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Department of Strategy and Development

FORECAST OF ENERGY DEMAND IN KOSOVO FOR THE PERIOD 2007 - 2016

Mars 2007

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Abbreviations

EAR	European Agency for Reconstruction
ERO	Energy Regulator Office
ESTAP	Energy Sector Technical Assistance Project
HPP	Hydro power plant
IPCC	Inter-govermental Panel for Climate Change
GIS	Generation Investment Study
GDP	Gross Domestic Product
GNP	Gross National Production
KEK	Korporata Energjetike e Kosovës (Kosovo Electro-Energy Corporation
KOSTT	Kosovo Transmission and Market System Operator
LEAP	Long Energy Alternative Planning
LPG	Liquified petroleum gas
MEM	Ministry of Energy and Mining
TPP	Thermal power plant

Unit Conversion

	Kcal	KJ	kWh	Kgoe
1 Kcal=	1	4.1871	0.001163	0.0001
1KJ =	0.2388	1	0.000278	0.0239×10^{-3}
1kWh =	860	3600	1	0.086
1Kgoe =	10000	41871.4	11.62	1
Liquid fuel 1t = 0.001 ktoe				
Heavy duel oil: 1t = 0.000946 ktoe				
Biomass (firewood) $1m^3$ = 0.0001664 ktoe				
Coal (lignite) 1t = 0.0001911 ktoe				
Dry coal: 1t = 0.00096 ktoe				
Elektricity: 1kWh = 0.086 ktoe				

1. Methodology of energy demand forecast and its coverage

In all former socialist countries, including Kosovo, it is very difficult to forecast the energy demand on the basis of the economic development. These difficulties are initially related to a great difference between the key energy and economic indicators, a lack of a suitable and effective infrastructure of data collection, and the difficult selection of a proper method for modeling the trends in supply of energy resources and in energy consumption, especially in transition periods. The lack of lacking clear development strategies for different sectors of the Kosovo economy is increasing the difficulties in the present situation,

The figure 1 provides the basic parameters used by all computer software in different countries of the world for forecasting energy demand for all sectors.

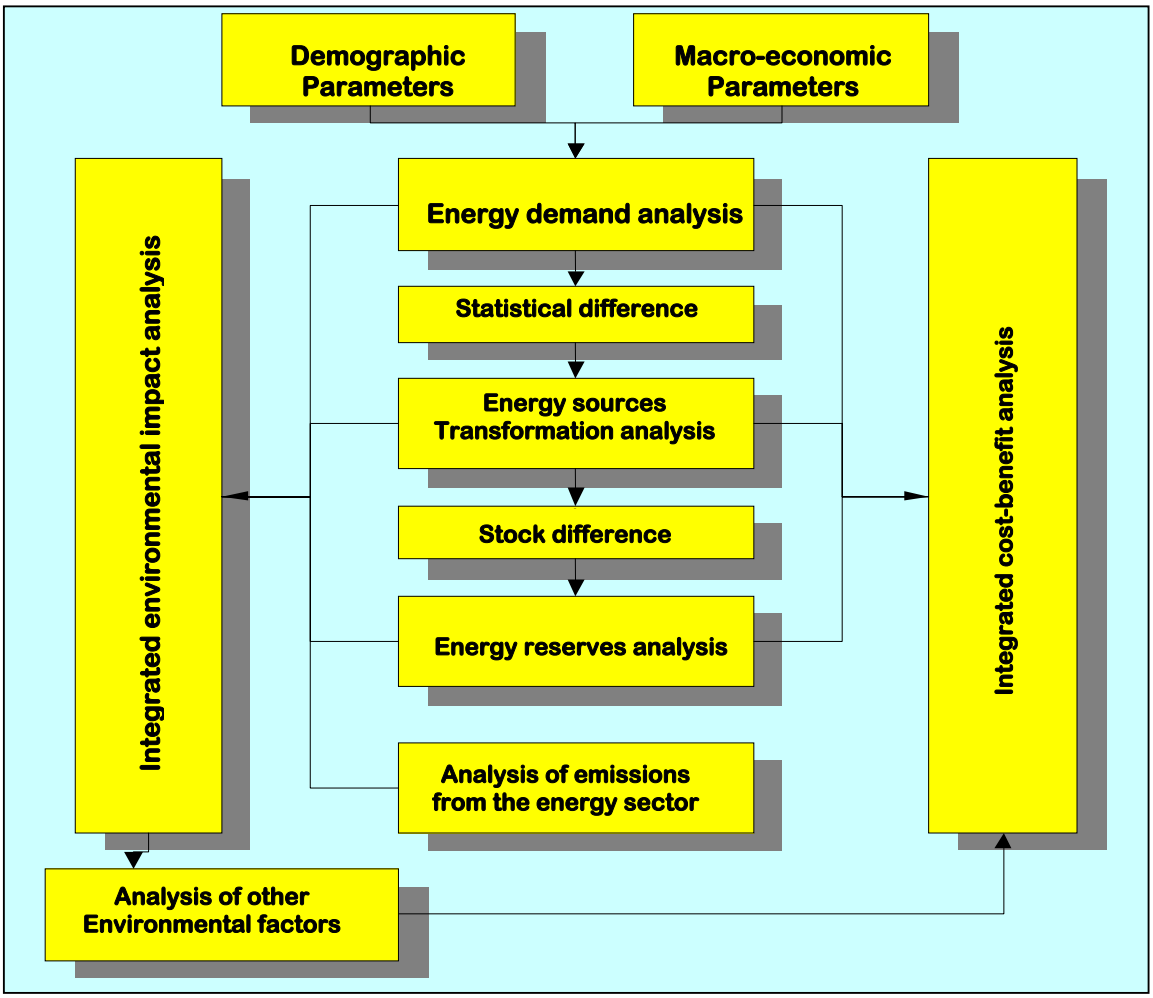

Figure 1: Basic parameters used for forecasting energy demand

The same data were used in forecasting the energy demands for Kosovo in the period 2006-2016. As shown in the charts, the basic data used for the forecast are:

1. The energy demand forecast was made based on a set of very important documents, such as the Energy Strategy, Energy Strategy Implementation Plan, Kosovo Energy Efficiency and Renewable Sources Implementation Plan, Energy Balances 2003-2005, KEK Restructuring Plan, Electro-

Energy Demand Forecasts by KOSTT, and other detailed studies currently being undertaken by MEM, supported by international assistance on development of new thermal and hydro power generation capacities.

2. Demographic data on population development and number of families in Kosovo for the period 2006-2016. These data were used for the energy demand forecast for the household sector. These indicators are described in more detail in a specific section.

3. Macro-economic data, such as gross national production by all economic sectors of Kosovo: industry, services, transport, agriculture. These indicators are the basis for forecasting the demand for the sectors above, and are described in more detail in their respective sections.

4. Historic data related to primary and secondary energy sources for the period 2003-2006. This group includes all energy sources: oil and its derivates, coal/lignite, firewood, solar and water energy. To enable their collection, the Division for Statistics and Balances of the Strategy and Development Department has engaged its best efforts to compile data and process the records for an energy demand forecast for the period 2006-2016.

5. Historic data related to transformation of primary and secondary energy sources. This group involves all records required in connection to TPP-s, HPP-s, dryers, central heating facilities, which enable transformation of primary energy sources into energy commodities ready for use as electricity, enriched coal/dry lignite, oil derivates and thermal energy. The data on all transformation processes in the whole energy industry have been collected in a suitable format to cover all requirements, in cooperation with all public asset-holding companies in relevant sectors..

6. Historic data related to assessment of energy losses in heat and power transmission and distribution networks. The data on all energy losses in networks have been compiled into a suitable format to fulfill requirements, in cooperation with all public asset-holding companies in relevant sectors (KEK, KOSTT, concentrated heating plants).

7. Historic data related to final energy consumption. This group covers all consumption of energy commodities used in households, industry, public and private services, transport, agriculture, and other sectors. Data on all transformation processes, on all energy industries, have been collected into a suitable format, using mainly necessary calculations. Only in the case of electricity, there are data collected by KEK on electricity sales for different consumer categories. On the other hand, there are no data related to electricity losses caused by deficient billing/collection, and on categories consuming this energy. As a consequence, it is worth mentioning that only estimates (projections) have been used, since there has not been any survey on the amount of consumption of different energy commodities in above-mentioned sectors.

8. The data on the energy sources' stock have been collected in cooperation with KEK, ICMM (on coal), and the MTI (on oil derivates).

9. Data on emissions discharged into the environment by utilization of energy sources have been obtained from the energy software of LEAP (Long Energy Alternative Planning) and IPCC (Inter-governmental Panel for Climate Change).

10. The data on other environmental factors have not been analyzed and shall be part of a more detailed research in the future.

11. Data on investment and costs of different energy technologies have not been analyzed, and shall be part of a more detailed research in the future, when a more detailed cost-benefit analysis is made.

The relation between economic development of a country and its energy demand is considered a key issue, and it is represented by a closed cycle. This cycle involves many economic, social and technological analyses. To define clearly their relations, many studies are required on different economic and social development sectors. These are the basis for the undersatnding of the challenges and the commitment of the energy sector in Kosovo to ensure supply of energy sources at the lowest cost, to guarantee sufficient energy supply for covering the consumer demand, and to ensure the conditions for a sustainable economic development. The energy supply growth rate must respond to the economic and development rate, and to the development of a functional balance between trends of macro-economic growth indicators and the energy balance, although this does not mean that an identical proportion of steps must be kept. The figures 2 and 3 forecast the GDP contribution of each sector until 2016, based on the ESTAP Study and different local and international consultancies.

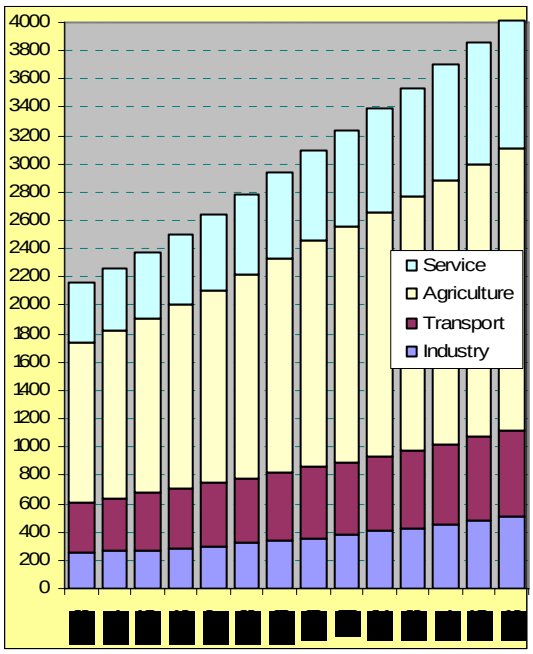

Figure 2: Forecast of value added from each economic sector to GDP of Kosovo (in million Euro)

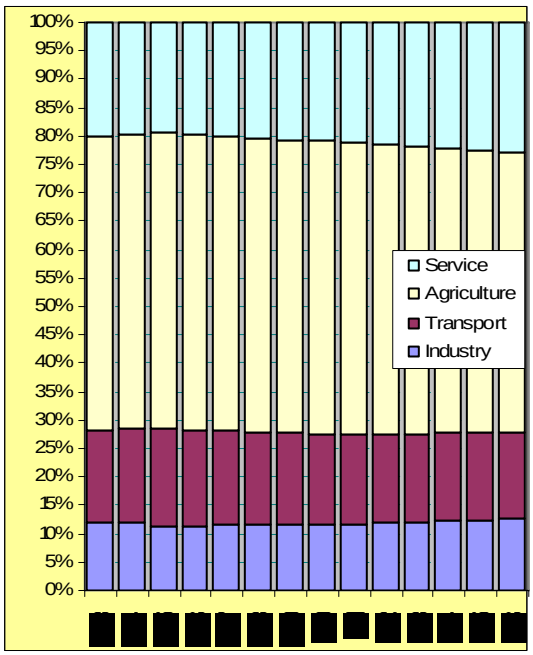

Figure 3: Forecast of value added from each economic sector to GDP of Kosovo (in %)

The scenario does not claim to produce an accurate forecast (since such an accuracy requires a lot of data and very clear development strategies of different

economic and social sectors), but it is an overview on potential developments in the energy systems in Kosovo for the next 10 years. The scenario describes the medium term development opportunities of the energy system in Kosovo, based on the forecasts of technological and economic development of neighboring countries, at their own economic and critical development conditions, related to the understanding of some future development trends of such a country.

The trend assessment of macro-economic indicators shows that in 2003-2006 the economy was strengthened by development of construction, services and agriculture sectors, the rehabilitation of industry, and diaspora remittances. The forecast was based on the National Economic Development Strategy in general, or on specific sectors, based on long and medium term development opportunities.

2. Forecast of energy demand by the household sector

The energy consumption and demand in the household sector has been carefully analyzed and discussed because of its importance, firstly due to the highest consumption of total energy, and secondly since such high energy consumption of electricity leads to a rather difficult situation of supply, and frequent interruptions. The number of population is an important guiding factor used in calculation of the energy demand in the household sector. The number of families in each climatic zone, based on degree-days for heating, has been used as a basic factor for the sector. The table 1 provides the key parameters used for forecasting energy demand in the household sector

Table 1: Key parameters for the projection of energy demand in the household sector

Year	No. of households	No. of people per household	Population
2003	360000	5.429	1954000
2004	372407	5.310	1977448
2005	385521	5.191	2001177
2006	399308	5.072	2025192
2007	413816	4.953	2049494
2008	429099	4.834	2074088
2009	445217	4.715	2098977
2010	462235	4.595	2124165
2011	478329	4.476	2141158
2012	495332	4.357	2158287
2013	513324	4.238	2175553
2014	532390	4.119	2192958
2015	552625	4.000	2210501
2016	571967	3.8852	2228184

As stated above, the prognosis is based on a “top-down” approach. The forecasted energy demand, based on the parameters and methodology above, has been shown in figures 4 and 5.

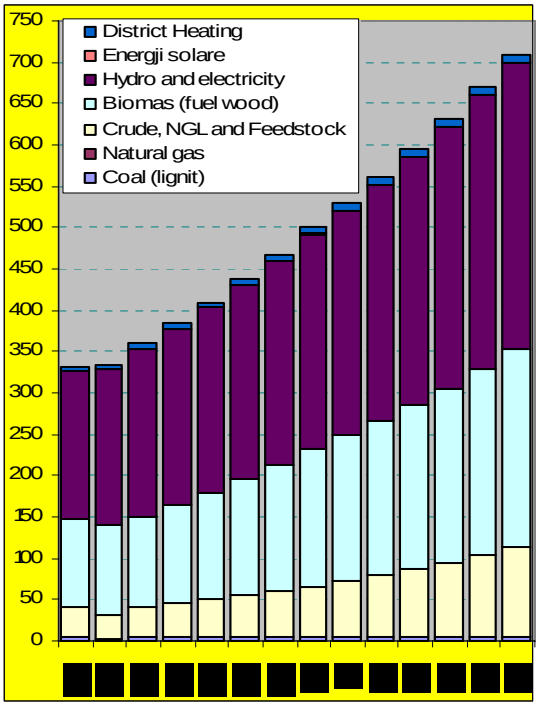

Figure 4: Forecast of energy demand for household sector (ktoe)

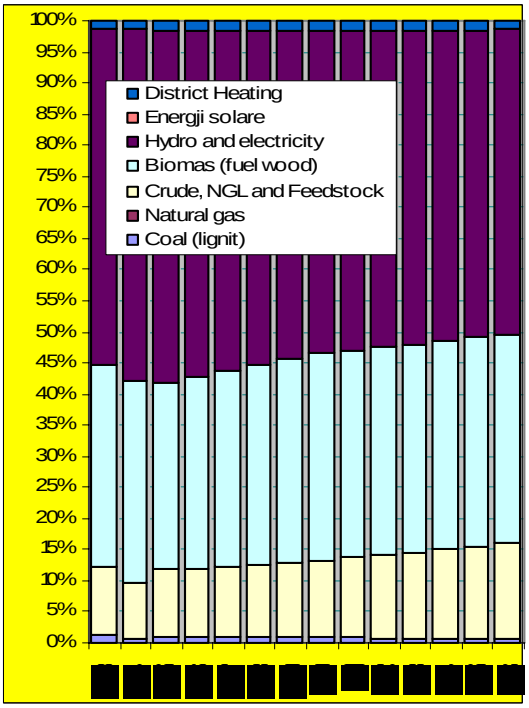

Figure 5: Forecast of energy demand for household sector (%)

As shown in the figure, the current key energy sources covering energy demand in the household sector are electricity, firewood and oil derivates. The coverage of demand for the future shows that electricity shall grow in absolute values, but in relative values its contribution shall decline. On the other hand, the decline of relative values of electricity shall be balanced by an relative increase of oil by-products (especially LPG) and firewood. As a result, it is very necessary that proper measures will be taken to promote LPG penetration into the Kosovo energy market.

3. Forecast of energy demand by the service sector

The energy demand analysis is based on general trends of the past period. A number of factors have been considered as decisive for the future energy demand. The public service buildings have the total volume as specific determining factor, divided into heated and non-heated building stock. To improve the service quality, the working conditions and the comfort for the public administration, it has been estimated that until the period 2007-2016, the share of the heated stock shall increase to 100%. Increased private sector GDP shall be followed by increased energy demand, due to higher requirements for comfort, quality improvement of services, and changes in the relation of urban to rural population. The analysis of the macro-economic indicators in the country have shown that the service sector contributes around 10.9% of the GDP, and shall continue to grow at the same rate, as shown in figures 2 and 3. The table 2 provides the key forecast parameters, on which the projected energy demand for this sector is based.

Table 2: Key parameters for the projection of energy demand of the service sector			
Year	**GDP-Service** [million EURO]	**Energy intensity in the service sector** [ktoe/million EURO]	**Total GDP** [million EURO]
2003	430.44	0.311170	2163
2004	443.03	0.268582	2260
2005	462.80	0.302615	2373
2006	495.20	0.306967	2504
2007	529.86	0.298815	2642
2008	566.95	0.302760	2787
2009	606.64	0.307184	2940
2010	649.11	0.741415	3102
2011	688.05	0.736923	3241
2012	729.34	0.733101	3387
2013	773.10	0.729983	3540
2014	819.48	0.727596	3699
2015	868.65	0.728256	3866
2016	921.637	0.728237	4041

The energy consumption in the public sector shall grow gradually, together with an increase of heated buildings, and improvement of the service conditions. Also, there are structural changes on the way: a low growth rate of coal use, and an increase of the role of oil byproducts in the consumption structure. As it was stated above, the forecast is based on the “top-down” approach. The forecasted energy demand, based on parameters and methodology above, for the service sector, is given in figures 6 and 7.

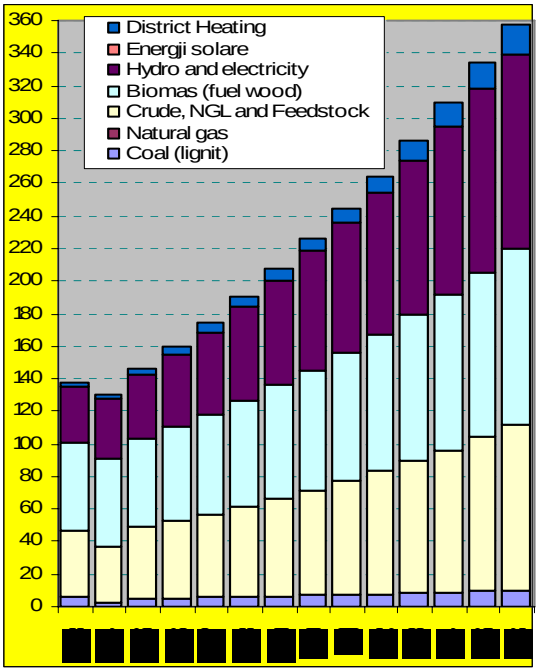

Figure 6: Forecast of energy demand for the service sector (ktoe)

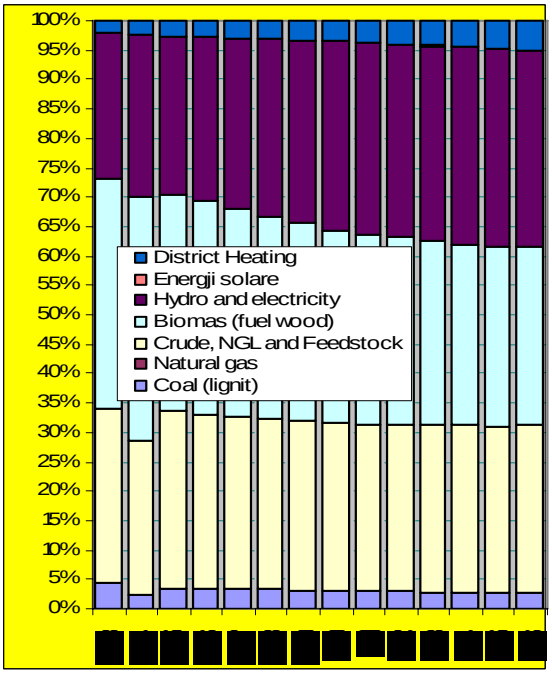

Figure 7: Forecast of energy demand for the service sector (%)

4. Forecast of energy demand by the industrial sector

During the last 3 years, stabilizing developments and tendencies of growth in the processing industry have build mainly on existing technology, with a few positive developments. In the view of energy consumption, industry continues to have a quite high energy intensity for each production unit, consuming 0.138 toe/ton, and for each monetary unit produced consuming 0.87 toe/thousand USD.

The scenario assumes the development of different industrial fields, maintaining the actual form of energy supply, generally expressed in energy intensity, and the contribution of energy sources for each industrial sub-sector. So far, the responsible institutions have not prepared their assessments on nature or value for the expected developments of industrial branches.

Based on past potentials and actual opportunities, and macro-economic indicators, the indicators of financial growth have been prepared, offered by the International Monetary Fund. The figures 2 and 3 represent the GDP trends of the industrial sector in general. The table 3 presents the key forecast parameters on which the energy demand for the industrial sector is based.

Table 3: Key parameters for the projection of energy demand of the industrial sector

Year	**GDP-Industry** [million EURO]	**Energy intensity in the industrial sector** [ktoe/million EURO]	**Total GDP** [million EURO]
2003	255.86	0.823028	2163
2004	267.44	0.634161	2260
2005	269.22	0.811195	2373
2006	285.37	0.798682	2504
2007	302.50	0.770810	2642
2008	320.65	0.758990	2787
2009	339.88	0.747470	2940
2010	360.28	0.736094	3102
2011	381.89	0.724921	3241
2012	404.81	0.713890	3387
2013	429.10	0.703123	3540
2014	454.84	0.692551	3699
2015	48213	0.006881	3866
2016	523.86	0.663212	4041

The largest contribution to the GDP comes from the sub-sectors food/drinks/tobacco, metallurgy and construction materials, followed by others. The key contribution related to consumption of energy sources comes from metallurgy, construction materials, food and textile (light industry).

As it was stated before, the forecast is based on the “top-down” approach. The forecasted energy demand for the industrial sector, based on above-mentioned parameters and methodology, , is given in figures 8 and 9.

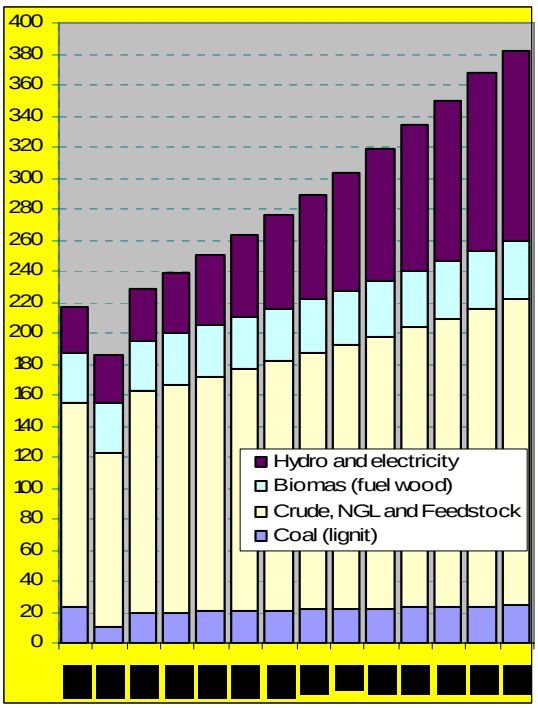

Figure 8: Forecast of energy demand for the industry sector (ktoe)

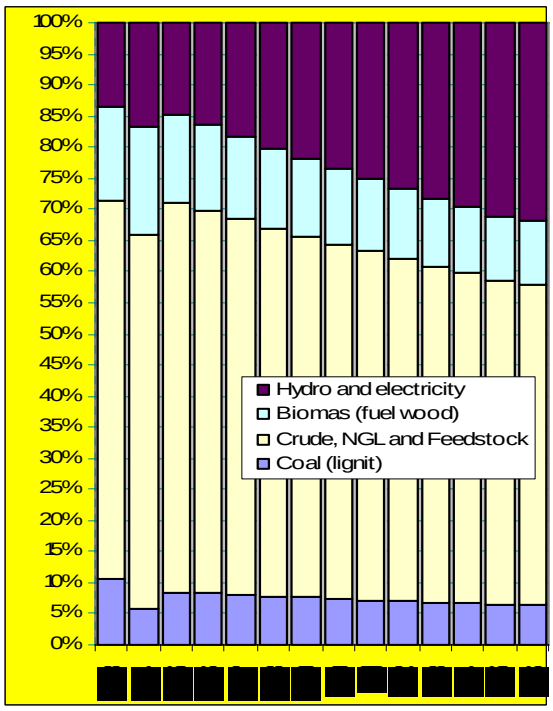

Figure 9: Forecast of energy demand for the industry sector (%)

As is shown in the figure, the current key energy sources covering industrial sector demand are petroleum products, electricity, firewood and lignite. The coverage of demands for the future shows that electricity shall increase in absolute values, which necessitates the automation of different industries at a current low rate of automation.

5. Forecast of energy demand by the transport sector

The trend of basic indicators, such as passenger/km and ton/km is the most important guiding factor in forecasting the energy demand for the passenger and goods transport. These are the basic indicators to be used as key factors for the calculation of the energy demand for both the transport sub-sectors. The passenger transport has risen quite, especially after 2003. This is due to use of private vehicles and trips within and abroad Kosovo. The trend of the key indicator passenger/km for the period 2003-2016 must be calculated by the Ministry of Transport, and in the coming years, a closer cooperation between the MEM and MTPT is required to have the figures for both parameters.

Since there are no data in relation to these parameters, we have supported our prognosis of energy demand for the transport sector on added value (part of GDP) from the transport sector. This is the main guiding indicator to be used in calculating the energy demand for these sub-sectors. It must be mentioned that the Ministry of Transport must also elaborate other indicators to be used in the future as approaches of the “top-down” method, to calculate the fuel demand for each transport mode, road, rail, marine and air. The table 4 provides the key parameters of the forecast, on which the projected demand of energy is based for the transport sector.

Table 4: Key parameters for the projection of energy demand of the transport sector			
Year	**GDP – Transport** [million EURO]	**Energy intensity in the transport sector** [ktoe/million EURO]	**Total GDP** [million EURO]
2003	351.94	0.972751	2163
2004	374.50	0.910761	2260
2005	407.19	0.958496	2373
2006	423.47	0.953243	2504
2007	440.41	0.926773	2642
2008	458.03	0.921992	2787
2009	476.35	0.917393	2940
2010	495.40	0.913020	3102
2011	512.74	0.908687	3241
2012	530.69	0.908063	3387
2013	549.26	0.900521	3540
2014	568.49	0.903657	3699
2015	588.38	0.893113	3866
2016	608.97	0.889666	4041

As it was stated before, the forecast has a “top-down” approach. The forecasted energy demand for the transport sector, based on parameters and methodology above, is given in Figures 10 and 11.

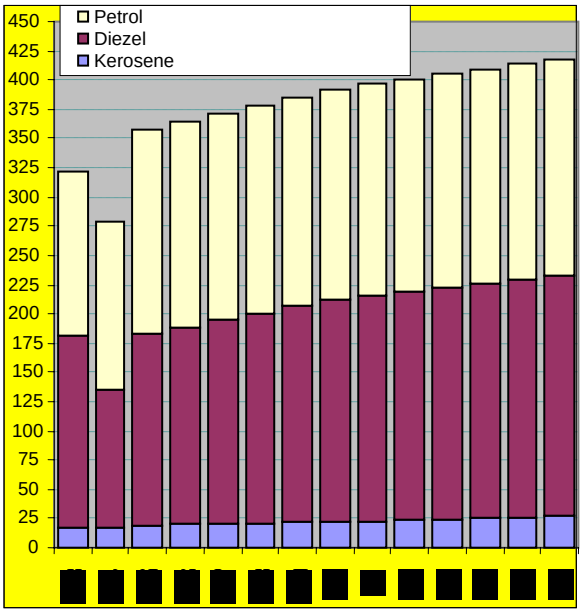

Figure 10: Forecast of energy demand for the transport sector (ktoe)

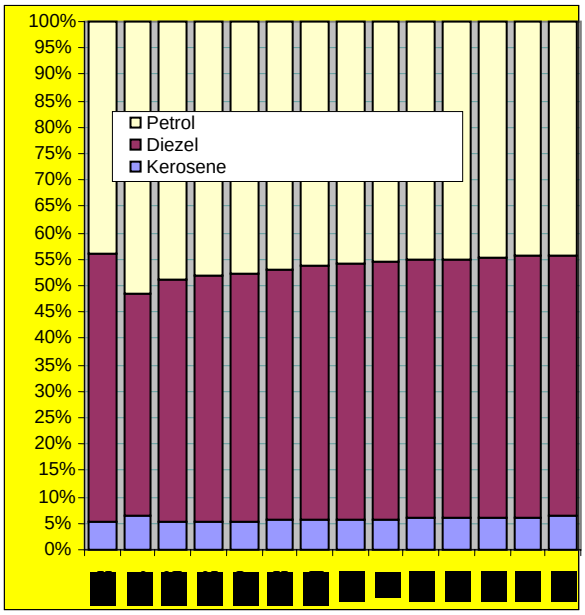

Figure 11: Forecast of energy demand for the transport sector (%)

As shown in the figure, the actual key energy sources covering energy demand in the transport sector are diesel, petrol and kerosene. The coverage of demand for the future shows that diesel and kerosene will increase slightly in comparison to petrol.

6. Forecast of energy demand by the agriculture sector

With the aim of forecasting the energy demand, the sector was divided into 4 sub-sectors: agriculture, stockbreeding, forestry and fishery. The calculation of future energy demand is based on the GDP added value, which was for the agriculture sector 1124 USD million in 2003; increasing by 1.72 times until 2016

(the tendency of the GDP for the agriculture sector is presented in figures 2 and 3). The value added by the agricultural sector and the energy intensity have been used as main indicators for forecasting the energy demand for the sector. Energy intensity was calculated as the ratio of energy consumption and the level of activity of the respective sub-sector, presented in millions of euros. The table 5 provides the key parameters used for the forecast of the energy demand in the agriculture sector.

Tabela 5: Key parameters for the projection of energy demand of the agriculture sector

Year	GDP-agriculture [million EURO]	Energy intensity in the agriculture sector [ktoe/million EURO]	Total GDP [million EURO]
2003	1124.76	0.046712	2163
2004	1175.3742	0.037137	2260
2005	1234.1429	0.043277	2373
2006	1299.8404	0.042182	2504
2007	1368.8288	0.042116	2642
2008	1441.2602	0.041027	2787
2009	1517.2924	0.039953	2940
2010	1597.0896	0.038896	3102
2011	1658.772	0.037847	3241
2012	1722.4949	0.036819	3387
2013	1788.3019	0.035805	3540
2014	1856.2353	0.034807	3699
2015	1926.3359	0.033821	3866
2016	1999.151	0.033989	4041

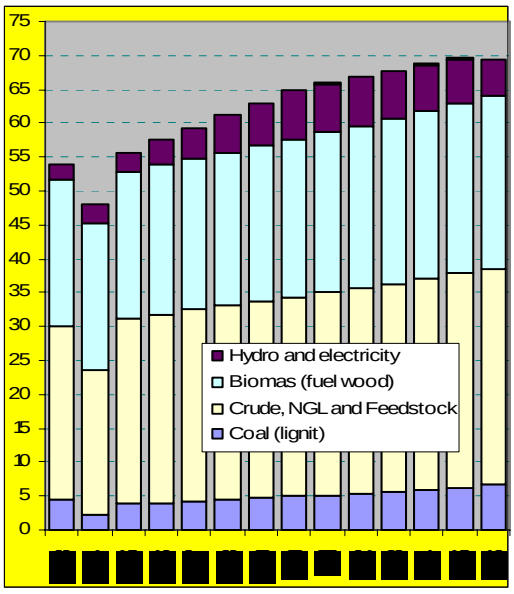

Figura 12: Forecast of energy demand for the agriculture sector (ktoe)

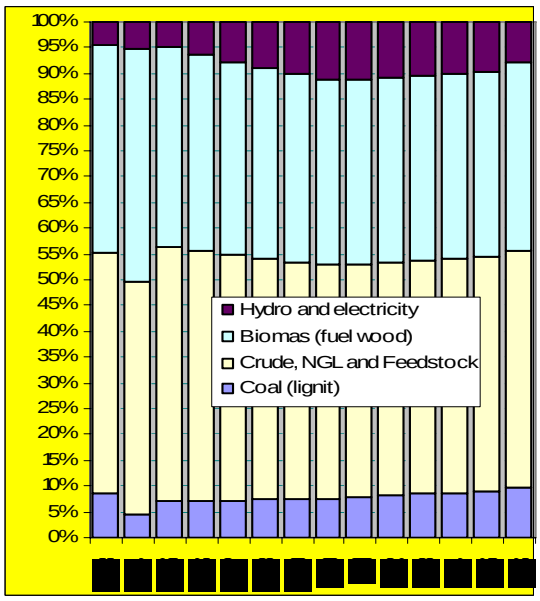

Figura 13: Forecast of energy demand for the agriculture sector (%)

The energy demand forecast assumes for the agriculture sector a considerable growth to support the development of this very important sector for the Kosovo economy. As it was stated above, the forecast has a “top-down” approach. The forecasted energy demand for the agriculture sector, based on parameters and methodology above, , is given in figures 12 and 13.

Oil consumption is expected to grow quite strong in the future to cover the increased energy demand in agricultural production, and maximal decline of manual work of Kosovo farmers. As it is shown in figures 12 and 13, the dominating fuels in the sector are petroleum products and firewood. The figure also shows that the electricity demand shall grow until 2016, although with a small percentage in the total of energy commodities, due to modernization of irrigation systems.

7. Forecast of energy demand by the all sectors

As a result, figures 14 and 15 (table 6) represent the energy demand forecast for each sector, and a demand forecast for each energy source (given in figures 16 and 17, and the table 7).

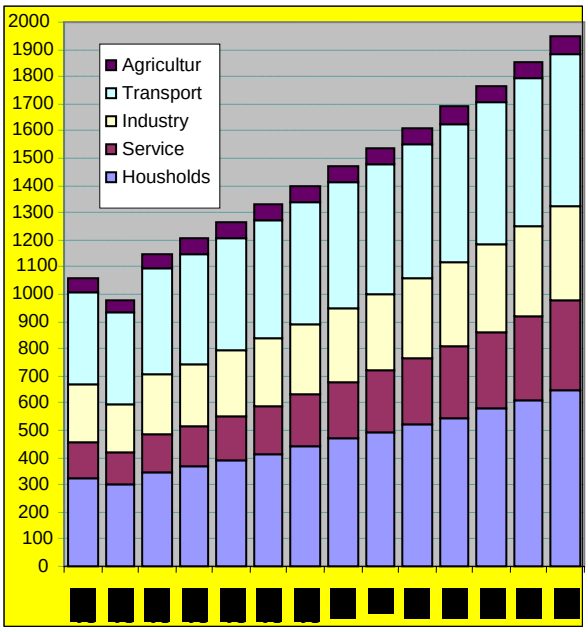

Figure 14: Forecast of energy demand for all sectors (ktoe)

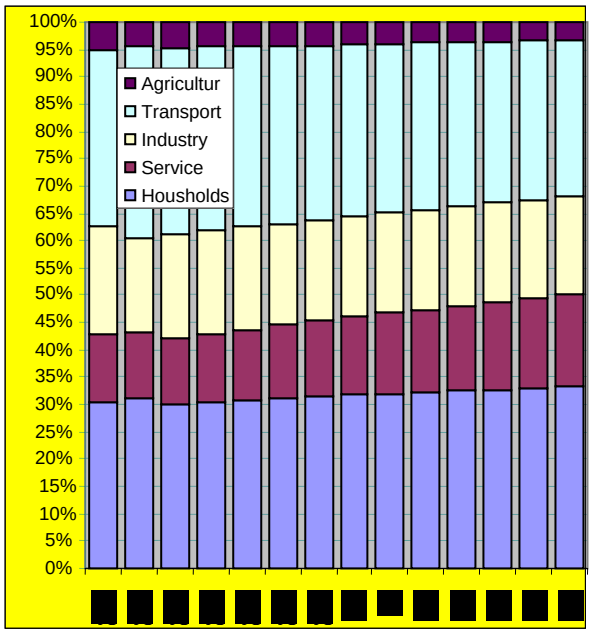

Figure 15: Forecast of energy demand for all sectors (%)

An analysis of figures 13 and 14 shows that the energy demand for each sector will grow: from 52.54 ktoe in 2003 up to 67.95 ktoe in 2016 for the agriculture sector (the contribution of agriculture to the overall energy demand will decrease from 4.93% in 2003 to 3.43% in 2016); from 321.79 ktoe in 2003 up to 680.33 ktoe in 2016 for the household sector (the contribution of the household sector to the overall energy demand will grow from 30.32% in 2003 to 33.01% in 2016); from 133.94 ktoe in 2003 to 328.067 ktoe in 2016 for the service sector (the contribution of the service sector to the overall energy demand will grow from 12.62% in 2003 to 16.47% in 2016); from 210.58 ktoe in 2003 up to 352.17 ktoe in 2016 for the industrial sector (the contribution of the industrial sektor to the overall energy demand will decrease from 19.84% in 2003 to 17.79% in 2016);in the transport sector, the energy demand will increase from 342.35 ktoe in 2003

to 549.174 ktoe in 2016 (the contribution of the transport sector to the overall energy demand shall decline from 32.26% in 2003 to 28.99% in 2016, although absolute consumption will double).

Table 6: Energy consumption for all sectors [ktoe]

Year	Households	Service	Industry	Transport	Agriculture	Total sectors
2003	321.79	133.94	210.58	342.35	52.54	1061.2
2004	303.63	118.99	169.6	341.08	43.65	976.94
2005	344.82	140.05	218.39	390.29	53.41	1146.97
2006	365.84	152.01	227.92	403.67	54.83	1204.27
2007	400.23	158.33	233.17	408.16	57.65	1257.54
2008	424.25	171.65	243.37	421.3	59.13	1319.7
2009	451.2	186.35	254.05	437	60.62	1389.22
2010	481.26	202.42	265.2	452.31	62.12	1466.112
2011	507.04	218.93	276.84	465.92	62.78	1537.421
2012	534.68	234.84	288.99	481.9	63.42	1613.156
2013	564.35	255.89	301.71	494.62	64.03	1693.66
2014	596.25	272.17	315	513.72	64.61	1778.93
2015	632.6	293.09	331.75	525.49	65.15	1869.76
2016	671.17	323.65	347.43	541.78	67.95	1978.62

An analysis of energy supply shows that the main role shall be played by electricity, petroleum products, solar energy, firewood, and LPG, Wind Energy; each represented in these percentages: 25.7%, 25%, 10.9%, 10.4%, 9.2% and 4% in 2016. Other energy sources, as shown in figures 16-17 and table 7, shall contribute only 14.8% in 2016.

Table 7: Kosovo energy demand forecast by energy source [ktoe]

Year	Coal (lignite)	Crude oil, NGL and feedstock	Biomass (firewood)	Hydro-and thermal electricity	Solar Energy	Wind Energy	District heating	Total
2003	38.55	554.99	216.32	244.48	0.08	0	6.78	1061.20
2004	18.24	476.74	216.32	257.79	0.09	0	7.76	976.94
2005	32.23	609.9	216.32	278.49	0.09	0	9.94	1146.97
2006	33.19	628.78	230.3	301.05	0.10	0	10.85	1204.27
2007	44.9	609.2	246.27	343.83	0.10	0	13.24	1257.54
2008	46.27	628.44	262.75	367.63	0.12	0	14.49	1319.70
2009	47.7	648.52	280.64	396.34	0.13	0	15.89	1389.20
2010	49.17	669.48	300.09	426.96	0.14	2.802	17.47	1466.11
2011	50.72	689.6	315.51	456.28	0.16	5.911	19.24	1537.42
2012	52.32	710.69	332.08	487.33	0.18	9.326	21.23	1613.15
2013	53.99	732.82	349.93	520.19	0.20	13.06	23.47	1693.7
2014	55.72	755.64	369.19	554.97	0.22	17.18	26.01	1778.9
2015	57.53	779.65	390.02	591.76	0.25	21.68	28.87	1869.8
2016	73.8	804.92	411.63	629.02	0.28	26.64	32.33	1978.6

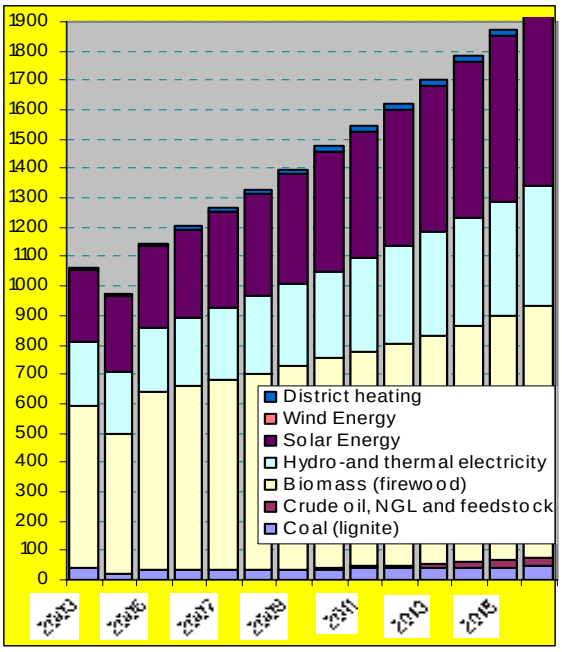

Figure 16: Forecast of energy demand for all sectors (ktoe)

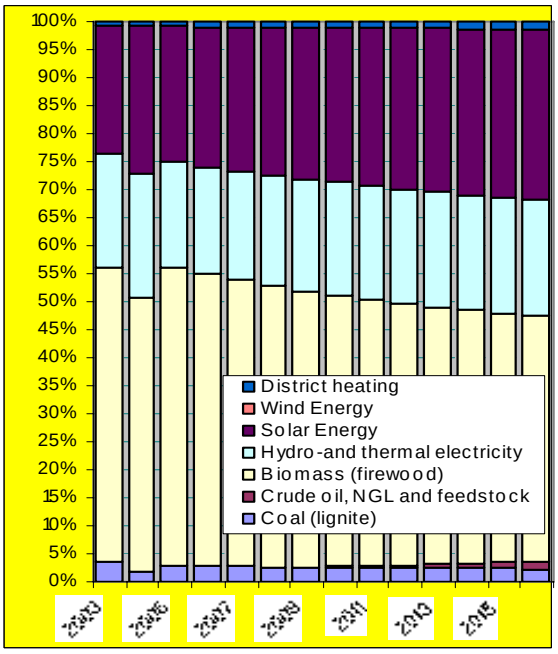

Figure 17: Forecast of energy demand for all sectors (%)

8. Analysis of KOSTT electric energy demand forecast

The energy demand analysis so far had a „top-down“ approach, based on integrated planning for all energy demands. Also, it is worth mentioning that electricity demand has been specifically analyzed by KOSTT, which is also entitled to do so, according to the Administrative Instruction No. 2005/4. As a result, the following is a short description of the demand forecast procedures.

By request of MEM, KOSTT has completed the demand forecast and the concept to cover electricity demand for the period of 2007-2016. The following is a short description of demand prognosis and the concept for demand coverage as used in the KOSTT study. On the other hand, the last section 1.7.3 gives a short summary of the „top-down“approach, given in more details above.

Based on studies on electricity supply in Kosovo carried out in the last years, and on interviews undertaken by KOSTT with KEK, MEM, EAR and other institutions, the KOSTT has developed a model of annual data forecast and the load profile for the total electricity consumption in Kosovo for the period 2006-2016. The electricity sector faces problems in electricity supply. On daily basis, planned or non-planned, power cuts are occurring almost every day. Planned (programmed) power cuts are mainly occuring in hours when demand cannot be met, due to an insufficient electricity production, and because the capacity of transmission facilities cannot cope with an overload, and while financial means for additional electricity imports are insufficient.

Another great problem is the large amount of electricity supplied, but not paid, the so-called non-technical losses. The factors causing the non-technical losses in Kosovo are insufficient billing and non-payment of bills. The non-technical losses are estimated to be around 50% in the gross consumption for 2006. The following Table 8 gives the scenarios of electro-energy demands, based on GDP

development, making four necessary corrections. Corrections 1 and 3 are assumed to be identical for all scenarios. The data on GDP development are taken from the GIS study scenarios. In the low economic development scenario, it has been assumed that billing and payment shall have an impact, since the residents shall aim for savings.

Respective correction	Low economic development	Basic (medium) economic development	High economic development	Remarks on respective corrections for each indicator taken in the analysis
GDP development	1.7%	3.6%	4.7%	GDP growth rates
Correction 1	10%	10%	10%	Without electricity supply reductions
Correction 2	20%	10%	0%	Improvement of billing and collection
Correction 3	Fixed	Fixed	Fixed	Monthly changes based on the GIS study
Correction 4	20%	15%	12%	Technical losses in 2016

Table 8: GDP Development Action Plan including respective corrections

Figure 18 represents the electricity demands for all three scenarios, according to KOSTT respective corrections in table 8. Apart from the scenarios prepared by KOSTT, GIS scenarios have been presented as well for comparison.

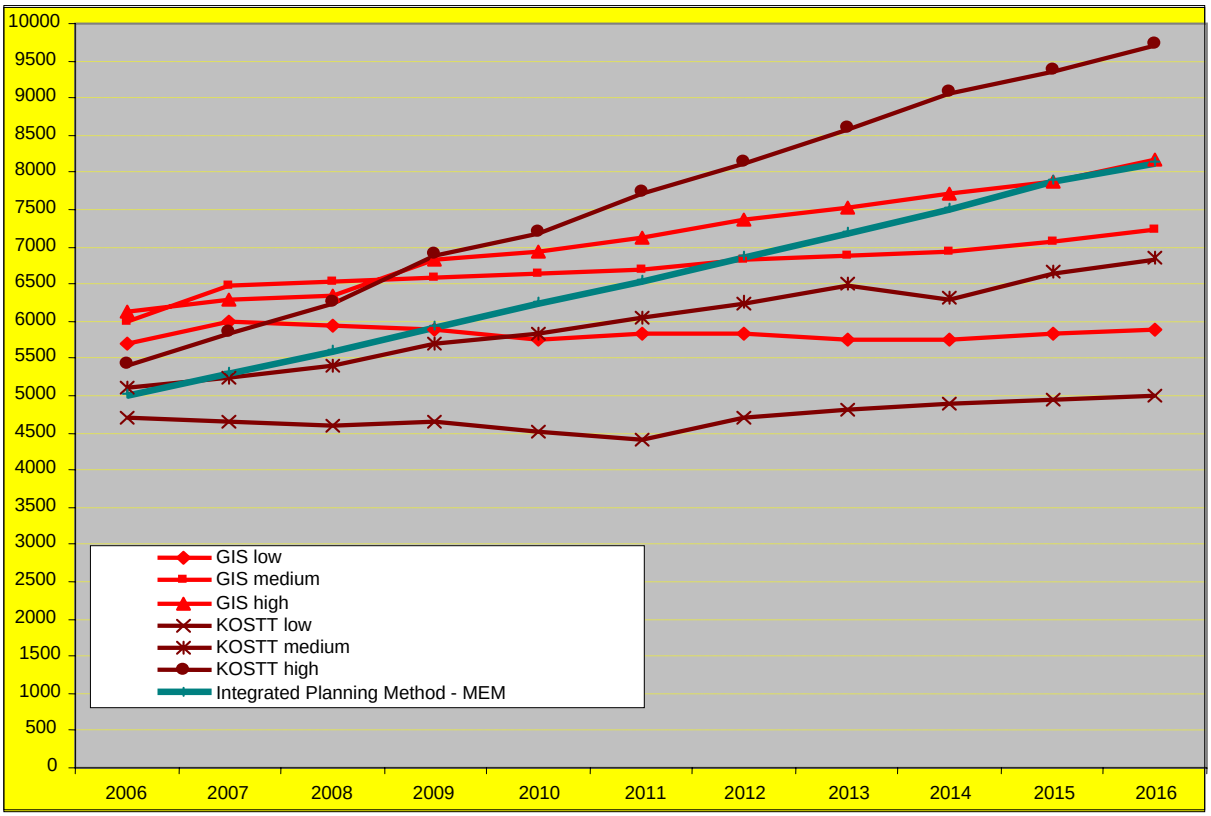

Figure 18: Forecast of electricity demand for three scenarios of KOSTT and three scenarios of GIS and Integrated Energy Planning Methods used by MEM

The KOSTT scenarios deviate partially in the initial years due to industrial development, but also due to application of correction factors. In the end of the period analyzed, the base scenarios are very close. The high KOSTT scenario is quite higher than the high GIS scenario, and the low KOSTT scenario is quite lower

than the GIS scenario. This makes the bandwidth of KOSTT scenarios almost twice greater than in the GIS scenarios.

Electricity in Kosovo is provided by the two main thermal power plants Kosovo A and Kosovo B. Both plants use coal as fuel, and coal is exploited in two open-cast mines, Bardh and Mirash, which cover an area of 9 km^2. It has been planned for the short term that a new mine will be developed in the Siboc Field.

Apart from the TPP-s Kosovo A and B, there is also the hydropower plant of Ujmani, which is relatively small.

A part of electricity demand is supplied by imports. Based on the demand and supply forecast, an additional plan has been prepared for supply through import contracts. Monthly contracts are the main way to cover the gap between the demand forecast and the supply plan. Due to financial problems, import contracts have been concluded only for the peak months. Apart from certain contracts, there are also contracts for natural exchanges with Albania, Montenegro and Serbia.

Apart from the records provided by power utilities to the KOSTT, information from the Ministry of Energy and Mining has been used to set the low, basic and high levels of electricity generation. Within the options mentioned as different sources, the following new generation capacities have been chosen: (i) The new Zhur HPP, and (ii) new generation plants (TPP) of different sizes and technological configuration.

In the first phase (2012-2013), it is planned the construction of about 1,000 MW new generation capacity in Kosovo. This new capacity is anticipated to meet Kosovo demad for electric energy. The high investment scenario anticipates construction of 1,000-1,100MW. In order to ensure the required quantities of lignite to feed the existing and new power generation capacities, it is planned that a new mine commences operation during 2008/2009.

Small HPP generation is also supported by the MEM. They have presented a potential of 67 MW, from which 34 MW have been considered by KOSTT in the base scenario, and 17 MW for the low investment scenario. The total potential of 67 MW has been admitted to commence only in the high scenario. The supply forecast for each investment (generation) scenario is presented in Figure 9. The MEM scenario is considered a base scenario.

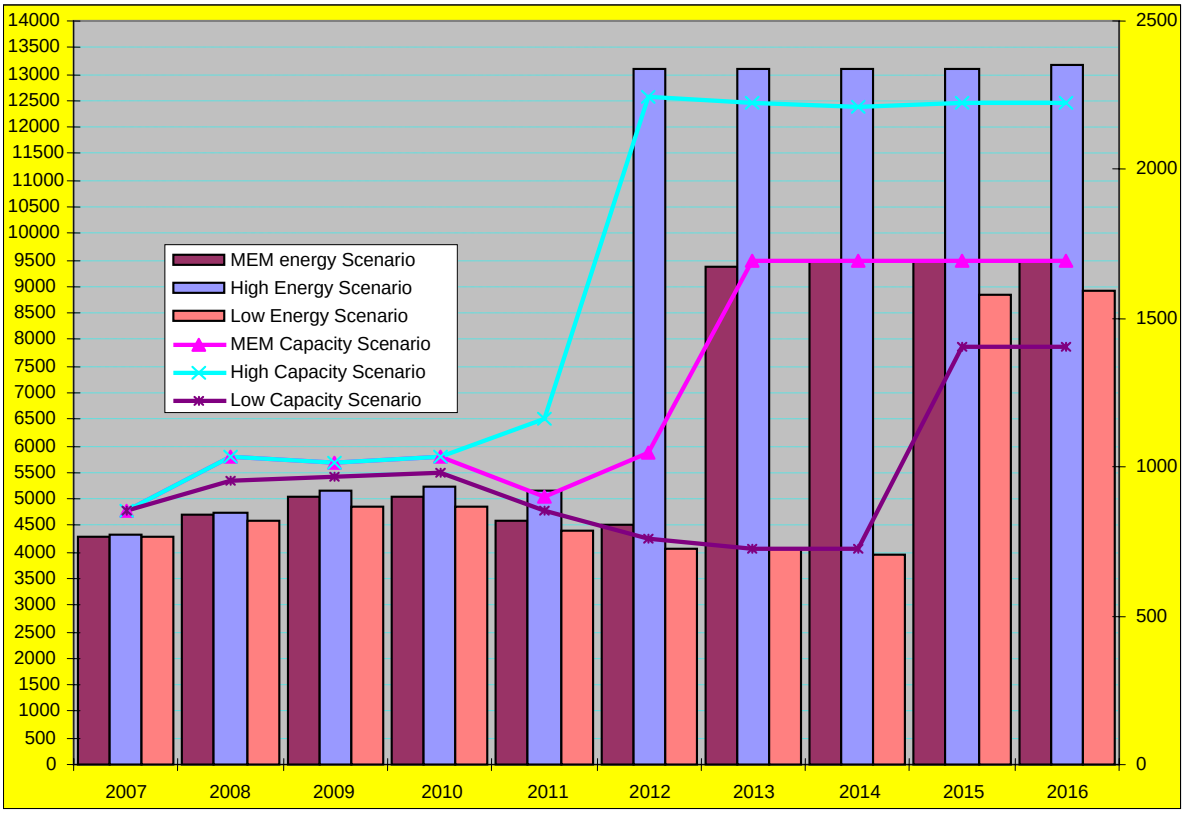

Figure 19: Forecast of electricity production (GWh)

The current solution in coping with the low generation capacities is import of electricity from different regional traders. Imported electricity is relatively expensive, and the trends have shown that price increases are due in the near future, because of low electricity production in the region. The import needs are calculated as the difference between demand and supply, presented in Figure 10 for the MEM (base) scenario on supply[1] and the base demand scenario. The figures show that until 2009, the import demands are very approximate (around 15% of demand). Starting from 2009, the import demand shall grow up to 19% up to 2011. In 2012, the need for import declines to zero when the new power plant shall be commissioned.

[1] MEM (base scenario) considers the commissioning of 293 MW in HPP Zhur in 2011, as well as the commissioning of a lignite burning TPP of 700 MW in 2012.

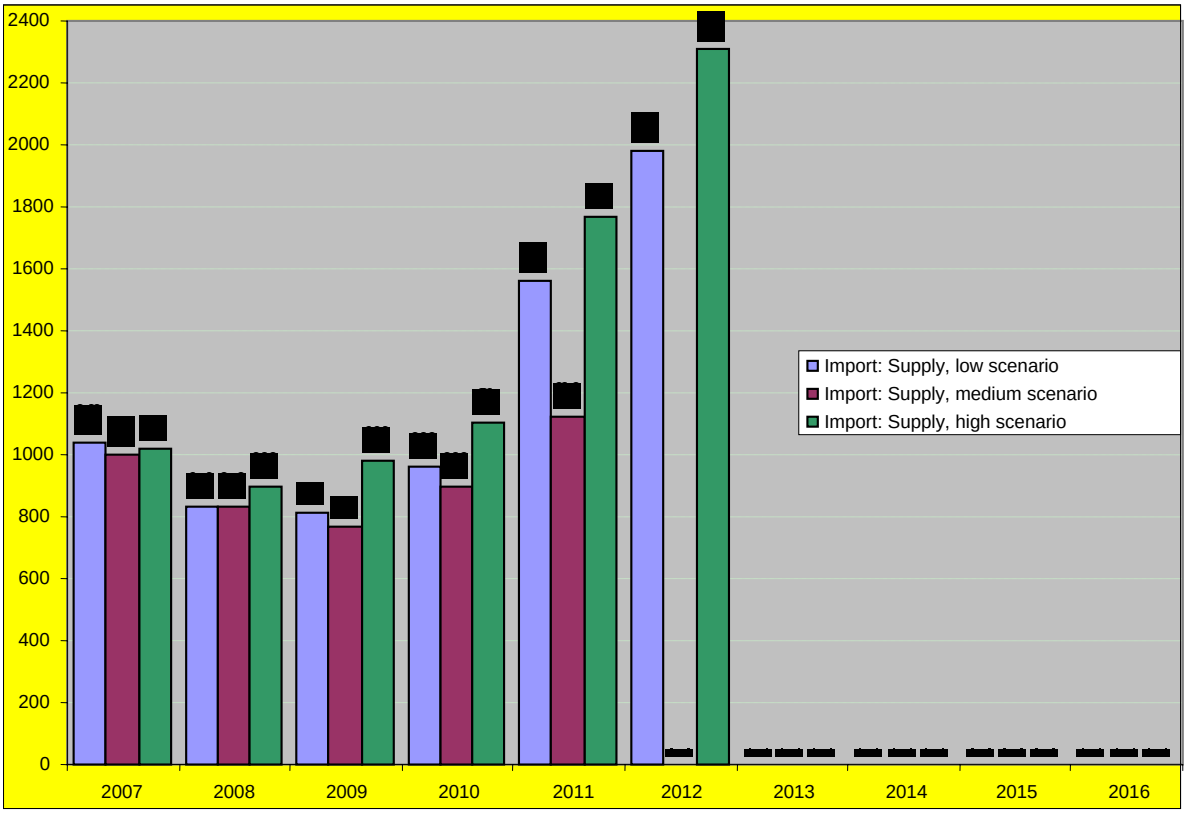

Figure 20: Electricity import needs (GWh)

In the case of an overhaul of the A5 Unit of Kosovo A, the import inclination shall happen even earlier (as accounted by the MEM supply scenario). In 2007, the import demand is around 19% of the annual demand. The postponement of new capacities development shall have a greater impact in the lack of electricity supply. If the Zhur HPP will not commence its function until 2012, and there will be a postponement of one year, the import demand for 2012 will be around 28%. If the new TPP willl commence one year later than 2014, the electricity demand will be around 41% of the total demand.

Scenarios of insufficient coal supply in 2008 (if the new mine is not completed in time) have not been taken into account in sensitivity analysis. In this case, the import demand shall be even higher, starting from 2008. Hence, it is necessary to undertake immediate measures to commence works for the Siboc mine early function. This mine is vital to the Kosovar energy supply, and for the whole sustainable development of the entire Kosovo economy.

9. Forecast of energy demand by integrated planning methodology

In all sections of this document, the total energy demand has been forecasted with the “top-down” approach, and with integrated planning of energy sources. Figures 21 and 22 provide the demand forecast for household, service, industry and agriculture sectors. Integrated energy demand planning in general, and electricity specifically, has shown that electricty demand will grow from 2843 GWh in 2003 to 6909 GWh in 2016.

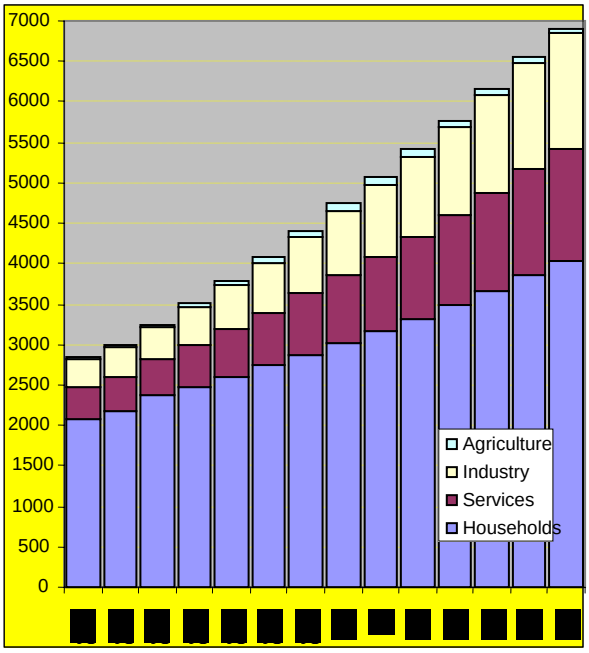

Figure 21: Forecast of electricity demand for all sectors based on Integrated Energy Planning methods [GWh]

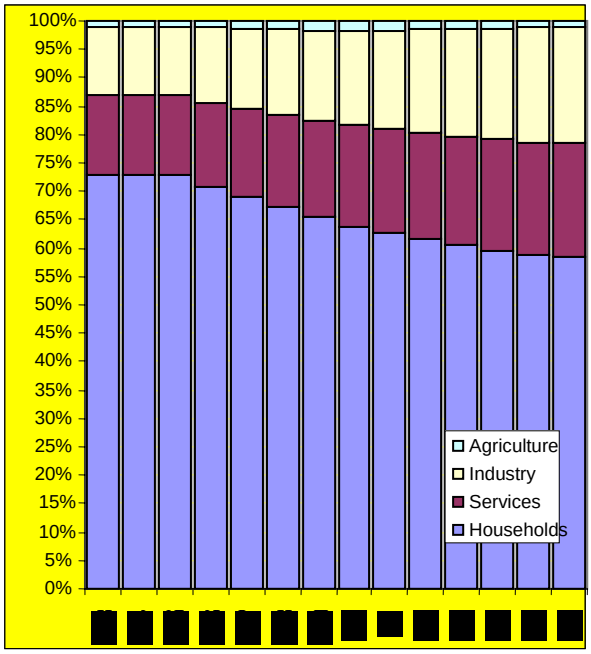

Figure 22: Forecast of electricity demand for all sectors based on Integrated Energy Planning methods [%]

An analysis of figures above shows that although we have an absolute growth of demand in all sectors (surely it is necessary for Kosovo to increase economic development – consumption growth in agriculture, industry and services – and welfare – consumption growth in population), we will have a decline of relative growth of the household sector from 73.08% in 2003 to 58.52% in 2016. On the other hand, the industrial sector will have an absolute and relative consumption growth from 12% in 2003 to 20.53% in 2016. The same tendency has the service sector, which will have a consumption increase in absolute and relative terms, growing from 14% in 2003 to 20.05% in 2016. This type of electricity demand forecast is very important for the sustainable economic and social development in the future.

In the forecast above, only energy demand is taken into consideration, while now we will analyze the forecast of electricity supply. To understand electricity supply, it is necessary to recognize the non-technical losses in transmission and distribution. Losses in transmission and distribution are taken in real values for the years 2003-2006, while for the future, a reduction has been assumed to amount up to 15% in 2016.

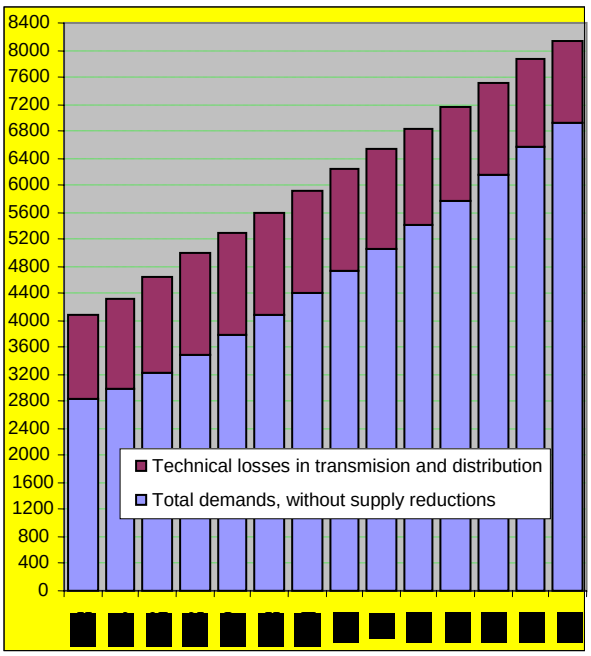

Figure 23: Forecast of electricity supply based on Integrated Energy Planning method including technical losses on the transmission and distribution sectors (GWh)

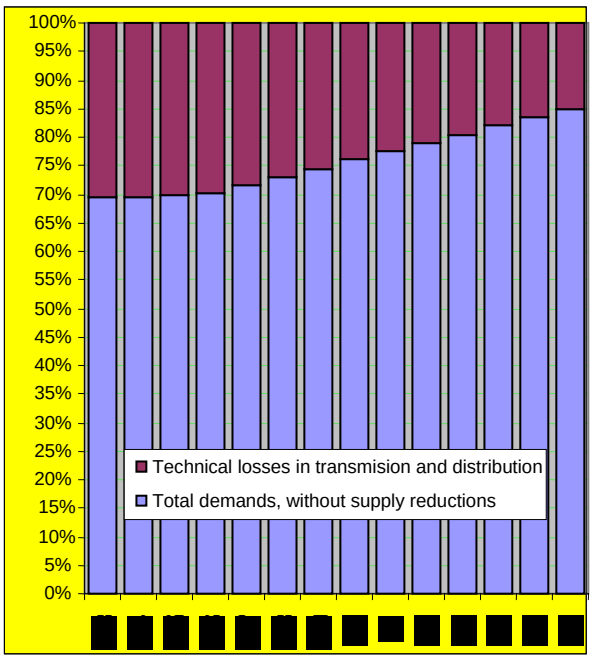

Figure 24: Forecast of electricity supply based on Integrated Energy Planning method including technical losses on the transmission and distribution sectors (%)

An analysis of figures 23 and 24 shows that electricity supply for 2016 is expected to amount up to 8124 GWh, by the method of integrated energy demand planning, including technical losses in transmission and distribution at the level of 15%.

10. Recommendations for improving the energy planning process

Let us compare now in figure 18 the forecasts of energy demands in studies of ESTAP, GIS and KOSTT by the method of integrated resource planning.

An analysis of the figure 18 shows that a forecast using the method of integrated resource planning is closer to the high forecast of KOSTT. This is expected, since only the high scenario of KOSTT assumes the continuous supply of electricity. The scenario according to the integrated resource planning method has been built on the same assumption.

The difference between these two group-methods, the one used in ESTAP, GIS and KOSTT (in which the electricity sector is addressed separately from other sectors) and the method of integrated resource planning (in which the electricity sector is treated as a sub-sector of the energy sector) is as follows:

1 So far, many studies on forecasting electricity demands have been carried out in Kosovo, and the most relevant were the studies of ESTAP, GIS, and lastly the one from KOSTT. It is worth mentioning that all these studies have analyzed the electricity sector as specific, and in majority of cases, separate from all other energy sectors.

2 Different from forecasts above, the method of integrated resource planning analyzes the electricity sector not as separate, but as part of the whole Kosovo energy sector. This is needed, especially when we deal with non-

stabilized electricity systems (such are the Kosovo and Albanian sectors), with low payment of electricity, low prices (lower than the costs of generation, transmission and distribution of electricity), and cross subsidies between different consumer categories.

3 The electricity demand forecast by ESTAP, GIS and KOSTT studies, which analyse the electricity sector as separate, can almost be unable to consider two very important factors:

- Substitution of electricity with alternative fuels (such as LPG, firewood and district heating) in those services which may be realized without electricity; and
- Taking into account the reduction of electricity consumption growth, as a consequence of improving energy efficiency in all economic and social sectors.

4 In its difference from forecasts above, the method of integrated resource planning, knowing that it plans integratively all sources, has an advantage in comparison to methods above, since it is easier to account for substitution of an energy sources (electricity in this case) by other energy sources where appropriate (LPG, firewood and district heating). Also, the method of integrated planning, using the energy intensity as a basic factor for demand forecast enables the consideration of energy efficiency.

The final conclusion of this comparison of methods shows that electricity demand for the future, taking into account the implementation of energy policies, introduction of alternative fuels, energy savings in all economic sectors, and reduction of technical losses according to the KEK Strategic Plan of Recovery, is 8124 GWh in 2016. This amount of electricity demand guarantees a continuous supply to all consumer categories, and is lower than the forecast provided by the KOSTT for the highest scenario (9706 GWh). This value is also smaller, since it considers the substitution of a part of electricity by other alternative sources, energy efficiency in all economic sectors, and this is the advantage of this method.