

# International Conference

## “2<sup>nd</sup>” South East Energy Dialog

# “RENEWABLE ENERGY SECTOR IN BULGARIA – NATIONAL POLICY, SITUATION AND PERSPECTIVE”

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- RES Legislation
- Existing RESe technologies in Bulgaria
- Fid-in tariffs and PPA
- Unutilized RES
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## RES Legislation

- **Energy Law - Chapter 11**

**“Promotion of Power Generation From Renewable Energy Sources and Combined Generation”**

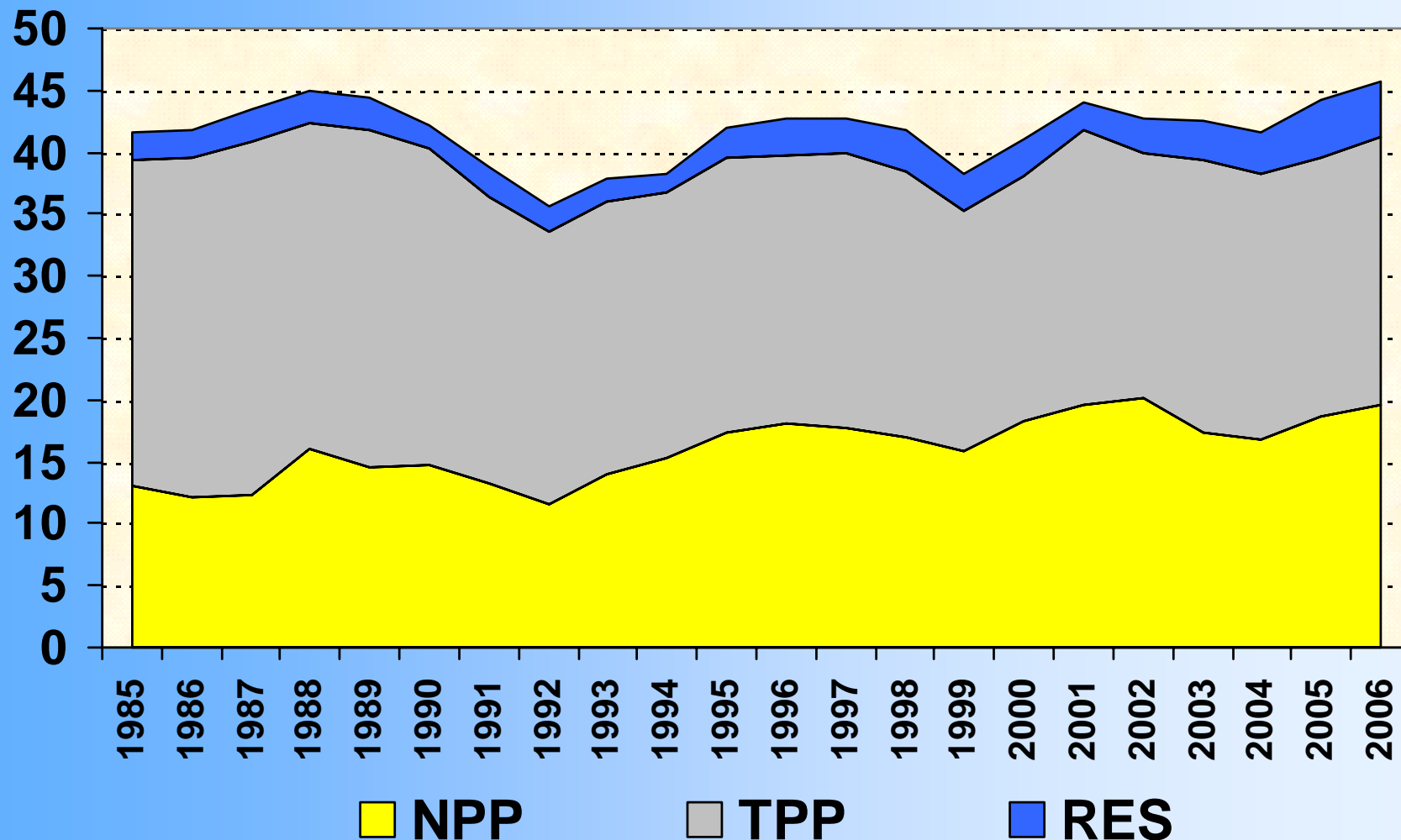
- **Law for Encouraging of Renewable Energy, Alternative Energy Sources and Biofuels**

## Existing RESe technologies in Bulgaria

№	Resource type	Energy technology	Feed-in tariff	Application
1.	Solar energy	Photovoltaic transformation	Yes	Yes
2.	Wind energy	Wind generators	Yes	Yes
3.	Water kinetic energy	Water turbines	Yes	Up to 10 MW
4.	<b>Biomass</b>			
4.1	Wood mass		Yes	Not yet
4.2	Solid agricultural waste		Yes	Not yet

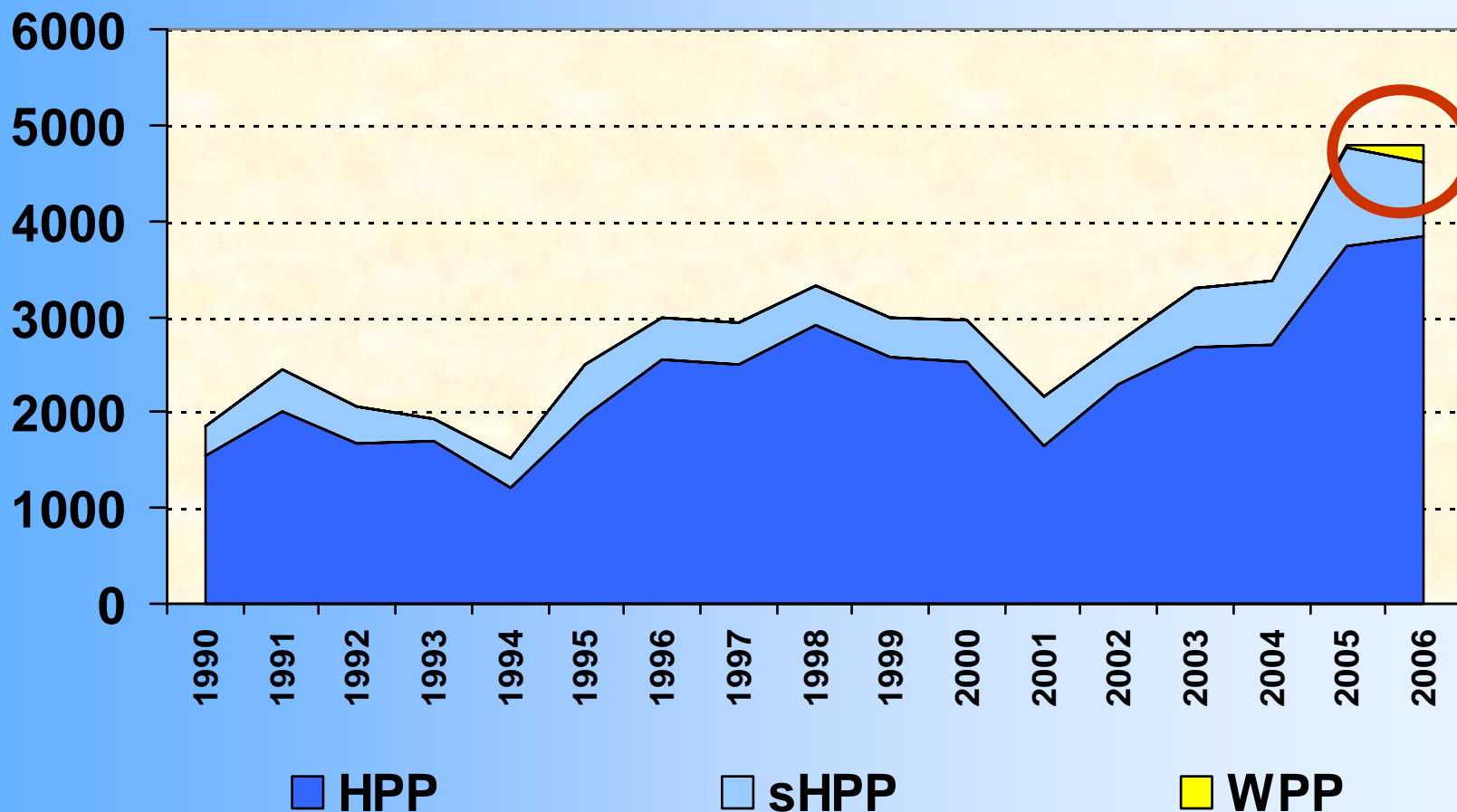
## Electricity production

### Electricity production, TWh

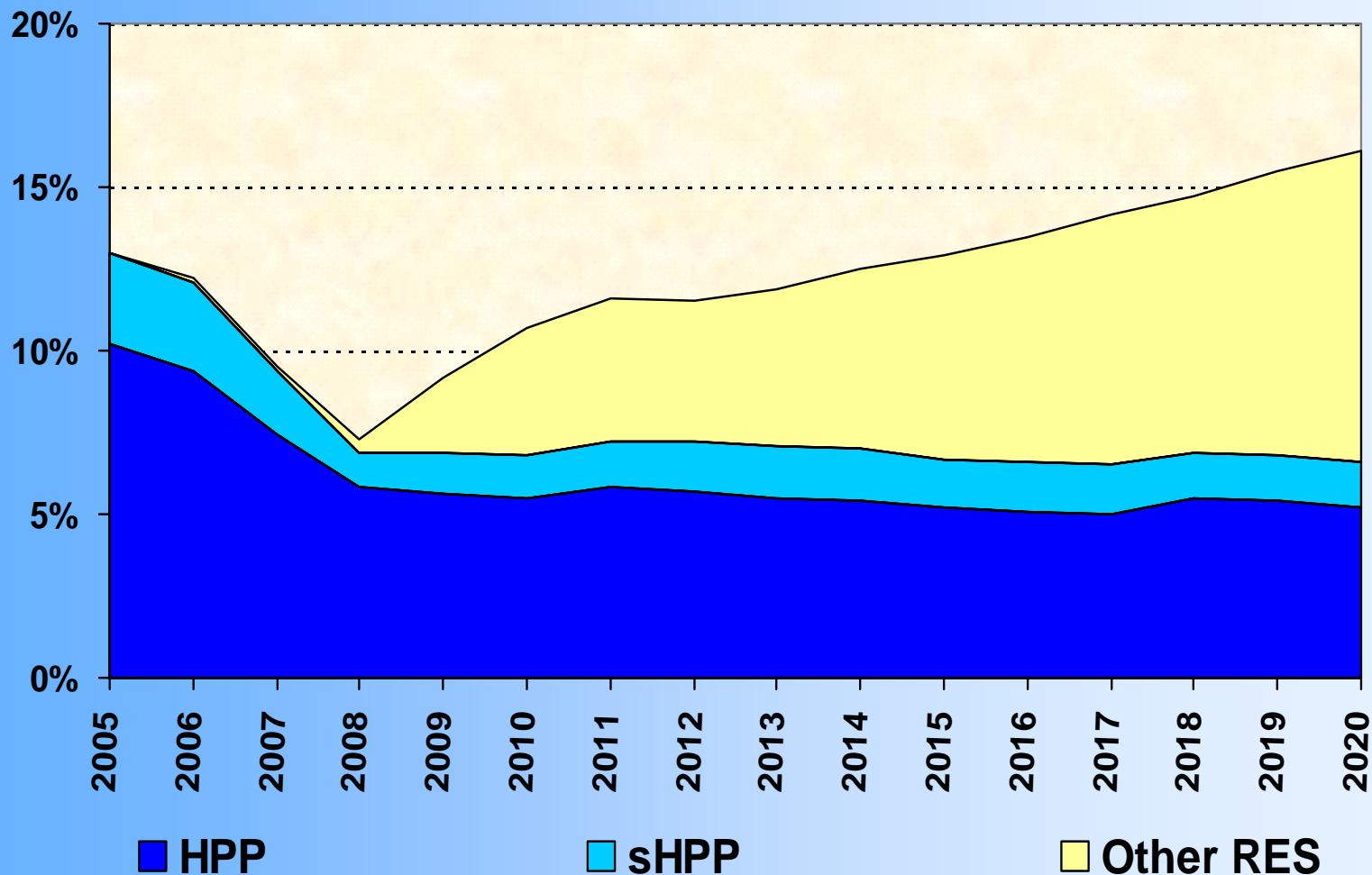


RESe production

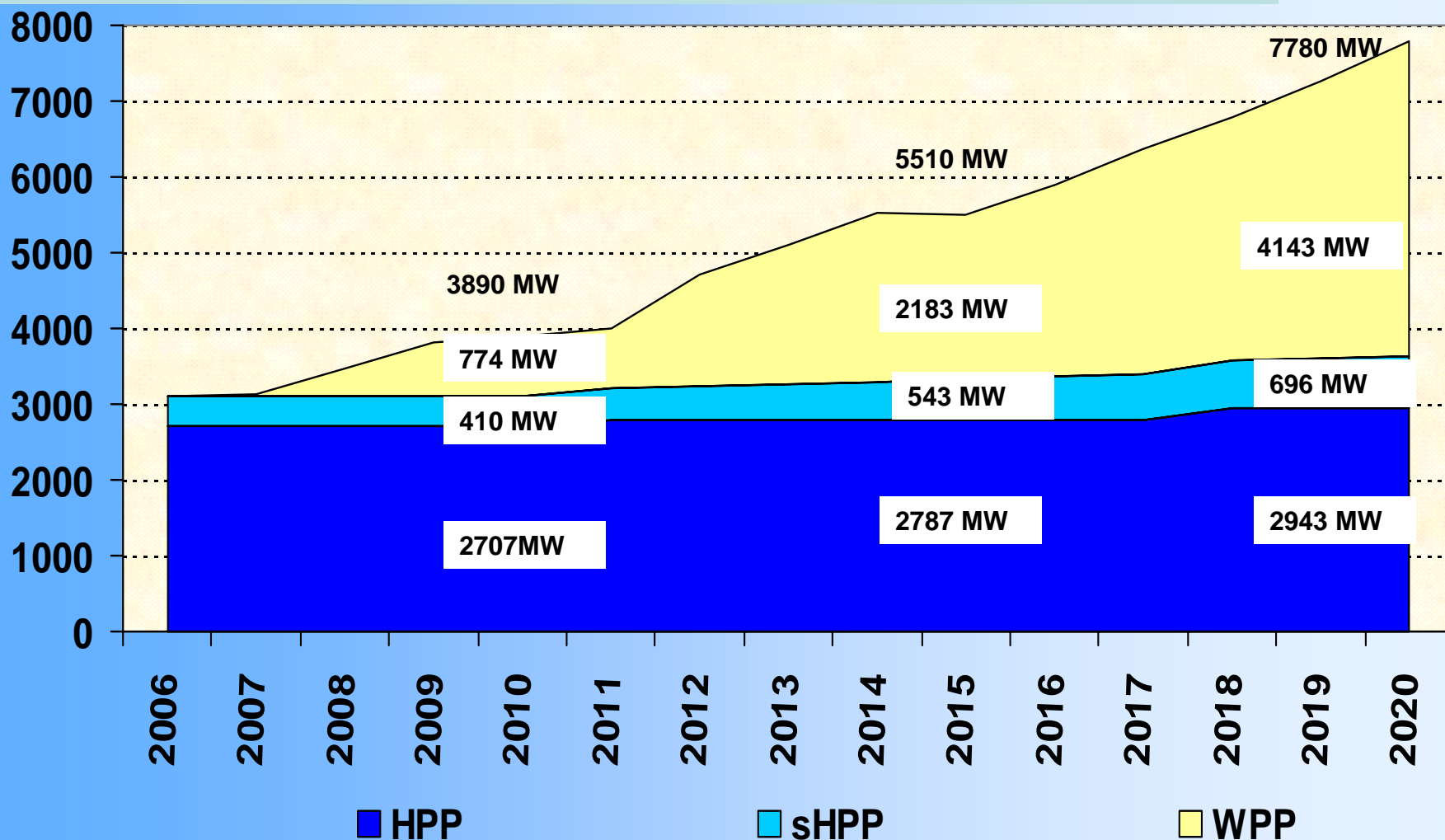
# RES Electricity Production, GWh



## RESe prognoses. % from final electricity consumption

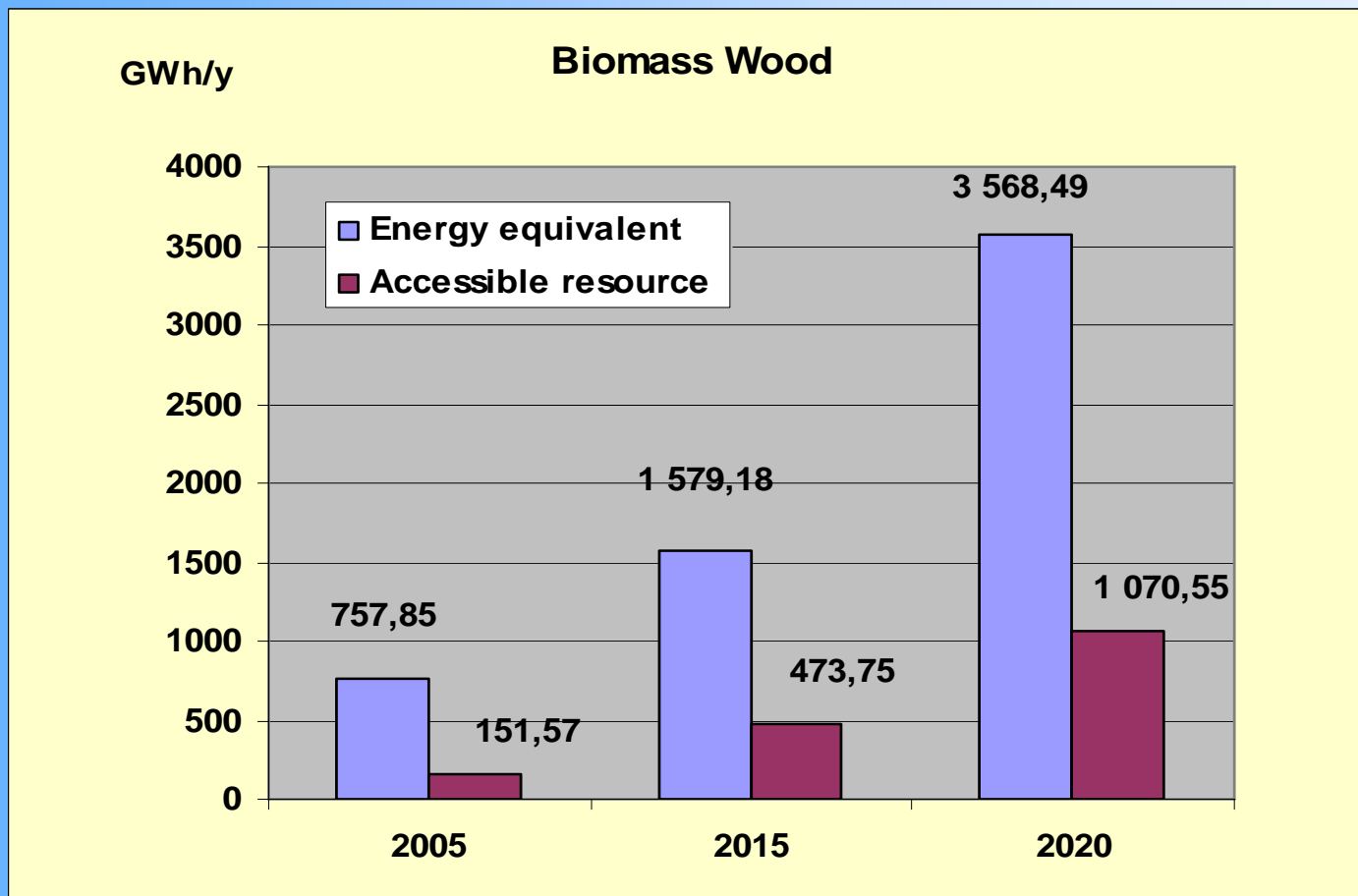


## RESe prognoses. Install capacities



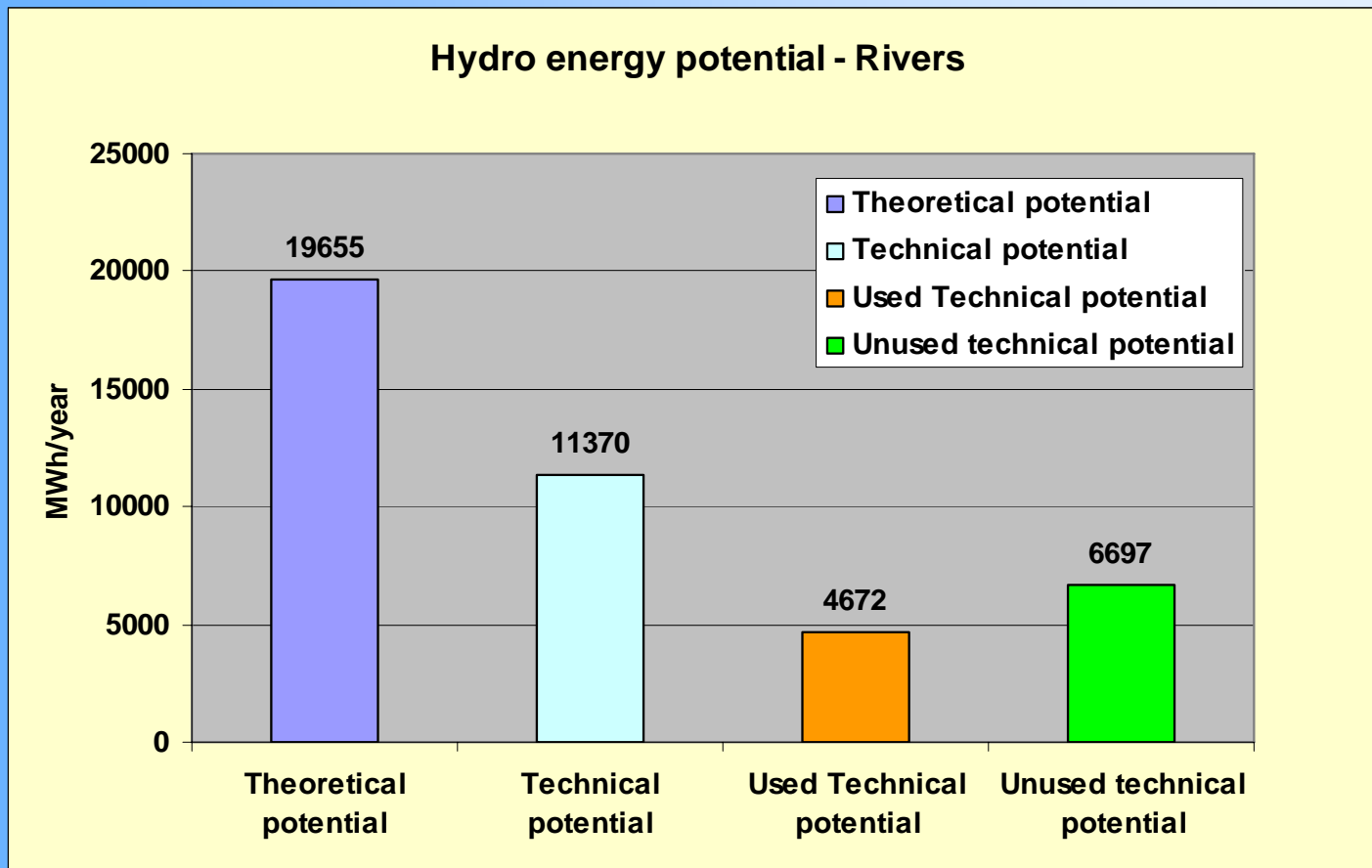


## RES Potential (1)



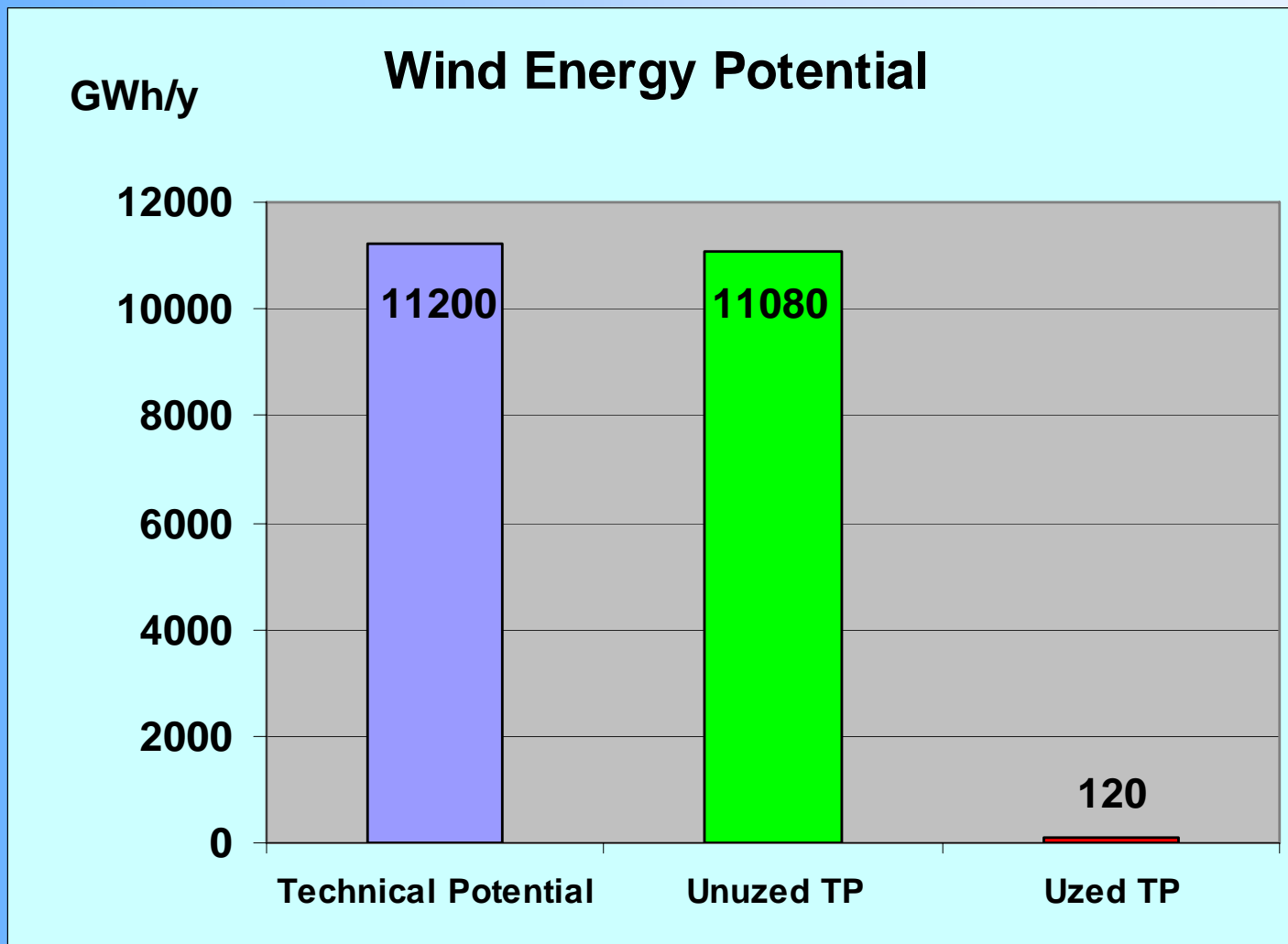
Source – ESD-Bulgaria 2007

## RES Potential (2)



Source – ESD-Bulgaria 2007

## Fid-in tariffs



## RES potential (3)

Averaged value for the three zones is taken and for inclination of 30 degrees and it is equal to **1,631 MWh/m<sup>2</sup>/year.**

Average annual efficiency factor of the installation – 0.08;

Available areas – 0,03 from the territory of the country

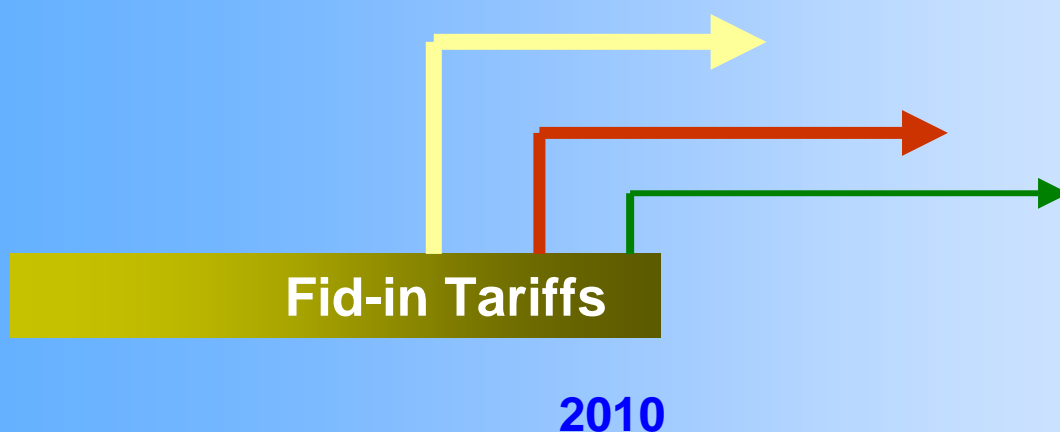
**Technical potential - 159 TWh/year.**

## Fid-in tariffs

### **Feed-in Tariffs – RES electricity**

- **Determinate from SEWRC**
- **Different prices for different technologies**
- **Minimum 70% of the average electricity price for household consumer during the previous year**

PPA



PPA  
Maximum  
duration 12  
years

## Marginal cost (1)

The marginal cost are estimated with software

***OMFAERES***

(Optimizational Model for Assessment of Preferential price of Renewable Electricity )

developed by ESD – Bulgaria Ltd.

## Marginal cost (2)

The solves three type of tasks.

1. “**Straight**” task – on the base of any set indicative target for RES electricity production (for 9 technologies) achieved in any period of time, to define preferential price for this produced electricity for each one of the technologies.

2. “**Reverse**” task – on the base of any preferential price for RES electricity (for 9 technologies) to define the level of electricity production that can be reached, i.e.:

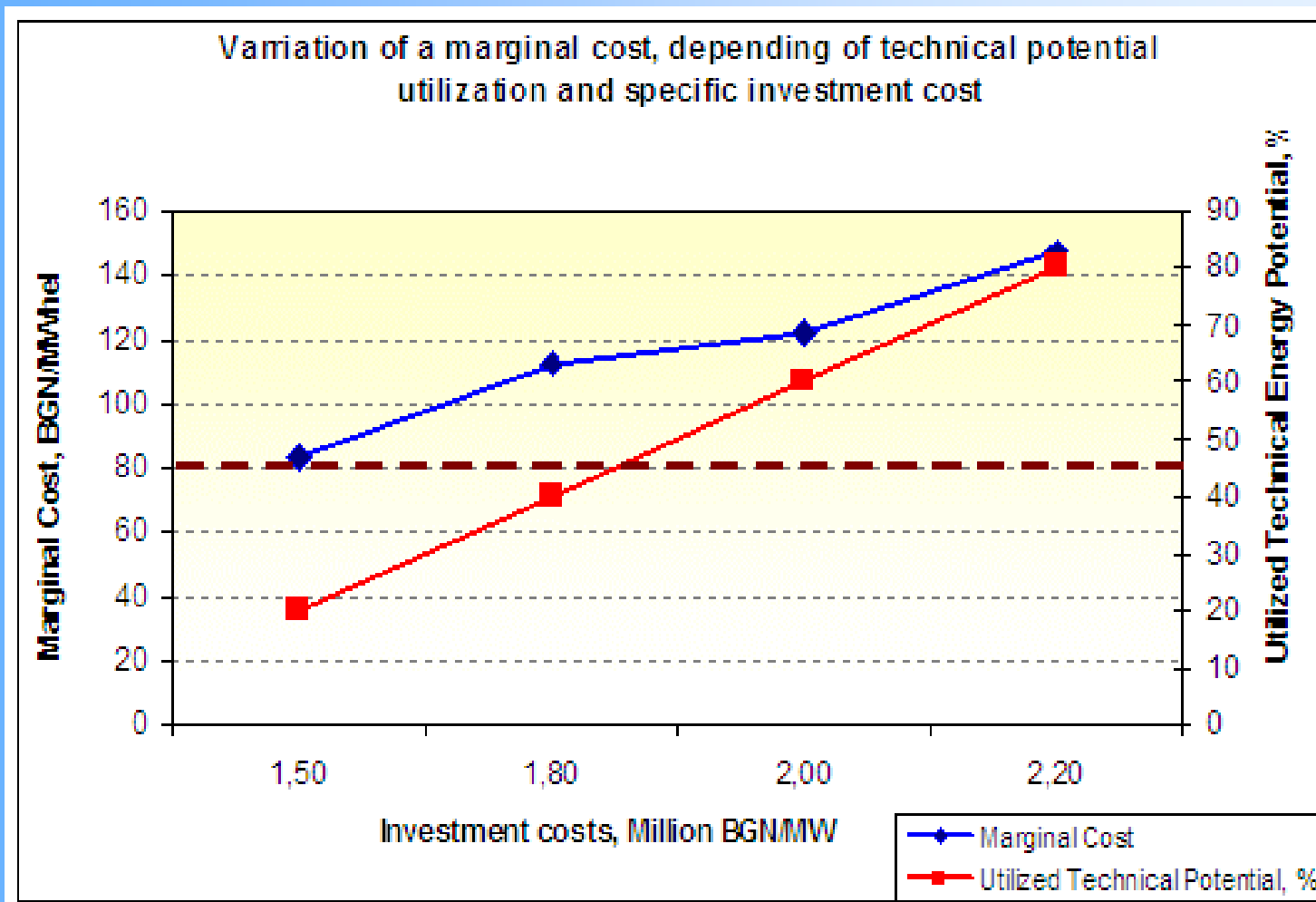
PP (Preferential Price) > ME (Marginal Expenditures)

3. “**Optimization**” task – to define optimal combination of preferential prices (for 9 technologies) which will be enough to reach the indicative target with minimum expenditures, i.e.:

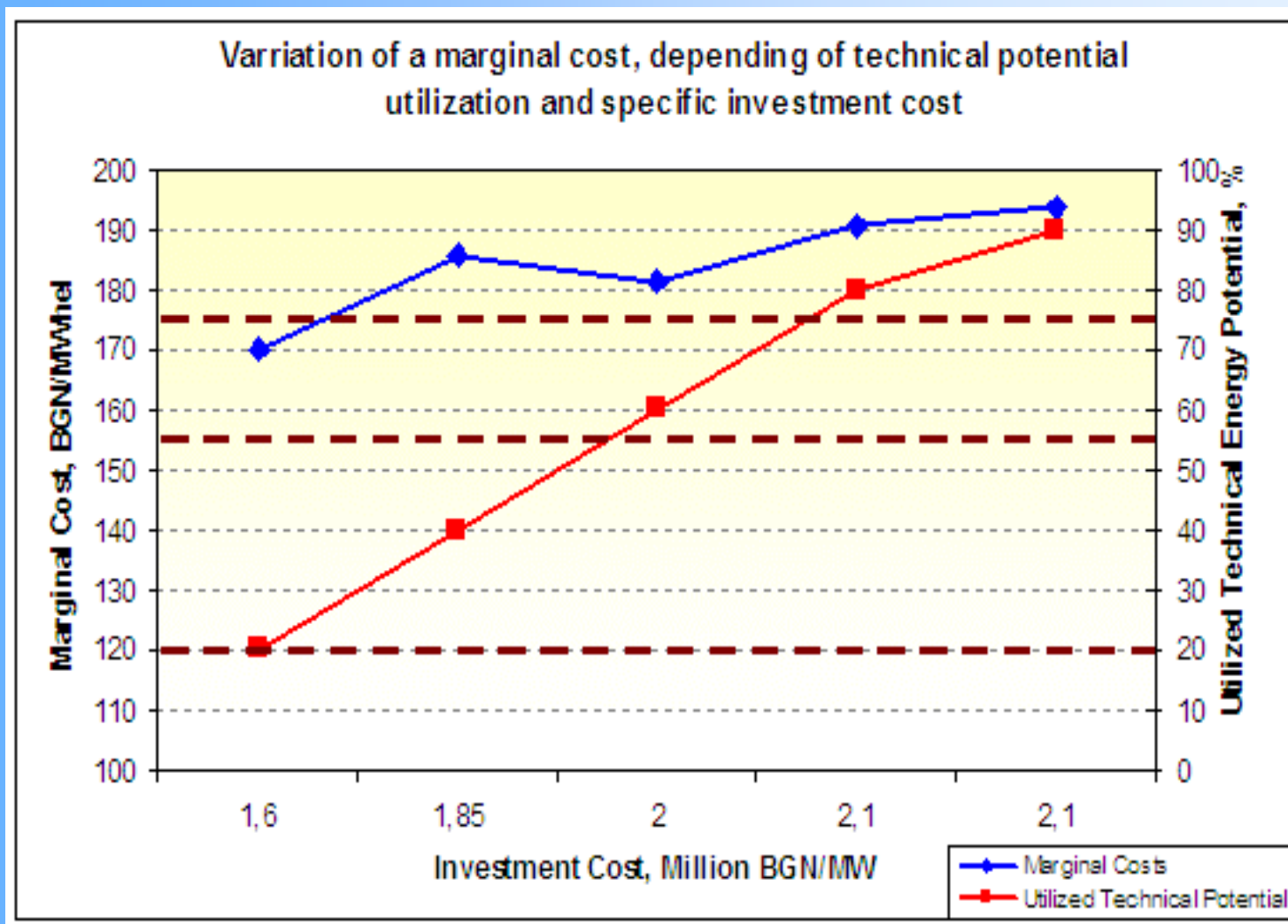
$(IT_{wind} + IT_{smal\ hydro} + IT_{large\ hydro} + IT_{biogas} + IT_{wood} + IT_{straw} + IT_{municipal} + IT_{landfill\ gas} + IT_{waste\ water\ gas}) > MRP,$



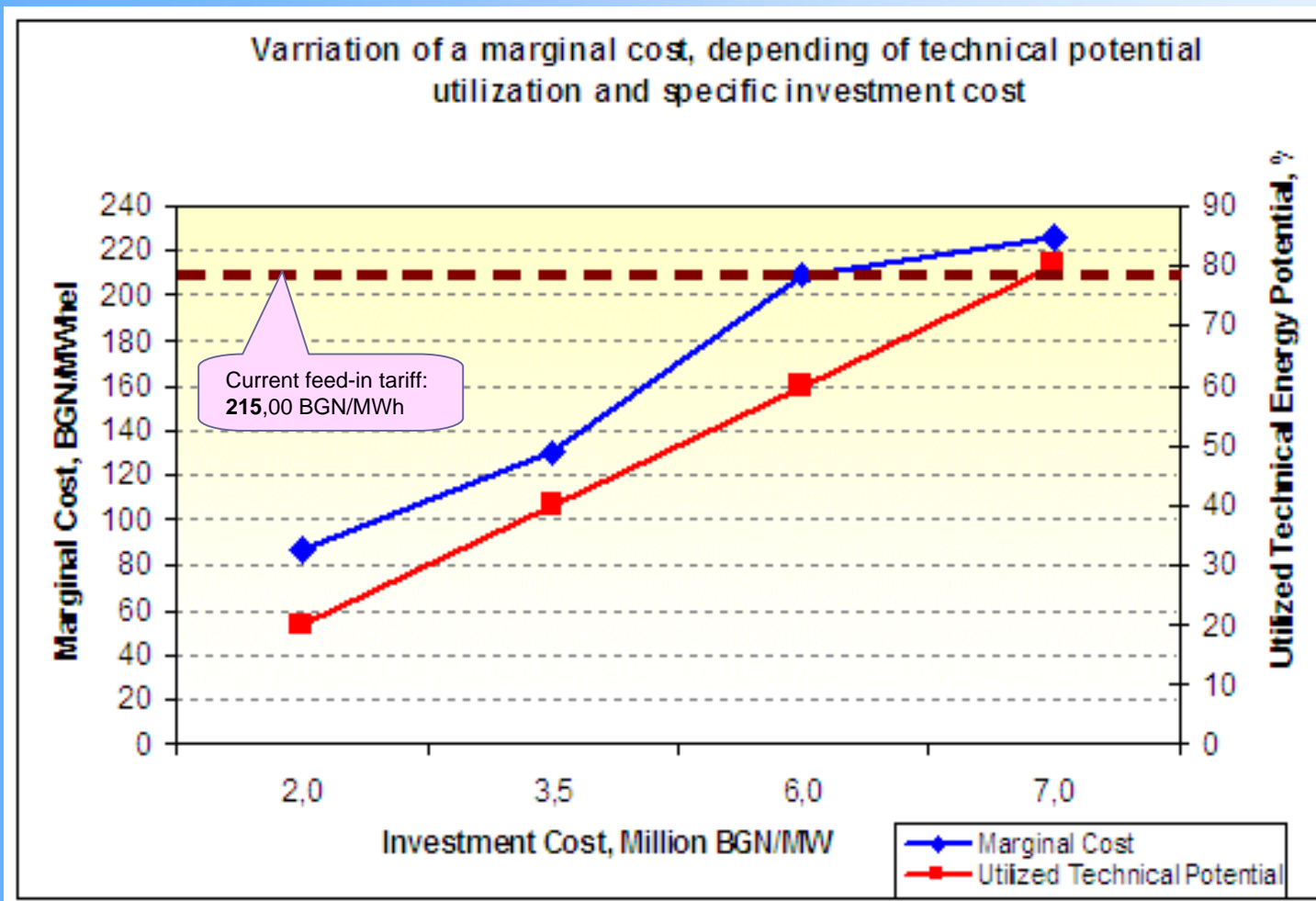
## Marginal cost of electricity from sHPP



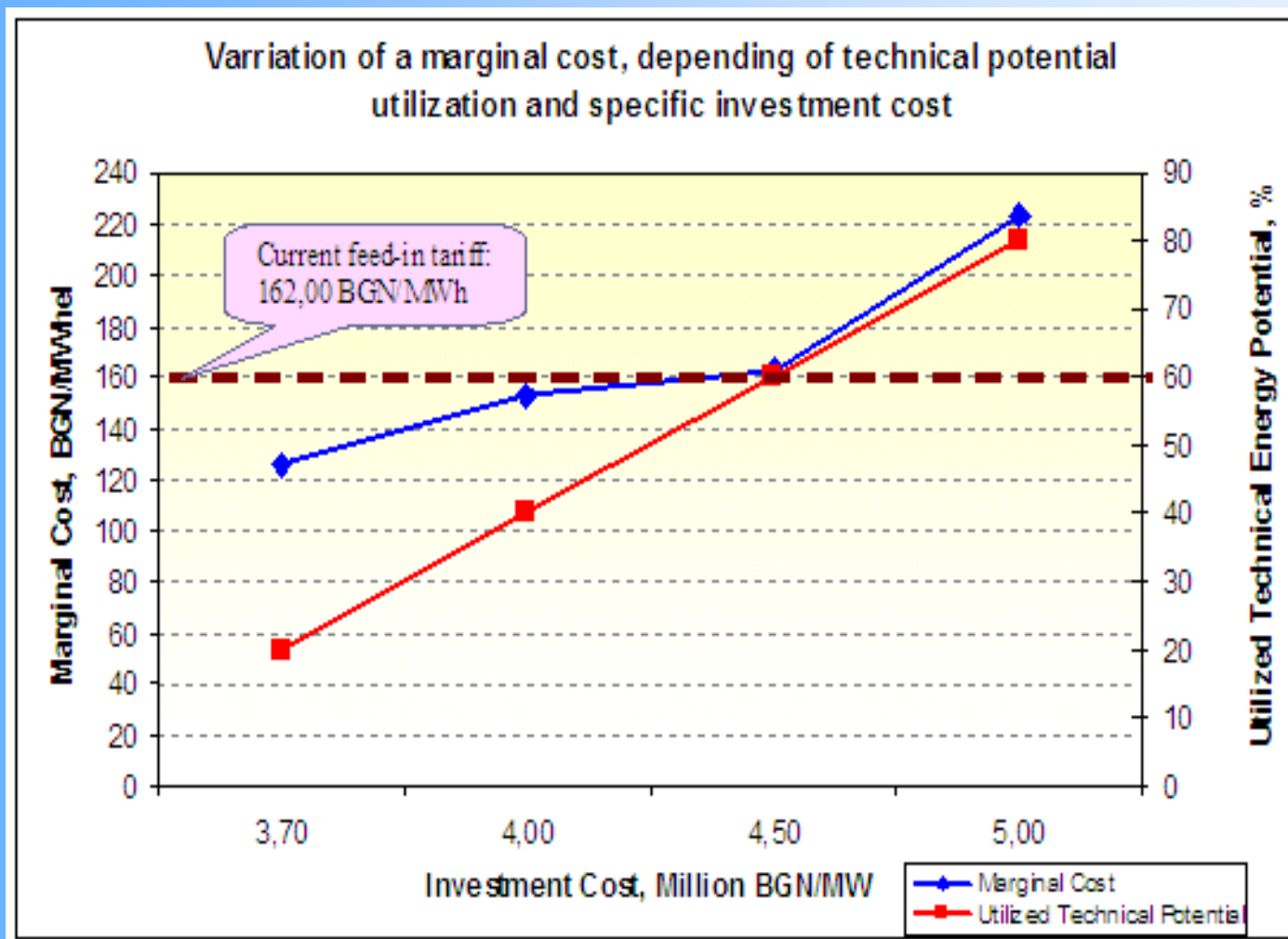
# Marginal cost of electricity from Wind PP



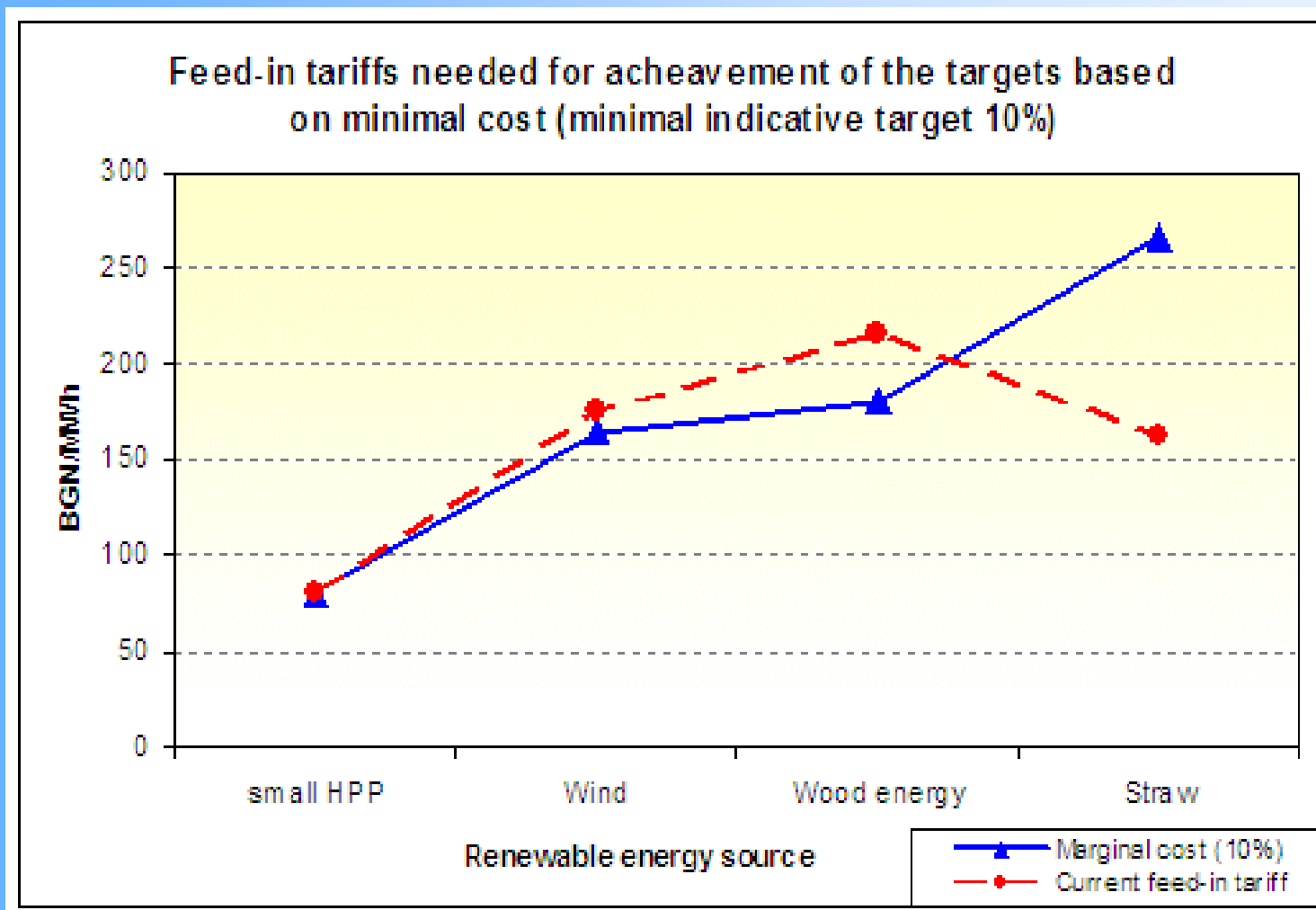
## Marginal cost of electricity from biomass - Wood



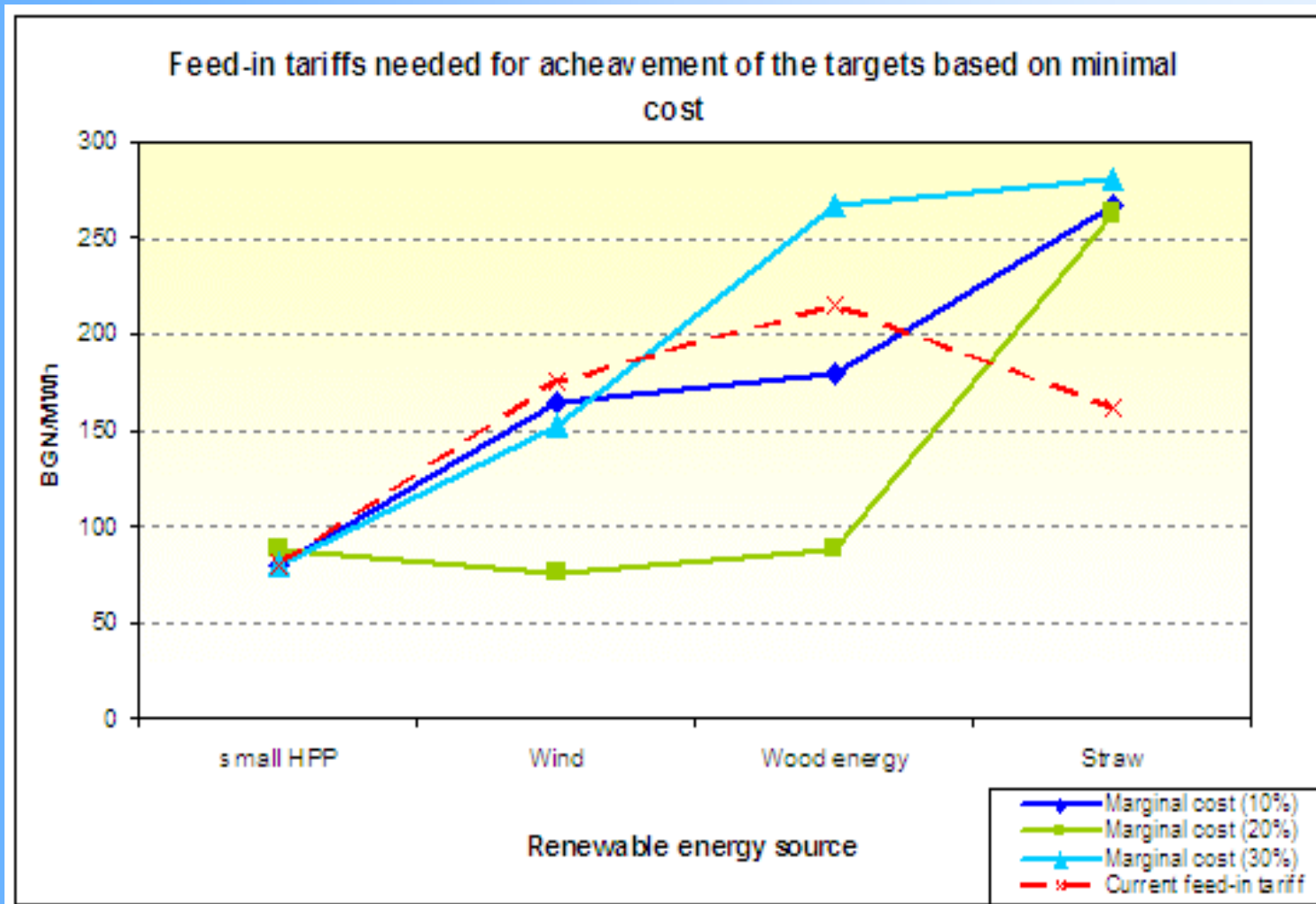
## Marginal cost of electricity from biomass (straw)



## Marginal cost – optimization task (1)



## Marginal cost – optimization task (2)



## Conclusions:

- **The current policy stimulate development of RES (e) technologies.**
- **The interest of investors is high**
- **With existing Fid-in tariffs Bulgaria will achive the target - 16% RES(e) - 2020**

## References:

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- **Balin Balinov** “From a non-renewable resources economy to an economy of the renewable resources”, TU Sofia, 2005
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**[www.esdb.bg](http://www.esdb.bg)**