

# **RENEWABLE ENERGY IN CROATIA**

The National Policy of Croatia in Developing Renewable Energy

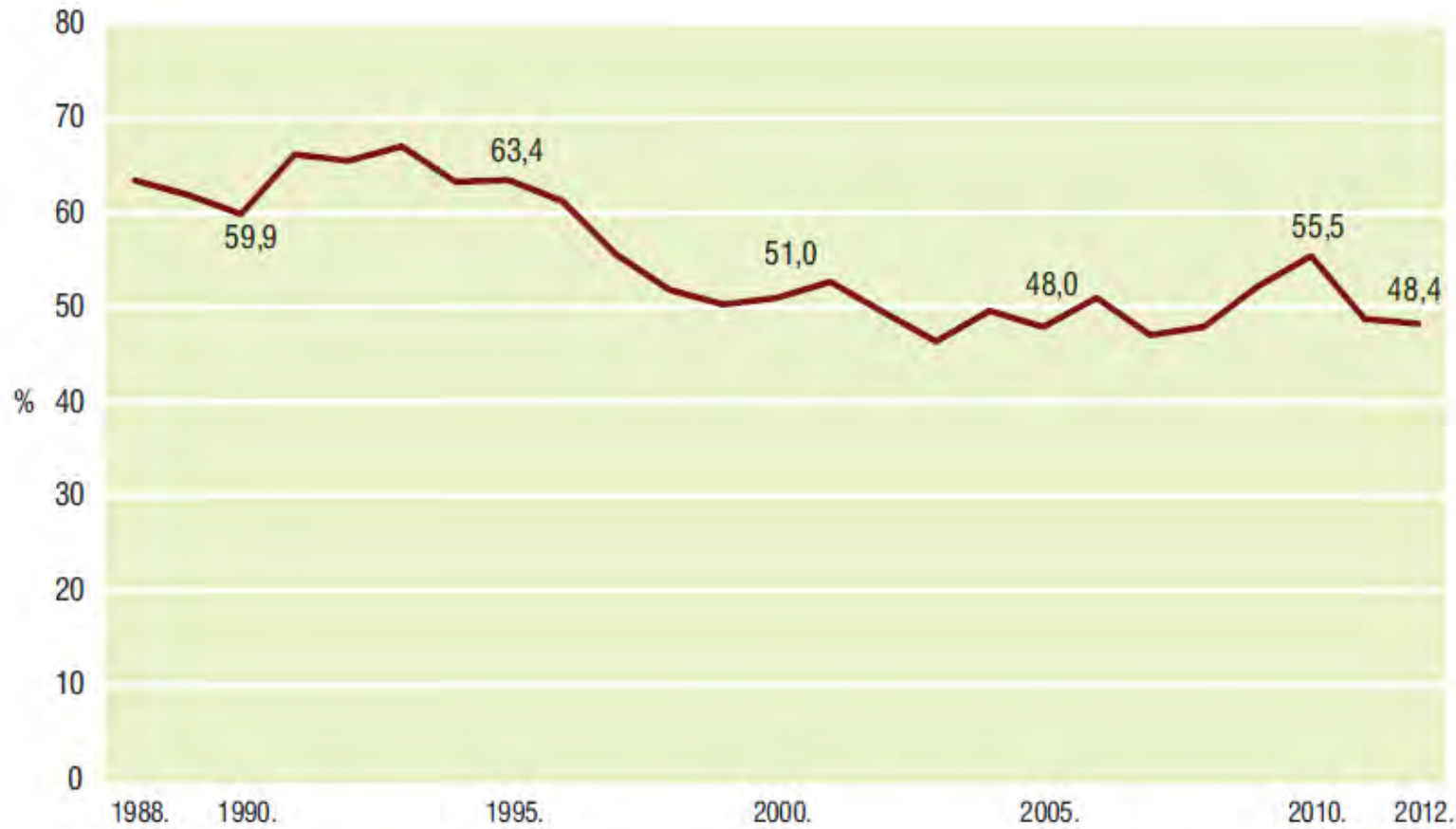
**Branka Jelavić, Ph.D.**  
**Energy Institute Hrvoje Požar**  
**Zagreb, Croatia**

**Croatia and the SE European Energy Bridge**  
**Zagreb, 10.10.2014.**

# Contents

- Motivation for RES, facts
- Legal background
- RES surroundings, projects
- Croatian RES potential and future outlook
- Conclusion

## Motivation for RES... Primary Energy Self Supply

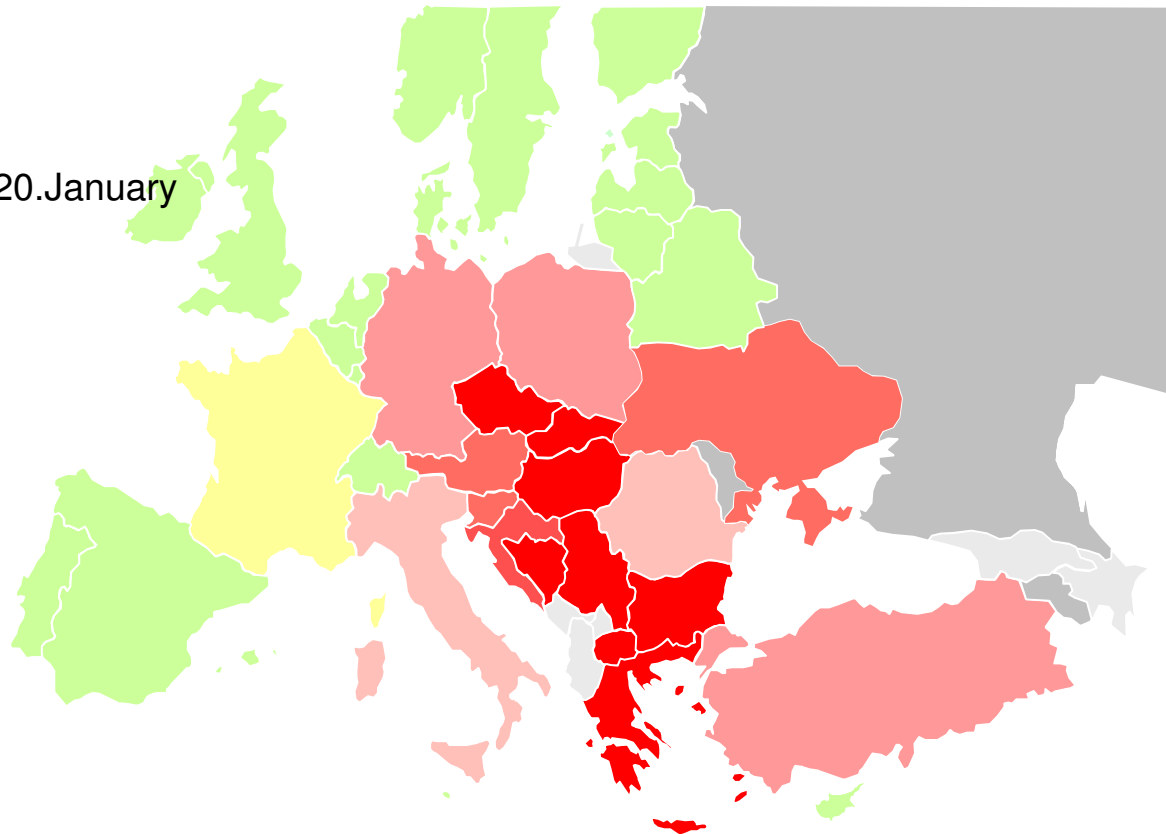
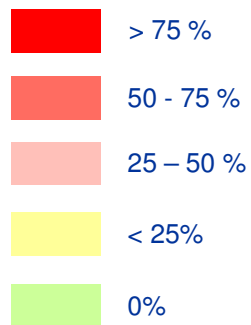


Source: Energy in Croatia, 2013

# Motivation for RES cont.

## Supply safety...

Gas lack percentage in period 6-20 January 2009



Source: EC

- Accepted and ratified Kyoto protocol (5% greenhouse gas emission reduction)
- High dependence on energy import

## Relevant regulation and documents:

- Law on energy (120/12, 14/14), Law on biofuels (OG 65/09, 145/10, 144/12, 14/14), Energy strategy (OG 130/09)
- Sublaws on RES electricity and cogeneration
  - Ordinance on RES & Cogeneration utilisation (88/12)
  - Ordinance regarding eligible producer status acquisition (132/13, 81/14, 93/14)
  - Regulation on RES & Cogeneration electricity fee (128/13)
  - Tariff system for RES & Cogeneration electricity (last vers. **OG 133/13**,151/13,20/14,93/14 )
- National Action plan for RES to 2020 (2013)
- Legal framework for RES not completely finished

## Surrounding for RES in Croatia

### National Energy Strategy 2009 by 2020

- 20% of energy from RES in gross final consumption
- 10% of biofuels share in transport (9 PJ)
- 35% of electricity from RES, including large hydro in total electricity consumption
- 20% of energy from RES in gross final consumption for heating and cooling
- Sustainable development scenario

# Tariff system for RES&C electricity

(feed-in 14 years), €/kWh in 2014 (OG 133/2013)

| HRK/€/kWh          | ≤5 MW                 |                |
|--------------------|-----------------------|----------------|
| <b>Solar:</b>      | Integrated (< 300 kW) | Non-integrated |
| < 10 kW            | 1,91/0,25             | APP            |
| 10-30 kW           | 1,70/0,22             |                |
| > 30-300 kW        | 1,54/0,20             |                |
| <b>Small hydro</b> |                       |                |
| <300kW             | 1,07/0,14             |                |
| 300 kW- 2MW        | 0,93/0,12             |                |
| > 2MW              | 0,88/0,12             |                |
| <b>Wind</b>        |                       |                |
|                    | APP                   |                |
| <b>Biomass</b>     |                       |                |
| < 300 kW           | 1,30/0,17             |                |
| 300 kW- 2 MW       | 1,25/0,16             |                |
| >2 MW              | 1,20/0,16             |                |
| <b>Geothermal</b>  | 1,20/0,16             |                |
| <b>Biogas</b>      |                       |                |
| < 300 kW           | 1,34/0,18             |                |
| 300 kW- 2MW        | 1,26/0,17             |                |
| >2MW               | 1,18/0,15             |                |
| <b>Others</b>      | APP                   |                |

1€ = 7,63 HRK (HNB)

| HRK/€/kWh  | > 5 MW |
|------------|--------|
| Hydro      | APP    |
| Wind       | APP    |
| Biomass    | APP    |
| Geothermal | APP    |
| Biogas     | APP    |
| Others     | APP    |

APP- average production price Blue tariff  
(0,53 HRK (0,07€)/kWh – OG 116/13)

## RES electricity fee:

**2007:** 0,12 €/kWh (total app. 9 M€)

**2008:** 0,12 €/kWh (total app. 19 M€)

**2009:** 0,12 €/kWh (total app. 18,3 M€)

**2010:** 0,068 €/kWh (total app. 10,7 M€)

**2011:** 0,068 €/kWh (total app. 10,7 M€)

**2012:** 0,068 €/kWh (total app. 10,1 M€)

**2013:** 0,068 €/kWh (total app. 19,5 M€)

## Regulatory framework

1. Directive 2001/77/EC on the promotion of electricity produced from RES in the internal electricity market
2. Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport
3. Directive 2009/28/EC 20-20-20 targets



**RENEWABLE  
ENERGY  
SOURCES**

**Economic  
instruments**

**Programs, measures  
projects**

1. Governmental
2. Regional/local self-government
3. National energy programmes





# Support to RES & energy efficiency promotion in Croatia

## Economic instruments

- o National Budget
- o County/Municipal Budget
- o Tariff System for RES and Cogeneration
- o Croatian Bank for Reconstruction and Development
- o Commercial Banks
- o International Funds – GEF, WB, UNDP
- o EU Funds – FP7, IEE, IPA, INTERREG, HORIZON 2020, LIFE
- o **Fund for Environmental Protection and Energy Efficiency**



# Transposition of EU Directives into Croatian legal framework

Share of final gross consumption in Croatia

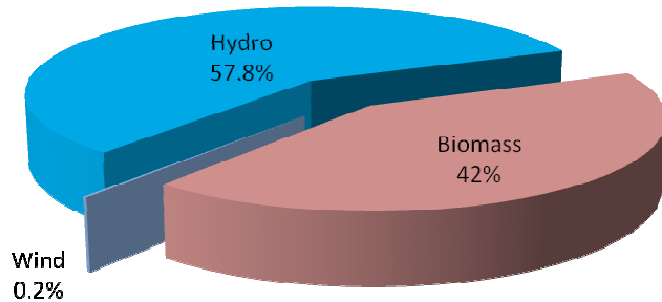
**2005**

**RES: 12.6%**

Electricity: 7.3%

Heating&Cooling: 5.3%

Transport: 0%



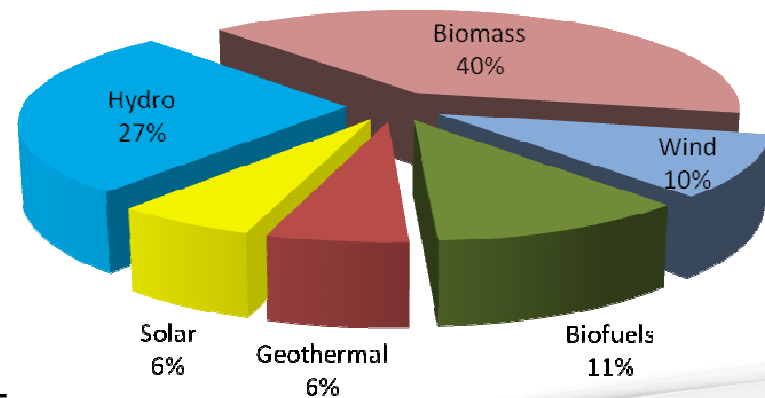
**2020**

**RES: 20.0%**

Electricity: 9.2%

Heating&Cooling: 8.6%

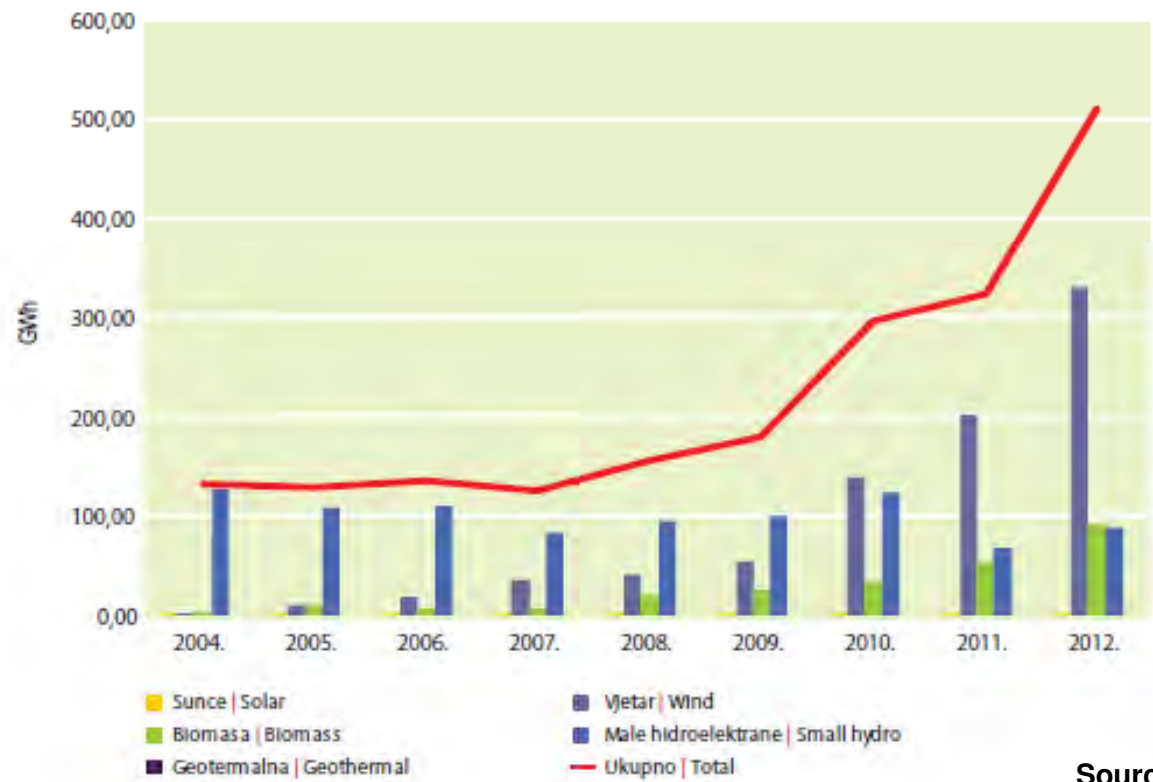
Transport: 2.2%



Source: MELE

# RES realisation...

RES electricity generation in Croatia for 2012



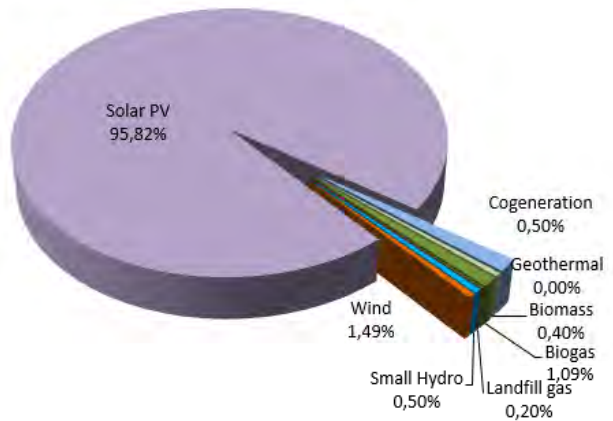
Goal 2020 - 2027 GWh\*

2012. god. - 510,75 GWh

Source: Energy in Croatia, 2013  
\* National action plan (2013)

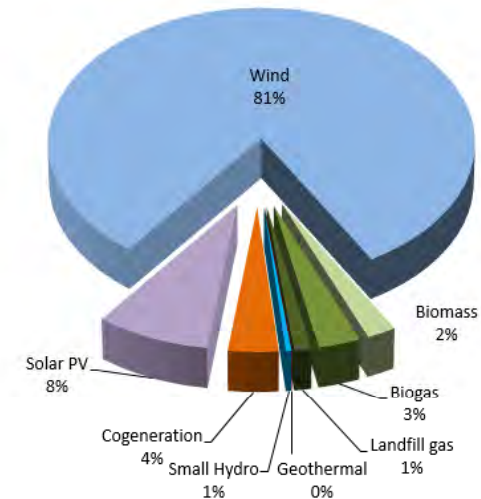
# RES for electricity production ACTUAL STATUS (October 2014)

RES shares by number of projects

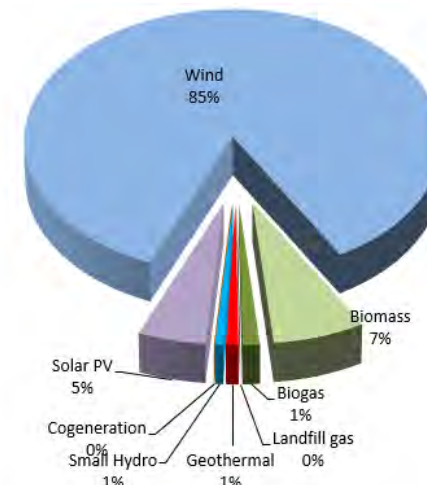
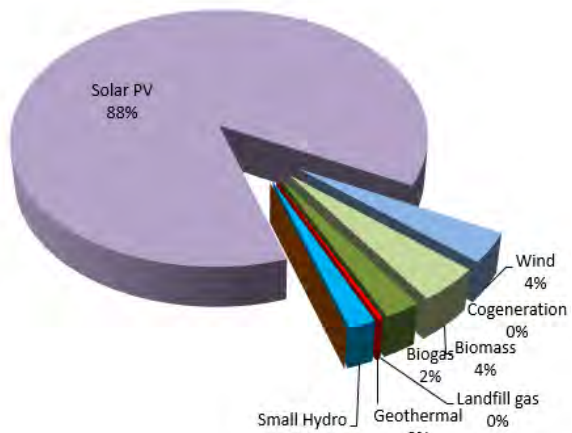


**Commissioned**  
1005 projects;  
365 MWeI

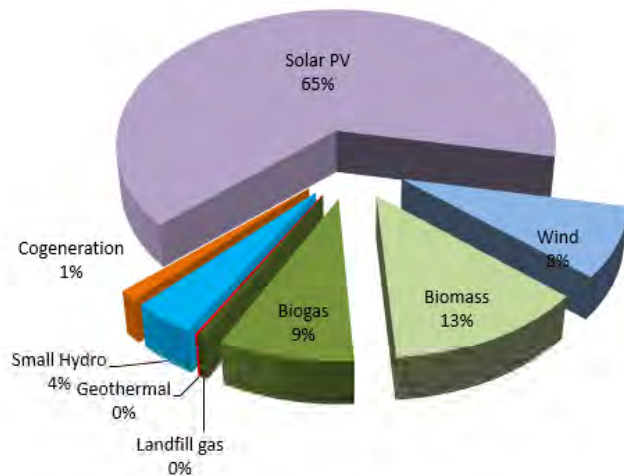
RES shares by electrical capacity (MW)



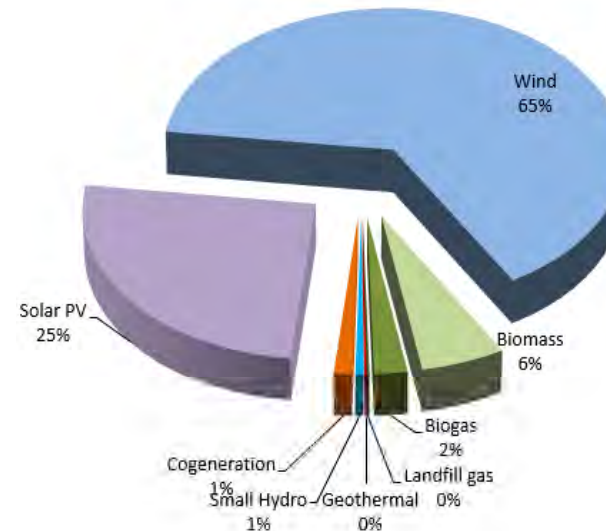
**Contracted**  
327 projects;  
510 MWeI



## Overview of projects entered in the Registry – 818 requests for PEA, 4321 MWeI (October 2014)



**RES shares by number of projects**



**RES shares by electrical capacity (MW)**

- Focus primarily on electricity production, thermal energy 112 MW (88 MW in cogeneration)

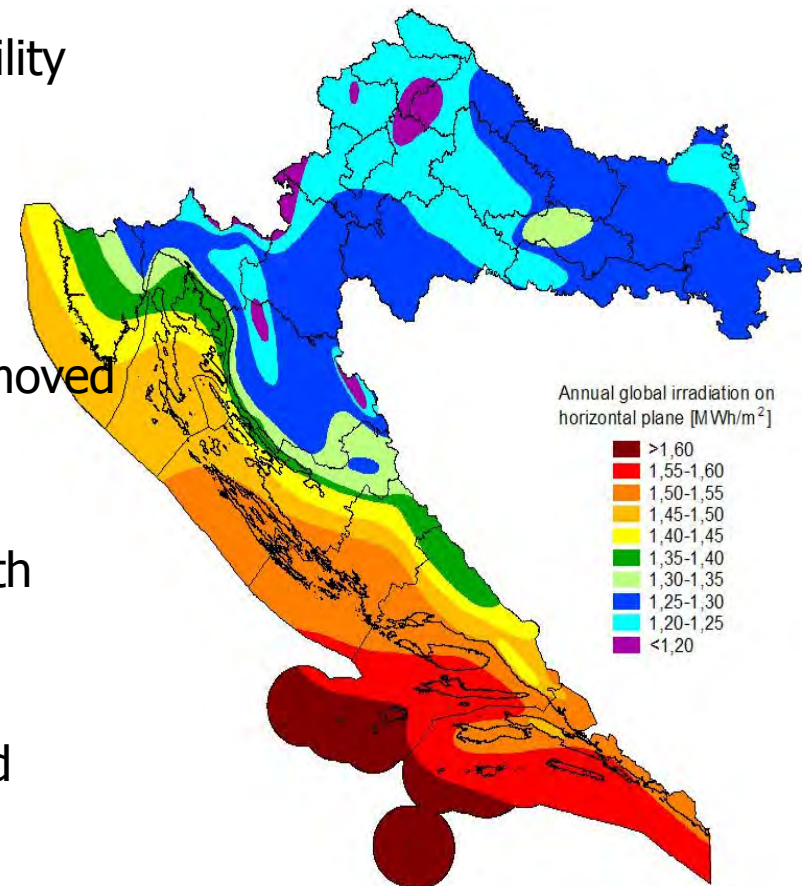
Source: Ministry of Economy, Registry

<http://oie-aplikacije.mingo.hr/pregledi/>



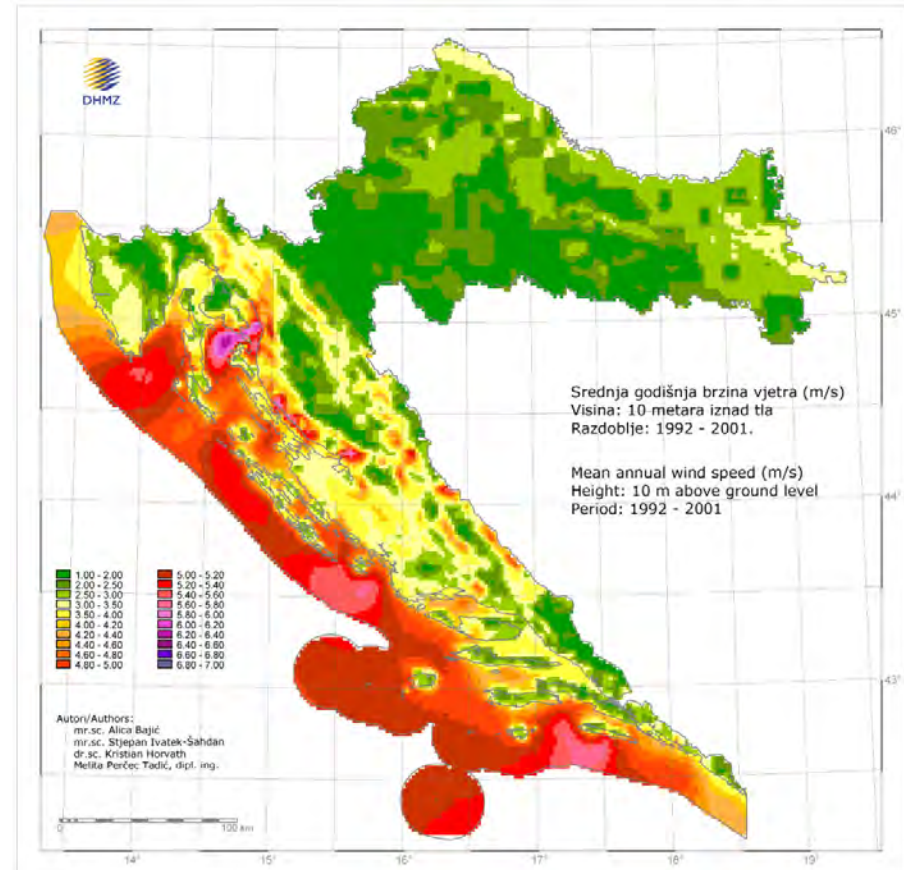
# Croatia – Solar energy

- Great potential, relatively low spatial variability (1,2-1,6 MWh/m<sup>2</sup>)
- Market potential by 2020 (Strategy):
  - heating and passive usage: 5,2 PJ/y
  - electricity: 0,3 PJ/y
- Limitations (legal background), partially removed 8/2012.
- Solar collectors – individual systems
- Concurrent need for energy and heating with available resource (tourism)
- Today (PV):
  - 30,19 MW / 963 projects commissioned
  - 25,52 MW /286 projects contracted



# Croatia – Wind Energy

- Lack of verified basic data (Wind Atlas only for Zadar county)
- Lower wind potential on the continent than along the coast line
- Measurements show plentiful potential... preliminary potential 3 TWh/a
- First wind power plants confirm predictions
- Technical limit set to 400 MW indicatively by HEP TSO
- Market potential by 2020:
  - Strategy (2009) -1200 MW
  - NAP (2013)- 400 MW
- Today:
  - 297,25 MW /15 projects commissioned
  - 435, 2MW /12 projects contracted
    - 42 MW/1 project in testing phase
    - 81,5 MW/3 projects fit into quota



- Biomass is the most complex RES
- By using biomass, energy issues are overlapping with other sectors (agriculture, forestry, waste management...)
- Biomass goals for 2020 (RES Strategy):
  - Woody biomass: 26 PJ, Biogas: 2,6 PJ, Biofuels: 9 PJ, Biodegradable component of municipal waste cc 2 PJ

Today (electricity production):

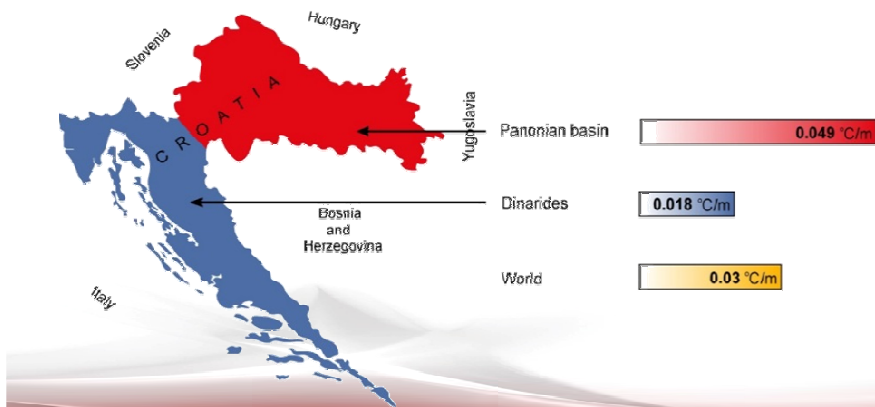
- Woody biomass: 7,69 MW / 4 projects commissioned  
34,76 MW /14 projects contracted
- Biogas from agriculture: 11,135 MW /11 projects commissioned  
6,554 MW / 8 projects contracted
- Biogas from waste water treatment and landfill: 4,536 MW/2 projects commissioned





# Croatia – Geothermal energy

- Croatia has higher temperature gradient than the european average
  - Panonian basin – 0,049 °C/m
  - Dinarides – 0,018 °C/m
- Total potential: 13227 TJ/a (heat) and 377 GWh/a (el.)
- Today: 36.66 MWh (space heating), 113.9 MWh (space heating & bathing)
- Projects: Velika Ciglena & Kutnjak Lunjkovec concession for exploitation
- Electricity production: 4,7 MW/ 1 project (Velika Ciglena) contracted
- The reserch is in progres at several locations (electricity production and direct use- greenhouses)



## Croatia-Small Hydro

- Long tradition of using hydroelectric power
- Environmental and planning constraints significantly reduce the potential
- Cadastre of small hydro power (<5 MW):
  - 699 potential locations, 177 MW, 570 GWh/a

According to Strategy the goal for small hydro clearly set to:  
270 GWh by 2020 (100 MW)

Today:

- 1,453 MW / 5 projects commissioned
- 3,103 MW /6 projects contracted



## Conclusions

- Positive attitude towards RES
- Legal framework to be completed
- Authorisation procedures to be simplified
- International cooperation
- Further research of available resources on national level (last activity in 1998 by National Energy Programmes)
- Promotion and education
- Systematic approach
- Regional and local RES action plans
- Sustainability awarenessraising
- Global climate change awareness

**THANK YOU FOR YOUR ATTENTION!**



**Energy Institute Hrvoje Požar**  
**Savska cesta 163, Zagreb, Croatia**  
**[www.eihp.hr](http://www.eihp.hr)**

**Branka Jelavić, Ph.D**

[bjelavic@eihp.hr](mailto:bjelavic@eihp.hr)

Nikola Karadža, dipl. ing.

[nkaradza@eihp.hr](mailto:nkaradza@eihp.hr)

Filip Prebeg, dipl.ing.

[fprebeg@eihp.hr](mailto:fprebeg@eihp.hr)

MSc. Željka Fištrek, dipl.ing.biol.

[zfistrek@eihp.hr](mailto:zfistrek@eihp.hr)