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# **Biomass for District Heating and Cooling**

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Combined Combustion of Coal and Biomass

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## Introduction

### Biomass

alternative fuel

renewable resource

wooden chips

saw dust

calorific value  
8.5 - 12 MJ/kg



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ZVOLENSKÁ TEPLÁRENSKÁ

SLOVAK REPUBLIK



## ZVOLENSKÁ TEPLÁRENSKÁ

Reconstruction in two stages

1st stage : reconstruction of boiler K 1, construction of transport routes for biomass

2nd stage : reconstruction of boiler K 2

Reconstruction targets

to fulfil emission limits valid from 1.1.2008

to co-combust biomass up to 30 % thermal input

to reach guaranteed parameters, output, steam temperature and pressure

## ZVOLENSKÁ TEPLÁRENSKÁ

Fuel

	Brown coal		Biomass	
$W^r$	40,0	%	35-50	%
$A^r$	10,2	%	2,0	%
$S^r$	0,45	%	0,0	%
$V^{daf}$	51,0	%	80,0	%
Calorific value	14,0	MJ/kg	8,5–12	MJ/kg
Grain size	0 - 22	mm	10 – 50	mm

## ZVOLENSKÁ TEPLÁRENSKÁ

Boiler K 1

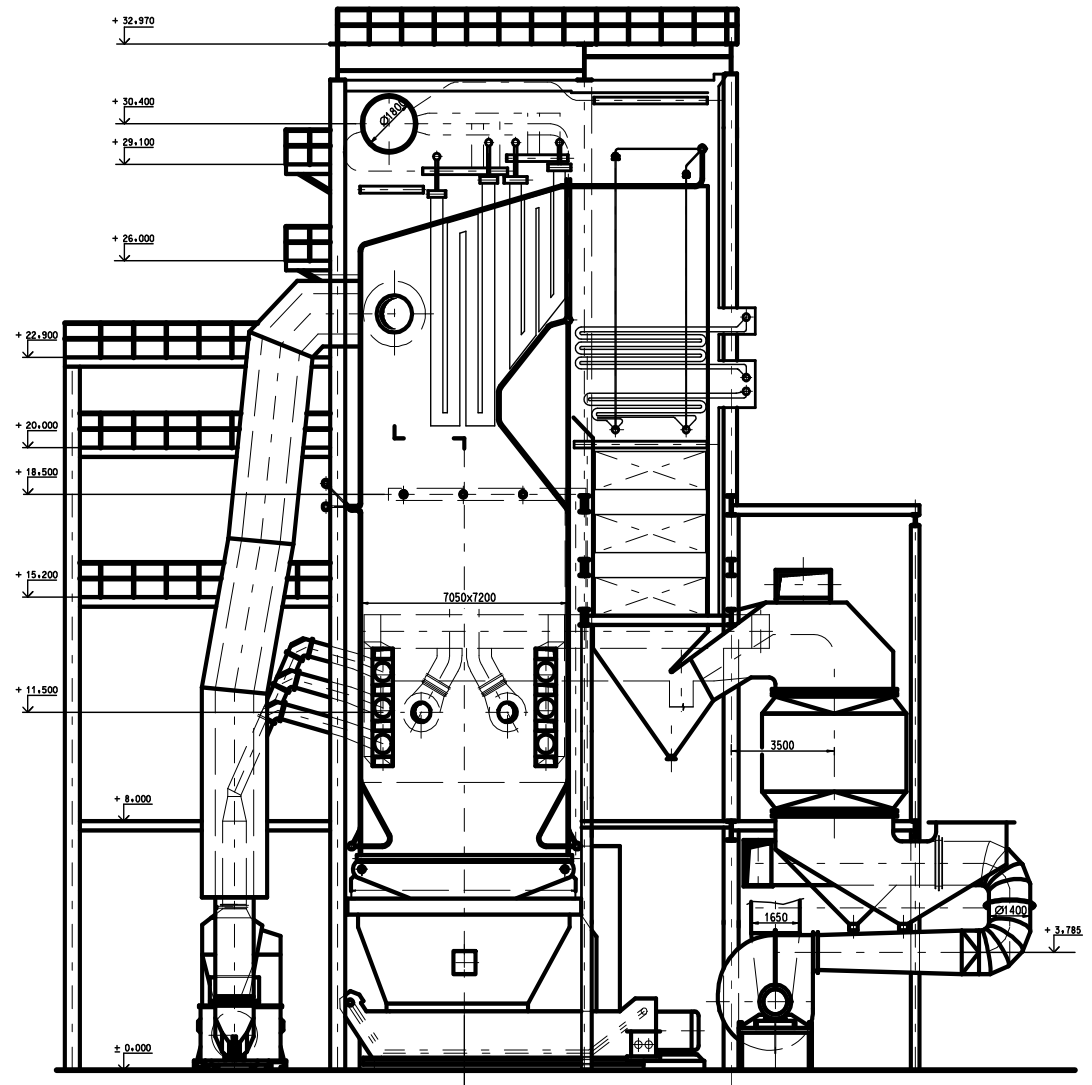
Main parameters of boiler :

Nominal output	160	t/h
Nominal pressure of steam	13.6	MPa
Nominal temperature of steam	540	°C
Nominal temperature of feed water	225	°C
Boiler efficiency	86	%

## ZVOLENSKÁ TEPLÁRENSKÁ

### Boiler K 1

- Dry-bottom boiler with extension grate
- Natural circulation
- Membrane combustion chamber
- Ljungstroem
- 4 fan-type mills
- 4 tilting-type coal burners
- 4 stable gas burners
- DENOX





## ZVOLENSKÁ TEPLÁRENSKÁ

Boiler K 2

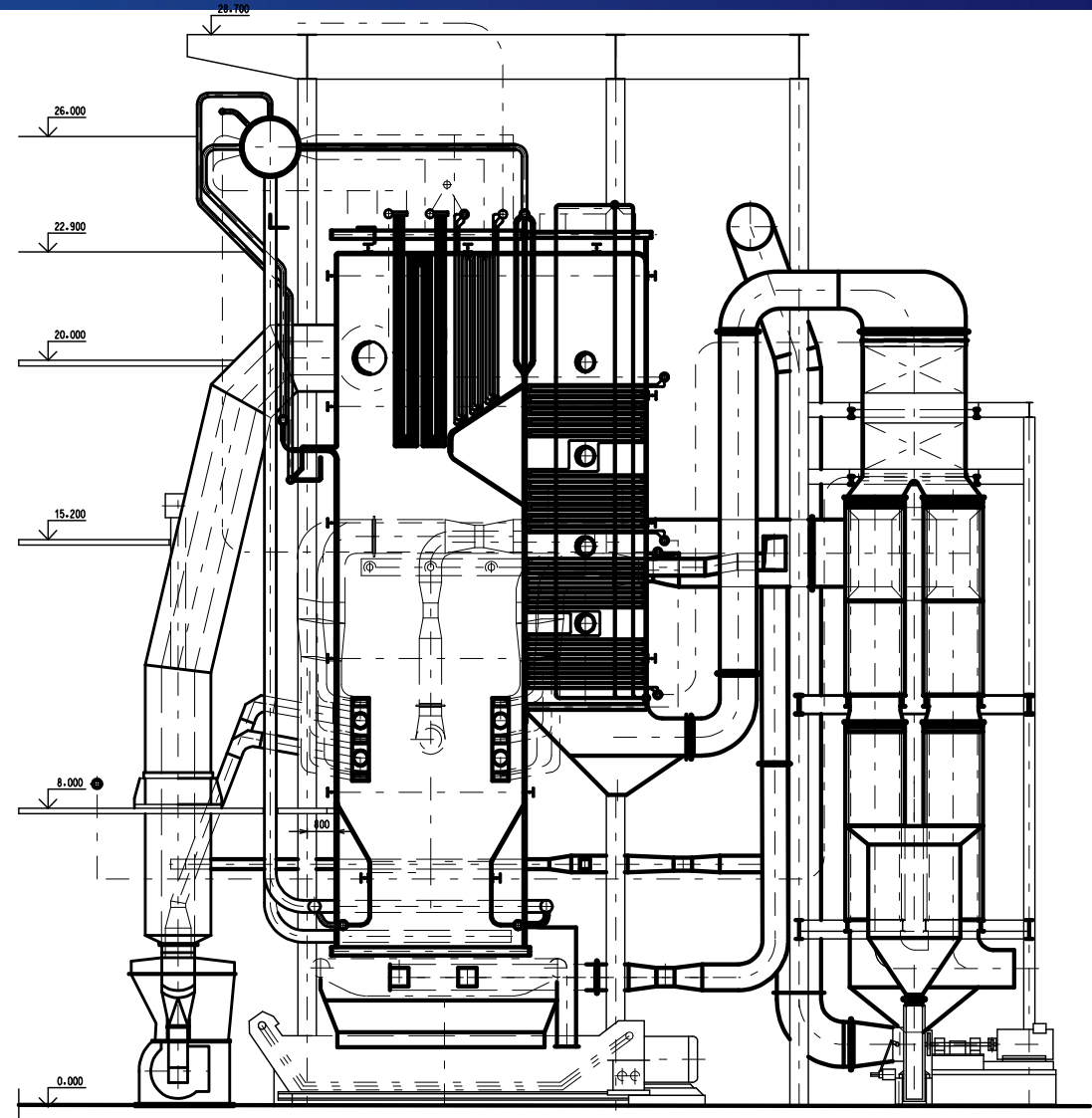
Main parameters of boiler :

Nominal output	90	t/h
Nominal pressure of steam	13.6	MPa
Nominal temperature of steam	540	°C
Nominal temperature of feed water	225	°C
Boiler efficiency	88.6	%

## ZVOLENSKÁ TEPLÁRENSKÁ

### Boiler K 2

- Dry-bottom boiler with extension grate
- Natural circulation
- Membrane execution
- Tubular air heater
- 4 fan-type mills
- 4 tilting-type coal burners
- 2 stable gas burners
- DENOX

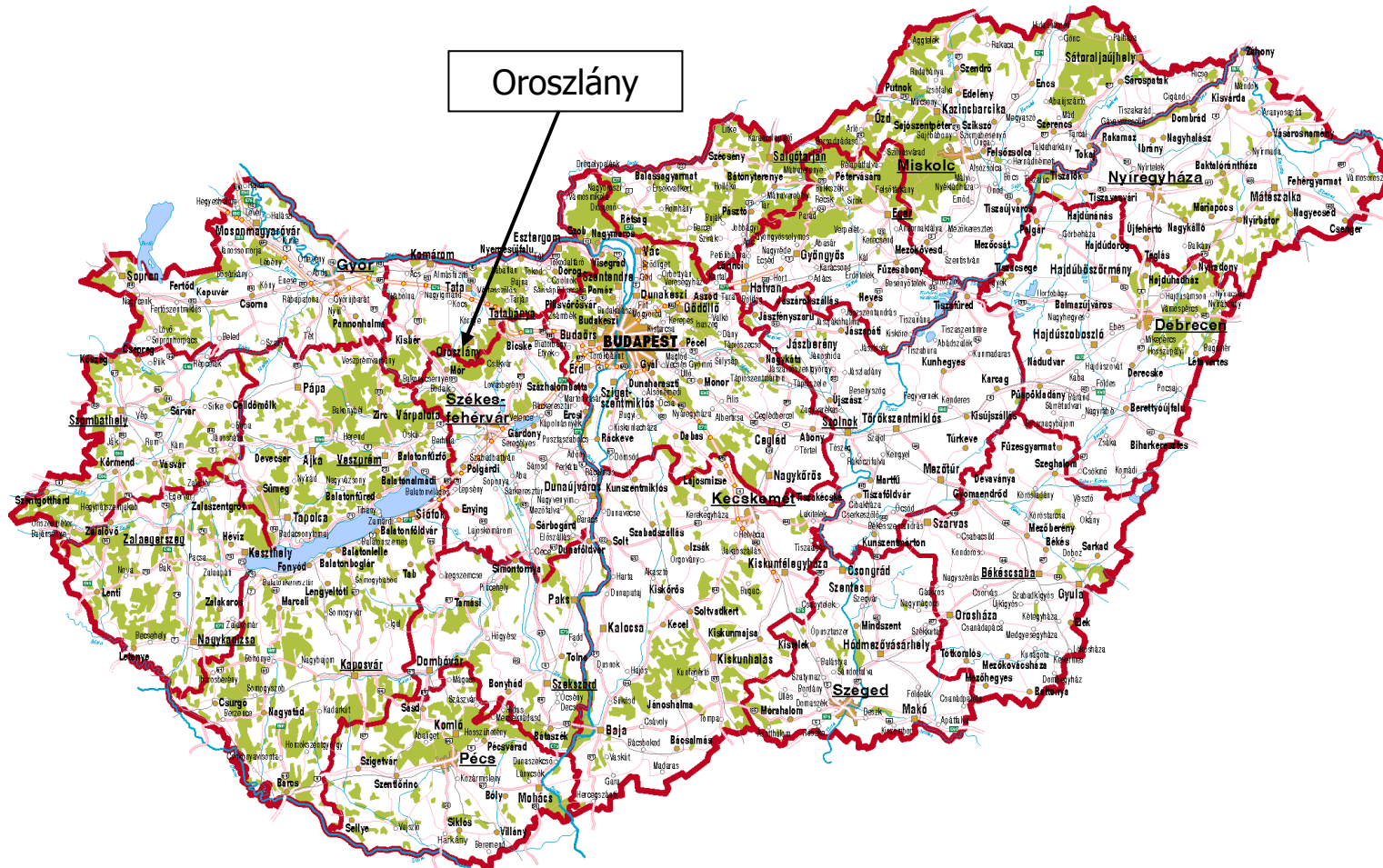


## ZVOLENSKÁ TEPLÁRENSKÁ

### Guaranteed emissions

NO <sub>x</sub>	600	mg/Nm <sup>3</sup>
CO	250	mg/Nm <sup>3</sup>
SO <sub>2</sub>	1600	mg/Nm <sup>3</sup>
Solids	50	mg/Nm <sup>3</sup>

# OROSZLÁNY Power Plant - HUNGARIA



## OROSZLÁNY Power Plant

Reconstruction in two stages

1st stage : reconstruction of boilers K 1-4,

2nd stage : reconstruction of boilers K 1-2 to co-combust coal and biomass

Reconstruction targets

to fulfil emission limits

to co-combust biomass up to 30 % thermal input

o reach guaranteed parameters, output, steam temperature and pressure

## OROSZLÁNY Power Plant

Fuel

	Brown coal		Biomass (wood)	
$W^r$	14,8	%	31-43	%
$A^r$	38,0	%	4,0	%
$S^r$	3,6	%	0,1	%
$V^{daf}$	33,0	%	80,0	%
Calorific value	12,2	MJ/kg	9,6–11,8	MJ/kg

Remark: Combusted biomass will consists of energy reed, agricultural wastes, straw, separated waste

## OROSZLÁNY Power Plant

Boiler K 1, 2

Main parameters of boiler :

Nominal output	230	t/h
Nominal pressure of steam	9.91	MPa
Nominal temperature of steam	540	°C
Nominal temperature of feed water	210	°C
Boiler efficiency	88	%

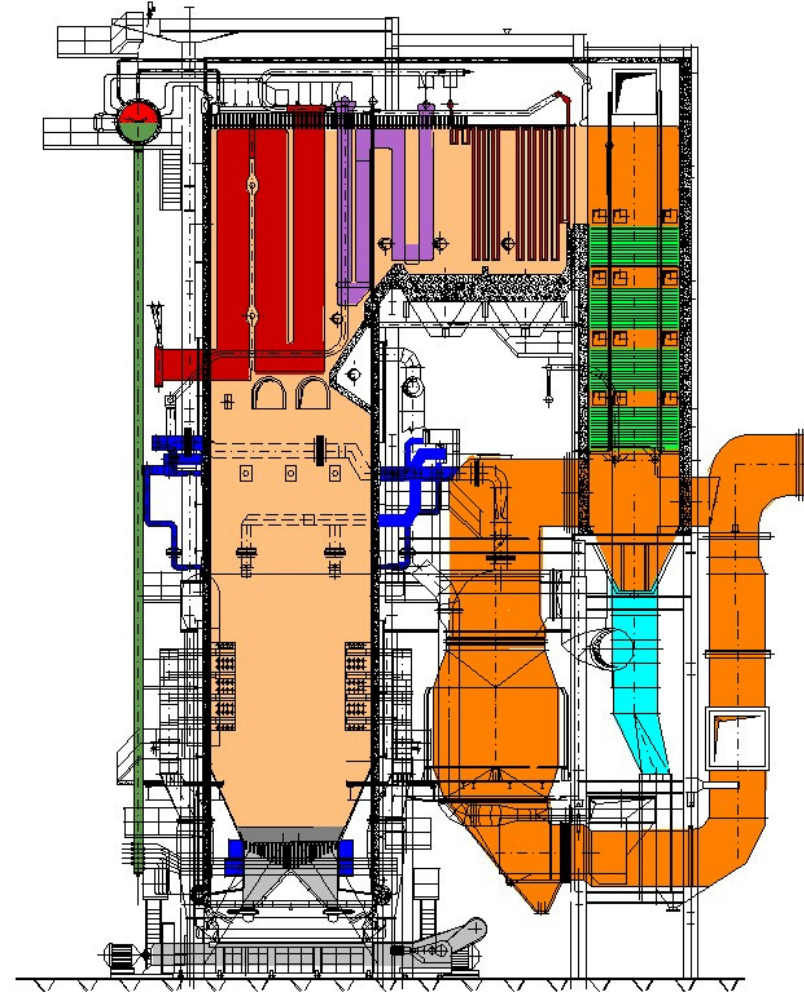
Guaranteed emissions

NOx	400	mg/Nm <sup>3</sup>
CO	250	mg/Nm <sup>3</sup>

## OROSZLÁNY Power Plant

### Boiler K 1

- Dry bottom boiler
- Natural circulation
- Membrane wall execution
- Ljungstroem
- 4 fan-type mills
- 4 coal burners
- 4 stable gas burners
- DENOX
- Fluidized bed grate for biomass combustion





## **What grants co-combustion of biomass**

To fulfil legal emissions of SO<sub>x</sub> without desulphurization a

To improve economy of operation

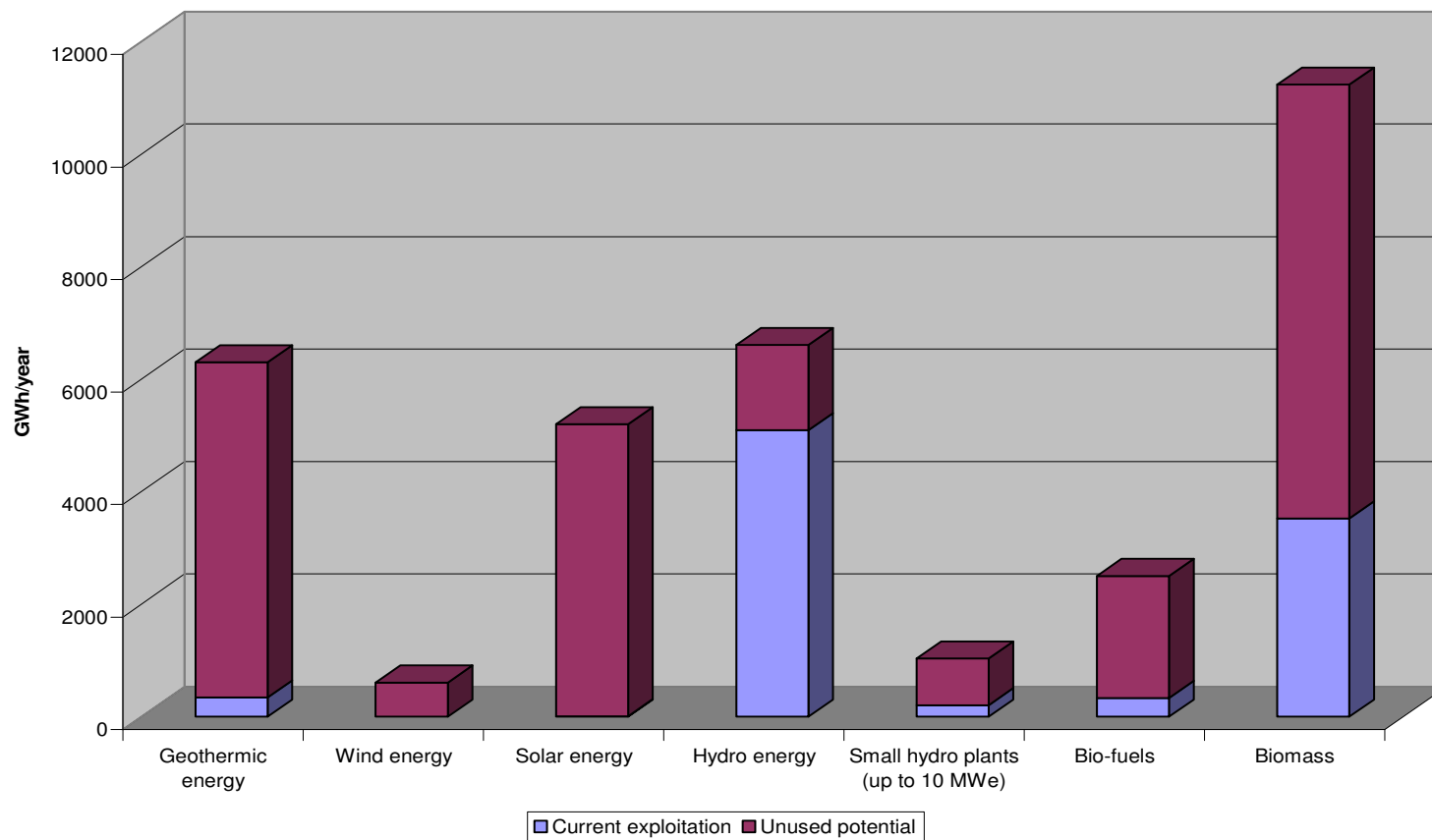
To increase the share of renewable resources in power generation

To reduce production of green house gases

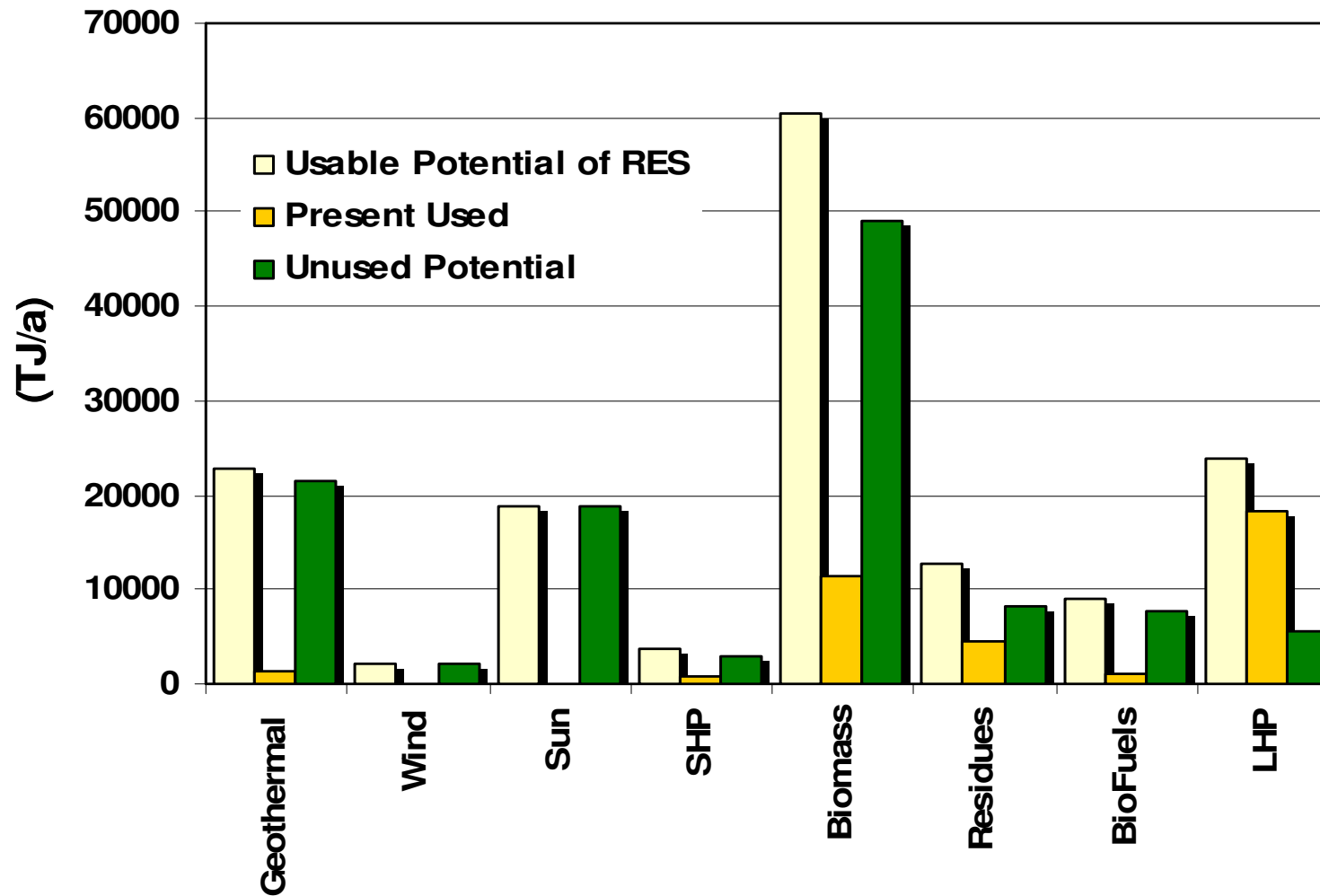
## *State of Art in exploitation of biomass LC-DH*



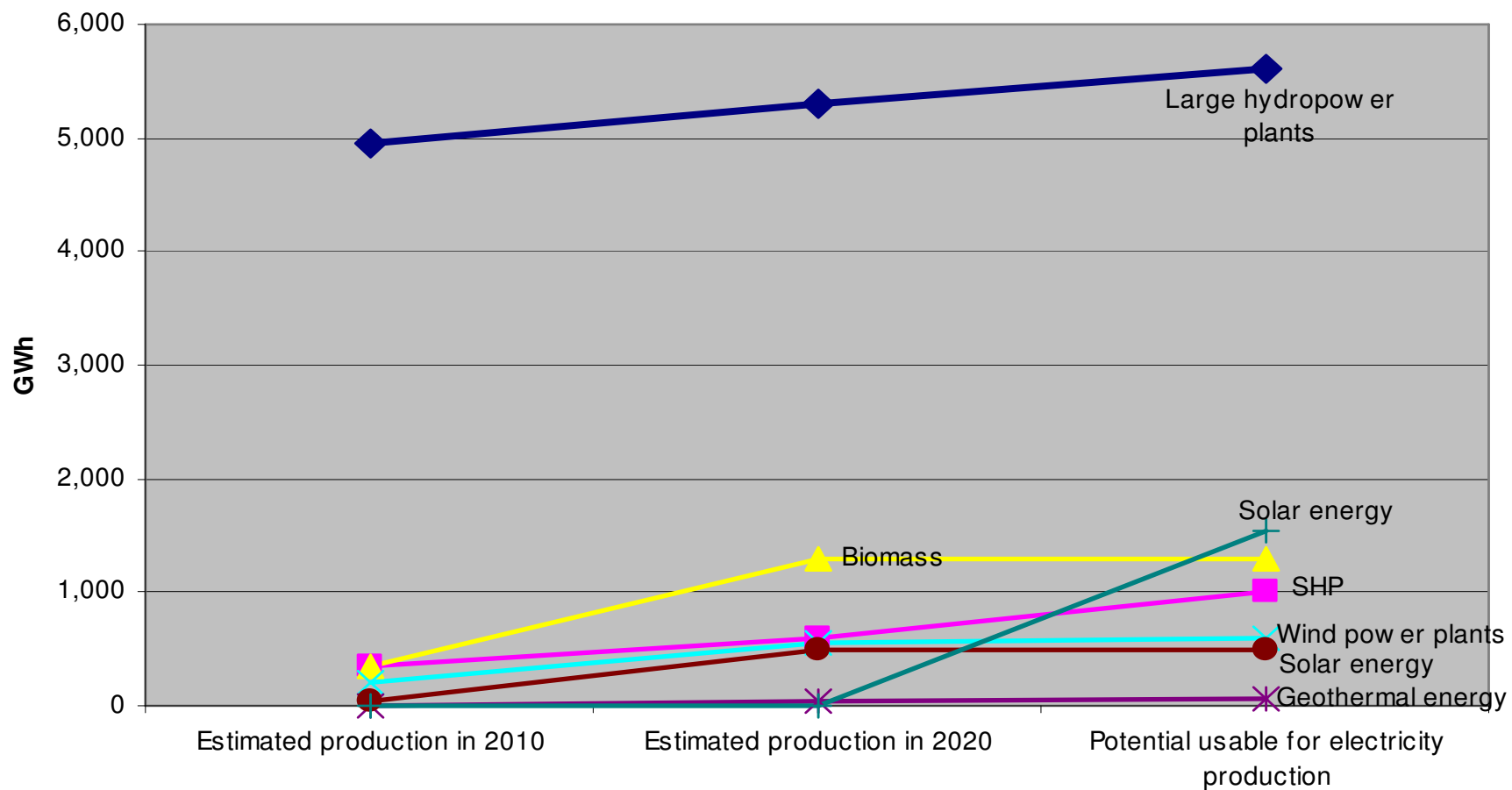
## RES potencial in Slovakia



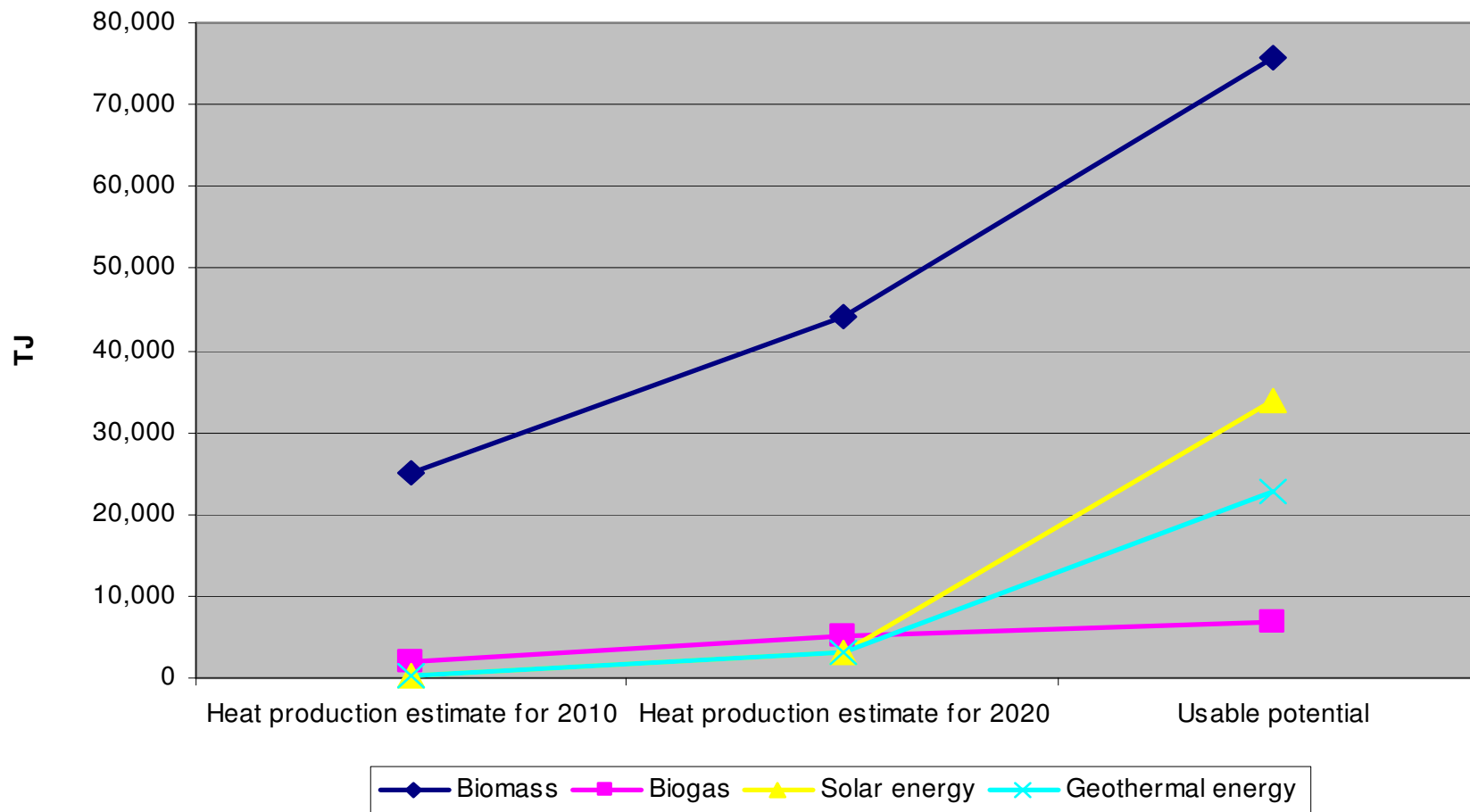
## Situation In Slovakia: R-E Resources & Carriers



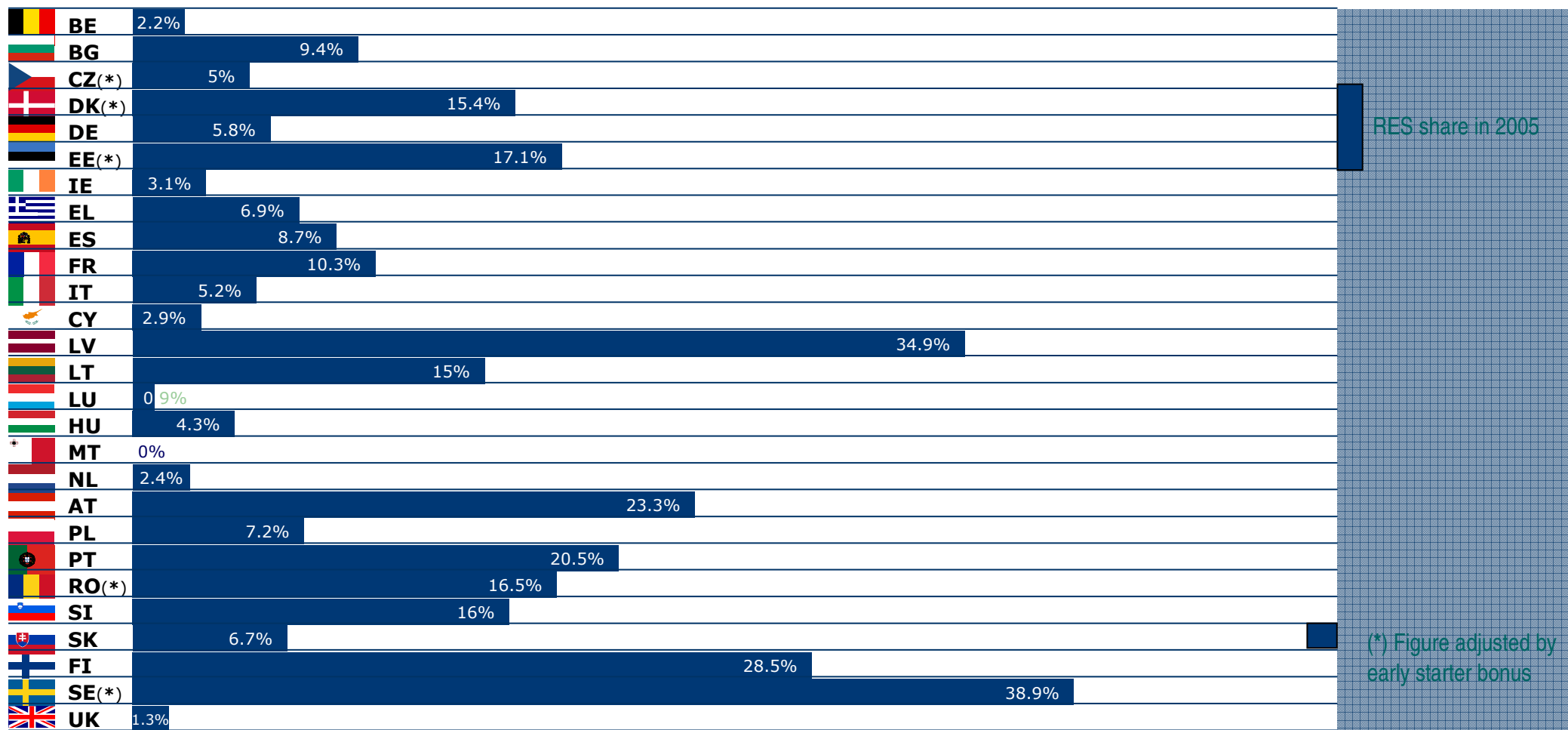
## RES-E Utilisation Outlook



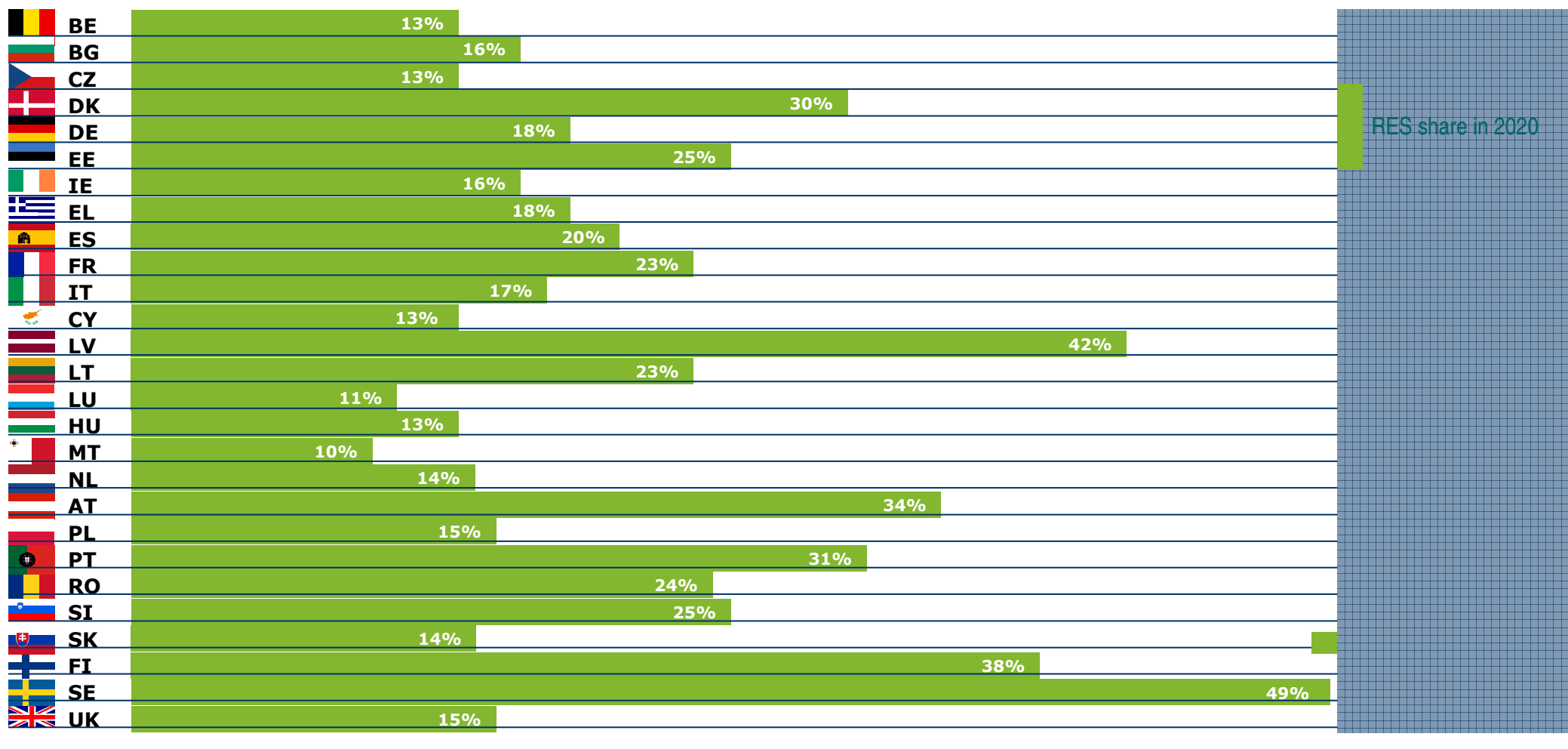
## RES-Heat Utilisation Outlook



## EU efforts to increase ONE share in the field of power engineering : Renewable carriers of energy and their share in power engineering in 2005



## EU intention to increase ONE share in the field of power engineering : Renewable carriers of energy and their planned share in power engineering in 2020





## Conclusion

For long-term ensuring the demands for energy, it is inevitable to provide sufficient variety of energy resources consisting mainly of fossil fuels as well as renewable resources.

Importance of renewable energy resources is justified primarily by necessity to reduce production and emissions of gaseous pollutants and greenhouse gases.

Technologies using renewable energy resources are generally cleaner, less hazardous and especially based on unlimited fuel resource – sun.

There are also other economical advantages of renewable resources utilization, e.g. no influence of exchange rates changes and it is of great importance for the countries depending on fuel import.

It is concerning energy as well as environment, sustainable development of society, safety, recovery of local production, creation of new jobs and complete branches of industry.

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Thank you for your attention

