Economic Instruments to Leverage Clean Energy Investment

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1.0 Introduction

Mobilizing finance for the implementation of Nationally Determined Contributions (NDCs) has been a primary focus of international discussions on achieving the goals of the Paris Agreement on climate change. It is estimated that as much as USD 12 trillion will be required to keep the world below a 2 degree Celsius temperature change threshold (Bloomberg New Energy Finance, 2016). Likewise, financing the achievement of the Sustainable Development Goals (SDGs) is also a significant challenge; meeting the 17 SDGs will require very high investment, with estimates of as much as USD 1.4 trillion in annual spending (Schmidt-Traub, 2015). The trillions needed for meeting the climate goals and SDGs can certainly overlap, but the overall message is that investment requirements are immense.

A clean energy transition is a central part of achieving both climate targets and SDGs, in particular SDGs 7 (affordable and clean energy), 11 (sustainable cities and communities) and 13 (climate action). In international fora, developing countries systematically call for greater support from developed countries in conducting a clean energy transition. While there is undoubtedly an important role for international support, there is also widespread recognition that the bulk of the investment needed to meet the Paris objectives and SDGs will have to come from private investors aiming to make commercial returns. For instance, Article 2 of the Paris Agreement highlights the need to make "finance flows consistent with a pathway toward low greenhouse gas emissions and climate-resilient development" (Conference of the Parties Twenty-first Session, 2015). The same rationale is applied to meeting SDGs, in particular those with a link to energy (United Nations Conference on Trade and Development [UNCTAD], 2014).

Yet one of the top challenges in NDC implementation identified in a global NDC review is private sector buy-in and engagement (van Tilburg, Lütkehermöller, Rawlings, Roeser, & Luijten, 2017). Many of the needed investments are not currently considered to be attractive private sector opportunities. How can those opportunities be made sufficiently attractive for private investors to dedicate their funds at the scale needed for the necessary energy transition? Answers to this question suggest a strong role for economic instruments capable of leveraging private investment.

1.1 Why Focus on Economic Instruments?

Economic instruments are government policies that affect the behaviour of producers and consumers by causing changes in the prices to be paid for goods or services (Organisation for Economic Co-operation and Development [OECD], 2005). In the context of sustainability, they typically include fiscal and other economic incentives and disincentives that internalize into prices the true social and environmental costs of goods and services (OECD, 2003).

Considering the scale of the funding challenge for implementing the necessary energy transition, the rationale for focusing on economic instruments is twofold:

- First, by definition the very premise of economic instruments is that they are intended to exert influence over a wide variety of private sector actors by changing prices and other incentives. In other words, they are designed to harness market forces.
- Second, many economic instruments are fiscal measures that raise revenues. In such cases, revenues can be reinvested in various ways in the economy. This can apply to any national development priorities—including further measures to foster innovation and drive investments into a sustainable energy transition.

Further, many climate action strategies in developing countries today appear to underutilize economic instruments. Relatively few NDCs have included economic instruments as part of their structure. An assessment in the leadup to COP 21 in Paris identified that only 39 NDCs covering 66 countries address at least one form of domestic economic instrument as part of their plan to achieve the NDC (Terton, Gass, Merrill, Wagner, & Meyer, 2015).[1] It is time to move from a piecemeal approach to NDC implementation—for example in which governments focus on identifying a list of projects to implement—to macroeconomic planning aligned with the NDC targets and energy-related SDGs. It is only by providing investment-friendly fiscal measures and market regulations that a meaningful shift in investments toward renewable energy can occur at scale.

1.2 Types of Economic Instruments

Economic instruments can be targeted policies aiming to achieve a certain outcome such as environmental and carbon taxes, direct budgetary transfers and tax relief for renewables. Other economic instruments can provide income and price support to investors through market interventions (e.g., renewable feed-in tariffs and clean energy certificates favouring renewables) or pricing carbon through emission trading systems.

Economic instruments used to promote renewable energy can generally be categorized into four broad groups:

- **Price regulation** is direct government intervention to set the price of energy, typically either by setting a fixed price or by setting a fixed gap between the market price and the official price. Price regulation of renewable energy is a form of subsidy that helps to improve the financial viability of renewable energy investments. Regulatory instruments, such as feed-in tariffs, generally do not raise revenues for the government—they require either direct expenditure or regulation that sets up a transfer between private actors and renewable energy-generation facilities. If a country has existing price regulation for fossil fuels, then deregulation—fossil fuel subsidy reforms—will also alter relative pricing, improving the viability of renewable energy investments, as well as freeing significant volumes of government revenue.
- **Quantity-based instruments** are market regulations that make a specific outcome mandatory, such as a quantity of renewable energy generated. This guarantees that producers will find a market for their goods at whatever price this outcome can be achieved, at the same time as maintaining an incentive to compete over prices, thereby bringing them down over time. Common quantity-based instruments include trading mechanisms, such as Renewable Portfolio Standards that allow the trading of Renewable Energy Certificates (RECs) or emissions trading systems to tackle GHGs. Such instruments have the potential to raise revenues for the government—for example, when quotas are auctioned.
- **Fiscal instruments** encompass direct budgetary transfers and various forms of taxes, such as value-added or carbon taxes, as well as tax holidays and reduced tax rates. In some cases, fiscal instruments may overlap with price regulation: for example, fixed prices may be paid for through direct budgetary transfers, or a fixed gap between market and official prices could be implemented through a tax reduction. In other cases, fiscal instruments may serve an independent function. For example, a tax on coal could be created to reflect its local and global air pollution costs, thereby changing relative prices for different energy sources, and improving investment conditions for renewables. When fiscal instruments take the form of taxes, they raise funds for governments.
- **Financial instruments** include green bonds and policies that provide financial support to renewable energy projects, thereby directly helping to de-risk such investments. By lowering risk, such policies can lower the cost of private finance and thereby drive increased investment flows into renewables. Such instruments, when they include financial products such as green bonds, can help raise revenues for governments.

[1] The European Union NDC covers 28 countries.

Table 1 presents examples of the different types of economic instruments, highlighting their potential to either mobilize revenue or incentivize investment or both.

Table 1. Types of economic instruments to promote renewable energy

Economic instruments		Potential to raise revenue	Potential to de-risk and incentivize private investments
Price regulation	Feed-in Policies and Premiums over Spot Price	—	Directly
	Other Premiums: Generation-Based Incentives (GBIs), Premiums for Use of Domestic Equipment or Services	—	Directly
	Deregulation of fossil fuel prices	Directly or indirectly	Indirectly
Quantity-Based Instruments	Renewable Portfolio Standards	Directly	Directly
	Emissions Trading Systems	Directly	Indirectly
	Competitive Bidding/Auction	—	Directly
	Removal of consumption and production obligations for fossil fuels	Indirectly	Indirectly
Fiscal instruments	Taxes on fossil fuel production and use, to raise revenue and internalize externalities, including GHG emissions	Directly	Indirectly
	Direct budgetary transfers, e.g., R&D grants, compensation for price regulation policies	—	Directly
	Removal of tax exemptions and budgetary transfers for fossil fuels	Directly	Indirectly
	Tax credits and exemptions	—	Indirectly
Financial Instruments	Green bonds	Directly	Directly
	Preferential Loans and Loan Guarantees for renewable energy	—	Directly
	Withdrawal of preferential loans and loan guarantees for fossil fuels	Directly	Indirectly

Source: Adapted from Elizondo Azuela & Augusto Barroso, 2011; Gerasimchuk, Wooders, Merrill, Sanchez, & Kitson, 2017.

Much attention has been paid to the role of economic instruments to achieve climate targets or different environmental and social objectives more broadly. However, these targeted instruments exist within a broader economic policy framework—and patterns of energy production and use are profoundly affected by broader economic policy and economy-wide fiscal overhauls. This includes the introduction or phase-out of various energy subsidies and the introduction, simplification or harmonization of taxation systems such as value-added tax (VAT) and excise taxes. Such reforms may be introduced to pursue non-climate or energy objectives, such as decreasing government expenditure, increasing tax revenue, increasing transaction costs for business and tax administration, or providing support to vulnerable groups—but with the right design, they can also create substantial co-benefits or disadvantages for the climate and for achieving the SDGs more generally. Moreover, relevant economic instruments can even include more generalized investments, such as in areas like innovation, infrastructure, education and health services (OECD, n.d.). Assessments of economic instruments for the clean energy transition should also consider the ways in which climate objectives can and should be mainstreamed into major ongoing structural reforms, which may be a window of opportunity to introduce policies that promote renewable energy and climate mitigation.

1.3 Objectives and Approach for Case Studies

The objective of this report is to explore the role of economic instruments—be they economy-wide or focused on the energy sector or greenhouse gases (GHGs)—in incentivizing private investment that will assist in achieving the NDCs and energy-related SDGs. The focus on economic instruments is not meant to suggest ruling out other types of policies. Rather, the intent is to explore in detail specific economic instruments of different types and highlight how they can support—or sometimes unintentionally detract from—NDC and SDG achievement.

While the report focuses on the central role of domestic policies to leverage private investment, it also examines how international public climate finance can be complementary. International climate finance has played a role in de-risking renewable energy investments through interventions that lower the cost of technologies or tackle financial barriers, but also importantly in creating policy environments that are conducive to private investment in support of NDC and SDG achievement. Considering the scarcity of international public finance, there is a need to use it carefully and strategically through an integrated vision of climate finance and economic instruments, seeking to use climate finance as a complement to economic instruments (World Bank, Ecofys & Vivid Economics, 2017).

The report explores the role of specific economic instruments, enacted through recent reforms undertaken in three major developing economies and G20 members, namely Indonesia, Mexico and India. The rationale for focusing on these three countries was that for each of them achieving a shift to renewable and clean energy is critical, and each country has sought to grow private investment in the energy sector, recognizing that public domestic and international climate finance resources must be supplemented to achieve the most successful transition. They also have recently conducted significant economic policy reforms that directly or indirectly affect the viability of renewable energy investments, albeit focusing on different types of policies. Together, they provide a compelling case for paying close attention to the impact economic instruments—even those not targeting energy or GHGs—can have on the renewable energy sector.

The first case study focuses on the role of fossil fuel subsidy reform and feed-in tariffs for renewable energy in Indonesia. The case study argues for major reforms of various economic instruments to be undertaken to attract private investment for Indonesia to have a chance of meeting its 23 per cent renewable energy target by 2025.

Mexico comes next, with a description of extensive energy policy reforms that have dramatically changed the structure of the energy systems and created a competitive market for electricity generation and commercialization, thereby making room for renewable energy to compete. The case study examines the use of a trading instrument established as part of the reforms through a market regulation, namely the Clean Energy Certificates (*Certificado de Energia Limpia* [CEL]) mechanism. By setting obligations for the consumption of clean electricity and allowing CELs to be used to meet the obligations, the CEL mechanism creates a market that helps make renewable energy more attractive.

The final case study concerns India and takes a macroeconomic view to explore the significance of economy-wide tax reforms for the renewable energy sector. While the Goods and Services Tax (GST), introduced in 2017, does not have specific objectives with regards to renewable energy, the case study illustrates the implications of the

GST on the renewable energy sector. It acts as a useful reminder of how economy-wide instruments that are not environmentally focused can matter a great deal to drive or obstruct the needed investments in renewable energy.

In exploring the role of economic instruments through the case studies, we paid pay special attention to the perception of private investors active in the market. As such, the assessment of these mechanisms is based not only on a review of available literature, but also on interviews with experts in various stakeholder groups, such as government, development organizations and non-governmental organizations, but predominantly from private sector actors (see Table 2).

Table 2. Types of actors interviewed

	Government	Development organizations	Non-governmental organizations	Private actor
Indonesia	4	10	2	7
Mexico	2	1	2	3
India	2		1	5

The views of these players are critical to creating the necessary investment environment for renewable energy growth. For each case study, situation-specific recommendations are presented, and the study concludes by drawing some general recommendations on the role of economic instruments to promote private investment in achieving the energy transition that underpins the NDCs of many countries and several SDGs.

2.0 Indonesia – Clean Energy Policy

2.1 Context

Indonesia has abundant potential resources of clean energy, but their development has historically lagged behind other countries. Over the past several years, the country has adopted strong national commitments to clean energy and GHG mitigation through its renewable energy policies and international climate change commitments. But it has also faced significant barriers to investment that includes an uncertain regulatory environment and a history of fiscal support for coal energy. This chapter focuses primarily on economic instruments targeting electricity generation in Indonesia.

What are the drivers behind the mismatch between renewable energy commitments and the results on the ground? What is preventing private investors from helping deliver on the government's pledge? Indonesia certainly does have significant potential renewable energy resources to exploit, from "favourable solar resources right across the country" (Bridle, et al., 2018) and geothermal expansion potential across all the major islands (Poernomo, et al., 2015).

There is a need for a reconsideration of fiscal support for renewable energy generation. Indonesia has gone through two iterations of this that both seemed to miss the mark. The first iteration of feed-in-tariffs promised to pay too large a rate to developers such that state-owned distribution company Perusahaan Listrik Negara (PLN) could not enter into agreements that would be economically sustainable. The second iteration placed renewables at a distinct disadvantage against coal-based electricity, which is the source of the majority of power produced. What Indonesia needs is an alternative that balances economic concerns about the cost of power for Indonesians while also encouraging a longer-term shift to cleaner energy sources that will assist with the achievement of NDCs and SDGs, which include within them national priorities related to poverty reduction, energy access and climate change.

Clean Energy Landscape and Renewable Energy Targets

Indonesia's electricity market is dominated by the state-owned energy company PLN, which has a monopoly on electricity distribution and is also the primary electricity generating entity in the country. PLN is the entity that enters into agreements with potential private sector electricity generators looking to supply the grid. As such it has a high degree of influence on the expansion of renewable energy in Indonesia. PLN is also expected to cover any economic losses in the electricity sector, which makes it cautious in terms of signing onto investment agreements with private developers. The sector would not be categorized as a liberalized market, but there are opportunities for private developers, under the right conditions, to generate and sell electricity to PLN.

The energy policy of Indonesia is rooted in the National Energy Plan (RUEN) that was prepared by the Ministry of Energy Resources in 2017. This plan includes a target to increase the share of new[2] and renewable energy in the national energy mix to 23 per cent by 2025 and 31 per cent by 2030 (President of the Republic of Indonesia , 2017). The RUEN also indicates what share fossil fuels should have in the energy mix, predicting that by 2025 oil should be less than 25 per cent of the energy mix. Coal is predicted to have a minimum of 30 per cent by 2025 and gas a minimum of 22 per cent (Republic of Indonesia, 2016).

Despite this commitment, and past supports for renewable energy, the share of renewable energy in the mix has remained significantly lower, at roughly 12 per cent of total energy production; meanwhile, the share of coal in energy production has increased significantly. Over the past decade hydro and geothermal capacity has increased by 39 and 67 per cent respectively, but in real terms this has been significantly outpaced by coal (Bridle, et al.,

[2] The term "new" has been used to refer to a category of energy sources that are neither traditional nor renewable in the Indonesian context. This includes hydrogen, liquified coal, gasified coal, coal bed methane and nuclear. It is expected that these fuel sources will be a very small portion of the target.

2018). In 2015 the total amount of installed capacity for coal was roughly 25,000 MW, while hydropower was 5,000 MW, geothermal less than half of that and solar very little (Bridle, et al., 2018). The 2017 *Handbook of Energy & Economic Statistics of Indonesia* prepared by the Ministry of Energy and Mineral Resources indicated that installed capacity of coal power had climbed to almost 30,000 MW while hydropower grew by only 50 MW, geothermal by 300 MW, and solar by only about 5 MW (Ministry of Energy and Mineral Resources, 2017).

The trend in energy growth, despite supportive high-level energy policy direction and abundant resources, as been toward expansion of coal production. However, in addition to the RUEN, the national climate change policies in Indonesia should also support a shift to renewables.

Climate Change Targets Included in NDC and SDG Roadmaps

Indonesia's Nationally Determined Contribution includes a pledge to reduce emissions by 29 per cent below the 2030 business-as-usual scenario to increase to 41 per cent with international support (Republic of Indonesia, 2016). The NDC also references past and expected future engagement with the private sector as an important step to achieving the NDC, but does not elaborate on specific strategies to achieve this. Indonesia's Third National Communication outlines that the land use sector remains the largest emitting sector, but that energy also is responsible for 70 per cent of non-land use emissions (Republic of Indonesia, 2017b). Emissions have been rising in recent years, with predicted increases to continue until 2030, as much as 95 per cent over 2010 levels (Climate Action Tracker, 2017). The continued predicted expansion of coal, despite the targets for renewable energy, is a contributing factor, and could hinder the achievement of GHG reduction goals.

Indonesia laid out its plans to implement the SDGs with Presidential Decree No. 59/2017 (Republic of Indonesia, 2017a). The SDGs are incorporated into three levels of Indonesia's development planning, including the National Long-Term Development Plan (2005–2025), the medium-term development plan (2015–2019) and short-term one-year Government Work Plans (UN Department for Economic and Social Affairs, 2018). The President is responsible for implementation, supported by a National Coordination Team that is formulating an SDG roadmap. Each individual SDG is assigned to a line ministry. Indonesia has expressly endorsed its obligation to the SDGs including to eradicate extreme poverty by 2030. One of the strategies mentioned for this is related to energy, namely better targeting of electricity and gas subsidies to the poor who most need them (Republic of Indonesia, 2017c), a move that is also intended to improve overall financial management.

Existing and Relevant Economic Instruments

Indonesia's history has seen its energy policy closely linked to the use of economic instruments, in particular its fiscal policies, in terms of subsidies that have existed for several fuels including transport fuels, coal and residential-use LPG.

Over the past decade—and more accelerated since President Joko Widodo came to power in 2014—there have been concerted efforts to reform some of these subsidies, with greater success in some areas than others.

Prior to the 2014 reforms, gasoline and diesel in Indonesia were sold at below-market rates, leading to significant subsidies at times when global oil prices were high. Essentially the price at the pump for these fuels was fixed and would not fluctuate when oil prices were high. The difference between the two was covered by a state-owned utility, and ultimately budgeted for by government. In 2014 the figure budgeted to cover the transport fuel subsidies was IDR 246 trillion (roughly USD 17.6 billion), which was equivalent to 13 per cent of all government expenditure (Pradiptyo, Susamto, Wirotomo, Adisamita, & Beaton, 2016). At the end of 2014 major reforms were undertaken that removed subsidies for gasoline (except those covering some distribution costs) and introducing a fixed IDR 1,000 subsidy for diesel. This—coupled with oil prices falling—allowed for massive fiscal savings, equal to IDR 211 trillion (USD 15.6 billion). These savings were then reallocated to regional transfers to villages, special programs to boost growth and reduce poverty (in line with the SDGs), and investment in infrastructure (Pradiptyo et al., 2016).

Over the next few years Indonesia attracted a lot of attention for this move, which was considered a success (IEA, 2016a). Subsidy reforms were also credited with easing traffic congestion on studied roadways by about 10 per cent (Burke, Batsuuri, & Yudhistira, 2017). However, recently there have been concerns about the return of subsidies, as the government has neglected to keep transport fuel prices linked to market rates. Recently the President instructed that fuel prices should be kept stable for the next two years, a move that effectively reintroduces subsidies if oil prices climb (Varagur, 2018). Subsidies for transport fuels are effectively back in place despite the strong efforts in 2014/15.

LPG, as previously mentioned, is a target area of the government in line with its commitment to the SDGs. LPG 3-kg cylinders have been sold at a fixed price to all buyers, which means the subsidy is not targeted, and in effect, the greatest benefits are felt by higher-income persons with greater buying power (Toft, Beaton, & Lontoh, 2016). Subsidies for LPG were equivalent to 2.76 per cent of state expenditure in 2014, equal to IDR 48.97 trillion (USD 3.91 billion) (TNP2K & IISD, n.d.). There have been some efforts to reform LPG subsidies, with different models examined, including integrating the subsidy into family rebate cards targeted to low-income households or integrating an electronic coupon system linked to SMS or other cellular telephone technology and e-banking. However, recent indications of projected budgets for 2018 indicate that any progress over the next year will be limited (GSI, 2018) even as prices climb to the point where half of the fuel cost is subsidized (Asmarini, 2017).

Electricity consumption and coal production subsidies have also been prevalent in Indonesia and serve to distort the electricity market for renewable energy. They cloud the true cost of electricity which includes not only the impact of subsidies, but also the negative externalities of coal such as the cost that coal emissions have on public health. While not subsidies per se, these negative externalities should be considered in government decision making because they place a cost on the public budget through their impacts on health and the environment. Coal production subsidies amounted to IDR 8.5 trillion in 2015 (USD 644 million) (Attwood, et al., 2017) while electricity subsidies amounted to ISD 58 trillion (USD 4.4 billion) in 2016 (GSI, 2016). Like other Indonesian subsidies, users effectively pay below-market rates for electricity, while coal producers also get various financial supports. It should be noted there has been some reduction in electricity subsidies in recent years, although they remain significant (Pranadi, 2017).

As for renewable energy supports, there has been a mix of approaches. The standing policy for the past several years, prior to recent changes, was the implementation of a feed-in tariff system that was intended to support renewable energy. However, tariffs were too high for the state-owned utility PLN to justify the procurement under the feed-in tariff system, especially as renewable energy technology prices fell, and some areas of Indonesia faced overcapacity. Tariffs were lowered in 2017 through regulation 12/2017. However, this was a dramatic departure as now the tariffs to be paid for renewable energy was capped at 85 per cent of the average local production cost of energy (*Biaya Pokok Pembangkitan*, or BPP) in some regions and 100 per cent in other regions (Horn & Sidharta, 2017). Based on PerMen ESDM 50/2017 (Menteri Energi Dan Sumber Daya Mineral Republik Indonesia, 2017). If the local BPP is higher than average national BPP, then the tariff is capped at 85 per cent local BPP. However, if the local BPP is the same or lower than national BPP, then the tariff is negotiable between PLN and the developer (but not expected to exceed 100 per cent).

What this rule does is effectively dictate that the maximum price that can be paid to renewable energy developers is at (100 per cent) or below (85 per cent) the cost of electricity that is already supplying the electricity grid, and where assets are depreciated. This existing electricity supply is often coal-based electricity. In a way this price cap almost acts as a reverse incentive for renewables as it guarantees that the prices that can be made are at best even, and at worst less than the cost of the current coal-based electricity supply. It also acts as an indirect price support for entrenched coal-based electricity. While this makes it more attractive for state-owned utility PLN to sign agreements with developers, it also places a damper on renewable energy developers, who can expect less return and must outperform coal-based electricity, which forms the baseline for local production. In regions where the 85 per cent limit is in place, stakeholders have indicated that renewable energy is currently not viable, and even where the limit is 100 per cent of BPP, the opportunity is still unattractive because the local BPP is already very low in many of these regions. That said, stakeholder interviews indicated that developers are "looking east," meaning looking to invest in the more remote and less-developed regions of eastern Indonesia (where BPP may be higher). However, this comes with its own difficulty due to a lack of a large-scale grid, necessitating smaller projects which may not have the same profit margins.

With fossil fuel subsidies and supports very prevalent in Indonesia, the first major step to foster clean energy investment must be undertaking first a reform and removal of fossil fuel subsidies followed by a swap of these subsidies that favours clean energy. Subsidies have become entrenched in the current system, and part of the motivation for the 85 per cent rule is concern in PLN and government that if a cap is not in place, a growth in renewable energy will lead to even greater subsidies if these renewable energy sources are not cost-competitive. Paraphrasing a comment from an energy official: *The last thing they [PLN/Government] want are projects that will add to their subsidy bill.* Subsidy reform is clearly and desperately needed, and investments in clean energy cannot lead to a dive back into subsidies.

A direct subsidy reform with reallocation only to clean energy is unlikely to be successful in meeting the needs of all stakeholders. Fossil fuel subsidy reform, in order to be broadly publicly acceptable in Indonesia, must be accompanied by investments that will help deliver on the social goals (in line with the SDGs) of Indonesia related to poverty reduction and energy access, which are key areas of focus for President Widodo.

Reverse auctions have been mentioned multiple times as an avenue for Indonesia that has worked elsewhere. While energy consultants interviewed noted that it would not be their preference, private sector developers have been effective at cutting costs and would likely be active in an environment where reverse auctions became more prominent. A committed shift by government indicating certainty that there will be large, open, competitive auctions will likely attract developers that have so far been reluctant to invest in Indonesia.

There are embedded concerns that a shift to clean energy will either increase energy prices or impact access. This assertion was backed up through interviews with stakeholders (including developers and independent power producers [IPPs]) who believe that—particularly before the 2019 elections—there is strong hesitation to do anything that may increase electricity prices, since a primary concern remains affordability of energy. The same scenario may also be in place with long-delayed LPG reforms. For this reason, it must be communicated to first the policy-makers, and then more broadly to the general public, that a reform of the fiscal system that supports fossil fuels will have a direct benefit for Indonesians. Even renewable energy supporters indicated in interviews that strong investment in social equity and poverty could be a key to stronger motivation for renewables, particularly if policy-makers can be convinced that subsidy reform is the answer to poverty.

An additional comment worth noting was that PLN was reluctant to enter into agreements with developers because any cost above market rates that these agreements entail is expected to be covered by PLN directly. Noting this, it is likely that the government would have to provide budgeted support to PLN for it to get over its reluctance to enter into agreements with developers. Representatives within and outside government have indicated that for PLN to be an active player in renewable energy expansion, they have to ideally see a profit motive, or at least avoid a loss.

While there has been less focus on environmental taxation and carbon pricing, Indonesia has been an active participant in the Partnership for Market Readiness (PMR) as one of the implementing country participants. Indonesia's most recent PMR Project Implementation Status Report indicated that the Implementing Agency, the Coordinating Ministry for Economic Affairs, had faced some delays, but had recently gotten the implementation project back on track. The PMR project in Indonesia looks at: profiling the emissions of the power and industrial sectors; designing the governance aspects of a measurement, reporting, and verification (MRV) system; piloting the system; developing a market-based instrument framework; and conducting organization, communication, consultation and engagement (PMR, 2017).

Indonesia's PMR Implementation Status Report also references the government's participation in the World Bank NDC Partnership Support Facility which includes "support for economic and fiscal policy reforms" (PMR, 2017) as well as the "GEF – Market Transformation through Design and Implementation of Appropriate Mitigation Actions in Energy Sector" (PMR, 2017). The GEF and World Bank work also both focus on fiscal measures to support investment.

2.2 Barriers to Clean Energy Development

Aside from the way that the current fiscal system hinders a shift to clean energy through subsidies to fossil fuels and renewable regulations that have not yet been effective at encouraging wide-scale expansion of renewable energy, there are other barriers to low-carbon energy development that also need to be considered:

- Local content requirements: Interviews with renewable energy developers (Bridle, et al., 2018) indicated that unclear and at times onerous local content requirements are hindering investment. There is a delicate balance needed because on one hand there is a desire to build local industry, but the requirement for local content can drive up costs if goods have to be manufactured locally rather than imported at a lower cost. A lack of clarity on what qualifies as meeting local content requirements can also be a hindrance or caution for potential investors.
- Uncertainty in regulation: Indonesia's policies with respect to renewables have changed at times without much warning, and, in the case of the feed-in tariffs in drastic fashion. Without a long-term understanding of how regulations to promote clean energy will evolve, it is difficult for investors to make commitments to major projects that will take years or decades to pay back on their initial investments.
- Abundant coal: Not only is Indonesia's coal production supported by subsidies, but coal is also abundant in the country. Indonesia ranks fourth in global coal production at 460 MT (2016), and is the second leading exporter at 367 MT (2016) (Smith, 2018). With a global shift away from coal, exemplified by initiatives like the Powering Past Coal Alliance (Government of Canada, 2018) there will be increased pressure to use more of Indonesia's coal domestically as export markets potentially dry up. Currently the price for domestic coal is also capped at a below-market value, and suppliers to PLN can apply for an increase to their approved production quota (Asmarini & Jensen 2018). These factors all contribute to an entrenched position for coal now and in the near term.
- Public perception: While there is a good understanding of the impact of transport fuels on air quality and health, there is less of a conversation in Indonesia of the impacts of coal on air pollution and public health (Petrofsky, 2017). Without the public pressure for cleaner air that there is in countries such as India and China, there is less motivation for policy reform that favours renewables.

Any policies designed to foster clean energy investment in Indonesia would have to take into account these dynamics as well as others as part of ensuring that new policies are successful. These are also non-financial dynamics, but they can be addressed in parallel with economic instruments to drive clean energy investors.

2.3 Policies to Foster Clean Energy Investment

Policy 1: Conduct a subsidy swap from fossil fuels to renewable energy and poverty reduction

A subsidy swap in Indonesia should entail a redirection of subsidy savings to support clean energy investment that does not entail large subsidies: "A SWAP is where countries undergo fossil fuel subsidy reform and allocate some of the resulting savings toward sustainable energy development" (Merrill, et al., 2017). Indonesia's reallocation of transport fuel subsidies is similar to a swap approach and can be re-applied in other subsidy cases. The one adjustment would be a consideration not only of sustainable energy development, but also Indonesia's commitment to poverty reduction.

With the SDGs in mind, this could include supports for pilot projects in remote areas, particularly where the default fuel is diesel, and where supply lines may be long and fuels expensive, increasing energy security and access. This would address the access issue while making it easier for policy-makers to agree to reforms. Development partners have also indicated that there is greater appetite in government for investment in off-grid communities where prices can also be a bit higher for developers.

With respect to LPG it is expected that a portion of subsidy will remain to assist those who require the support. However, the remaining portion can still be redirected to other forms of low-carbon transition.

However—and more importantly—the swap should also include a redirection of revenue to support social development. The model of the 2015 transport fuel subsidy reform resulted in increased investments in growth and poverty reduction as well as transfers to villages and investments in infrastructure.

It should be noted that budgetary laws prevent the direct reallocation of revenue within Indonesia. However, the 2015 example shows how projected savings from subsidy reform can be redirected to other avenues through careful budget planning and effective prediction of the estimated savings, particularly since subsidies for fuels such as LPG directly impact the state budget.

Policy 2: Restructure renewable energy policy to support cost-competitive renewables without subsidizing coal

Recognizing earlier comments that renewable energy must be cost-competitive to attract support from key stakeholders in the energy sector (a fair statement), an approach to foster renewable energy development through fiscal reforms in Indonesia must lead to smart investment while at the same time levelling the playing field with coal-based electricity.

There are several measures that can be taken to increase renewable energy investment:

- The BPP rule restricting renewable energy should be replaced, and current coal subsidies and supports should be reviewed and where possible reformed. It is a given that renewable energy technologies have to be economically competitive, but the BPP rule puts in place an economic disadvantage for renewable electricity compared to coal which forms the basis of much of the existing power in Indonesia, particularly when prices are capped below BPP. As indicated earlier, there are also additional subsidies in place for coal production that should be reformed (and where possible removed) to both open budget space for PLN and government and also level the playing field for renewable energy.
- A shift to reverse auctions as opposed to feed-in tariffs or fixed or negotiated prices—provided they are large, open and competitive—could significantly drive down renewable energy prices. Developers would have some certainty over the opportunities available, while the government and PLN would be getting the lowest possible cost out of prospective renewable energy power developers. This would also create a much-needed pipeline of renewable energy products, services and projects including equipment, financing, maintenance and infrastructure.
- Any subsidies that are put in place for renewable energy (for example in remote areas or for new technologies) should be well structured so that they do not create a long-term burden for PLN. Multiple stakeholders indicated that the potential for a subsidy to renewable energy is a key barrier. While some technologies may require some support to foster greater implementation, renewable energy technologies have been rapidly maturing, and prices are coming down. Avoiding locking PLN into fixed, above market

prices for the long-term will reduce the concern for government and PLN about entrenched subsidies. Any subsidies for renewable energy should be budgeted by government to get over reluctance about PLN entering into agreements.

Private Sector Considerations

Analysis of the sector (including interviews with Indonesian experts) predicts that there is little chance Indonesia will be able to meet its 23 per cent renewable energy target by 2025 without significant changes in domestic implementation (Bridle, et al., 2018). If this target is not met—meaning that a significant shift to renewables does not occur—it is difficult to see Indonesia meeting its GHG reduction target even with international intervention. Interviews with private sector developers, development partners and other stakeholders with interest in private sector development all indicated several key barriers to investment, but also opportunities to overcome these with reforms to key policies and practices.

From the perspective of developers, the most commonly referenced element of de-risking investment was less about specific prices or incentive mechanisms, and more about clear policy certainty for investors, knowing what to expect once an agreement is signed and a firm timeline for development, both of which are currently lacking.

Recognizing the concern over subsidies, the suggestion was made that there needs to be stronger partnerships with the private sector, and that one solution is that once renewable energy subsidies are put in place, they be time-limited to a set number of years that scale down over time as projects become operational. Adaptive subsidies that would evolve as technologies matured was also advocated, rather than the blunter tool of a set price cap or floor. These would phase out over time but be responsive to how the market is acting. Adaptive subsidies should also help reduce the risk for both parties either that developers enjoy windfall profits or the government scares off potential developers with locked-in low-cost offers.

However, far and away the most called for change by the private sector is to end the 85 per cent rule. Certainly, there is a profit motive for the private sector in calling for this move, but nonetheless they see it as an entrenched barrier to investment.

Another critical area of concern for the private sector is a clean energy lending environment. The banking system is not currently orientated toward the provision of green finance. Local bank interest rates are comparatively high, and renewable energy is still perceived as an area that calls for caution in investing compared to traditional fossil fuel electricity projects. Climate finance donors and lenders can push for lower interest rates and other lending supports for clean energy projects, as well as promoting security for clean energy lending through partnerships between private and public entities. They can also use their investment to provide equity or otherwise reduce the average cost of capital to private sector lenders. It is also critical that private stakeholders push for private sector access to climate change finance where appropriate so that climate finance is not funnelled solely to public sector projects, a risk that has been identified in interviews.

The Ministries of Energy and Finance have been involved in discussions with financial institutions and others to improve the investment climate for clean energy and should be engaged by parties such as development partners also looking toward eliminating barriers to clean energy investment in Indonesia.

Role of Climate Finance

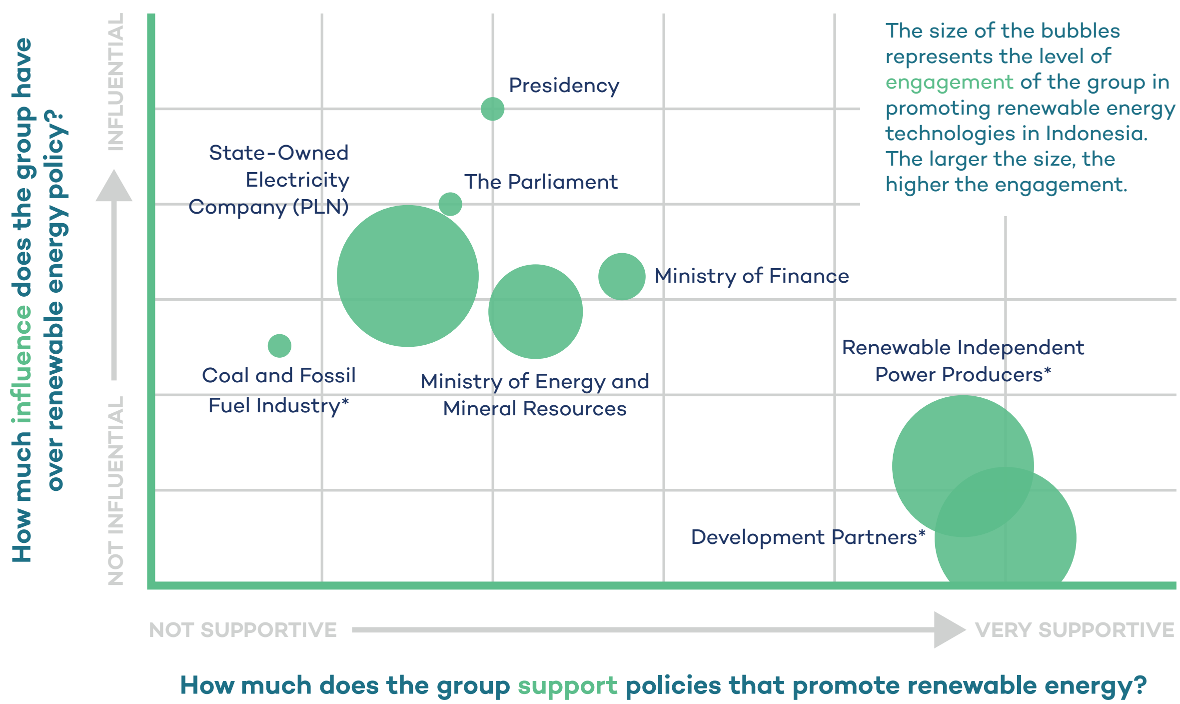
The issue in Indonesia is neither a lack of funds nor a lack of support—it is that implementation has been lagging due to the need for more engagement from key stakeholders and the need to create a more attractive investment environment for clean energy projects. The individual stakeholders, their engagement and their individual influence are highlighted in Figure 1.

While development partners, including bilateral country relationships and multilateral funders, are very engaged and very supportive of clean energy investment in Indonesia, they are not strongly influential in policy development. This can be rectified by engaging some of the more influential, but less involved parties such as the relevant ministries and ultimately the President.

Pressing these more influential members who support policy change would be a good position for development partners. This could include a push for regulatory changes as well as changes in domestic fiscal policy. It would also be useful to back this up with evidence of the benefits that these actions can have in terms of leveraging international climate finance from public and private sources.

An important consideration for donors and financiers is that the issues of poverty and energy access are also significant for these influential stakeholders, and so discussion on a low-carbon energy transition must keep in mind that issues of poverty and access will often take precedence over switching to clean energy. Renewables have to be as or more effective at addressing these related issues in order for less engaged, but notionally supportive policy-makers to fully buy in. For this reason, it is critical to make the case that renewable energy can be economically competitive with fossil fuels to encourage buy-in.

Figure 1. Relative support for policies promoting renewable energy, influence and level of engagement of stakeholder group



Source: Bridle, et al., 2018.

Another critical role for development partners and climate finance bodies is in building bridges and supporting private sector investment through leveraging. Indonesia has successfully attracted a significant amount of climate finance already, and there is potential for more as the presence of the Green Climate Fund (GCF) in the country matures and GCF funding makes its way into Indonesia-focused projects. There are significant bilateral and multilateral funds available for climate investment already (Figure 2), but implementation has still lagged, and there is potential to engage the private sector more effectively. With the challenges to investment inherent in the current energy pricing regime, climate finance can play a role in bridging some of these gaps. For example, with the low level of penetration of advanced renewable energy sources, one focus for climate investment can be in developing pilot projects and other de-risking activities that can pave the way for greater climate investment in the future.

In terms of its own domestic policy framework supporting investment, Indonesia launched a Roadmap for Sustainable Finance in 2014 (Otoritas Jasa KeuanGan, 2014) as a way to integrate climate change into its financial management in a more mainstream manner. This roadmap indicates that even with the sizeable current levels of finance available for climate change relevant projects as outlined in Figure 2, private investors will continue to have to account for over half of the required investment to meet national GHG reduction goals and, more broadly, Indonesia's NDC.

There has also been an attempt to support Indonesia's efforts to increase clean energy implementation and reduce emissions through the Partnership for Market Readiness. A USD 3 million project is currently underway that is looking at appropriate market-based mechanisms to reduce Indonesia's GHG emissions (PMR, 2017). While this project was delayed, there are currently efforts to profile the emissions of the electricity sector and estimate costs and potential for GHG mitigation actions. A measurement, reporting and verification system will also be mapped through the project as well as an eventual market-based instrument framework.

Linking climate finance to domestic policy processes (such as through the PMR) can also help drive the reforms needed without having to use climate finance on discrete clean energy projects. Results-based financing is another tool that can be used to link climate finance with achievement of domestic policy processes and building targeted implementation capacity (World Bank Group, 2017). More specifically, three roles for climate finance have been identified including (World Bank Group, 2017): driving down the cost of advanced technologies; developing the enabling environment needed for low-carbon development; and tackling financing barriers to technology deployment to support investment. Given Indonesia's domestic barriers to renewables, intervention on all three of these topics would be worthwhile.

Figure 2. Climate Finance Resources Dedicated for Indonesia (USD)

2.4 Policy Recommendations

Indonesia's energy sector is characterized by some fundamental dynamics that support investment in renewable energy, including:

- High-level support from government leadership including an aggressive growth target for renewable energy that is enshrined in national energy policy and in Indonesia's NDC.
- A significant amount of resources in terms of climate finance from a number of sources.
- Natural resource potential, including strong potential for solar power.
- Opportunities for large-scale renewables on islands like Java, while also opportunities for smaller scale off-grid renewables in more remote areas.
- General declining costs of renewable energy technologies.

At the same time, there are also a number of critical hurdles to renewable energy including:

- An electricity sector that is based on subsidies and supports for fossil fuels, including subsidies for coal production.
- An investment and lending environment that has not fully matured to incentivize green lending.
- A lack of incentives for renewable energy investments, including BPP restrictions that require that in many areas renewable energy prices can be no more than 85 per cent of the cost of electricity already on the grid.
- A lack of engagement from some of the key players who are supportive, and also a strongly entrenched group of coal interests.
- Restrictions on foreign ownership and investment, and local content requirements.
- A lack of attention on the harmful effects of air pollution and other externalities of fossil fuel production and use.

The fundamental supporting dynamics lay the groundwork for significant expansion of renewable energy. With a strong consideration on subsidy reform—and utilizing created budget space to incentivize renewables—both the resources and interest in investment exist. There are also some non-fiscal barriers, such as the BPP regulatory restrictions and complicated local content requirements, that will also need to be address in addition to fiscal reforms. A reform of the current renewable energy implementation policy (the 85 per cent rule) is also critical but falling renewable energy technology prices will counterbalance concerns about increased costs for consumers.

In the medium to longer term there is also potential for stronger energy taxation or participation in international carbon markets as a way to create the necessary environment for private sector investment. Environmental taxation will help monetize the negative environmental externalities associated with fossil fuels while also levelling the playing field with renewable energy. Participation in international carbon markets also has the potential to attract investors.

Continuing to work with the PMR, and also engaging in the UNFCCC negotiations on international market mechanisms (notably Article 6 of the Paris Agreement) is a way for the government to build capacity on market engagement and can help incentivize the private sector to engage.

Finally—and perhaps most critically—there is also a need for renewable energy investments to be structured so that they can also contribute to Indonesia's SDGs and other development goals, which for private investors highlights the fact that projects with substantial co-benefits for the environment, energy access and poverty reduction are more likely to be supported by government players. It was highlighted repeatedly in interviews that increasing access to electricity is a major national focus, and ensuring the energy remains affordable is a critical aspect to any efforts to reform energy prices or potentially increase renewable energy implementation. Developers and development partners could likely make good progress with a focus on investments that could contribute to the SDGs.

3.0 Mexico – Clean Energy Certificates

In Mexico, the hydrocarbon and electricity sectors were dominated for 75 years by two energy sector monopolies: PEMEX (Petroleos Mexicanos) and CFE (Comisión Federal de la Electricidad, the Mexican Federal Electricity Commission). The centralized oil and electricity sectors left little room for private investors to play a role in energy supply in the country.[3] This brought inefficiencies in operations and oil and electricity generation at a time when the country was facing growing energy demand. In addition, Mexico's electricity generation mix had been traditionally dominated by fossil fuels, including oil, natural gas and coal.

To address the inefficiencies and growing energy demand, Mexico introduced the Energy Reform in 2013, implemented through different laws (see Table 3). These steps dramatically changed the structure of the energy systems, opened new markets to private investors and offered multiple investment opportunities, while enabling the diversification of the energy mix through clean energy. For the electricity sector, the reform unbundled the vertically integrated CFE, and created a competitive market for electricity generation and commercialization.

As a result of the reforms in the electricity sector, Mexico saw a significant increase in renewable energy capacity in the country, with a large number of private actors participating in the new generation market. The main factors behind that growth were abundant natural resources, the downward trend of the cost of renewable technologies, low labour costs and favourable market and infrastructure conditions.

Clean Energy Certificates (*Certificado de Energia Limpia* [CEL]) are a central mechanism introduced through the reform. This scheme was designed to promote investment in clean energy and help the country reach its clean electricity targets by setting obligations for the consumption of clean electricity.

This case study assesses the CELs as an instrument to incentivize private investments in clean electricity to meet Mexico's Nationally Determined Contribution (NDC) under the Paris Agreement on climate change. The study also looks at the linkages between the CELs and other environmental economic instruments used in Mexico, specifically the carbon tax and the forthcoming emissions trading market (ETS).

3.1 Context

Mexico's electricity demand is expected to continue its steady increase at an average annual growth rate of 2.9 per cent between 2017 and 2031, with the industrial sector as the largest consumer using over half of the electricity supply in the country (Rennkamp, Haunss, Wongsa, Ortega, & Casamadrid, 2017). To meet this demand, the government of Mexico is expected to invest USD 89 billion in new clean energy generation during the same period (Secretaria de Energia, 2017).

Before the 2013 Energy Reform, Mexico's electricity mix was dominated by fossil fuels, which accounted for 83 per cent of the total power supply and included gas, oil and coal. Non-hydro renewables represented a mere 3 per cent of the mix, and around 16 per cent with hydro and bio energy included (IEA, n.d.). Within the fossil fuel mix, in the mid-2000s low natural gas prices saw that fuel start to replace oil as the main fuel for electricity generation (Santaló, 2009). Mexico has also recently joined the Powering Past Coal Alliance, thereby expressing its intention to phase out coal.

[3] Under the previous electricity regime, defined by the LSPEE (Law of Public Service for Electricity), there was a possibility for private investments in electricity generation, which included options for consumers that produce their own electricity, independent power producers (IPPs), small-scale production and electricity imports/exports.

The 2012 General Climate Change Law (*Ley General de Cambio Climático*, or LGCC) paved the way for a greater penetration for clean energy in the country, putting forward Mexico's low-carbon pathway by setting a clean energy target of 35 per cent by 2024 (Government of Mexico, 2012). After the Energy Reform, targets were further defined in 2014 under the Electricity Industry Law (*Ley de la Industria Electrica*, LIE), with two more targets of 40 per cent by 2035 and 50 per cent by 2050 (Presidencia de la República, 2016). These additional targets called for greater penetration of clean electricity in the mix. Following the LGCC, Mexico released its Nationally Determined Contribution (NDC), reemphasizing the LGCC's greenhouse gas reduction target of 30 per cent below business-as-usual emissions by 2020 and 50 per cent below 2000 levels by 2050, while at the same time introducing an unconditional reduction target of 22 per cent below business-as-usual emissions by 2030 (Government of Mexico, 2012; Gobierno de la República de México, 2016).

The LIE laid out the legal framework for the new wholesale electricity markets in the country and created the independent grid operator CENACE[4] (Government of Mexico, 2014). The LIE also created the CELs regulation aiming to boost investment in clean electricity.

Deepening the reforms, in November 2015 Mexico approved the Energy Transition Law (Ley de Transicion Energetica, LTE), which specified the instruments for planning the national policy on clean energy and energy efficiency (Government of Mexico, 2015a).[5] With key laws in place (see Table 3), the new electricity market structure presented new opportunities for independent electricity generators, as explained in Box 1. Since the establishment of the new electricity market, Mexico has become one of the 10 countries with the highest investment in clean energy (CENACE, 2018).

Table 3. Laws shaping Mexico's new clean energy development

Law	Publication	Main implications
General Climate Change Law (LGCC)	June 2012	Main national framework for climate change direction in the country. Sets the national goal to reduce greenhouse gas emissions 30 per cent below business-as-usual (BAU) by 2020, and a 50 per cent reduction below 2000 levels by 2050. Establishment of clean energy targets of 35 per cent by 2024. Stipulates use of fiscal and market-based instruments in support of environmental and climate change national policies, including carbon tax and ETS.
Electricity Industry Law (LIE)	August 2014	Created a wholesale electricity market for power generation, open to private investors and defined a system of medium- and long-term auctions as the main mechanism to procure energy capacity and power, including from renewable sources. Creates CENACE and established the requirements and criteria for CELs.
Energy Transition Act (LTE)	December 2015	Established the specific regulatory framework to support the General Climate Change Law and the Energy Industry Law through clean power generation and specified the instruments for planning the national policy on clean energy and energy efficiency. Launched in 2015, the law stipulates short-term clean energy targets of 25 per cent for 2018, 30 per cent for 2021 and 35 per cent for 2024.

Sources: Government of Mexico, 2012; Government of Mexico, 2014; Government of Mexico, 2015a; Government of Mexico, 2015b.

[4] CENACE is the entity responsible for controlling the new wholesale electricity market and enables qualified customers to purchase power directly from electricity generators.

[5] It is important to note that Mexico includes nuclear energy, carbon capture and storage (CCS) and efficient co-generation in its definition of clean energy, among others.

Box 1. Market options for renewable electricity generators in Mexico

The new electricity framework opened the market to free competition for power generation, with the goal of promoting private investment. Under the new electricity market, independent generators have different options[a] to sell electricity and CELs: (1) electricity markets; (2) long-term contracts granted through auction; or (3) direct contracts with qualified consumers via power purchase agreements (PPAs)[b] (EY México, 2018). A fourth option is self-generation and consumption, which was in place prior to the reform.

Prices of each of the different options differ significantly, and so does the duration of the supply contracts. Private investors and developers that took part in the interviews conducted during this study indicated that there is room for portfolio optimization combining the different mechanisms.

[a] The types of contracts that existed under the former LSPEE (Service Public Law for Electricity) are not considered here, since—although they are still valid under the new regime—they are not an option for new actors.

[b] This option applies only to qualified consumers, i.e., those with yearly electricity demand above 1 MW.

3.2 Clean Energy Certificates

A central economic instrument introduced through the LIE is the CELs (the Spanish acronym for Clean Energy Certificates). The instrument aims to incentivize clean electricity investments in Mexico, primarily with a view of diversifying the sources of power generation. Other policies aiming to drive down GHG emissions are also in place or being introduced under the 2012 LGCC, namely a carbon tax and a carbon market (ETS). In addition, international financing institutions and development and multilateral banks have also supported the development of the renewable energy sector in Mexico in the form, for example, of low-cost loans and the issuance of green bonds.

While this policy landscape aims to promote clean energy in support of meeting Mexico's NDC emissions target, it makes for a complex set of regulations and price signals to navigate for electricity generators and investors. Before assessing the implications for private investment in the next section, this section describes the CELs regulation and takes a closer look at the interaction with the carbon tax and the ETS and the potential role of climate finance in promoting renewable energy investments.

Clean Energy Certificates to Incentivize Investment

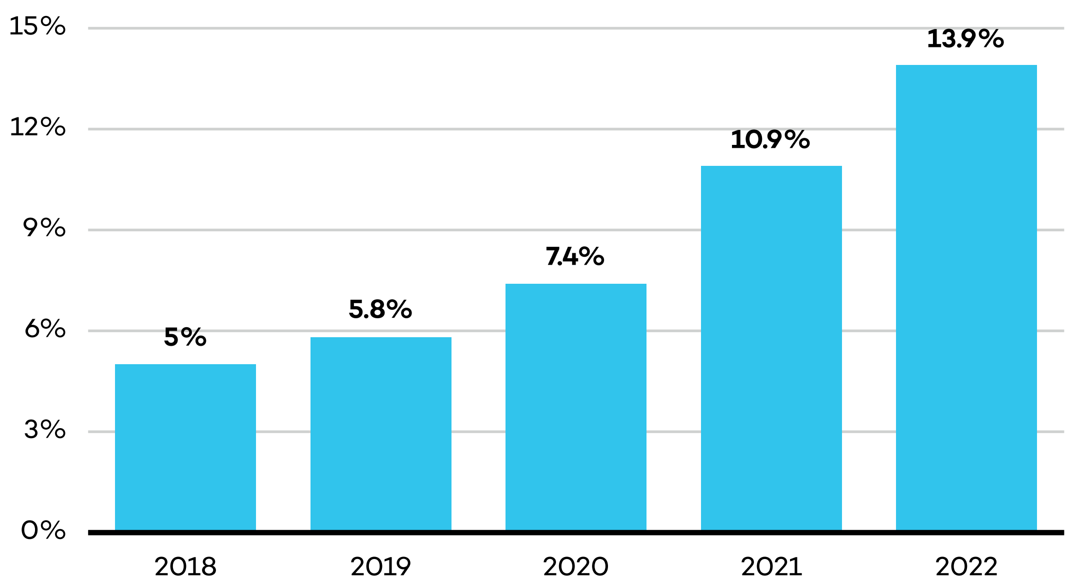
CELs are a mechanism designed to create consumer demand for clean electricity from electricity suppliers[6] and large energy consumers (called "qualified consumers"),[7] by obliging them to procure a minimum percentage of clean energy. CELs are granted to generators of clean energy, who can then sell CELs to suppliers and qualified consumers, thereby creating a market for CELs. One CEL, equalling 1 MWh of electricity, is valid for 20 years. The mechanism can help level the playing field between conventional and clean energy sources and influence the investment decisions of power generators, since it creates an additional source of income for clean energy generators. Because it functions under a regulated regime, both CEL consumers and producers are subject to sanctions in case they do not meet their obligations or supply contract, respectively. The effectiveness of the CEL mechanism therefore depends on the sanctions' deterrence effect and the enforcement of penalties (Chanona Robles, 2016).

[6] Electricity suppliers are intermediaries between power generators and end consumers, i.e., they supply power to households and non-qualified consumers. Suppliers meet the CEL obligations on behalf of these consumers.

[7] More concretely, the actors obliged to purchase CELs are: basic service suppliers, qualified service suppliers, qualified consumers that participate directly in the wholesale electricity market, and holders of interconnection contracts that include load centres or points that are not entirely supplied by clean electricity. In addition, there is a voluntary CEL system (CRE, n.d.).

The CEL obligations are set yearly by the Ministry of Energy (SENER) and defined to respond to Mexico's clean energy objectives. Figure 3 shows that the targets for the CEL obligations set by SENER, defined as percentage of the total electricity consumption, increase gradually overtime.

Figure 3. Evolution of CEL obligations as percentage of the total electricity consumed, defined by SENER for the period 2018–2022



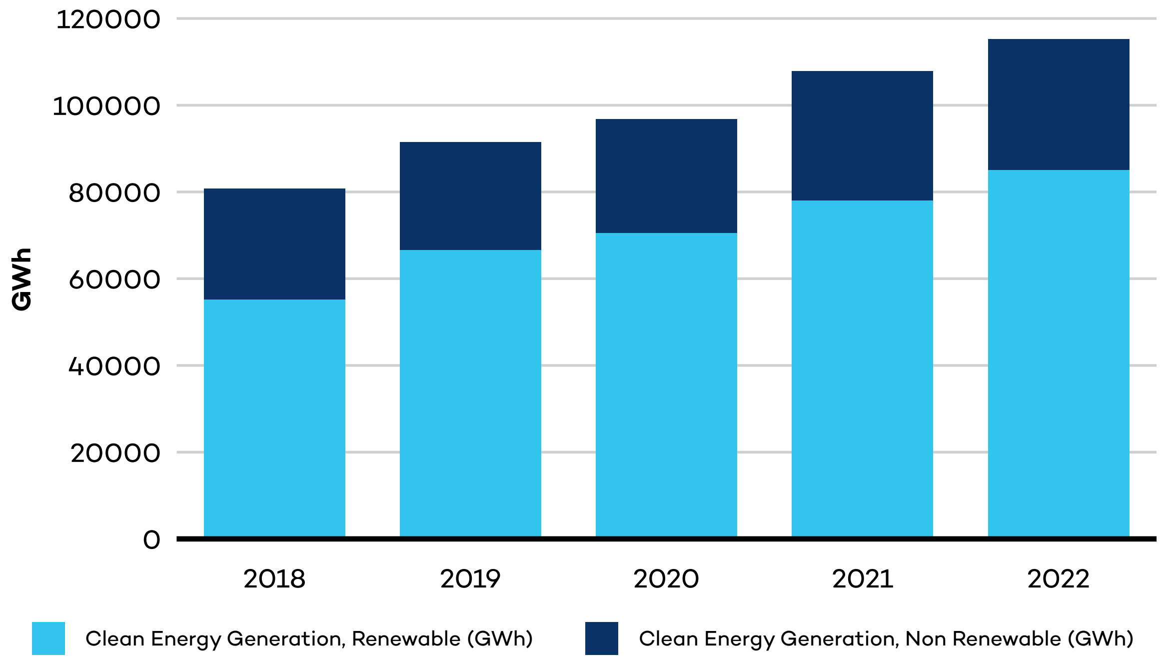
Source: Author's elaboration with data from Government of Mexico, 2016; 2017.

There are three ways for an entity with a CEL obligation to purchase CELs: 1) on the market overseen by CENACE, 2) through long-term auctions or 3) through direct bilateral purchase agreements. These are the same options as those described in Box 1. As with electricity, the price of CELs is expected to vary for each of these options, as they include different risks. In cases where CELs are obtained through long-term auctions or bilateral purchase agreements, their price is defined through the bidding process and bilateral negotiations respectively. The price of CELs purchased on the market is defined according to a price-discovery mechanism that considers demand and supply (EY México, 2018; Razo, 2016; Export Gov, 2017).

To date, there is no publicly available information on CEL prices. Auctions held in Mexico between 2015 and 2017 included CELs. However, the price of CELs in these auctions was bound to the price of electricity, so that it is not possible to determine the specific price of the awarded CELs. The first year to comply with the CEL obligations is 2018, so market activities are expected to start once the final 2018 electricity consumption is determined and market participants have a better understanding of supply and demand.

Since the objective of the CELS is to diversify electricity generation sources with a view to reducing GHG emissions, the definition of clean electricity (and thus of CELs) is not limited to renewable electricity. The LIE includes as clean energy sources wind, solar (PV and thermal), ocean, geothermal, bioenergy, residual gas, hydrogen, hydro, nuclear, waste, efficient cogeneration, thermal with carbon capture and storage (CCS), other sources with carbon emissions below 100 kg of CO_2 per MWh generated. (Government of Mexico, 2014). However, the Ministry of Energy (SENER) expects most of the clean energy capacity additions between 2018 and 2022 to be from renewable electricity sources (see Figure 4).

Figure 4. Expected renewable and non-renewable clean energy generation 2018–2022 according to SENER's forecast.



Source: Author's elaboration with data from Secretaria de Energia, 2017.

CELs and Other Environmental Economic Instruments

Other environmental economic instruments come into play in supporting Mexico's transition to a low-carbon economy and meeting its energy and climate change commitments. These are the carbon tax and the emissions trading system (ETS), two instruments under the administration of the Ministry of Environment (SEMARNAT), as opposed to the SENER for the CELs. These policies will co-exist with CELs, and it is interesting to evaluate their complementarity and the potential overlaps between them (see Table 4).

The carbon tax introduced in 2014 was Mexico's first fiscal instrument used to address environmental externalities on fossil fuels, in addition to increasing fiscal revenues for the federal government. All fossil fuels, except for natural gas, are taxed in the production and import of energy, and the cost is passed down to consumers (MEXICO2, n.d.; MEXICO2, EDF & IETA, 2017). Though the tax does not cover natural gas, oil and coal are covered, with coal being taxed at a lower rate than other fuels (OECD, 2017).

When it was first introduced in 2014, the tax came in at MXN 39.80 (USD 3.50) per tonne, a significant drop from its proposed amount of MXN 70.68 (USD 6.22) per tonne (OECD, 2017; MEXICO2, EDF & IETA, 2017). After its first two years of implementation the tax generated MXN 9.6 billion (approximately USD 722 million) in 2014 and MXN 7.5 billion (approximately USD 643 million) in 2015 (MEXICO2, EDF & IETA, 2017). In 2017, the tax was set to MXN 43.77 (approximately USD 2.31)[8] per tonne, and by the second quarter in 2017 generated MXN 7.871 million (approximately USD 439 thousand), increasing by almost 114 per cent from the previous

[8] Though the MXN increased in value, due to the difference in exchange rate between MXN and USD in 2014 (0.0752) and in 2017 (0.0557) the value is lower in USD.

year. An increase in gasoline demand combined with an increase in the tax between 2016 and 2017 fuelled the rise in revenues generated (Saldívar, 2017). In addition to revenue generation, the tax has supported green technology awareness among various industries in Mexico, where national companies are following suit with international ones in adopting green, more efficient technologies to improve energy efficiency and reduce fuel consumption (Saldívar, 2017). Since the carbon tax excludes natural gas—responsible for 43.7 per cent of power generation in 2016—it is not expected to play a major role in shifting electricity production toward clean energy (SENER, 2017).

In addition to the carbon tax, the Chamber of Deputies introduced an amendment to the LGCC requiring that a mandatory ETS be established, and it is currently in the Senate to be approved. Once the amendment is passed, the legal framework will be in place to establish the ETS. In 2017, SEMARNAT, the Mexican Stock Exchange and MEXICO2[9] announced a simulation ETS with 100 high-emitting companies, including oil and gas (PEMEX), electricity sector, and cement, chemical, and paper companies (La Asociación Mexicana del Edificio Inteligente y Sustentable A.C. [IMEI], 2017; International Carbon Action Partnership [ICAP], 2018). The simulation started in October 2017 and will end in August 2018 (ICAP, 2018). With the end of the simulation a pilot ETS will be launched in mid-2018 with the national ETS to be launched by 2021.

In 2017, a total of 926 companies reported their emissions, with the highest emissions coming from the energy and industry sectors, sitting at over 13 billion tonnes of carbon dioxide equivalents (tCO_2e) and over 4 billion tCO_2e, respectively (SEMARNAT, 2018).[10] This means that the ETS could create an additional liability for fossil fuel power generators from which clean energy power producers could benefit.

Many questions remain on the interactions between the ETS and the CELs. A note of caution is warranted on the risk of double counting as the rules for offsets are developed. Clean energy developers may be selling the same clean energy generation as CELs and as offsets, which goes against environmental integrity under an ETS.

Table 4. CELs, carbon tax and ETS

	CEL	Carbon Tax	ETS
Entities targeted	Electricity suppliers and qualified consumers	Fossil fuel producers and importers, excluding natural gas	To be defined
First year of implementation	2018 (with adjustments of CELs happening early 2019)	2014	2021 (a pilot phase is expected to start by mid-2018)
Price range (USD/ MWh)	n/a (first market prices expected in 2019)	MXN 43.77/tCO_2e, adjusted according to the carbon content of fuels	n/a

Though there is a recognition of the need to understand the dynamics between the different economic instruments (MEXICO2, EDF & IETA, 2017), no substantial analysis has been carried out on how these instruments will interact with one another, or how they will impact the electricity sector and market signals for private investment. This is a gap that needs to be addressed, as challenges, risks and opportunities need to be clearly understood to create an enabling environment for private investors.

[9] MEXICO2 is a carbon credits exchange platform created by the Mexican financial exchange (Bolsa Mexicana de Valores), with support of SEMARNAT, the U.K. Embassy in Mexico, the National Institute of Ecology and Climate Change, the National Forest Commission and the United Nations Environment Programme. It was created to support environment markets under the GLCC and Mexico's commitment under the Paris Agreement.

[10] Some reports included estimated emissions. All submitted reports are to be verified through third-party verification to ensure that information is accurate.

Private Sector Considerations

In the past few years, Mexico has experienced an unprecedent boom of renewable electricity sources, notably solar PV and wind. Renewable energy investments in Mexico grew by 810 per cent in 2017 vs the previous year, reaching USD 6 billion (Frankfurt School-UNEP Centre/BNEF, 2018). The plentiful resources for wind and solar, growing electricity demand, the ongoing decrease of the cost of renewable technologies, Mexico's low labour costs and a relatively well-developed grid infrastructure are among the main factors attracting private investors.

However, the renewable energy boom in Mexico is very recent, and most of the capacity awarded through auctions has yet to be built. Delays have been reported due to issues with the projects' capacity to secure financing and land availability. More concretely, the low auction prices granted only for 15 years (compared to the 25- to 30-year lifespan of the renewable technologies) and limited market maturity have affected investors' confidence and increased the cost of capital, negatively affecting the bankability of some projects (Spektor, 2018; St. James, 2017). There are also reports of cases of wind projects that have suffered significant delays or been stopped due to the opposition of Indigenous people and local communities (Burnett, 2016; Rangel, 2016). The effectiveness of the new incentives created by the CEL mechanism will therefore also have to be assessed against the clean energy actually produced.

Much uncertainty remains in the market, which prevents CELs from providing a strong incentive. The lack of information on the price of CELs is a major issue, which makes it very difficult for investors to assess the extent to which CELs may meaningfully impact the economics of renewable investments. Beyond the lack of information, there is also a perceived risk of volatility, due to the limited demand and supply, which, for example, may lead to a price drop due to the implementation of large clean energy projects. In addition, the upcoming elections are a source of uncertainty around the new government's intentions, which, depending on the results of the elections, may instead focus on non-market mechanisms or increase the current clean energy targets (Torres, 2018; La Verdad, 2018). The experience of the United States with the Renewable Energy Certificate (REC) market also highlights the risk of volatility; mid-term prices varied between USD 1 and USD 60 per REC and spot prices higher than USD 600 per REC (O'Shaughnessy, Heeter, Liu, & Nobler, 2015). It therefore appears to be too early to determine whether the price of CELs will be a determining factor for renewable energy producers.

Considering other risks that private investors and project developers have identified, it has become clear that economic instruments alone are not enough to drive private investments. The major risks include: the limited maturity of the electricity market, the volatility of the Peso (especially linked to the ongoing NAFTA negotiations) and a challenge with fighting corruption and implementing the rule of law[11] (EY México, 2018). While the CEL mechanism can help to positively change the risk/reward balance of clean energy projects, private developers interviewed were of the view that economic instruments supporting renewable energy are not a main determinant of their investment decisions.

Role of Climate Finance

Most of the new clean energy contracts in Mexico have been awarded to private companies that have searched for private financing, according to the interviews conducted for this study. Nonetheless, low-cost loans from development banks or multilateral lending institutions still play a role in investment and are especially significant in the case of small-scale renewable energy projects to support climate change adaptation and rural development (SEMARNAT, n.d.).

[11] In terms of corruption perception, Mexico is in the 30th percentile out of 100, with 0 being "very corrupt" and 100 "low corruption." In rule of law, Mexico is in the 33rd percentile out of 100, with 0 meaning "low" and 100 "high."

The Mexican public development bank, Nacional Financiera (NAFIN) plays a relevant role in helping raise international financial support, such as the USD 100 million loan from the EU's European Investment Bank (EIB) to promote private investments in wind power projects (Nacional Financiera, 2017a). NAFIN has further facilitated wind power investments by issuing green bonds (Nacional Financiera, 2017b).

The Interamerican Development Bank (IDB) has also offered financial support to programs to strengthen the national institutions in the implementation of the Energy Reform and to specific renewable energy projects (IDB, 2018b). An example of such projects is the Cubico Alten Solar PV plant, expected to be the largest solar power plant in Latin America and the Caribbean (IDB, 2018a).

International climate finance could play a very relevant role in mitigating the risks highlighted by the sector (see Section 2.4). Climate finance could support the impact assessment process or the elaboration of viability studies (technical and financial), especially for less popular and riskier technologies, such as geothermal. This type of study would help minimize the risk of projects, which could reduce the cost of capital, a critical factor in determining investments (MIREC Week, 2017).

Climate finance can also support grid stabilization and modernization in the country. Mexico anticipates investments of around USD 20 billion in transmission and distribution projects, with the private sector expected to play an important role. The increase of intermittent renewables (wind and solar) in the electricity mix calls for upgrades and enhancements in the grid to integrate energy storage technologies. Climate finance could help to finance feasibility studies for energy storage and smart grids and obtain the necessary investments (Yaneva, Tisheva, & Tsanova, 2018).

Apart from infrastructure investments, international public climate finance can support analyses of the various economic instruments that have been and will be launched, including the CELs, the carbon tax and the ETS. There is a gap in understanding of how these will interact, the level of cross-over and potential risks and opportunities.

Some examples already exist. Mexico has international support for its ETS simulation in order to increase the private sector's understanding of the system, including public consultations. In addition, international support was given to SEMARNAT and MEXICO2 to provide technical assistance on the ETS simulation platform (CarbonSim) (MEXICO2, EDF & IETA, 2017).

3.3 Policy Recommendations

In the past few years, Mexico has undergone a massive reform of its energy sector, notably through the liberalization of the power generation market and introduction of fiscal instruments to incentivize clean energy investments. As a result of this reform, the country has seen an unprecedent growth in renewable energy generation capacity, fuelled by private and international investments. However, to date, it appears that the emerging CELs mechanism has had a limited impact on the growth experienced in renewable energy. The adoption of CELs, combined with the carbon tax and the ETS, is perceived as a signal of current policy direction, but it is unclear for now the extent to which these instruments reduce the risks of clean energy investments compared to a few years ago.

In order to increase the effectiveness of CELs in promoting renewable energy investments in Mexico and make CELs a more impactful instrument to help reduce some of the risks that the renewable power generation business is facing, we propose the following policy recommendations:

- **Ensure transparency of CELs prices to give clear signals to investors.** Greater transparency on how various actors value CELs is critical for CELs to truly create an incentive for investment. To date, information on the price of CELs is very scarce, so there is a lack of any price signal for market actors. Auctions are a great tool to enable price discovery. However, the current practice of bundling CELs and power generation in the auctions does not encourage transparency and limits the capacity of market actors to take into account the value of CELs in investment decisions. Along those lines, unbundling CELs from power may be an avenue worth exploring.

- **Improve the understanding of the interaction between CELs, ETS and carbon tax.** Beyond CELs, the policy landscape makes for a complex web of incentives to navigate for power producers and investors. The carbon tax, the ETS and the CELs all point to a more attractive investment environment for clean energy, but many uncertainties remain around the magnitude of the incentives they will provide. The CELs, carbon tax and ETS might have cross-over effects as they are fully implemented. There is a need for a more comprehensive strategy, perhaps through an NDC implementation plan, that would ensure greater coordination between the various economic instruments. Better understanding of the interactions between the three policies is needed so that they create an attractive investment environment on clean energy to achieve Mexico's sustainability targets.

In addition, Mexico could also strengthen the role of climate finance to reduce renewable energy investment risks. International climate finance can play a decisive role in reducing the risk of new markets by providing project financing instruments adapted to the new market conditions where traditional financing institutions—wary of higher risks—might not be interested. This would mitigate the risk of non-bankability of projects highlighted in the risks section. This role would be particularly relevant during the first years of CELs, to provide some time for them to give clearer price signals to investors.

4.0 India – Goods and Services Tax (GST)

In India, both the solar and wind sectors have achieved high growth due to a number of support policies, including a series of tax exemptions. However, this changed significantly in 2017 when a new tax regime, the Goods and Services Tax (GST) was introduced.

The GST was not introduced with a specific objective with respect to renewable energy. Rather, it was a long-planned restructuring of the tax system in India, intended to make taxation across states more consistent and thereby reduce the overall costs of doing business. Nonetheless, this had large impacts on the energy sector: overnight, the tax burden on renewable energy and conventional energy was increased, in some cases significantly. In particular, the renewable energy sector lost all of its previous tax exemptions, putting into question whether this would affect the viability of some renewable power projects. India also scrapped its National Clean Energy and Environment Fund (NCEEF), which had previously been dedicated to supporting renewable energy, and redirected the revenues to compensate state governments for any losses incurred in the transition to the new tax system.

At the time of writing in May 2018, the GST in India is still less than a year old and as such there have not been any comprehensive impact evaluations. This case study attempts to fill this information gap through a review of analysis of the topic to date, supplemented by a series of interviews with policy and industry experts. In doing so, it aims to draw out lessons for other countries: both about the ways in which large fiscal reforms can be harnessed to have positive or negative effects on renewable energy development and more generally about the role that taxation plays as an instrument for promoting renewable energy as markets mature.

4.1 Context

Clean Energy Scenario in India

In its nationally determined contribution (NDC) under the Paris Agreement, India has a goal of 175 gigawatts (GW) of installed renewable energy capacity by the year 2022 (United Nations Framework Convention on Climate Change [UNFCCC], 2016). This target is disaggregated by different renewables: 60 GW from wind power, 100 GW from solar power, 10 GW from biomass power and 5 GW from small hydropower. Achieving this target should decrease carbon dioxide emissions by 326 million tonnes per year.

As of April 2018, India has already installed 69 GW of renewables, of which 21 GW was solar and 34 GW wind (Central Electric Authority [CEA], 2018a). It is estimated that the country will be the second largest solar market in the world in 2018 (Beetz, 2018).

This represents a transformation of India's electricity generation. In April 2016, thermal sources of electricity generation (coal, diesel and gas) constituted 69 per cent of India's installed capacity, while the share of renewables was 15 per cent (see Table 5). By April 2018, the share of thermal energy had decreased to 65 per cent, while renewables had increased to 20 per cent. These capacity changes are large but the share of electricity generated by renewables is still relatively small: only 8 per cent in financial year (FY) 2017–18 (see Figure 5).

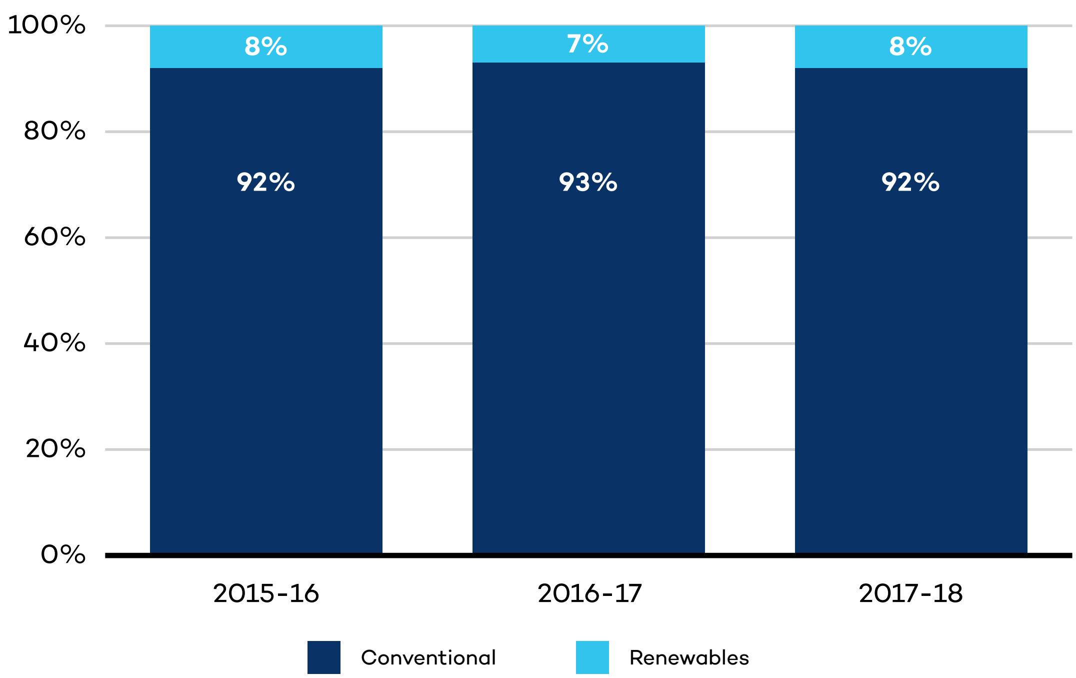
Table 5. Installed Capacity of Utilities (GW)

Installed Capacity from Different Sources	April 2016		April 2017		April 2018	
	GW	% of total	GW	% of total	GW	% of total
Thermal	210.6	69%	220.5	67%	222.9	65%
Nuclear	5.7	2%	6.7	2%	6.7	2%
Hydro	42.7	14%	44.5	14%	45.2	13%
Renewables*	45.9	15%	57	17%	69	20%

* Includes solar, wind, small hydro, biomass and power generated from urban waste.

Source: CEA, 2016; 2017a; 2018b.

Figure 5. Electricity Generated from Different Sources



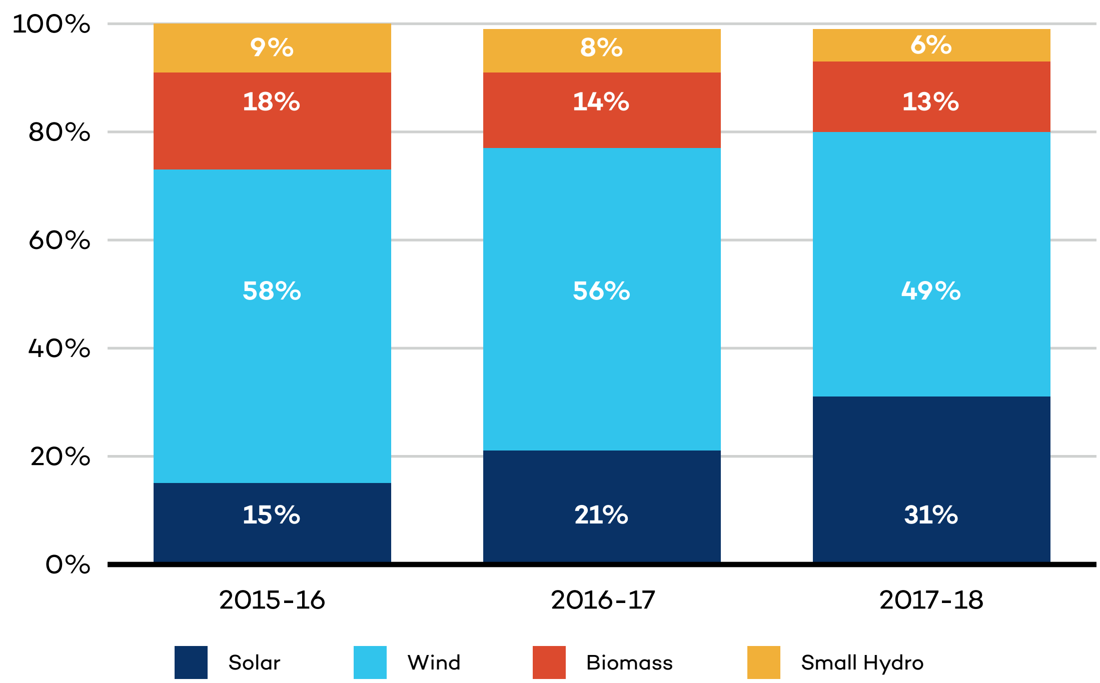
Note: "Conventional" energy is defined as thermal power, large-scale hydropower and nuclear power.
*Data was available from April 2017 to February 2018

Source: CEA, 2017b; 2018a.

Policy Frameworks to Promote the Growth of Solar and Wind

Among renewables in India, the year-on-year share of solar has recently grown the fastest (see Figure 6). Installed capacity grew from 6,762 megawatts (MW) in FY 2015–16 to 21,651 MW in FY 2017–18. In comparison, growth in installed capacity of wind was much slower, from 26,777 MW in FY 2015–16 to 34,046 MW in FY 2017–18 (CEA, 2016; 2018b). In part, this is because India's wind sector is already well developed, with 34 GW installed in April 2018—over half of its target of 60 GW by 2022.

Figure 6. Installed Capacity of Renewables



Source: CEA, 2016; 2017a; 2018b.

A key landmark in the evolution of India's solar sector was the launch of the Jawaharlal Nehru National Solar Mission (JNNSM) in 2010. This set a target of 20 GW by 2022, which was easily achieved by 2013 (IISD, 2017, p. 46). At the time, JNNSM was introduced to push grid-connected solar power plants. This policy was pursued by "bundling" electricity, where thermal power companies purchased 1,000 MW of solar power from solar power plant developers, bundled this solar power with thermal power and then sold this bundled power at a rate of INR 5 (USD 7.4 cents)[12] per kWh (Ministry of New and Renewable Energy [MNRE], 2012, p. 13), which at the time was higher than coal-based electricity sold at INR 3.5-4 (USD 5.1–5.9 cents) per kWh. At the same time, JNNSM also pushed a rooftop solar program and created the Renewable Energy Certificate (REC) mechanism. The REC mechanism imposed a solar energy purchase obligation on utilities. If they were unable to comply, they were required to purchase a certificate for each 1 megawatt hour (MWh) of their obligation. Between 2015 to March 2017, the price of solar RECs was given a floor of INR 3,500 and a ceiling of INR 5,800 (~USD 51–85) per REC (REC Registry India, n.d.). As of April 2017, the price of solar RECs was adjusted to a floor of INR 1,000 and a ceiling of INR 2,400 (USD 15–35) per REC (REC Registry India, n.d.).

Altogether, the first phase of JNNSM created 704 MW of grid-connected solar power projects (MNRE, 2012, p. 13). The REC mechanism continues today but there are some challenges that have made the scheme slow to take off. Early on, solar power was more expensive, and utilities with poor finances struggled to afford to buy RECs—so they did not purchase them. Industry experts report that this was possible because of poor enforcement (Bhuyan, 2015). As of 2017, solar power is much cheaper: solar tariffs in the latest auctions have fallen to as low as INR 2.44 (USD 3.6 cents) per kWh (Press Information Bureau, Government of India, 2017).

From the year 2013 onward, under Phase Two of JNNSM, the policy pursued the creation of 750 MW of grid-connected solar power through the Viability Gap Funding (VGF) scheme. The VGF invited bidding from solar

[12] Unless otherwise stated, all INR values are exchanged at a fixed rate of INR 68 per USD.

power plant developers to sell power at a fixed tariff of INR 5.43 (USD 9.0 cents) per kWh.[13] Developers were allowed tax exemptions and other fiscal benefits like accelerated depreciation, as well as viability gap funding—in essence, a grant to help cover capital costs—averaging to INR 12 million (USD 0.2 million) per MW (MNRE, 2015, p. 4). The second phase of JNNSM also moved from feed-in tariffs (a cost-plus approach) to competitive tariffs, allowing solar tariffs to fall dramatically. For example, in 2012, the solar tariff stood at INR 10.95 (USD 16 cents) per kWh and by 2017, this reduced to INR 2.44 (USD 3.6 cents) per kWh under the new phase of competitive auctions (WISE, 2017, p. xiiii).

India's wind sector benefited initially from the feed-in tariff schemes, where the wind power project developer received a guaranteed payment for generating electricity from wind. The wind sector also benefited from the accelerated depreciation policy that was first introduced in 1994, withdrawn in 2013, but subsequently reintroduced. Learnings from the solar sector have now been applied: feed-in tariffs have been phased out and replaced with competitive bidding, allowing for further reduction of wind tariffs.

Going forward, India's NDC estimates that around USD 2.5 trillion is required between 2015–2030 in climate finance (UNFCCC, 2016). It identifies that some funds can be drawn from budgetary resources while others must be generated through a mix of market mechanisms, fiscal instruments and regulatory interventions. The two main budgetary funds it identifies are a tax on coal called the Clean Environment Cess, with its related National Clean Environment Fund; and a National Adaptation Fund with an initial allocation of INR 3,500 million (USD 51 million) (UNFCCC, 2016). In addition to this, it identifies a range of fiscal instruments, including: recent subsidy reductions and tax increases for gasoline and diesel, as well as efforts to rationalize liquefied petroleum gas (LPG) subsidies; tax-free infrastructure bonds; and incentives for the creation of forest-related carbon sinks (UNFCCC, 2016). In addition to this, it emphasizes the need for new and additional funds to be sourced from developed countries to implement its commitments (UNFCCC, 2016).

Subsidies to Renewable Energy

The accelerated deployment of renewable energy sector has benefited from a range of government subsidies from central and state sources. An inventory of subsidies to renewable energy in India (IISD, 2017) found central government subsidies to renewable energy increased from INR 2,607 crore (USD 431 million) in FY2014 to INR 9,311 crore (USD 1.4 billion) in FY2016. The report tracked subsidies in the form of exemptions from import duties and taxes, credit support and price support for renewable energy projects. The report also found the renewable energy sector benefited from the direct budgetary support of both the national and state governments. Support from state governments varied based on the growth of the sector there. For example, Tamil Nadu, with the highest rate of installed wind capacity and third highest installed solar capacity in the country, received the highest grants from the central government in 2016 to further accelerate renewable energy within the state.

In addition to direct subsidies for renewables, the government created the Clean Environment Cess in 2010 to tax coal and then place the revenues in a special facility called the National Clean Energy and Environment Fund (NCEEF). The NCEEF's funds were earmarked for funding research and development projects in clean energy technologies. The cess was set at INR 50 (USD 0.7) per tonne in 2010 and then adjusted to INR 200 (USD 2.9) per tonne in 2015 and INR 400 (USD 5.9) per tonne in 2016. The NCEEF was criticized, however, for not disbursing the majority of its funds, and for allocating more disbursements to ministries than to renewable energy projects (Sengupta, 2017). The NCEEF has since been scrapped as part of the GST introduction (see later in this case study for more information).

[13] This tariff was for the initial year and as well as an annual escalation of INR 0.05 per kWh for the next 20 years.

4.2 Barriers to Clean Energy Development

India's large solar and wind market attracts both domestic and foreign investments. The World Bank committed a loan of over USD 1 billion for solar projects, the largest in any country (World Bank, 2016). Similarly Japan's SoftBank is investing USD 930 million into India's solar market (Economic Times, 2018). Despite this, a number of barriers must still be addressed if India is to meet its ambitious renewable energy targets. Some of the most important are listed below.

Higher Cost of Financing

Financing costs can make up close to 70 per cent of renewable energy prices (Niti Aayog, 2015, p. iii). The average interest rate on debt in developed countries is 3 to 6 per cent, while in emerging economies like India it is between 10 to 15 per cent (Chawla & Aggrawal, 2016). Added to the higher cost of debt are other financial risks like currency, off-taker risks and early-stage risks that involve identifying funds at early project stages. This makes renewable energy projects more expensive in India than in other countries. The government is already providing subsidies to the renewable energy sector, and there are constraints on government budgets to that limit their ability to offer facilities, credit and risk guarantees (Shrimali, 2018). Innovative financial instruments will need to be further explored to reduce the cost of debt in India.

Falling Solar and Wind Tariffs Make Utility-Scale Renewable Projects Risky

Solar tariffs have fallen sharply, from INR 17.9 (USD 26.3 cents) per kWh in 2010 to INR 2.44 (USD 3.6 cents) per kWh in 2017 (De, 2012; Bridge to India, 2017c). This makes solar cheaper than coal as a source of electricity generation, improving the business case for investments, but it also makes the business environment uncertain for project developers. This is because utility-scale renewable energy power projects typically have power purchase agreements (PPAs) for 25 years, and falling tariffs make older projects running at higher tariffs unattractive. Purchasers of these projects, mostly electricity utilities, are increasingly keen to cancel or renegotiate their PPA. For example, as of January 2018, the state of Uttar Pradesh's electricity agency was in the process of renegotiating the tariffs of six solar projects totalling 80 MW.[14] The agency was proposing a tariff of INR 5 (USD 7.4 cents) per kWh while some projects commissioned in 2015–16 had quoted tariffs of INR 7 to 8 (USD 10.3 to 11.8 cents) per kWh (Mercom India, 2018). On the other side of the equation, project developers may delay procurement in the hope of purchasing equipment at lower costs on the back of falling solar panel prices.

Regulatory Risks – Tax reform and changing international trade policies

In mid-2017, India introduced the goods and services tax (GST), a major reform that replaced a complex system of central and state-by-state taxation with one unified scheme of consistent taxation across the country. This created several uncertainties for solar and wind companies. Project developers were uncertain about applicable tax rates, as the previous regime allowed renewables to enjoy several tax holidays and exemptions. A few months after the introduction of the GST, the tax rates were adjusted a second time. This resulted in delays in procurements, project commissions and tendering.

India has also been trying to build its renewable energy sector on the basis of domestically manufactured content. In 2010, the government introduced a domestic control requirement (DCR) policy as part of the JNNSM (MNRE, 2009, p. 7). This required projects that were based on crystalline silicon technology to use locally manufactured solar modules (MNRE, 2009, p. 7). In light of high imports of solar panels, the policy hoped to protect and promote the domestic solar panel manufacturing sector. However, this attempt ran into trouble with WTO rules.

[14] Uttar Pradesh Electricity Regulatory Commission (UPERC) is the state body that monitors the functioning of the electricity utilities in the state as per the Electricity Acts.

The United States challenged India's support for its domestic solar industry in 2013 at the WTO (ICTSD, 2013). In 2016, the latter ruled in favour of the United States, saying that India's policy did not comply with international trade agreements (Kanth, 2016). In light of the ruling, the Government of India changed its policy to enforce the DCR scheme only for power projects related to public consumption such as railways and non-commercial purposes. The United States objected to this policy too, and the DCR ended as of Dec 2017. This prompted the domestic solar panel manufacturing industry to ask for anti-dumping duties on solar panels imported from China (World Institute of Sustainable Energy [WISE], 2017). The government was considering such a duty at the same time the GST was introduced. With most solar projects importing panels, this added to the uncertainties of estimating project costs. The implementation of tax remained with the Central Board of Indirect Taxes that delayed the clarification of the status of import duty on imported solar panels, leading solar panels to pile up at various ports in the country (Chandrasekaran, 2018a). As of the time of writing, there has been no policy announcement on this. The government is continuing to explore ways in which it can promote the entire solar power generation equipment sector domestically without violating trade agreements.

Operational Barriers

Apart from installation of renewable energy projects, integrating power projects into the grid also presents a challenge. Transmission infrastructure needs to grow at the same pace as installation of power projects—but it requires more time to be installed. This mismatch has created a challenge that the government is addressing by investing in a Green Energy Corridors (GEC) program. The GEC aims to create new transmission infrastructure, while simultaneously solving technical challenges linked to the integration of renewables, such as forecasting and intermittency (Deutsche Gesellschaft für Internationale Zusammenarbeit [GIZ], n.d.). Without better systems and capacity, there is the risk that renewable energy over-supply could overburden the grid and cause blackouts. Experience with large-scale blackouts linked to conventional technology—such as the northern grid failure in 2012, which left nearly half of India without electricity for two days—make this a priority concern in India (Prasad & Bhaskar, 2017).

4.3 The Goods and Services Tax (GST)

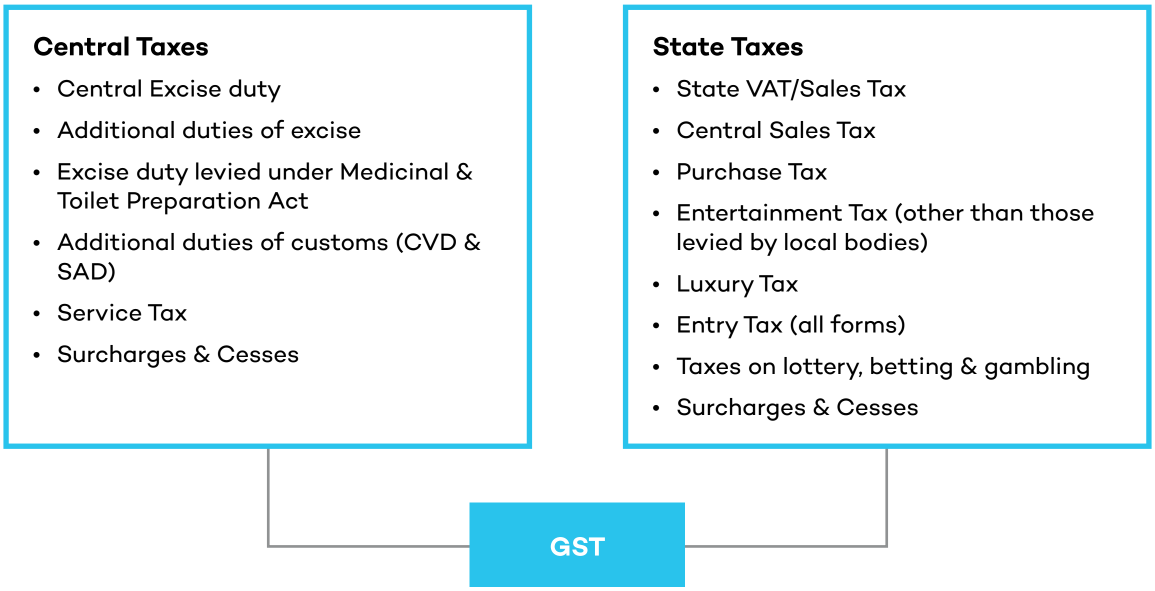
The GST is a unified tax regime. This means that it is one consolidated tax system for the whole country, as opposed to the previous system, where multiple national and state-level taxes could lead to a large degree of variation in the net tax burden for goods and services across different states.[15] The previous regime also had multiple acts, rules, procedures and tax administrations. For example, a national level tax could include one or all of the following: customs duty, excise duty, central sales tax and service tax. A similar and complex taxation structure was observed at the state level, increasing the complexity and transaction costs of doing business, as well as the net tax burden.

The GST regime simplifies the tax structure, transitioning a large number of individual taxes into a single tax administration with four tax rates and uniform law and digital procedures that reduce paperwork and lower the tax burden on goods (see Figure 7). It has not subsumed all taxes. A number of independent taxes remain, including electricity duty, basic customs duty, toll taxes (such as road tax and environment taxes), alcohol tax and property tax (Green GST, 2017).

The GST has four tax rates that cover most goods and services: 5 per cent, 12 per cent, 18 per cent and 28 per cent. The majority of goods fall under the 12 per cent or the 18 per cent rate. For precious metals like gold and diamonds, there is a separate tax rate of 3 per cent and 0.5 per cent. These tax rates are applicable to all goods and services, except for four categories of goods: alcohol, tobacco, some petroleum products (crude oil, diesel, petrol, natural gas and airline fuel) and entertainment tax levied by local bodies (GST Council, 2018).

[15] India has a federal structure constituting of 29 states and seven union territories. The Indian constitution distributes the legislative, administrative and executive powers between the national (or central) and the state governments.

Figure 7. Tax Structure in India Prior to GST



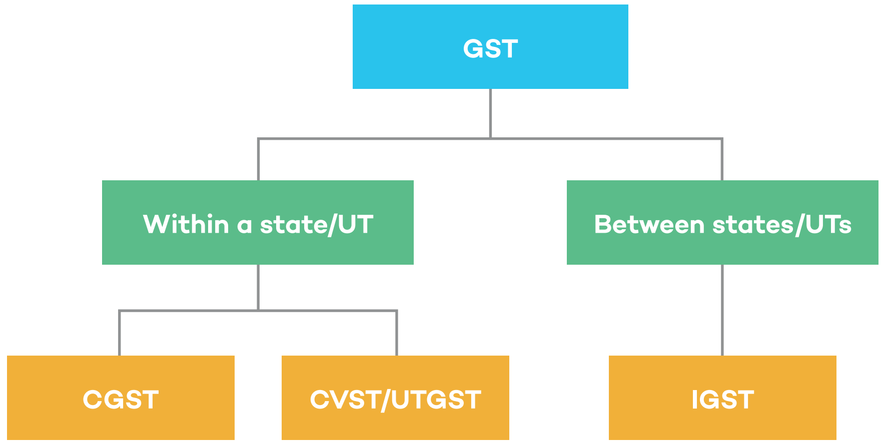
Source: GST Council, 2018.

The GST was launched across India on July 1, 2017, but discussions on the introduction of the tax first began in 2006. Since then several committees and working papers evaluated the merits of introducing the GST. From 2011, repeated attempts were made to introduce the GST bill in parliament, and in August 2016 the bill was finally passed, becoming a constitutional act. Communications and recommendations on the tax structure began a year before the GST's launch. Since August 2016, the GST Council (consisting of the finance ministers from the national and state governments) began revising taxation rates and clarifying and communicating with taxpayers to ease implementation.

The GST structure involves concurrent jurisdiction, which means that both the central or national government and the state government have the right and responsibility to levy and collect GST taxes. Thus the sale of goods and services in a state comprises of a central GST (CGST), levied by the central government; and a state or a union territory GST (SGST or UTGST), each equal to half of the total applicable tax rate. For example, if a business located in Mumbai invoices a consumer also based in Mumbai for a good in an 18 per cent tax slab then the business will pay a 9 per cent CGST to the central government and a 9 per cent SGST to the state of Maharashtra (as Mumbai is located in Maharashtra).

In some cases, goods and services are traded between states. For these, an integrated GST (IGST) is applied at the point of inter-state sale, equal to the full applicable tax rate, minus a credit for any sums already paid for CGST and SGST in previous state-level transactions (ClearTax, 2017). If necessary, the sum paid in IGST can subsequently be used as a credit to reduce the applicable CGST and SGST for any further sales between actors at the state level. See Figure 8 for an illustration of the different sub-categories of GST (ClearTax, 2017).

Figure 8. Administrative Structure of GST



Source: adapted from GST Council, 2018 and ClearTax, 2017.

In order to ensure the right overall rates are paid, the GST uses an input tax credit (ITC) mechanism. The previous tax regime led to a cascading tax or a tax-on-tax scenario at every stage of a good's value chain. This increases the final cost of goods and services and impacts competitiveness. Under GST, the relevant taxation rate (5 per cent, 12 per cent, 18 per cent or 28 per cent) is intended to apply to the final value of a good or a service at the end of the value chain, where the centre and state administer taxes concurrently. Any GST paid at an earlier stage of the value chain of a product can be referenced to offset any subsequent taxes arriving at a later stage of the value chain and, if necessary, final adjustments in revenue collection are resolved between the central and state governments (GSTCouncil, n.d.; ClearTax, 2017). The ITC mechanism is intended to reduce the tax burden for investors and to make it easier for businesses to estimate the total tax burden on products.

The four-tier tax structure of the GST is designed to allow for lower taxes for essential goods and increased taxes on luxury goods. Table 6 provides examples of goods and services under different tax rates. Many energy products are taxed at the lowest rate.

Table 6. An example of GST tax rates for different goods and services

Goods under 5% tax rate	Goods under 12% tax rate	Goods under 18% tax rate	Goods under 28% tax rate
Fish, milk, vegetables, tea, coffee, baked foods, coal, bio-gas, PDS kerosene, LPG, renewable energy devices	Frozen meat, pharmaceutical goods, candles, stationery, textile products, clothing exceeding INR 1,000 per piece etc.	Ice cream, fertilizer, photographic paper, biodiesel, iron ore products, LPG stoves, machine tools etc.	Chocolate, tobacco, aerated drinks, fireworks, leather clothing, refrigerators, washing machines, motor cycles etc.

Source: Central Board of Excise and Customs (CBEC), 2017.

Private Sector Considerations

Under the prior tax regime, solar and wind power projects were given various tax holidays. In the context of solar, for example, this included concessions on customs duty for importing solar panels (Press Information Bureau [PIB], 2014) and exemptions in excise duty on machinery used for setting up solar power plants (CBEC, 2012).

Some states such as Rajasthan provided further exemptions from state taxes for solar power plant equipment (MNRE, 2017a, p. 25). As part of introducing a consolidated tax rate across the country, such exemptions have been eliminated. The main impact of this has been upon the capital cost of solar and wind power projects—largely through influencing the costs of goods and services related to physical capital. The GST has also affected the costs of services linked to operations and maintenance required to operate renewable energy power generation facilities.

Analysis of GST's Impact on Solar Projects

Solar and wind power projects can be viewed as having upstream and downstream activities. Upstream activities comprise the procurement of goods and the construction of facilities. Downstream activities consist largely of services related to operations and maintenance (see Box 2. This section examines the changes in these costs because of the GST.

Upstream Activities

Upstream activities in solar and wind power projects include the procurement of solar panels or wind turbines, land, civil works, mounting structures, cables and transformers. It is difficult to estimate the exact share of upstream costs as a share of total levelized electricity costs because of the rapid cost reductions in solar photovoltaic (PV) technology, and the site-specific conditions that can influence the level of generation. On average, however, upstream capital costs—including the costs of return on equity and debt servicing—are thought to account for 80.5 to 88.5 per cent of the levelized cost of electricity generated by grid-scale solar PV (Chawla & Aggrawal, 2016).

Solar panels account for approximately 50 to 60 per cent of capital costs. Changes to the costs of panels therefore have a significant impact on overall levelized electricity costs. Post-GST, a 5 per cent tax rate is imposed on solar modules, while pre-GST there was no tax on them.

It is worth noting that the GST does not affect import duties and the Central Board of Indirect Taxes and Customs (CBITC) passed a circular clarifying that most solar modules (except those without blocking diodes) will continue to qualify for import duty exemption. India has a small domestic solar panel industry. Most imported modules are from China (Bridge to India, 2017d, p. 20) and are estimated to be around 10 per cent cheaper than domestic modules (Bridge to India, 2017b, p. 4). To make domestic solar panels more economical in comparison, the domestic solar panel industry association is pursuing an anti-dumping duty on imported solar modules. It remains uncertain, however, if the government will pursue such a duty.

Land costs attracted no change in taxation under GST and hence the capital costs in the project remain unaffected from implementation of GST.

Civil and general works constitute 9.5 per cent of the total capital costs for solar power projects. Before GST, there was a 4 per cent tax on civil works that has increased to 5 per cent under GST.

In solar power projects, prior to the GST, **mounting structures and power conditioning units**, attracted a tax of 12.5 per cent, but after GST this has fallen to 5 per cent.

Evacuation costs (**cables and transformers**) attracted a 12.5 per cent tax before the GST, which was also reduced to 5 per cent after the introduction of GST.

Downstream Activities

The main downstream activity in solar power generation is the **operation and maintenance** (O&M) of facilities. As with upstream costs, it is difficult to estimate the share that O&M makes up of power costs, but on average it is thought to be 11.5–19.5 per cent of the levelized cost of electricity (Chawla & Aggrawal, 2016). Under the previous regime, the average tax rate on services was 14.5 per cent, while under the GST it has risen to 18 per cent, suggesting an overall increase in project costs.

Box 1. Goods or Services? PPAs and EPCs under the GST

One challenge for solar companies operating under the GST has related to exactly how the tax system is categorizing different types of contracts: according to the goods purchased within them, or identifying the overall contract as a service?

Solar power projects that sell power to electricity utilities are selected through a competitive bidding process linked to either a power purchase agreement (PPA) or an engineering, procurement and construction (EPC) contract. In the PPA contract, solar project developers that are private companies are responsible for financing, owning, building and operating the power project and sell power. These PPAs typically run for 25 years, and the tariffs are determined as part of the bidding process. EPC contracts are run by some government agencies that own land, like Coal India and the National Thermal Power Corporation (NTPC). A similar competitive process is conducted to determine tariffs, but the selected EPC company will hand over the project to the funder upon construction, who thereafter owns and operates the facility. Most utility-scale solar projects in India are run by project developers. Segmentation of projects based on these two models reveals that of all the tendered projects in 2016, PPA contracts accounted for 82 per cent of the tendered projects, while 18 per cent of projects were under the EPC contracts (Bridge to India, 2017a).

Under the GST, there is uncertainty about whether these two types of contracts are taxed differently. The tax treatment for developers under the PPA model is largely covered by their upstream procurement of goods, with the majority of goods related to solar PV plant construction being taxed at 5 per cent under the GST, as described above and set out in Table 6. EPC contracts, however, appear to be treated like services contracts. Under the previous tax regime, services were subject to a tax rate of 14.5 per cent; and under the GST, this has now increased to 18 per cent (Arora, 2017). Since the introduction of the GST, the MNRE has issued a clarification stating that the treatment of EPC contracts will depend on individual cases: an EPC contract can be treated either as a standalone services contract or bundled together with goods that will each attract a different tax rate (MNRE, 2018). In spite of this attempt to clarify matters, the tax liability of EPC-contracted power projects remains unclear.

Overall

A summary of the change in tax rates on capital costs of grid-scale solar PV is provided in Table 7, drawn from a range of sources. While there has been an increase in the costs of solar PV modules and O&M services, there have also been decreases in several other cost areas, and the reliability of data is hard to assess, making it challenging to determine the exact impact of GST on electricity generated by grid-scale solar power projects.

A wide range of claims are made by third-party sources. Many are produced by industry stakeholders, whose claims may reflect negotiating positions as much technical analysis. Further, there have been a number of changes to GST rates in the months running up to its launch and in the nine months after its introduction. Very few sources set out the evidence for their claims, so there is no way to review the rates and cost data that form the basis of their analysis or the types of project and contract they have included. There are also differences in how cost impacts are estimated: sometimes as impacts in "project costs" and in others as impacts on "solar tariffs."

There is nonetheless general consensus that the net impacts of the GST have been cost increases for the solar power sector. In the month that the GST was introduced, the MNRE released an evaluation for consultation with industry that estimated a 6 per cent rise in total project costs but with data that show only a 0.75 per cent increase on solar tariffs themselves (MNRE, 2017b). Around the same time, the consultancy firm Bridge to India (2017c) estimated an increase of 3 to 8 per cent in the cost of solar projects; law firm HSA Advocates (2017) estimated a 5 per cent increase in project costs; and think tank the Centre for Energy, Environment and Water (CEEW) estimated a 1.6 per cent increase in solar tariffs (Chawla, 2017). As of end-2017, the All India Solar Industries Associate (AISIA) has released statements that the GST has increased solar power project costs by 10 to 12 per cent, amid claims that the tax burden on inverters, cables and transformers has in fact increased under the GST because these items are not being defined as part of the solar power generating system but as independent products (MoneyControl, 2017; Sraisth, 2018). Similar complaints have been made by individual renewable power producers (Arora, 2017).

Interviews with MNRE, analysts and solar power companies suggest that these varying estimates are a result of the uncertainties that the GST has brought about. For example, many projects under the EPC model are purchasing individual components at varying tax rates of 5, 8 and 18 per cent which requires calculations per component to arrive at a higher estimate of the GST's impact on project costs. Theoretically, as confirmed in an interview with MNRE, an EPC contractor can bill to the developer a 5 per cent GST for procurement of goods and then secure a refund for the extra tax paid under the GST's input tax credit mechanism (ITC). Solar companies, however, argue that the MNRE is only a guiding body and not a tax authority. The GST is implemented by the CBEC, which demands proof from the EPC company that the component procured is being used in the solar power generation sector. Respondents argued that this requirement is ad hoc and makes the tax subject to varying interpretations.

Table 7. Impact of GST on Solar Tariff of Solar PV Grid under an EPC contract

Part of production chain	% of Total levelized cost of electricity (LCOE) Tariff	Capital cost heads	% of Sub-Total (Pre-GST)	Pre-GST tax rate	GST*
Upstream	80.5–88.5%	PV Modules	51%	0%	5%
		Land Cost	6%	0%	0%
		Civil and General Works	9.5%	4%	5%
		Mounting Structures	6.5%	12.5%	5%
		Power Conditioning Unit	6.5%	12.5%	5%
		Evacuation Cost	15%	12.5%	5%
		Soft Cost	5.5%	14.5%	18%
Downstream	11.5–19.5%	Operations & maintenance	100%	14.5%	18%
		Total	**100%**		

* Includes CGST + SGST (i.e., 2.5 per cent each for the 5 per cent tax slab and 9 per cent each for the 18 per cent tax slab.)

Source: Authors' analysis based on CBEC, 2017; MNRE, 2017b; Chawla & Aggrawal, 2016.

GST's Impact on Wind Projects

In terms of upstream costs, MNRE estimated that the cost of wind turbines and other parts, including rotors, constitute 69 per cent of the capital cost of wind power projects (MNRE, 2017b). Prior to GST, these components, if imported, were subject to a basic customs duty of 5 per cent, while all other taxes like excise duty and VAT were not applied. Locally sourced turbines attracted a VAT of 5 per cent in some states. The GST has not changed this tax burden, as the prevailing GST tax rate for wind turbines remains 5 per cent (CBEC, 2017).

In the wind power sector, the cost of transformers and transportation has increased under the GST. MNRA estimates that these constitute less than 7 per cent of total capital costs (MNRE, 2017a), so this is likely to have had a limited impact on costs.

The remaining 24 per cent of the wind project costs are estimated to be made up of services (MNRE, 2017a, p. 37). Under the GST, these now draw a higher tax rate of 18 per cent, compared to the previous average of 14.5 per cent (MNRE, 2017a, p. 8).

This suggests that a higher tax on transformers, transportation and services will lead to a net increase in project costs compared to the prior taxation regime.

For wind projects, no final estimate on increased project costs is given by MNRE, but there is a general understanding within the industry that owing to an increase in services tax from 12 to 18 per cent the total project cost has marginally increased.

Impacts Relative to Other Sources of Energy Generation: The GST and coal

Absolute costs are not the only factor that affects investment decisions in renewable energy: much also depends on the relative competitiveness of other energy sources. As noted in Figure 5, the majority of India's electricity is generated from conventional energy. Of this, the majority is made up of coal power generation, which generated 76.4 per cent of electricity as of March 2017 (CEA, 2017b).

There is general consensus that the GST has brought down the overall tax burden on coal and coal-fired power generation, although the precise calculations underlying this analysis are not publicly available, and the tax structure implies that the new system differentiates between domestic and imported products as well as existing and newly built coal power generation facilities.

Under the previous tax regime, coal was subject to a series of taxes that were already lower than standard rates. As summarized in Table 8, domestically produced coal was subject to an excise duty of 6 per cent (lower than the standard rate of 14 per cent) and a stowing excise duty (for rehabilitation, stowing and infrastructure development of abandoned mines) of INR 10 (USD 0.15) per tonne of coal production; while imported coal was subject to an import duty of 2.5 per cent (lower than the standard rate of 10 per cent). All coal was then also subject to a 5 per cent VAT for sale within a state and a 2 per cent central sales tax if traded from state to another before sale (PIB, 2017b). It is difficult to estimate the net rate of tax on coal from this system, due to the cascading nature of the taxes, as it is levied as a share of the product's price at the point of taxation along the supply chain. Various sources report that this resulted in a total tax burden on coal of around 10–11 per cent for domestic coal.

Following the introduction of the GST, domestically produced coal is subject to a 5 per cent tax rate instead of the standard GST rate of 12 per cent or 18 per cent (PIB, 2017b). Further, the tax rate for the transportation of coal from domestic mines is charged at 5 per cent as well. This amounts to a reduced tax rate with respect to the previous regime and an increased level of preferential treatment with respect to benchmark rates of taxation. Imported coal, on the other hand, is now subject to a 10 per cent import duty (the standard value) as well as a 5 per cent rate under the GST, amounting to a net tax rate of 15 per cent. This change is a relative price advantage for domestic coal producers. Given the fact that domestic production accounts for around 70 per cent of India's annual consumption (IEA, 2015), this can be expected to reduce coal prices on average.

Table 8. Key Taxes on Coal Before and After the Introduction of the GST

pre-GST			post-GST		
Taxes	**Conditions**	**Charges**	**Taxes**	**Conditions**	**Charges**
Import duty	Imports only, cascading	2.5%	Import duty	Imports only, cascading	10%
Excise duty	Domestic production only, cascading	6%	GST	All coal, levied on final price	5%
Stowing excise duty		INR 10 per tonne			
Central sales tax	Inter-state trade, cascading	2%			
VAT	Intra-state trade, cascading	5%			

Source: PIB, 2017b; Dutta, 2017.

Despite the significant reduction in the tax burden on coal, the net impact on coal power generation is reported to be marginal, due to an increased tax burden on equipment used for coal power generation. Analysis by the private investment company ICRA Ltd estimates that the net impact of this will be to affect the cost of power generation by very small amounts: a decrease of around INR 0.03-0.04 (~USD 0.04-0.06 cents) per kWh for domestic coal; and an increase of around INR 0.07 (USD 0.1 cents) for imported coal (Dutta, 2017).

Apart from the cost of coal itself, the introduction of the GST has had one separate impact that links coal and renewable energy. Following the introduction of the GST, the government replaced the Clean Environment Cess with the GST Compensation Cess, through the Taxation Laws Amendment Act, 2017 (Financial Express, 2017). Under the new scheme, there is still an INR 400 per tonne tax on coal, but the revenues are no longer invested in a National Clean Energy and Environment Fund (NCEEF) for disbursement on renewable energy. Instead, funds raised are used to help compensate states for any revenue losses linked to the elimination of state-level taxes (Financial Express, 2017). During its eight-year lifetime, the Clean Environment Cess raised around INR 57,000 crore (USD 8.3 billion), of which around INR 21,000 crore (USD 3.1 billion) was transferred to the NCEEF and around INR 16,000 crore (USD 2.3 billion) was used to finance renewable energy projects (Department of Expenditure, Ministry of Finance, n.d.). This is more than one and a half times the total value of subsidies conferred to renewable energy in 2016, USD 1.4 billion (IISD, 2017).

Overall Impact of GST

The GST is reported to have increased the costs of renewable energy projects and to have had little or marginal impacts on coal power generation, although improving the business environment for domestic coal producers. This implies that the GST has made conventional power relatively more price-competitive than grid-scale solar power, to a small degree. The new tax system also provides a higher degree of preferential treatment for coal compared to the previous system: coal is subject to a more generous rate in comparison to standard goods, and solar power in particular receives less-generous tax treatment, despite the considerable local and global pollution externalities associated with coal.

Further, the co-opting of the coal cess to help fund state-level tax losses represents a significant restriction in the available finance for state investments in renewable energy research and development projects: the anticipated revenue from the coal cess in 2018 was INR 8,700 crore (USD 1.27 billion) (Department of Expenditure, Ministry of Finance, n.d.), almost the full value of all renewable energy subsidies provided in the latest year of available data, 2016 (IISD, 2017). This is a notable impact, also taking into account the large amount of funds that had accumulated unspent in the National Clean Energy and Environment Fund, as well as the fact that this was identified as one of India's two main national funds to support the development of climate change action in its NDC.

To some extent, this reflects the Indian government's confidence in the fundamental strengths of the renewable energy sector. In a July 2017 press interview, one MNRE official stated, "Solar tariffs have fallen from over Rs.17 per unit to below Rs. 2.50 per unit within a few years, now GST will play the role of leveller and will not allow such a steep decline to happen so suddenly…" (Prateek, 2017). This argument has some merit: part of the energy transition in India will require the government to begin drawing on renewable energy as part of the tax base, thereby decreasing reliance on revenue raised from fossil alternatives. At the same time, it is too soon to add to the cost burden for renewables: India has a considerable gap to close in order to achieve its renewable energy targets, with only 8 per cent of electricity generated from renewable sources. It is far from the case that cost challenges for renewables are over. In particular, issues of balancing variable generation and storage are likely to grow in importance and require dedicated domestic funds for research and development.

In the short term, the GST does not appear to have slowed the market. The solar sector received USD 10 billion between January and December 2017. Private equity investments increased by 47 per cent to USD 920 million between January and September 2017, compared to the same time period in 2016. A financing loan of USD 100 million for rooftop solar was co-signed by the Asian Development Bank (ADB) and Punjab National Bank (PNB) (IBEF, 2018). Solar tariffs also appear to be continuing their downward trajectory. The Solar Energy Corporation of India (SECI)—a government body that has many power generation assets and announces tenders for utility-scale projects—reduced the benchmark tariff from INR 3.93 (USD 5.8 cents) per kWh in 2016 to INR 3.43 (USD 5.0 cents) per kWh in 2017 for its 750 MW solar park in Rajasthan (Bridge to India, 2017c, p. 34). In April 2017, just a month before the launch of GST, the winning bid for a solar project was a low tariff of INR 2.44 (USD 3.6 cents) per kWh (Bridge to India, 2017c, p. 34). After the introduction of GST, the latest auction saw the winning bid at INR 2.94 (USD 4.3 cents) per kWh in Karnataka (Chandrasekaran, 2018b). While this is higher than in Rajasthan, the variance is also likely due to state-level variables: Karnataka gets lower solar radiation compared to Rajasthan and is therefore expected to have somewhat higher solar tariffs.

In the medium to longer term, one of the benefits that ought to be created by the GST is a simpler tax system that is less costly to navigate and facilitates investment. More time is required to observe whether such impacts take place. It is worth noting, however, that in the short term, the introduction of the GST—with lack of information on rates until very late the process of formulation, and with many rates changing in the months following introduction—has created a great deal of uncertainty and anxiety in the renewable energy sector. And despite its ambitions to simplify taxation in India, there remains ongoing debate about the extent to which it has achieved this aim: only four other countries in the world have a GST with four separate non-zero rates (LiveMint, 2018).

Role of Climate Finance

India has been a major recipient of climate finance to date, with large flows of donor finance and private finance flowing in particular into the energy sector. The Clean Technology Fund (CTF) is reported to have approved USD 775 million for projects in India on hydropower, solar energy, transmission infrastructure and energy efficiency (CIF, 2015). The Global Environment Facility (GEF) reports having utilized USD 59.1 million of an initial USD 87.8 million allocation for climate change activities in India (GEF, n.d.).

Donors and climate finance institutions could work with India to provide analytical support on ways in which the new tax system can be harnessed help shift revenue streams away from fossil fuels and toward clean forms of renewable energy. This is well aligned with India's own NDC, which notes the removal of subsidies on liquid petroleum products as a key first step toward more rational energy pricing. Such efforts can now be taken forward in the context of relative energy taxation under the GST. Alternatively, given that India's recent reforms have reduced and formalized the extent to which renewable energy can benefit from differences in relative taxation of energy, donors and climate finance institutions could also how market-based mechanisms such as the existing Renewable Energy Certificate (REC) system can be strengthened and better enforced.

To the extent that such mechanisms are able to increase the tax burden on fossil energy—recognizing the unpriced carbon externalities of these fuels—this will help incentivize further transitions away from GHG-intensive energy.

4.4 Policy Recommendations

India has ambitious renewable energy policy objectives as part of its climate change commitments. In light of this, the introduction of the GST is a missed opportunity. The MNRE, industry and policy analysts all estimate that it has increased project costs for renewables, particularly solar while leaving coal-powered electricity largely unaffected, while at the same time eliminating one of India's main funds for investing in renewables.

The government should consider the following recommendations:

1. **Create a transparent evidence base for ongoing assessment and adjustment.** There is surprisingly little good data that shows how the GST has affected the renewable energy industry. A database should be created, particularly as the GST remains a dynamic policy area where the government continues to reclassify various goods in the light of implementation impacts. Such information can help inform rate adjustment if and when appropriate. Good data can also inform debate about whether and how the GST system should be further simplified.
2. **Resolve ongoing areas of uncertainty under the GST.** The MNRE is the guiding body for the renewable energy industry. It has released various statements about renewable energy is treated under the GST, but ultimately it is not a tax authority. The Central Board of Excise and Customs (CBEC) should work more closely with the MNRE to ensure that the CBEC can understand areas of confusion for developers, issue clarifications and train tax officers to remove implementation challenges.
3. **Maintain and increase the net tax rate on coal production.** Coal is a highly polluting energy source. The coal industry is already under pressure as investor confidence falters in the light of increased competitiveness from renewables. The Government of India should not respond by providing a more generous net tax environment for coal. At a minimum, it should maintain the existing net tax burden, and ideally it should augment the net tax rate on coal, such as by increasing its treatment under the GST to the standard rate of 12 per cent or 18 per cent, to help reflect its full costs and further incentivize an energy transition.
4. **Revisit the termination of the National Clean Energy and Environment Fund.** The decision to redirect funds originally earmarked for clean energy to support state losses from GST introduction goes against the renewable energy objectives of India's NDC. It also suggests optimism about the scale of challenges that may be required to reach a high level of renewable energy market penetration. The Government of India should consider alternative means for raising revenue for GST compensation, such that the NCEEF can maintain operations in supporting renewable energy deployment.
5. **Climate finance remains an area of international cooperation that India can draw on for assistance.** Climate finance can play a role supporting India with all previous recommendations, including technical analysis of renewable energy sector experiences and fossil fuel taxation through to the direct provision of funds for overcoming technology challenges. Should India wish to avoid further use of taxation

as a lever for the sector, climate finance can also help to develop market-based mechanisms, such as India's existing Renewable Energy Certificate (REC) system.

India's experiences also suggest a range of lessons for other countries:

1. **Simplifying tax rates is an opportunity to ease the costs of doing business but it can also be a cause of confusion and market uncertainty.** Lack of clarity on GST rates and their application before and after the introduction of India's GST has created a great deal of short-term uncertainty for the renewable energy sector. Reducing such uncertainty should be a priority for tax sector reforms for a growing industry that the government is seeking to promote.
2. **Renewable energy can and should be taxed in India, but tax rates should take into account the impact that higher costs will have on climate objectives. Taxation should equally ensure that the external costs of fossil fuels are reflected in their prices.** As countries seek to transition away from fossil fuels, governments will lose revenue that has traditionally been collected on the production and sale of these energy sources. At some point, this may create political economy challenges for renewables, unless they can make an equivalent contribution toward national revenue-raising targets. The timing of this shift is a key concern and should take into account both the objectives for renewable deployment and also the relative taxation of fossil fuel products, which should be subject to much higher rates of taxation to account for externalities.
3. **Major economic structural reforms can have costs—but these should not be borne by budgets dedicated the climate change.** The reallocation of funds from the NCEEF to GST compensation is a good illustration of how national policy challenges can co-opt funds required to address climate change. This is a risk for fiscal tools that seek to earmark funds for climate purposes.

5.0 Conclusions and Policy Recommendations

Financing the energy transition underpinning potential achievement of the Paris goals (as well as the energy-related SDGs) is an immense challenge that calls for economic instruments to redirect financing toward clean energy solutions. NDCs to date have not paid enough attention to the role that targeted economic instruments can play, as well as the impact of other macroeconomic policies of the energy transition.

Indonesia, Mexico and India are all pursuing a shift to renewable and clean energy, in part to achieve their Paris climate targets. Their experience in introducing new economic instruments or in reforming existing ones highlights their critical importance in planning the achievement of NDCs and energy-related SDGs. On the one hand, they can impede renewable energy investment, a situation that calls for urgent reforms to better align the economic policy environment to the countries' international commitments. In Indonesia, the renewable energy feed-in tariff does not actually make renewable energy more competitive than coal electricity production, while the new Goods and Services Tax (GST) in India resulted in higher costs for renewable energy. On the other hand, the use of new economic instruments must be part of policy packages used to incentivize desirable private investments to drive the energy transition. Mexico's case highlighted the use of a CEL market alongside other climate-focused policies to promote clean energy investment.

As in most countries, the economic instruments examined in greater depth in the three case study countries co-exist with other policy instruments with which they interact. Policy contexts are in constant evolution, and the experiences of the three countries have highlighted the risk that economic policy reforms may not help align incentives in a way that fosters—or that fosters to the desired extent—the clean energy transition. Interactions between policies include those between energy or GHG-focused instruments, such as in Mexico, where the CEL market and an Emissions Trading System are being introduced in a context where a carbon tax is already in place. In India, the reform of the GST has had consequences for the renewable energy industry that could be tempered by adjusting tax rates, revamping the REC market or reconsidering the elimination of the National Clean Energy and Environment Fund. Along those lines, interactions can make investment decisions more difficult to assess, while at the same time providing options to counter the impact of economy-wide policies through targeted economic instruments.

Along those lines, governments should consider the following recommendations:

1. Seek to align economic policies with NDC targets and energy-related SDGs. Economic policy reforms, such as the phase-out of fossil fuel subsidies and the introduction of energy taxes, are opportunities to seek alignment with international commitments that governments cannot afford to overlook. Mexico appears to have seized this opportunity by introducing new instruments like the CEL mechanism. On the other hand, in Indonesia, the government has signalled the right policy direction by setting an ambitious renewable energy target, but economic policies currently in place are not attracting investors. Beyond instruments focusing on clean energy or on GHG emissions, economy-wide policy reforms also matter a great deal in driving clean energy investment. Along those lines, India's GST illustrates how a general tax system reform can be a missed opportunity for aligning economy-wide tax structures with climate targets and the SDGs.
2. Ensure economic instruments, taken as a whole, send an overall signal to investors that is clear and strong enough to shift investments. Economic instruments run the risk of confusing the marketplace or making it difficult for investors to decipher the overall price signal and its significance for their business. In India, for instance, it has proven challenging for industry to navigate the mixed signals resulting from the introduction of the GST. The GST has changed the tax burden on different energy types, but it is still difficult to assess the overall impact because of the difficulty of estimating the cumulative impact of the GST on the whole value chain. In Mexico, the lack of price information on the CEL market (which is admittedly still in its infancy) has been a barrier to greater investment to date, despite it being a policy with a positive intent for the sector.

Further complicating matters, various economic instruments inevitably interact with each other, which can dilute the incentives for private investors or make the overall impact on their investments difficult to assess. This was notable in Mexico, for instance, where multiple economic policies aimed at carbon pricing and promoting clean energy—CELs, carbon tax and ETS—have also contributed to uncertainty for investors.

3. Consider using public finance raised by economic instruments in a way that fosters the energy transition. Beyond sending a price signal that needs to be internalized by investors, economic policy reforms create savings and revenues for governments—and these can be significant. The potential global savings in 2015 from phasing out subsidies to both fossil fuel production and consumption are estimated to be around USD 425 billion (Merrill, et al., 2017). For carbon pricing around the world, the most recent State and Trends of Carbon Pricing report (World Bank, 2017) estimated that USD 33 billion was raised through carbon pricing policies in 2017. One idea is that of swapping government finance from traditional (fossil fuels) to clean energy sources (Merrill, et al., 2017), with some countries allowing hypothecation—the direct transfer from one public budget line to another—while others perform indirect swaps, for example by reducing a budget for fossil fuel support while at the same time increasing a budget for clean energy. Along those lines, swaps provide a "means of implementation" to deliver the clean energy that underpins a major part of the NDCs and many of the SDGs. India's Clean Environment Cess was a good example of a swap, that, however, was scrapped in early 2018. Actively looking to include swaps in NDCs and SDG implementation plans and supporting policies and plans is strongly encouraged, as is the inclusion of economic instruments more generally.
4. Build an evidence base for the careful design of economic instruments and their ongoing assessment and adjustment. Across the three case studies, it appeared that very few assessments of the impacts of reforms, or of multiple interacting policies, on the renewable energy industry have been conducted. These policy environments are dynamic, as countries gauge how to best achieve their NDC targets and SDGs, and adjustments are bound to be made. There is a need for further research to inform reforms to come as well as help countries make further adjustments to new policies. This research would also help countries report to the international community on progress made, whether it be to the UNFCCC or on SDGs.

The case studies have also highlighted the importance of the interplay between international climate finance and national economic policy. Climate finance is an area of international cooperation that must play a stronger role in supporting countries in undertaking policy reforms. Countries must be encouraged to seriously consider reforming economic policies. This could be achieved through the following actions:

- Raise awareness and understanding of the benefits of different types of economic instruments. Introducing economic instruments can be politically challenging and may appear difficult to manage. International support can play a role in demonstrating the benefits of using economic instruments, notably through lesson sharing from other countries, and start changing perceptions and building a supportive constituency both within government, and also outside it, among private sector actors and civil society. Mexico provided a good example of international support for its ETS simulation in order to increase the private sector's understanding of the system.
- Provide technical policy assistance in designing economic instruments. All three case study countries have strong partnerships with multilateral and bilateral donors. Considering the complexity of some of the economic instruments and their interaction with other policies, international support can play a key role in helping governments create economic policy environments that leverages private sector engagement. Along those lines, there is a need to conceptualize international climate finance as complementary to economic policy reform.

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