Trends, Opportunities, Obstacles and Investment in Hungarian power generation sector

UNECE-e8-EBRD-WEC Clean Electricity Production Forum

Tamás Jászay
Head of Business Development RWE Hungária
Geneva, 22.-24 November, 2010
Global market trends will influence the power market in Hungary

- De-Carbonization
- Regional markets
- New markets (renewables)
- New technologies (CCS, Smart metering / grid)
- Security of supply
- Need for flexibility

RWE Hungária
There are some promising upstream opportunities in Hungary

**Opportunities**

- Replacement of aging power plants
- Power plant demand increase over European average
- Relatively mature gas market with gas storage new planned pipelines
- Strong government commitment for “green economy”
- Strong European investors in the sector

**Obstacles**

- Present uncertainties of regulatory environment
- Limited financing resources post-crisis
- Complicated licensing processes
- Public opposition against hydro plants
- Coal fired projects need new technologies (CCS)

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Power Plant Mátra / RWE Hungária

- Increase biomass co-firing potential
- Develop alternative new build projects for the brownfield site
- Increase of flexibility of power plant operations
Electricity Generation Investment Case: Stakeholders, Key Issues, Obstacles and Objectives

Branko Terzic, P.E., Sc. D (h.c.)
Executive Director, Deloitte Center for Energy Solutions
and
Chairman of the UNECE Ad Hoc Group of Experts on Cleaner Electricity Production

November 22, 2010
Session 1

- This session will provide an introduction to the work and describe the stakeholders and key issues to be dealt with.
- In particular, this introductory session will also review the principal obstacles for the increased domestic and foreign investments in cleaner electricity production from fossil fuels and accordingly present the objectives of the project and this Forum.
The 21st Century’s Energy Problem

- Securing an adequate energy supply at reasonable cost (not new)
- Intelligently managing energy demand to lower consumer bills (not new)
- Managing the greenhouse gas (“global warming”) issue (new)
Interests: Who has a stake?

- Employees
- Investors
- Customers
- Contractors
- Vendors
- Rating Agencies
- Acquirers
- Competitors
- Lawmakers
- Government Executive Branch
- Regulators
- Media
- Special interests
- Courts
The Wall Street Carbon Principles are:

- **Energy efficiency.** An effective way to limit CO2 emissions is to not produce them. Encourage clients to invest in cost-effective demand reduction, taking into consideration the value of avoided CO2 emissions

- **Renewable and low carbon distributed energy technologies.** Encourage clients to invest in cost-effective renewables and distributed technologies, taking into consideration the value of avoided CO2 emissions

- **Conventional and advanced generation.** Encourage regulatory and legislative changes that facilitate carbon capture and storage (CCS) to further reduce CO2 emissions from the electric sector

  - James A. Slutz DOE March 20, 2008
Coal, Oil, and Natural Gas Will Remain Indispensable: New Electric Power Supply Investment is Required

8,755 Million tons of Oil Equivalent

11,429 Million tons of Oil Equivalent

17,721 Million tons of Oil Equivalent

Source: IEA 2007 World Energy Outlook
A global perspective on fossil fuel use

- **Coal**
  - Abundant in US, China, India, Europe, Russia etc
  - Low cost but needs transport
  - Competitively priced
  - Requires carbon capture and sequestration (CCS)

- **Natural gas**
  - Abundant in some geographies, Australia, US, Canada, Russia, Middle East
  - Regional pricing differences
    - Europe Asia index to “market basket” of oil
    - North America market prices

- **Requires CCS generally**
  - At least 12 pilots and $1 billion each required immediately
  - Some international progress on R&D, scale-up
Billions of Tons of Carbon Emitted per Year

Historical emissions

Currently projected path

Flat path

1. Aggressive end-use efficiencies
2. More biofuels, biomass
3. RE: more wind, solar, geo
4. Expand safe nuclear worldwide
5. Sequester carbon (coal use)
6. Better vehicles (PI hybrids)
7. Manage natural sinks

All wedges will be needed to make progress on curbing carbon emissions.
Power system overview
Government Policy Issues

Governments have multiple goals available when developing an energy policy with respect to the electricity generation segment of the economy.

At the same time domestic and international investors have many investment choices including: country, industry, individual company, and choice of stocks versus bonds.

The issues are how to find policies which support government goals while also attracting investment capital.
Policy decisions pending for global warming

- **International**
  - United Nations Framework Convention on Climate Change (UNFCCC or FCCC) US is signatory
  - Conference of Parties COP 17 March 18, 2011 in South Africa

- **National**
  - Climate change legislation
  - Alternative / Renewable / “clean” energy programs and requirements
Energy Policy Options

Figure 8. Schematic of various RE policy mechanisms. [4] [N. Enzensberger et al. / Energy Policy 30 (2002) 793–801]
Clean Coal: Leading Questions

- Market factors and business risks have shifted since 2000 in consideration of clean coal (e.g., low natural gas prices).
- Is lack of investment primarily a matter of elevated capital costs? Other business risks?
- Which risks most deter construction of commercial clean coal plants?
- Which policies could encourage commercial adoption of “clean coal gasification” (e.g., environmental regulations, state & federal financial support, PUC agreements)?
- How can risk-targeted, credit-based incentives improve prospects for clean coal plants?
CCS Key Issues

- Demonstrating CO$_2$ Capture and Storage
  … commit by 2010, to a diverse portfolio of at least 20 fully integrated industrial-scale demonstration projects … with the expectation … for the broad deployment of CCS by 2020.
- Taking Concerted International Action
- Addressing the Financial Gap
- Establishing Legal and Regulatory Frameworks
- Raising Public Education & Awareness
  – Barbara McKee 2009
Barriers to clean fossil investment

- High carbon capture costs
- Need for storage experience
- Undeveloped transport infrastructure
- Lack of value for CO₂ emissions reductions
- Need to create viable markets for CCS
- Lack of legal/regulatory framework
- Limited public awareness and need for acceptance
- Inadequate international mechanisms
  - Barbara McKee June 8, 2009
Different risks arise at each phase of power projects, so different financing tools can be used to address different risks.
Overview and Approach to Risk Framework – Andy Patterson

This diagram depicts the study’s logic flow and approach to the analysis.

1. **Power Plant Project Development Timeline**
   - Timeline Evaluation
     - Delineation of key development stages for power plant
     - Matching of development stages with financing events

2. **Risk Analysis of Coal Project Development Stages**
   - Risk Analysis by Stage of Project Development
     - "Showstoppers":
       - Air regulatory issues?
       - Tech performance and availability?
       - PUC rate approval?
   - Major Risk Category
     - Technology / Design
     - Development / Siting
     - Regulatory
     - Construction
     - Operating performance
     - Fuel price, supply
     - Demand
     - Dispatch
     - Waste, byproducts
     - Transmission

3. **Rating and Ranking of Risks by Stages**
   - Interview and Rating Approach
     - Design of survey instrument
     - Work with industry groups for interview candidates
     - Selection of interview candidates
     - Contact of candidates
     - Interviews, risk ratings
     - Evaluation of risks
     - Workshops with industry on results

4. **Evaluation, Application of Risk Mitigation Mechanisms**
   - Evaluation of Mitigation Mechanisms
     - Financial model and sensitivity analysis (conducted by utilities)
     - Delineation of mechanisms
     - Matching of possible mechanisms to risks
     - Evaluation of risk coverage for each stage
     - Determination of measures, legislation needed to implement
     - Negotiations

The risk framework approach builds on work done for the “Business Case for Nuclear Power” (www.nuclear.gov)
Common Equity Cost Rate - Pressures

- Recovery from the “Great Recession”?
- Downward trend in authorized ROEs
- Risk adjustments to ROE
- Increasing capital expenditure needs / declining trend in capital investment
- Downward trend in credit quality
- Pressure on Efficient Market Hypothesis (EMH)
  - Pauline Ahern, AUS Consultants
Common Equity Cost Rate - Pressures

- Downward trend in authorized US utility ROEs:

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<tr>
<th></th>
<th>1992</th>
<th>2010</th>
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<tr>
<td>Electric Cos.</td>
<td>12.09% (48)</td>
<td>10.48% (39)</td>
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<tr>
<td>Gas Distribution Cos.</td>
<td>12.01% (29)</td>
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- Downward trend in utility bond ratings:

<table>
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<tbody>
<tr>
<td>Electric Cos.</td>
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<td>BBB+</td>
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<tr>
<td>Combination E&amp;G Cos.</td>
<td>A</td>
<td>BBB+</td>
</tr>
<tr>
<td>Gas Distribution Cos.</td>
<td>A</td>
<td>BBB+</td>
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Regulatory Research Assoc. (An SNL Co.) / AUS Utility Reports (An AUS Company)
Common Equity Cost Rate - Pressures

- Downward trend in US utility bond ratings:

<table>
<thead>
<tr>
<th>Category</th>
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<td>BBB+</td>
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<tr>
<td>Combination E&amp;G Cos.</td>
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<td>BBB+</td>
</tr>
<tr>
<td>Gas Distribution Cos.</td>
<td>A</td>
<td>BBB+</td>
</tr>
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</table>

- Downward trend in public utility bond yields:

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<tr>
<td>“A”</td>
<td>8.69%</td>
<td>6.04%</td>
</tr>
<tr>
<td>“Baa”</td>
<td>8.86%</td>
<td>7.06%</td>
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</table>

AUS Utility Reports (An AUS Company) / Mergent Bond Record

**Fossil Future**
- **“GRAPES OF WRATH”**
  - Low relative demographic growth
  - Vulnerability to disruption
  - More Oil & Gas E&P (tax incentives)
  - Higher mileage ICE (cars)
  - Extended coal plant life
  - Some mass transit growth
  - EE in new homes
  - Hybrid vehicles

**High Growth**
- **“ENERGY ENTERPRISE”**
  - High demand + carbon intensity reduction
  - Less vulnerability to disruptions
  - Massive EE & DSM
  - Accelerated nuclear plant construction
  - Renewable power (wind, solar, bio); Biofuels
  - Clean coal with CCS
  - Plug-in hybrid vehicles + mass transit
  - Community scale EE and Co-gen
  - Reforestation / sequestration

**New World**
- Technology
- Joint Venture
- Investment incentives

**Rising Asia**
- Joint R&D
- Bi-lateral agreements
- Market mechanisms

**Low Growth**
- **“CLUB OF ROME”**
  - Low demographic growth
  - Lower carbon intensity
  - Heavy mandates / regulations
  - Huge imports of natural gas (to replace coal)
  - CO2 limits / allocations / trading
  - Marked rise in biopower
  - Feed-in tariffs for renewable power
  - Urban electric mass transit
  - Co-generation for EE / DG

**Carbon Mgmt (Energy Security)**
- Guidelines / Regulations
- Multi-lateral agreements
- Public-private partnerships

**“GREENHOUSE”**
- High demographic growth
- More vulnerability to disruptions
- More Oil & Gas E&P
- Gas turbines for power
- Diesel engines for power
- GTL + CTL for fossil fuels
- LNG bonanza
- Coal-fired power
- Mass transit for urban growth

- Joint R&D
- Bi-lateral agreements
- Market mechanisms
Branko Terzic

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Office +1 703 251 4350
Joint UNECE-e8-EBRD-WEC Forum
- Geneva, 22-24th November 2010 -

Electricity Market in South-East Europe

Slav Slavov
World Energy Council
Major regional characteristics
- energy profile prior to reforms-

- low energy consumption per capita;
- sector dependence of Russian supplies & technology;
- el.generation based on local lignite; low EE, high pollution;
- heavy industry involvement, high degree of energy intensity;
- energy prices were not cost reflective;
- cross-border interconnections justified by need of hard currency
- devastating effect that war caused on territory of ex-Yugoslavia.
Recent reforms & developments
- since 1990 -

• start unbundling vertical publicly owned companies by copying the EU liberalization policy and west-European experience;

• reforms road-maps similar due to common features;

• rehabilitation of electric power infrastructure financed by foreign grants and funds mainly;

• preparation to re-connect with UCTE.
Recent reforms & developments
- since 1990 (more…)

• lack of finance to strategic investments in power generation, and in the full energy chain;

• enhanced political will, to think regionally on security of supplies resulted in launching an initiative to create regional el.market; and subsequently to connect it, to Pan-European one;

• Promising projects on hydrocarbons, thanks to strategic position of SEE, in particular on natural gas.
Installed generating capacities in SEE, 2008

1. TPP based on coal – 24669 MW
2. TPP on heavy fuel & gas – 12352 MW
3. NPP – 3873 MW
4. Hydro – 21594 MW
5. RES – 602 MW
Total – 63090 MW
Regional Electric Power Structure, in 2008

1. TPP – 141,718 GWh
2. NPP – 26,027 GWh
3. Hydro – 61,792 GWh
4. RES – 1,600 GWh

Total – 231,137 GWh
Cross-region exchange of electricity in SEE in GWh, 2008

Export (-); Imports (+)
Promoting the sustainable supply and use of energy for the greatest benefit of all

SECI 2005 400 kV Interconnections

- Existing
- New In
- New Option
## Forecast electricity demand growth in SEE, 2005 – 2020 %

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<tr>
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<tbody>
<tr>
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<td>2.0</td>
<td>2.0</td>
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<tr>
<td>B &amp; H</td>
<td>4.0</td>
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</tr>
<tr>
<td>Bulgaria</td>
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<td>Croatia</td>
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<td>2.5</td>
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<tr>
<td>Greece</td>
<td>1.5</td>
<td>1.5</td>
<td>1.0</td>
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<tr>
<td>FYRM</td>
<td>4.0</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Romania</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Serbia + Montenegro</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
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<tr>
<td><strong>SEE Region</strong></td>
<td><strong>2.3</strong></td>
<td><strong>2.1</strong></td>
<td><strong>2.1</strong></td>
</tr>
</tbody>
</table>
Prognosis of SEE- regional electricity demand growth, period 2005 – 2020, GWh

Growth of 36,4%, between 2005-2020; or by 2,4%/year;
A Few Conclusions..

• **Currently**: lack of electricity in South-East Europe; and sustain reduction of electricity supplies; shortages/blackouts in Albania, Montenegro, Macedonia; this results in a..

• high increase of el.prices, subsidies applied when importing;

• earlier closure of Kozloduy 4-reactors had negative impact on regional electricity demand;

• Political and social tension due to shortages of electricity as prices are regulated;

• **Absence of full unbundling in SEE region.**
A Few Conclusions (cont`)

- internal cross-border connections relatively good, but not the external ones;
- by 2020, el.demand grows by 85 000 GWh or 36,4% (average of 2,4% per year). To meet the needs, new gen.capacities of 20 GW are necessary. The required investments: in order of 30 B Euro;
- over next 3-5 years, electricity shortages of 10 000 GWh should be covered by imports from external suppliers; from where ???. IPPs would generate a large portion;
Some priority needs…

• refurbishing of coal-based TPPs and enhancing further connections; urgent investments and build of new gen. capacities;

• enhancing efficiency of power generation as priority;

• diversification of energy mix (more gas, RES, nuclear);

• developing a regional market design and compatible market rules for the region.
THANK YOU

WWW.WORLDENERGY.ORG
CLEAN ELECTRICITY PRODUCTION FORUM

In the framework of the UNECE-e8-EBRD-WEC cooperation

Sixth Session of the UNECE Ad Hoc Group of Experts on Cleaner Electricity Production

Geneva, 22 November 2010
Power generation sector in economies in transition

- Power plant fleet largely obsolete
- Average age close to 50 years
- Low efficiency, outdated technology
- Efficiency from 15 to 30 percent in most cases
- Some new plants recently
Pressing issues

• Inefficient supply chain
• Transmission and distribution lacking investment as well
• End user price generally below economic levels
• Pollution high
Investments required

- Estimate – around €250-300 billion
- Beyond means of economies in transition
- IFI of help but too small to take the burden
- Coupled with political, technological, cost and logistic challenges
- FDI the main source
How to secure investments?

- Role of the UNECE-e8-EBRD-WEC joint initiative
- Strong endorsement by the UNECE member-countries
- Follow-up on Montreal conclusions
- Montreal results
- Focus of the UNECE secretariat
CLEAN ELECTRICITY PRODUCTION FORUM
In the framework of the UNECE-e8-EBRD-WEC cooperation

Sixth Session of the UNECE Ad Hoc Group of Experts on Cleaner Electricity Production
Geneva, 22 November 2010
The Importance of the Regulatory Framework for Electricity Generation

Branko Terzic, P.E., Sc. D (h.c.)
Executive Director, Deloitte Center for Energy Solutions
and
Chairman of the UNECE Ad Hoc Group of Experts on Cleaner Electricity Production

November 22, 2010
The 21st Century’s Energy Problem

- Securing an adequate energy supply at reasonable cost (not new)
- Intelligently managing energy demand to lower consumer bills (not new)
- Managing the greenhouse gas (“climate change”) issue (new)
Three important government factors

- Compliance with policy decisions
  - International agreements
  - Federal legislation
  - Local requirements
- Meeting new regulatory requirements
  - International agreements
  - National / state regulation
- Approvals of investment in new technology (R&D, Pilots, Commercial)
  - Clean fuels and waste handling advancements
    - CARBON CAPTURE AND SEQUESTRATION
    - ASH
    - POLLUTANT GASES AND CHEMICALS
  - Transmission and distribution system "smart grid" advances
  - End use conversion efficiencies and novelties
Coal, Oil, and Natural Gas Will Remain Indispensable

1990
8,755 Million tons of Oil Equivalent

2005
11,429 Million tons of Oil Equivalent

2030
17,721 Million tons of Oil Equivalent

Source: IEA 2007 World Energy Outlook
Power system overview
Policy decisions pending for global warming

- **International**
  - United Nations Framework Convention on Climate Change (UNFCCC or FCCC) US is signatory
  - Conference of Parties COP 17 March 18, 2011 in South Africa

- **National**
  - Climate change legislation
  - Alternative / Renewable / “clean” energy programs and requirements
Regulation

“The imposition by a government of controls over the decisions of firms in order to prevent exploiting of market power to extract pure economic profits.

.. an alternative to nationalization”

.. a reason .. to encourage competition.”

Source: A Concise Dictionary of Business, Oxford University Press
Regulation is a substitute for competition.

- The objectives of electric utility regulation are to:
  
  1. Attract capital sufficient to build and maintain adequate and reliable service,
  
  2. Insure service at reasonable prices to consumers.
The First Problem: Creation of Policy

Governments have multiple goals available when developing an energy policy with respect to the electricity generation segment of the economy.

At the same time domestic and international investors have many investment choices including: country, industry, individual company, and choice of stocks versus bonds.

The issues are how to find policies which support government goals while also attracting investment capital.
Investor’s Strategic Framework
Government policy is the key

- Appropriate government policy can attract reasonable cost capital by providing for:
  1. Stable government
  2. Consistent economic policies
  3. Predictable regulation
  4. Recognition by regulators of requirements of capital markets
  5. Desire to maintain national economic competitiveness
Government Duties in Electricity

- Selection of workable market model
  - Competitive power market – market regulation
  - Monopoly power supply – cost of service regulation

- Establishment of viable initial starting position
  - Provide clarity of how existing assets will be regulated
  - Provide clarity in how new investment would be regulated

- Recognition of regional realities in energy and financial markets
Typical government policy determinations

- Corporatization policy where there is government ownership of existing infrastructure
- Choice of type of corporate restructuring when divestiture & unbundling of vertical integrated systems are planned
- Establishment of regulation
  - Wholesale power market regulator
  - Transmission and distribution regulation
- Rules for private concessions for “greenfield”
- Transparent privatization of existing assets
- Clarity in liberalization if retail competition is introduced
International Consensus on need for:

- World Bank: “..market structure, competition, and regulation”
- World Energy Council: “..liberalization, competition, ..empowerment of consumers”
- International Energy Agency: “competitive and liberalized markets”
Model of EC “liberalization” available

- Electricity Directive adopted 1996 covers generation, transmission and distribution, and supply
- Member states shall pass laws to comply no later than 19 February 1999
- new generation tendering procedures,
- transmission choose from negotiated and regulated third party access or a single buyer
- 6 year gradual opening of end use markets
- “competition is introduced or enhanced in markets thanks to the removal of monopolies”
Decisions for policymakers

- Clarify policy objectives
- Establish adequate competition, where competition will be introduced
- Create non-discriminatory and transparent regulation for both any new competitive power market and the residual monopoly of transmission and distribution
Decisions in the Privatization Phase

- Create industry structure first
- Identify competitive markets and provide legal basis for competition
- Establish regulation for residual monopoly
- Remove residual regulatory authority from previous laws and ministries
Ms. Nemat Tallat Shafik, World Bank

“healthy [electricity] market criteria:
- secure legal framework,
- sound regulation,
- efficient banking,
- basic fundamentals to reduce risk perception.”
National energy policy objectives

National energy (electricity) policy objectives include the following considerations:

- to seek efficiency
- to have supply reliability
- to sustain environmental programs
- to provide consensus level of social subsidy
- to remove energy subsidies
International Energy Agency

- World Energy Outlook 1999 Insights “Looking at energy Subsidies: getting the Prices Right” (IEA November 1999)
- “removing energy subsidies would support the three principal aims of sustainable development: social welfare, environmental protection and economic growth.”
Ada Karina Izaguirre, World Bank

- Writing in Note 54 of World Bank’s “Public Policy for the private sector”
- “The most successful countries have been those that have found the political will to abandon a long history of subsidized tariffs and to establish regulatory frameworks that offer credible commitments to investors”
An International Investor’s View

- CEO, Vivendi electric & water Senegal Morocco
- Discussing experience in developing countries “good regulatory system was a necessary factor for success.”

- This CEO also called for World Bank to help train regulators
Regulatory guides for capital attraction

The following characteristics are those of electricity regulatory systems which have attracted capital at reasonable cost:

- **Transparent process** - the regulator explains the basis for decisions
- **Decisions are issued in a timely manner** - a “bad” timely order may be preferable to a long delayed decision
- **Balanced consideration** - to insure that the public perception is that their interests were fairly represented
- **Availability of review** - for legal merits and process
- **Stability of regulation** - orders expected to stand review and, principles evenly applied
- **Independence of regulatory action** - sufficient to gain public confidence that regulation was based on law and merits of the application
Regulation important to investors

 “the regulatory structure is the main factor to determine how attractive that country is to outside investment capital”
 “..in Europe the regulations are there-but the regulatory structure needed to carry them out is NOT there”
 From the CEO of Southern International (now Mirant Corp.)
Capital attractive rate making - COS

- A system of rate making which will attract capital at must recognize and include in rates:
  1. A “reasonable” level of costs of service (electricity production, transmission and distribution)
  2. Full recovery of depreciation over economic service lives
  3. All taxes as a “cost of service”
  4. The opportunity to earn a “fair” return on investment after taxes are paid.
Fair Return Opportunity

- Realistic chance to obtain a “market derived” cost of capital
- Opportunity for higher profits for exceptional performance
- Incentives for innovation and improvements
USA wholesale market-based pricing goals

1. Reduce wholesale electric prices (FERC sets wholesale and transmission rates)
   1. Make markets work
   2. Not protect competitors

2. Incent investment in infrastructure
   1. Transmission,
   2. Generation,
   3. Demand response

3. Incent development of technology
   1. Demand response
   2. Efficiency gains

4. Protect the environment
   1. Encourage demand response
   2. Use of more efficient generation

US FERC “Standard Market Design”

- Same set of rules for all users of the grid
  - Open access and flexible transmission service
  - Administered by fair and independent entity
- Market rules protect against market manipulation
  (addresses Enron type trading strategies)
- Customer protection through market power mitigation measures and oversight
- Clear transmission pricing and planning policies for grid expansion
An early view of role of investment

“It is not because a corporation has a large capital or transacts a large and profitable business that it is an injury to community or a menace to prosperity. On the contrary, the development and growth of modern business have made large aggregations of capital absolutely necessary, and such capital is fairly entitled to a reasonable and legitimate profit. The wrong is done and the injury inflicted when such combination of capital are enabled, by means adopted for the purpose, to control prices, stifle competition and create a monopoly.”

- La Follette edited by Robert S. Maxwell
- Governor of Wisconsin Robert “Fighting Bob” LaFollette later U.S. Senator
- Electric utility regulation established in Wisconsin in 1907
Summation

- Regulation is the key to attraction of capital for investment in electric infrastructure.
- Private capital is available to meet all needs.
- But attracting private capital at reasonable cost requires good regulatory policy and performance.
- The parameters of good regulation are knowable from international experience.
- This is valid under both Market Based Regulation and Cost of Service Rate Making.
Generation Investment Case: Stakeholders, Key Issues, Obstacles and Objectives

UNECE-e8-EBRD-WEC Clean Electricity Production Forum

Tamás Jászay
Head of Business Development RWE Hungária
Geneva, 22.-24 November, 2010
Agenda

The Hungarian energy industry in a nutshell

The privatisation of the Hungarian energy sector

Regulation – history, recent interventions and potential future

The banking environment

RWE in Hungary and its power plant developments so far

Next challenges for a cleaner power generation
# Hungary in a Nutshell

## Main data of Hungary (2009)

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<td><strong>Area</strong></td>
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<tr>
<td><strong>Population</strong></td>
<td>Mio.</td>
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<tr>
<td><strong>GDP (2009 est.)</strong></td>
<td>Billion EUR</td>
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<tr>
<td><strong>GDP per capita</strong></td>
<td>EUR</td>
</tr>
<tr>
<td><strong>Monthly average salary (gross)</strong></td>
<td>EUR/month</td>
</tr>
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![Map of Hungary](image)
Dependency on gas is among the Top 3 in Europe; energy efficiency is still to improve.

Total primary energy consumption 1125 PJ (312,6 TWh)

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<th>Energy Source</th>
<th>Hungary</th>
<th>Germany</th>
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<tr>
<td><strong>Specific Energy consumption kWh/capita</strong></td>
<td>33 218</td>
<td>62 150</td>
</tr>
<tr>
<td><strong>Energy intensity kWh/1000 EUR GDP</strong></td>
<td>3 109</td>
<td>1 626</td>
</tr>
<tr>
<td><strong>Ø HH electricity price EUR c/kW incl. taxes</strong></td>
<td>16</td>
<td>22</td>
</tr>
</tbody>
</table>

Source: MEH 2008

Energy-economic data in comparison to Germany

**Electricity**

<table>
<thead>
<tr>
<th>Category</th>
<th>Hungary</th>
<th>Germany</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total consumption</td>
<td>38 TWh</td>
<td></td>
</tr>
<tr>
<td>Peak demand</td>
<td>6 439 MW</td>
<td></td>
</tr>
<tr>
<td>Total production</td>
<td>9 086 MW</td>
<td></td>
</tr>
<tr>
<td>Import – Export Saldo</td>
<td>5,5 TWh</td>
<td></td>
</tr>
</tbody>
</table>

Source: MEH 2008

**Gas**

<table>
<thead>
<tr>
<th>Category</th>
<th>Hungary</th>
<th>Germany</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total consumption</td>
<td>14 Bcm/a</td>
<td></td>
</tr>
<tr>
<td>Gas production</td>
<td>3 Bcm/a</td>
<td></td>
</tr>
<tr>
<td>Gas peak</td>
<td>91,7 M m³/ day</td>
<td></td>
</tr>
<tr>
<td>Import</td>
<td>11 Bcm/a</td>
<td></td>
</tr>
</tbody>
</table>

Source: MEH 2008
Hungary has a strategic geographical position in the Central European energy supply networks

The Hungarian Grid-System / Export-Import in GWh

- Hungary is a net importer of electricity with strong interconnections
- Hungary has two major gas interconnections, the NETS project of MOL will enable further regional co-operation
- Both Nabucco and South Stream plans to cross the country
- Gas storage facilities improve security of supply and are extendable
High gas and low renewable share represents the primary energy mix of Hungary

Source: Eurostat
Hungary’s energy and gas dependency is high, but not without example in Europe.

### Total energy dependency
- % of net imports in gross inland consumption

### Natural gas dependency
- % of net imports in gross inland consumption

Source: Eurostat
Gas demand is driven by power plants and households, power demand by services

Gross gas consumption by sectors

- Households 141.7 PJ (30%)
- Industry 61.9 PJ (27%)
- Trade and local 120.7 PJ (14%)
- Power plants 131.2 PJ (29%)

Electricity consumption by sectors

- Households 41.3 PJ (25%)
- Industry 35.7 PJ (23%)
- Service 39 PJ (26%)
- Agriculture 3.4 PJ (11%)
- Transport 4.3 PJ (10%)
- Powerplants self consumption 18 PJ (3%)
- Network losses 16 PJ (2%)

Source: Hungarian Energy Office, 2008
The Hungarian energy industry in a nutshell

The privatisation of the Hungarian energy sector

Regulation – history, recent interventions and potential future

The banking environment

RWE in Hungary and its power plant developments so far

Next challenges for a cleaner power generation
Hungary privatised its power industry in 1995; Major European players dominate the sector

- The Hungarian Electricity Works Trust (MVMT) – including all Hungarian power plants and power supply companies – was founded in 1963

- After the political changes in 1993 6 regional energy distribution companies and all power plants were hived off in separate joint stock companies and the MVMT continued its operation in a Holding structure as MVM Rt.

- During the privatizations from 1995-97 the major power plants – except the nuclear power plant Paks – and the six power supply companies were sold to foreign investors

- In order to being able to sell the power plants, parallel to the privatization contracts long-term PPAs were concluded with the power plants

- After privatization MVM remained the Hungarian system operator and the owner of the transmission network, a nuclear and some smaller back-up power plants
The privatisation of the gas sector took place in several steps between 1995 - 2005

> GDCs were split off the former oil and gas trust OKGT and were privatised parallel to the power sector in 1995 to major European industry players

> MOL remained the owner of all transport network assets and storage facilities, as well as the import and wholesale contracts and was privatised in several steps over the Budapest Stock Exchange

> MOL’s gas trading and storage business units, as well as its 50% stake in importer Panrusgas were sold to E.On Ruhrgas in 2004

> Gas transport and indigenous E&P has remained with MOL who built up sales and re-entered the storage business

> E.ON and GdF-SUEZ consolidated their gas sales activities after the unbundling of the GDCs
The international investors faced several challenges after the privatisation

- Good technical knowledge and equipment was not accompanied by state of the art commercial and financial skills
- Low electricity and gas tariffs did not cover costs, therefore companies were unprofitable
- The network business was represented by a high level of technical and commercial losses
- A strategic asset management for the networks had to be developed
- Organisations were hierarchic, complicated and overstaffed with low productivity in comparison to Western Europe
- Due to high level of in-house services no „make or buy” opportunities were there to optimise costs
- A customer orientated and entrepreneurial company culture was missing
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Energy regulation in Hungary has had a history and experience of over 13 years

The Hungarian Energy Office was established by law in 1993

1. Permanent development in its methods and expert team
2. Stronger control than in Germany and in most Central and Eastern European countries
3. Strong international co-operation of regulators in the region and world-wide

1997 1999 2001 2003 2005 2007 2008 2009 2011 2012

- First price and cost supervision, Price period
- Price and cost supervision, Price period
- Price and cost supervision, Price period
- Last price and cost supervision, Price period

- Market opening 1st Phase
- First decision of Energy office about guaranteed Services
- Legal Unbundling
- Accounting unbundling
- Full market opening
- Tendering of Net service and consumer service activities
- Government Decree about the service quality parameters
Although both gas and power markets are fully liberalised, households and small entities have an access to regulated prices.
Hungary preserved the duality of regulated and liberalised power markets

> Duality of open and regulated market with the right of eligible customers to choose the more favorable
  – heavy fluctuation of open market volumes depending on price level (see 2007)

> As of 1.1.2008 new market model:
  – Universal Service Providers (USP) established for households and small businesses (>3*50A)
  – Obligatory open market supply for non-USP-eligible customers

> From 1.1.2009: USP access granted for public institutions and small businesses up to 3*63A (←→original plan)
Gas market opening took place similarly to power: households and SME still regulated
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Next challenges for a cleaner power generation
OTP and the subsidiaries of international banks share the Hungarian financial market

- OTP Bank (HU): Market share: 29.4% Balance sheet total: 9,755
- K&H (BEL): Market share: 10.5% Balance sheet total: 3,065
- MKB Bank (D): Market share: 10.0% Balance sheet total: 3,107
- Erste Bank (A): Market share: 9.8% Balance sheet total: 2,903
- CIB Bank (I): Market share: 9.4% Balance sheet total: 2,757
- Raiffeisen Bank (A): Market share: 8.5% Balance sheet total: 2,461
- UniCredit (A): Market share: 6.5% Balance sheet total: 1,737
- Budapest Bank (USA): Market share: 3.1% Balance sheet total: 901
- Citibank (USA): Market share: 2.8% Balance sheet total: 642
- FHB (H): Market share: 2.6% Balance sheet total: 801
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RWE in Hungary and its power plant developments so far

Next challenges for a cleaner power generation
RWE Hungária is active both in upstream and downstream in the Hungarian energy sector.

RWE AG

RWE Hungária

CEO

CFO

Sales Electricity

Gas

Generation

IT

RWE IT GmbH

Electricity

Gas

Water

Generation

IT Service

RWE IT Magyarország

- ELMŰ 55.3%
- ÉMÁSZ 54.3%
- ELMŰ / ÉMÁSZ KSG 70%
- ÉMÁSZ DSO 30%
- ELMŰ / ÉMÁSZ NSG 65%
- ÉMÁSZ DSO 35%
- MÁSZ 50%
- Sinergy 50%

- FŐGÁZ 49.8%
- TIGÁZ 44.2%
- FŐGÁZ DSO 100%
- TIGÁZ DSO 100%

- BWW 12.5%
- KW Mátra 50.9%

RWE Hungária
The Hungarian electricity market is dominated by RWE and E.ON, national champion MVM is catching up.

### Market shares (Sales) of major investors

<table>
<thead>
<tr>
<th></th>
<th>USP-market</th>
<th>Free market</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RWE</strong></td>
<td>6,0** (43%)</td>
<td>5,0 (24%)</td>
<td>11,0 (31%)</td>
</tr>
<tr>
<td><strong>E.ON</strong></td>
<td>6,1 (44%)</td>
<td>5,8 (27%)</td>
<td>11,9 (34%)</td>
</tr>
<tr>
<td><strong>EdF</strong></td>
<td>1,8 (13%)</td>
<td>2,6 (13%)</td>
<td>4,4 (13%)</td>
</tr>
<tr>
<td><strong>MVM</strong></td>
<td>-</td>
<td>1,9 (9%)</td>
<td>1,9 (5%)</td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td>-</td>
<td>5,8 (27%)</td>
<td>5,8 (17%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>13,9 (100%)</td>
<td>21,1 (100%)</td>
<td>35,0 (100%)</td>
</tr>
</tbody>
</table>

Grid loss is excluded.

*Electricity sales in TWh (market share in %)*
The major players of the Hungarian gas market are big European utilities and EMFESZ

Market shares of the distribution companies

Market shares of investor companies

Sales, Mm³/y (market share %) (*)

<table>
<thead>
<tr>
<th></th>
<th>Regulated market</th>
<th>Free market</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bp+RWE (FŐGÁZ)</td>
<td>1 100 (23%)</td>
<td>920 (14%)</td>
<td>2 020 (18%)</td>
</tr>
<tr>
<td>ENI+RWE (TIGÁZ)</td>
<td>1 770 (36%)</td>
<td>510 (8%)</td>
<td>2 280 (20%)</td>
</tr>
<tr>
<td>E.ON</td>
<td>870 (18%)</td>
<td>1 470 (22%)</td>
<td>2 340 (20%)</td>
</tr>
<tr>
<td>GdF</td>
<td>1 100 (23%)</td>
<td>960 (14%)</td>
<td>2 060 (18%)</td>
</tr>
<tr>
<td>EMFESZ</td>
<td>(0%)</td>
<td>1 700 (26%)</td>
<td>1 700 (15%)</td>
</tr>
<tr>
<td>Others</td>
<td>20 (0%)</td>
<td>1 035 (16%)</td>
<td>1 055 (9%)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>4 860 (100%)</td>
<td>6 595 (100%)</td>
<td>11 455 (100%)</td>
</tr>
</tbody>
</table>
The ageing of the Hungarian power plants requires new gas, nuclear and renewable developments

**Fuel mix in capacity in MW total**
- 8,895 MW*
  - Nuclear: 1,629 MW (18%)
  - Gas and oil: 4,844 MW (54%)
  - Coal: 2,000 MW (23%)

**Fuel mix in generation in total 37,1 TWh**
- Nuclear: 6,307 TWh (17%)
- Gas: 14,480 TWh (36%)
- Coal/lignite: 13,356 TWh (37%)
- Renewables: 2,597 TWh (7%)

* MAVIR estimates for 2010

**Remark:** capacity and generation are in gross values.
Sinergy – the contracting subsidiary of RWE is a market leader in cogeneration plants for industry and district heating plants with a total investment volume of 257 million €

**BC Power Plant, Kazincbarcika**

- **Project:** Development of the BorsodChem industrial power plant project, long-term operation and maintenance of the power plant
- **Client:** BC-Erőmű Kft
- **Project cost:** EUR 44 million
- **Project years:** 2000 – 2001
- **Project location:** Kazincbarcika, BorsodChem Zrt.
- **Installed capacity:** 50 MW electric

**TVK Power Plant, Tiszaújváros**

- **Project:** Implementation of the TVK industrial power plant project, long-term operation and maintenance of the power plant
- **Client:** TVK-Erőmű Kft.
- **Project cost:** EUR 53.4 million
- **Project years:** 2002 – 2004
- **Project location:** Tiszaújváros, TVK Nyrt.
- **Installed capacity:** 35 MW electric
RWE Hungária has developed the lignite fired Mátra plant in several steps – What’s next?

<table>
<thead>
<tr>
<th>Main functions: lignite, biomass and gas based electricity production</th>
</tr>
</thead>
<tbody>
<tr>
<td>936 MW, 85% coal; 10% biomass; 5% gas</td>
</tr>
<tr>
<td>approx. has 15% share of the Hungarian electricity production</td>
</tr>
<tr>
<td>Coal mining from two own mines (Hungary’s largest lignite-occurrence)</td>
</tr>
</tbody>
</table>

| The flue-gas desulphurization system at the Mátra Power Plant filters 180 thousand tons sulphur a year |
| Investment: 1,5 bln. HUF |
| Year of construction: 2001 |
| Utilization of gypsum for the construction industry |

| Heat recovery topping gas turbine (2x33 MW) |
| Year of construction: 2007 |
| Investment: 17 bln. HUF |

| Biomass preparation equipment for co-firing (103 MW) |
| 10% of the electricity from biomass from 2008 (40% of the total Hungarian green electricity production) |
| Annual biomass consumption is: 6.826 PJ (2008) |

| Due to environmental concerns and CO2 emissions planned 400 MW lignite block was stopped |
| Operating licenses of existing blocks run until: 2025 |
| Utilization of the Mátra site for future projects is presently under survey (gas/ renewable/ etc.)|
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Next challenges for a cleaner power generation
# Key challenges of a future cleaner power supply

## Reduction of carbon emissions
- State of the art technologies and efficiencies
- Increase of renewable share in power generation
- Efficiency in energy consumption

## Increasing security of supply
- New reliable equipment
- Flexibility of operation
- Diversified supply routes, reliable sourcing

## Enhanced competitiveness
- Mature and liquid energy markets
- Access to networks

## Investments and local employment
- Stable regulatory environment, risk mitigation
- Reliable investors with long term view
- Convincing return on investment
Transmission is the real bottle-neck for development / utilization of power plants

Alessandro Clerici – ABB SpA

“Clean Electricity Production Forum”
Geneva, 22 November 2010
- The real bottleneck in electrical systems is coming from the transmission networks, especially in Europe.

- There is no possibility of an actual electrical European integrated market without solving the problem of new interconnectors and optimal use of the existing ones.

- Considering the always longer times to get authorisations and to realise construction of new OHTL's (Overhead Transmission Lines) the importance to maximise the utilisation / upgrading of existing transmission infrastructures is becoming of paramount importance.
Among the others the transformation of AC lines to DC ones (3-4 times increase of transmissible power with same conductors and modifications to insulators and towers) should be analysed.
Possible transformation of Italian 220 kV lines to HVDC ones
Possible transformation of 380 kV Saudi OHTL’s
• Smart grid concepts applied to Transmission could be implemented soon and a better utilisation of OHTL’s and trafos could be of substantial help to maximise performance of existing assets.

• The on line monitoring of sags / temperature of line conductors and of winding temperature of interconnecting trafos combined with their diagnostic is a step in the above direction.
The France – Spain interconnection is under discussion since 25 years; the average time from initial thinking to commissioning of a new 400 kV line of some tens of km is 12/15 years in Europe while in China for 2,000 km of a new $+800$ kV UHVDC line has been less than around 3 years. How can Europe compete?
Generation projects in CEE Region
The experience of Slovenske Elektrarne

Nicola Cotugno
Director of Power Division

Geneva, November 22nd 2010
Enel Group overview
Installed capacity, production and sales

North America
- 0.8 GW
- 2.4 TWh

Central America
- 0.4 GW
- 2 TWh

Colombia
- 2.8 GW
- 12.7 TWh
- 7.7 TWh

Peru
- 1.7 GW
- 8.7 TWh
- 5.3 TWh

Chile
- 5.6 GW
- 22.7 TWh
- 6.8 TWh

Brazil
- 1.1 GW
- 3.9 TWh
- 15 TWh

Argentina
- 1.1 GW
- 3.9 TWh
- 15 TWh

Iberia
- 22.1 GW
- 71.5 TWh
- 104.6 TWh

Morocco
- 0.1 GW
- 0.9 TWh

France
- 5.3 GW
- 19.9 TWh
- 1.3 TWh

Italy
- 40.4 GW
- 84 TWh
- 127.3 TWh

Slovakia
- 0.1 GW
- 0.3 TWh

Russia
- 8.2 GW
- 39.1 TWh
- 19.7 TWh

Bulgaria
- 0.8 GW
- 3.7 TWh

Greece
- 0.1 GW
- 0.3 TWh

Romania
- 9.6 TWh

Data pro-forma full year 2009

An international integrated energy player

Fostering Investment in Electricity Generation in CEE and Central Asia – Geneva, Palais de Nations
SE is the leading generation Company in SK
A diversified production portfolio

<table>
<thead>
<tr>
<th>Plant</th>
<th>Installed Capacity</th>
<th>Nº of Units</th>
<th>Mix %</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBO 3&amp;4</td>
<td>1000 MW</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>EMO 1&amp;2</td>
<td>940 MW</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>EVO</td>
<td>880 MW</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>ENO</td>
<td>518 MW</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Hydro (1)</td>
<td>2 399 MW</td>
<td>34</td>
<td>42</td>
</tr>
<tr>
<td>Total</td>
<td>5 737 MW</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) As of today, including Gabčíkovo hydro plant which is not owned but operated by SE

Fostering Investment in Electricity Generation in CEE and Central Asia – Geneva, Palais de Nations
A snapshot on SE
2009 key figures

<table>
<thead>
<tr>
<th>€</th>
<th>Revenues</th>
<th>2,045</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EBITDA</td>
<td>828</td>
</tr>
<tr>
<td></td>
<td>Net Profit</td>
<td>392</td>
</tr>
<tr>
<td></td>
<td>Net Debt</td>
<td>187</td>
</tr>
<tr>
<td></td>
<td>Headcount</td>
<td>5,335</td>
</tr>
</tbody>
</table>

SE Installed Capacity 1
(MW)

- Hydro: 5,617, 43%
- Thermal: 67%, 25%
- Nuclear: 19,6, 32%

SE Power Generation 1
(TWh)

- Hydro: 21%, 12%
- Thermal: 67%
- Nuclear: 32%

- 88% of generation is CO2 free – determining a low CO2 intensity
- Strong EBITDA margin 41% - #3 among European utilities
- Net Debt/EBITDA ratio 0.2 - industry avg 2.8

1) Including Gabčikovo hydro plant which is not owned but operated by SE

Fostering Investment in Electricity Generation in CEE and Central Asia – Geneva, Palais de Nations
Fostering Investment in Electricity Generation in CEE and Central Asia – Geneva, Palais de Nations

Changeover after acquisition
Rising Company efficiency

EBITDA and Net debt development

Pursuing continuous improvement...
- Boosting performance of generation asset
- Leaning culture and focusing on process efficiency
- Resources and competence approach, talents pooling

... together with a strong push for developing market environment in SK

until 2000
Administrative price establishment (URSO, Ministry)

2000 – 2005
Big bilateral contracts with Distribution companies

2005 – 2007
One big tender (auction) for whole production

2008
Sales splitted into more auctions and bilaterals

2009
Mainly continual sales on broker platforms and PXE exchange

Fitch rating was continuously improved from BB+ in 2006 to the current level (2010) of BBB
The challenge of capacity developments
Implementing a sustainable solution in SK

Priorities:
• Sufficient volume of electricity
• Clean electricity production
• Competitive and affordable prices

Defining specific projects leveraging on asset background and country’s technologies potential

<table>
<thead>
<tr>
<th>Nuclear</th>
<th>Thermal</th>
<th>Renewables</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Baseload capacity covering most of energy needs</td>
<td>• Keeping as flexible source</td>
<td>• Focus on Biomass</td>
</tr>
<tr>
<td>• Safe and clean production</td>
<td>• Lowering weight in portfolio</td>
<td>• Exploring opportunities in small hydro</td>
</tr>
<tr>
<td>• Competitive source</td>
<td>• Investment in refurbishment of existing asset</td>
<td></td>
</tr>
</tbody>
</table>

Nuclear as a part of sustainable solution
EMO 3,4 is the largest investment in the region
A part of a wider nuclear development plan

• **Largest** single current investment of SE & Enel – **EUR 2.775 bn**

• **Consolidated design with evolutionary safety measures** assessed positively by the European Commission and approved by the Nuclear Regulatory Authority

• **Short time** from investment decision to operation

<table>
<thead>
<tr>
<th>Nuc Investments</th>
<th>Power Plant</th>
<th>Capacity (MW)</th>
<th>Date of Commissioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBO V2 Uprate</td>
<td>142</td>
<td>2007-2010</td>
<td></td>
</tr>
<tr>
<td>EMO 1,2 Uprate</td>
<td>140</td>
<td>2008, 2018-2019</td>
<td></td>
</tr>
<tr>
<td>EMO 3&amp;4</td>
<td>880</td>
<td>2012-2013</td>
<td></td>
</tr>
<tr>
<td>EMO 3&amp;4 Uprate</td>
<td>140</td>
<td>2015-2016</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1,302</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

• **Competitive economics, operational flexibility** due to the small units size of reactor and steam turbines – **sustainable energy production**

• **Valid Building Licence; EIA for Operation** completed in 2010
EMO 3&4 investment impacts
The relevance of the project

**Project is fully financed by SE**
- The project didn’t benefit of any kind of support

**Contribution to boost SK economy in crisis period**
- Out of 3 bn €, 2,5 bn € already contracted (45% out of SK)
- ~ 2500 workforce involved in construction right now, soon rising to ~ 4000

**Recreating a nuclear energy platform in SK**
- Opportunity for all stakeholders to play an active role in unique project in EU
- Stimulating R&D, innovation centers and universities
- SE and contractors could benefit of positive momentum to be involved in other international projects

**A long term guarantee for country energy security**
- With about 7 TWh of additional capacity, EMO3,4 will massively contribute to restore domestic long position in generation until 2030
Investments on Thermal Power Plants
Reshaping the role in generation portfolio

**Relevant background elements:**
- Lack of competitive coal/lignite domestic resources
- Few logistic infrastructures to guarantee diversification and competitive fuel supply
- Baseload capacity gap already covered by nuclear projects

**Strategic goals:**
- Increase efficiency, fuel diversification and environmental performance of production fleet
- Focus on flexible portfolio support through modulation and back up services
- Priority to refurbishments of existing assets

<table>
<thead>
<tr>
<th>Power Plant</th>
<th>Installed Capacity (MW)</th>
<th>Description and Status of the Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENO B (refurbishment)</td>
<td>2 x 110</td>
<td>Environmental retrofitting of existing equipment before 2015. Prolonging use of domestic lignite with positive impact on regional mining industry</td>
</tr>
<tr>
<td>ENO A (new)</td>
<td>60</td>
<td>Replacement of decommissioned boilers to secure heat supply to the region. Burning biomass and municipality wastes.</td>
</tr>
<tr>
<td>EVO 5 (reconstruction)</td>
<td>110</td>
<td>Renewal EVO I unit 5 after the fire accident in April of 2009. Installation of new turbine and generator.</td>
</tr>
<tr>
<td>EVO 5,6 Biomass</td>
<td>tbd</td>
<td>Equipments to support higher level of biomass cofiring. Require developments of current regulatory support framework.</td>
</tr>
</tbody>
</table>

More than 140 M€ investments
Final remarks

- Centrel is a **fast developing electricity region** where important capacity projects are going to be implemented in the next future.

- Local Electricity Markets faced great steps during the last few years, getting closer to most developed European markets
  - Full liberalization
  - Active spot market
  - Market coupling CZ-SK
  - Broker platforms and Exchange
  - Developments of Intraday

- Transparency of demand and supply
- Liquidity growth
- Market driven prices in line with DE ones
- Increased number of players

- Nevertheless, some **gaps** are still preventing the passage from domestic to regional mkt.

- The relevance of capacity projects envisioned require the consolidation of an **efficient regional market** to reduce investors risks.

- Developments of **crossborder infrastructures** as well as of the **internal grids** are needed to reinforce the system backbone.

- **Coordinated and harmonized market and regulatory mechanisms** are inevitable to foster regional integration.
Thank You for Attention!
Energy investments: Siemens Financial Services perspective

Johannes Schmidt
CEO Equity Investments and Project Finance
Siemens Financial Services GmbH

Geneva, November 22, 2010
## Investing in energy projects: an overview

### Rising energy demand
- Globalization and urbanization
- In the absence of regulatory overhaul, energy demand to grow 49% from 2007 to 2035
- Over 1.5 billion people have no access to electricity

### Climate change – a major challenge
- World energy-related CO2 emissions to rise 43% from 2007 to 2035
- Efficient technology could lower annual CO2 emissions by 18% to 22%

### Growing focus on renewable energy
- Alternative power accounts for a quarter of global power-generating capacity
- Renewables to account for 50% of newly installed power capacity in 2010/2011

### Government gives impetus to clean energy
- Allocation of $521 billion as part of “green stimulus” programs globally
- Public-private partnership model gaining ground
Change: Project finance in Eastern Europe has become more difficult

Quelle: Dealogic, 2010
<table>
<thead>
<tr>
<th>Topic</th>
<th>SFS Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project financing</td>
<td>▪ Project financing in start-up and development phase</td>
</tr>
<tr>
<td></td>
<td>▪ Equity investments</td>
</tr>
<tr>
<td>Advisory on export and project financing</td>
<td>▪ Structured finance, external debt finance, letters of credit, guarantees</td>
</tr>
<tr>
<td>Equipment financing</td>
<td>▪ Leasing, performance contracting, loans, managed services, hire purchase</td>
</tr>
<tr>
<td>Insurance</td>
<td>▪ Industrial insurance solutions</td>
</tr>
<tr>
<td>Treasury</td>
<td>▪ Treasury services and solutions</td>
</tr>
<tr>
<td></td>
<td>▪ Credit warehouse</td>
</tr>
</tbody>
</table>
Preconditions for financing energy projects in today’s environment

- Sound project economics
- Robust contractual and legal framework – permits and government approvals
- Low construction risk – including proven technology, cost and schedule control and contractor experience
- Low political risks, especially in emerging markets
- Extensive due diligence – technical, environmental, economic and legal factors
- Credible partners and credit-worthy counterparties – including suppliers
The goal: create win-win situations that produce stable earnings for public and private partners

From an unstable equilibrium…

Uncertainty-filled projects, e.g., because of:
- untenable access to risk sharing
- high bidding costs
- excessively long contract terms
- lack of competition

Error intolerance

Win-win situation

…to stable earnings for the public and private sectors

Project quality criteria (example: UK):
- determination of service to be outsourced
- risk sharing
- earnings expectations
- key conditions and preconditions
- bankability
- binding schedule
- self-commitment of sponsors
- statutory process

+5-10%
Example 1: Criteria for successful equity investments

Infrastructure projects

- Emphasis on financing the development, construction and operation of infrastructure projects
- Capital requirements of the projects range from around €100 million to more than €1 billion
- Mostly minority holdings of 10 to 40 percent
- Specialization in energy, transportation, healthcare, airports
- Company influence necessary (e.g., through representation in company bodies)
- Exit prospects within five years
- Insurance for country risks where possible and economically viable. Use of export insurance to improve risk-return profile
- Strict adherence to market conditions when Siemens serves as a supplier
Example 2: key success factors for successful Public Private Partnerships

<table>
<thead>
<tr>
<th>Identifiability</th>
<th>The interfaces to the economic environment must be clearly identifiable and definable. Example: power plant vs. railroad network</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable demand</td>
<td>Due to the long service life, efficient risk sharing requires a reliable basis for long-term planning Example: energy and water supplies, mobility</td>
</tr>
<tr>
<td>Low risk of substitution</td>
<td>Similarly, the risk related to the introduction of competing solutions and technology must be limited throughout the project Example: bridges / tunnels in road construction</td>
</tr>
<tr>
<td>Flexible contract design</td>
<td>Sustainable solutions must be project focused, not based on standardized stipulations Transportation sector example: Arlanda airport rail connection Stockholm</td>
</tr>
<tr>
<td>Low risk of “politicization”</td>
<td>It must not be possible to use the project for political purposes Example: administrative prices as an election campaign tool (local public transport, energy, water, disposal)</td>
</tr>
</tbody>
</table>
Financing energy projects in Eastern Europe: There are opportunities

- Putting the money behind the best technology and the right projects is how Siemens makes a difference.
- Efficiency – mind you – is the opposite of waste.
- Efficiency improvements (do more with less) through technology by far the biggest lever.
- Government efforts to stimulate the economy can provide a boost to infrastructure spending.
- Environmental considerations will play a major role in government action.

Of particular importance:
- Sound project economics
- Credible partners
- Contractual and legal framework

Efficiency – mind you – is the opposite of waste.

Putting the money behind the best technology and the right projects is how Siemens makes a difference.
Questions & answers
Financing and investment perspectives

UNECE-e8-EBRD-WEC
Clean Electricity Production Forum
22nd – 24th November 2010
CEE the financing market

Recovering lenders appetite ... however, tennors still short
CEE the financing market

Average pricing for BBB-rated companies moved down:
3Q ... 88 bps compared to 134 bps in 2Q

Average pricing for A-rated companies moved down to 72 bps in 3Q
**CEE the financing market**

**Governmetal CDS**

<table>
<thead>
<tr>
<th>CDS IN CEE COUNTRIES (5Y CDS)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Country</strong></td>
<td><strong>5OCT</strong></td>
<td><strong>1NOV</strong></td>
</tr>
<tr>
<td>Hungary</td>
<td>304,3</td>
<td>281,9</td>
</tr>
<tr>
<td>Poland</td>
<td>133,3</td>
<td>114,5</td>
</tr>
<tr>
<td>Czech republic</td>
<td>81,7</td>
<td>82,0</td>
</tr>
<tr>
<td>Slovakia</td>
<td>82,5</td>
<td>72,3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CDS IN WESTERN EUROPE (5Y CDS)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Country</strong></td>
<td><strong>5OCT</strong></td>
<td><strong>1NOV</strong></td>
</tr>
<tr>
<td>Greece</td>
<td>739,84</td>
<td>856,7</td>
</tr>
<tr>
<td>Portugal</td>
<td>408,06</td>
<td>402,8</td>
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<tr>
<td>Italy</td>
<td>195,27</td>
<td>177,96</td>
</tr>
<tr>
<td>Spain</td>
<td>227,65</td>
<td>228,15</td>
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<tr>
<td>Belgium</td>
<td>127,74</td>
<td>123,6</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>64,63</td>
<td>64,44</td>
</tr>
<tr>
<td>Germany</td>
<td>37,745</td>
<td>35,65</td>
</tr>
</tbody>
</table>
CEE the financing market

Private sector

Index iTRAXX Europe (the most liquid 5Y EUR CDS of 125 important European companies) demonstrates dramatic development on European market. Index is back on the level of 91.3 bps.
# CEE the financing market

<table>
<thead>
<tr>
<th>LOANS (NEW ANNOUNCEMENTS/ SIGNINGS)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Borrower</strong></td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td><strong>AUGUST</strong></td>
</tr>
<tr>
<td>Lukoil OAO</td>
</tr>
<tr>
<td>Oil/Gas/Russia</td>
</tr>
<tr>
<td><strong>SEPTEMBER</strong></td>
</tr>
<tr>
<td>MOL</td>
</tr>
<tr>
<td>Oil/Gas/Hungary</td>
</tr>
<tr>
<td><strong>OCTOBER</strong></td>
</tr>
<tr>
<td>E-ON Utility &amp; Energy/Germany</td>
</tr>
<tr>
<td>RWE Utility &amp; Energy/Germany</td>
</tr>
<tr>
<td>EdF Utility &amp; Energy/France</td>
</tr>
<tr>
<td>Vitol Oil &amp; Gas/Switzerland</td>
</tr>
</tbody>
</table>

www.csob.cz
## CEE the financing market

### BOND MARKET

<table>
<thead>
<tr>
<th>Borrower</th>
<th>Rating</th>
<th>Amount</th>
<th>Tenor</th>
<th>Price over mid-Swaps (bps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP</td>
<td>A2/A</td>
<td>EUR 1,000 m</td>
<td>4Y</td>
<td>Swaps+135</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EUR 1,000 m</td>
<td>7Y</td>
<td>Swaps+160</td>
</tr>
<tr>
<td>EDF SA</td>
<td>Aa3/A+</td>
<td>GBP 1,000 m</td>
<td>40Y</td>
<td>140 all in</td>
</tr>
<tr>
<td>Autostrade</td>
<td>A3/A-</td>
<td>EUR 1,000 m</td>
<td>7Y</td>
<td>Swaps+122</td>
</tr>
<tr>
<td>GDF Suez</td>
<td>Aa3/A</td>
<td>GBP 700 m</td>
<td>50Y</td>
<td>Swaps+150</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EUR 1,000 m</td>
<td>7Y</td>
<td>Swaps+60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EUR 1,000 m</td>
<td>12Y</td>
<td>Swaps+80</td>
</tr>
<tr>
<td>Alstom</td>
<td>Baa1/BBB+</td>
<td>EUR 500 m</td>
<td>5Y</td>
<td>Swaps+100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EUR 500 m</td>
<td>8Y</td>
<td>Swaps+130</td>
</tr>
<tr>
<td>Areva</td>
<td>BBB+</td>
<td>EUR 750 m</td>
<td>11Y</td>
<td>Swaps+105</td>
</tr>
</tbody>
</table>
**Three principal points of view**

**Governmental based financing**
- Only the state payment risk is taken

**Corporate approach**
- If negligible influence of the project on overall company performance. Traditional corporate financing approach.

**Project approach**
- SPVs with non/limited recourse to owners.
- Project finance
Owners and the Project company

Project company – SPV

- A newly established special purpose vehicle under which lenders’ would have either limited or non-recourse to the SPV’s owners.
- The financial standing is given by the owners’ involvement in form of equity and by actual economic performance of the project.
- The owners’ financial standing is based on similar approach like for the Corporate however compared with their financial obligations to the project company or the lenders.
Design, Construction, and Operating capabilities

Owners

– Related technical and implementation experience
– **Professional practice** managing and designing/constructing/operating similar activities for similar kind of similar volume project.
– **Reference projects** under the personal management having the same kind of technology, territory, etc.
– **Financial stability**
**Design, Construction, and Operating capabilities**

**Contractor’s expertise**
- **Track record** of successfully implemented similar projects supplied at similar volume at least.
- No negative signs in terms of quality and disputes with offtakers.
- **Financial standing** allowing to comply with liabilities under the EPC contract, considering also other contractor’s activities and liabilities running parallel with our project.

**Contracting requirements**
- EPC covering both (i) design, (ii) construction
- **fixed priced**, no reserve contract;
- **liquidity damages** covering lost revenues and increased costs due to delay in start up operation, etc;
- liquidity damages for lower output/availability compensating decreased revenues and/or increased costs to the level allowing repayment of the bank financing;
- **warranty package** covering Performance bond (bank L/C) or retention until project start, warranty in form of a bond (bank L/C) or retention over the EPC contractual price.
Design, Construction, and Operating capabilities

- **Specifically**, if decisive part of technology is to be purchased independently from the overall construction - **Clear risk sharing matrix** has to be identified in order to avoid potential disputes in case the liquidated damages/bonds are enforced.

- **Specifically**, for the O&M contracts: payments to the operator have to be based on **actual performance** and availability of the plant preferably with base fee and bonus/malus arrangement. Shortfalls have to be covered by liquidated damages, supported by related guarantee instrument. The penalty should allow repayment of the banks debt under justifiable risk valuation.
**Inputs & Outputs**

The key aspect is to achieve a long terms and fixed cash flow margin in order to allow predictable repayment of the financing debt and return to the borrower’s owner.

- **Inputs**, strong and reliable. Diversification could be an advantage in case of market change. Need to keep link to outputs.

- **Outputs**, key offtaker(s) with history and assumption of long term existence. Low payment risk. Principal source of revenues.

- **Payment mechanics**: „Take or pay“ or similar structures are frequently used. Also tolling approach possible for availability led schemes.


Conclusion

- The lenders appetite is increasing
- The liquidity is available
- However:
  - Long term political, regulatory and commercial stability is needed
  - Strong and experienced investors and contractors are soughted
  - Verified and implemented technology as an inevitable condition
CONTACTS

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director project finance
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E-mail: jtrojak@csob.cz
Financing Alternatives for Clean Power Generation in CEE

UNECE-e8-EBRD-WEC
Clean Electricity Production Forum

Gábor Kurutz, Partner

Geneva, 22-24 November, 2010
Agenda

Summary of Key Discussion Points

- Power Generation Assets from Bankers’ Perspective
- Financing Partners in various Phases of Investment Cycle
- Hungarian Track Record since mid 90ies’ Privatization
- Post Crises Trends in Financing – Key Issues
Summary of key discussion points (2/1)

Industry from Bankers’ Perspective
- Long asset life typically fits to long term financing (10 years+)
- Stable and forecastable regulatory framework required
- Required government support dependent on the broader regulatory context
- Foreign Exchange Risk: was/is a key factor to be considered

Role of different Financing Partners
- Supranationals: EIB, EBRD, IFC, Worldbank, ADB. etc.
- Export Credit Agencies (ECAs) and Eximbank(s)
- Strategic industry investors
- Financial investors
- Commercial Banks, Capital markets
Summary of key discussion points (2/2)

**Hungarian Experience**
- Rehabilitation of outdated facilities financed by Worldbank programmes w/o tested regulatory environment in the early 90’ies
- Privatization & launch of single buyer market model coupled with transparent regulatory framework
- Entry of large creditworthy industrial players from the mid 90ies
- Successful new projects supported by international and domestic commercial banks from mid 90ies
- Introduction of EU driven market liberalization measures requires new approach in financing

**Current Trends**
- Financial crisis significantly changed financing parameters
- Following some break banks are prepared to lend to quality projects
- Well prepared projects with strong sponsor support receive funding
- Fossil fired projects are more difficult due to uncertainties regarding carbon pricing in EU
- Shift in project pipeline to renewables (wind, biomass)
Agenda

Summary of Key Discussion Points

**Power Generation Assets from Bankers’ Perspective**

- Financing Partners in various Phases of Investment Cycle
- Hungarian Track Record since mid 90ies’ Privatization
- Post Crises Trends in Financing – Key Issues
Various risks considered by the banks

- Permitting / Authorization / Regulatory Risks
- Technology / Construction Risks
- Financeability Risks
- Long Term Operation & Maintenance Risks
- Market Risks (Price & Volume)
Technologies well known, but risk issues remain

**Technology**
- New technology risks
- Unique local circumstances
- Mitigation: commercially proven technology & local partners

**Technology Vendor / EPC Contractor**
- Equipment suppliers w/o EPC contractor
- Credit quality of EPC
- Mitigation: „Tier 1” EPC

**O&M**
- New technology risk for Sponsor
- Not experienced O&M contractor
- Mitigation: involvement of proven O&M firm
Agenda

Summary of Key Discussion Points

Power Generation Assets from Bankers’ Perspective

Financing Partners in various Phases of Investment Cycle

Hungarian Track Record since mid 90ies’ Privatization

Post Crises Trends in Financing – Key Issues
Typical power plant project phases

Development
- Basic Design
- Permitting
- Negotiation of key supplier contracts (EPC)
- Negotiation of Fuel Supply Agreement(s) (FSA)
- Negotiation of Power Offtake Agreements (PPA)
- Negotiation of Green Certificate Offtake or Carbon Quota Acquisition arrangements
- Negotiation of financing arrangements

Construction
- Turn-key construction
- Grid connection works
- Test run
- Guarantee tests
- Commissioning
- Beginning of warranty period

Commercial Operation
- Start of normal commercial operation

Project Risks decrease over time
Taylored financing to specific investment phases

<table>
<thead>
<tr>
<th>Funding Source</th>
<th>Preparatory Phase/Development</th>
<th>Construction / Commissioning</th>
<th>Commercial Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity from Sponsor</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Equity from Strategic Investor</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Equity from Financial Investor</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Senior Non-Recourse Debt</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Corporate Debt</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Supranational Institutions (EBRD, EIB, Worldbank, IFC)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>ECAs, Eximbank(s)</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

- **Early phase investment activities** (basic design, permitting, etc.): financed by equity provided by sponsors/government/investment partner potentially supported by Supranational Agencies
- **Construction and commercial operation phases**: financed by a combination of equity provided by sponsor/government/industry investor/financial investor whilst senior project finance loan is a customary debt instrument
- **Capital markets** offer a late investment phase opportunity to finance power projects typically after construction risk is removed
Agenda

Summary of Key Discussion Points

Power Generation Assets from Bankers’ Perspective

Financing Partners in various Phases of Investment Cycle

Hungarian Track Record since mid 90ies’ Privatization

Post Crises Trends in Financing – Key Issues
Regulatory Environment - Financial Structuring

Prior toPrivatization in 1995
- Regulatory Environment deficiencies
- Rehabilitation of outdated fossil fired plants
- New CCGT units
- Equity injection by Government
- World Bank funding to MVM (the integrated state owned electricity utility)

From Privatization to EU Entry & Market Liberalization
- Single Buyer Market Model coupled with transparent regulatory framework
- New CCGT units
- Rehabilitation of old fossil (lignite, gas) fired units
- Industrial and CHP power plants
- Equity funding by strategic investors and accumulated cashflow of producers
- Debt funding by commercial banks via classical Project Finance facilities
- LT PPAs
- FCY Debt

Currently under Open Market Environment
- Liberalization triggered by EU Directives
- Energy policy driven by EU targets
- Focus on Co-Generation, Renewables (wind, biomass)
- Equity from utilities, financial investors, local investors
- Project finance, corporate debt via parent company
- FX risk becomes a main risk factor
- Robust project structures necessary
Agenda

1. Summary of Key Discussion Points
2. Power Generation Assets from Bankers’ Perspective
3. Financing Partners in various Phases of Investment Cycle
4. Hungarian Track Record since mid 90ies’ Privatization

Post Crises Trends in Financing – Key Issues
## Significant Impact on Attitude of the Financial Sector

<table>
<thead>
<tr>
<th>International Banks</th>
<th>Capital markets</th>
<th>Supranationals / Multilaterals</th>
<th>ECAs &amp; Exims</th>
</tr>
</thead>
</table>
| - Increased funding cost, risk capital constrains, limited syndication market  
- Uncertainties regarding long term interest rate development, shorter tenors  
- Shift in strategy towards projects in developed and matured markets (EMEA and Asia Pacific were the worst hit regions and energy was the worst performing sector) | - Still limited depth of capital markets  
- Competition for funding with other asset classes  
- Some small sized capital market transactions successful on local markets | - Significantly increased role of supranationals in EU member countries  
- EBRD and IFC back to countries which were not any more priority investment countries  
- Supranationals act complementary to other lenders and investors | - ECA covered financial solutions are important not only in emerging markets  
- ECA’s cannot replace banks, but can help them  
- ECA’s role is to cover extraordinary risk and make sure good deals get done |

Global project finance (Debt&Equity) **decreased by 38 per cent in 2009!**  
But the good news is that funding is available for Quality Projects from 2010!
Relevant structural issues in financing (2/1)

- Long term projects with significant long-term operation risks
- Banks focus on reliable sponsors with the ability to fund development and secure equity
- Track record in similar investments required

**Tier 1 Sponsor with track record**

- Turn-key EPC contracts necessary
- Creditworthy EPC counterparties
- EPC contracts according to international standards (e.g. FIDIC)
- Adequate warranties
- Maintenance to be secured upfront at least for mid term

**Construction Risk Mitigants**
Relevant structural issues in financing (2/2)

**Market Risks**
- CEE electricity markets converge, but difficult to secure project finance on merchant basis
- Classical PPAs (‘style in 90ies) not possible any more, but in an amended form a must for fossil projects
- Fuel supply to be arranged on FSA basis
- Carbon risks shall be addressed upfront for fossil fired projects
- Regulatory risk re. renewables and small sized CHPs is acceptable based on feed-in tariffs

**Debt Structures / Pricing**
- Equity/Debt: min. 20-40% Equity, 60-80% Debt
- Tenors: upto 14-15 years possible
- Currency: local (HUF) and EURO
- Upfront Fees: 150-250 bps
- Margins: 250-400 bps
Your Contact

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gabor.kurutz@falkenburg.com | www.falkenburg.com
Key factors to secure funds for initial investment and for the sustainable replicability of projects

Piotr Piela

Geneve, 22 November 2010
Agenda

► Investment needs of electricity generation

► Polish example – Problems with investment and financing related decisions

► Acceleration of investment – suggestions for course of action
Key factors to secure funds for initial investment and for the sustainable replicability of projects
Fostering investment in electricity generation

Factors forcing investments in generation:
- climate protection,
- replacement investments in power generating capacity,
- increase in demand.

In the Central and Eastern European countries (similarly to all developed countries) the first two factors determine the investment level, in Central Asia the last one (as in all developing countries).

In Poland, climate protection is decisive factor in fostering investments - illustrated by the analysis of condensing power plants, which supply approximately 70% of electricity in Poland.
Key factors to secure funds for initial investment and for the sustainable replicability of projects
Investment in European electricity generation

Starting from the 80s of last century, the fast pace of investments in generation in the majority of European countries was slowed down due to the following reasons:

- decline in demand growth – increasing prices, inter alia, due to internalisation of external costs (interference with the environment), made the improvement in energy efficiency more attractive,
- higher capacity utilization - increased electricity trade between companies and elimination of monopoly supply,
- economic downturns – disturbances in the economies were present in the Central and Eastern European countries after the geopolitical changes in the late 80s and 90s and across the Europe in the recent years.

Over the last 20 years, investments in generation were focused on modernization. New generation capacity was mainly installed in the renewable energy and in combined sub-segments.

Currently we experience further development of renewable and combined energy sources as well as accumulation of replacements, accelerated by climate protection.
Polish example
In the last 20 years, electricity consumption was set at comparable level. In generation dominates lignite and hard coal.
Age of Polish generation units – shares in halves of exploitation periods

Cumulated capacity of generation units

64% of the generation units’ capacity is in the 2nd half of the exploitation period

Source: EY development based on the ARE (The Energy Market Agency) data
Replacements and modernizations of Polish generation units

Source: EY development based on the ARE (The Energy Market Agency) data

**Standard replacements – after 55 years, standard modernization after 25 years**
Replacements and modernizations in power plants forced by EU Climate Policy

Total capacity of generation units in the given age group

<table>
<thead>
<tr>
<th>Age groups of generation units (in years)</th>
<th>Total capacity of generation units in the given age group</th>
</tr>
</thead>
<tbody>
<tr>
<td>54 - 50</td>
<td>0</td>
</tr>
<tr>
<td>49 - 45</td>
<td>0</td>
</tr>
<tr>
<td>44 - 40</td>
<td>0</td>
</tr>
<tr>
<td>39 - 35</td>
<td>0</td>
</tr>
<tr>
<td>34 - 30</td>
<td>7000</td>
</tr>
<tr>
<td>29 - 25</td>
<td>6000</td>
</tr>
<tr>
<td>24 - 20</td>
<td>5000</td>
</tr>
<tr>
<td>19 - 15</td>
<td>4000</td>
</tr>
<tr>
<td>14 - 10</td>
<td>3000</td>
</tr>
<tr>
<td>9 - 5</td>
<td>2000</td>
</tr>
<tr>
<td>4 - 0</td>
<td>1000</td>
</tr>
</tbody>
</table>

Additional replacements forced by climate protection (preferred to 2020) (9013 MW)

Source: EY development based on the ARE (The Energy Market Agency) data
Level of investments in Polish generation segment in the period 10 -15 years

► Condensing power plants – approximately EUR 15 bn (10 GW x EUR 1.5m/GW),

► Combined Heat and Power (including biofuels) – approximately EUR 6 bn (3 GW x EUR 2.0m/GW),

► Renewable sources - approximately EUR 7.5bn (5 GW x EUR 1.5m/GW),

These capital expenditures are mainly related to reduction of CO2 emissions within the process of electricity generation (“decarbonisation” of electricity).
Financing of the investments in Polish generation segment (1)

► CHPs and renewable sources dispose of multiple support systems, which attract investors and debt capital. In case comparable support systems to already existing ones are maintained (currently new regulations in this field are being discussed), no extensive problems with financing of these generation sub-segments is seen.

► Investments in CHPs and renewable sources will probably cover the increased demand for electricity. It has to be noticed though that reaching 20% share of electricity from renewable energy in the total electricity generated may increase the price of electricity by approximately 25%.
Financing of the investments in Polish generation segment (2)

- The main problem is financing of condensing power plants’ construction, mainly by replacing existing capacity.

- The problems are wider:
  - exchange of not fully amortized units due to high cost of acquiring CO2 emission allowances is difficult for energy consumers to accept;
  - limited choice of technology:
    - replacement of existing units with efficiency equalling to 35 - 38% for new ones with supercritical parameters, reduces emission of CO2 by only 20-25%, and CCS installations are not mature yet,
  - introduction of CCGT gas units has limits related to gas availability and its price,
  - introduction of nuclear energy requires lengthy preparatory phase, moreover requires new law regulations and construction of supervisory infrastructure.
  - implementation of the program will take place with a growing share of acquisition costs of CO2 emission allowances, may not result in further increase in prices though – required high share of long-term debt instruments.
Investment challenges in the energy sector in the Central and Eastern Europe as well as Central Asia
Investment challenges in energy sector (1)

► Polish example illustrates the situation of electricity generation in the majority of European countries, especially within EU.

► To compare German economy also needs to „decarbonise” the electricity production, which is mainly generated with use of carbon and lignite, mostly in the over 30 years old units; the economy as a whole is very strong though.

► The Central and Eastern European countries belonging to EU have in general higher investment challenges arising from climate protection than the EU 15 and non-EU countries, this imbalancement is currently not fully compensated by the Cohesion Policy.
Investment challenges in energy sector (2)

- The countries of Central and Eastern Europe, which are not a Member States of EU and part of the countries of Central Asia (mainly from the former USSR) have on the one hand lower coercions resulting from decarbonisation pace, on the other hand worse conditions for acquiring financing for investments.

- Energy sector in Central Asian countries with high growth rate (China, Turkey) created conditions favouring investments. In general they do not have extensive problems with financing investments in generation as the high GDP growth rate enables to cover the required expenditures; it has to be noted though that they will also face the problem of decarbonisation and share of existing investments will generate stranded costs.
Acceleration of investment forced by climate protection
– suggestions for course of action
Problems related to exchange of power forced by climate protection

► The necessity to incur high expenditures in generation (also in network) for the investments not changing the level of commodity supply (i.e. electricity), is a big challenge for the restructuring economies of Central and Eastern Europe as well as of Central Asia.

► In the current situation, standard solutions not always ensure rationalisation of risk to the level required for undertaking investment decision and acquiring of financing. Level of undertaken investments is still too low.

► Effective implementation of „decarbonisation” policy of energy sector (and economies as a whole) requires adoption of extraordinary solutions.
Decarbonisation programs

► In the interested countries, the decarbonisation programs should be developed. These programs comprehensively implement the global climate policy formulated by UN and European policy formulated on the EU level.

► To implement these programs it is necessary to cumulate the State aid and to ensure wide support of non-commercial financial institutions.

► In Poland several governmental centres are working on such programs, mainly Ministry of Economy. The supporting actions from NGOs are focused in Social Council of the National Programme for Reduction of Carbon Emissions.

► National actions of NGOs should be supported by international initiatives such as Clean Electricity Production Forum.
Financing of decarbonisation programs

- The scope of works and scale of capital expenditures on implementation of decarbonisation programs justifies comparison to Marshall Plan, which enabled economies of numerous countries to quickly exit from the post-war slowdown.

- Current pace of economies’ decarbonisation forced by EU requires comparable extraordinary solutions.

- The reduction of risk is required, especially this related to implementation of new technologies and to unstable political and/or economic situation of numerous countries of discussed regions.

- The increase in availability of financing sources is required. This goal can be met by involving non-commercial financing institutions such as IBRD, EBRD and EIB.
Extraordinary solutions – general proposals

- Implementation of new, complex technologies (e.g. nuclear power, mature CCS) in the given country can be classified as construction of infrastructure and can benefit from the same conveniences in the preparatory phase, in organisation of financing and implementation phase. For example, in Poland this may apply to the first nuclear power plant with a capacity of 3000 MW.

- For the purpose of reducing technological and geopolitical risks in the selected countries, the creation of special insurance-guarantee decarbonisation fund should be considered on the UN and EU level (using the structures of IBRD, EBRD as well as EIB).

- IBRD, EBRD and EIB (and possibly other regions) can create a package of long-term debt instruments with preferential interest rates for spreading the capital costs of decarbonisation programs over many years. For the first units of nuclear energy the periods of 30-50 years may be required.
Extraordinary solutions – EU proposals

- The EU could develop the programs for development of renewable and combined energy as well as homogenised support systems for these programs.
- Climate-energy policy of EU should to the higher extent take into account economic analysis, and thus conditions of individual countries.
- Energy mix should be optimised and developed on the EU level taking into account retaining security of supply through use of local resources. Selected countries can be characterized by different energy mix.
- Such changes would decrease the expenditures on electricity (and heat) on the EU level and would lead the stream of investment funds to the most effective investments, e.g. for the construction of windmills the new spaces characterized by the best wind should be used (seaside – Northern and Southern Europe), generation and use of biofuels in the Central and Eastern Europe, France could be a leader in development of nuclear energy, Germany and Poland a leader in coal and lignite technologies etc.
Extraordinary solutions – proposals for Poland

► The burden of investments in coal and nuclear sources can be carried by large companies. In Poland there is place for only two such national companies. These entities should be formed quickly.

► Construction of the first two nuclear units should be organised and financed based on the infrastructure rules by use of PPP formula. One should aim at launching first unit in 2020, in accordance with preliminary assumptions.

► The Government should agree formally on EU forum on gradual phasing-out from coal-fired power. High-performance units (with the provision of „CCS ready” on the area of power plants) should be treated as a rightful technology.

► National Investment Plan developed under the application for the possibility of free allocation of CO2 emission certificates should be used to implement part of the programs of energy decarbonisation.

► From the beginning of IPP development in the USA, under consideration within the planned new solutions for renewable and combined energy is the use of „project finance” structures.
Summary

Implementation and maintenance of wide decarbonisation process of Central and Eastern European as well as Central Asian economies requires application of extraordinary solutions.

These solutions need to be carefully analysed and preferably verified in comparable conditions.

Investments characterized by high risk (pure coal and lignite technologies) and/or with lengthy payback period (nuclear energy) should be implemented with use of multiple PPP forms.

All this will ensure acceptable conditions for investors and creditors.
Thank you for your attention!
Example of applied solution

Installation for biomass co-combustion
55 MWe unit
COD June 2009
Max biomass share: ~55% by energy
Primary fuel: hard coal
Biomass fuel: pellets
Boiler type: powder fired
Biomass transportation

1000 m length conveyor
unloading and storage biomass in port
Overview of biomass handling system

A – eight-hour capacity pellet silo  B – cyclone filters  C – powder silo

The pellet storage silo is equipped with combustion sensors, explosion panels, spark detectors, and fire suppression systems.
Biomass powder from hammer mill is drawn through a minimal duct run (which is equipped with fire-suppression equipment) into cyclone filters to separate the biomass powder from the transport air.

Each mill has a separate duct led into a separate cyclone filter for system integrity and redundancy.

A  cyclone filter

B  duct
## Key figures

<table>
<thead>
<tr>
<th>Item</th>
<th>Figure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capex</td>
<td>&lt; 35 MEUR</td>
</tr>
<tr>
<td>Max achievable biomass utilization</td>
<td>&gt; 115 kt/a</td>
</tr>
<tr>
<td>Max achievable reduction of coal consumption</td>
<td>&gt; 75 kt/a</td>
</tr>
<tr>
<td>Max achievable reduction of CO$_2$ emission</td>
<td>&gt; 180 kt/a</td>
</tr>
<tr>
<td>Max achievable production of green electricity</td>
<td>&gt; 130 GWh</td>
</tr>
<tr>
<td>Max achievable revenues from green certificates incentives</td>
<td>&gt; 7.5 MEUR/a</td>
</tr>
</tbody>
</table>
Lessons learned from completion of nuclear power plant EMO 3,4
Case Study

Geneva, November 24, 2010
Juraj Chren, Centrel Business Development Manager
Slovenské Elektrárne, member of Enel group, is the leading generation company in Slovakia

Production portfolio composition

<table>
<thead>
<tr>
<th>Plant</th>
<th>Installed capacity (MW)</th>
<th>No of Units</th>
<th>Mix %</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBO 3&amp;4</td>
<td>1 000</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>EMO 1&amp;2</td>
<td>940</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>EVO</td>
<td>880</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>ENO</td>
<td>518</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Hydro (1)</td>
<td>2 399</td>
<td>34</td>
<td>42</td>
</tr>
<tr>
<td>Total</td>
<td>5 737</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) Including the Gabčíkovo hydro plant which is operated by SE Slovenské Elektrárne, member of Enel group, is the leading generation company in Slovakia

Completion of EMO 3,4 under progress
Case study – EMO 3,4 completion

Project background and history

**Restart of the project in the nuclear renaissance era**

- Construction of units 3 and 4 of VVER-440 nuclear power plant in Mochovce ("EMO 3,4") were started in 1986 and suspended in 1992
- Approximately 30% of technology had been supplied and 70% of civil works had been done
- Slovenske elektrárne, a.s. ("SE") acquired by Enel in 2006 (66%), started project of EMO 3,4 completion in 2009
- SE possesses wide experience basis regarding VVER nuclear technology gained with development, construction and operation of EMO 1,2 and EBO 1,2,3,4 power plants
- EMO 3,4 will be ready for the power up-rate after the phase-in scheduled to 2012 and 2013
- EMO 3,4 represents the biggest private sector investment in Slovakia ever.
# Main project data

<table>
<thead>
<tr>
<th><strong>Investment cost</strong></th>
<th>2 775 M€</th>
</tr>
</thead>
</table>
| **Construction period** | Unit 3 50 months  
                          Unit 4 58 months |
| **1st synchronization** | Unit 3 30.12.2012 |

| **Contractual strategy** | Multi-contract (more than 100 contracts)  
                          Slovenske elektrarne-Enel |
|--------------------------|-----------------------------|
| **Main Contractors** | Skoda JS, ASE, VUJE, Enseco, ISKE, PPA, Rolls Royce  
                          Enel (EPCM Contractor), Skoda Power, Brush, ZIPP  
                          Areva-Siemens |
| **Project Management Team** | approx. 420 (SE + Enel EPCM, outsourcing excluded) |
| **Site construction** | More than 15 million  
                          More than 3500 |
| **Peak number of resources** |
| **Peak number of workers** |
Case study – EMO 3,4 completion
Legal and regulatory framework

Slovakia – nuclear country

- Slovakia is nuclear country with well developed regulatory framework, established and working regulatory and nuclear oversight authorities and positive perception of citizens
- EMO 3,4 is in compliance with the IAEA standards and undergone all required international and local permitting and licensing procedures including EU commission inquiry
- SE with existing nuclear production has been in positive working relationship with all nuclear authorities and regulatory bodies.
- Nuclear project development in well experienced country represents considerable simplification and strongly supported project feasibility
- Some legislation change required, however was well defined in the privatization documents.
Case study – EMO 3,4 completion

Financing

Positive financial performance of SE made the financing easier

- SE successfully passed through the restructuring and cost reduction process after acquisition by Enel that enabled flexible financing structure
- Operating cash flow is the key source of EMO 3,4 financing
- Multi-purpose loan facility, secured by corporate cash flow, supplemented required funds
- No state or mother company guarantees has been required
- Project financing, typically used for financing of energy projects based on conventional or renewable fuels in the region, was not necessary.
Case study – EMO 3,4 completion
SE has become a healthy company and it made financing easier

SE’s changeover - a gradual process of continuous improvement

<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>Initial mapping of potential</td>
</tr>
<tr>
<td>2006</td>
<td>New shareholder</td>
</tr>
<tr>
<td>2007</td>
<td>Start up of initiatives</td>
</tr>
<tr>
<td>2008</td>
<td>Launch of key efficiency improving initiatives</td>
</tr>
<tr>
<td>2009</td>
<td>Further development of initiatives</td>
</tr>
<tr>
<td>2010-2013</td>
<td>New investment strategy at full speed</td>
</tr>
<tr>
<td></td>
<td>Continuous growth</td>
</tr>
</tbody>
</table>

EBITDA and Net debt development

Fitch rating was continuously improved from BB+ in 2006 to the current level (2010) of BBB

(M€)

- EBITDA
- INDEBTEDNESS
Case study – EMO 3,4 completion

Positive results support new investment strategy

SE investment plan

Over 3 bln EUR investments in SK

- Up-rate of EMO 1&2 and EBO 3&4
- Completion of EMO 3&4
- Refurbishment of thermal plants
- Biomass and small hydro projects
- Hub for commercial activities in the region
- Hub for expansion in region
- Leverage sustainable energy competences
- R&D activities

Further growth
Case study – EMO 3,4 completion

Energy policy and market conditions

Supportive energy policy and liberalized market

- Energy policy of Slovakia strongly supported EMO 3,4 completion to assure energy independence and fuel diversification.
- Decommissioning of two units of EBO V1 as a result of EU accession treaty resulted in lack of generating capacity in Slovakia.
- Slovak energy market has undergone robust liberalization process (including privatization of SE and distribution companies).
- Slovakia, member of ENTSO-E, is well covered with the high-voltage grid with considerable interconnections to surrounding countries.
- EU energy market integration supports export potential of SE.
Case study – EMO 3,4 completion

Favorable investment conditions

- Political stability, Slovakia is a member of EU, NATO and number of world trade, economic and security organizations
- Economic stability, country rating: A+ (S&P)
- Flat tax regime of 19% with 0% withholding taxes on dividends
- Currency stability - Euro has been adopted in 2009
- Highly skilled and experienced workforce
- Steady developing road and railway infrastructure in the very center of the Europe
- Law enforcement improving continuously.
Case study – EMO 3,4 completion
Liabilities and risks mitigation

Tailored multi-contract vendor solution

- EMO 3,4, representing completion of the power plant, was a specific case where multi-contract vendors structure were adopted rather than turn-key solution
- SE employs well experienced professionals participating on similar nuclear development projects in the past
- Costs overrun and delay risks covered in vendor contracts.
Completion of EMO 3,4 provides positive effects

- Energy security
- 45% of Slovak electricity consumption will be covered by completed Mochovce NPP
- Total investment of 2.775 bln. EUR
- Up to 4 500 jobs
- Neither state aid nor state guarantees

EMO 3,4 Completion

- Rebuilding of technical competencies (78% of supplies delivered by SK and CZ companies)
- Center of excellence in VVER technology
- Slovak nuclear R&D activities (jointly with Slovak Academy of Science, VUJE, Technical University)
SK Electricity Balance 2009-2030
Long term support to energy security

SLOVAK PRODUCTION MIX 2009

- Hydro & renewables: 18%
- Nuclear: 54%
- Thermal: 28%

SLOVAK ENERGY BALANCE 2009

- Net balance: -1.3 TWh
- Net demand: 27.4 TWh
- Net production: 26.1 TWh

SLOVAK PRODUCTION MIX 2030

- Hydro & renewables: 21%
- Nuclear: 57%
- Thermal: 22%

SLOVAK ENERGY BALANCE 2030

- Net balance: +3.6 TWh
- Net demand: 35.9 TWh
- Net production: 39.5 TWh
### Executive summary

<table>
<thead>
<tr>
<th>Lessons learned summary</th>
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<tbody>
<tr>
<td><strong>Regulatory framework</strong></td>
</tr>
<tr>
<td>- Experience counts: Slovakia has been a nuclear country with well developed regulatory framework, established and working regulatory and oversight authorities and positive perception of citizens</td>
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<td><strong>Financing</strong></td>
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<td>- Healthy and well performing company: Project financing, typically used for financing of energy projects based on conventional or renewable fuels in the region, was not used.</td>
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<td>- Combination of operating cash flow and uncollateralized multi-purpose loan facility was chosen to improve project flexibility and costs</td>
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<td><strong>Energy policy and market</strong></td>
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<td><strong>Investment environment</strong></td>
</tr>
<tr>
<td>- Slovakia represents a stable country with favorable tax regime, experienced workforce, steady developing infrastructure and law enforcement</td>
</tr>
<tr>
<td><strong>Liabilities and risks mitigation</strong></td>
</tr>
<tr>
<td>- EMO 3,4 is being completed using multi-contract strategy with the key technology providers as supplier of both nuclear and conventional island.</td>
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</tbody>
</table>