

PROJECT CONCEPTS

**ARMENIA RENEWABLE RESOURCES AND ENERGY EFFICIENCY FUND**

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**PROJECT CONCEPT**

# **CREATION OF INFORMATION-ANALYTICAL AND EDUCATION CENTER IN THE RENEABLE RESOURCES AND ENERGY EFFICIENCY FUND**

## **Description of Project Concept**

The concept envisages creation of an Information-Analytical and Education Centre in Armenia Reneable Resources and Energy Efficiency Fund aimed at dissemination of professional and general information, as well as implementation and publication of professional researches.

The project concept on creation of an Information-Analytical and Education Centre in RR and EE complies with the following strategy directions of R2E2:

* (1) Policy elaboration and legal reforms
* (2) Capacity development, public awareness and promotion of innovations
* (5) Consultancy and expertise, evaluation and monitoring
* (6) International cooperation in sustainable energy sector

This project concept includes 2 projects:

* Creation of Information-Analytical Centre
* Creation of Education Centre

Besides, the program also envisages that the Fund can conduct RR and EE training, evaluation and certification of professional knowledge. The program concept is planned to start in 2016 for 10-year period.

Despite of favourable conditions of the RA in terms of renewable and sustainable energy and the steps undertaken by Fund for sector development, the share of RR and EE in the RA Energy market is still relatively low, which is partially due to the lack of awareness among the potential consumers, as well as sector related researches. It should be noted that the Fund currently exercises analytical and educational functions, is the most reputable structure in RA RR and EE sector, and the whole sector related information and knowledge is concentrated herein. Thus, it is expedient that creation of Information-Analytical and Education Centre is done by R2E2. The objective of the concept is to make this function more coordinated, which will enable managing available information and researches, as well as enhancing sector awareness and researches. This, in its turn, can be a serious impulse for sector development.

Within the scope of the concept the target market includes consumers of electrical energy, professional organizations (producers, distribution networks, etc.), reneable resources and energy efficiency organizations, state bodies, etc.

The beneficiary of the project concept is the population of the Republic of Armenia.

Creation of Information-Analytical and Education Centre in RR and EE is one of the main directions of the concept on “**Implementation of Innovative Programs**”.

## **Final Project Objectives and Expected Results**

The main objective of the project is creation and dissemination of information, analytical and educational opportunities in RR and EE sectors. As a result of the project it is expected that increase of professional knowledge within the population, as well as among the beneficiaries and potential investors will be faced.

Enhancing information and professional knowledge on sector will promote increasing the sector interest and development. Particularly, due to the implementation of this concept it is expected to increase the trust towards R2E2, which will promote escalating the effectiveness and easy implementation of other ongoing projects. Besides, increase of sector related awareness among potential investors will promote also raising attractiveness of sector investments.

The rechecked indicators of the project implementation are presented below:

* Level of awareness among beneficiaries,
* Number of participants in information events,
* Number of sector related analytical materials prepared within the project
* Number of sector related educational events organized within the project
* Other indicators demonstrating massive application of energy saving elements

## **Implementation Methods**

It is envisaged to implement the project mainly on the account of Fund means and, if possible, by attracting assistance from the RA Government and international donor organizations. R2E2 is responsible for project implementation. There can be cooperation within the scope of the project with interested parties, if both parties demonstrate interest. The concept wise implementation of the project can assume receiving educational, consultancy and other types of services.

## **Sources and Methods of Financing**

Financing of this project concept is planned on the account of Fund means, as well as by attracting other means not forbidden by the law.

## **Financial Plan**

Creation of Information-Analytical and Education Centre in Reneable Resources and Energy Efficiency is one of the important bases for sector development. Development of these directions requires investments, which payback period, according to initial calculations will be 5-7 years. Investments, will be mainly made on the account of Fund means by attracting international donor organizations if possible.

**PROJECT CONCEPT**

# **CREATION OF INVESTMENT FUND**

## **Description of Project Concept**

This project concept envisages creation of Investment Fund aimed at financing sustainable energy (renewable energy and energy efficicency) projects in the RA.

Creation of an Investment Fund is “(3) **Organizing Implementation of Reneable Resources and Energy Efficiency Programs**” and “(4) **Elaboration, introduction and organization of financial tools and mechanisms, including loans and grants**”, which is one of the project concepts of R2E2 strategy.

The Investment Fund will exercise the following programs:

* Financing reneable resources projects
* Provision of consultancy to reneable resources sector organizations on establishing own capital, as well as on more efficient methods and sources for receiving required financial means

The Investment Fund will enable to considerably increase the scope of financing of reneable resources sector by involving additional means not only from international financial organizations, but also from international financial markets and other private investors.

The activities of Investment Fund will enable to considerably increase the amount of financial resources directed to the reneable resources sector, which will lead to the growth of renewable or net energy weight within general volumes of produced energy. This measure will reduce the volume of emissions of greenhouse gases, which is a key measure reducing the impact of climate changes. Meantime, the growth of reneable resources weight will reduce the dependence of energy sector from imported energy and will improve RA balance of payments and increase external reserves of the RA CB.

The project is planned to start in 2016. Currently, R2E2 financially supports energy efficiency activities through the banks, which directly provide loans to proper organizations (legal and physical persons) for implementation of energy efficiency programs. This system has its advantages and disadvantages. From the point of the Fund the advantage is that the banks bear full responsibility for loans payback, which considerably decreases financial risks of crediting by Fund. From the other hand, in this case, the price of credit resources is higher than in case of direct crediting by the Fund, since the percent of loans provided by banks includes also bank overheads (bank margin).

Financial assistance by the Fund is provided on the account of grants and loans provided to the State by international donors. Further increase of those means is rather limited, taking into consideration particularly the reducing margins of the RA public debt growth. However, according to current estimates only in the sector of reneable resources there is a need of at least USD 500,0 mln investment. These means can be obtained from proper financial markets without direct increase of public debt. Therefore, it is expedient to establish an Investment Fund by R2E2, which shares can belong to R2E2, as well as to international financial organizations, investments funds and other private investors. In case of effective activities of the Investment Fund Manager these means can be attracted from international financial markets taking into consideration the following important policy measures undertaken by the RA Government in reneable resources sector, which increase the investment attractiveness in the sector:

1. At least 15 years of guaranteed market for produced energy consumption,
2. Proper tariff policy ensuring payback of investments maximum within 6-7 years

The target market for implementation of this project concept is the RA energy market and the key beneficiary is the population of the Republic of Armenia. The Investment Fund will become the key tool for implementation of reneable resources projects by the Fund. This directly supports implementation of measures reducing impact of climate changes.

## **Final Project Objectives and Expected Results**

The final objective of the project is sustainable energy development in the RA, as well as increasing the energy safety level within the country.

The result of the project is creation of an Investment Fund and financing of reneable resources projects. Besides, another result of this project concept is creation of favourable investment environment in sustainable energy sector for similar projects, as well as formulation of an investment market for alternative energy sector and making the sector more attractive for investors.

The environmental impact of reneable resources projects financed by Investment Funds will depend on certain type of the project, such as hydro energy, wind plant or photovoltaic plant.

Social and economic impact will be positive in terms of investment fund. At least two dozen new jobs will be created and new energy plants will be operated, thus additional income, workplaces, etc. will be ensured. In general, the indicators evaluating the effectiveness of investment fund activities can be divided into 2 phases by implementation periods:

Phase one: number of organizations financed by the Investment Fund. Total amount of projects financed by the Investment Fund.

Phase two: the weight of energy produced as a result of the projects financed by the Investment Fund within general volumes of energy produced in the RA.

## **Implementation Methods**

Capital supplementation of the Investment Fund will be done mainly by the RA Government, international financial organizations and private investors. The selection of the Manager will be done through international competition. The Armenia Reneable Resources and Energy Efficiency Fund is responsible for the Fund creation. The partners of the Investment Fund are the shareholders, as well as the Fund Manager and the Fund creditors.

Implementation of Project Concept assumes procurement, consultancy and other types of services.

## **Sources and Methods of Financing**

The envisaged sources of financing are R2E2, RA Government, International Financial Organizations and private investors.

Financing is planned to implement by phases. Methods of financing are financial means attracted from international financial organizations, financial markets and private investors, inflows or savings expected from project implementation.

## **Financial Plan**

The volume of profitability depends on energy tariff to be approved by Public Services Regulation Committee.

The payback period of the project is planned to be 6-7 years.

**PROJECT CONCEPT**

# **FINANCING ENERGY EFFICIENCY INVESTMENTS IN PUBLIC SECTOR BY FINANCIAL MARKET**

## **Description of the Project Concept**

The concept on “Financing Energy Efficiency Investments in Public Sector by Financial Market” assumes financing of Reneable Resources (RE) and Energy Efficiency (EE) measures in the public sector of Armenia, particularly in public and municipal organizations, structures and systems, as well as in multi apartment buildings. Also structures envisaged for providing education, cultural and health services to population regardless of the type of ownership can be considered.

The strategy directions of theconcept on “Financing Energy Efficiency Investments in Public Sector by Financial Market” are:

* (2) Capacity building, public awareness and innovation promotion,
* (3) Organizing implementation of RR and EE projects,
* (4) Elaboration, introduction and organization of financial tools and mechanisms, including loans and grants

This Project Concept includes such projects as

* Support to RR and EE measures of buildings and structures,
* Promotion of led diode lamps application in the RA,
* Promotion of led diode traffic lights application in Armenia,
* Modernization of street lightening by application of led diode lights.
* Promotion of thermal pumps application

The public buildings and other systems of Armenia primarily were designed and constructed during the Soviet times, when the energy price was not calculated anyhow. Besides, those buildings are physically depreciated during the years and due to the energy crises lost convenient heating systems. These buildings are vulnerable also due to the applicable energy tariffs, since it is impossible to ensure full heating, lightening or air conditioning due to the lack of budget means. However, as a result of certain energy efficiency measures energy efficiency thereof will increase:

* The energy efficiency capacities of buildings and structures varies between 30-40%,
* The energy efficiency capacity of street lightening system varies between 40-65%,
* The energy saving capacities of thermal pumps varies between 15-25%[[1]](#footnote-1).

Taking into consideration limited opportunities of public means and grants it is expedient to attract amounts required for energy efficiency investments through the financial market by expanding the number of beneficiaries and creating new market for the banks. The RR and EE market of the RA is the target market in the context of the concept and the beneficiaries are the RA Government, communities, LSGBs, as well as the RA population.

## **Final Project Objectives and Expected Results**

The final objective of the project is sustainable energy development in the RA, as well as enhancing the level of energy safety. Besides, it is envisaged to re-equip the energy system within the scope of the project, as a result of which the effectiveness will be increased.

The result expected from the project is introduction of energy saving system in the RA, including:

* Increase of public and semi-public buildings that participated in energy efficiency project,
* Increasing in the number of led diode traffic lights in the territory of RA,
* Increasing application of thermal pumps,
* Increasing the number of re-equipped water supply and wastewater pumps,
* Increasing application of led diode lamps.

The RA energy efficiency potential is assessed up to 16% of produced energy and 30% gas consumption[[2]](#footnote-2). Introduction and dissemination of energy efficiency systems in the RA will promote enhancing energy safety in the country, as well as will increase sector effectiveness.

The control indicators of project are:

* The number of public and semi-public buildings participated in the energy efficiency project,
* The number of installed led diodes,
* The number of installed pumps,
* The number of re-equipped water supply and wastewater pumps,
* The number of energy efficient lamps used for street lightening.

## **Implementation Methods**

It is envisaged to implement the project on the account of Fund means, as well as by attracting support of the RA Government and other international donor organizations, if possible.

Implementation of project concept assumes procurement, consulting, construction and other types of services.

## **Sources and Methods of Financing**

Financing is planned to be implemented by R2E2 revolving funds and means provided by the WB and other international structures. Financing by R2E2 revolving funds is done by repayment principle through involvement of other investments, if possible.

## **Financial Plan**

Project implementation is envisaged to be done by revolving means of the Fund.

The payback periods are as follows:

* Energy efficiency investments in buildings and structures, wherein the payback period of RR and EE measures is 6-8 years.
* There are about 500 crossroads in the RA and there are 32 traffic lights in each of them[[3]](#footnote-3). The price of led diode traffic lights is USD 150, which means that substitution of all traffic lights will cost USD 2,4 million. The project payback period is 3 years.
* Total financing for promoting application of thermal pumps will be about USD 4 million and the payback period is 10-12years[[4]](#footnote-4).
* Re-equipping water supply and wastewater pumps. Currently there are about 500 big water supply and wastewater pumps. Substitution of each pumps will cost USD 15,000. As a result, USD 7,5 million will be required for project implementation and the payback period will be 2 years.
* Modernization of street lightening. Within the scope of the project substitution of about 325,000 street lightening lamps is envisaged, wherefrom 180,000 in Yerevan and 145,000 outside Yerevan. The cost of one lamp is USD 350, including the installation. The payback period is 3 years[[5]](#footnote-5).

**PROJECT CONCEPT**

# **FINANCING RENEWABLE RESOURCES AND ENERGY EFFICIENCY INVESTMENTS IN PUBLIC SECTOR BY PROVISION OF ENERGY SERVICES**

## **Description of the Project Concept**

The concept envisages initiation of Renewable Resource (RR) and Energy Efficiency (EE) measures in the RA public sector, building and structures, modernization of external and internal lightening, substitution of traffic lights with led diodes, etc. Within the scope of this project R2E2 undertakes studies for introduction of EE and RR technologies, elaboration of recommendations, preparation of design estimation documents, as well as direct financing of projects.

Financing of energy services in public sector by the Fund is part of the following strategy directions of R2E2:

* (2) Capacity development, public awareness and innovation promotion,
* (3) Organization of RR and EE projects
* (5) Consulting and expertise, evaluation and monitoring.

The concept envisages implementation of the following projects:

* Supporting public structures in implementation ofRRand EE measures,
* Promotion of led diode traffic lights application in the territory of RA,
* Modernization of external street lightening by led diode lights.

The RA public sector has wide opportunities for introduction of energy efficiency technologies. This is due to the fact the availability of numerous and various buildings (e.g., schools, kindergartens, Universities, medical institutions, multi apartment buildings, etc.), equipment (e.g. boiling houses, lightening systems), infrastructures (e.g. irrigation systems, pumps, street lightening, traffic lights, etc.), as well as due to the low level of energy saving technologies. Thus the project implementation will enable to considerably increase the effectiveness of mentioned structures and infrastructures.

EE capacities in terms of buildings and structures is assessed 30-40%, street lightening 40-65%, and the energy efficiency capacities of thermal pumps varies 15-25%[[6]](#footnote-6). The market of RR and EE technology services and the project beneficiaries are the RA Government, communities, LSGBs and the RA population. In general, the RR and EE measures for public sector buildings of the RA is related to the following project concepts:

* Introduction of RR and EE technologies in public sector through financial markets,
* Introduction of RR and EE technologies in private sector through provision of energy services by the Fund,
* Implementation of innovation projects.

## **Final Project Objectives and Expected Results**

The final objective of the project is introduction of RR and EE technology solutions in the public sector of RA economy, dissemination of energy saving technologies. The expected results of the project are enhancing the energy efficiency of RA public structures, reduction of energy expenses of the buildings, formulation and development of RR and EE products and services in water supply and wastewater sectors.

Project implementation creates favourable conditions for reduction of greenhouse gas emissions, reduction of energy consumption. Control mechanisms for the project can be street lightening, percent of energy saving by street lightening, traffic lights, water supply systems, percent of natural gas, electricity saving by public structures taking into consideration seasonality, day light duration, etc.

## **Implementation Methods**

Energy saving projects will be implemented through national tenders. RR and EE projects implementation in public sector assumes close cooperation with public structures and local self-governance bodies.

Within the scope of project implementation, the construction companies that won the tenders are considered partners. This process assumes procurements, tenders, as well as consultancy, construction and other types of services.

## **Sources and Methods of Financing**

Financing is planned to be implemented by R2E2 revolving funds, international institutional investors, as well as by private investors in future. Investments on the account of community budget, as well as own means of beneficiary public structure also can be considered.

Financing on the account of R2E2 revolving funds will be implemented by crediting, as well as by 10% co-financing by beneficiaries.

## **Financial Plan**

Financing of RR and EE projects for up to 10-year period. After the completion of RR and EE projects the cost of services provided by R2E2 will increase for 10% aimed at future monitoring and hire-purchase payment management[[7]](#footnote-7). The table presents the size, payback period (by years), as well as energy efficiency percent of investments required for energy saving purposes by various structures revealed during the studies.

|  |  |  |  |
| --- | --- | --- | --- |
| ***Structures*** | ***Investment***  | ***Payback period (year)*** | ***EE (%)*** |
| *Kindergarten* | *10.07 mln AMD /26.5 thousand USD*  | *7.02* | *59* |
| *School*  | *17.27 mln AMD /45.5 thousand USD* | *4.7* | *55* |
| *Hospital*  | *86.9 mln AMD /228.8 thousand USD* | *6.4* | *42* |
| *Street lightening*  | *15.4 mln AMD /40.6 thousand USD*  | *4.3* | *52[[8]](#footnote-8)* |

**PROJECT CONCEPT**

# **FINANCING RENEABLE RESOURCES AND ENERGY EFFICIENCY INVESTMENTS IN PRIVATE SECTOR BY FINANCIAL MARKET**

## **Description of the Project Concept**

The idea of project concept on “FinancingReneable Resources and Energy Efficiency Investments in Private Sector by Financial Market Energy” is promoting energy efficient technologies in RA private companies. The RA efficiency potential is assessed 16% of the total energy consumption and 30% of total gas consumption[[9]](#footnote-9). Introduction of energy saving technologies can promote solving the energy safety problem within the country. The strategy directions of the concept are:

* (2) Capacity development, public awareness and innovation promotion,
* (3) Organization of RR and EE projects
* (4) Elaboration, introduction and organization of financial tools and mechanisms, including loans and grants.

This concept includes such projects as follows:

* Financing introduction of RR and EE technologies in private organizations, buildings (e.g. private health institutions, private educational institutions, hotels, etc.) through financial market,
* Financing introduction of RR and EE technologies industrial infrastructures of private organizations (e.g. food processing, production of construction materials, greenhouses, etc.)
* Financing introduction of thermal pumps by Financial market,
* Re-equipping water supply and wastewater pumps under the possession of private sector.

This project includes financing of RR and EE measures, which should be done by interference of financial system (banks, credit organizations, other financial mediators). Means will be provided by payback principles, and review of the financial state of beneficiaries and the payback risk of provided financial means will be covered by the financing organization.

The project includes re-equipping thermal, water supply and wastewater pumps and promoting introduction of energy efficiency technologies.

RE and EE project implementation will promote the growth of country economic competitiveness, creation of favourable business environment, development of production of thermal insulation materials and energy efficient equipment, as well as will reduce negative impact on the environment.

The RR and EE technology services investment market is the target market within the scope of the concept and the beneficiaries are the private sector of the RA economy, water supply, wastewater, irrigation water supply companies of the RA and the population using such services.

This concept is directly related to the following concepts of the Fund:

* Introduction of RR and EE technologies in public sector through financial markets,
* Introduction of RR and EE technologies in private sector through provision of energy services by the Fund,
* Implementation of innovation programs.

## **Final Project Objectives and Expected Results**

The final objective of the project is introduction of RR and EE technology solutions in the private sector of RA economy and dissemination of energy efficiency technologies. As a result of project implementation it is expected to form and develop RR and EE products and services in private sector. Introduction of RR and EE technologies will have a positive environmental impact, since greenhouse gas emissions will be reduced.

Control indicators for this project concept can be the number of private structures, wherein RR and EE technologies are introduced, as well as the number of re-equipped or constructed thermal, water supply and wastewater pumps.

## **Implementation Methods**

Energy efficiency projects will be implemented trough national tenders. RR and EE project implementation in private sector assumes close cooperation with public and private sector representatives aimed at implementation of financing, construction and other types of works.

R2E2 is responsible for implementation of specific projects. Within the scope of project the partners are the companies that won construction and other types of tenders. Implementation of project concept assumes procurement, consulting, construction and other types of tenders.

## **Sources and Methods of Financing**

Financing of this project is envisaged to be done by R2E2 revolving funds, means of international investors and private investments. Financing by R2E2 will be done through provision of loans.

## **Financial Plan**

The payback period of re-equipping water supply and wastewater pumps is 2 years and total investment costs from public and private financial means is about USD 7.5 mln[[10]](#footnote-10).

The potential of thermal pumps is rather limited. The total cost of widespread thermal pumps project is about USD 200 thousand for each project. It is planned that the investment costs will be USD 4mln[[11]](#footnote-11). The calculated payback period is planned to be from 10-12 years[[12]](#footnote-12).

**PROJECT CONCEPT**

# **FINANCING RENEABLE RESOURCES AND ENERGY EFFICIENCY INVESTMENTS IN PRIVATE SECTOR THROUGH PROVISION OF ENERGY SERVICES**

## **Description of Project Concept**

The project concept is promotion of energy efficient technology solutions in private companies of the RA. RA energy efficiency potential is assessed 16% of the total energy consumption and 30% of total gas consumption[[13]](#footnote-13). Introduction of energy efficiency technologies can promote solving the issue of energy safety. The project includes re-equipping thermal, water supply and wastewater pumps and promoting introduction of energy efficiency technologies. The strategy directions of the concept on “Financing Introduction ofReneable Resources and Energy Efficiency Technologies in Private Sector through Provision of Energy Services by The Fund” are as follows:

* (2) Capacity development, public awareness and innovation promotion,
* (3) Organization of RR and EE projects
* (5) Consulting and expertise, evaluation and monitoring.

This concept includes such projects as follows:

* Support in introduction of RR and EE technologies in private, profit organizations (e.g. modernization of boiling houses) through provision of energy services by the Fund,
* Support in introduction of thermal pumps,
* Re-equipping water supply and wastewater pumps.

The project includes support to RR and EE measures in a form of logistic support. The assistance will be provided based on the payback principle and review of the financial state of beneficiaries and the payback risk of provided financial means will be covered by the Fund.

Further, the project financing functions will be gradually transferred to R2E2 Investment Fund, which will cover the financial risk of the investment project.

The RR and EE technology services investment market is the target market within the scope of the concept and the beneficiaries are the private sector of the RA economy, water supply, wastewater, irrigation water supply companies of the RA and the population using such services.

This concept is directly related to the following concepts of the Fund:

* Introduction of RR and EE technologies in public sector through financial markets,
* Introduction of RR and EE technologies in private sector through provision of energy services by the Fund,
* Professional services
* Implementation of innovation programs.

## **Final Project Objectives and Expected Results**

The final objective of the project is introduction of RR and EE technology solutions in the private sector of RA economy and dissemination of energy efficiency technologies. As a result of project implementation it is expected to form and develop RR and EE products and services in private sector. Control indicators for this project are:

* Number of private structures participated in the energy efficiency project
* Number of installed thermal pumps,
* Number of installed water supply and wastewater pumps,
* Number of re-equipped water supply and wastewater pumps.

## **Implementation Methods**

It is envisaged to implement the project on the account of Fund means and USD 1,820,000 grant provided by the WB within the scope of “Energy Efficiency Project”, as well as by attracting support of the RA Government and other international donor organizations, if possible. Energy Efficiency projects will be implemented by national tenders. Implementation of RR and EE projects in private sector assumes close public-private cooperation in terms of financing, construction and other types of works. R2E2 is responsible for implementation of specific projects. Within the scope of project, the partners are the companies that won construction and other types of tenders. Implementation of project concept assumes procurement, consulting, construction and other types of tenders.

## **Sources and Methods of Financing**

Project financing is planned to be done on the account of Fund revolving means, as well as by attracting support of the RA Government and other international donor organizations, if possible.

Financing is planned to be provided by payback principle, R2E2, international institutional investors and in future by private investors.

## **Financial Plan**

The payback period of re-equipping water supply and wastewater pumps is 2 years and total investment costs from public and private financial means is about USD 7.5 mln[[14]](#footnote-14).

The potential of thermal pumps is rather limited. The total cost of widespread thermal pumps project is about USD 200 thousand for each project. It is planned that the investment costs will be USD 4mln[[15]](#footnote-15). The calculated payback period is planned to be from 10-12 years[[16]](#footnote-16).

**PROJECT CONCEPT**

# **CONSTRUCTION OF PHOTOVOLTAIC POWER PLANTS**

## **Description of Project Concept**

The main objective of this project is promoting development of photovoltaic energy in the RA. This assumes both provision of consultancy for construction of photovoltaic power plants and attracting investments for the construction thereof.

Construction of photovoltaic plants is included in the following strategy directions:

* (2) Capacity development, public awareness and innovation promotion,
* (3) Organization of RR and EE projects
* (6) International cooperation in sustainable energy sector

This concept includes implementation of the following projects:

* Construction of photovoltaic power plants
* Construction of “local photovoltaic plants” on buildings and structures
* Promotion of production of photovoltaic boards

Within the scope of this concept one of the steps of the Fund can be also measures enabling reduction of investment risks and costs, as well as developing proper market.

One of the important components of project concept is construction of photovoltaic plants on the roofs of buildings and structures. Implementation of this projects develops energy surplus and payback opportunity for distribution networks both for households and private sector.

Development of photovoltaic plants will enable creating alternative energy sources and reducing greenhouse gas emissions. Development of this source of energy will enable solving equal social and community expansion issues, particularly in rural communities. In general, a favourable condition for project implementation is the fact that in 2030 worldwide energy consumption will increase by 58%[[17]](#footnote-17).

The next important development step of photovoltaic energy is education and utilization of internal professional potential.

RA electricity market is the target market of this project. The main beneficiaries of the project targeting installation of local photovoltaic plants can be households that can accommodate such plants on the roofs of residential buildings (e.g. detached houses, hostels, other private structures). Information technology companies, small and medium entrepreneurs also can be among the beneficiaries.

The beneficiary of photovoltaic plants installation and production project in the RA territory is the whole population, since they will benefit from the results. The project is related to the following:

* Project concept on **“Creation of Information, Analytical and Education Centre for Reneable Resources and Energy Efficiency”**, since it is expedient to construct photovoltaic plants, do economic calculations, as well as organize training on construction and operation.
* Concept on **“Professional services”**, enabling to regulate the sector,
* In future it can be related to the concept on **“Creation of Investment Fund”**, since it is possible to attract household and private sector investments, as well as financing investment projects of various sizes.

## **Final Project Objectives and Expected Results**

The final objective of the project is sustainable energy development and construction of photovoltaic power plants in the RA. Another objective is increasing the level of energy safety within the country, as well as an indirect objective can be improvement of social conditions in rural communities.

The project results are:

* Increasing the number of photovoltaic power plants. It will promote development of alternative energy in the RA and formulation of favourable investment climate for implementation of sustainable energy projects.
* Increasing the weight of solar energy in total RA energy production.

Application of photovoltaic plants in general will have positive impact from the environmental point, since it will considerably reduce greenhouse gas emissions into the atmosphere[[18]](#footnote-18).

The control indicator of project implementation can be the volume of production by photovoltaic method in the RA energy balance, i.e. 2-5%.

By 2020 it is expected to increase the capacity of photovoltaic plants up to 40 MW and up to 80 MW in 2025[[19]](#footnote-19).

## **Implementation Methods**

The project can be implemented by tenders and by direct contracting. It will be implemented by R2E2 and private sector cooperation. Also attraction of financial means from private sector, as well as financing through the financial system is possible.

Possible partners of the project are:

* Construction, financial organizations and other service companies,
* Households, as well as private sector companies interested in the project.

## **Sources and Methods of Financing**

Sources of financing are R2E2 revolving funds, means provided by RA Government, International Financial Organizations, as well as private investors.

Financing can be done both by R2E2 means and by private investments and investments of International Financial Organizations. It is expected to implement financing based on the payback principle.

## **Financial Plan**

The RA climate conditions are more favourable for solar, particularly photovoltaic energy development. There are long term energy radiation dates in the RA, which is 2500 hour sunny days within the year and 1720 kWh/m2 solar energy on 1square meter (average figure for Europe is 1000 kWh/m2)[[20]](#footnote-20). This creates favourable conditions for development of photovoltaic plants. The payback period calculated for photovoltaic plants is 6-10 years[[21]](#footnote-21). According to the Energy Charter the total potential of country solar energy is more than 6,500 MW and the capacity of certain plants can be up to 20-24 MW.

**PROJECT CONCEPT**

# **GEOTHERMAL ENERGY DEVELOPMENT**

## **Description of Project Concept**

Geothermal energy is transformation of entrails thermal energy into electric energy. Firstly, it was used for industrial purposes in Italy in 1911. Geothermal energy is developed in Iceland, New Zealand, Italy, France, Lithuania, Mexico, Philippines, China, Japan, etc. The main advantage of geothermal energy is that in practice it is an unlimited resource and has no dependence on environment and weather conditions. Geothermal energy is an important component of sustainable energy. This means satisfying current energy requirements without exhausting this resource.

The project implementation is also important in terms of RA energy safety, since it increases the level of country independence from imported energy and from traditional sources of receiving energy. Plant construction will enable reducing greenhouse gas emissions in the RA territory. The RA territory has favourable conditions in terms of geothermal energy development. According to the WB financed project the Jermaghbyur (Syunik region) geothermal plant has 25 MW potential capacity, which can annually generate 194,4 mln KW/h electricity[[22]](#footnote-22).

The project strategy directions are:

* (2) Capacity development, public awareness and innovation promotion,
* (3) Organization of RR and EE projects
* (6) International cooperation in sustainable energy sector

This concept includes implementation of the following projects:

* Research drilling,
* Industrial drilling,
* Preparation of documents necessary for construction of geothermal plant

The concept assumes creation and development of geothermal energy in the RA. It includes construction of the power plant and drilling. During the first phase of the project research drilling should be done. This will enable collecting enough information about the entrails thermal indicators and in case those indicators are positive phase 2 of the project will be initiated. It will include drilling of 6 industrial wells and construction of geothermal power plant. The initiative will create a system and in case of implementation will have an essential importance in the RA energy sector.

The target market of this concept is the RA energy market and the beneficiary is the population of the Republic of Armenia.

Construction of geothermal power plant is directly linked to the concepts on “Creation of information-analytical and education centre inReneable Resources and Energy Efficiency Sectors” and “Implementation of Innovative programs”.

## **Final Project Objectives and Expected Results**

The final objective of the project is development of sustainable energy in the RA, as well as increasing the level of energy safety. The project result is construction of geothermal power plant, as well as development of alternative energy in the RA. Besides, creation of favourable investment climate in energy sector for other similar projects, as well as establishment of investment market for alternative energy sector and making the sector more attractive for sector investors is another result of this project.

According to the WB and R2E2 reports the geothermal power plant will have certain environmental and social impact, since the concept assumes construction of road, water supply systems and other infrastructures, drilling, transfer of water resources to the project site, receipt of surplus materials from drilling, emission of polluted water and perhaps certain quantity of hazardous emissions (materials used during the drilling and emissions of the drilling). However, plant construction will have positive environmental and social impact, since emissions will be reduced and additional work places will be created in the region.

This project consists of 3 phases; which control indicators are:

* **Phase one.** **Drilling of Research Wells**

The further steps are defined based on the results. 3 scenarios are worked out by the WB envisaging constriction of geothermal plants by various technologies (scenario 2 and 3) or project termination (scenario 1).

* **Phase two. Industrial drilling**

It is envisaged to drill 6 industrial wells with 3km depth and 2 neighbouring wells each with 1.5km depth.

* **Phase three. Power plant construction**

The capacity of constructed plant should be 25 MW. In order to construct a plant, the thermal characteristics of underground water should have 700-1000m depth and not less than 200°C.

Implementation of Projec Concept assumes various types of procurement, as well as acquisition of consulting, construction and other types of services.

## **Sources and Methods of Financing**

The project financing sources are: R2E2, RA Government, International Financial Organizations, private investors, beneficiaries. It should be mentioned that the WB financing will be done through grants.

Financing is planned to be done by phases. During phase 1 pilot drilling will be done. 80% of financing will be provided by the World Bank (USD 8,55 mln) and 20% by the RA Government (USD 2,1375 mln).

## **Financial Plan**

The volume of profitability depends on electricity tariff approved by public services regulatory committee. However, the breakeven point of the plant is 2,44 cent/KW/h (about 11,7 AMD/KW/h) and the economic calculations are done based on tariff of 4,5 cent/KW/h (about 21,6 AMD/KW/h).

The payback period will be 12 years, including 2 years required for plant construction.

Total costs of plant construction are assessed USD 39.1 mln and the total period of project will be 30 years[[23]](#footnote-23).

**PROJECT CONCEPT**

# **ACCOMPLISHMENT OF INNOVATION PROGRAMS**

## **Description of Project Concept**

Taking into consideration the current development trends of science and technologies implementation of innovation approaches is vital for ensuring sector development and effectiveness. The project will promote introduction of innovations in energy efficiency and reneable resources sector. The concept assumes assistance to initiatives targeting introduction of innovations in the energy efficiency and reneable resources sectors, which will ensure sustainable development of the sector.

Strategy directions of the concept on “Implementation of Innovation Programs” are:

* (2) Capacity development, public awareness and innovation promotion,
* (3) Organization of RR and EE projects
* (4) Elaboration, introduction and organization of financial tools and mechanisms, including loans and grants
* (6) International cooperation in sustainable energy sector

This Project Concept includes such projects as:

* Financing innovative programs,
* Promoting innovations in RR and EE sectors.

The target market of the concept is RA energy market, including EE, RR and sustainable energy sectors. The project beneficiaries are:

* Representatives of science sector of the RA Energy Efficiency and Reneable Resources sectors.
* Population of the Republic of Armenia.

It should be noted that all project concepts are closely related to this concept.

## **Final Project Objectives and Expected Results**

The final objective of the project is development of innovation technologies and approaches in RA energy efficiency and reneable resources sectors, as well as implementation of innovation programs, creation and development of investment markets for innovation programs in RA energy efficiency and reneable resources sectors.

As a result of the project implementation it is envisaged implementation of innovation programs in the RA energy efficiency and reneable resources sectors that will promote sector development and enhance effectiveness.

Control indicators of project are:

* Number of innovation programs implemented in the RA energy efficiency sector
* Number of innovation programs implemented in the RA reneable resources and sustainable energy sectors.

## **Implementation Methods**

It is envisaged to implement the project on the account of investment fund by attracting assistance of the RA Government and International Donor Organizations if possible.

Within the scope of the project there can be cooperation between all interested structures in case of bilateral interest. Project partners can be public structures responsible for the sector, private investors, venture companies, etc.

Implementation of Project Concept assumes procurement, consulting and other types of services.

## **Sources and Methods of Financing**

Financing is planned to be done on the account of R2E2 investment fund (Investment Fund is not yet created, however, its establishment is one of the important objectives of the Fund), as well as by attracting international donors, investment and venture organizations if possible. The Fund can implement small scale pilot projects aimed at introducing in the market the most demanded sector technologies.

## **Financial Plan**

It is envisaged to invest about USD 10 million in the RA energy efficiency sector, wherefrom 5-10% will be directed to the sector development. If half of the amount will be provided by R2E2, then for coming 10 years the Fund will have about USD 250-500 for sector development and implementation of innovation programs[[24]](#footnote-24).

**PROJECT CONCEPT**

# **PROVISION OF PROFESSIONAL SERVICES**

# **Description of Project Concept**

RE and EE development and investment market establishment in the RA will gradually create a need of professional services, such as evaluation of investment projects for private investors and implementation of energy efficiency studies and audits. It is envisaged also that licensing of private audit companies, energy efficiency expertise and labelling of imported and locally produced equipment, preparation of energy balance, etc. will be activated. Introduction of mentioned professional services in the RA is an important step for development of investment market infrastructures, as well as in terms of dissemination of renewable and energy efficient technology solutions.

Concept on “Professional Development” is included in “(5) **Consulting, Expertise, Evaluation and Monitoring**” strategy direction.

This Project Concept includes:

* Energy studies and expertise,
* Accreditation of energy auditors,
* Energy audit of private companies,
* Energy audit of public companies,
* Expertise in RR and EE sectors,
* Labelling of goods,
* Preparation of energy balance,
* Provision of professional services for financial market
* Evaluation of investment projects.

Provision of professional services in energy sector is one of the important directions of Fund activities. The scope of these services includes energy audit of public and private structures, expertise, goods labelling and preparation of energy balance.

The target markets of the project concept are:

* Market of RR and EE projects,
* Goods/equipment market,
* RA Government and International Organizations (preparation of energy balance),
* RE and EE Investment market (evaluation of investment projects).

The project beneficiaries are:

* RA state departments (e.g. Ministries, Committees, PIU-s, HEIs, etc.),
* Private companies and households,
* RE and EE private and international institutional investors,
* RA Government

This concept is directly or indirectly linked with the following concepts:

* Creation of an Information-Analytical and Education Centre in Armenia Reneable Resources and Energy Efficiency,
* Financing Energy Efficiency Investments in public sector through Financial Market,
* Financing Reneable Resources and Energy Efficiency Investments in Public Sector Through Provision of Energy Services,
* Financing Reneable Resources and Energy Efficiency Investments in Private Sector by Financial Market,
* Financing Reneable Resources and Energy Efficiency Investments in Private Sector Through Provision of Energy Services,
* Accommplishment of innovation programs

# **Final Project Objectives and Expected Results**

The final objective of the project is RR and EE development in the RA. The expected project results are creation and development of professional service market in RR and EE sectors.

The social and environmental impact of the project depends on understanding of changed approaches and energy efficiency as one of the efficient criteria of investment projects in public and business structures.

The control indicators can be periodic (e.g. annual, quarterly) preparation of energy balances, introduction of labelling practice in the economy, number of RR and EE investment projects. The project implementation phases and control mechanisms by phases can be selected during the project implementation based on priority.

# **Implementation Methods**

Project will mostly be implemented on the account of R2E2 means by attracting financing of international structures as much as possible.

Implementation of project concept assumes public-private cooperation during energy audit of public structures, RR and EE sector expertise, goods labelling, preparation of energy balances. Besides, implementation of Project Concept assumes procurement, consulting, construction and other types of services.

# **Sources and Methods of Financing**

Project financing will be done on the account of R2E2 Investment Fund, as well as by the help of private investors and international institutional structures.

# **Financial Plan**

The payback period of investments made within the scope of the project is rather short. In general, the payback periods for investments made during the concept vary between 1-5 years[[25]](#footnote-25). This is a rather positive indicator and in terms of investments one of the more attractive directions of the project. Level of energy efficiency is assessed 20-35%[[26]](#footnote-26) as a result of energy audits.

1. Ameria Management Advisory, “Market study and elaboration of operational plan for the RA Reneable Resources and Energy Efficiency Fund”, Task 2 Report, page 55, [↑](#footnote-ref-1)
2. http://www.r2e2.am/ [↑](#footnote-ref-2)
3. Ameria Management Advisory, “Market study and elaboration of operational plan for the RA Reneable Resources and Energy Efficiency Fund”, Task 2 Report, page 56։ [↑](#footnote-ref-3)
4. Ameria Management Advisory, “Market study and elaboration of operational plan for the RA Reneable Resources and Energy Efficiency Fund”, Task 3 Report, page 19։ [↑](#footnote-ref-4)
5. Ameria Management Advisory, “Market study and elaboration of operational plan for the RA Reneable Resources and Energy Efficiency Fund”, Task 3 Report, page 10։ [↑](#footnote-ref-5)
6. Market assessment and future business plan for the R2E2 fund, task 2 report, Ameria Management Advisory, p. 47․ [↑](#footnote-ref-6)
7. RA Government Decision N 174-Ն, “On distribution of loan means managed by Armenia Reneable Resources and Energy Efficiency Fund and on approval of energy efficiency and reneable resources financial program", Clause 3 [↑](#footnote-ref-7)
8. http://r2e2.am/ [↑](#footnote-ref-8)
9. Ameria Management Consulting, “Market study and elaboration of operational plan for the RA Reneable Resources and Energy Efficiency Fund”, Report on Task 2, page 55 [↑](#footnote-ref-9)
10. Ameria Management Consulting, “Market study and elaboration of operational plan for the RA Reneable Resources and Energy Efficiency Fund”, Report on Task 3, page 12 [↑](#footnote-ref-10)
11. Ameria Management Consulting, “Market study and elaboration of operational plan for the RA Reneable Resources and Energy Efficiency Fund”, Report on Task 3, page 20 [↑](#footnote-ref-11)
12. Ameria Management Consulting, “Market study and elaboration of operational plan for the RA Reneable Resources and Energy Efficiency Fund”, Report on Task 3, page 56 [↑](#footnote-ref-12)
13. Ameria Management Consulting, “Market study and elaboration of operational plan for the RA Reneable Resources and Energy Efficiency Fund”, Report on Task 3, page 55. [↑](#footnote-ref-13)
14. Ameria Management Consulting, “Market study and elaboration of operational plan for the RA Reneable Resources and Energy Efficiency Fund”, Report on Task 3, page 12 [↑](#footnote-ref-14)
15. Ameria Management Consulting, “Market study and elaboration of operational plan for the RA Reneable Resources and Energy Efficiency Fund”, Report on Task 3, page 20 [↑](#footnote-ref-15)
16. Ameria Management Consulting, “Market study and elaboration of operational plan for the RA Reneable Resources and Energy Efficiency Fund”, Report on Task 3, page 56 [↑](#footnote-ref-16)
17. http://r2e2.am/ [↑](#footnote-ref-17)
18. http://r2e2.am/ [↑](#footnote-ref-18)
19. RA Government Decision No 54 on approval of the “Long term (up to 2036) development ways the RA energy system” adopted on December 10, 2015 [↑](#footnote-ref-19)
20. http://r2e2.am/ [↑](#footnote-ref-20)
21. Ameria Management Consulting, “Market study and elaboration of operational plan for the RA Reneable Resources and Energy Efficiency Fund”, Report on Task 2, page 47 [↑](#footnote-ref-21)
22. http://r2e2.am [↑](#footnote-ref-22)
23. http://r2e2.am [↑](#footnote-ref-23)
24. Ameria Management Advisory, “Market study and elaboration of operational plan for the RA Reneable Resources and Energy Efficiency Fund”, Task 3 Report, page 32 [↑](#footnote-ref-24)
25. Ameria Management Advisory, “Market study and elaboration of operational plan for the RA Reneable Resources and Energy Efficiency Fund”, Task 3 Report, page 73 [↑](#footnote-ref-25)
26. Ameria Management Advisory, “Market study and elaboration of operational plan for the RA Reneable Resources and Energy Efficiency Fund”, Task 3 Report, page 73 [↑](#footnote-ref-26)