

# **“Investing in Energy in SE Europe”**

## **Regional Conference: Balkan – The New European Energy Sources,**

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**INSTITUTE OF ENERGY  
FOR SOUTH EAST EUROPE**





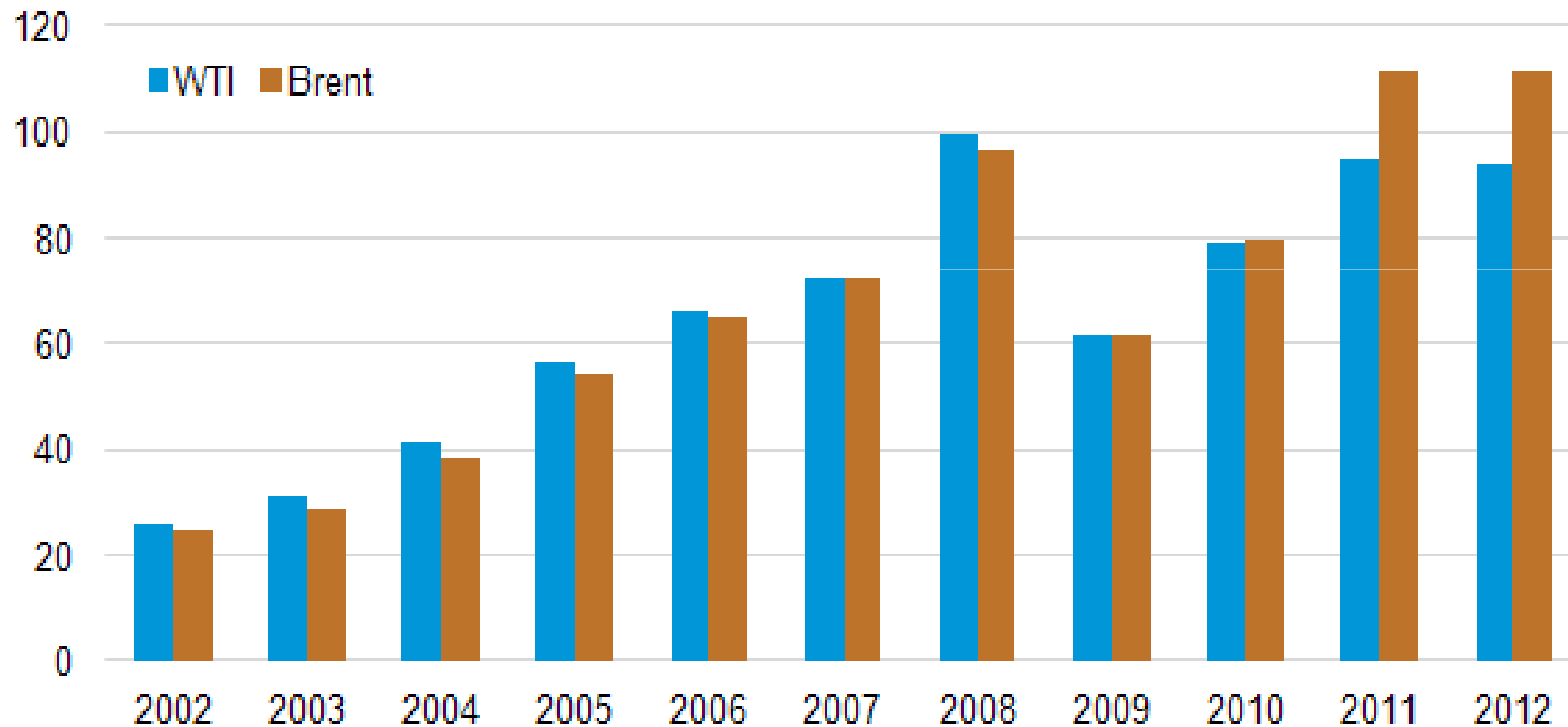
## Introductory Remarks – The Global Environment

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- We have been witnessing historic high oil prices over the last two years with the average price for Brent in 2012 at \$111.67 and \$111.26 in 2011
- High oil prices have direct impact on gas prices
- High oil prices, i.e. above \$100 per barrel are likely to be sustained over the next 12 months
- Natural gas continues to take slice of oil markets worldwide with LNG trade developing much faster than piped gas
- There is a strong tendency for the decoupling of gas prices from oil indexation with USA gas prices already following an independent trajectory
- Oil and gas production boom in USA and Canada will have implications on global oil and gas trade
- RES will continue to make strong inroads in European energy mix
- Nuclear electricity will expand in MENA countries and Asia

## Average 2012 crude oil prices remain near 2011 levels

Average annual spot price for Brent and WTI crude oil, 2002-2012  
dollars per barrel



Source: U.S. Energy Information Administration



# Brent Crude Oil Spot Prices (2010 – 2011 – 2012)



Source: Thomson Reuters.







## Global Oil Demand (2009 – 2013)

*(million barrels per day)*

|                              | 2009        | 2010        | 2011        | 2012        | 2013        |
|------------------------------|-------------|-------------|-------------|-------------|-------------|
| Africa                       | 3.3         | 3.4         | 3.3         | 3.4         | 3.5         |
| Americas                     | 29.5        | 30.1        | 30.3        | 30.3        | 30.4        |
| Asia/ Pacific                | 27.5        | 27.3        | 28.4        | 29.5        | 29.9        |
| Europe                       | 15.0        | 15.3        | 15.0        | 14.5        | 14.2        |
| FSU                          | 4.4         | 4.5         | 4.4         | 4.6         | 4.7         |
| Middle East                  | 7.4         | 7.8         | 7.4         | 7.6         | 7.8         |
| <b>World</b>                 | <b>86.8</b> | <b>88.3</b> | <b>88.8</b> | <b>89.8</b> | <b>90.7</b> |
| Annual Chg (%)               | 2.6         | 3.2         | 0.9         | 1.1         | 0.9         |
| Annual Chg (mb/d)            | 2.2         | 2.7         | 0.8         | 1.0         | 0.8         |
| Changes from last OMR (mb/d) | 0.01        | 0.01        | -0.04       | 0.00        | -0.09       |

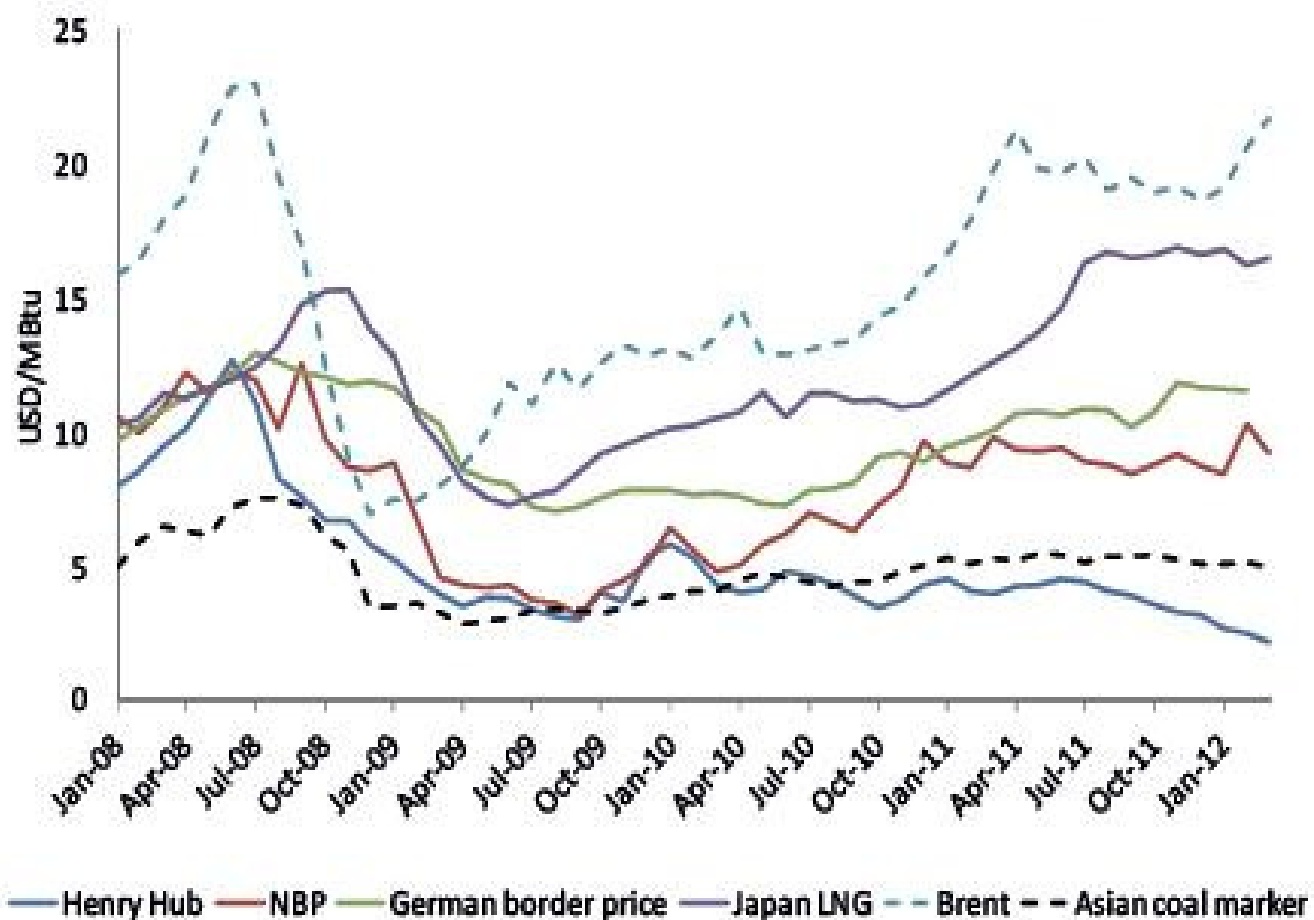


## World Gas Demand Reaches New Highs

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- Global gas demand is projected to grow relatively fast over 2011 – 2017, at 2.7% per year
- Gas demand in 2017 is 3.937 bcm, 576 bcm higher than 2011 levels
- Non – OECD countries will represent 69% of the incremental growth
- The fastest growing country is by far China, where natural gas consumption doubles over 2011 – 2017

### International gas prices, Asian coal and Brent, 2008-12



Source: ICE, Japanese Customs, and the German customs.

## The South East Region Defined





## Introductory Remarks – SE Europe

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- The energy sector has emerged over the last ten years as a top investment priority in SE Europe
- So far major energy related investments have been targeted in the East Balkans and Turkey
- The West Balkans are following suit with the electricity-gas sector in the frontline followed by RES
- In spite of subdued economic growth in SE Europe over the last 2 years the energy sector, which is governed by long term planning, is attracting considerable interest and funding

# SE Europe Basic Economic & Energy Parameters (2011)

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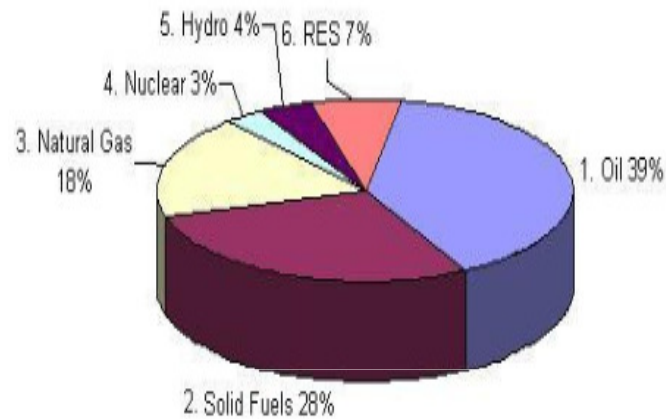
|   |                     |
|---|---------------------|
| <input type="checkbox"/> Population                     | 137.02 million      |
| <input type="checkbox"/> GDP                            | 1.585.6 USD billion |
| <input type="checkbox"/> Installed Electricity Capacity | 135 GW              |
| <input type="checkbox"/> Oil Consumption                | 1.728.700 bbl/day   |
| <input type="checkbox"/> Oil Production                 | 166.600 bbl/day     |
| <input type="checkbox"/> Gas Consumption                | 69.95 BCMs          |
| <input type="checkbox"/> Gas Production                 | 14.84 BCMs          |

## Oil and Gas Production and Consumption in SE Europe (2011 oil statistics, 2010 gas statistics)

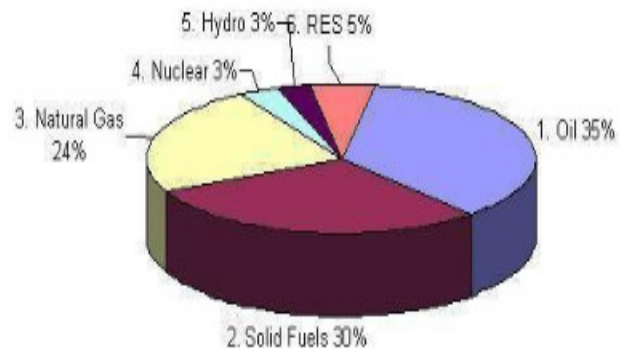
| COUNTRY              | OIL PRODUCTION<br>(bbl/day) | OIL CONSUMPTION<br>(bbl/day) | GAS PRODUCTION<br>(bcf/year) | GAS CONSUMPTION<br>(bcf/year) | OIL REFINING CAPACITY<br>(bbl/day)<br>[2009] |
|----------------------|-----------------------------|------------------------------|------------------------------|-------------------------------|--|
| ALBANIA              | 15,500                      | 44,000                       | 2                            | 1                             | 26,000                                       |
| BOSNIA & HERZEGOVINA | 0                           | 35,000                       | 0                            | 7                             | 0  |
| BULGARIA             | 1,000                       | 134,000                      | 0                            | 77                            | 115,000                                      |
| CROATIA              | 13,500                      | 113,000                      | 67                           | 100                           | 250,000                                      |
| CYPRUS               | 0                           | 65,000                       | 0                            | 0                             | 0  |
| EGYPT                | 564,500                     | 697,000                      | 2,369                        | 1,630                         | 726,000                                      |
| F.Y.R.O.M.           | 0                           | 19,000                       | 0                            | 3                             | 50,000                                       |
| GREECE               | 1,800                       | 336,800                      | 0                            | 135                           | 423,000                                      |
| ITALY                | 99,200                      | 1,455,500                    | 293                          | 2,930                         | 2,337,000                                    |
| ISRAEL               | 100                         | 237,000                      | 114                          | 129                           | 220,000                                      |
| LEBANON              | 0                           | 88,000                       | 0                            | 0                             | 0  |
| MONTENEGRO           | 0                           | 4,000                        | 0                            | 0                             | 0  |
| ROMANIA              | 86,900                      | 217,000                      | 374                          | 455                           | 517,000                                      |
| SERBIA & KOSOVO      | 2,200                       | 81,000                       | 15                           | 80                            | 215,000                                      |
| SYRIA                | 300,200                     | 258,000                      | 356                          | 340                           | 240,000                                      |
| TURKEY               | 45,700                      | 679,900                      | 24                           | 1,346                         | 714,000                                      |
| <b>TOTAL</b>         | <b>1,130,600</b>            | <b>4,464,200</b>             | <b>3,614</b>                 | <b>7,233</b>                  | <b>5,833,000</b>                             |

Source: U.S. Energy Information Administration

# Total Primary Energy Consumption in SE Europe



**Total Primary Energy consumption  
shares in SE Europe (2000)**  
**180.469,00 mtoe**



**Total Primary Energy consumption  
shares in SE Europe (2009)**  
**225.386,00 mtoe**





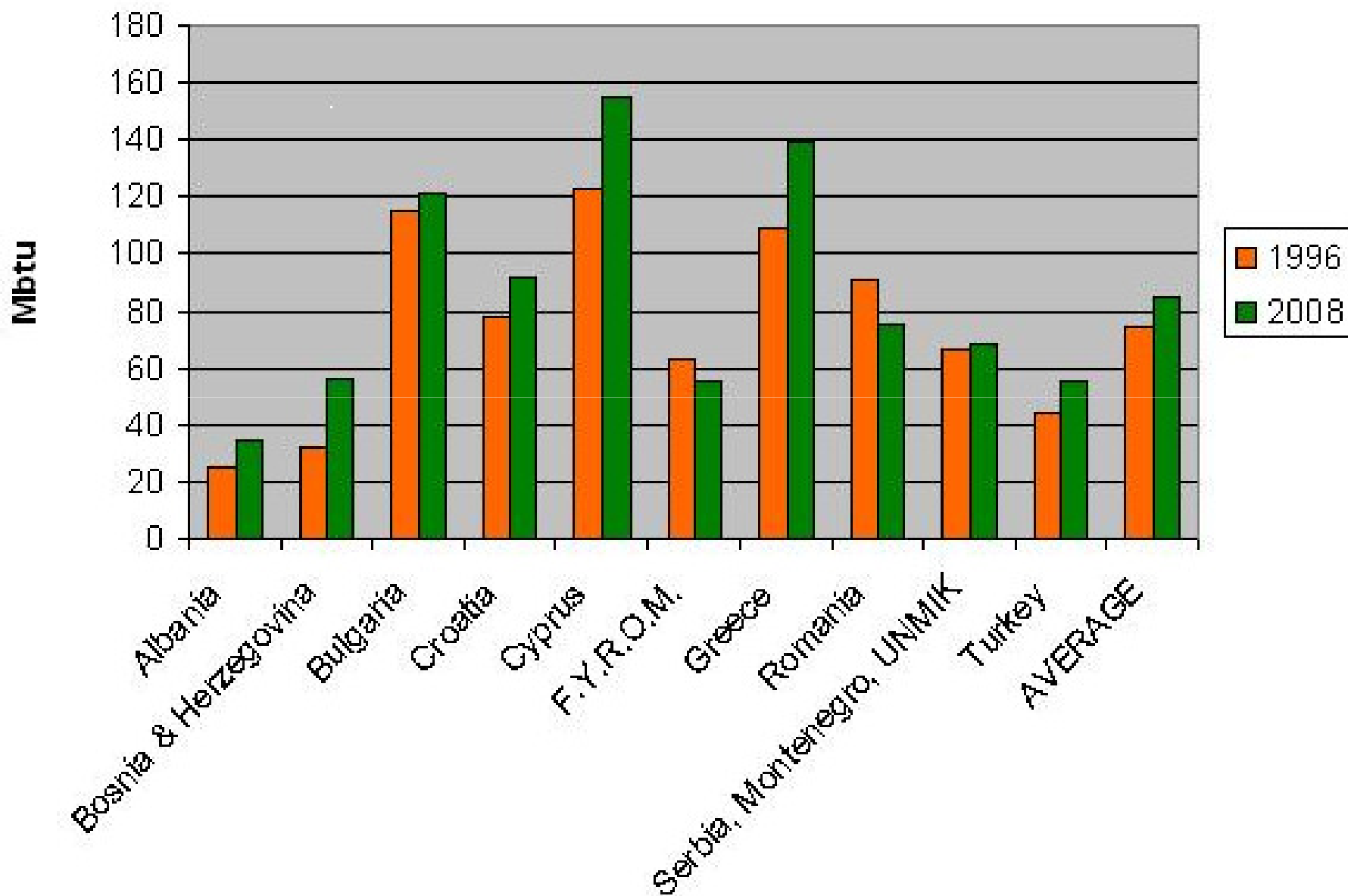
## SE Europe Capacity Mix 2009,2020

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### Installed Electricity Capacity in GW

|                    | 2009         | 2020         | Additional Capacity (GW) |
|--------------------|--------------|--------------|--------------------------|
| <b>Oil</b>         | 5,5          | 3,3          | -2,2                     |
| <b>Solid Fuels</b> | 39,7         | 45,8         | +6,1                     |
| <b>Nuclear</b>     | 3,5          | 10,3         | +6,8                     |
| <b>N. Gas</b>      | 25,1         | 32,1         | +7,0                     |
| <b>Hydro</b>       | 32,5         | 37,6         | +5,1                     |
| <b>RES</b>         | 4,1          | 14,5         | +10,4                    |
|                    | <b>110,4</b> | <b>143,6</b> | <b>33,2</b>              |

## Energy Consumption per Capita



# SE Europe as an Energy Bridge

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## Natural Gas

- Current gas flows: East to West
- Potential additional gas flows: South to North and South to West

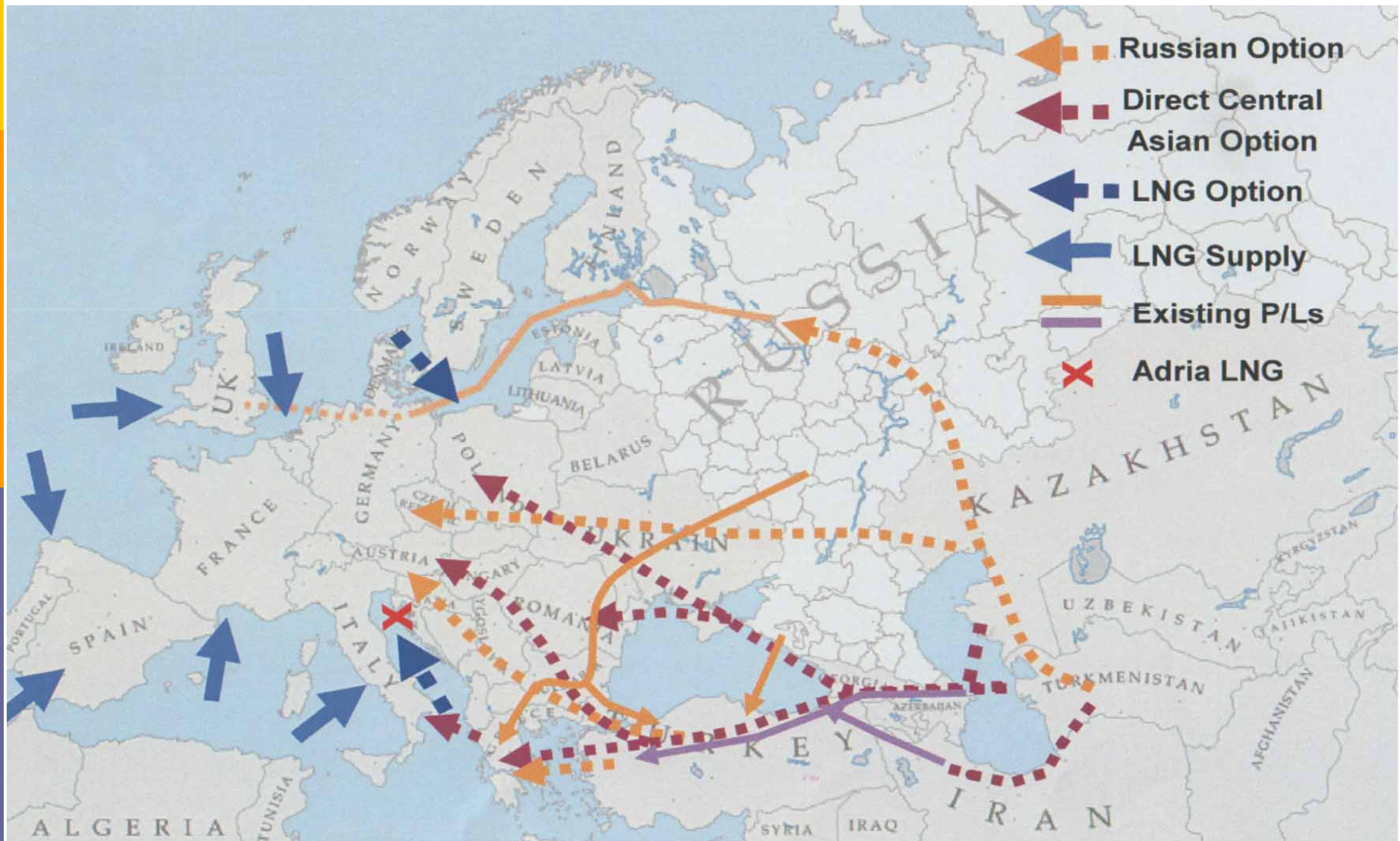
## Electricity

- Current flows: North to South and West to East
- Potential additional flows: South to North

## Oil

- Current flows: East to West
- Potential additional flows: South to West

# Gas Routes and European Energy Security





## Gas Demand 2000-17 (bcm)

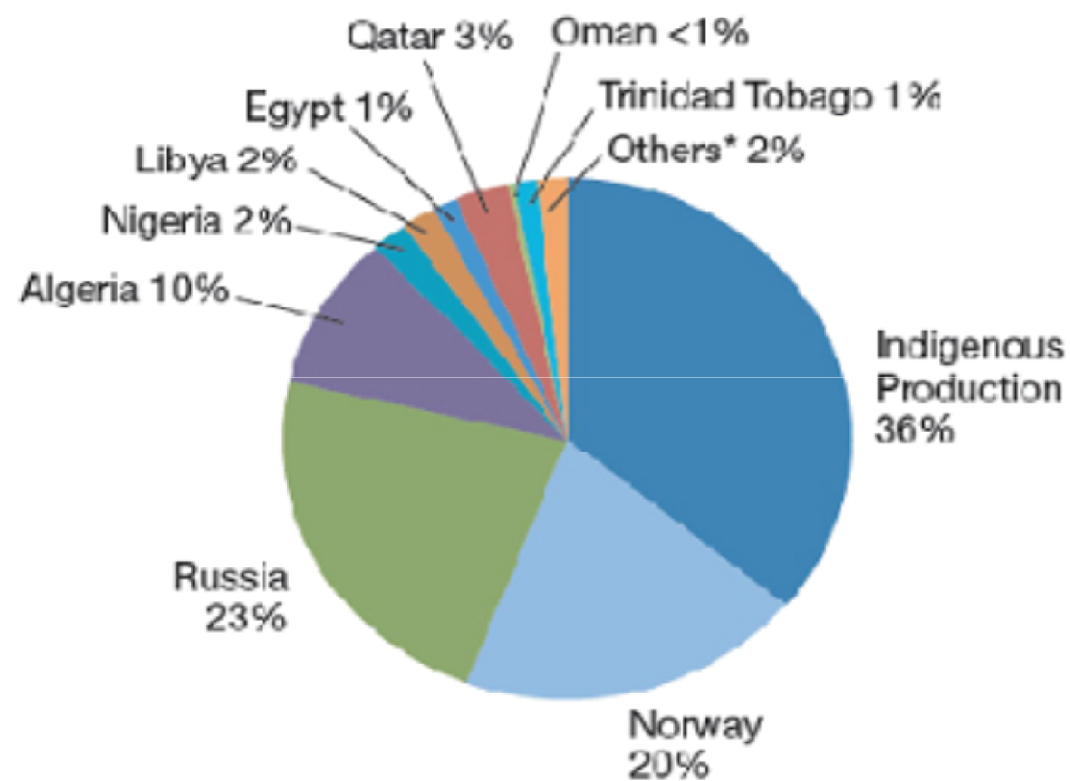
|                     | 2000         | 2010         | 2011         | 2013         | 2015         | 2017         |
|---------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Europe              | 474          | 570          | 520          | 529          | 547          | 561          |
| G4*                 | 300          | 329          | 288          | 296          | 302          | 303          |
| Americas            | 794          | 840          | 862          | 909          | 941          | 969          |
| United States       | 661          | 673          | 690          | 728          | 754          | 779          |
| Asia Oceania        | 131          | 195          | 212          | 211          | 227          | 241          |
| Japan               | 83           | 109          | 121          | 121          | 126          | 129          |
| Latin America       | 95           | 136          | 139          | 152          | 163          | 179          |
| Africa              | 59           | 103          | 111          | 125          | 139          | 149          |
| Middle East         | 179          | 369          | 389          | 427          | 444          | 468          |
| FSU/Non-OECD Europe | 597          | 690          | 705          | 722          | 731          | 735          |
| Russia              | 391          | 473          | 483          | 493          | 499          | 501          |
| Asia                | 180          | 399          | 424          | 489          | 564          | 634          |
| China**             | 28           | 110          | 132          | 176          | 226          | 276          |
| OECD                | 1 400        | 1 606        | 1 593        | 1 649        | 1 715        | 1 771        |
| Non OECD            | 1 111        | 1 698        | 1 768        | 1 915        | 2 041        | 2 166        |
| EU-27               | 477          | 545          | 489          | 497          | 508          | 515          |
| <b>Total</b>        | <b>2 510</b> | <b>3 303</b> | <b>3 361</b> | <b>3 564</b> | <b>3 757</b> | <b>3 937</b> |

Note: detailed demand by country and by sector are available in Table 28 and 29 in the chapter "The Essentials" at the end of this publication.

\* G4: France, Germany, Italy and the United Kingdom.

\*\* China includes Hong Kong.

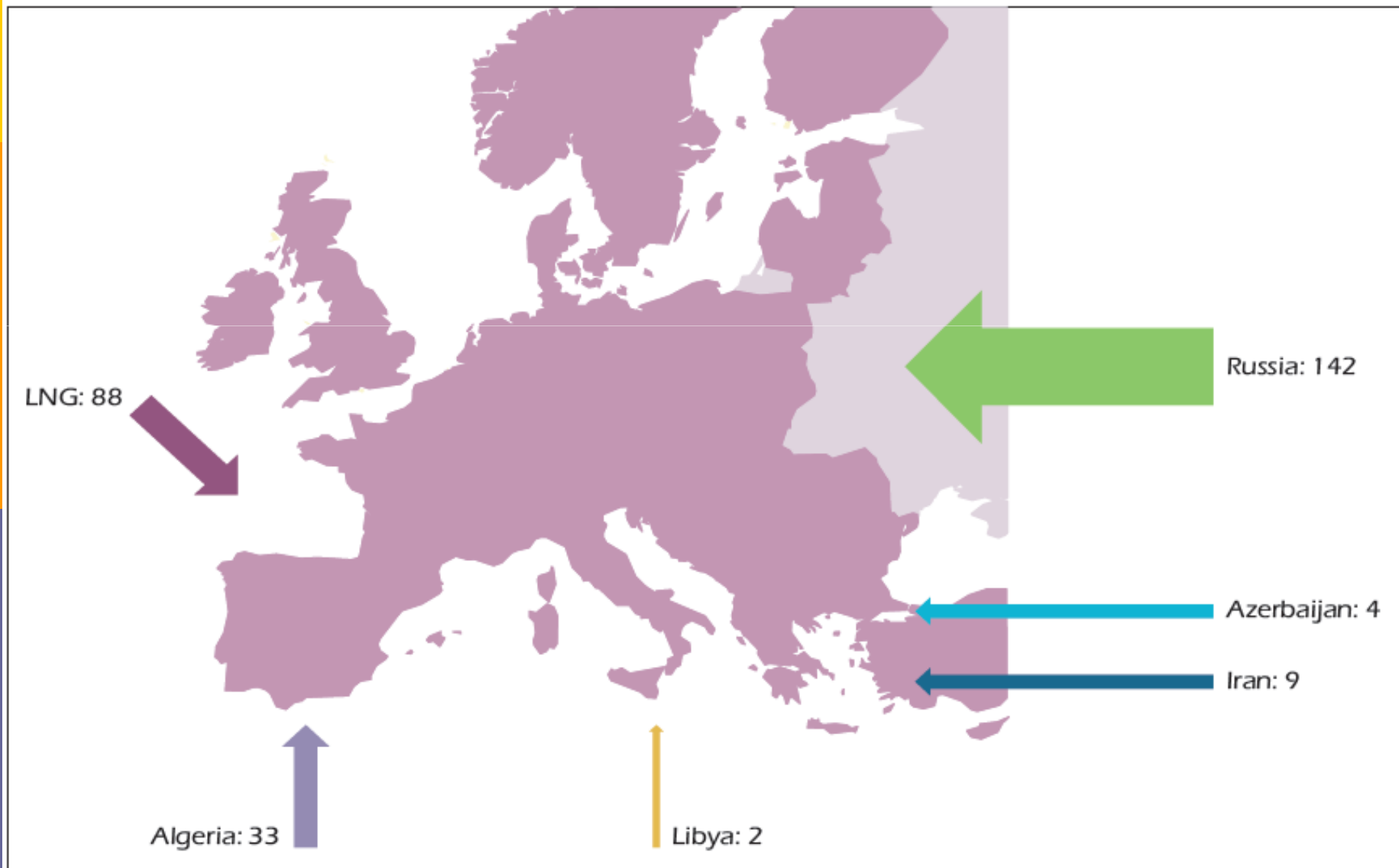
## EU-27 Gas Supply (2010)



*\*Including supplies from sources which can not be identified.*

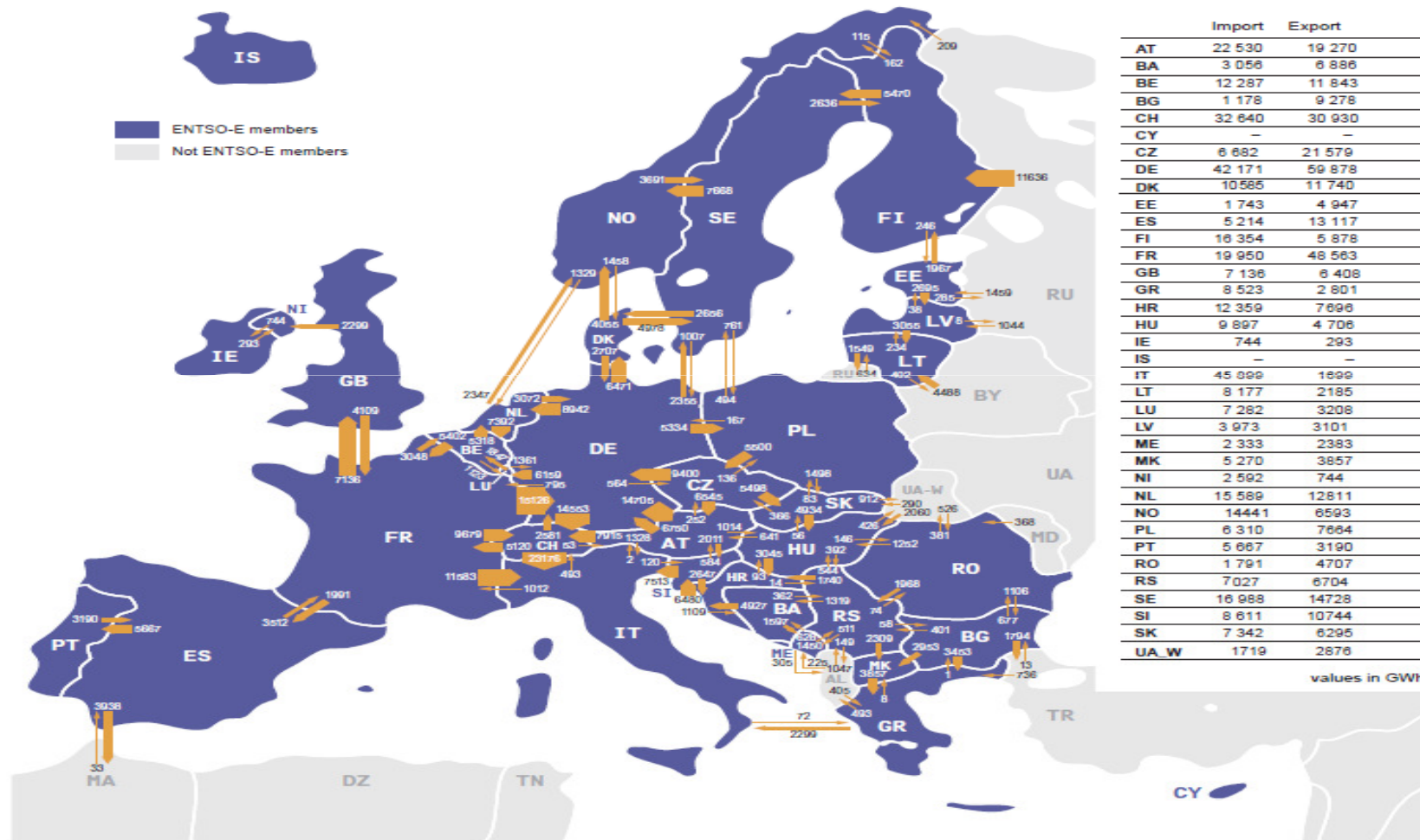
Source: Eurogas, BP

## Gas Trade in Europe, 2011 (bcm)





# Electricity flows, 2010 (Gwh)

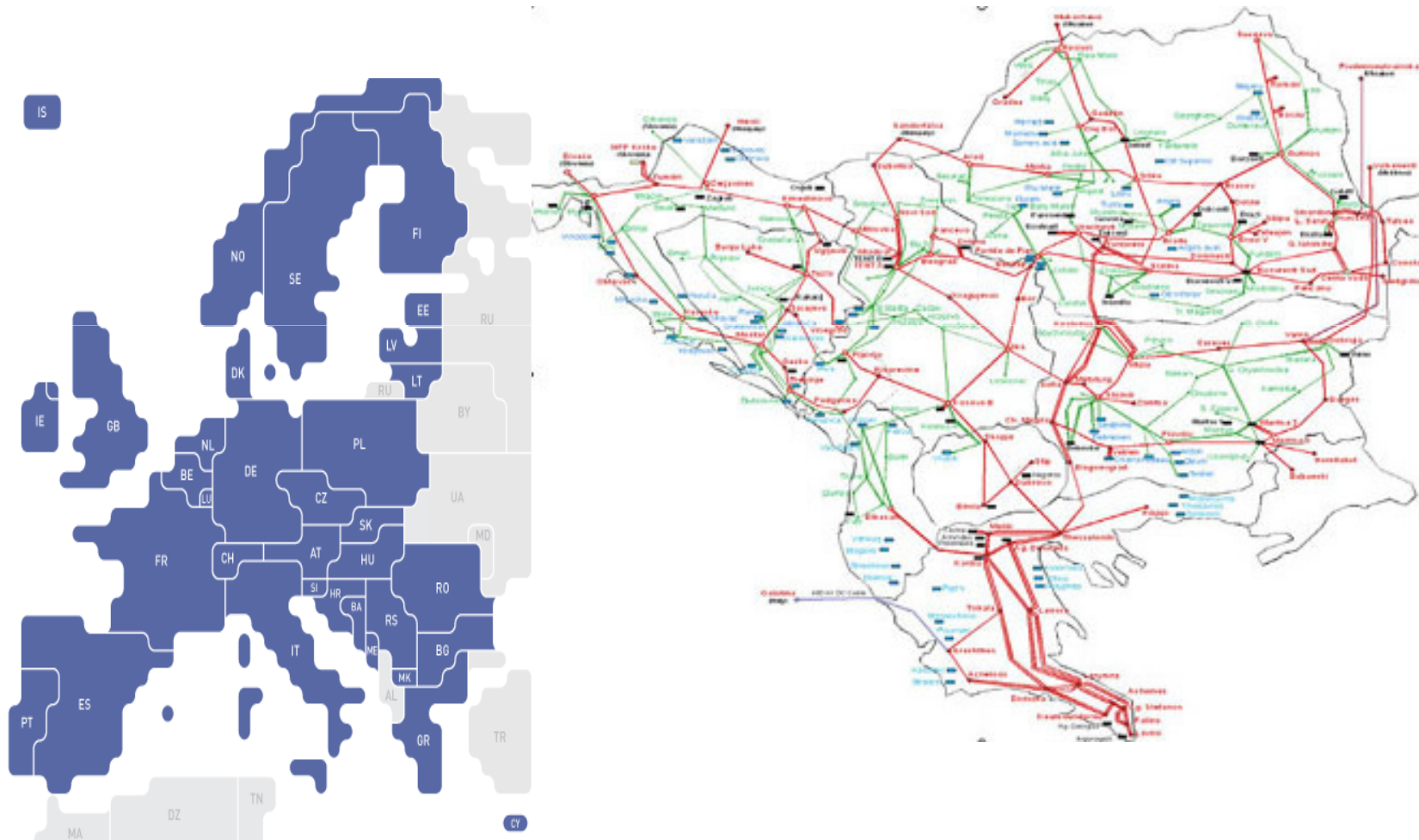


Sum of physical energy flows between ENTSO-E countries = 347172 GWh<sup>2</sup>

Total physical energy flows = 381594 GWh<sup>2</sup>



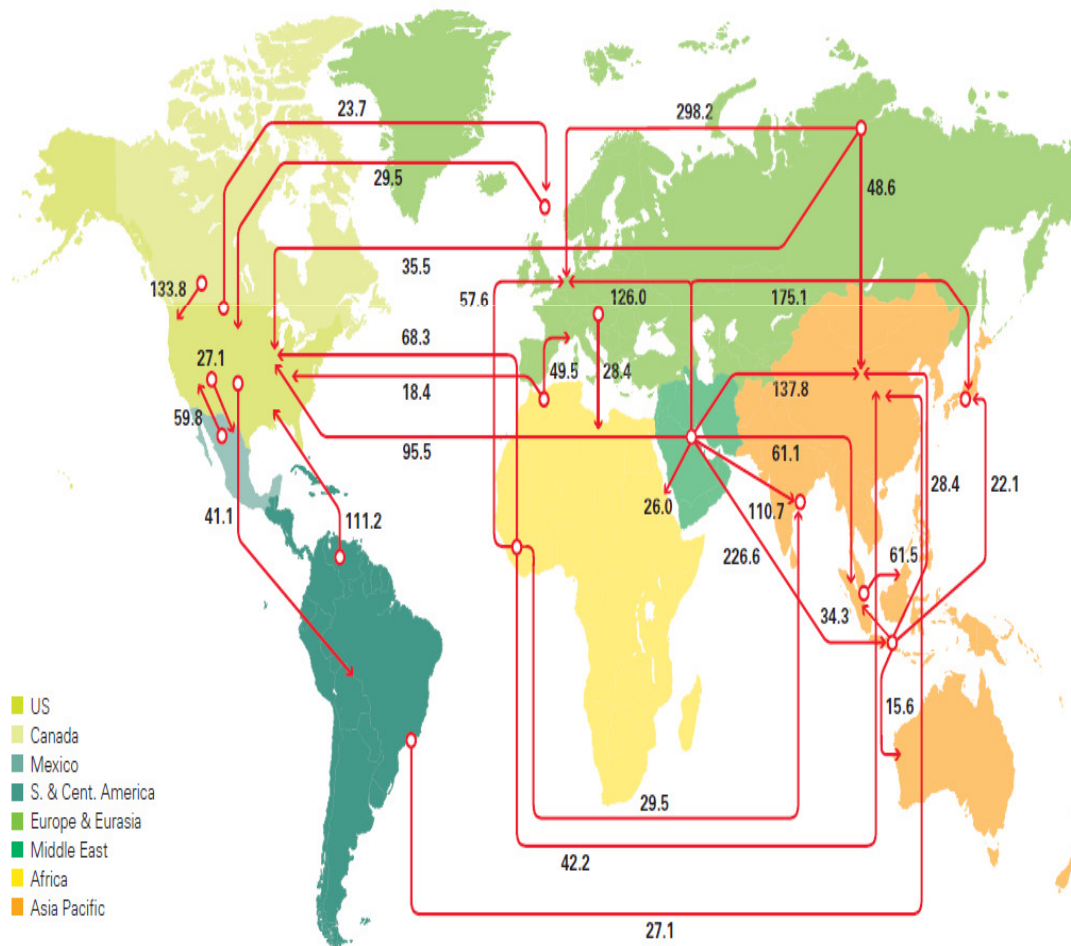
# ENTSO-E (formerly UCTE network)



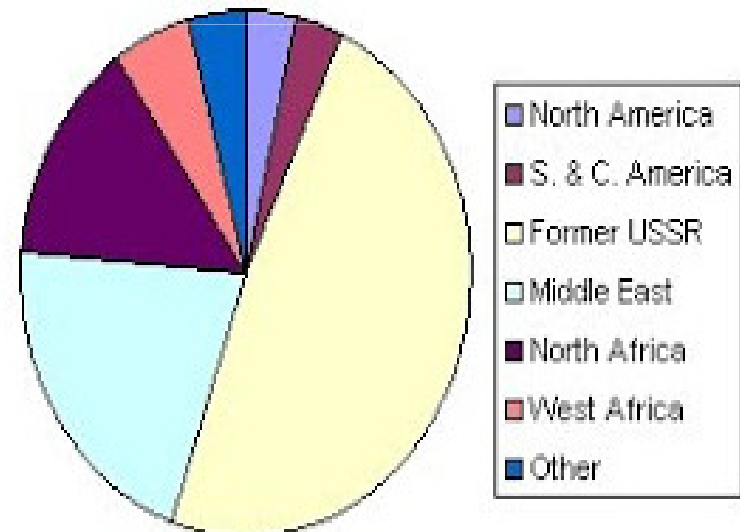
# Oil flows worldwide, 2011 (mt)

## Major trade movements 2011

Trade flows worldwide (million tonnes)



## European Sources of Oil by Region





## “Redefining SE Europe’s Energy Map”

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- A number of significant developments in terms of policy and infrastructure are currently taking place in SE Europe which when completed, by the end of this decade, will have helped reshape the energy landscape of the region.
- These developments concern both market operation and energy production/ transmission capabilities.
- There appears to be some important policy implications



## Market Operation

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- Integration of the electricity market and its full liberalization are goals which can and should be achieved by 2020
- In electricity although a de jure liberalization exists in almost all countries a de facto market opening is not in evidence
- In electricity market the ultimate goals remain:
  - (i) The removal of regulated electricity prices
  - (ii) The substantial easing of network congestion
  - (iii) Barrier free cross border exchanges of energy
- In gas, substantial investments are required in transmission and storage infrastructure in order to improve market liquidity
- Investment in infrastructure is key to achieving market competition for both electricity and gas
- Development of freely accessible energy trading/ auctioning platforms is necessary in order to enhance market competition



## Energy Infrastructure (a)

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- The realization of a number of key energy infrastructure projects is of vital importance and will lead to the transformation of the region's energy landscape. These include:
  1. Gas interconnectors (IGI, IGB, Turkey – Bulgaria, Bulgaria – Serbia, Bulgaria – Romania etc)
  2. Extended electricity grid interconnections between all countries of the region
  3. Construction of the Trans – Anadolou (TANAP) gas pipeline
  4. South Corridor Pipelines (TAP, Nabucco West, South Stream)
  5. Introduction of nuclear power in Turkey
  6. Large scale exploration of Romanian gas deposits and broader Black Sea hydrocarbon development in the Black Sea.



## Energy Infrastructure (b)

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7. Exploitation of large Natural Gas deposits in the Israel – Cyprus axis
8. Increase of indigenous oil and gas production by almost all countries of the region
9. Addition of significant new and upgraded refining capacity in Greece, Serbia, Turkey and Bulgaria
10. Construction of underwater electricity transmission cables (i.e. Israel – Cyprus, Greece, Greece – Italy, Aegean islands – Greek mainland, Turkey – Cyprus)
11. Addition of significant new coal/lignite power generation capacity in whole region
12. Large scale RES utilization (i.e. PV in Greece and Bulgaria, Wind in Greece, Romania, Turkey and Hydro in Albania, Montenegro, Croatia etc)

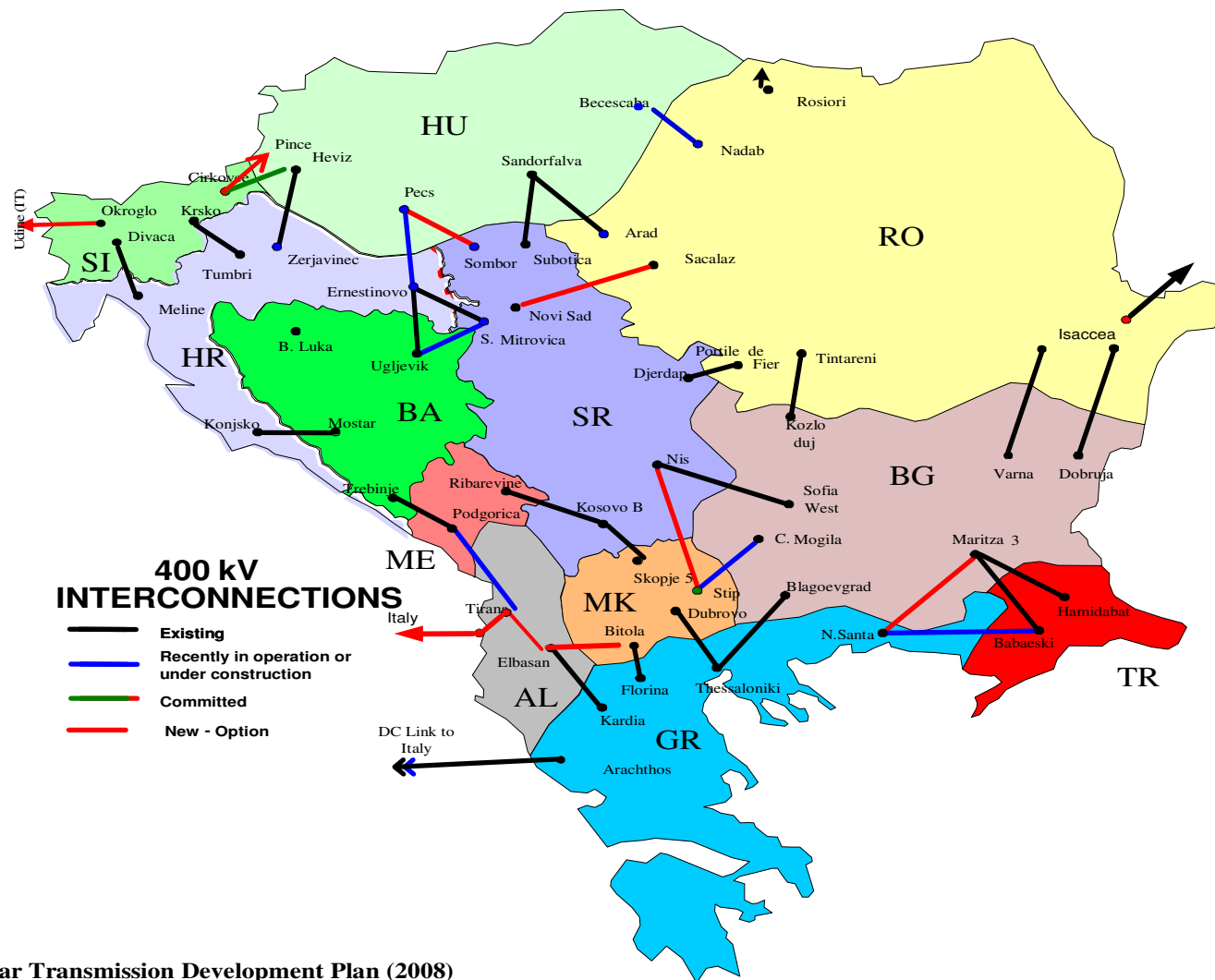


## Substantial new Electricity Infrastructure is Foreseen in SE Europe by 2020 for all 12 Countries of the Region

- ❖ **Anticipated new power generating capacity:**
  - Thermal/ nuclear (excl. Turkey) ~ 20.0 GW
  - Renewables      Low scenario ~ 15.0 GW  
                         High scenario ~ 25.0 GW
  
- ❖ **Anticipated investments in:**
  - Thermal/ Nuclear plants, lignite/ coal mine development, electricity grids, HV Transmission lines ~90.0 Billion Euros
  - RES (Solar Thermal, Solar PV, Wind, Biomass, Geothermal, Min Hydro) ~35 – 50 Billion Euros



# Electricity Interconnections



Source:  
UCTE 10 Year Transmission Development Plan (2008)





## Turkey' Nuclear Plans Are Advancing

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- Sinop station – 5.000 MW by 2023
- Akkuyu station - 4.800 MW by 2025 (?)





## Cyprus – Israel Natural Gas Deposits

- **Major New Natural Gas Discoveries:**
  - Cyprus, Block 12 ~ 7.0 – 9.0 TCF,  
(gross mean estimated)
  - Israel, Tamar deposit ~ 9.0 TCF
  - Israel, Dalit deposit ~ 3.0 TCF
  - Israel, Leviathan deposit ~ 15.0 TCF
  - 2<sup>nd</sup> Cyprus Round just completed





## Romania - Black Sea

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- New major offshore gas finds promise significant production opportunities
- Ana, Doina and Domino fields are vital for opening up Black Sea exploration in Romania sector
- Estimates for 600 Bcm offshore natural gas resource base
- Anticipated capital investment of \$ 30.0 billion over next 15 years



# Ana and Doina Development



Ana and Doina are the next (and currently only) fields to be developed offshore Romania

# Major Oil Refining Projects under Development in SE Europe (2010-2020)



**New refining capacity, revamping, upgrades and expansion, including addition of new storage capacity, oil terminals and crude/ product pipelines and biofuel plants**

- Greece, Cyprus, Turkey, Bulgaria and Romania - 19.0 Billion Euros
- Albania, FYROM, Montenegro, Bosnia - Herzegovina, Croatia and Serbia - 4.0 Billion Euros





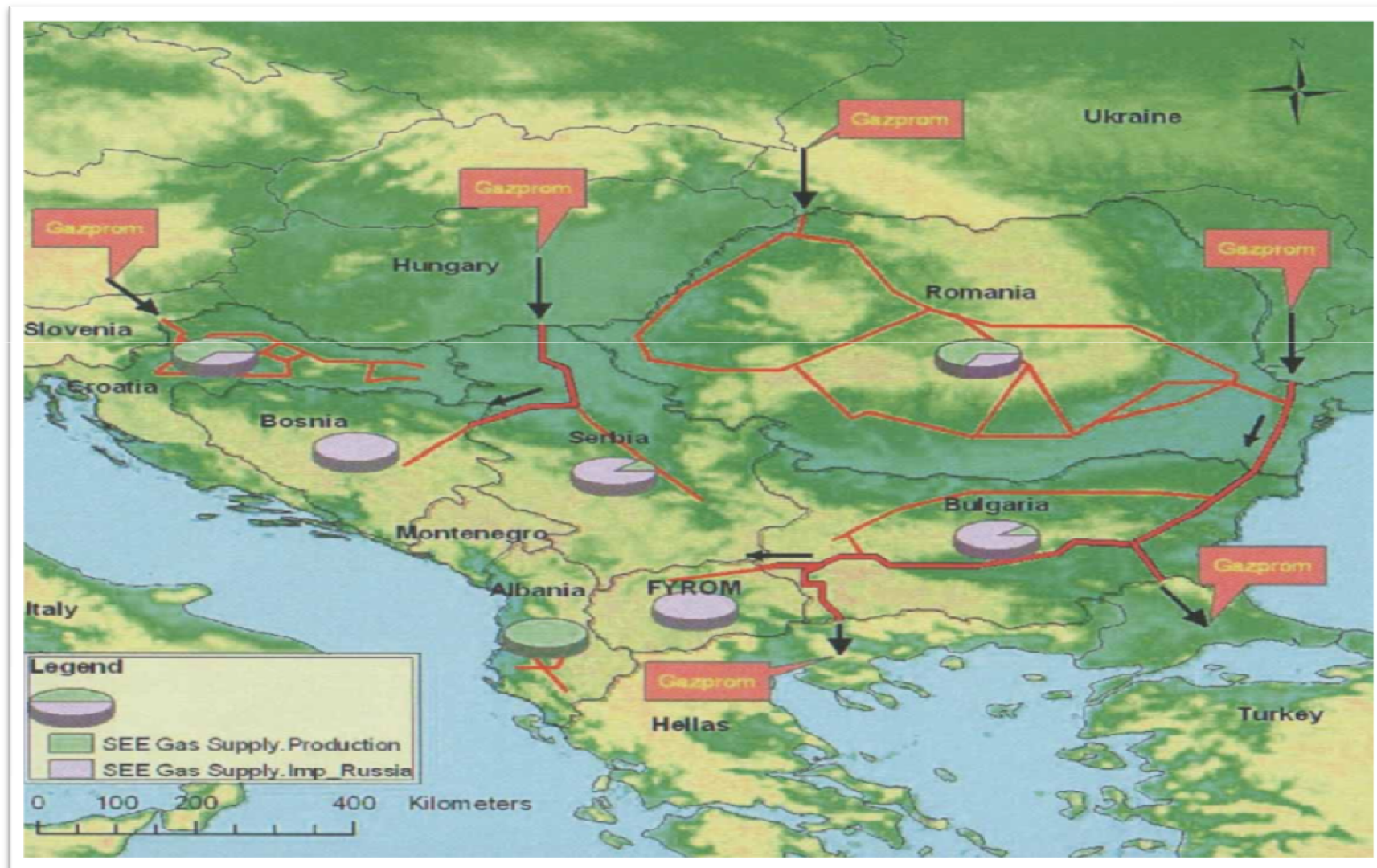
## South Corridor Gas Pipelines

- ❖ TANAP
- ❖ ITGI – IGB
- ❖ TAP
- ❖ West Nabucco
- ❖ East Med
  
- ❖ South Stream





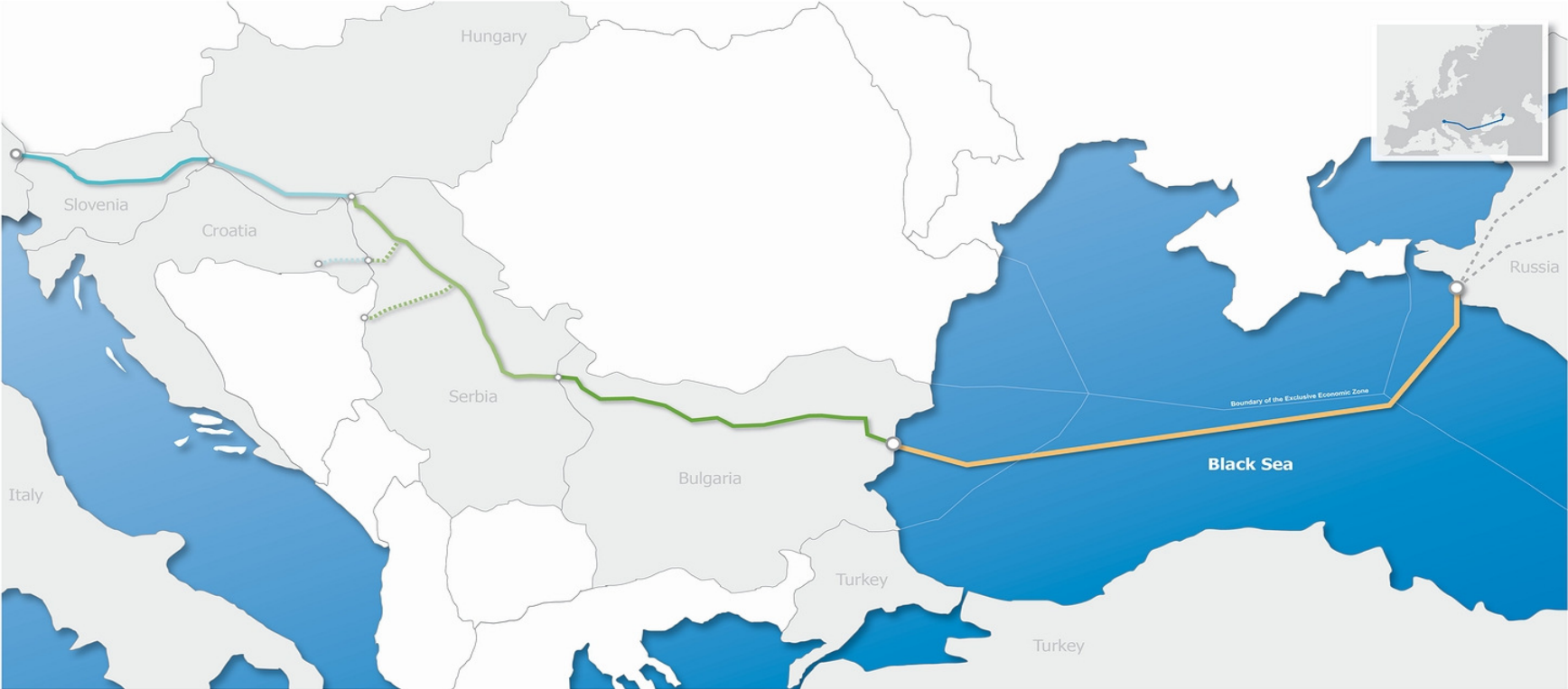
# SE Europe Gas Supply





# South Stream Pipeline

South Stream  
ENERGISING EUROPE





# Nabucco West Vs TAP



# Renewable Energy Sources



## Some Latest Important Developments (February 2013)

- Steep rise in RES installed capacity over last 3 years
- Solar PV in Greece and Bulgaria ~ 2300 MW of total installed capacity
- Wind in Greece, Bulgaria, Romania, Turkey ~ 6.250 MW of total installed capacity
- Small Hydro – Albania, Montenegro, Croatia, Serbia, Romania, Greece, Turkey, Bosnia – Herzegovina ~1900 MW





## Significant Investment and Business Opportunities in SE Europe in Current Decade (2010 – 2020)

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- ✓ Oil and Gas (upstream)
- ✓ Oil (midstream, downstream)
- ✓ Natural Gas (transmission, distribution , storage)
- ✓ Power Generation (Thermal Plants, CCP, Nuclear, Large Hydro)
- ✓ Electricity Transmission and Distribution
- ✓ RES (SWH, Photovoltaic, Wind, Mini-Hydro, Biomass, Geothermal)

***Estimated Total investment potential ~ Euro 240.0 billion (±10%)***

# Anticipated Total Energy Infrastructure Investment Per Sector in SE Europe by 2020



| Sector  | Investments<br>(€ Million) |
|---|----------------------------|
| <b>Oil Upstream</b> ( <i>Research, Exploration and Production</i> )   | <b>33,820</b>              |
| <b>Oil Downstream/Midstream</b> ( <i>incl. liquid biofuels</i> )  | <b>23,100</b>              |
| <b>Electricity</b> <ul style="list-style-type: none"> <li>▪ Thermal Plants</li> <li>▪ Nuclear Plants</li> <li>▪ Lignite Mine Development</li> <li>▪ Grids - Upgrade and Expansion (<i>incl. metering systems</i>)</li> <li>▪ HV Transmission Lines</li> </ul> | <b>89,692</b>              |
| <b>Gas</b> <ul style="list-style-type: none"> <li>▪ Main and branch gas pipelines</li> <li>▪ Gas Storage</li> <li>▪ LNG Terminals and Liquefaction plants</li> <li>▪ Town grids</li> </ul>  | <b>24,955</b>              |
| <b>RES</b> ( <i>Wind, PV, Biomass, Mini Hydro, Geothermal</i> )   | <b>47,633</b>              |
| <b>Intraregional Mega Projects</b> <ul style="list-style-type: none"> <li>▪ Oil Pipelines</li> <li>▪ Gas Interconnectors</li> <li>▪ Main gas pipelines</li> </ul>   | <b>20,800</b>              |
| <b>Total</b>  | <b>240,000</b>             |



## Total Energy Infrastructure Investments per Country

|  | <i>(in million Euros)</i> |
|--|---------------------------|
| ✓ <b>Albania</b>   | 8.800                     |
| ✓ <b>Bosnia &amp; Herzegovina</b><br>(Republic of Sroksa only) | 3.855                     |
| ✓ <b>Bulgaria</b>  | 17.150                    |
| ✓ <b>Croatia</b>   | 7.000                     |
| ✓ <b>Cyprus</b>  | 19.000                    |
| ✓ <b>FYROM</b>   | 1.850                     |
| ✓ <b>Greece</b>  | 35.300                    |
| ✓ <b>Kosovo</b>  | 4.620                     |
| ✓ <b>Montenegro</b>  | 3.960                     |
| ✓ <b>Romania</b>   | 36.500                    |
| ✓ <b>Serbia</b>  | 10.665                    |
| ✓ <b>Turkey</b>  | 70.500                    |
| <b>TOTAL</b>   | <b>219.200</b>            |

## Anticipated Total Energy Infrastructure Investment Per Sector in SE Europe



| Sector  | Investments (€ Million) |
|---|-------------------------|
| <b>Oil Upstream(Reaserch, Exploration and Productions</b>   | <b>33,820</b>           |
| <b>Oil Downstream/Midstream (incl. Liquid biofuels</b>  | <b>23,100</b>           |
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| <b>▣ Total</b>  | <b>240,000</b>          |

| <b>SERBIA Key Energy Figures (2008)**</b>  |   |   |
|--|---|---|
| <b>in Mtoe</b>                             |   |   |
| <b>Total Primary Energy Supply (TPES)</b>  | 16.03   |   |
| <b>Total Final Consumption</b>             | 9.96  |   |
| <b>TPES Composition</b>                    |   |   |
| <i>Oil</i>                                 | 3.25 Crude, 0.98 Oil Products   |   |
| <i>Gas</i>                                 | 2.0   |   |
| <i>Coal</i>                                | 8.12  |   |
| <i>Electricity</i>                         | 0.006   |   |
| <i>RES</i>                                 | 0.82 Hydro, 0.80 Combustibles + waste, 0.05 Geothermal + Solar                                  |   |
| <b>Oil</b>                                 |   |   |
| <i>Production</i>                          | 0.66 crude,   | 3.38 Mtons Refined (2008 IEA)                                     |
| <i>Consumption</i>                         | 3.54 oil products,  | 2.9 Mtons oil products (2008 IEA)                                 |
| <i>Imports</i>                             | 2.66 crude,<br>1.28 oil products,   | 2.58 Mtons crude (2008 IEA)<br>1.09 Mtons oil products (2008 IEA) |
| <i>Exports</i>                             | 0.24 oil products,  | 0.18 Mtons oil products (2008 IEA)                                |
| <i>Reserves</i>                            |   |   |
| <b>Natural Gas</b>                         |   |   |
| <i>Production</i>                          | 0.21  | (0.19 BCM, 2007)  |
| <i>Consumption</i>                         | 1.42, 0.49 ( CHP + Heat plants)   | (2.35 BCM, 2007)  |
| <i>Imports</i>                             | 1.79  | (2.2 BCM, 2007)   |
| <b>Coal</b>                                |   |   |
| <i>Production</i>                          | 7.37  | 36.4 Mtons lignite (Euracoal 2008)                                |
| <i>Imports</i>                             | 0.94  | 1Mtons hard coal (Euracoal 2008)                                  |
| <i>Exports</i>                             | 0.06  |   |
| <i>Reserves</i>                            | 13.4 Btons  |   |
| <b>Electricity</b>                         |   |   |
| <i>Generation</i>                          | 3.13  | 37.32 TWh (2008 IEA)  |
| <i>Consumption</i>                         | 2.34  | 27.26 TWh (2008 IEA)  |
| <i>Imports</i>                             | 0.76  | 8.87 TWh (2008 IEA)   |
| <i>Exports</i>                             | 0.76  | 8.80 TWh (2008 IEA)   |
| <b>Total Installed Generation Capacity</b> | 7,155 MW  |   |
| <b>Installed RES Generation Capacity*</b>  | 2,831 MW LHPP   |   |
| <b>RES Potential</b>                       | 4.3 Mtoe (2.7 Mtoe Biomass, 0.6 Mtoe hydro, 0.2 Mtoe geothermal, 0.2 Mtoe Wind, 0.6 Mtoe solar) |   |
| <b>Energy Dependency %</b>                 | N. A.   |   |

*RES includes: Hydro, Wind, Solar, Biomass, Geothermal*

**\*\* All data in Mtoe of 2008, source IEA, other data as designated in terms of units, year and source.**



Table: 14.11

## COUNTRY ENERGY INVESTMENT INFORMATION

## SERBIA

*Contributor(s): Mr. Nenad Stefanovic*

| Project Sector |                     | Description                                | Investment Estimate in Million Euros  |
|----------------|---------------------|--|---|
| OIL            | Upstream            | ▪ Field Exploration                        | -   |
|                |                     | ▪ Development of new oil and gas wells     | -   |
|                | Downstream          | ▪ Refining                                 | 550<br>(NIS)<br>300<br>(Comico Oil)   |
|                |                     | ▪ Loading Terminals                        | -   |
|                |                     | ▪ Storage facilities                       | 15<br>(Transnafta)  |
|                |                     | ▪ Crude / Product Pipeline(s)              | 175<br>(Transnafta-product pipeline)  |
|                |                     |  | 15<br>(Transnafta - pipe line extension from Pančevo to Smederevo)                                |
| GAS            | Country Gas Network | ▪ Grid expansion                           | 325   |
|                |                     | ▪ Main intra country pipeline(s)           | 330   |
|                |                     | ▪ Storage facilities                       | 65  |
|                |                     | ▪ LNG terminal(s)                          | -   |
| ELECTRICITY    | Power Generation    | ▪ Lignite                                  | 2,500<br>(new)<br>1,300<br>(rehabilitation)   |
|                |                     | ▪ Coal                                     | -   |
|                |                     | ▪ Gas                                      | 320   |
|                |                     | ▪ Nuclear                                  | -   |
|                |                     | ▪ Large Hydro                              | 3,470<br>( new, including 2 cascade, 5X20 MW and 10X10 MW approximately)<br>400<br>rehabilitation |
|                | Electricity Grid    | ▪ New H/V transmission lines               | 91<br>(400 and 220 kV lines)<br>52<br>(110 kV lines)  |
|                |                     | ▪ Upgrading and expansion of existing grid | 107<br>(400 and 220 kV lines)   |

Table: 14.4

## COUNTRY ENERGY INVESTMENT INFORMATION

## CROATIA

Contributor(s): Mr. Vladimir Durovic and IENE Estimates

| Project Sector  |                     | Description   | Investment Estimate in Million Euros |
|---|---------------------|---|--------------------------------------|
| OIL   | Upstream            | ▪ Field Exploration   | 250                                  |
|   |                     | ▪ Development of new oil and gas wells  | 350                                  |
|   | Downstream          | ▪ Refining:<br>Modernization of INA refineries in Sisak and Rijeka                | 500                                  |
|   |                     | ▪ Loading Terminals   | -                                    |
|   |                     | ▪ Storage facilities:<br><br><i>Oil stocks facilities – JANAF new capacities:</i> | 185                                  |
|   |                     | • Žitnjak 130 000 m <sup>3</sup>  |                                      |
|   |                     | • Lendava 80 000 m <sup>3</sup>   |                                      |
|   |                     | • Slavonski Brod 80 000 m <sup>3</sup>  |                                      |
|   |                     | • Omišalj 5x80 000 m <sup>3</sup> + 3x80 000 m <sup>3</sup>                       |                                      |
|   |                     | <i>Oil products stock facilities:</i>   |                                      |
| • Terminal Birižine 100 000 m <sup>3</sup>  | 30                  |   |                                      |
| • Terminal Gaženica 50 000 m <sup>3</sup>   | 15                  |   |                                      |
| • Terminal Žitnjak 200 000 m <sup>3</sup>   | 60                  |   |                                      |
| ▪ Crude / Product Pipeline(s)   | -                   |   |                                      |
| GAS   | Country Gas Network | ▪ Grid expansion:   |                                      |
|   |                     | • Gas transmission system   | 600                                  |
|   |                     | • Gas distribution system od Lika and Dalmatia                                    | 100                                  |
|   |                     | ▪ Main intra country pipeline(s)  | -                                    |
|   |                     | ▪ Storage facilities:<br><i>New peak storage UGS – Grubišno polje</i>             | 15                                   |
|   |                     | • maximum operating capacity 25 mil m <sup>3</sup>                                |                                      |
|   |                     | • minimum exit capacity 100 000 m <sup>3</sup> /h                                 |                                      |
| ▪ LNG terminal(s)   |                     |   |                                      |
| ADRIA LNG terminal Omišalj(Krk)/15 bcm per year/ planned start up → not before 2017!? | 800                 |   |                                      |
| LNG RV receiving terminal   | 50                  |   |                                      |

Table: 14.2

## COUNTRY ENERGY INVESTMENT INFORMATION

### BOSNIA & HERZEGOVINA REPUBLIKA SRPSKA

*Contributor(s): Mr. Ljubo Glamocic*

| Project Sector                            |                               | Description                                | Investment Estimate in Million Euros |
|---|-------------------------------|--|--------------------------------------|
| OIL                                       | Upstream                      | ▪ Field Exploration                        | 120                                  |
|   |                               | ▪ Development of new oil and gas wells     | -                                    |
|   | Downstream                    | ▪ Refining                                 | 530                                  |
|   |                               | ▪ Loading Terminals                        | -                                    |
|   |                               | ▪ Storage facilities                       | 110                                  |
|   | ▪ Crude / Product Pipeline(s) | -  |                                      |
| GAS                                       | Country Gas Network           | ▪ Grid expansion                           | 180                                  |
|   |                               | ▪ Main intra country pipeline(s)           | 80                                   |
|   |                               | ▪ Storage facilities                       | -                                    |
|   |                               | ▪ LNG terminal(s)                          | -                                    |
| ELECTRICITY                               | Power Generation              | ▪ Lignite                                  | 552                                  |
|   |                               | ▪ Coal                                     | -                                    |
|   |                               | ▪ Gas                                      | -                                    |
|   |                               | ▪ Nuclear                                  | -                                    |
|   |                               | ▪ Large Hydro                              | 1.735                                |
|   | Electricity Grid              | ▪ New H/V transmission lines               | 8,0                                  |
|   |                               | ▪ Upgrading and expansion of existing grid | 17                                   |
| RES                                       |                               | ▪ Small Hydro                              | 320                                  |
|   |                               | ▪ Wind farms                               | 150                                  |
|   |                               | ▪ Photovoltaics                            | 20                                   |
|   |                               | ▪ Concentrated Solar Power                 | -                                    |
|   |                               | ▪ Biomass (including liquid biofuels)      | 20                                   |
|   |                               | ▪ Geothermal                               | 13                                   |
|   |                               | ▪ Solar Water Heating                      | 13,0                                 |
| <b>Total Estimated Investment by 2020</b> |                               |  | <b>3,855</b>                         |

Table: 14.6

## COUNTRY ENERGY INVESTMENT INFORMATION

## FYRO MACEDONIA

Contributor(s): Mr. Simon Uzunov and Ms. Violeta Kogalniceanu

| Project Sector                            |                     | Description  | Investment Estimate in Million Euros                        |
|---|---------------------|--|---|
| OIL                                       | Upstream            | ▪ Field Exploration  | -   |
|   |                     | ▪ Development of new oil and gas wells   | -   |
|   | Downstream          | ▪ Refining   | 80  |
|   |                     | ▪ Loading Terminals  | -   |
|   |                     | ▪ Storage facilities   | 30  |
| GAS                                       | Country Gas Network | ▪ Crude / Product Pipeline(s)  | -   |
|   |                     | ▪ Grid expansion   | 50  |
|   |                     | ▪ Main intra country pipeline(s)   | 100   |
|   |                     | ▪ Storage facilities   | -   |
| ELECTRICITY                               | Power Generation    | ▪ LNG terminal(s)  | -   |
|   |                     | ▪ Lignite  | -   |
|   |                     | ▪ Coal   | -   |
|   |                     | ▪ Gas  | -   |
|   |                     | ▪ Nuclear  | -   |
|   |                     | Large Hydro:   |   |
|   |                     | 1. HPP "Boskov Most" on Mala River<br>Installed capacity 68,2 MW; - Medium annual generation 117,54 GWh (EBRD and MEPSO financing); preparation of FS and ESIA undergoing.   | 70  |
|   |                     | 2. HPP "Cebren" (with indicative total installed capacity of 333MW) and HPP "Galiste" (with indicative total installed capacity of 193,5MW) – private investors – tender on going.   | 340<br>(The indicative investment value of the Cebren HPP ) |
|   |                     | 3. 12 HPP's on the river Vardar; total installed capacity of the objects is envisaged to be 325MW, and the total annual generation of electricity 1050 GWh. These were tendered in 2009, but the investor(s) is not yet selected.  | 200<br>(The indicative investment value of the Galiste HPP) |
|   |                     | 810<br>(The total estimate HPPs and the displacement of the railway)   |   |
| RES                                       | Electricity Grid    | ▪ New H/V transmission lines   |   |
|   |                     | 1. 400 kV OHTL Interconnection Serbia/ Nis<br>– FYRO Macedonia/Stip : 70 km on Macedonian side up to SS Stip and total length is 145 km on Serbian side; the line was completed on Serbian territory to the border, including substations and will start construction in 2011 on the FYRO Macedonia territory. | 15<br>(For the line in the FYRO Macedonia)                  |
|   |                     | 2. 400 kV OHTL interconnection FYRO Macedonia – Albania; the feasibility study and ESIA will be prepared in 2011, under the WBIF technical assistance.   | 40<br>(Investment cost estimate)                            |
|   |                     | ▪ Upgrading and expansion of existing grid   | Cost estimates not available; procurement through EBRD      |
| RES                                       |                     | 1. Rehabilitation of S/S 220/110/35 kV Skopje 1 with Supply and Installation of a new Control System on 110 kV level and replacement of the existing 110 kV protection system  |   |
|   |                     | 2. Rehabilitation of S/S 400/110 kV Bitola 2 with Supply and Installation of the new Control System and replacement of the existing 400 kV and 110 kV protection systems   |   |
|   |                     | ▪ Small Hydro  | 60  |
|   |                     | ▪ Wind farms   | -   |
|   |                     | ▪ Photovoltaics  | 25  |
|   |                     | ▪ Concentrated Solar Power   | -   |
|   |                     | ▪ Biomass (including liquid biofuels)  | 5   |
| ▪ Geothermal                              | -                   |  |   |
| ▪ Solar Water Heating                     | 25                  |  |   |
| <b>Total Estimated Investment by 2020</b> |                     |  | <b>1,850</b>  |

Table: 14.9

## COUNTRY ENERGY INVESTMENT INFORMATION

## MONTENEGRO

Contributor(s): Mr. Aleksandar Mijuskovic

| Project Sector                             |                                     | Description  | Investment Estimate in Million Euros              |
|--|-------------------------------------|--|---|
| OIL  | Upstream                            | ▪ Field Exploration  | 200   |
|  |                                     | ▪ Development of new oil and gas wells   | -   |
|  | Downstream                          | ▪ Refining   | 300   |
|  |                                     | ▪ Loading Terminals  | -   |
|  |                                     | ▪ Storage facilities   | 50  |
|  |                                     | ▪ Crude / Product Pipeline(s)  | -   |
| GAS  | Country Gas Network                 | ▪ Grid expansion   | -   |
|  |                                     | ▪ Main intra country pipeline(s)   | -   |
|  |                                     | ▪ Storage facilities   | -   |
|  |                                     | ▪ LNG terminal(s)  | -   |
| ELECTRICITY                                | Power Generation                    | ▪ Lignite  | 1,200<br>(TPP 500 MW + coal mine Maoce)           |
|  |                                     | ▪ Coal   | 300<br>(TPP 110 MW + coal mine Berane)            |
|  |                                     | ▪ Gas  | -   |
|  |                                     | ▪ Nuclear  | -   |
|  |                                     | ▪ Large Hydro  | 540   |
|  |                                     | - (HPP on Moraca river 238 MW – Andrijevo, Raslovici, Milunovici, Zlatica)           | 170   |
|  | - (HPP Komarnica 168 MW)            | 170  |   |
|  | Electricity Grid                    | ▪ New H/V transmission lines   | 750<br>(AC/DC connection to Italy)                |
| ▪ Upgrading and expansion of existing grid |                                     | 50   |   |
| RES  | Small Hydro                         | - (concession given for 33 small hydro to be built, with approximate power of 95 MW) | 140   |
|  |                                     | ▪ Wind farms   | 150<br>(Agreements signed, wind farms cca 100 MW) |
|  |                                     | ▪ Photovoltaics  | 80  |
|  | ▪ Concentrated Solar Power          | -  |   |
|  | Biomass (including liquid biofuels) | ▪ Geothermal   | 10  |
| ▪ Solar Water Heating                      |                                     | 20   |   |
|  |                                     |  |   |
| <b>Total Estimated Investment by 2020</b>  |                                     |  | <b>3,960</b>                                      |



Table: 14.9

## COUNTRY ENERGY INVESTMENT INFORMATION

## MONTENEGRO

Contributor(s): Mr. Aleksandar Mijuskovic

| Project Sector                             |                                     | Description  | Investment Estimate in Million Euros              |
|--|-------------------------------------|--|---|
| OIL  | Upstream                            | ▪ Field Exploration  | 200   |
|  |                                     | ▪ Development of new oil and gas wells   | -   |
|  | Downstream                          | ▪ Refining   | 300   |
|  |                                     | ▪ Loading Terminals  | -   |
|  |                                     | ▪ Storage facilities   | 50  |
|  |                                     | ▪ Crude / Product Pipeline(s)  | -   |
| GAS  | Country Gas Network                 | ▪ Grid expansion   | -   |
|  |                                     | ▪ Main intra country pipeline(s)   | -   |
|  |                                     | ▪ Storage facilities   | -   |
|  |                                     | ▪ LNG terminal(s)  | -   |
| ELECTRICITY                                | Power Generation                    | ▪ Lignite  | 1,200<br>(TPP 500 MW + coal mine Maoce)           |
|  |                                     | ▪ Coal   | 300<br>(TPP 110 MW + coal mine Berane)            |
|  |                                     | ▪ Gas  | -   |
|  |                                     | ▪ Nuclear  | -   |
|  |                                     | ▪ Large Hydro  | 540   |
|  |                                     | - (HPP on Moraca river 238 MW – Andrijevo, Raslovici, Milunovici, Zlatica)           | 170   |
|  | - (HPP Komarnica 168 MW)            | 170  |   |
|  | Electricity Grid                    | ▪ New H/V transmission lines   | 750<br>(AC/DC connection to Italy)                |
| ▪ Upgrading and expansion of existing grid |                                     | 50   |   |
| RES  | Small Hydro                         | - (concession given for 33 small hydro to be built, with approximate power of 95 MW) | 140   |
|  |                                     | ▪ Wind farms   | 150<br>(Agreements signed, wind farms cca 100 MW) |
|  |                                     | ▪ Photovoltaics  | 80  |
|  | ▪ Concentrated Solar Power          | -  |   |
|  | Biomass (including liquid biofuels) | ▪ Geothermal   | 10  |
| ▪ Solar Water Heating                      |                                     | 20   |   |
|  |                                     |  |   |
| <b>Total Estimated Investment by 2020</b>  |                                     |  | <b>3,960</b>                                      |



## Energy Policy Implications

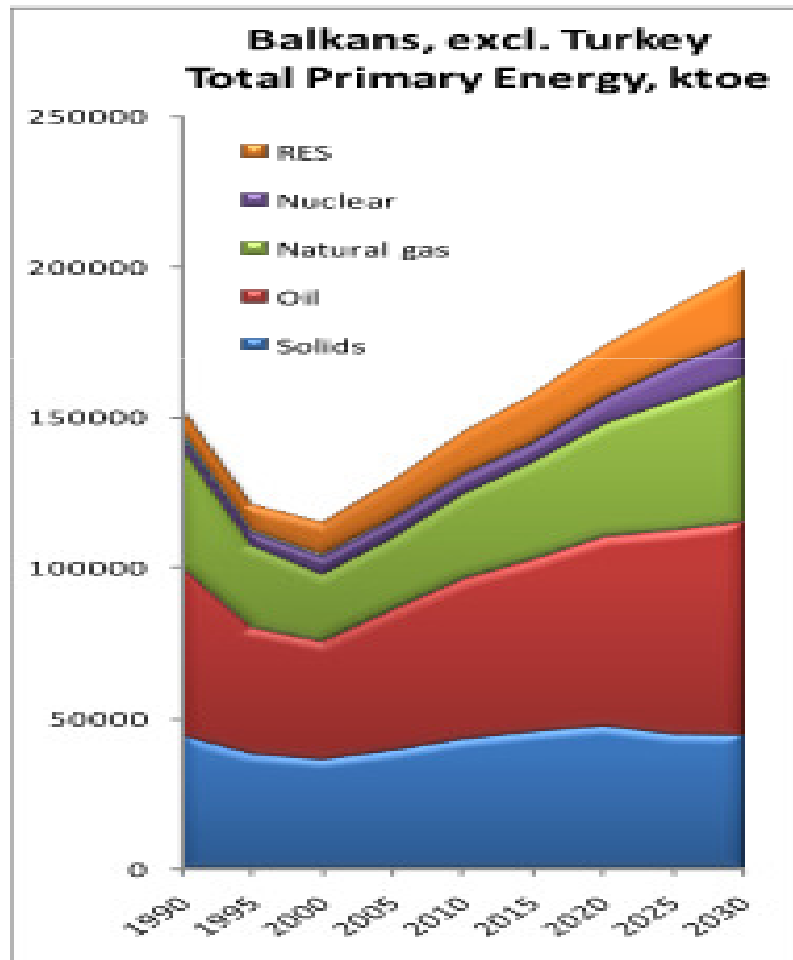
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- Rising energy demand over the next 10 years but at a much slower pace than previously forecasted
- Continuing strategic relevance of coal
- Urgent need to replace antiquated and low efficiency thermal electricity plants
- Inadequate progress in electricity and gas market liberalization
- Very high net hydrocarbon import dependence and unsatisfactory import diversification.
- Need to increase indigenous oil and gas output and explore for new fields.

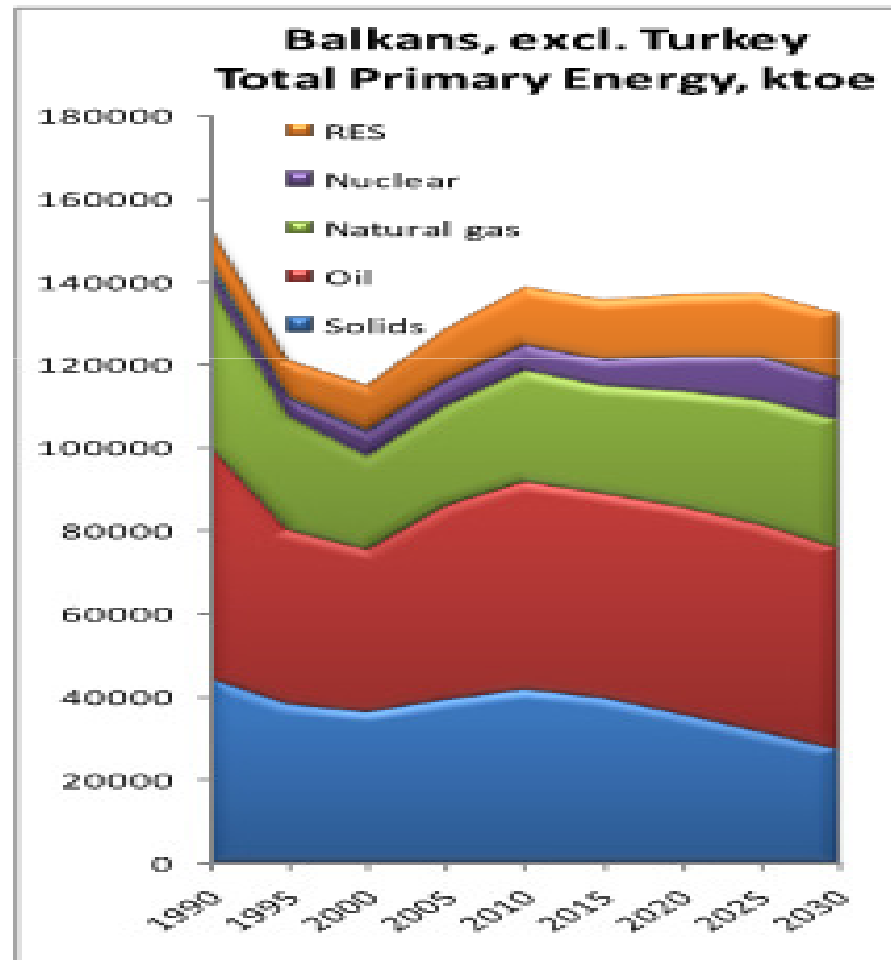


# Primary Energy Consumption 1990-2030

View 2 years ago



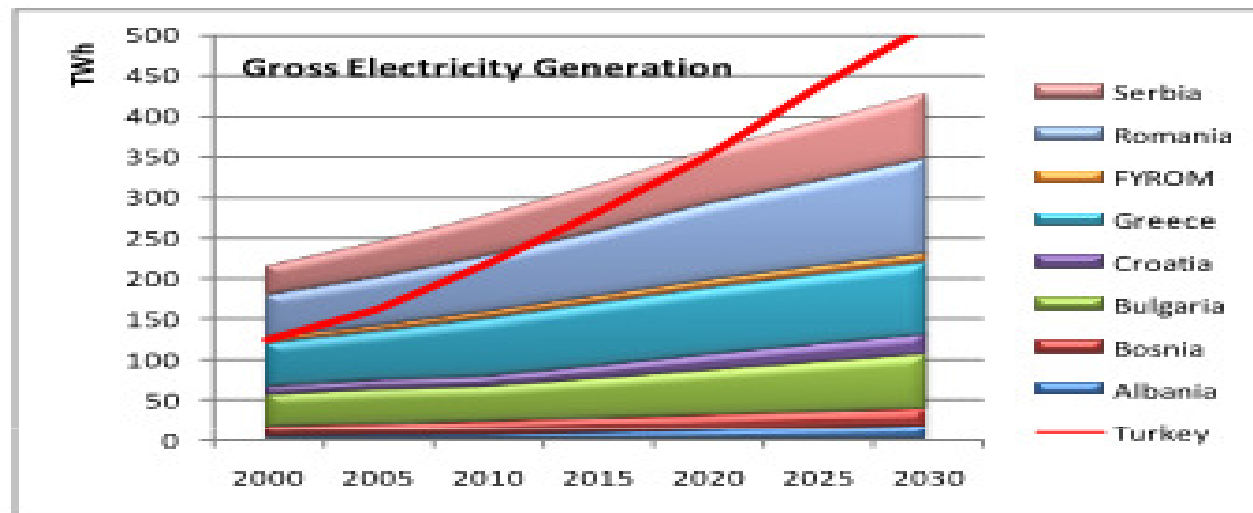
Current View



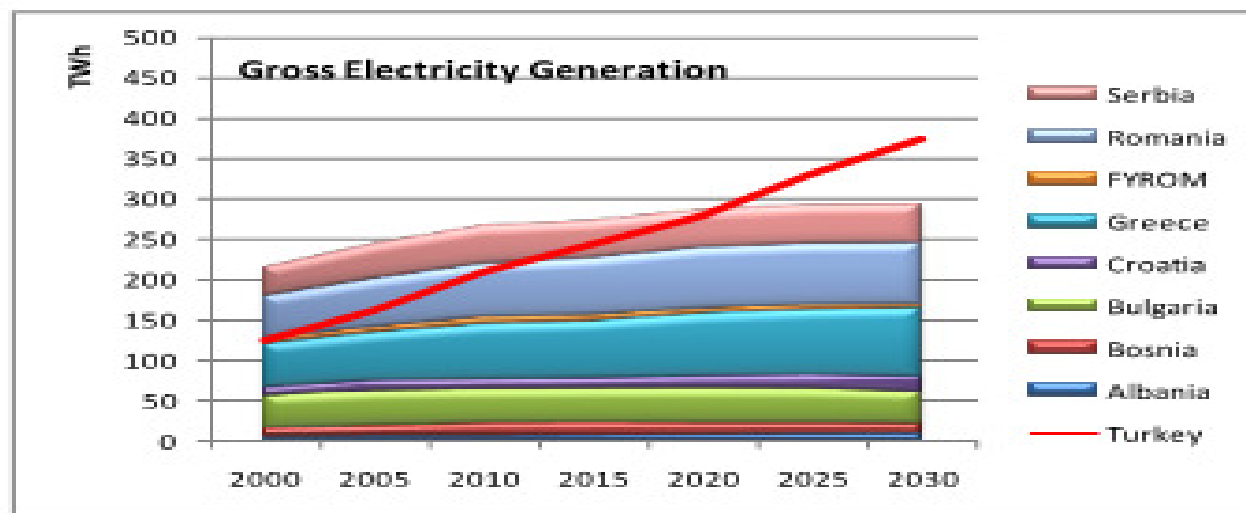
Source: EC3 Lab, NTUA

# Electricity Generation in SE Europe (2000-2030)

View  
2 years ago



Current  
View



Source: EC3 Lab, NTUA



## Concluding Remarks – SE Europe Key Energy Challenges

- Need to replace and upgrade old and outdated refinery complexes
- Present underdevelopment of R.E.S combined with newly introduced incentives will lead to massive investments and significant penetration by 2020/2030
- Low infrastructure inter- connectivity in oil & natural gas
- Need to complete main gas interconnectors in all SE European countries.
- Priority must be given to the construction of key inter-regional oil pipeline projects (i.e. BAP, TAPCO)



## Concluding Remarks (continued)

### SE Europe Key Energy Challenges

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- Plans for the construction of South Gas Corridor projects must be accelerated so that new gas pipelines are in place by 2020, in order to meet rising European gas demand and help with diversification of supplies
- Azerbaijan has key role to play as supplier and prospective hub for European gas supply
- Cyprus and Israel are fast emerging as major potential gas suppliers to Europe
- Positive investment climate with East Balkans and Turkey far ahead compared to Western Balkans in terms of actual investments and potential.
- Underlying substantial energy related investment potential in Western Balkans
- Need to identify and describe in detail energy infrastructure investment potential in Western Balkans



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**Thank you for  
your attention**

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