ETSAP Workshop 2010

MARKAL application in the Republic of Moldova for Energy Efficiency and RES Analysis

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Overview of Presentation

- Republic of Moldova
- Model Status
- Data Sources and Issues
- Reference Scenario description
- Overview of Analysis undertaken
- Key Results

Republic of Moldova.

- Location: East Europe, northeast of Romania
- Total area: 33845 km2
- Population: 3.589 mill.
- GDP: 7000 mill Euro, PPP2006
- Moldova has NO fossil fuels resources

Model Background

- The model was developed in the framework of the Synenergy Project
- Funded by USAID-HellenicAid
- Aims to set up local modeling teams and energy planning capabilities and ties with the respective Ministries
- In the Energy Community Contracting Parties and Observer Countries.

Model Background

The project has four tasks

1. Renewable Energy potential assessment
2. Energy Efficiency promotion
3. Strategic Planning – modeling in this task
4. Capacity building

Task 3 will finish in September 2010 producing an analysis for Energy Efficiency measures and Renewable Energy penetration in the countries.

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Model Status

- Key organizations involved in model development:

a) Institute of Power Engineering of Academy of Sciences of Moldova

b) Ministry of Economy

c) Alliance for Energy Efficiency and Renewables - Moldova.

- The model has been under development since 2009 when national training was organized by CRES, Greece.
- Over last six months, the model was constantly improved during workshops, and communications with CRES coordinator.
- High interest in results by Ministry of Economy.

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Model – Sectors Analysis

- The residential sector (RSD) distinguishes 10 end-uses in 4 dwelling categories. Only space heating, water heating and space cooling are broken out by building types, owing to the variance in thermal integrity, seasonal use profile, and device and conservation options for each dwelling type.
- The commercial sector has been divided into two broad sub-sectors: small and large buildings.
- Agricultural sector is modeled as a single demand with generic devices per fuel.
- At the moment only the electricity driven part of transport is modeled.

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Model – Sectors Analysis

The industrial sector (IND) distinguishes three end-uses in each of the seven industry subsector:

- chemical industry;
- food industry;
- iron and steel industry;
- non-ferrous metals industry;
- non-metallic minerals industry;
- other manufacturing industry; and
- pulp and paper industry.

The end-use categories within each industry are:

- high temperature heat;
- low temperature heat; and
- machine drive.

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Data Sources

- National Bureau of Statistics of the Republic of Moldova
  http://www.statistica.md
- National Agency for Energy Regulation
  http://www.anre.md
- UNDP Moldova
  http://www.undp.md

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Overview of Analyses Undertaken

- **Reference Scenario** (D_REF Business as Usual Scenario) with slower replacement of existing end use demand devices, energy prices according to WEO 2009.
- **Renewable Energy Target Scenario** (D_RE using IPA-derived target) -10% biofuels in 2020 for transport sector
- **Energy Efficiency Scenario** (D_EE with greater penetration of efficient end-use technologies)
- **Renewable Energy Target plus Energy Efficiency Scenario** (D_EERE) combines RE&EE scenarios

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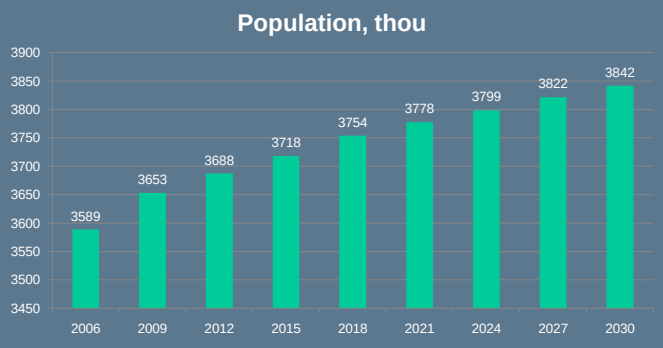
Reference Scenario description



• *Population of the Republic of Moldova is 3589 thousand inhabitants in 2006 and has a growth rate of 0.33% per year*

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Reference Scenario description

• *GDP was 7000 mill Euro,PPP2006 in year 2006 and has a growth rate of 6% per year.*

• *by the end of study period the value of GDP is estimated to be around 28000 mill Euro, PPP2006*

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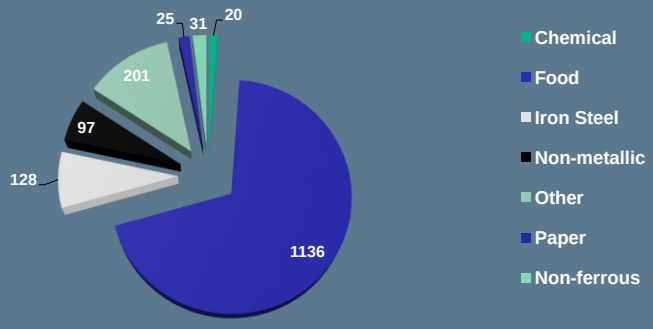
Reference Scenario description

Value added per activity in 2006, MEuro



• The main industrial activity of Moldova is Food industry with 1136 mill. Euro, or 69% of Industrial sector;
• followed by Other activities of 201 mill. Euro, or 12%; and Iron-Steel 128 mill. Euro, or 8%.

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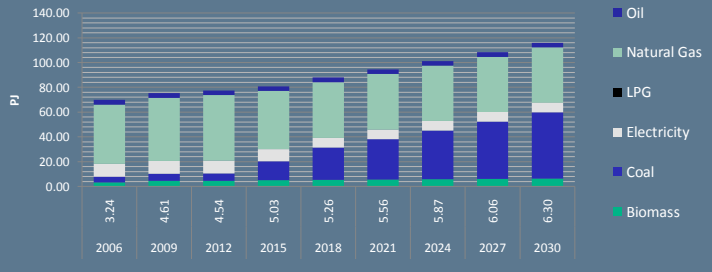
Reference Scenario description

Primary Energy Supply [PJ]

(without transport sector)



• The main fuel is natural gas with 47.75 PJ of total 72 PJ primary energy supply in 2006; followed by Electricity of 10.3PJ ;
• Biomass supply is 3.24 PJ in 2006 and will double to 6.3 PJ in 2030
• Coal supply is increasing due to coal-fired power plant which in planned to be operated starting with 2015,

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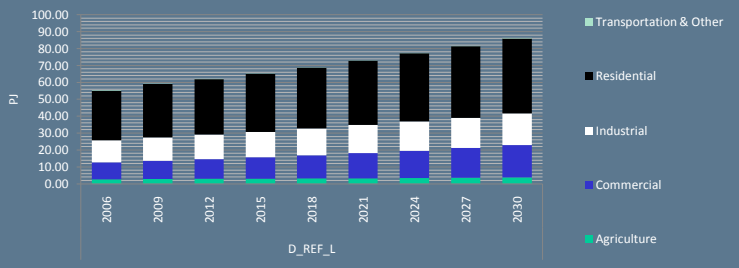
Reference Scenario description

Final Energy Consumption by Sector [PJ]



- *Residential sector is the main consumer of final energy with 29.5PJ in 2006 and 44.4 PJ in 2030;*
- *Commercial sector's final energy consumption has the highest growth rate from 10PJ in 2006 to 19PJ in 2030*

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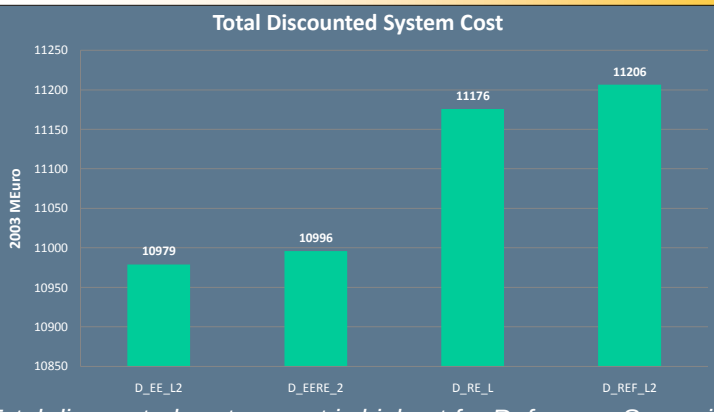
Total Discounted System Cost, MEuro



Total discounted system cost is highest for Reference Scenario due to the reason that: existing end use devices remain longer into the energy system comparing to the other scenarios (Business as Usual Approach)

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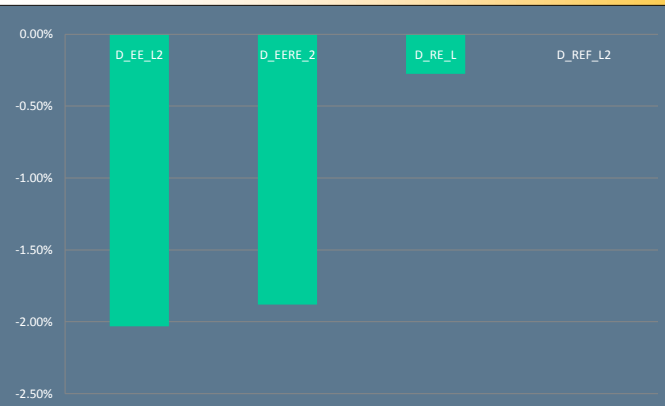
Change in Total Discounted System Cost, %



The Renewable Target Scenario has a lower Total Discounted Cost comparing to REF Scenario, this happens due to: earlier penetration of efficient demand devices than reference , but higher cost of investment in renewable technologies is increasing the Total system cost; Promoting efficiency measures reduces costs 2%.

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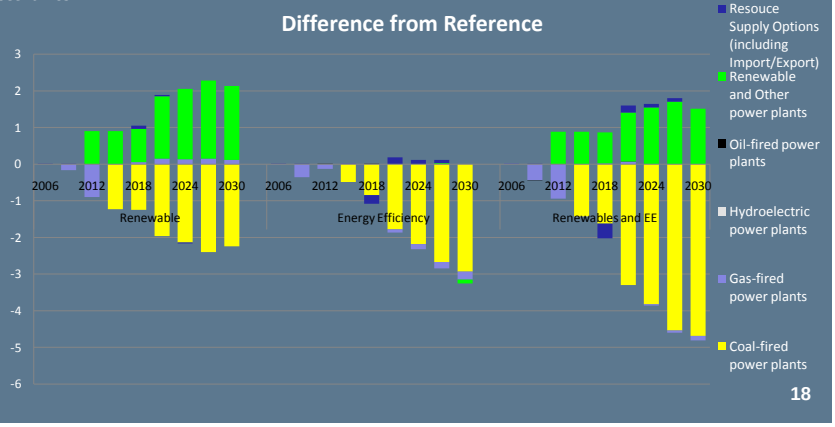
Impact on power generation system

a) **The amount of electricity produced in Renewable Target Scenario is close to Reference Scenario values, but there is a substitution of coal by renewable.**

b) **In the EE Scenario we have lower demand for electricity, mainly decreasing coal electricity production**

c) **The EE&Renewable Scenario combines the results of first two scenario (EE and RE); has lower investment in renewable than RE; and higher substitution of coal-fired power plants than in other scenarios**



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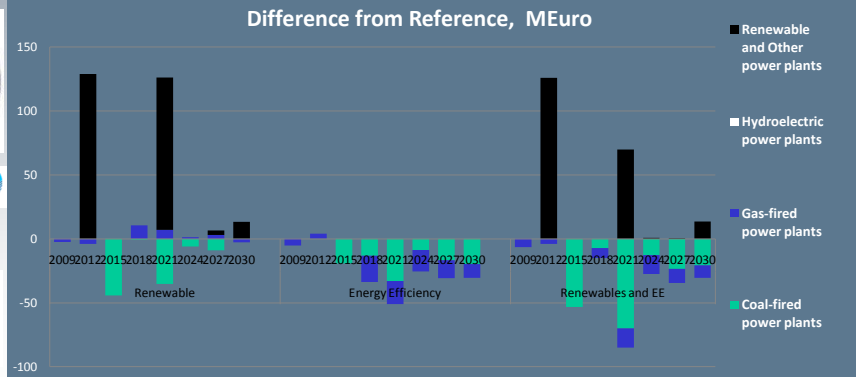
Savings in Investment Level (MEuro) by Fuel Type

- Potential need to change investment incentives to achieve RE target
- Significant less investment demand in energy efficiency scenario



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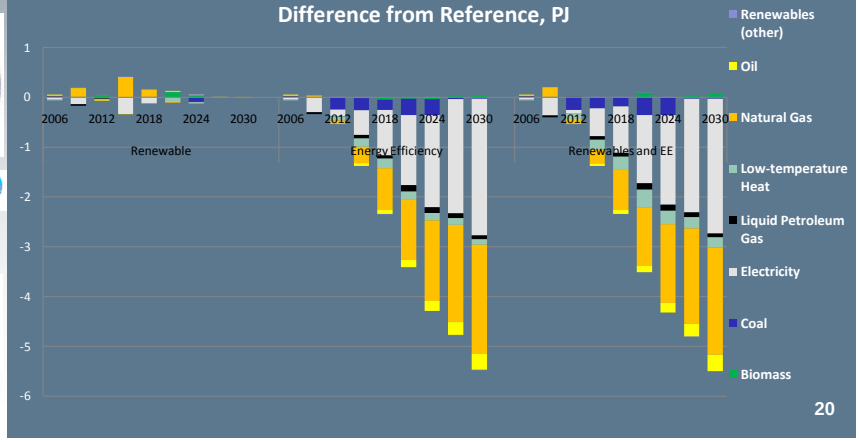
Savings in final energy consumption

a) In Renewable Scenario - Final energy consumption profile remains the same as in REF Scenario except small trade-off between gas and electricity

b) Significant reductions in EE and EE&RE target scenarios is mainly due to the availability of more efficient end use devices using electricity and gas.



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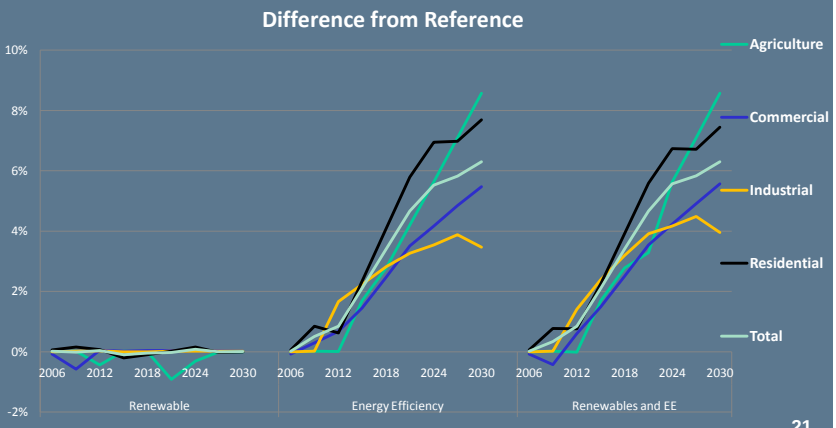
Savings in final energy per sector

a) **Residential sector has the highest reduction potential in final energy consumption for EE scenarios mainly due to implementation of advanced end-use devices. Residential sector is main consumer comparing to other sectors**

b) **The RE scenario doesn't change the final energy consumption pattern.**



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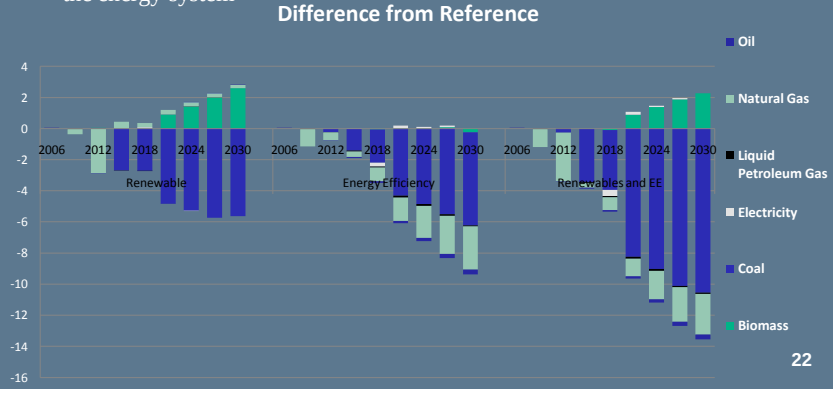
Savings in primary energy

a) In RE scenario biomass substitutes the coal used in REF scenario

b) EE measures application results to lower electricity demand,

- mainly produced by coal,

a) Gas consumption levels get lower as soon as new gas efficient devices enter the energy system



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Key results

- Meeting renewable targets is cost-effective with application of advanced end-use technologies
- Key measures will be needed to shift investment from fossil to renewable generation
- Encouraging uptake of more efficient technologies is a priority issue as the economic potential for energy saving is significant
- Combining EE and RET scenarios leads to more efficient energy system
- Residential sector is most interesting for implementation of energy efficiency measures.

MARKAL database at least for 2006 to be published on the web (www.kanors.com/DCM/RES2020)

Thank you!