A Carbon Neutral Electricity Sector in Uzbekistan

Summary for Policymakers

A Carbon Neutrality Roadmap of Uzbekistan's Electricity Sector

Uzbekistan electricity sector needs a fundamental shift in its electricity generation from coal and gas to cleaner energy sources, in order to meet the increasing energy demands in line with the predicated growth in the GDP and population, while also meeting the country's GHG emissions reduction targets under the Paris Agreement. The diversification of electricity generation sources will be critical in ensuring the resilience of the energy system, best achieved through mobilizing private sector development for the purpose of increasing the share of renewables, enhancing regional electricity trade, and promoting energy efficiency.

A Roadmap developed, with the support from the European Bank for Reconstruction and Development (EBRD) and funding from Japan, **aims to assist Uzbekistan government in prioritising the development of renewable and low-carbon technologies and align its power sector development with its commitments under the Paris Agreement.** Moreover, the Roadmap outlines the actions responsible stakeholders need to take, in order to secure a low-carbon future for the electricity sector in Uzbekistan.

Importantly, the Roadmap **demonstrates that it is technically and economically possible in Uzbekistan to achieve an early peaking of GHG emissions in the electricity sector and reach carbon neutrality by the year 2050.** The decarbonisation of the power sector will not only contribute towards meeting the national emissions targets of the Uzbekistan's Nationally Determined Commitment (NDC), but also aligns the investment needs of Uzbekistan with the green lending policies of the International Financial Institutions (IFI) and multilateral and bilateral providers of development and climate finance.

The Roadmap **builds upon an extensive analysis that reflects various existing government policies**, including the Government of Uzbekistan's energy policies and growth forecasts, and modelling assumptions verified with relevant key stakeholders. The analysis takes into account the 2030 energy sector strategy and the fuel constraints embedded in it. The Roadmap offers an integrated assessment of the power sector in Uzbekistan, including the assessment of investment needs. It outlines the physical and operational constraints that require change and, more importantly, the gaps in the legal, regulatory, and institutional framework that are hampering large scaled investments in decarbonisation of Uzbekistan's electricity sector.

The Roadmap adopts a holistic approach to electricity generation planning that is "value driven", meaning it sets targets for key performance indicators to guide decisions on the optimal combination of new generation capacity and retirement of older assets to minimise the net present value (NPV) of the total costs of the system over a long-range planning horizon (2021–2050). In order to achieve early peaking and reaching zero carbon by 2050, under various scenarios of demand growth, the modelling[1] results illustrate:

[1] The detailed analysis of Transmission and Distribution investment needs is not considered in detail in the analysis

i) ***the technical considerations and constraints*** to achieving a zero-carbon power system and the required changes to the infrastructure (generation and transport),

ii) ***an assessment of the investments*** required to fully phase out CO2 emissions by 2050, and

iii) ***the incentives the new policy objectives*** must offer and elaborates on the role of carbon pricing

The EBRD adds

The EBRD is committed to continuing its successful cooperation with the Government of Uzbekistan and the relevant public and private-sector stakeholders to develop regulatory, policy, market and investment conditions to enable the implementation of the Roadmap.

Carbon Neutrality Action Plan for the Uzbek Electricity Sector: Five-pillar approach

The Carbon Neutrality Roadmap provides an Action Plan built around **five priority areas**:

1. ***Electricity generation infrastructure transformation*****,** building on the ongoing reform and continue the development of more efficient and low carbon capacities and the associated development of the grid.
2. ***Establishment of a regulatory framework to enhance renewable energy penetration*****,** implementing regulatory and institutional reforms to allow and support the development of renewable energy sources in Uzbekistan.
3. ***Subsidy reform and a carbon price mechanism*****,** creating a level playing field by terminating regulatory and institutional preferences for carbon-intensive sources and eventually setting up a carbon pricing mechanism.
4. ***Awareness raising campaigns to generate public support*****,** to ensure social acceptability and sustainability of the changes introduced.
5. ***Environmental protection*****,** both in terms of climate change mitigation and increasing climate resilience, and reducing other negative environmental impacts.

The Action Plan identifies for each priority action relevant stakeholders, who will own and/or support the implementation of the Roadmap.

Table 1 Short summary of Action Plan

Priority	Stakeholders[2]	1–2 y	3–5 y	5 y+
1. Electricity generation infrastructure transformation	MoE			

[2] Abbreviations: Electricity Market Regulator (EMR), State Committee for Ecology and Environmental Protection (SCEEP), Ministry of Energy (MoE), Ministry of Economic Development and Poverty Reduction (MoDPR), Ministry of Investments and Foreign Trade (MIFT), Ministry of Finance (MoF).

2. Regulatory framework to allow for renewable energy penetration	MoE, SCEEP, EMR, MoF, MIFT	
3. Subsidy reform and a carbon price mechanism	MoE, SCEEP, MoF, MIFT, MoDPR	
4. Campaigns to generate public support	MoE, SCEEP, MoDPR	
5. Environmental protection	MoE, SCEEP, MIFT	

Priority 1: Electricity generation infrastructure transformation

The first priority is to build on the ongoing reform and continue the development of more efficient and low carbon generation capacities, and the grid to enable the integration of large shares of renewable energy in the future. This includes a continuation of the transition towards more efficient thermal generation, as scheduled in the latest Ministry of Energy Concept for 2020-2030. In particular, natural gas-fired capacity is essential as it replaces more carbon intensive generating assets while renewables increase at scale, and in later years will still remain relevant for system balancing in case sufficient storage capacity is not introduced at the pace matching the rollout of intermittent renewables. There is also a role to play for the interconnectivity of the grids with other countries in the region to diversify the volatility of renewables and increase the absorption capacity of the systems.

The introduction of wind and solar power plants into the electricity system and the system's capacity to absorb these sources, **should be closely monitored, in accordance with this Concept, and feed into the design of future grid developments**. Parallel programmes for development of storage, demand management and energy efficiency will allow the system to cope with flexibility challenges. New generation planning studies will be necessary on a regular basis, making the best use of new data collected from the operation of the installed PV and wind power plants, but also of studies on resource availability and weather statistics. New software tools are becoming available to support the optimisation of the overall system.

Priority 2: Regulatory framework to enhance renewables penetration

The next priority is **regulatory and institutional reforms to allow and support development of renewable energy sources in Uzbekistan**, mobilizing investments from domestic and international players into renewables, and contributing with energy efficiency and other technologies to create green jobs in the country.

Renewables have already proven that they can strive in a competitive market environment and the cost of wind and solar technologies has reduced sharply in the last decade. Uzbekistan is well positioned to benefit from this global trend given its renewable potential and should **make renewables at the centre of planning the strategy for the future energy system and safeguard investment in renewables from non-market risks**. A transparent, ambitious and long-term plan for the auctioning of renewable energy capacity should be set up. The regulatory comfort and financial guarantees given to investors in renewable energy must be safeguarded, based on stability commitments that are enforceable before arbitration.

The EBRD adds

Currently the energy sector is dominated by SOEs in Uzbekistan. It is therefore important that **the legal framework of governance of SOEs is updated to reflect key KPIs on the delivery of a decarbonisation of the energy sector while facilitating the entry of private sector participants along the same decarbonisation trajectory**. Fossil fuel assets shall be separated from low carbon assets in order to avoid cross subsidization and potential conflict of interests in the companies.

Priority 3: Market reform and carbon price mechanism

There are important legal, regulatory and institutional obstacles that must be addressed, if Uzbekistan is to successfully make the transition to a low-carbon electricity sector. **The regulatory and institutional preferences in favour of carbon-intensive sources must be terminated to support levelling of the playing field.** This starts with the phase out of subsidies to energy which shall be substituted by cost reflective tariffs and monetization of subsidies for the vulnerable customers. In particular subsidies to the oil and gas sector should be eliminated as soon as possible. A shadow carbon price should be introduced at the government level for new investment proposals. Eventually, a carbon pricing mechanism should also be introduced, potentially together with carbon emission performance standards and the mandatory closure of the most obsolete installations, to facilitate the decommissioning of carbon-intensive plants.

Carbon pricing is unlikely to send the right signals to the operators of fossil-based power plants in the absence of a fully liberalized electricity market where renewables can compete and deliver both price and environmental benefits to consumers. Similarly also fossil fuel markets, especially gas should be fully liberalized in order to provide the market with the true cost of the commodities once it is subsidy free. These initiatives are ongoing, but it will take time before their impacts materialise. The ongoing reform of the electricity market, including the drafting of a new Electricity Law, offers a unique opportunity to integrate the missing sustainability dimension into the legal and regulatory architecture.

The EBRD adds

One of the policy priorities in this regard is the creation of a **well-functioning power market**, including for ancillary services, in conjunction with the phasing out of subsidies to fossil fuels across the supply chain. Long-term policies combined with effective markets provide the stability required for private-sector investors to enter and grow their presence in the sector, particularly for the vital growth of the renewable energy segment.

Priority 4: Awareness raising campaigns to generate public support

Developing public support is a crucial dimension for the implementation of decarbonisation initiatives, which includes **measures related to communication and consultation of the public and key stakeholders**. Measures to protect vulnerable consumers (e.g. through offsets against price increase, subsidies for energy efficiency or renewable energy installations in residential buildings, transparency of electricity bills, and the recycling of carbon

revenues) will also support the social acceptability and the sustainability of the change required in the power sector.

Priority 5: Environmental protection

It is important **to monitor impacts of new projects on biodiversity and environmentally protected sensitive areas, and to continue improving environmental legislation in general.** The integration of the potential risks related to the physical impacts of climate change into strategic planning processes is becoming best practices within the international financial community and will become mandatory in the medium term, e.g. by implementing a shadow carbon price for investment planning. Climate risk assessment and disclosure flowing the recommendations of the Taskforce for Climate-related Financial Disclosures (TCFD) will play an increasing role in understanding the impact of climate change on electricity generation assets.

Box 1 - Overview of Uzbekistan Power Sector: Uzbekistan, a major electricity producer in Central Asia with strong renewable energy attributes

Uzbekistan is a major electricity producer in Central Asia, with total installed capacity exceeding 12 GW, generating over 61 TWh per year, or ~2 MWh per capita. The electricity generation infrastructure is aging and inefficient and almost exclusively based on natural gas. Hydropower represents a small percentage of the total generation, with other renewables accounting for less than 0.1% of consumption.

Uzbekistan manages a significant portion of the installed capacity of the united power system of Central Asia and has a well-developed electricity sector, covering nearly 100% of the population. The country can satisfy its energy needs from its own primary energy resources where two companies, Thermal Power Plants and Uzbekistan Hydro Energy Company, provide most of the electricity. The National Electric Networks of Uzbekistan and Regional Electric Networks are responsible for electricity transmission and distribution. Uzbekistan also has cross-border transmission line interconnections with Afghanistan, Kazakhstan, the Kyrgyz Republic, Tajikistan and Turkmenistan. These offer opportunities for regional coupling of energy systems and overall synergies in accelerating the decarbonisation of the region.

Electricity demand is rising, and frequent shortages affect the system. Uzbekistan plans to strengthen the country's institutional and legal framework to promote investments in renewable energy and energy efficiency, in line with its long-term sustainable development goals. The first industrial scale solar PV plants may be operational in 2021, with full potential of solar energy yet to be tapped. The country is also in the process of assessing wind energy potential. The first solar tender was successfully awarded in 2019 and 700 MW solar and wind projects are being tendered.

In addition, several policies have been adopted into law that will support Uzbekistan's transition towards a low-carbon power sector. This includes the enactment of the Law "On the Use of Renewable Energy Sources" in 2019, as well as the simultaneous adoption of the National Green Economy Strategy up to 2030.

Although these developments are positive signals about Uzbekistan's renewable energy trajectory, the gaps in the present legal and regulatory framework will act as impediments to Uzbekistan adopting a sufficiently ambitious, comprehensive, and long-term strategy to decarbonise the country's power sector. A more ambitious NDC target is possible beyond the present reduction target of 10% from the level in 2010.

At present, the dominating renewable source in Uzbekistan's electricity system is hydropower, providing 1.85 GW, or 14.3% of the installed capacity. The Ministry of Energy envisions increasing this to 3.8 GW by 2030. Studies, including the ADB's Power Sector Master Plan[3], have considered all renewable energy sources, notably solar power, that can also be harnessed for heat generation.

The potential for wind energy is estimated at between 520 to 1000 GW, the solar at up to 3000 GW, both vastly exceeding the projected electricity demand by 2050 and the needs to fully decarbonise the sector. Other RE sources, like low enthalpy geothermal waters could provide up to 1 GW of capacity, considerably less than the potential of biomass estimated in the range of 15–17 GW (mostly for agricultural and domestic use). Emerging

technologies such as battery storage and carbon capture and storage could be also deployed, as could hydrogen within the constraint of water availability.

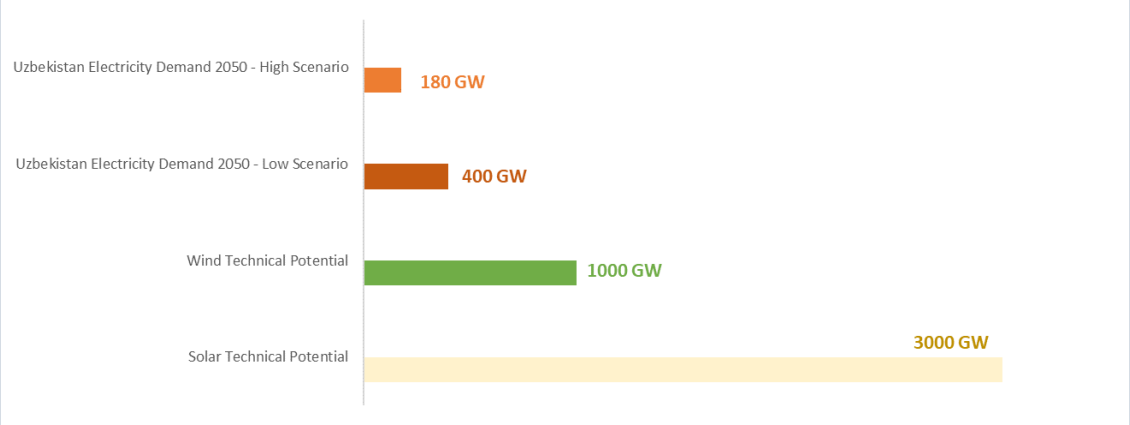
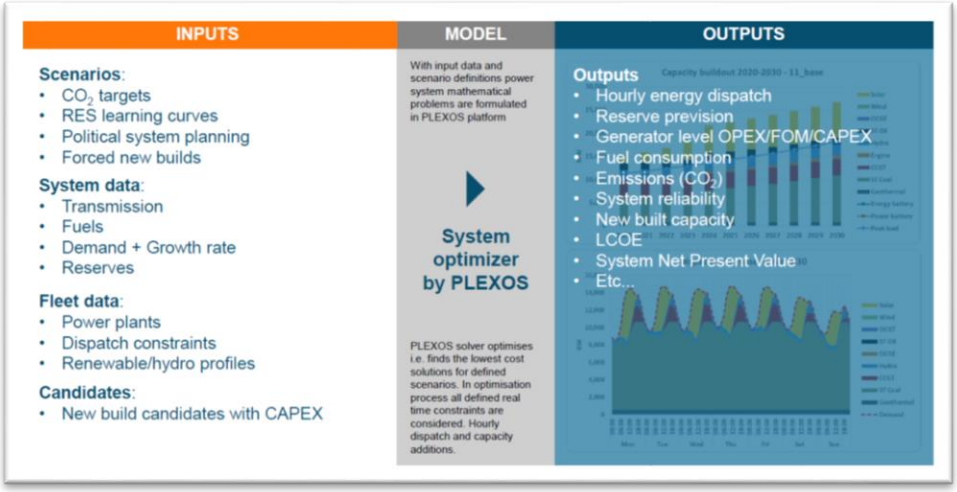


Figure 1: Estimates of technically achievable renewable potential compared to the expected (2050) demand

Modelling Approach: A Scenario-case mix extending the Government of Uzbekistan's 2020-2030 Concept to 2050 with a focus on carbon neutrality

The industry leading generation cost modelling software "Plexos" (LT-Plan) was used for modelling a least-cost generation capacity expansion plan.

Figure 2 - High level description of PLEXOS software

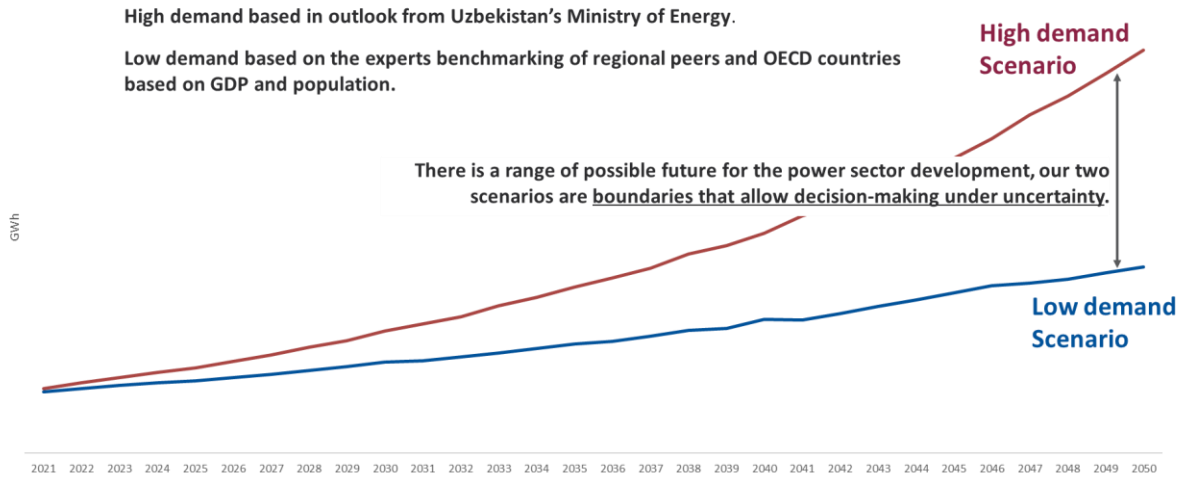


The existing energy infrastructure and proposed policy mix are used in the modelling, including the 2020-2030 Security of Electricity Supply Concept (2020–2030 Concept)[4] published by the Government of Uzbekistan. In particular, the generation and retirement plans of the 2020–2030 Concept were used to model the power sector for the period between

[3] *Uzbekistan Power Sector Master Plan, Volumes 1 to 3, Mott MacDonald & Corporate Solutions 2019.*
[4] *2020-2030 Security of Electricity Supply Concept (2020–2030 Concept), Ministry of Energy, 2020.*

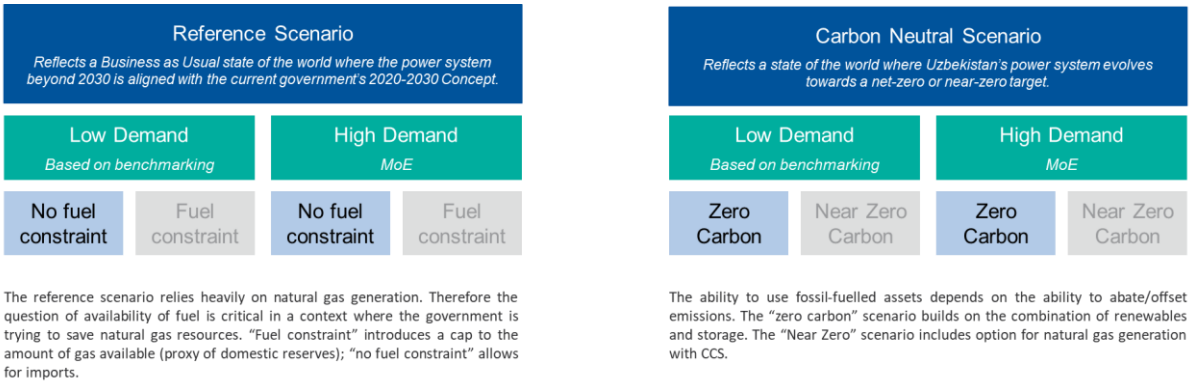
2020 and 2030. Starting in 2030, the technology candidates have been expanded to give the model the freedom to select the cheapest technology, considering additional constraints, such as emissions and/or limited fuel usage. A separate section in the Roadmap is dedicated to the peak power demand forecast.

Figure 3 - Two electricity demand profiles considered for the study



To arrive at the recommended Roadmap scenario, a "scenario-case matrix" was developed, where each case is a combination of a demand profile and a fuel policy to which another dimension with the gradual exclusion of carbon technologies has been added. Unserved energy demand is treated as an opportunity cost, representing the negative economic impact on businesses and the population not supplied with electricity needed. **The study considered 13 cases in total** and with detailed simulations for five of them (see figure 4 below **Error! Reference source not found.**). The initial increase of the LCOE to 2025 is substantial in all cases and is due to the modernisation or replacement of power plants i.e. investment in new gas power plants.

Figure 4 - Choice of scenarios developed for the study



The model makes decisions in the order of power dispatch, based on a short run marginal cost (SRMC), with simulations showing the predicted dispatch profile on a typical winter day in 2050 to be feasible. Given their maturity and market penetration, only battery storage and CCS are considered in the simulation model. Hydrogen is best suited for seasonal

storage and, although considered in the analysis, was not included in the final modelled scenarios as the modelled power system did not present a seasonable coverage gap.

Different cases have been assessed against five key principles: i) Energy Security, ii) Adequacy, iii) Affordability, iv) Economic and Social Development and v) Minimum Environmental Impact using several key performance indicators (KPI). **The "Roadmap Case" is set as the central scenario with a low/moderate demand that outperforms the other cases across all KPIs..** The "Roadmap Case" achieves a 100 % reduction in CO_2 emissions with limited impact on levelised cost of electricity (LCOE), low investment needs, and with no unserved energy.

In terms of limitations, **the study did not include geographical modelling of the grid**, which might not account for impact of regional distances between supply and demand, as well as the possible impact of regional interconnection with neighbouring exporting and/or importing countries. This level of detail is to be further incorporated in the follow-up development of the Roadmap.

Technical Roadmap: Carbon neutral electricity sector in Uzbekistan is achievable by 2050 with a prominent role of renewable energy and natural gas in the next 20 years

Uzbekistan has abundant renewable resources that are sufficient to satisfy the country's energy needs by 2050. There are, however, several technological, operational and physical constraints to introducing large capacities of renewables into the present power system of Uzbekistan.

To accommodate the increasing uptake of renewable energy, the **Roadmap proposes a phased build-up of new electricity generation assets up to 2050**.The technical roadmap evolves in **three stages over time, from a modernization of gas power plants (fuel saving stage), over a transition to low carbon (balancing stage), and finally towards a net zero carbon stage (see** Figure 5**)**.

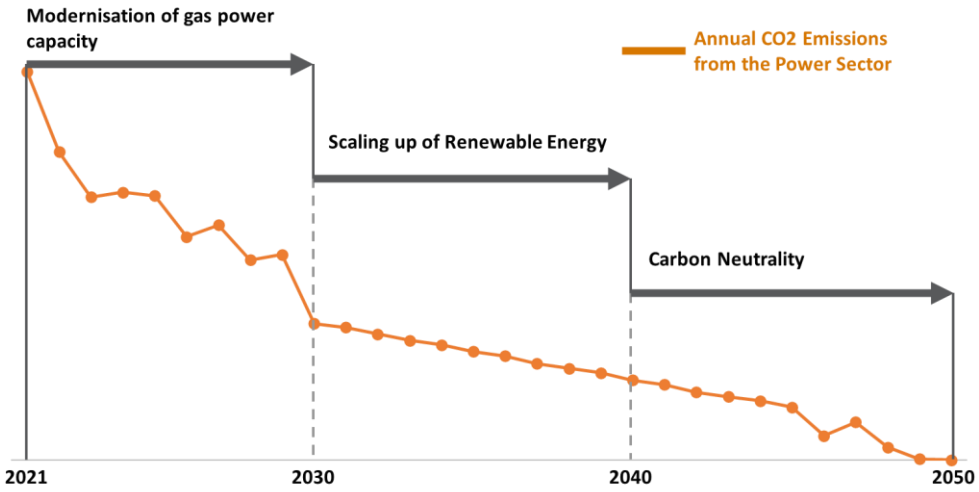


Figure 5: Development of CO_2 emissions in three stages of the roadmap from 2021 to 2050

1. **Modernisation of gas power stage (2020 – 2030)**. This stage is characterised by the introduction of variable (solar and wind) resources in the system and the increased use of

the country's hydropower potential. This renewable energy will reduce the use of gas and coal with 54 billion m^3 saved in the period 2020–2030. The integration can still be managed through the flexibility offered by the gas power stations, but some larger storage facilities, such as pumped storage hydro (200 MW), may be necessary by the end of the decade. In parallel, inefficient conventional gas power plants are replaced by more efficient gas power stations, meeting the demand growth. The construction of new gas power stations can be largely completed by the middle of the decade. This is an important modernisation step that complements the early growth of supply from renewable power plants, as by replacing older and less efficient assets it helps saving significant amounts of GHG emissions (i.e. early peaking) while the sector transitions towards carbon neutrality. If high efficiency gas assets are not introduced in the next few years, the power sector would likely achieve carbon neutrality later in time with an overall higher total emission of carbon.

2. **Transition to low carbon stage (late 2020s – 2040s)**. The installed total variable capacity of 22 GW[5] necessitates the installation of a larger electrical storage capacity, while keeping the modern gas power plants. Since these gas power plants will increasingly be used only as balancing plants, they will become less efficient. No new gas power plants are built after 2030. Acceleration of the introduction of renewable sources is accompanied by the installation of larger electric storage (15 GW providing 1.3 TWh[6]) to help balance the system.
3. **Net zero carbon stage (2040s – 2050)**. In order to achieve zero carbon emissions, the system requires significant wind and solar capacity[7], as well as a considerable electrical storage (39 GW providing over 44 TWh[8]) that will dispense large amounts of stored electricity during periods of low wind and solar availability. By 2050 all gas power plants are retired (with a few kept in reserve) at the end of (or close to) their technological lifetime, alternatively some gas-fired power plants can be repurposed for decarbonized fuels like hydrogen. The system is operated on solar, wind, nuclear and hydro power plants, as well as decarbonized fuels. The modelling did not get into the details of the preferred storage solutions. This is because as the market and technologies develop, storage solutions could take the form of batteries (e.g.: co-located with power generation plants, within the transmission infrastructure or close/at the points of consumption), other static systems or energy carriers such as hydrogen.

The chart below illustrates the evolution of the installed capacity and generation of the electricity system of Uzbekistan until 2050:

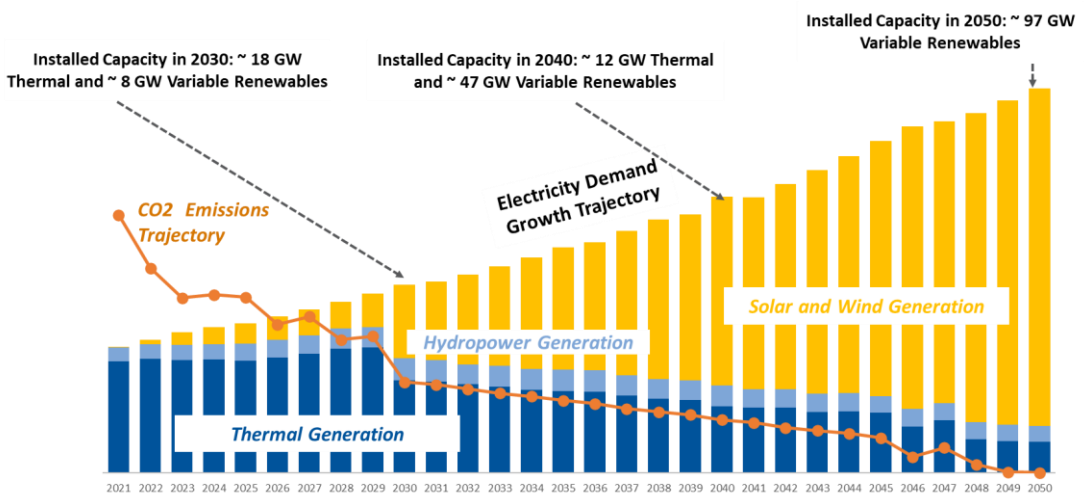
5 Value for ModDem cases. For HighDem cases: 50 GW

6 Value for ModDem cases. For HighDem cases: 35GW/38,000GWh

7 Value for ModDem cases. For HighDem cases: 150 GW and 63 GW respectively

8 Value for ModDem cases. For HighDem cases: 45GW and 128,000GWh

Figure 6 - Evolution of electricity generation Mix and CO2 emissions under carbon neutral scenario



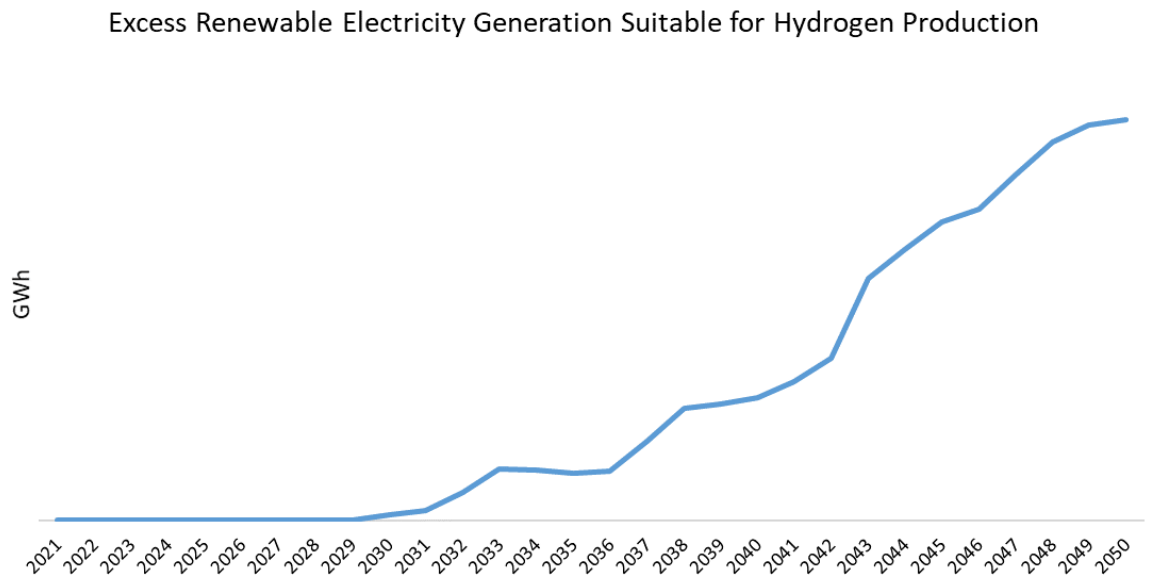
Notes: the thermal generation capacity includes nuclear power as described in the Ministry of Energy's 2020-2030 Concept.

A similar phased build-up is proposed for the generation and transportation infrastructure. The Roadmap recommends that from 2030 the construction of new gas power plants should cease, and the system increasingly relies on solar and wind generation to satisfy demand. This will necessitate a significant increase in the carrying capacity of the transmission and distribution systems and will require the building of roads and bridges to access remote sites where renewable energy can be harnessed.

The EBRD adds

High efficiency thermal power plants fuelled by natural gas provide an important role in the initial stages of the Roadmap, as they enable meeting a growing electricity demand while reducing carbon emissions until renewable energy sources eventually takes over. In this sense, it is crucial to minimise the overall carbon footprint of the natural gas supply chain, in particular by improving its energy efficiency and abating **methane emissions**.

One of the side benefits of the gradual deployment of renewable energy capacity is the generation of renewable electricity in excess of the demand during certain seasonal conditions. This electricity is a resource at no marginal cost that can be stored and used to generate **renewable hydrogen** as a by-product of the electricity sector deep decarbonisation. This renewable hydrogen can further support the development of the hydrogen economy in Uzbekistan leading to further energy sector coupling in the country and the broader region. In this regard, new gas infrastructure developments shall be future proven for a possible mid/long-term future operation on decarbonised gases, including hydrogen.

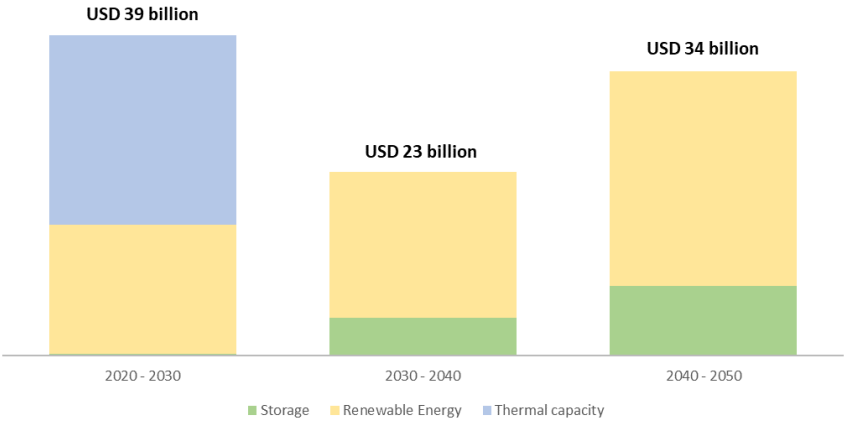


Investment Roadmap: The net zero-carbon case for the electricity sector requires least amount of investment among the studied scenarios

The Roadmap quantifies the capital investment needs in generation at some USD 94 billion to 2050. Ideally, these investments should be realised under public-private partnerships (PPP) and power purchasing agreement (PPA) arrangements to allow the Government of Uzbekistan's resources to be targeted at improving and extending transmission and distribution infrastructure. **The investments needed under the zero-carbon scenario are less than those under other scenarios considered in the simulation runs**.

On an annual basis, the forecasted investments in the energy sector average USD 3.65 billion/y for the period 2020–2030, or 4.8% of the annual GDP for that decade, as the thermal electricity generation fleet undergoes a major modernisation. For the period of 2030–2040, the investments on average amount to USD 2.28 billion per year, constituting 1.8% of the annual GDP for that period. With the wider introduction of renewables and storage to reach carbon neutrality by 2050, the average investment requirements rise to USD 3.48 billion/y for the period 2040–2050, but its share of GDP stands low at 1.9% due to the growing GDP of the country.

Figure 7 - Share of total investment by technology



Policy Roadmap: Leveraging the ongoing ambitious policy reform agenda

The present legislation and regulation need to phased out implicit preferences for carbon-intensive electricity production and institutionalise incentives for low-carbon generation. The long-term objective should be to introduce long-term targets for the periods after 2030, the introduction of carbon pricing to create a level playing field, and legal, regulatory and institutional reforms to promote investment and operational progress towards the above decarbonisation targets.

Under the Roadmap case, there is a risk that carbon intensive investments, in particular in coal, may become stranded assets after 2030. In order to avoid resistance to decarbonisation from vested interests in carbon intensive sources, Uzbekistan should avoid creating new regulatory and economic incentives for investors in polluting technologies.

For existing investments, steps need to be taken to phase out the present regulatory preferences, include reforming fossil fuel subsidies, possibly introducing carbon emission performance standards, and the mandatory closure of the most obsolete installations. These regulatory measures are needed to facilitate the decommissioning of carbon-intensive plants.

In the absence of a level playing field between electricity production from renewable energy and fossil fuels, renewable energy investments continue to depend on public support. To institutionalise the support for renewable energy, **the amendment of Renewable Energy Law is needed to facilitate the integration of renewable energy sources through planning.** It should also recognise priority access to the network of electricity produced from renewable energy sources and protect investors against retroactive changes of support schemes. The Renewable Energy Law should introduce guarantees on the financial sustainability of the support scheme and create a level playing field for market players to invest in and operate storage installations.

Decarbonisation should be included in the legal and regulatory architecture governing the electricity market reform. This includes a sufficiently high, stable, and predictable carbon price to drive investments in the decarbonisation of electricity supply. The Government should provide regulatory guidance on the treatment of the capital expenditures in emission reduction measures eligible for recovery through the regulated electricity prices.

In order to improve the predictability and stability of investment conditions for decarbonisation and reinforce the integrity of the electricity market reform, **institutional reform should take place based on the principles of efficiency, transparency and expertise**. The Roadmap suggests distribution of regulatory powers over different authorities, following these principles:

(i) transferring regulatory powers in the electricity sector to an independent Electricity Market Regulator (EMR),

(ii) avoiding overlap of regulatory functions and ensuring consistency between electricity market regulation and decarbonisation, and

(iii) taking decarbonisation objective into account in the development of investment programs by the Ministry of Energy.

Providing support to the most vulnerable segment of the population and transparency on the use of carbon revenues in the case of the implementation of a carbon price are prerequisites to securing public acceptability of ambitious decarbonisation measures. In this respect, the Ministry of Economic Development and Poverty Reduction has an important role to play in the provision of financial support to vulnerable consumers.

Conclusion: Uzbekistan's transition to a carbon neutral electricity sector is within reach

It is possible for Uzbekistan to achieve a zero-carbon power system as early as 2050 from both technical and economic perspectives. The estimated investment needs amount to less than 2% of annual GDP for the period between 2030–2050. The expected benefits in terms of new manufacturing value chains and lowered environmental footprint far outweigh the financial cost involved. In addition, the Roadmap will allow Uzbekistan to preserve domestic gas reserves, as well as potentially use excess renewable energy generation to support the development of the hydrogen economy. The government already plans to end all gas exports by 2025, as it believes it can capture more economic value, create jobs and attract investments by converting gas to higher value products.

The proposed transformation will necessitate significant technical and regulatory reforms, which must be backed by strong political support. The Roadmap offers the government a basis to formulate an ambitious, comprehensive, and long-term strategy to decarbonise the country's electricity sector and garner public support against those resisting to change.

Project Background

Funded by the Government of Japan, the European Bank for Reconstruction and Development (EBRD) commissioned a technical assignment to support the development of a policy and technology roadmap ("the Roadmap") that summarises the policy and technology actions needed to secure a low-carbon future for the electricity sector in Uzbekistan. The project demonstrated that it is both economically and technically feasible for Uzbekistan to fully decarbonise its electricity sector by 2050.The Roadmap presented outlines a pathway to achieve this goal. It is developed, based on a full carbon neutral scenario, using the fuel constraints provided by the GoU, combined with a more moderate energy demand than previously estimated by the GoU.

Throughout the project, there has been frequent consultations with experts and stakeholders in the energy sector, including meetings in Tashkent in January 2020 between the Consortium, EBRD and the key stakeholders in Uzbekistan. The document analyses the current status of the country's electricity sector, followed by modelling to underpin the proposal for achieving zero carbon emissions by 2050. The modelling takes into consideration the energy sector strategy formulated by the GoU up to 2030 and the fuel constraints embedded in that directive.

The Roadmap outlines the physical and operational constraints facing the power system, as well as gaps in the legal and regulatory framework to facilitate large, scaled investments in renewable generation in the sector. For the transformation to be successful, relevant stakeholders need to recognise, prioritise, and adopt the requirements identified in the Roadmap. In this respect, the Action Plan accompanying the Roadmap elaborates a set of prioritised actions.

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