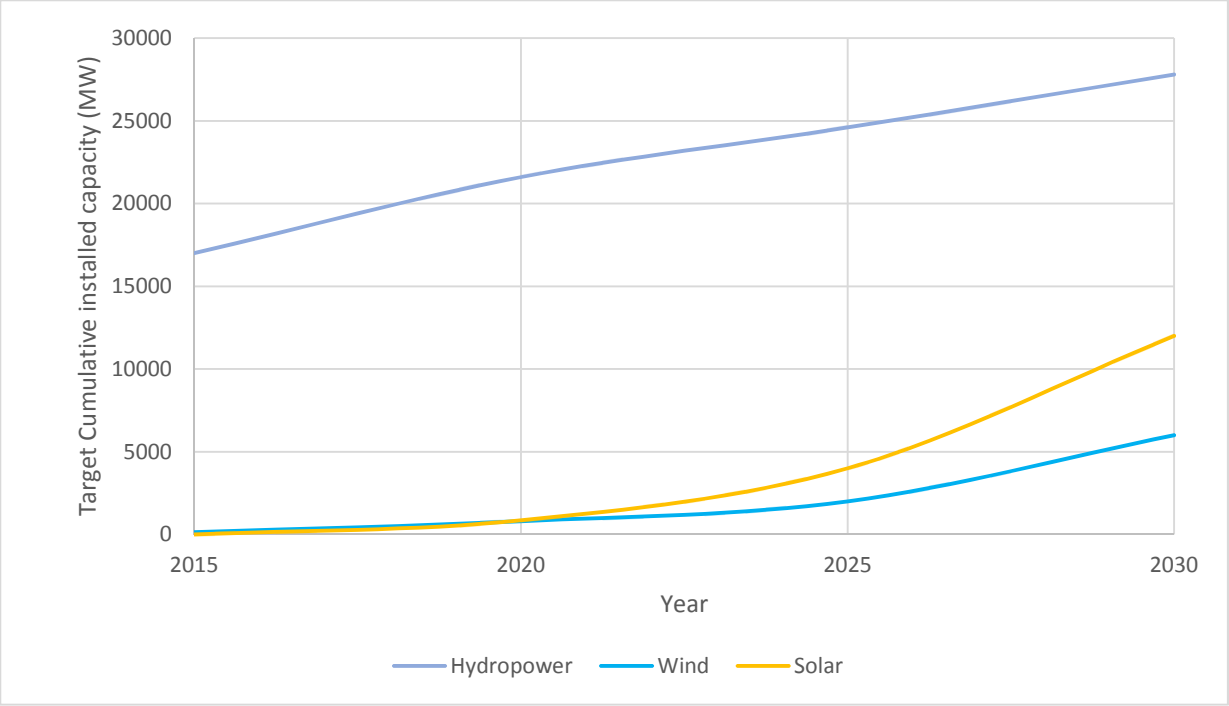

Figure 9 Targets for cumulative installed capacity for hydropower, wind and solar PV in Vietnam.

Part of the Renewable Development Strategy is to introduce policy mechanisms to guide renewable energy deployment. For example, large power generation companies will have to reach 3% of renewable power capacity by 2020, 10% by 2030 and 20% by 2050. Renewable energy development will focus on proven technologies, including hydropower, wind power, solar power, biomass energy and biogas. Feed-in tariffs, net metering and preferential taxation policies are also key instruments for increasing renewable energy. One of these taxation policies is that renewable energy projects for power generation are able to claim accelerated depreciation for tax benefits (IEA 2017). Projects also receive corporate tax exemptions for the first four years, which reduces to 50% for the following nine years. There are also import tax exemptions and a standardised power purchase agreement template. Independent renewable generation projects can also access support from the Sustainable Energy Promotion Fund.

Some of the strategic goals of the renewable energy strategy are to (Thuc 2015):

- prioritize the development of renewable energy for the production of power by increasing the utilization rate to 7% in 2020 to over 10% in 2030;
- reduce the dependence on imported coal and oil products;
- increase the proportion of households with solar water heating devices to 12% in 2020, 26% in 2030 and 50% in 2050;
- scale up the application of biogas technologies – from 4 million cubic meters (2015) to 8 million cubic meters in 2020, 60 million cubic meters in 2030 and 100 million cubic meters in 2050;
- increase the percentage of households using advanced/high performing stoves (30% in 2020, 60% in 2025, and 100% in 2030);
- increase the production of biofuels (5% by 2020, 13% by 2030, and 25% by 2050);

- increase the proportion of domestically manufactured equipment in the renewable energy field (30% in 2020, 60% in 2030).

Importantly, the program gives prioritized connection for renewable energy technologies to the national power system.

Targets for installed generation capacity can be seen in Figure 10. It can be seen that whilst renewable energy will be increased, other traditional generation sources will also continue to be installed and make up the majority of generation capacity and newly installed generation capacity.

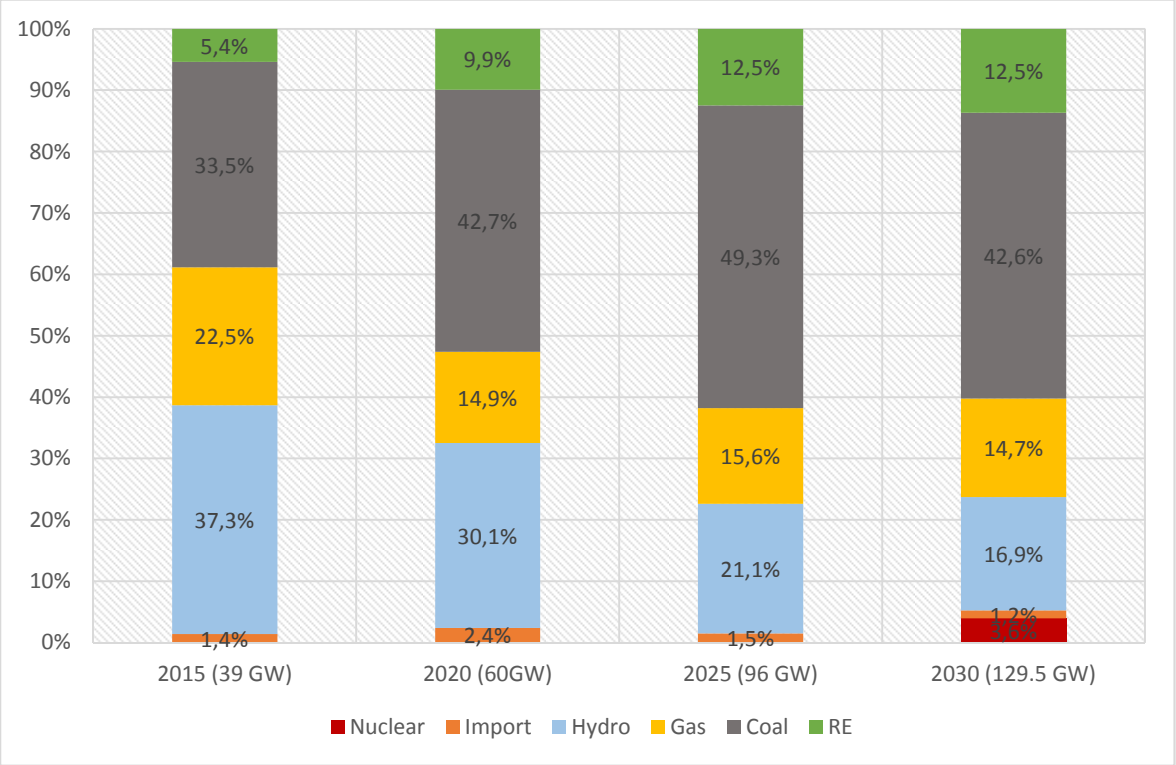

Figure 10 Vietnam installed capacity targets according to PDP 7 rev (GIZ 2016).

Comparison

All three countries reviewed use a mixture of demand pull, technology push and finance push to achieve their renewable energy and energy efficiency objectives. A comparison of some of the main initiatives can be seen in table 1. All three countries are, however, still investing heavily in traditional generation and hydropower to meet their rapidly increasing electricity demands. The exponential growth of solar PV predicted by both Vietnam and Malaysia from 2025 demonstrates their expectations of the cost reductions for this technology.

Table 1. As detailed in ACE (2016), key policies for attracting private sector investors are appropriate feed-in-tariffs; simplified permit procedures; and attractive incentives and financing support mechanisms. Targeting these barriers has helped these countries to be leaders in the region for renewable energy.

In both Malaysia and the Philippines over 300 MW of solar PV has been installed in recent years, with solar PV developers taking advantage of the available feed-in-tariffs. A draft circular for a solar feed-in-tariff in Vietnam has been released with the standardized power purchase agreement soon to follow from the Ministry of Industry and Trade, Vietnam. It is expected that, as seen in Malaysia and the Philippines, this feed-in-tariff will also soon contribute to the deployment of multiple hundreds of megawatts of solar across the country, as per Vietnam's targets. All three countries are, however, still investing heavily in traditional generation and hydropower to meet their rapidly increasing electricity demands. The exponential growth of solar PV predicted by both Vietnam and Malaysia from 2025 demonstrates their expectations of the cost reductions for this technology.

Table 1 Comparison in demand pull, technology push and finance push policies for the Philippines, Malaysia and Vietnam.

PHILIPPINES	MALAYSIA	VIETNAM
Demand Pull		
• Renewable energy targets • Sector strategy • Feed-in-tariffs • Priority grid connection for renewable technologies • Priority purchase and payment of energy from renewable technologies • Mandatory requirement for local biofuel percentage	• Renewable energy targets • Sector strategy • Feed-in-Tariffs • Priority grid connection for renewable technologies • Priority purchase and payment of energy from renewable technologies • Environmental standards	• Renewable energy targets • Sector strategy • Feed-in-Tariffs • Rooftop solar PV net metering • Standardised power purchase agreements • Research and development
Technology Push		
• Renewable portfolio standards • Guidelines • Green energy option program (end users have the option to purchase electricity from renewable energy facilities)	• Biofuel sector development initiatives (R&D, commercialization) • Development of renewable technology manufacturing sector • Renewable energy advocacy programs • Research and development initiatives • Human resource development	• Development of renewable technology manufacturing sector • Green building codes
Finance Push		
• Accelerated depreciation • VAT exemption • Fiscal incentives • Tax incentives • Stable, long term feed-in tariff (policy certainty) • International development partner co-financing and guarantees • Credit guarantees • Climate bonds	• Stable, long term feed-in tariff (policy certainty) • Tax benefits • Green technology finance scheme (financing guarantees and reduced interest rate) • Public procurement policies for renewable energy • Policies targeting transaction costs	• Financial incentives • Tax benefits • Stable, long term feed in tariff (policy certainty) • International development partner co-financing and guarantees

Part 3: Analysis of Cambodia's regulatory gaps

Review of Cambodia's performance on the Regulatory Indicators for Sustainable Energy (RISE)

RISE – Regulatory Indicators for Sustainable Energy – is a set of indicators which help to compare national policy and regulatory frameworks for sustainable energy. This scorecard is an initiative of the World Bank and covers 111 countries in both the developed and developing world. The assessment covers countries' policy and regulatory support for three categories of sustainable energy – access to modern energy, energy efficiency, and renewable energy. 27 indicators are used to provide an overall score for the country, with each indicator using a series of criteria. The resulting scorecard allows a comparison among different countries and support for sustainable energy policies. RISE indicators are published biennially (RISE 2016).

For the 2016 RISE assessment, Cambodia scored an average of 70% for energy access, 21% for energy efficiency, and 34% of renewable energy, giving an overall score of 42% as seen in Figure 11. This places Cambodia into the middle bracket ("yellow bracket") on a world comparison. Cambodia's overall score bracket can be compared with other countries' in Figure 12 (figure from RISE (2016)), which presents the RISE country brackets for each country covered by the program.

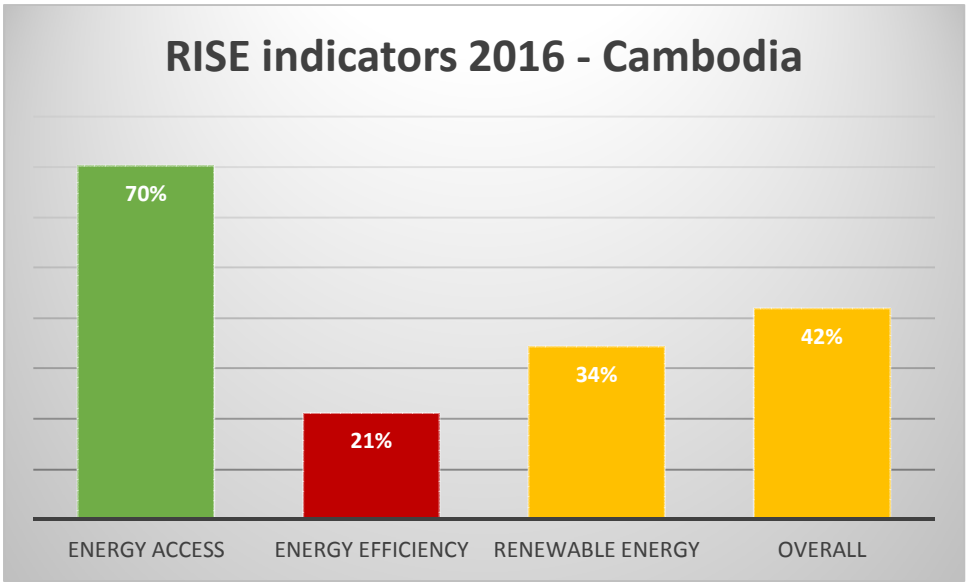

Figure 11 RISE indicators for Cambodia. Data from RISE (2016).

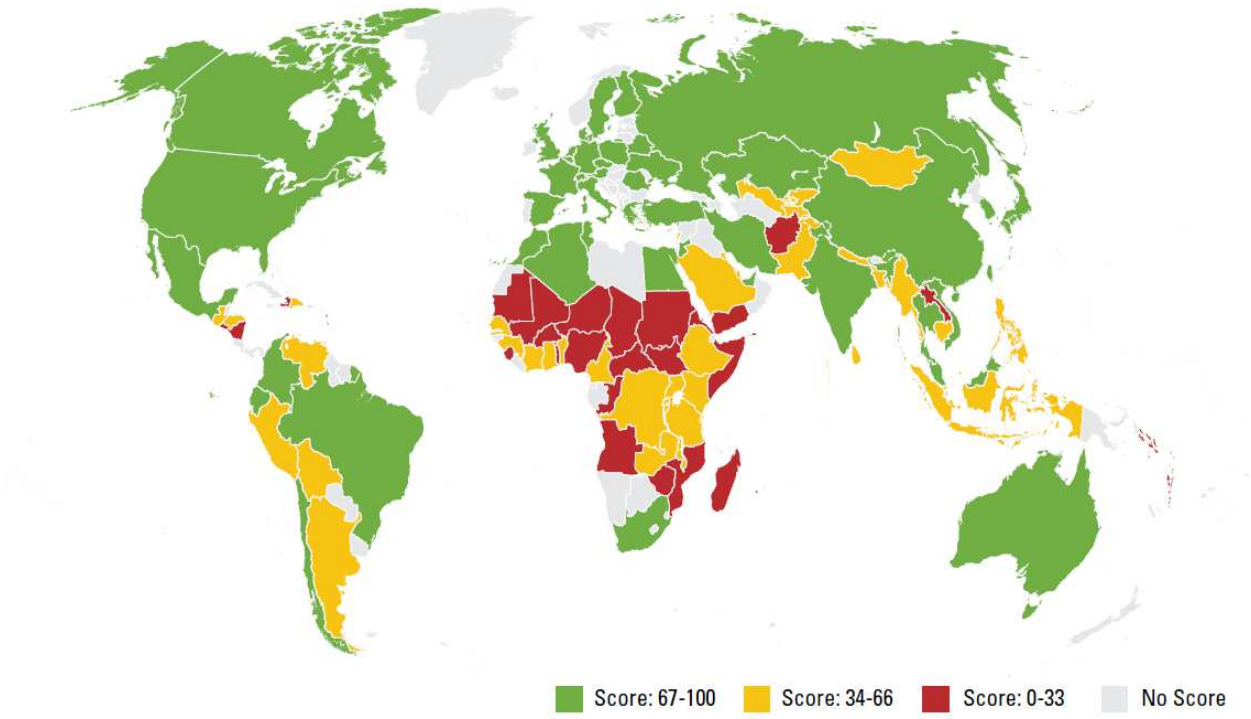

Figure 12 RISE overall scores for 2016. Image from (RISE 2016).

RISE scores for the ASEAN countries can be seen in Table 2. It can be seen that Cambodia is currently only in front of Myanmar and Laos.

Table 2 Rise indicators for the ASEAN region.

ASEAN Countries		Energy Access	Energy Efficiency	Renewable Energy	Overall Score
	Vietnam	100	71	64	78
	Thailand	100	63	60	74
	Malaysia	100	52	68	73
	Philippines	82	42	67	64
	Indonesia	61	34	55	50
	Cambodia	70	21	34	42
	Myanmar	59	13	43	38
	Laos	47	8	46	34
	Brunei	-	-	-	-
	Singapore	-	-	-	-

The RISE indicators for *energy access* are plotted in Figure 13. Cambodia achieves quite a high overall score for this category (70%), making it into the highest bracket. Key areas for improvement are:

- Scope of the officially approved electrification plans;
- Utility transparency and monitoring; and
- Consumer affordability of electricity.

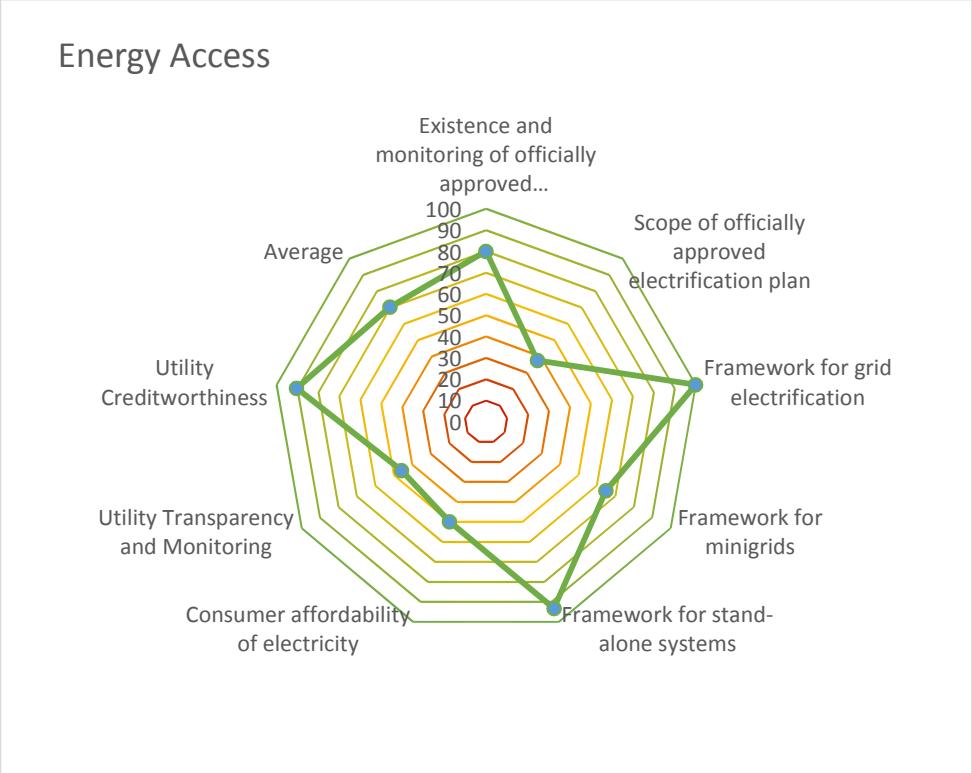

Figure 13 Cambodia's RISE indicators for Energy Access. Data from RISE (2016).

The RISE indicators for *energy efficiency* are plotted in Figure 14. This is Cambodia's worst performing category, achieving only 21%. Key areas for improvement are:

- National energy efficiency planning;
- Incentives & mandates for large consumers, public sector and utilities;
- Financing mechanisms for energy efficiency;
- Minimum energy efficiency performance standards;
- Energy labelling systems;
- Building energy codes; and
- Carbon pricing (for energy efficiency projects).

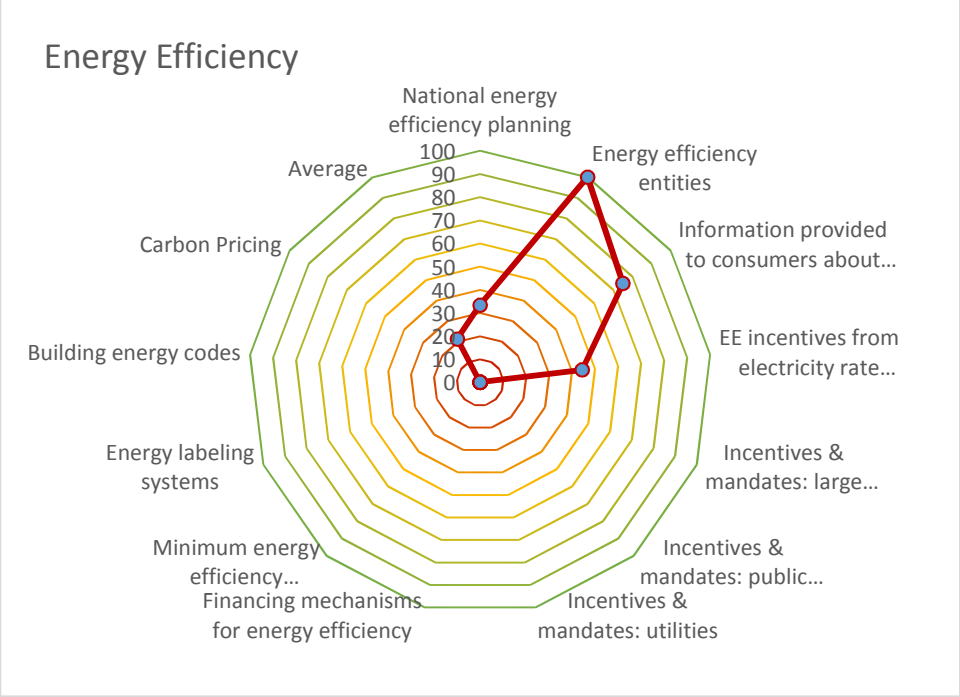

Figure 14: Cambodia's RISE indicators for Energy Efficiency. Data from RISE (2016).

The RISE indicators for *renewable efficiency* are plotted in Figure 15. Cambodia just makes it into the middle bracket for this category. To improve this score, key indicators for improvement are:

- Planning for renewable energy expansion;
- Attributing financial and regulatory incentives;
- Network connection and pricing; and
- Carbon pricing and monitoring (for renewable energy).

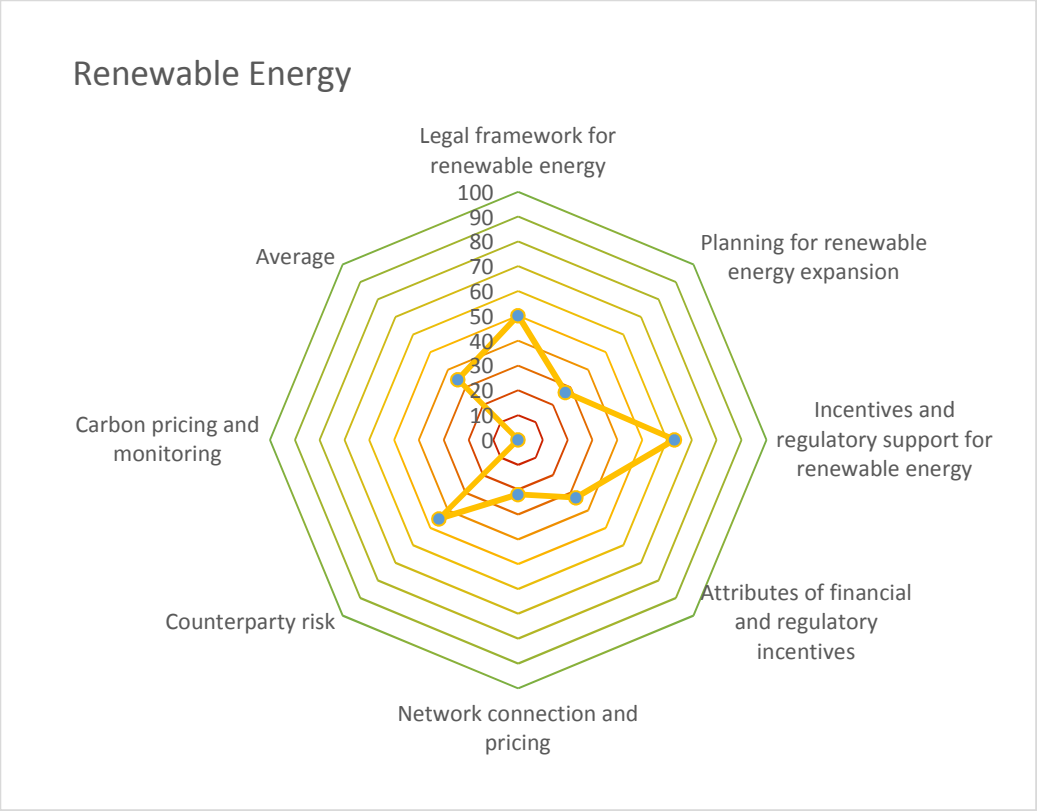

Figure 15: Cambodia's RISE indicators for Renewable Energy. Data from RISE (2016).

Expanding the national grid across Cambodia has been, and is, a key interest of the Cambodian Government. Development partners worked with the Ministry of Mines and Energy to develop a framework for grid electrification and solar household systems. Reform of the sector and documentation of the electricity network and its operation has helped the main utility achieve a good credit rating. The development of hydropower dams and coal powered generators has partially helped to bring down electricity costs. Overall this has led Cambodia to achieve a top tier rating for energy access.

Whilst there is a responsible government body – the Ministry of Mines and Energy – responsible for setting energy efficiency strategies, standards and regulation, the planning and implementation of the action plan has so far not been strong, with limited establishment of energy labelling systems, building energy codes, or minimum energy performance standards. As a result Cambodia received a very low score of 21% for energy efficiency.

Cambodia has utilized support schemes for renewable energy for off-grid application and has also had a strong focus on the development of hydropower dams. There has been very little planning, however, on setting broader renewable energy targets and action plans, with a lack of clarity in network connection and a lack of fiscal incentives for renewable energy generators to connect. This has led Cambodia to receive a low mid-tier RISE score of 34% for renewable energy.

Review of existing policies, regulations and programs

Cambodia's regulatory environment for energy is influenced by various ministries and organizational bodies. The Ministry of Mines and Energy (MME) is the key ministry for energy. The Ministry for Industry and Handicrafts is also relevant for energy use throughout Cambodia, due to the impact of energy prices and reliability on industry. In regards to local environmental impacts and climate change impacts, the Ministry of Environment (MoE) is relevant. The Ministry of Economy and Finance (MEF) is in charge of tax and custom related policies, which can impact the cost of energy projects and technology.

The Ministry of Mines and Energy works with the Electricity Authority of Cambodia (EAC) to manage regulation and policy related to electricity generation and supply. The Electricity Law of the Kingdom of Cambodia was established in 2001 and provides a broad regulation framework for electricity supply and services throughout Cambodia. It also established the Electricity Authority of Cambodia to regulate the power sector. The electricity law defines the responsibility of MME and EAC separately. MME are responsible for administrating government policies, strategies and planning, whilst EAC is responsible for ensuring the provision of services and the use of electricity in an efficient, qualitative, sustainable and transparent manner (EAC 2016). The division of responsibilities of the two organisations can be seen in Figure 16. The electricity network throughout Cambodia is managed primarily by Electricite Du Cambodge (EDC), as well as other smaller private operators. Approximately 98% of energy generated in 2015 was by independent power producers (EAC 2016).

In 2015 electricity imports for Cambodia were at 25% of total electricity sent out, predominantly from Vietnam (20% of total electricity available), and Thailand (5% of total electricity available). Electricity transmission/distribution losses accounted for 13.5% of electricity use (EAC 2016).

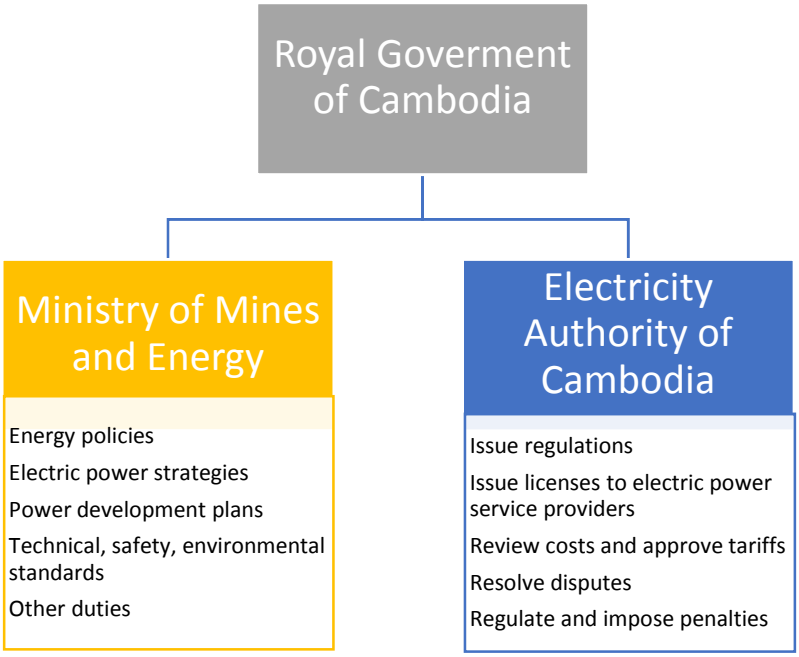

Figure 16: Roles and responsibilities of the Ministry of Mines and Energy and the Electricity Authority of Cambodia (EAC 2016).

The current key priorities of MME are to (EAC 2016):

- ensure a balance in the supply and demand of electricity (with a reserve capacity of approximately 25%). The capacity of the transmission network should also be sufficient to meet the load demand;
- expand the area of supply of the National Grid: 100% of villages to be covered by 2020, and 70% of households by 2030;
- facilitate the provision of electricity in rural areas for use by the poor;
- improve the quality of supply, through an increased focus on standards;
- provide a subsidised tariff for the poor.

As can be seen in Figure 17, Cambodia's electricity generation is rapidly increasing, with the use of oil fuels being reduced, as additional hydropower and coal power plants come online.

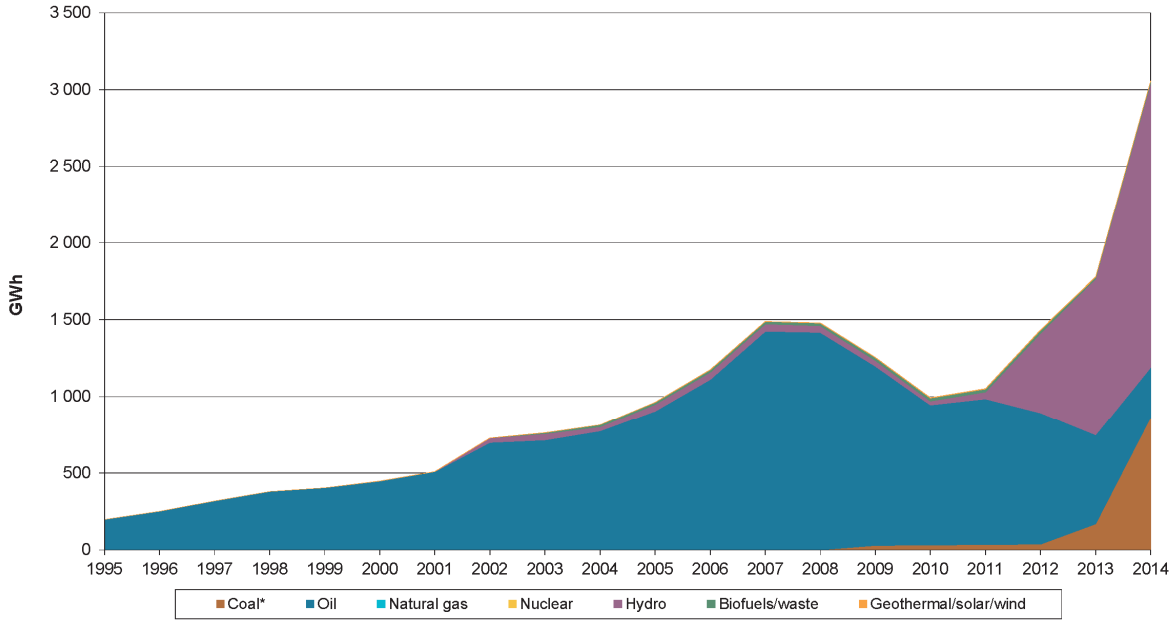

Figure 17 Cambodian historic electricity generation by fuel type (OECD/IEA 2016).

Policies related to renewable energy are, in general, incorporated into other rural development policies. Important policies for renewable energy are shown in Table 3.

Table 3: Key policies impacting renewable energy in Cambodia (Ratha 2014, ACE 2016).

YEAR	POLICY
2006	• Rural Electrification Master Plan (REMP)
2007	• Power Development Plan 2008–2020 • National Policy on Rural Electrification by Renewable Energy
2010	• Cambodia Green Growth Roadmap 2010 • National Strategic Development Plan Update (2009–2013)
2013	• National Climate Change Strategic Plan 2014–2023 • The National Policy and Strategic Plan for Green Growth 2013–2030 • National Policy on Green Growth 2013
2014	• National Strategic Development Plan 2014–2018 • Programme for the Development of Rural Electrification

A key renewable energy policy by the Royal Government of Cambodia is the National Policy on Rural Electrification by Renewable Energy. This policy aims to (ADB 2016):

- provide access to reliable, safe electricity services, with insignificant impact on the environment;
- encourage the private sector to participate in providing electricity services by renewable energy in the rural areas;
- act as a market enabler through various incentives;,
- encourage using renewable energy technologies;
- promote electricity systems by renewable energy at least cost for rural communities, through research and pilot development;
- empower the poor to participate in rural electrification.

To meet these targets the government has established the Rural Electrification Fund (REF). The REF provides grants for rural electrification using both conventional and renewable technologies. Thus the amount of renewable energy used to meet these goals will depend on the uptake of all types of electricity sources, and the participation of relevant stakeholders, but is negligible compared to energy generation fed into the national grid.

The National Council for Sustainable Development

The National Council for Sustainable Development (NCSD) sits under the Ministry of Environment and has a mandate to coordinate and monitor the implementation of policies, strategies, legal instruments, plans and programs related to climate change. As such the NCSD must coordinate with other ministries and government bodies for an effective climate change response. Responsibilities include preparation of climate change strategic plans and the climate change financing framework.

Scaling up Renewable Energy (SREP)

The Scaling-Up Renewable Energy in Low-Income Countries Program (SREP) is part of a multi-country program under the Clean Investment Funds (CIF) initiative, with funding channelled through five multilateral development banks. The aim is to support scaled-up deployment of renewable energy solutions to increase energy access. The SREP will be used to support the Royal Government of Cambodia in undertaking renewable energy sector development (ADB 2016).

The Joint Crediting Mechanism

The Joint Crediting Mechanism was formed as a market-based approach for countries to meet their greenhouse reduction obligations from the Paris Agreement under the United Nations Framework Convention on Climate Change. The project-based bilateral offset crediting mechanism was initiated by the Government of Japan. The mechanism facilitates the transfer of low carbon technologies and infrastructure to achieve miti-

gation of greenhouse gas emissions and contribute to the sustainable development of developing countries (ADB 2016). A joint crediting mechanism agreement was signed between Cambodia and Japan in 2014.

Energy Efficiency Program

MME have recently launched the revised National Policy, Strategy and Action Plan for Energy Efficiency as part of the EUEI-PDF program. This energy efficiency program revises the program launched in 2013 and limits the scope of the sectors targeted to buildings, industry and transport. The program has an aim to implement a range of demand pull, technology push, and finance push instruments, such as awareness raising, creating financial incentives for energy efficiency, capacity building and development of standards.

The two main goals of this policy are to (EUEI-PDF/MME 2017):

1. Improve the management and maintenance of existing infrastructure (e.g. buildings) and industrial processes (e.g. for the use of fuel wood) for increased energy efficiency;
2. Increase the transfer and adoption of energy efficient technology (e.g. fuel efficient vehicles and light bulbs) to reduce energy intensity.

The overarching target set for the national energy efficiency policy is to reduce energy demand by 20% by 2035, relative to the business as usual scenario.

The Environmental and Natural Resources Code of Cambodia

This code has been developed in collaboration with the Ministry of Environment principally by Vishnu Law Group. The code is an extensive effort to set environmental standards and direction that will be managed by the Ministry of Environment working with other ministries. The code covers many environmental topics. The section most relevant to a sustainable energy transition is Book 3, Title 6: Sustainable Energy.

This section aims to achieve sustainability objectives through (MoE 2016):

- support and promotion of sustainable energy projects;
- consideration of the Kingdom of Cambodia's international climate change commitments in all decision on energy projects;
- adoption of a clear sustainable energy target;
- consideration of financial incentives to promote sustainable energy projects;
- promotion of environmentally friendly technology;
- support for decentralized sources of energy and mini- and micro-grid systems; and
- promotion of household rooftop solar and other household generation and storage systems.

The code has now been through seven revisions but has still not reached a point where it can be enacted and as such, how the various ministries will take on the requirements of the code is also as yet to be seen.

Stakeholder perceptions

As part of the development of this brief, stakeholders from government, development partners and the private sector were interviewed to determine the policy gaps in the energy sector.

Government

Currently, the government has a predominant focus is on the expansion of the transmission and distribution electricity network. They are particularly open to biomass projects. However, they still have concerns about the intermittency of solar PV, and how generation by grid-connected households may affect the stability of the grid and the ability to recoup capital expenditure of infrastructure. The government is also keen to support industry, and thus they are interested in ways of reducing energy costs for businesses.

Development Partners

Various development partners have tried different approaches and programs for supporting renewable energy, and at all scales- from household systems to utility power supply. To improve the uptake of renewable energy, development partners highlighted the need for:

- the government to set renewable energy targets;
- clear policies/regulation, and clarification of existing regulation relevant to renewable energy;
- policies that support the uptake of renewable energy and energy efficiency technologies, such as tax deductions and guaranteed grid access to renewable projects.

International development partner co-financing and credit guarantees are available and important for a finance push. However, there is a need for improved demand-pull policies that create a clear signal for increased renewable energy.

In its *White Book,* EUROCHAM (2016) emphasises the need for forming a green building council that could work to ensure sustainable building practices throughout Cambodia. This would be an important step towards meeting the goals of the EUEI–PDF program.

Whilst solar energy and biomass have become a high focus for many of the development partners, fewer organisations are focusing on deforestation from wood use. Wood use from industry and for charcoal production is particularly unsustainable and is leading to deforestation, particular as cleared timber from economic land concessions becomes less available. In Cambodia, one of the few organisations working on this issues is Geres, who have shown the impacts of this wood use and demonstrated the potential of other agricultural waste biomass resources (Joya 2015).

Private Sector

From discussions with the private sector, it was clear that opportunities existed for renewable energy but also many regulation barriers, which make it difficult to deploy new technologies. To achieve an enabling regulatory environment, the private sector demands for:

- clarity – clearly defined legislation relating to renewable energy (particularly relating to solar PV, and grid connection);
- simplification of meeting regulation requirements, such as creating a clear process for licensing and templates for power purchase agreements;
- from part of the government to show a clear sign to investors that they support the deployment of renewable energy – such as through setting renewable energy targets;
- a focus on policy to remove illegally logged wood from industry supply chains, and a need to increase the number of businesses and organisations working on this;
- a focus on enabling the private sector, as Cambodia has a strong private sector-led strategy for change and development.

Whilst several fiscal and investment incentives have been introduced, the possibilities and ease for companies to benefit from these incentives vary greatly, as does the information on reduced customs duties for renewable energy technologies.

Summary

Cambodia is still lacking in clear policies for the promotion and implementation of renewable energy and energy efficiency projects. Whilst several projects are underway for utility scale solar PV deployment, EDC and MME are still taking a conservative approach to this technology, despite the interest from developers and the need to increase and diversify energy generation in Cambodia.

Large scale hydropower has been the focus for increasing generation capacity. However, an indefinite halt to starting construction on new hydropower projects has recently been implemented by the government, due to the environmental and livelihood risks associated with large scale hydropower.

Clear policy reform is evident from industry for making a more enabling environment for renewable energy and energy efficiency. RISE indicators and comparisons to policy reform occurring in nearby countries also provide direction for where a focus is needed. A summary of policies, programs and regulations that have been achieved in Cambodia and ones that are still required can be seen in Table 4. As can be seen, compared to the Philippines, Malaysia and Vietnam, very few enabling policies have been implemented, with many options for improvement in each of the *demand pull, technology push and finance push* categories.

Specific recommendations for a few of these highlighted regulatory tools follow in *Part 4: Policy recommendations to improve the enabling environment*.

Table 4 Summary of demand pull, technology push and finance push policies, programs and regulation implemented and missing in Cambodia.

ACHIEVED	MISSING
Demand Pull	
• Hydropower target (>50%, 2020) • Off-grid RE sector strategy and plan	• Renewable energy targets • RE Sector strategy • Feed-in-Tariffs • Priority grid connection for renewable technologies • Priority purchase and payment of energy from renewable technologies • Clear licensing and connection regulation • Environmental standards, building codes, mandatory energy labelling
Technology Push	
• Pilot solar and biomass utility projects • Grid connected solar rooftop businesses • Good solar initiative (off-grid)	• Renewable portfolio standards • RE and EE Guidelines • Development of renewable technology manufacturing sector • Renewable energy and energy efficiency advocacy programs • Research and development initiatives • Public procurement policies for renewable energy • Human resource development
Finance Push	
• Some international development partner co-financing and guarantees. • Tax and VAT exemptions for some projects • Some local financing	• Stable, long term feed-in tariff (policy certainty) • Accelerated depreciation • VAT exemptions for RE and EE technologies • Tax benefits • Green technology finance scheme (financing guarantees and reduced interest rates) • Policies targeting transaction costs • Credit guarantees • Climate bonds

Part 4: Policy recommendations to improve the enabling environment

Renewable Energy Targets

An aspirational renewable energy target of 23% by 2025 was established for the ASEAN region, set by the AMS at the 33rd ASEAN Ministers on Energy Meeting in 2015 (ACE 2015, ACE 2016).

Currently, Cambodia does not have specific renewable energy targets in the framework of its energy or renewable energy policy. However, Cambodia will likely meet the ASEAN targets, due to the large amount of large-scale hydropower that is already in operation and planned under Cambodia's power development plan. In 2015, approximately 47% of power generated was from large-scale hydropower (EAC 2016).

To diversify the energy mix, protect the environment and improve energy security, renewable energy targets excluding large-scale hydropower have also been recommended for Cambodia in reports by deFerranti, Fullbrook et al. (2016), and WWF (2016), and in the Environmental and Natural Resources Code of Cambodia (draft) (MoE 2016).

In *Switching On: Cambodia's Path to Sustainable Energy Security,* (deFerranti, Fullbrook et al. 2016) propose two possible interim renewable energy targets (excluding large scale hydropower):

- 100MW by 2020 (representing 10% of peak demand in 2015 of approximately 1.000MW).
- 156MW by 2020 (representing 10% of peak demand in MME's low case (+20% reserve margin) forecast for 2020).

Setting of these targets will send a clear message to potential investors and lower the perceived risk of investment into these technologies. This policy will help Cambodia to improve its RISE indicator *planning for renewable energy expansion*.

Grid-connected solar PV (Residential, commercial and industrial)

The price of electricity in Cambodia, combined with the ample annual hours of sunshine, make Cambodia advantageous for the use of grid-connected solar for residential, commercial and industrial sites. As current legislation stands, however, it is not explicitly stated that it is legal to connect a solar PV system to the grid; nor that energy not consumed onsite (self-consumption), can be legally supplied into the grid. This policy would help Cambodia to improve its RISE indicator n*etwork connection and pricing*.

To clarify this position, it would be beneficial for EAC to produce a legal document declaring that:

- residential, commercial and industrial systems installed for self-consumption, may legally connect and synchronize their solar PV system to the distribution network;
- no generation license is required for these systems.

This demand pull regulation would remove a perceived risk and allow households and businesses to be confident to install solar PV systems. Following this, a next rooftop solar policy initiative could trigger a technology push policy to create a feed-in-tariff to reward the generator for supplying energy to the grid close to demand areas. The rate would be based on:

- the average cost of power at the point of consumption, with a charge subtracted to cover grid costs. A tariff of 0.091USD/kWh was selected for the 10MW utility solar project in Bavet City, Svay Rieng Province (EdC 2016). This tariff price could also be used for the rooftop grid connected feed-in-tariff. EDC could administer this payment and then charge the network licensee for this power.

The benefit is that this measure would improve the economic return of a rooftop solar PV project, whilst providing low cost energy to EDC close to the point of consumption. For Cambodia, it would reduce fuel imports and help to meet energy requirements. For business, it would lower the cost of solar PV installations, allowing them to access energy at a lower price than that offered by the network operator. This policy will help Cambodia to improve its RISE indicators of c*onsumer affordability of electricity* and *incentives and regulatory support for renewable energy*.

Large scale solar PV

The predominant barrier to utility solar PV projects is that purchasing entities are not yet convinced of the value of solar energy. As such it is difficult for them to justify the purchase of solar energy over seemingly lower cost hydropower. A technology push is therefore needed to demonstrate the benefits of solar PV and to promote an understanding of how this technology works:

- Solar PV, which has a high output during the dry season, can be complimentary for hydropower plants, which generate far less energy during the arid months causing significant energy reliability risk during droughts.
- Whilst solar PV production can be highly variable over a day, this effect can be mitigated through distributing systems across the country.
- Unlike hydropower resources and the supply of coal, oil and gas, availability of solar energy is extremely predictable for many years into the future. Energy resource diversification helps to ensure energy security and reliability.
- Solar energy will reduce coal imports.

Pilot projects demonstrating these benefits will help to promote demand-pull policies that shift away from predominantly meeting future growth by using new coal and hydropower power plants. They also support creating a more enabling environment for this technology, such as:

- accessible, transparent and value-based contracts for energy generation;
- streamlined licensing processes and licensing regulation aligned with solar development companies.

Sustainable biomass companies

Companies such as Sustainable Green Fuel Enterprise (SGFE) have shown that financially sustainable production of charcoal using waste biomass resources is possible. The scaling up and formalisation of the sustainable biomass industry would help to provide low carbon fuels whilst reducing rates of deforestation. This is a very nascent industry and as such demand pull, technology push and finance push policies will all benefit these businesses to be launched.

- Fiscal incentives to support sustainable biomass companies,
- Continued support of VAT exemption and extension to sustainable biomass companies that can demonstrate their environmental and social benefits,
- Business support to access local financing for expansion of production capacity.

Conclusion

This policy paper briefed in detail about the environmental, financial and energy security rational of an energy transition in Cambodia and the role of the regulatory environment in enabling this transition more effectively.

Policy overviews from the Philippines, Malaysia and Vietnam were given, presenting the demand pull, technology push and finance push mechanisms used as part of their energy transition. The three countries reviewed had all set renewable energy targets, sending a clear signal that their governments were behind energy diversification and a shift towards renewable energy.

The RISE indicators focused on three main categories: energy access, energy efficiency, and renewable energy, with Cambodia only achieving an overall score of 42%. Existing policies and programs in place where examined to outline what is already in place and being pursued for the energy transition. Development partners and the private sector showed a strong interest in policy reform that supported the deployment of solar PV. Using the RISE indicators and stakeholder engagement, it was highlighted that there are currently several gaps in Cambodia's regulatory environment that could be focused on to support this transition.

The setting of renewable energy targets can be seen as a strong signal for Cambodia's commitment to move towards an energy transition. Providing a legal basis for connecting rooftop solar systems was suggested to enhance investor and consumer confidence to invest into these systems. A technology-push approach for large scale solar systems was also recommended to demonstrate the advantagees of utility scale solar. Policy support for sustainable biomass companies could allow these businesses to compete financially with informal businesses and help this nascent sector to grow and contribute to the sustainable energy use of Cambodia. These four areas for policy reform were chosen to demonstrate how to build an enabling environment for renewable energy and energy efficiency.

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