

GEF-8 PROJECT IDENTIFICATION FORM (PIF)

TABLE OF CONTENTS

GENERAL PROJECT INFORMATION	3
Project Summary	4
Indicative Project Overview	4
PROJECT COMPONENTS	4
PROJECT OUTLINE	7
A. PROJECT RATIONALE.....	7
B. PROJECT DESCRIPTION.....	22
Project description.....	22
Coordination and Cooperation with Ongoing Initiatives and Project.....	34
Core Indicators.....	34
Key Risks	36
C. ALIGNMENT WITH GEF-8 PROGRAMMING STRATEGIES AND COUNTRY/REGIONAL PRIORITIES	38
D. POLICY REQUIREMENTS.....	40
Gender Equality and Women’s Empowerment:	40
Stakeholder Engagement	40
Private Sector.....	42
Environmental and Social Safeguard (ESS) Risks	43
E. OTHER REQUIREMENTS.....	43
Knowledge management.....	43
ANNEX A: FINANCING TABLES	43
GEF Financing Table	43
Project Preparation Grant (PPG)	43
Sources of Funds for Country Star Allocation	44
Indicative Focal Area Elements	44
Indicative Co-financing	44
ANNEX B: ENDORSEMENTS	45
GEF Agency(ies) Certification	45
Record of Endorsement of GEF Operational Focal Point (s) on Behalf of the Government(s):.....	45
ANNEX C: PROJECT LOCATION	45
ANNEX D: ENVIRONMENTAL AND SOCIAL SAFEGUARDS SCREEN AND RATING	46
ANNEX E: RIO MARKERS.....	47
ANNEX F: TAXONOMY WORKSHEET	47

General Project Information

Project Title	
Demand-driven digital smart grids	
Region	GEF Project ID
Europe and Central Asia	12100
Country(ies)	Type of Project
Kazakhstan	MSP
GEF Agency(ies):	GEF Agency ID
UNDP	10318
Executing Partner	Executing Partner Type
Ministry of Energy - The Committee of energy supervision and control of the Republic of Kazakhstan	Government
GEF Focal Area (s)	Submission Date
Climate Change	10/9/2025
Project Sector (CCM Only)	
Mixed & Others	
Taxonomy	
Focal Areas, Climate Change, Climate Change Mitigation, Technology Transfer, Energy Efficiency, Renewable Energy, Influencing models, Transform policy and regulatory environments, Demonstrate innovative approach, Stakeholders, Beneficiaries, Private Sector, Capital providers, Large corporations, Civil Society, Academia, Type of Engagement, Participation, Partnership, Capacity, Knowledge and Research, Innovation, Capacity Development, Learning, Knowledge Exchange, Knowledge Generation, Gender Equality, Gender results areas, Access to benefits and services, Participation and leadership, Gender Mainstreaming, Gender-sensitive indicators	
Type of Trust Fund	Project Duration (Months)
GET	48
GEF Project Grant: (a)	GEF Project Non-Grant: (b)
2,185,100.00	0.00
Agency Fee(s) Grant: (c)	Agency Fee(s) Non-Grant (d)
207,584.00	0.00
Total GEF Financing: (a+b+c+d)	Total Co-financing
2,392,684.00	18,020,000.00
PPG Amount: (e)	PPG Agency Fee(s): (f)
100,000.00	9,500.00

PPG total amount: (e+f)

109,500.00

Total GEF Resources: (a+b+c+d+e+f)

2,502,184.00

Project Tags

CBIT: No NGI: No SGP: No Innovation: No Competitive Window: No

Project Summary

Provide a brief summary description of the project, including: (i) what is the problem and issues to be addressed? (ii) what are the project objectives, and if the project is intended to be transformative, how will this be achieved? (iii), how will this be achieved (approach to deliver on objectives), and (iv) what are the GEBs and/or adaptation benefits, and other key expected results. The purpose of the summary is to provide a short, coherent summary for readers. The explanation and justification of the project should be in section B “project description”. (max. 250 words, approximately 1/2 page)

The project will support the Government of Kazakhstan in improving the efficiency and resilience of the national electricity system through the introduction of smart-grid technology with customer-driven demand-side management (DSM). Households and enterprises will gain improved access to distributed renewable energy and storage systems. This project will reduce dependence on fossil fuel-based generation, while enhancing grid reliability, load balancing, and service stability during peak demand. The scalability potential of smart grids will enable modular development, lower risks, and attract private sector investment into the sector. At the national level, optimized resource utilization will reduce energy costs and lower the energy and carbon intensity of the economy.

The project will provide technical assistance to address regulatory, informational, financial, capacity and technological barriers. Policy support will enable conducive regulations and DSM business models through regional utilities acting as demand aggregators. It will build sector capacity to generate customer demand profiles and advance digitalization of grid operations, thereby enabling evidence-based DSM strategies, investment planning, and operational optimization. A financial mechanism will be established to secure revenues from energy savings while de-risking investment in DSM assets. In addition, the project will promote national smart-grid standards, accelerate grid digitalization, and strengthen technical capacities through collaboration with domestic institutions and international experts. DSM smart-grids will integrate renewables, storage, grid upgrades, and efficiency measures, contributing to 87,750 tCO₂eq (direct and indirect) reductions over 10 years, while benefitting around 20,000 people directly (52% women, 48% men) and 1,000,000 people indirectly.

Indicative Project Overview

Project Objective

To accelerate the decarbonization and efficiency of Kazakhstan’s Unified Energy System by demonstrating digital smart grids for customer-driven electricity demand management with the integration of distributed low-emission energy systems.

Project Components

1. Policy and regulation

Component Type

Technical Assistance

Trust Fund

GET

GEF Project Financing (\$)	Co-financing (\$)
426,048.00	500,000.00

Outcome:

1.1 The policy and regulatory framework for enabling demand-driven smart grids in Kazakhstan's electricity network has been strengthened.

Output:

1.1.1 Gap analysis of sector legislation and regulation, including financial and regulatory barriers affecting cost-recovery and investment in transmission and distribution (T&D) infrastructure conducted.

1.1.2 Regulatory amendments, including new concepts, standards, and procedures for demand aggregators developed and proposed for adoption.

1.1.3 Measurement, reporting and verification (MRV) protocols for energy savings and GHG emission reductions by smart-grid DSM aggregators developed.

1.1.4 Roadmap and timeline for development and adoption of regulatory amendments, financial incentives and alternative instruments prepared and presented to incumbent authorities.

2. Technology and information

Component Type	Trust Fund
Technical Assistance	GET
GEF Project Financing (\$)	Co-financing (\$)
455,000.00	950,000.00

Outcome:

2.1 Technology and information gaps have been closed to enable the deployment of demand-driven, electric smart-grids supported by digital technologies.

Output:

2.1.1 Electricity demand profiles for selected customer groups, including assessment of demand flexibility created and verified.

2.1.2 Updated gap analysis concerning smart grid technology and electricity sector digitalization conducted.

2.1.3 Development of a national technical standard for smart-grid components and protocols, adapted to country conditions.

2.1.4 Targeted training and capacity building on smart-grid technology for utility staff, sector experts, and other stakeholders organized and implemented.

2.1.5 A roadmap for digital, demand-driven smart-grid implementation in one selected region designed.

3. Business model development and demonstration

Component Type	Trust Fund
Technical Assistance	GET
GEF Project Financing (\$)	Co-financing (\$)
300,000.00	500,000.00

Outcome:

3.1 Business model options for demand-driven, digitalized smart-grids have been developed and evaluated.

Output:

3.1.1 Financial mechanisms and incentives enabling smart-grid DSM business models developed.

3.1.2 Identification of three (3) clusters of electricity consumers, to be managed by DSM smart-grid aggregators in combination with distributed RE and BESS systems completed.

3.1.3 Basic business plan for DSM smart-grids, including ownership, organisational, technical, financial, and commercial details developed and validated.

3. Business model development and demonstration

Component Type	Trust Fund
Investment	GET
GEF Project Financing (\$)	Co-financing (\$)
800,000.00	14,500,000.00

Outcome:

3.2 A proof of concept for smart-grid business model has been tested in collaboration with consumers and the regional electricity company.

Output:

3.2.1 Functional and technical specifications of smart-grid components including digital automated metering, control, and communication systems prepared.

3.2.2 Procurement of smart-grid components and services for field trials and parameter verification in alignment with established technical standards.

3.2.3 Implementation and testing of the DSM smart-grid business model in a virtual simulation environment for performance evaluation, sensitivity analysis, and learning purposes completed.

3.2.4 Assessment of DSM smart-grid business case for field implementation, including assessment of legal and financial risks completed.

3.2.5. DSM smart-grid business model implemented by a regional electricity company (aggregator).

M&E

Component Type	Trust Fund
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Technical Assistance	GET
GEF Project Financing (\$)	Co-financing (\$)
100,000.00	150,000.00

Outcome:

4.1 KM and M&E activities have been prepared and implemented.

Output:

4.1.1 Knowledge building, monitoring, sharing of experience, and promotion among stakeholder groups, including through a gender lens, are facilitated.

4.1.2 Project Mid-Term Review and Terminal Evaluation Implementation and annual PIR reporting completed in a timely manner.

Component Balances

Project Components	GEF Project Financing (\$)	Co-financing (\$)
1. Policy and regulation	426,048.00	500,000.00
2. Technology and information	455,000.00	950,000.00
3. Business model development and demonstration	300,000.00	500,000.00
3. Business model development and demonstration	800,000.00	14,500,000.00
M&E	100,000.00	150,000.00
Subtotal	2,081,048.00	16,600,000.00
Project Management Cost	104,052.00	1,420,000.00
Total Project Cost (\$)	2,185,100.00	18,020,000.00

Please provide justification

PROJECT OUTLINE

A. PROJECT RATIONALE

Briefly describe the current situation: the global environmental problems and/or climate vulnerabilities that the project will address, the key elements of the system, and underlying drivers of environmental change in the project context, such as

population growth, economic development, climate change, sociocultural and political factors, including conflicts, or technological changes. Describe the objective of the project, and the justification for it. (Approximately 3-5 pages) see guidance here

Country context and background

With a territory of 2.7 million km², Kazakhstan ranks 9th globally in terms of land area and is the largest landlocked country. More than 90% is flat, with arid natural zones (desert, semi-desert, and dry steppe) covering most of the territory, except in the northern part which is more humid. The climate is distinctly continental.^{[1]¹} As of 2024, the population counted 20.6 million people, Gross Domestic Product (GDP) was US\$288 billion and per capita GDP 13,991.^{[2]²} Annual GDP growth in 2023 was 5.1%.^{[3]³} With a Human Development Index (HDI) of 0.837, Kazakhstan ranks 60th globally as a country with very high human development.^{[4]⁴}

The economic reforms adopted in the 1990s elevated Kazakhstan to the ranks of upper middle-income countries. Between 2000 and 2013 Kazakhstan experienced economic growth levels around 8% annually, which assisted in increasing living standards and reducing poverty. Over the last decade, growth rates have slowed down due to structural challenges including the reliance on export commodities such as oil and gas, low economic complexity and stagnant productivity. In 2024, oil and gas represented over 62% of total export and 16% of GDP which makes the economy very sensitive to oil market fluctuations.^{[5]⁵}

The combination of depreciated production assets, abundant domestic energy supplies, and high real income increase, does not incentivize investment in innovation and productivity, which explains the loss of economic diversity and complexity, high inflation rates, and a focus on consumer credit at the expense of business lending.^{[6]⁶}

As a result, the national currency tenge (KZT) depreciated by 250% in the period 2014-2023^{[7]⁷} which particularly affected vulnerable population groups. Similarly, the lack of investment brings along environmental externalities including high per capita greenhouse gas (GHG) emissions and health issues due to particulate matter pollution (PM2.5 and PM10), primarily due to coal use for residential heating. The PM2.5 levels exceed World Meteorological Organisation standards by 2-5 times. Air pollution reportedly causes over 10,000 premature deaths and costs the economy over US\$ 10.5 billion annually.^{[8]⁸} According to the World Bank, investment in infrastructure and human capital is critical to boost productivity and advance the decarbonization of the economy.^{[9]⁹}

Policy context

On 30 July 2024, the President signed the decree approving the National Development Plan (NDP) for Kazakhstan until 2029. The approaches outlined in the Plan aim to accelerate the transition processes for

achieving the sustainable development goals (SDGs) by 2030. The NDP includes the following priorities: (1) high quality of life, including healthcare, education and science, and social protection; (2) a strong economic foundation, concerning the mineral resources base, and manufacturing; (3) new growth points, including transport and logistics, the agro-industrial complex, innovation and the digital economy; and (4) cross-cutting economic and social transformations, including the creation of a more dynamic entrepreneurial environment, enhancing environmental sustainability, rule of law and effective public finance and administration.

By 2029, the NDP aims to achieve several targets: (1) GDP to reach US\$450 billion (compared to US\$264 billion in 2023); (2) GDP per capita of US\$21,055 (US\$13,277 in 2023); (3) real economic growth rate of 6.7% year-on-year (5.1% in 2023); and life expectancy of 77 years (75.09 years in 2023). By 2029, renewable energy (RE) sources shall account for 12.5% of total energy production and measures shall be taken to develop circular economy principles including more efficient use of resources.^{[10]¹⁰}

On 2 February 2023, the President issued Decree No. 121 concerning the approval of the Strategy on Achieving Carbon Neutrality by 2020.^{[11]¹¹} The Strategy acknowledges that Kazakhstan signed the Paris Agreement on 2 August 2016 (ratified on 6 December 2016) and its commitments in the first NDC (15% unconditional and 25% conditional GHG emission reductions relative to 1990 levels). Kazakhstan submitted its updated NDC on 27 July 2023.^{[12]¹²}

The institutional framework for reducing GHG emissions as stated in the NDC is laid down in the Environmental Code of the Republic of Kazakhstan.^{[13]¹³} Since 2019, the Ministry of Ecology and Natural Resources (MENR) is responsible for developing and coordinating climate change policy, as well as for the implementation of international climate change treaties. The Environmental Code also establishes the market mechanism for trading carbon units, which covers almost half of the total national emissions. For the carbon budgeting period 2021-2025, the carbon budget for 2021 is at least 1.5 percent lower than the carbon balance of 1990, and in subsequent years it is reduced by at least 1.5 percent annually from the level of the carbon budget of the previous year.^{[14]¹⁴} Article 113 of the Code creates a basis for the introduction of best available technologies (BAT) aimed at reducing the negative impact on the environment and contributing to the transition towards a green economy and low-carbon development.

In the NDC 3.0, which is under development, Kazakhstan aspires further increasing its current NDC targets towards 2035, aiming at a 50% share of RE and alternative energy sources for electricity generation, which aligns with Kazakhstan's broader strategy for green economic growth and its commitment to achieving carbon neutrality by 2060. Measures to achieve these ambitious goals are underpinned by substantial policy and structural changes. Since 2018, Kazakhstan has introduced an auction-based system for RE projects, replacing the earlier fixed feed-in tariff model. The auctions have boosted investment in RE generation and led to significant cost reductions. They underscore Kazakhstan's resolve to create a competitive and sustainable energy market while promoting the adoption of clean energy technologies.

However, the integration of variable RE sources such as solar and wind, brings challenges to the grid system. The NDC emphasizes the transformative role that smart grid technologies will play in addressing these challenges. Smart grids involve an extensive digitalization of the electricity distribution network, which is supportive for incorporating additional RE sources and is critical for ensuring grid stability and

reliability. Smart grids enable adaptive dispatching, thereby enhancing the operational flexibility and efficiency of the grid. This modernization allows for real-time management of distributed RE resources and battery storage systems. The use of virtual simulations (“digital twins”) based on a characterization and digital modelling of specific grid sections, allows gaining a detailed understanding of a grid’s operational behaviour and constraints, before moving on to investment in physical upgrades.

The NDC also highlights the need for a comprehensive policy framework to support smart grid implementation. This includes standardization of technologies, fostering partnerships between local and international stakeholders, and building technical capacities. The scalability of smart grid systems presents opportunities to expand RE projects while controlling financial and technical risks within agreed limits, thereby attracting private capital to the energy sector.

Decree No. 479 (2020) approves the Action Plan for the Implementation of the Concept for the Transition of the Republic of Kazakhstan to a Green Economy for 2021 – 2030. Relevant interventions include: (1) energy saving and EE measures in housing, communal services, and heating system; (2) ensuring monitoring of energy consumption by large enterprises; (3) modernization of street lighting using energy-saving technologies; and (4) a roadmap for energy conservation and energy efficiency (EE) for 2022-2026.

Electricity sector infrastructure

As of 1 January 2024, Kazakhstan’s installed electricity generating capacity amounted to 24.6 GW, of which 19.2 GW (79%) are thermal power plants (coal 13.1 GW, gas 6.1 GW). Out of a total of 64 thermal power plants, 37 are combined heat-and-power (CHP), which play a key role in Kazakhstan’s energy infrastructure as these deliver heat energy to residential and industrial consumers during the long and cold winter period. Large coal mines have been operating for many decades in the Pavlodar and Karaganda regions.^{[15]¹⁵} The share of gas in electricity generation has gradually increased as a result of the growing gas and oil industry in the west of Kazakhstan. In the period 2014-2024, 3.6 GW has been added to the grid system, of which 67% (2.4 GW) were RE technologies (wind, solar, and hydropower). In 2014, supportive legislation for RE sources was enacted. A total of 130 projects were connected, of which 46 are based on wind, 44 solar PV, 37 small hydro (up to 35 MW), and 3 biogas solutions.^{[16]¹⁶} More RE capacity is planned to be added over the next years under auctions, backed by intergovernmental mechanisms to warrant the agreed tariff. The national electricity system lacks flexibility, however, to absorb high levels of intermittent power sources (i.e. wind and solar). In response, Kazakhstan held auctions for commissioning of gas-fired power plants (1.7 GW) in 2022.

Kazakhstan’s electricity system is divided into three zones: (1) Northern and (2) Southern Energy zones, interconnected by three 500 kV transmission lines; and (3) the Western Energy zone, which operates independently. Plans for interconnecting the Western and Northern zone are being studied. The Northern zone concentrates 70% of Kazakhstan’s generating capacity. Large coal deposits are found in this region, as well as the metallurgical industries and other large industrial consumers. The Southern energy zone is less developed, but it is in this area where nowadays the larger share of Kazakhstan’s population is found. The installed capacity in the South is only 4.5 GW compared to 16.4 GW in the North. The energy mix in the South is diverse but insufficient to meet demand, the deficit (11,500 GWh/year) being supplied from the Northern zone. Investment in the South is hampered by severe price competition from cheap coal in the North, leading to significant under-utilization of available gas-fired plants in the South, including the large Zhambyl power plant, while the transmission lines connecting both regions are regularly overloaded.

The national system operator is KEGOC, which operates the main electricity network. KEGOC provides the service for the use of the national grid for connected power producers and wholesale consumers. Total electricity production in 2022 was 112,000 GWh, composed as follows: coal 68%; gas 20%; hydropower 8.1%; wind 2.1%; and solar 1.6%. Since 2014, energy production has increased by 20% (18,900 GWh). The industrial sector accounts for over 57.9% of total electricity consumption in Kazakhstan, compared to 22.3% for housing and communal services. The Aksu Ferroalloy Plant is the largest single industrial electricity consumer in Kazakhstan (4.6% of total consumption).^{[17]¹⁷} Electric energy is distributed through 17 regional electricity companies (REC) serving retail consumers. Since 1st of January 2025, all ESO have been eliminated and only RECs have licenses to supply the consumers. The transmission volumes in 2024 were 61,900 GWh through the KEGOC network, while electricity losses amounted to 7,500 GWh (8%). The long distances in the country are one factor leading to above-industry standard loss levels.^{[18]¹⁸}

While network losses in the KEGOC grid are of the order of 5%, those in the regional grids are at least twice as high on average (10.9%, equivalent to 4,700 GWh, in 2022). The high losses are symptomatic for the generalized under-investment in fixed assets in the sector. Depreciation levels (“wear and tear”) in the REC networks are above 65% on average. The upgrades of thermal power plants are focused on the turbines while boilers and ancillary structures are not paid due attention to. The impact of under-investment is even more dramatic in the heating networks, with a total length of more than 12,000 km. Energy losses reach 30% as a result of low-efficiency heat sources and wear and tear levels above 60% on average (and 77% for privately-owned networks). A high share of this wear and tear is attributed to auxiliary equipment. Both for electricity and heat, the situation leads to a substantial reduction of technically available capacity and unplanned maintenance and repair, which adversely impacts on overall system balancing and operation. The under-investment is partly due to the methodologies applied for calculating the capacity tariff (for CHP) and the cost-based tariff policies used by the REC, which impede the accumulation of sufficient financial reserves for reinvestment in sector assets.^{[19]¹⁹}

Electricity sector governance and legislation

The electric power industry is governed by the Laws of the Republic of Kazakhstan (1) “On the Electric Power Industry”, (2) “On Natural Monopolies”, and (3) “On Support of Renewable Energy Sources”. The Ministry of Energy is charged with the implementation of state policy in the electric power industry. It is responsible for setting the power price caps for electric power, the price caps for balancing, and the price caps for capacity. In addition, it sets individual capacity tariffs for existing and newly commissioned power plants.

The Committee for the Regulation of Natural Monopolies (CREM) of the Ministry of National Economy sets tariffs for the services of natural monopolies: (i) transmission and/or distribution of electricity; (ii) production, transmission, distribution and/or supply of heat energy; (iii) technical dispatching to the network and consumption of electrical energy; and (iv) power production and consumption balancing.

Several instruments are in place to create an enabling environment for Renewable Energy Sources (RES): (1) a designated single electricity purchaser for the electricity market, the Settlement and Financial Center for Support of RES, LLC; (2) a model form of renewable power purchase contract; (3) terms of prioritized investment contract specified for RES; (4) tariffs set through RES auctions; and (5) prioritized dispatching of RES and unimpeded access to the national grid of the Republic of Kazakhstan.

Electricity market model

Until 1st July 2023, the wholesale market in Kazakhstan consisted of the following segments: (1) a centralized market operated through a trading floor for long-and medium-term contracts and day-ahead spot trading; (2) a decentralized market based on bilateral contracts between participants; (3) a balancing market; (4) a market for system and ancillary services; and (5) an electricity capacity market. Pricing on the centralized market was determined by exchange methods (bilateral auctions and continuous counter trading).

The balancing market has operated in simulation mode since 2008, implying that market participants were not made individually accountable for deviations from the approved daily schedule. Total deviations were settled by KEGOC under agreements with Russia and the costs were averaged among all market participants. Importantly, 97% of all electricity was not traded at the centralized market but under bilateral contracts with parties determining independently the terms, only limited by the cap tariffs set by the authorization body. The inherent shortcomings of this market model were: (1) lack of transparency of the bilateral contracts; (2) inability of customer groups to access the cheaper electricity producers; and (3) lack of an incentive for participants to adhere to agreed daily supply and demand schedules, thereby aggravating system imbalances and inefficiencies with resulting increased needs for energy imports from Russia.

Over time, the imbalance volume in Kazakhstan grew to 1,500 MW. Moreover, amid the shortage of flexible power to meet fluctuating demand, power plants were utilized to their maximum capacity, affecting scheduled maintenance and duration of repairs, which consequently led to power plant failure rates of 17-20%, reaching 3,500 MW in 2023. Under this model, the costs of balancing and energy imports were not fully recovered by KEGOC.^{[20]²⁰} Therefore, on 19 April, 2023, the Head of State signed the amendment to the Law “On Electric Power Industry”, introducing the Single Electricity Purchaser (SEP) figure and the operation of the balancing electricity market in real-time mode, to become effective 1st July 2023. Under the new market model, the Financial Settlement Centre for Support of Renewable Energy Sources LLP was assigned to the SEP, and KOREM JSC was established as the Balancing Market Settlement Centre envisioned under the Law amendment.

Under the new market model, a combined national consumption schedule is created (demand), which the SEP tries to meet through the purchase of electricity from various sources according to a pre-established set of criteria (supply). Electricity generation from CHP and RE is guaranteed, while other generators enter through centralized auctions to ensure transparency. If the country’s demand cannot be met by domestic sources, the SEP is authorized to import electricity from abroad. Any deviations from the schedule are classified as imbalances, the costs of which to be settled through the Balancing Electricity Market.

On average the SEP price for the second half of 2023 was KZT 13.69 (US\$0.025)^{[21]²¹} per kWh. The electricity volume purchased from RE sources under long-term contracts amounted 2,900 GWh (7%), at an average price of KZT 33.6 (US\$0.062) per kWh. CHP supplies were 14,300 GWh (36.9%) at an average price of KZT 13.76 per kWh. Energy purchased from other power plants under centralized auctions added to 19,946 GWh (51.5%), at an average price of KZT 8.5 (US\$0.016) per kWh. Finally, planned electricity imports were 1,778 GWh (4.6%), at a price of KZT 32.3 (US\$0.060) per kWh.^{[22]²²}

Future scenarios, baseline assessment and outcome requirements

Notwithstanding the recent electricity market reforms and the impressive increase of RE sources in the energy mix, future scenario 1 is characterized as follows: Kazakhstan's electricity sector is trapped in a vicious circle of under-investment, low efficiencies, and persistent power and electricity supply imbalances. Despite ambitious decarbonization targets, the availability of abundant domestic coal supplies and depreciated sector assets, translate into low energy costs which offer little incentive for investment. In the longer term, however, the transmission system will be incapable of handling increasing demand volumes; network imbalances and losses are already high and the integration of RE technologies becomes increasingly constrained by the lack of flexibility in the system.

The introduction of a commercial balancing model in Kazakhstan's electricity sector aims to achieve two key goals: creating financial incentives to reduce imbalances and improving conditions for the development of flexible capacities. However, current pricing appears insufficiently attractive to incentivize investment in flexible capacity, as the balancing price is capped by the maximum and minimum tariffs occurring in the energy market. Other unresolved issues under the new balancing market are the absence of intra-day adjustments, and the inability of customers to compensate their own deviations. Moreover, only 43% of market participants use Automated Commercial Energy Metering Systems (ACEMS, "smart meters"), in which case regional load profiles are applied and the unbalance cost is unfairly shared with other consumers. Electricity sector digitalization and metering are key drivers for establishing a real-time energy market in Kazakhstan. Despite visible progress in metering infrastructure and dispatch systems, the country remains at the early stage of digital evolution.

Future scenario 2 represents the accelerated adoption of the new electricity market model by addressing current barriers. Under this scenario, sector policies, regulation and market mechanisms are effectively implemented and enforced. This scenario requires increased awareness and commitment of sector agents to change the status quo that currently affects the national electricity grid system. The drivers behind such transformation include: (1) electricity market model and competition, including a gradual transition to more flexible tariffs, incentivizing the adoption of DSM by energy consumers; (2) decarbonization of power generation through increased utilization of RE sources; (3) electricity sector planning enabling cost-optimization and more efficient system operation; (4) mobilization of investment capital, including improved access to finance and concessional elements; and (5) technological innovation including digitalization.

The present ownership structures and bilateral contracts divide the electricity market into isolated niches, impeding equal access for all customers and leading to suboptimal allocation from a national perspective. Pushing forward the sector reform agenda to remove privileges and create a level playing field is therefore a key driver for change. While the addition of RE capacity already contributes to sector decarbonization, adequate system planning is critical to address the legacy grid infrastructure. Access to finance for investment in grid infrastructure is currently constrained for grid operators, leading to structural underinvestment and depreciated assets. Capital injections are therefore a major driver for modernization of the grid system.

An important feature of DSM is that it not only reduces power demand but also makes the electricity system more reliable, which is a technical priority for the regional grid operators to ensure electricity service delivery. Reliable power supply is also an enabler for business development and growth in a broader sense; as such, support for DSM from the Regulator and national business development organizations is very likely. Finally, technological innovations are an enabler for more advanced approaches to electricity system planning and grid operation, as well as the transformation towards a more decentralized grid system with increased roles for distributed, renewable power generation, demand management, and smart grid functionality.

This proposal aims to contribute to future scenario 2 by tapping into the potential of demand-side management (DSM) and digital smart grids. This will create room for grid operators to improve system parameters and attract investment for further upgrading of assets and grid management systems. The approach would be to select a grid node (conceptually, in the 35-kV or 110-kV network) and proceed as follows: (1) reduce peak loads through EE measures and DSM; (2) add local “capacity buffers” to the distribution network, by integrating distributed RE sources and battery energy storage systems (BESS); (3) promote energy conservation by connected end-users; and (4) invest in T&D capacity and digital (real-time and smart) grid management technology.

Scenario 2 will include an articulated financial mechanism that will both push and incentivize the transition to DSM. The financing mechanism for DSM aggregators, as well as regional grid operators, applies a coherent de-risking logic, as follows: (1) tariff support through the Regulator, by setting an appropriate pay-back tariff enabling recovery of investments; (2) loan guarantees to reduce financial risks for lenders, thereby facilitating borrowing and reducing capital costs; and (3) green loans or issuances of green bonds to send a positive signal to the capital markets and tap into cheaper, long-term capital sources for investment.

Loan guarantees and green loans already exist in Kazakhstan. An example of the green loans is the Green Economy Financing Facility (GEFF) program^[23], funded by EBRD and implemented by three banks in Kazakhstan, providing loans with a rate slightly below-market interest rate. These green loans encourage lending for green projects, compared to full commercial lending. The loan guarantees are provided by the Damu Fund (www.damu.kz). The experiences in Kazakhstan with loan guarantees and green loans provide confidence that similar schemes can be adopted for DSM grids. Moreover, private investments in smart grids may receive an additional boost if the GKZ would provide sovereign guarantees, to back up investments in the national T&D grids.

As such, the main challenge for DSM grids under scenario 2 is not access to investment capital but adjusting the tariff system to create a rewarding revenue stream and make a financially robust business case. The current energy delivery and system reliability issues already demonstrate the economic soundness of DSM smart grid solutions. This provides strong arguments to convince the Regulator to address the tariff barrier and become supportive to the DSM aggregator model, although this may take some time to happen.

The table below summarizes the proposed financing mechanism under scenario 2.

For electricity consumers	For aggregators and grid operators
Tariff system changes, incentivizing shift of consumption to off-peak hours, reducing consumption at peak hours and encouraging co-operation with the aggregators	Tariff system changes, incentivizing investments in the DSM equipment and know-how, to provide for the guaranteed reasonable pay back
Green loans (moderately concessional) to acquire Automated Commercial Energy Metering Systems (ACEMS, “smart meters”)	Green loans (moderately concessional) to acquire DSM equipment
Loan guarantees by Damu Fund to facilitate borrowing (up to 85% of loan principal for small-scale projects)	Loan guarantees by Damu Fund to facilitate borrowing (up to 30% of loan principal for large-scale projects over KZT 7 billion)

The DSM approach is scalable and can be applied to clusters of electricity end-users such as residential areas and industrial parks. Smart demand-side management (DSM) can be viewed as a kind of virtual, low-carbon, power plant. It is particularly effective in combating GHG emissions against the current baseline of Kazakhstan's high carbon-intensity of grid electricity; while investment and operating costs are low and modular which, in principle, facilitates financing. However, Kazakhstan has little experience with customer-driven DSM; technology gaps exist including digitalization of the grid infrastructure; and there is no established business model to implement the concept. The project aims to address identified barriers and deliver a proof of concept for country-wide adoption of the smart-grid DSM model by regional electricity companies (REC) and private businesses acting as the DSM aggregator.

Engagement with utilities and the Kazakhstan Energy Association (KEA) during PIF development points out the need to establish a financial incentive for electricity customers as a condition for viability of the DSM aggregator business model. Also, while the new market model promotes transparency through the creation of the SEP, it is still unclear how efficient the interaction with this new entity will be, compared to the previous situation in which most contracts were bilateral. Given that DSM grids will be multi-stakeholder involving new technologies and approaches, the stakeholders endorse the proposal to establish a technical working group for coordinating and detailing all aspects prior to piloting the DSM smart grid model.

Barriers:

A preliminary assessment of the barriers affecting the uptake of smart grid technology in Kazakhstan's electricity sector is provided in the next paragraphs. The identified barriers provide the framework for defining the interventions under the Project's components (see Section B). A more detailed assessment of the barriers and fine-tuning of the intervention for addressing these barriers will be carried out during the PPG.

1) Policy and regulation: Specific regulation for demand-side management is not in place. The energy and capacity market lack liquidity as a result of technical constraints (generation deficit and capacity bottlenecks in the transmission system), as well as regulatory barriers (tariff caps and capacity payment methodologies impeding a profitable business case; neither reflecting the real costs of services). The balancing market remains small (in terms of energy volume as well as finance) due to price capping and also because bilateral contracts absorb transmission capacity alongside other connected parties who pay for using the national grid system. Finally, the daily settlement scheme greatly suppresses a balancing market; the transition to a real-time market would require technological upgrades including digitalization, allowing much higher prices in the short-term market. A first step would be the mandatory installation of ACEMS for all commercial consumers. Unlike RE sources, there are no provisions in regulation for decentralized battery storage (BESS) or smart DSM systems; although BESS is being integrated into utility-scale RE projects, such as the 1-GW wind farm with 600-MWh BESS under development by Masdar.^[24]²⁴ Current sector policy seems to focus on large-scale generation projects, while individual smart DSM grids will be in the range of a few MW each. DSM grids require an operator or aggregator to act on the electricity market on behalf of the customers; this figure needs to be created in sector regulation. The second step will be introduction of changes in the tariff system, incentivizing the consumers to adopt and support DSM measures.

2) Technology barriers: Smart grids require advanced digital technology and communication structures for data management, system control, and settlement of transactions. It implies a transition from a

command-driven to a demand-driven control model, which also implies that technical and price information will need to flow in parallel. Kazakhstan needs to close technology gaps to enable such model. Smart grid technology can be introduced and tested behind a suitable node in the electric grid (a substation or large transformer), or in an isolated grid system. Since the level of aggregation is scalable, one can depart from the distribution grid and work upward by integrating multiple smart grids into one larger system. Specific technology barriers include the absence of applicable technical standards and communication protocols, integration of new technologies into utility capabilities, as well as ensuring swift supply and servicing (i.e. to build the technology ecosystem).

3) Information barriers: Demand-driven DSM requires customers to have price information to decide whether it is beneficial for them to reduce demand during a given time window. The incentive is proportional to the price; current low energy and capacity prices in Kazakhstan provide a weak incentive. Customers also need to understand whether they can offer demand flexibility; they may need expert advice to make proper judgements. The impact and benefits of demand-driven DSM can only be demonstrated in an area where significant load flexibility exists. Additional metering in local grids is needed to fill information gaps and build load profiles at the level of individual clients and small clusters. The DSM aggregator (or project developer) and the local grid company shall work together to assess the technical feasibility and expected impact of a local DSM smart grid.

DSM is economically most effective at grid nodes where marginal costs per kWh are highest. One can offer a higher price for DSM services at these points (instead of the current flat tariff) which is critical for financial feasibility. Underlying data to make such detailed economic assessment is probably not available at present. However, one can start a process towards a gradual refinement of costing methodologies to understand the operation of regional grid systems from an economic perspective.

4) Delivery channels and skills: The ecosystem to deliver smart grids in Kazakhstan is underdeveloped. Key agents include the national system operator (KEGOC) as well as the regional grid operators and electricity companies. It shall also involve contractors and equipment suppliers. New agents include the DSM aggregator, the clearinghouse to settle DSM transactions, and ideally an independent arbitrage entity. The utilities require technical upskilling to harness digital grid technology including hardware components, communication protocols, and control platforms and management models. A baseline shall be established to assess specific technical capacity gaps.

A second domain is the design of an appropriate business model for DSM and creating the necessary commercial skills to implement such model. Automated equipment and digital platforms are critical enablers for this model, and legislation (such as related to customer data privacy) shall be adjusted to accommodate the chosen DSM business model. It also requires utilities to become more customer-oriented (rather than thinking in terms of “connections”), which fits in a global trend in the market.

5) Finance barriers: The main finance barrier in place are the low energy tariffs and price caps imposed on the balance market. Individual customers have little incentive to conserve energy and invest in smart grid functionality, which is demonstrated by the low adoption of automatic metering devices (ACEMS). A proper pricing shall be set that responds to the actual costs of grid imbalance and may consider the costs of unserved energy to customer groups due to grid constraints. A second barrier is access to investment capital. This applies to the regional electricity companies, for which it has led to structural underinvestment in T&D upgrades - let alone to keep up with digitalization trends. It also applies to DSM grid developers. For addressing this barrier, synergies may be explored with investment mechanisms targeting EE in industry and commercial sector, as well as promoting a market for Energy Service Companies (ESCOs). Another option to explore are joint ventures between energy consumers and regional utilities.

Outcome requirements

The present proposal in support of future scenario 2, is aligned with the GEF-8 CCM strategy and programming guidelines. Specifically, it responds to the following objectives under CCM Pillar I “Promote innovation, technology development and transfer, and enabling policies for mitigation options with systemic impacts”: (1.1) Accelerate the efficient use of energy and materials; and (1.2) Enable the transition to decarbonized power systems. The project contributes to objective (1.1) through the envisioned electricity demand management of end-users (downstream). Contributions to objective (1.2) are delivered through the installation of decentralized RE power systems connected to the distribution grid. Upstream benefits are also created, as improved energy demand profiles strengthen electric system reliability and efficiency. The project delivers technological know-how and proposals for financing mechanisms, it provides policy and regulatory support and promotes access to global best practices for accelerating the deployment of digital smart grids in Kazakhstan, while considering climate risks and long-term sector resilience. The intervention targets technological innovation and fits into national strategies towards a power sector transformation in Kazakhstan to eliminate current inefficiencies and promote the integration of distributed clean energy technologies.

Stakeholder engagement

The identified main stakeholders and their role in the project are summarized in the following table:

Stakeholders	Mandate/ Role	Role in the project development and implementation
Ministry of Energy (MOE)	GKZ lead ministry entity for electricity sector regulation and purview (project executing agency/implementing partner) The first consultation with the Ministry were held in January 2025 to discuss the concept of the DSM project, followed by 4 consultations in March - June 2025 to discuss the project concept and needs in detail.	Project Steering Committee (PSC) member for policy guidance and high-level buy-in.
Ministry of Ecology and Natural Resources (MENR)	GKZ lead ministry and lead entity for environment and green economy transition, GEF Focal point Three joint meetings were conducted starting from December 2024 till May 2025 with the ministry in its role of a GEF focal point.	Project Steering Committee (PSC) member for policy guidance and high-level buy-in.
Kazakhstan Electricity Grid Operating Company (KEGOC)	Public company, system operator of Kazakhstan unified electric power system	KEGOC is the main electricity sector stakeholder with specific knowledge of grid system characteristics and challenges.
Astana Regional Electricity Company (Astana REC)	Public company responsible for operation and commercialization of electric energy in the Astana Region.	Potential project partner and beneficiary of a DSM pilot in the Astana region. Their role is providing input data for pilot project design, implement field trials, and collaborate closely with the envisioned aggregator entity.
Karaganda Regional Electricity Company (KaragandaZharyk REC)	Public company responsible for operation and commercialization of electric energy in the Karaganda Region.	Potential project partner and beneficiary for a DSM pilot in the Karaganda region. Their role is to provide input data for pilot project design, implement field trials, and

		collaborate closely with the envisioned aggregator entity.
The Kazakhstan Electricity Association (KEA)	Non-governmental energy sector organization to promote energy business development in Kazakhstan. KEA unites 126 organizations, encompassing approximately 90% of Kazakhstan's electricity sector. Its members include major generation companies, the national transmission operator, regional distribution companies, power supply organizations, the system operator, market operators, R&D and design institutes and equipment manufacturers	Project partner for business model development with profound knowledge of KZ power sector including private and public actors; serves as a conduit for broad stakeholder engagement.
Electricity Sector Science and Research centers including: Kazakh National Technical University (KazNTU), L.N. Gumilyov Eurasian National University (ENU), and Kazakh British Technical University (KBTU)	Sector technical research and development groups (to be identified). Relevant research groups are expected within KEGOC, energy sector laboratories, and universities.	National knowledge partners include public research institutes, universities, and energy sector laboratories and research groups. These will act as project counterparts for knowledge building and sharing.
Private energy project developers	Private businesses active in energy project development. These include RE developers, energy service companies (ESCOs), and future minigrid developers.	Potential project partner for developing the aggregator business model. Foreign RE developers and ESCOs may play an important role to bring in specific knowhow as input for shaping the smart-grid DSM business model and provide recommendations on regulatory amendments.
Local industrial park operators	Electricity consumer and direct beneficiary.	Industrial parks (IP) are an attractive target for DSM pilots and can act as a conduit to engage with the hosted industries (tenant companies). An initial mapping of potential IP will be carried out during the PPG.
International Green Technologies and Investment Projects Center assists in finding investors for the implementation of «green» projects	Quasi state enterprise 100% of shares belong to the MENR, special vehicle for BAT preparation	Project partner for capacity building/trainings.
Representatives of women organizations	Public and non-governmental organizations advocating the role of women (to be identified)	Women organizations will act as a conduit and provider of local expertise to ensure inclusiveness and fair sharing of project benefits. The PPG will identify and map these groups as input for project development.

Alignment with other initiatives

Project / initiative	Description	Link to current proposal	Contribution to key policy targets
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De-risking renewable energy investments (UNDP-GEF)	The Project aimed to boost RE development in the country mainly focused on small scale RE development (rooftop solar) and introduction of innovative financial instruments to de-risk RE investments namely – RE site specific auction; financial support to the local entrepreneurs to develop rooftop solar projects	This is a logical continuation of the UNDP-GEF completed DREI project as the demand side management (DSM) allows the country to integrate more renewables into the grid at the user's side.	Increasing the level of renewable generation up to 15% by 2030
GCF-EBRD Kazakhstan Renewables Framework	Supporting the construction of 8-11 renewable energy projects in Kazakhstan, with a total capacity of 330 MW	RE integration into the grid becomes more challenging to the System operator, DSM approach will help tackle the issue by shifting the peak consumption BESS integration and potentially other flexible instruments such as vehicle to grid (V2G).	Increasing the level of renewable generation up to 15% 2030

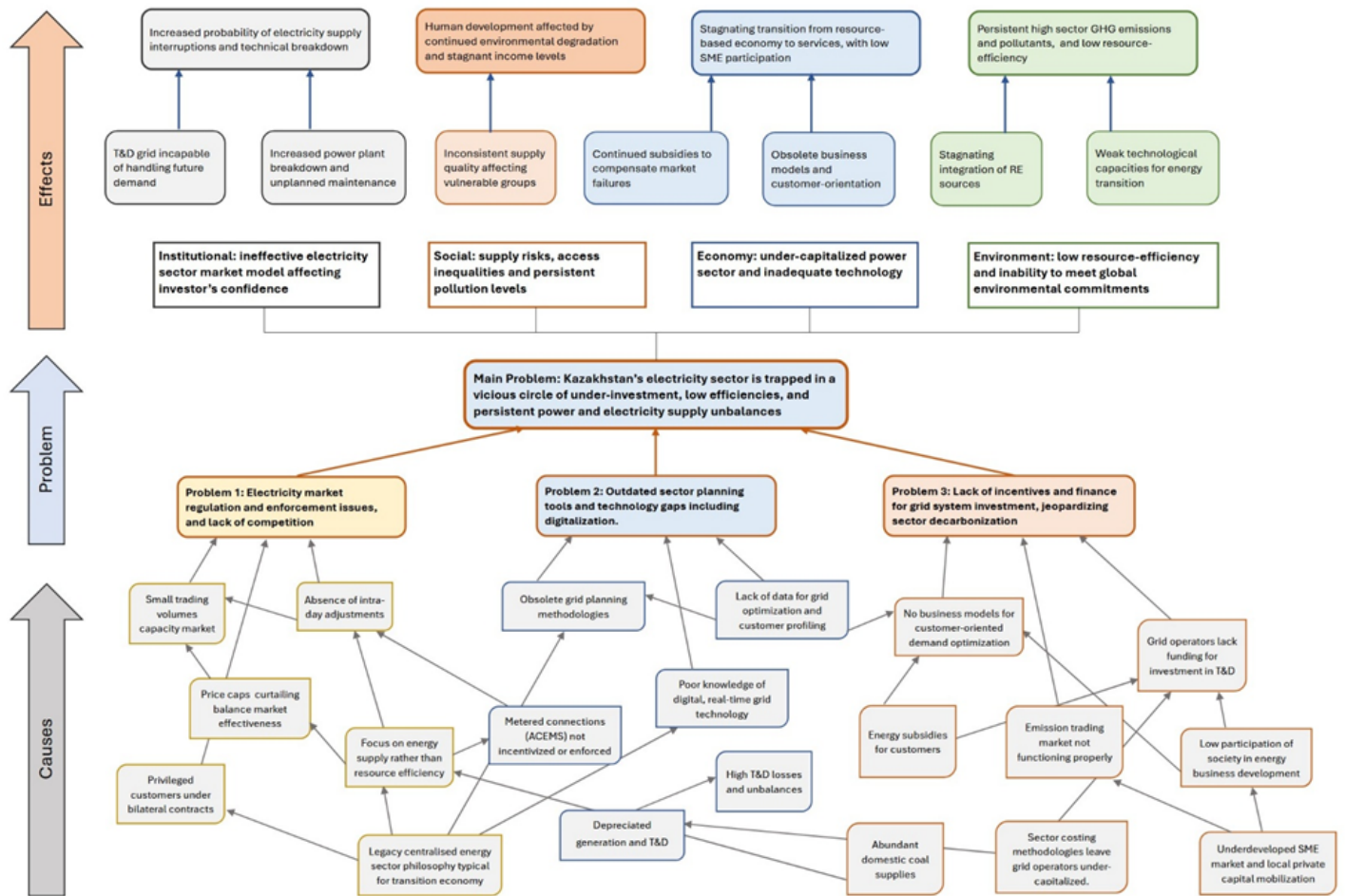


Figure 1: PROJECT'S PROBLEM TREE

- [1] Kazakhstan 8th National Communication to the UNFCCC, Executive Summary (2022).
- [2] <https://www.worldbank.org/en/country/kazakhstan/overview>
- [3] <https://data.worldbank.org/country/kazakhstan>
- [4] <https://www.undp.org/kazakhstan/press-releases/undp-kazakhstan-maintains-its-position-human-development-index-rankings-action-needed-address-inequality-and-environmental>
- [5] <https://stat.gov.kz/ru/industries/economy/foreignmarket/publications/158559/>
- [6] UN Common Country Analysis Kazakhstan, p.25
- [7] From KZT 179 in 2014 to KZT 456 in 2023, per USD.
- [8] Source: UN Common Country Analysis Kazakhstan, p.63.
- [9] <https://www.worldbank.org/en/country/kazakhstan/overview>
- [10] <https://chambers.com/articles/national-development-plan-of-the-republic-of-kazakhstan-until-2029-what-to-expect>
- [11] https://unfccc.int/sites/default/files/resource/Carbon_Neutrlaity_Strategy_Kazakhstan_Eng_Oct2024.pdf
- [12] <https://unfccc.int/documents/630387>
- [13] Article 283, paragraph 1.
- [14] Article 284, paragraph 2. Source: Updated First NDC, p.5.
- [15] <https://ar2023.kegoc.kz/en/industry-sructure.html>.
- [16] Source: Kazenergy National Report 2023.
- [17] Source: Kazenergy National Report 2023, p.217.
- [18] <https://ar2023.kegoc.kz/en/industry-sructure.html>
- [19] Source: Kazenergy National Report 2023, p.217.
- [20] Source: Analysis of the wholesale electricity and capacity market for 2023, KEGOC, Astana 2024, p.31-32.
- [21] Approximate values as per USD/KTZ exchange rate 02 September 2025.
- [22] Source: Analysis of the wholesale electricity and capacity market for 2023, KEGOC, Astana 2024
- [23] <https://ebrdgeff.com/kazakhstan/>

[24] Source: <https://astanatimes.com/2025/05/uae-kazakhstan-deepen-energy-ties-with-renewable-and-battery-storage-agreement/>

B. PROJECT DESCRIPTION

Project description

This section asks for a theory of change as part of a joined-up description of the project as a whole. The project description is expected to cover the key elements of good project design in an integrated way. It is also expected to meet the GEF's policy requirements on gender, stakeholders, private sector, and knowledge management and learning (see section D). This section should be a narrative that reads like a joined-up story and not independent elements that answer the guiding questions contained in the PIF guidance document. (Approximately 3-5 pages) see guidance here

The objective of the proposed project is: "To accelerate the decarbonization and efficiency of Kazakhstan's Unified Energy System (UES) by demonstrating the concept of digital smart grids for customer-driven energy demand management and the integration of distributed RE and BESS systems." The Project design aims to address the barriers outlined above and is structured into four components, as follows:

- **Component 1. Policy and regulation.**

This component focuses on the policy and regulatory framework for enabling demand-driven smart grids in Kazakhstan's electricity network. It develops proposals and recommendations to address policy, regulatory, and finance barriers, establishes MRV protocols, and a roadmap for timely adoption of identified instruments and mechanisms.

- **Component 2. Technology and information.**

This component targets technology and information gaps in preparation of the design and effective deployment of demand-driven, electric smart-grids supported by digital technologies. It identifies current technology gaps, including digitalization, builds technical capacities among stakeholders and supports the design and adoption of a national smart-grid technical standard.

- **Component 3. Business model development and demonstration.**

This component seeks to deliver proof of concept for demand-driven digitalized smart-grids in collaboration with consumers and the regional electricity company. It will develop and validate business model options and detail the business case based on updated consumer demand profiles and grid technical and operational parameters. The proof of concept will be delivered in a digital (virtual environment); an assessment will be conducted to evaluate commercial deployment as a first-of-a-kind investment.

- **Component 4. Knowledge Management and M&E.**

This component addresses information and institutional barriers by documenting lessons learned, facilitating knowledge-sharing, and tracking results. It supports replication and scaling-up by ensuring transparency and sharing of results between countries supported by UNDP, as well as providing feedback for future UNDP and GEF programming.

Role of the private sector

While electric utilities in Kazakhstan are still predominantly public-owned, the project opens windows for private sector investment because new functions are created, as outlined in the figure below.

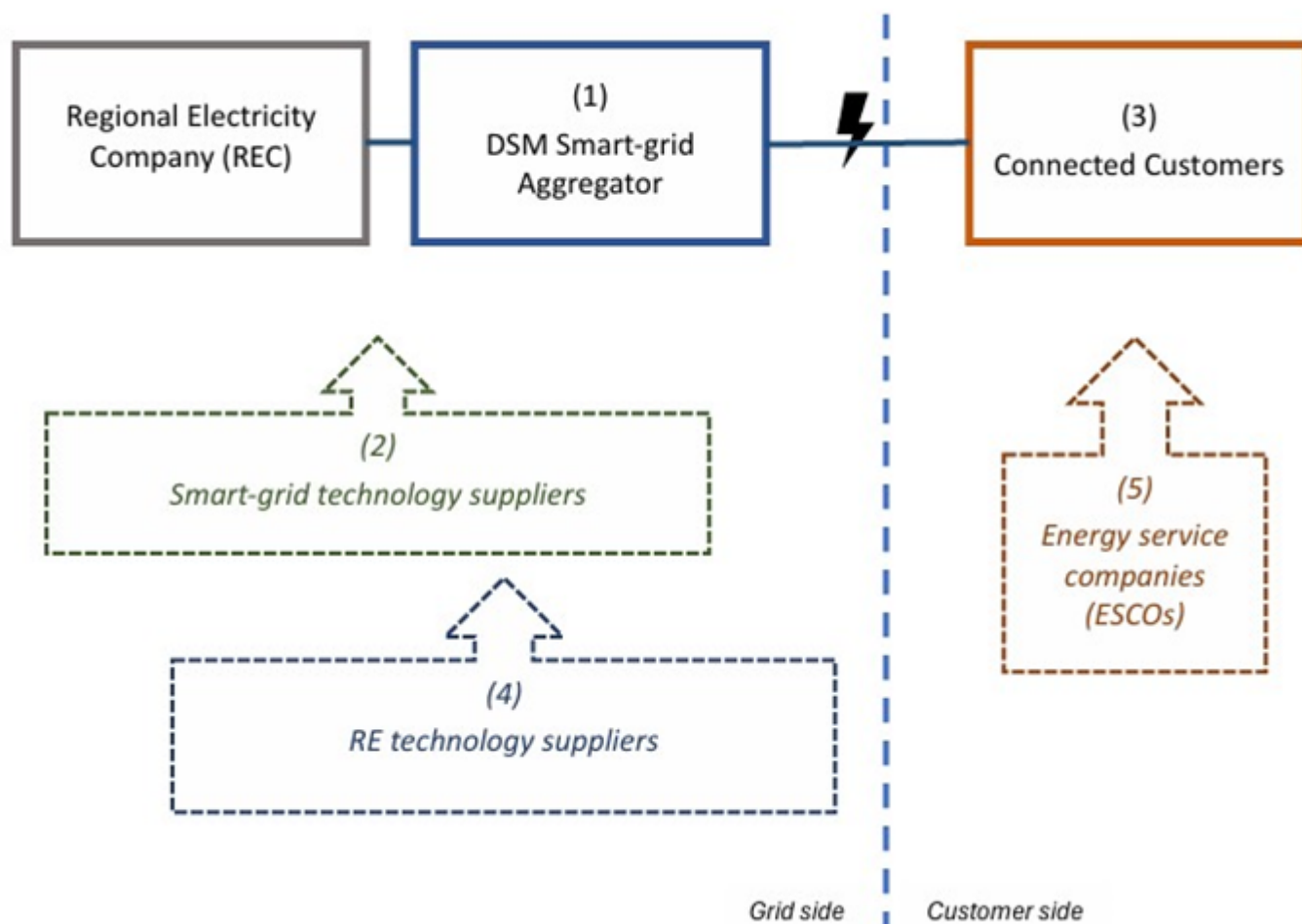


Figure 1 Roles of the private sector

- 1) The aggregator is a new function, which is best assigned to an independent private business. It acts as the interface between the connected consumers, and the Regional Electricity Company (REC). The aggregator implements the DSM business model and must be profitable to ensure sustainable operations.
- 2) Suppliers of distributed RE power plants (PV) and battery storage (BESS) technology, for integration into the smart grid. Their clients can be the aggregator, the REC, private RE project developers and investors, or one or several of the end-users connected to the smart grid.
- 3) Private technology suppliers of smart-grid electric and digital communication equipment. These will supply the REC and the aggregators for upgrading of the distribution grids and for installing smart meters at customers' premises and grid node points.
- 4) The customers connected to the smart-grid are mostly private individuals, commercial businesses and industries (although public entities can equally be connected). They are beneficiaries of the DSM smart-grid. Customers may also organize into a private entity (or a cooperative) to take up the aggregator role themselves, if they have access to know-how and investment capital.

- 5) Energy service companies (ESCOs) who develop and implement energy efficiency (EE) solutions for reducing electricity demand and enabling peak-shaving. Their customers are usually larger industries, connected to the smart-grid.
- 6) Private entities can co-invest in infrastructure for DSM smart-grids, provided this is permitted through legislation and regulation. Larger industries may seek joint-ventures with electricity companies to upgrade infrastructure and incorporate DSM smart-grid functionality, which may cover heat and power. Regional utilities, with weak balance sheets, may benefit from private investor participation through dedicated investment funds and sovereign guarantees. Small-scale grids may depart from organizational models such as energy communities^{[1]25} to accumulate the necessary equity for accessing debt capital.

^[1] This concept has been proposed under European Directives for incorporation into EU member countries. See for example: <https://www.rescoop.eu/toolbox/second-generation-eu-legislation-for-energy-communities>.

Theory of Change and key assumptions

The project design is based on the following assumptions:

- 1) Availability of capable national knowledge and technology partners; both for building national competences in smart-grid technology, as well as for execution of field tests and pilot activities.
- 2) Sustained political buy-in and support for the project, through the incumbent ministry; as well as firm commitment to push forward sector modernization policies and action plans.
- 3) Commitment of regional utilities and consumers for development of demonstration pilot. And:
- 4) The establishment of adequate market conditions for commercial deployment of the smart-grid DSM business case; specifically, to ensure a sufficient revenue stream for financial closure.

The assumptions (1), (2) and (3) are plausible and will be further validated during the PPG phase. Assumption (4) is not valid under the baseline. While the Project will prepare proposals for regulation and financial instruments, their adoption cannot be guaranteed (or may be delayed). Only if assumption (4) becomes valid during the project's lifetime, the DSM investment pilot can be physically implemented and be operated sustainably.

Considering that there is a substantial risk that regulation and financial instruments will not be adopted in a timely manner, the Project will first prove the concept by digital simulations of the smart-grid DSM business model with the selected electricity sector partners. This demonstration will be computerized, possibly in virtual reality. The project is critical to provide the necessary input information and know-how. A digital demonstration circumvents potential issues related to sustainability of a physical demonstration smart grid, with the additional benefit to test a broad range of configurations and business concepts at little extra costs.

Full commercial demonstration is only feasible and sustainable if appropriate financial conditions are in place. Based on digital simulation, a full assessment will be conducted together with the candidate electricity company (or aggregator). The assessment may lead to the conclusion that commercial demonstration would be premature, in which case, the first DSM smart-grid is expected to materialize after the project implementation phase (medium-term impact). In any case, the Project aims to visualize the economic benefits

of the smart-grid DSM business model to stakeholders and build a convincing case, thereby accelerating market adoption.

The project's Theory of Change is formulated as follows: IF (adequate information about customer energy demand is available and electricity sector agents are proficient in the use of digital smart-grid technologies) AND IF (the DSM smart-grid aggregator concept has been successfully validated and evaluated through simulations and field trials) AND IF (enabling regulation has been enacted and financial incentives adopted) THEN (the DSM smart-grid business model can be physically deployed in a commercial environment and ready for upscaling and replication).

The Project's Theory of Change (TOC) is graphically represented in the next figure.

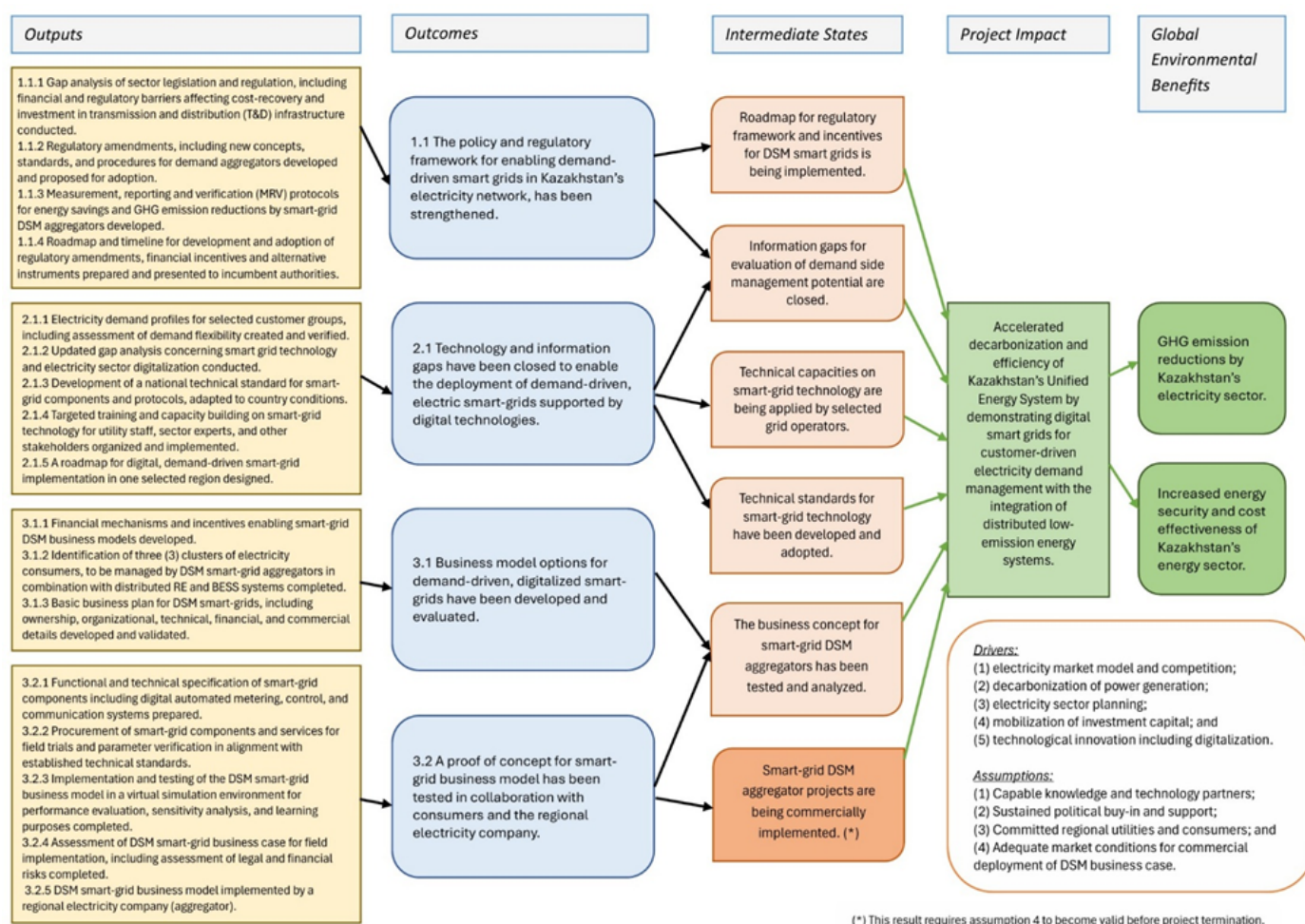


Figure 2 Theory of change

(Note: The project has been structured to minimize interdependencies that could negatively affect the timely implementation of activities across the various components. Assuming sufficient political endorsement—a key underlying assumption—Components 1 and 2 can be initiated in parallel, given that their respective domains and stakeholder groups are largely distinct. Regarding the relationship between Components 1 and 3, the following approach has been adopted: Progress under Component 1 is influenced by political and regulatory factors outside the project's direct control. KEGOC and utilities may be unable or unwilling to advance a DSM pilot within their service areas. To address this, Component 3 has been designed so that most activities can proceed independently of regulatory developments. This consideration also informed the decision to include an initial "digital twinning" proof-of-concept. Under this approach, only Output 3.2.5 would remain directly dependent on progress under Component 1. As an interim solution, one options is for the government to issue a decree establishing a "technical pilot area"

to allow implementation of the physical smart-grid pilot. Limited progress under Component 1 may also affect the level of detail achievable in the legal dimension of the business plan under Outcome 3.1 and may reduce stakeholder confidence in the DSM business model. Conversely, early achievements under Component 3 may help accelerate policy and regulatory developments by demonstrating the practical feasibility of DSM smart-grid solutions in Kazakhstan. In summary, while some interdependence between Components 1 and 3 remains, it has been reduced as much as practicable through the project's design.)

Project impact

The project aims to improve the technical and economic operation of Kazakhstan's electric grid system by introducing digital smart-grids for demand-side management of customers connected to this grid. The implementation of peak-shaving and demand-saving measures will result in cost savings for the nation as the avoided system imbalances will no longer be settled through international transactions. This enables the Government to channel fiscal budget to investments in infrastructure upgrades, as well as social needs thereby improving the quality of life of people. The economic opportunities created in the energy market are expected to foster business development and economic diversification, offering new jobs and income opportunities along the entire value chain. The project provides opportunities for empowering women to assume new responsibilities, for example as DSM aggregator business developers, project engineers, and technical and sales functions with smart-grid technology suppliers. Direct environmental benefits will be delivered by avoiding electricity sector GHG emissions and other pollutants from thermal power plants, as well as by improved resource efficiency in industrial processes. Importantly, the DSM smart-grid business model enhances accountability and cost transparency; as such, it has the potential to accelerate the current modernization process towards a more equitable electricity market in Kazakhstan.

The project's components, outcomes and outputs

Component 1. Policy and regulation

Outcome 1.1: The policy and regulatory framework for enabling demand-driven smart grids in Kazakhstan's electricity network, has been strengthened (GEF US\$ 426,048; cofinance US\$ 500,000). This component aims to prepare sector regulation and supportive policies to enable the deployment of smart-grids for demand-side management (DSM) in Kazakhstan's electricity system and promote their sustainable operation. The project will depart from the baseline analysis (sector status reports and updated analysis to be delivered during PPG) to prepare a gap analysis of the market context for DSM smart-grids. As outlined in the barriers analysis, gaps are expected as related to current T&D grid technology and communication infrastructure; definition of smart grid concepts; proposals for regulatory instruments and governance mechanisms; economic losses due to electricity service interruptions and grid congestion; availability of energy price information for customers; engagement processes between utilities and customers to establish and formalize customer clusters; and availability and access to information as related to existing and projected electricity uses. As the latter is concerned, the gap analysis shall assess the adequacy for electricity services to all customers including underprivileged groups and women, identify information voids and recommend how smart grids can promote inclusive access to grid electricity at the local level. The gap analysis shall apply a gender-sensitive approach to electricity sector assessments and gap analysis. The gap analysis shall identify the opportunities for regulatory amendments that can be implemented in the short-term, as well as processes that can be supported to address more systemic issues and barriers through (medium-term interventions (1.1.1)).

Departing from the gap analysis, this component will deliver an in-depth analysis of sector regulation to identify entry points for anchoring the DSM business model into current legislation. Preliminary, identified options are to enable regional utilities to assume the role for the DSM aggregator, or to have customer groups

and RE developers establish a (private) entity under an expanded IPP model. New concepts need to be defined and aligned with legislation; in parallel, regulation shall be prepared to accommodate additional technical standards and procedures, including an updating or refinement of the roles and responsibilities of the entities involved. **Proposals developed under the project will ensure mainstreaming of gender-equality policies and measures into new concepts and instruments (1.1.2).**

The project will design a protocol to determine energy savings and other services delivered by the aggregator (including reduced capacity imbalances, grid stability support services; and associated GHG reductions). Monitoring, reporting and verification (MRV) of energy savings achieved is typically done by comparison with expected demand (baseline scenario); the difference represents a value that can be monetarized and provides the basis for certification of GHG emission reductions. **For larger industries, MRV can often be aligned with other monitoring processes already in place (e.g. to feed ESG reporting), yet it can be challenging for clusters made up of diverse clusters, especially if residential users are incorporated. The project shall ensure participation of women and vulnerable groups (VG) in decision-making and verification protocols wherever appropriate to identify, and respond to, their specific needs and energy consumption patterns.** It is acknowledged that information voids need to be addressed in parallel, for which further digitalization and refinement of the electricity market model **(addressed through Component 2)** are instrumental (1.1.3). Finally, the project will engage closely with the Ministry to develop a roadmap for implementation of the identified interventions, for endorsement by the authorities. **The roadmap shall acknowledge regional circumstances and in response, propose differentiated actions according to current status of T&D infrastructure, electricity demand characteristics (e.g. heavy industry areas versus (North); rapid urban development (South); and more disperse grid networks). Where appropriate, citizen groups shall be duly identified and incorporated into the roadmap process as key stakeholders; this also applies to women's roles (1.1.4).**

Specifically, this component envisages the following outputs:

1.1.1 Gap analysis of sector legislation and regulation, including financial and regulatory barriers affecting cost-recovery and investment in transmission and distribution (T&D) infrastructure conducted. **Indicative target: one (1) gap analysis.**

1.1.2 Regulatory amendments, including: new concepts, standards, and procedures for demand aggregators developed and proposed for adoption. **Indicative targets: one (1) technical standard for minigrid system components; one (1) regulation formalizing the demand aggregator entity.**

1.1.3 Measurement, reporting and verification (MRV) protocols for energy savings and GHG emission reductions by smart-grid DSM aggregators developed. **Indicative target: one (1) MRV protocol adopted.**

1.1.4 Roadmap and timeline for development and adoption of regulatory amendments, financial incentives and alternative instruments prepared and presented to incumbent authorities. **Indicative targets: one (1) roadmap delivered; one (1) intermediate event (seminar) to present progress and discuss relevant topics.**

Component 2. Technology and information

Outcome 2.1: Technology and information gaps have been closed to enable the deployment of demand-driven, electric smart-grids supported by digital technologies (GEF: US\$ 455,000; cofinance: US\$ 950,000).

The purpose of this component is to build adequate technical capacity and know-how in Kazakhstan for the effective deployment of electric smart grid technology. This component builds forth on the gap analysis conducted under Component 1. The Project acknowledges the critical role of digitalization and communication technologies as an enabler of the customer-driven, DSM business model and the urgency for Kazakhstan to

close current gaps. It is noted that digitalization by regional electricity companies is at best incipient, while automated metering is not generally applied. The project will therefore work in regions where the infrastructure is more advanced; preliminary identified regions include Astana and Karaganda.

The project will ; and to reduce identified information gaps as related to consumer demand patterns and . will support collecting customer electricity demand data to build user profiles – , which these are the building blocks for forecasting demand at aggregated levels. . Where appropriate, it will assess energy needs and demand profiles from a gender-differentiated perspective, which is particularly relevant in a context of SME clusters and residential areas. In collaboration with regional utilities, data gaps will be identified and strategies devised to close these, for example by setting up additional measurements at (large) customers' premises or at grid node points (2.1.1).

Gaps are also expected as related to proficiency with electricity sector digitalization and communication technologies required for smart-grid development and data collection and management. The technology gap analysis update shall recommend specific actions to close current breaches, including proposals to link with existing technical education institutions and upgrading of curricula in the field of electric engineering, energy management, energy law, and telecommunication sciences. While a comprehensive approach to building digital skills is beyond the scope of this project, some recommendations as related to capacity building can be piloted through collaborations with technological partners under Component 3. The PPG phase will assess opportunities for training and capacity building interventions as input for the design of the project document, and identify and consider gender gaps in digital and energy sector education and employment (2.1.2 and 2.1.4).

This component will further assist electricity sector entities and the national standards agency to develop a technical standard for smart grid components and communication protocols. This will be done by coordinating stakeholders to establish a technical committee on digital smart-grid standards and support its operation. The process shall include gender considerations in the specification of technical standards; implying that women are duly represented in standard committees. After an initial review of existing standards worldwide, the process to adapt or develop a national standard is expected to take about one year (2.1.3).

With more detailed consumer data in hand and a clear understanding of smart-grid technology, the project will work with the GKZ and sector entities to select a geographic (grid) area and develop a roadmap to prepare this network for the integration of DSM smart-grids. This output will provide the regional operator with the necessary information to make a network upgrading investment plan (including digitalization). Through the Project Steering Committee (PSC), the project will prioritize opportunities to maximize impact and ensure equal access to affordable energy by optimizing the allocation of electricity in the target region. The roadmap shall consider opportunities to promote social and economic development, including gender-transformative action (2.1.5).

Summarizing, this component encompasses the following outputs:

2.1.1 Electricity demand profiles for selected customer groups, including assessment of demand flexibility created and verified. Indicative targets: (1) sets of time series for selected industrial consumers, residential consumers, industrial parks, SME clusters in at least two areas; (2) report with statistical analysis, trend patterns, and extracted consumer group demand profiles including probability predictions.

2.1.2 Updated gap analysis concerning smart grid technology and electricity sector digitalization conducted. Indicative targets: one (1) updated baseline and gap analysis of smart-grid technology competences,

educational offering, laboratory infrastructure, and international partnerships of technology and academic institutions in Kazakhstan; one (1) updated baseline and gap analysis of utility sector equipment, components and systems for smart-grid integration, including institutional and management barriers.

2.1.3 Development of a national technical standard for smart-grid components and protocols, adapted to country conditions. Indicative targets: one (1) national technical standard; one (1) testing and compliance protocol.

2.1.4 Targeted training and capacity building on smart-grid technology for utility staff, sector experts, and other stakeholders organized and implemented. Indicative target: one (1) professional training programme for utility staff implemented in collaboration with a national institute; at least two (2) customer group capacity building programmes implemented in target areas in collaboration with akimats and utilities.

2.1.5 A roadmap for digital, demand-driven smart-grid implementation in one selected region designed. Indicative target: one (1) roadmap designed, consulted with stakeholders and presented to GKZ for replication.

Component 3. Business model development and demonstration

This component follows a two-step approach: by shaping the business model for DSM smart-grids for various grid areas and electricity consumers (outcome 3.1), and subsequently, detailing, testing and demonstration of a selected business case (outcome 3.2). Through this structured approach, key outputs are generated while managing implementation risks, prior to full-scale demonstration and upscaling.

Outcome 3.1: Business model options for demand-driven, digitalized smart-grids have been developed and evaluated (GEF: US\$ 300,000; cofinance: US\$ 500,000). This outcome will design a financial mechanism and propose incentives enabling feasibility of the DSM smart-grid model. The current prices for energy, imbalance, and other grid services are insufficient for an attractive business case and poorly reflect the economic benefits; the focus shall therefore be on improving the revenue streams that can be generated. The proposed mechanisms will ensure accessibility to women-led businesses and projects. The proposals and recommendations will be submitted to the GKZ for review and formal adoption (3.1.1).

Departing from a short-list of intervention areas to be developed during the PPG, this outcome will further narrow down on potential target areas to map electricity supply and demand, customer groups and consumption profiles (demand side), and the status of the regional electricity grid (supply side). To this purpose, the project team will establish a set of selection criteria in coordination with project partners. The selection criteria shall be subject to a screening on gender and social inclusion aspects to ensure equality and be presented to the PSC for approval. Partnerships with women organizations are recommended as a conduit to collect relevant information and for understanding contextual gender aspects of electric energy (3.1.2).

This outcome further entails the development of the DSM smart grid business model, and its application to selected electricity consumer groups in identified grid areas. The basic DSM model will be expanded with distributed RE generation and storage (BESS) capacity enabling an aggregator to increase response flexibility and strengthen the business case. The business plan will address key technical, economic, legal, and operational aspects; as well as social and gender benefits and circumstances. The plan will provide the basis for pre-feasibility and feasibility analyses, and serve as a communication document with stakeholders, potential project developers (aggregators), customer groups, and investors (both public and private). The initial choices and proposals delivered by the project will be presented to stakeholder groups for inputs and validation. One or more DSM business proposals will be consolidated and considered for the subsequent testing and demonstration phase (3.1.3).

The following outputs are identified:

3.1.1. Financial mechanisms and incentives enabling smart-grid DSM business models developed. **Indicative target: one (1) mechanism developed (to be further detailed during PPG).**

3.1.2 Identification of three (3) clusters of electricity consumers, to be managed by DSM smart-grid aggregators in combination with distributed RE and BESS systems completed. **Indicative target: a shortlist with three (3) consumer groups for smart-grid development.**

3.1.2 Basic business plan for DSM smart-grids, including ownership, organizational, technical, financial, and commercial details developed and validated. **Indicative target: one (1) business plan developed.**

Outcome 3.2: A proof of concept for smart-grid business model has been tested in collaboration with consumers and the regional electricity company (GEF: US\$ 800,000; cofinance: US\$ 14,500,000). The purpose of this outcome is to demonstrate the concept, operation, and benefits of the electric DSM smart-grids to sector stakeholders and investors. This will reduce risks related to early-market introduction, including organizational, operational, technical, and (real and perceived) performance risks. The testing and demonstration approach follows a stepwise structure. Departing from the business plans developed under Outcome 3.1, the PSC will select a specific grid area, regional electricity company, and cluster of consumers for implementing the demonstration pilot. A technical plan will be prepared for integrating smart functionality to the grid system (behind a chosen grid node – such as a substation or a large transformer). **The plan will draw on the national standard for smart-grid technology (envisioned under output 2.1.3).** This technical plan involves the specification of digital measurement equipment, control components (switches and controllers), and communication technology at specific grid points (transformers), as well as connected consumers and distributed RE generators and BESS units **(3.2.1).**

The smart-grid system will be modelled in a computer environment to understand its technical functioning, including grid stability, peak shaving and demand shifting capacity under various conditions. The project will support the regional utility to procure equipment for field trials and parameter verification **to close data gaps and to better understand technical and operational issues (3.2.2).** The information collected will be used to improve the digital model **(“digital twinning”).**

Through the PSC, the project will seek partnerships with national research institutes (e.g. electric engineering institute and universities) and foreign experts **for hosting the digital model.** This approach seeks **institutionalize smart grid modelling within an existing electric engineering laboratory environment for ongoing research and optimization of the digital model** and use it for training and learning purposes of graduate students, experts, and practitioners. Since the digital simulation environment is flexible, one can test and demonstrate different configurations of smart grids without additional investment. **The PPG phase will develop a plan for institutionalization and exit strategy for the digital modelling environment.** The finalized digital smart-grid will be demonstrated to sector stakeholders, including policy makers and public and private investors. This result provides a first proof of concept and can be implemented in a virtual reality (VR) environment. **Throughout the design and development process, the project will involve female experts and engineers ensure a gender balance in technical teams and contracted services (3.2.3).**

Based on the digital proof of concept, the physical implementation and operation of a selected smart-grid business case can be considered. This will require additional investment in smart-grid components (as well as RE/BESS power systems if one chooses to add these). The project will carry out an assessment of this demonstration pilot to evaluate all risks, as well as the technical, social, and economic circumstances and expected benefits, including gender aspects and gender-responsive actions. The smart-grid DSM business case

is expected to be feasible, if regulatory and finance risks are adequately addressed, and if the regional utility and consumers are willing to participate in this activity. At PIF stage, the risk that finance is not sufficiently addressed, is assessed as high – which implies that the DSM project would generate insufficient revenues for sustainable operation. The integration of RE/BESS capacity is expected to improve financial robustness; the digital demonstration, sensitivity analysis and the assessment are critical for quantifying this impact (3.2.4).

If the business case proves to be feasible, then it can be implemented (through cofinance investment) as a first-of-a-kind DSM smart-grid in Kazakhstan, serving as a template for upscaling and replication. At PIF stage, the formal ownership of the “digital twin” is assumed to rest with KEGOC in partnership with the host technology institute, on behalf of the Ministry of Energy. Institutionalization is foreseen by embedding in the curricula of the technology institute and the use of the digital simulation environment for technical training of KEGOC, utility experts and other interested entities. Financial sustainability is envisioned through institutional budgets and service fees for training and research.

To guide physical implementation of the pilot smart-grid, the project SESP shall be updated and the appropriate instruments (ESMF) detailed as appropriate; this may imply the preparation of targeted management plans such as governing the life cycle of electric and electronic equipment and waste). The project shall further update the Stakeholder Engagement Plan to incorporate relevant actors in the physical intervention area and ensure that decision-making is gender-sensitive with participation of women (3.2.5). The physical pilot will, in principle, become part of the corresponding utility assets, on behalf of the GKZ. Scaling-up of the pilot will be guided by the envisioned regional and national roadmaps (outputs 1.1.4 and 2.1.5).

The following outputs are envisioned to deliver this outcome:

3.2.1 Functional and technical specification of smart-grid components including digital automated metering, control, and communication systems prepared. Indicative target: one (1) detailed procurement report.

3.2.2 Procurement of smart-grid components and services for field trials and parameter verification in alignment with established technical standards. Indicative target: one or two (1-2) batches of minigrid equipment supplied for field and laboratory trials.

3.2.3 Implementation and testing of the DSM smart-grid business model in a virtual simulation environment for performance evaluation, sensitivity analysis, and learning purposes completed. Indicative targets: one (1) partnership agreement with host institute for research, capacity building, and implementation of the “digital twin” DSM smart grid; at least three (3) scenarios for DSM minigrid pilot simulated, tested, and reported; one (1) scientific report with system description, smart-grid performance assessment, sensitivity analysis, and discussion; and one (1) smart-grid technology course incorporated into sector curricula.

3.2.4 Assessment of DSM smart-grid business case for field implementation, including assessment of legal and financial risks completed. Indicative targets: one (1) summary report on DSM smart-grid performance (simulation) for policy makers; one (1) workshop/seminar for policy makers, utility managers, and experts from utilities and academia; and one (1) set of consolidated recommendations to support policy and regulatory process.

3.2.5. DSM smart-grid business model implemented by a regional electricity company (aggregator). Indicative targets: co-finance leveraged from public and private stakeholders; one (1) detailed project plan including

technical, social, financial, and management aspects; one (1) physical DSM smart-grid implemented and monitored in a selected target area.

Component 4. Knowledge Management and M&E

Outcome 4.1: KM and M&E activities have been prepared and implemented (GEF: US \$100,000; cofinance: US\$ 150,000). This component incorporates project activities related to Knowledge Management (KM) and Monitoring and Evaluation (M&E). It will prepare a KM plan, to be updated annually, indicating the products and events initiated or support by the project. The KM products will cover lessons learned and best practices on advancing gender equality and women's empowerment. The project will ensure women's participation in promotional events. The PMU shall engage with national stakeholders and the UN community to set a strategy for continuation of KM activities post-project.

This component further entails setting up the detailed M&E plan including indicator verification in the project inception phase. Project monitoring includes a systematic review of project approaches and activities on gender and social inclusion aspects during project inception phase, annual reviews, and on an as-needed basis. The M&E plan shall include gender-specific indicators. Gender expert services will be contracted to support the PMU on gender aspects including a periodic screening of proposed activities and project results (e.g. proposals, strategies, terms of reference). In response to the Gender Action Plan, this component will develop and implement a gender strategy as part of the Social and Environmental Safeguards (4.1.1).

This component will further prepare and deliver the Mid-term Review (MTR) and Terminal Evaluation (TE) and annual PIR reporting, shall report on the implementation of results, including the implementation of the Gender Action Plan and gender-specific results. The project will ensure a gender balance in evaluation teams, as well as the PMU and PSC (4.1.2).

This component encompasses the following outputs:

4.1.1 Knowledge building, sharing of experiences, and promotion among stakeholder groups, including through a gender lens, are facilitated. Indicative targets: one (1) KM plan prepared, implemented and updated; one (1) M&E plan prepared, implemented and updated; at least one (1) KM product delivered compiling lessons learned on technical, social inclusion, gender and women empowerment aspects, among others.

4.1.2 Project Mid-Term Review and Terminal Evaluation implementation and annual PIR reporting completed in a timely manner. Indicative targets: one (1) MTR conducted and reported; and one (1) TE conducted and reported.

Environmental and Social Benefits

Direct environmental benefits are created by avoided fossil fuel consumption in electric power plants as a result of reduced grid system imbalances and transmission losses. These benefits translate into reduced GHG emissions by Kazakhstan's electricity system, as well as avoided emission of pollutants (such as SO₂, NO_x, and soot). The organization of consumers into local smart-grids contributes to increased awareness about energy costs and rational use of energy. Financial incentives for peak-shaving and demand-shaving provide a basis for careful planning of demand, as well as the introduction of energy-efficiency (EE) and energy conservation (EC) measures and technologies. Such upgrades typically bring along additional benefits for industrial value chains including reduced water consumption and material use (resource efficiency), as well as enhanced competitiveness. Customer groups and industries may organize themselves to invest in distributed renewable energy (RE) power systems for local consumption, with positive impact on the

electricity grid. Moreover, end users such as households / small and medium enterprises may use renewable energy as well as battery storage system widely.

Gender

The Constitution of the Republic of Kazakhstan guarantees equality of rights and freedoms of all citizens and prohibits discrimination on the basis of gender. Kazakhstan is ranked 76th out of 146 nations in the World Economic Forum's (WEF) Gender Gap Report 2024, with a score of 0.710.^[1] The country scores high on the categories 'level of education' and 'survival and health'. Nevertheless, persistent gender imbalances remain, particularly as related to wages and access to employment and career opportunities.

The project aims to mainstream gender considerations into the financing, technical assistance, capacity building, and policy dialogue activities of the project. In alignment with UNDP and GEF principles and policies, the project will assure gender-sensitivity at all levels, seeking gender-responsive action where possible. The preliminary Gender Action Plan (see annex) provides a set of Gender Sensitive Actions to be undertaken for each output of the project under each of the four components and their corresponding outcomes. In addition, Gender Sensitive Indicators are proposed to measure and track progress on these actions, which will be integrated into the detailed M&E plan that will be developed during the inception phase of the project.

Knowledge Management

As the project seeks to build technical capacities and expertise with electric smart-grid technology, the transfer and management of knowledge is pivotal. Domestic expertise is limited and presumably best developed within KEGOC; a gap analysis shall provide better insight into the baseline situation. The Ministry of Energy, through the PSC, shall provide the necessary guidance and incorporate national knowledge partners into the project. The proposed development of a technical standard provides an appropriate platform to convoke key stakeholders and initiate a process of knowledge building and exchange. The project will facilitate the participation of foreign experts in the standards committee to speed up the learning curve. It is envisioned to assign a technical team to prepare and develop smart grid simulations and carry out field tests. This technical team will be composed of members from KEGOC and the selected regional electricity company, as well as experts from engineering institutes and universities, complemented with project consultants.

As part of annual planning, the Project team will update the Knowledge Management plan including the identification of specific activities and the assignment of tasks to key stakeholders, ensuring that knowledge and information is validated and shared, and made transparent. Special emphasis will be put on gender-mainstreaming in the context of knowledge management/sharing. The KM plan will be submitted to the PSC for review and approval. Through its Regional Hub, UNDP will leverage knowledge and expertise from its global CC project portfolio to speed up smart grid development in Kazakhstan.

Scalability and Innovation

The DSM smart-grid business concept is highly scalable. One smart grid can hold just a few large connections (for example an industrial park), but it can also contain a larger number of small consumers (such as a residential neighbourhood). Separate smart grids can be aggregated at a higher level, following the structure of the electric grid nodes. If provided with extensive metering options, consumers can form energy communities for sharing local surpluses to optimize utilization of the distribution grid. This functionality is further enhanced if RE generation, battery storage, and smart electric vehicle charging technologies are incorporated into the local smart-grid. The modularity of smart-grid technology provides

flexibility and scalability for project developers, allowing adjustment to local electricity demand profiles (in terms of demand volumes and flexibility), as well as the opportunities to access investment capital. The innovative character of smart-grid technology goes beyond hardware. The smart-grid business model is driven by customer data; moreover, the technical operation of a smart-grid relies on real-time information. The successful application of smart grids requires a utility perspective that departs from the customer demand side (rather than power supply). This is innovative for Kazakhstan and can set a new paradigm for grid design and operation in the country. The introduction of digital technology will thereby be an asset for accelerating the modernization of the national grid system, enabling near real-time operations and cost allocation and the application of more advanced infrastructure planning methodologies such as Integrated Resource Planning (IRP).

[1] <https://www.weforum.org/publications/global-gender-gap-report-2024/>

Coordination and Cooperation with Ongoing Initiatives and Project.

Does the GEF Agency expect to play an execution role on this project?

No

If so, please describe that role here. Also, please add a short explanation to describe cooperation with ongoing initiatives and projects, including potential for co-location and/or sharing of expertise/staffing

Detailed roles and responsibilities of the parties will be defined during the PPG phase, subject to capacity assessment, in consultation with the GEF focal point. (UNDP is not expected to play an execution role.) The project will be implemented under National Implementation Modality by the Committee of energy supervision and control of the Ministry of Energy. The following responsible parties (quasi state companies: International Green Technologies and Investment Projects Centre – 100% of the shares belong to the Ministry of Ecology and Natural Resources and the Situational analytical Centre of fuel and energy complex of the Republic of Kazakhstan – 100% of the shares belong the Ministry of Energy) plan to be engaged for the project implementation.

Core Indicators

Indicator 6 Greenhouse Gas Emissions Mitigated

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO₂e (direct)	13500	0	0	0
Expected metric tons of CO₂e (indirect)	74250	0	0	0

Indicator 6.1 Carbon Sequestered or Emissions Avoided in the AFOLU (Agriculture, Forestry and Other Land Use) sector

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO₂e (direct)				
Expected metric tons of CO₂e (indirect)				
Anticipated start year of accounting				
Duration of accounting				

Indicator 6.2 Emissions Avoided Outside AFOLU (Agriculture, Forestry and Other Land Use) Sector

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO₂e (direct)	13,500			

Expected metric tons of CO ₂ e (indirect)	74,250			
Anticipated start year of accounting	2030			
Duration of accounting	10			

Indicator 6.3 Energy Saved (Use this sub-indicator in addition to the sub-indicator 6.2 if applicable)

Total Target Benefit	Energy (MJ) (At PIF)	Energy (MJ) (At CEO Endorsement)	Energy (MJ) (Achieved at MTR)	Energy (MJ) (Achieved at TE)
Target Energy Saved (MJ)	256,500,000			

Indicator 6.4 Increase in Installed Renewable Energy Capacity per Technology (Use this sub-indicator in addition to the sub-indicator 6.2 if applicable)

Technology	Capacity (MW) (Expected at PIF)	Capacity (MW) (Expected at CEO Endorsement)	Capacity (MW) (Achieved at MTR)	Capacity (MW) (Achieved at TE)
Energy Storage	250.00			

Indicator 11 People benefiting from GEF-financed investments

	Number (Expected at PIF)	Number (Expected at CEO Endorsement)	Number (Achieved at MTR)	Number (Achieved at TE)
Female	10,400			
Male	9,600			
Total	20,000	0	0	0

Explain the methodological approach and underlying logic to justify target levels for Core and Sub-Indicators (max. 250 words, approximately 1/2 page)

Reducing electricity demand volumes (unit: Joule) and load capacities (unit: watt) triggers a chain of positive effects. These include: (1) direct energy savings implying resource efficiency, costs savings, and avoided GHG emissions; (2) reduced emission through lower T&D losses; (3) reduced need for investment in system upgrades and expansion; (4) reduced baseline energy consumption through better operation of the Unified Electric System; (5) increased flexibility allowing higher penetration levels of intermittent, renewable energy generators; (6) reduced risk of power outages and consequential economic losses; and (7) increased system resilience to extreme climate events. The benefits will vary according to the location of the DSM smart-grid, the profile of connected customers and the baseline status of the regional electric grid. An accurate quantification of benefits, and attribution thereof to DSM action, requires detailed technical and economic information about the local grid. Closing this information gap is one of the main purposes of this project, as it is a condition for establishing the business model. The above aspects will be further elaborate during the PPG phase and included in the Project Document.

Ignoring the consequential impacts, an initial estimate of expected benefits is as follows.

Direct benefits: The project envisions modelling and demonstrating a DSM smart-grid with a connected load of 50-MW. It is assumed that a capacity peak reduction of 10% can be achieved during approx. 500 hours per year. The corresponding energy savings are: $10\% \times 50 \text{ MW} \times 500 \text{ h/y} = 2,500 \text{ MWh}$ per year. While the project will target a cluster of mixed energy end-users, an indicative figure of 10-kW connection capacity is assumed per household. The number of direct beneficiaries is: $50 \text{ MW} / 10 \text{ kW} = 5,000$ households (approx. 20,000 individuals).

At a CO₂-intensity of the UES of 0.54-ton CO₂eq/MWh, the annual GHG emission reductions would be: $2,500 \text{ MWh/y} \times 0.54 \text{ tCO}_2\text{eq/MWh} = 1,350 \text{ tCO}_2\text{eq}$ per year. If implementation of the demonstration pilot would materialize by project mid-term, direct benefits during project duration would still accrue during approximately three (3) years. The resulting direct energy savings would be 7,500 MWh, and the associated GHG emission reductions 4,050 tCO₂eq. Assuming a 10-year impact horizon, the total

savings would be 25,000 MWh electricity and 13,500 tCO₂eq. The cost-effectiveness of the GEF grant would be US\$148 per tCO₂ avoided.

Indirect benefits: At a current generation capacity of 24.5 GW in Kazakhstan's UES, the upscaling potential for DSM is 500 times the 50-MW demonstration pilot size (top-bottom approach). A realistic upscaling scenario (bottom-up) assumes that a total of 250-MW load capacity will be developed into DSM smart grids through one or more aggregators, per year. After 10 years, the total load managed through DSM smart-grid technology would be 2,500-MW, with a load reduction potential of 10% (250 MW). In other words, after 10 years about 10% of the current grid capacity would have been transformed into smart grids with DSM capability. Assuming a linear growth of the DSM capacity added to the grid, the total energy savings over the 10-year period would be: 250 MW x 500 h/y x 10 y x 0.55 = 687,500 MWh (approx. 700 GWh over a 10-year period, or 70 GWh per year on average).

At the indicated CO₂-intensity of the national grid, the equivalent GHG emission reductions would be 371,250 tCO₂eq (0.37 Mt CO₂eq). Applying a GEF causality factor of 20% (including a baseline shift correction), the estimated indirect GHG emission reductions would be: 74,250 tCO₂eq. The corresponding number of beneficiaries would be 2,500 MW / 10 kW = 250,000 households: of the order of 1 million individuals. Considering direct and indirect benefits combined (87,750 tCO₂eq over a 10-year impact horizon), the cost-effectiveness of the GEF grant would be of the order of 23 US\$ per tCO₂eq avoided. The GEF causality factor is conservatively chosen (20%): while the GEF intervention is expected to have a very substantial impact on the technology transfer process (enabling Kazakhstan to make effective use of smart grid technology), the GEF project has limited influence on market development post-project. Key factors include finance for investment in DSM smart grid projects, the operationalization of relevant sector policies and investment plans, and confidence by all stakeholders in the DSM business model. The proposed GEF causality factor responds to this combination of factors. Core Indicator 11: Approx 20,000 direct beneficiaries (48% male, 52% female); and 1,000,000 indirect beneficiaries.

Key Risks

	Rating	Explanation of risk and mitigation measures
CONTEXT		
Climate	Low	Climate risks attributable to the project have not been identified. No mitigation measures are proposed.
Environmental and Social	Moderate	Social and environmental screening is prepared DSM might prioritize industries and wealthier districts, leaving others behind. This risk will be controlled through proper accountability enforcement and the integration of fairness principles into the operating terms for DSM aggregators. With respect to gender, the Project shall adhere to UNDP and GEF policies and avoid reproducing discriminatory patterns, ensuring women are targeted not only as beneficiaries but also promoted as leaders in the sector (see preliminary gender action plan).
Political and Governance	Low	The country and sector context and governance are deemed stable. Project outcomes aim to enhance sector governance.
INNOVATION		
Institutional and Policy	Substantial	Strategies and Policies: The approval process of proposals to address regulatory and finance barriers, may be sluggish and face political resistance. Deployment of DSM grids may therefore become delayed. This risk cannot be eliminated. To manage the risk, the project will establish an early and continuous policy dialogue with key government stakeholders and regulatory authorities. This might be complemented by the creation of an inter-

		ministerial working group to fast-track decision-making on DSM-related regulations and financial mechanisms, if need be.
Technological	Substantial	Technical design of project or program: There is a risk that the relevant stakeholders might be to some extent, reluctant to work together effectively, share know-how and build an eco-system. This risk is mitigated by design through the envisioned technical standard committee. The business case for DSM smart grids is currently not viable due to low prices offered for energy and capacity savings. This barrier is linked to systemic issues in national electricity market model. Vested interests may impede the creation of financial incentives for DSM grids, thereby delaying their adoption. While this risk cannot be eliminated, the project would seek high-level government support to address concerns from market players, if such a scenario occurs.
Financial and Business Model	Low	Macro-economic: The country and sector context and governance are deemed stable. The investment needs for smart grid technology are modest.
EXECUTION		
Capacity	Moderate	Institutional capacity for implementation and sustainability: MOE is the lead entity for the sector with strong convening power. It has demonstrated capacity to execute GEF projects ; UNDP will re-assess capacities prior to GEF CEO request submission.
Fiduciary	Moderate	Fiduciary: Financial Management and Procurement: MOE has a demonstrated track record; yet UNDP shall apply a due diligence process during the PPG phase as related to fiduciary and implementation capacity.
Stakeholder	Moderate	Several factors exist pushing this project to become overly top bottom: (1) focus on technological innovation; (2) centralized government tradition; and (3) challenges to identify and engage CSO. To mitigate this risk, the project shall duly prepare and implement stakeholder management plans. UNDP will develop and communicate a stakeholder engagement plan during the PPG phase (see brief summary of consultations for context on the engagement of CSOs and academia.)
Other	Moderate	The introduction of digital smart grid technology may face challenges due to data privacy regulation or cyber-security concerns. The project will integrate robust data protection and cyber-security measures from the design stage, aligning with national regulations and international best practices. Collaboration with the relevant regulatory authorities will ensure compliance with data privacy requirements, while capacity-building programs will strengthen the ability of utilities and system operators to manage digital and cybersecurity risks.
Overall Risk Rating	Substantial	The Project is relevant and likely to implement successfully the scheduled activities; SESP risks are low. However, the risk of not achieving impact within the foreseen time horizon is substantial, because policy and finance

		risks exist which are beyond control of the project. Logic: if at least one risk is deemed substantial, the overall project is rated as of substantial risk.
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C. ALIGNMENT WITH GEF-8 PROGRAMMING STRATEGIES AND COUNTRY/REGIONAL PRIORITIES

Describe how the proposed interventions are aligned with GEF- 8 programming strategies and country and regional priorities, including how these country strategies and plans relate to the multilateral environmental agreements.

Confirm if any country policies that might contradict with intended outcomes of the project have been identified, and how the project will address this.

For projects aiming to generate biodiversity benefits (regardless of what the source of the resources is - i.e., BD, CC or LD), please identify which of the 23 targets of the Kunming-Montreal Global Biodiversity Framework the project contributes to and explain how. (max. 500 words, approximately 1 page)

The project is aligned is aligned with the GEF-8 CCM strategy and programming guidelines. Specifically, it responds to the following objectives under CCM Pillar I “Promote innovation, technology development and transfer, and enabling policies for mitigation options with systemic impacts”: (1.1) Accelerate the efficient use of energy and materials; and (1.2) Enable the transition to decarbonized power systems. The project contributes to objective (1.1) through the envisioned electricity demand management of end-users (downstream). Contributions to objective (1.2) are delivered through the installation of decentralized RE power systems connected to the distribution grid. Upstream benefits are also created, as improved energy demand profiles strengthen electric system reliability and efficiency. The project delivers technological know-how and proposals for financing mechanisms, it provides policy and regulatory support and promotes access to global best practices for accelerating the deployment of digital smart grids in Kazakhstan, while considering climate risks and long-term sector resilience. The intervention targets technological innovation and fits into national strategies towards a power sector transformation in Kazakhstan to eliminate current inefficiencies and promote the integration of distributed clean energy technologies.

The Project is aligned with, and responds to the Development Strategy 2050 of the Republic of Kazakhstan^{[1]²⁶}, the Concept for the transition to a Green Economy,^{[2]²⁷} the National Development Plan 2050 of the Republic of Kazakhstan^{[3]²⁸}, the Green Economy Action Plan 2021-2030^{[4]²⁹}, and – as of 2023 – the Strategy of the Republic of Kazakhstan on Achieving Carbon Neutrality by 2060.^{[5]³⁰} These proposals contributes to the objective of the political transformation and economic reforms “Just Kazakhstan” to demonopolize economic sectors and diversify energy sources.^{[6]³¹}

Kazakhstan signed the Paris Agreement on 2 August 2016 (ratified 6 December 2016). The NDC commitments (15% unconditional GHG emission reduction by 2030) have been legally implemented through the Environmental Code (Art. 283, par 1).^{[7]³²} The introduction of smart grids is supported by the Environmental Code (Art. 113) which creates a basis for introducing best available technologies (BAT) aimed at reducing environmental and climate change impacts. The project is supportive to Kazakhstan’s NDC Roadmap (draft 2021-2025) which highlights the need for capacity building in support of decarbonization including research and ecosystem development for innovative energy technologies and digitalization. The introduction of smart grids fits into the approach to accelerate investment in green technologies to

reduce GHG emission reductions, which, in the context of high depreciation levels of current electricity sector assets, can be achieved at very limited (3.8%) additional costs. [8]³³ The proposal specifically contributes to the line of action “decarbonization of electric and thermal power generation” of Kazakhstan’s Carbon Neutrality Strategy 2060. [9]³⁴

Project contribution to the Sustainable Development Goals

The project directly contributes to the achievement of several SDGs, particularly those related to climate action, affordable and clean energy, and sustainable communities. By addressing environmental, energy, and development challenges, it supports national efforts toward inclusive and resilient growth.

Sustainable Development Goal		Project contribution
SDG-5	Achieve gender equality and empower all women and girls	Delivery of skills development and training, closing the information gap, ensuring women’s energy needs are adequately considered as part of demand-side interventions.
SDG-7	Affordable and Clean Energy	Implementation of cost-effective smart-grid technologies and distributed RE generation and energy storage technologies, leading to reduced overall costs of electricity supply in Kazakhstan.
SDG-11	Sustainable Cities and Communities	Upgrades of electricity distribution grids and development of consumer clusters through decentralized smart-grids, contribute to empowerment of urban citizens and other communities, promoting awareness on cost and environmental aspects of energy supply, while providing new business opportunities.
SDG-12	Responsible Consumption and Production	Adequate energy solutions improve user awareness, which generates additional environmental benefits and cost savings, and serves as a model to follow at the household level.
SDG-13	Climate Action	Smart grids combined with distributed RE generation, directly offset baseline fossil fuel GHG emissions (mitigation) and are an asset for building a more decentralized and resilient power system in Kazakhstan, which fits into adaptation strategies to climate change.

[1] Statement of the President of the Republic of Kazakhstan dated 14 December 2012

[2] Presidential Decree of the Republic of Kazakhstan #577 dated 30 May 2013

[3] Presidential Decree of the Republic of Kazakhstan #636 dated 15 February 2018

- [4] Enactment of the Government of the Republic of Kazakhstan #479 dated 29 July 2020
- [5] Decree of the President of the Republic of Kazakhstan of 2 February 2023 No. 121
- [6] Decree of the President of the Republic of Kazakhstan # 2 dated 26 November 2022.
- [7] Updated Nationally Determined Contribution of the Republic of Kazakhstan, approved Decree 313, 19 April 2023, unofficial translation, p. 4.
- [8] Carbon Neutrality Strategy 2060, par. 3.2
- [9] Carbon Neutrality Strategy 2060, par. 3.3.1.1. Specifically, “the development of small-scale RES and smart power”.

D. POLICY REQUIREMENTS

Gender Equality and Women’s Empowerment:

We confirm that gender dimensions relevant to the project have been addressed as per GEF Policy and are clearly articulated in the Project Description (Section B).

Yes

Stakeholder Engagement

We confirm that key stakeholders were consulted during PIF development as required per GEF policy, their relevant roles to project outcomes and plan to develop a Stakeholder Engagement Plan before CEO endorsement has been clearly articulated in the Project Description (Section B).

Yes

Were the following stakeholders consulted during project identification phase:

Indigenous Peoples and Local Communities:

Civil Society Organizations: Yes

Private Sector: Yes

Provide a brief summary and list of names and dates of consultations

Gender: Women experts are to be included into Project Board steering committee; , the capacity building will be targeting ed women engineers and technicians; as well at least 40% of the targeted group are expected to be a women expert. Please also refer to the preliminary gender analysis and action plan presented as an annex to this document.

Stakeholder Engagement:

Provide a brief summary and list of names and dates of consultations.

The development of the PIF concept was shaped by an iterative consultation process primarily involving the focal persons at the Ministry of Energy and the Ministry of Ecology and Natural Resources, complemented by meetings with interested electric utilities, International Green Technologies and

Investment Projects Centre and the Situational analytical Centre of fuel and energy complex of the Republic of Kazakhstan. The national association of energy sector businesses (Kazenergy) provided technical inputs and liaison with sector stakeholders through a national expert, who was guided by an international expert in GEF project formulation, both convening through the UNDP office in Kazakhstan. Team meetings and dialogue with national stakeholders during 2025 was mostly done remotely. This modality was preferred given the large distances within Kazakhstan making physical meetings more difficult and costly to arrange. The PIF proponents are aware that this modality restrained the opportunities to extend stakeholder engagement beyond the Government partners and the electricity sector itself.

Moreover, it must be stressed that the Republic of Kazakhstan is a transition economy with a persistent domination of state-owned enterprises (SOE) in the economy, in particular the energy sector. Centralization of decision-making is thus more conducive for top-down policy and program design, rather than for shaping grass-root initiatives. The current PIF demands a more customer-oriented, and customer-data driven, electricity service (which requires understanding societal and private sector end-users); while the sector paradigm and mindset is still supply-driven. As such, consultation with private sector and CSO's during the PIF phase has largely been indirect (through Kazenergy and its members). Beyond the technical aspects of smart grids, the required change in perspective is certainly disruptive; this GEF project aims to contribute to this process through transformative action. Cognizant of this challenge, UNDP will develop and communicate a stakeholder engagement plan at the very start of the PPG phase, seeking a structured approach in widening circles:

(1) Government of Kazakhstan (GKZ). Departing from current engagement with MOE and MENR, the PPG will raise awareness that the GEF project also relates to other sectoral policies including technology and innovation, regional planning and economic development, and finance. Anticipating a multi-disciplinary approach towards smart-grid policy and regulation, UNDP - through its national partners – will identify focal persons within relevant GKZ entities to provide input for design of the GEF project. At a later stage, this approach shall facilitate validation of the Project Document before submission for GEF endorsement.

(2) Electricity end-users from industry and society (CSO). This stakeholder group is prioritized because: (1) UNDP is aware that engagement with these groups during PIF was limited due to the challenges outlined above. Information voids need to be covered, and interventions related to inclusion and gender will be hard to define without meaningful engagement and understanding of specific circumstances; (2) High-ranking of non-public stakeholders sends a clear and immediate signal to the project partners that DSM smart-grids cannot be achieved through a business-as-usual approach. Shaping the Stakeholder Engagement Plan in close dialogue with the GKZ will therefore be a priority activity during start-up of the PPG phase. The project can draw on UNDP KZ's long-term experience working with and beyond the electricity sector to compile a preliminary list of relevant stakeholders (CSO, private end-users, women groups) for consideration by the government. The buy-in from GKZ partners will be critical as a starting point for further outreach and shall be considered an important milestone in the PPG process.

(3) Academia. Several entities have been identified: (i) the Kazakh National Technical University (KazNTU)^{[1]³⁵}, which can perform a support role through applied research, testing and technical advisory services; (ii) The L.N. Gumilyov Eurasian National University (ENU)^{[2]³⁶}, with competences in the field of energy system

modelling and workforce training; and (iii) the Kazakh-British Technical University (KBTU)[3]³⁷, which can support innovation and capacity building. The PPG will carry out a mapping exercise of academic and technology institutions and perform a quick scan of relevant curricula to identify one or more candidate entities for hosting the digital simulation environment, ideally through a long-term partnership with GKZ and KEGOC focused on continuous education and applied research in the field of smart grids.

(4) National grid operator (KEGOC), selected electric utilities, and regional authorities (akimats). The electricity sector entities are natural stakeholders for the GEF project with some of them having demonstrated interest in DSM solutions. Based on an initial scoping of opportunities for DSM smart-grids involving GKZ and KEGOC, supported with inputs provided by the PPG team, one or more regions will be prioritized. Subsequently, the regional electricity companies, and akimats will be identified and engaged.

(5) For each region, the PPG will prepare an initial mapping of local stakeholders, including private sector (industrial parks, local investors), CSO's, and women groups. The information will be used for updating the SESP and forthcoming ESMF and management plans. The mapping will provide a starting point for effective engagement with electricity consumers and other stakeholders during project implementation.

[1] <https://satbayev.university/en>

[2] <https://www.enu.kz/en/>

[3] <https://kbtu.edu.kz/en/>

Stakeholder engagement PIF development		
Date	Stakeholder	Venue
January 5, March 10, April 15, May 20, July 15 2025	Ministry of Energy	At ministry location - 5 meetings with the Ministry as a beneficiary of the project - to develop the PIF. Needs, priorities and investment plans were discussed during the series of meetings.
Dec 10, 2024 – May 5, 10, 2025	Ministry of Ecology and Natural Resources (MENR)	At the ministry location (three joint meetings) – OFP consultations
May 5, 2025	The Kazakhstan Electricity Association (KEA)	At the association location – discussed the PIF concept
August, 25 2025	Four electric utilities: JSC 'Alatau Zharyk Kompaniyasy', TOO 'Mezhregionenergotransit', Ontustik Zharyk Transit LLP, LLP 'Karagandy Zharyk' The Kazakhstan Electricity Association (KEA)	Virtual meeting (Kazakhstan)

(Please upload to the portal documents tab any stakeholder engagement plan or assessments that have been done during the PIF development phase.)

Private Sector

Will there be private sector engagement in the project?

Yes

And if so, has its role been described and justified in the section B project description?

Yes

Environmental and Social Safeguard (ESS) Risks

We confirm that we have provided indicative information regarding Environmental and Social risks associated with the proposed project or program and any measures to address such risks and impacts (this information should be presented in Annex D).

Yes

Overall Project/Program Risk Classification

PIF	CEO Endorsement/Approval	MTR	TE
Medium/Moderate			

E. OTHER REQUIREMENTS

Knowledge management

We confirm that an approach to Knowledge Management and Learning has been clearly described in the Project Description (Section B)

Yes

ANNEX A: FINANCING TABLES

GEF Financing Table

Indicative Trust Fund Resources Requested by Agency(ies), Country(ies), Focal Area and the Programming of Funds

GEF Agency	Trust Fund	Country/ Regional/ Global	Focal Area	Programming of Funds	Grant / Non- Grant	GEF Project Grant(\$)	Agency Fee(\$)	Total GEF Financing (\$)
UNDP	GET	Kazakhstan	Climate Change	CC STAR Allocation: CCM- 1-1	Grant	2,185,100.00	207,584.00	2,392,684.00
Total GEF Resources (\$)						2,185,100.00	207,584.00	2,392,684.00

Project Preparation Grant (PPG)

Is Project Preparation Grant requested?

true

PPG Amount (\$)

100000

PPG Agency Fee (\$)

9500

GEF Agency	Trust Fund	Country/ Regional/ Global	Focal Area	Programming of Funds	Grant / Non- Grant	PPG(\$)	Agency Fee(\$)	Total PPG Funding(\$)
UNDP	GET	Kazakhstan	Climate Change	CC STAR Allocation: CCM-1- 1	Grant	100,000.00	9,500.00	109,500.00
Total PPG Amount (\$)						100,000.00	9,500.00	109,500.00

Please provide justification

Sources of Funds for Country Star Allocation

GEF Agency	Trust Fund	Country/ Regional/ Global	Focal Area	Sources of Funds	Total(\$)
UNDP	GET	Kazakhstan	Climate Change	CC STAR Allocation	2,402,184.00
UNDP	GET	Kazakhstan	Land Degradation	LD STAR Allocation	99,999.50
UNDP	GET	Kazakhstan	Biodiversity	BD STAR Allocation	0.50
Total GEF Resources					2,502,184.00

Indicative Focal Area Elements

Programming Directions	Trust Fund	GEF Project Financing(\$)	Co-financing(\$)
CCM-1-1	GET	2,185,100.00	18020000
Total Project Cost		2,185,100.00	18,020,000.00

Indicative Co-financing

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Investment Mobilized	Amount(\$)
Recipient Country Government	Ministry of Energy	In-kind	Recurrent expenditures	3250000
Recipient Country Government	KEGOC	Public Investment	Investment mobilized	14500000
GEF Agency	UNDP	In-kind	Recurrent expenditures	150000

GEF Agency	UNDP	Grant	Recurrent expenditures	120000
Total Co-financing				18,020,000.00

Describe how any "Investment Mobilized" was identified

Co-financing identified at the PIF stage includes in-kind support from the Government of Kazakhstan (GKZ) and public investment in smart-grid infrastructure by KEGOC and one or more regional electricity companies (REC).

ANNEX B: ENDORSEMENTS

GEF Agency(ies) Certification

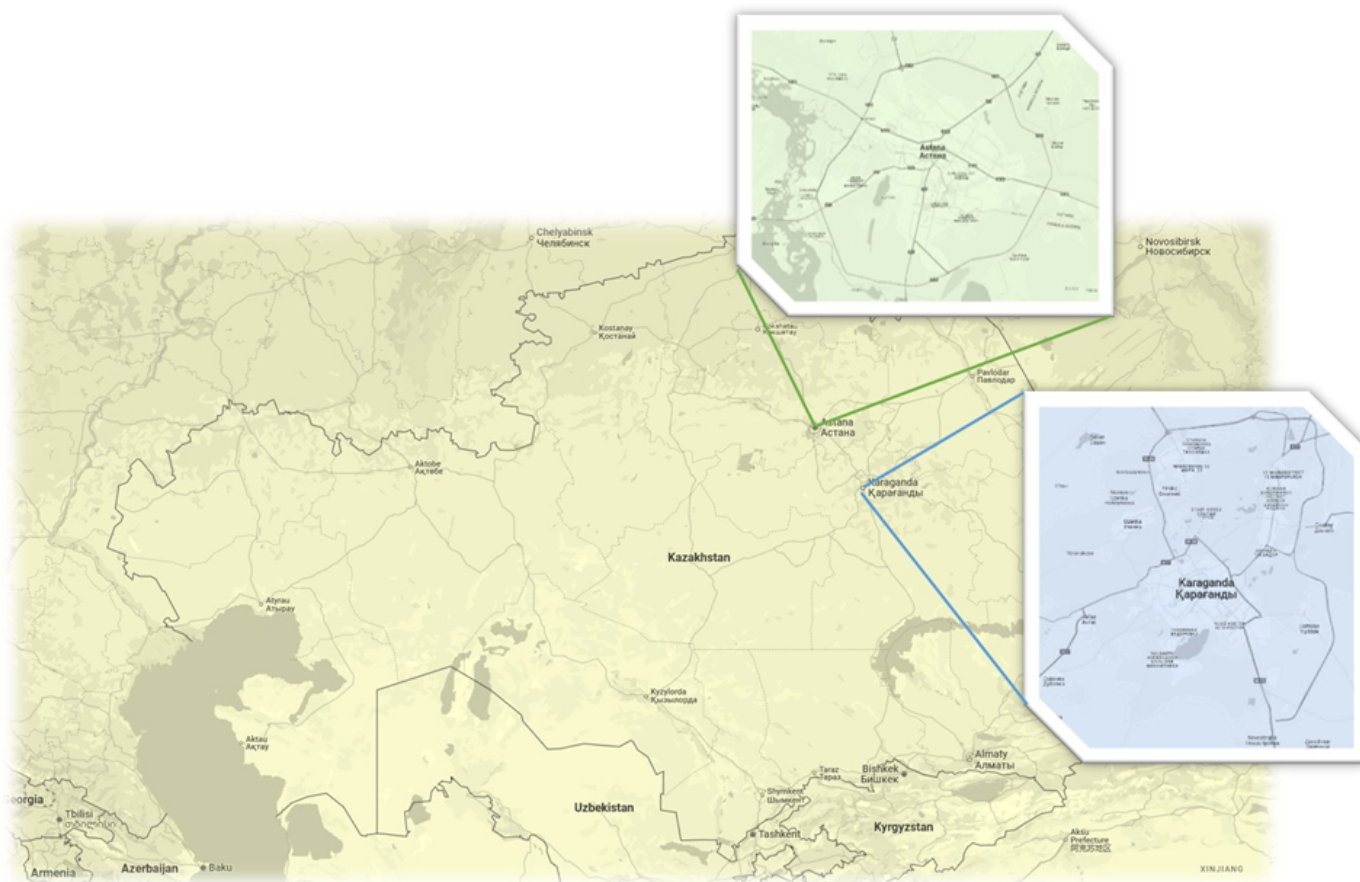
GEF Agency Type	Name	Date	Project Contact Person	Phone	Email
GEF Agency Coordinator	Ms. Nancy Bennett	10/9/2025	Ms. Jana Koperniech		jana.koperniech@undp.org

Record of Endorsement of GEF Operational Focal Point (s) on Behalf of the Government(s):

Name	Position	Ministry	Date (MM/DD/YYYY)
Yerlan Nyssanbayev	Minister and National Coordinator of GEF	Ministry of Ecology and Natural Resources of the Republic of Kazakhstan	1/29/2026

ANNEX C: PROJECT LOCATION

Please provide geo-referenced information and map where the project interventions will take place



Upstream project interventions in principle benefit the entire territory of Kazakhstan, located in a rectangle between the latitudes: 55°26'36.8"N and 40°34'06.9"N; and meridians: 46°29'03.4"E and 87°18'57.7"E.

Downstream activities including demonstration pilots with regional utilities and energy consumers are envisioned to take place in:

- 1) Astana City, which comprises the area around geographical location: 51°09'42.3"N, 71°25'20.4"E (green area on the map); and:
- 2) The area around Karaganda in the Region with the same name, around location: 49°48'04.6"N, 73°05'22.6"E (blue area on the map).

These indicative project locations will be assessed during the PPG phase. A final decision where to execute field projects will be taken during project execution and based on a due diligence process.

ANNEX D: ENVIRONMENTAL AND SOCIAL SAFEGUARDS SCREEN AND RATING

(PIF level) Attach agency safeguard screen form including rating of risk types and overall risk rating.

Title

10318_UNDP_KZ_SmartGrid_PreSESP_5 SEPTEMBER

ANNEX E: RIO MARKERS

Climate Change Mitigation	Climate Change Adaptation	Biodiversity	Land Degradation
Principal Objective 2	No Contribution 0	No Contribution 0	No Contribution 0

ANNEX F: TAXONOMY WORKSHEET

Level 1	Level 2	Level 3	Level 4
Influencing models			
	Transform policy and regulatory environments		
	Demonstrate innovative approaches		
Stakeholders			
	Private Sector		
		Capital providers	
		Large corporations	
	Beneficiaries		
	Civil Society		
		Academia	
	Type of Engagement		
		Partnership	
		Participation	
Capacity, Knowledge and Research			
	Innovation		
	Knowledge and Learning		
		Knowledge Management	
		Innovation	
		Capacity Development	
		Learning	
Gender Equality			
	Gender Mainstreaming		
		Gender-sensitive indicators	
	Gender results areas		
		Participation and leadership	
		Access to benefits and services	
Focal Areas/Theme			
	Climate Change		
		Climate Change Mitigation	
			Energy Efficiency
			Technology Transfer
			Renewable Energy