FINAL REPORT

ENERGY EFFICIENCY AND RENEWABLE ENERGY IMPROVEMENT ROADMAP

Prepared for:
USAID Macedonia

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TABLE OF CONTENTS

I. PURPOSE AND METHODOLOGY **5**

II. BACKGROUND **5**

III. PAST AND CURRENT USAID ACTIVITIES **7**

IV. ENERGY SECTOR DEVELOPMENT CHALLENGES AND PROSPECTS **8**

IV.1. Inefficiency of energy use **8**

IV.2. Investment delays in development of renewable energy utilization facilities due to legal, regulatory and institutional impediments **9**

IV.3. Use of potential biomass resources **10**

IV.4. Other issues **12**
IV.4.1. Access to finance 12
IV.4.2. High investment costs for energy efficiency technology and renewable energy **Error! Bookmark not defined.**
IV.4.3. Low awareness for energy efficiency improvements in industry 13
IV.4.4. Service providers for energy efficiency improvements 13

V. SUMMARY OF ASSESSMENT ACTIVITIES **14**

V.1. Financial sector **14**
Macedonian Bank for Development Promotion 14
Procredit Bank 14
European Bank for Reconstruction and Development 15
EBRD TAM/BAS program 15

V.2. Energy sector regulatory and other institutions **16**
Ministry of Economy 16
Energy Agency 16
Energy Regulatory Commission 17
MEPSO (Electricity transmission system and market operator) 17

V.3. Relevant Government organizations **17**
Ministry of Agriculture, Forestry and Water Economy (MAFWE) – Directorate of Forestry (DoF) and PE Macedonian Forests 17
Ministry of Environment and Physical Planning (MoEPP) – Climate Change Program 19

V.4. Academia **20**
MANU (Macedonian Academy for Sciences and Arts) 20

V.5. Industry specific assessments **20**
UNIDO (United Nations Industrial Development Organization) Industrial Consultants 20
Chamber of Commerce 21

Makstil, AD 21
M-Peleti Ltd. 22
USAID Competitiveness Project Roundtable 22

V.6. Other Donors discussed on meetings 23
Norsk Energi – Cleaner and more cost-effective industry in Macedonia 23
Italian Ministry for Environment, Land and Sea, Task Force Central and Eastern Europe 24

V.7. Other International Donors active in EE and RE development in Macedonia 25

List of Annexes

Annex 1. Schedule of Meetings and Materials Reviewed
Annex 2. Overview of Energy Consumption, GDP and Employment by Industry in Macedonia
Annex 3. Analysis of the Potential for Biomass Residues Use for Pellet Production in Macedonia
Annex 4. Summary of Energy Costs in Selected SMEs
Annex 5 Brief cost comparison for use of pellets, firewood and electricity for heating

ACRONYMS

ADA	Austrian Development Agency
CDM	Clean Development Mechanism
DCA	Development Credit Authority
DOF	Directorate of Forestry
DNA	Designated National Authority
EA	Energy Agency
EBRD	European Bank for Reconstruction and Development
EC	European Commission
EE	Energy Efficiency
ESCO	Energy Service Company
ERC	Energy Regulatory Commission
EU	European Union
GEF	Global Environment Facility
GDP	Gross Domestic Product
GHG	Greenhouse Gasses
GoM	Government of Macedonia
GTZ	German Technical Cooperation Office
IPPC	Integrated Prevention Pollution and Control
ISO	International Organization for Standardization
FIs	Financial Institutions
MAFWE	Ministry of Agriculture, Forestry and Water Economy
MANU	Macedonian Academy for Sciences and Arts
MBDP	Macedonian Bank for Development Promotion
MEPSO	Macedonian Transmission System Operator
MEEP	Municipal Energy Efficiency Plan
MLGA	Macedonia Local Government Activity
MoE	Ministry of Economy
NGO	Non-Governmental Organization
OECD	Organization for Economic Co-operation and Development
PE	Public Enterprise
PDD	Project Design Document
RE	Renewable Energy
RES	Renewable Energy Sources
SMEs	Small and Medium-sized Enterprises
USAID	U.S. Agency for International Development
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization

Units of Measurement

kg	kilogram
m	meter
m^3	cubic meter
MT	Metric Ton
tCO_2	tonne of carbon dioxide
tCO_2eq	tonne of carbon dioxide equivalent
Ha	hectare

I. Purpose and Methodology

The United States Agency for International Development (USAID) in Macedonia selected a team of experts to draft a new energy project design as part of the process of implementing its 2011-2015 Strategy. The design team consisted of Robert Archer and Steven Burns from the Energy and Infrastructure office in Washington, Dragan Blazev and Danco Uzunov as local Macedonian experts and Margareta Lipkovska Atanasov from the USAID Macedonia Economic Growth office. The task of the design team was to look into possible areas of improvement in the regulatory and legal framework to further the energy sector reform with an emphasis on development of energy efficiency and renewable energy in Macedonia, and to collect and analyze relevant information from the Macedonian energy related sectors. Specifically, the team was tasked to explore options for improving private sector competitiveness across various industries and to analyze possibilities for renewable energy development with focus on biomass waste increased utilization. The main objectives of the design are to increase industry competitiveness, energy security and climate change mitigation. This report is prepared by the two local experts who incorporated the design team.

The purpose of this report is to provide USAID/Macedonia with the findings from discussions and conclusions from analysis, research and meetings with key stakeholders in the country for the development of energy efficiency and renewable energy sector, with focus on energy business enabling environment, technology adaptation and investment for competitiveness. The team evaluated the suggested interventions from the Energy Efficiency and Renewable Energy Assessment conducted during the spring of 2009 and took into consideration the priorities of the Government of Macedonia and the assistance provided by other donors in this sector.

Methods used for this report include interviews, roundtables, and industry-related meetings. Interviews with a cross-section of government officials, employers and employees were conducted during the course of two weeks between January 24, 2011 and February 3, 2011. Meetings were held with relevant ministries, agencies, industry representatives, financial institutions, academia, consultants, and relevant professional associations. Two roundtables discussions were organized with SME industrial representatives from the USAID Competitiveness project and with industrial representative business associations at the Chamber of Commerce. These interviews guided the direction of the research and dictated the contents of this report. The selection of industry segments contained within this report were those discussed during the interviews and conclusions stated in this report. A schedule of meetings and materials reviewed are given in Annex 1.

Analysis was performed on data collected from the meetings and documents on energy efficiency and renewable energy developed in the country. The analysis aided the search for underlying issues and similarities in responses across all participants in the interview and research process. Internet-related research was conducted as well, but it served primarily as a foundation upon which to gain background knowledge and to formulate interview questions. Information gained using traditional research methods was only incorporated into this report if they were found matching with the responses from the discussions and confirmed to be an accurate reflection of the current condition of the market and industry.

II. Background

The structure of the Macedonian economy (sector composition, high energy intensity, obsolete technologies, etc.) triggers increased energy consumption. On the other hand the country has limited supplies of commercial energy resources, with domestic energy production covering about 60% of the demand. The energy import in the country is high, in the range of 40%, and has been increasing during the last few years. Final energy use has been steadily increasing since 2001. The energy consumption in Macedonia is

concentrated in four sectors. The highest consumption of energy is in the industry at 33.8%; the residential sector accounts for about 29.2%; transport 20.5%; and commercial and service sector 13.1%. According to statistics, the final energy consumption per capita in Macedonia in 2006 was three times lower than the consumption in OECD countries, while the primary energy consumption per unit of GDP is almost four times higher. The reason for this high energy intensity can be attributed to the heavy use of energy across all industrial sectors and in particular by the metal processing industry; low-efficiency power generation, supply and consumption; and the prevalence of using electricity for residential heating.

The current status of the Macedonian energy sector, relative to country's competitiveness, energy security and climate change viewpoint, can be summarized in the following:

- Macedonia has a strong dependence on foreign energy sources, leaving the country vulnerable to supply shocks and relegating it to price taker status in some regards. This limits national energy security and therefore competitiveness.

- Macedonian industry has high energy intensity, limiting competitiveness in international markets, especially considering pending electric price increases in Macedonia.

- Macedonian energy supply is primarily based on hydropower and coal resources. Development of internal coal reserves will lead to higher cost power, again limiting competitiveness. Use of lower-cost coal from Kosovo is an option for cheaper power, but this must be balanced with energy security concerns.

- Use of coal as a primary energy source has climate change implications, and further development of this resource will be difficult in the current international investment climate.

- Direct foreign investment in the power sector is limited due to a perception of high risk, resulting in part from an overly complex project development process.

- Heating is primarily through electric power (coal and hydro based) and fuel-wood, both of which have climate change implications.

- Electric prices are due to increase, and with limited natural gas availability, increased use of fuel wood will likely result. However, increased fuel wood usage may be problematic from a climate change standpoint. Furthermore, anecdotal evidence supports the fact that the current fuel wood market is unreliable and inefficient.

- The fuel wood pellet and pellet-stove industries are potential growth industries for Macedonia. Macedonia exports pellet stoves, which are much more energy efficient than standard fuel wood stoves, and imports wood pellets.

In recent years serious attention has been given to the need for rationalizing energy consumption. A major strategic and legislative framework for energy efficiency and renewable energy has been developed over the past few years. International support for developing an enabling environment for energy efficiency has been initiated. Small hydro and solar photovoltaic development are the most promising renewable energy initiatives in the country at present, mainly driven by private developers. However, energy efficiency has not gained enough priority in the Government's implementation performance while the renewable energy project development process is recognized as strenuous. A specific structured and resourced action is needed to close the implementation gap and successfully improve the situation, especially in increasing industry competitiveness by reducing energy intensity of production processes;

strengthening the institutions capacity; continuing the pricing reform; reducing the electricity used for heating; increasing renewable energy utilization; reducing carbon emissions by introducing new technologies; and information and awareness raising.

An important influence on Macedonian energy policy is the overall country's objective for EU accession. After 2004, when the Stabilization and Association Agreement entered into force, Macedonia gradually moved towards meeting the EU requirements regarding the development of the energy sector. In 2006, Macedonia ratified the Energy Community Treaty. The strategic priorities of Macedonia in the energy sector and provisions that transpose the acquis communautaire are incorporated in the new Energy Law.

III. Past and Current USAID Activities

USAID Macedonia's current assistance to the Energy Sector has been implemented through Mission buy in the regional programs of the Energy and Infrastructure Office in the E&E Bureau, USAID Washington. In the 2011-2015 Strategy, USAID Macedonia determined energy efficiency as a cross cutting theme due to its importance and range of activities that are spread throughout the three core technical offices. The new strategy for the first time also includes an Intermediate result on energy – S.I.R 3.1.3 Effectively Functioning Energy Market Established under the Assistance Objective #3: "Increased Job Creating-Private Sector Growth in Targeted Sectors".

The assistance provided by the USAID to date was generally focused on development of strategies, policies and legislation, both primary and secondary. In 2010, the Government of Macedonia (GoM) developed and adopted three key strategies in the Energy sector for achievement by 2020: – the overall Energy Strategy, the Energy Efficiency Strategy, and the Renewable Energy Strategy. USAID provided substantial support for the update of the Energy Efficiency Strategy and the development of the National Energy Efficiency Action plan, which is yet another requirement of the Energy Community.

For implementation of the strategies, the GoM requested that USAID support the development of five year implementation plans. One of the Government key efforts in 2010 was the development of a new Energy Law[1] that would bring Macedonia's energy related legislation in compliance with the Energy Community Treaty and the EU Directives. Directives being incorporated in this law include the EU Directive on Energy Performance in Buildings and on Indication by labeling and standard product information of the consumption of energy and other resources by energy-related products. The new law was developed with substantial USAID support. Following the adoption, the GoM needs to develop the secondary legislation.

Energy efficiency has been an area of USAID assistance through E&E regional activities and mission programs for several years. Previous and ongoing work includes the following activities:

1. "Residential Energy Efficiency-Social Safety Net Initiative" – a pilot project that focuses on application of energy efficiency measures in apartment blocks with high occupancy by vulnerable households. Three buildings – 2 in Skopje and 1 in Kumanovo were selected based on defined criteria that besides the household income status included various types of heating sources – district heating, electricity and firewood. A small workforce development component that focused on internships for vocational high school graduates was included in an effort to establish the Green Jobs Corps.

2. Municipal energy efficiency demonstration projects: 12 projects in schools and other municipal buildings in five cities. Follow-up activities under the Macedonia Local Government Activity program provided assistance on municipal energy efficiency planning, project preparation, and municipal

[1] Adopted by the Parliament in February 2011.

creditworthiness analyses, conducted in conjunction with Norwegian-funded ENSI program. The Primary Education Program conducted energy efficiency improvements and associated building rehabilitation in over 40 primary schools through 2008, with a total goal of 120 schools. The improvements were implemented by local contractors.

3. Development Credit Authority facilities established in September, 2007 with UniBanka and NLB Leasing. The facilities provide loan guarantees for municipal and residential energy efficiency loans, with a total combined portfolio size of $10 million. One project has been implemented to date.

4. The USAID Macedonia mission's EG office has conducted programs on competiveness and workforce development that should be relevant to the Clean Energy area. The mission is considering development of a Green Jobs Corps to build low-skill employment opportunities for youth.

5. E&E's regional SYNENERGY program activities include Strategic Planning for Energy Efficiency and Renewables; Energy Efficiency in Municipal and Residential Buildings; and Regional Assessment of Renewable Energy.

IV. Energy Sector Development Challenges and Prospects

As mentioned before, during the period from January 24, 2011 to February 3, 2011 a team of USAID personnel and two individual local consultants carried out a series of meetings with a number of Governmental and other public organizations responsible for the energy sector, industry/SMS representatives, banks, donor organizations, etc. Provided below is a description of identified most relevant challenges for development of the energy sector in Macedonia.

IV.1. Inefficiency of energy use

Competitiveness of Macedonian companies is affected by excessive energy costs due to inefficiency of use. Industrial sector accounts for more than 28 percent of GDP and employs over 30 percent of labor force. There is a lack of energy management in industrial plants, inadequate energy efficiency engineering services, limited awareness in the banking sector, and a lack of advocacy/promotion. Industry is not prepared for the rising energy costs over the next four years and industry is the largest energy consumer. Very limited budget is allocated for energy efficiency activities. All significant funding of energy efficiency projects is done predominantly through international cooperation. Some positive signs in general commercial financing over the last few years has not influenced energy efficiency financing so far. A number of barriers hamper the investment in energy efficiency both on the financial sector side, and on the customers' side. Major problematic areas in Macedonia, as far as energy efficiency is concerned, are the inefficient energy consumption in industry and the wide use of electricity for domestic heating.

Improvements in energy efficiency are important in order to reduce expenditures on energy, enhance the competitiveness of the businesses, and create new employment opportunities in technologically more advanced sectors. Beyond that energy efficiency reduces the greenhouse gas emissions that cause climate change compared to the business as usual scenario and would make easier for the country to meet its renewable energy targets as part of the given commitments to the European Energy Community.

A large share of industrial energy use stems from heavy fuel oil and coal that are used to operate highly inefficient boilers and electricity generators, while the industrial electricity consumption is mostly dedicated to inefficient electric motor drives. Systemic approaches to cost control in energy consumption are needed to improve energy efficiency in industry and thus increase their product competitiveness to domestic and foreign markets. Introduction of ISO 50001 standard for energy management system in

industrial companies would establish an energy policy, objectives, targets and processes necessary to improve energy performance, including energy efficiency, use, consumption and intensity. Such systematic energy management approach, which is considered voluntary, would eventually lead to reduction in energy cost, greenhouse gas emissions and other environmental impacts. However, its successful implementation depends on commitments made in companies and particularly from top management and company's shareholders. According to the Energy Efficiency Strategy (USAID 2010) potential energy efficiency improvement measures in Macedonian industry include increasing efficiency in motor drives and air compressors, efficient utilization at industrial boiler plants, and waste heat recovery.

Implementation of energy management procedures and equipment will help identify the most cost effective interventions, thus providing justification for lending institutions and leading to more capital for businesses. Energy management systems, heat recovery, steam traps and combustion controls are relatively inexpensive investments and have years of application and incremental improvement across number of countries. Majority of large industries in Macedonia has introduced internal system of tracking energy use and intensity and has taken improvement actions. This was supported by their top managements and transfer of know-how from their international mother companies.

Rising energy costs can lead to higher production and distribution costs for businesses, eroding long-term competitiveness and profitability. SMEs are particularly vulnerable due to limited resources and tight operating margins. Cutting energy waste can be a quick way for them to reduce costs, but they often lack the knowledge, financing and dedicated personnel needed to identify efficiency opportunities and implement improvements. Very little has been done to educate and introduce energy management procedures in their operations. Introduction of systematic approach of energy management in targeted industry SME sectors will yield easy replicability within individual sectors. Recent discussion with SMEs representing various industries revealed high interest for application of energy management improvement practices in their respective companies.

Potential savings can be unlocked through simple measures, such as retrofitting or replacing old equipment with new technologies and including energy savings targets into long-term performance strategies. Energy efficiency projects typically mean improvements to production lines including waste heat recovery, improved regulation and control, improved insulation of heat/steam pipes, fuel switching, improved regulation of indoor temperature, introduction of high efficiency lighting systems, etc. Local financial institutions can help SMEs finance energy efficiency projects through investments that often pay for themselves and also offer a healthy return over time.

Annex 2 shows an overview of energy consumption, GDP and employment by industry in Macedonia.

With respect to energy security and climate change implications, reduced energy consumption will inevitably reduce country's susceptibility to fuel supply shocks and at the same time limit national greenhouse gas footprint. Furthermore, improved domestic capacity with respect to energy management and energy efficiency "opens doors" to a pool of donor/IFI investment funds available in the region for these upgrades, again bringing external capital to Macedonia.

IV.2. Investment delays in development of renewable energy utilization facilities due to legal, regulatory and institutional impediments

Investment lags in the development of renewable energy. The legal, regulatory and institutional impediments exist for private investors. There is a need for institutional support, strengthening of implementation structures, and coordinated approach among all institutional stakeholders. Renewable energy sources presently being utilized in Macedonia are represented by hydro, providing a significant

contribution to energy and power balances, biomass used to generate heat, and to a much lesser extent geothermal and solar. The Renewable Energy Strategy of 2010 assumes a nominal target of 21% of gross final energy generation from renewable energy sources by 2020. In order for this target to be met, a number of improvements need to be introduced in the system to attract private capital investments in renewable energy project development. An assessment underway of the renewable energy investment process indicates a series of barriers related to implementation of RE projects generated by existing primary and secondary legislation. The major problem for the private capital is the overall complex administrative procedure of renewable energy project development, the right to land use, obtaining the status of preferential generator and power purchase agreements.

Improvements are expected with the introduction of the new Energy Law; however, there will be a great need for coordination of relevant institutions, adjustments of legislation, drafting secondary legislation in relevant ministries and agencies to improve development process and streamlining the application process for obtaining approvals and licensing. The new energy law defines by-laws (rulebooks) which need to be developed by the Government of Macedonia, the Ministry of Economy, the Energy Agency and the Energy Regulatory Commission within a defined timeframe that for various rulebooks ranges from 6 to 18 months from the adoption of the new energy law in February 2011. The new by-laws will precisely define the procedures that will apply to the renewable energy project development process including communication formats, fees, timelines, etc. Until these by-laws are not developed and adopted, the existing procedures defined within the current renewable energy project development structure will apply.

With respect to energy security and climate change implications the development of local renewable energy sources will increase domestic energy generating capacity and potentially offset the need for new coal-powered development, thus improving energy security and addressing climate change. In addition, improvements in the renewable energy development process are expected to encourage foreign investment in the energy sector, bringing foreign capital to Macedonia.

IV.3. Use of potential biomass resources

Potential biomass resources are estimated to cover approximately 18% of the country's total primary energy supply. Of this, forest-based biomass is the most significant biomass resource, accounting for more than one third of the total biomass potential. However, according to energy balance of 2007, biomass contributed about 6% in the primary energy supply while 9.5% of the total final energy consumption in Macedonia[2].

The annual production of firewood used for local supply ranges between 600,000 and 1,000,000 m^3. The total forest resources in the country equal to approximately 1 million hectares of forest land[3]. Furthermore, it is estimated that roughly 15% to 18% of the annually exploited firewood produced from logging activities ends up as residues (wood waste), which at present has no commercial value and by and large is left to degrade in the forests; additional 5% of the total firewood represents wood waste from wood processing companies and sawmills. The total annual accessible volume of forest-based wood waste is estimated to equal 87,000 to 140,000 m^3/year[4]. Additional 55,000 to 58,000 m^3/year is wood waste from orchard pruning[5].

The current practice of forest management in the country, carried out by PE Makedonski Sumi, is such that planned commercial forest-exploitation activities by and large extract and handle wood cuts that are

[2] Source: Macedonia Energy Efficiency and Renewable Energy Assessment, Final Report 2009, USAID.
[3] Source: Strategy for Sustainable Development of Forestry in Macedonia, MAFWE (2006).
[4] Estimates given by PE Makedonski Sumi.
[5] Estimates: Consultants.

part of tree trunks only, thus having uniform shape, high biomass content and finally higher commercial value on the local market. Nonetheless, such-organized activities cause large amounts of wood residues, mainly in the form of mid- to small-size branches/cuttings, to remain lastingly in the woodlands. As reported, these residues cause high pressure for tree disease dispersion and fire hazard. The PE sells these wood wastes to individual rural households for a price of \$17/m^3 (€13/m^3; 800 MKD/m^3). The price does not include transport, i.e. the buyers organize transportation of collected residues from the forests by themselves.

On the other hand, household energy consumption in the country is dominated by electricity (53%) and biomass (30%). Biomass is extensively used for heat production in the residential sector, especially in rural and semi-urban areas. It is estimated that approximately 76% of total households in the country use firewood for heating, accounting for a total of 600,000 to 1,000,000 m^3 of wood mass used for heating annually. Industrial or other uses are very small and represent less than 1% of the total biomass final energy consumption[6].

From meetings with relevant institutions it was concluded that there is a potential to use wood pellets to replace firewood for heating in the residential sector. With proper assessment and clear strategy the wood waste could be used for production of pellets. Initial estimates refer to potential annual production of wood pellets from biomass residues only between 58,000 and 80,000 t/year, of which 35,000 to 56,000 t/year coming from forestry-based wood residues and the remaining 23,000 t/year from agriculture residues (pruning). Annex 4 shows an analysis for potential biomass residues use for pellet production in Macedonia.

As biomass is a major source of heat at present and likely to remain so in the foreseeable future, the use of wood pellets as a substitute for pure firewood can be expanded. The initial assessment is that the price of locally produced wood pellets (currently between 150–200 €/ton) would be competitive to the ongoing price of firewood and electricity[7]. Furthermore, pellets have significantly higher efficiency for heating and are much more cleaner, environmentally friendly and convenient for use compared to firewood.

On the other hand, the availability of pellets and high efficiency wood stoves will be important to Macedonia from a climate change and social safety net standpoint given that electric price increases have the potential make heating costs prohibitive, leading to illegal forestry and significantly increasing greenhouse emissions. Also, growth in the wood pellet and pellet-stove industries would provide added growth to Macedonia, while lowering heating costs for rural populations. Wood pellets would be sourced from waste wood, limiting climate change impact.

In recent years few small-scale pellet production units (enterprises) have been established in the country. However, the total production capacity of these enterprises is negligible, estimated to amount to 1,000 t/year. In addition, a much bigger amount of pellets is imported mainly from Serbia, estimated to amount to 5,500 t/year.

There is an evident need for overcoming impediments to rapid expansion of the local wood pellet market and creating a sustainable supply of wood residues for commercial pellet production. Thorough attention should be given to: assessment of the local pellet market (size, trends, prices, distribution channels, etc.); analysis of policy options regarding access to wood residues and creation of sustainable supply including logistics (waste collection and transport) aspects and possibilities for engaging PE Macedonian Forests in the activities; assessment of options for providing financial and other assistance at a firm-level for wood pellet and furnace production; assessment of options for providing financial assistance to support

[6] Source: Macedonia Energy Efficiency and Renewable Energy Assessment, Final Report 2009, USAID.
[7] Brief cost comparison for use of pellets, firewood and electricity for heating is given in Annex 5.

expansion of individual households switch from using pure firewood and other energy sources to wood pellets.

IV.4. Other issues

IV.4.1. Access to finance

The lack of access to low-cost financial resources for business development and expansion, as well as for securing working capital requirements, is regularly being perceived as one of the most important challenges in Macedonia. Numerous assessments have been carried out based on which the following issues are identified as prevailing:

I. On the demand side: (1) poor identification and planning of a firms' investment needs, and (2) limited atractiveness/creditwortiness of firms to outside investors/creditors.

II. On the supply side: (1) high collateral requirements and fixed bank fees, (2) limited depth and outreach of financial service offer, and (3) limited use of a project finance approach.

The final effects of the two core groups of access to finance issues are: limited level of domestic investment; lost opportunity for business growth (overall firm sales and exports); and lost opportunity for incremental employment.

Following the meetings organized with major local banks and IFIs in the country that provide financing for energy development investments (both energy efficiency and renewable energy), it was concluded that there are numerous 'specialized' financing possibilities existing for referenced investment needs. The major ones include: energy efficiency and renewable energy loan facilities offered by the Macedonian Bank for Development Promotion (MBDP); the Western Balkans Sustainable Energy (WBSE) credit line of the EBRD with loan financing administered through several local banks for loans up to €2.0 million and directly by the Bank for loans €2.0–6.0 million; and the KfW EE facility of €7.0 million administered through ProCredit Bank. Furthermore, in 2002 and in 2010 USAID established the DCA portfolio loan guarantee with the goal to increase access to finance for SMEs. The DCA Program in Macedonia is carried out by the Uni Banka and NLB Tutunska Banka and two microfinance institutions FULM and Moznosti. Nevertheless, it was also concluded that utilization levels of all listed finance possibilities are very low.

On the other hand, looking more closely at the finance supply (financing institutions') side, financing energy projects is compounded by the fact that local banks have little or no real practical experience in evaluation of energy efficiency and renewable energy projects. That is, local financing institutions are in general unfamiliar with how to assess the risks of financing such projects and with ESCO performance contracting practices, which hinders the decision making process to provide financing. Furthermore, current loan evaluation procedures focus almost exclusively on collateral with limited analysis of the cash flow that a project would generate.

Clearly, there is a mismatch between the demand and supply of financial services for energy investments. Potential activities that can be developed and implemented to help overcome such a situation include: promotion of energy management (as a policy measure at a company level) and facilitation of energy project finance, with the aim of identifying and developing demonstration energy investments to a level acceptable for loan financing; providing training to local financial institutions with respect to energy investment appraisal and risk assessment; providing training of local technical and financial experts/consultants on energy management and energy project appraisal and packaging; and dissemination of successful energy management investments through industry associations.

IV.4.2. Low awareness for energy efficiency improvements in industry

Awareness for energy improvements through introduction of systematic management practices and investments in industry is limited. Management must choose how to use the limited capital either for capacity expansion or for investing in increasing energy and material efficiency. In many cases, companies focus on capacity expansion which increases the bottom line by the amount of profit on expanded sales. However, this undermines the profit impact that companies will have by investment in energy efficiency improvements resulting in reduced energy use and related costs which directly increases company's profit by full amount of energy savings. Companies also often lack a good understanding of their energy use, their energy saving opportunities and the related economic indicators that make project sound and attractive. Further assistance from industry associations and international organizations would also help in developing and applying standardized methodologies for energy management and energy efficiency. This would help raise awareness of the importance of energy efficiency and enable a better understanding of the competitive advantage that can be gained from implementing measures for reducing energy use, energy intensity and cost.

IV.4.3. Complex procedures

The procedures for renewable energy project development are often slow and complex. The recent developed roadmap of the renewable energy project development process documents 13 main procedures that involve various institutions, agencies and ministries. Discussions with project developers revealed that there are multiple gaps in the process which extend the time for applications and increase project cost and perceived risk by investors. Therefore, a streamlined development process for RE investments needs to be organized and put in place. The new energy law sets a guideline for the relevant institutions to develop by-laws that will closely determine procedures including communication formats, fees, timelines, etc.

IV.4.4. Service providers for energy efficiency improvements

Energy efficiency activities have been introduced on the local market within the last several years. Although earlier efforts were made to establish a utility-based ESCO in the country it has not become effective. Important barriers to utility-based ESCO operation persisted such as constraints on municipalities to take on liabilities and provisions in the law on public procurement making it impractical to operate on an ESCO model and therefore lack of energy performance-based contracting and utilization of measurement and verification protocols.

However, there is knowledge and skills with the local engineering firms to provide technical services through a traditional fee for service approach which will generate energy savings through increased efficiencies and decreased power and energy costs. The local experience for services ranges from energy auditing and project design through construction and monitoring to project commissioning with financing to be provided by clients. However, local energy auditors and contractors need to be trained in the latest energy efficiency technologies and up-to-date energy efficiency improvement measures.

The contractors with fixed payments could help clients design and implement the projects and receive a fixed lump-sum fee. This traditional approach is of standard use in the country and although energy performance-based contracting is lacking, clients could be assisted to address industrial energy efficiency through this traditional approach.

V. Summary of Assessment Activities

V.1. Financial sector

Macedonian Bank for Development Promotion

Established in 1998, the Macedonian Bank for Development Promotion (MBDP) acts as an agent for providing short-term export insurance against commercial risk. MBDP is a joint stock company, fully owned by the government. The financial products of the bank are offered at market terms through local commercial banks. A credit and guarantee scheme for building sustainable energy efficiency and renewable energy sources is established through six local, commercial banks: Komercijalna Banka, UNI Banka, NLB Tutunska Banka, IK Banka, Ohridska Banka, and TTK Banka. Energy efficiency projects are financed up to $500,000 per project with the following financial structure: 60% MBDP, 10% owner's equity, and 30% commercial bank participation, with a repayment period up to 4 years, with a requirement that at least half of a project benefits should come from measurable energy savings. Renewable energy projects are supported up to $4 million per project with the same financial structure as for the energy efficiency and a repayment period from 5 to 10 years including a grace period of 3 years. Target groups are small hydro power plants with capacity up to 10 MW, biomass-based power and heat production, utilization of heat waste and solar and wind projects.

Until present, few projects have been approved and supported for financing in energy efficiency or renewable energy development. The bank representatives raised three issues that should be addressed in order to improve project development, as follows: (1) conservative local banks with lack of understanding in financing energy efficiency or renewable energy projects; (2) long administrative and heavy bureaucratic procedures for project development; (3) lack of serious and quality-based projects submitted by applicants. A recommended potential area of improvement could be training of commercial bank staff on screening and approval for financing energy efficiency and renewable energy projects.

Procredit Bank

ProCredit Bank Macedonia was founded in 2003 by international financial organizations and is a part of ProCredit group which today consists of 21 financial institutions in Europe, Africa and South America. The bank is focused on small and medium-sized enterprises, entrepreneurs and agricultural producers. At present, the bank has 33,000 active borrowers and about $200 million loan portfolio. Based on the bank's mission to provide banking services that support long term and sustainable development, in 2009 the bank launched "Eco" loans to promote financing of energy efficiency projects and reducing carbon emissions by supporting energy-saving technology. The Eco loans are provided to enterprises and households to finance investments in energy saving measures with an incentive of 1% lower interest rate than the bank's standard terms.

To support energy efficiency and renewable energy project development, the German bank KfW undertook to refinance projects for renewable energy and energy efficiency to Macedonian banks. Under this objective, at the end of 2010 the local ProCredit Bank signed a KfW loan for a total amount of about $9.5 million to be used for financing energy efficiency and renewable energy projects undertaken by SMEs and private households with up $2.7 million per single borrower. In addition, KfW is providing a technical assistance to the bank in introducing the new loan product by providing targeted training to bank's staff and thus helping to raise the overall awareness of energy efficiency issues on the part of the bank's employees and among its clients. The average anticipated loans for energy efficiency and renewable energy projects at this bank is in range from $15.000 to $130.000.

During the discussion, the bank representatives expressed that the bank's staff need to be more knowledgeable in explaining benefits to clients and using various channels to market the loan product for financing energy efficiency and renewable energy projects. The bank raised concerns on risk in unexpected change of feed-in tariffs and need for streamlining the project development process with focus on licensing.

European Bank for Reconstruction and Development

In January 2009 EBRD launched two investment facilities that provide debt financing for renewable energy, building sector energy efficiency and industrial energy projects to small and medium-sized enterprises in the Western Balkans including Macedonia, as follows:

- Western Balkans Sustainable Energy Direct Financing Facility (WeBSEDFF). A regional facility of €50 million to provide direct individual loans for large scale projects between €1 and €6 million to industrial energy efficiency and renewable energy projects. The facility is complemented with grant funding for Technical Assistance for project identification, preparation and implementation verification. Incentive payments of up to 15% of the loan principal shall be provided to eligible projects upon successful physical completion of the construction and beginning of operation of project facilities. The incentive payments are based on the estimated reduction of CO_2 emissions resulting from project implementation. The repayment period can be up to 12 years including a grace period of 2 to 3 years.

- Western Balkans Sustainable Energy Credit Line Facility (WeBSECLF). A regional facility of €60 million credit line to provide loans to participating local banks (Ohridska Banka, IK Banka, and NLB Tutunska Banka) for on-lending to sub-borrowers for energy efficiency and renewable energy investments up to €2 million per project in the industrial sector or in buildings used for commercial services. The facility is complemented with grant funding for marketing and awareness rising, establishing technical eligibility criteria, preparing/appraising projects, implementation verification, etc. Incentives payment up to 20% of the loan principal is provided to eligible projects. The facility is scheduled to end by mid 2011.

Until now the bank has extended two direct loans in Macedonia through WeBSEDFF, one energy efficiency improvement project in a meat processing factory of €1.3 million and second project in development of seven small hydro power plants of €6.0 million. Possible impediment for financing renewable energy projects is granting power purchase agreement to an applicant at the end of the project development process and first come first serve approach in a limited cap of installed capacity of renewable energy projects under the feed-in tariff structure. Although this may not be the case with small hydro plants development given that there is no cap on renewable capacity eligible for feed-in tariffs, the support for wind farms development or other renewable projects are seen at risk by the bank.

EBRD TAM/BAS program

The EBRD Turn Around Management (TAM) Program started operations in Macedonia in 1998. Since then 37 projects have been completed in a variety of sectors and industries in food manufacturing, fabricated metal products, accommodation and food product manufacturing. TAM supports introduction of international best practices in small and medium sized enterprises by bringing international advisors from developed countries with extended professional experience in a relevant sector. Typical TAM project lasts around 18 months. TAM has worked with an even distribution of small and medium-sized enterprises. 47 per cent of the projects were with companies of more than 200 employees, 19 per cent with companies of between 100 and 200 employees, 28 per cent with companies of between 50 and 100

employees A total of approximately €1.9 million in funds has been invested to finance these and other on-going projects.

The EBRD Business Advisory Service (BAS) Program was established in Macedonia in 2002. BAS acts as a facilitator for the use of local, private-sector consultants by micro, small and medium sized enterprises to obtain a diverse array of services both on demand and supply side. By assisting individual enterprises to engage with local consultants on narrowly-based, specific projects with a rapid payback, it stimulates demand and the understanding of the potential benefits of using external consultants. BAS supported projects typically last around 4 months. Since the inception, BAS has undertaken a total of 393 projects by engaging mostly local consultants. The industry spread of projects has been wide, but there has been a focus on food and beverages, construction and engineering, and wholesale/retail distribution. BAS has also undertaken a number of market development activities, promoting the benefits of advisory services to SMEs. For example, SMEs training focusing on cross-cutting issues relevant to environmental management and energy efficiency including integrated prevention pollution and control (IPPC), and environmental impact assessment (EIA). Until now BAS carried out trainings for 937 local consultants including trainings on energy efficiency auditing in industry (32 consultants) and energy auditing of buildings (6 consultants). A consulting project is cost-shared by BAS up to 50% of the total project cost but not more than €10,000.

The TAM/BAS representative indicated an interest for cooperation with the new USAID energy project in providing advisory support services that would be beneficial for increasing SMEs competitiveness. One area of cooperation might be the energy efficiency industrial auditing that could be utilized towards improving industrial energy management investment practices and systemic approaches to cost control in industry.

V.2. Energy sector regulatory and other institutions

Ministry of Economy

The Ministry of Economy is in charge of energy policy making. The Ministry has 12 departments; one of them is the Energy Department. Its main functions include the implementation of state energy policies through programs and measures and development of laws and by-laws related to energy. The energy department is also in charge of data collection on energy production and use, and preparation of public reports. An obligation of the energy department is to implement energy-related European directives into Macedonian laws.

Under the Program of development of entrepreneurship, competitiveness and innovation the Ministry of Economy supports SMEs in providing cost-sharing to local companies for international patent application and certification according to various standards of the International Organization for Standardization (ISO). The annual budget for cost sharing is about $22.000, but not more than 50% of the incurred costs are approved or up to $1,300. In 2009 the Ministry of Economy approved cost-sharing for 32 SMEs while in 2010 it approved cost-sharing for 9 SMEs.

Energy Agency

The Energy Agency was established in December 2005 in order to support the activities of the Ministry of Economy in the implementation of the energy policy. It is responsible for professional technical support on data management, strategy analysis, policy and project assessment, and implementation coordination. The formal determination of the Energy Agency is set with the Law on Establishment of an Energy Agency adopted in July 2005. The Management Board of the Agency has been appointed and involves the Ministry of Economy, the Ministry of Finance and non-governmental representatives nominated by

the Ministry of Economy. The Energy Agency is independent in its work and financially accountable to the Ministry of Economy. The new energy law of 2011 sets responsibilities for the Energy Agency. Specific activities of the Agency include issuing, transferring or revoking guarantees of origin generated from renewable energy sources and maintaining a registry of issued guarantees.
Specific activities of the Agency will be aimed towards the preparation of mid-term and long term strategies and development plans, preparation and coordination of energy reforms, proposals and evaluations of studies and projects in the energy sector as well as preparation and coordination on implementation of investment projects.

Energy Regulatory Commission

The Energy Regulatory Commission (ERC) was established in June 2003. The ERC is a regulatory body which is fully independent from interests of the energy industry and the governmental bodies. It has 5 members of the Board including the president, and 17 support staff at present. Its main competences are to ensure safe, secure, continual and quality energy supply to end consumers; environmental protection and promotion of competitive energy market based upon transparent and non-discriminatory principles.

The new energy law sets responsibilities for the ERC including adoption of regulations and tariff systems and approval of tariff methodologies for electricity, natural gas, oil and oil derivatives, thermal and geothermal energy. Other activities include development of authorization procedures (licenses for energy generation, distribution and supply), development/verification of Grid Code and Market Code, dispute settlement and customer protection. According the new energy law the ERC should develop and adopt 19 by-laws (rulebooks) within a defined timeframe. The by-laws shall regulate actions that are under responsibility of the ERC. The Commission is well structured and has the capacity to meet the requirements and obligations under the new energy law. Assistance maybe needed for development of few new by-laws.

MEPSO (Electricity transmission system and market operator)

MEPSO is a state owned enterprise in charge for operation, maintenance and development of the national transmission grid and for ensuring long term grid stability and reliability. It is also an electricity market operator responsible for organization and operation of the national electricity market. According to the new energy law about the renewable energy project development under the feed-in tariff structure, MEPSO is obliged to sign a power purchase agreement (PPA) on request from an approved preferential generator. The recently developed renewable energy implementation plan addresses a concern about PPA coming as a final step after construction has occurred, which creates significant difficulties for completion of financing since for conventional project financing or other debt financing of energy projects PPA is required prior to disbursement of funds. Another concern and thus need for improvement is the fact that the current PPA itself is a very limited document that does little more than establish a price. The insufficiency of current contracts to meet international financing standards is an issue for private project financing in terms of defining rights and obligations of each party.

V.3. Relevant Government organizations

Ministry of Agriculture, Forestry and Water Economy (MAFWE) – Directorate of Forestry (DoF) and PE Macedonian Forests

The DoF within the MAFWE is the Government body responsible for creation and implementation of policies for forestry development and management in the country, which includes development of strategies, legislation and legislative changes, and forestry management plans. The public enterprise of

Macedonian Forests (PEMF) is responsible for implementation of day-to-day forest management activities including carrying out (re)forestation and commercial wood exploitation, distribution and sales.

In 2006 the MAFWE has prepared a Strategy for Sustainable Development of Forestry in Macedonia, which represents a basic strategic/policy-guiding document and sets the main forestry management framework. The Strategy includes: (1) vision, goals and directions for forestry development; (2) overview of forest resources - wood, game, and non-wood products (herbs, forest fruits and fungi); (3) definition of the Government's role in forestry development; (4) environmental aspects; (5) social aspects; and (6) an action plan for sustainable forestry management.

The forest resources in the country equal to approximately 1 million hectares (ha) of forest land managed by the MAFWE/PEMF; additional 50,000 ha are forests within national parks managed by separate public branch entities, and approximately the same area (50,000 ha) are privately owned forests. Hence, the MAFWE and PEMF manage roughly 90% of the total forest area, which account for 92.2% of the total wood mass.

The annual volume of wood harvest (cut) in the past 10 years varies between 600,000 and 1,000,000 m^3. Nearly 90% of the harvest is sold by PEMF as firewood to individual households and public institutions (e.g. schools, kindergartens, etc.) in rural communities. The price of the firewood (harvested wood) is set up by the Government of Macedonia. The price varies among wood types (determined by calorific value) and categories of wood cuts. The average current price equals to about $50/m^3$.

Of the total annual harvested wood mass 6%-10% ends up as waste. The 'standard' wood waste refers to branches with diameter of up to 4 centimeters. Furthermore, there are additional 10% of 'Class III" firewood cuts, which represent a very low quality wood with minimal commercial value (branches with diameter of 6-7 centimeters), thus are practically also considered as waste. Hence, the total annual volume of wood residues varies between 108,000 m^3 and 180,000 m^3 (table below).

Currently, as stated by the MAFWE there is no clear policy and concrete activities regarding wood residues management in the country. By and large the 'standard' wood wastes after the harvest are only piled and left in the forests to decompose. The PEMF sells these wood wastes to individual rural households for a price of $17/m^3$ (€13/m^3; 800 MKD/m^3). This price does not include transport, i.e. the buyers organize transportation of collected residues from the forests by themselves. However, based on information by the PEMF, nearly 90% of the residues are not being collected and remain in the forests.

The table below provides summary information regarding the range of annual volume of harvested firewood and wood residues.

In addition to wood residues from commercial forest management, there are also important quantities of wood residues that come up from sawmills' operations. As reported, 15% to 40% of the wood mass processed by sawmills in the country[8] ends up as waste. Estimated annual volume of wood residues from sawmills ranges from 30,000 to 40,000 m^3/year. It is considered that currently there are roughly 240 operational sawmills in the country.

The wood residues create a significant potential for production of wood pellets. It is estimated, based on assumed average use of 2.5 m^3 of wood mass for production of 1 ton of pellets, that the annual pellet production from forestry wood residues only[9] may equal between 29,000 and 48,000 tons. The main

[8] Practically all sawmills in the country are privately owned and operated. During the period 2003 to 2005 all sawmills owned by the PEMS have been privatized/divested.
[9] Wood pellets can also be produced from agriculture residues (pruning), which is a separate analysis.

obstacle represents the issue of wood waste accessibility. If wood residues from sawmills are included, the annual pellet production may go up to 34,800 to 56,000 tons.

Forest-based Biomass and Residues[1]

Source	Total biomass (m3/year)		Availability (%)[4]	Available quantity (m3/year)	
	Low	High		Low	High
Total fuelwood[2]	600,000	1,000,000	100%	600,000	1,000,000
Forest residues (8% of fuelwood)[3]	48,000	80,000	50%	24,000	40,000
3-rd class firewood (10% of fuelwood)[3]	60,000	100,000	80%	48,000	80,000
Total biomass as forestry residues	108,000	180,000		72,000	120,000
Sawmill residues	30,000	40,000	50%	15,000	20,000
Total forest-based biomass residues	138,000	220,000		**87,000**	**140,000**

Estimates refer to state-owned forests managed by the Public Enterprise 'Macedonian Forests' (PE), which account for 90% of total area under forests in the country and 92.2% of the total wood mass; forests within national parks and privately-owned forests are not taken into consideration.

[2] Figures refer to annual cut/harvest in the past 10 years.

[3] Estimates given by PE 'Macedonian Forests'.

[4] Estimates include accessibility of forest residues for use; part of sawmill residues are used for own heating purposes.

The MAFWE clearly indicated a readiness for participation in activities focused on development of market for pellet production from wood residues in the country. The PEMF, on the other hand, stated that they would prefer to conduct a study and possibly establish commercial production of wood pellets on their own.

Ministry of Environment and Physical Planning (MoEPP) – Climate Change Program

As a candidate country for EU accession, Macedonia bases its policy on climate change and harmonizes it with the general policies on EU level. Furthermore, as a Party to the United Nations Framework Convention on Climate Change (UNFCCC) and Kyoto Protocol non-Annex I country, Macedonia respects the principle of the Convention for common but differentiated responsibilities in stabilization of concentrations of greenhouse gases in the atmosphere.

In order to take advantages of the opportunities of Clean Development Mechanism (CDM), in 2007 the GoM adopted the National Strategy for the CDM for the first period of obligations 2008-2012 based on the Kyoto Protocol. Also, the GoM completed all the necessary pre-conditions for functioning of this mechanism by nominating the Ministry of Environment and Physical Planning (MoEPP) as an administrative body (also referred to as designated national authority - DNA) responsible for coordinating activities for implementation of projects under this mechanism.

The second National Communication on Climate Change presents the conditions in the country with respect to the inventory of greenhouse gases (GHG), but at the same time it represents a framework in which the state-measures for reducing (mitigating) GHG and adaptation to climate change are defined. From the aspect of bilateral cooperation in the area of climate change and the Kyoto Protocol, the MoEPP has signed Memoranda for cooperation with the Italian and with the Slovenian Ministries of Environment, as well as with the United Nations Development Programme (UNDP) for carbon funding. With financial

support of donor organizations several potential CDM projects have been identified so far, which are at various stages of implementation and financing preparation.

During the discussions with the representative of the MoEPP responsible for climate change issues and also a member of the National Committee for Climate Change, it was revealed that the organization lacks sufficient financial and human capacity to conduct regular GHG, energy use and renewable energy generation baseline and inventory, and also capacity to perform regular sector and sub-sector data monitoring and reporting according to international standards.

V.4. Academia

MANU (Macedonian Academy for Sciences and Arts)

The Research Center for Energy, Informatics and Materials (ICEIM-MANU) of the Macedonian Academy of Sciences and Arts, which has been established in February 1986, had a leading role in the development of the Macedonian Energy Strategy for 2030 and the Renewable Energy Strategy until 2020. In general, the role of the Center is to initiate and coordinate the national research programs and to perform high-level research in particular fields. Within ICEIM four divisions are acting: Energy, Environment, Neuro-informatics, and Materials.

MANU was contracted by the Ministry of Economy to develop the National Energy Development Strategy until 2030 and the Renewable Energy Strategy until 2020.

V.5. Industry specific assessments

UNIDO (United Nations Industrial Development Organization) Industrial Consultants

The National Cleaner Production Center (NCPC) was established at the Mechanical Faculty in Skopje in 2006. The NCPC is supported by UNIDO and it was formed to deliver services to business, government and other stakeholders in the country, to assist them with the implementation of clean production methods, practices, policies and technologies, and to stimulate public-private partnerships. It contributes to improved environmental performance and resource efficiency of enterprises and other organizations, which also increases their productivity and competitiveness. The key services include: information dissemination and awareness creation; professional training; in plant assessments and demonstrations; policy advice; and support for the transfer of environmentally sound technologies.

The center provides small grants for technical assistance to SMEs including agro business, food processing, metal processing, mining, and others. The center also provides training and certification to consultants for identifying weak spots in industrial processes in terms of energy savings and cleaner production. Over the last five years NCPC worked with total of 45 industrial companies and developed prefeasibility studies by its trained and certified national consultants. The consultants work with individual enterprises to identify, evaluate and help implement clean production options that are appropriate to the enterprise's processes, products or services, technologies and management systems and skills. The consultants use Einstein toolkit, whish is a special toolkit for thermal energy optimization in industries. Einstein evaluates process optimization possibilities and indicates demand reduction through the use of efficient technologies. It analyses the production system by a Pinch analysis to assess saving opportunities through heat integration between different processes. Based on a reduced heat demand Einstein shows technical alternatives for the integration of renewable energy supply systems and evaluates them in a detail cost calculation.

The recommendations made by UNIDO's representatives is to bridge the gap between SMEs and banks in support of financing bankable projects that could be identified from the pool of prefeasibility studies prepared by the UNIDO's consultants.

Chamber of Commerce

The Chamber of Commerce has around 15,000 members on voluntary bases out of which most are small and medium sized enterprises. It has 17 branch associations and 4 associations as representative bodies of various industries including Agriculture and Food processing industry, Wood processing industry and Furniture manufacturing, Leather processing industry, Paper and Pulp, Printing and Publishing industry, Textile and Garments industry, Chemical industry, Metal-working and electrical engineering industry, Materials and non-metal industry, and others.

The meeting held with the Chamber during the assessment activity, besides the General Manager, brought together representatives of the Association of Power Supply Industries, and Ferrous and Non-ferrous Metallurgy; Association of Wood-processing Industry and Furniture Manufacturing; Agriculture and Food-processing Industry Association; Metal and Electrical Engineering Industry Association; Textile and Garments Industry Association; and the Association of Civil Construction, Building Materials and Non-metal Industries.

A number of industries face challenges to remain competitive on the local and international market. The structure of the sector is largely dominated by traditional industries such as textiles, clothing, and steel industry. The number of small and medium sized enterprises is high and increasing (total enterprises: 75,497 in 2010 of which 99.7% are SMEs[10]), but the share of this category of companies working with new technologies is small. Generally, the technological equipment of the sector is obsolete and the level of technological innovations is low.

The energy cost per unit produced varies across industries. The discussion with representatives of branch associations revealed that the energy input cost ranges from 2% in the textile industry to about 80% in the paper industry. However, the average energy consumption cost across industries has said to be around 10% from the final product cost[11]. Annex 5 shows a summary of energy costs in a limited sample of selected SMEs.

Makstil, AD

Makstil, AD is a producer of continuous steel cast slabs and hot-rolled heavy steel plates, located in Skopje. The plant was formally established in 1997, upon acquiring through a privatization process part of the former Mines and Iron Steelworks, Skopje. It has a mixed ownership, though the predominant owner (over 60%) is Duferco Skop Investment Ltd (part of Duferco Group).

Plant's current production process includes an electric-furnace steel slab production plant and rolling plate mill. In 2009 the plant produced 270,400 MT of cast slabs and nearly 300,000 MT of steel plates. The maximum production volume during the past decade was recorded in 2007, equaling 366,000 MT of slabs and 368,000 MT of plates. However, the long-term target annual production volume of the plant is 600,000 MT.

According to the local standards the plant is a huge energy consumer. The energy demand is met through intensive natural gas, electricity and heavy oil consumption, i.e. energy sources that the plant needs to

[10] State statistical office; www.stat.gov.mk
[11] The conclusion is based on discussions with industry representatives.

obtain on a free market basis. Because of these reasons, energy efficiency has been in the forefront of the company's focus since its start up. Hence, up to now two technology modernization phases have been implemented, as a result of which roughly 20% of electricity and nearly 30% of natural gas consumption reductions/savings have been accomplished; a third production modernization and upgrading phase is planned for near future.

The plant holds an ISO 9001 certification from the early stage of its operation (1990-ties), but it does not have a separate formally established energy management unit. However, energy use and related energy costs are continuously being tracked on a per unit of production and even per shift basis. Collected data is analyzed by a group of production managers on a monthly basis, and obtained results/conclusions used as a starting point for identification of improvement needs. Nevertheless, the two formal criteria for selection of technology improvement priorities, as clearly stated by company's representatives are: expected benefits in terms of production increase, and equipment availability/compatibility.

M-Peleti Ltd.

M-Peleti is currently the only producer of wood pellets in the country. Based in Ohrid, the production unit was established in 2009, with 2010 being the first year of operation. The initial capacity of plant was max 2.0 tons/day, with the drying unit being the most serious bottleneck. However, the current production capacity (with a new drying unit purchased recently) equals 8-10 tons/day, with variations depending on inflow of raw materials.

The facility currently purchases raw material – firewood, wood residues and sawdust – from several sources. For example in 2010 it purchased a total of 800 m^3 of firewood (various classes and wood types) from PE Macedonian Forests, wood residues (chipped with mobile cheeping machine) from local 'wood dealers', and saw dust from a number of saw mills located mostly in the western part of Macedonia. The purchasing price of wood-dealers' wood residues equals 45-50 €/ton, which includes transport of chipped wood particles from the place of origin to the plant site; saw dust is purchased for 40-45 €/ton without transportation costs. Due to the limited capacity and production uncertainties the plant still does not have a firm (longer-term) contract with any wood supplier.

The production unit currently operates at maximum of 10 hours/day. It uses approximately 2.5 m^3 of chopped wood for production of 1 ton of wood pellets.

The current retail sales price of wood pellets produced by M-Peleti and sold entirely on the local market equals 200 €/ton; its bulk price (sales to wood pellet dealers) goes as low as 150 €/ton. It was noted during the meeting that these are market-based prices, having a sufficient price margin. Namely, being the only local producer of wood pellets, plant's competitors are pellet producers from Serbia whose retail selling price is 200-215 €/ton; however, this price includes supplementary (compared to M-Peleti) transport costs of roughly 30 €/ton.

The owners of M-Peleti have estimated that the current demand of wood pellets in Macedonia is in the range of 35 tons/day throughout the winter season of 180 days (which equals to 6,300 tons/year), and growing constantly; It was also estimated that the demand would increase to a minimum of 150 tons/day (roughly 27,000 tons/year) in a 2-3 year period.

USAID Competitiveness Project Roundtable

The USAID Macedonia Competitiveness Project (MCP) is a five-year project, implemented by CARANA Corporation, that supports initiatives to stimulate foreign and domestic investment, capture higher value export markets, and generate significant numbers of new jobs for Macedonia. MCP implements cost-

effective, high-impact and market-oriented activities within an integrated approach that considers sector-specific issues as well those that affect country's ability to achieve export-driven growth across sectors.

MCP's activities are structured on vertical and horizontal levels whereas the vertical components (sectors) include: (1) apparel; (2) light manufacturing; and (3) information and communication technology (ICT), while the horizontal or cross-cutting component activities – intended to benefit multiple sectors – include: (1) access to finance; (2) workforce development; and (3) foreign direct investment (FDI). The typical MCP interventions involve: (1) market linkages with international companies, (2) new foreign investments, (3) financing (debt or equity) for local companies, (4) adoption of modern technologies and practices and compliance with certifications, (5) investments in students and employees, resulting in a workforce with upgraded skills and flexibility. During the period since initiation of the activities the MCP has worked directly and supported a number of local companies (SMS) in achieving planned development objectives.

The meeting (round table) organized during the new USAID energy project design assessment stage brought together several MCP's 'clients' from various industry sectors such as: textile and apparel ("Mond"), metal/machine industry ("Ruen Kocani"), plastics ("Dema stil") food processing ("Bonum", "Altra"), paper recycling, and energy services ("Energo Sistem"). The discussions that took place during the meeting touched upon several aspects related to companies' energy use and related costs (as a percentage of overall costs/revenues), applied energy efficiency and energy management practices, current problems with energy supply/use, obtained and planned production standards, etc. The overall conclusions include:

- the companies' energy use – energy-related costs – vary between 10% (textiles, metals and part of food processing) to 35% (food processing which includes canning) and even 80% (paper recycling) of the total production costs;
- the share of energy-related costs in the total direct production costs is considered as important to significant, however, currently not much focus is given to application of energy efficiency (energy saving) measures. Instead, by and large, the companies are focused on expanding their production capacity and market share, where majority of investments are directed. As regards to possibilities for direct energy-related cost savings the companies in general are focused on exploring possibilities for fuel switch, as opposed to energy savings through implementation of energy efficiency measures.
- Energy management, as a specific policy or management activity is not present. By and large the companies are aware of possibilities for – and willing to – undertaking energy audits, based on which they intend to implement energy efficiency measures in future. Nevertheless, energy audits are seen as a 'one-off' event as opposed to implementing continuous energy tracking (management) practices.
- As a rule the companies either already have or plan to obtain in the near future the ISO 9001 quality management standard. Other standards, in general, are not planned in near future.

V.6. Other Donors discussed on meetings

Norsk Energi – Cleaner and more cost-effective industry in Macedonia

The Cleaner and More Cost-effective Industry in Macedonia (www.ccei.org.mk) is a 3-year donor program funded by the Government of Norway (Ministry of Foreign Affairs) and implemented by a consortium comprising Norsk Energi (www.energi.no) and two local NGO: - Centre for Climate Change and the National Cleaner Production Center. Implementation of the program is supported by the MoEPP and the Macedonian Chamber of Commerce.

The goal of the project is to contribute to reduction of GHG emissions and to more cost effective (less energy intensive) industry in Macedonia. The program addresses barriers to project implementation by building local competence, increasing awareness, developing a pipeline of climate projects ready for financing, as well as improving the dialogue between the authorities, academia, project developers, industry and financial institutions.

The main aspects of the program include: (1) identification of potential energy efficiency projects in energy intensive industries and district heating companies; (2) environmental management promotion; (3) assistance to project development; (4) preparation of pre-feasibility studies and business plans for selected projects; (5) assessment of possibilities for carbon financing to cover part of investment costs; (6) assistance in obtaining project financing; (7) building of local competence for identifying and developing projects for GHG emission reduction; and (8) assisting the Macedonian industry for future EU obligations by increasing social responsibility and competitiveness and producing goods in an environmental friendly manner.

Since 2009, the program has supported preparation and assessment (at a pre-feasibility level) of several industrial and public sector energy efficiency projects – SILMAK, University Clinical Centre, "Karpos Factory, Wab-tacGroup (former Poli-MZT), Teteks Factory, REK Bitola (2 projects), OHIS and Municipality of Kavadarci. Big part of the projects have been presented to financing institutions, however, no funding has taken place.

Italian Ministry for Environment, Land and Sea, Task Force Central and Eastern Europe

Firstly instituted in Belgrade in 2004, it develops and coordinates the activities of bilateral cooperation for environmental protection trough the support of both Italian and local experts. It was established to create a geopolitical network in Central and Eastern Europe in environmental fields, in particular with focus on the Balkan region setting bilateral cooperation to encourage political and environmental dialogue within the countries.

In 2005, the Italian Ministry for the Environment Land and Sea has signed a Memorandum of Understanding on "Cooperation in the field of the Environment and Sustainable Development" with the Macedonian Ministry of the Environment and Physical Planning. The cooperation aims to develop supporting activities for Kyoto Protocol implementation, environmental protection, natural resources improvement, environmental pollution reduction, legal assistance to adopt the Acquis Communautaire, and promotion of sustainable development trough programs, initiatives and jointed projects. For this purpose, the Task Force for Central and Eastern Europe of the Italian Ministry for the Environment Land and Sea has established a permanent office in Skopje, in order to provide for the Macedonian counterparts legal and technical assistance necessary to build-up institutional structures and to realize environmental policies more focused on sustainable development.

Main activities developed in the frame of Bilateral Cooperation include scouting and promotion of CDM projects in Macedonia, support to the Designated National Authority (DNA), technical and legal assistance, and strengthening the central and local level capacities for environmental management.

The CDM projects regard energy efficiency, renewable energy (hydroelectric, geothermic, wind, biomass), fuel switching, waste management, and afforestation. Potential ideas are proposed to the Italian investors through a Call of Interest, and they obtain an Italian co-funding for the realization of feasibility studies and Project Design Documents (PDDs). After the evaluation of the CO_2 saving potential, the Task Force has performed a scouting phase in order to identify specific project opportunities. More than 20 potential CDM projects have been identified in different sectors, and 10 of them are actually in the

pipeline: in details, one related to waste water management, six focused on renewable energy sources and three related to energy efficiency. All projects have been presented to Italian or Italian-Macedonian enterprises willing to invest in these sectors. PDDs for these projects are on going and are at different stage of development. The average range for annual emission reduction per project is from 15 to 25 $ktCO_2eq$. The most advanced project in the process of validation is the paper factory Hartija from Kochani with project objective to use wood biomass to generate electricity. The GHG offset is estimated at 119 $ktCO_2eq$ for a 10-year period while the estimated investment cost for installing biomass boilers for thermal energy generation is about $2.0 million.

The Task Force in cooperation with the University of Siena provides technical and legal assistance to the Macedonian Ministry for the Environment and Physical Planning for the drafting of the environmental legislation implementing the acquis communautaire and supports Macedonia in the creation of the legislative framework for CDM approval, providing a permanent legal support for the UNFCCC and Kyoto Protocol implementation. The activities aim at supporting the process of harmonization of the national legislation with the EU acquis with focus on the analysis of the EU legislation on IPPC and Emission Trading, with a view to provide Macedonia with the assistance for drafting the necessary amendments to the Law on Environment by regulating all relevant aspects and issues in the environmental sector.

In collaboration with UNEP, the Italian Ministry for the Environment, Land and Sea is financing a program to spread thermal solar systems, encouraging their use in Macedonian residential areas. The project aims to facilitate the purchase and the installation of the solar water heating systems trough a suitable financial program and to spread the know how among possible users in residential area.

The South Eastern Europe University of Tetovo is setting up an "Ecological Campus" including the use of renewable energy and application of energy efficiency technologies in buildings. The Italian Ministry for the Environment, Land and Sea is supporting the realization of a Climate Action Plan with the target of a "Zero Emission" Campus. It could become a spreading academic and technological center for the use of eco-friendly technology.

The Italian Ministry financed a study on biomass availability in Macedonia for energy use from agriculture and forestry residues. The study represents a baseline document for the scouting of new CDM projects for the use of biomass. The Italian Ministry also provided technical assistance for issuing concession on integrated waste management in four regions in Macedonia. The project, with the support of the Regional Environment Center consists of technical and legal assistance to Macedonia in Waste Sector, in order to identify new landfills in the country and define procedures for concessions.

The Task Force indicated their interest to cooperate with the new USAID energy project in order to avoid overlapping and to combine forces in developing projects and assisting Macedonian institutions in meeting their targets.

V.7. Other International Donors active in EE and RE development in Macedonia

- *World Bank*, Restructured GEF Sustainable Energy Project; $5.5 million grant has three components: (i) Institutional support, technical assistance and project management; (ii) Financial support for EE in public buildings; and (iii) Sustainable Energy Financing Facility (SEFF) - Credit line for RE/EE. The objective of the project is to develop a sustainable market for Energy Efficiency and Renewable Energy by supporting development of an enabling framework, institutional capacity, and financing mechanisms. The global environment objective is to reduce greenhouse gas emissions on a continuous basis by overcoming barriers to implementation of EE and RE. Specifically, the project

aims to support the implementation of the Government's recently announced National Program for Energy Efficiency in Public Buildings.

- *SIDA*, Promotion of Sustainable Farming and Energy Practices in the Rural Areas of Macedonia, 2008-2010, €457k, TA: EE and RE in agriculture, training to farmers; Pilot projects; "AgroEnergy" project to promote EE and utilization of RE resources in rural areas, a grant of €2.0 million extended in 2010.

- *European Investment Bank (EIB)*, South East Europe EE Fund (SE4F), €65 million (total for Western Balkan region), credit lines to commercial banks for on-lending to the residential sector and SMEs for EE and RE.

- *United Nations Economic Commission for Europe (UNECE)*, "Financing Energy Efficiency Investments for Climate Change Mitigation" project, under which a PPP investment fund called "Eastern Europe Energy Efficiency Fund", will be established. Fund capital commitments will be about €250 million. This fund offers mezzanine and equity financing for EE/RE projects or companies developing, manufacturing, distributing or installing EE/RE equipment or services in target countries. The minimum investment is €10 million and the Fund will operate in twelve countries, including Albania, Bosnia and Herzegovina, Macedonia and Serbia.

- *GTZ,* Open Regional Fund for South East Europe Energy Efficiency and Renewable Energy (ORF-E), €3 million (total for region), 2008-2011 (follow up is planned). TA: assistance to the Ministry of Economy in preparing of the National Energy Efficiency Action Plan (monitoring and verification of data); The South East European Capital Cities Initiative: preparation of Sustainable Energy Action Plan for Skopje (by 04/2010), establishment of the EE Team in the administration of Skopje and capacity building for it; establishment of the info-center; public awareness raising campaign.

- *Austrian Development Agency (ADA)*
  - Energy Efficiency in Buildings Program, €1.7 million, 2009-2012, TA: Establishment of an enabling environment for EE in buildings, assistance with legal framework (legal acts, sub-laws, rulebooks), capacity building at the Ministry of Economy and the Energy Agency;
  - Mitigating climate change through Improving EE in Buildings Program, €350k, TA: Development of the national climatic database by region; Development of the national inventory of public buildings, identification of least-cost EE measures and development of municipal EE in public buildings programs.

- *Energy Savings International (ENSI),* Energy Efficiency in Macedonia Buildings Program, TA: Municipal EE Planning (5 municipalities), collection of relevant data, capacity building at municipalities; Training Energy Auditing of Buildings was provided to the Technical University.

- *Swiss Development Cooperation and State Secretariat for Economic Affairs,* School Rehabilitation Project, 2000-2009, CHF2 million (US$2.1 million), Rehabilitation with EE measures at 13 schools was performed by a contractor.

Annex 1

USAID Energy Project Design in Macedonia

Schedule of Meetings
Week 1: 24-28 January 2011

Mon. 24 Jan	**Organization**
09:00 – 12:30	Team meeting
13:00 – 14:00	Macedonian Bank for Development Promotion
14:30 – 15:30	USAID's Competitiveness Project
16:00 – 17:00	USAID's orientation meeting
Tue. 25 Jan	
10:30 – 11:30	Ministry of Agriculture, Forestry and Water Economy
12:00 – 13:00	Ministry of Environment and Physical Planning
13:30 – 14:30	Macedonian Forests, public enterprise
15:30 – 16:30	Procredit Bank (KfW EE Lending Facility)
Wed. 26 Jan	
09:00 – 09:45	Ministry of Economy, ISO standardization
10:00 – 11:30	Energy Regulatory Commission of Macedonia (ERC)
12:00 – 13:00	European Bank for Reconstruction and Development (EBRD) Macedonia and EBRD's Turn Around Management (TAM) and Business Advisory Service (BAS) Program
13:30 – 15:00	Macedonian Academy for Sciences and Arts (MANU)
15:30 – 18:30	Results Framework closed session, USAID Mission Office
Thu. 27 Jan	
09:00 – 10:15	Energy Agency
10:45 – 11:45	Ministry of Economy, Energy Department
12:00 – 13:00	MEPSO, Macedonian Transmission System and Market Operator
14:00 – 15:00	Chamber of Commerce (Industrial representative business associations)
10:00 – 11:45	Makstil, AD industrial walk-through visit
Fri. 28 Jan	
10:30 – 12:00	Roundtable Competitiveness Project
12:30 – 14:00	UNIDO's industrial consultants
12:30 – 13:30	M-Peleti Ltd., wood-pellet producer
14:30 – 15:30	Task Force Central and Eastern Europe, Italian Ministry for Environment, Land and Sea
16:00 – 18:00	Team meeting – First week debrief

Week 2: 31 January – 03 February 2011

Mon. 31 Jan	**Field Trips**
10:00 – 13:00	Discussion and walk through visit at BONUM, food processing plant
13:30 – 16:00	Discussion and walk through visit at LIRA, lights manufacturing plant
Tue. 01 Feb	
10:00 – 11:00	Ministry of Economy, Minister of Economy
11:30 – 13:00	Macedonian Food-processing Association
09:30 – 15:30	Norsk Energi – Seminar on Financing opportunities for realization of Industrial Energy Efficiency Projects in Macedonia
Wed. 02 Feb	
10:00 – 11:00	Saw mill EL-MIK, Skopje
Thu. 03 Feb	
16:00 – 17:30	Final Debrief at the USAID Mission Office

Materials reviewed

[1] USAID Strategic Plan 2011–2015
[2] Energy Efficiency and Renewable Energy Assessment, June 2009
[3] Draft Energy Law, December 2010
[4] Energy Efficiency Strategy, adopted September 2010
[5] Renewable Energy Strategy, adopted September 2010
[6] Draft Renewable Strategy Implementation Plan, September 2010
[7] National Energy Efficiency Action Plan (NEEAP), December 2010
[8] EG Roundtable Report, June 2009
[9] Workforce Development Assessment, March 2009
[10] Business Environment Assessment, December 2009
[11] Strategy for Sustainable Development of Forestry in Macedonia, MAFWE, May 2006
[12] Draft ISO 50001 – Energy Management Standard
[13] Law on Energy, February 2011
[14] Regional Renewable Energy Assessment, Biomass in Macedonia, CRES Study
[15] Biomass Energy in Macedonia, MAGA report 2010

Annex 2

Overview of Energy Consumption, GDP and Employment by Industry

Energy Consumption by Industry	Electricity (GWh)					Heat (TJ)					GDP value (million denars)			Number of employees		
Industries	**2005**	**2006**	**2007**	**2008**	**2009**	**2005**	**2006**	**2007**	**2008**	**2009**	**2007**	**2008**	**2009**	**2007**	**2008**	**2009**
Iron & steel industry	1,547	1,574	1,778	1,650	835	388	442	429	378	347		12,193	9,987		13,352	12,944
Non-ferrous metal industry	10	13	15	12	9	0	0	0	0	0		0	0		0	0
Chemical industry	47	49	48	70	66	222	175	170	159	144		3,896	3,191		2,214	2,049
Glass, pottery & building mat. industry	146	159	157	155	130	214	217	179	185	170		6,118	5,011		3,640	2,960
Mining industry	74	118	116	159	176	1	2	2	5	6		4,350	4,137		3,373	3,420
Food processing, beverages & tobacco	130	128	163	167	153	1,085	908	912	860	823		18,311	14,998		16,693	16,708
Textile, leather & clothing industry	70	67	67	71	61	448	386	285	314	274		12,042	9,863		44,818	45,507
Paper and printing industry	13	12	12	14	16	111	112	102	107	106		3,568	2,922		5,018	5,021
Engineering & other metal industry	59	61	52	68	68	95	80	48	41	40		1,170	958		1,968	1,576
Other industries	48	40	42	45	50	77	45	48	32	25		13,337	10,925		20,003	17,986
Total	**2,143**	**2,221**	**2,450**	**2,412**	**1,562**	**2,641**	**2,367**	**2,174**	**2,081**	**1,934**	**0**	**74,984**	**61,993**	**0**	**111,079**	**108,171**
Annual Growth Rate		3.6%	10.3%	-1.6%	-35.2%		-10.4%	-8.2%	-4.3%	-7.1%			-17.3%			-2.6%

Energy Consumption by Industry	Electricity (% of total)					Heat (% of total)					GDP (% of total)			Employees (% of total)		
Industries	**2005**	**2006**	**2007**	**2008**	**2009**	**2005**	**2006**	**2007**	**2008**	**2009**	**2007**	**2008**	**2009**	**2007**	**2008**	**2009**
Iron & steel industry	72.2%	70.9%	72.6%	68.4%	53.4%	14.7%	18.7%	19.7%	18.2%	17.9%		16.3%	16.1%		12.0%	12.0%
Non-ferrous metal industry	0.5%	0.6%	0.6%	0.5%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%		0.0%	0.0%
Chemical industry	2.2%	2.2%	2.0%	2.9%	4.2%	8.4%	7.4%	7.8%	7.6%	7.4%		5.2%	5.1%		2.0%	1.9%
Glass, pottery & building mat. industry	6.8%	7.2%	6.4%	6.4%	8.3%	8.1%	9.2%	8.2%	8.9%	8.8%		8.2%	8.1%		3.3%	2.7%
Mining industry	3.5%	5.3%	4.7%	6.6%	11.3%	0.0%	0.1%	0.1%	0.2%	0.3%		5.8%	6.7%		3.0%	3.2%
Food processing, beverages & tobacco	6.1%	5.8%	6.6%	6.9%	9.8%	41.1%	38.4%	42.0%	41.3%	42.6%		24.4%	24.2%		15.0%	15.4%
Textile, leather & clothing industry	3.2%	3.0%	2.8%	2.9%	3.9%	17.0%	16.3%	13.1%	15.1%	14.2%		16.1%	15.9%		40.3%	42.1%
Paper and printing industry	0.6%	0.6%	0.5%	0.6%	1.0%	4.2%	4.7%	4.7%	5.1%	5.5%		4.8%	4.7%		4.5%	4.6%
Engineering & other metal industry	2.8%	2.8%	2.1%	2.8%	4.3%	3.6%	3.4%	2.2%	2.0%	2.1%		1.6%	1.5%		1.8%	1.5%
Other industries	2.2%	1.8%	1.7%	1.9%	3.2%	2.9%	1.9%	2.2%	1.5%	1.3%		17.8%	17.6%		18.0%	16.6%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**		**100%**	**100%**		**100%**	**100%**

Annex 3

Analysis of the Potential for Biomass Residues Use for Pellet Production

Forest-based Biomass Residues[1]

Source	Total biomass (m3/year)		Availability (%)[4]	Available quantity (m3/year)	
	Low	High		Low	High
Total fuelwood[2]	600,000	1,000,000	100%	600,000	1,000,000
Forest residues (8% of fuelwood)[3]	48,000	80,000	50%	24,000	40,000
3-rd class firewood (10% of fuelwood)[3]	60,000	100,000	80%	48,000	80,000
Total biomass as forestry residues	108,000	180,000		72,000	120,000
Sawmill residues	30,000	40,000	50%	15,000	20,000
Total forest-based biomass residues	138,000	220,000		**87,000**	**140,000**
Potential pellet production from forest-based residues (t/year)[5]				**34,800**	**56,000**

Agriculture Biomass Residues[6]

Source	Area (ha)	Average plants per hectare	Residue biomass per hectare (t/ha)	Availability (%)[7]	Available quantity	
					t/year	m3/year
Orchards	13,916	606	3.25	65%	29,398	58,795
Total agriculture biomass residues					**29,398**	**58,795**
Potential pellet production from agriculture residues (t/year)					**23,518**	

	Low	High
Total potential pellet production from biomass residues (t/year)	**58,318**	**79,518**

	Current	3-5 years
Estimated pellet demand in Macedonia (t/year)[8]	**6,300**	**27,000**

[1] Estimates refer to state-owned forests managed by the Public Enterprise 'Makedonski Sumi' (PE), which account for 90% of total area under forests in the country and 92.2% of the total wood mass; forests within national parks and privately-owned forests are not taken into consideration.

[2] Figures refer to annual cut/harvest in the past 10 years.

[3] Estimates given by PE 'Makedonski Sumi'.

[4] Estimates include accessibility of forest residues for use; part of sawmill residues are used for own heating purposes.

[5] Based on assumed average use of 2.5 m3 of biomass for production of 1 ton of pellets.

[6] Includes only residues from pruning of orchards.

[7] Estimate includes reduction of pruning residues used for heat production by farmers.

[8] Figures based on estimated current demand of 35 tons/day over 180 days per year; estimated to expand to 150 tons/day.

ANNEX 4: Summary of Energy Costs in Selected SMSs

Sector	**Food production**
Sub sector	**Canned food**
Location	**Macedonia**
Total energy costs in 2008	**469,391 €**
Total forecasted energy costs in 2013	**1,724,388 €**

	Product 1	Product 2	Product 3	Product 4	Product 5	Total	Share in direct production cost	Share in total COGS	Share in total revenues
Production in units (jars)	957,125	147,250	147,250	73,625	147,250	1,472,500			
Sales price per unit	1.38 €	0.98 €	0.81 €	1.38 €	1.38 €	1.28 €			
Revenues	**1,322,856 €**	**143,659 €**	**119,715 €**	**101,758 €**	**203,516 €**	**1,891,504 €**			**100%**
Cost of good sold per unit	**823,210 €**	**105,047 €**	**107,083 €**	**63,324 €**	**128,751 €**	**1,227,415 €**		**100%**	**65%**
Direct production costs per unit	**802,256 €**	**101,824 €**	**103,859 €**	**61,712 €**	**125,527 €**	**1,195,178 €**	**100%**	**97%**	**63%**
Direct material costs	223,664 €	22,387 €	24,422 €	17,205 €	46,090 €	333,768 €	28%	27%	18%
Direct energy costs	311,260 €	38,309 €	38,309 €	23,943 €	38,309 €	450,130 €	**38%**	**37%**	**24%**
Packaging	233,445 €	35,915 €	35,915 €	17,957 €	35,915 €	359,146 €	30%	29%	19%
Direct labor	33,887 €	5,213 €	5,213 €	2,607 €	5,213 €	52,134 €	4%	4%	3%
Production overhead	**20,954 €**	**3,224 €**	**3,224 €**	**1,612 €**	**3,224 €**	**32,236 €**		3%	2%
Heating	8,856 €	1,362 €	1,362 €	681 €	1,362 €	13,624 €		1%	1%
Electricity	3,664 €	564 €	564 €	282 €	564 €	5,636 €		0%	0%
Maintenance	8,434 €	1,298 €	1,298 €	649 €	1,298 €	12,976 €		1%	1%
Total energy costs	**323,780 €**	**40,235 €**	**40,235 €**	**24,906 €**	**40,235 €**	**469,391 €**	**38%**	**38%**	**25%**

Sector	**Food production**
Sub sector	**Processed Cheese Production Company**
Location	**Macedonia**
Total energy costs in 2010	**18,183 €**
Total forecasted energy costs in 2015	**42,127 €**

Cost structure 2010	Share in total COGS	Share in total costs	Share in total revenues
Total	**734,908 €** **100%**	**929,892 €** **100%**	**1,022,577 €** **100%**
Direct production costs (COGS)		**79%**	**72%**
Raw materials	**60%**	**48%**	**43%**
Cheese	55.2%	43.7%	39.7%
Additives	5.2%	4.1%	3.7%
Water	0.0%	0.0%	0.0%
Other production costs	**19%**	**15%**	**14%**
Packaging	16%	12%	11%
Electric energy	**1.8%**	**1.4%**	**1.3%**
Fuel	**0.7%**	**0.6%**	**0.5%**
Laboratory	0.3%	0.2%	0.2%
Chemical agents	0.2%	0.1%	0.1%
Maintenance	0.9%	0.7%	0.6%
Direct labor	**20.2%**	**16.0%**	**14.5%**
Other operating and non operating costs		**21%**	**19%**
General sales and administrative costs		6.1%	5.5%
Salaries of management and administration		3.5%	3.2%
Depreciation		0.7%	0.7%
Interest		1.2%	1.1%
Non-operating expenses		1.3%	1.2%
Extraordinary expenses		7.1%	6.4%
Taxes		1.1%	1.0%
Net income			**9%**
Share of total energy costs	**2.5%**	**2.0%**	**1.8%**

Sector	**Metal and plastic fabrication**
Sub sector	**Plastic processing and tool and mould production**
Location	**Macedonia**
Total energy costs in 2010	**30,580 €**
Total forecasted energy costs in 2015	**82,891 €**

	Share in total operating costs	Share in total costs	Share in total revenues
Total Revenues			**100%**
Total Costs		**100%**	**87%**
Total operating costs	**100%**	**74%**	**65%**
Direct material costs	42%	31%	27%
Production services	7%	6%	5%
Gross salaries	21%	15%	13%
Energy costs	9%	6%	6%
Electric energy	7%	5%	4%
Oil	2%	1%	1%
Rent	3%	2%	2%
Transportation cost	8%	6%	5%
Other operating expenses	11%	8%	7%
Depreciation		9%	8%
Interest		3%	2%
Extraordinary expenses		14%	12%

Sector	**Metal industry**
Sub sector	**Foundry**
Location	**Macedonia**
Total energy costs in 2009	**1,044,366 €**
Total production in tones in 2009	**3,577**
Optimal production capacity tones	**6,500**

	Share in total energy costs	Share in total COGS	Share in total costs	Share in total revenues
				100%
Total costs			**100%**	**91%**
Cost of goods sold		**100%**	83%	75%
Direct materials costs		55%	45%	41%
Gross salaries		19%	16%	15%
Energy costs	100%	**16%**	**13%**	**12%**
Electric energy	73%	11%	10%	9%
LPG	22%	3%	3%	3%
Installed power	2.3%	0.4%	0.3%	0.3%
Oil	1.7%	0.3%	0.2%	0.2%
Petrol	0.6%	0.1%	0.1%	0.1%
Wood (for heating)	0.3%	0.1%	0.0%	0.0%
Other production costs		10%	8%	8%
Other operating costs			7%	6%
Depreciation			4%	4%
Interest			6%	5%

Annex 5: Brief cost comparison for use of pellets, firewood and electricity for heating

					Oil	Oil	Coal	Wood
		kWh	MWh	GJ	t	l	t	m3
	kWh	1.000	0.001	0.004	0.000	0.102	0.000	0.000
	MWh	1,000.000	1.000	3.600	0.086	102.000	0.360	0.484
	GJ	277.778	0.278	1.000	0.024	28.333	0.100	0.134
Oil	t	11,666.667	11.667	42.000	1.000	1.000	-	-
Oil	l	9.804	0.010	0.035	1.000	1.000	-	-
Coal	t	2,777.778	2.778	10.000	-	-	1.000	-
Wood	m3	2,066.780	2.067	7.440	-	-	-	1.000

Calorific value (1 ton pellet): 18 GJ

Equivalent (1 ton pellets)		Unit Measure	Unit Price (EUR)	Total Price (EUR)
Pellets	5000	kWh	0.03	**150**
Firewood	2.419222	m3	50.00	**121**
Electricity	5000	kWh	0.0854	**427**