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A. Objectives and project timeline
Why a CAREC Energy Investment Outlook?

- Energy infrastructure investment needs of the CAREC region (excluding PRC) in 2020–2030 are estimated to be at least $400 billion. Currently, only about a quarter of the needed investment level is available and about two-thirds of investments are public sector investments.

- Therefore, creating enabling conditions for crowding in private and commercial capital is needed to relieve the growing pressure on government budgets.

- However, potential investors currently lack reliable and comprehensive knowledge of energy market trends and investment opportunities.

- The CAREC Energy Investment Outlook will provide the first comprehensive source of information for potential investors to understand the energy landscape of Central Asia, its likely future development and related investment opportunities.
Energy landscape of CAREC is changing rapidly with multiple moving parts – Potential investors lack comprehensive overview

Investors struggle to grasp and follow all moving parts in a rapidly changing energy landscape

**Emergence of new technologies**

New technologies continue to emerge in the global and regional energy landscape, promising to provide cheaper and sustainable alternatives to traditional fuels

**Incomplete and scattered data**

Even if investors are willing to analyze multiple sources, only limited information is available on recent energy trends and investments needs in CAREC

**Infrastructure condition**

Energy infrastructure in many CAREC countries is outdated and in dire need of modernization and innovation in order to ensure security of supply

**Rising energy demand**

Rapid economic growth across CAREC is accompanied with higher energy demand from industry, residents and service sector

**Environmental awareness**

CAREC, whose members are vulnerable to the effects of climate change, is becoming increasingly aware of the environmental challenges and the need of urgent actions

**Regulatory reforms**

Many CAREC members have shown strong ambition in advancing regulatory framework towards liberalization, one of the key factors for potential investors

Source: CAREC; Roland Berger

Roland Berger in cooperation with ILF
CAREC Energy Investment Outlook 2030 will be a landmark publication and important data source for investors and officials.

Key features of Energy Investment Outlook 2030

<table>
<thead>
<tr>
<th>Objective</th>
<th>The Outlook will be a unique new source of information for investment decision making and critical insights into regional market trends</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>By providing data and enhancing transparency, the Outlook will stimulate much needed energy infrastructure investments in member countries</td>
</tr>
<tr>
<td></td>
<td>It will also provide information and recommendations to decision-makers to support their efforts in attracting investments</td>
</tr>
</tbody>
</table>

| Development | The Outlook will be developed on a horizon to 2030 and will be published in early 2022 |

| Beneficiaries | Regional and international investors |
|              | CAREC member countries decision makers |

Project results

- The Outlook, including:
  - Energy Demand & Supply Outlook
  - Priority Energy Technologies Outlook
  - Carbon Emissions Outlook
  - Energy Investment Outlook

Enhanced cooperation across CAREC region

Source: CAREC; Roland Berger
Apart from three key CAREC meetings, we will schedule bilateral interactions to align on forecasts before Outlook publication in 2022.

Overview of preparation process and future meetings

<table>
<thead>
<tr>
<th>Date</th>
<th>Key CAREC Meetings</th>
<th>Bilateral interactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 28th</td>
<td>Working Group &amp; Task Force Meetings</td>
<td></td>
</tr>
<tr>
<td>June 10th</td>
<td>Energy Sector Coordinating Committee Meeting</td>
<td>Bilateral meetings with representatives of each country will be scheduled in summer and autumn to align on forecasts and discuss key drivers and assumptions</td>
</tr>
<tr>
<td>October 12th</td>
<td>Energy Investment Forum</td>
<td></td>
</tr>
<tr>
<td>February 2022</td>
<td>Publication of the Outlook</td>
<td></td>
</tr>
</tbody>
</table>

Source: CAREC; Roland Berger
B. Proposed Structure of the Outlook
The Outlook will provide assessment of CAREC energy system from various angles and probe its potential future until 2030 via 3 scenarios

General approach and methodology

The Outlook will **project energy system in CAREC and its member countries until 2030 from various angles.** The starting point of our approach will be **forecast of energy demand** based on key drivers (e.g. GDP, population) and changes in efficiency, considering also country-specific historical trends. Projected demand will be matched with energy supply by fuel type, allowing us to calculate resulting carbon footprint based on combustion emission factors. Finally, the investment needs in each country will be forecasted based on improvements in the energy systems required to secure supply until and beyond 2030.

While the future cannot be predicted in principle, preparing scenarios is useful to explore potential developments and evaluate implications. Following this logic, the forecasts will be united in three scenarios:

- **Business-as-usual** scenario assumes continuation of current trends and policies
- **Government commitments** scenario assumes adoption of policies to meet efficiency and climate change targets
- **Green growth** scenario assumes more rapid regulatory and technological change

Scenarios will contain different assumptions in terms of energy efficiency, fuel and technology shifts etc, which will be discussed with country representatives to ensure relevance of the results.

Furthermore, we will qualitatively assess energy technology based on country-specific context, energy priorities and global shifts. Complemented with an analysis of barriers to private investments and potential levers to address them, the Outlook will provide a comprehensive view on energy system in CAREC until 2030.
First part of the Outlook will contain perspective on energy in CAREC overall, followed by eleven country-specific sections.

Table of contents of the Outlook

**Introduction and executive summary**

**Part I. CAREC level**

1. CAREC at glance
2. Supply and demand Outlook
   - 2.1. Historic overview
   - 2.2. Supply and demand forecast 2030
3. Technology Outlook
   - 3.1. Global technology trends
   - 3.2. Development of technologies in CAREC
4. Carbon emissions Outlook
5. Investment Outlook
   - 5.1. Global investment trends
   - 5.2. Challenges and opportunities in CAREC
   - 5.3. Energy investment needs
   - 5.4. Role of IFIs

**Part II. Country level (x11)**

1. Country at glance
2. Supply and demand Outlook
   - 2.1. Historic overview
   - 2.2. Supply and demand forecast 2030
3. Technology Outlook
   - 3.1. Policy and regulatory framework analysis
   - 3.2. Priority technologies
4. Carbon emissions Outlook
5. Investment Outlook
6. Policy recommendations

*Aggregated view on the entire CAREC region*

*Deep-dive for each CAREC member country*

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Source: Roland Berger
Supply and Demand section will focus on projecting energy balances under three scenarios at CAREC-aggregated and country-levels.

Key elements of Supply and demand Outlook

1. CAREC/ Country at glance
2. Supply and demand Outlook
3. Technology Outlook
4. Carbon emissions Outlook
5. Investment Outlook

Supply and demand

- Analysis of historic data on energy supply and demand ✓ ✓
- Forecast of energy demand until 2030 per fuel type (coal, oil products, natural gas, electricity and other) and sector (industry, transport, residential and services) under 3 scenarios ✓ ✓
- Forecast of primary energy supply until 2030 per fuel type (coal, oil products, natural gas, renewable sources and other) under 3 scenarios ✓ ✓
- Forecast of energy efficiency development until 2030 under 3 scenarios ✓ ✓

Source: Roland Berger
Technology section will contain overview of trends and modern energy technologies, case studies and country-specific priorities

Key elements of Technology Outlook

<table>
<thead>
<tr>
<th>Section of the Outlook</th>
<th>Technology</th>
<th>CAREC level</th>
<th>Country level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. CAREC/ Country at glance</td>
<td>Analysis of global technology trends</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>2. Supply and demand Outlook</td>
<td>Overview of key energy transition technologies and their development until 2030</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>3. Technology Outlook</td>
<td>Definition of priority energy technologies in order to reach NDC, other national targets and policies</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>4. Carbon emissions Outlook</td>
<td>Case studies of innovative energy technologies in CAREC with derived lessons learned for regional peers</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>5. Investment Outlook</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Roland Berger
Forecasts of energy-related carbon emissions will be supplemented by the analysis of drivers and implications for NDCs' targets.

Key elements of Emissions Outlook:

1. CAREC/ Country at glance
2. Supply and demand Outlook
3. Technology Outlook
4. Carbon emissions Outlook
5. Investment Outlook

Carbon emissions:

- Definition of carbon emission drivers related to energy [CAREC level]
- Forecast of carbon emission resulting from the combustion of energy sources under 3 scenarios [CAREC level, Country level]
- Analysis of scenario implications regarding achieving targets set in NDCs of the Paris Agreement [CAREC level, Country level]
Investment section will focus on assessing investments needs as well as key trends, role of IFIs and case studies on private investments.

### Key elements of Investment Outlook

<table>
<thead>
<tr>
<th>Section of the Outlook</th>
<th>CAREC level</th>
<th>Country level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment Forecast of energy investment needs until 2030 under 3 scenarios</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Analysis of global energy investment trends as well as challenges and opportunities in CAREC</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Definition of IFI's role in energy investments</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Case studies of private sector investments in modern energy infrastructure in CAREC and lessons learned</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

**Source:** Roland Berger
Three scenarios have been defined to assess development under various policy measures and subsequent energy mixes

### Overview of forecast scenarios

<table>
<thead>
<tr>
<th>Description</th>
<th>1 Business-as-usual (BAU)</th>
<th>2 Government commitments</th>
<th>3 Green growth</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>&gt; Projected energy supply and demand with current energy system and policies, including COVID-19 impact and post-COVID recovery trajectory</td>
<td>&gt; Projected energy supply and demand considering individual priorities &amp; pledges of CAREC governments (incl. CO₂ emissions according to NDCs and other national plans)</td>
<td>&gt; Energy &amp; supply demand under enhanced environmental policies vs the ones pledged by the countries, considering increased energy efficiency and, generally, an accelerated economic development</td>
</tr>
<tr>
<td><strong>Forecasting approach</strong></td>
<td>&gt; Forecast is based largely on the historical energy supply and demand mix</td>
<td>&gt; The existing energy mix is adjusted to reflect shifts in energy policy, i.e., individual country priorities, national commitments through NDCs</td>
<td>&gt; The existing energy mix is significantly adjusted to meet the higher levels of national commitments (if both conditional or unconditional pledges are available) or more optimistic targets vs the pledges</td>
</tr>
<tr>
<td></td>
<td>&gt; Slight adjustments that account for existing deployment plans of energy generating assets</td>
<td>&gt; Rising environmental awareness among consumers</td>
<td>&gt; Stronger environmental awareness among consumers</td>
</tr>
</tbody>
</table>

### Expected investments

- **Low**
- **High**

Source: Roland Berger
Several key assumptions will be considered to develop the Outlook along the three defined scenarios

Zoom-in on the forecasting approach for scenarios – Main assumptions

<table>
<thead>
<tr>
<th></th>
<th>Business-as-usual (BAU)</th>
<th>Government commitments</th>
<th>Green growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic growth</td>
<td>Economic growth forecast by major international institutions (e.g., Oxford Economics)</td>
<td>Accelerated economic development vs forecast by major international institutions</td>
<td></td>
</tr>
<tr>
<td>Energy efficiency</td>
<td>Limited energy efficiency increase, mostly derived from technology advancement</td>
<td>Noticeable energy efficiency increase, both in transformation processes &amp; consumers</td>
<td>Significant energy efficiency increase, both in transformation processes &amp; consumers</td>
</tr>
<tr>
<td>Shifts in the energy mix</td>
<td>Limited shifts in the energy mix, mostly continuing the current split of fuels</td>
<td>Moderate shifts in the energy mix, by incorporating renewable sources and/or transitional fuels</td>
<td>Advanced shift in the energy mix, with higher envisaged role of renewable sources</td>
</tr>
<tr>
<td>Carbon emissions</td>
<td>Highest carbon emissions, as effect of limited actions undertaken in the energy sector</td>
<td>Noticeable carbon emissions decrease</td>
<td>Significant decrease of carbon emissions, considering also enhanced economic activity</td>
</tr>
</tbody>
</table>

1) Other factors like population, degree of access to power & natural gas grid or COVID-19 to be considered as assumptions, while in terms of outputs investments will also be a key dimension
2) Dependent on country-specific natural resources and limitations

Source: Roland Berger
Developed on CAREC and country levels, the Outlook will assess future energy system until 2030 along four key dimensions

Summary of the Outlook approach and structure

The Outlook, prepared on the horizon of 2030, will reflect a range of potential developments of energy system in CAREC via 3 scenarios (BAU, Government commitments and Green growth). Scenarios assume varying level of policy and regulatory advancements until 2030 and of resulting technology shifts and energy efficiency. The assumptions used in preparation of forecasts will be discussed with representatives of member countries.

Energy system will be analyzed on two levels: CAREC (aggregated view for all members) and Country (deep-dive for each member country). Analysis on both levels will be conducted along the same four key dimensions: supply and demand, technology, carbon emissions and investments.

Supply and demand Outlook will investigate future energy balances in CAREC overall and each country, focusing on supply and demand as well as energy efficiency.

Technology Outlook will shed light on global trends in energy technology, leading energy technologies in CAREC. It will also outline priority technology for each country in meeting their security and sustainability goals.

Carbon emissions Outlook will assess carbon footprint resulting from combustion of energy sources and implications towards meeting various climate change targets.

Investment Outlook will identify investment requirements in each country as well as global trends in energy investments, complemented by the case studies of private sector investments in CAREC and role of IFIs.

Source: Roland Berger
C. Snapshots of the Outlook: an early glimpse into the content
First part of the Outlook will contain perspective on energy in CAREC overall, followed by eleven country-specific sections.

Table of contents of the Outlook

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   5.3. Energy investment needs
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Aggregated view on the entire CAREC region

**Part II. Country level (x11)**

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   3.2. Priority technologies
4. Carbon emissions Outlook
5. Investment Outlook
6. Policy recommendations

Deep-dive for each CAREC member country

Source: Roland Berger
In the Demand and Supply section, inter alia, various scenarios of primary energy supply until 2030 will be considered.
Technology Outlook will investigate future development of main energy technologies and, inter alia, overarching global trends.

Snapshot of the Outlook (2/6)

Section of the Outlook

Part I. CAREC level

1. CAREC at glance

2. Supply and demand Outlook

3. Technology Outlook

4. Carbon emissions Outlook

5. Investment Outlook

Content illustration: Global energy technology trends

Overview of main global energy trends

- **Renewable energy**
  - Tumbling of the energy costs from wind and solar will continue in this decade.
  - Renewables, in particular solar, will become the cheapest energy source, also boosted by wider adoption of carbon prices.
  - Renewables will achieve a prominent role in energy system at the expense of carbon-heavy fuels, especially coal.

- **Alternative fuels / Hydrogen**
  - Hydrogen and hydrogen-based fuels have emerged as alternative fuel due to significant interest from political and business stakeholders.
  - Hydrogen can be burned without harmful emissions and has a considerable potential to replace fossil fuels.
  - In combination with CCUS¹, blue hydrogen can be produced from natural gas; existing gas infrastructure can be potentially adopted for the transportation of blue hydrogen.

- **Electrification**
  - Direct consumption of coal and oil products is expected to be gradually replaced by electricity across sectors, especially transportation.
  - Natural gas is likely to play a role of transitional fuel due to its lower carbon footprint.
  - Considering the essential role of renewable sources in the future, main enablers of broad electrification are optimization of batteries and balancing technologies.

- **Carbon capture, utilization and storage**
  - Despite being at an early adoption stage, CCUS already allows to remove and safely store CO₂ emissions from industrial and power plants.
  - CCUS will be essential to decarbonization of power sector and heavy industry.
  - Expansion and commercial viability will depend on carbon prices.
  - In the long term, CCUS is likely to evolve into capturing of CO₂ directly from air.

- **Digitalization**
  - Digitalization is expected to unlock a new dimension of energy automation and control, leading to higher efficiency.
  - Smart grids are projected to be a centerpiece of future energy infrastructure as advanced metering will enable interconnections to smart cities, smart mobility solutions etc.
  - Improved data availability as a result of digitalization will likely foster innovation further.

Global trends shaping long-term future of energy

¹ Carbon capture, utilization and storage

Source: Roland Berger
Multiple case studies on private sector investment in modern energy technologies in CAREC will be analyzed to derive key takeaways.

Snapshot of the Outlook (3/6)

Section of the Outlook

Part I. CAREC level

1. CAREC at glance
2. Supply and demand Outlook
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5. Investment Outlook

Content illustration: Investment case study

100 MW large scale solar power plant in central Uzbekistan

Project description
As part of the Government’s strategy to develop up to 5 GW of solar power by 2030, state-owned Uzbekenergo JSC awarded UAE-based developer Masdar (part of Mubadala) the contract to develop Uzbekistan’s first large-scale PV plant with a capacity of 100 MW. Located in Navoi region, the plant will be commissioned in 2021. The bid price was USD 0.027/kWh, one of the lowest bid for PV in emerging markets.

<table>
<thead>
<tr>
<th>Project details</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Main shareholders/developer</td>
<td>Uzbekenergo JSC, Masdar (developer, financier, operator)</td>
</tr>
<tr>
<td>Other promoters</td>
<td>Financing by ADB, IFC and EBRD, transaction advisory by IFC, technical assistance by the World Bank, the Governments of Austria, the Netherlands and Switzerland</td>
</tr>
<tr>
<td>Operational model</td>
<td>Public Private Partnership (PPP) with a 25 year duration</td>
</tr>
<tr>
<td>Output</td>
<td>100 MW</td>
</tr>
<tr>
<td>Tender/bid procedure</td>
<td>Competitive tender (23 bids received)</td>
</tr>
<tr>
<td>Winning bid/ energy tariff [USD/kWh]</td>
<td>USD 0.027 per kWh (lowest bid for large scale solar in emerging markets)</td>
</tr>
<tr>
<td>Regulations/framework</td>
<td>Power purchase agreement &amp; govt support agreement</td>
</tr>
<tr>
<td>Approximate cost</td>
<td>USD 100 m</td>
</tr>
</tbody>
</table>
Investment Outlook will also examine role of IFIs in advancing energy systems in CAREC, e.g., available instruments

Snapshots of the Outlook (4/6)

<table>
<thead>
<tr>
<th>Part I. CAREC level</th>
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<tbody>
<tr>
<td>1. CAREC at glance</td>
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<tr>
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</tr>
<tr>
<td>3. Technology Outlook</td>
</tr>
<tr>
<td>4. Carbon emissions Outlook</td>
</tr>
</tbody>
</table>

5. Investment Outlook

Section of the Outlook

<table>
<thead>
<tr>
<th>Illustrative</th>
</tr>
</thead>
</table>

Content illustration: Role and instruments of IFIs

<table>
<thead>
<tr>
<th>Instruments utilized by IFIs</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Equity / Direct investments** | - IFIs provide developmental support and long-term growth capital by making equity investments  
- Investment size is usually between 5 and 20 percent of company's equity |
| **Guarantees / Insurance** | - IFIs guarantee payments for the principal and interest on debt issuance (up to certain percentage) under new or existing loan portfolios in case the borrowers do not pay |
| **Grants** | - IFIs often provide grants for interest or technical assistance  
- The allocated grant funds are generally concessional |
| **Loans** | - IFIs provide initial funding for the projects by giving loans under favorable conditions (low interest rate and relatively long repayment period); loans can be also given in local currency |
| **Blended finance** | - Strategic use of for profit and public funding to mitigate investment risks (balance risk/benefit ratio) and facilitate private sector investment  
- Frequently used when IFIs mobilize private investment in pioneering projects and challenging environments |
| **Technical assistance / Advisory** | - IFIs can also assist by providing project preparation support, high level screening, due diligence, formulation for project components, etc.  
- Knowledge products (e.g., Country Private Sector Diagnostic) are developed by IFIs to assist provide market overview, enabling informed and effective decision making for private sector  
- In addition, IFIs take an active role in helping governments to develop laws and regulations that stimulate private sector investments |

Source: Roland Berger
Each country level analysis will start with energy highlights to underline standout features of country's energy system.

Snapshot of the Outlook (5/6)

Section of the Outlook

Content illustration:
Country energy highlights

Part II. Country level

1. Country at glance
2. Supply and demand Outlook
3. Technology Outlook
4. Carbon emissions Outlook
5. Investment Outlook

Georgia: Energy highlights

- 40 TWh: Hydropower generation potential, in addition to realized c. 10 TWh
- 83%: Share of renewable sources in total power generation
- 81%: Of total energy supply was provided by imports from other countries
- 2.5 GW: Electricity interconnection capacity with neighboring countries, projected to reach 4.7 GW by 2030
- 32 bcm: Annual natural gas transit capacity via South Caucasus and North-South Main Gas Pipelines

1) Figures for 2019

Source: Roland Berger
At the country level, supply and demand forecasts will be analyzed in greater detail

Snapshots of the Outlook (6/6)

**Part II. Country level**

1. Country at glance
2. Supply and demand Outlook
3. Technology Outlook
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5. Investment Outlook

Content illustration: **Forecast of final energy demand**

Primary energy supply under Green growth scenario [m toe]
D. Questions to Task Force Members
We will appreciate the countries' insight on targets and expectations in the energy mix, energy efficiency and security by 2030.

Questions to Task Force Members

- Do you agree with the proposed structure, composition and approach of the CAREC Energy Investment Outlook?

- What energy mix do you expect in your country in 2030?
  - Will there be a significant shift in the type and amount of conventional fuels used as compared to today? If yes, in which respect?
  - What do you expect the share of renewable energy to be in the total energy mix in the most optimistic scenario?

- Can you name the most important domestic or cross-border infrastructure projects (planned or desired) that will help you achieve energy security and a cleaner energy mix in the next 10 years?

- CAREC Energy Ministers Declaration committed to double energy efficiency level in the region by 2030. What national policies are planned in order to reach this goal?

Source: ADB; Roland Berger