

Mapping India's Energy Subsidies 2020:

Fossil fuels, renewables,
and electric vehicles

REPORT

INDIA'S ENERGY TRANSITION



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Executive Summary

Subsidies matter because they are used by governments around the world to influence energy producers and consumers. This report examines how the Government of India (GoI) has used subsidies to support different types of energy, updating two previous reviews of India's energy subsidies. We seek to answer: How have India's energy subsidy policies changed? What have been the most significant developments in India's dynamic energy policy environment? And is public support aligned with India's desired energy future?

Our data cover all subsidies from production to consumption for coal, oil and gas, electricity transmission and distribution, renewable energy and electric vehicles. Nuclear and hydropower are not included due to a lack of adequate data availability. The underlying data are [available online](#) and have been made easier to explore with an accompanying [data portal](#).

Five ways India's energy subsidies have changed since our last review

1

Oil and gas subsidies up by over 65%.

This rise—from INR 40,762 crore (USD 6.1 billion) in financial year (FY) 2017 to INR 67,679 crore (USD 10.07 billion) in FY 2019— is largely driven by



higher oil prices and growing use of subsidized liquefied petroleum gas (LPG).

2

Renewable energy (RE) subsidies down by 35%, but likely to rise again.

RE subsidies fell from a high of INR 15,313 crore (USD 2.3 billion) to only INR 9,930 (USD 1.5 billion) in FY 2019. This reflects falling RE costs but also a slowdown driven by policy decisions such as the solar safeguard duty and price caps in auctions. Several new, large policies have been confirmed since FY 2019, so subsidies are expected to rise again in FY 2020.



3

Consumption subsidies rising. Success in expanding energy access has also increased the cost of consumption subsidies. State-level under-priced electricity is the most costly individual subsidy policy in India,



estimated at INR 63,778 crore (USD 9.5 billion). Evidence suggests it is not well-targeted.

4

Coal subsidies remain largely unchanged, and the net costs of coal are much larger than the revenues.

We estimate total revenues from coal taxes and charges and total costs from coal-related subsidies, air pollution and greenhouse gas (GHG) emissions. Even with conservative assumptions, the outcome is a large net cost from coal. Coal subsidies are estimated at INR 15,456 (USD 2.3 billion) in FY 2019 and may increase significantly from FY 2020, given non-compliance with deadlines to install air pollution control technology.



5

Support for electric vehicles (EVs) has skyrocketed. EV subsidies have grown over 11 times since FY 2017.

This reflects the fact that India has only very recently stepped up its support levels for EV. Growth is expected to continue.





What Does This Mean for India's Efforts to Shift Public Funds to Clean Energy?

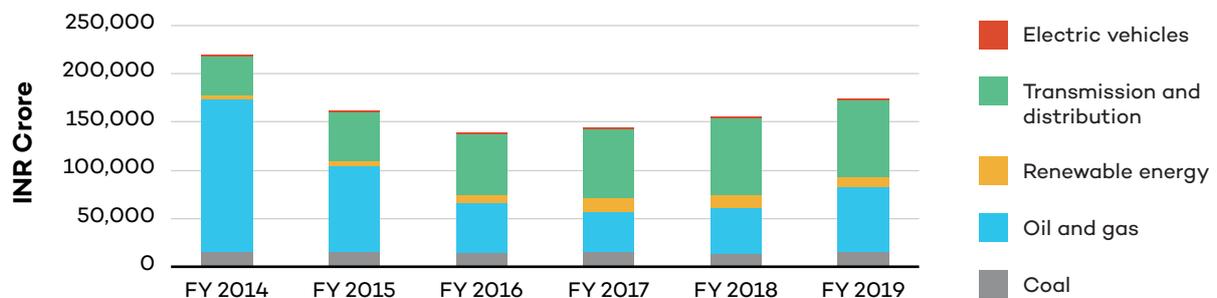
Recent increases in fossil fuel subsidies and decreases in renewable energy subsidies have not yet altered larger trends—since FY 2014, India has shifted significant public resources toward a clean energy transition. In FY 2014, the first year from which we track data, fossil fuel subsidies have fallen by more than half, largely driven by falling world oil prices and policy reforms to diesel and kerosene pricing, while subsidies for RE and EVs have increased over three and a half times, largely due to policy efforts to meet capacity targets. EV subsidies, in particular, have increased over 440 times from a very low baseline in FY 2014.

More remains to be done: subsidies for fossil fuels are still over seven times larger than subsidies for alternative energy. In FY 2019, subsidies for oil, gas and coal amounted to INR 83,134 crore (USD 12.4 billion), compared to INR 11,604 crore (USD 1.7 billion) for renewables and electric mobility.

How Might Energy Subsidies Change in Response to the COVID-19 Crisis?

India should prioritize health and economic recovery as it navigates the COVID-19 crisis—but clean energy transition can and should be reflected in coping strategies and support measures. At the time of writing, it is hard to predict the full impacts of COVID-19, but it seems likely they will be significant and prolonged. There are three key implications for public resources and energy transition in India. (1) The crash in world oil prices can free up revenue to help tackle the crisis by temporarily eliminating petroleum product subsidies and enabling higher tax rates. India has already shown leadership by significantly increasing gasoline and diesel taxes. (2) At the same time, there will be increasing demand to support energy producers, as profits fall, demand falters and perceptions of risk rise. If India considers economic stimulus, it should carefully assess how different interventions for producers will undermine or support clean energy transition. (3) There will be increasing demand for social protection and effective and efficient public services. Investments in these areas can create new options to target energy access subsidies, allowing benefits to be clustered on those most in need.

Figure ES1. Total quantified energy subsidies, FY 2014–FY 2019 (INR crore)



Source: Authors' calculations. Note that a significant number of subsidy policies have been identified but cannot be quantified due to a lack of transparently available data: six for coal, 15 for oil and gas, four for renewables, one for electricity transmission and distribution, and two for EVs in FY 2019. See the full report and [accompanying spreadsheets](#) for more details.

Recommendations

1 Increase the shift of public resources to clean energy. India's progress since FY 2014 shows commitment to energy transition, driven at least in part by specific actions to reform perverse subsidies and back clean energy. But action is still insufficient to address the scale of sustainability challenges. It is recommended that the GoI further swap public resources from fossil fuels to clean energy.

2 Resist demands for new oil and gas subsidies. Volatile world oil prices create demand for price interventions—such as a tax reduction for motor fuels in FY 2018 and FY 2019—and various support measures are being considered for natural gas. If any economic stimulus is introduced, there will be further demands to help producers. It is strongly recommended to avoid such subsidies: volatility makes them a fiscal liability; they are hard to remove once introduced; and they cause fossil energy lock-in. Investments in targeted social protection and public services can better help consumers cope with shocks.



3 Adapt RE subsidies for emerging technologies and grid balancing. Clean electricity is essential: other sectors, such as transport and cooking, will rely on electrification to deliver clean energy. The price competitiveness of on-grid solar and wind power has brought into question the need for continued RE subsidies. But new cost barriers can quickly alter competitiveness, and emerging technologies still need assistance. To achieve 450 GW by 2030, the GoI must develop quality interstate grid transmission and storage—little support was identified in these areas. It is recommended to adjust RE subsidies carefully and use subsidies with other policy tools to promote emerging technologies and grid balancing.



4 Target consumption subsidies for energy access: LPG and electricity. Access policies have grown increasingly costly. The Ministry of Petroleum and Natural Gas and the Ministry of Power should work with social protection agencies to design and test mechanisms to target assistance without harming energy access, such as an “Ujjwala 2.0” or a Direct Benefits Transfer for Power.



5 Address the full costs of coal. Taxes and charges do not come close to covering the net cost of coal to India. A plan is needed to address coal pricing in a socially responsible way, including diversifying coal revenues and protecting consumers and workers. The coal cess should be maintained and the National Clean Energy and Environment Fund, or some equivalent, should be revived and improved.



6 Closely monitor and adapt EV subsidies. Policies should be monitored to ensure effective, efficient and equitable support, including for two-wheelers, public transport, waste treatment and battery recycling. Support may still not be sufficient to reach 2030 targets.



7 Develop formal reporting structures on subsidies. Subsidy reporting can be conducted in line with formal guidelines for Sustainable Development Goal 12(c)1 and India's G20 peer review of fossil fuel subsidies. With fuller data, ministries should monitor, evaluate and adapt their most significant subsidies to better meet policy objectives.



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List of Abbreviations

AD	accelerated depreciation
ADITYA	Atal Distribution System Improvement Yojana
CAG	Comptroller and Audit General of India
CEA	Central Electricity Authority
CEEW	Council on Energy, Environment and Water
CERC	Central Electricity Regulatory Commission
CIL	Coal India Limited
CNG	compressed natural gas
CO₂	carbon dioxide
CO₂e	carbon dioxide equivalent
COVID	coronavirus disease
DBTL	Direct Benefit Transfer for LPG
DBT-P	Direct Benefit Transfer for Power
DDUGJY	Deendayal Upadhyaya Gram Jyoti Yojana
DISCOM	distribution company
DRE	decentralized renewable energy
EV	electric vehicle
FAME	Faster Adoption and Manufacturing of Hybrid and Electric vehicles
FGD	flue gas desulphurization
FRP	Financial Restructuring Plan
FY	financial year
GBI	generation-based incentive
GDP	gross domestic product
GHG	greenhouse gas
GoI	Government of India
GST	Goods and Services Tax
IEA	International Energy Agency
IISD	International Institute for Sustainable Development
IPDS	Integrated Power Development Scheme
IREDA	Indian Renewable Energy Development Agency (IREDA)
JNNSM	Jawaharlal Nehru National Solar Mission
KUSUM	Kisan Urja Suraksha evem Utthan Mahabhiyan
LNG	liquefied natural gas
LPG	liquified petroleum gas

MLE	Ministry of Labour and Employment
MNRE	Ministry of New and Renewable Energy
MoEFCC	Ministry of Environment, Forest and Climate Change
MoP	Ministry of Power
MoPNG	Ministry of Petroleum and Natural Gas
NCEEF	National Clean Energy and Environment Fund
NDC	Nationally Determined Contribution
NEMMP	National Electric Mobility Mission Plan
NESM	National Energy Storage Mission
NMTBS	National Mission on Transformative Mobility and Battery Storage
NO_x	nitrogen oxide
O&G	oil and gas
PCT	pollution control technologies
PDS	Public Distribution System
PFC	Power Finance Corporation
PIB	Press Information Bureau
PM	particulate matter
Ujjawala	Pradhan Mantri Ujjwala Yojana
PPAC	Petroleum Planning and Analysis Cell
PTI	Press Trust of India
PV	photovoltaic
RE	renewable energy
Saubhagya	Sahaj Bijli Har Ghar Yojana
SDG	Sustainable Development Goals
SHAKTI	Scheme for Harnessing and Allocating Koyala Transparently in India
SO₂	sulphur dioxide
T&D	transmission and distribution
TPP	thermal power plant
UDAY	Ujjwal Discom Assurance Yojana
WHO	World Health Organization
WLD	work-loss days
WTO	World Trade Organization



1.0 Introduction

Subsidies matter because they are used by governments around the world to influence energy producers and consumers. For producers, subsidies alter the relative competitiveness of different energy technologies and send a signal about national priorities to influence investment decisions and shape the energy mix. For consumers, subsidies can make different energy types more or less affordable to influence consumption decisions and target social outcomes.

Subsidies can help drive positive changes. They can help consumers afford modern energy, bring down the costs of new technologies and encourage investors to take risks in new markets. Subsidies can also be poorly designed, encouraging public ills rather than public goods, despite well-intended policy outcomes. Subsidies are often expensive. They may achieve their objectives but do so inefficiently, taking up scarce resources at large opportunity costs. They can also encourage the wasteful use of energy. In particular, subsidies for fossil fuels increase consumption, driving up air pollution and carbon emissions while crowding out investment in renewables and energy efficiency—this is why 193 countries have committed to fossil fuel subsidy reform as part of Sustainable Development Goal (SDG) 12 on responsible consumption and production. For all these reasons, transparency is needed about what subsidies exist, how much they cost and what impacts they have.

This report examines how the Government of India (GoI) has used subsidies to support different types of energy, updating two previous reviews of India's energy subsidies—[India's Energy Transition 2017](#) and [India's Energy Transition, 2018 Update](#). The [underlying data have been updated](#) to FY 2019¹ and made easier to explore with an accompanying [data portal](#). Detailed descriptions of existing subsidies can be found in our previous publications, while descriptions of new subsidies are available on the [IISD website](#). We seek to answer: How have India's energy subsidy policies changed? What have been the most significant developments in India's dynamic energy policy environment? And is public support aligned with India's desired energy future?

This year, the update also contains a special chapter that examines coal subsidies in greater detail. It contextualizes the data on coal by comparing the value of subsidies with the value of tax revenues, cross-subsidies and social costs, such as air pollution and carbon emissions, to explore the question, is coal over-subsidized or over-taxed in India? The methodology and calculations are also available in the [supporting datasheet](#).

Since this review was last conducted, India has declared its intention to conduct a peer review of its fossil fuel subsidies with France as part of the G20 commitment to phase out subsidies. Meanwhile, the United Nations Environment Programme has published a formal methodology to help countries report on their efforts to phase out fossil fuel subsidies under SDG 12. This report hopes to provide a useful resource for the GoI and others as these processes go forward.

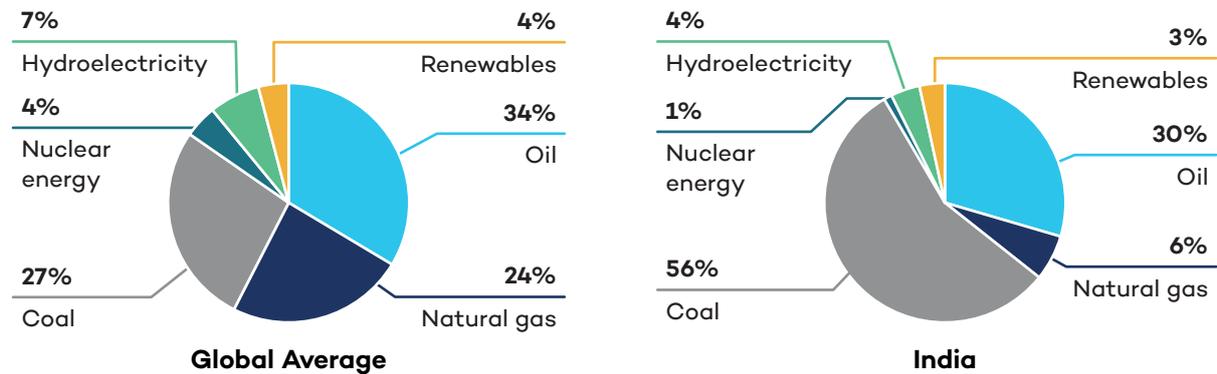
¹ FY 2019 refers to the year beginning in April 2018 and ending in March 2019, and likewise for other years.



2.0 Context

Robust growth in the economy and population has driven a massive increase in India's primary energy consumption: a 10-year growth average of 5.4% from 2008 to 2018, compared to a global average of 1.5% (BP, 2019b). As demonstrated in Figure 1, coal and oil dominate the commercial energy mix nationally and globally. As of 2018, coal made up 56% of primary commercial consumption compared to a global average of 27%. Oil made up 30% compared to a global average of 34%. Gas remained a marginal fuel, at 6% of primary consumption, compared to a global average of 24%. The shares of renewables, hydro and nuclear were 3%, 4% and 1%, respectively, a similar scale to global averages.

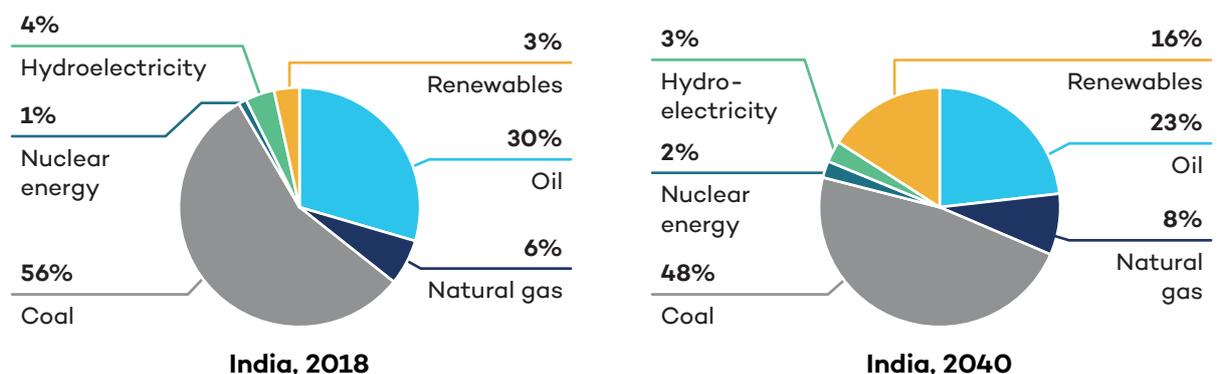
Figure 1. Primary energy consumption of commercial fuels in 2018 (global average and in India)



Source: BP, 2019b. Note that, while the share of coal and oil in primary consumption is high, their contribution to satisfying final service demand is lower due to conversion losses. For the same reason, the contribution of renewable energy (RE) to satisfying energy service demand is larger than its share in primary consumption.

Assuming that recent trends continue, the BP Energy Outlook estimates that India will account for more than a quarter of net global primary energy demand growth between 2017 and 2040. As illustrated in Figure 2, primary energy demand will see significant growth in the share of renewables, a small decrease in the share of coal and a significant fall in the share for oil. According to the International Energy Agency (IEA) projections, this continued reliance on conventional energy will see outdoor air pollution and energy-related water use rise significantly by 2040 (IEA, 2016a, 2016b). Carbon dioxide (CO₂) emissions will roughly double as well (BP, 2019a).

Figure 2. Primary energy consumption of commercial fuels in India, 2018 and 2040



Source: BP, 2019a, 2019b.

India's energy policy balances various objectives: sustaining economic growth, achieving universal access and powering prosperity, while also reducing air pollution, water use and carbon intensity. Some of the most important targets for sustainability are summarized below.

20–30% REDUCTION IN PM_{2.5}, PM₁₀

India has some of the world's worst air pollution, contributing to hundreds of thousands of premature deaths per year. The National Clean Air Program aims to reduce particulate matter (PM_{2.5} and PM₁₀) by 20–30% by 2024, compared to 2017, including a program in 43 cities with the highest pollution (Ministry of Environment, Forest and Climate Change [MoEFCC], 2019).

CLEAN COOKING FOR 80+ MILLION HOUSEHOLDS

To achieve universal clean cooking, the Ministry of Petroleum and Natural Gas (MoPNG) reports having connected 8 crore women in low-income households to LPG and the Ministry of New and Renewable Energy (MNRE, 2018a) also has programs to reduce the use of traditional biomass. Other initiatives exist for improved cookstoves, biogas plants and piped natural gas, among others.

175 GW TO 450 GW IN RE

The government is targeting 175 GW RE electricity capacity by 2022, increasing the share of non-fossil capacity to above 40% (MoEFCC, 2015). This is a key initiative in the Nationally Determined Contribution (NDC) under the Paris Agreement to reduce emissions intensity by 33–35% by 2030 (MoEFCC, 2015). 86 GW of RE capacity was installed as of December 2019, more than doubling capacity in four years. In 2019, Prime Minister Modi committed to a target of 450 GW, following a Central Electricity Authority (CEA) report on the optimal energy mix in 2030 (CEA, 2019a; Press Trust of India [PTI], 2019b). This would comprise 300 GW of solar, 140 GW of wind and 10 GW of biomass, as well as 73 GW of hydro and 34GW or 136 GWh of battery storage systems to ensure grid stability (CEA, 2019a).

NESM FOR ENERGY STORAGE

Draft plans for a National Energy Storage Mission (NSEM) have been developed to ensure enough storage is available to balance variable RE. Key focuses include integrating RE with distribution and transmission grids, setting rural microgrids with diversified loads or standalone systems, and building storage into electric mobility plans (MNRE, 2018b).

EV30@30, NEMMP & NMTMBS

As a member of the EV30@30 campaign, India is aiming for 30% of all new vehicle sales to be electric by 2030, from a baseline of around 3.5% in FY 2018 (Laan & Jain, 2019). It is promoting EVs through the National Electric Mobility Mission Plan (NEMMP) 2020. The draft 2018 National Auto Policy notes that this is for both sustainability and India's automotive industry, in line with the "Make in India" campaign (Ministry of Heavy Industries and Public Enterprise, 2018a). The National Mission on Transformative Mobility and Battery Storage (NMTMBS) will also support several large plants for export-competitive integrated batteries and cell manufacturing (PM India, 2019).

FOSSIL FUEL SUBSIDY REFORM

As part of the G20 and SDG 12.c.1, India has committed to rationalizing and phasing out inefficient and wasteful fossil fuel subsidies (G20, 2009). In 2019, India committed to a G20 fossil fuel subsidy peer review.

3.0 Approach and Scope

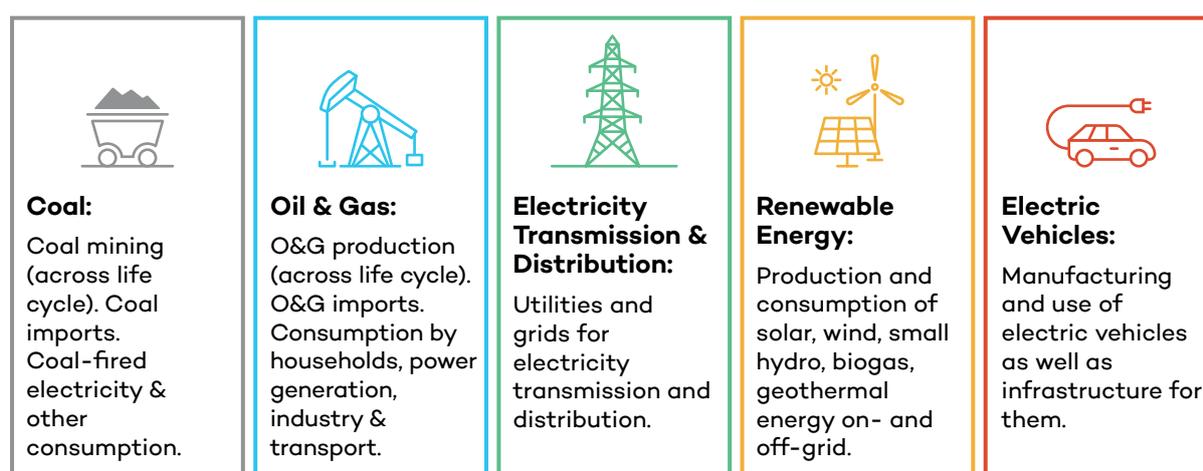


As described in detail in Annex 1, our definition of “subsidy” is taken from the Agreement on Subsidies and Countervailing Measures of the World Trade Organization (WTO), agreed by all 164 WTO members. This includes (WTO, 1994):

1. Direct and indirect transfers of funds and liabilities (budget outlays)
2. Government revenue foregone (reduced tax rates and tax exemptions)
3. Provision of goods or services below market value (such as land or water)
4. Income and price support through market regulations (including non-enforcement).

In this publication, the terms “subsidy” and “government support” are used as synonyms. We categorize subsidies into five groups, illustrated in Figure 3: coal; oil and gas (O&G); electricity transmission and distribution (T&D); RE; and EVs. Subsidies to nuclear and large hydropower are excluded due to a lack of data. All categories include the full value chain of production and consumption: for example, O&G includes upstream subsidies for refineries and downstream subsidies for retail consumers. For most subsidies, estimates are based on official government data. Some are identified but “non-quantified,” due to a lack of data (see Annex 2). Our data cover FY 2014 to FY 2019.

Figure 3. Grouping of energy subsidies



Most subsidies in the review are central government policies. Thus, estimates are conservative—they do not include state mechanisms. An important exception is under-recoveries for electricity. These are set by states and partially paid by state-level budgets. We include them because they exist across almost all states, and they are very large, so exclusion would be a serious omission. Notably, these subsidies are partly paid by higher charges (cross-subsidies) for other consumers and losses by electricity distribution companies (DISCOM) losses. We do not include these elements in our estimates, due to challenges collecting data. Another important exception in the electricity sector is bailout packages for DISCOMs. Methodologically, this is hard to attribute as a subsidy to specific years, because it covers losses that have accumulated over many years and come from many sources. It is therefore excluded from T&D totals and marked separately as a standalone group “electricity sector bailout.”

For more details on the methodology, see Annex 1, as well as [data spreadsheets](#) and the [new subsidy description templates](#) accompanying this report.



**4.0 Key Trends in
Energy Subsidies From
FY 2014 to FY 2019**

HIGHLIGHT:

- Government support for fossil fuels has increased in the past two years while support for renewables declined. The general trend since FY 2014, however, is still a net shift of support away from fossil fuels and toward clean energy. Nonetheless, India's subsidies to oil, gas and coal (INR 83,134 crore or USD 12.4 billion in FY 2019) remain more than seven times the value of subsidies to renewables and EVs (INR 11,603 crore or USD 1.7 billion in FY 2019).

As shown in Figure 4, total quantified energy subsidies declined from INR 2,18,622 crore (USD 36.2 billion) in FY 2014 to INR 1,42,619 crore (USD 21.3 billion) in FY 2017, but then increased again, reaching INR 1,74,408 crore (USD 25.95 billion) in FY 2019. This can be explained by the following trends:

- Oil and gas have seen a resurgence in the past two years. They had fallen almost 75%—from INR 1,58,482 crore (USD 26.2 billion) in FY 2014 to 40,762 crore (USD 6.1 billion) in FY 2017—largely driven by low world oil prices and subsidy reforms for petrol, diesel, LPG and kerosene. Their rise again—to INR 67,679 crore (USD 10.1 billion) in FY 2019—is largely due to higher world oil prices and growing use of subsidized LPG.
- Electricity T&D subsidies have grown steadily, from INR 41,252 crore (USD 6.9 billion) in FY 2014 to INR 79,671 crore (USD 11.9 billion) in FY 2019. By far the biggest share is made up of electricity DISCOMs selling electricity at below-market rates to certain groups, largely residential and agricultural users, and transfers by state governments to partly cover the loss. A much smaller share is for the expansion of infrastructure and improved operational and financial performance for DISCOMs.
- Coal subsidies remain largely unchanged, from INR 15,660 crore (USD 2.6 billion) in FY 2014 to INR 15,456 crore (USD 2.3 billion)² in FY 2019.
- RE subsidies have seen a reversal of trends. After rising almost five-fold from FY 2014, they fell 35%, from a high of INR 15,313 crore (USD 2.3 billion) in FY 2017 to INR 9,930 crore (USD 1.5 billion) in FY 2019. This was largely due to the way that increased competitiveness of grid-scale solar and wind has affected subsidy policies, particularly Viability Gap Funding and tax benefits, as well as other policies that slowed the market, such as the solar safeguard duty. Policies confirmed since FY 2019, however, are expected to see RE subsidies rise again in subsequent years.
- EV subsidies remain nascent but are gaining momentum: increasing over 400-fold, from INR 3.8 crore (USD 0.6 million) in FY 2014 to INR 1,673 crore (USD 249 million) in FY 2019.

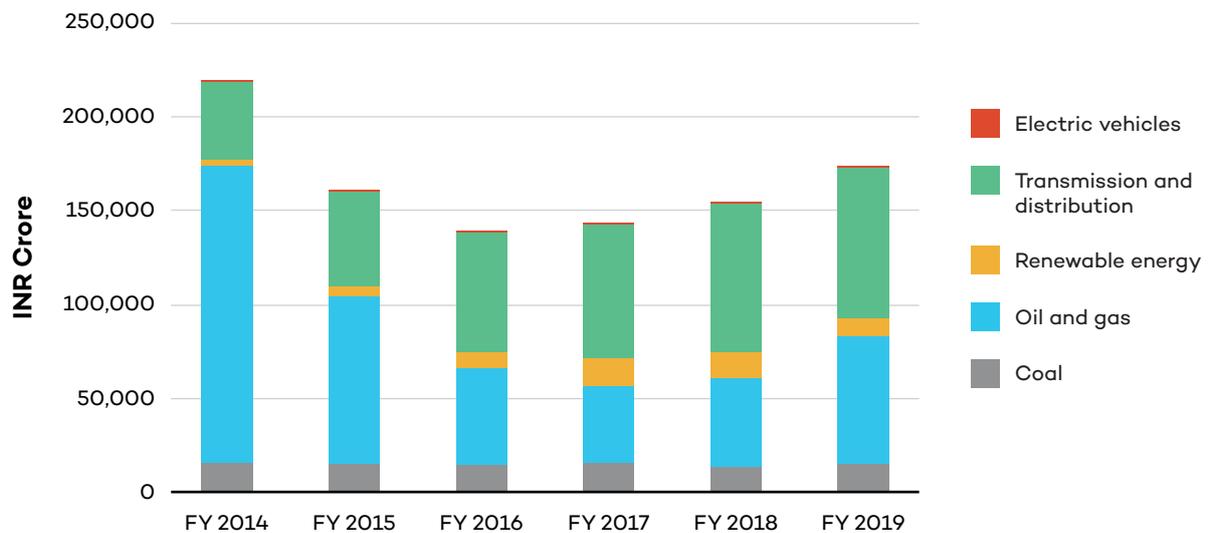
Further to this, India's bailout for DISCOMs, Ujjwal DISCOM Assurance Yojana (UDAY), was equal to INR 92,113 crore (USD 14.1 billion) and INR 74,228 crore (USD 11.1 billion) in FY 2016 and FY 2017, respectively. As it comes to an end, it declined to INR 10,177 crore

² The value in USD shows a decline on account of INR devaluation from FY 2014 to FY 2017.

(USD 1.5 billion) in FY 2019. UDAY is intended to help improve the solvency of DISCOMs created by many years of under-recoveries from numerous causes, including subsidies. It is not included in the estimate of total subsidies, because it is methodologically hard to attribute to any individual year without biasing interpretation of trends.

The two most costly individual subsidies are for consumption—under-pricing of electricity and Direct Benefit Transfers for LPG (DBTL or PAHAL). Improving targeting could reduce costs while increasing benefits for those in need. Finding how to do this without compromising energy access is a challenge.

Figure 4. Total quantified energy subsidies, FY 2014–FY 2019 (INR crore)



Source: Authors' calculations. Note that a significant number of subsidy policies have been identified but cannot be quantified due to a lack of transparently available data: six for coal, 15 for O&G, four for renewables, one for electricity T&D, and two for EVs in FY 2019. See subsequent discussion and [accompanying spreadsheets](#) for more details.

Since our last review in FY 2017, five new energy subsidies have been introduced and 13 have been discontinued (see Annex 3 and [accompanying spreadsheets](#) for details). Major schemes that were announced in FY 2019 are Pradhan Mantri Kisan Urja Suraksha evam Utthan Mahabhiyan (KUSUM) and Phase 2 of the Grid Connected Rooftop Solar Programme, which aims to significantly increase the use of decentralized solar power capacity for agriculture and households. In 2018, the introduction of the Goods and Services Tax (GST) system also made significant changes to subsidies linked to taxation. Under the new regime, the benchmark rates for most minerals were set at 18%, while some goods enjoyed a concessional rate of 5%. As discussed in Soman, McCulloch et al. (2019), this made coal thermal power cheaper than the earlier regime, while solar power became more expensive. It also led to the effective dismantling of the National Clean Energy and Environment Fund (NCEEF). NCEEF revenues had previously been earmarked for the support of RE but were redirected to pay compensation to states for general revenue losses associated with the new GST system.

4.1 Subsidies to Coal

HIGHLIGHT:



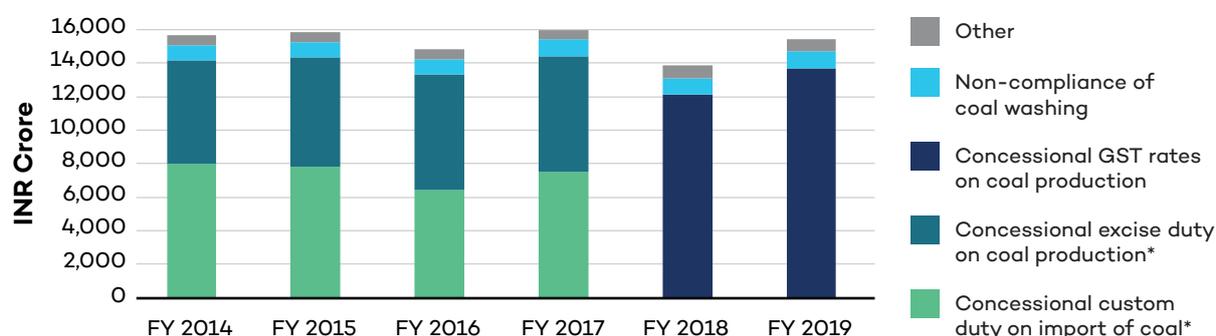
- Quantified coal subsidies have remained stable since FY 2014, declining only marginally from INR 15,660 crore (USD 2.6 billion) to INR 15,456 crore (USD 2.3 billion) in FY 2019.
- The largest individual subsidy is a concessional tax rate, foregoing INR 13,681 crore (USD 2.0 billion) of revenue in FY 2019, equal to 7% of all energy subsidies and 87% of all coal subsidies.

Quantified coal subsidies remained relatively stable between FY 2014 and FY 2019, from INR 15,660 crore (USD 2.6 billion) to INR 15,456 crore (USD 2.3 billion). As shown in Figure 5, the major subsidies to coal in FY 2019 were:

- A concessional 5% sales tax under the GST, against a benchmark of 18% applied to other minerals, which reduces input costs for coal-based electricity generation, worth INR 13,681 crore (USD 2 billion).
- Non-compliance with coal washing regulations that reduce air pollutants, conferring a financial value of INR 1,027 crore (USD 153 million) to coal producers.
- Other smaller policies that cover a range of objectives, including conservation and safety of coal mines, exploration in difficult areas, and special benefits to employees.

There is a long-standing debate about whether coal is over-subsidized or over-taxed. In previous reviews, we have received feedback that coal subsidies alone are only one part of the picture. For this reason, our 2020 update includes a special focus on coal, looking comparatively at subsidies, taxes, special charges, and social costs—for full details, see Chapter 5.

Figure 5. Total subsidies to coal in India



Source: Authors' calculations; see the [accompanying spreadsheets](#) for more details. Policies marked with * are no longer in place as of FY 2019. A number of policies were identified but could not be quantified due to a lack of data. These policies include low-interest-rate loans for coal power plants; exemption of customs duty on coal mining equipment; concessional rates for long-distance railway freight; revenue foregone from coal distribution through the Memorandum of Understanding route; compensation for land acquired for coal mining; a lack of coal sector regulator; and non-competitive pricing of coal.

Non-compliance with environmental norms has been a major area of concern for coal subsidies in recent years. Currently, the only quantified subsidy in this area is non-compliance with coal washing regulations. The Central Pollution Control Board requires power plants located 500–749 km from mine pit-heads to only combust coal if it has 34% ash content or less, in order to reduce harmful pollutants (MoEFCC, 2014). This requires the beneficiation or “washing” of domestic coal, which typically has an ash content above 40% (Powell & Sati, 2017). Many generators have refrained from coal washing, often supported by state authorities. For example, in 2019, the Supreme Court of India instructed the Punjab State Power Corporation Limited to reimburse generators for coal washing costs, against an earlier decision by the Punjab State Electricity Regulatory Commission (Sirhindi, 2019).

There are ongoing concerns about the delay of new norms on sulphur dioxide (SO₂), nitrogen oxide (NO_x), PM and mercury (see Box 1). In this review, the delay of norms has not been considered a subsidy, because the official timeline for compliance has itself been extended, rather than not enforced. However, 11 units in the Delhi National Capital Region with a capacity of 12.8 GW were mandated to comply by December 31, 2019 (CEA, 2019b). Only one had complied as of January 1, 2020, and the remaining 10 continue to operate at the time of writing (Varadhan, 2020). In February 2020, the Central Pollution Control Board issued a notice to 14 plants to explain why they are not complying (Mohan, 2020). As a result, coal subsidies may increase significantly in FY 2020, with every day of non-compliance representing a large financial benefit for producers, paid by society.

Otherwise, there may be significant subsidies linked to coal supplies and pricing, but these could not be quantified. Efforts have been undertaken to improve transparency around coal supply agreements, with the 2017 introduction of the Scheme for Harnessing and Allocating Koyala Transparently in India (SHAKTI). One issue identified is that auctions are non-transparent, with no information on source, recipient, quantity, and cost for coal supply agreements. Another issue is that SHAKTI provides preferential treatment to state-owned bodies that get supplies based on Ministry of Power (MoP) recommendations at Coal India Limited (CIL) notified prices, while private producers must bid by offering discounts on existing power purchase agreements or paying a premium on notified prices (Chirayil & Sreenivas, 2019).

Coal subsidies are largely provided by tax breaks (government revenue foregone), which make up around 90% of subsidies, while budgetary transfers accounted for the remainder (Figure 6).

Figure 6. Energy subsidies to coal by mechanism



Source: Authors’ calculations; see the [accompanying spreadsheets](#) for more details.

BOX 1. NON-COMPLIANCE OF ENVIRONMENTAL NORMS BY THERMAL POWER PLANTS

Despite being the largest source of electricity in India, coal-fired power produces a range of externalities, including air pollution. Harmful pollutants include SO₂, NO_x, PM and mercury. Coal is one of the largest sources of PM_{2.5}, anticipated at current trends to cause 1.3 million deaths per year by 2050 (GBD MAPS Working Group, 2018).

The MoEFCC notified stringent norms in 2015 to curb coal power emissions, with a two-year window for compliance, ending in December 2017. Plants have to install pollution control technologies (PCTs) such as flue gas desulphurization (FGD), selective catalytic reduction (SCR), selective non-catalytic reduction, over-fire air, low NO_x burners and electrostatic precipitators for particulate matter control, with some variation of norms according to plant age. This involves significant costs nationally, estimated at INR 73,176 crore (USD 11.3 billion) (Garg et al., 2019). The MoP has recommended for costs to be passed into consumer tariffs (Central Electricity Regulatory Commission [CERC], 2019).

Compliance was not achieved by December 2017 and, for most plants, the deadline was extended to December 2022. As of September 2019, out of 166 GW capacity to be installed with FGD, bids have been awarded to 35 GW and tenders have been issued for 99 GW (CEA, 2019b). Given that FGD procurement and installation can take up to two years, it is likely that many plants will miss the deadline (Srinivasan et al., 2018). Meanwhile, NTPC Ltd. conducted pilot studies of selective catalytic reduction and selective non-catalytic reduction to analyze their performance. It concluded that both technologies under-performed in Indian conditions and have not met the emission standard. The providers have disagreed with NTPC Ltd., arguing that their technology is proven for different types of coal and operating conditions (Tripathi, 2020).

Coal mining, like coal-fired power, also significantly affects public health. A recent audit by the Comptroller and Auditor General of India (CAG) for FY 2014 to FY 2018 found that six out of seven CIL producing companies did not formulate an environmental policy, as mandated. It also found that 12 mines owned by CIL companies violated rules by not installing Continuous Ambient Air Quality Monitoring Stations (CAG, 2019a). Further, many mines did not install treatment plants for polluted water, thereby contaminating groundwater, and had not received a no-objection certificate from the Central Ground Water Authority (CAG, 2019a).

At a policy level, a tax called the “coal cess” was started in FY 2011 to address these social costs. It does not completely internalize the costs of pollution, though it has grown from INR 50 per tonne to INR 400 (USD 5.7) per tonne. Revenues were originally to be used for clean energy and environmental causes through the NCEEF, but were subsequently redirected to compensate states for losses linked to national tax reforms. The Office of the Prime Minister has recently proposed to waive the cess to soften the cost of PCT investments for power plants, and to avoid increasing electricity tariffs. Coal consumption in FY 2019 was 630 million tonnes, so waiving the cess would have foregone approximately INR 25,000 crore (USD 3.7 billion) of revenue. The estimated cost for PCTs—INR 73,000 crore (USD 11.3 billion)—is almost three times this sum. Given the existing inefficiency of electricity consumption subsidies, the proposal is questionable. It would significantly dilute what can be regarded as India's boldest step in pricing local and global pollutants.

4.2 Subsidies to Oil and Gas

HIGHLIGHT:

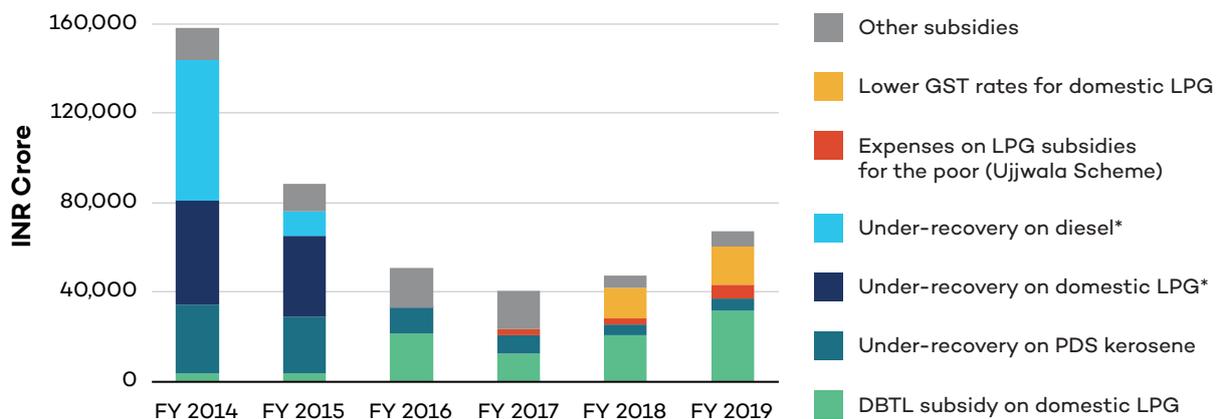


- From FY 2017 to FY 2019, support to O&G increased by two thirds, largely due to higher oil prices and growing LPG use. Despite this, subsidies in FY 2019 remain 57% lower than FY 2014.
- The largest individual subsidy is DBTL for LPG cooking, worth INR 31,447 crore (USD 4.7 billion), 17.9% of all energy subsidies and 37% of all O&G subsidies. All LPG policies together amount to INR 54,518 (USD 8.1 billion)—28% of all energy subsidies and 64% of all O&G subsidies.
- A large portion of LPG subsidies is believed to go to higher-income households, while poor households still face affordability problems.

Quantified O&G subsidies benefit both upstream and downstream actors, from exploration to consumer products. They have declined, from INR 158,482 crore (USD 26.2 billion) in FY 2014 to INR 67,679 crore (USD 10.1 billion) in FY 2019. As shown in Figure 7, key subsidies in FY 2019 were:

- The DBTL (or PAHAL), worth INR 31,447 crore (USD 4.7 billion), which transfers cash to LPG consumers after purchase to make it more affordable.
- Low GST rates for domestic LPG, worth INR 17,422 crore (USD 2.6 billion).
- LPG connection subsidies for the poor (Pradhan Mantri Ujjwala Yojana (Ujjwala) scheme), worth INR 5,649 crore (USD 0.84 billion).
- Public Distribution System (PDS) kerosene, worth INR 5,950 crore (USD 0.88 billion).

Figure 7. Total subsidies to O&G in India



Source: Authors' calculations; see [accompanying spreadsheets](#) for more detail. Policies marked with * are no longer in place as of FY 2019. A number of policies were identified but could not be quantified due to a lack of data. These policies include a sales tax differential for LPG; customs duty exemption for kerosene; and 11 concessional rates or exemptions for O&G companies linked to research, exploration, royalties, assets, storage, supply, sales, and site restoration.

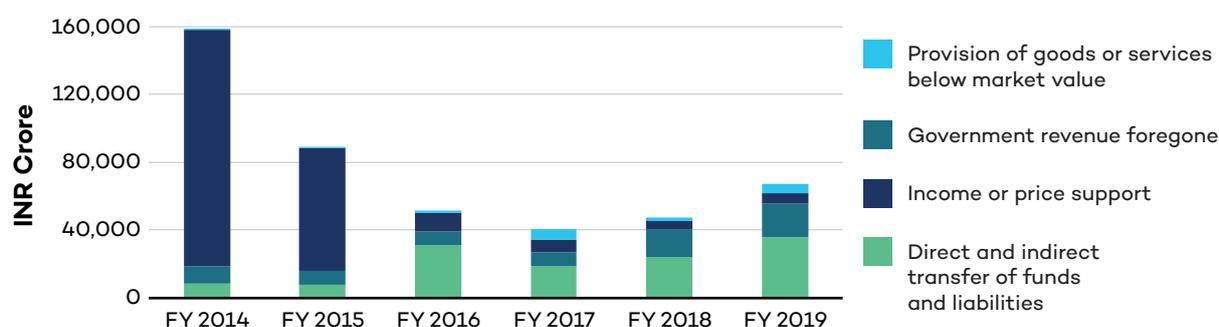
The large scale of LPG subsidies reflects a higher consumer base, due to various schemes to promote clean cooking, as well as rising oil prices. In FY 2017, the Ujjwala scheme was launched to subsidize LPG connections. The government also provides the DBTL (or PAHAL) scheme and a concessional 5% GST rate to keep LPG refill prices low. The subsidies have been successful in extending connections, but efforts are needed to shift households away from biomass and improve targeting (see Box 2).

The reduction of kerosene subsidies is also linked to clean energy access, as kerosene is a source of indoor air pollution (World Health Organization [WHO], 2018). The government has been gradually reducing subsidies for kerosene while extending electrification and clean cooking. Under-recoveries have fallen by 80%, from INR 30,574 crore (USD 5.1 billion) in FY 2014 to INR 5,950 crore (USD 0.9 billion) in FY 2019. A concessional GST rate on kerosene, however, remains at 5%.

The reform of costly gasoline and diesel subsidies in 2010 and 2014 has been a major success for India. In October 2017, however, the government reduced the excise tax on motor fuels by INR 2 (USD 0.03) per litre to smooth the impact of rising world oil prices (Press Information Bureau [PIB], 2017). This was followed in October 2018 by a reduction of INR 1.5 (USD 0.02) per litre and a requirement for state-owned oil marketing companies to reduce margins by INR 1 (USD 0.01) per litre. This was partially reversed in the FY 2020 budget and rates were hiked substantially when oil prices crashed in early 2020. We have not added this to subsidy totals because there are arguments both for and against doing so (see Box 3). Regardless, such reductions do forgo significant revenue: INR 30,894 (USD 4.6 billion) in FY 2019, if compared to excise rates in FY 2017. This highlights how even small per-unit fuel subsidies rapidly accumulate and the need to be cautious with fuel pricing. For the medium term, capacity is needed to target assistance to low-income households when costs of living rise.

Around 96% of quantified O&G subsidies are for consumption. As illustrated in Figure 8, their form has changed over the years. Income or price support made up around 88% of subsidies in FY 2014 and FY 2015, when India controlled prices of diesel, PDS kerosene and household LPG. As these subsidies were reformed, policy shifted to direct and indirect transfers and foregone revenue, under schemes like DBTL, Ujjwala and concessional taxes, which now make up 53% and 30% shares, respectively.

Figure 8. Energy subsidies to O&G by mechanism



Source: Authors' calculations; see the [accompanying spreadsheets](#) for more details.



BOX 2. ISSUES IN TARGETING LPG SUBSIDIES

The WHO (2018) reports that smoke from fuels like firewood, crop residue, coal and kerosene leads to 3.8 million deaths per year globally from diseases such as pneumonia, stroke, heart disease, lung disease and cancer. To reduce women's and children's exposure to household pollution, the government launched the Ujjwala scheme in FY 2017. It targeted 50 million new LPG users by providing a subsidy of INR 1,600 to women in households classified as below poverty line by the Socio-Economic Caste Census. This covered half the initial adoption costs (i.e., the capital cost of an LPG stove). Households could either pay the other half directly or take a loan, to be paid back by foregoing DBTL (or PAHAL) consumption subsidies (Sharma, Jain, et al., 2019). The target for new connections was subsequently revised upwards to 80 million new LPG users.

According to the CAG, around 72 million connections were issued as of April 2019—an enormous achievement that expanded LPG coverage to 94.3% of India (CAG, 2019b). As of September 2019, the Ujjwala dashboard reports over 80 million new connections (MoPNG, 2019a). However, the CAG also suggests that the Ujjwala has not fully achieved its objective.

The biggest challenge is that, on average, Ujjwala consumers used three refills per year in FY 2019, far below the average of 6.7 among non-Ujjwala users. The Council for Energy, Environment and Water's (CEEW) latest ACCESS survey found that 63% of rural households (across six of the poorest states) still use biomass as their primary cooking fuel and 39% use a mix of energy types for cooking (Jain et al., 2018). Prices appear to be influencing this situation with the loan system, taken up by around 68% of Ujjwala beneficiaries (CAG, 2019b), to be paid back by foregoing consumption subsidies. A 2018 survey found that 14% of LPG users said they would stop using LPG if charged market prices and 39% would reduce use (Sharma, Singh, et al., 2019). The government has also gradually increased the price of subsidized LPG over the past few years—likely motivated by ballooning fiscal costs—which may also have reduced affordability for low-income users (Laan et al., 2018). Separately, the CAG audit identified problems with diversion: 344,000 accounts were issued 2–20 refills per day and 1.4 million received 3–14 refills per month.

In order to address these issues, ideally, low-income LPG users would receive higher support, while, for financial sustainability, prices could gradually increase for higher-income users. Some efforts have been made to improve LPG subsidy targeting, but this has only excluded around 10% of users, and some may have unintentionally been low-income (Laan et al., 2018). Numerous proposals have been floated for an “Ujjwala 2.0” to increase benefits for the poorest and extra support for certain social categories, such as families with young children (Sharma, Jain, et al., 2019).

While improving targeting, it is also important to support clean cooking comprehensively—not only LPG. A recent review by CEEW, NITI Aayog and Gesellschaft für Internationale Zusammenarbeit GmbH concluded that greater efforts are needed to improve awareness of biomass's health impacts and that subsidies should be provided for “clean cooking,” rather than individual fuels or technologies, so alternatives can emerge and compete (Patnaik et al., 2019, p. 104). This includes improved cookstoves, biogas, piped natural gas, and solar and electric cooking. In the medium term, diversification is also important for India's energy security, particularly if oil prices rise. Large volumes of LPG are imported to meet domestic demand, and this contributed to around 6.5% of the trade deficit in FY 2018 (Narula & Beaton, 2018).

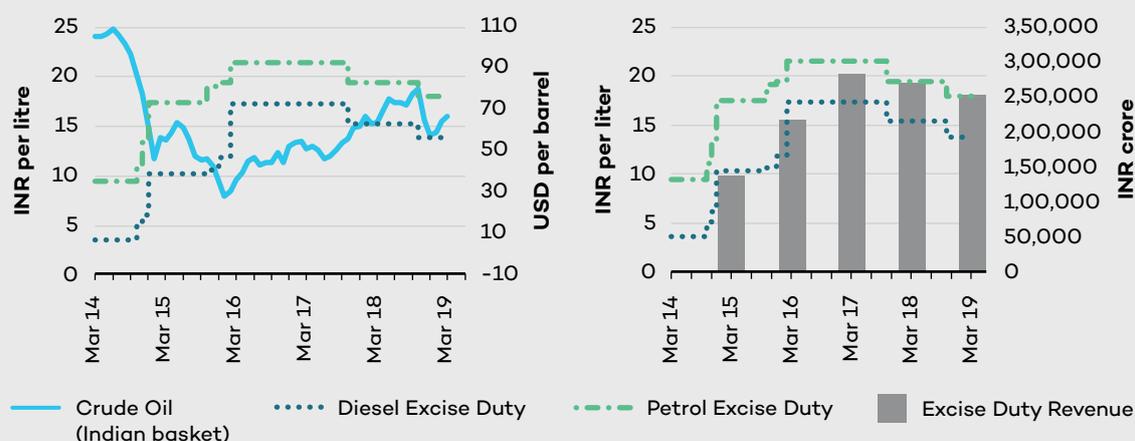
BOX 3. IS INDIA'S FUEL EXCISE REDUCTION A SUBSIDY?

As described in Chapter 3 and Annex 1, our subsidy definition includes foregone tax revenue. This requires a normative benchmark for the “appropriate tax,” typically from the national tax system—but in some cases, it can be challenging to identify. India's excise duty for gasoline, for example, increased from INR 9.48 (USD 0.16) per litre in FY 2014 to INR 21.48 (USD 0.32) in FY 2017 and back to INR 18.73 (USD 0.28) in FY 2019. Are tax reductions a subsidy? Or is the norm for tax to vary?

On the one hand, India's NDC states that “India has cut subsidies and increased taxes on fossil fuels (petrol and diesel) turning a carbon subsidy regime into one of carbon taxation” (MoEFCC, 2015). This implies that higher tax was to be permanent and to partially internalize carbon costs. The government also recognized that the move would forego revenue—in 2018, for example, the Minister of Finance flagged a loss of INR 10,500 crore (USD 1.56 Billion) (Mishra, 2018). On the other hand, high taxes coincided with low world oil prices, and tax reductions with high oil prices (Figure 9). Following the crash of world oil prices in early 2020, the tax has been increased significantly (Economic Times, 2020). This suggests an informal variable tax regime is in place.

Equally, there is no easy way to choose a benchmark tax rate for subsidy estimation. We could take the highest rate from FY 2017—by not maintaining taxes at this level, INR 30,894 crore (USD 4.6 billion) was foregone in FY 2019. Alternatively, we could take the average rate since excise was first increased at the end of 2014, which would result in an FY 2019 subsidy of INR 6,106 crore (USD 0.9 billion).

Figure 9. Excise tax (INR per litre), revenues (INR crore), and oil prices (USD per barrel)



Source: Excise duty rates and revenues are taken from monthly PPAC Ready Reckoner reports from 2014 to 2020 and crude oil prices from PPAC, 2020b.

In light of these challenges, we flag this policy as a possible subsidy, but do not include it in our totals. Regardless of what it is called, a number of lessons can be drawn. First, the revenue foregone by excise tax reductions is large. It will need to be paid by increased revenue, increased borrowing or decreased expenditure in other areas. Second, tax reductions like this are risky—they can be a route for consumer price subsidies to return. Clear rules are a better basis for pricing than ad hoc decision-making. Third, trying to dampen fossil energy prices is not an effective policy intervention. Capacity is needed to provide social protection and public services that better help low-income households than lower fossil fuel prices.

4.3 Subsidies to T&D

HIGHLIGHT:

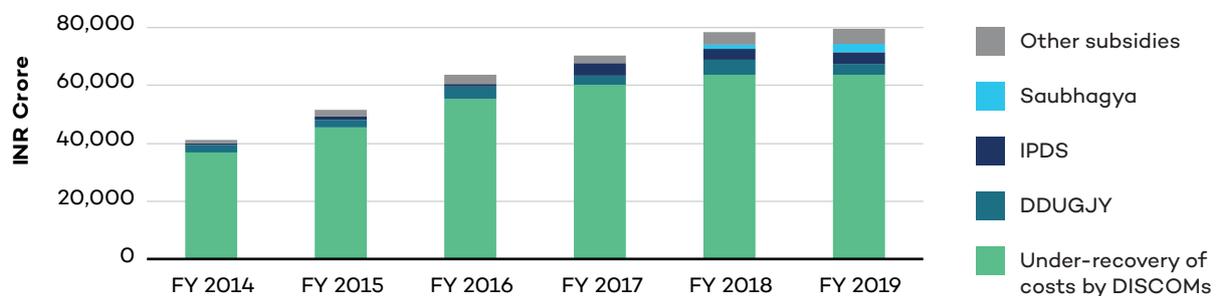
- Subsidies to T&D have doubled during the period FY 2014 to FY 2019, from INR 41,252 crore (USD 6.1 billion) to INR 79,671 crore (USD 11.9 billion).
- The largest T&D subsidy is under-pricing of electricity, worth INR 63,778 crore (USD 9.5 billion), 33% of all energy subsidies and 80% of all T&D subsidies.
- Subsidies for under-pricing electricity are poorly targeted. Improving targeting can free up more resources to promote uninterrupted quality supply of power or other policy goals.



Quantified electricity T&D subsidies have doubled between FY 2014 and FY 2019, from INR 41,252 crore (USD 6.8 billion) to INR 79,671 crore (USD 11.9 billion). As shown in Figure 10, the major subsidies to T&D in FY 2019 were:

- Price support through subsidy provision by the state government, worth INR 63,778 crore (USD 9.5 billion).³ These state-level subsidies make up around 80% of all quantified T&D subsidies and have grown significantly since FY 2014.
- Deendayal Upadhyaya Gram Jyoti Yojana (DDUGJY), a rural electrification scheme worth INR 3,800 crore (USD 565 million).
- Pradhan Mantri Sahaj Bijli Har Ghar Yojana (Saubhagya), a household electrification scheme worth INR 2,750 crore (USD 409 million).
- Integrated Power Development Scheme (IPDS), worth INR 3,970 crore (USD 591 million).
- Other subsidies were largely focused on grid infrastructure, including the Power System Development Fund and schemes targeted at North-Eastern states.

Figure 10. Total subsidies to T&D in India



Source: Authors' calculations; see the [accompanying spreadsheets](#) for more details. One policy was identified but could not be quantified due to a lack of data: an excise duty rebate on T&D equipment.

³ Data on these subsidies for FY 2014 to FY 2016 have been taken from PFC reports. For FY 2017 to FY 2019, data have been compiled by the authors for major states from the tariff orders of various DISCOMs.

In most states, the main beneficiaries of under-priced electricity are agricultural and residential consumers. This is effectively a fossil fuel subsidy because most electricity is generated from fossil sources—82% in FY 2018 (Ministry of Statistics and Programme Implementation, 2019, p. 123). This will change, however, as renewables' share in the electricity mix increases. The structure and size of the subsidies varies significantly by state. The last comprehensive analysis, based on 2010 data, found that, on average, over 50% of benefits were captured by the most affluent 40% (Mayer et al., 2015). More recent data suggest that the subsidies still benefit most consumers: in 2017, 16 states set subsidized rates for relatively high consumption volumes (200 kWh per month and above) and 24 states subsidized the first units (below 200 kWh per month) for all residential users, regardless of final consumption (Sharma, Jain, et al., 2019). There is a need for better data to properly evaluate these subsidies, particularly in light of MoP commitments to a Direct Benefits Transfer for Power (DBT-P).

It is important to emphasize that our quantification of under-pricing only includes state government transfers, which in most states cover just a share of subsidy costs. The remainder is paid by “cross-subsidies,” where others, typically industrial and commercial users, pay prices above the cost of supply. There is no good multi-year data on this. It is likely significant, however: a 2015 analysis found around INR 23,900 crore (USD 3.9 billion) of cross-subsidies in 10 states alone (PWC, 2015). There are national targets to bring cross-subsidies to within 20% of the average cost of supply, but it is hard to track progress due to limited data.

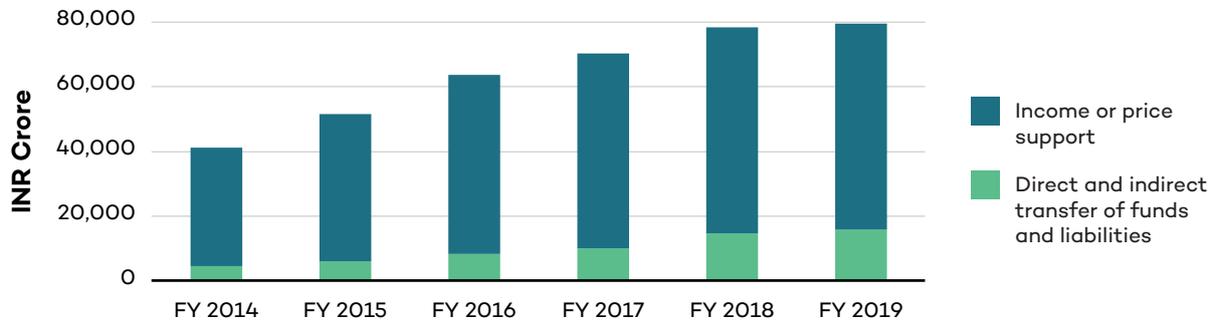
There are also non-financial costs of under-pricing when DISCOMs cope with insufficient revenue by reducing the quality of services and charging high industry tariffs that affect job creation, production and economic growth. This becomes more problematic as subsidies interact with other challenges. A recent study in Bihar, for example, found that, when subsidies, theft and non-payment were combined, the DISCOM collects revenues equal to only 30% of the cost of supply (Burgess et al., 2019). The general poor financial health of DISCOMs has led to various bailout programs: in 2012, a Financial Restructuring Plan (FRP) of State DISCOMs scheme; in 2015, UDAY. These have had limited success in fixing root problems (see Box 4), such as an absence of competition; weak enforcement of regulations to ensure efficient supply; a lack of centre-state coordination; and economically inefficient tariff setting. In 2020, yet another scheme is being readied to invest funds in network infrastructure and reduce losses: Atal Distribution System Improvement Yojana (ADITYA).

Otherwise, at a central level, most subsidies have focused on energy access and strengthening infrastructure. DDUGJY and Saubhagya have played a key role in achieving universal electrification at the village level, as well as strengthening sub-T&D infrastructure. The IPDS has supported transmission networks of strategic importance under the Power System Development Fund program and grid balancing among eight renewable-rich states.

Including the INR 605 crore (USD 90 million) for Green Energy Corridor projects, only 0.8% of T&D subsidies was for storage and grid balancing in FY 2019. A study by the Institute for Energy Economics and Financial Analysis noted that India's transmission sector has not kept pace with RE capacity additions in FY 2020 and called for improving interstate grid transition capacity and sustained funding for green energy corridors (Buckley & Shah, 2020). Meanwhile, recent bids for a 1,200 MW solar-plus-storage tender revealed tariffs of INR 3.89-4.07 per kWh, which is 8% less than recent thermal power bids (Dutta, 2020b), suggesting favourable economics of battery storage.

The majority of T&D subsidies (85%) are for consumption, in the form of income or price support (Figure 11).

Figure 11. Energy subsidies to T&D by mechanism



Source: Authors' calculations; see the [accompanying spreadsheets](#) for more details.

BOX 4. CONCESSIONAL LOANS TO DISCOMS

Having electrified millions of households in recent years and embarking on plans for ambitious GDP growth, India's electricity demand is set to grow many times in the next decade. DISCOMs, which are mostly state-owned, are the intermediary between power generators and consumers. Their financial and operational health is, as a result, fundamental to sustaining growth.

DISCOMs are perennially under financial stress. Their main revenue is electricity bill collection, and their main expenditure is the procurement of power, around 70% of costs (Bharadwaj et al., 2017a; Josey et al., 2018). But DISCOMs aren't efficiently transferring power and collecting bills—the average aggregate technical and commercial loss is 21.35% of all costs (UDAY, n.d.). This has begun to affect generators too, when DISCOMs fail to pay for electricity, usually due to delays in bill collection. As of November 2019, the national total of outstanding dues payable by the DISCOMs to power producers was INR 80,930 crore (USD 12 billion). This includes around INR 9,735 crore (USD 1.5 billion) outstanding for RE generators (CEA, 2019c). This is an alarming figure, given various efforts to distress DISCOMs, such as FRP in 2012 and UDAY in 2015.

Producers usually request payment within 60 days, but DISCOMs in Rajasthan, Haryana, Tamil Nadu, Andhra Pradesh, Karnataka, Madhya Pradesh, Telangana and Delhi may take more than 800 days (IANS, 2019). To bail out DISCOMs, the government is considering a new loan facility involving lenders like the Power Finance Corporation (PFC), Rural Electrification Corp. Ltd, and the Indian Renewable Energy Development Agency (IREDA) (IANS, 2019). These agencies will offer loans at concessional interest rates that are closer to their cost of funds, with a sovereign guarantee from the state government.

Paying power producers is essential so they can service loans and avoid assets becoming stressed or non-performing. As long as DISCOMs are financially unstable, generators will be vulnerable. At the same time, in the medium term, if DISCOMs do not turn around their finances, concessional loans will affect the debt sustainability of states. The only solution is targeted, timely and evidence-based interventions to address the root causes of losses efficiencies. This includes timely tariff revisions, including a consideration of consumer price subsidies as one source of low revenue.

4.4 Subsidies to Renewables

HIGHLIGHT:

- RE subsidies have increased three-fold between FY 2014 and FY 2019: from INR 3,224 crore (USD 533 million) to INR 9,930 crore (USD 1.5 billion).
- RE subsidies fell 35% from a high of INR 15,313 crore (USD 2.3 billion) in FY 2017. They are likely to rise again, however, due to several large policies that have since been confirmed and begun implementation.
- Future support may need to focus on new technology and balancing variable RE.

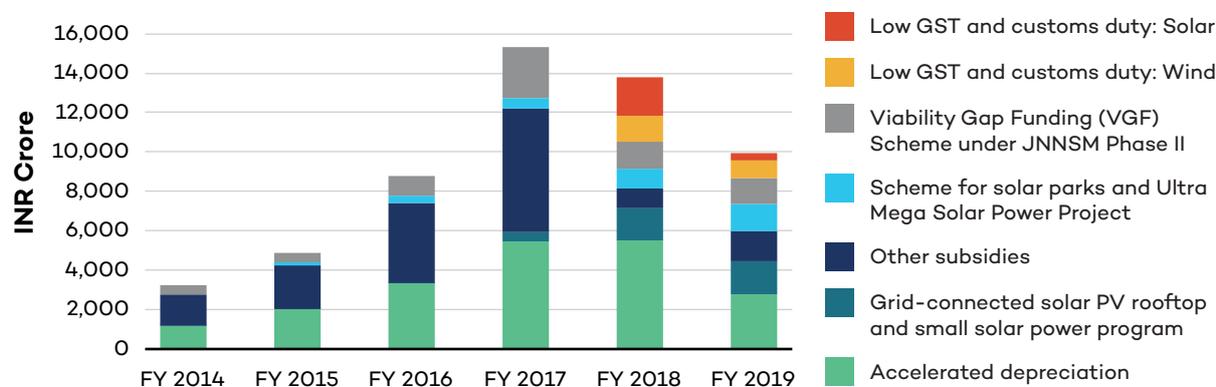


Quantified RE subsidies have increased three-fold: from INR 3,224 crore (USD 533 million) in FY 2014 to INR 9,930 crore (USD 1.5 billion) in FY 2019, largely driven by efforts to deploy 175 GW by 2022. As shown in Figure 12, the major subsidies in FY 2019 were:

- Accelerated depreciation for wind and solar, at INR 2,778 crore (USD 413 million).
- Support for solar parks and large solar power, at INR 1,400 crore (USD 208 million).
- Solar rooftop and other applications, at INR 1,667 crore (USD 248 million).
- The Viability Gap Funding Scheme under the Jawaharlal Nehru National Solar Mission Phase II worth INR 1,335 crore (USD 199 million).

Since a high of INR 15,313 crore in FY 2017, RE subsidies have fallen 35%. This is for a variety of reasons. Two major subsidies—Viability Gap Funding and Grid-Connected Solar Rooftop Solar Programme—are quantified based on budgets, and there is no available reporting on released amounts in FY 2018 and FY 2019. A safeguard duty on imported solar was put in place in FY 2019, effectively removing a customs duty waiver worth INR 1,152 crore in FY 2018 (CBIC, 2018). Finally, accelerated depreciation has the greatest benefits when projects begin. Due to a fall in year-on-year installations, subsidy benefits fell.

Figure 12. Total subsidies to renewables in India



Source: Authors' calculations; see the [accompanying spreadsheets](#) for more details. A number of policies were identified but could not be quantified due to a lack of data. These policies include resource assessments, solar charging for LED lanterns, a waiver for interstate transmission charges and support for solar heat-based applications. Some estimates differ from our previous update as some subsidies are now based on realized rather than budgeted amounts.



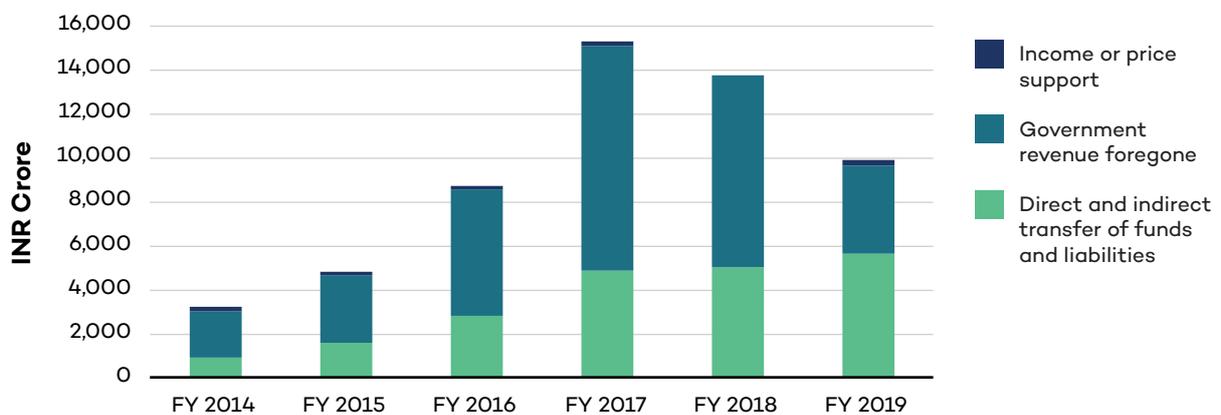
At the same time that RE subsidies fell, growth in solar and wind has been sluggish. Annual installations peaked in FY 2018 and reverse auctions have seen a poor response due to tariff caps, the imposition of new solar module import duties, and policy headwinds, including centre-state policy disputes. After the addition of, on average, 13 GW of renewable energy capacity in FY 2017 and FY 2018, less than 10 GW of on-grid RE capacity was added in FY 2019 (Buckley & Shah, 2020). This has led to significant concerns from investors, as evident from the decline in participation in SECI reverse auctions (Thomas, 2019b). The government, however, appears to be responding with plans to drop tariff caps and boost support (Chandrasekaran, 2020).

A number of announcements suggest that expenditure will rise again in the near future. Various new policies have been introduced that support decentralized renewable energy (DRE), and the share of renewable energy subsidies that include support to DRE has grown from 4% in FY 2017 to 8% in FY 2019. This includes the approval of KUSUM and phase II of the Grid Connected Rooftop Solar Programme, amounting to a planned outlay of INR 58,000 crore by FY 2022 (USD 8.6 billion) (see Box 5). New technologies will also be a focus for future support measures. In November 2018, a reverse auction for 50 MW of floating solar saw a successful bid at a tariff of INR 3.29 (USD 0.05) per kWh (Chandrasekaran, 2018), signalling a renewed interest in the technology. The National Institute of Wind Energy has acknowledged that the target of 5 GW of offshore wind by 2022 is unlikely to be achieved, but that a first tender for a 1 GW offshore wind project is expected in the near future (Lee, 2019; Prasad, 2020).

One notable development in 2019 is the revival of the Central Public Sector Undertakings Scheme. This encourages India's state-owned enterprises and other government bodies to diversify from fossil fuels with INR 8,580 crore (USD 1.3 billion) of Viability Gap Funding for 12 GW of solar capacity from FY 2020 to FY 2023, using only domestically manufactured technology (MNRE, 2019). NTPC Ltd. has already awarded Tata Power Solar System a 250 MW solar project under the scheme (ANI, 2020).

Around 91% of RE subsidies are for production, while the remaining schemes support both production and consumption. As illustrated in Figure 13, they are largely provided through tax breaks (government revenue foregone), with concessional duties and taxes making up around 60% of total RE subsidies. Budgetary transfers account for another 38% and income or price support only 2%.

Figure 13. Energy subsidies to renewables by mechanism



Source: Authors' calculations; see the [accompanying spreadsheets](#) for more details.

BOX 5. GOVERNMENT SUPPORT FOR DRE

In the past several years, schemes such as Saubhagya and DDUGJY have achieved 100% grid electrification at the village level. Interest in DRE has shifted more toward reliability than energy access (Clean Energy Access Network, 2019).

The government has announced several schemes, one being Phase II of the Grid-Connected Rooftop Solar Programme, announced in February 2019. The total outlay is INR 11,814 crore (USD 1.75 billion) till FY 2022 (Cabinet Committee on Economic Affairs, 2019b). This has a renewed focus on the residential sector, which can receive financial assistance for 40% of the value of systems up to 3 kW. Unlike earlier schemes, where consumers had to approach several agencies, the program has been designed to make DISCOMs the primary implementation agency, with a performance-based financial incentive to achieve results.

For farmers, the government has launched KUSUM, to deploy solar power for agricultural use, budgeted at INR 34,422 crores (USD 5.1 billion) for three years (Cabinet Committee on Economic Affairs, 2019a). By 2022, KUSUM aims to install 0.75 million off-grid solar-powered irrigation pumps and 1 million grid-connected solar pumps, along with 10 GW of solar power plant capacity in rural areas. Reflecting concerns on groundwater over-extraction, the grid-connected pumps will include feed-in tariffs so farmers can sell back excess electricity. It remains to be seen how the policy will target low-income farmers and prevent off-grid pumps from over-extracting groundwater, so it will be important to coordinate with water and food policies and carefully monitor and adapt implementation (Beaton et al., 2019).

Both schemes combined amount to a planned outlay of INR 58,000 crore (USD 8.6 billion) and should help deploy another 40 GW by 2022. By shifting electricity consumers to renewables, they will also relieve pressure on DISCOMs.

There is still more potential to promote DRE in India, even with full grid coverage. Uninterrupted power supply remains a huge challenge, with many people continuing to use kerosene for lighting. Kerosene releases particulate matter that harms health and generates poor-quality light. Solar alternatives are cheaper, but households cannot afford to switch because of high upfront costs. CEEW's ACCESS survey found that 86% of households across six states would support subsidies for solar lanterns, even if it meant lower kerosene subsidies (Jain et al., 2018). Table 1 summarizes findings from a 2019 study, which found that kerosene subsidies could be swapped to fund a range of solar energy products. In FY 2019, government subsidies for kerosene still amounted to INR 7,469 (USD 1.1 billion).

Table 1. Cost of solar energy vs. subsidized kerosene (INR per month per household)

Monthly cost	Solar product		
	Lantern	Home system	Microgrid
Levelized cost of solar product	54	142	146
Average cost of kerosene	183	183	183
Household expenditure	70	70	70
Government subsidy	113	113	113
Net cost of swap	-129	-41	-37

Source: Laan et al., 2019.

4.5 Subsidies to EVs

HIGHLIGHT:



- Subsidies for EVs are nascent but growing rapidly: over 400 times, from INR 3.8 crore (USD 0.6 million) in FY 2014 to INR 1,673 crore (USD 249 million) in FY 2019. Since FY 2017, support has grown over 11 times.
- Subsidies are likely to at least double again with the scheme Faster Adoption and Manufacturing of (Hybrid and) Electric Vehicles (FAME) II, budgeted at INR 10,000 crore (USD 1.4 billion) over three years, and favourable tax rates.
- Increasing adoption of EVs will need to be coupled with better storage technology, improving the capacity of the grid to utilize RE for EV charging.

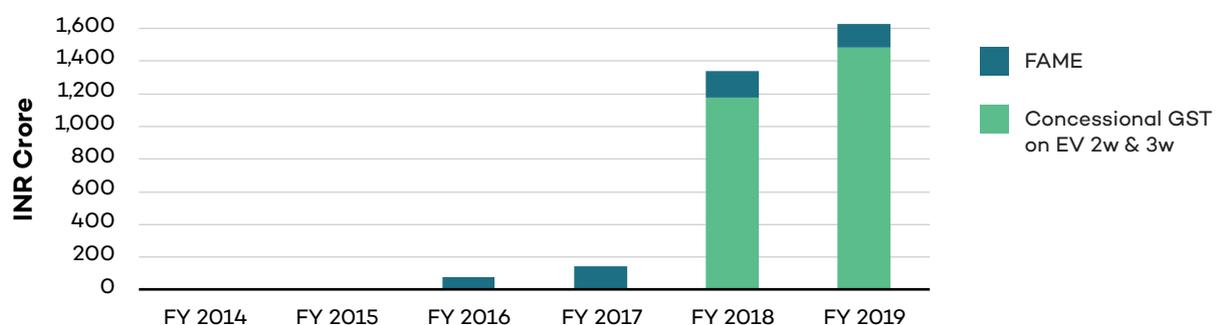
EV subsidies are still at a nascent stage. Government support began in earnest with various schemes in FY 2016, especially for public transport. Since then, support has increased from INR 79 crore (USD 24 million) in FY 2016 to 1,673 crore (USD 249 million) in FY 2019.

As shown in Figure 14, the major subsidies in FY 2019 were:

- A concessional GST rate on electric two-wheelers and three-wheelers, worth INR 1,482 crore (USD 220 million)
- The FAME scheme, worth INR 145 crore (USD 22 million)

The EV market is just developing: in 2019, there were two electric car manufacturers, 10 electric two- to three-wheeler manufacturers and 3–4 electric bus manufacturers (Laan & Jain, 2019). EVs were only 3.5% of new vehicle sales in 2018 but made up a sizable share of the three-wheel market, where they accounted for over 57% of sales, equal to 850,000 vehicles. One goal of the subsidies is to increase domestic production so that the Indian automotive sector can compete in a future global market (see Box 6).

Figure 14. Total subsidies to EVs in India



Source: Authors' calculations; see the [accompanying spreadsheets](#) for more details. A number of policies were identified but could not be quantified due to a lack of data. These policies include an exemption for customs duty on EV parts, the Modified Special Incentive Package Scheme, which provides a 20% capital subsidy in special economic zones and a 25% subsidy outside of Special Economic Zones for companies in electronics manufacturing (Ministry of Electronics & Information Technology, n.d.).

Going forward, EV subsidies are likely to increase considerably. The central government's flagship EV program is the FAME scheme, which provides the purchaser of electric and hybrid vehicles an upfront reduction in price at the time of purchase. In phase one (FAME I), 2.6 million subsidized vehicles were sold (Ministry of Heavy Industries & Public Enterprise, 2018b). The total allocation of FAME I was INR 895 crore (USD 134 million) between April 2015 and March 2019, out of which INR 597 crore was spent, and the remainder was rolled over into FAME II (Laan & Jain, 2019). FAME II is to be implemented from April 2019 over three years, with an allocation of INR 10,000 crore (USD 1.4 billion) (Department of Heavy Industries, 2019).

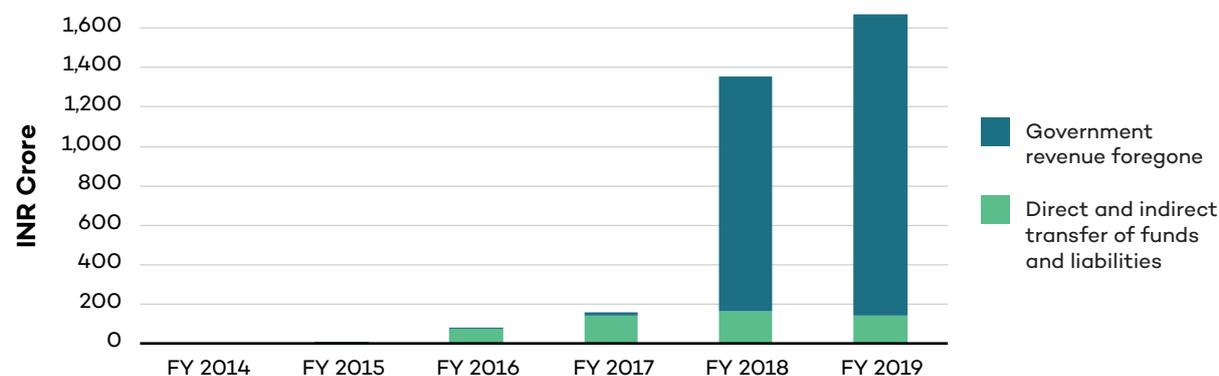
In addition, the government provides various concessional taxes for electric vehicles. In July 2019, the government further reduced the concessional GST rate on all EVs from 12% to 5%, compared to 28% for conventional vehicles, while rates for EV chargers and charging stations were reduced from 18% to 5%. Local authorities' hiring of electric buses with a carrying capacity of 12 or more was fully exempted from GST (Ministry of Finance, 2019b). In the FY 2020 budget, the government also provided an income tax deduction of INR 150,000 (USD 2,100) for interest paid on loans to purchase EVs, resulting in a benefit of approximately INR 250,000 (USD 3,500) over the loan period (Laan & Jain, 2019).

Various states and union territories also support the adoption of EVs through subsidies for manufacturers, consumers, and charging infrastructure, or through government procurement. State- and territory-level incentives have not been quantified and included in this report.

As EV subsidies grow, it will be increasingly important to ensure that there are comprehensive strategies to ensure sustainability. A use-phase study by NITI Aayog & Rocky Mountain Institute (2019) estimated that FAME II could save 5 million tonnes of oil equivalent (Mtoe) and 7 million tonnes of CO₂, but full life-cycle assessments based on the context in India are still needed, alongside measures to address battery waste (see Box 6).

Around 90% of EV support is for consumption, aiming to lower prices for faster adoption. The balance of approximately 10% is made up of schemes that support both production and consumption. As shown in Figure 15, EV subsidies are largely provided through tax breaks, with concessional taxes making up around 90% of subsidies. Budgetary transfers account for the remaining 10% share.

Figure 15. Energy subsidies to EVs by mechanism



Source: Authors' calculations; see the [accompanying spreadsheets](#) for more details.



BOX 6. GOVERNMENT AMBITION TO BOOST THE ADOPTION OF EVs IN INDIA

In recent years, the government has shown significant ambition to scale up EVs. FAME II has been allotted 10 times the budget of FAME I to rapidly scale up adoption across a range of vehicle types. The government has also set a minimum share of manufacturing localization to be eligible for subsidies to help consolidate India as a global manufacturing hub. A strong feature of FAME II is its focus on public transport and shared mobility, intended to maximize the share of benefits for the general population. It primarily targets vehicles in the three-wheeler, four-wheeler and bus categories. Privately-owned electric two-wheelers are also covered.

A key challenge for FAME II has been its impacts on the two-wheeler market. In FY 2019, two-wheelers enjoyed 130% growth, with 126,000 units sold (Wadhwa, 2019). This is expected to decrease in FY 2020, mainly due to the tough FAME II criteria established for two-wheeler subsidies: a lithium-ion battery with a minimum range of 80 km per charge and a minimum top speed of 40 kmph. It is estimated that more than 95% of current models are ineligible (CRISIL, 2019). This has negatively affected the market, with investments as high as INR 700 crore (USD 104 million) put on hold for a year (Bloomberg, 2020). According to recent reports, the first six months of FY 2020 have seen a 94% decline in sales (S. Mukherjee, 2019). EVs made up approximately 0.3% of total two-wheeler sales and 6% of all vehicle sales in 2018, and India is a two-wheeler dominant country (Laan & Jain, 2019). The government may need to revisit these criteria to achieve its EV targets (PIB, 2019a).

With the global automotive market preparing for EV, there is a huge opportunity for India. It is estimated that with a higher domestic share of powertrain and battery pack assembly, India's automotive industry would gain 5.7% higher value-added in a 30% EV scenario in 2030, compared to business as usual (Soman, Ganesan, et al., 2019). With this in mind, the NMTBS is aiming to build domestic battery and EV component manufacturing infrastructure through a phased program. The basic customs duty on various EV components—which was reduced in June 2017 and again in January 2019—will be increased in future years to promote local manufacturing.

Most EVs today rely on lithium-ion for battery storage, which requires lithium and cobalt resources. India has limited cobalt and lithium resources, so it currently depends on imports (Indian Bureau of Mines, 2019, p. 11). To achieve its battery production targets, India will be reliant on foreign mineral resources, and global demand is expected to escalate. This will make it strategic to support research and development of alternate battery technologies such as solid-state batteries and metal-air batteries (Krishnan, 2020).

In the dash to decarbonize transport, it will be important to incorporate sustainability into policy design. In a review of literature on EV sustainability, Laan & Jain (2019) found that no fully transparent life-cycle assessments for EVs have been conducted in India. For local impacts, EVs will certainly avoid harmful urban air pollution associated with conventional vehicles. But impacts on coal-related air pollution and net GHG emissions will depend on the carbon intensity of electricity. This underscores the importance of a clean electricity transition for the sustainability of EV. In turn, EV can provide storage that helps manage variable renewables. The review also found that further measures are required to treat battery waste: around 50% of lead-acid batteries are recycled in “backyard” centres in India, while fewer than 5% of lithium-ion batteries are recycled globally (Laan & Jain, 2019).



**5.0 Cost
Assessment
of Coal-Fired
Power in India**



Coal subsidies are one part of a bigger picture. Coal is also subject to an array of taxes and charges that raise considerable revenue. At the same time, it is highly polluting, affecting land, water and ecosystems during mining, and air quality during combustion, at a considerable social cost. To unravel these interconnections, this update has a special focus on coal, using FY 2018 to compare:

- Central government coal subsidies, as reported in the previous chapter.
- Central and state tax revenues from domestic and imported coal for the power sector.
- Overcharges on coal by Indian Railways (IR).
- Social costs of coal associated with air pollution and GHG emissions.

We restrict our analysis to these elements largely due to resource constraints but welcome efforts to build on and complexify this analysis, including the relative benefits of energy and jobs created by coal versus other energy technologies and broadening social costs to include factors such as environmental degradation and water pollution. While such an exercise is also relevant for highly taxed petroleum products, we focus on coal due to its greater social costs.

5.1 Methodology and Estimates

5.1.1 Subsidies

Subsidies are estimated as described in Chapter 3, including central government policies only. They were equal to INR 13,875 crore (USD 2.2 billion) in FY 2018.

5.1.2 Tax Revenues

For domestic coal, tax revenue is estimated at the mining stage of the coal supply chain. CIL and its subsidiaries supply 78–80% of coal used by the power sector between FY 2014 and FY 2019 (CIL, 2014–2019; MOSPI, 2019). This accounted for 76–81% of net domestic coal sales between FY 2014 and FY 2019 (CIL, 2014–2019; MOSPI, 2019). As a result, CIL's reported taxes are considered as revenue from domestic coal. For imported coal, import duties and consumption taxes on non-CIL coal for the power sector are included by multiplying the annual volume of sales by the price of coal and various taxes.

In this estimate, we do not calculate corporate taxes paid by power producers because it is difficult to disaggregate the plants on which they pay taxes. Such taxes are likely relatively small because revenues are based on profits, which have been low in recent years (Buckley et al., 2019). Further, we do not calculate taxes collected on coal supplied by non-CIL domestic producers and captive mines, due to lack of data. Transportation service taxes on coal by IR are not calculated as they are not explicitly reported. Taxes on other forms of freight are not calculated due to methodological complexity: many actors transport coal, requiring data on transport distances and products carried.

This methodology was established through consultations with coal sector experts in India and is consistent with other similar studies, including Spencer et al. (2018) and Tongia and Gross (2019). A description of taxes is provided in a separate Annex that [accompanies this study](#), and calculations and sources are provided in [accompanying spreadsheets](#).

Overall, we estimate tax revenue of INR 52,406 crore (USD 8.1 billion) for FY 2018. Revenues for the time period FY 2014 to FY 2019 are summarized in Table 2.

Table 2. Tax revenues from coal-fired power in India, FY 2014–2019 in (INR crore)

Code	Revenue source	Tax type	Exchequer	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019
CT.1	Royalty	Producer	State	5,684	6,118	6,592	6,862	7,810	9,110
CT.2	Contribution to District Mineral Foundation	Producer	State	-	-	-	3,111	2,331	2,326
CT.3	Contribution to National Mineral Exploration Trust	Producer	Central	-	-	-	174	160	184
CT.4	Stowing Excise Duty	Producer	Central	349	383	401	422	170	-
CT.5	Clean Energy Cess	Producer	Central	1,798	3,311	7,612	16,526	5,548	-
CT.6	Basic Customs Duty	Consumer	Central	5,750	7,076	5,778	5,908	7,895	9,887
CT.7	Countervailing Duty	Consumer	Central	1,150	1,415	1,156	1,182	-	-
CT.8	Excise Duty	Consumer	Central	2,948	3,038	2,781	2,054	401	6
CT.9	Central Sales Tax	Consumer	Central	728	785	873	942	160	6
CT.10	Value Added Tax	Consumer	State	1,498	1,575	1,865	2,187	706	6
CT.11	GST Compensation Cess	Producer	Central	-	-	-	-	12,997	19,423
CT.12	Inter-state GST	Consumer	Central	-	-	-	-	706	726
CT.13	Central GST	Consumer	Central	-	-	-	-	697	1,151
CT.14	State GST	Consumer	State	-	-	-	-	698	1,141
CT.15	Entry tax	Consumer	State	163	163	198	223	61	3
CT.16	State Cess on Coal	Producer	State	1,428	1,149	1,213	1,339	1,275	1,353
CT.17	Consumption taxes, non-CIL coal	Consumer	Both	5,994	10,159	8,792	11,907	10,792	12,778
CT.18	Corporate taxes from TPP	Producer	Both	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
CT.19	Coal transportation taxes	Consumer	Both	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Total				27,490	35,173	37,261	52,835	52,406	58,100

Source: Authors' calculations. '-' indicates a tax was not in place. 'n.d.' indicates data was not available to estimate values.



5.1.3 Charges: Cross-subsidies to IR⁴

Coal in India is subject to a special charge that amounts to a significant transfer of resources. The IR “social service obligation” reduces passenger fares and freight charges of essential goods by overcharging freight for other goods. In FY 2018, the value of this obligation was INR 32,358 crore (USD 4.8 billion) (IR, 2018). We estimate the share from coal by considering the share of coal among freight (45.84% in FY 2018) and its wagon class rating of 145, which implies it is charged 45% more than the base rate required for cost recovery (IR, 2018). As a result, we assume that 31% of coal revenue is overcharged, consistent with the study by Kamboj and Tongia (2018). This is a simple method that does not directly compare coal freight rates and transport distances to other goods. The calculations and sources are provided in [accompanying spreadsheets](#). This charge is quantified at INR 16,151 crore (USD 2.5 billion) for FY 2018 (Table 3).

Table 3. Freight coal, cross-subsidy estimates to the IR, FY 2014–FY 2018

Year	Freight coal, cross-subsidy (INR crore)
FY 2014	12,148
FY 2015	14,877
FY 2016	15,315
FY 2017	14,036
FY 2018	16,151

Source: Authors’ calculations

5.1.4 Social Costs: Air pollution and GHG emissions

It is inherently challenging to estimate the social cost of coal because we need to assign financial value to non-financial impacts that involve great uncertainty. We have attempted to chart a moderate course by reviewing multiple sources, adopting mid-point values when there is a range and preferring strongly conservative options when ranges varied over a magnitude in order. Where only one external source was identified, we ensured it was conservative.

Due to the complexity of estimation, we consider only three social costs: mortality due to air pollution from coal, morbidity (disease) due to air pollution from coal and climate change impacts of GHGs from coal. For morbidity, we only account for work-loss days (WLDs), due to challenges identifying data on respiratory hospital admissions. Coal has a range of other costs whose value we have not attempted to estimate, such as accidents, biodiversity loss, noise and water pollution, as elaborated by Nkambule and Blignaut (2017).

We used a two-step process to estimate social costs. First, we reviewed literature for estimates of total deaths (mortality), WLDs (morbidity) and GHG emissions caused by coal-related air pollution, taking a mid-point from available estimates. Second, a cost for each unit was identified, again by reviewing literature and taking a mid-point from estimates.

⁴ We have estimated these charges independently but are grateful to the prior work by Kamboj & Tongia (2018), who conducted a detailed analysis of this cross-subsidy, along with a forward-looking model of its impact on IR.

The two data points in each category were then multiplied and summed to estimate a total financial cost. Key findings from this are summarized below, with an overview of key variables and accompanying notes in Annex 4.

- **Deaths:** Several reputable sources on loss of life linked to air pollution from coal power involved experts from Urban Emissions. We chose their latest analysis as the most up-to-date estimate (Guttikunda & Jawahar, 2018), taking a mid-point value of 119,250 deaths in 2017.
- **Statistical value of life:** There is no consensus on how to assign the value of a statistical life. We adopt a highly conservative value, drawing on Guttikunda & Jawahar (2014): INR 20 lakh (USD 33,060), based on average life insurance coverage in 2011. This was adjusted for inflation to INR 30.1 lakh (USD 43,548). This is much lower than sources such as Mani et al. (2012) and Majumder and Madheswaran (2018, p. 24), who assign INR 1.6 crore and INR 4.6 crore (USD 0.26 million and 0.64 million), respectively.

- **Number of WLD:** Srinivasan et al. (2018) estimates that air PCT for coal power could save 126 million WLD over 11 years. We annualized this to an average of approximately 11.5 million per year. This is a conservative estimate because it is based only on WLD savings from installing PCTs—some pollution would continue even after installation.
- **Economic cost of WLD:** The only source that assigned a financial value for WLD was Gunatilake et al. (2014, p. 70), at INR 224 (USD 3.7) per WLD, based on the Ministry of Labour and Employment (MLE)'s average daily wage rate. We used the same approach, identifying MLE's lowest minimum daily wage for unskilled agricultural workers, INR 321 (USD 498) (MLE, 2018).

- **GHG emissions:** GHG Platform India (n.d.) estimates 1,017 million tonnes of emissions from coal and lignite for power in 2014, based on plant efficiency, coal quality and consumption volume. This is a conservative estimate, as emissions in FY 2018 will have risen since this time.
- **Cost of carbon:** Ricke et al. (2018) estimate a social cost of carbon in India of USD 86 per tonne of CO₂ equivalent (CO₂e) with a confidence interval of USD 49–157. To maintain a conservative approach, USD 49 (INR 3,479) was used. This is the low end of World Bank (2019) estimates that a price of USD 40–80 per tonne of CO₂e is required globally to meet Paris Agreement targets.

The total estimate for social costs is INR 3,91,128 crore (USD 60.7 billion), as summarized along with the various cost components in Table 4. These are not indexed to a single year because the underlying data are collected across a range of years. They are taken as a proxy for FY 2018.



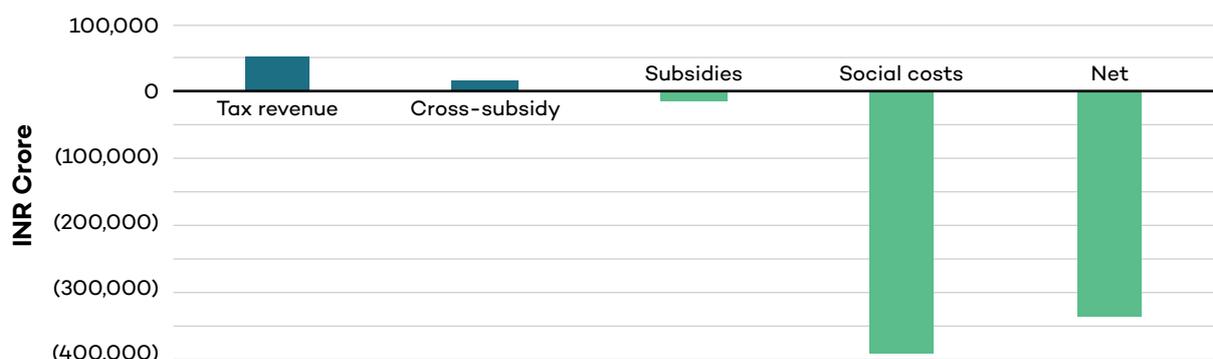
Table 4. Build-up of externality cost of coal-fired power plants in India

Indicator	Unit	Year	Value
Mortality	Deaths per year	2017	119,250
Morbidity	WLDs per year	2018	11,454,545
GHG emissions	Total carbon emissions from coal and lignite used in power production (tCO ₂ e)	2014	1,017,216,670
Mortality costs	Value of life (INR crore)	2018	0.31
Mortality costs	Total cost per year (INR crore)	2018	36,871
Morbidity costs	WLD (INR crore)	2018	0.0000321
Morbidity costs	Total cost per year (INR crore)	2018	367.7
Cost of carbon	Cost of carbon (USD per tCO ₂ e)	2018	49
Cost of carbon	Cost of carbon (INR per tCO ₂ e)	2018	3,479
Cost of carbon	Total cost per year (INR crore)	2014	353,890
Net costs	Total cost per year (INR crore)	2018	391,128

5.2 Comparison of Coal Subsidies, Taxes, Charges and Social Costs

The comparison finds that, with current subsidies, taxes, charges and social costs, there is a net overall cost associated with coal power, estimated at INR 3,36,446 crore (USD 52.2 billion) in FY 2018, and coal subsidies are nearly 5 times as much as the combined value of taxes and charges (Figure 16). While there is a uncertainty in these estimates—particularly around social costs—the approach has been conservative, and, as such, the “direction” of the results (a net negative balance) is likely accurate, while the magnitude likely represents the lower bound of possible values. In particular, a deeply conservative value on life was used: the estimate would be 10-fold larger using the same benchmark as Mani et al. (2012) or Majumder & Madheswaran (2018, p. 24). Further, treatment costs associated with sickness were not incorporated, and a number of other externalities, including water stress, were not included.

Figure 16. Net benefits associated with coal-fired power in India, FY 2018



Source: Authors' calculations

Despite these results, the exercise also brings the duality of India's coal sector into focus. Coal is responsible for an enormous amount of revenue, which has more than doubled since FY 2014, with a sharp hike in FY 2017 coinciding with an increase in the coal cess. Cross-subsidies for IR have also risen significantly, up 33% from FY 2014 to FY 2018. Together, these make up around 4% of all revenue receipts, reported at INR 19,19,009 crore (USD 297 billion) in FY 2018 (Ministry of Finance, 2019a). This suggests that, paradoxically, the more that coal is taxed to reflect social costs, the harder it is to further internalize social costs—if coal becomes too expensive, consumption will fall, and the government will lose an important source of revenue. The best solution to this dilemma is revenue diversification. Realistically, this would require ring-fencing a share of coal revenue to invest in diversification. This was, in fact, the original function of the NCEEF, before it was effectively dismantled and its revenues were redirected to compensate states for tax reforms.

In early 2020, the government floated whether to waive the cess on coal to help power producers pay for PCTs (Reuters, 2019). This comes after in-principle approval for power plants to pass through costs to consumers (CERC, 2019). While it is important to invest in PCTs, waiving the cess would be a step backward for charging the full cost of coal. Changing the price signal would disincentivize the low-carbon transition. Further, the cess can be an annual source of funds for transition—equal to INR 25,000 crore (USD 3.72 billion) in FY 2019. This could be used to help diversify business models of major fossil-intensive state-owned enterprises, such as through the Central Public Sector Undertakings Scheme, or to support communities and workers affected by the energy transition (see Box 7). In economic terms, the most efficient option for PCTs is to “let the polluter pay.”

Key recommendations based on this analysis are:

- Develop a plan to reform coal subsidies—bringing tax up to the same rate as other minerals, enforcing coal washing laws and phasing out support for exploration and drilling, among others—so prices approach true costs, and distortions are eliminated. This should include enforcement of regulations on PCTs without further aid and communications like Give it Up to create new norms to leverage further reform.
- Revive the NCEEF, or some equivalent, to promote revenue diversification, including efforts to ensure it efficiently disburses funds according to its mandate.

BOX 7. OPENING A DIALOGUE ON JUST TRANSITION

If India is to meet its 450 GW RE target, the consumption of coal will likely decline. Some groups could be particularly vulnerable to change, including workers in coal mines and power plants, communities dependent on mines, and small businesses and sub-contractors. A plan to address their concerns is the core tenet of calls for a just transition (Zinecker et al., 2018). An upcoming IISD review, based in-depth interviews, finds that key needs for transition planning include:

- Identifying long-term growth options in states with coal dependency.
- Ownership of the transaction costs associated with the transition.
- Fulfilling the social development mandate of state-owned enterprises.
- Job creation and the future role of trade unions.



6.0 Looking Forward

In recent years, India has been the fastest-growing trillion-dollar economy in the world. In 2019, its GDP ranked seventh at current USD exchange rates and third in terms of purchasing power parity (World Bank, n.d.). The government is looking for ways to steer further growth and increase per capita GDP to world standards. In this dynamic environment, it is easy for our subsidy review to be one step behind the times. This chapter serves to flag emerging issues that will likely influence India's energy subsidy landscape in the near future.

6.1 A Risk of New Oil and Gas Subsidies?

India is heavily reliant on imported oil and liquefied natural gas (LNG). Oil import dependence reached a multi-year high at 84% of total domestic oil consumption in FY 2019 (PTI, 2019a). Natural gas import dependence has also risen, reaching 45% of total domestic consumption. Oil and natural gas imports have increased an average of 4.1% and 7% per year, respectively, from FY 2012 to FY 2019 (PPAC, 2020a). This exposes India to significant fiscal and energy security risks from volatile crude oil prices. Historically, the government protected consumers by providing substantial subsidies for petroleum products, shifting the risk onto government budgets. Since 2010, it has been gradually reforming these policies, to set more rational prices and free up revenues for more effective policy tools.

International experience shows there is always a risk of O&G subsidies returning, particularly when world oil prices rise. Indeed, in FY 2018 and FY 2019, gasoline and diesel excise rates were cut temporarily, and LPG subsidies grew significantly. For FY 2020, the government increased budget lines for petroleum products by 12% to reflect higher projected oil prices (TNN, 2019). Pressure will also come from air pollution controls to meet Bharat Stage-VI fuel emission requirements, expected to increase prices by INR 0.80 per litre for gasoline and INR 1.45 per litre for diesel for five years (Choudhary, 2019).

At the time of writing, world oil prices have crashed below USD 30 per barrel (Constable, 2020). This reflects the economic slowdown from the outbreak of COVID-19 and disagreement on production targets between Organization of the Petroleum Exporting Countries plus allies (OPEC+) and Russia (Zhdannikov, 2020). In the short term, this will temporarily eliminate most petroleum product subsidies and has enabled the government to rapidly hike excise taxes, raising much-needed revenue to cope with the health and economic crisis (Economic Times, 2020). As the situation develops, the economic impacts of the COVID-19 crisis may lead India to consider stimulus packages, like other major world economies. There may be demand for this to include new O&G subsidies for struggling producers. If so, it will be important to carefully assess the consistency of any measures with a clean energy transition. Finally, social protection and public services will be essential to help consumers cope with the economic crisis. Investments to increase capacity may open up opportunities to improve the targeting of LPG subsidies, which will be essential to clustering benefits on low-income consumers as oil prices recover in FY 2021 and FY 2022 (Knoema, n.d.).

Natural gas is also one to watch—the government has various initiatives to promote this fuel. With limited domestic production, much will have to come from LNG imports, aided in the near-term by plummeting LNG prices (down over 50% in the last two years). Our estimates do not quantify any subsidies for natural gas, but a number of existing policies may already involve subsidization, and should be investigated more thoroughly (see Box 8).

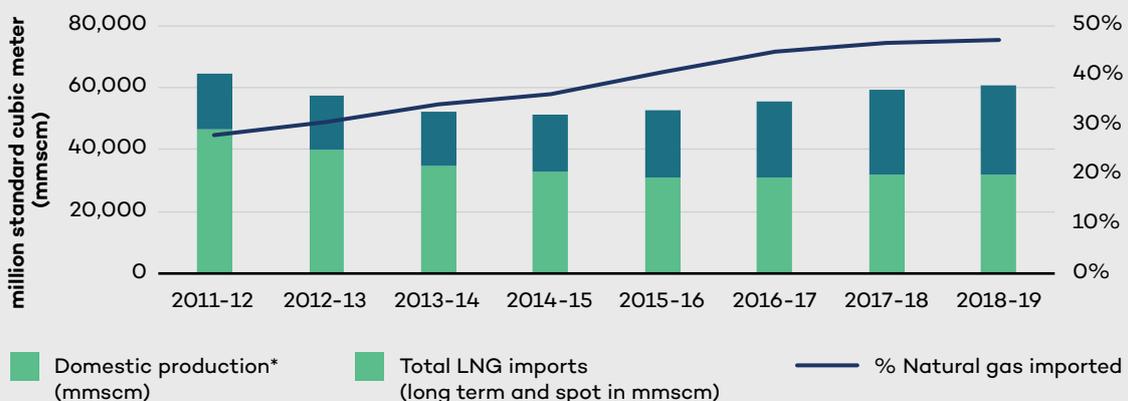
BOX 8. EMERGING AND EXISTING MEASURES ON NATURAL GAS

India aims to increase natural gas in its primary energy mix from 6% to 15% by 2030 (PIB, 2019b). The government plans to invest USD 60 billion by 2024, including a national gas grid and port terminals (Mukherjee & Verma, 2019). A draft policy to promote compressed natural gas (CNG) and piped natural gas in cities focuses on setting up city gas distribution networks, converting public transport to CNG and creating green corridors for inter-city traffic, with incentives for gas-driven mobility that are comparable to electric vehicles (Dutta, 2020a). The government is also working on setting up a natural gas trading hub to enable better price discovery. And multiple taxes on gas across states are considered a key bottleneck, raising the prospect of exemptions (Telegraph, 2019).

Analysis by the IEA (2019) shows that natural-gas-based power faces competition from both cheap coal and—increasingly—cheap renewables. Without subsidies, it may not be the most cost-competitive fuel. Further, investments in gas-based infrastructure can lock in energy choices.

In FY 2018, 67% of natural gas was consumed for fertilizer production, electricity generation, piped cooking gas for households and automobile fuel (MOSPI, 2019). A smaller share was consumed by industries like petrochemicals and refineries. India's domestic production is low, and the bulk of rising consumption is from LNG imports (see Figure 17). In FY 2019, nearly half of all gas was imported. Increasing consumption could lead to an import dependency comparable to imported oil.

Figure 17. India's natural gas consumption, domestic production and LNG imports



Source: PPAC, 2019.

*Note: Net domestic production is derived by deducting gas flared and loss from gross production.

India has multiple pricing regimes for natural gas, where prices differ based on the source. Imported LNG is more expensive than domestically produced gas (PTI, 2020d; MoPNG, 2019b). This may result in subsidies because domestic gas prices are not based on market value (IEA, 2020, p. 305). The market is further controlled by a policy that preferentially allocates domestic gas to groups for whom imported LNG could be cost-prohibitive, such as the fertilizer industry, households, transport, gas-based LPG plants and gas-based power plants that supply DISCOMs. This has, however, not been sufficient to meet demand. Approximately 14.3 GW of gas-based power plants are stranded (PRS India, 2019). There is a need for improved transparency on such potential subsidies to better inform policy.

6.2 Bailing Out Electricity DISCOMs

To date, the government has offered numerous financial packages to bail out distressed DISCOMs and improve their performance—but with limited success. The recent bailout through the UDAY scheme was effective in bringing down DISCOM financial losses and reducing the national aggregate technical and commercial losses in FY 2017 and FY 2018. The gap between cost of supply and average revenue realized also dropped materially during this period. However, the tariff gap rebounded in FY 2019, and aggregate losses are nearly double that recorded in the previous year (Thomas, 2019a). As of November 2019, DISCOMs owed INR 82,269 crore (USD 12.2 billion) to power generators, out of which INR 72,970 crore (USD 10.8 billion) was not paid even after a 60 days' grace period (MoP, 2020). This includes around INR 9,735 crore (USD 1.5 billion) outstanding for RE generators (CEA, 2019c).

As of August 2019, the central government enforced a payment security mechanism to help address this increasingly problematic issue. It requires DISCOMs to open letters of credit to get power supply. To further help states settle dues, a concessional loan for DISCOMs is under discussion (IANS, 2019). This would help DISCOMs settle the immediate needs of power producers and prevent disruption in supplies while setting stringent requirements to improve infrastructure and energy accounting practices. DISCOMs that lack proper energy accounting systems and do not receive subsidy payments on time would not qualify for loans (Singh, 2020).

The government is also considering a new bailout scheme: ADITYA, with central funding of up to INR 1.1 trillion (USD 16.3 billion) over three phases until March 2024 (Bhaskar, 2020). A remaining balance of INR 2.9 trillion (USD 42.5 billion) would be funded by states. The PFC and its subsidiaries would be the nodal agency for implementation. In its design to date, the scheme is planned to install smart meters in the first phase, starting from electricity feeders and then reaching consumers. In the second phase, it will install insulated aerial bunched cables to prevent electricity theft with hooks, separate feeders for agricultural and household consumption, and supervisory control and data acquisition systems for better monitoring and consumer experience. Further, state DISCOMs will be able to adopt various business models, such as public–private partnerships, multiple supply and network franchisees or working through input-based distribution franchisees. ADITYA's status is not yet clear, however, with a large power sector budget in FY 2021 but no specific mention of the scheme. It is possible that it will be re-tooled to help the power sector cope with impacts of the COVID-19 crisis.

6.3 Support Needed to Integrate Large-Scale RE Penetration

India has exceptionally ambitious RE targets: 175 GW of RE capacity by 2022, rising to 450 GW by 2030. To meet its targets and achieve optimal costs, the government will have to invest in and support quality interstate grid transmission expansion, including the green energy corridors program. For large-scale integration of RE, considerable technical and financial resources will be required to expand energy storage. In 2019, the government is planning to set up battery-making capacity of 40 GW to boost the adoption of EVs and RE, with investments of USD 40 billion in the next 2–3 years (Singh, 2019). The central government is working on fiscal and non-fiscal measures to help states set up manufacturing units in India so that RE integration and EV adoption becomes more viable.



6.4 Fossil Fuel Subsidy Commitments

India has made several commitments to rationalize and phase out inefficient fossil fuel subsidies that encourage wasteful consumption, including as part of the G20 and through SDG 12.c.1 (G20, 2009; UN Stats, 2019). In August 2019, India and France reiterated their G20 commitment and declared their intention to participate in a joint peer review of their fossil fuel subsidies (Ministry of External Affairs, 2019). Also, as part of SDG 12.c.1, countries are expected to report on the “amount of fossil fuel subsidies per unit of GDP (production and consumption) and as a proportion of total national expenditure on fossil fuels” (UN Stats, 2019). In 2019, the United Nations Environment Programme published a formal methodology to report on this indicator (Wooders et al., 2019).

India can step forward as a leader in peer review and SDG reporting, given the significant progress it has made in reducing fossil fuel subsidies since FY 2014 and its redirection of government resources toward RE. Peer review can also be an opportunity to evaluate existing subsidies against their stated objectives and to identify priorities for redesign or removal.

India has also highlighted subsidy reforms and the coal cess in its NDC to the Paris Agreement (MoEFCC, 2015). According to modelling by IISD’s Global Subsidies Initiative (2019), the reform of all fossil fuel subsidies in India could reduce national GHG emissions by 1% from 2018 to 2030. This could increase to 5.8% if 30% of savings are invested in RE and energy efficiency, and a 10% energy tax is introduced. To maintain ambition in the run-up to climate discussions in late 2020, it will be important to build on NDC commitments on gasoline and diesel pricing and the coal cess.

BOX 9. IMPACT OF THE FY 2021 BUDGET ON GOVERNMENT SUBSIDIES TO VARIOUS ENERGY TYPES

The Union Budget for FY 2021 includes a number of important decisions for energy.

- For O&G, the Union Budget has allocated funds to expand pipelines to 27,000 km from the existing 16,200 km (PTI, 2020a). Price reforms are also being planned by the government to increase gas market penetration.
- For electricity, INR 22,000 crore (USD 3.3 billion) was allocated to the MoP for FY 2021 (PTI, 2020c) but with no mention of a new scheme to revive DISCOMs. The government has also pressed states to replace existing electricity meters with smart meters to help DISCOMs manage their load and reduce metering and billing losses.
- The Ministry of Coal was allocated INR 40,350 crore (USD 6 billion), 2.25% less than the previous year (Tripathi & Shetty, 2020). The government has also planned to shut down old, highly polluting thermal power plants.
- For RE, the FY 2021 budget plans a 10.6% increase in funding for MNRE, at INR 19,480 crore (USD 2.9 billion) (Tripathi & Shetty, 2020). The government also proposed a 20% safeguard duty on imported solar cells and modules but put it on hold for now (PTI, 2020b). This would have been in addition to the temporary 2018 import duty of 25% (declining to 20% then 15%), which aimed to support domestic solar manufacturers but made it harder to achieve RE targets (Tripathi & Shetty, 2020).
- For EVs, the budget hardly mentions schemes, instead focusing on increasing the import duty of EV components to promote domestic manufacturing.



7.0 Recommendations



Transparency about energy subsidies is important so people can understand what support measures exist, how much they cost and how they perform with respect to stated policy objectives. In general, government support has shifted away from fossil fuels and toward cleaner energy; however, fossil fuel subsidies have surged again in the last two years, while RE subsidies have declined. Subsidies to oil, gas and coal (INR 83,134 crore or USD 12.37 billion in FY 2019) remain more than seven times the value of subsidies to renewables and EV (INR 11,603 crore or USD 1.7 billion in FY 2019).

We make the following high-level recommendations:

- **Maintain and increase ambition to shift public resources to clean energy.** India's progress since FY 2014 shows commitment to energy transition, driven at least in part by specific actions to reform perverse subsidies and back clean energy. But action is still insufficient to address the scale of sustainability challenges. While prioritizing health and inclusive economic recovery, it is recommended that the GoI further shift public resources to clean energy.
- **Resist new O&G subsidies.** Volatile world oil prices create demand for price interventions and support is being considered to promote natural gas. If economic stimulus is introduced, there will be further demands to help producers. It is strongly recommended to avoid such subsidies: volatile prices make them a liability; they are hard to remove once introduced; and they cause fossil energy lock-in. Investments in targeted social protection and public services can better help consumers cope with shocks.
- **Adapt RE subsidies for emerging technologies and grid balancing.** Clean electricity is essential: other sectors, such as transport and cooking, will rely on electrification to deliver clean energy. Emerging RE technologies still require assistance and, to achieve targets of 450 GW by 2030, the GoI must develop quality interstate grid transmission and energy storage. Little support was identified in these areas. It is recommended to adjust RE subsidies carefully and to use them with other policy tools to promote emerging technologies and grid balancing.
- **Target consumption subsidies for energy access: LPG and electricity.** The MoPNG and the MoP are recommended to work with social protection agencies to design and test mechanisms to target assistance without harming energy access.
- **Address the full costs of coal.** Taxes and charges still do not come close to covering the net cost of coal to India. A plan is needed to address coal pricing in a socially responsible way, including diversifying revenues and protecting consumers and workers. The coal cess should be maintained, and the NCEEF, or some equivalent, should be revived and improved.
- **Monitor and adapt EV subsidies.** Policies should be monitored to ensure effective, efficient and equitable support, including for two-wheelers, public transport, waste treatment and battery recycling. Support may still not be sufficient to reach 2030 targets.
- **Develop formal reporting structures on subsidies.** Subsidy reporting can be conducted in line with formal guidelines for SDG 12(c)1 and India's G20 peer review of fossil fuel subsidies. With fuller data, ministries should monitor, evaluate and adapt their most significant subsidies to better meet policy objectives.

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Annex 1. Details on Subsidy Methodology and Calculations

This Annex is adapted from Garg et al. (2017) and Soman et al. (2019) and provides details on the methodology used to identify and estimate subsidies.

A1.1 Definition of Subsidy

We define “subsidy” based on Article 1 of the Agreement on Subsidies and Countervailing Measures of the World Trade Organization (WTO, 1994), agreed by all WTO members (Box A1).

BOX A1. DEFINITION OF SUBSIDIES ACCORDING TO THE WTO

“1.1 For the purpose of this Agreement, a subsidy shall be deemed to exist if:

*(a)(1) there is a **financial contribution by a government or any public body** within the territory of a Member (referred to in this Agreement as “government”), i.e. where:*

*(i) a government practice involves a **direct transfer of funds** (e.g. grants, loans, and equity infusion), potential direct transfers of funds or liabilities (e.g. loan guarantees);*

*(ii) government **revenue that is otherwise due is foregone or not collected (e.g. fiscal incentives such as tax credits)**(1);*

*(iii) a government **provides goods or services other than general infrastructure, or purchases goods;***

(iv) a government makes payments to a funding mechanism, or entrusts or directs a private body to carry out one or more of the type of functions illustrated in (i) to (iii) above which would normally be vested in the government and the practice, in no real sense, differs from practices normally followed by governments;

or

*(a)(2) there is any form of **income or price support** in the sense of Article XVI of GATT 1994;*

And

(b) a benefit is thereby conferred.”

Source: WTO, 1994 (emphasis added by authors).

A1.2 Subsidy Classifications

The subsidies in our database are grouped in three ways:

1. Their mechanism according to the WTO definition of subsidies. See Table A1 for a typology of common mechanisms in each category.
2. The beneficiary (energy producers, energy consumers, or both).
3. Stimulated activity in the value chain (though a lot of subsidies are found to be cross-cutting through different activities, for example, both coal mining and transport).

Official Indian documents use various terms to refer to different types of subsidies. For instance, the Union Budget refers to direct budgetary transfers as “fiscal subsidies,” and government revenue foregone is commonly spoken of as “off-budget subsidies.” We do not attempt to categorize subsidies according to these conventions in our database.

Table A1. Typology of energy subsidies depending on their mechanism

Direct and indirect transfer of funds and liabilities	Direct spending	<p>Earmarks: Special disbursements targeted at the sector.</p> <p>Agency appropriations and contracts: targets spending on the sector through government budgets</p> <p>Research and development support: funding for research and development programs</p> <p>Government procurement of goods or services for above-market rates</p>
	Government ownership of energy-related enterprises	<p>Security-related enterprises: strategic petroleum reserve; securing foreign energy shipments or key assets</p> <p>Municipal utilities and public power: significant public ownership of coal- and natural gas-fired electricity stations; some T&D systems for both natural gas and electric power</p>
	Credit support	<p>Government loans and loan guarantees: market or below-market lending to energy-related enterprises or energy-intensive enterprises</p> <p>Subsidized credit to domestic infrastructure and power plants</p> <p>Subsidized credit to energy-related exports</p>
	Insurance and indemnification	<p>Government insurance/indemnification: market or below-market risk management/risk-shifting services</p> <p>Statutory caps on commercial liability: can confer substantial subsidies if set well below plausible damage scenarios</p>
	Occupational health and accidents	<p>Assumption of occupational health and accident liabilities</p>
	Environmental costs	<p>Responsibility for closure and post-closure risks: facility decommissioning and clean-up, long-term monitoring, remediation of contaminated sites, natural resource restoration, litigation</p> <p>Waste management: avoidance of fees payable to deal with waste</p> <p>Environmental damages: avoidance of liability and remediation to make the environment whole</p>



Government revenue foregone	Tax breaks and special taxes	<p>Tax expenditures: foregone tax revenues, due to special exemptions, deductions, rate reductions, rebates, credits and deferrals that reduce the amount of tax that would otherwise be payable</p> <p>Overall tax burden by industry: marginal tax rates are lower than other industry</p> <p>Exemptions from excise taxes/special taxes: excise taxes on fuels, special targeted taxes on energy industry (e.g., based on environmental concerns or “windfall” profits)</p>
Provision of government goods or services below market value	Government-owned energy minerals	<p>Process for mineral leasing: auctions for larger sites, sole source for many smaller sites</p> <p>Royalty relief or reductions in other taxes due on extraction: reduced, delayed or eliminated royalties are common at both federal and provincial levels; royalties targeted based on type of energy, type of formation, geography or location of reserve (e.g., deep water)</p> <p>Process of paying royalties due: allowable methods to estimate and pay public owners for energy minerals extracted from public lands</p>
	Government-owned natural resources or land	<p>Access to government-owned natural resources land: at no charge or for below fair-market rate</p>
	Government-owned infrastructure	<p>Use of government-provided infrastructure: at no charge or below fair-market rate</p>
	Government-provided goods or services	<p>Government-provided goods or services at below-market rates</p>
Income or price support	Market price support and regulation	<p>Consumption mandates and mandated feed-in tariffs: fixed consumption shares for total energy use</p> <p>Border protection or restrictions: controls on imports or exports leading to unfair advantages</p> <p>Regulatory loopholes: any legal loopholes, either in the wording of the statute or in its enforcement, that transfers significant market advantage and financial return to particular energy market participants</p> <p>Regulated prices set at below-market rates: for consumers (including where there is no financial contribution by government)</p> <p>Regulated prices set at above-market rates: including government regulations or import barriers</p>

A1.3 Approach for Quantifying Subsidies

Where possible, our subsidy estimates are drawn from official government sources, such as documentation pertaining to the process of budget drafting and execution, performance monitoring, reports of state-owned companies, annual reports and tariff orders of electricity DISCOMs.

In cases where it was not possible to identify an official estimate, various methods have been used to quantify subsidies independently, following standard international approaches. A summary of these is provided below.

All reported subsidy values are nominal and calculated for the fiscal year. Values are in INR and converted to USD at Reserve Bank of India notified rates for each year.

TAX SUBSIDIES BEFORE AND AFTER THE GOODS AND SERVICES TAX (GST)

Before the GST was introduced, there were a variety of taxes such as the excise duty, value-added tax, Central Sales Tax, service tax, entry tax, cesses and levies that were charged on goods at each point along the supply chain, with different rates between states and the possibility that taxes could cascade as they were levied at different points in the supply chain. This made estimating average tax rates cumbersome. For dates before FY 2017, for each relevant policy, a single proxy national benchmark was determined by identifying the gap between the rate that was actually charged and the rate that was charged as standard for typical, similar goods. It was not possible to take into account the impact of tax cascading.

The GST reforms have made it possible to estimate tax subsidies more precisely. Now, tax rates are applied uniformly for different product types across the country, as well as removing a large number of exemptions. Few products now fall under the nil GST category.

For FY 2018 and FY 2019 estimates, tax subsidy estimates are based on the GST rates, which have five main categories: 0%, 5%, 12%, 18% and 28% (Ministry of Finance, 2018b). The vast majority of goods attract the 18% tax rate. Essential commodities, such as milk, eggs and unbranded food grains are exempt from the GST (MSME Development Institute, 2017). A subsidy is identified and estimated if an energy product or service is subject to a tax rate that is much lower than most comparable goods—rates for these comparable goods being the “benchmark” rate for subsidy estimation. For example, under the GST, the tax on coal stands at 5%. This is much lower than other products in the “mineral” taxation category, with the highest tax rate being 18%. Therefore, if 18% GST is used as the benchmark, then 13% (18% minus 5%) of the value of coal consumed is revenue foregone and constitutes a tax subsidy.



COAL SUBSIDIES

A. Concessional Duty Rebates on Coal Mining Equipment

1. Total value of capital goods, stores, spares and components imported by Coal India Limited (CIL) and its subsidiaries are taken from CIL annual and accounts reports of respective years. However, this has not been reported in FY 2019, and hence the subsidy has not been calculated.
2. Total revenues foregone have been estimated by subtracting customs duty paid at actual rates from customs duty that would have been paid at normal rates, which is applicable to other similar products (highest rate applicable in that category).

B. Concessional Customs Duty Rates on Import of Coal

1. The total value of different grades of imports (in INR) is taken from reports of the Ministry of Commerce.
2. Total revenues foregone have been estimated by subtracting customs duty paid at actual rates from customs duty that would have been paid at normal rates, which is applicable to other similar energy products (highest rate applicable in that category).

C. Concessional Excise Duty Rates on Coal Production

1. The total net cost of coal by CIL is taken from CIL annual reports and accounts of respective years.
2. As excise duty is applicable to Basic Cost + Crushing Charges + Surface Transportation Cost, the cost build-up applicable to total coal produced by CIL is estimated.
3. Total revenues foregone have been estimated by subtracting excise duty paid at actual rates from excise duty that would have been paid at normal rates, which is applicable to other similar products (highest rate applicable in that category).
4. This has been updated based on concessional GST rates on the sale of domestically produced coal after the tax reform starting in FY 2018.

D. Credit Support from Multilateral Organizations

Subsidy amounts for low-cost financing from bilateral and multilateral agencies have been estimated by subtracting actual interest paid on the loans from the interest amount that would have been paid at the rate applicable for other domestic loans, which are reflected in CIL annual reports.

E. Non-Incurrence of Costs for Coal Washing Due to Non-Compliance of Mandate Related to Coal Washing/Beneficiation

1. Net washed coal requirement is estimated taking the difference between all-India coal consumption (where transportation of coal is $\geq 1,000$ km) and all-India washed coal.
2. Subsidy amounts for non-incurrence of costs of coal washing have been estimated by taking the product of the net washed coal requirement and the cost of washed coal.

OIL AND GAS SUBSIDIES

A. Customs Duty Exemption for Power Companies Purchasing Imported Liquefied Natural Gas

The total value of imported liquefied natural gas (LNG) is obtained from the website of Petroleum Planning and Analysis Cell (PPAC) of the Ministry of Petroleum and Natural Gas, Government of India. The share of the power sector in LNG consumption for different years has been obtained from PPAC Ready Reckoner for different years, which is available at the PPAC website. After obtaining the figure on the consumption of LNG by the power sector, it is multiplied by the customs duty waiver of 5% that is applicable to the consumption of imported LNG by the sector to obtain the figure for subsidy on account of customs duty waiver.

B. Domestic Liquefied Petroleum Gas Excise Duty Exemption

The total value of domestic liquefied petroleum gas (LPG) is obtained by multiplying the retail price of a 14.5-kg cylinder with the total amount of LPG consumed (in kg). The domestic LPG consumption (in kg) is derived through conversion from LPG consumption in metric tonnes. The data on the consumption of domestic LPG is obtained from the PPAC Ready Reckoner and the retail selling price from the PPAC website. The waiver of 8% for domestic LPG (as compared to non-domestic LPG) is then multiplied by the total value of domestic LPG to arrive at the subsidy figure.

C. PDS Kerosene Excise Duty Exemption

Total value of Public Distribution System (PDS) kerosene is obtained by multiplying the consumption of PDS kerosene (in litres) with the retail selling price. The PDS kerosene consumption (in litres) is derived through the conversion of consumption from metric tonnes to litres. The data on the consumption of PDS kerosene is obtained from the PPAC Ready Reckoner and the retail selling price from the PPAC website. The waiver of 14% for PDS kerosene (as compared to non-PDS kerosene) is then applied by multiplying it by the total value of PDS kerosene, and the subsidy figure is obtained.

D. Customs Duty Exemption on Imported LPG use for Domestic Use

The total domestic LPG demand, domestic LPG production and value of LPG imported is obtained from PPAC Ready Reckoner. Given that domestic LPG demand exceeds domestic LPG production, it is assumed the remainder of the demand is met by imports. The difference between demand and domestic production is calculated as the imported LPG for domestic use, which enjoys a customs duty exemption. Its value is calculated as a fraction of the total value of imported LPG in terms of volume. This value of imported LPG for domestic use is multiplied by the 5% customs duty waiver that it enjoys.



ELECTRICITY T&D SUBSIDIES

A. Subsidized Loans from Multilateral Organizations

Subsidy amounts for low-cost financing from bilateral and multilateral agencies have been estimated by subtracting actual interest paid on the loans from the interest amount that would have been paid at the coupon rates of corporate bonds issued by Power Grid Corporation of India Limited for respective years.

RENEWABLE ENERGY SUBSIDIES

Some estimates for renewable energy subsidies differ from our previous update, as some subsidies are now based on realized rather than budgeted amounts.

A. Financing and Non-Financing Schemes by IREDA

Subsidy amounts for low-cost financing from the Indian Renewable Energy Development Agency (IREDA) have been estimated by subtracting interest paid on loans from IREDA (at actual interest rate) from the amount that would have been at benchmark priority sector lending rates.

B. Tax Breaks on Excise and Customs Duty: Solar and Wind Energy

1. Benchmark cost norm of solar photovoltaic modules and currency exchange rates from the Central Electricity Regulatory Commission (CERC) have been used to estimate the cost of modules.
2. Share of projects that are established using domestic modules is estimated on the basis of share of Domestic Content Requirement projects tendered/commissioned during the last four years (17.5% of total installed capacity). On domestic modules, excise duty is applicable.
3. The remaining approximately 82.5% of total installed capacity is assumed to be imported. On imported modules, customs duty is applicable. This was updated in FY 2018 in lieu of an additional safeguard duty.
4. Total revenues foregone have been estimated by subtracting excise and customs duties paid at actual rates from excise and customs duties that would have been paid at normal rates, which is applicable to other similar products (highest rate applicable in that category).

C. Accelerated Depreciation

1. Using CERC benchmarks for capital costs for wind and solar PV, annual cash flows and tax benefits for the investments are evaluated.
2. Two scenarios are considered in the model: first, tax applicable without accelerated depreciation (AD) benefit and second, tax applicable when AD benefit of 80% is taken by the developer. The AD benefit of 40% has been used FY for 2018 onwards following regulatory change.
3. The assumptions used in the model are the same as those used by CERC to calculate generic renewable technology tariffs.

4. The total annual subsidy on account of AD is the difference between the tax benefits in these two scenarios.
5. As no resource is available publicly that provides us with the exact number of projects and associated capacities that have availed AD benefits, a conservative approach assumes that only corporate additions and public sector developers would have benefited from AD benefits.

D. Viability Gap Funding Scheme and Grid-Connected Solar PV Rooftop Programme

These subsidies are estimated based on announced budgets. This has been done due to a lack of clear reporting on released amounts. The nodal agency for releasing these subsidies is the Solar Energy Corporation of India Ltd (2020), which has shared financial statements on payments made. However, these amounts aren't reflected due to difficulties in cross-referencing payments to subsidies and concerns about missed (unreported) payments. The released amounts are often staggered over a longer time period than budgeted amounts.



Annex 2. List of Subsidies Non-Quantified Due to Lack of Data

This review is a best attempt to identify the major energy subsidy expenditure in India today. No such review can ever be fully comprehensive, as there are many such policies, and the data required for estimation is not always available. The full list of subsidies that were identified—quantified and non-quantified—is available at the [online data portal](#) and [online spreadsheets](#) accompanying this review.

In this update, some of the previously unquantified subsidies have been captured while some remained “not available” on the database. Among these, the following measures can be of significant value and could benefit from further review:

- Permanent cash advance pertaining to DBTL
- Customs duty rebates on transmission and distribution equipment
- Income tax exemption to companies engaged in production of “mineral oil” from New Exploration Licensing Policy blocks
- Oil marketing company support for extension of LPG connection to poor families under the Corporate Social Responsibility Scheme (Energy Access subsidies)
- Income tax exemption for the generation of power
- Compensation for land acquired for coal mining purposes
- Waiver of interstate transmission charges and losses on transmission of electricity generated from solar and wind plants
- Generation Based Incentive (GBI) for small solar power generation and grid-interactive wind power projects
- Exemption of customs duty on EV parts

Annex 3. List of Discontinued and New Subsidies, FY 2014 to FY 2019

DISCONTINUATION OF SUBSIDY SCHEMES (FY 2014–FY 2019)

- Concessional customs duty rates on import of coal
- Concessional excise duty rates on coal production
- Under-recovery on domestic LPG
- Excise duty exemption on domestic LPG
- Excise duty exemption on PDS kerosene
- Income tax exemption to companies engaged in production of “mineral oil” from New Exploration Licensing Policy blocks
- Biomass Gasifier Programme
- Small Wind Energy and Hybrid Systems (SWES) Programme
- Akshay Urja Shops Programme
- Tax breaks on excise and customs duty: Solar & wind
- Generation Based Incentive (GBI) for grid interactive wind power projects
- National Biogas and Manure Management Programme (NBMMP)
- Concession of excise duty on EVs

NEW SUBSIDIES (INCLUDED WITH RETROSPECTIVE VALUES)

- Construction of 220 kV Transmission line from Srinagar to Leh via Kargil
- Project Management Expenditure (PME) & Information Education and Communication (IEC) expenditure under Ujjwala
- PDS kerosene and domestic LPG subsidy scheme, 2002
- Concession of GST rates on electric two and three-wheelers

Annex 4. Literature Review on Social Costs of Coal-Fired Power

Table A2. Literature review of social costs from local air pollution from coal power

Source	Scope	Findings
Conservation Action Trust (2014)	Emissions from coal-fired thermal power plant (TPP)	Premature mortality: 186,500 to 229,500 annually in 2030
		Asthma cases: 42.7 million annually by 2030
Guttikunda & Jawahar (2014)	Emissions from coal-fired TPP (PM _{2.5} , SO ₂)	Premature mortality: 80,000 to 115,000 annually in 2010/11
		Child mortality (under 5): 10,000 in 2010/11
		Respiratory symptoms: 625 million in 2010/11
		Chronic bronchitis: 170,000 in 2010/11
		Chest discomfort: 8.4 million in 2010/11
		Asthma attacks: 20.9 million in 2010/11
		Emergency room visits: 900,000 in 2010/11
		Restricted activity days: 160 million in 2010/11
Guttikunda & Jawahar (2018)	Emissions from coal-fired TPP (PM _{2.5} , SO ₂)	Premature mortality (without flue gas desulphurization [FGD]): 112,500–126,000 by 2017
		Premature mortality (without FGD): 132,500–153,500 by 2020
		Premature mortality (without FGD): 164,000–197,500 by 2025
		Premature mortality (without FGD): 186,500–229,500 by 2030
		Monetary benefits (with FGD in INR crore): 7,800–12,600 by 2017
		Monetary benefits (with FGD in INR crore): 9,000–14,800 by 2020
		Monetary benefits (with FGD in INR crore): 10,900–18,100 by 2025
		Monetary benefits (with FGD in INR crore): 12,200–20,300 by 2039

Source	Scope	Findings
Srinivasan et al. (2018)	Emissions from coal-fired TPP	Premature loss of lives (without emission compliance): 320,000 between 2019 and 2030
		Respiratory hospital admissions (without emission compliance): 52 million between 2019–2030
		Work-loss days (without emission compliance): 126 million between 2019 and 2030
		Monetized health benefits (with emission compliance): INR 9,62,222 crore between 2019 and 2030
		Cost per life saved (with emission compliance): INR 1.36 crore to 1.44 crore
Balakrishnan et al. (2019)	Emissions from all source (PM _{2.5})	Air pollution resulted in 1.2 million premature deaths in 2017
Gupta & Spears (2017)	Emission from coal-fired TPP	Average number of days of missed work: 4.09
		Average exposure of 1 coal plant: 28 million person-years
		Marginal morbidity cost of coal plant: USD 0.9 per person per year
		Cost of average episode of short-term morbidity: INR 550
		Marginal morbidity cost of 1 coal plant: USD 25.2 million
Gunatilake et al. (2014)	Emissions from power plants in Asia	Respiratory hospital admissions case: INR 13,750
		Work-loss Days (WLD): INR 224
MLE (2018)	Minimum wage	WLD: INR 321
Mani et al. (2012)	Social costs of environment and resource depletion	Value of a Statistical Life INR 16,197,563 to 19,109,280

Table A3. Literature review of social costs from GHG emissions from coal power

Source	Scope	Findings
GHG Platform (2019)	National GHG emissions 2004–2015	Public Electricity Generation from coal, CO ₂ e (t) Global Warming Potential 5th Assessment Report (GWP-AR5) Year 2005: 531,739,894
		Public Electricity Generation from coal, CO ₂ e (t) GWP-AR5 Year 2006: 566,165,451
		Public Electricity Generation from coal, CO ₂ e (t) GWP-AR5 Year 2007: 607,674,137
		Public Electricity Generation from coal, CO ₂ e (t) GWP-AR5 Year 2008: 651,763,099
		Public Electricity Generation from coal, CO ₂ e (t) GWP-AR5 Year 2009: 678,857,651
		Public Electricity Generation from coal, CO ₂ e (t) GWP-AR5 Year 2010: 710,086,310
		Public Electricity Generation from coal, CO ₂ e (t) GWP-AR5 Year 2011: 771,155,047
		Public Electricity Generation from coal, CO ₂ e (t) GWP-AR5 Year 2012: 841,042,048
		Public Electricity Generation from coal, CO ₂ e (t) GWP-AR5 Year 2013: 907,648,582
		Public Electricity Generation from coal, CO ₂ e (t) GWP-AR5 Year 2014: 983,810,400
		Public Electricity Generation from lignite, CO ₂ e (t) GWP-AR5 Year 2005: 24,070,768
		Public Electricity Generation from lignite, CO ₂ e (t) GWP-AR5 Year 2006: 23,957,456
		Public Electricity Generation from lignite, CO ₂ e (t) GWP-AR5 Year 2007: 26,234,804
		Public Electricity Generation from lignite, CO ₂ e (t) GWP-AR5 Year 2008: 26,176,470
		Public Electricity Generation from lignite, CO ₂ e (t) GWP-AR5 Year 2009: 27,227,256
		Public Electricity Generation from lignite, CO ₂ e (t) GWP-AR5 Year 2010: 29,333,990
		Public Electricity Generation from lignite, CO ₂ e (t) GWP-AR5 Year 2011: 31,008,124
		Public Electricity Generation from lignite, CO ₂ e (t) GWP-AR5 Year 2012: 32,497,963
		Public Electricity Generation from lignite, CO ₂ e (t) GWP-AR5 Year 2013: 27,220,803
		Public Electricity Generation from lignite, CO ₂ e (t) GWP-AR5 Year 2014: 33,406,270

Source	Scope	Findings
Ricke et al. (2018)	Global, long-term forecast	India social cost of carbon: USD 86 per tCO ₂ (49–157 CI)
Thambi et al. (2019)	Analysis on emissions in India	GHG emissions, power sector, 2032: 3400 Mt CO ₂ e
Dubash et al. (2018)	Meta study	Aggregated middle value of annual GHG emissions, 2030: 4 GtCO ₂ e
		Total primary energy, coal, 2030: 580-920 Mtoe
Herzog et al. (2005)	Analysis on emissions in India	Aggregate GHG emissions, 2025: 900 Mt CO ₂ e
Myllyvirta (2019)	Emissions by energy sector	GHG emissions growth rate, 2019: 2%
World Bank (2019)	Carbon pricing across the world	Sweden: USD 127/t
		High end, COP 21 targets: USD 80/t
		Low end, COP 21 targets: USD 40/t
		European Union Emissions Trading System: USD 25/t



