1. Country and Sector Background

Moldova has minimal proven oil and natural gas reserves. A small coal industry produces low-grade bituminous coal. National borders are defined by the two rivers Nistru and Prut, but there is limited hydro-electrical capacity. 98% of primary and electrical energy requirements are imported, natural gas from Russia and electrical power mostly from the Ukraine. Agriculture, together with the food and drinks industry, is the key sector of the Moldovan economy. Arable land, 80% of which is black soil, accounts for about half of the total land area of 3.4m hectares. Moldova has the lowest forest cover as a percentage of land area in Europe, about 10%. Following the National Land Programme - the break-up of collective farms, most agricultural land has been privatized and a national land register is in place. Agricultural production, which declined during the reform period of the 1990’s, is expected to rise by 35% over the coming decade.

The majority of the population of 4.3 million lives in rural communities, where living conditions are especially difficult in the cold winter months. Traditionally, coal and wood was used as a heating fuel in rural areas. After the collapse of the Soviet Union the price of fuels, including coal, increased dramatically. Total annual coal consumption dropped in the following decade, from 2,500,000 to 50,000 tons, an indication of latent demand. Coal supplies to fuel heating systems in public buildings, especially in rural communities, were severely cut-back often resulting in the closure of public buildings in the winter period. District heating plants stopped operating except in the biggest cities.

Rural incomes are especially low and only partly based on cash based transactions. Household land plots contribute greatly toward family subsistence. Most consumers cannot afford to pay for normal energy services. Other forms of freely available heating fuel are used including sunflower stems, shelled maize cobs, maize stalks, and other agricultural wastes supplementing coal and wood for domestic fires and stoves (1-5KWth range). Biomass is used inefficiently due to simple and outdated technologies – domestic fires and stoves with an efficiency rating estimated not to exceed 50%. Some biomass materials are unused, as they are not available in a form that can be used with existing technologies.

There are some 1500 settlements in Moldova. A typical rural community comprises 1000 households surrounded by 1200 hectares of agricultural land. The usual, stable, 5-7 year crop rotation includes...
winter wheat, which has been identified as the best starting point for a biomass fuel cycle given its availability and lack of alternative use. Wheat straw serves little purpose as a soil conditioner especially on the predominantly black soils of Moldova. Unwanted and unused straw would be sufficient to fuel the energy needs of public buildings in a typical rural community, systems in the region of a 500 - 1000 KWth capacity. A legacy of the former Soviet planning system is a uniformity of design and specification of public buildings in all settlements. Replicability is therefore easier being a function of standardized town planning and public building specifications.

There is however no experience of using efficient biomass technology in Moldova and as such there is a very significant 'credibility barrier'. Once it has been demonstrated that biomass fuel works on a communal scale, scale can be further increased to include larger district heating units and industrial applications, 5 MWth and above. Further potential would also arise for high efficiency domestic stoves in the 1-5 KWth. There are various infrastructural and social development programs on-going and in development. These include the replacement of district heating plants and subsidies for the connection of communities to the main arterial gas supply system, where available. Heat supply is a national priority. The heating season stretches from November to April. Replacement and upgrade decisions at household, municipal and national level are underway. Biomass is now appearing on the development radar in Moldova, emerging from studies, strategies, declarations and protocols. There are good prospects that biomass will be included in social infrastructure and energy system development programs in Moldova. There is also developing cross-border cooperation, especially with the Ukraine.

2. Project Objectives

The main objective is to overcome barriers to the update of biomass technologies by providing examples of best practice (demonstration plants) in the use of biomass fuelled energy systems as a viable alternative to gas, oil and coal and as a sustainable means of addressing the energy supply problems facing rural communities and agro-enterprises. Demonstration systems would be of a size, scale and cost appropriate for wide replication in rural areas. This would be supported by access to information, technical support and a fund to cover the incremental capital cost in installation of biomass-fuelled systems.

3. Rationale for Bank’s Involvement

The main barrier to the use of renewable energy (agricultural wastes) is that there is no current possibility for an independent and rational decision maker, in Moldova, to be aware of, to investigate or to source a renewable energy / biomass option as a fuel for an energy requirement. The current availability and information is totally geared toward gas, oil, coal and electricity. The means to overcome this barrier have been reviewed at length, drawing on experiences in countries including the Ukraine, Romania, Caucasus, Balkan Countries and Austria. There exists a common perception in Moldova that agricultural wastes cannot be effectively utilized to produce heat other than in simple domestic stoves. This energy source is therefore not considered as a serious option. The development of demonstration sites, information and a commercial infrastructure for the marketing of efficient technologies are the key constraints in the use of renewable energy. Preliminary energy audits have highlighted that the higher capital cost of biomass technology can be offset by the significantly lower annual fuel cost of biomass, obtained from local sources – agricultural lands surrounding rural villages. However, the technology and fuel cycle and the economic package have to be proven so that biomass fuelled thermal energy systems will become a rational economic decision.

Primary and unprocessed agricultural arable crop wastes, especially wheat straw, have been identified as the most suitable, available and unused biomass for thermal energy production in Moldova, initially for

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1 World Bank sector study, ‘Potential Use of Renewable Energy (Biomass) in Moldova’, 2002
use in small scale systems (50-500KWth). The project will initiate the creation of sustainable biomass based energy generation in Moldova, initially using baled straw as the energy carrier, by addressing the institutional, financial, and informational barriers. There is significant identified potential for replication throughout Moldova, which would include interacting with developments in the technologies, used for biomass based energy systems in neighboring countries, the Ukraine and Romania.

The Bank’s involvement in the project is warranted as trustee of the Global Environment Facility (GEF), through its experience in climate change projects, and through the ability to link the investment under this projects to relevant projects in Moldova rural sectors (projects in agriculture, biodiversity, and social infrastructure).

4. Description

The project will provide a foundation for a broad and efficient use of biomass in substitution for imported fossil fuels (coal), acting as a catalyst for the introduction and promotion of the use of primary agricultural wastes (biomass) to fuel energy generation using efficient technologies. This will (i) reduce greenhouse emissions by replacing fossil fuels and simultaneously reduce environmental pollution from unwanted biomass otherwise being burnt in the fields; (ii) improve energy efficiency in heating systems; (iii) introduce renewable energy from local sources substituting carbon neutral biomass for fossil fuels; (iv) recycle ash residues as a fertilizer; (v) generate the possibility for new income streams for rural population, and (vi) provide social and economic community benefits.

Primary and unprocessed agricultural arable crop wastes, especially wheat straw, have been identified as the most suitable, available and unused biomass for thermal energy production in Moldova, initially for use in small scale systems (50-500KWth). The project will initiate the creation of sustainable biomass based energy generation in Moldova, initially using baled straw as the energy carrier, by addressing the institutional, financial, and informational barriers. There is significant identified potential for replication throughout Moldova, which would include interacting with developments in the technologies, used for biomass based energy systems in neighboring countries, the Ukraine and Romania.

Project Outcomes

- Demonstration of social and economic benefits of renewable energy, including decreased operating costs;
- Identification of least expensive „local solutions“ for production of biomass systems;
- Encouraging development of straw bale market;
- Improvement in global and local air quality as a result of implementation of biomass demonstration systems with a total capacity of 3,000 kWh.

Component A: Biomass Energy Demonstration Units

The component objective is installation of demonstration sites in rural communities along with the integrated and relevant support to new thermal energy heating units, including provision of equipment for installing a complete biomass heating systems on sites, training to the beneficiaries on maintenance, demonstration of systems’ operation to more than 500 potential future users.

Component B: Biomass production and fuel cycle support

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2 World Bank sector study, ‘Potential Use of Renewable Energy (Biomass) in Moldova’, 2002
The component objective is to assist in establishment of full biomass chain supply, who would contribute with their own land, labor and machinery, but also receive a partial grant support from the project to motivate and compensate for the new market start up risks, to transfigure biomass agricultural wastes, often lost, into a sustainable market product and a suitable thermal energy raw material.

Component C: Public awareness, outreach and dissemination, information barriers removal

The objective of the component is to provide a full range of measures, including an intensive information campaign throughout local mass-media, an important number of regional and site workshops, seminars, panel discussions, a telephone “hot-line”, etc., in order to get a 15% increase in awareness of rural population, regarding usage of renewable energy and biomass in the country.

Component D: Project Management, audit, monitoring and evaluation activities

The component will provide support for day-to-day project management, including planning and division of tasks, book-keeping, disbursement and reporting, procurement, budgeting and performance analysis; direct and indirect monitoring and evaluations of the process indicators and outcome indicators, including global and local impact of the project. This will also include the independent audit of the project accounts and financial reports.

5. Financing

The project financing will be complemented by Government Financing and co-financing from the ongoing IDA credits and donors projects as follows:

<table>
<thead>
<tr>
<th>Source</th>
<th>Amount</th>
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<tr>
<td>PDFA:</td>
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<td>GEF:</td>
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<td>Co-financing:</td>
<td>1,080,563</td>
</tr>
<tr>
<td>Total:</td>
<td>US$2,078,483</td>
</tr>
</tbody>
</table>

Component A:  US$ 402 500 Moldova contribution: US$ 180 054;
Component B:  US$ 231 500 Moldova contribution: US$ 799 821;
Component C:  US$ 175 175 Moldova contribution: US$ 55 000;

6. Implementation

The Consolidated Agricultural Projects’ Management Unit, established under the Government of Moldova (CAPMU), will serve as the executing and implementing agency responsible for the overall management of the project, planning and budgeting, use of funds and generation of outputs, accounting, reporting, monitoring and evaluation of the project, TORs preparation, tendering and supervision of the sub-contracts, impact assessments and audit of resources. The General Director of CAPMU will serve as the National Project Manager (NPM). However, a Project Manager Assistant (PMA) will be appointed to manage all the technical issues of the project implementation process. S/he will assume the responsibility for the project implementation works and performance achievement (i.e. fulfillment of the overall technical objectives of the project, assurance for reaching the project targets and performance indicators, as well as day-to-day management of the respective personnel, including local and foreign consultants). S/he will be accountable for the quality, timeliness and effectiveness of the services provided and the activities carried out under the preliminary agreed annual working plans.
The supervisory board includes the Deputy Prime Minister, Ministry of Agriculture and Food Industry, Ministry of Ecology and Natural Recourses, Ministry of Finance, Ministry of Economy and Trade, National Bank of Moldova and representatives from the Parliament.

CAPMU is currently implementing a portfolio of World Bank projects, with a combined value of USD$50m, including the ‘Agricultural Pollution Control Project (APCP)’ providing a mix of investments and policy related activities to mainstream environmental concerns in Moldova and the ‘Rural Investment and Services Project’.

7. Sustainability

The indicative target for raising the share of renewable sources of energy is equivalent to 650,000tCO2e per year, approximately 2.5% of total national emissions, and 1% from biomass. This would equate to the use of 10-15% of the national annual average yield of straw. This would equate to 100-200 systems, of a type that are to be developed by the project.

The first and most important step in removing barriers is the development of demonstration sites supported by an efficient information, promotion, and procurement and supply infrastructure. Successful project implementation and replication depends on few main factors: availability of straw bales to the specification required; the economic competitiveness of biomass in comparison with fossil fuels, and; the financing mechanisms for the supply of systems. All analyses indicate positive outcomes, including the experience of a pilot straw based installation in the Ukraine. The financing mechanisms for replication represent new and untested areas, but the indications are that the financing mechanisms now in development in Moldova will play an important role in placing biomass energy systems as part of the “common” decision practice for thermal energy generation in rural and sub-urban locations.

8. Lessons learned from past operations in the country/sector

The project has incorporated the following lessons learned from the Bank's forestry and rural development operations in Moldova and elsewhere:

- Early consultations; involvement of local stakeholders and communities in project preparation; capacity of the implementing agency; cooperation of government agencies involved in the project implementation are essential in order to ensure ownership and successful project implementation in Moldova;
- Technical options will be evaluated based on the past Bank experience in the sector (biomass energy) at the time of detailed project designed and fully reflected in project documents.

9. Environment Aspects (including any public consultation)

The project has been placed in environmental screening category B under the provisions of the World Bank’s Operational Policy 4.01, “Environmental Assessment”. Project will support the promotion of biomass use for production of thermal energy in Moldova as a viable, cost-effective alternative to gas, oil and coal, by using “examples of best practice” such as efficient technologies and demonstration sites. Through this approach, the project is expected to make a positive environmental impact through reduction of the pollution from additional biomass, mostly cereal’s straws that usually remain burned and therefore unused on the fields.

10. List of factual technical documents:

PDF-A Grant Application
Project Concept Note
Renewable Energy Study of the World Bank

11. **Contact Point:** Samir M Suleymanov, Task Manager; The World Bank; 1818 H Street, NW Washington D.C. 20433; Telephone: 202 473 0943; Fax: 202 614 0717

12. For information on other project related documents contact: The InfoShop; The World Bank 1818 H Street, NW; Washington, D.C. 20433; Telephone: (202) 458-5454; Fax: (202) 522-1500; Web: http://www.worldbank.org/infoshop

*Note: This is information on an evolving project. Certain components may not be necessarily included in the final project.*