

ENERGY REGULATORY OFFICE

Kosovo's Energy Sector Profile

**Prishtina
4th August 2005
Visit by RAO-UES of Russia**



General Country Profile

- Territory 10 877 km²
- 2 million inhabitants
- highest density in SEE region
180 persons / km²
- Continental climate
 - warm summers (a. 22 °C, h. 38 °C)
 - cold winters (a. -1 °C, l. -22 °C)
- Official currency – Euro (€)
- GDP (2004) – 1,845 mil €
- GDP per capita – approx. 900 €
- Economic Growth Rate – 3.2 %



Legal framework on Energy Sector

Established since June 2004

- **Law on Energy**
- **Law on Electricity**
- **Law on Energy Regulator**

Promoting integration of Kosovo

- *in European Economic area – EU in future*
- *in all relevant international agreements*
- *in legal framework of EU harmonizing Kosovo's energy legislation with the EU energy legislation*



Law on Energy

Defines basic principles for an energy strategy and energy programs in Kosovo, promoting:

- **efficient and economical use of energy resources**
- **investments in the energy sector**
- **conditions for developing a modern energy market**
- **competition in the energy market under the general principles of non-discrimination, transparency and equality**
- **customer protection**
- **economic and social cohesion of Kosovo**



Law on Electricity

Defines conditions for performing all electricity activities and organization of the electricity market with the purpose to:

- **Achieve a competitive and sustainable electricity market**
- **Guarantee the conditions for a safe, reliable, efficient and permanent supply of electricity**
- **Ensure that all final customers have the right to be supplied electricity of a specified quantity**
(when technically and economically feasible)



Law on Energy Regulator

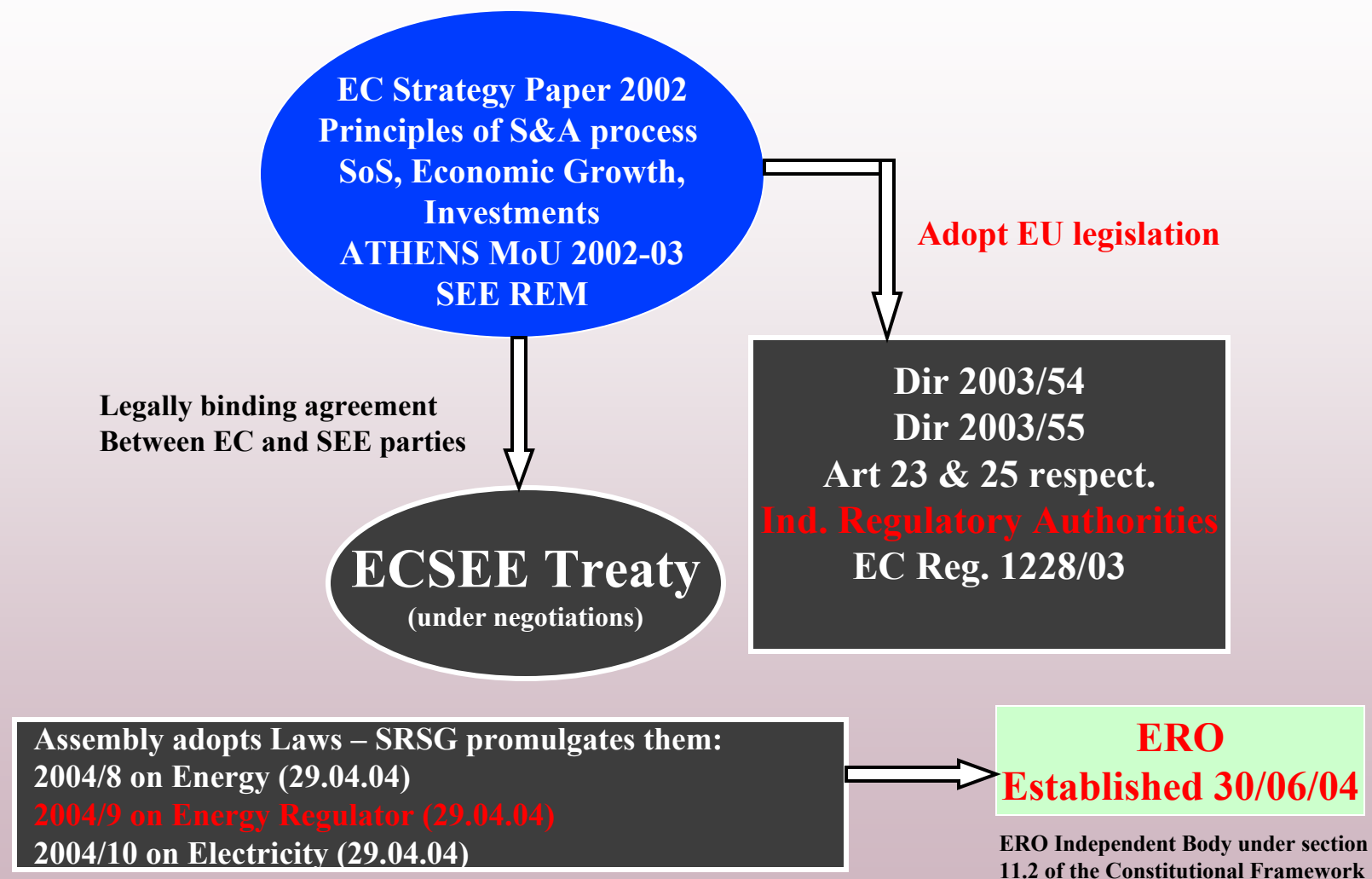
Establishes Energy Regulatory Office (ERO) and its institutional role and authority in energy sector ensuring:

- **transparent and non-discriminatory functioning of an energy market based on free market principles**
- **transparent and open criteria for issuing licenses for energy activities and granting permits for the construction of new installations**
- **That prices for regulated energy activities are transparent, reasonable and based on “ex-ante” published tariff methodologies issued by ERO**
- **That customers and licensees are protected with adequate dispute settlement procedures**



ERO

Kosovo Regulatory Framework



Mandate of ERO

Economic Regulation of all Energy Activities (Electricity – Heating – Gas)

Objective

“Set the Regulatory Framework for a Transparent and non discriminatory Energy Market, based on free Market principles – promote competition”

Tasks

- Perform the twin function of protecting **Customers** and ensuring **Investors’** Interests
- Ensure **non-discriminatory access** to all transmission network users at prices reflecting true economic costs
- Promote economic **efficiency** of the customers/users’s consumption by providing short and long term price signals



Statutory Powers of ERO

- **Issue Secondary Legislation** (Rules, Codes, Decrees, Ordinances, Guidelines)
- **Set the Criteria and Issue Licenses** for Energy Enterprises (exemptions)
- **Approve Tariffs on Public Services Activities** (non Market-based). Regulated Prices based on “ex-ante” Methodology issued by ERO and Tariffs approved by ERO.
- ERO Approves PPAs for PS.
- Grants **Permits** for Construction of new Capacity, Lines and Pipelines and Direct Lines. Grants its consent for the merging, reduction in capital and/or divestments of assets of energy enterprises
- Issues “**Certificates of Origin**” for RES – Approves “**compensation cost**” of PSO. Recovery of “**Stranded Costs**” determined and approved by ERO
- Resolution of **Disputes** between Customers/Licensees, Arbitration Procedures
- Approves Grid/Distribution/Metering/Market/etc. **Codes**



Institutional set-up of the Energy Sector (i)

Ministry of Energy and Mining (MEM)

- energy sector *strategy and policy* (preparation and implementation)
- development of *secondary legislation*, energy inspectorate, renewable energy sources and rational use of energy
- coordination of donors and *attraction of investments*

UNMIK / EU Pillar - *Economic Reconstruction of Kosovo*

Kosovo Trust Agency (KTA) - under UNMIK/EU Pillar

- *trusty of all POEs assets*
- *responsible to preserve or enhance the value, viability and corporate governance of POEs and SOEs*
- *can restructure KEK, lease the assets but cannot privatise POEs*

Energy Regulatory Office (ERO) - *regulatory authority in energy sector*



Institutional set-up of the Energy Sector (ii)

Independent Commission for Mines and Minerals (ICMM)

- *regulatory authority in the mining sector*

Korporata Energjetike e Kosovës (KEK)

- *vertically integrated power utility* - Publicly Owned Enterprise
under the process of incorporation and unbundling (ITSMO)

District Heating (DH) Companies

- *3 vertically integrated companies* – Publicly Owned Enterprises

Donor Community - representative offices of the:

- European Agency for Reconstruction (EAR)
- *United Nations Development Program (UNDP)*
- *World Bank (WB)*
- *United States Agency for International Development (USAID)*
- *bilateral donors (GTZ and KfW - Germany, SDC - Switzerland, Sida - Sweden)*



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Kosovo's energy sector

Two sub-sectors (industry specific)

- **Electric Energy Sector (Electricity)**
- **Heat Energy Sector (District Heating)**

Electricity

KEK - *vertically integrated power utility of Kosovo, including:*

- *coal mining*
- *power generation*
- *transmission & dispatch*
- *distribution*
- *supply*

note

KEK is currently the subject of incorporation, legal and accounting unbundling processes, which will be completed by the end of 2005



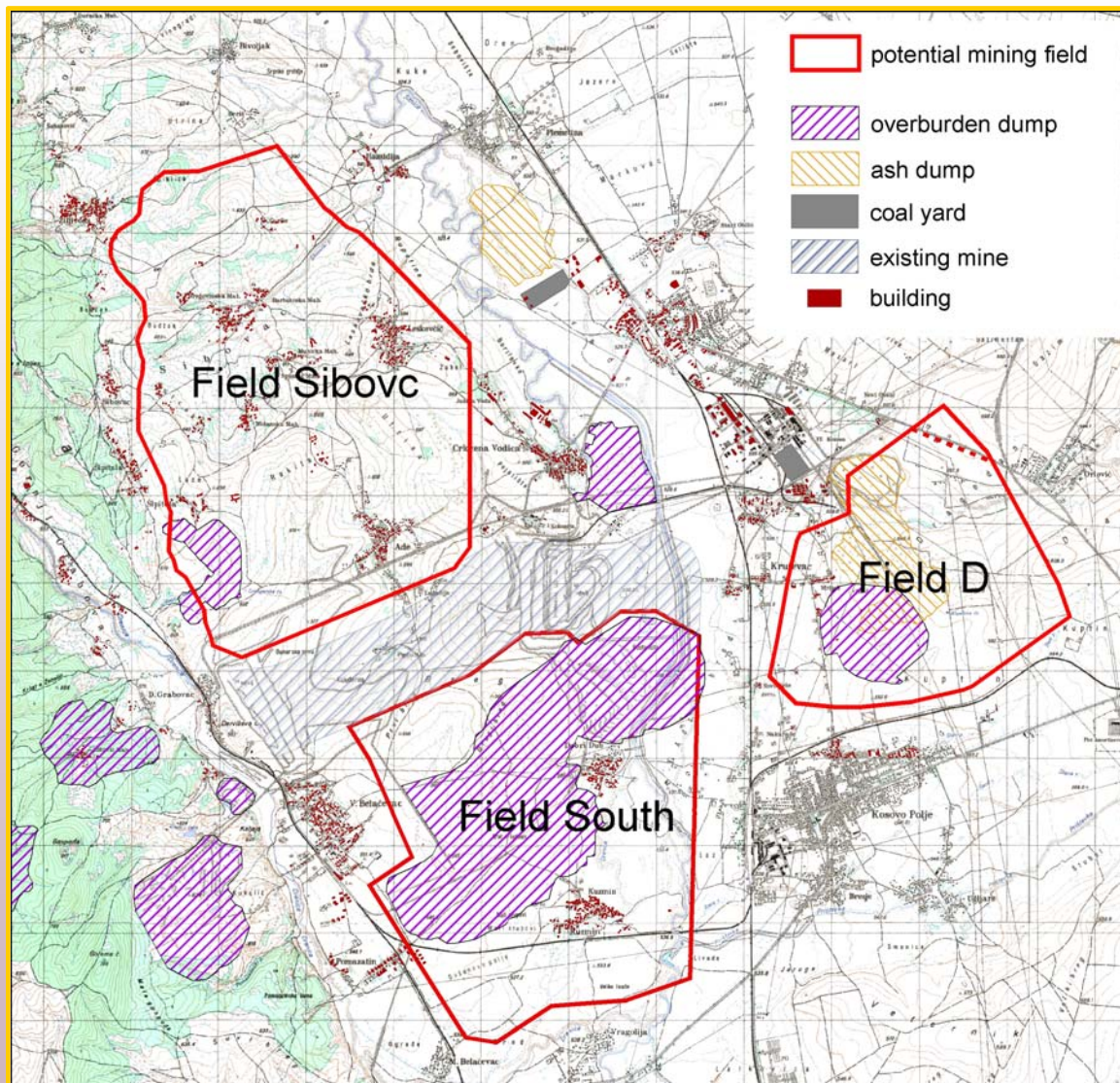
Mining

Power generation in Kosovo is based on Lignite deposits

- high calorific lignite deposits – **1,863 kcal/kg**
- estimated reserves - over **10 billion tons**
- two lignite mines (Bardh and Mirash)
- annual production (2004) – **5.76 mil tons**
- annual consumption (2004) – **5.71 mil tons**, for generating **4.3 GWh**
- existing mines will be completely depleted by **2009**
- new lignite field (Sibovc – 1,980 kcal/kg) that is planned to be opened directly to the north of the existing mines, has the necessary lignite reserves (1 billion tons), to ensure the medium and long-term fuel supply



Potential Mines



Comparison of Mining Alternatives

	Field Sibovec	Field South	Field D
Coal Content, geol. mine able	990 mt 830 mt	537 mt 370 mt	395 mt 280 mt
Sufficient for :	2000 – 2500 MW	ca. 1000 MW	ca. 600 MW
O : C [m ³ /t]	0.9 : 1	2.8 : 1	0.9 : 1
Net Calorific Value	8300 kJ/kg	8000-8300 kJ/kg	7300 kJ/kg
Disadvantage	resettlement of Hade	most expensive high O : C ratio	limited coal content
Result	best possibility for TPP > 1000 MW	to be postponed	eliminates an environmental liability



Power Generation and Capacity

Main Power Plants

- Kosova A (5 Units)
- Kosova B (2 Units)
- HPP Ujmani (2 Units)

Due to

- *inadequate maintenance*
- *irrational use during pre-war period*
- *war impairments*

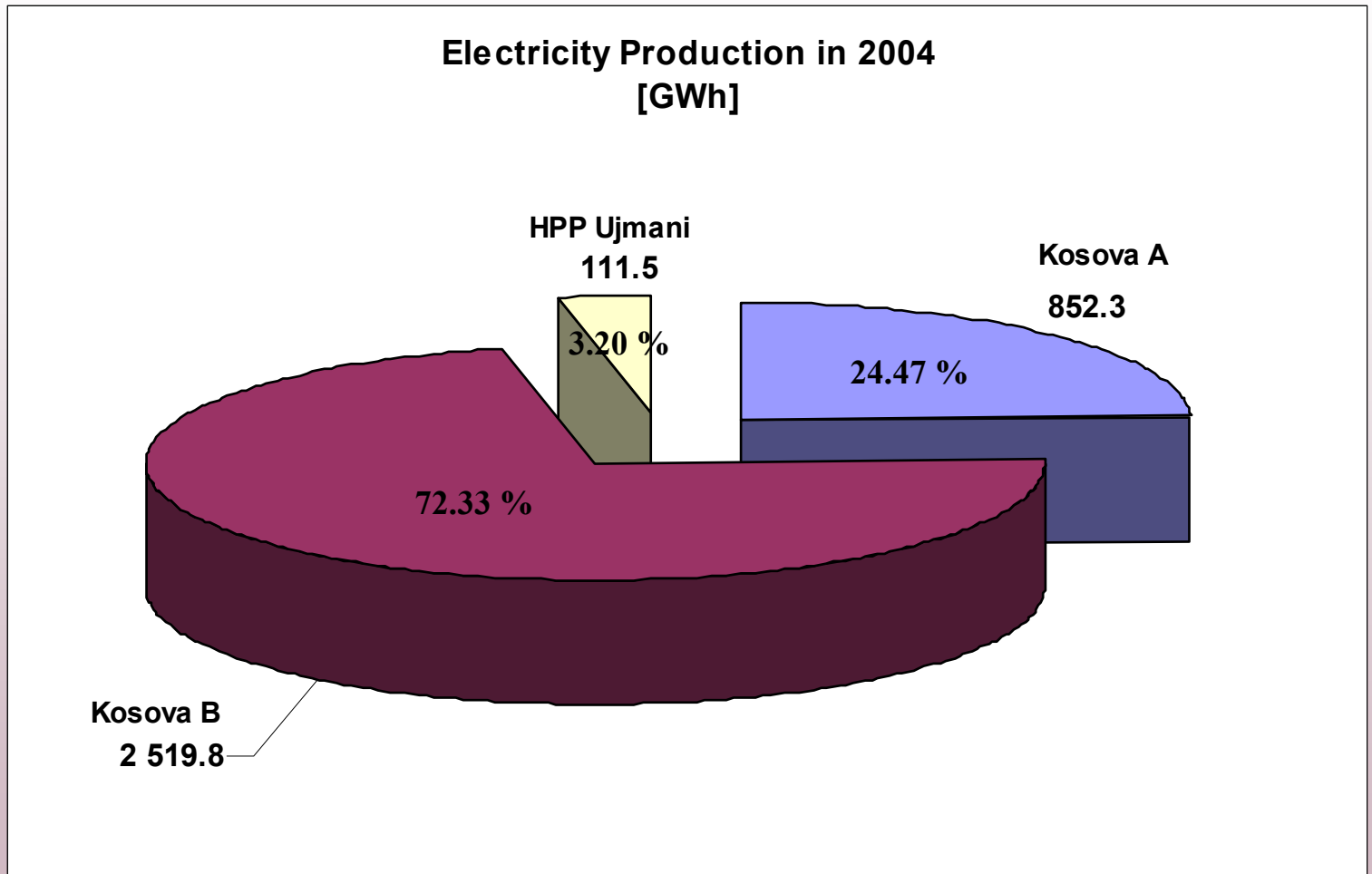
Current used capacity is less than 50% of installed capacity

Power Plant	Installed capacity	Operational Capacity	Load Factor (2004)	Annual Net Production 2004	Foreseen Production (Power Balance) 2005
<i>Units</i>	<i>[MW]</i>	<i>[MW]</i>	<i>%</i>	<i>[GWh]</i>	<i>[GWh]</i>
A1	65	25	2.47%	5.4	105.2
A2	125	-	-	0.0	0.0
A3	200	95 (0)	33.79%	281.2	0.0
A4	200	100 (0)	13.13%	115.0	0.0
A5	210	110	46.77%	450.7	596.1
Total Kosova A	800	330 (135)	29.48%	852.3	701.4
B1	339	250	65.47%	1 433.7	1 524.5
B2	339	250	49.59%	1 086.1	1 648.8
Total Kosova B	678	500	57.53%	2 519.8	3 173.3
HPP Ujmani	35	35	36.37%	111.5	79.2
Total	1513	865 (670)	45.97%	3 483.6	3 953.9



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Electricity Production in 2004



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Electricity data from 2004

Energy Balance	GWh	%
Imports	650.6	14.35%
Generation	3 884.6	85.65%
Total	4 535.2	100.00%
Exports	194.6	4.29%
Power Plant own use	401.0	8.84%
Transmission Losses	171.0	3.77%
Distribution Losses	1 710.0	37.71%
(Net Consumption)	2 058.6	45.39%
(Net Consumption)	2 058.6	100.00%
Industry	248.0	12.05%
Commercial and Public	313.0	15.20%
Household	1 497.6	72.75%

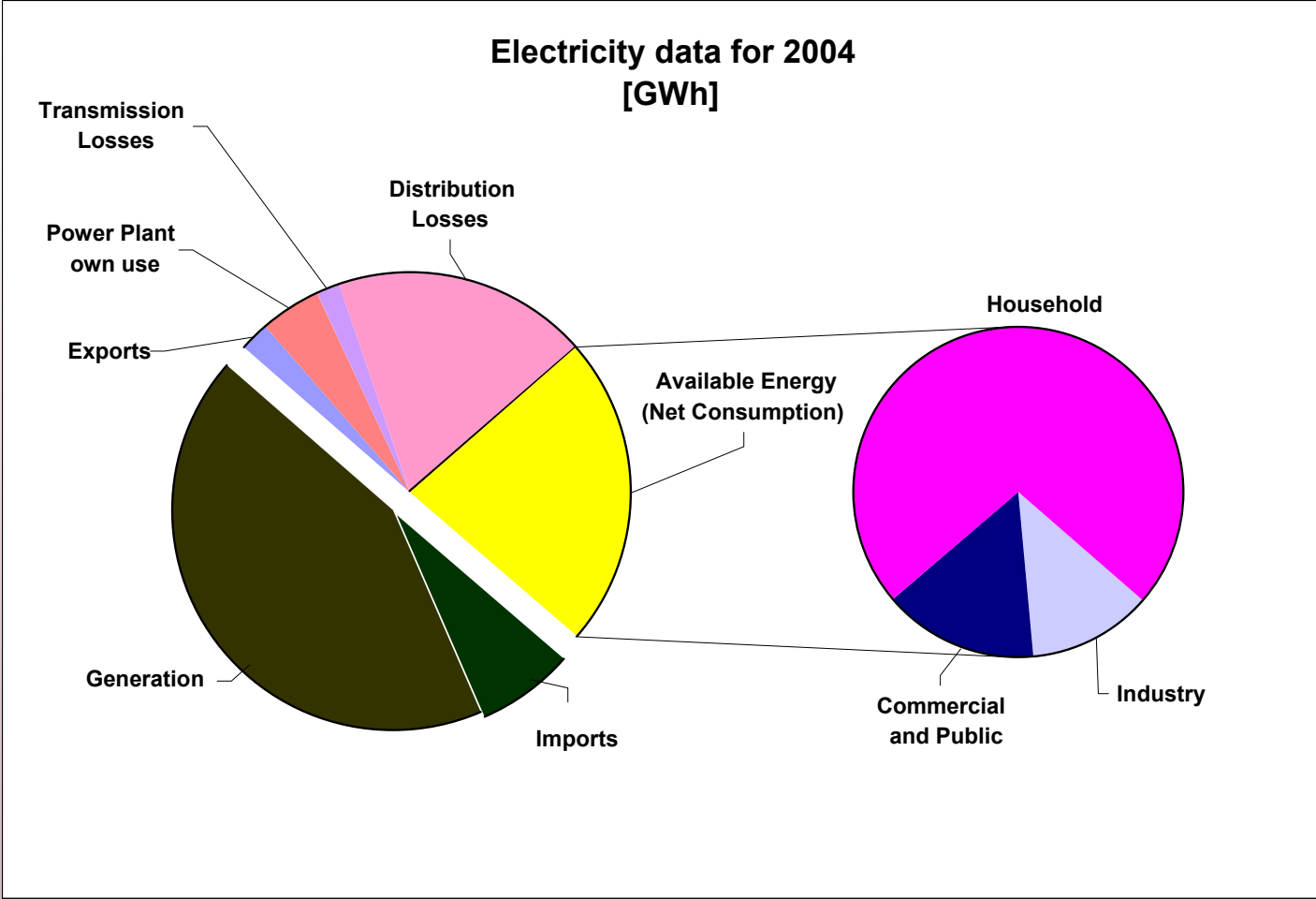
- *Demand is much higher than available energy*

- *during 2004 were applied load shedding;*

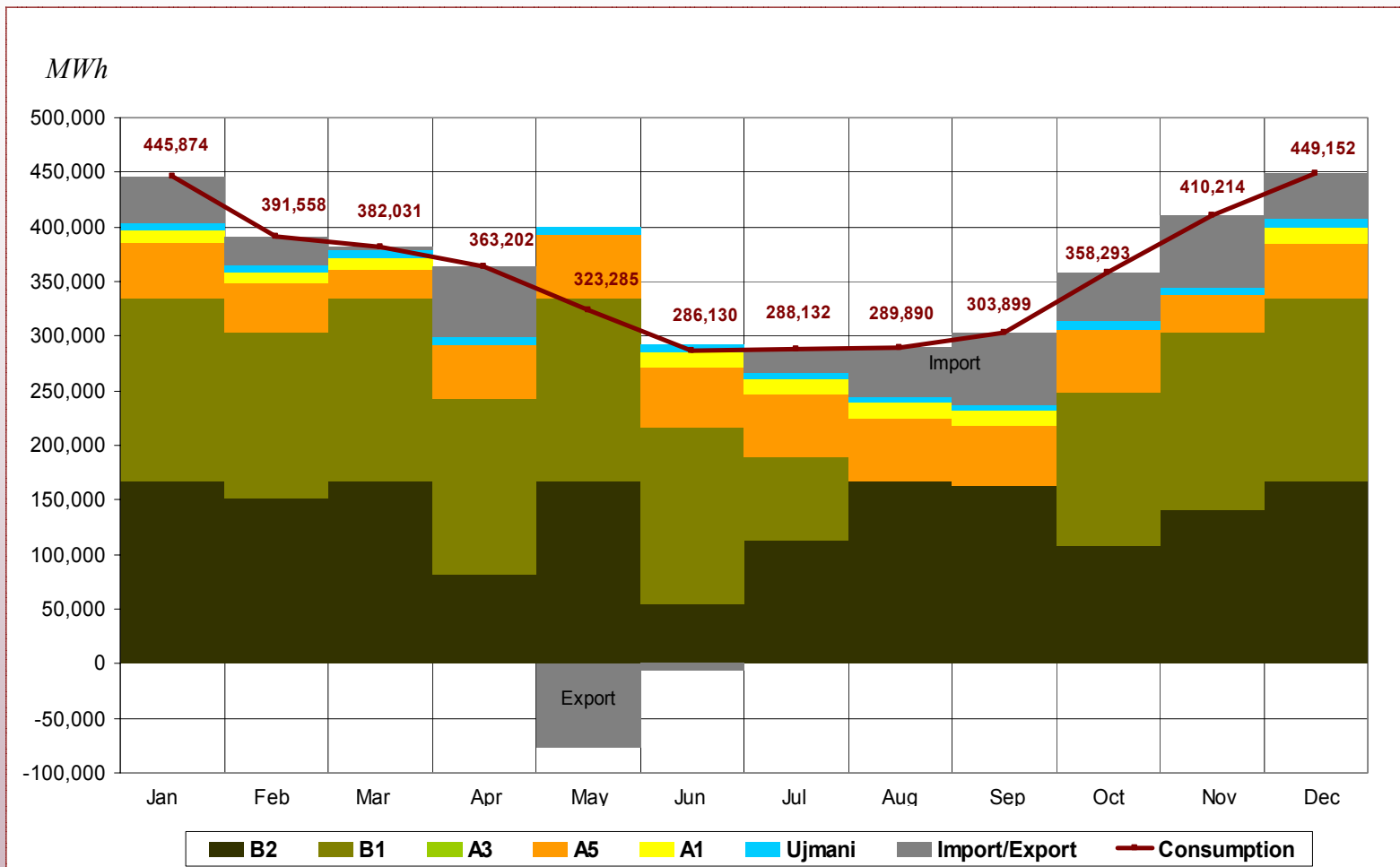
4:2 during peak time and winter

5:1 during base load and summer.

Power Balance for 2004



Forecasted Power Balance for 2005



District Heating

DH sector in Kosovo is limited only to 3 geographical locations, part of which are covered by 3 companies:

- *TERMOKOS (Prishtina)*
- *DH GJAKOVA (Gjakova)*
- *TERMOMIT (Mitrovica)*

- supplying only 5% of heat demand in Kosovo

- it is used exclusively for space heating

- does not include supply of hot tap water, so heat enterprises are not all-year in operation during the heating season (15 October - 15 April) heat enterprises operate with night-stops

District Heating Data

- Heat generation is carried out at the heating plants equipped with fuel oil boilers using heavy oil (mazut)

Company (Town)	Installed capacity	Annual Production 2003/04
<i>Units</i>	<i>[MW]</i>	<i>[GWh]</i>
TERMOKOS (Prishtina)	159	96.8
DHC (Gjakova)	38.6	18.3
TERMOMIT (Mitrovica)	16.9	N/A
Total	214.5	115.1

Energy Sector Technical Assistance Project (ESTAP)

- Is study of rehabilitation and development options for the energy sector in Kosovo
- financed by World Bank
- main objective of ESTAP
 - *to provide technical assistance for development of a strategy for the medium-term and long-term program for reconstruction and recovery of the energy sector in Kosovo*
 - *definition of a least-cost investment program for rehabilitation, reconstruction and expansion of the energy sector for the period from 2002 to 2015*
- Project (report) includes thirteen distinct modules
 - *providing basic technical, economic, financial and institutional information*



Generation Investment Study (GIS)

- *prepared by Pricewaterhouse Coopers LLP*
- *funded by European Union*

GIS objective

- **identifying priority list of investments in generation and related electricity infrastructure from a regional perspective**
 - *timing, size and location*
- **demand forecast (different scenarios)**
- **indicative least-cost investment plan**
(new building or rehabilitation)

Kosovo's energy sector perspective

- **data and information given covers many aspects of the energy sector in South East Europe (GIS) and particularly in Kosovo (ESTAP)**
 - **real possibilities for investment in energy sector in SEE region**
 - **Kosovo is mostly emphasized**
- **attractive environment**
 - **very high growth rate of electricity demand**
 - **lack of capacities for covering current demand**
 - **huge lignite reserves – high calorific value**
 - **least-cost of lignite**

Demand Forecast for Kosovo

- pragmatic choice among three estimated scenarios for annual growth rate of electricity consumption
- in 2020 electricity demand in Kosovo – 7 800 GWh
- growth rate in Kosovo – much higher after consolidation of many industrial sites

Dynamic of electricity demand	Forecasted Demand Growth in Kosovo		
	Year	GWh	Peak MW
	1991	2 695	-
	1195	2 751	-
	2000	2 869	-
	2005	(4 500)	(900)
	2010	6 735	1 265
	2015	7 050	1 247
	2020	7 800	1 384



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Demand Forecast for SEE

Dynamic of electricity demand	Forecasted Demand Growth in SEE region		Peak
	Year	GWh	%
			MW
2005	166 203	-	27 882
2006	169 071	1.7%	
2007	172 234	1.9%	
2010	182 248	5.8%	29 649
2011	186 027	2.1%	
2012	189 956	2.1%	
2015	204 487	7.6%	33 151
2016	210 389	2.9%	
2019	228 805	8.8%	
2020	235 201	2.8%	38 049

Country	Growth	Demand on GWh (2020)
Albania	4.00%	12 490
Bosnia & Hercegovina	3.00%	16 404
Bulgaria	1.60%	42 481
Croatia	3.20%	25 889
UNMIK-Kosova	3.20%	7 800
FYR Macedonia	2.50%	10 965
Montenegro	0.70%	4 820
Romania	2.60%	76 796
Serbia	1.10%	37 556
SEE	2.30%	235 201

Installed capacity of SEE countries

Country	Total	Hydro	Thermo	Nuclear	Annual Generation 2003
	<i>MW</i>	<i>%</i>	<i>%</i>	<i>%</i>	<i>GWh</i>
Albania	1 519.5	95.26%	4.74%	0.00%	4 905.0
B&H	3 714.0	52.48%	47.52%	0.00%	11 257.0
Bulgaria	12 357.0	23.18%	53.52%	23.31%	42 546.0
Croatia	3 964.5	48.81%	42.28%	8.92%	13 223.0
Macedonia	1 485.5	32.35%	67.65%	0.00%	5 618.8
Montenegro	840.0	77.26%	22.74%	0.00%	3 237.0
Romania	17 919.0	33.96%	62.13%	3.91%	51 525.0
Serbia	7 665.0	37.20%	62.80%	0.00%	29 609.0
Kosova	1 513.0	2.31%	97.69%	0.00%	3 221.0
Total	50 977.5	35.89%	56.39%	7.72%	165 141.8

Lignite Characteristics

- Investments in energy generation \Leftrightarrow the **fuel resources**
- Kosovo's main **strength** - most favorable lignite deposits in SE Europe
- Least-cost base load generation promoted by GIS is lignite fired PP
- Current operation of mines is considered uneconomical
- investments required to increase efficiency and productivity and for the opening of new mines
- Efficiency of new PP (GIS ref.) is 33.5% - 39.5%

Lignite Quality

Coal Quality	Ash	Moisture	Heating Value
<i>Area</i>	<i>%</i>	<i>%</i>	<i>KJ / Kg</i>
Bardh	14.1	47.7	7 860
Mirash West	14.4	47.5	7 750
Mirash East (Sitnica)	19.9	43.9	7 928
Sibovc	13.85	47.8	8 300

Comparison of coal quality	Kosovo Sibovc	Bulgaria	Poland	Turkey	Germany
Calorific Value (kcal/Kg)	1 980	1 601	1 863	1 051	2 126
Ash (%)	14	2	5	18	5
Sulphur (%)	1	0	0.3	1.7	0.3

Fuel Costs and Consumption

Lignite	Local			
	2005	2010	2015	2020
Fuel Costs €/GJ				
Albania	-	-	-	-
B&H	1.71	1.71	1.71	1.71
Bulgaria	0.88	0.88	0.88	0.88
Croatia	-	-	-	-
Kosovo-UNMIK	0.62	0.62	0.62	0.62
FYR Macedonia	1.34	1.34	-	-
Montenegro	2.44	2.44	2.44	2.44
Romania	1.52	1.52	1.52	1.52
Serbia	1.34	1.34	1.34	1.34

- 0.62 €/GJ
- 8,300 kJ/kg (1,980 kcal/kg)
- 39.5 % efficiency
- 5.65 €/MWh output
- 1.10 t/MWh
- 5.15 €/t

Plant	Installed capacity [MW]	Efficiency %	kcal/kg	kWh/kcal	kWh/kcal * eff.	kcal/kWh	t/MWh
Lignite Sub-critical	300	33.50%	1 980.00	0.001163	0.00039	2 566.70	1.30
	500	35.00%	1 980.00	0.001163	0.00041	2 456.70	1.24
Lignite Super-critical	300	37.50%	1 980.00	0.001163	0.00044	2 292.92	1.16
	500	39.00%	1 980.00	0.001163	0.00045	2 204.73	1.11
	600	39.50%	1 980.00	0.001163	0.00046	2 176.82	1.10

Candidate plants

- Significant investments are needed in the Balkans
- Least-cost power generation plan include:
 - Cernavoda 707 MW and Belene 1000 MW nuclear plants
 - Kosovo lignite plants of 300 MW and 500 MW (4,200 MW)
 - Kolubara lignite #1 and 2
 - 300 MW and 500 MW combined cycle gas turbine plants firing natural gas
 - Combined Heat and Power plants burning gas
- Rehabilitated Capacity - 11,574 MW
- New Capacity - 11,000 MW
- Total investment - € 34,092 Mil

Carbon Credits Impact (i)

- **€ 4.8 billion** – for rehabilitation in SEE
 - EU Environmental Directives - **€ 2.3 billion** additional
- Elimination of non cost effective rehabilitation, proportionally increases investments in new plants
- € 5/ton of CO₂ credits reduces rehabilitation projects to 61-65 % of the official plan
- €10/ton of CO₂ credit reduces rehabilitation projects to 34-44% of the official plan
- € 5/ton results in 2.9% further increase of natural gas use with corresponding decline of coal + lignite
- € 10/ton results in 4.1% increase of natural gas and 2% increase in nuclear with corresponding decline of coal + lignite

However

- lignite plants in Kosovo remain the least-cost option for the region
 - as carbon credit values increase and existing power plants become less cost-effective, there is need for **new efficient plants** burning Kosovo lignite
- *baseline plan included **4,200 MW** of new plants burning Kosovo lignite*
- *when the carbon credits were included, the new plant capacity burning Kosovo lignite increase to **5,500 MW** over the planning period (2005-2020)*



Carbon Credits Impact (ii)

(GIS) Impact of carbon credits on the competitiveness of existing power plants
Rehabilitated Capacity (MWs)

Scenario	Partial Environmental Compliance		Full Environmental Compliance	
	Rehabilitations MW	New Units MW	Rehabilitations MW	New Units MW
Official Rehabilitation Plan	11,574	11,000	11,574	11,000
Optimum Rehabilitation Plan	9,916	11,884	9,223	12,760
Optimum Rehabilit. Plan with CO ₂ €5/t	7,497	14,976	7,039	15,464
Optimum Rehabilit. Plan with CO ₂ €10/t	5,099	17,328	3,899	18,596

Candidates Plants between 2005-2020

Candidate Plant	Type of fuel	Installed Cap.(MW)	Investment costs (€/MW)
Zhur	Hydro	293	590
Kosovo B3	Lignite	180	1089
Kosovo B3	Lignite	220	1069
Kosovo B3	Lignite	300	994
TPP Dom. Lignite	Lignite	300	1069
TPP Dom. Lignite	Lignite	500	994
Cernavoda 3 (Rumania)	Nuclear	707	1421
Kolubara A6 (Serbia)	Lignite	200	1224
Belene U1	Nuclear	1000	1361
CHP Plant	Gas	2 x 100	NA
CHP Plant	Gas	2 x 300 +500	NA

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