

Workshop on Case Studies on Overcoming Barriers to Investments into
Energy Efficiency and Renewable Energy Projects through Policy Reforms

UNECE Project "Financing Energy Efficiency Investments for Climate Change Mitigation"

Reform to Promote Renewable Energy Investments in Croatia

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ENERGY INSTITUTE HRVOJE POŽAR

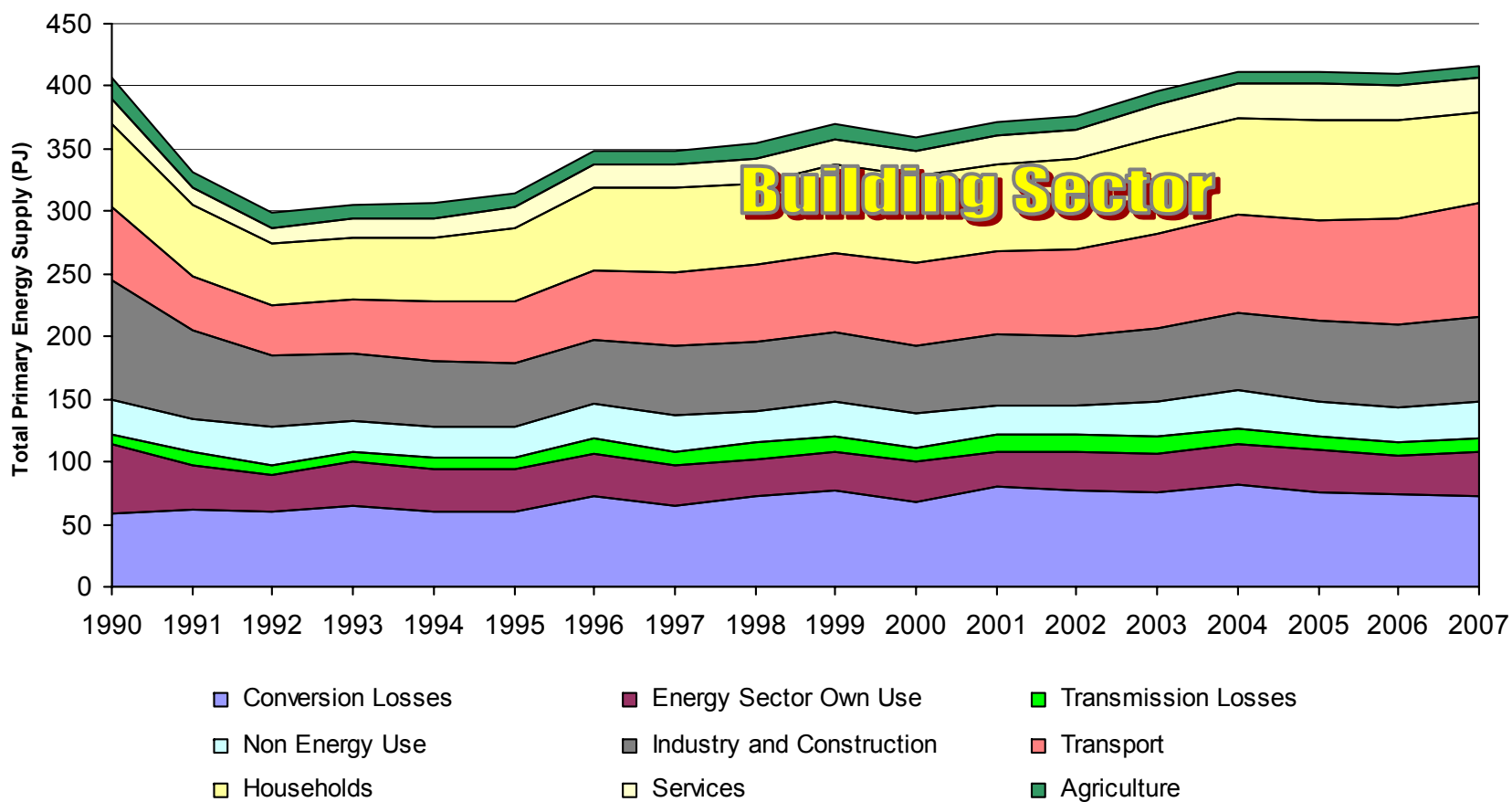
Kiev, 10-11 November 2009

INTRODUCTION

- **Case Study**

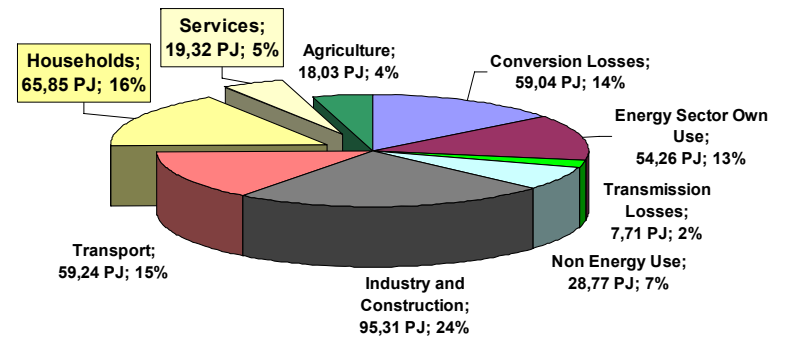
- Energy context of the chosen sector: **Buildings (Residential and Service sectors)**
- Relevant policies in place, before the reforms
- Impact of the expected new policy measures in Building sector on energy, economy and environment:
 - energy savings, costs of RES projects and GHG emission reduction
- Description of the used methodology
- Conclusions and recommendations (possible implications for the other countries in the Project)

TOTAL PRIMARY ENERGY SUPPLY IN CROATIA

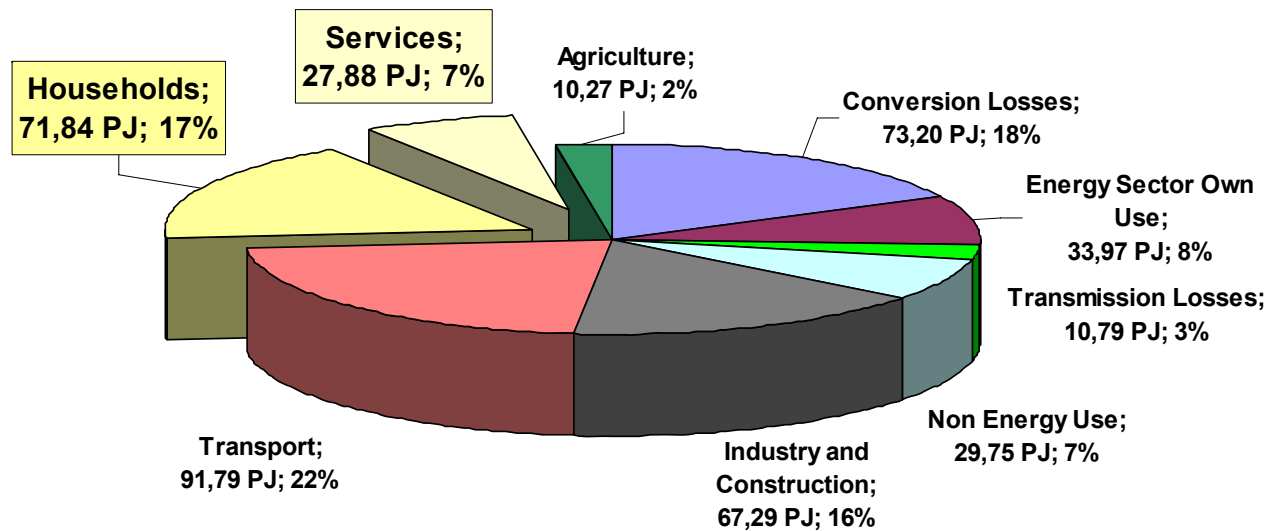


CONTRIBUTION OF ENERGY SECTORS IN TPES

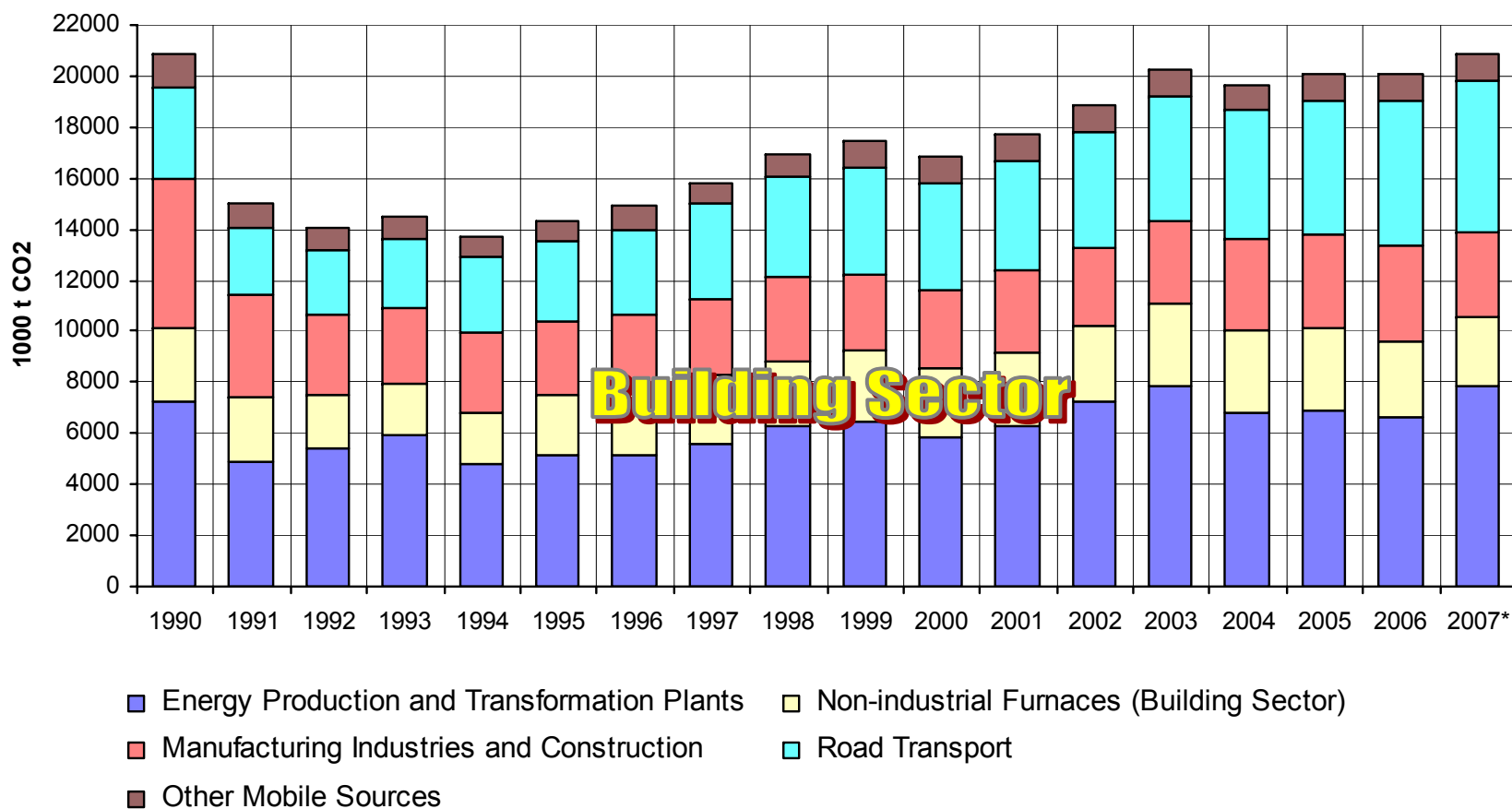
Total Primary Energy Supply (1990)



Total Primary Energy Supply (2007)

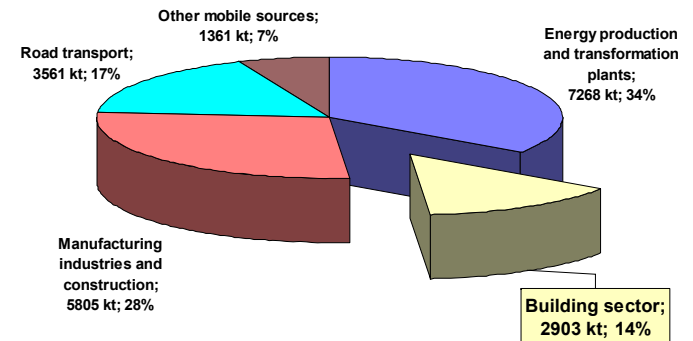


CO₂ EMISSION FROM STATIONARY AND MOBILE ENERGY SOURCES

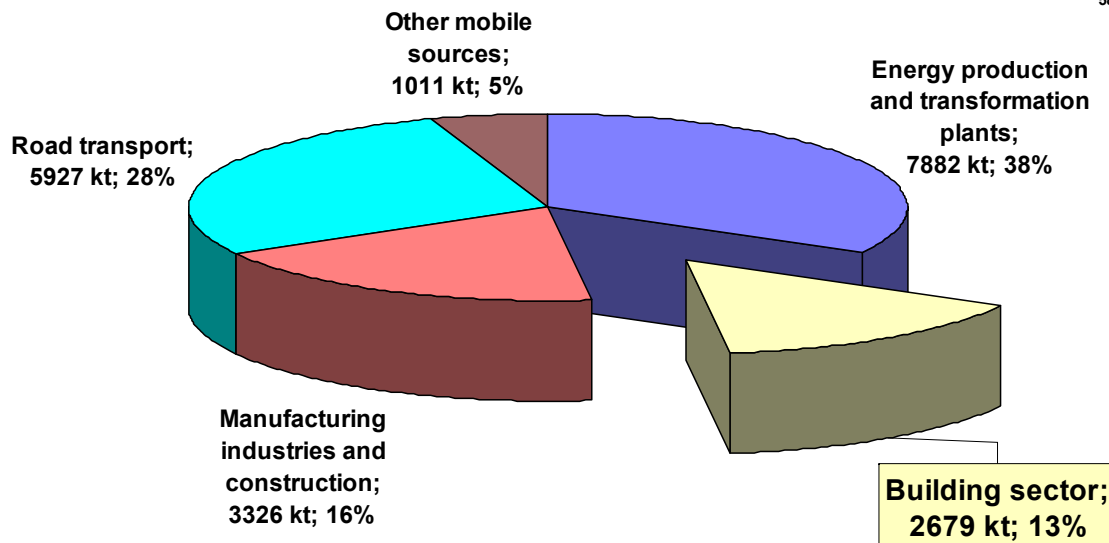


SHARE OF BUILDING SECTOR IN CO₂ EMISSION FROM ENERGY SOURCES

CO₂ emission (1990)



CO₂ emission (2007*)



RES POLICY REFORM

- Currently in Croatia there is only defined policy for subsidizing RES electricity generation, but it is still lacking for RES heat&cool production
- RES-H/C sub-laws are in a development phase and should be in place during the 2010
- Expected RES-H/C sub-laws include:
 - Rulebook on acquiring the status of subsidized RES heat&cool producer - defining eligible RES heat&cool technology (biomass, solar, geothermal) and technical criteria for each technology
 - Regulation on the minimum share of subsidized RES heat&cool production and financial incentives - defining the minimum share of subsidized RES heat&cool production in total primary energy supply and final energy consumption for 2020, as well as the amount of financial incentives for different RES heat&cool technologies

RES PROJECTS IMPLEMENTATION

- Impact of RES-H/C sub-laws on RES investments in Building sector
→ implementation of the following RES projects:
 - solar thermal collectors in residential sector
 - solar thermal collectors in services
 - pellet boilers in households
 - wood log furnaces in households
 - geothermal heat pumps in households
- RES projects could be implemented in a house (one facility – one user), in a residential or commercial building (one facility – multi users) or in a town/village (district heating).
- Analyses are conducted for existing prices of electricity and natural gas, and for expected future prices (30% increase for electricity on 0.114 EUR/kWh and 62% increase for natural gas on 0.452 EUR/m³).

SOLAR THERMAL COLLECTORS

- Solar thermal collectors in residential sector (hot zone) in combination with electric boilers, expected future price of electricity:
 - Investment: 2 877 EUR
 - Collector surface: 4 m²
 - Energy saving (electricity): 1 100 kWh (or 3.96 GJ)
 - CO₂ emission reduction: 904 kg
 - Needed incentives: 27.0% (194 EUR/m²)
- Solar thermal collectors in services:
 - Investment: 6 000 EUR
 - Collector surface: 20 m²
 - Energy saving (natural gas): 17.7 GJ
 - CO₂ emission reduction: 988 kg
 - Needed incentives: 27.0% (81 EUR/m²)

BOILERS ON BIOMASS

- Pellet boilers in households (cold zone), instead of natural gas boiler, expected future price of natural gas
 - Investment: 11 000 EUR
 - Installed power: 15 kW
 - Energy saving (natural gas): 81.20 GJ; increase of electricity for 679 kWh
 - CO₂ emission reduction: 4 111 kg
 - Needed incentives: 27.7% (203 EUR/kW)
- Wood log furnaces in households
 - Investment: 5 000 EUR
 - Installed power: 15 kW
 - Energy saving (natural gas): 80.57 GJ; increase of electricity for 854 kWh
 - CO₂ emission reduction: 3 967 kg
 - Needed incentives: 0% (suggestion: 10% or 33 EUR/kW)

GEOHERMAL HEAT PUMPS

- Geothermal heat pumps in households in combination with electric boilers for hot water preparation, instead of boiler on natural gas; expected future prices of natural gas and electricity
 - Investment: 12 200 EUR
 - Installed power of pump: 4 kW
 - Energy saving (natural gas): 83.64 GJ; increase of electricity for 1550 kWh
 - CO₂ emission reduction: 3 395 kg
 - Needed incentives: 26.7% (814 EUR/kW)

PROJECTIONS (2020)

- Analysis of heat and cool demand until 2020 (MAED model)
- “*Baseline scenario*” - slower penetration of RES heat/cool projects
- “*With measures scenario*” - larger contribution of heat and cool production from RES
- Energy potential for implementation of RES projects is based on the difference between two scenarios, for households and services
- The number of typical RES projects implemented (solar thermal collectors, boilers on biomass and geothermal heat pumps) is estimated using “Bottom up” approach
- Incentives or “soft” credit lines will be necessary for realization of the “*With measures scenario*”

WITH MEASURES SCENARIO

- “*Scenario with measures*” – bottom up approach
 - Measures implemented in 320 000 houses (20% of households in Croatia) and 7 100 objects in service sector till 2020
 - **Option 1** (defined by MARKET-SHARE model)
 - 191 000 biomass (70% pellets & 30% wood logs), 68 000 solar thermal collectors and 61 000 geothermal heat pumps in households
 - 7 100 solar thermal collectors in services
 - **Option 2** (more solar thermal collectors instead of biomass)
 - 80 000 biomass (70% pellets & 30% wood logs), 179 000 solar thermal collectors and 61 000 geothermal heat pumps in households
 - 7 100 solar thermal collectors in services

AGGREGATED POTENTIAL OF ENERGY SAVINGS IN BUILDING SECTOR

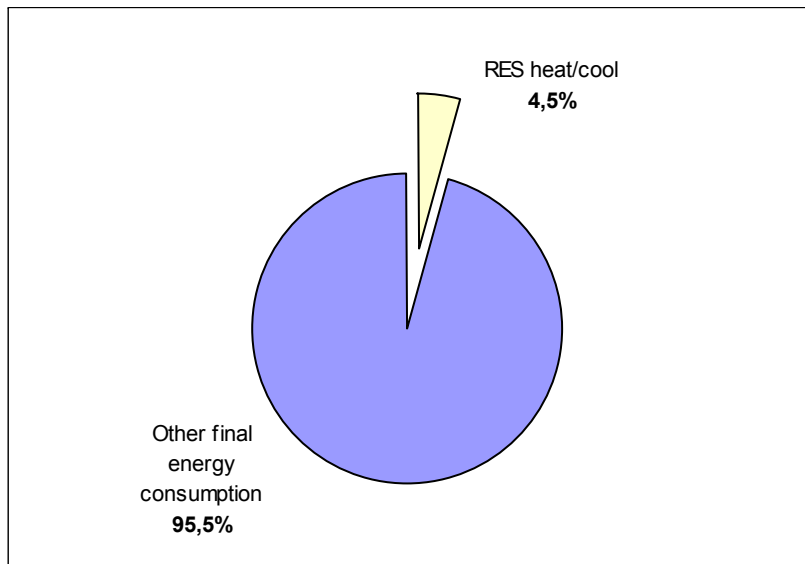
- Preliminary results of energy savings in 2020

Energy savings in 2020	Option 1		Option 2	
	PJ	%	PJ	%
Solar thermal collectors	0.9	5	1.6	13
Geothermal heat pumps	4.3	24	4.3	34
Biomass boilers/furnaces	12.7	71	6.7	53
Total	17.9	100	12.6	100

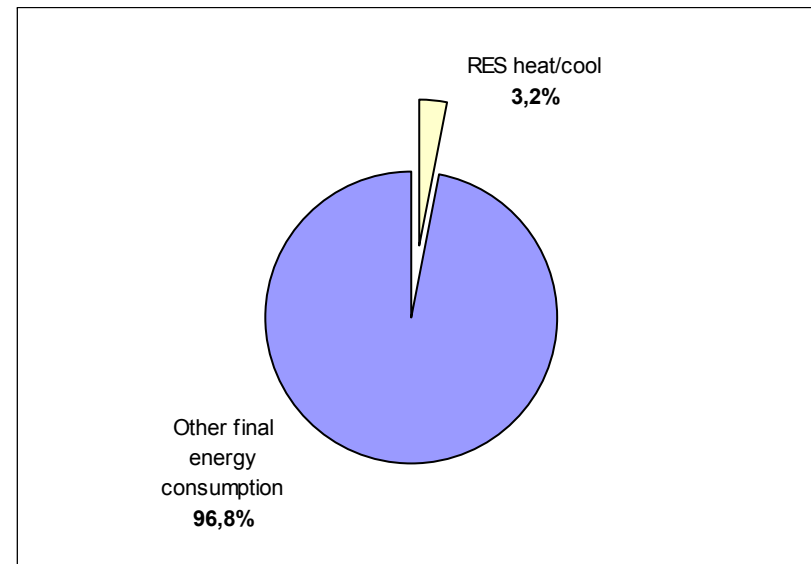
SHARE OF RES HEAT/COOL IN FINAL ENERGY CONSUMPTION IN 2020

Preliminary results:

Scenario with measures – Option 1



Scenario with measures – Option 2



AGGREGATED CO₂ EMISSION REDUCTION – PRELIMINARY RESULTS

Cumulative CO ₂ emission reduction till 2020	Option 1		Option 2	
	t	%	t	%
Solar thermal collectors - residential	45 454	4	119 652	18
Solar thermal collectors - services	7 015	1	7 015	1
Geothermal heat pumps - residential	207 102	20	207 102	31
Biomass (pellets) - residential	548 793	53	228 150	35
Biomass (wood logs) - residential	228 103	22	97 192	15
Total	1 036 467	100	659 110	100
Solar thermal collectors	52 469	5	126 667	19
Geothermal heat pumps	207 102	20	207 102	31
Biomass boilers/furnaces	776 896	75	325 342	49
Total	1 036 467	100	659 110	100

CONCLUSIONS

- **RES-H/C policy reform** in Croatia could:
 - Attract significant RES investments in Building sector
 - Brought energy savings up to 17.9 PJ (Option 1) or 12.6 PJ (Option 2) in 2020
 - Result in CO₂ emission reduction of 165 kt (Option 1) or 90 kt (Option 2) in 2020
 - Increase share of RES-H/C in final energy consumption at about 4.5% (Option 1) or 3.2% (Option 2) in 2020

RECOMMENDATIONS

- **RES-H/C sub-laws** should be carefully prepared to result in:
 - simple and clear procedures for acquiring the status of eligible RES heat&cool producer and
 - appropriate amount of financial incentives
- After implementation of RES heat/cool sub-laws, they could be promoted and shared with other countries as a good practise example.

Thank You for Your Attention!



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