

TERMS OF REFERENCE FOR CONSULTANTS

1. For the proposed knowledge and support technical assistance (TA), a consulting firm composed of international and national consultants will be recruited to undertake the studies listed under the TA. The consulting firm will engage 9 person-months international inputs and 16 person-months national inputs. The Mongolian Government will provide counterpart support to the consultants, 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 consultants 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. The consultant firm will be engaged in accordance with ADB's Procurement Policy (2017, as amended from time to time) through the quality- and cost-based selection method (90:10), following submission of biodata technical proposals.

2. **Electric energy storage specialist/Team leader** (international, 3.5 person-months, intermittent). The consultant must have (i) at least a master's degree on electrical engineering or relevant fields; (ii) a minimum of 8 years of work experience in electric energy storage field; (iii) preferably with good oral and written English communication skills; and (iv) experience in international cooperation and management. The consultant will be the team leader and will:

- (i) analyze historical and current power load curves in the Central Energy System (CES) at different temporal scales;
- (ii) review current energy infrastructure and examine technical issues related to electric energy storage applications, including but not limited to, peak-shaving and valley-filling, frequency regulation, voltage control, and transmission and distribution congestion relief;
- (iii) overview current electric energy storage technologies and offer technological solutions to address identified issues;
- (iv) support heat storage specialist in designing heat storage options;
- (v) propose an enabling support policy (including tariff reform and the other financial incentives) and viable business solutions for deployment of electric energy storage technologies;
- (vi) develop a mid- and long-term electric energy storage deployment strategy for greater renewable energy penetration towards 2030; and
- (vii) prepare a feasibility study on deployment of electric energy storage technologies in CES.

3. **Heat storage specialist** (international, 3 person-months, intermittent). The consultant must have (i) at least a master's degree on energy engineering or relevant fields; (ii) a minimum of 8 years of work experience in heat storage field; (iii) preferably with good oral and written English communication skills; and (iv) experience in international cooperation and management. The consultant will also be the co-team leader and will:

- (i) analyze historical and current heat load curves in the CES at different temporal scales;
- (ii) review current heat supply infrastructure and identify alternative heating methods;
- (iii) overview current heat storage technologies and offer power-to-heat storage technologies in collaboration with electric energy storage specialist;
- (iv) propose an enabling support policy (including tariff reform and the other financial incentives) and viable business solutions for deployment of heat storage technologies;

- (v) develop a mid- and long-term heat storage deployment strategy for greater renewable energy penetration towards 2030; and
- (vi) prepare a feasibility study on deployment of heat storage technologies in CES.

4. **Financial analyst** (international, 1 person-month, intermittent). The consultant must have (i) at least a bachelor's degree in finance or energy economics; (ii) a minimum of 5 years of experience in financial and economic analysis of energy projects; (iii) good understanding of the Mongolian energy sector; and (iv) good oral and written English communication skills. The consultant will:

- (i) assess the financial and economic viability of proposed energy storage technologies comparing levelized cost of storage against prices for power and heating;
- (ii) identify investment needs with possible financing sources for proposed energy storage technologies;
- (iii) undertake a cost-benefit analysis of proposed energy storage technologies;
- (iv) assist the team leaders in developing business models for deployment of proposed energy storage technologies;
- (v) recommend the actions needed on how to engage the private sector;
- (vi) estimate avoidable power imports and coal consumptions for power and heat generation; and
- (vii) assist the team leader in providing training and workshops to the relevant agencies.

5. **Environment specialist** (international, 1.5 person-months, intermittent). The expert must (i) have a postgraduate degree in environmental science, environmental engineering, environmental management, or in any relevant field; (ii) have at least 10 years of working experience; (iii) familiarity with energy storage technologies; (iv) have a good understanding in ADB's Safeguard Policy (SPS); and (v) be fluent in English. The expert with experience in the region and or in Mongolia will be an advantage. The consultant will undertake the following activities:

- (i) analyze environmental impacts of proposed solutions on using energy storage technologies; and
- (ii) prepare an environment assessment report in English for a feasibility study for the selected technical solutions including associated facilities meeting ADB's SPS, specifically, Safeguard Requirements (Appendix 1 of SPS) and submit it to ADB.

6. **Energy specialist/Deputy team leader** (national, 6 person-months, intermittent). The expert must have (i) a master's degree in electrical or thermal engineering or other relevant field; (ii) a minimum of 5 years of work experience in energy sector analysis in Mongolia; and (iii) good oral and written English communication skills. The consultant will:

- (i) analyze current energy policy and estimate future power generation capacity and locations;
- (ii) review current prices for electricity and heat;
- (iii) review transmission and distribution plans of CES;
- (iv) examine the dynamics of prices for power and heat;
- (v) forecast future prices based on existing energy policy; and
- (vi) assist the team leaders in drafting policy recommendations for deployment of energy storage technologies.

7. **Grid system specialist** (national, 4 person-months, intermittent). The consultant must have (i) at least a master's degree on electrical engineering or relevant fields; (ii) minimum of 8

years of work experience in grid system; and (iii) good oral and written English communication skills. The consultant will:

- (i) assist the electric energy storage specialist in assessing current grid stability and identifying opportunities for electric energy storage technology applications; and
- (ii) collaborate with the national energy specialist and international electric energy storage specialist to evaluate grid stability from added generation capacity.

8. **Financial analyst** (national, 4 person-months, intermittent). The consultant must have (i) at least a bachelor's degree in finance or energy economics; (ii) a minimum of 5 years of experience in financial and economic analysis of energy projects; (iii) good understanding of the Mongolian energy sector; and (iv) good written and oral English communication skills. The consultant will assist the international financial analyst to:

- (i) assess the financial and economic viability of proposed energy storage technologies comparing levelized cost of storage against prices for power and heating;
- (ii) identify investment needs with possible financing sources for proposed energy storage technologies;
- (iii) undertake a cost-benefit analysis of proposed energy storage technologies;
- (iv) assist the team leaders in developing business models for deployment of proposed energy storage technologies;
- (v) recommend the actions needed on how to engage the private sector;
- (vi) estimate reduced power imports and coal consumptions for power and heat generation; and
- (vii) assist the team leader in providing training and workshops to the relevant agencies.

9. **Environment specialist** (national, 2 person-months, intermittent). The consultant must have (i) at least a bachelor or above degree on environmental engineering or relevant fields; (ii) minimum of 10 years of work experience on environmental due diligence; and (iii) familiarity with energy storage technologies. The consultant will assist international environment impact assessment specialist to:

- (i) analyze environmental impacts of proposed solutions on using energy storage technologies; and
- (ii) prepare the environment assessment report in English for a feasibility study for the selected technical solutions including associated facilities meeting ADB's SPS, specifically, Safeguard Requirements (Appendix 1 of SPS) and submit it to ADB.

Deliverables

10. The consultant team shall collectively submit the following reports to ADB:

11. **Report on CES assessment.** This report will be submitted in January 2019. It will deliver a comprehensive current and future assessment on CES including (i) heat and power load curves at different temporal scales, (ii) heat and power supply curves subject to locations of installed renewable energy capacity, (iii) impacts of renewable energy penetration upon the grid stability, and (iv) prices for power and heating.

12. **Report on appropriate power and heat storage options.** This report will be submitted in April 2019. It will deliver technical feasible energy storage options for various applications based on the market research of commercialized technologies.

13. **Report on market potential of energy storage and a mid- and long-term energy storage deployment strategy.** This report will be submitted in December 2019. It will deliver (i) a cost-benefit analysis including levelized cost of energy assessment of the identified energy storage technologies, (ii) impact assessment upon reductions of imported electricity and coal consumption, (iii) an enabling support policy (including tariff reform and the other financial incentives) and viable business solutions for deployment of energy storage technologies, (iv) a mid- and long-term energy storage deployment strategy for greater renewable energy penetration towards 2030, and (v) a feasibility study for prioritizing power and heat storage technologies to enhance the project preparedness for future investment.

14. **Final report.** It will be submitted in January 2020. The final report will include all study items of above (paras. 11–13) incorporating all comment from stakeholders. A maximum of 10 pages of executive summary should be included in the final report.

Milestone Payment Schedule

15. The Consulting firm shall be paid following the approval of the milestones deliverables outlined above in accordance with the following schedule:

Report on CES assessment – 20%

Report on appropriate power and heat storage options – 30%

Report on market potential of energy storage and a mid- and long-term energy storage deployment strategy – 40%

Final Report – 10%