

CROATIA

Risk Assessment Exercise

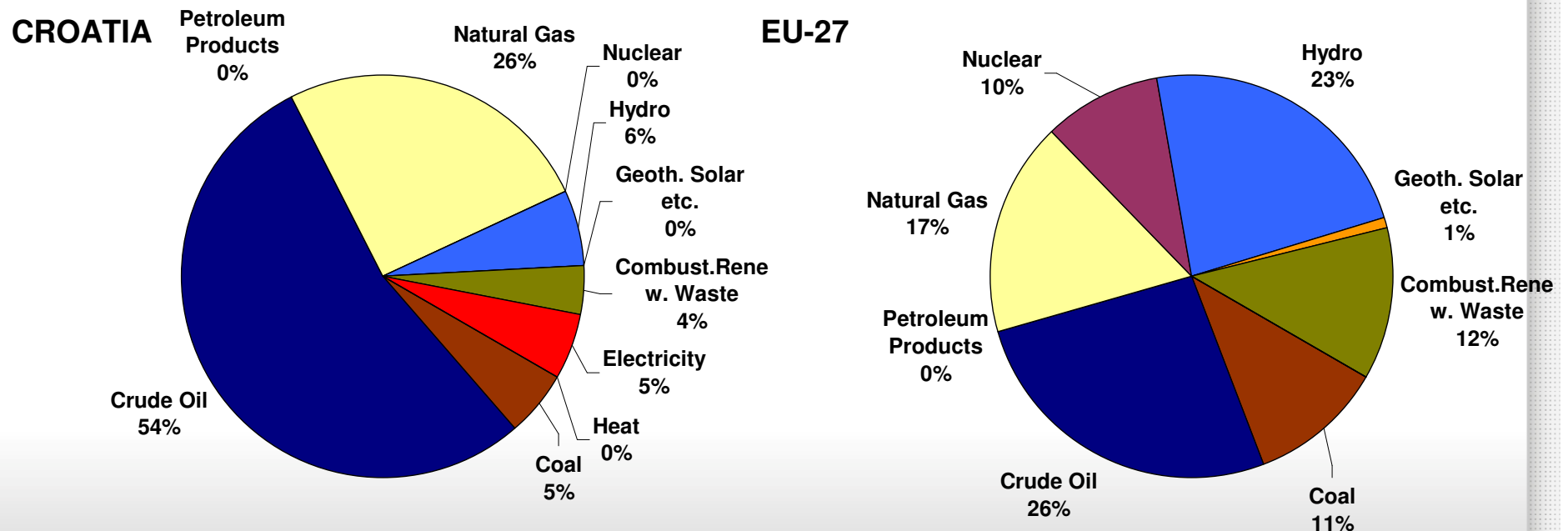
JRC Institute for Energy
Enlargement and Integration Workshop, 5-7 October 2011
Hotel Valamar Lacroma, Dubrovnik, Croatia

Robert Bošnjak, Energy Institute Hrvoje Požar

BASIC INDICATORS

- TOTAL PRIMARY ENERGY SUPPLY

- o In TPES the structure of energy consumption is somewhat more unfavorable as compared to the EU-27. Crude oil has a 2 times higher share than in EU-27, while the consumption of natural gas is 50 percent higher than in the EU-27. The EU Member States make up for the lower share of crude oil with higher shares of hydro, coal, combust. renewables and waste and nuclear .

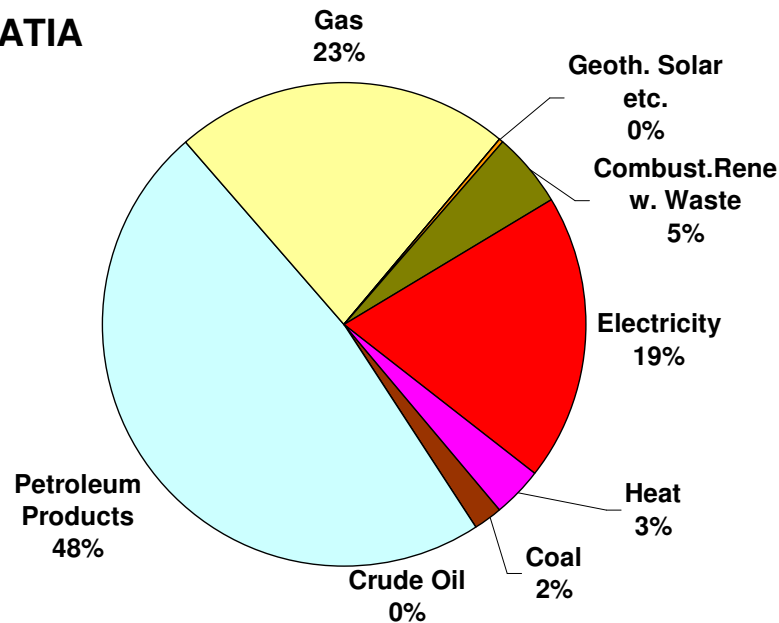


BASIC INDICATORS

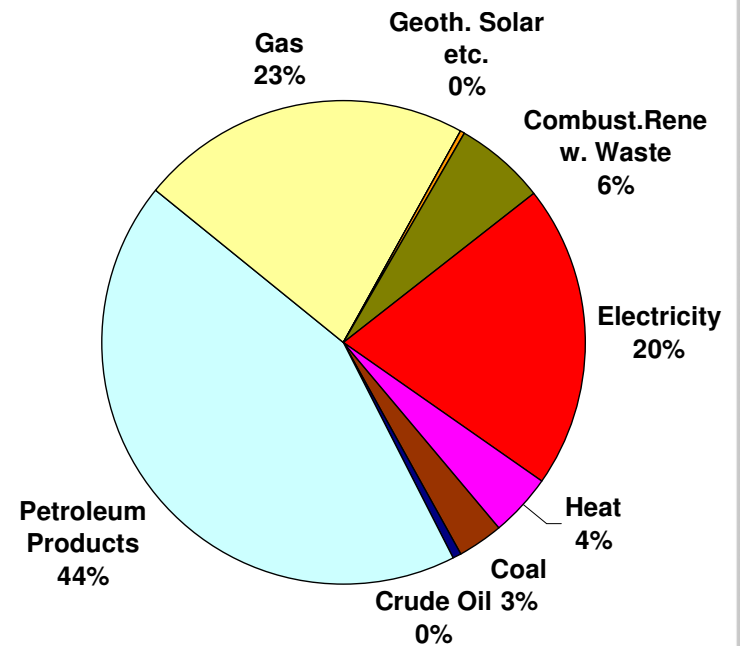
- TOTAL FINAL ENERGY CONSUMPTION

- o In TFEC energy shares are almost identical as to that of the EU-27

CROATIA



EU-27

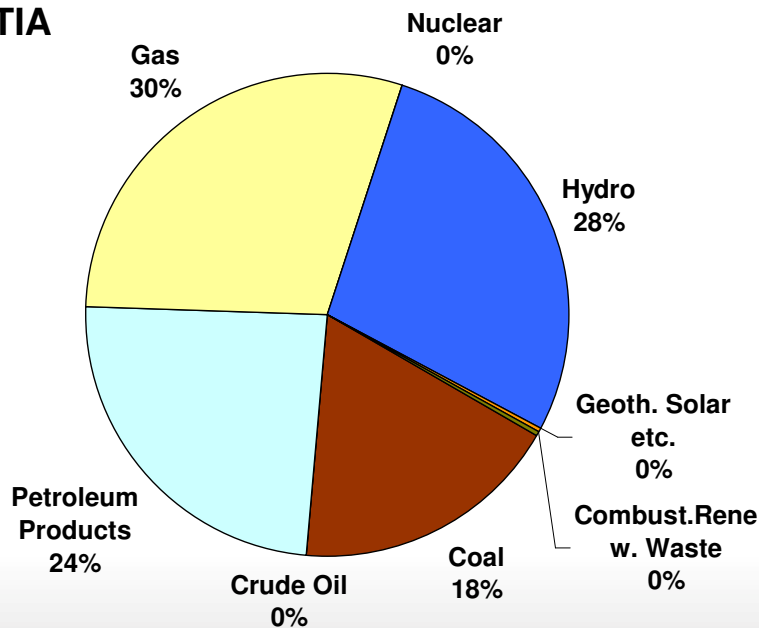


BASIC INDICATORS

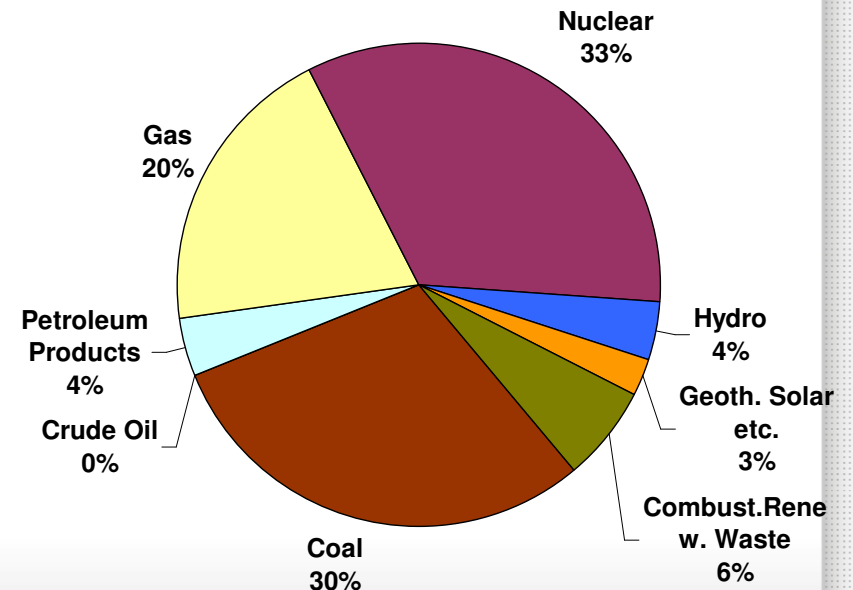
- ELECTRICITY PRODUCTION

- o In the production of electricity there is no dominant energy source. Share of petroleum product is high. An increase in the use of natural gas and coal can be expected in the future, and most probable in nuclear also, due to the need to reduce CO2 emissions.

CROATIA



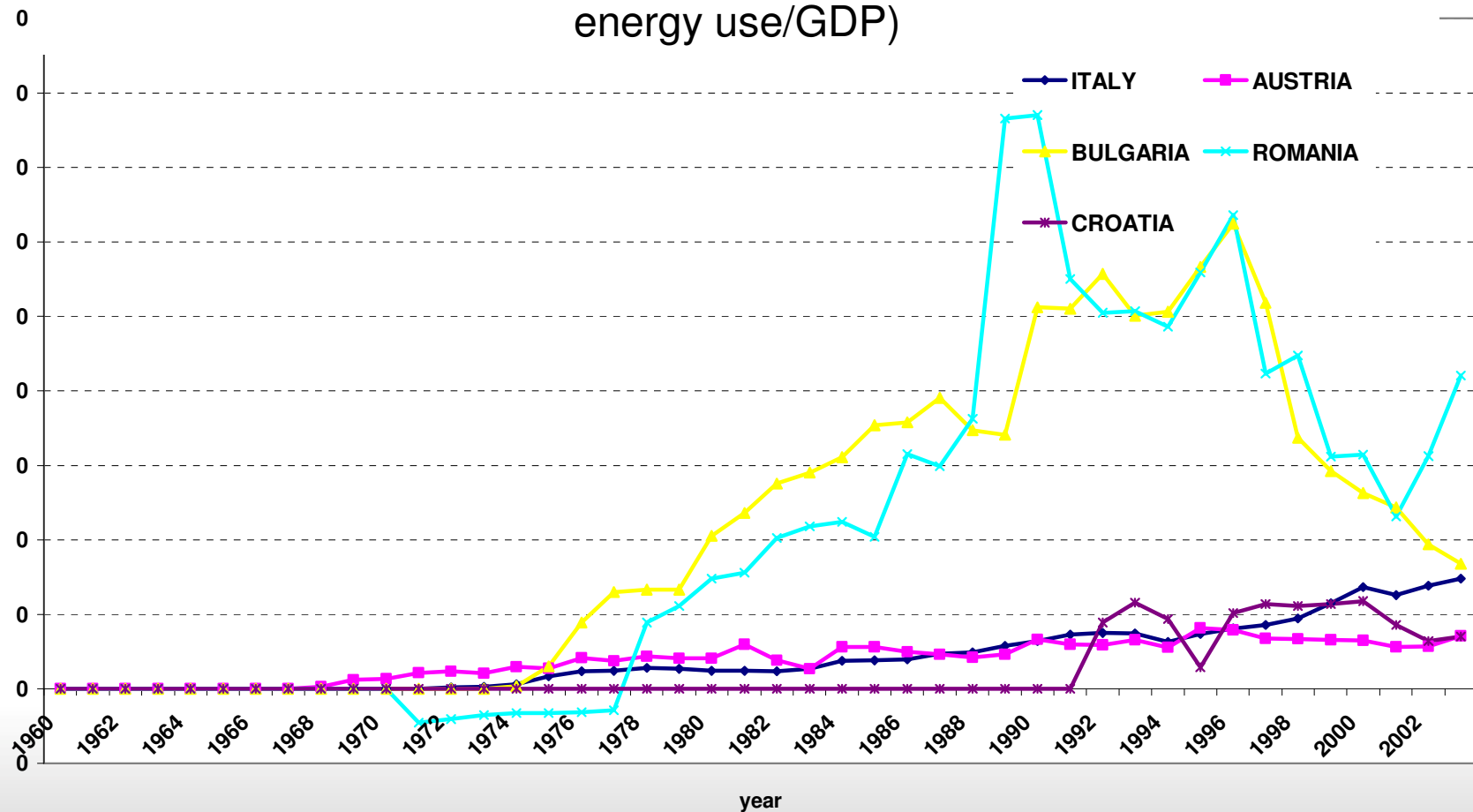
EU-27



SECURITY OF SUPPLY

Gas dependence of national economy

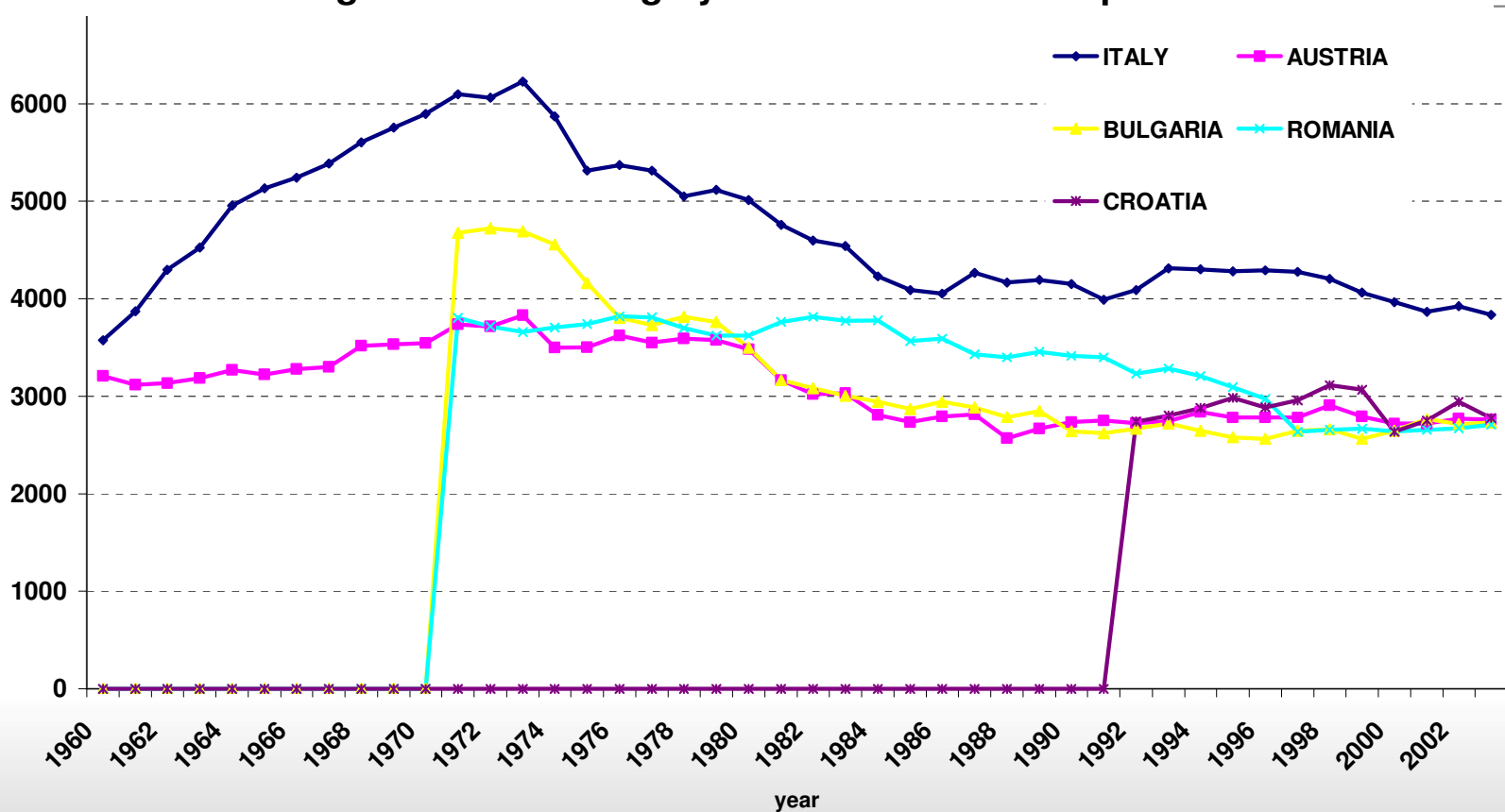
$$= (\text{gas imports}/\text{total gas use}) \times (\text{total gas use}/\text{total energy use}) \times (\text{total energy use}/\text{GDP})$$



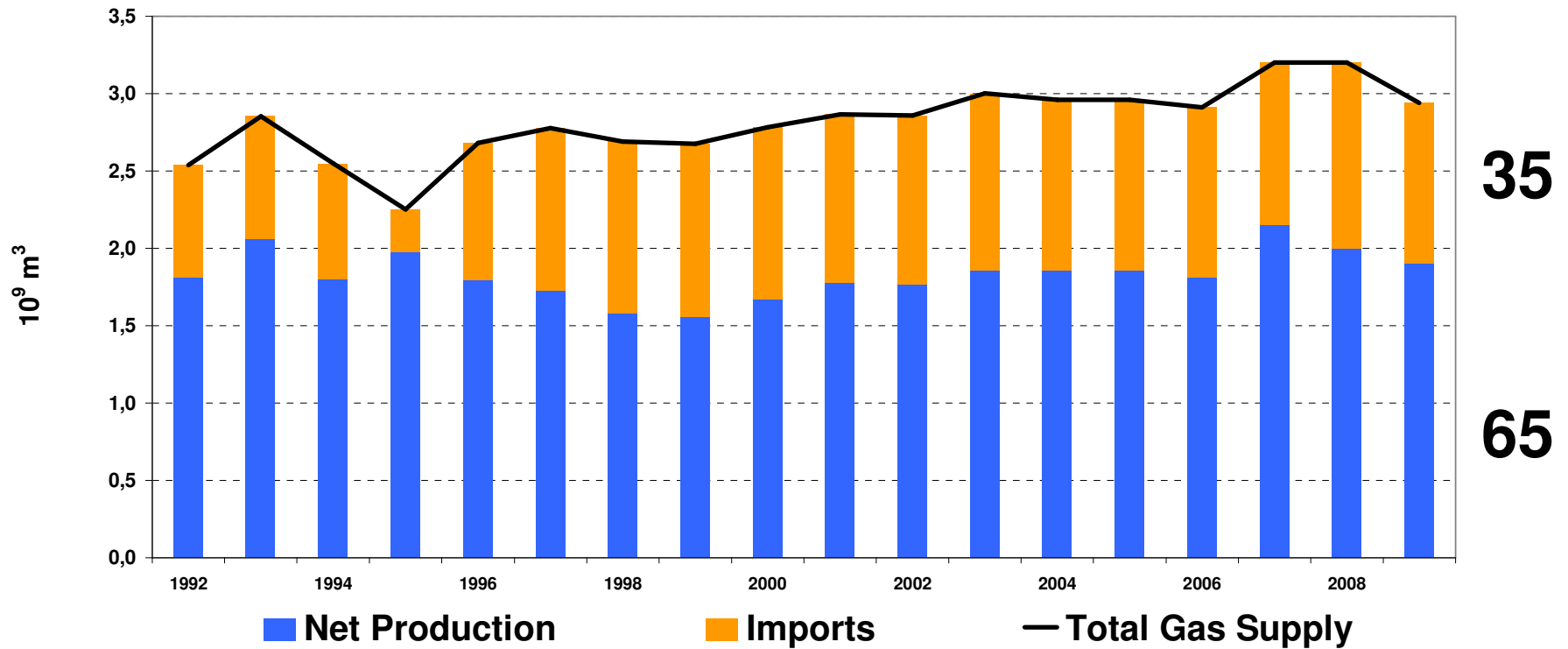
SECURITY OF SUPPLY

Herfindahl-Hirschman Index

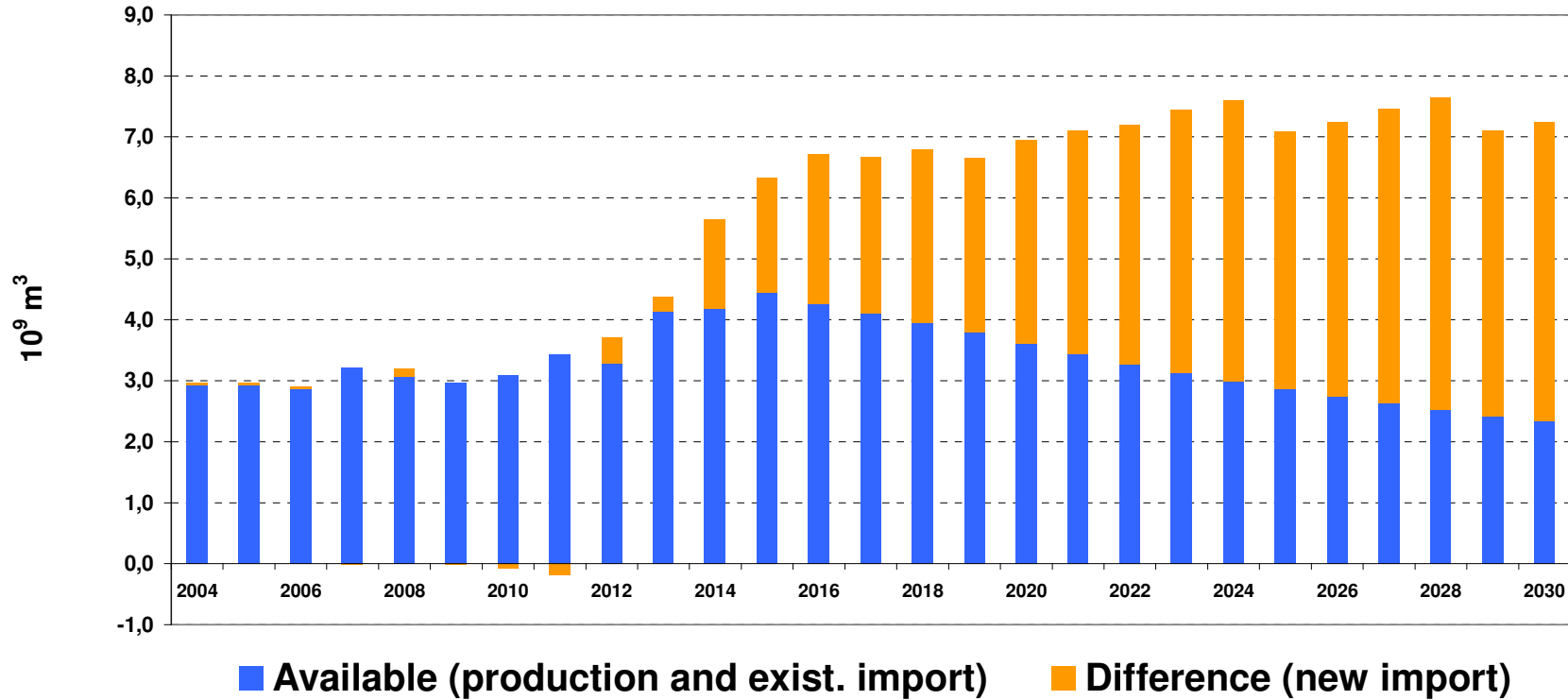
measure of market concentration, 1,000 to be a competitive marketplace; a result of 1,000-1,800 to be a moderately concentrated marketplace; and a result of 1,800 or greater to be a highly concentrated marketplace



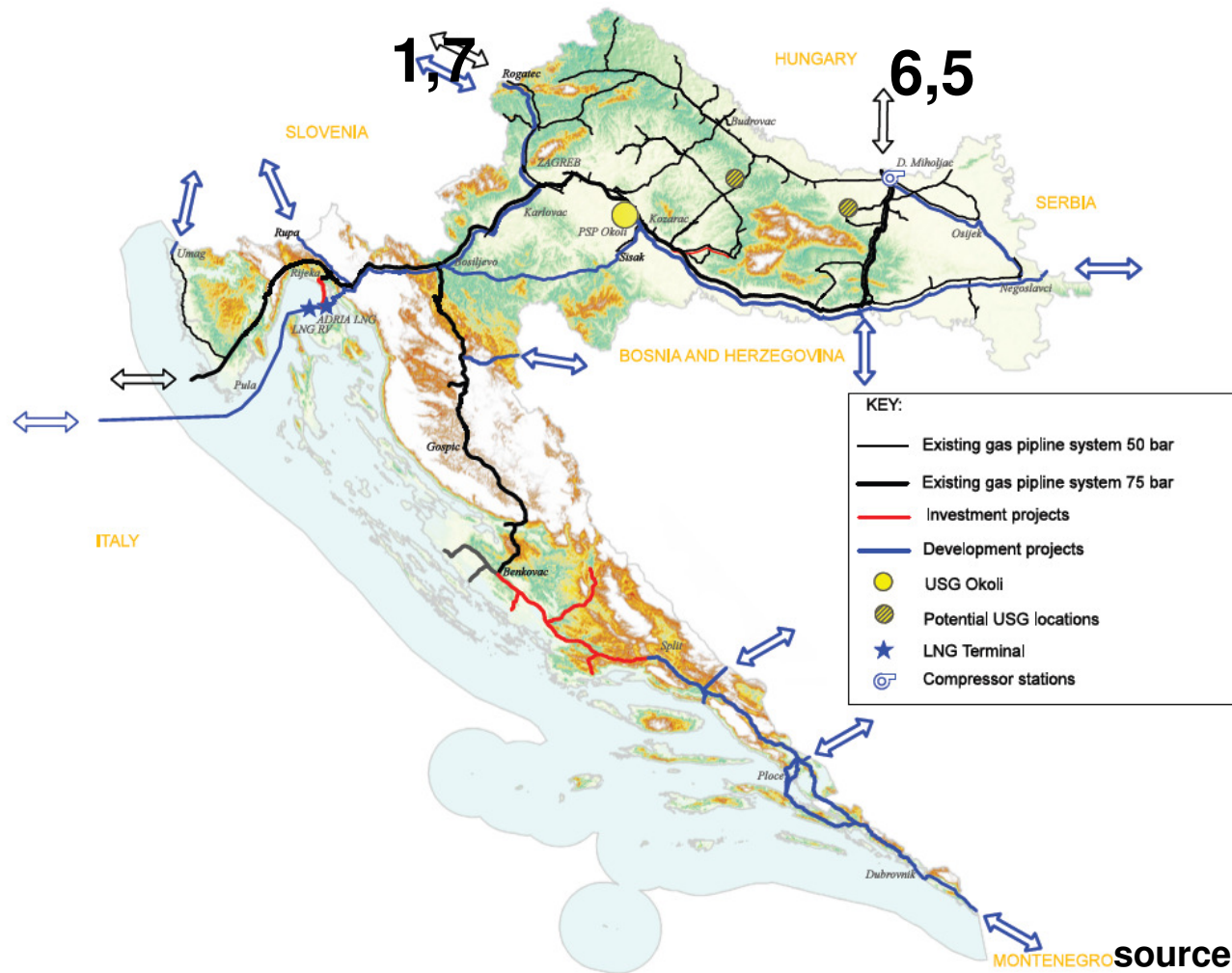
GAS CONSUMPTION



GAS CONS. FORECAST



GAS SYSTEM



SECURITY

$$N-1 \equiv \frac{EP_m + P_m + S_m + LNG_m - I_m}{D_{max}} \times 100$$

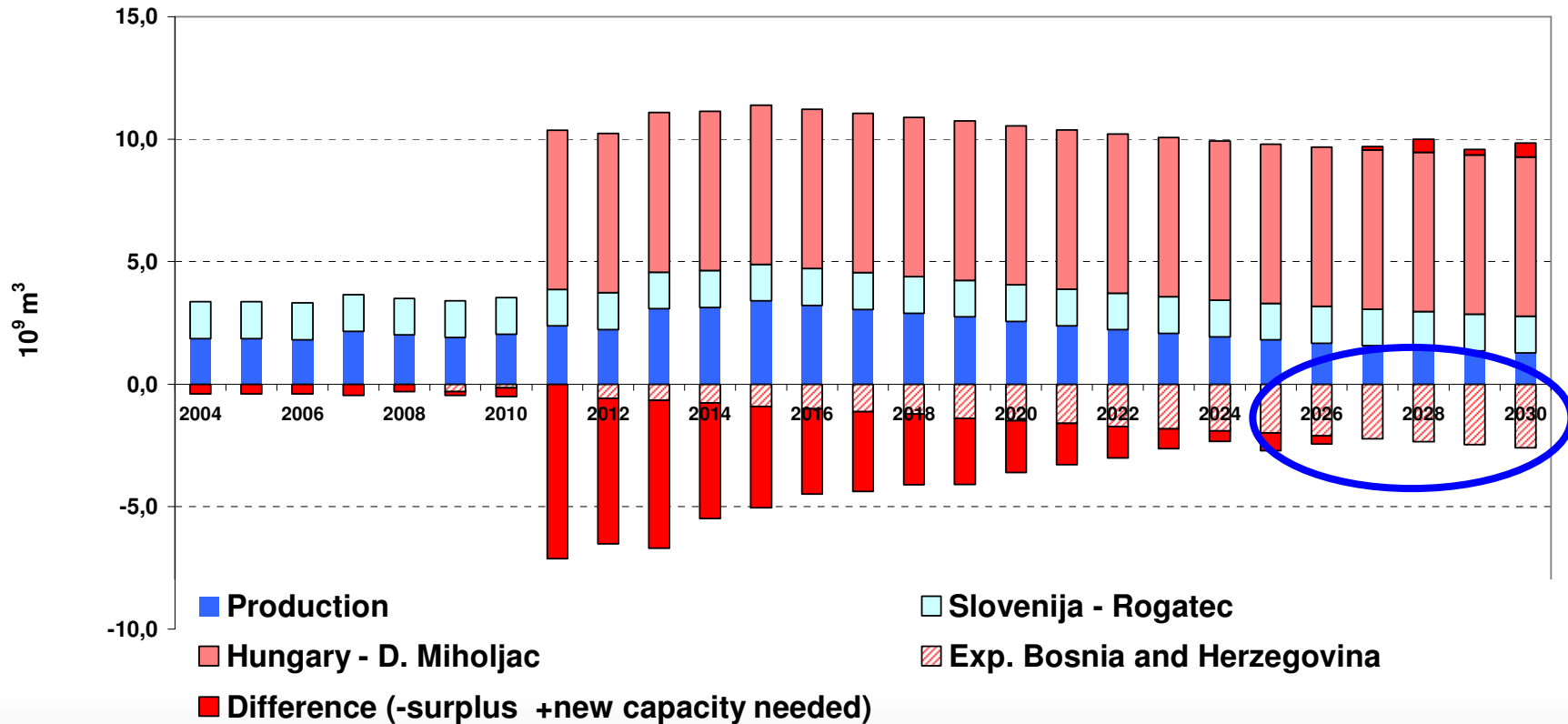
Entry points (EP_m)
 Production (P_m)
 Storage withdrawal (S_m)
 LNG terminal send-out (LNG_m)
 Single largest supply infrastructure (I_m)
 Total gas demand 1-in-20 (D_{max})

Regulation 994/2010 requirement:

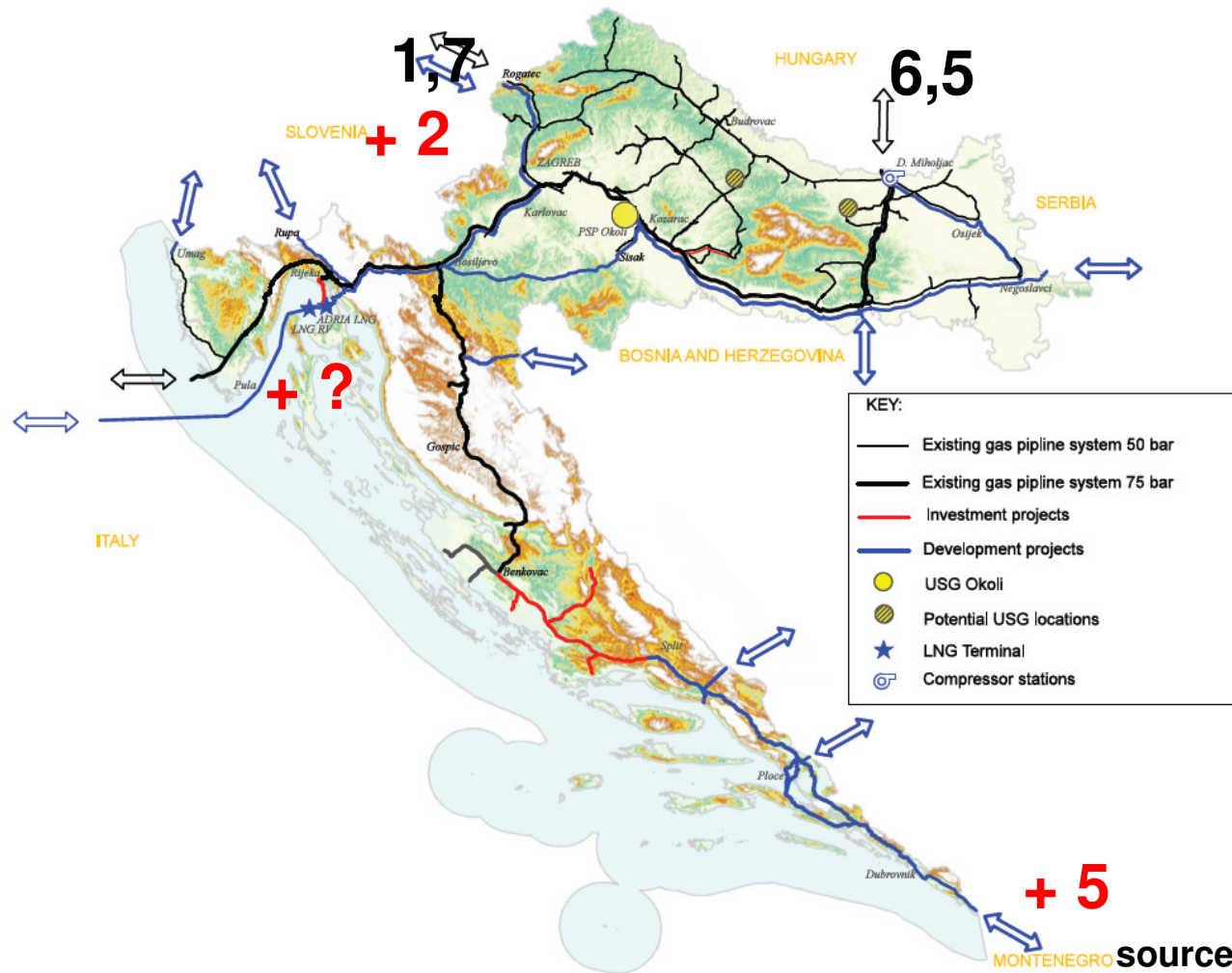
$$N-1 \geq 100\%$$

Croatia = 184%

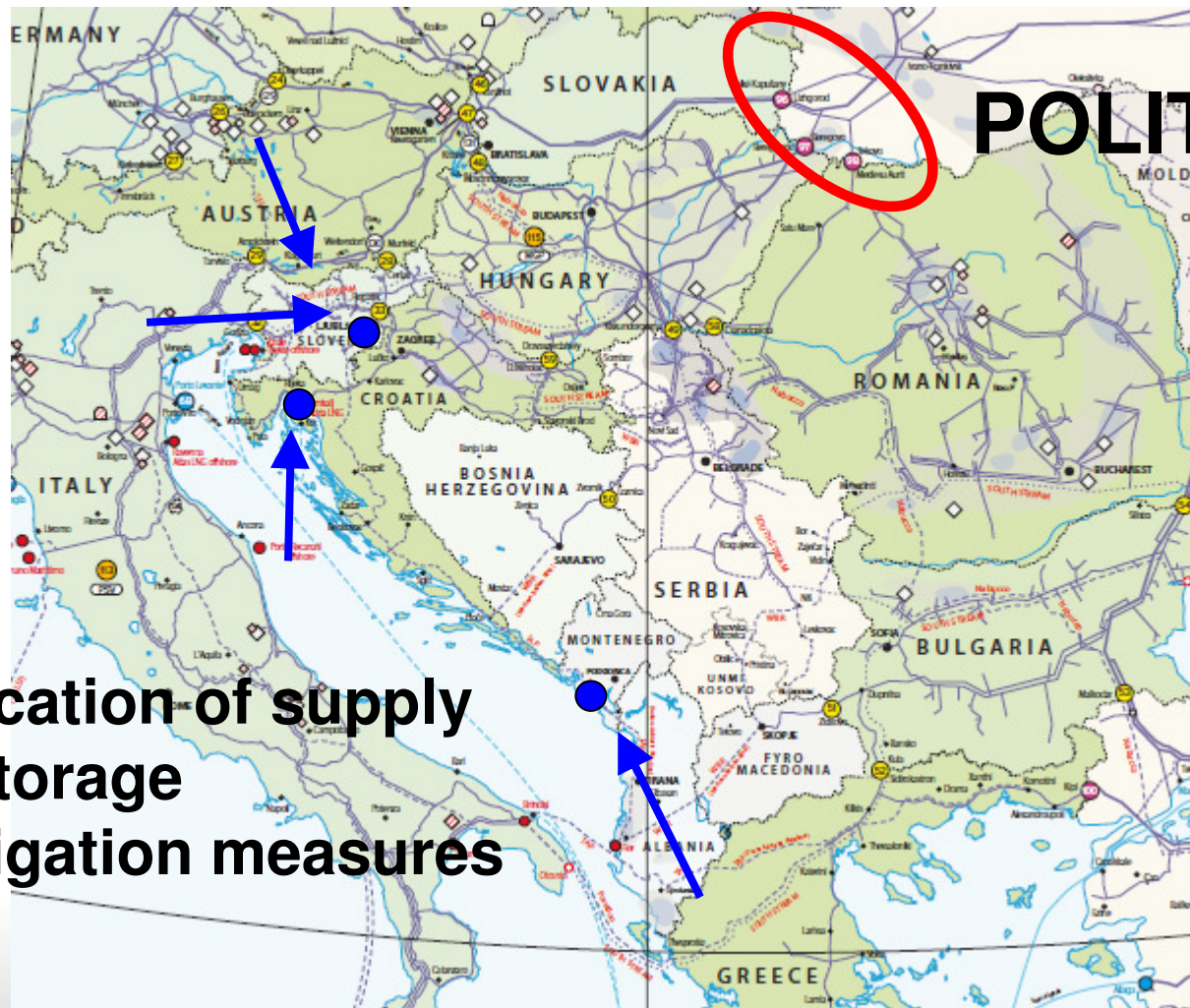
GAS SYSTEM



GAS SYSTEM



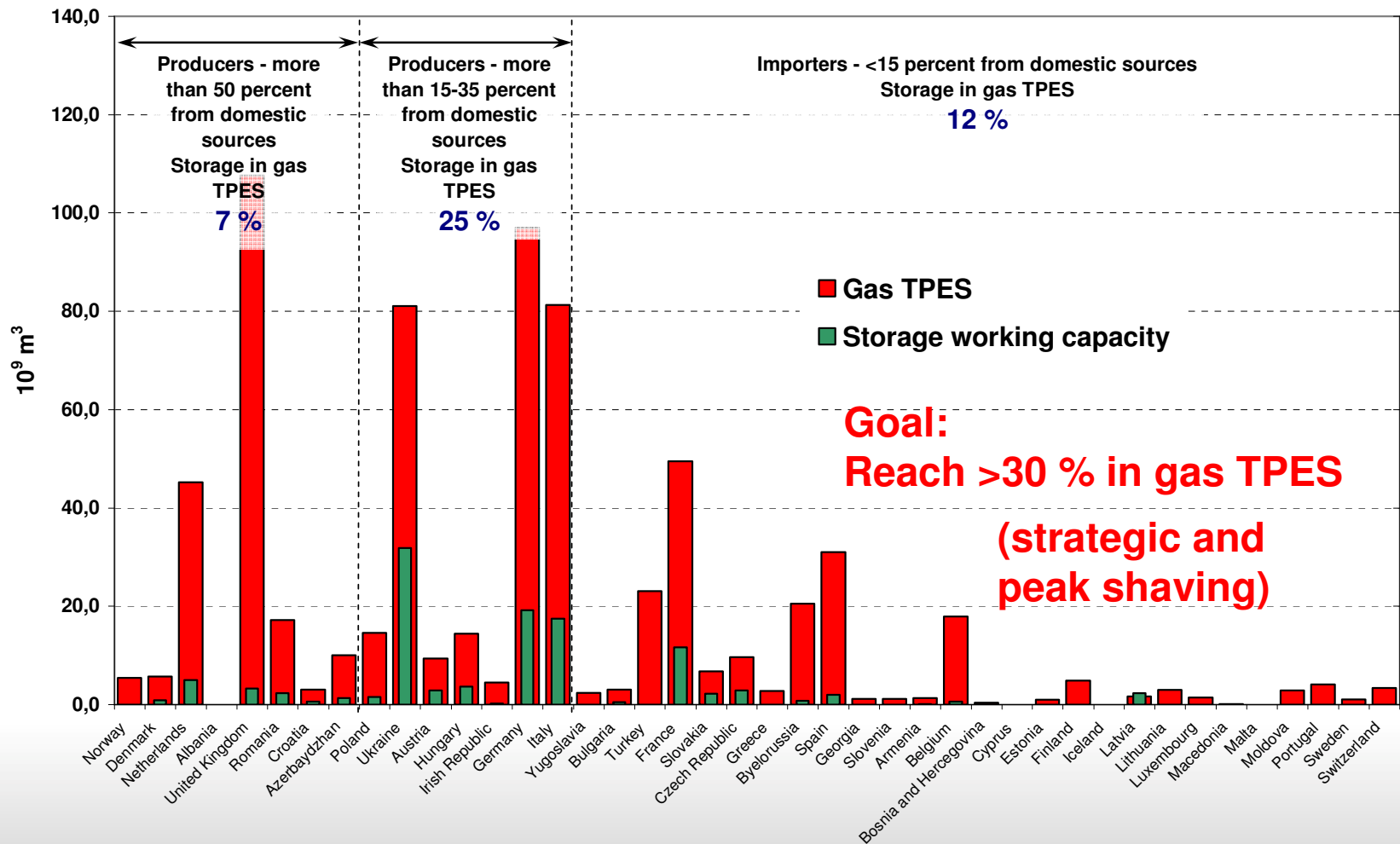
RISKS



POLITICAL

**Diversification of supply
Larger storage
Risk mitigation measures**

STORAGE



CRISIS MITIGATION

1. **Decrease supply of gas heat and power to 62.000 m³/h , fertilizers to 60.000 m³/h, refinery to 10.000 m³/h**
2. **Decrease supply of fertilizers to 15.000 m³/h, refinery to technical minimum and others on transport to available capacity**
3. **Decrease supply of all costumers with replacements fuels**
4. **Decrease supply of gas heat and power to 32.000 m³/h , fertilizers and others on transport to technical minimum**
5. **Decrease supply to costumer on distribution level with replacements fuels**
6. **Supply interruption to non-producing costumer on distribution level to technical minimum**
7. **Decrease supply to producing costumer on distribution level to technical minimum**
8. **Supply interruption to all costumer on transport (not heat and power), and to costumers on distribution level**
9. **Supply interruption to all costumers except protected**
10. **Supply interruption to all to of the minimal functioning level of gas system**