REFORMS FOR A BRIGHTER FUTURE

TIME TO DECIDE

PRELIMINARY DRAFT FOR CONSULTATIONS AND DISCUSSION

## DISCUSSION NOTE 5

# ACHIEVING SUSTAINABLE ENERGY

### Towards Affordable, Reliable, and Sustainable Energy

WORLD BANK GROUP

## Towards Affordable, Reliable, and Sustainable Energy

Energy is a critical enabler of economic development and poverty reduction in Pakistan. However, the sector is not adequately fulfilling this role as a result of persistent fiscal, reliability, and energy security challenges. Inefficiencies and an incapacity to recover costs have led to the accumulation of around US$8.3 billion of circular debt in the electricity sector and US$6.3 billion in the gas sector, imposing substantial fiscal costs and risks. It is estimated that power shortages result in lost economic output of more than US$8 billion a year. Additionally, the country imports around 43 percent of its total energy supply, requiring around US$13 billion of foreign currency per year, which is likely to increase over time based on current trends. There is significant use of imported coal, especially in industry, and the country suffers from relatively high energy intensity of GDP. Furthermore, there are major gaps in the provision of universal access to modern energy and energy sector emissions are the largest contributor to GHG emissions and air pollution in Pakistan. A major policy shift is required to move towards more secure, environmentally sustainable, lower-cost sources of energy that take advantage of Pakistan's hydropower, solar and wind resources, especially if combined with an improvement in supply- and demand-side efficiency, efforts to decarbonize industry and transport, and sustained structural and fiscal reforms.

## Potential Benefits From Sustainable Energy

**13% Reduction**
in generation costs from mobilizing renewable energy

**US$2 Billion**
in savings potential from energy efficiency

**US$13 Billion**
potential savings in avoided imports

# The Problem

**Pakistan's energy sector cannot currently provide affordable, reliable, sustainable, and modern energy for all (SDG7).**

**Key challenges include:**

- Heavy dependence on fossil fuels. Fossil fuels comprise 86 percent of the primary commercial energy supply[1], exposing Pakistan to high prices, energy insecurity (including price shocks and supply disruptions), and generating air pollution and greenhouse gas (GHG) emissions.
- Growing financial deficits due to energy prices that do not reflect costs, misaligned subsidies, and the poor performance and inefficiency of electricity and gas distribution companies.[2] Large financial losses place a heavy fiscal burden on the government and disincentivize private investment in the sector.
- Electricity and gas supply interruptions that stem from electricity transmission bottlenecks, aging equipment, and managed load-shedding of electricity and gas (undertaken for commercial reasons).[3]

[1] This excludes highly uncertain estimates of the use of traditional biomass and waste.
[2] The issues include theft, losses (including methane leakage from the gas network), inaccurate consumer billing, and incomplete collections and arrears.
[3] Some consumers systematically do not pay their bills, and the distribution companies respond to this by providing limited supply to those consumer groups to try and stem their losses.

Unreliable supply generates additional costs to households and firms in lost productivity and heat stress. It also increases incentives for firms and households to generate their own electricity, depriving utilities of paying customers.[4]

- Relatively high energy intensity of GDP, with low rates of improvement. This places additional cost burdens on households and businesses and further exacerbates energy insecurity.
- Persistent gaps in the provision of universal energy access, with significant rural-urban and regional disparities.

**Heavy reliance on fossil fuels, combined with the expected growth in demand, threatens to exacerbate many of the current challenges of the energy sector.** Although considerable focus is given to the electricity sector, only 17 percent of Pakistan's energy consumption is in the form of electricity, with the balance coming primarily from the direct consumption of coal, gas, and oil in the domestic, industrial, and transport sectors (see Figure 1 & 2). Total energy supply is likely to increase from 84 million tons of oil equivalent (MTOE)[5] in 2019 to 115 MTOE in 2025, at an annual growth rate of 5.8 percent under a BAU scenario, much of which will come from fossil fuels under the current policies.

**Figure 1: Final Energy Consumption 2019–20**

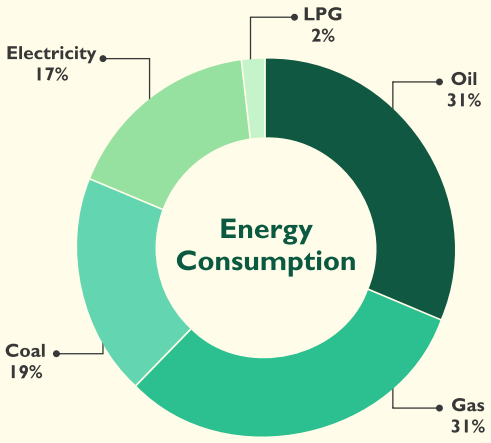
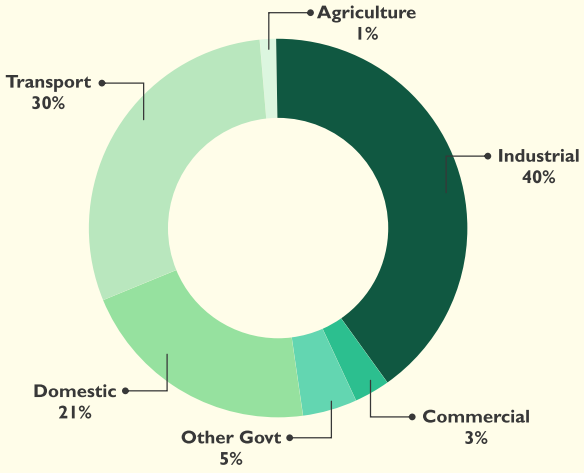



**Figure 2: Energy Consumption By Sector: 2020-2021**




**Structural issues, poor planning, and substantial subsidies have resulted in huge inefficiencies across the energy sector, affecting the reliability of supply and generating huge fiscal deficits (referred to as "circular debt").**[6] Pakistan has the highest subsidies on energy products in South Asia. Energy subsidies in 2020 accounted for 2.6 percent of the country's GDP, two-thirds of which were for electricity consumption, with the remainder for natural gas.[7] The notified tariff remains below the cost- recovery

[4] Some consumers find it cheaper and more efficient to generate their own electricity. The loss of such profitable, paying consumers can create a spiraling problem for the DISCOs because the less revenue they are able to collect, the less electricity they are able to supply, and the more erratic the electricity service becomes, which compels more customers to leave the grid, which further diminishes the revenue of the DISCOs.

[5] Million tons of oil equivalent.

[6] The reference to circularity captures the fact that the arrears keep getting passed from one energy sector entity to the next. In the power sector the deficits cascade from the distribution sector to the central power purchaser, and then to the power producers and fuel suppliers.

[7] IMF, Fossil Fuel Subsidies Database (Washington, DC: International Monetary Fund, 2022), https://www.imf.org/en/Topics/climate-change/energy-subsidies. Note that this figure includes only "explicit subsidies." The IMF also provides an estimate for "implicit subsidies" that takes account of the underpricing of externalities. Total energy subsidies, including both explicit and implicit, are estimated at 11.9 percent for 2020. For further details about the IMF's research, see Ian Parry, Simon Black, and Nate Vernon, Still Not Getting Energy Prices Right: A Global and Country Update of Fossil Fuel Subsidies (Washington, DC: International Monetary Fund, 2021), https://www.imf.org/en/Publications/WP/Issues/2021/09/23/Still-Not-Getting-Energy-Prices-Right-A-Global-and-Country-Update-of-Fossil-Fuel-Subsidies-466004.

level. 62 percent of residential and all agriculture consumers are subsidized. While the progressivity of the subsidy to residential consumers has improved with recent tariff notifications (July 2022 and July 2023), the subsidy to electric tube-wells continues to be regressive. As a result of the absence of cost-reflective tariffs, combined with operational and technical inefficiencies within the state-owned electricity and gas distribution companies, revenue collection does not fully cover the cost of energy supply, which leads to deficits.

**The circular debt has continued to accumulate, especially in the last few years.** As of the end of June 2023, circular debt stood at roughly US$8.3 billion in the electricity sector and US$6.3 billion in the gas sector, creating barriers to future investment.[8] The situation has been exacerbated by the recent addition of large coal and imported gas power plants with "take-or-pay" contracts that have increased capacity payments by 50 percent and increased the country's exposure to international fossil fuel price volatility—as witnessed over 2022. The inefficiencies in the electricity and gas distribution companies include outdated metering practices, low collection rates, high technical losses, rampant theft, and gas leakages as a result of old and poorly maintained pipelines and sabotage.[9] The gas sector has also been facing structural challenges. A shortage of domestic gas supply combined with increasing demand, has contributed to rising imports of Re-gasified Liquified Natural Gas (R-LNG). Today, R-LNG is used to supply 45 percent of demand.[10] While the increase in share of imported gas has come at a higher cost, gas tariffs for end-consumers have remained constant. The latest tariff increase in February 2023 was the first in three years and the gas tariff is still below cost recovery level as it does not include the cost of imported gas. Diversion of expensive R-LNG to the two lowest paying consumer categories - domestic and fertilizers –, and subsidized R-LNG to export industries, has accelerated the buildup of the gas circular debt. The deep discounts offered to the fertilizers and domestic consumers has driven up prices for other consumers, which increases the cost of electricity generation. Persistent circular debt curtails investment in the gas and power distribution networks, undermines the ability of both sectors to operate at full capacity due to fuel shortages, and increases the difficulty of attracting investors to support future power sector requirements.

# Recommendations

1. **The government must maintain its commitment to comprehensive reform, including transition away from fossil fuels.** For the power sector, this requires reducing the cost of generation and overdependence on imported fossil fuels, bringing end-consumer tariffs closer to the cost recovery level, and improving supply-side efficiency and collections. For the gas sector, tariff reforms are required to eliminate cross-subsidies and contain the increase in gas demand, especially of domestic consumers. Bringing the tariff to a cost reflective level, while also unbundling the sector (i.e. delinking the role of gas transporter and downstream supplier),[11] while allowing third party access for both pipelines and terminals, will be critical. For the first time, the government's reform program covers all aspects of the sector, focusing strongly on reducing current and future power costs, reducing reliance on imported fossil fuel, scaling up RE, addressing inefficiencies within the electricity distribution companies (DISCOs), and lowering subsidies in both electricity and gas sectors by better targeting them to those most in need.

[8] At the end of FY2023, Pakistan's total circular debt was PKR 2,374 billion in the electricity sector and PKR 1,800 billion in the gas sector. The exchange rate: 1 US$ = 285 PKR.
[9] In the gas sector these issues are often collectively referred to as "unaccounted-for gas." Although the portion due to leakages is hard to estimate, this is a further source of avoidable GHG emissions in the country.
[10] For SNGPL network the share of RLNG is 58%.
[11] Currently, the two SUIs companies have three functions, transporting, distributing and selling gas to end-users.

2. **Pakistan has huge solar and wind power potential, but this has not so far been utilized.** Several factors have contributed to slow deployment of renewable energy (RE), ranging from political economy to the technical ones. Large variations of the seasonal peak demand create some challenges for deployment of RE which requires simultaneous expansion and strengthening of the grid. Of the 43 GW of current installed capacity, 40.5 GW is classed as "dependable", and yet the "peak capability"[12] of the National Transmission & Despatch Company (NTDC) system is just under 28 GW, against a peak summertime demand of over 30 GW.[13] This, along with the unwillingness of the government to operate all available capacity due to high fuel prices, and the incur the large commerci al losses involved in supplying non-paying consumer segments, drove widespread scheduled power cuts during 2022. Development of additional RE capacity is necessary to meet the current supply deficit in the summer. According to a World Bank study, utilizing just 0.071 percent of the country's available area for solar photovoltaics (PVs) would meet Pakistan's current total electricity demand.[14] The wind resource is also considerable, especially in Balochistan and Sindh. The Indicative Generation Capacity Expansion Plan 2021–2030[15] (IGCEP) has a target to reach 60 percent of electricity generation by 2030. This would require a significant build-out of 13.6 GW of additional solar and wind capacity based on current projections, but this has yet to begin. Achieving this objective will require: (i) introducing competitive bidding for new power generation projects and ending the old practice of direct contracting and cost-plus tariffs that have led to high power costs and an over-reliance on fossil fuels; and (ii) strengthening and expanding the transmission network to address bottlenecks that curtail integration of more RE capacity in the system (including some cheaper wind power), potentially including through increased private participation.

3. **The energy intensity of GDP is relatively high in Pakistan compared to other countries in the region, and there is substantial potential for improvement in demand-side efficiency.** Pakistan's energy intensity—the amount of energy needed to produce US$1 of GDP and a measure of energy efficiency—was 4.6 megajoules (million joules, MJ) per dollar in 2018, compared to 4.4 MJ/$ in India, 2.6 MJ/$ in Türkiye, 2.5 MJ/$ in Bangladesh, and just 1.8 MJ/$ in Sri Lanka. Moreover, the rate of energy efficiency improvement was only 1.2 percent over 2000–2018 (declining in more recent years), which is well short of the SDG7 global target of 2.6 percent.

4. **High energy intensity, combined with rapidly growing energy consumption, adversely affects energy security by further adding to the country's dependence on imported fuel for meeting its energy needs, and by increasing peak demand requirements in the electricity and gas sectors.** For example, a large and growing source of electricity demand, especially during summer peak periods, is cooling.  usage of air conditioning, combined with poor levels of building energy efficiency and rising temperatures, will place huge pressures on the electricity network and could increase annual cooling-related GHG emissions from 23 million MtCO2e in 2020 to over 50 million MtCO2e by 2030.[16] Furthermore, there are over 175 million electric fans in Pakistan, most of which are inefficient models that consume over twice as much electricity as highly efficient fans with direct current (DC) motors that can be manufactured domestically.[17]

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[12] The total "dependable capacity" consists of all the available capacity on the NTDC network assuming that all plants are generating at full output, with no fuel or hydrological constraints, but taking account of plant deratings due to age and inefficiencies. In practice this is virtually impossible to achieve, even if the current fuel cost and CD issues were addressed, due to the seasonal and daily availability schedules for large hydropower, scheduled and unscheduled maintenance, fuel shortages at individual plants, and the variability of solar and wind. "Peak capability" takes account of these constraints, and will vary throughout the year.

[13] NEPRA. 2022. State of Industry Report 2022. Available at: https://nepra.org.pk/publications/State%20of%20Industry%20Reports/State%20of%20Industry%20Report%202022.pdf

[14] World Bank, "Solar Photovoltaic Power Potential by Country," World Bank Understanding Poverty website, July 23, 2020, https://www.worldbank.org/en/topic/energy/publication/solar-photovoltaic-power-potential-by-country.

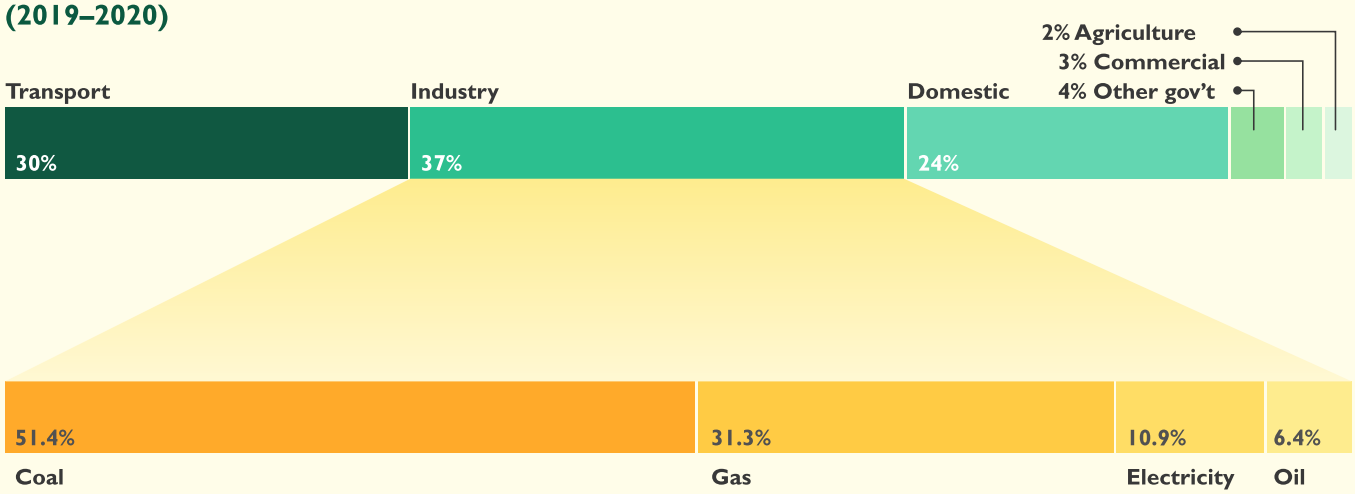
[15] Syed Safeer Hussain, "Submission of Revised Indicative Generation Capacity Expansion Plan (IGCEP) 2021–30)," National Electric Power Regulatory Authority (NEPRA), Managing Director's Letter to National Transmission & Despatch Co. Ltd (NTDC), September 24, 2021, Republic of Pakistan, https://nepra.org.pk/licensing/Licences/LAT-01%20IGCEP%2024-09-2021%2037702-29.pdf.

[16] Green Cooling Initiative Country Data, last accessed September 5, 2022, https://www.green-cooling-initiative.org.

[17] World Bank. 2022. Supporting the Manufacture in Pakistan of High-Quality DC Fans. https://openknowledge.worldbank.org/handle/10986/

5. **Reducing industry's use of coal (imported and domestic) would have significant benefits for Pakistan's balance of payments and GHG emissions.** The industrial sector has the highest share of energy use. Combined with its heavy reliance on coal, the sector makes a disproportionate contribution to air pollution and GHG emissions. In 2020, industry represented 37 percent of total energy consumption and 73 percent of coal consumption (mostly imported). Electricity generation represents a smaller share of total coal consumption, albeit one that has grown rapidly in recent years due to a number of new coal-fired power plants. Industrial coal consumption is dominated by the brick kiln and cement industries, leading to both energy use and process emissions, with air pollution impacts. These industries are economically significant contributors to GDP and employment and have important linkages to other sectors. But since much of the coal consumption in the industrial sector uses imported coal, there would be wider economic benefits to implementing efficiency and decarbonization measures, in addition to the significant environmental benefits.

**Figure 3: Energy Consumption By Sector (Above) And By Fuel Type In The Industrial Sector (Below) (2019–2020)**




**To achieve sustainability in energy, government should immediately implement the following policy shifts.**

5. **Transition away from fossil fuels.** Based on the government's least-cost capacity expansion plan for the power sector, and supported by the World Bank's own analysis, there is no justification for further investment in fossil fuel capacity, even before considering GHG emissions and other environmental externalities. The scale-up of solar and wind power is long overdue and needs to be prioritized to reduce the cost of generation and move away from fossil fuels. Pakistan should: (i) accelerate the development of renewable energy capacity starting with the immediate procurement of 2 GW of solar and wind capacity through competitive bidding, followed by annual rounds of procurement to meet the government's targets; (ii) undertake gas tariff reforms that will direct scarce gas resources to the most efficient power plants, thus limiting the need for imports, while also removing the cross-subsidies, especially to the fertilizers and domestic consumers (these reforms will be critical for decarbonizing the gas supply by providing the right signals for demand and supply); and (iii) cease further development of fossil fuel power plants, reflecting the conclusions of the government's own least-cost plan and building on the moratorium on plants using imported coal (climate finance could be utilized to support early retirement of existing plants).

6. **Improve supply-side efficiency.** Improving supply-side efficiency is critical for stemming commercial and technical losses and introducing greater financial discipline and transparency. This will involve a politically difficult restructuring of tariffs and state-owned distribution companies. Without this, the sector will continue to bleed resources and provide poor services to households and firms. Pakistan should: (i) fully implement tariff and subsidy reforms to ensure full cost recovery in the electricity and gas sectors, while protecting the poor through tariff design and broad social protection systems;

(ii) introduce private-sector participation in the management of the power distribution companies in order to improve efficiency, quality of service, and consumer satisfaction; (iii) ensure the successful introduction of a competitive wholesale power market to bring greater transparency to future contracting; and (iv) increase public and private investment in transmission and distribution infrastructure.

7. **Enhance demand-side efficiency.** Reducing the country's reliance on imported fuels and mitigating the impact of high prices on consumers can be made much easier by pursuing demand-side efficiency. Measures should be taken to reduce peak demand for electricity and gas. Pakistan should: (i) target quick wins to generate national support and build early momentum, such as setting minimum performance standards for mass-market appliances and improving the energy efficiency of existing and new buildings in the commercial and residential sectors; (ii) shift to electricity where economically and technically feasible, such as for space and water heating; (iii) launch commercially driven replacement or exchange programs for inefficient older appliances, such as fans and incandescent lighting; and (iv) develop the market for energy service companies to mobilize private-sector investment.

8. **Decarbonize the industrial sector.** The industrial sector has many economically beneficial opportunities for raising energy efficiency and adopting technological improvements. Achieving deeper decarbonization, however, will require fuel switching where this is feasible, process changes (for example, in cement manufacture) and the potential deployment of carbon-capture technology. Concessional climate finance will be required to help pilot and scale up interventions that are not yet commercially viable, supported by regulation and private sector investment. Key recommendations include: (i) Incentivizing decarbonization and efficiency improvements in industrial energy use through regulations, fiscal incentives, and improved access to financing; (ii) Supporting the electrification of the industrial sector, and fuel switching from coal where feasible, including to green hydrogen and bioenergy.

9. **Ensure a "just" energy transition.** Any national development transition of this magnitude will likely face resistance, not only from vested interests but also because it could result in lost jobs and livelihoods as industrial, commercial, and public sector organizations modernize and adapt. It is important that Pakistan ensures a just energy transition, which will include efforts to tackle remaining gaps in access to modern energy services. Pakistan should: (i) develop a clear understanding of those who might stand to lose politically and financially and avoid disproportionately favouring some interest groups over others; (ii) protect the poor and vulnerable through targeted retraining and financial support; and (iii) achieve universal access to modern energy by 2030, with a particular focus on rural households and on the uptake of off-grid electrification and clean-cooking solutions.

## ABOUT THE "REFORMS FOR A BRIGHTER FUTURE" DISCUSSION NOTES:

"Reforms for a Brighter Future" is an initiative of the World Bank, aimed at fostering debate and dialogue on critical economic development policy issues facing Pakistan. Further information is available from the World Bank Pakistan website at https://www.worldbank.org/en/country/pakistan/brief/reforms-for-a-brighter-future-time-to-decide. This is the fifth of a series of eight discussion notes. These notes outline World Bank recommendations across selected policy areas where major reforms are critical for Pakistan's progress towards inclusive and sustainable development. They do not aim to be comprehensive, but rather focus on selected areas where major policy shifts will be required to improve Pakistan's current development trajectory. Feedback from consultations and dialogue will be incorporated as the notes are finalized. This note was prepared by Teuta Kacaniku (Senior Energy Specialist), Oliver Knight (Senior Energy Specialist), and Mohammad Anis (Senior Energy Specialist). Please send feedback or comments to Tobias Haque (Task-Team Leader, thaque2@worldbank.org) and Puteri Watson (Task-Team Leader, pwatson2@worldbank.org).