Project logo:

Priority logo:

Project No: **INCO – CT – 2004 – 509205**
Project acronym: **VBPC – RES**
Project title: **Virtual Balkan Power Centre for Advance of Renewable Energy Sources in Western Balkans**

Instrument: Coordination Action

Thematic priority:
International Cooperation (INCO)

D14: Report from 2nd Workshop for Decision Makers

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Organization name:
Faculty for Electrical Engineering, University of Tuzla

Revision:

Project co-founded by the European Commission within the Sixth Framework Programme (2002 – 2006)

Dissemination level

PU	Public

VIRTUAL BALKAN POWER CENTRE FOR ADVANCE OF RENEWABLE ENERGY SOURCES IN WESTERN BALKANS

2nd WORKSHOP FOR DECISION MAKERS

Task leader: UNTZ

The 2nd Decision Maker's Workshop entitled "Regulatory framework for RES penetration support" was held in Hotel Zenit in Neum, Bosnia and Herzegovina, between September 14-15, 2006. The Workshop belongs to the project “Virtual Balkan Power Centre for Advance of Renewable Energy Sources in Western Balkans”, project acronym: VBPC-RES, Contract INCO-CT-2004-509205, under the Sixth Framework Programme, Priority 6, Sustainable Development, Global Change and Ecosystems. The 2nd Decision Makers Workshop is a part of the Work Package 3 (WP3) of the VBPC-RES project. It was attended by 39 participants from 9 countries from the Western Balkans Region and the rest of Europe.

During the two days of the workshop, the project partners presented 9 contributions, which are included in the report. The presentations focused on the issues connected to regulation and other governmental incentives supporting RES penetration in isolated regions.

The contributions reflect the knowledge and experience of the authors on the presented topics. The contributors presented many interesting details about facilitating the exchange of information on establishing incentives for promotion of RES and experiences with harmonisation with EU legislation in EU and WB countries. Prominent WB energy policy makers, other governmental officials, decision makers from business community (from utilities and SMEs from different European countries), consultants involved in preparation of regulatory framework and other stakeholders participated in the workshop.

Sixth Framework Programme, DG Research, International Cooperation

Contract: INCO-CT-2004-509205

AGENDA

Hotel Zenit, Neum, Bosnia and Herzegovina

14. – 15. September 2006

Thursday, 14th September 2006

8^{30} –	Registration open	
9^{30} – 10^{15}	The Greek regulatory framework for RES penetration	Prof. Dr. Pavlos Georgilakis, National Technical University of Athens, Greece
10^{15} – 11^{00}	Regulatory Framework for Renewable Energy Sources Penetration Support in Bosnia and Herzegovina	Mr. Almir Ajanović, Intrade Energija d.d., Sarajevo, Bosnia and Herzegovina
11^{00} - 11^{45}	Removing Barriers for RES Penetration in Macedonia	Prof. Dr. Marija Kacarska, Faculty of Electrical Engineering, "Ss. Cyril & Metodius" University, Skopje, R. of. Macedonia
11^{45} – 12^{15}	Coffee break	
12^{15} – 13^{00}	A Theoretical Framework for Comparison of Support Mechanisms for Renewable Generation	Dr. Juan Rivier, Universidad Pontificia Comillas, Madrid, Spain
13^{00} – 13^{45}	Prospective Development of Support Mechanisms for RES Penetration in Serbia: Case of Vojvodina Region	Ms. Elena Boškov, DMS Group, Novi sad, Serbia
14^{00} – 15^{00}	Working Lunch	
16^{00} –	Visit to one of the adriatic natural beauty spots	

Friday, 15th September 2006

9^{30} - 10^{15}	The Slovenian Regulatory Framework for RES Support: Case of Biomass	Mr. Borut DelFabbro, Istrabenz Energetski Sistemi, Nova Gorica, Slovenia
10^{15} – 11^{00}	Weaknesses and Success Factors of RES Regulatory Support in Slovenia	Mr. Stane Merše,"Jožef Stefan" Institute, Ljubljana, Slovenia
11^{00} - 11^{45}	Regulatory Framework for Renewable Energy Sources Penetration Support in Bosnia and Herzegovina: District Heating Case	Prof. Dr. Suad Halilćević, University of Tuzla, Bosnia and Herzegovina
11^{45} – 12^{15}	Coffee break	
12^{15} – 13^{00}	Renewable Energy Policy in Croatia: Support Mechanisms and Barriers	Ms. Vesna Bukarica,University of Zagreb, Croatia
13^{00} – 13^{45}	Regulatory Framework for ENCOURAGING RES Penetration in Romania: The Current Situation and Developed plans.	Prof. Lucian Toma, "Politehnica" University, B
13^{45} – 14^{00}	Final discussion and closing of the event	

$14^{00} – 15^{00}$ **Working Lunch**

6. Framework Programme, Priority: International Cooperation (INCO),
Contract: INCO – CT – 2004 – 509205

Virtual Balkan Power Centre for Advance of
Renewable Energy Sources in Western Balkans

Balkan Power Center Report

2nd WORKSHOP FOR DECISION MAKERS

HOTEL "ZENIT", Neum, Bosnia and Herzegovina
14.-15. September 2006

Index

"Jožef Stefan" Institut, Ljubljana, Slovenia
Energy Efficiency Centre

Weaknesses and Success Factors of RES Regulatory Support in Slovenia

Stane Merše, M.Sc.
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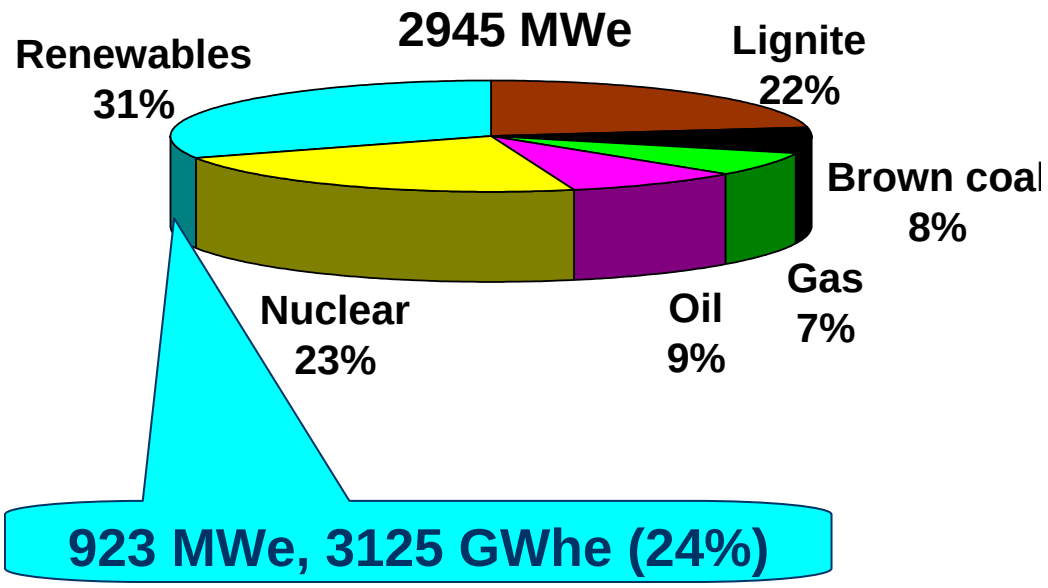
Ljubljana, Slovenia

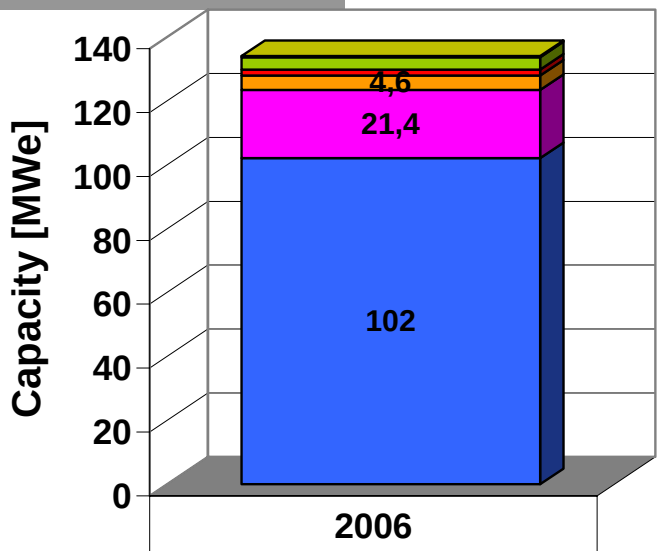
2nd Decision Maker's Workshop
"Regulatory framework for RES penetration support"
14.-15. September, Neum, BIH

RES electricity generation in Slovenia

TOTAL Installed el. gener. capacity:
~ 3000 MW_e
(50% of NPP owned by Croatia)

Installed RES capacity (<10 MW):
~ 134 MW_e
500 GWh (4%)



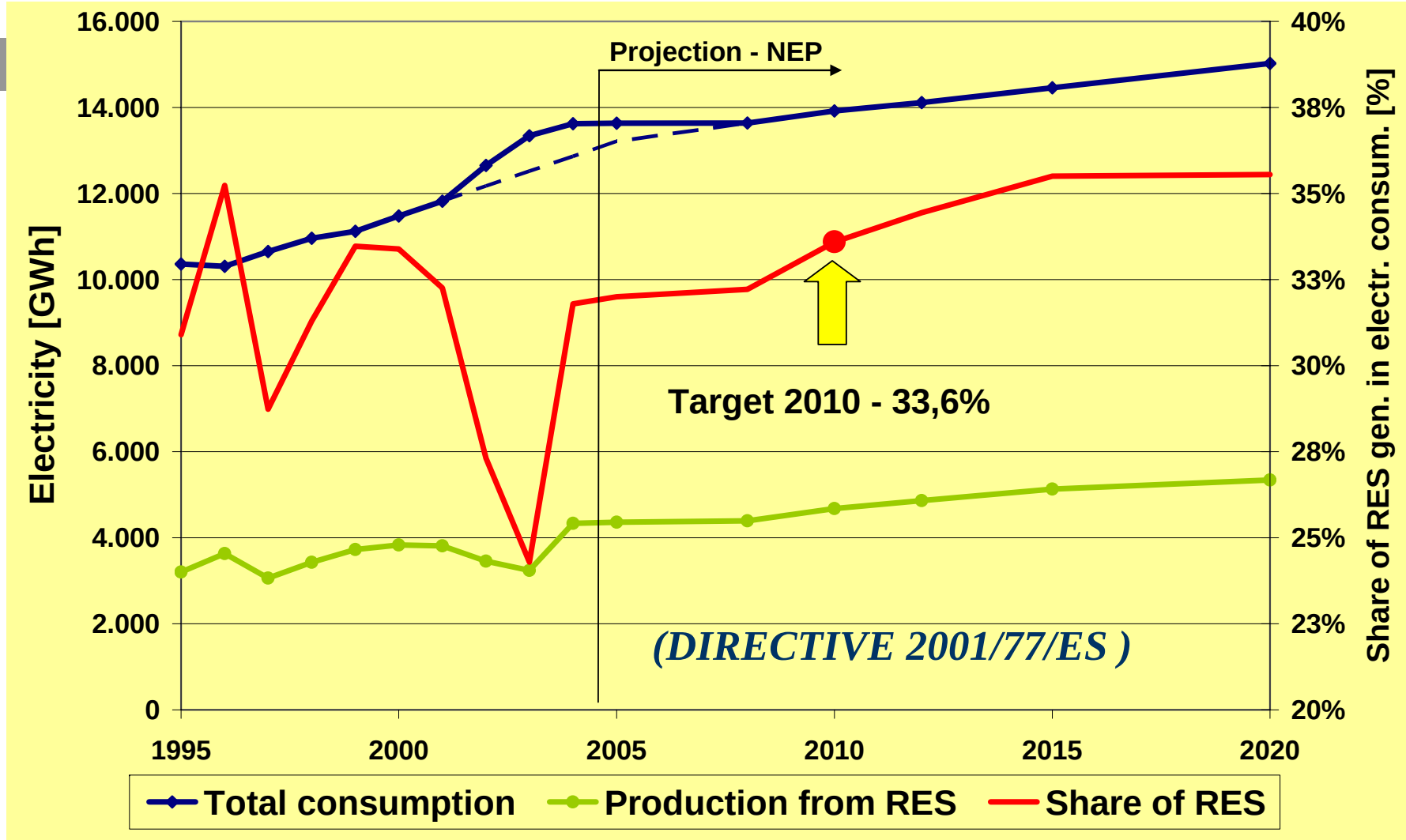


	2006
Wind	0,01
PV	0,33
Bio gas	3,92
Sevage gas	1,8
Landfill gas	4,6
Biomass	21,4
Small Hydros	102

Why RES Electricity in Slovenia ?

- **>30%** electricity production from RES **(*5th EU-25*)**
- use of domestic energy sources ***(coal & RES 17% & 11%)***
- decrease of import dependency ***(▲52,4%)***
- regional economy and spatial development
- decrease of GHG and other emissions ***(Kyoto target ▲ + 7,3% 2004)***
- EU – community and national target ***(33,6% of cons. 2010)***

Slovenia RES Electricity target – *33,6% of cons.*



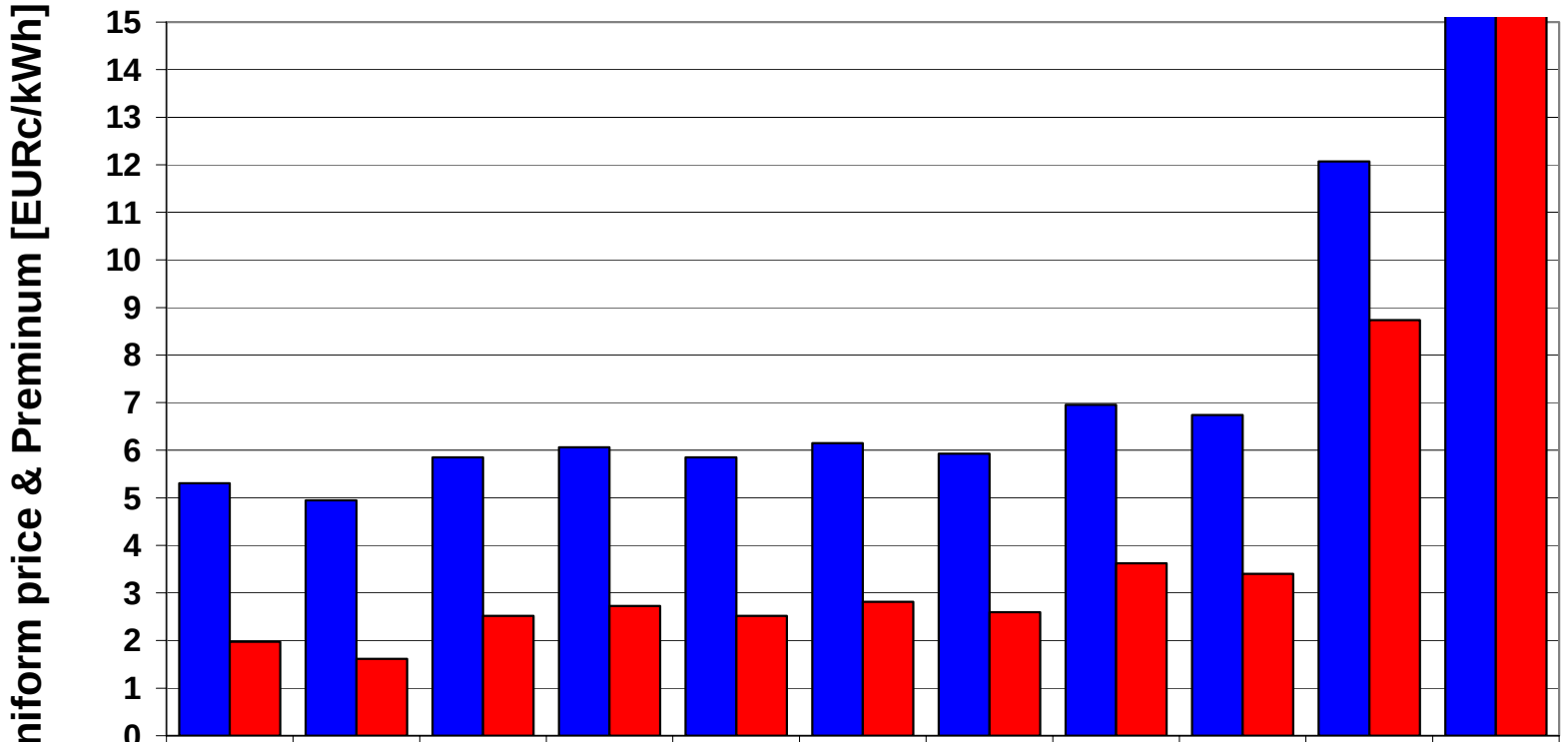
Legal Framework for RES installations

- **Energy Act (1999.2004)**
- **Status of "Qualified electricity producers" (QP):**
  - with above-average efficiency CHP (Yearly efficiency ≥ 78%)
  - **use of renewable energy sources (RES)**
  - **in a manner consistent with the protection of the environment**
- **Network system operators:**
  - responsible for the purchase of all electricity offered by QP at the price determined by the Government
  - obliged to conclude **long-term (10 years) feed-in contracts**.
  - payment of a premium for the independent el. sales of QP
  - All costs covered by the price for the use of networks.
- **Ministry for the Economy - responsible for QP policy:**
  - Requirements for QP, setting and updating of feed in tariffs

Feed-in Tariffs (FIT) for QP

- **Uniform price** or **binom tariff** (day/night, seasons)
- **Premium** – varied by technology and primary source:
  - **100%** for independent electricity sell
  - **30%** for own electricity use (without use of public network)
- **Reduction of FIT:**
  - **-5%** on transmission net., after 5 years, for each 10% invest. subsidy
  - **-10%** after 10 years of operation
- **Micro QP (<36kW)** – household tariff (two way counters)
- **FIT renewed once per year** (inflation, other costs)

Feed-in Tariffs for OP (2)



	< 1MWe	< 10 MWe		< 1 MWe	> 1 MWe	< 1 MWe	< 10 MWe	< 1 MWe	> 1 MWe		
Uniform price	5,3	4,9	5,9	6,1	5,9	6,1	5,9	7,0	6,7	12,1	37,4
Premium	2,0	1,6	2,5	2,7	2,5	2,8	2,6	3,6	3,4	8,7	34,0
	Land fill		Geotherm.	Wind		Small hydro		Biomass		Bio gas	PV

Subsidies and network costs

- **Subsidies and financing:**
  - **restricted investment subsidies:**
    - biomass, biogas, heat pumps and remote PV installations (yearly tenders).
  - **financing (up to 50%) feasibility studies and project documentation**
  - **Soft loans** (Environmental found of the RS)
- **Minimum costs of network prices for use of electricity from QP up to 1 MWe:**
  - **Consumers (even households eligible customers before 1.7.2007) pay the price for use of network reduced by:**
    - the network charge for the use of transmission network
    - supplement for preferential dispatch *(QP + Dom. coal protection)*

Certification

- **<u>RECS certification system:</u>**
  - Agency of energy (regulator) – designated certifier
  - **Holding Slovenske elektrarne – main trader**

- **<u>Guarantees of origin (2003/54/EC)</u>**
  - Decree drafted
  - Agency of energy (regulator) – issuing body

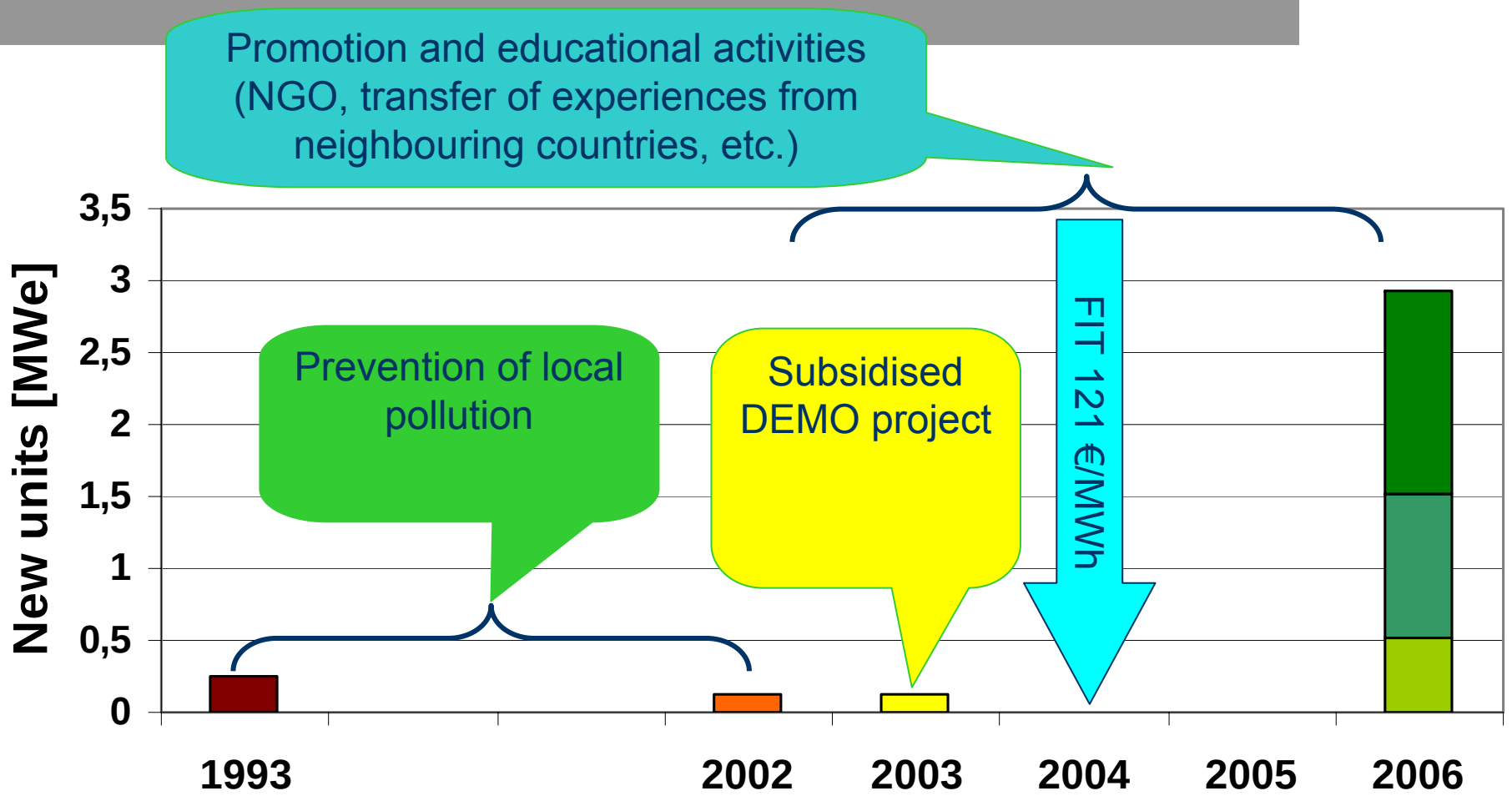
Green electricity market

- **<u>Private supply company created by owners of small hydro PP</u>**
  - Small commercial customers and HH
  - **Huge problems with energy balancing !**
- **<u>Holding Slovenske elektrarne</u>**
  - All eligible customers (industry, services)
  - *Price supplement:* ***4 EUR/MWh***
  - ***Large hydro PP production***
  - ***2005: ~ 600 contracts, 25 GWh***
- **<u>Distribution company Ljubljana</u>**
  - Households
  - Very limited response (50 contracts)
  - Recent decrease of price (*price supplement:* ***4EUR/MWh)***

Bio gas CHP units (farms)

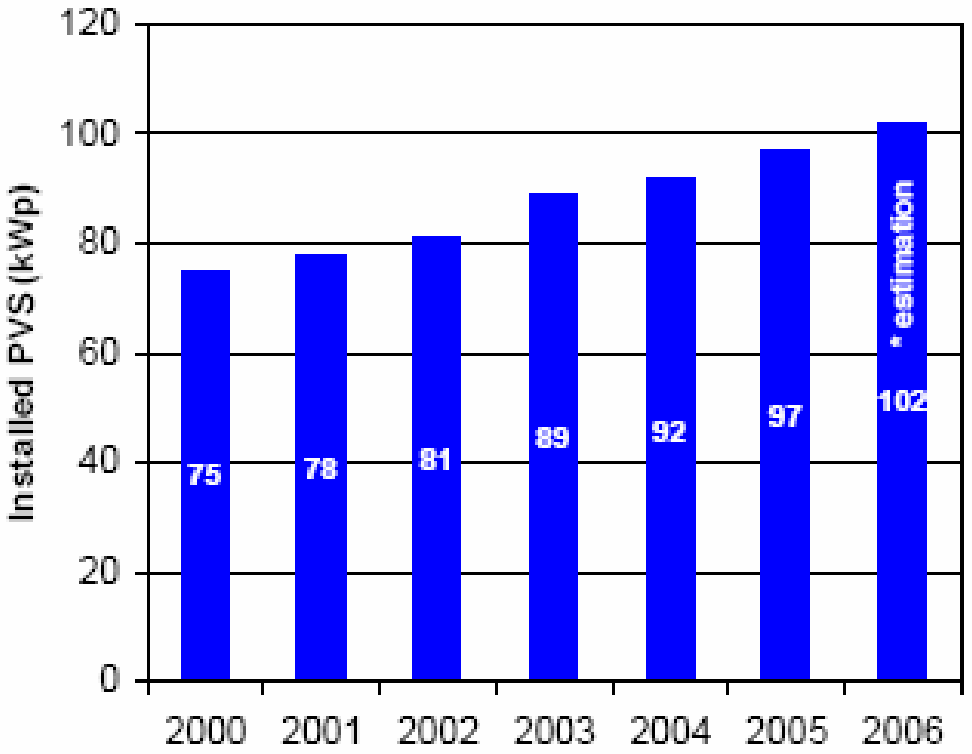
- **Heat use:** fermenters heating, heating of buildings, hay drying
  - **Income by electricity generation (FIT)**
  - **Secondary effects:**
    - ✓ reduction of local sting,
    - ✓ decrease of water and soil pollution,
    - ✓ quality fertilizer production
    - ✓ reduction of methane (GHG) emiss.

Bio gas CHP units market development



PV installations

- **Off grid PVS market development:**
  - remote areas (alpine huts, weekend houses, etc.)
  - ***~5%/year growth***

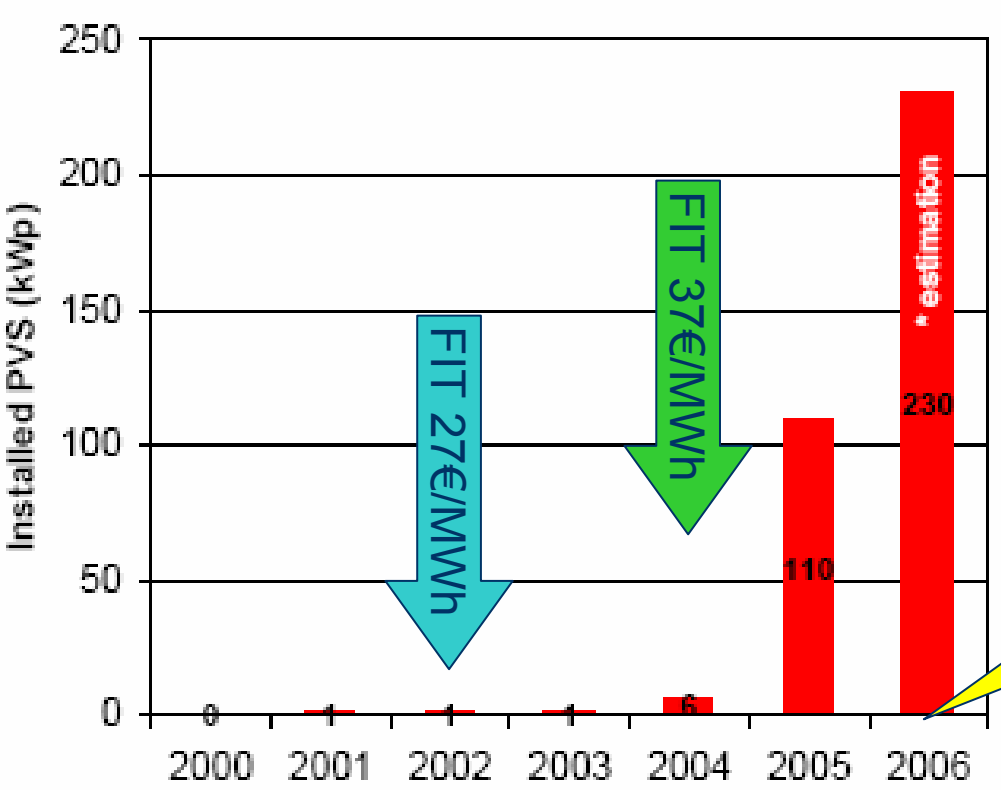


Source: Marko Topič, National PV program

Subsidies (up to 60 % and up to 2000 € per application) – annual public tender but with limited and rather small budget.

PV installations 2

- **Grid connected PVS market development:**
  - huge recent growth after feed in tarrif (FIT) and market establishment



FIT 37€/MWh also for PVS >36kWe – start of bigger PVS installations

Source: Marko Topič, National PV program

PV installations 3

PV market development outcome:

- **starting production of mc-Si PV module in 2006** (Bisol, 15 MWp)
- **5 small component producers:** inverters, charge controllers, batteries, etc.

(TAB Mežica, Eti Elektroelement, Iskra zaščite, Iskra sistemi, Iskra Emeco)

- **~50 people employed in PV industry**
- **grid operators and electricity producers started with PV projects**
- **government technology support (clusters, platforms)**

Slovenian Photovoltaic Technology Platform
http://www.pv-platforma.si

Although the simple payback time of PV is above 10 years, there is no need for further FIT increase!

Source: Marko Topič, National PV program

Landfill gas CHP units

- **total installed capacity 4,3MW$_e$ (6 units)**
  - ✓ 3,6 MW$_e$ recent new units (Ljubljana, Maribor, Celje)
  - ✓ big potential still exist (~ 15 MW$_e$)
  - ✗ low heat utilisation

Other RES-e technologies

- **Small hydro:**
  - he biggest volume, still huge potential
  - some new units, reconstructions of existing plants
  - restricted and slow spatial planning and issuing of permits (some past bad practice)
- **Wood:**
  - district heating on-going projects, individua
  - recent start of CHP (Steam engine 600 kW_e)
- **Wind:**
  - 5 small installations (14 kW_e)
  - big plants plans – conflict with environme
    - intact region
    - wild birds prevention
    - low wind speed?

Lessons learned

- **Moderate – slow recent development** (far from ambitious plans and targets).
- **Development of local industry and companies** (clusters, techn. platforms, etc.)
- **FIT – efficient instrument, market oriented**
  - Support scheme compatible with EU **(DG COMPETITION investigation?)**
- **EU structral founds** – financial resources for RES projects
- **RES environmental effects** - support could not be automatic.
  - ⇨ Only well prepared feasible environmental and economical project should be supported.
- **Public relations - awareness** / avoid bad experiences!
- **Establishing green electricity market:**
  - choice for consumers – several actors!
  - Simple balancing mechanism for QP (direct sales)
- **Common** Energy, Agriculture, Forestry,...**policy and actions**!
  - ⇨ biomass market, bio gas, technology production,...

Main barriers to the development of RES

- **In Slovenia not different from other countries!**
- **Active or only declarative support** (whole energy sector)?
  - Acceptance of distributed generation?
- **Insufficient support to domestic technology development**
  - wider benefits to the economy than complete import of technology !
- **Consistent and transparent spatial planning**
  - clear definition of potential investment area (exclusion of national parks, intact areas) to avoid conflicts of interests and speed up procedures.
- **Low electricity prices** (households, market uncertainty)
- **Bad project preparation:**
  - big environmental effects and low whole economy effects of RES projects
  - bad public communication – strong opposition (NGO, etc.)

Main conclusions for Slovenia

✓ Success factors

1. Feed in tarrifs (FIT)
2. Investment subsidies and soft loans (EU strucutural founds)
3. Subsidies for technology development and linking of companies (technology transfer and domestic development)

☹ Weaknesses

1. FIT stability - not proved level for 10 years period
2. Connection to the grid – clear rules still missing
3. Establishing of effective green market
4. Spatial planning and procedures

“Jožef Stefan” Institut, Ljubljana, Slovenia
Energy Efficiency Centre

Thank you for your attention!

2nd Decision Maker’s Workshop
"Regulatory framework for RES penetration support"
14.-15. September, Neum, BIH

Virtual Balkan Power Centre

A theoretical framework for comparison of supporting mechanisms for renewable generation

Juan Rivier, Tomás Gómez, Pablo Frías

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Sixth Framework Programme, DG Research, International Cooperation
Contract: INCO-CT-2004-509205

Contents

- Renewable energy in the international energy context
- Supporting mechanisms for renewable electricity generation
- Theoretical framework for comparison of supporting mechanisms

International energy context

- Sustainability
  - Climate change (CO_2, Kyoto protocol, AP6)
  - Other pollutants (SO_x, NO_x)
  - Availability for future generations
- Security of supply
  - External dependency on energy imports
    - Low political stability in exporting countries
  - Future scarcity
- Competitiveness
  - Energy has a direct and important impact on the economy
  - Availability of energy at reasonable prices is crucial
  - Higher and more volatile energy prices

Renewable Energy Sources (RES)

- Sustainable
  - Major player in CO_2 reductions
  - Environmentally friendly
  - Renewed for future generations by definition
- Secure supply
  - Usually local resource
  - Only guaranteed future energy source
- Competitive
  - Non-volatile prices
  - Not yet competitive with fossil energy sources?

Local context

- Large number of different supporting mechanisms
  - Very different levels of RES penetration
- Very different local context
  - Environmental commitment
    - Level of local support (public in general, government, institutions)
  - External dependency
    - Countries with highest penetration of renewable sources are highly dependent on energy imports
  - Regulatory framework and tradition
    - Market oriented or regulation oriented
    - Recent history and regulatory processes
  - Local resources
    - Fossil fuels and renewable energy sources

Contents

- Renewable energy in the international energy context
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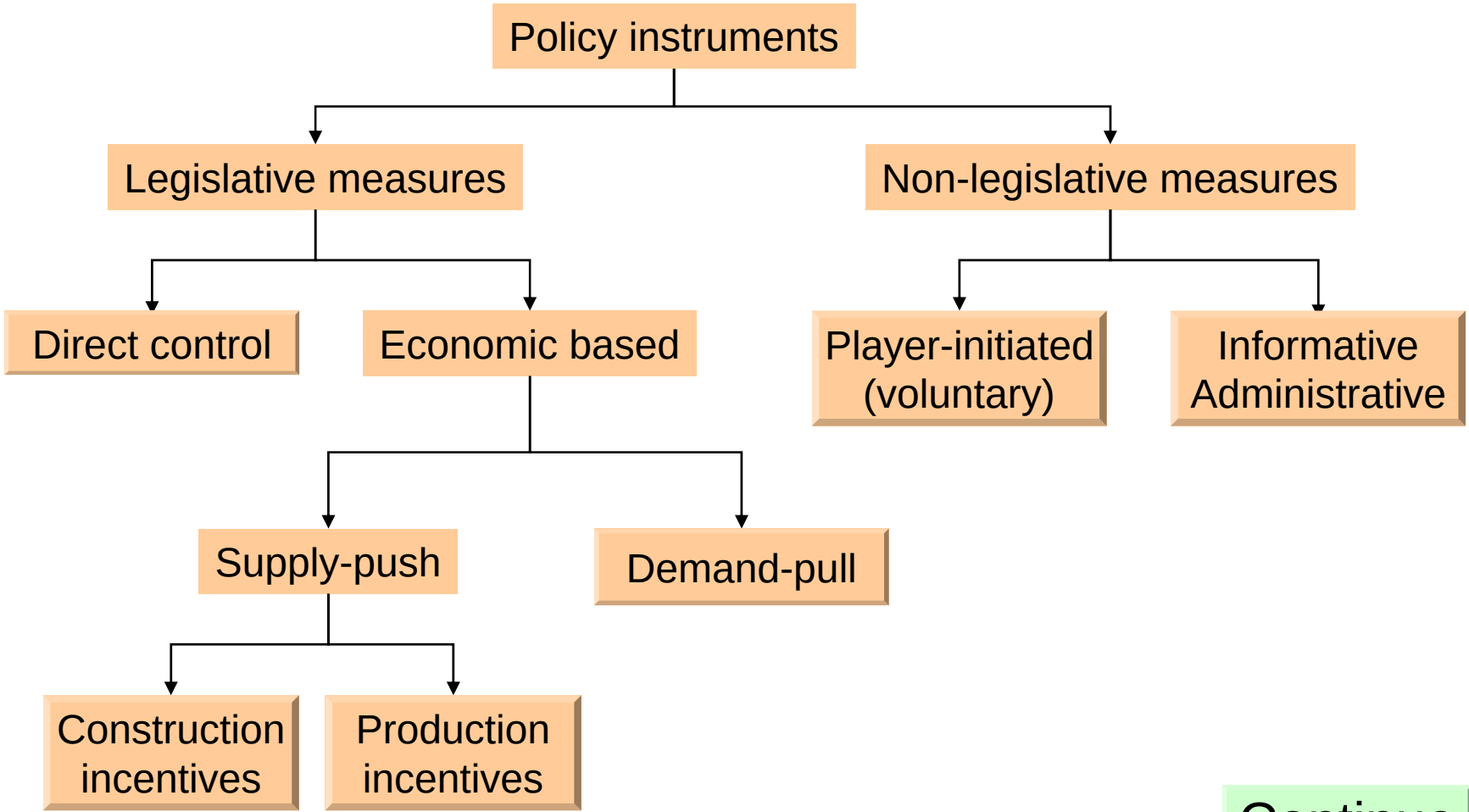
RES supporting mechanisms classification

From Enzesberger et al, 2002



Continue

Informative & administrative

- Policy instruments
  - Non-legislative measures
    - Informative & administrative

      Resource mapping

      Investor advising

      Publicity / campaigns

      Improved administrative procedures

These are necessary but not sufficient measures for RES uptake

Player-initiated (voluntary)

- Policy instruments
  - Non-legislative measures
    - Player-initiated (voluntary)

      Green pricing

      Certification

      Self-obligation

Marginal push for renewables

Direct control

- Policy instruments
  - Legislative measures
    - Direct control

      Forced investment

      Forced shut-downs

      Standards (safety, reliability)

Design to act where economic instruments cannot reach or are too risky (nuclear, safety issues)

Demand-pull

- Policy instruments
  - Legislative measures
    - Economic based
      - Demand-pull

        Tradable Green Certificates (Quota systems)

        Tax deductions for green power purchasers

One main type of RES supporting mechanism

Construction incentives

- Policy instruments
  - Legislative measures
    - Economic based
      - Supply-push
        - Construction incentives

          Direct subsidies

          Accelerated depreciation

          Tax deduction

          Below-market-rate loans

Usually in addition to some other mechanism

Production incentives

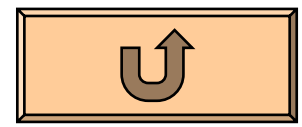
- Policy instruments
  - Legislative measures
    - Economic based
      - Supply-push
        - Production incentives

          Feed-in Tariffs (fixed tariff, market + premium)

          Tax exemption

          Competitive tenders for long-term power sales contracts

Second main type of RES supporting mechanism



Main supporting mechanisms

- Feed-in Tariffs (FiT)
  - Expanding throughout Europe
  - In a number of USA states
- Tradable Green Certificates (TGC)
  - Growing steadily, still a lot of questions about performance

Contents

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Setting the objectives of the policy

- Environmental objectives
  - CO_2, SO_x, NO_x emissions reduction
  - Sustainability
- Political objectives
  - Price volatility reduction
  - Low energy prices (long term)
  - Increasing security of supply
- Economic development vs. import costs
  - Local employment
  - Industry development
  - Local economic development

Policy evaluation (i)

- Effectiveness in terms of RES deployment
  - What is the target and has it been fulfilled
- Efficiency in terms of cost
  - Least cost solution
    - Least cost technology & better locations (high resources)
    - Cost impact in the existing system
  - Long-term cost reduction
    - Dynamic efficiency
      - Manufacturing, construction, know-how
  - Minimising cost transfer to final customers
  - Transaction costs

Policy evaluation (ii)

- System conformity
  - Integration in the system and regulatory framework
    - Network development
    - System operation
    - System security
    - Compatibility with other mechanisms (GHG emission reduction)
- Flexibility
  - Capacity to adapt to new and evolving data
- Local economic development induced

Factors affecting the results (i)

- Design
  - For each mechanism, there are several possible design choices that can affect performance
  - In addition, a combination or accumulation of different mechanisms may be used
- Settings
  - Time horizon, target in TGC, price in FiT, etc.
- Structure
  - Size of the market, number of potential participants
- Context
  - Physical, social and regulatory context

Factors affecting the results (ii)

- Context
  - Physical
    - Network & system capacity
    - Resource availability
      - RES and conventional
    - Local R&D and manufacturing facilities
  - Social
    - Agents (promoters, DSO, TSO, SO, regulator), society and administration attitude towards RES
  - Regulatory
    - Previous regulation (tradition)
    - Adaptation of TSO, DSO, SO regulation to RES penetration
    - Standards

TGC (Quota system)

- Preferred option of ‘market mechanism promoters’
  - High competition between generators for least cost options
    - Both technologies and sites
  - Marginal cost of RES should be determined by the market
  - TGC allow burden to be shared between all consumers
  - Better market integration than FiT (see later)
- Disadvantages
  - Market will pick a winner
    - No support for a broad range of technologies
  - Pressure for best spots may concentrate RES deployment
    - NIMBY effect
    - Integration problems may arise
  - High risk for the investment (volume, price and regulatory)
    - Price may not be as competitive as expected

TGC: results

- Effectiveness
  - Until now, no record of meeting the intended target
    - Complex design prone to flaws and stakeholder pressure
    - Inherent high risk for promoters
    - Impact of a derivative market on risk mitigation?
- Efficiency
  - Practical experience
    - European (UK, Italy) experience show higher prices with TGC than with FiT
    - USA experience show need of additional support for RES deployment to happen
    - Australia has had low prices (ignoring the cost of supporting hydro and solar water heating), but this might be related to high resources and small target
  - Lack of dynamic efficiency for non-mature technologies

TGC: results

- System conformity
  - Does allow a certain level of integration into the market
    - Still the TGC premium distorts the wholesale market economic signal
  - Does not interfere with network integration
  - Concentration of RES deployment may stress
    - Network
    - System operation (high correlation of outputs)
- Flexibility
  - Changes in the target may jeopardise the stability of the market created, increasing the risk
- Local economic development
  - Does not seem to lead to local industry development, although it might be related to the small amount of RES being driven

TGC: assessment

- Design
  - Complex
  - Some improvements may be difficult to tune up
    - Support to specific technologies through technology quotas may lead to small markets and lose least-cost advantage
- Settings
  - RES target can radically change the characteristics of the supporting mechanism
    - As a marginal market, it is highly dependent on the marginal technology and spot price
      - Flat marginal cost curve is most suitable
      - Ambitious target may lead to high marginal costs

TGC: assessment

- Structure
  - Need a large market to avoid market power
  - Does not allow small- and medium-sized participants
- Context
  - Concentration of deployment in a few spots may lead to DSO, TSO and local community opposition
  - Availability of resources
    - Flat marginal cost curve is most suitable

FiT or market + premium

- Treats RES as a regulated activity
  - Installed capacity driven by the price
  - Low risk for the promoter
    - Allows deployment of a large spectrum of technologies at different stages of maturity
    - Allows small- and medium-sized facilities (increases social acceptance and widens installed capacity potential)
  - Allows deployment in non-optimal resource locations (reduces NIMBY effect)
  - High competition at the manufacturing and construction stages
- Disadvantages
  - Regulation picks winners
  - FiT may act as a barrier for a correct integration into the system
  - High short-term cost (high cost technology, sub-optimal spots)

FiT: results

- Effectiveness
  - Hard to meet the intended target exactly, but may be exceeded or fall short
  - Has driven most of today's RES facilities
- Efficiency
  - High cost in the short term
    - Although lower than TGC for the same technology and resource level (low associated risk)
  - High cost reduction induced in several technologies (dynamic efficiency)
    - Hard to transfer cost savings to customers
      - A predetermined decreasing path of tariff may help solve this problem
  - Strong competition at the manufacturing and building stages
    - Similar results to a RPI-X regulation

FiT: results

- System conformity
  - FiT is a barrier to system integration
    - Market + premium helps, but still has the same problems as TGC and also has other associated risks
  - Does not allow network integration without modification
  - Spread out RES deployment may help to avoid stress of
    - Network
    - System operation (non-correlation of outputs)
- Flexibility
  - Although in theory easily adapted, changes have been difficult because of strong lobbying activity
- Local economic development
  - Early adopters have seen large industrial development
  - Strong impact on the local economy due to high deployment

FiT: assessment

- Design
  - Simple (difficult to get it wrong)
- Settings
  - Price has dramatic effects on installed capacity
    - Target exceeded or shortfall
    - Seems not too difficult to set a price that drives deployment without exceeding target too much
    - Market + premium option is hard to tune correctly in the long term due to market volatility
- Structure
  - No major problem with the size of the market
  - Allows small- and medium-sized participants
  - Easy of entry

Combination of mechanisms

- (Midttun and Gautesen) suggest that these mechanisms are complementary and should be implemented at the same time
  - FiT for emerging technologies
  - TGC for mature technologies

Further reading (i)

1. Bolinger, M. and R. Wiser, *Case Studies of State Support for Renewable Energy. The impact of State Clean Energy fund Support for Utility-Scale Renewable Energy Projects*. May 2006, Berkeley Lab and the Clean Energy States Alliance.
2. Butler, L. and K. Neuhoff, *Comparison of Feed in Tariff, Quota and Auction Mechanisms to Support Wind Power Development*, in *Cambridge Working Papers in Economics CWPE 0503*, U.o.C.-D.o.A. Economics, Editor. 2004, The Cambridge-MIT Institute. p. 35.
3. Enzensberger, N., M. Wietschel, and O. Rentz, *Policy instruments fostering wind energy projects--a multi-perspective evaluation approach.* Energy Policy, 2002. **30**(9): p. 793-801.
4. Fairley, P., *The greening of GE.* IEEE Spectrum Online, 2005. **July**.
5. Hamrin, J., D. Lieberman, and M. Wingate, *Regulator's Handbook on Renewable Energy Programs & Tariffs*. 2006, Center for Resource Solutions. p. 72.
6. Huber, C., et al., *Green-X. Deriving optimal promotion strategies for increasing the share of RES-E in a dynamic European electricy market*. 2004. p. 154.
7. Jacobsson, S. and V. Lauber, *The politics and policy of energy system transformation--explaining the German diffusion of renewable energy technology.* Energy Policy, 2006. **34**(3): p. 256-276.
8. Komor, P. and M. Bazilian, *Renewable energy policy goals, programs, and technologies.* Energy Policy, 2005. **33**(14): p. 1873-1881.
9. Lauber, V., *REFIT and RPS: options for a harmonised Community framework.* Energy Policy, 2004. **32**(12): p. 1405-1414.

Further reading (ii)

10. Martinot, E., *Renewables 2005. Global status report*. 2005, REN21 Renewable Energy Policy Network. Worldwatch Institute: Washington DC. p. 35.
11. Menanteau, P., D. Finon, and M.-L. Lamy, *Prices versus quantities: choosing policies for promoting the development of renewable energy.* Energy Policy, 2003. **31**(8): p. 799-812.
12. Midttun, A. and A.L. Koefoed, *Greening of electricity in Europe: challenges and developments.* Energy Policy, 2003. **31**(7): p. 677-687.
13. A. Midttun and K. Gautesen, "Feed in or Certificates, Competition or Complementarity? Combining a Static Efficiency and a Dynamic Innovation Perspective on The Greening of The Energy Industry," The Norwegian School of Management, pp. 10.
14. Mitchell, C., D. Bauknecht, and P.M. Connor, *Effectiveness through risk reduction: a comparison of the renewable obligation in England and Wales and the feed-in system in Germany.* Energy Policy, 2006. **34**(3): p. 297-305.
15. Mitchell, C. and P. Connor, *Renewable energy policy in the UK 1990-2003.* Energy Policy, 2004. **32**(17): p. 1935-1947.
16. Sawin, J.L., *National Policy Instruments. Policy Lessons for the Advancement & Diffusion of Renewable Energy Technologies Around the World*, in *International Conference for Renewable Energies*. 2004, Secretariat of the International Conference for Renewable Energies: Bonn.

Virtual Balkan Power Centre

Thank you for your attention

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Regulatory framework for encouraging RES penetration in Romania. The current situation and developed plans

Lucian Toma Mircea Eremia Ion Triştiu

University "Politehnica" of Bucharest

DM2, Neum, 4 – 5 September 2006

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Selected legislation

HG 443/2003 - promote the electrical energy production from RES

HG 1535/2003 - approve the strategy for electrical energy production from RES

1892/2004 - promotion system for generating electricity from RES;

HG 958/2005 - modifies HG 1532003 specifies the yearly quota of green certificates until 2012;

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Financial Incentives for renewables

- **Green certificates market**

  price of electrical energy produced from RES = 65-75 Euro

  → **energy sold on the electricity market**

  → **green certificates**

- **Obligatory quota for 2006 is 2,22% of the el. energy supplied to the final consumer**

  → **total no. of green certificates issued in 2006 is 16381**

  → **until to 17 August 2006, only 598 GC (3,65%) were traded**

  → **15783 GC are available**

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Financial Incentives for renewables

Legislation: O.U.G. no 196/2005 - Budget for the Environment
Law no 105/2006

Authority: National Agency for Energy Conservation &
Administration of Budget for the Environment
(Environment and Water Utilization Ministry)

- Financial support:
  - juridical persons: up to 30% of the eligible costs
    + 10% can be added for the SMC
      + 10% if the project assumes the energy saving
  - local authorities: up to 60% of the eligible costs
- from 50.000 lei (14000 Euro) up to 20 millions lei (5.6 M Euro)
- duration: up to 7 years

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Business plan

Legislation: GD no. 540/2004

Authority: Romanian Energy Regulatory Authority - ANRE

The business plan must be developed in such a manner to fulfil the following main purposes:

- **to impose the self-discipline of the economic agent in the licensed activity**
- **to determine the detailed plan, step-by-step, of the activity and to anticipate the eventual problems and risks that could occur**
- **to inform the competent authority and the business partners about the technical, financial and organizational capacity of the economic agent to enter the electric power market and the investment market**

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Guaranties of Origin

Legislation: GD 1429/2004 approves the Regulatory framework for the certification of the guaranties of origin from RES.

Authority: Romanian Energy Regulatory Authority - ANRE

The guaranties of origin are used to:

- monitor the fulfillment of the national target regarding the share of electricity generated from renewables in the national gross consumption
- determine the share of electricity produced from RES in the electric energy bill of the final consumer
- give access to producers to the legal frameworks that promote the electricity generated from RES
- import/export electricity generated from renewables

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Guaranties of Origin

The guaranties of origin are issued every six months:

- for the entire quantity of electricity generated from RES and supplied in the electrical network by a producer, during the six month period
- with the distinction of the monthly amounts of electricity generated from RES and supplied in the electrical network for each producer

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Guaranties of Origin

The information presented by a RES producer in order to obtain the guaranties of origin refer to:

- the renewable source and the technology used to produce the electricity
- the starting and the ending date of the RES generation period for which the producer demands the guarantee of origin
- the location where the electricity will be generated and the name of the generating unit
- the installed capacity of the power plant
- the amount of electricity (MWh) generated each month for the period for which guaranties of origin are requested
- the type of financial support which the applicant has benefited

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Grid Connection rules

Information required at the connection of RES to the grid:

- the capacity of the electrical network
- the connection possibilities
- the economic and technical solutions referring to the connection equipment at the site(emplacement) requested by the user
- evaluation of the utilization mode (manner) of the capacities for the existing networks
- choosing the optimal solution from the point of view of the network's architecture
- identification of some strengthening necessities of the electrical network
- cost evaluation in the electrical network after the applicant's connection

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Bio-fuel

- **European legislation and incentives**
  - Directive UE 2003/30/CE promote the use of renewable fuels, to reduce the energy import dependency and reduce the green-house emissions
  - Structural funds: 40 de euro/ha (probably starting with 2007)
- **Romanian legislation and incentives**
  - exempt producers of biomass from the payment of excise tax
  - promote renewable fuels used by the end of 2007 must reach 2% of total consumption.
    - this level must increase up to 5.75% by 2010. Consequently, production must reach 100,000 tons / year and 300,000 by 2010

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Photovoltaics

28 July 2006: the first photovoltaic power plant in Romania

Installed power: 30 kWp

Location: Faculty of Electrical Engineering (Univ Politehnica of Bucharest)

Designed and installed by: ICPE

Financial support:

- 70% from FP5 project
- 30% from National Grant “Relansin”

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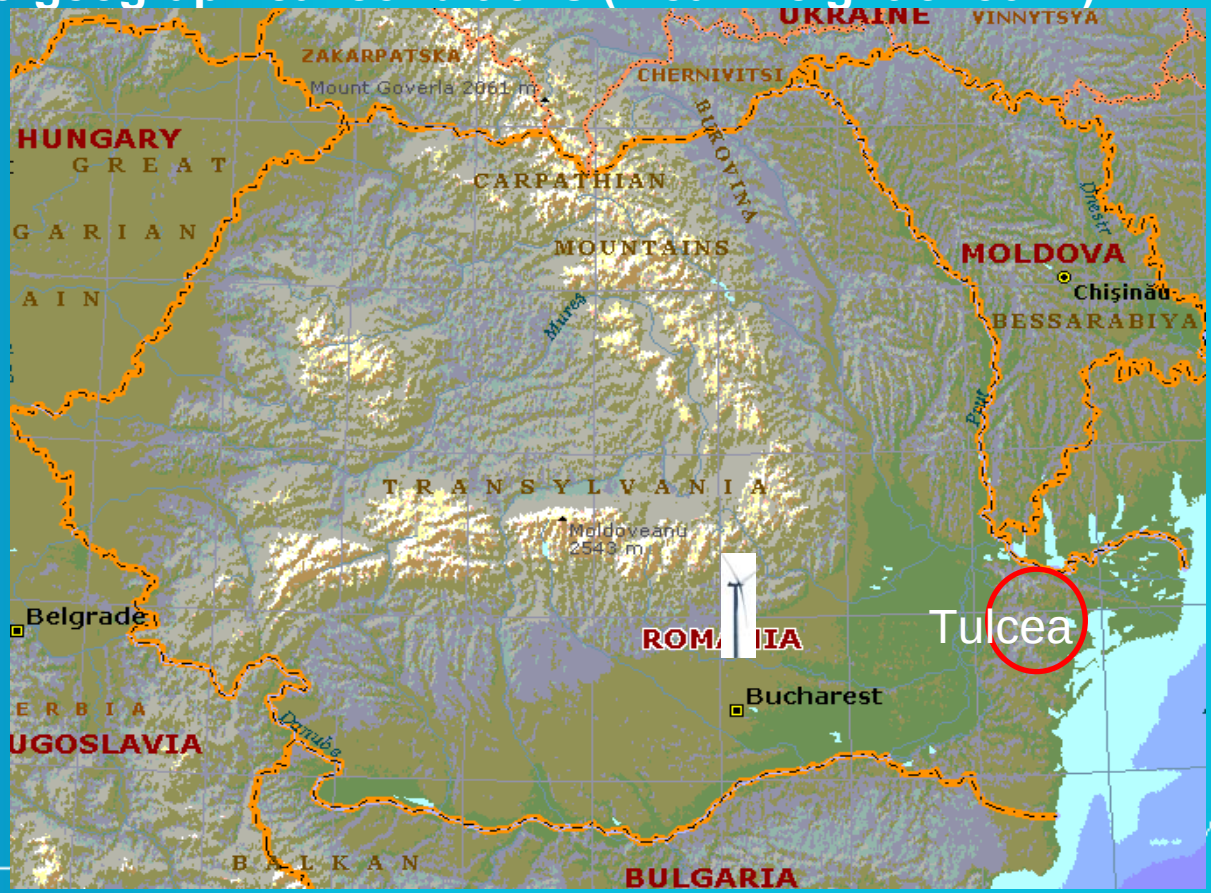
Wind energy

Five wind zones have been identified in Romania, in terms of environment and topo-geographical conditions (mean height of 50 m):

- Black Sea coast
- mountain areas
- Moldova plane
- Dobrogea plane
- off-shore area



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Wind energy

… from newspapers

- *Martifer SGPS* from Portugal started a feasibility study regarding the installation of hundreds of MWs in wind farms, in Tulcea county **(safe source)**
- *Energia & Servizi SRL* intend to make investment in Botosani and Suceava counties for wind farms. This company expressed the intention to make investments in west of Romania – Timis County
- *Ecoprod Energy*, which owns the turbine at Ploiesti, of 660 KW capacity, intend to relocate it to Constanta area. It plans to install three new turbines of 550 KW installed power each

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Micro-hydro power plants

- According to Chapter 14, Energy, negotiated with European Commission, Hidroelectrica must sell up to the end of 2007 about 150 micro-hydro power plants.
- This year (2006) Hidroelectrica will sell about 51 MHPP. The first auction is in September
- Since 2004, when the privatization process started, until the end of 2005 Hidroelectrica sold 38 MHPP. The reminder will be refurbished, with the own funds of Hidroelectrica; each year several MHPP are commissioned
- In 2005 Hidroelectrica accounted a record level of electrical energy production, of 20 TWh, meaning 33,7% of the total national energy consumption

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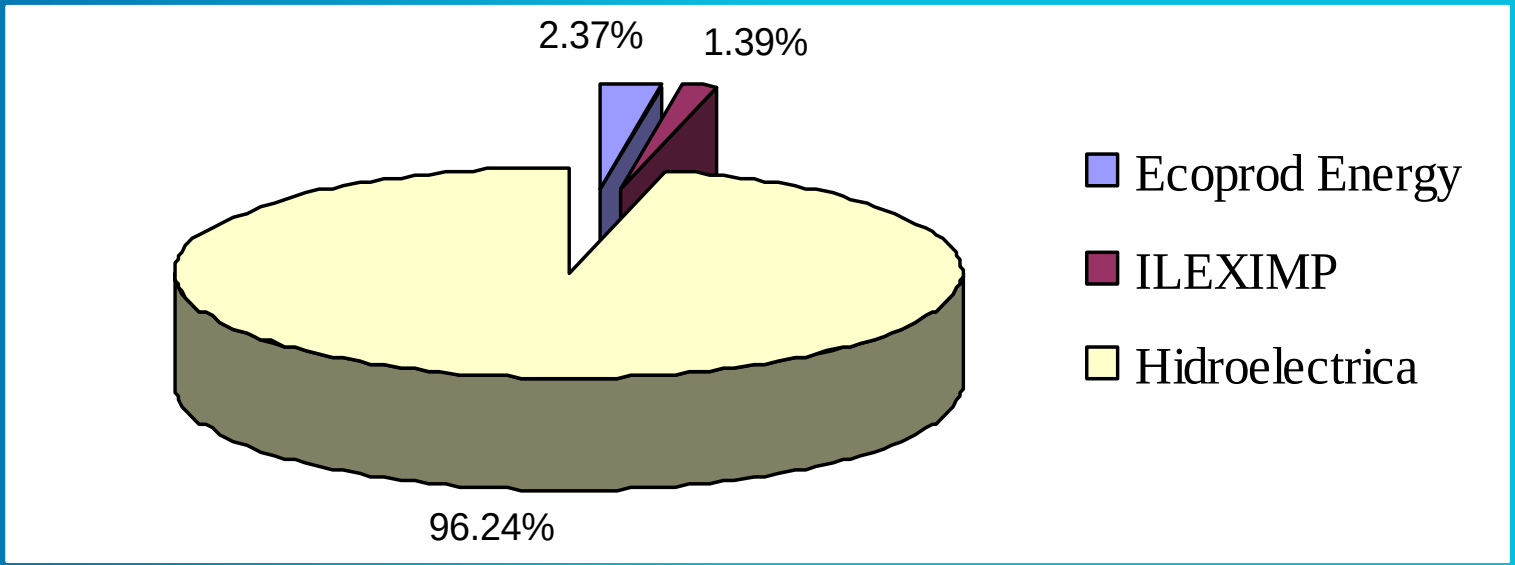
Micro-hydro power plants

Energy production from RES in 2005 (source: ANRE)



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Future plans

- The Romanian Energy Conservation Agency (ARCE) has drafted a law project that provides for the granting of fiscal incentives and subsidies to companies and individuals that use renewable energy sources in order to obtain thermal energy.

- The granting of the incentives will be based on projects that target obtaining thermal energy from renewable sources, such as biomass and geothermal energy and the reduction of electricity costs for the final consumer.

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Future plans

Incentives:

- the state could finance 30% of the purchase costs of acquiring renewable energy equipment.
- 50% funding from state for solar panels used by domestic consumers and public buildings for the production of thermal energy
- reduction of VAT to 9.5% for equipment meant to produce renewable energy
- exemption from the payment of environmental taxes for companies using RES equipment for a period between 5 and 10 years.
- small and medium companies, commercial companies with production activity and tourism companies could benefit from 30% subsidy for the production of thermal energy from solar panels.

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2nd Decision Maker's Workshop
Regulatory framework for RES penetration support
14 – 15 September 2006 Neum, Bosnia and Herzegovina

PROSPECTIVE DEVELOPMENT OF SUPPORT MECHANISMS FOR RES PENETRATION IN SERBIA: CASE OF VOJVODINA REGION

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Sixt Framework Programme, Priority 6
Sustainable Development, Global Change and Ecosystems ; Contract: INCO-CT-2004-509205

Contents

- Current legislation and barriers
- Promotional mechanisms
- Projects

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Overview of legislation in Serbia

Serbian Energy Law: 2004 - Articles 84, 85 and 86
(Article 86)
"Privileged power producers shall enjoy priority on the organized electrical power market over other producers who offer electrical power under equal conditions.
Privileged power producers shall be entitled to subsidies, tax relief, customs exemptions and other relief in line with laws and other regulations on taxes, customs and other duties, i.e. subsidies and other incentive measures." ***– no further regulations***

Technical recommendation No.16
Basic technical requirements for connection of small-scale power in distribution network in Serbia is Technical recommendation no.16 issued by Power Company of Serbia.

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Barriers

- No guarantee for investor to be granted with a desired location after application for the project
- No organized governmental support; available resources are – Ministry of Energy & Mining, Energy Agency or Energy Efficiency Agency, private sector agencies
- The procedure is long: over 20 different permits required
- No guaranteed price after connection to the grid, no subsidies

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Trends in the region of Vojvodina

Main potentials: biomass, wind power

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Promotional support

- From 1983 to 1989 Regional Dept. for Energy directed the funds realized from basic oil tax in programs for use of RES, followed by support funds from “NIS Naftagas”
- “Information about potentials of using RES in AP Vojvodina”, Novi Sad, June 2001 – preceded the legislation strategy of Energy Development in Serbia, for the next decade
- Regional Department for Energy: “Information about potentials of using energy of wind, sun and biogas in the territory of AP Vojvodina” – Novi Sad, December 2004

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Wind Energy

- Background: in 1982 Denmark donated the first wind generator in AP Vojvodina to Regional Dept. in Novi Sad; Public Utility "Elektrovojvodina" placed a wind generator near spa "Junakovic" but it is no longer in function

- EPS study in 2002: Wind potentials in Serbia – 4 out of 20 stations in Serbia were from Vojvodina. Avg. annual speed: 6.27 m/s (Vrsac)

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New projects

- The first wind-energy generator in Serbia: constructed near city of Indjija in Vojvodina, deadline - end of this year (2006).
- Generator installed power: 1MW
- The project contract between County of Indjija Austrian-Serbian company RE-Energy (project value: € 1.5 million)
- Generator will be built near the Belgrade-Novi Sad highway.

Future plans: to construct 11 wind mills in the next three years, estimated project worth 30 million €.

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Strategy for local economic development

- In process of completing a Strategic Plan for local economic development in Indjija, which is planed to be adopted in the local assembly in September 2006

- Major development projects: Regional Development Center – Technology Park for 4 types of industry, setting up of Windmills as a beginning of the transfer to a more progressive use of RES in Indjija, creation of Education Center for reeducation and crash courses for labor force tailored to the needs of new investors, initiating the process of recycling in the municipality beginning with paper and plastic, and many more projects.

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Biomass

- Background: In 1995, during sanctions, the Agricultural Corporation of Belgrade Collective, which feeds the Serbian capital, produced some 10,000 tonnes of biofuel
- Introduction of biodiesel to Belgrade's transportation system in March 2006: a trial-period that took a little over a month, resulted in amount of fuel spent on bus line "511" to be the same as that spent by the vehicles using oil. Now GSP plans to introduce this fuel on the six busiest lines in Belgrade
- GSP's campaign was made possible by "Viktorija grup" company, which incorporates Šid's oil factory "Mladost"
- Similar projects start September 1st in Novi Sad and Subotica

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Biodiesel projects

- Local producer from the vegetable oil sector, “Victoria Group” from Sid in Vojvodina, is planning to build a plant worth 15m euros that will produce 100,000 tons of biodiesel annually from rapeseed, soya bean and sunflower.
- The factory today has capacity for producing 50.000 tons of biodiesel, export to Austrian company
- Regional benefit for agricultural area: mixing biodiesel with fossil fuel – increased collecting of returns for farmers, export potential

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Conclusion

Further support schemes to be developed (in different directions):

- **Feed-in tariffs**
- **Quotas with Tradable Green Certificates (TGCs)**
- **Tendering/bidding systems**
- **Investment subsidies**
- **Fiscal and financial incentives**
- **Green pricing/Green funds**

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REGULATORY FRAMEWORK FOR RENEWABLE ENERGY SOURCES PENETRATION SUPPORT IN BOSNIA AND HERZEGOVINA – DISTRICT HEATING CASE

- air pollution,
- untenable current energy sources are growing,
- Unstable political and economical situation

turning to clean and renewable energy sources is necessary

Dr. Suad Halilčević

Dr. Vlado Madžarević

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District heating systems distribute:

steam, and
hot water.

The heat can be provided from a variety of sources:

RES: geothermal, biomass, solar

cogeneration plants,

waste heat from industry.

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A recent census by the Department of Energy of USA found more than 30,000 district heating systems in the United States, and

there are thousands more throughout the world

several world-wide towns supplied by heat through the district heating systems

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City	PJ	GWh
St. Petersburg	237	66.000
Moscow	150	42.000
Prague	54	15.000
Warsaw	38.2	10.600
Bucharest	36.7	10.197
Seoul (est.)	36	10.000
Berlin	33	9.247
Copenhagen	30	8.000
New York City	28	7.800
Stockholm	27	7.500
Hamburg	20	5.500

Thermal Power Plant Tuzla can produce for whole year to the amount of 7.000 GWh of electricity

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Paris	17.6	5.100
Göteborg	12	3.500
Reykjavík	11	3.200
Krakow	10.4	2.900
Katowice	8.6	2.400
Gdansk	8.3	2.300
Tampere, Finland	6.4	1.800
Indianapolis	5.8	1.625
Gdynia	5.4	1.500
Philadelphia	4	1.100
Detroit	3.1	870

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The commercially successful district heating system has been started by 1877 and the contributor was Birdsill Holly, who that year installed the first district heating system in Lockport, New York

All modern heating apparatus can be traced back to Roman inventions, including hypocausts, greenhouses, water pipes, and hot water heating apparatus for baths

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This technology, which never completely disappeared, became more widespread beginning with a climactic cold period in fourteenth and fifteenth centuries

At least one geothermal district heating system has been operating since the fourteenth century

These systems influenced on the district heating innovations for the next five hundred years

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By the sixteenth and seventeenth centuries, fuel conservation, smoke abatement, and safety were large factors in design of heating apparatus

Examples:

1623 proposal to install district heating in London.

A Russian palace built in 1783 had an extensive hot water system based on French technology

Separate boiler plants and underground piping were used by English factories in the 1790s and by 1820 was fairly common

Waste heat from factories was used to warm public baths by the 1830s and several proposals were put forward to heat worker's houses with this same heat supply.

The Crystal Palace in London had district heating in 1851

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At least two steam district heating systems were built in the United States in 1853 and one, at the U.S. Naval Academy in Annapollis, has been in continuous operation ever since

A General Steam Supply Company was proposed in London in 1859 and a steam supply company was incorporated in Pennsylvania in 1869

Factories and institutions began to centralize their steam boilers on a large scale in the 1870s and many new boiler plants were built

In 1876, hot water district heating was used to heat several large buildings at an asylum outside London

Systems were proposed for Zürich and Warsaw in 1872 and several patents were obtain for district heating in the 1860s and early 1870s.

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In spite of these efforts, no one had been able to introduce district heating on a commercial basis until Birdsill Holly, a Lockport, New York inventor, installed a steam system in that town in 1877.

Holly had previously developed a successful direct pressure water supply system and applied many of the same principles to the Holly steam system

His company installed nearly fifty systems before being sold to a group of investors, who sold hundreds more throughout the world over the next eighty years

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Best practice of regulatory framework for district heating based on renewable energy sources

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Should be based on:

- ✓ *Strong support from central authorities*
- ✓ *Strong support from municipalities*
- ✓ *Consumer ownership*
- ✓ *Efficient financing*
- ✓ *Variety of technical solutions*
- ✓ *Simple technical solutions*
- ✓ *Dynamic development and co-operation*

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Strong support from central authorities:

- *National least-cost energy planning*
- *Monitoring of the least-cost urban heat planning*
- *Monitoring of strict zoning of district heating and other sources for heating*
- *Encouragement of local authorities and utilities to implement least cost projects*
- *Implementation of legal measures that enforce building owners to connect and remain connected to district heating*

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Strong support from central authorities:

- Ban on electric heating in new buildings
- High taxation of fossil fuels for heating
- Investment subsidies to utilities which rehabilitate and complete networks
- Investment subsidies to consumers who install central heating and connect to district heating

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Strong support from municipalities

- **The municipalities have a natural interest in developing a good local district heating system for the benefit of the inhabitants**
- **The district heating network is regarded as a natural part of the urban infrastructure,**
- **Heat planning is an integral part of urban planning**
- **Urban development areas should be provided with district heating as well as water, sewage and other services**

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Consumer ownership

- **Almost all district heating companies are owned by the consumers,**
  either directly as consumer co-operatives or
  indirectly as municipally owned companies

- ✓ **This gives certain benefits:**
- **All company profit is given back to the consumers**
  at the end of the year or
  is transferred to the next year to lower the heat price

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Consumer ownership

- **Management will be encouraged to work for good consumer services at the lowest possible price**
- **All budgets and prices will be transparent for the consumers**
- **Consumers will be more motivated to pay the bills, i.e. only the consumers will make profit on the heat supply - or suffer possible losses**

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Efficient financing

- *Financing is a problem in many countries*
- *Most companies finance their investments in networks and CHP plants 100% by international credits at the lowest market based interest rate*
- *Banks compete to offer the best conditions as long as they can see that the security is high*
- *And security is high, due to following reasons:*

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- *The national energy policy is stable*
- *The municipalities guarantee for loans, also the consumer co-operatives*
- *The consumers are obliged to remain connected and to pay at least the fixed tariffs*
- *The proven technology and maintenance management ensure long life-time*
- *The consultants provide know-how on feasibility studies and project implementation*
- *There are clear roles of responsibility and efficient decision-making in the companies*
- *Therefore other private investors boot concepts and the like offer no real competition.*

The security of financing is high

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Variety of technical solutions

- There are district heating systems, that are typical for the one state approach today

- However, there are no obligatory norms and standards that specify detailed technical solutions and design criteria which have to be followed

- On the contrary, the technological development is very dynamic and it can be find a huge variety of technical solutions adjusted to the local conditions and the opinion of the local decision makers

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Variety of technical solutions

For example, the following variety of existing technical solutions can be adopted:

System design: steam,
super-heated water,
normal hot water (maximal 120 °C) or
low-temperature systems

Pipe construction: preinsulated steel pipes,
steel pipes in concrete ducts,
steel pipes in steel or
plastic pipes (in small dimensions)

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Variety of technical solutions

Indirect connection: via heat exchangers or direct connection

Meters: energy meters or flow meters only

Preparation of domestic hot water: with storage tank or with heat exchanger, but absolutely no open systems (tapping hot water from the district heating circuit)

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Variety of technical solutions

- The district heating company will, often assisted by its consultant,
- select the concept which gives the consumers the best value
- for money in the long run

- After all, the consumers are the only ones to pay for the costs

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Simple technical solutions

Simple and cheap solutions could be more important than the advanced ones for the further market development of district heating in the South-East Europe countries and for the survival of their small local distribution systems

➢ ***Characteristics of the simple technical solution:***

✓ ***Maximal design temperature 95 °C***

✓ ***Variable flow and operational supply temperature down to 60 °C in the summer***

✓ ***Network of the preinsulated bonded system without expansion loops, compensators or pre-stressing***

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Characteristics of the simple technical solution

- For further lowering of costs, curved pipes can be installed in a new optimised trench only 60 cm below ground
- Substations with direct connection and differential pressure valve in each building complex
- Production of domestic hot water in each building substation
- Flow meter or heat meter in each substation to distribute costs among the buildings
- Closed heating circuit and water treatment

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Dynamic development and co-operation

The following factors have been important for this development:

- **Norms and standards are based on prescribed functions (not on specific details) and therefore they allow a huge variety of solutions (as described above) which stimulate a competitive development**
- **This development creates a good environment for co-operation between district heating companies, suppliers of equipment and consultants**
- **Many small enterprises in the private sector work in a competitive environment**

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Dynamic development and co-operation

- **The government supports the development of energy efficient technology by investment subsidies to individual projects in the initial phase**

- **The State District Heating Association should be organized which will offer support and advice to all its member-companies and acts as interest-organisation for the sector**

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Bosnia and Herzegovina circuimstances regarding RES applied in the district heating sector

The Bosnia and Herzegovina RES specific project potentials have to be studied through the next several questions:

- **who were the entrepreneurs for RES?**
- **what motivated them?**
- **what institutional settings did they face?**
- **what policies and programs did they initiate?**
- **what factors facilitated or constrained RES innovation?**

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The whole process of campaign to heat communities through the district heating systems should be organized through the next segments:

- ***Legal framework for DH installations based on RES***
- ***Financing of DH installations***
- ***Standards and Rules***

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Legal framework for DH installations based on RES

Ministry of Industry, Energy and Mining should support Special Operational Framework Programme to establish and speed-up the realization of DH systems

The special secretariat of this Ministry should be in charge of this programme. It would content the four Units:

- **Programming-evaluation unit**

This unit creates and publishes the criteria for participation in the programme and evaluates the proposals

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Legal framework for DH installations based on RES

- **Administrative and monitoring of the projects of the programme**

This unit is in charge of monitoring the progress of the project within the programme. Sectors of this unit should be established in each canton of Federation, or region of Bosnia and Herzegovina

- **Control**

Controls the actions for their validity according to EU and national laws

- **Administrative and organisation unit**

This unit helps in any technical mater of the secretariat.

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Legal framework for DH installations based on RES

- **The government supports the development of energy efficient technology by investment subsidies to individual projects in the initial phase**

- **The State District Heating Association should be organized which will offer support and advice to all its member-companies and acts as interest-organisation for the sector**

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Legal framework for DH installations based on RES

Measures such as aid for investment in co-production, renewable energy sources and energy saving systems should take into account the next measures:

- **Diversification of energy sources and reduction of the dependence on imported energy sources**
- **Decrease of operating cost in industrial and public services sector**

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Legal framework for DH installations based on RES

- **Environmental protection via the reduction of fuel consumption in order to comply with the Kyoto Commitment protocol**
- **Support of local development via RES installation**
- **Increase of local employment at the RES installation sites**

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Legal framework for DH installations based on RES

The research priorities to support the legal framework follow:

- ***Information, support and promotion of CHP, RES and DH measures***
- ***Expansion of infrastructure in CHP, RES and DH***
- ***Financial incentives for private investments in RES***
- ***Investment in heating systems of Public sector, like Schools, Hospitals etc.***

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Legal framework for DH installations based on RES

The legal framework may consist of:

- ***Replacement of conventional fuels infrastructure with natural gas, biomass based fuels, etc.***
- ***Energy efficiency measures***
- ***RES and CHP installations to produce electricity additionaly***
- ***Heating systems based on RES for public buildings of Bosnia and Herzegovina***

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Financing of DH systems based on RES

- Installation of DH system based on RES
- Energy Saving Projects
- Projects that reduce the losses in the industrial process or use part of the rejected energy
- CHP projects
- Update of the existing thermal production infrastructure to produce electricity and vice versa

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Financing of DH systems based on RES

The financing support should cover the next points:

- *Technical solutions combining old and new installations*
- *Institutional solutions*
- *Operation management*
- *Tariffs*

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Standards and Rules

The following standards and rules should be applied to DH installations based on RES in Bosnia and Herzegovina:

- ***Utility Technical Guideline** for the Connection of boiler, main steam-pipe, heat distribution and heat end-users*
- ***Sets forth the technical conditions** and requirements for the connection of heat end-users to the heat distribution grid*
- ***Issues** are pressure variations, and reliability for heating installations*
- ***Distribution Network Code***

Principles for the operation, maintenance, planning and expansion of the heat distribution network, determines the jurisdiction and obligation of the Distribution Network Operator

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Standards and Rules

- *Other Technical Guidelines*
- *Technical policies implemented by engineers in a great variety of network issues, including many affecting RES installations*
- *Extensive set of legal documents (laws, decrees etc.) that regulate the RES in Bosnia and Herzegovina after recent deregulation in electricity sector*
- *Licencing procedure should be quickly and transparence based on necessary permissions of local community, Regulatory Commission and Ministry of Energy*

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SUBCONCLUSION

Effective co-operation of the local authorities with the investors is the key factor for speeding-up the procedure

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Municipality heating company in Bosnia and Herzegovina

Motivation for Bosnia and Herzegovina communities in changing of energy policy should be based on the follows:

- **Political profile**
- **Ambitious local utility**
- **Recessive local economy with a need to cut municipal expenditure**
- **State, World Bank and other available financial funds for RES investment should be used**
- **Ambition to make a national reputation as an environmentally sound cities**

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Municipality authorities have to take into consideration the competitive circuimstances

That means that each district heating technology has the same starting point and that each of these technologies is under the same district interest and demands.

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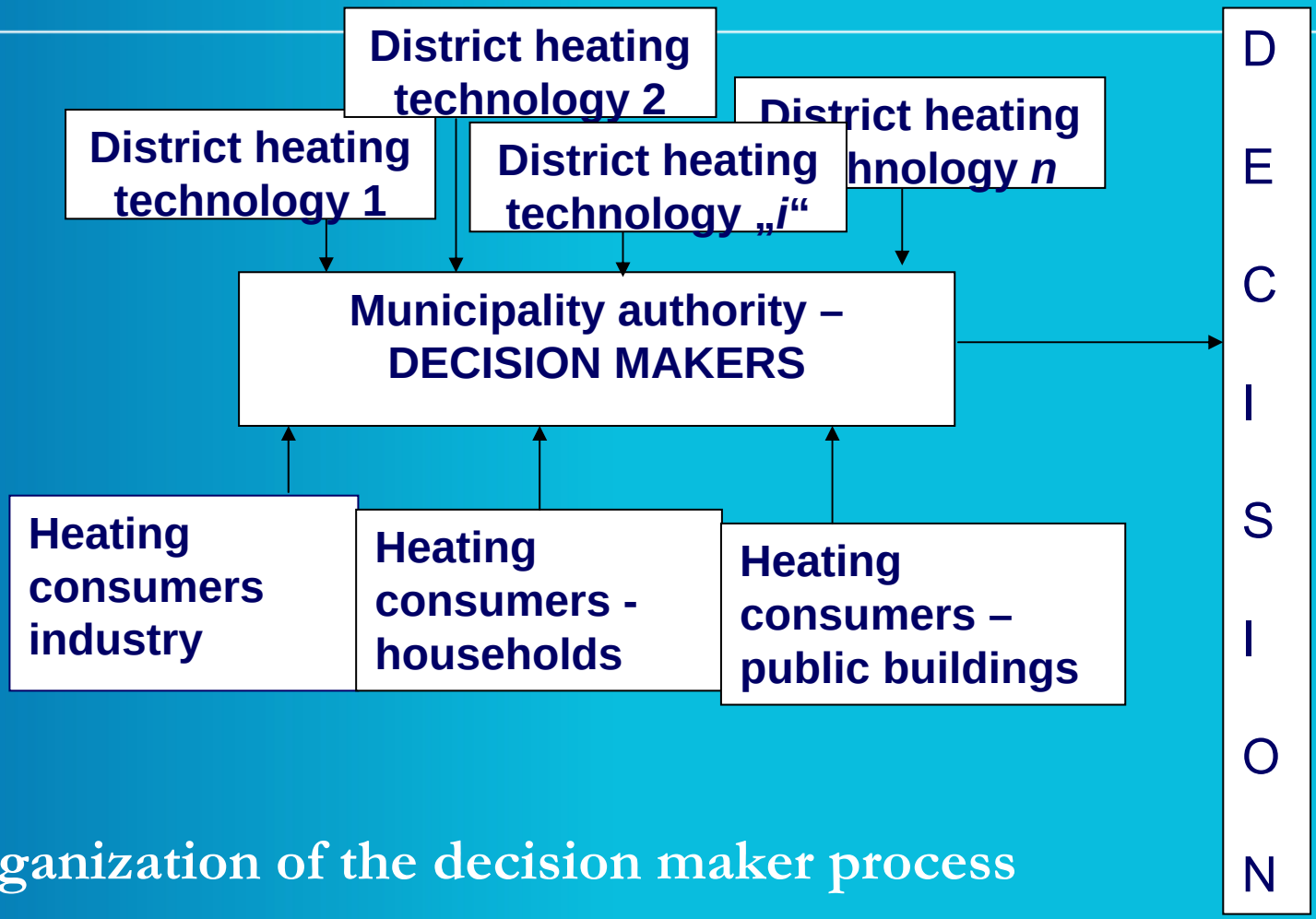

Organization of the decision maker process

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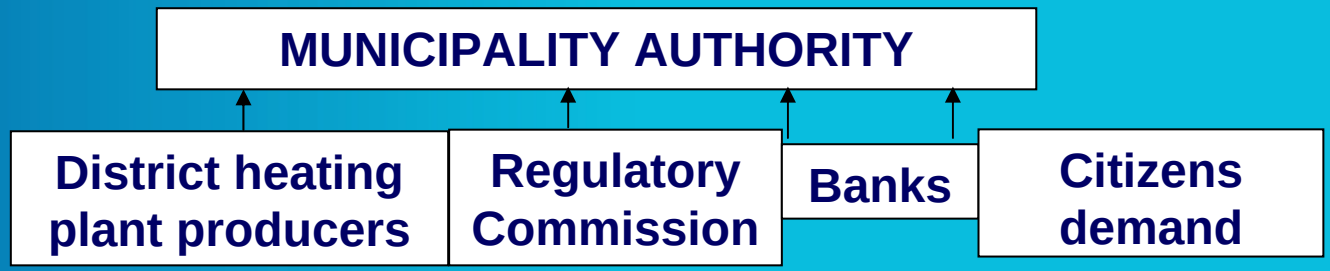

Influences on the municipality authority to its decision to solve district heating problem

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How can municipal authority to solve dilemma?!

- The method by which the municipality authorities can solve the problem of decision-making regarding district heating technology in the given legal framework arises from the field of operational research and management science

- The municipality energy company should have one systematic and quantitative approach

- These requirements are satisfied by Analytic Hiearachy Process

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Analytic Hierarchy Process

Suitable for municipal energy company to adopt a decision

The procedure is designed to quantify managerial judgments of the relative importance of each of several conflicting criteria used in the decision-making process.

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AHP is based on:

- **pairwise comparasion matrices**
- **priority vectors**
- **overall priorities, and**
- **hierarchy construction**

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Dilemma case

One municipal heating company is imposed to two criterias taking into account the legal framework of RES penetration in to the district heating system:

- **RES penetration financial support, and**
- **Ownership**

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The financial support for larger penetration of RES in DH can be realized through the next mechanisms:

- **feed-in tariff (FT)**
- **subsides through the capital costs (SCC)**
- **tax policy (TP)**

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The ownership can be realized through the next cathegories:

- **municipal (MP)**
- **private (P)**
- **mixed (municipal and private) (MX)**

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The district energy company estimates the quality of each of the available options

Taking into account present state of municipality, future plans and estimated development, municipality officials and citizens in the scale of 0 to 5, prefer:

- Tax policy two times more with respect to SCC
- Tax policy 1,5 times more with respect to FT
- SCC 1,5 times more with respect to FT

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When the ownership is taken into account, then the citizens in the scale of 0 to 5 prefer:

- **Mixed ownership four times more of private one**
- **Mixed ownership three times more of municipal one**
- **Municipal ownership two times more of private one.**

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With presented input data the municipality authority can estimate the best way to provide the heat energy in the existing legislative framework

First, construction of the pairwise comparasion matrix for financial support has to be made

$$\begin{array}{c} \\ FT \\ SCC \\ TP \end{array} \begin{array}{c} \begin{array}{ccc} FT & SCC & TP \end{array} \\ \begin{bmatrix} 1 & 1/1{,}5 & 1/1{,}5 \\ 1{,}5 & 1 & 1/2 \\ 1{,}5 & 2 & 1 \end{bmatrix} \end{array}$$

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The pairwise comparasion matrix for ownership of district heating system

$$\begin{bmatrix} MP \\ P \\ MX \end{bmatrix} \begin{bmatrix} 1 & 2 & 1/3 \\ 1/2 & 1 & 1/3 \\ 3 & 4 & 1 \end{bmatrix} \begin{matrix} MP \\ P \\ MX \end{matrix}$$

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The priority vector for financial support

FT: (1/4 + 1/5,5 + 1/3,25) / 3 = 0,2465

SCC: (1,5/4 + 1,5/5,5 + 1,5/6,5) / 3 = 0,2928

TP = (1,5/4 + 3/5,5 + 1,5/3,25) / 3 = 0,4607

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The priority vector for ownership

MP: (1/4,5 + 2/7 + 1/5) / 3 = 0,2359

P: (1/9 + 1/7 + 1/5) / 3 = 0,1513

MX: (3/4,5 + 4/7 + 3/5) / 3 = 0,6127

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- It is easy now to decide which of the offered options can be accepted in terms of the financial support mechanisms and question of ownership.

- In this case, the acceptable tax policy and mixed ownership are dominant options that should be installed in the legal framework of community in to aim to install DH system based on RES.

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The different influences such as ownership, support mechanisms, etc. in the framework of RES support directly determine the rates of district heating service

Acceptable average rates for district heating service in Bosnia and Herzegovina depend on the type of RES and consumers (households, industry, public buildings), respectively, and of the current economical and energy situation

These are in to the range of 0,015 to 0,055 euro/kWh.

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CONCLUSION

The regulatory legal framework to support including of RES in the existing municipality energy systems should be adopted as soon as possible

The agile and transparence work of municipality officials to support DH system is neccessary

The whole interested parties such as investors, citizens, academy society, financial agencies, etc. should be included in the process of discussion and dilemma:

which of the regulatory legislative framework regarding RES and DH systems to apply and in a which way

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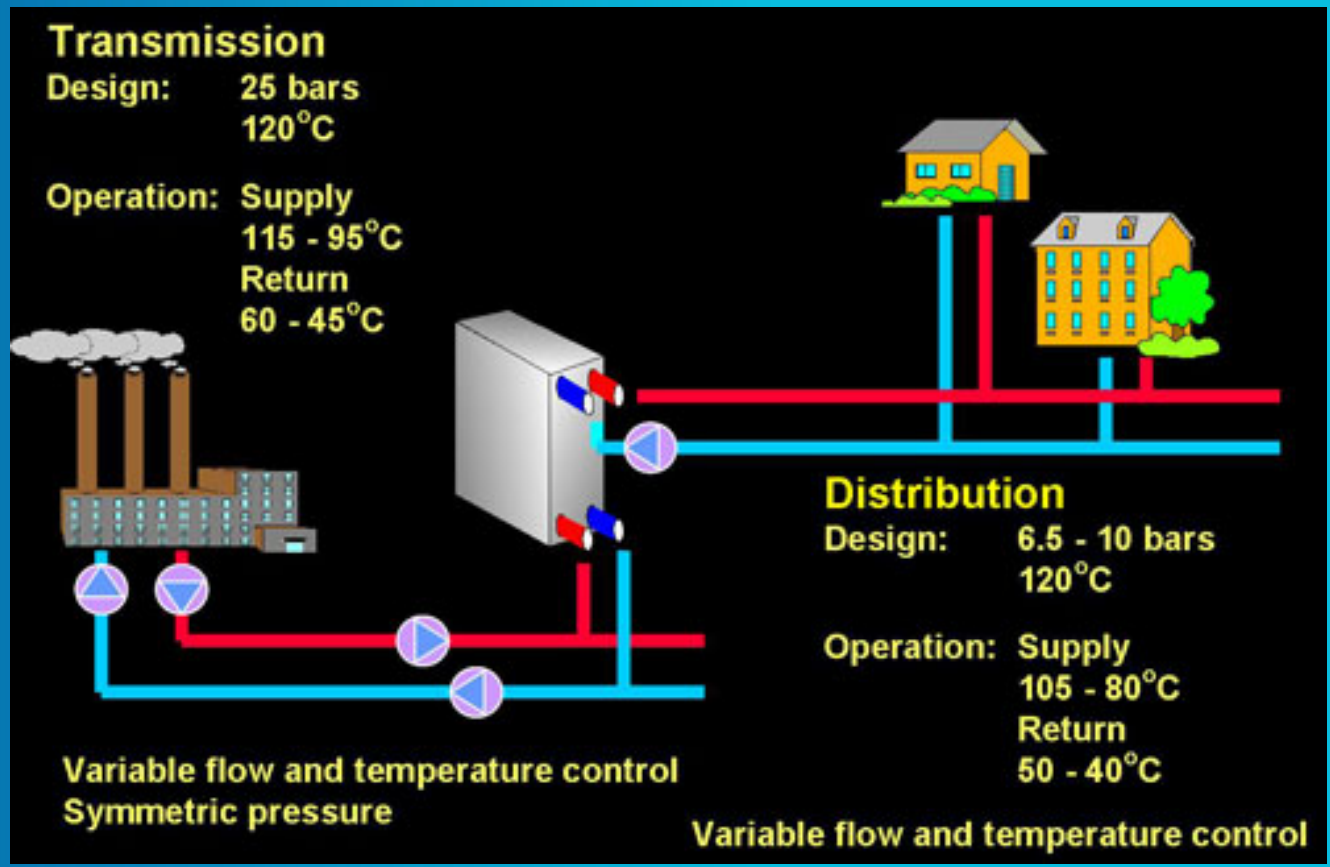
GOOD LUCK AND DO IT



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The Greek Regulatory Framework for Renewable Energy Sources Penetration

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Contents

- Harmonization with EU
- Legal framework for RES installations
- Promotion of RES
- Financing of RES
- Best practices
- Lessons learned
- Main barriers to the development of RES

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Harmonization with EU

- According to EU Directive 96/92, 20.1% of energy in Greece by 2010 must be produced from RES
- Greek laws 2244/94 and 2773/99 for the promotion of RES
- Center for Renewable Energy Sources (CRES) was founded before EU Directive in September 1987
- Creation of Regional Centres for energy in various regions of Greece

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Optimistic estimate of RES-power production by year 2010

	Installed capacity in year 2003 (MWe)	Installed capacity estimation for 2010 (MWe)	Power production, by 2010 (TWh)	% per RES-type by 2010
Wind	420	2170	6.08	8.45
S-hydro	66	475	1.66	2.31
Large hydro	3060	3680	5.47	7.59
Biomass	8	125	0.99	1.37
Geothermal	0	8	0.06	0.09
Photovoltaic	0	5	0.01	0.01
Total	**3461**	**6463**	**14.27**	**19.82**

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Conservative estimation of RES-power production by year 2010

	Installed power capacity in year 2003 (MWe)	Installed power capacity estimation for 2010 (MWe)	Power production, by 2010 (TWh)	% per RES-type by 2010
Wind	420	1200	3.36	4.67
S-hydro	66	200	070	0.97
Large hydro	3060	3680	5.47	7.59
Biomass	8	100	0.79	1.10
Geothermal	0	8	0.06	0.09
Photovoltaic	0	5	0.01	0.01
Total	**3461**	**5193**	**10.39**	**14.43**

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Legal Framework for RES installations (1)

- Feed-in tariff model (Greek laws 2244/94, 2773/99)
- RES and CHP installations do not participate in the electricity market, they are priority dispatched and their energy is sold at fixed tariffs.
- RES electricity is bought at prices linked to the LV consumer tariffs. Energy is paid 90% of the respective retail price for island systems and 70% for mainland.
- In mainland, installed power is compensated at 50% of the applicable consumer tariff. In island power systems, no credit is given to power (only to energy produced).
- For CHP using non-renewable sources, similar tariff system applies. The same for self-producers.

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Legal Framework for RES installations (2)

- Measure 2.1 of the 3rd Community Operational Framework Programme “Competitiveness” of the Ministry of Development of Greece
  - Wind Energy : 30% of the budget
  - PV : 50% of the budget
  - Geothermal : 50% of the budget
  - Biomass energy : 50% of the budget
- Companies operating on Greek islands with population under 3100 inhabitants have tax reduction
- New call for installing PVs on public buildings of islands (with population under 3100 inhabitants) with almost 100% subsidy

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Legal Framework for RES installations (3)

Standards and Rules

- **Utility Technical Guideline for the Connection of DG to the Grid**

  Sets forth the technical conditions and requirements for the connection of RES and other DG to the distribution grid. Issues are slow and fast voltage variations, flicker, harmonics, interconnection protection, short circuit level etc., for LV and MV installations.

- **Distribution Network Code**

  Principles for the operation, maintenance, planning and expansion of the distribution network, determines the jurisdiction and obligation of the Distribution Network Operator. Inevitably affects DG.

- **Other Technical Guidelines**

  Technical policies implemented by PPC engineers in a great variety of network issues, including many affecting DG installations.

- **Legal Framework for the Electricity Market**

  Extensive set of legal documents (laws, decrees etc.) that regulate the Greek electricity market after recent deregulation. (non-technical)

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License Procedures

- Each prefecture gives the necessary permissions for installing RES in its territory
- Regulatory Authority for Energy (RAE) approves or not the investment plan and gives permissions for signature to Ministry of Development
- Ministry of Development signs authorizations.

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Regional Energy Centers

- Regional Energy Centers make significant efforts in informing the citizens of specific regions about RES and also for promoting RES. There are offices at various Greek Islands.
- Energy Centers in Greek Islands:
  - Regional Energy Centre of Crete
  - Regional Energy Centre of North Aegean Sea
  - Regional Energy Centre of Cyclades Islands
  - Regional Energy Centre of Dodecanesse Islands

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Other Authorities that promote RES

- Additionally to Regional Energy Centers, other local authorities that promote RES are:
  - Organization for the Development of the Sitia Region, Crete Island
    - 0.5 MW installed wind capacity since 1993
    - License for 1.2 MW wind power
  - Municipality of Mitilini, Lesvos Island
    - 800 kW installed wind power, 8 kW PV capacity
  - Municipal Waste Water Treatment Plant with biogas in Heraklion and Chania, Crete Island

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Non-Governmental Bodies that promote RES

- Greenpeace, WWF
- Hellenic Network of Ecological Organizations
  - consisting of 4 local ecological organizations in Crete and 7 organizations on the rest Aegean Islands
- Greek Association of RES Electricity Producers
- The Hellenic Association of Photovoltaics

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The current regime of public subsidies for RES investments

Brief cost and production elements from RES power installations that are financed by resources of the 2nd European Community Support Framework

	Wind	Small-hydro	PV	Biomass	Total
Number of applications	14	9	15	13	**51**
Final budget (in million €)	124.5	17.2	6.1	48.5	**196.3**
Total public cost (in million €)	49.8	7.7	4.2	22.9	**84.6**
Total installed power capacity (MWe)	116	11.5	0.74	8.74	**136.98**
Annual power production (TWh)	0.335	0.053	0.001	0.168	**0.557**

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Competitiveness program

TOTAL COST: € 6.7 billion

- **EUROPEAN FINANCING: 30.8%**
- **NATIONAL PARTICIPATION: 19.4%**
- **PRIVATE SECTOR: 49.8%**

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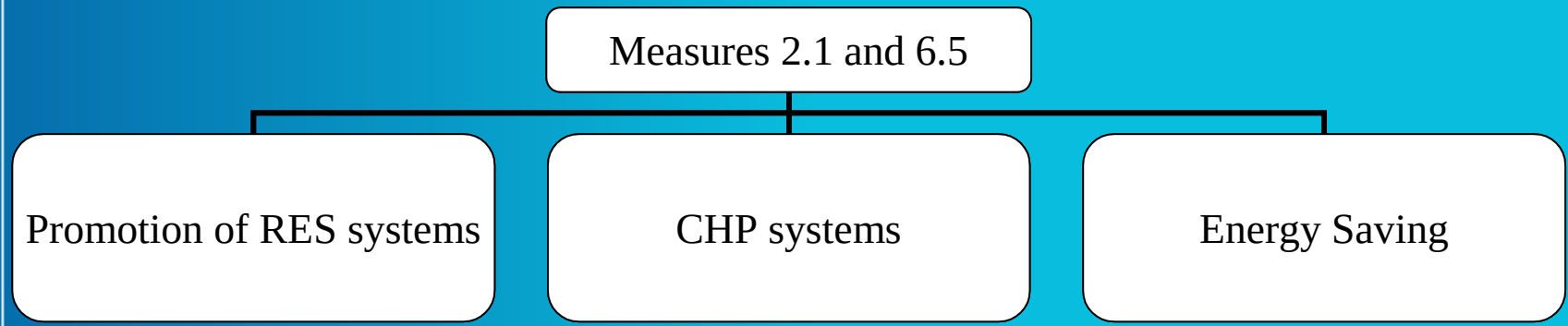
Competitiveness program Measures 2.1 and 6.5



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Competitiveness program Measures 2.1 and 6.5

Targets

- Increase of RES and CHP participation in Power production system of the country;
- Secure energy supply with parallel reduction of dependence on imported primary energy through differentiation of energy resources;
- Environmental protection.

Cost

- Total cost of Measures 2.1 and 6.5: € 1.15 billion
- National participation: € 360 million with 50% EU contribution

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Competitiveness program
General investments categories

General investments categories are:

- Energy Saving (Energy Conservation) (ES)
- Combined Heat and Power (CHP)
- Conventional Fuel Substitution with gaseous fuels (FS)
- Renewable Energy Sources (RES)

- Final date of investments implementation: 31/12/2007

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Competitiveness program
Eligible costs upper limit (1)

TECHNOLOGY	**UPPER ELIGIBLE COSTS LIMIT (€)**
Combined Heat and Power (CHP)	1.050 / installed kW_e, for installatons < $1MW_e$ 750 /installed kW_e, for installations > $1MW_e$
Wind	900 / installed kW_e
Geothermal applications in Greenhouses	100.000 / 1000 m^2 of glass greenhouse 60.000 / 1000 m^2 of plastic greenhouse
Small-hydro on water streams	1.500 / installed kW_e
Small-hydro on hydraulic networks	1.100 / installed kW_e
Power-production or Combined Heat and Power by biomass	Agricultural residues: 1.600 / installed kW_e Sewage wastes: 1.300 / installed kW_e Industrial and municipal sold wastes: 1.500 / installed kW_e

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Competitiveness program
Eligible costs upper limit (2)

TECHNOLOGY	UPPER ELIGIBLE COSTS LIMIT (€)
District-heating / district-cooling by RES or by Natural Gas	750 / installed kW_{th}. 900 / installed kW_{th}, in case of total transformation of the produced thermal energy into cooling
Bio-fuels production (bio-ethanol, bio-diessel)	500 / tonne
Central Solar systems – Conventional collectors	300 / m^2
Central Solar systems – High efficiency	500 / m^2
Photovoltaic systems (interconnected to the grid without storage system)	8.800 / kWp
Autonomous Photovoltaic systems (PV panel, storage system)	10.000 / kWp

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Competitiveness program
Techo-economic evaluation criteria

		WEIGHTING FACTOR (%)	
No	**CRITERION**	**Investments with budget greater than €440.000**	**Investments with budget lower or equal to €440.000**
1	Internal Return Rate (IRR)	20	-
2	Primary Energy Saving	25	40
3	Environmental Impacts	15	20
4	Social Impacts	10	10
5	Technology Reliability and Competence of Investment Proposal	30	30
TOTAL		**100**	**100**

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Best Practices (1)

- Places with high RES penetration in Greece (above 10% in electricity):
  - Crete Island : instantaneous 38%
  - Lesvos Island: instantaneous 42%
  - Kythnos Island : above 40% for 1000 hours, 100% for few hours a year

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Best Practices (2)

- Wind Parks Installations in Crete :
  - Before law 2244/94 : 7.1 MW
  - Currently : 87.1 MW, this is 80 MW in 10 years
  - Annual energy penetration around 10%
  - Another 114 MW of Wind Parks with installation licenses.
  - Three times faster License procedures by Crete Prefecture than in other regions of Greece.

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Lessons learned

- Need for speeding up license procedures
- The license procedure should be differentiated according to the RES type of installation
- Effective co-operation of the local authorities with the investors was the key for speeding up the license procedure (Crete and Thrace)

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Main Barriers to the development of RES

- Most important is the complexity of the legal framework and particularly the time consuming license procedure, frustrating for many small investors.
- The often inhibitive cost for the interconnection to the grid (mostly reinforcement or construction of new network lines).
- For larger stations (more than ~20 MW) and in certain areas with very high wind potential, lack of sufficient HV transmission system capacity. Due to environmental restrictions and local community protests, expansion of the HV system is in some cases impossible.
- In the case of wind farms, public opposition in some cases.

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Renewable Energy Policy in Croatia: Support Mechanisms and Barriers

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- Overview of Croatian energy policy
- Status of RES in legislative framework
- Overview of support mechanisms
- Current status of RES in Croatia and future developments
- Conclusion: Future steps

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Overview of Croatian energy policy - chronology

- 1991: New Energy Strategy
- 1994: PROHES – Development and Organization of the Croatian Energy Sector Programme adopted by the Government
- 1997: National Energy Programmes (RES and EE)
- 1998: Energy sector development strategy
- 2001: energy legislation → package of energy laws:
  - Energy Act
  - Electricity Market Act
  - Oil and Oil Products Market Act
  - Gas Market Act
  - Energy Activities Regulation Act
- 2002: Energy strategy – "Croatia in the 21st century"

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Overview of Croatian energy policy – chronology (*cont.*)

- 2003: Environmental Protection and Energy Efficiency Fund (EPEEF)
- 2004: new and amended energy legislation → to incorporate relevant EU directives:
  - Directive 2003/54/EC on the internal market in electricity
  - Directive 2003/55/EC on the internal market in natural gas
  - Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market;
  - Directive 2004/8/EC on the promotion of cogeneration based on a useful heat demand in the internal energy market
  - Directive 2003/30/EC on the promotion of bio fuels and other renewable energy sources in transportation.
- 2004: Programme for Energy Strategy Implementation
- 2005: Production, distribution and supply of heat Act

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Overview of Croatian energy policy – strategy and goals

- The final goal of energy sector reform is congruence of Croatian energy policy and energy market with European energy market even before Croatia becomes the Member State
- Main goals of Croatian energy policy defined in Strategy for energy sector development:
  - improvement of energy efficiency
  - security of energy supply
  - diversification of energy sources and technologies
  - use of renewable energy sources
  - realistic energy prices and development of energy market
  - environmental protection

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Overview of Croatian energy policy - NEP

- Energy strategy is to be implemented through National Energy Programmes (NEP):
  - PLINCRO- Croatian natural gas programme
  - MIEE - industrial energy efficiency network
  - KUENzgrada - programme for energy efficiency in building construction
  - KUENcts - programme for energy efficiency in centralized heating systems
  - KOGEN - co-generation programme
  - **MAHE** - small hydro power plants construction programme
  - **SUNEN** - solar energy utilization programme
  - **BIOEN** - biomass and waste utilization programme
  - **ENWIND** - wind-energy utilization programme
  - **GEOEN** - geothermal energy utilization programme

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Status of RES in legal framework

- Energy Act (OG 68/2001, 177/2004)
  - increased use of renewables is in the interest of the Republic of Croatia
  - conditions and possibilities as well as legal rights and obligations of legal entities regarding to RES use will be defined in Rules on use of RES and cogeneration → Ministry of Economy
  - compensations for renewable energy will be part of both regulated and free energy prices for all forms of energy
  - collected compensations will be distributed to RES facilities via feed-in tariffs to be set for all eligible RES facilities by the Government

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Status of RES in legal framework, II

- Energy Act (OG 68/2001, 177/2004), *cont.*
  - For establishment of programmes for RES implementation according to Strategy and Programme responsible:
    - On the national level Ministry of Economy
    - On the local level responsible bodies of local authorities
  - Incentive measures in programmes: education, information, energy advise centres, publications

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Status of RES in legal framework, III

- Electricity Market Act (OG 177/2004)
  - transmission system operator (TSO) or distribution system operator (DSO) obliged to ensure that the whole electricity produced by eligible producers is taken over, according to terms defined in Rules on use of RES and cogeneration
  - eligible producers (Rules on granting of status of eligible electricity producer → Ministry of Economy):
    - Energy subject that in the same plant produces electricity and heat, uses waste or renewables to produce electricity in the economically appropriate manner and in respect to the environment
    - For granting status of eligible producer responsible Croatian Energy Regulatory Agency (HERA)
    - Eligible producers except hydro power plants over 10 MW are entitled to incentive price

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Status of RES in legal framework, IV

- Electricty Market Act (OG 177/2004), *cont.*
  - market operator (MO) obliged to collect incentives for RES and cogeneration paid by all consumers
  - distribution of these incentives according to Tariff system for RES and CHP
  - MO enters into contracts with all suppliers to comply with the Ordinance on minimum share of electricity produced from RES and cogeneration
  - Ordinance prescribes minimal share that electricity supplier must take over
  - Energy supplier is obliged at least once a year inform consumer about RES shares in electricity supply

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Status of RES in legal framework, V

- Production, distribution and supply of heat Act (OG 42/2005)
  - The goal: establishment of regulation in this sector, promoting new centralised heating systems, improving efficiency of existig once and promotion of cogeneration
  - Cogenerations have priority when choosing solution for new system
  - Energy subjects that use cogeneration and waste, bio-degradable parts of waste or renewables for production of heat in economically appropriate way and in the respect to the environment can be granted with status of eligible producer
  - Rules on granting status of eligible heat producer will determine conditions
  - Sources and amounts of financial incentives for eligible producers is determined by the Government

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Completion of legal framework

- Secondary (implementation) legislative acts crucial for higher RES penetration:
  - Rules on use of RES and cogeneration (*EA article 14/2*)
  - Ordinance on minimum share of RES and cogeneration in electricity generation mix (*EMA article 26/4*)
  - Tariff system for electricity generated for RES and cogeneration (*EA article 28/3*)
  - Ordinance on compensation for promotion of electricity produced from RES and cogeneration (*EA article 28/3)*
  - Rules on granting of status of eligible electricity producer (*EMA article 8/2*)
  - Rules on granting of status of eligible heat producer (*PDSHA article 9/3*)
- All of them still missing! → expected to be adopted by the end of 2006

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Completion of legal framework, II

- Rules on use of RES and cogeneration
  - legal rights and obligations of energy entities regarding to RES use
  - Register of RES and cogeneration projects managed by HERA
- Ordinance on minimum share of RES and cogeneration in electricity generation mix
  - prescribes the minimal share of electricity produced from RES that energy supplier is obliged to take over
- Tariff system for electricity generated for RES and cogeneration
  - the incentive price for eligible producers that MO is obliged to pay for delivered electricity
  - diversification based on RES type and rated power of the plant

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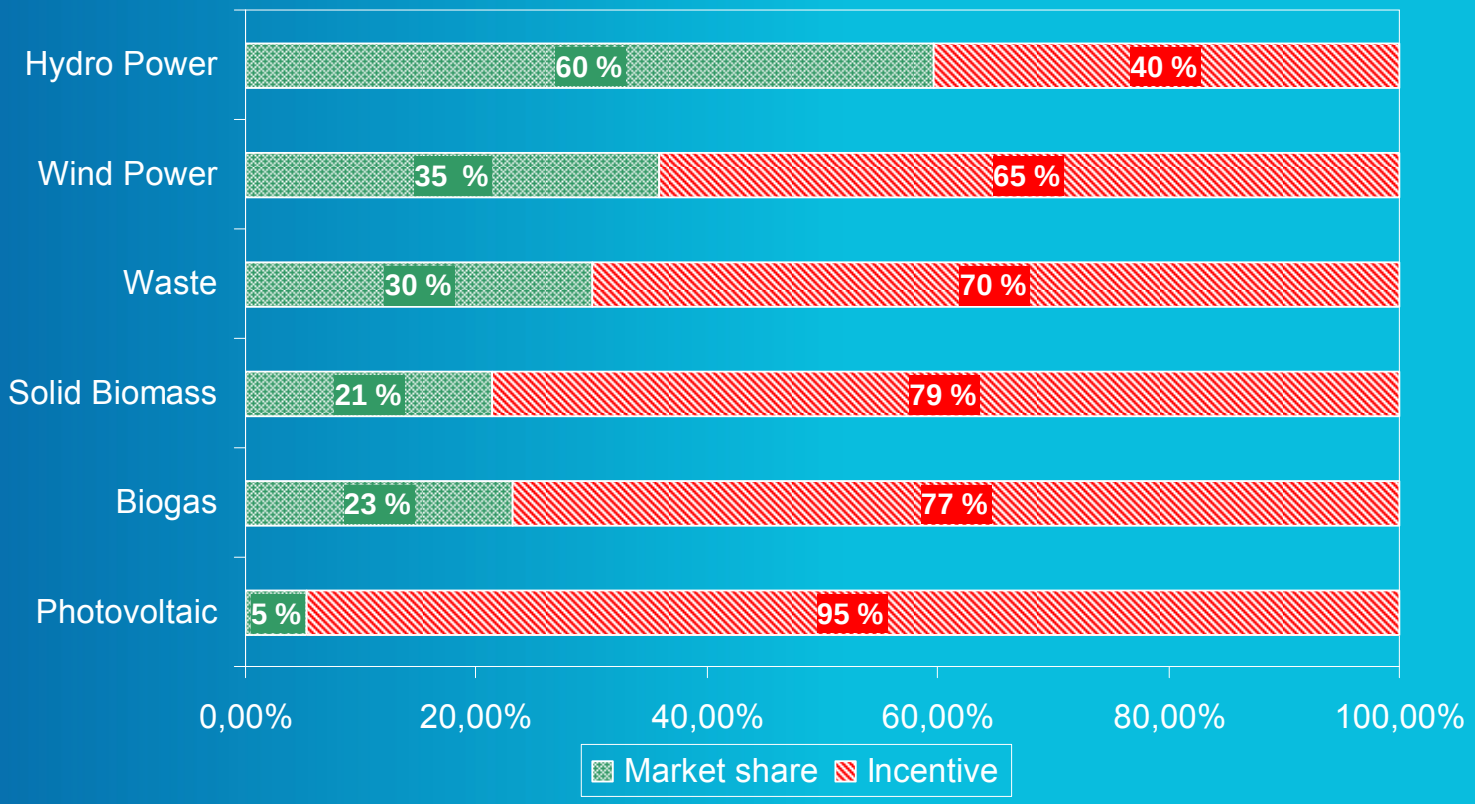
Completion of legal framework, III

- Tariff system for RES-E and CHP



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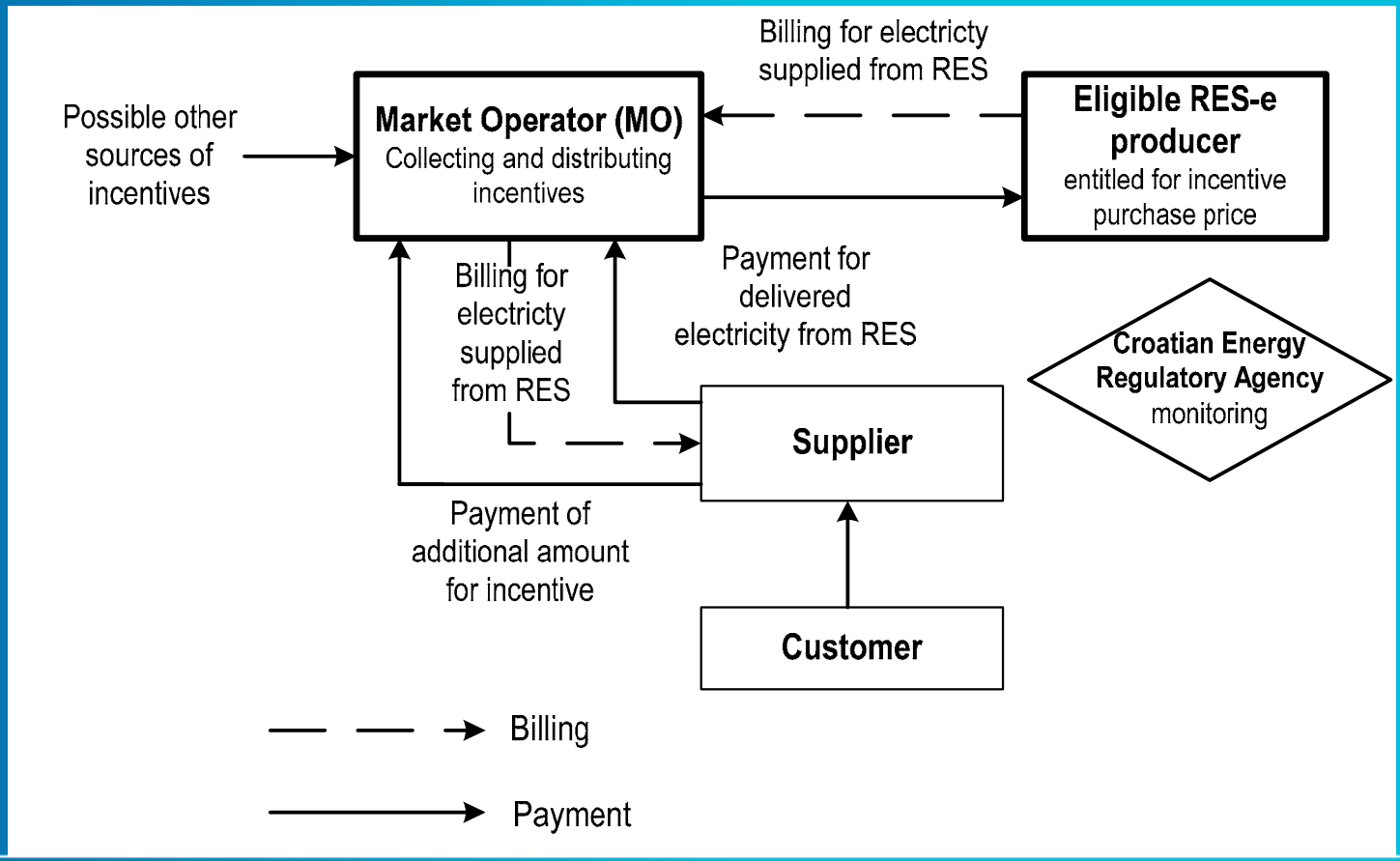
Completion of legal framework, IV

Institutional Framework



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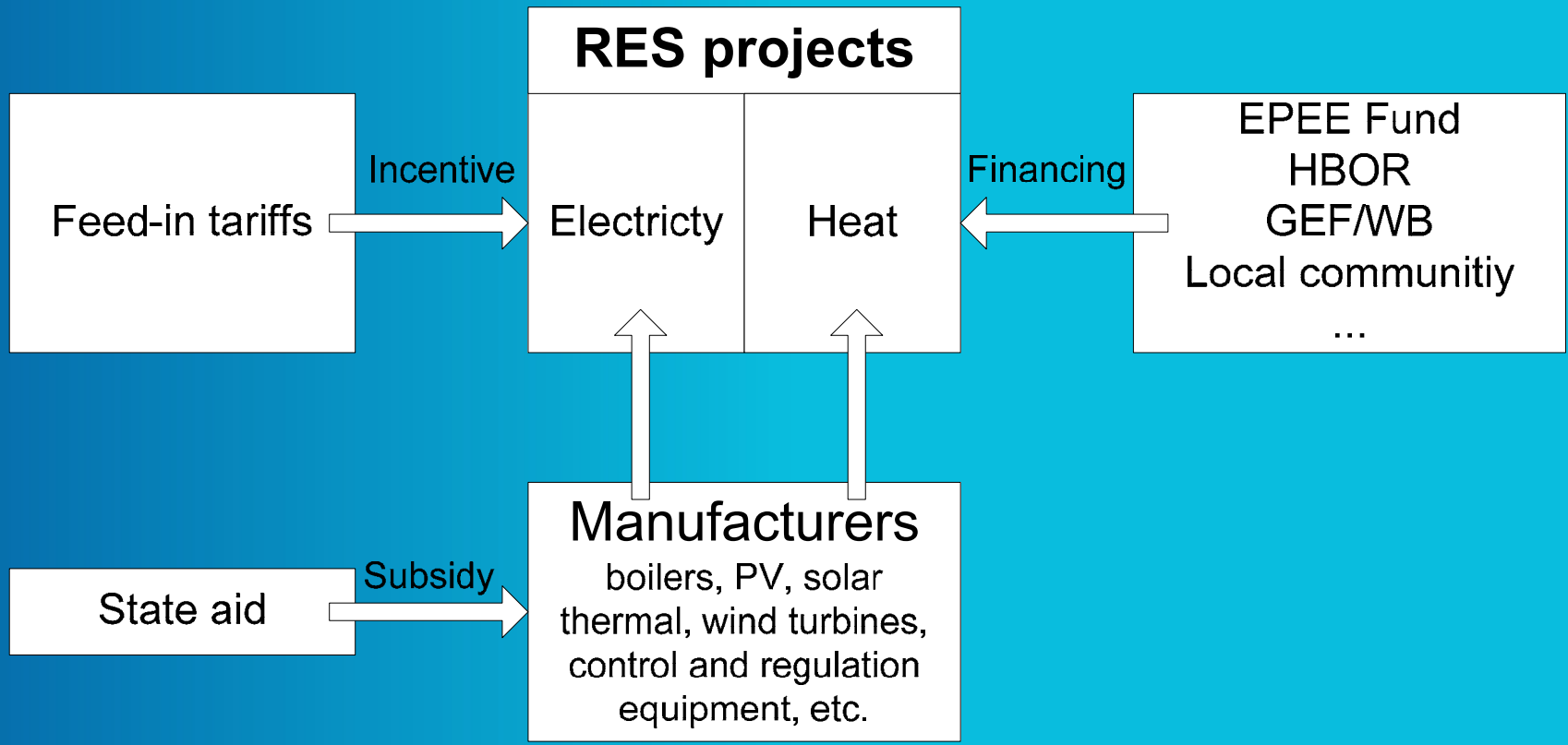
Support mechanisms for RES



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Financial framework for RES

- **no expenditures from the state budget!**
- for grid connected facilities → feed-in tariffs
- for off-grid facilities, heating applications and production of bio-fuels: support from the Environmental Protection and Energy Efficiency Fund
- the Fund was established and started to operate in the beginning of 2004

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Financial framework for RES - EPEEF

- Activities of the EPEEF divided in two basic areas:
  - Environmental protection
    - environment quality, clean production, waste management, biodiversity, sustainable use of natural resources, etc.
  - Energy efficiency → also includes RES
    - national energy programmes, RES use, sustainable building, clean transportation
- Sources of funding:
  - **Non budget** institution
  - "Polluter pays" principle
  - The most important sources are environmental charges!
  - Bilateral and multilateral cooperation
  - International agreements and donations

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Financial framework for RES – EPEEF, II

- The charge for emissions into the environment
  - 26,3 €/tone SO_2/NO_2 in 2005
  - 42,5 €/tone SO_2/NO_2 in 2006
  - CO_2 charge has not yet been applied (1,6 €/tone)
- The charge for the environment use
  - For buildings or constructions that require environmental impact assessment
- The charges for burdening the environment with waste
  - for communal and/or no hazardous industrial waste (1,6 €/ metric tone)
  - For hazardous waste (6,8 €/metric tone in 2005, 13,7€/metric tone in 2006)
- Special environmental charges for motor vehicles
  - The most important source of funding
  - Dependant on vehicle, engine and fuel type, engine volume and power, and vehicle age

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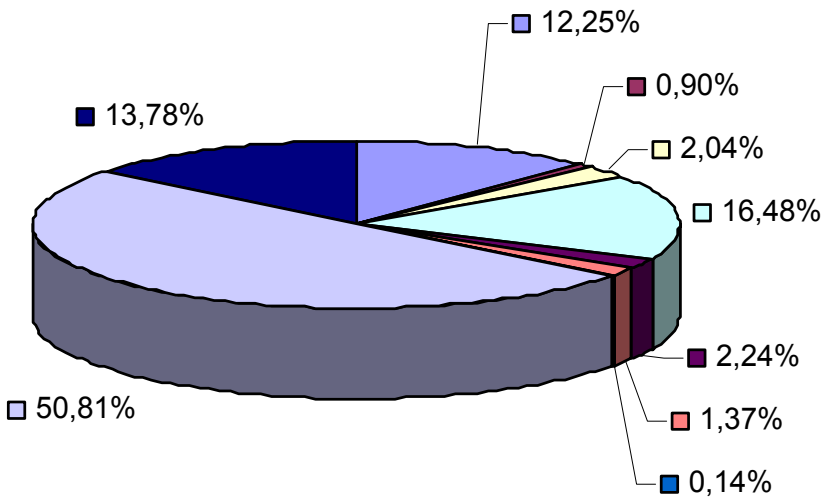
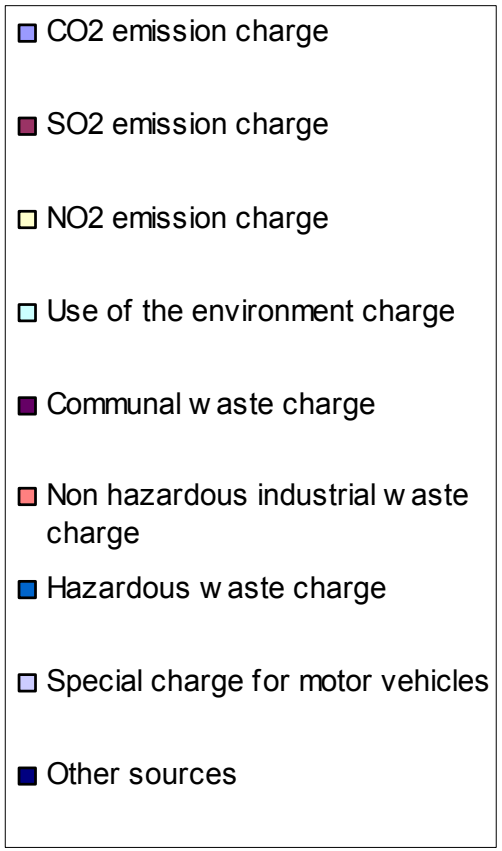
Financial framework for RES – EPEEF, III

- 208.8 millions € in time period 2005-2008 expected





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Financial framework for RES – EPEEF, IV

- Allocation of financial means:
  - Interest-free loans (grants)
    - Repayment period 5 years, with possible 2 years delay
    - Maximal amount 227.000 €
  - Subventions
    - on loan interests → 2% subventions according to agreement with Croatian Bank for Reconstruction and Development (final interest up to 4%)
  - Financial help
    - Only for local governments
    - Maximal amount determined by contracting
  - Donations
    - Usually provided from international financing institutions

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Financial framework for RES – EPEEF, V

- Conditions:
  - Users of the Fund's financial support are obliged to invest their own financial means in the proposed project
  - The Fund can finance up to 40% of the total required investment
  - Exemptions:
    - areas under the State's special care up to 80%
    - undeveloped areas up to 60%
- Planned investments:
  - 71.72% of planned incomes will be allocated for environmental protection projects
  - 90% of that amount goes for waste management projects → very interesting fact since waste charges contribute with less then 4% in total Fund's incomes
  - For energy efficiency and RES projects 57.23 millions € are predicted

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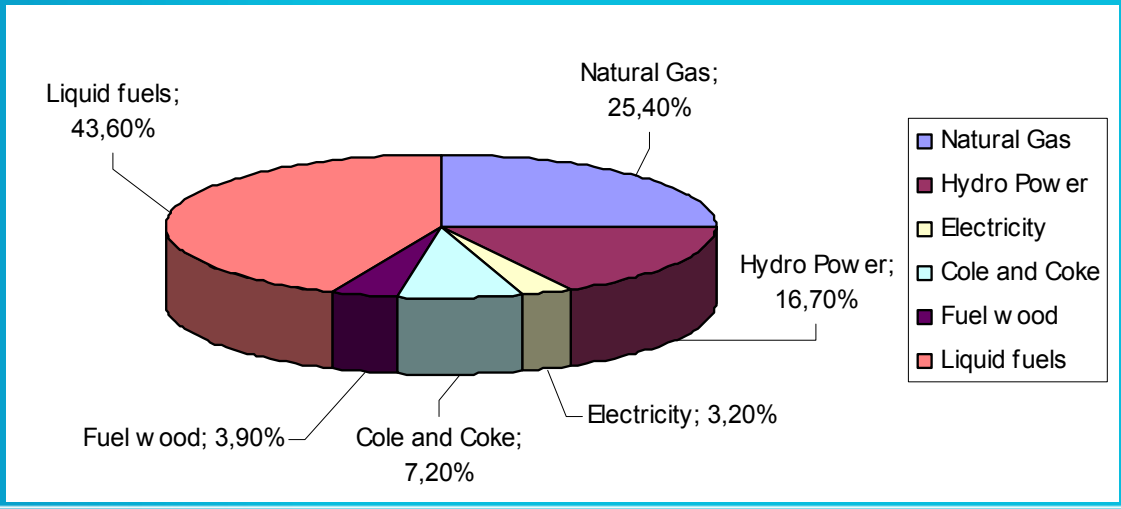
Current status of RES in Croatia

- large share of RES in total energy production and total energy supply → consequence of large share of hydro power
- total primary energy produced in 2004 was equal to 204.40 PJ
  - hydro power 33.8%
  - fuel wood 7.8%
- total primary energy consumed in 2004 was equal to 412.04 PJ
  - hydro power 16.7%
  - fuel wood 3.9%



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Current status of RES in Croatia, II

- electricity production → 51% of total installed capacities are in hydro power plants (2.078,6 MW)
- small share of other renewables in electricity production
- installed RES capacities (electricity and heat) in 2004

Type of RES	Installed heat capacity	Installed power capacity
Sun	N/A	12,74 kW
Wind	0	5,95 MW
Biomass	510 MW	0
Small hydro	0	26,7 MW
Geothermal	113,9 MW	0
TOTAL	**623,9 MW**	**32,663 MW**

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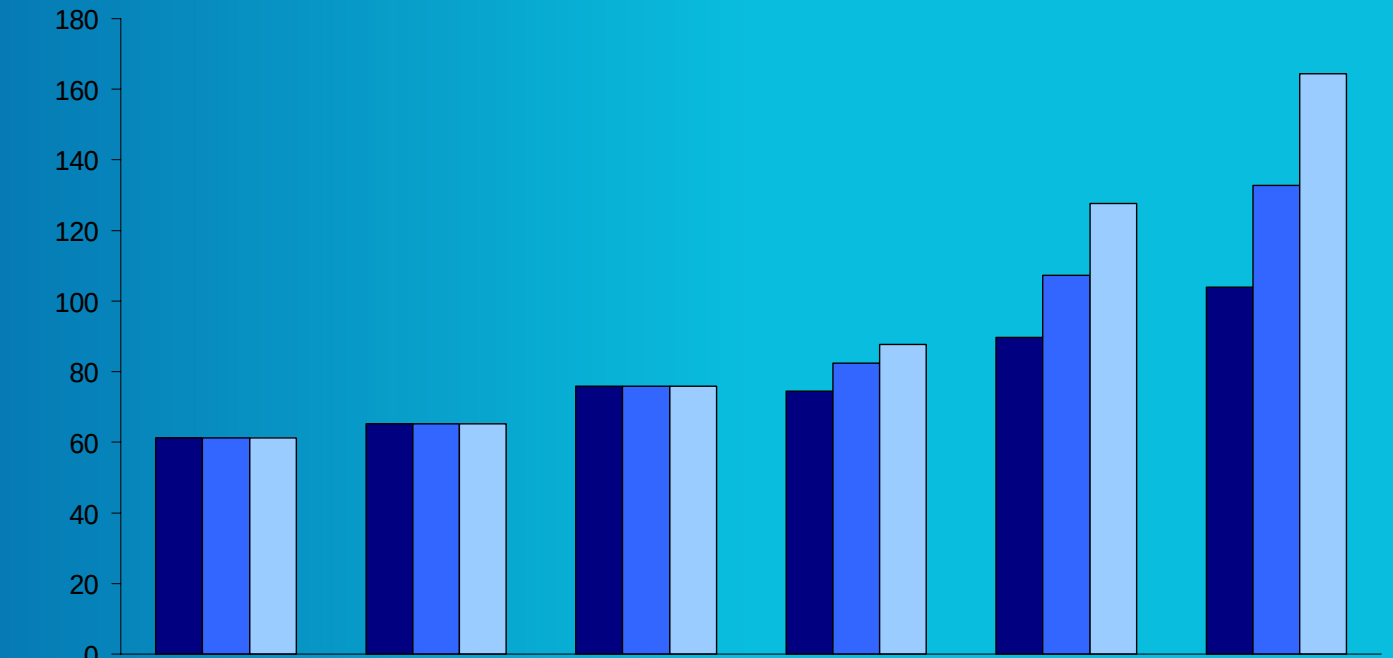
Future status of RES in Croatia

- Energy production from RES – three development scenarios



PJ	1990.	1995.	2000.	2010.	2020.	2030.
S1	61,23	65,27	75,79	74,47	89,80	103,90
S2	61,23	65,27	75,80	82,36	107,34	132,70
S3	61,23	65,27	75,79	87,69	127,69	164,39

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Future status of RES in Croatia, II

- Electricity production from RES – three development scenarios:
  - Low (RES1): 900 GWh from RES in 2010 (4.7%)
  - Medium (RES2): 1,100 GWh from RES in 2010 (5.8%)
  - High (RES3) 1,850 GWh from RES in 2010(9.7%)
- Current economy indicators → the most cost effective and thus the most probable target would be RES2
- According to this target, the compensation for encouragement of RES payable by all electricity consumers will be determined
- The latest proposal suggests that this compensation could be equal to 0.0098 HRK/kWh (0.13 €c/kWh)

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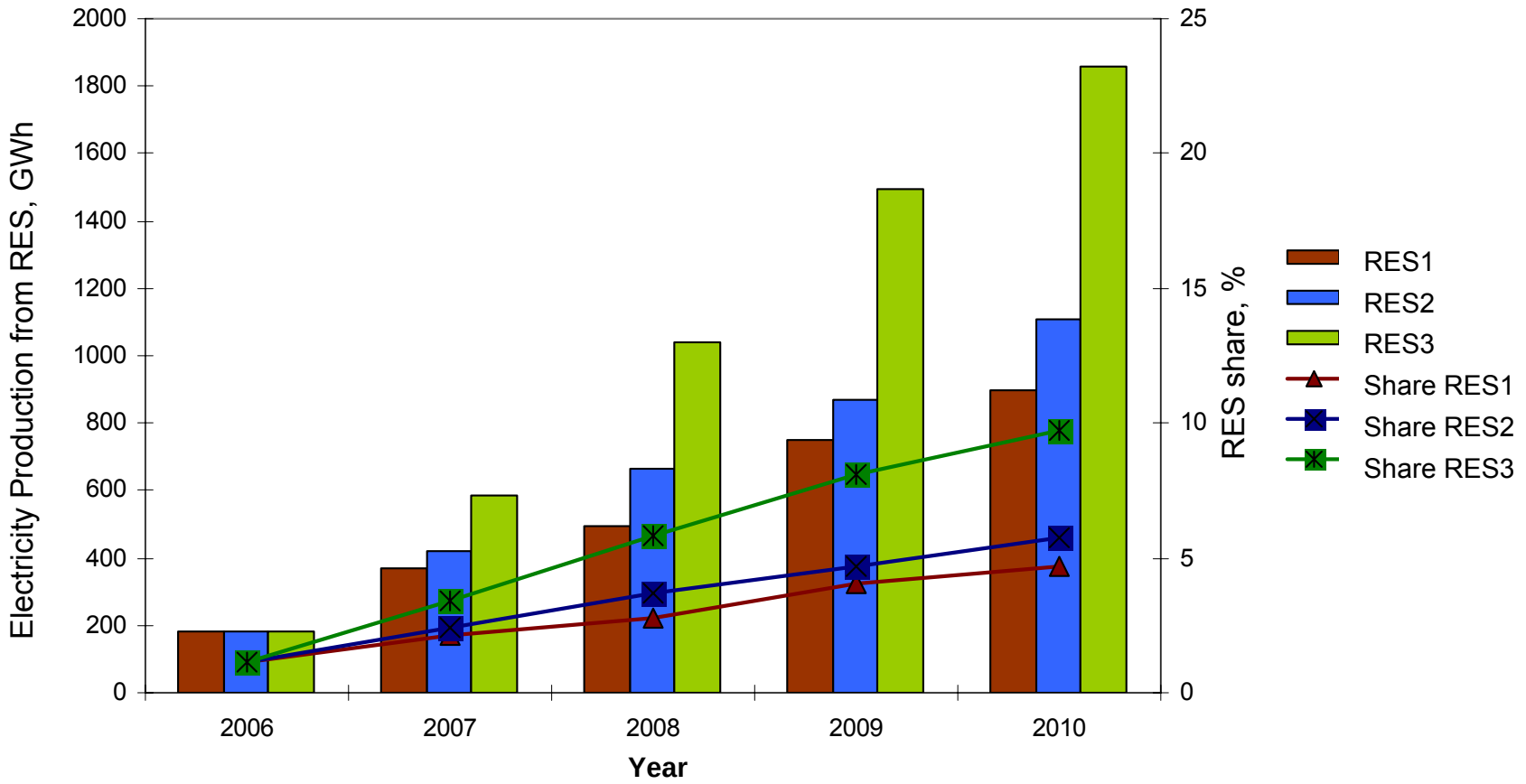
Future status of RES in Croatia, III



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Potentials for RES in Croatia

- solar (SUNEN) → technical potential assessed to 777 TWh, mostly low temperature heating applications; goal: 80% hot water from solar energy in coastal area by 2020
- biomass and waste (BIOEN) → significant potentials (39 PJ) from agriculture and wood industry; goal: 15% of total energy consumed coming from biomass by 2030
- geothermal (GEOEN) → total potentials assessed to 839 MWth and 47.9 MWel, mostly from existing boreholes used for oil and natural gas extraction
- small hydro (MAHE) → potentials assessed to 100 MW, two PPA signed with Croatian power utility
- wind (ENWIND) → largest interest, potentials assessed to 1,300 MW and 3 TWh annual production, two operational WPP (5.95 MW + 11.2 MW), several projects in preparation

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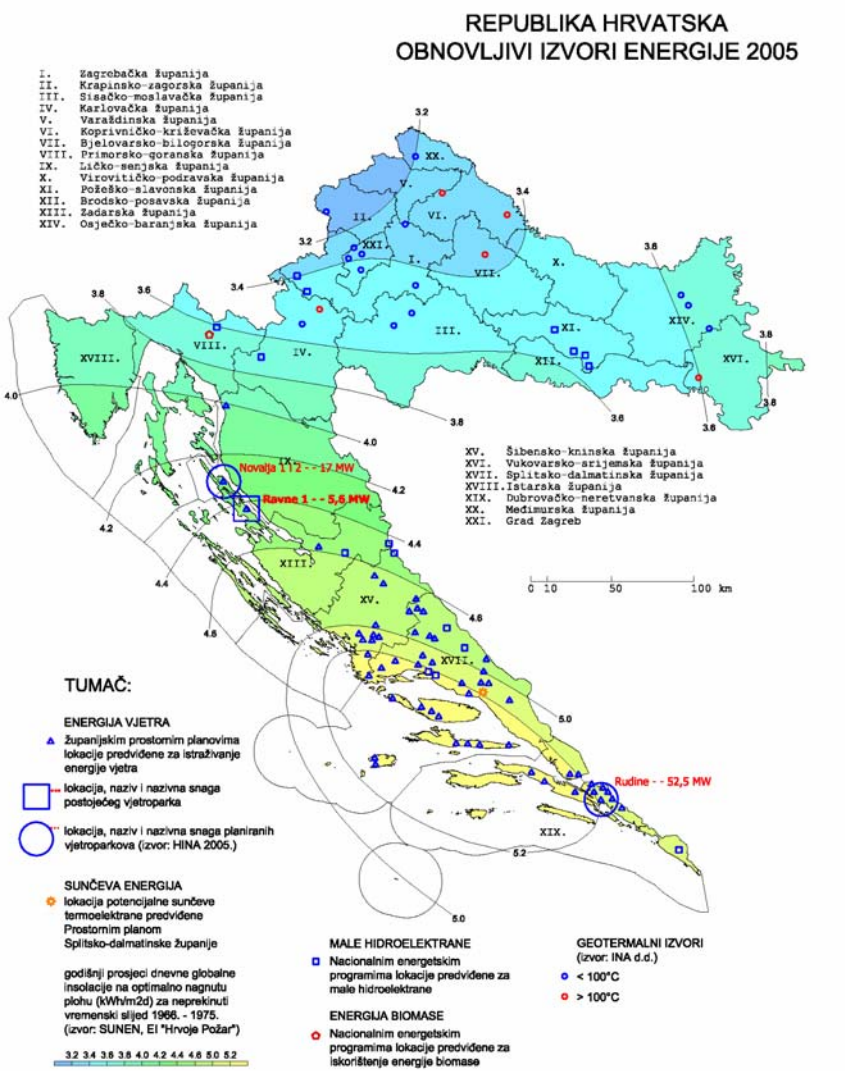

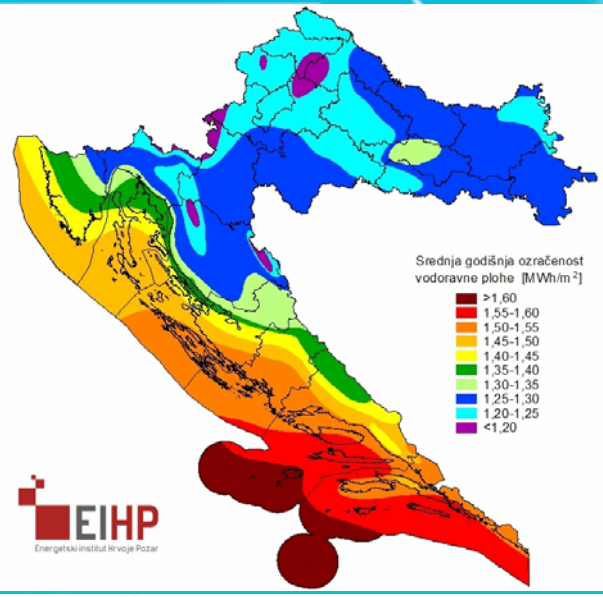

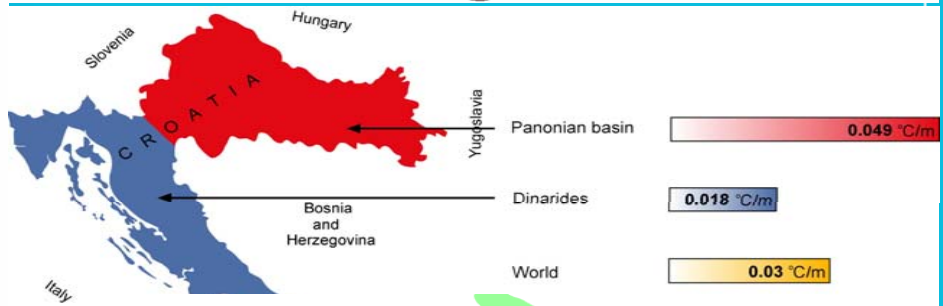

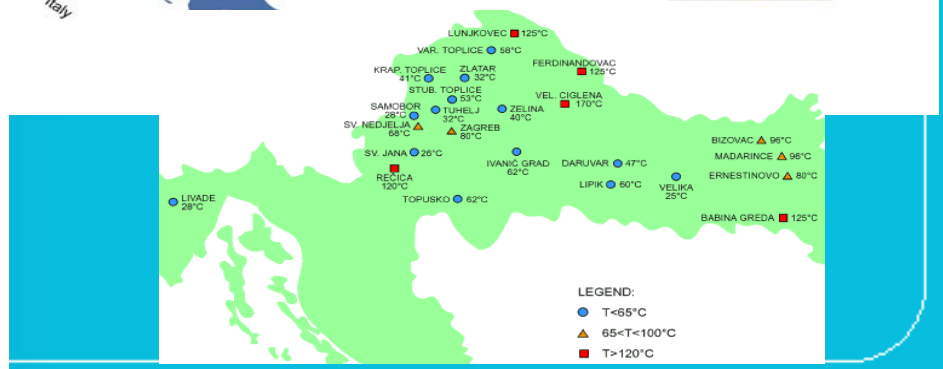

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Barriers

- universal
  - high up-front investment
  - uncertainties regarding the energy system liberalisation
- country-specific
  - cross-sectoral approach – RES issues are under jurisdiction of different Ministries – harmonisation needed
  - scarce financing opportunities
  - pending secondary legislation
  - Information and education

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Conclusions

- with adoption of by-laws Croatia will have a complete and stable legal and financial framework (without involvement of public budget!) that will trigger more investments from private sector
- natural potentials for RES use are very good
- Croatian energy related industry is experienced enough to be involved in RES business → creation of additional jobs (biomass and wind are from this point of view seen as most perspective RES)
- increased RES use will contribute to environmental protection goals and fulfilment of Kyoto obligations as well as to increased security of energy supply

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Thank you for your attention!

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Removing Barriers for RES Penetration in Macedonia

WORKSHOP DM 2: REGULATORY FRAMEWORK
FOR RES PENETRATION SUPPORT

Marija Kacarska
Faculty of Electrical Engineering
Skopje, Macedonia

RES potentials in Macedonia

According latest reports overall power consumption is growing every year. 2005/2004 is 7,8 %.

Macedonia imports electric energy.

- ✓ 2000 – 4,4 %
- ✓ 2003 – 15 %
- ✓ 2005 – 33 %

In order to meet the increase in power demand in the incoming period, Macedonia plans to exploit it's own energy resources, especially RES potentials.

RES potentials of Macedonia

Macedonia has promising native resources of renewable energy. These include:

- Biomass and biogas
- Geothermal
- Solar
- Wind power
- Hydropower

RES projects in Macedonia

To address these issues, the projects exploring various investment options are of the highest priority for the country. Renewable energy projects with short pay back period have been identified:

- ✓ revitalization of old small hydropower plants
- ✓ automation of small hydropower plants in operation
- ✓ replacement of electricity and liquid fuel boilers by biomass firing boilers
- ✓ utilization of available biomass wastes in industry and agricultural farms for heating
- ✓ assessment of wind energy potential at most interesting locations and feasibility study.

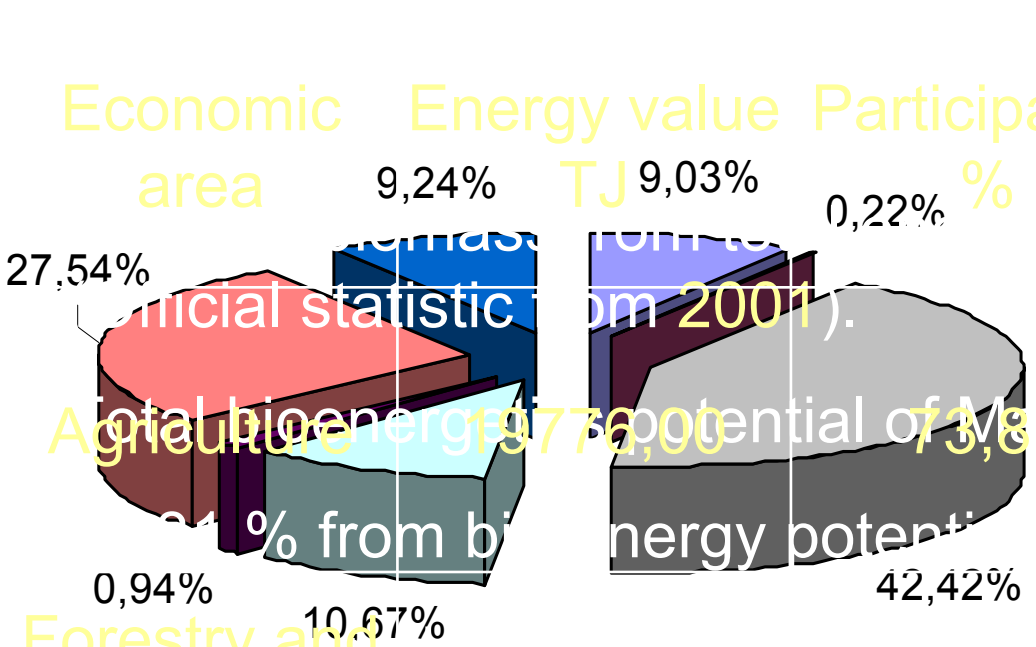
Supporting RES in Macedonia

A very important topic that needs to be given special attention is that renewable facilities are very capital intensive and for that reason the price of electricity produced is in most cases still higher than the price of kWh from conventional facilities.

Therefore support mechanisms for renewable electricity are needed, that are in line with the liberalized electricity market:

- legislation supporting documents,
- funding mechanism,
- preferential taxation, etc.

Bio energy



Economic area | Energy value TJ | Participation % | Use %

official statistic from 2001).

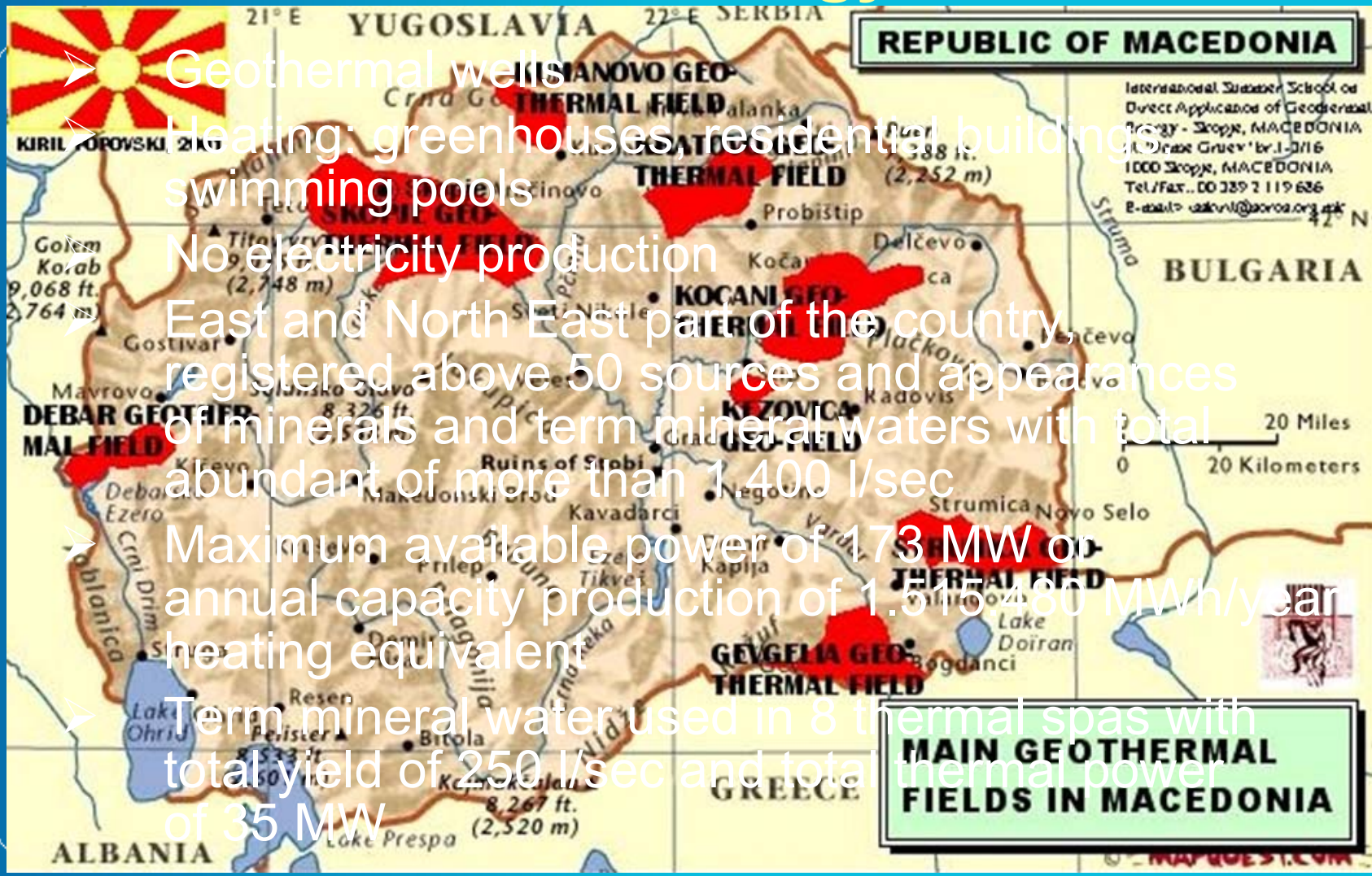
Total bioenergy potential of Mo

Agriculture 9776,00 73,81 35,52

% from bioenergy potenti

Forestry and wood processing 7018,00 26,19 90

Geothermal energy



- Geothermal wells
- Heating: greenhouses, residential buildings, swimming pools
- No electricity production
- East and North East part of the country, registered above 50 sources and appearances of minerals and term mineral waters with total abundant of more than 1.400 l/sec
- Maximum available power of 173 MW or annual capacity production of 1.515.480 MWh/year heating equivalent
- Term mineral water used in 8 thermal spas with total yield of 250 l/sec and total thermal power of 35 MW

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Solar energy

- Macedonia is area with a large number of sunshine hours
- Actual irradiation / total possible irradiation 50%
- Flat plate collectors systems
- Heating

- Less than 1 % from total energy consumption
- 300-500 % more expensive than fossil fuel

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The map shows that the best wind resources in Macedonia is generally found along high mountain ridges, while lowlands and valleys are likely to have much lower average wind speeds. The predicted mean wind speed at 80m height on the ridge tops varies from 6,5m/s to 8,5m/s.

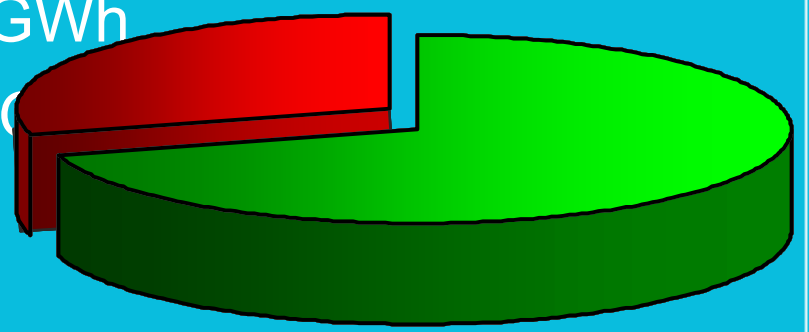
Hydropower

- The total theoretically exploitable energy potential of all rivers is 6.434 GWh.
  Only 1.370 GWh is used, less than 22%.
- **Hydropower energy investments will be targeted**
- The structure of total installed energy capacity in Macedonia - 2003:

  total hydropower — 1.370 GWh

  total consumption — 7.215 G

  imports — 15 %
- 11% from 21 sHPP.



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Existing 21 sHPP in Macedonia

ROT project of 7 sHPP

FIRST CONCESSION PROJECT IN MACEDONIA for Rehabilitation, Operation and Transfer of 7 sHPP's:

- HPP DOSNICA
- HPP KALIMANCI
- HPP MATKA
- HPP PENA
- HPP PESOCANI
- HPP SAPUNCICA
- HPP ZRNOVCI

CONCESSION GRANTED TO MAKHIDRO

- **Total investments** **20 mil EUR**
- **Total capacity** **30 MW**
- **Total generation** **86 GWh**
- **Period of concession** **11 years**

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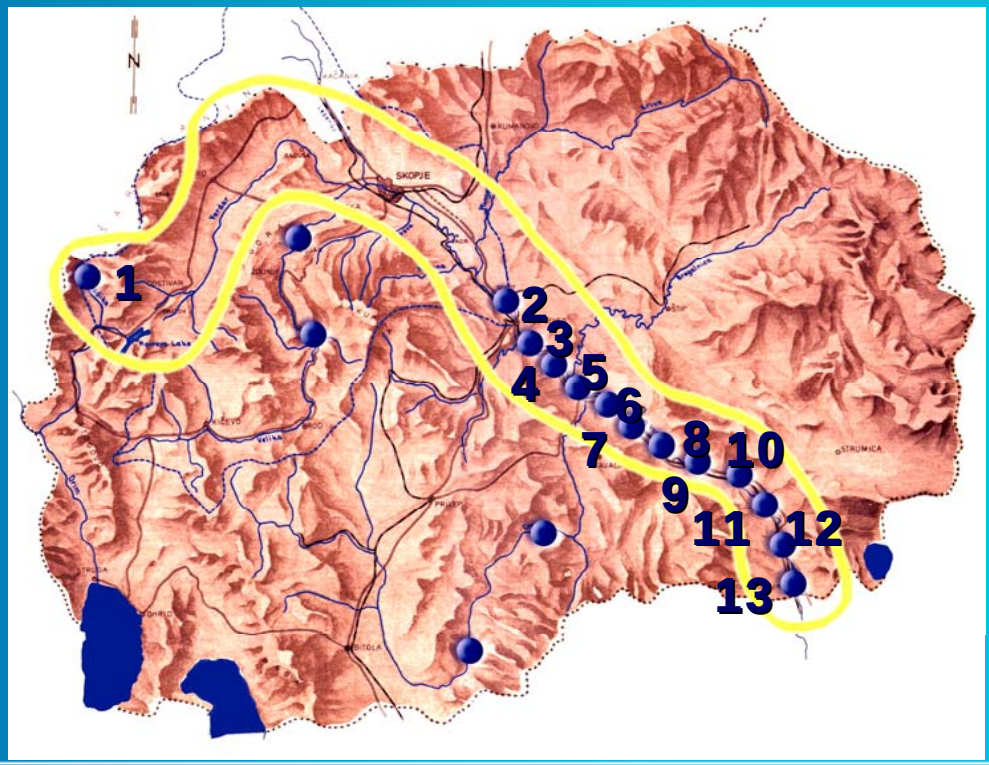
Vardar Valley project – 13 sHPP

The Feasibility Study deals with development of:

- Energy sector, Agricultural sector, Environmental protection
- Possible navigable way



1. Storage Lukovo Pole
2. HPP Veles
3. HPP Babuna
4. HPP Zgropolci
5. HPP Gradsko
6. HPP Kukurecani
7. HPP Krivolak
8. HPP Dubrovo
9. HPP Demir Kapija
10. HPP Gradec
11. HPP Miletkovo
12. HPP Gavato
13. HPP Gevgelija

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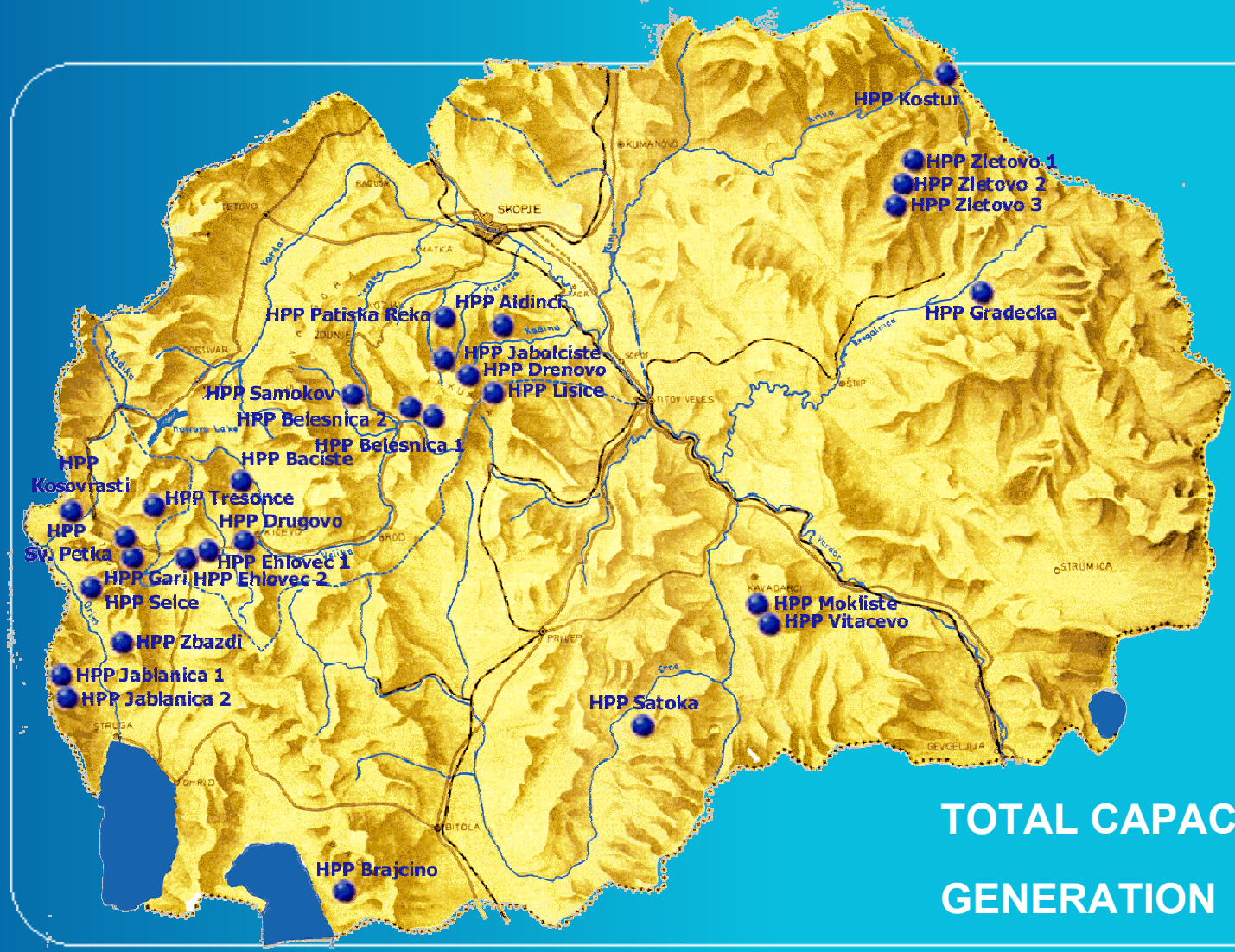
Possible investment projects for 29 sHPP



TOTAL CAPACITY 100 MW

GENERATION 335 GWh

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Legal framework

1. **Energy Law (Official Gazette of RM No.63/2006)**
2. Law on water (Official Gazette of RM No.4/1998) and Law for modification and amendment of the Law on water (Official Gazette of RM No.42/2005)
3. Law on concessions (Official Gazette of RM No.25/2002) and Law for modification and amendment of the Law on concessions (Official Gazette of RM No.24/2003)
4. Law on terrain and urban planning (Official Gazette of RM No.51/2005)
5. Law on construction (Official Gazette of RM No.51/2005)
6. Law on environment (Official Gazette of RM No.53/2005)

Legal framework

7. Ordinance regulating conditions, manner and the procedure for issuing, changing and canceling licenses for generating electric power (Official Gazette of RM No.42/2005)
8. Ordinance regulating procedure for acquiring electric-energy approval for connection to the electric power system (Official Gazette of RM No.38/1998) and modifications to the Ordinance (Official Gazette of RM No.78/1998)
9. Ordinance regulating conditions and procedures for electricity price adjustment (Official Gazette of RM No.95/2004 and modification from 2005)
10. Decree on general conditions for the supply of electric energy (Official Gazette of RM No.6/2001)

Energy Law — 2006

On 23 May 2006 Assembly of R. Macedonia vote for the new Energy Law. In the law the Directive 2001/77/EC for promotion of RES is implemented.

- Energy Agency
- The Strategy for the exploitation of RES
- Programme for the implementation of The Strategy for the exploitation of RES
- Green certificates
- The Rulebook on the exploitation of RES

Energy Law – General provisions

- The Energy Law governs:
  - …market for thermal or geothermal energy, requirements for realization of energy efficiency and promotion of the utilization of renewable resources.
- One of six objectives of the Energy Law stands for:
  - energy efficiency enhancement and encouragement of the utilization of renewable resources
- Detailed list of energy activities (23 activities) is defined by the Energy Law and two of them are related to EE and RES:
  - generation of geothermal energy;
  - distribution of thermal or geothermal energy;
  - supply of thermal or geothermal energy;
  - generation of energy from renewable energy resources.
- The activities of public interest considere the following:
  - generation of thermal or geothermal energy;
  - distribution of thermal or geothermal energy; and
  - supply of thermal or geothermal energy.

Regulation of energy activities

The regulation shall be ensured on way accordance with this law, through adoption of:

- …
- **Methodologies** for price setting as to certain types of energy and regulated services,
- **Tariff systems** with regard to relevant types of energy;
- **Prices** of specific types of energy in compliance with the price setting methodologies and tariff systems for relevant types of energy and services related to the pursuing of different energy activities;
- **Conditions** for supply of certain types of energy from the energy systems;
- **Construction** of new and reconstruction of existing buildings from the aspect of energy efficiency;
- **Certificate** for energy characteristics of a building;
- **Technical specifications and standards** for efficient utilization of fossil fuels;
- **Energy efficiency labeling** of home appliances;
- **Utilization** of renewable energy resources;
- **Green certificates**;
- …

Energy Agency

- The Energy agency of the Republic of Macedonia gives its support to the Ministry of economy in the elaboration and implementation of the Strategy for improvement of energy efficiency and the Strategy for renewable energy resources exploitation.
- The Energy agency of the Republic of Macedonia gives its support to the Ministry of economy in the elaboration of the Programme for the implementation of the Strategy for renewable energy resources exploitation.

The Strategy

- The Strategy for the exploitation of renewable energy resources defines the aims of renewable energy resources exploitation and the modalities of achieving these aims, namely:
  - the potential of **renewable** energy resources;
  - the possibilities for exploitation of the potential of renewable energy resources;
  - the volume and dynamics of representation of renewable energy resources in the energy balance;
  - introducing production certificates for renewable resource energy for the purpose of establishing market economy;
  - defining transitional measures for subvention of the renewable energy resources exploitation through special tariffs, financial assistance and other.
- The Strategy for the exploitation of renewable energy resources shall be adopted for a period of at least 10 years

Programme for implementing Strategy

- Upon the proposal of the Ministry, the Government of the Republic of Macedonia adopts a Programme for the implementation of the Strategy for renewable energy resources exploitation.
- Programme for the implementation of the Strategy for renewable energy resources exploitation shall be adopted for a period of at least 5 years.

On local level

- The local policy for renewable energy resources exploitation comprises geothermal energy, biomass and solar energy. The local policy is established within the local Programme for renewable energy resources which has to be in accordance with the Strategy for renewable energy resources exploitation.
- Upon the proposal of the Mayor, the Programme shall be adopted by the Municipal council or the Council of the City of Skopje.

Green certificates

- Energy Agency of RM issues and maintains a registry of issued green certificates.
- All electricity suppliers shall provide or produce a relevant quantity of green certificates in the course of one year. The quantity is defined as a percentage of their annual sale of electricity determined in the Rulebook. Only the green certificates entered in the Registry may be used for fulfillment of this obligation.
- The supplier having a lack of green certificates shall make a payment per certificate determined by the Rulebook, to a special account published by the Energy Agency for the purpose of financing new renewable energy resources.

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Tariffs for electricity from RES

- Until the establishment of functional mechanism for trade in green certificates, the Regulatory Commission shall establish relevant tariffs for purchase of electricity from the distributional generation of electricity from renewable energy sources.
- The green certificates produced by the distributed producers of electricity that use special tariffs shall be considered as property of the Government of the Republic of Macedonia.
- A distributed producer of electricity from **renewable** energy sources must not use special tariffs and green certificates simultaneously.
- In order to support the exploitation of thermal renewable energy resources the Regulatory Commission establishes feed–in tariffs for purchase of thermal energy produced by renewable energy resources

Financial assistance

- A mechanism for financial assistance is established for the realization of the Strategy for renewable energy resources exploitation.
- The means for financial assistance shall be provided by:
  - The Budget of the Republic of Macedonia;
  - The budgets of municipality or budget of Town Skopje
  - grants, donations, sponsorships by foreign and domestic entities; and
  - foreign and domestic loans;
  - state subsidiary in accordance with Law for state subsidiary.

Guide for realization of sHPP

- Paper issued in October 2005 by Economic Chamber of R. Macedonia deals with the key components for project development of sHPP with installed capacity up to 10MW:
  - plan,
  - location,
  - cost and financing permissions,
  - building interconnection,
  - exploration,
  - maintain and development
- 400 new locations are selected with about 200MW projected installed capacity. The project documentation of different level exists for almost 100 of them.

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Guide for realization of sHPP

The Guide comprehends the procedure of issuing all permits needed for sHPP realization from 5 national bodies in Macedonia:

Ministry of transport and communication

Ministry of agriculture, forestry and water supply

Energy regulatory commission of Macedonia

MEPSO
(Macedonian electric power transmission system operator)

ESM
(Electric Distribution Company)

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Public competition for sHPP

Pursuant to Article 13, item 1 of the Law on Concessions (Official Gazette of the Republic of Macedonia No. 25/02 and 24/03) and Article 155, item 1 of the Law on Waters (Official Gazette of the Republic of Macedonia No. 4/98, 19/00 and 42/05), and the Conclusion of the Session of the Government of the Republic of Macedonia, held on April 20, 2006, the Ministry of Economy publishes

PUBLIC COMPETITION

For collecting bids for construction of small hydro power plants according to the Design, Build, Operate, Transfer-DBOT model on the following rivers:

a) Crn Drim
b) Konska River
c) Galicka River
d) Radika
e) Zajaska River

1. Subject of the this public competition is construction of small hydro power plants grouped in the following packages:

Public competition for sHPP

- All necessary hydrological, geological and topographic data as well as information regarding the land ownership are available in the State Hydrometeorology Office, Department for mineral resources in the Ministry of Economy and the State Geodetic Works Office. These data may be obtained pursuant to the Rule Books and Price Books of the above-mentioned institutions.
- Only bids submitted by **September 29, 2006**, until 16:00 CET, would be considered for review.
- The water concession for hydro power plants with installed power up to 2 MW will be granted for a period of 20 years, for hydro power plants with installed power between 2 and 10 MW is granted for period of 30 years.

Conclusions

- In the past 5 years Macedonia is removing barriers for RES penetration.
- The new Energy law will complete regulations and supporting documents for RES as Energy Agency, Green certificates etc.
- Energy market will be opened. Until 2007 industrial costumers will be free to purchase electric energy on the market, until 2015 all costumers.

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Conclusions

- Macedonia is open for national and international investments in energy area.
- Government supports capital investments (HPP Sv. Prtka, mine Brod-Gneotino).
- Public competition for 19 sHPP, 17,7 MW installed capacity, 22 million euros investment.
- New Government will implement a Programme for attracting foreign investments in energy sector.

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Thank you for your attention!

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The Slovenian Regulatory Framework for RES Support: Case of Biomass

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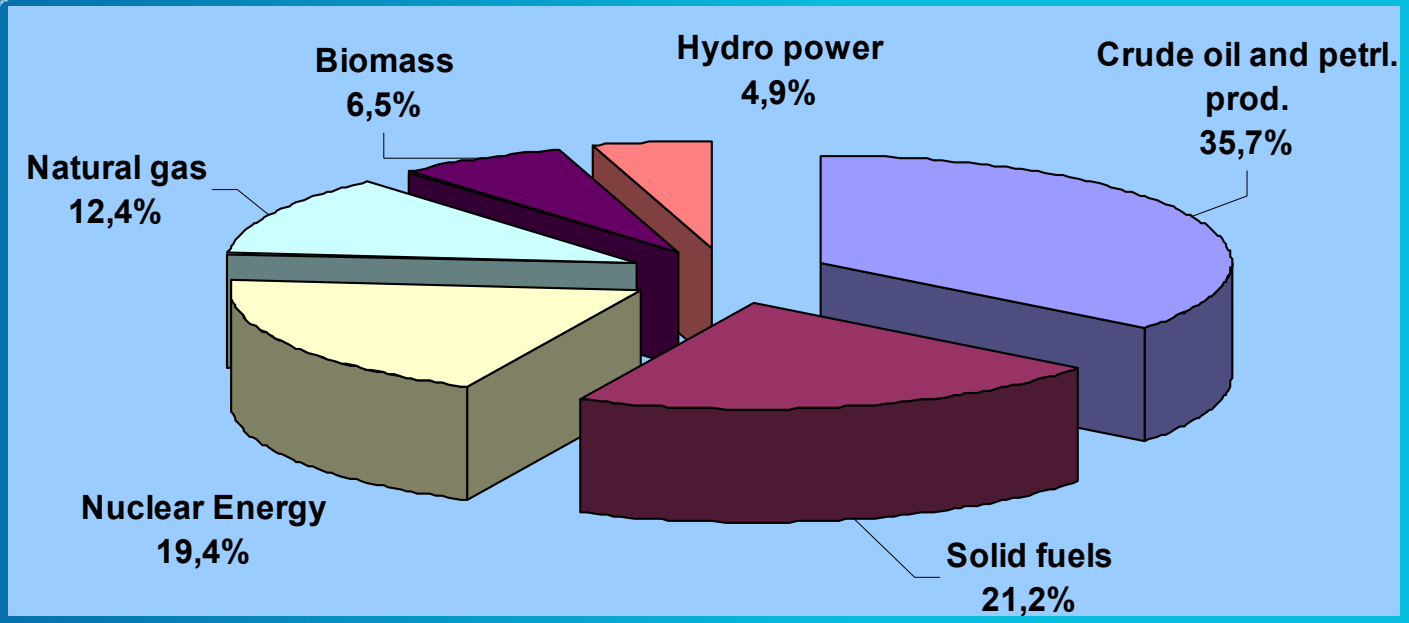
Penetration of RES in Slovenia:

Primary energy consumption



Primary Energy Consumption in Slovenia *Source: Eurostat 2004*

11,4 % in Primary Energy Consumption from RES in 2004

National Energy Program: 12 % of RES in total energy consumption by year 2010

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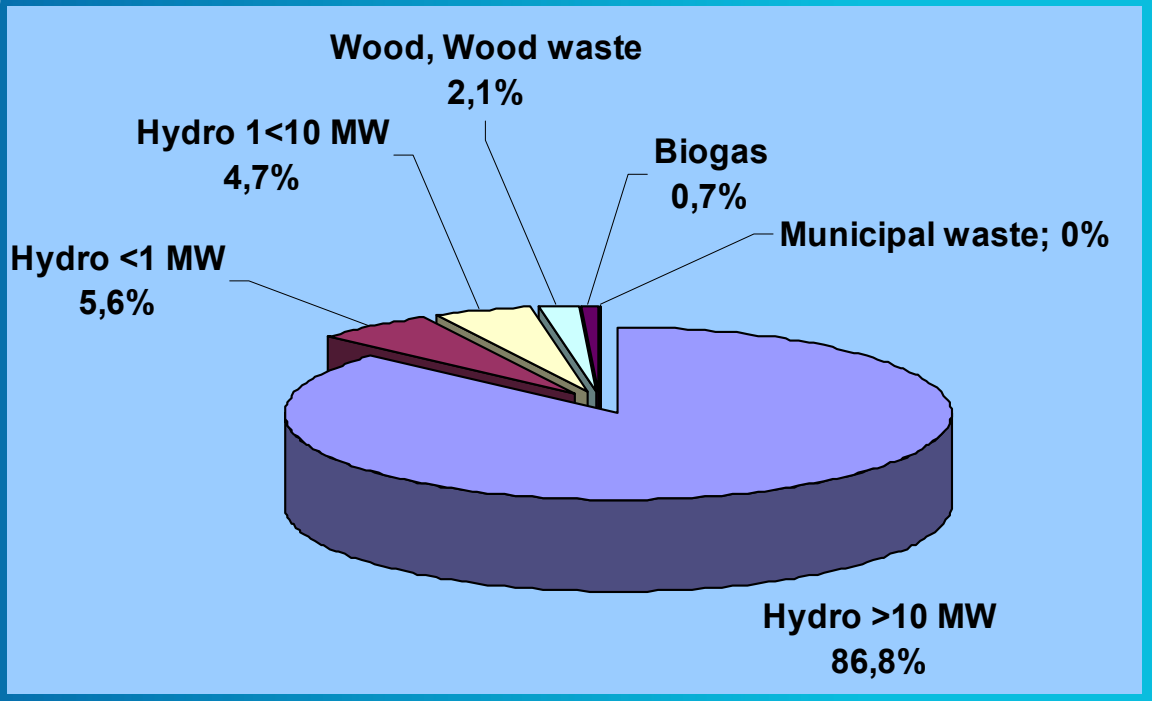
Penetration of RES in Slovenia:

Gross Electricity Generation



Shares of various RES in Power Production *Source: Eurostat 2004*

- Gross Electricity Generation in 2004: 27,6 % from RES
- By 2010 Slovenia should achieve 33,6 % of electricity generation from RES, which is not likely to happen.

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Current role of Biomass

- Current biomass share
  - 6,4 % in Primary Energy Consumption
  - 2,8 % in RES Power Generation
  - 0,8 % in Gross Electricity Generation
- In 2005:
  - Slovenia had ca. 12.000 km2 of forests
  - 59,2 % of all Slovenian Area
  - 2,8 million m3 of wood is cut
- Unused potential!!

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Regulatory Framework

- **Feed-in Tarrifs (FIT)**
- **Investment Subsidies**

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Feed in Tarrifs (1)

- Legislative frame required for FIT system:
  - status of Qualified Electricity Producer (QP) and
  - price regulation of the electricity produced from RES
- Relevant body of regulation:
  - National Energy Program (guidelines for RES)
  - Energy Law
  - Decree on the Conditions for Obtaining the Status of Qualified Electricity Producer (QP)
  - Decree on the Rules for Determining the Prices of Electricity and the Buying Scheme from the QP
  - Resolution on Prices and Premiums for Electr. from QP

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Feed in Tarrifs (2)

- Here are **two schemes** for the QP to choose:
  - to sell electricity directly to the Distribution Company or
  - sell it independently and get the premium from the Distribution Company.
- Electricity Distribution Company is obliged to buy ALL the Electric Energy produced from the QP
- If the QP sells the Electric energy independently, the Distribution Company is obliged to pay the premium

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Feed in Tarrifs (3)

Type of QP	Size	Uniform Price (c€/kWh)	Uniform Premium (c€/kWh)
Biomass	Up to 1 MW	9,4	5,6
	Above 1 MW	9,1	5,3
Biogas	-	12,1	8,3

Example: QP burns biomass and has 0,8 MW of installed capacity

1. QP sells **all** the Electric Energy to the **Distribution Company**

   QP gets **9,4 c€/kWh**

2. QP sells **all** the Electric Energy **independently** for 4,5 c€/kWh

   QP gets 4,5 c€/kWh for energy + 5,6 c€/kWh for premium
   = 10,1 c€/kWh

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Feed in Tarrifs (4)

- Biomass power production in Slovenia is not economically viable – except in wood industry
  - Feed in Tarrifs are not enough to cover the investment in a reasonable time
  - Feed in Tarrifs in the neighbouring countries Italy and Austria are much higher – results in higher biomass prices in Slovenia
- Biomass consumption is mostly focused on heat generation

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Investment Subsidies (1)

- Agency for Efficient Energy Use (AURE)
  - The focus of AURE is on
    - heat production and
    - efficient energy use.
  - Investment Subsidies in RES on yearly tenders
    - For households up to 40 % of the investment, or certain cash limit:
      - 1.250 € for wood logs boiler
      - 1.670 € for wood pellet boiler
      - 2.080 € for wood chips boiler

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Investment Subsidies (2)

- GEF (Global Environment Facility) Project
  - Removing Barriers to Increase Biomass Use as an Energy Source
  - Subsidies for feasibility studies and project documentation
    - Up to 50 % of studies and documentation cost
  - Tenders for investment subsidies
    - % of investment or capital share in the company
- The State received funds from GEF project
  - Supports biomass projects through AURE and Government.
  - Several district heating projects were subsidized through GEF Project

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Investment Subsidies (3)

- Environmental Fund
  - Low Interest Loans (Eko kredit)
  - Used for renewable energy systems, efficient energy use, building of low energy buildings, buying hybrid or electric cars,…
  - Up to 90 % of all eligible cost or max. 20.800 €
  - Fixed yearly interest rate 3,2 % (last tender)
  - Maximum duration 10 years

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Best Practice (1)

Biogas CHP on a farm in Nemščak:

- started operating in 2006
- ca. 1,3 MW_e installed
- ca 9.800 MWh planned production
- electricity is sold on the market, so the total Feed in Tarrif is even higher.

- **Total investment**	**ca. 8,1 million €**
- **Environmental Fund Eco Loan**	**ca. 6,2 million €**
- **Private capital**	**ca. 1,9 million €**
- **Feed in Tarrif**	**12,1 c€/kWh minimum**

A very recent investment.

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Best Practice (2)

District Heating in Kočevje:

- refurbishing and extension of the old district heating system.
- started operating in season 05/06
- 4,5 MW wood biomass boiler + existing heating oil boiler
- 12.000 m3 of wood residues yearly

- **Major part of the project financing comprise funds operated by State.**

- **Total investment**	**2,44 million €**
- **Eco Fund**	**0,62 million €**
- **AURE subsidies**	**0,52 million €**
- **GEF capital investment (company share)**	**0,52 million €**
- **Kočevje Community**	**0,78 million €**

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Best Practice (3)

Wood residues CHP in Kamnik:

- 9,2 MW_{th} boiler, 2,4 MW_e installed
- Ca. 12.200 MWh of yearly electricity production
- Feed in Tarrif 9,1 c€/kWh minimum
- Selling electricity on the market

- **An old industrial heat and power plant can survive with Feed in Tarrifs and keep jobs in the city.**
- **It unburdens the Ljubljana municipal dump of wood residues.**
- **Currently 5 wood biomass CHP in the register of QP**
  - Only in wood processing industry
  - Ca. 21,5 GWh of yearly electricity production

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Barriers

- High investment
- Bureaucracy and paperwork
  - Building permit, grid connection permit by the Distribution Company, status of QP, license for the electricity generation…
- People are uninformed
  - neighbours are usually against RES instalations!

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Conclusions

- Biomass has a big unused potential in Slovenia
- Feed in tarrifs are not enough to recover the investment – additional subsidies needed
- Higher feed in tarrifs in Italy and Austria make wood prices high also on the Slovenian market
- Because of low electricity prices biomass consumption is diverted into heat production
- Administrative barriers
- The situation is changing very slowly

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Thank you for your attention

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Regulatory Framework for Renewable Energy Sources: Penetration Support in B&H

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- Long way for law passing on different legislature levels: entities and state level.
- Since year 2002 In B&H are created all legal conditions on which basis were constructed first electricity generation capacities based on utilization of renewable resources.
- Laws for the first time in Bosnia and Herzegovina enabled the private capital to be involved into the energy projects

- In year 2002, Government of Federation of B&H had passed the Electricity Law which defines and regulates:
  - electric-power system,
  - electric-power industry activities,
  - development of electricity market and institutions for the market regulation,
  - general conditions for electricity supply,
  - planning and development, construction,
  - reconstruction and maintenance of electric-power facilities,
  - supervision of law conduction and other issues considerable for performing of electric-power industry activity in Federation of Bosnia and Herzegovina except electricity transmission,

- Electricity Law in has the following targets:
  - encouragement of development in field of electric-power industry,
  - encouragement for private domestic and foreign investments,
  - more reliable supplying of customers with high quality electricity,
  - joining to the international electricity market through the unified electricity market in B&H, economic and rational electricity utilization,
  - energy efficiency,
  - introducing of competition, transparency and preventing of unwanted effects of monopoly,
  - environment protection in accordance with regulations and domestic and international standards.

- The emphasize was put on the institutions for market regulation as the future holders of activities at the electricity market. Their competencies are:
  - supervision and regulation of relation between electricity generation, distribution and electricity purchasers including electricity traders,
  - prescribing of methodology and criteria for setting a price for supplying of unqualified electricity purchasers,
  - establishing of tariff items for users of distributive systems and tariff items for unqualified purchasers,
  - issuing or revocation of licenses for generation, distribution and supplying of electricity and electricity trade,
  - issuing of preceding permits for construction and permissions for utilization of electric-power facilities except facilities for electricity transmission,
  - establishing General conditions for electricity supply.

- This Law introduces function of the qualified producer and purchaser of electricity.
- The task of regulatory agency is to establish who satisfies legal obligations for producer and purchaser of electricity.
- It is worthwhile for the state owned electric-power companies as the existing producers as well as for a future private companies which decide to construct new generation or some other electric-power facilities.

- Law on Concessions establishes:
  - subject, manner and conditions under the domestic and foreign legal persons could be awarded with concessions for providing the infrastructure and services and exploitation of natural resources,
  - financing, designing, construction, reconstruction and/or managing with such infrastructure and all accompanied buildings and facilities in fields which are exclusively in capacity of Federation of Bosnia and Herzegovina,
  - competencies for concessions awarding,
  - establishing Committee for the Federation’s concessions,
  - tender procedure,
  - content of the concession contracts, termination of the concession contracts, rights and duties of the concessionaires, solving of disputes and other issues important for the concession awarding.

- The aim of this Law is to create transparent, nondiscriminatory and clear legal framework for establishing conditions under the domestic and foreign legal persons could be awarded with concessions in BiH Federation as well as encouraging investment of foreign capital in subject fields.

- This Law also had foreseen establishing of Committee for concessions of Federation of Bosnia and Herzegovina as independent regulatory body.

- For regualtoring purpose are established:

  - ISO - Independent System Operator and
  - SERC - State Regulatory Electricity Commission
  - State electric power transmission company.

- SERC is put in charge for regulation of system at the state level, such as two entity obliged to do that at the entity level. For performing of international trade is necessary to have a license, i.e. license issued by SERC.

- The SERC’s jurisdiction includes:
  - issuance, modification, suspension, revoking and monitoring, as well as compliance with licenses within its jurisdiction,
  - regulating, approving and monitoring tariffs and tariff methodologies for services of transmission, ancillary services and operation of the Independent System Operator (ISO)
  - issuance of rules and regulations within the framework of its competencies including revision and approval of market rules and grid codes as well as conditions for connection and access to the networks,
  - establishment, monitoring and conduction of rules related to fair and non-discriminatory access of the third parties to the transmission network,

- monitoring and enforcing of conditions related to international trade in electricity, in particular ensuring that international technical requirements are met and adhered to,
- establishing, monitoring and enforcing quality standards for electricity transmission and ancillary services,
- coordinating and approving investment plans of company for transmission of electricity, including the plans related to transmission network and quality of electricity transmission services,
- monitoring of efficiency of mechanisms and methods securing the balance between electricity demand and supply within the system
- consumers protection ensuring: fair and non-discriminatory treatment, high quality services and prevention of anti-competitive activities...

- Owners of ISO of BiH are:

  - Federation of Bosnia and Herzegovina and
  - Republic of Srpska

- Activities of ISO

Activities of ISO of BiH include managing of transmission system for purpose of securing reliability, management with funds and facilities at the central control system, managing of the balanced market and ensuring of system services, ensuring of auxiliary services, development and application of reliability standards, development and management of rules that regulate usage of the transmission system, development and enforcing of market rules which are managed by provisions related for system and auxiliary services at the transmission system.

- It is important to mention that beside all mentioned legal provisions there are problems that are not treated by Law, but they appeared in practice.

- Therefore in the future shall be done necessary corrections of some parts of the Law as well as of some provisions so that they could be applicable in practice.

- Bosnia and Herzegovina is signatory of the Energy Community Treaty which was signed in Athens on October 25, 2005

Thank you
for your attention!