TERMS OF REFERENCE FOR CONSULTANTS

I. Objective

1. For the proposed knowledge and support technical assistance (TA), MON: Methane Gas Supply Chain Development Master Plan, a consulting firm composed of international and national experts will be recruited to undertake the study. The TA will support the Mongolia’s energy policy to (i) mitigate air pollution; and (ii) to ensure the reliable, clean, and secured primary energy supply in Mongolia, by preparing a methane gas supply infrastructure development strategy. The strategy will provide the roadmap to replace coal by cleaner methane gas in selected and prioritized uses.

2. The TA is aligned with the country’s Implementation Plan for the Government Action Plan 2016–2020 (Government resolution No. 121). The TA’s executing agency is the Ministry of Energy.

II. Background

3. The Government of Mongolia approved the National Program for Reducing Air and Environmental Pollution in March 2017, setting the target to reduce air and environmental pollution by at least 50% by 2025. The program aims to impose a total ban on the use of unprocessed coal with few exceptions like its use of thermal power plants in Ulaanbaatar. Upon the government’s request, the Asian Development Bank (ADB) has assisted the government to meet the policy target.

4. Air pollution is one of the most serious issues in Mongolia, posing serious public health risks. According to World Health Organization (WHO), annual mean particulate matter of less than 2.5 micrometers in diameter (PM$_{2.5}$), an indicator of air pollution, in Ulaanbaatar, where around half of the nation’s population lives, is 6–10 times higher than the recommended safe levels of the WHO air quality guidelines. The pollution levels are worse during winter months. The main causes are burning solid fuel, mainly raw coal and waste in ger areas (around 220,000 households) for heat and cooking purpose (80%), followed by vehicle emissions, and coal-fired combined heat and power plants. The ger areas lack adequate public services like district heating supply, which has not kept up with increasing demand from nomadic herders’ migrating to the capital city.

5. The Implementation Plan for the Government Action Plan 2016–2020 aims to develop a master plan for the country’s first nationwide gas supply system, using unconventional primary energy resources like domestic methane gas from coal reserves as well as possible imported gas in the future. The Mid-term National Program 2019–2023 for the implementation of the State Policy on Energy sets one of its goals as “Ensuring reliable energy supply and security,” aiming to assist these activities. The government has conducted prior similar activities to increase the use of liquefied petroleum gas (LPG) and successfully increased its use for transport by almost 10 times compared with previously prepared LPG master plan. The LPG-related activities have not met the residential heat demand due to its higher supply cost than the incumbent fuels. The government has also studied the possible exploration/production of methane gas from domestic coal reserve with support from the U.S. Environmental Protection Agency, but the scope did not cover gas transmission and distribution.

6. To address the above issues, the government requested ADB to support the study to prepare the country’s first nationwide methane gas supply infrastructure development strategy. Switching fuel for heat demand from coal to gas would contribute towards lowering greenhouse gas (GHG) emissions and improving air quality. Therefore, the expected primary use of the
methane gas is to meet heat demand in UB area. The main beneficiaries would be the residents in Ulaanbaatar.

7. Mongolia has over 300 known coal deposits with an estimated 152 billion tons of coal resources and total estimated p50 coal mine methane (CMM) resources of coal basins are 3,117 billion cubic meters. To date there has been no commercial CBM or CMM activity in Mongolia. Nowadays, several private companies have conducted exploration studies/surveys at existing coal mines as well as potential reserve. Most of the development activities are ongoing in the southern area of the country, such as Omnogovi province and Dornogovi province. Most existing coal mines in Mongolia is categorized as open-pit mines, not underground mines.

8. Because of the above arrangement the challenge to develop the methane gas infrastructure is the modality of the gas transportation. UB city locates far from the main CMM reserves in the south, typically around 300 to 500 kilometers away. The district heating business in the southern provinces would not be economically viable considering the scarce demand. Considering the uncertainty of the actual gas reserve and relatively small demand, the liquefied gas and/or compressed natural gas (CNG) transportation by truck would economically make sense at the early stage, switching to pipeline transportation as the demand grows.

9. In addition to the primary use of methane gas for heat demand, the use of the gas for power generation is also to be considered. The Ministry of Energy (MOE) has conducted a pre-feasibility study on combined heat and power (CHP) fueled by methane gas. The consultant is expected to review their finding and make recommendation.

10. The strategy will cover the entire country and focus on demand mainly from households for heating and cooking, partly for existing small-scale heat-only-boilers (HOBs) and selected combined heat and power plants.

III. Scope of work

11. The study’s expected outputs are (i) methane gas supply chain development strategy prepared, (ii) pre-feasibility study report of prioritized methane gas infrastructure project prepared, and (iii) capacity in methane gas supply infrastructure enhanced. The strategy will cover the entire country and focus on demand mainly from households for heating and cooking, partly for existing small-scale HOBs and selected combined heat and power plants.

12. The study will provide solutions for the identified problems and for the strategy to develop a methane gas supply chain for Mongolia’s heating and power demand. The consulting firm is expected to achieve the outputs through the main tasks but not limited to.

(i) Output 1: Methane gas supply chain development strategy paper prepared
   (a) Prepare domestic gas demand and supply outlook and scenarios;
   (b) Assess domestic coal mine methane and coal bed methane resources over the entire country;
   (c) Develop basic technical design of the methane gas supply chain infrastructure from the gas exploration to transportation, distribution, and conversion to heat/power. Compare technology options and recommend the optimal design. Conduct the network analysis;
   (d) Develop the 10-year supply chain infrastructure development plan. Estimate the investment cost and the development schedule. Conduct preliminary social and
environmental impact assessment for the development plan. Assess the financial requirements and needs. Conduct the plan’s economic and financial analysis. The plan considers the regional dynamism, including the possible cross-border gas pipeline development with neighboring countries, such as Russia and the People’s Republic of China (PRC);

(e) Conduct market assessments. This includes cost-based wholesale/retail tariff design and institutional design of gas supply service. Evaluate pricing options for various segments with respect to domestic sales. The consultant is to recommend candidate business entities, such as exiting oil/gas distributor or new entities with specific function design. Evaluate methane gas supply business scheme and recommend the optimal scheme;

(f) Assess legal and regulatory framework. This includes the assessment of the responsibility of relevant ministries, including MOE, Ministry of Mining and Heavy Industry (MMHI), and Mineral Resources and Petroleum Authority (PA). The streamlining of licensing activities like production sharing contract (PSC) approval procedure will be analyzed;

(g) Prepare roadmap, including 10-year infrastructure development plan, preliminary safeguard impact assessment result, economic and financial analysis result, and investment plan; and

(h) Summarize the above findings as the development strategy paper.

(ii) Output 2: Pre-feasibility study report of prioritized methane gas infrastructure project prepared

(a) Identify future investment projects of the gas supply infrastructure; and

(b) Prepare the pre-feasibility study report on the identified project.

(iii) Output 3: Capacity in methane gas supply infrastructure enhanced

(a) Enhance MOE’s capacity on the methane gas supply system. An international study tour will be organized for the executing agency (EA) staff’s capacity building. The consultant is to propose the program, which is subject to ADB’s approval; and

(b) Organize domestic workshops to disseminate the findings, inviting resource persons for knowledge transfer of international best practice.

(c) Prepare the knowledge sharing report, which summarizes international best practice on methane gas infrastructure development and relevant business operation practice. The report should include the lesson from the similar past ADB projects in PRC.¹

Prepare and implement the capacity building program for MOE staff (minimum 3 staff) and the other relevant government officials as requested by the EA and ADB.

13. In addition to the above, the consulting firm is expected to:

- review current and past diagnostic work in Mongolia’s gas sector to estimate the CMM reserve for the future project;
- analyze the existing institutional framework of the gas sector, its linkages with the power sector and the overall energy;
- analyze CMM supply and demand balances while assessing the present and future average and peak demand requirements that takes into account growth in power generation, transport and household sectors;

• analyze the technical and financial feasibility and the economic benefits of CMM gas development;
• research how CMM is currently handled in coal mine, and impact to GHG emission.
• analyze the economically viable CMM transportation options from the reserve to the heat load center in Ulaanbaatar;
• conduct preliminary safeguard assessment as well as economic and financial analysis of the identified project; and
• may design the application of CMM for power generation and/or district heating service near the CMM reserve.

IV. Consultant Team Profiles and Subject Matter Expertise

14. The following team profiles and expertise are indicative and meant to provide guidance on achieving the objectives of the TA. Total input will be 20.0 person-months of international and 23.5 person-months of national experts. The competitive consulting firm will have the following three qualifications: (a) familiar with Mongolia; (b) experienced with coal mine/bed methane gas infrastructure development; and (c) good at project management without delay.

<table>
<thead>
<tr>
<th>Experts</th>
<th>Person-month</th>
<th>International</th>
<th>Local</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Exploration specialist/ Team Leader</td>
<td>3.5</td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>b. Gas transportation expert</td>
<td>3.0</td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>c. Business development expert</td>
<td>2.0</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>d. Policy and regulatory expert</td>
<td>2.5</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>e. Engineer in gas application</td>
<td>2.5</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>f. Climate change specialist</td>
<td>1.5</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>g. Gender specialist</td>
<td>1.0</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>h. Economist/ financial analyst</td>
<td>2.0</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>i. Environment and social expert</td>
<td>2.0</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20.0</strong></td>
<td><strong>23.5</strong></td>
<td></td>
</tr>
</tbody>
</table>

A. International experts

15. Exploration specialist/Team Leader (3.5 person-months, intermittent). The expert preferably has (i) at least a master’s degree on geology, civil engineering, energy engineering or relevant fields; (ii) at least 10 years of work experience in coal mine/bed methane gas infrastructure design/operation; (iii) at least 10 years of work experience to manage gas infrastructure development projects/studies; (iv) excellent written and oral English; and (v) experience in international cooperation and management. The scope of work includes but not limited to (i) responsible for the overall preparation, coordination, and quality delivery of the project; (ii) responsible for the overall management of the project and liaise with ADB, executing agency, and consultants during the implementation of the TA; (iii) primarily responsible for gas exploration design, gas demand forecasting, as shown in para 10, (i)-a, b, c, d, g, h, (ii), and (iii); (iv) review background data and the past study reports for the CMM gas reserve resource assessment; (v) Compare internationally available best technologies/practices in terms of PM$_{2.5}$ emission reduction, identify pros and cons for best available technologies, and propose optimal technology/practice in the project design; (vi) deliver reports in ADB formats and quality standards and lead capacity building activities in coordination with other experts.

16. Gas transportation expert (3.0 person-months, intermittent). The expert preferably has
(i) at least a bachelor’s degree on energy engineering or relevant fields; (ii) at least 5 years of work experience in coal mine/bed methane infrastructure design/operation; (iii) at least 10 years of work experience in gas pipeline infrastructure; (iv) excellent written and oral English; and (v) experience in international cooperation and management. The scope includes but not limited to (i) prepare a brief summary of the current status of the gas sector, mainly LPG, in the country; (ii) review the existing and planned road network/infrastructure and assess the possible truck transportation of the gas from the reserve to UB city; (iii) estimate the development cost of the pipeline transportation; (iv) carry out least-cost assessment of the proposed transportation modalities, including but not limited to pipeline, gas compressor, underground gas storage near Ulaanbaatar city like salt cavern, aquifer for peak demand; and CNG tank truck, CNG cylinder for distribution; (v) compare the modality and recommend the optimal transportation modality; (iv) assess the technical and institutional capacity of the business supplier of the gas transportation/distribution service and recommend, where required, changes to the business supplier’s institutional structures to improve technical and institutional implementation capacity; (v) provide necessary inputs to the deliverables to the Team leader as requested; and (vi) tasks related to para. 10 (i)-(c), d, g, h, (ii), and (iii).

17. **Business development expert** (2.0 person-months, intermittent). The expert preferably has (i) at least a master’s degree on business, energy policy, or relevant fields; (ii) at least 5 years of work experience in fossil fuel industry; (iii) excellent written and oral English; and (iv) experience in international cooperation and management. The scope includes but not limited to (i) tasks related to para. 10, (i)-(e), f, (ii), and (iii); (ii) analyze demand-size (residential and commercial buildings) of heat demand as well as power demand; (iii) review and evaluate legal and regulatory to provide gas supply service in Mongolia. Recommend improvements as needed; (iv) assess the business climate of the gas supply service in Mongolia, considering heat and power demand forecasts, gas pricing, and the other factors; (v) analyze government policies that may have significant impact on the gas supply business. Provide a detailed discussion of the assumptions and methodology used in demand forecasting; (vi) discuss the possibilities for corporatization of gas supply companies; (vii) identify any barriers to enter the market; (viii) prepare a report and prepare the analysis section for the heating and gas sectors of the report; and (ix) provide necessary inputs to the deliverables to the Team leader.

18. **Policy and regulatory expert** (2.5 person-months, intermittent). The expert must have (i) at least a master’s degree on energy or relevant fields; (ii) at least 5 years of work experience in energy sector and familiar with energy regulation; (iii) excellent written and oral English; and (iv) experience in international cooperation and management. The scope includes but not limited to (i) tasks related to para. 10, (i)-(e), f, (ii), and (iii); (ii) analyze the sectoral and policy context; (iii) review and assess the policies; (iv) review the fossil fuel as well as heating tariff structures and tariff adjustment procedures. Discuss with relevant government agencies on their plans to reform fuel/heating tariff system and the implementation plan for approved reforms; (v) assess affordability issues related to fuel/ heating supply for the poor, review the current practices to help reduce the burden of the poor on fuel/ heating tariff, recommend pro-poor activities that could be included in the project; (vi) review the current PSC approval procedure and recommend how to expedite the procedure; and (vii) provide necessary inputs to the deliverables to the Team leader.

19. **Engineer in gas application** (2.5 person-months, intermittent). The expert preferably has (i) at least a bachelor’s degree on energy engineering or relevant fields; (ii) at least 10 years experience in designing or operating combined heat and power infrastructure and the other gas application equipment like heat-only-boilers; (iii) excellent written and oral English; and (iv) experience in international cooperation and management. The scope includes but not limited to (i) tasks related to para. 10, (i)-(c), d, e, g, (ii), and (iii); (v) review the MOE’s pre-feasibility study
result on CHP fueled by methane gas, and recommend any to be improved; (vi) investigate CCGT application; and (vii) provide necessary inputs to the deliverables to the Team leader.

20. **Climate change specialist** (1.5 person-months, intermittent). The expert preferably has (i) at least a master’s degree on environment or relevant fields; and (ii) a minimum of 5 years of relevant experience. The scope includes but not limited to (i) assessing the climate change mitigation impact including the reduced greenhouse gas (GHG) emissions; (ii) carrying out a climate risk and vulnerability assessment in line with ADB Climate Risk Management Framework to develop climate adaptation options; (iii) documenting consideration given to projected climate change effects, identify and agree with the executing agency on the adaptation measures to be integrated in design, construction, operation and maintenance to increase climate resilience and provide an estimate of associated costs.

21. **Gender specialist** (1.0 person-month, intermittent). The expert preferably has a master’s degree in gender, sociology, ethnic minorities, development, or other related fields and have a minimum of 5 years of relevant professional experience. The specialists should adhere to the guidance in ADB’s Safeguard Policy Statement (SPS, 2009) and should follow the Environment Health and Safety Guidelines, meaningful consultation and GRM. The scope includes but is not limited to conducting a gender analysis and identify: (i) gender differences and disparities that may affect the success of the project; (ii) opportunities within the project to reduce gender disparities and mainstream gender concerns to improve women’s access to social services, economic opportunities, and decision-making; (iii) actions/measures to ensure equal participation and benefits for male and female; and (iv) collect evidence-based data and analyze sex-disaggregated socioeconomic baseline data and performance targets specific to the project and its sectors; which will be used to develop the gender action plan (GAP) in accordance with ADB guidelines.

22. **Economist/ financial analyst** (2.0 person-months, intermittent). The expert must have (i) at least a master’s degree on economics/finance or relevant fields; (ii) at least 10 years of work experience in fossil fuel infrastructure development; (iii) excellent written and oral English; and (iv) experience in international cooperation and management. The scope includes but not limited to conducting economic and financial analysis of the project.

23. **Environment and social expert** (2.0 person-months, intermittent). The expert must have (i) at least a master’s degree on environment/ social or relevant fields; (ii) at least 10 years of work experience in energy infrastructure development; (iii) excellent written and oral English; and (iv) experience in international cooperation and management. The scope includes but not limited to assessing the project’s environmental and social impact.

**B. National experts**

24. A team of national experts will supplement and support the international experts with similar expertise. The national experts will have demonstrated knowledge of energy sector of Mongolia and will assist the international experts to quickly become familiar with their tasks by (i) conducting local investigation and obtain necessary data from local authorities as instructed by the international experts; (ii) reviewing relevant reports, analytical data, policies, regulations; and (iii) translating documents into English. Their desired qualification includes work experience of more than 5 years in the energy sector, preferably either fossil fuel or electricity subsectors with academic qualification of bachelor’s degree or higher.

**V. Implementation schedule and deliverables**
25. The expected study period is 18 months. The consulting firm will submit the following reports to ADB (in both English and Mongolian) and to the government (in Mongolian) in the soft copy:

(i) **Inception report.** To be submitted within 1 month from commencement of service. The report will summarize discussions with counterparts and other relevant stakeholders, include a detailed work program, and address any major inconsistencies in the terms of reference.

(ii) **Interim report.** To be submitted within 7 months from commencement of service. The report will include the draft strategy paper, interim results of activities, an updated work program, and address any issues and concerns. An interim workshop will be organized to disseminate the finding to the executing agency and the relevant stakeholders.

(iii) **Draft final report.** To be submitted within 16 months of commencement of service. The report will include the draft pre-feasibility report of prioritized methane gas infrastructure project. Upon submission of the draft final report, a final workshop will be held, attended by relevant stakeholders, to obtain feedback on the report.

(iv) **Final report.** To be submitted within 1 month following receipt of comments from ADB and the government on the draft final report. The final report shall take into consideration comments by ADB and the government. An executive summary (with a maximum length of 5 pages) should be included in the final report.

26. The consulting firm will provide the following knowledge sharing events to the relevant staff of the executing agency staff:

(i) An international study tour will be organized for the executing agency staff to acquire hands-on and the up-to-date knowledge in methane gas infrastructure development and its latest business operation practice. The study tour program will provide capacity building for 2 to 3 government officials over 1 to 2 weeks. The consultants are expected to propose the study tour program including the countries to be visited. The study tour is subject to ADB’s approval and should be conducted in an ADB member country. Because ADB has implemented the similar project in PRC before, one of the sites is desired to be the project site in Shanxi province, PRC.

(ii) Domestic workshops will be organized to disseminate the findings, inviting resource persons for knowledge transfer of international best practice.

VI. Others

27. Ministry of Energy will be the executing agency and will provide counterpart support to the consulting firm, including (i) adequate office space; (ii) bilingual counterpart personnel available to provide assistance in collecting data and coordinating with government agencies, if required; (iii) assistance with visas and other permits required by the consulting firm to enter and to work; and (iv) access to all data, including documents, reports, accounts, drawings and maps, and permission to enter offices, as appropriate and necessary, to undertake the work.

---

2 Footnote 1; and ADB. 2004. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to the People's Republic of China for the Coal Mine Methane Development Project.* Manila.