



- **Unconventional Use of Coal – European activities and R&D needs**

Dr. Marion Wilde

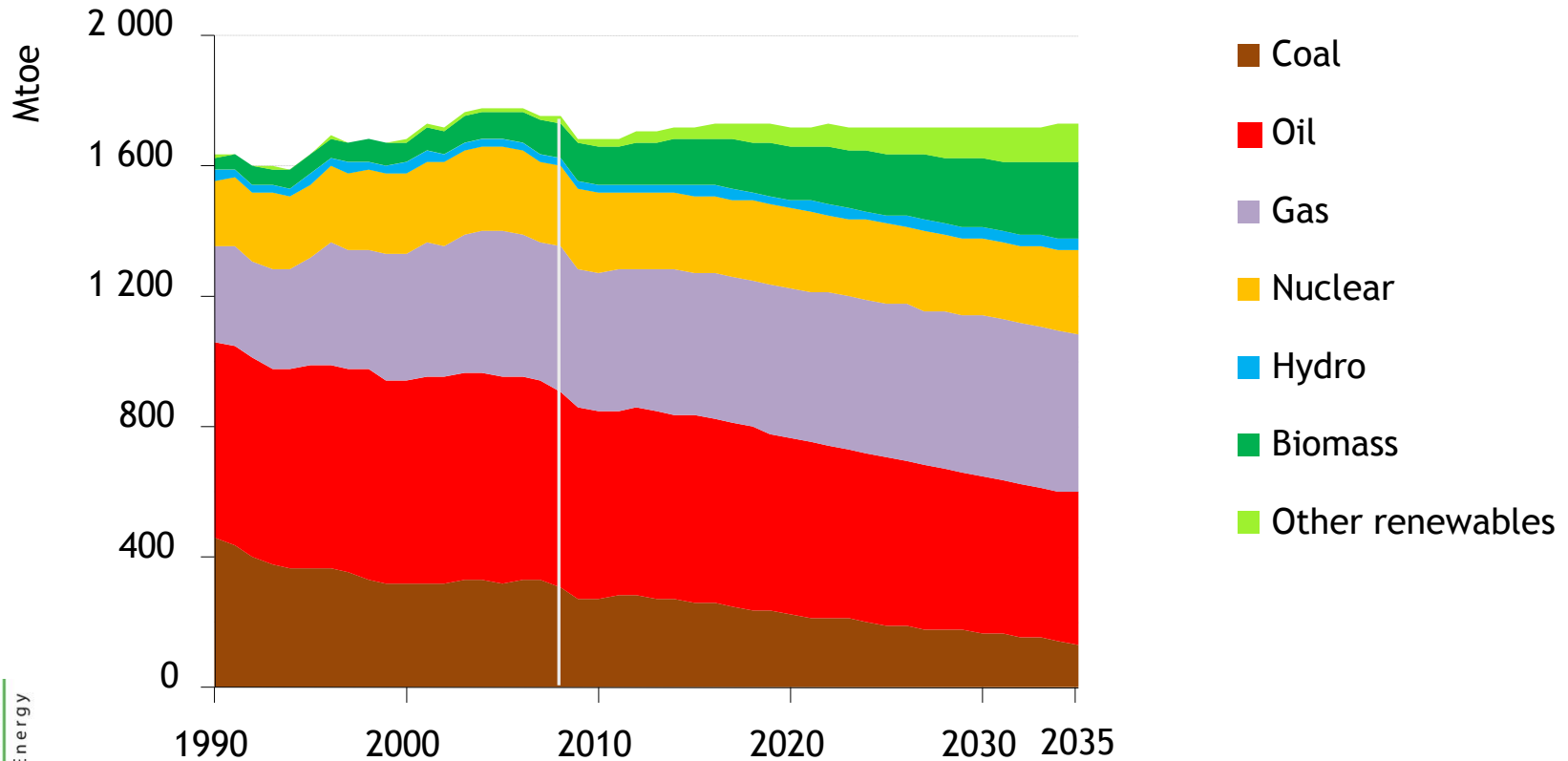
Society of Mining Professors – 22nd Annual General Meeting

12- 15 September 2011, Arequipa, Peru

● The role of coal in the EU

- EU is the fourth largest consumer behind China, USA and India
- Coal represents 17% of EU-27 total energy consumption; 27% of the power generation is based on coal
- 62 % of EU's solid fuel supply in 2010 was indigenous – main hard coal suppliers Russia, Colombia, South Africa, Australia and Indonesia
- EU coal production in 2010:
 - » 403 Mio t brown coal/lignite (99 % of total EU lignite consumption)
 - » 130 Mio t hard coal (46 % of total EU hard coal consumption)
- Coal industry important employer (260 000) and major component in a number of regional economies
- **Coal scores high on security of supply and competitiveness. The environmental sustainability of coal use remains a challenge.**

EU energy mix



European Union primary energy demand by fuel in the New Policies Scenario of the IEA World Energy Outlook 2010

© OECD/IEA 2010

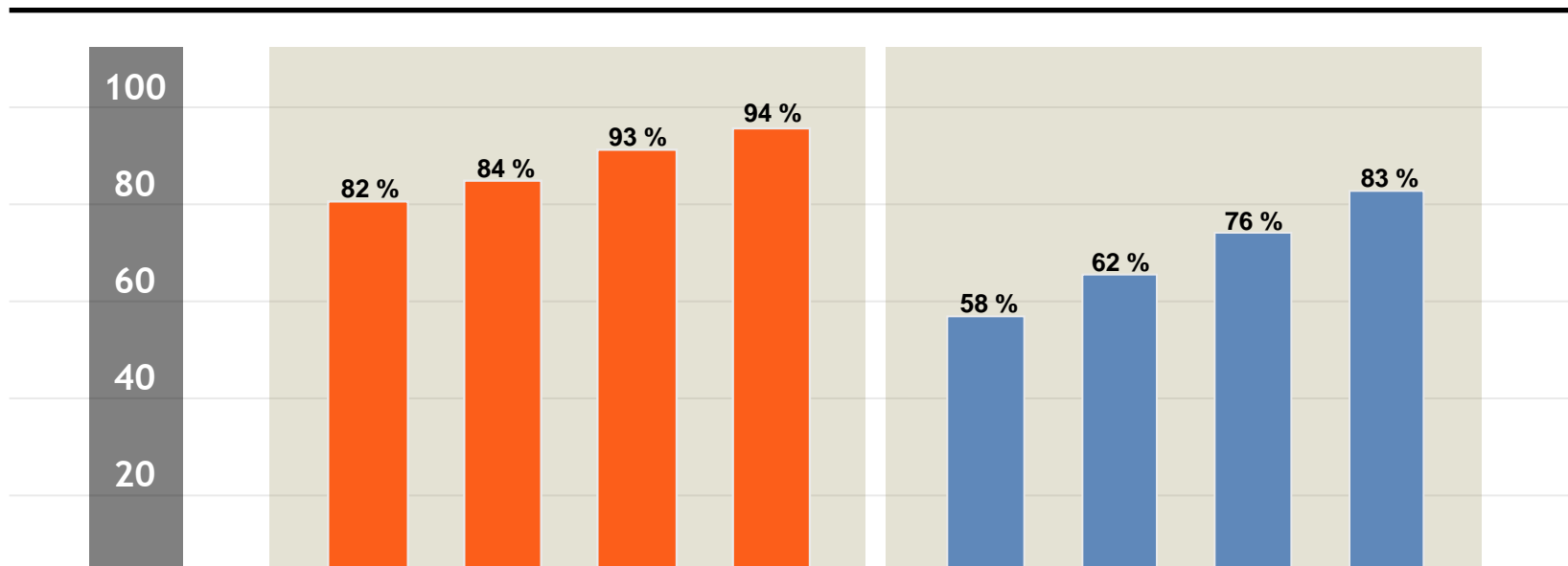
Import dependency

in %

OIL

GAS

2005 2008 2020 2030 2005 2008 2020 2030



« Business as usual » scenario based on 2009 figures

Today, Europe imports more than half of the energy it uses. If nothing changes, EU dependence on fossil fuel imports will rise by 2030.

Objectives of EU Energy Policy

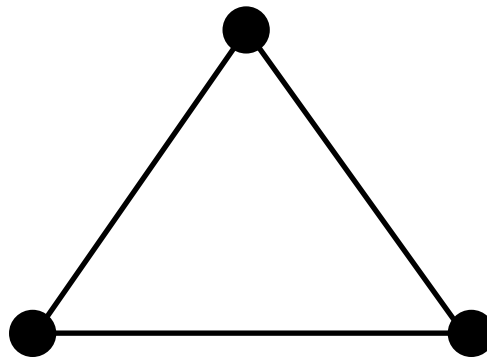
- Goal: To ensure that European businesses and consumers obtain **safe, secure** and **sustainable** energy at **competitive prices**.

- Internal Market
- Networks and other Infrastructure
- Research & Innovation

- Climate change control
- Environmentally friendly production and combustion

Sustainability

Competitiveness



- International Dialogue
- Diversification
- Best use of indigenous fuels

Security of supply



Second Strategic Energy Review

Best Use of Indigenous Fossil Fuels

- It recognised the potential contribution of EU's indigenous energy resources to energy security (reduced import dependency)
- Coal remains an essential component of EU domestic energy supply
- **Long-term use of coal requires:**
 - » Highly-efficient plants and wide availability of CCS
 - » Competitive and environmental acceptable coal production
 - » Use of domestic potential of unconventional fossil fuels

● Best Use of Indigenous Fossil Fuels

- Continued competitive hard coal and lignite mining
- Berlin Fossil Fuels Forum and Indigenous Fossil Fuels working group
 - » Good practice sharing, e.g. on environmental issues
 - Backing of initiatives by industry
 - Dissemination of Member State good practices
 - Workshop on surface mining May 2011
 - » Use of unconventional fossil fuel resources like UCG, CBM and shale gas
 - » Transparency of EU coal inventory - EU map of coal resources and CBM potential

● Assessing the Potential

- “In order to further enhance its security of supply, Europe’s potential for sustainable extraction and use of conventional and unconventional (shale gas and oil shale) fossil fuel resources should be assessed.”[European Council 4. Feb. 2011]
- Assessment of economically recoverable potential of unconventional gas – longterm and common effort
 - » Following ongoing projects
 - » Many explorations in EU just started
 - » Member State Assessments
- JRC literature study focusing on economic impact
 - » Review of the evidence

● Assessing Environmental Impact

- Exchange with US
 - » Agreed at EU US Energy Council Nov. 2010
 - » US country with extensive experience
 - » First activity: conference on 14 March 2011
<http://www.acus.org/event/european-unconventional-gas-developments>
- Legal Study on unconventional gas (Oct. 2011)
 - » Analyse the application of relevant EU legislation during the licensing and permitting of shale gas projects (final report due in October 2011)
 - » Based on cases in selected Member States
 - » Possible good practices

● Underground Coal Gasification

- Research and pilot projects in UK, Spain and Poland – partly with public funding
- RFCS project HUGE – Hydrogen Oriented UCG with 11 partners
 - » Modelling and simulations of the geo-reactor
 - » Protection of deep water resources against pollution
 - » Laboratory test and in-situ experiments at 15m depth in coal mine in Spain
 - » 2 stages gasification in ex-situ reactor (oxygen and steam) in 3 experiments
 - » Successful trial to control gas composition and to obtain up to 40 % of hydrogen (heating value 2,5 – 10 Mj/m³)
 - » Later stage (outside HUGE) pilot project of UCG via super daisy shaft in a 15km² circular area

http://cordis.europa.eu/search/index.cfm?fuseaction=proj.document&PJ_RCN=10102759

● Underground Coal Gasification

- Challenges and R&D needs:
 - » Unproven performance at large scale
 - » Seam/site characteristics - low data available
 - » Operation and control of a dynamic geo-reactor
 - » Safety problems (avoiding of gas explosions)
 - » Environmental assessment – contaminating of ground water
 - » Licensing and permitting issues
 - » UCG with CCS - Capture of carbon and other contaminants
 - » Permanent storage of CO₂ in the affected area (new RFCS project)
 - » Skills and training – competent authorities

● Coal Bed Methane

- Research and pilot projects in Germany, Belgium, UK and Poland – partly with public funding – small scale CBM is proven in UK
- CBM funding possible by RFCS – several CMM projects
- Challenges and R&D needs:
 - » New Multi-lateral drilling and completion technology to release the gas trapped in coal
 - » Maximise economic recovery by lower permeability coals – UK Carboniferous coal (US Cretaceous and Tertiary coals)
 - » Environmental consistent methods (impacts of hydraulic fracing on formation water, water treatment etc)
 - » Suitable stimulation methods (e.g. Multi-Fracs)
 - » Georisk management
 - » Licensing and permitting issues – acceptance

● Coal to Chemicals – Polygeneration

- Research and pilot projects in Germany, Czech Republic and Poland, UK – IGCC project Hatfield
- CTC funding possible by RFCS – Polygeneration with CCS by FP7
- Challenges and R&D needs
 - » Identification and quantification of components of coal
 - » Selective mining – integrated management
 - » Process orientated coal molecular structure (modelling ect)
 - » Polygeneration – coal gasification combined with CCS
 - » CO2 low coal conversion and CO2 utilisation in the process (new FP 7 call: Chemicals and other products from CO2)
 - » High capital costs – replace oil as feedstock

● Clean Coal and CCS Technologies under Research Framework Programme FP 7

- Funding CCS and Clean Coal Technologies (CCT) to support early demonstration, prepare for commercial deployment, address public awareness
- New Calls 2012 Working programme published on 20 July 2011
 - » Area 5, CCS: capture technologies, storage site development and public awareness
 - » Area 6, CCT: efficiency increase in power production with a view on CCS
 - » Area 5&6, cross cutting: integrated concepts of highly efficient power plants with CCS

Future Research and Innovation Funding

- **Research Fund for Coal and Steel (RFCS)**

- » Budget of **~15 M€/year** on industrial research for coal
- » **Covers the entire value chain, from coal mining operation, conversion and processing, CBM, CMM and CTL (CTC)**
- » **Open call** for proposals, cut-off date 15th September every year
- » Flagship projects includes COMPTES700 (test facility for 700C power plant; 15Mio Euro); ECLAIR (emission free chemical looping; 6.4Mio Euro) and HUGE (underground coal gasification; 3.1Mio Euro)
- » More details on: <http://cordis.europa.eu/coal-steel-rtd/>

- **EuropeAid Call on CCT/CCS (EuropeAid/129199/C/ACT/Multi)**

- » Capacity building and studies on CCT & CCS in India, Indonesia, Kazakhstan, the Russian Federation, South Africa and Ukraine
- » Two 1M€ capacity building programmes to promote clean coal technologies and CCS in India

● Future Research and Innovation Funding

- Research and innovation: Common Strategic Framework (CSF) for Research and Innovation – “Horizon 2020”
http://ec.europa.eu/research/horizon2020/index_en.cfm?pg=home
- Build upon the successes of the current Framework Programme for Research (FP7), the Competitiveness and Innovation Framework Programme (CIP) and the European Institute of Innovation and Technology (EIT).
- February 2011 - Publication Green Paper ‘Towards a Common Strategic Framework’
- November 2011 – proposed date for adoption by the European Commission of the draft legislative proposal for Horizon 2020

Summary

- With the right policies and innovative technologies we are confident that coal can maintain an important role in the European energy mix
- Best use of indigenous conventional and unconventional fossil fuels important
 - Economically viable potential unclear
 - R&D challenges – large scale
 - Environmental concerns: credible answers needed
 - Public awareness and perception is important
- EU has legal framework in place
 - Member States have to ensure appropriate licensing and permitting regimes
- Important: Innovative companies and authorities – skills!

Disclaimer: This presentation is not an official position of the European Commission. Should you wish to obtain a political statement or for media related purposes please contact the Commission's press service or the Commissioner's spokesperson.