

**Aide-Memoire for
Scaling-up Renewable Energy Program in Low Income Countries (SREP)
Joint MDB Scoping Mission to Armenia
July 2-12, 2012**

I. Introduction

1. A Joint World Bank/IFC, Asian Development Bank (ADB), and European Bank for Reconstruction and Development (EBRD) team¹ visited Armenia on July 2-12, 2012 to conduct the Scoping Mission for the Scaling up Renewable Energy Program in Low Income Countries (SREP).

2. Over 30 countries applied for SREP funding and for five of the six pilot countries investment plans were approved. Armenia is among the 6 reserve countries and has applied for US\$300,000 grant financing to develop an investment plan. In March 2012, the SREP sub-committee ranked Armenia fourth in the list of priority countries (after Tanzania, Liberia and Yemen) and agreed that, should additional resources be made available, Armenia would qualify for concessionary financing.

II. Mission Activities and Outputs

1. The mission held discussions with the Ministry of Energy and Natural Resources, the Public Services Regulatory Commission (PSRC), donors and bilateral agencies (KfW, USAID, UNDP, JICA, UNIDO), the Renewable Resources and Energy Efficiency Fund (R2E2 Fund), the Energy Institute, commercial banks and several private sector entities engaged in renewable energy projects. A consultative workshop was also held and attended by 60 participants from the Government, private sector, donors, and the academe (full list of participants is attached in Annex 1). In addition, the MDB team also conducted site visits to two small hydro power plants, a biogas power plant, and a solar water heating installation.

2. A detailed list of stakeholders met by the MDB team is provided in Annex 2. During the meetings, the MDB explained its objectives, the status of SREP implementation, and the processes involved in the country-led SREP process. The MDB team also clarified the key features of SREP, including: (i) barrier reduction, (ii) leveraging investments, (iii) increasing renewable energy capacity and reducing emissions, (iv) transformational impact, and (v) scaling-up through private sector participation. SREP may also support capacity building and creation of enabling environments for scaling up renewable energy.

¹ The team comprised: **World Bank** - Gevorg Sargsyan, SREP Program Coordinator and Arthur Kochnakyan, Energy Economist; **IFC** - Tigran Parvanyan, Operations Officer; **EBRD** - Remon Zakaria, Energy Efficiency and Climate Change Business Development Manager; **Asian Development Bank** - Cinzia Losenno, Sr. Climate Change Specialist, Don Purka, Principal Investment Specialist, and Cindy Tiangco, Energy Specialist. The mission was also joined by Jiwan Acharya, Sr. Climate Change Specialist – Energy, Areg Barseghyan, Senior Country Coordination Officer, and Rey Guarin, Climate Change Mitigation Consultant, Asian Development Bank.

III. Summary of Scoping Mission Findings and Agreements:

3. **Potential areas of engagement:** The analysis to be conducted by the R2E2Fund/Ministry of Energy and Natural Resources (MENR) will include an assessment of the renewable energy potential, including the supply costs, and prioritization of proposed interventions. The broad areas of engagement under SREP might include: geothermal, wind, solar, biomass/biogas, and small hydropower plants (with installed capacity not exceeding 10MW). Assessment efforts will focus on innovative and transformational applications consistent with Government's energy sector strategy.
4. The small hydropower segment (less than 10 MW) appears to be sufficiently developed and with relatively strong participation by private sector investors. There are only limited opportunities in this segment for SREP support given the maturity of the market and technology and limited opportunities for innovative or transformative role of SREP financing. Quality assurance and associated costs suggest a need for support and increasing capacity in developing and implementing SHPP designs compliant with international best practices.
5. As Armenia is likely to need base-load power replacement capacity in the next ten years, geothermal energy may be the most appropriate renewable energy technology for that purpose and offer a transformative and innovative option for SREP by reducing project development risks. In-depth resource assessments, feasibility studies, and exploratory drilling for geothermal projects may be considered. SREP funds could cover the cost of development of geothermal resources that neither the Government has capacity to borrow, nor the private sector is willing to finance prior to knowing whether the project is feasible. SREP financing would mitigate the risk for exploratory drilling to confirm availability of the resource, which is a key barrier for the development of this technology.
6. Development of wind, including potential PPP structures, with use of SREP funding to increase attractiveness of wind projects for private developers. There has been some assessment of the wind potential in the country completed under a number of projects financed by donors and bilateral.
7. The potential for additional biogas development will also need to be explored. This can include biogas generated from animal farms, solid waste or landfill. There may be an opportunity to consider parallel MDB funding under their traditional lending windows.
8. For non-electricity applications of renewable energy, the Government should explore the feasibility of solar collectors (for hot water and heating) to displace imported natural gas and address affordability issues of low income households.
9. The Government could consider including into the broader Investment Plan additional technologies which can improve economics for renewable energy and reliability and safety of the entire system, such as pumped storage hydro and infrastructure of electric vehicles.

10. **Preparation of the investment plan:** The Government has requested US\$ 300,000 grant from SREP for investment plan preparatory activities. The MDB team agreed with the Government that the SREP grant will be provided from the World Bank directly to the R2E2 Fund. R2E2 Fund will provide about \$60,000 co-financing for implementing the activities. The TOR of the consultant to assist Government in the preparation of investment plan was discussed and finalized during the mission (Annex 4). The R2E2 will publish the Request for Expression of Interest (REOI) for selection of the consultant by August 10, 2012 and will have the consultant selected by end of October 2012.

The preparation of the Investment Plan will consist of two phases: (i) assessment of the renewable energy potential and costs and demand and supply assessment; (ii) preparation of investment plan and project briefs. Stakeholder consultations will take place after each phase. The mission agreed with the MENR that the Investment Plan will cover development of the entire renewable energy sector and will identify areas for SREP support. It will also recommend funding from MDBs and other development partners to provide comprehensive financing package.

11. **Capacity Building and Advisory Services:** Capacity development and advisory services in specific areas of governance, policy and regulatory issues may be explored for SREP funding support. General capacity development activities for the MENR, PSRC, the R2E2 Fund, and other relevant institutions and groups to ensure long term sustainability of the renewable energy sector may also be considered.

IV. Next Steps

The MDB team agreed with the Government on the following key activities to be implemented and to proceed with preparation and approval of the investment plan for Armenia².

Actions	By whom	By when
Processing of investment plan preparation grant	R2E2 Fund/MENR	August 30, 2012
Selection of consultant to support with preparation of investment plan	R2E2 Fund	October 30, 2012
MDB Joint mission and workshop to review the results of the Phase I of the Investment Plan preparation with key stakeholders	R2E2 Fund	March 30, 2013
Finalization of investment plan (first draft of final investment plan)	R2E2 Fund	May 15, 2013
MDB join mission to finalize investment plan	MDBs	July 5, 2013
Disclosure of investment plan for public consultations (2-weeks for review and provision of comments)	R2E2 Fund/MENR	August 15, 2013

² The above timetable is tentative and the government may choose to accelerate the implementation

Actions	By whom	By when
MDB internal quality review	MDBs	September 15, 2013
Government approval of the investment plan		October 1, 2013
Approval by SREP sub-committee	SREP	November 30, 2013

ANNEX 1: WORKSHOP PARTICIPANTS

<i>The Government Organizations</i>		
1.	Areg Galstyan	Deputy Minister of Energy and Natural Resources
2.	Levon Vardanyan	Power system operator CJSC
3.	Daniel Stepanyan	Head of RE Division
4.	Artashes Bakhshyan	Deputy Minister of Territorial Administration
5.	Vardan Aramyan	Deputy Minister of Finance
6.	Garnik Badalyan	Deputy Minister of Economy
7.	Simon Papyan	Deputy Minister of Nature Protection
8.	Avag Hakobyan	Deputy Minister of Urban Development
9.	Abgar Budaghyan	Head of Department, PSRC
10.	Astghik Gevorgyan	Central Bank
11.	Robert Harutunyan	ADA
12.	Liana Hunanyan	The Government of Armenia
<i>Non-Governmental Organizations</i>		
13.	Ara Marjanyan	Noravank Foundation
14.	Astghine Pasoyan	Alliance to Save Energy
15.	Aghasy Manukyan	Alliance to Save Energy
16.	Aram Gabrielyan	UNCEI National coordinator
17.	Arsen Karapetyan	Development Solutions NGO
18.	Manya Melikjanyan	Lore Eco-Club
19.	Rafael Mkhitryan	3 rd Nature NGO
20.	Martiros Tsarukyan	The Ministry of Nature Protection
21.	Naira Nahapetyan	SHPP
22.	Mher Hakobyan	SHPP
23.	Michayel Martirosyan	Association of energy service companies
24.	Gevorg Paytyan	Elenex LLC
25.	Anjela Manukyan	Director of Lusakert biogas plant
26.	Grigor Grigoryan	GRP Systems LLC
27.	Victor Afyan	Contact-A LLC
<i>Scientific Research Institutions</i>		
28.	Jury Chilingaryan	National Academy of Science
29.	Artak Ghambaryan	AUA
30.	Arkady Karakhanyan	Institute of Geology
31.	Hektor Babayan	Georisk
32.	Levon Aghekyan	Energy Institute
33.	Suren Shatvoryan	Energy Institute/ArmSEF project
<i>Private Sector, including Financial Institutions</i>		
34.	Gagik Sahakyan	Ameria Bank
35.	Stepan Gishyan	ACBA CreditAgricole
36.	Misak Avagyan	ArmSwissbank
<i>International Organizations and Projects</i>		
37.	Gevorg Sargsyan	The World Bank

38.	Arthur Kochnakyan	The World Bank
39.	Tigran Parvanyan	IFC
40.	Valeriu Razlog	EBRD
41.	Areg Barseghyan	ADB
42.	David Dole	ADB
43.	Bella Andreasyan	KfW
44.	Gevorg Tumanyan	German-Armenian Fund
45.	Marina Vardanyan	USAID
46.	Armen Martirosyan	UNDP Armenia Office
47.	Svetlana Harutyunyan	UNDP/GEF Small Grants Program
48.	Diana Harutunyan	UNDP/GEF Project
49.	Armen Arzumanyan	USAID Project Tetra Tech
50.	Anahit Simonyan	UNIDO Project manager
51.	Cinzia Losenno	ADB
52.	Remon Zakaria	EBRD
53.	Don Purka	ADB
54.	Cindy Tiangco	ADB
55.	Rey Guarin	ADB
56.	Jiwan Acharya	ADB
<i>R2E2 Fund</i>		
57.	Tamara Babayan	R2E2 Fund
58.	Hayk Yesayan	R2E2 Fund
59.	Armen Lisikyan	R2E2 Fund

ANNEX 2: STAKEHOLDERS MET

GOVERNMENT

Mr. Armen Movsisyan, Minister of Energy and Natural Resource
Mr. Areg Galstyan, Deputy Minister of Energy and Natural Resource
Mr. Shiraz Kirakosyan, Deputy Chairman of Public Services Regulatory Committee
Mr. Levon Aghekyan, Director, Energy Institute

PRIVATE SECTOR

Mr. Arkady Karakhanyan, Geothermal Expert
Mr. Sazonov, Deputy Director, Armenian Electric Network
Ms. Marine Karapetyan, AmeriaBank
Mr. Misak Avagyan ArmSwissBank
Mr. Artak Hambaryan, Associate Director, Engineering Research Center, American University of Armenia
Mr. Grigor Gabayan, Hydroenergetika Design Company

DEVELOPMENT PARTNERS

Mr. Armen Martorosyan, UNDP
Ms. Marina Vardanyan, USAID
Ms. Bella Andreasyan, KfW
Ms. Tamara Babayan, Director, Renewable Energy and Energy Efficiency Fund

ANNEX 3: COUNTRY CONTEXT AND CRITICAL ISSUES FOR RENEWABLE ENERGY

12. Armenia is estimated to have significant renewable energy resources, but with the exception of hydro, most are largely untapped. Approximately 740 MW (around 25 percent of existing installed capacity) of small hydropower (SHPP), wind and geothermal resources³ were identified. The country made substantial progress in development of small hydropower potential, also through the private sector with support of the MDBs. Between 2005 and 2011, approximately US\$85 million was invested in SHPP, which added 158 MW of new SHPP capacity. The renewable energy based annual electricity generation increased from 137 GWh in 2005 (0.5 percent of total generation) to 520 GWh in 2011 (around 7 percent of total generation). The donor community played an important role in promoting development of renewable energy in Armenia through a number of projects, including resource assessments and mapping, which also provided both investment and technical assistance to improve the legal and regulatory framework for renewable energy.

13. Overall, the existing legal and regulatory framework in Armenia support renewable energy. The Energy Law and the Law on Renewable Energy and Energy Efficiency clearly articulated the importance of renewable resources and provided a framework for facilitating their development. Among others, the legal framework provides for 15 years off-take of electricity produced for all small renewable power plants at the tariffs set by the regulator, Public Services Regulatory Commission (PSRC). Amendments have been initiated to eliminate a number of bottlenecks in the legal framework and reduce the legal/regulatory risks of private investors in the sector.

Critical Issues for scaling up renewable energy in Armenia

14. Armenia faces atypical challenges in scaling up renewable energy given its 100% electricity access rate and relatively low-carbon energy sector. Apart from the usual financial, technical and institutional barriers, the following critical issues need consideration: (1) the uncertain medium to long term supply and demand scenario given the wavering decision to decommission and replace the existing 815 MW nuclear power plant; (2) low absolute tariffs that render several renewable sources unviable; (3) sufficient power supply to meet current and forecast demand, (4) affordability of end-user electricity tariffs; (5) energy security; and (6) borrowing constraints of the Government.

15. Research and technical capacity as well as studies, policies and plans for renewable energy development already exist in Armenia. However, further institutional capacity building may be required in establishing an enabling policy and regulatory framework to support renewable energy, particularly tariff setting, and governance issues such as coordination and information sharing. Updated, enhanced, and published supply and demand forecast with corresponding analyses on costs and benefits, carbon emissions, investment requirements, and tariff requirements, is needed.

³ Geothermal estimate is only for one site (Jermakhbyur in the South of the country).

16. Donors and bilateral agencies support SREP and renewable energy development in Armenia, including support for a sustainable development plan, renewable energy roadmap, tariff study, energy planning, wind and solar mapping, and resource assessments for geothermal, solar, wind and biomass. A list of reports on these efforts is in Annex 4. Donors stressed the affordability of poor households and use of renewable sources for heating as one of the potential areas for SREP support.

**ANNEX 4: LIST OF AVAILABLE REPORTS AND DOCUMENTS RELATED TO
RENEWABLE ENERGY**

N	Report Title	Year	Language
1	Wind Power Development in Armenia, R2E2/World Bank	2008	Eng/Arm
2	The update of the existing scheme for small hydro power stations of the republic of Armenia, R2E2	2008	Eng/Arm
3	Independent interpretation of the results of the 3D MT, gravity and CO ₂ surveys conducted at the Karkar Site, Georisk/R2E2	2008	Eng
4	Renewable Energy Roadmap for Armenia, R2E2	2011	Eng/Arm
5	A preliminary feasibility assessment of the preferred alternative for implementing a commercial scale bio-ethanol fuels program for Armenia in the near to mid term, Enertech/BBI/R2E2	2008	Eng/Arm
6	Assessment of PV Industry Development Potential in Armenia, Danish Energy Management/SolarEN int./R2E2	2010	Eng/Arm
7	Independent interpretation of results of MT study for Gridzor and Karkar geothermal sites	2009	Eng/Arm
8	Demand-Side Management Study” FINAL REPORT, Danish Energy Management, The World Bank	2011	Eng
9	Charged Decisions: Difficult Choices in Armenia’s Energy Sector, World Bank	2011	Eng
10	The Other Renewable Resource: The Potential for Improving Energy Efficiency in Armenia, World Bank	2008	Eng
11	Wind Energy in Armenia: Overview of Potential and Development Perspectives, USAID	2010	Eng/Arm
12	Wind Energy Development in Armenia: Legal, Regulatory, Tax and Customs Regulations, USAID	2010	Eng/Arm
13	Armenia energy security and regional integration (Summary of year 1 technical results), USAID	2010	Eng
14	Connection of Photovoltaic Power Plants (with up to 5 MW of capacity) to the Common Grid of Electrical Power System, USAID	2010	Eng/Arm
15	Small Hydro Power (SHPP) Sector Framework, Status, Development Barriers and Future Development, USAID	2010	Eng/Arm
16	Methodology for Evaluating the Economics, Financial Viability and Environmental Consequences of Proposed Georgian Interconnection and Transmission Line Options, USAID	2011	Eng/Arm
17	Overview on Solar Electric Power in Buildings with Applications in Armenia, USAID	2011	Eng/Arm
18	Contract for the sale and purchase of electricity generated by wind power, USAID	2011	Eng
19	Developing an improved wind power purchase agreement for Armenia, USAID	2011	Eng
20	Congestion management in European grid and Applicability of Methodologies for Armenia draft report, USAID	2011	Eng
21	Armenia Energy Sector Note, World Bank	2011	Eng/Arm
22	Armenia Power Sector 2006 Least Cost Generation Plan APPENDIX A: ANPP Upgrade Projects, Decommissioning, Life Extension and Replacement Issues and Cost APPENDIX B: Renewable Energy Technologies and Resources APPENDIX C: Capital Structure of the Electric Sector Companies	2006	Eng

	APPENDIX D: Electricity Demand Forecast APPENDIX E: Fuel Price Forecast Update APPENDIX F: Results of Detailed Analysis		
23	Analysis of feed-in tariff for renewable energy sources in Armenia (eng), IFC	2011	Eng/Arm

ANNEX 5: TERMS OF REFERENCE FOR PREPARATION OF ARMENIA INVESTMENT PLAN

1. BACKGROUND

The Armenian energy sector is currently characterized by a reliance on imported fuel for electricity generation (gas and nuclear) and ageing power sector infrastructure. In the coming period it faces the challenge of replacing existing nuclear power capacity and rehabilitating its existing medium to large scale hydropower capacity. It also faces the challenge of responding to the global climate change agenda, by promoting a greater use of renewable and low carbon energy resources.

To date renewable energy generation in Armenia is almost entirely confined to small hydropower, which accounts for approximately 7% of annual electricity generation and where projects are well established. However, despite the existence of feed-in tariffs and enabling regulation, there has been very limited development of other renewable energy sources such as wind, solar, biomass and geothermal. The use of renewable energy for heating and hot water is similarly not well developed.

Armenia has been selected as one of the six reserve countries for the Scaling Up Renewable Energy Program in Low Income Countries (SREP). The objective of the SREP is to pilot and demonstrate the economic, social and environmental viability of low carbon development pathways in the energy sector by creating new economic opportunities and increasing energy access through the use of renewable energy. An initial group of six pilot countries was selected to receive funding under the SREP program (i.e., Kenya, Ethiopia, Mali, Nepal, Honduras, Maldives). In addition, a group of “waitlisted” countries, including Armenia, was selected to receive SREP funding, provided additional resources become available. In March 2012, the SREP sub-committee agreed upon the upper amount of funding and order of priority in which funding would be allocated to these countries: (1) Tanzania, US\$50 million; (2) Liberia, US\$50 million; (3) Yemen, US\$40 million; (4) Armenia, US\$40 million; (5) Pacific Regional (Vanuatu, Solomon Islands), US\$30 million; and (6) Mongolia, US\$30 million. As of May 2012, only Tanzania has secured SREP funding, implying that Armenia will receive SREP funding once additional resources have become available for Liberia and Yemen (in this order).

The Government is committed to promoting the development of renewable energy in the country and to that end, expressed its interest to be one of the pilot countries under SREP and was included in the reserve list. Participation in the SREP would allow Armenia to access donor funds to facilitate the greater exploitation of renewable energy resources.

2. OBJECTIVES

The objective of this assignment is to support the Armenian government to prepare an investment plan for developing renewable energy in the country and securing funding from the SREP. The plan should be comprehensive, clear and effective in demonstrating how SREP resources and other donor and private sector financing would be used in Armenia to overcome current obstacles to the wider penetration of renewable and low carbon energy.

The study will be conducted in two phases. Phase I will assess the potential and costs of applicable renewable energy technologies, prioritize potential interventions and facilitate discussions of these results with stakeholders.

Based on the outcomes of Phase 1, Phase II will develop the draft investment plan for the prioritized areas.

3. SCOPE OF WORK

In order to achieve the above objective, the Consultant shall carry out the following principal tasks.

Phase 1 –ASSESSMENT OF RENEWABLE ENERGY POTENTIAL

A large number of studies and surveys on Armenia have been prepared covering the energy sector in general and renewable energy in particular. However, these studies have been carried out by different entities for different purposes, and there is therefore an absence of an organizing framework to collate and summarize this information.

A list of some of these documents is set out in Appendix 1 and will be shared with the Consultants.

Task 1: Compile background information on the country and energy sector overview.

Under this task the consultant is specifically expected to prepare:

- Prepare a background section with description of the country context, including main demographic, social and economic indicators as of the most recent date.
- Prepare an overview of the energy sector, including: (a) basic energy balance; (b) description of the sector structure; (b) legislation and regulatory framework; government strategy; (c) electricity generation, transmission and distribution assets; (d) electricity generation mix; (d) tariffs and tariff structures; (e) key entities involved in regulation of the energy sector and (f) key challenges facing the sector
- Prepare an overview of the estimated potential for various renewable energy technologies and renewable energy penetration targets as well as the review of the ongoing and planned activities and projects in Armenia in the field of renewable energy.
- Summarize the key barriers (technical, regulatory, financial) hindering the development of renewable energy technologies reviewed and propose measures to overcome them. This activity should provide detailed description of availability of private or other government financing for renewable energy projects, including terms of financing and discuss the bottlenecks to development of renewable energy associated with availability and/or terms of financing.

Task 2: Conduct comprehensive assessment of various renewable energy technologies applicable in Armenia. The Consultant is specifically expected to:

- Assess the levelized economic costs (LECs) of various renewable energy technologies, including, SHPPs, pumped storage, geothermal, wind, solar PV, concentrated solar power plants (CSPs), biomass, solar heaters, heat pumps and any other technology suggested by the Ministry of Energy and Natural Resources (MENR). The analysis should also assess LECs of potential renewable energy projects contemplated by the Government. Build a supply cost curve using the potential and estimated LECs of renewable energy technologies.
- Simulate combinations of assessed renewable energy based electricity generation options with other fossil-fuel based generation options considered by the Government for meeting the electricity demand, including peak demand, considering the planned shut-down of some of the existing generation assets, planned commissioning of the generation plants under construction and their future availability to meet domestic demand. The generation options shall include all combinations analyzed under the Armenia Energy Sector Issues Note (2011). The simulation analysis shall be conducted assuming base case electricity demand growth scenario and commercial and concessional financing terms for all types of new generation assets. The consultant shall use a level of power supply standard appropriate to the Armenian economy or the standard already used in Armenia. As part of this activity, the Consultant should refine the demand model⁴ developed under the ESMAP/World Bank financed Energy Sector Issues Note (2011) to update the high-growth scenario assuming increased use of electric vehicles.
- Assess the viability of renewable based heating technologies included in the analysis and estimate the relative economic attractiveness of renewable based alternatives to electricity, gas-based, coal-based or firewood based heating. As part of this activity, the Consultant should also estimate the potential impact of heating related fuel switching on projected electricity demand.
- Assess the impact of combinations of renewable energy options and other generation investments on end-user tariff analyzed under the ESMAP/World Bank financed Power Sector Tariff Study by using the model developed.
- Conduct trade-off analysis of promising renewable energy generation technologies considering advantages and disadvantages and prioritize the projects based on at least four criteria agreed with the Government. The criteria might include, but not limited to LECs, employment impacts, energy security, GHG reduction, finance ability, etc.).

Task 3: Provide necessary support to the MENR and R2E2 Fund for stakeholder discussions of the priority list of renewable energy technologies. The Consultant is specifically expected to:

- Help the R2E2 Fund to prepare summary of the main findings of Phase 1 explaining the context and contents in accessible terms to be discussed with key stakeholders.
- Participate in meetings with the key stakeholders and prepare the minutes of meetings.

⁴ The demand model will be provided to all short-listed bidders

- Consult with the private sector companies for identification of potential renewable energy projects to be included in the Investment Plan.
- Support the R2E2 Fund to review and prepare draft responses to stakeholder comments.
- Support the R2E2 Fund with presentation of key findings to the MENR and discussion on the strategy to proceed with the development of the Investment Plan for SREP.

PHASE 2 – DRAFT SREP INVESTMENT PLAN FOR ARMENIA

Task 4: Prepare the draft Investment Plan for developing renewable energy in Armenia, based on the findings from Phase 1 analysis and the consultations with key stakeholders. As part of this task, the Consultant is specifically expected to:

- Prepare the draft Investment Plan following the structure defined in Appendix 3, based on prioritized list of renewable energy investments. The Investment Plan shall present the requirements for financing under SREP and present other available financing options.
- Provide concept briefs of the priority investments for SREP funding, as per template presented in Appendix 2.
- Identify the issues that need to be endorsed in order to successfully allow the implementation of the proposed Investment Plan.

The Investment Plan shall also meet the requirements of, and be compatible with, the procedures and goals of the SREP. The draft investment plan will be revised and finalized in response to comments received from stakeholders.

4. IMPLEMENTATION

The Consultant shall closely coordinate the implementation of the activity with the R2E2 Fund and Task Force under the MENR and will report to the designated staff of the R2E2 Fund. As necessary, the Consultant will collaborate with the PSRC, Ministry of Finance, Ministry of Economy, MDB team, and other stakeholders.

5. KEY STAFF REQUIREMENTS

Expert No 1: Team Leader

The team leader will be the main interface with R2E2 during the project and regarding all logistical and follow-up issues. The team leader shall have the following minimum qualifications:

1. MSc or equivalent diploma in engineering or economics, with at least 12 years of relevant experience in power system planning, economic assessment/feasibility studies for renewable energy projects, assessment and structuring of renewable energy investments;
2. Operational experience in Technical Assistance within international cooperation projects in Armenia;
3. Good knowledge of the Armenian power sector would be an advantage;
4. Excellent knowledge of English; knowledge of Armenian or Russian would be an advantage.
5. Relevant experience in energy in the region, with international financing institutions and similar assignments will also be considered.

Expert No 2: Renewable Energy Technology Specialist

The Renewable Energy Technology Specialist will have the following minimum qualifications:

1. MSc or equivalent diploma in engineering, with at least 10 years of relevant experience in renewable energy technologies, including, but not limited to SHPPs, wind, solar, geothermal, biogas. Strong expertise in the analysis/assessment of renewable energy projects, including CAPEX, OPEX and energy production;
2. Operational experience in Technical Assistance in Armenia would be an advantage;
3. Excellent knowledge of English; knowledge of Armenian or Russian would be an advantage.
4. Relevant experience in energy in the region, with international financing institutions and similar assignments will also be considered.

Expert No 3: Energy Economist

The Energy Economist will have the following minimum qualifications:

1. MSc or equivalent diploma in economics, with at least 10 years of relevant experience in economic appraisal of renewable energy projects; assessment of economic/financial viability of renewable energy potential and similar assignments;
2. Operational experience in Technical Assistance in Armenia would be an advantage;
3. Excellent knowledge of English; knowledge of Armenian or Russian would be an advantage.
4. Relevant experience in energy in the region, with international financing institutions and similar assignments will also be considered.

6. Deadlines and Deliverables

The assignment is expected to begin on November 2012 and completed on May 2013.

The Consultant should submit the following reports and deliverables as specified in the below table. All reports and deliverables should be submitted in English language accompanied by Armenian translation. The Consultant should also make available all the relevant analytical material in MS Excel or other software format.

Deliverable	Deadline
Inception report	Contract signing + 15 days
Task 1 and Task 2 reports	Contract signing + 90 days
Stakeholder consultations	Contract signing + 110 days
Task 4 report	Contract signing + 180 days

APPENDIX 1 TO THE TOR: LIST OF AVAILBLE DOCUMENTS

N	Report Title	Year	Language
1	Wind Power Development in Armenia, R2E2/World Bank	2008	Eng/Arm
2	The update of the existing scheme for small hydro power stations of the republic of Armenia, R2E2	2008	Eng/Arm
3	Independent interpretation of the results of the 3D MT, gravity and CO ₂ surveys conducted at the Karkar Site, Georisk/R2E2	2008	Eng
4	Renewable Energy Roadmap for Armenia, R2E2	2011	Eng/Arm
5	A preliminary feasibility assessment of the preferred alternative for implementing a commercial scale bio-ethanol fuels program for Armenia in the near to mid term, Enertech/BBI/R2E2	2008	Eng/Arm
6	Assessment of PV Industry Development Potential in Armenia, Danish Energy Management/SolarEN int./R2E2	2010	Eng/Arm
7	Independent interpretation of results of MT study for Gridzor and Karkar geothermal sites	2009	Eng/Arm
8	Demand-Side Management Study” FINAL REPORT, Danish Energy Management, The World Bank	2011	Eng
9	Charged Decisions:Difficult Choices in Armenia’s Energy Sector, World Bank	2011	Eng
10	The Other Renewable Resource: The Potential for Improving Energy Efficiency in Armenia, World Bank	2008	Eng
11	Wind Energy in Armenia: Overview of Potential and Development Perspectives, USAID	2010	Eng/Arm
12	Wind Energy Development in Armenia: Legal, Regulatory, Tax and Customs Regulations, USAID	2010	Eng/Arm
13	Armenia energy security and regional integration (Summary of year 1 technical results), USAID	2010	Eng
14	Connection of Photovoltaic Power Plants (with up to 5 MW of capacity) to the Common Grid of Electrical Power System, USAID	2010	Eng/Arm
15	Small Hydro Power (SHPP) Sector Framework, Status, Development Barriers and Future Development, USAID	2010	Eng/Arm
16	Methodology for Evaluating the Economics, Financial Viability and Environmental Consequences of Proposed Georgian Interconnection and Transmission Line Options, USAID	2011	Eng/Arm
17	Overview on Solar Electric Power in Buildings with Applications in Armenia, USAID	2011	Eng/Arm
18	Contract for the sale and purchase of electricity generated by wind power, USAID	2011	Eng
19	Developing an improved wind power purchase agreement for Armenia, USAID	2011	Eng
20	Congestion management in European grid and Applicability of Methodologies for Armenia draft report, USAID	2011	Eng
21	Armenia Energy Sector Note, World Bank	2011	Eng/Arm
22	Armenia Power Sector 2006 Least Cost Generation Plan APPENDIX A: ANPP Upgrade Projects, Decommissioning, Life Extension and Replacement Issues and Cost APPENDIX B: Renewable Energy Technologies and Resources APPENDIX C: Capital Structure of the Electric Sector Companies APPENDIX D: Electricity Demand Forecast	2006	Eng

	APPENDIX E: Fuel Price Forecast Update APPENDIX F: Results of Detailed Analysis		
23	Analysis of feed-in tariff for renewable energy sources in Armenia (eng), IFC	2011	Eng/Arm

APPENDIX 2 TO THE TOR: CONCEPT BRIEF PROJECT TEMPLATE

For each Investment Plan component, an investment concept brief (maximum two pages) should be provided as annex that includes:

- Problem statement (1-2 paragraphs)
- Proposed contribution to initiating transformation (1-2 paragraphs)
- Implementation readiness (1-2 paragraphs)
- Rationale for SREP financing (1-2 paragraphs)
- Results indicators
- Financing plan
- Project preparation timetable
- Requests, if any, for investment preparation funding

APPENDIX 3 TO THE TOR: INVESTMENT PLAN TEMPLATE

- 1) Proposal Summary (2 pages)
 - a) Objectives
 - b) Expected outcomes
 - c) Program criteria, priorities and budget
- 2) Country Context (3-4 pages)
 - a) Energy sector description (market structure, demand supply, and dispatch composition, electricity cost and pricing) incl. renewable energy status
 - b) Gap/barrier analysis; needs assessment
- 3) Renewable Energy Sector Context (3-4 pages)
 - a) Analysis of RE options (technology, cost, mitigation potential, barriers)
 - b) Government plans or strategy for the sector (willingness to move towards renewable energy investments, existing or envisioned policy, regulation, plans, and resource allocation)
 - c) Institutional structure and capacity (technical, operational, financial, equipment supply, information)
 - d) Role of private sector and leverage of resources
 - e) Ongoing/planned investment by other development partners
- 4) Contribution to National Energy Roadmap (2 pages)
 - a) Likely development impacts and co-benefits of SREP investment
 - b) How SREP investment will initiate a process leading towards transformational low carbon growth
- 5) Program Description (6-8 pages)
 - a) Capacity building and advisory services
 - b) Investment preparation activities
 - c) Technology deployment investments
 - d) Parallel activities to be funded by other development partners
 - e) Environmental, social and gender co-benefits
- 6) VI. Financing Plan and Instruments (3-4 pages)
 - a) Budget envelop for investments
 - b) Costs and sources of funding
 - c) SREP assistance (grant, concessional debt, etc.)
 - d) Recipients of funding
- 7) Additional Development Activities (2-3 pages)

a) Leverage complementary co-financing with other development partners such as bilaterals, private sector, and financial institutions

8) VIII. Implementation Potential with Risk Assessment (2 pages)

a) Country/regional risks - institutional, technology, environmental, social, financial

b) Absorptive capacity for SREP and leveraged resources

9) IX. Monitoring and Evaluation (1/2 page)

a) Results framework table

Annexes

Information should be included in annexes on the following areas:

- Assessment of countries absorptive capacity
- Stakeholder consultations
- Co-benefits
- Existing activities in the field of renewable energy, particularly activities of other development partners
- Request for MPIS
- Request for PPGs (if applicable)
- Independent Technical Review: matrix addressing comments and Government/MDB responses

Note that the Independent Technical Review report should be submitted as a separate file.

ANNEX 6: DETAILED DISCUSSIONS WITH STAKEHOLDERS

1. **Public Sector Regulatory Commission** – The regulator has set specific feed-in tariffs for technology specific renewable energy sub-sectors. The tariffs are single-part and all energy produced by such projects must be purchased by the electric utility, not subject to any market dispatch orders. The PPAs are signed for a 15 year operating period. The feed-in tariffs are fixed, but there is some allowance by the regulator for pass through of inflation (35% weighting for small hydro and 10% for wind) and foreign exchange costs (35% weighting for small hydro (USD/AMD) and 90% for wind (EUR/AMD)). While tariffs for small hydropower projects, SHPPs (approximately the equivalent of \$0.05/kwh) appear to be viable for numerous private sector sponsors. The SHPP tariff is defined as less than 10 MW, so a significant majority of projects in the private sector are below that threshold. There are approximately 111 operating SHPPs of about 158 MW aggregate installed capacity, and licenses have been issued by the regulator for an additional 88 SHPPs, totaling 176.6 MW.

2. Development of wind power is limited. A donor-funded 2.6 MW wind power project is under operations. Now an Italian private sector company is pursuing a 20 MW wind power project and has approached the regulator for a revised FiT. The regulator indicated that they are not inclined to revise any FiTs without clearer signals from the Government (e.g., the Ministry) on the long-term generation plan and support for renewable energy. The regulator does not support development of solar power projects as the costs are well above the average grid purchase price (which is approximately \$0.035-0.045/kwh).

3. **The Energy Institute** - With over 60 experts working on various energy disciplines, the Energy Institute is a self-sustaining government-owned think tank with considerable experience working regionally and with various national and international organizations. The Institute helped develop several strategic papers on energy including the RE Roadmap. Key expertise include wind power assessment and development as well as energy sector planning using various software such as Leap and Markal Times. Emissions reduction and GHG inventories are also key expertise. The Institute will consider participation in the preparation of the Investment Plan.

4. **National Academy of Sciences – Institute of Geological Sciences** – The Academy of Science conducts research on RE and the Institute of Geological Sciences, in particular, has been commissioned by the World Bank to conduct preliminary assessments of geothermal resources in two of the four potential sites in the country. Results indicate Karkar site is promising and has promising temperature gradients and could warrant drilling of exploratory wells.

Consultations with private sector

5. **Hydroenergetica** – The Mission met with a leading design/engineering company that specialized in SHPPs, having worked on approximately [25] SHPPs in Armenia. They also have worked on SHPPs in Syria, Iran, and Ukraine which provide context for their comments on local development. While many projects have been successfully developed in the past several years, they are concerned that the feed-in tariff from the regulator may not be sufficient to develop the next phase of projects. These projects (88 new licenses issued totaling ~177 MW) are less viable than the first phase. As a result, private sector developers are seeking to reduce costs – this

includes limiting the detailed design to the bare minimum to receive a license from the regulator and also purchasing low quality turbine-generators sets (without automatic regulation), using used pipes and electrical equipment, etc. Often the design firm is given a fixed budget to develop an initial plant design. They confirmed what was mentioned by several other stakeholders, that the small hydropower association is not well organized, not effective in lobbying the government on key issues and barriers (e.g., new VAT and custom duties being charged on generators as a result of a court case of a specific project).

6. **Electricity Network of Armenia (ENA)** – Scaling up renewable energy power impacts the grid and the private distribution company supports SREP stressing viability as a key issue. Due to lack of funding for distribution network extension, two hydro projects have been delayed and ENA expressed interest in accessing MDB financing for extension and upgrade of their existing network. EBRD has provided financing to ENA, and ADB through its Private Sector Operations Department and IFC

7. **American University of Armenia (AUA)** – The AUA has considerable expertise in RE, with particular focus on solar energy. The university plans to expand their program to include undergraduate courses, and will put emphasis on technical courses to support renewable energy. The AUA proposed to establish an Armenia Renewable Energy Center through collaboration with Government and MENR.

Consultations with commercial banks:

8. **Ameriabank** – Ameriabank is one of the strongest commercial banks lending in Armenia. It is one of IFC partners under its Sustainable Energy Finance Program and also one of the banks under ADB's trade finance program. Ameriabank has received credit lines of \$15 million from IFC and an additional \$10 million from FMO (the Dutch commercial lending arm). Almost all of these funds have been deployed in support of an aggregate 23 SHPPs over the past two years. Ameriabank has also taken over loans from Cascade Bank, which was the beneficiary of World Bank funding for SHPPs; a portfolio of \$3 million was transferred in the process. Under the IFC/FMO program, Ameriabank was lending for a tenor of 8 years including a grace period of up to 3 years. IFC also provided some training and technical support from its infrastructure advisory services. Ameriabank generally does lend for SHPPs from its own internal resources, as there is no other sources of medium or long term funding in Armenia. It can lend for up to 5 years maximum from its own resources, which is insufficient for most projects.

9. Most SHPPs in their portfolio are performing quite well. There has been some minor restructuring of amortization schedules to adjust for the seasonality of energy production (but maintaining same repayments within a fiscal year). Some projects have been rejected in due diligence due to poor designs (sponsors not willing to invest in proper detailed design) or sponsors have started construction already and have not been willing to consider changes to the design or project to accommodate recommendations from the bank's technical advisors.

10. ADB specifically explored the security/collateral requirements for SHPPs under these funding arrangements. Banks are generally lending on a project cash flow basis, but with

significant recourse/collateral of other assets. Prior to funding the loans for SHPPs, the sponsors have to provide security over other assets, usually real estate assets at a 70% loan-to-value ratio. As SHPP assets are built and commissioned, then the banks release security on the other assets. Personal guarantees for loan repayment are required for all projects throughout the tenor of the loan; this appears to be a regular market practice. It apparently has not inhibited private sector investment in SHPPs.

11. **ArmSwissBank** – While a relatively smaller private commercial bank (no retail banking operations), Armswissbank has provided debt funding for approximately 30 small hydropower projects. Their current outstanding portfolio is approximately \$11 million. Almost all of these projects have been funded by sources of long-term capital provided from donor agencies. This includes the German-Armenia Fund (GAF), the IFC and EBRD. Most of their portfolio of projects were funded by the GAF, which provided funds to the central bank for onlending to banks in local currency. The funds from the central bank are lent at 6%, and there is an agreement that loans from the banks will not exceed 10.5%. The process is the bank applies to the GAF for a specific project and receives approval prior to the bank funding the loan. Once the bank makes a disbursement for a project, said disbursement then gets refinanced by the GAF. The GAF conducts a separate/parallel technical evaluation of the project prior to approval; this process is somewhat redundant to the bank's own independent technical DD. Loans for these projects are lent with a maximum tenor of 10 years, including 2 years of grace from principal repayments. They are considering additional projects of about \$4 million, but dependent on having access to long term funds. While there are some additional funds, there appears to be a slight delay at present.

12. EBRD also has a lending facility but less concessional than GAF; funds are lent to the banks at 9.5% floating rate (which benefits from a non-deliverable forward contract from TCX Fund covering the foreign exchange risk; the rate floats based on the local 6-month treasury bill rate) Armswissbank are only looking at one biogas project which is a pig farm; they are aware of the Lukskert biogas project.