EU AT

International Conference within the Austrian EU Presidency

ENERGY PATHS – HORIZON 2050

Thursday, 16th March 2006
Palais Auersperg
Vienna, Austria

BUNDESMINISTERIUM für WIRTSCHAFT und ARBEIT

bmvit
Federal Ministry
for Transport,
Innovation and Technology

ENERGY PATHS – HORIZON 2050

Vienna, March 16th, 2006

BUNDESMINISTERIUM für WIRTSCHAFT und ARBEIT

The current President of the EU Energy Council welcomes you to this International Conference

Dr. Martin Bartenstein
Austrian Federal Minister
of Economics and Labour

e2050 NACHHALTIGwirtschaften

WELCOME

to the International Conference within the Austrian EU Presidency

ENERGY PATHS - HORIZON 2050

bmvit Austrian Federal Ministry for Transport, Innovation and Technology

e2050 NACHHALTIGwirtschaften

- Rising oil prices
- Gas supply crisis
- Grid breakdowns
- CO_2 issues
- Worldwide increasing energy consumption

More Research and Development for a Sustainable Energy System

bmvit Austrian Federal Ministry for Transport, Innovation and Technology

ENERGY PATHS – HORIZON 2050

The international conference "Energy Paths – Horizon 2050" is organised within the Austrian EU presidency in the first half of the year 2006. The conference aims at strengthening the long-term energy perspective of the EU with a clear view to achieve a sustainable and secure energy future that is based on the implementation of appropriate technologies.

The identification of crucial factors that are going to affect the energy system over the next 40- to 50- years is essential when making policy decisions. Exploring and identifying the uncertainties of these factors are therefore critical in order to formulate strategies. Despite the given uncertainties, these strategies have the aim to produce the fewest drawbacks and to provide the greatest benefits for our society.

Through adequate European policy and regulatory framework, policy responses can support the development of a rational mix of the most efficient, environmentally friendly and economical energy technology options in order to approach a sustainable energy system.

Conference Language: English

2050

Programme

09:00 **Welcome and Opening**
Eduard Mainoni, Secretary of State, Austrian Federal Ministry of Transport, Innovation and Technology
Martin Bartenstein, Austrian Federal Minister of Economics and Labour

Session 1 Long-term Policy Perspectives
09:20 **The Energy Future of EU 25+**
Alfonso Gonzalez Finat, European Commission, DG TREN
09:50 **The Role of RTD to achieve sustainable Energy Paths**
Pablo Fernandez Ruiz, European Commission, DG RTD
10:20 **Global Energy Perspectives to 2050 and Beyond**
Nebojsa Nakicenovic, Technical University of Vienna and International Institute for Applied Systems Analysis (IIASA)

10:50 Coffee Break

Session 2 National Perspectives
11:20 **UK's Energy Future – Forming a low Carbon Future**
Graham White, UK Department of Trade and Industry (DTI)
11:45 **Policies to shape an alternative Energy Future in Bulgaria**
Stoyan Todorov, Bulgarian Energy Efficiency Agency (EEA)

12:10 Lunch

Session 3 Industry Perspectives
13:50 **Shell's future sustainable Energy Scenarios**
Wim Thomas, Shell International
14:15 **Balancing the Triangle of Economy, Security and Environment in an open European Energy Market**
Kurt Häge, Vattenfall Europe
14:40 **Future Technologies for Power Generation**
Nick Otter, Alstom Power
15:05 **Financial Impacts of Climate Change**
Jane Milne, Association of British Insurers (ABI)

15:30 Coffee Break

Session 4 Alternative Perspectives
16:00 **Sustainable long-term Energy Perspectives**
Arthouros Zervos, European Renewable Energy Council (EREC)
16:25 **EnR's Vision for a sustainable Energy System**
Havard Solem, European Energy Network (EnR) / Enova

Summary
16:50 Fritz Unterpertinger, Austrian Energy Agency

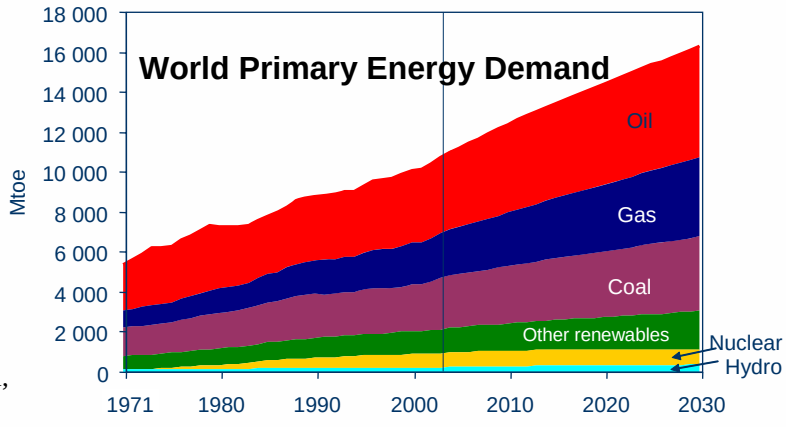
17:00 End of Conference

NACHHALTIGwirtschaften

ENERGY 2050

A Strategy Process has been started

NACHHALTIGwirtschaften



[Laura Cozzi, IEA]

Oil and gas together account for more than 60% of the growth in energy demand between now and 2030 in the Reference Scenario

Austrian Federal Ministry for Transport, Innovation and Technology
www.NachhaltigWirtschaften.at

2050 ??

- What will our energy sytem look like?
- What does that mean for the development of our economy?
- Research and development: What will be needed?

e2050 NACHHALTIGwirtschaften

Austria started a Strategy Process ENERGY 2050

considering

- Longterm perspectives
- Global development
- Ecological framework
- Sociological change
- New technologies

bmvit Austrian Federal Ministry for Transport, Innovation and Technology www.NachhaltigWirtschaften.at

PRIORITIES OF THE AUSTRIAN ENERGY RESEARCH

- Renewable energy resources
- Strategies for efficiency
- Innovative company research
- Strategic fundamental research
- International networking and cooperation

Research issues

- Foresight studies
- Smart grids
- Key technologies
- Renewable energy technologies
- Social innovation, life style
- etc.

e2050 NACHHALTIGwirtschaften

Example 1

- Flexible energy supply model with 100% regional biomass
- Combined heat and power generation
- Biogenic fuels

Energy self-sustaining model Güssing

e2050 NACHHALTIGwirtschaften

Example 2 Production with solar energy

Study on the potential of thermal solar energy systems in trade and industry depending on the production processes

- Identification of production processes and branches
- Determine the potential of solarthermal systems to provide low-temperature heat
- Case Studies: successful realization of a car washing plant „Sun Wash“ in Köflach

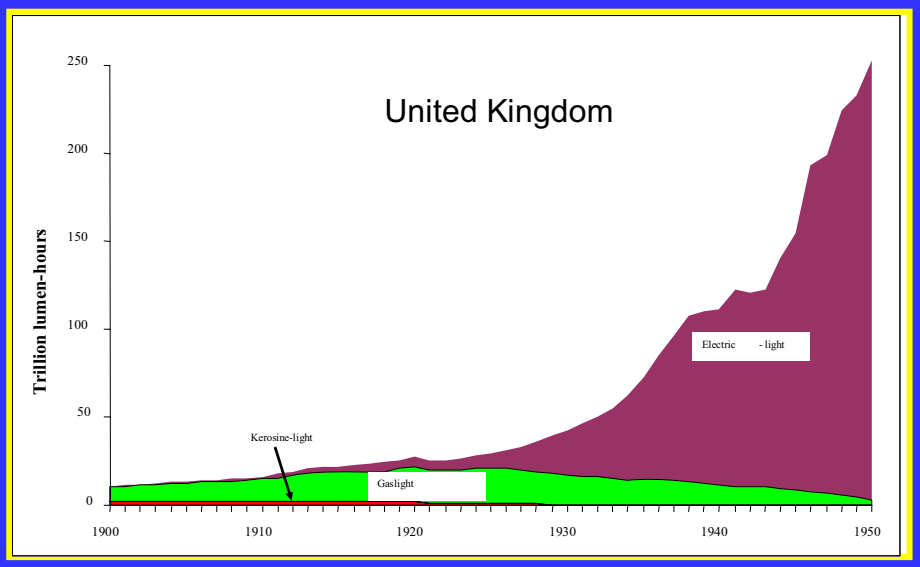
bmvit Austrian Federal Ministry for Transport, Innovation and Technology www.NachhaltigWirtschaften.at

Global Energy Perspectives to 2050 and Beyond

Nebojša Nakićenović
Vienna University of Technology
International Institute for Applied Systems Analysis
naki@eeg.tuwien.ac.at

International Conference within Austrian EU Presidency
Energy Paths – Horizon 2050, Palais Auersperg, Veinna – 6 March 2006

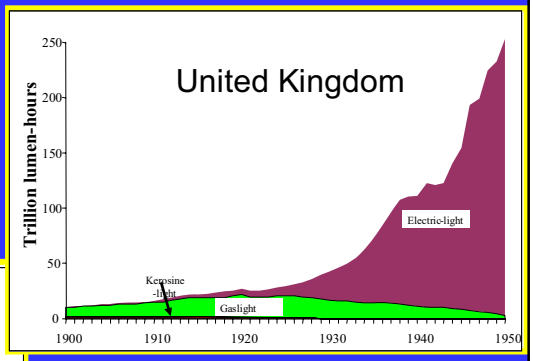
The Example of Lighting

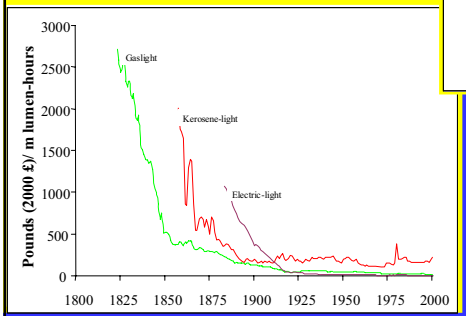


Nakicenovic Source: Fouquet&Pearson (2003) #3 TU 2006

The Example of Lighting

Energy service

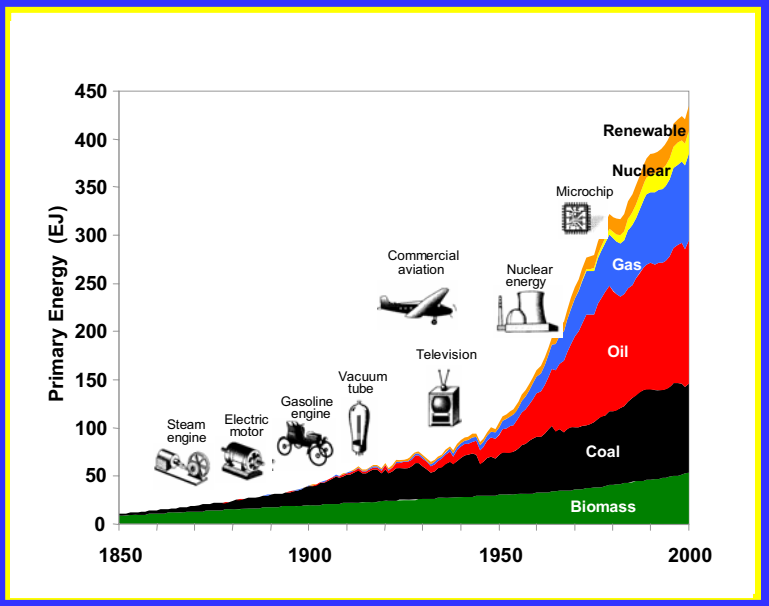




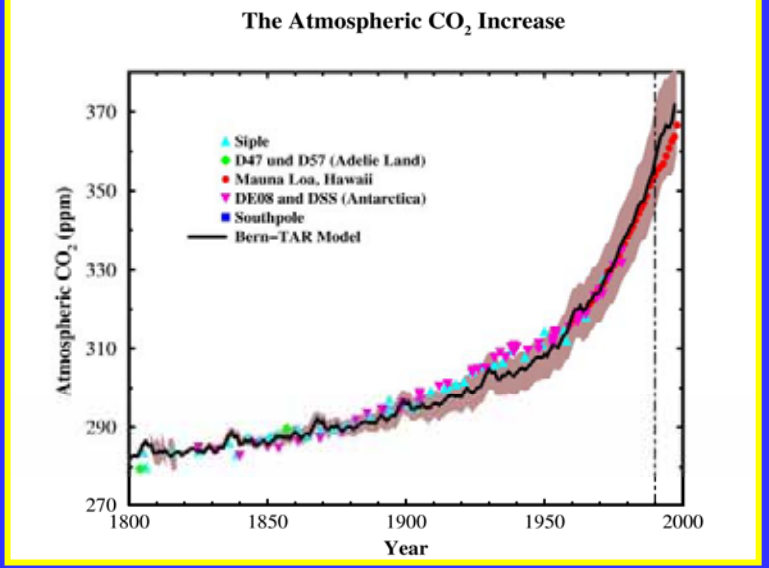
Price

Nakicenovic Source: Fouquet&Pearson (2003) #4 TU 2006

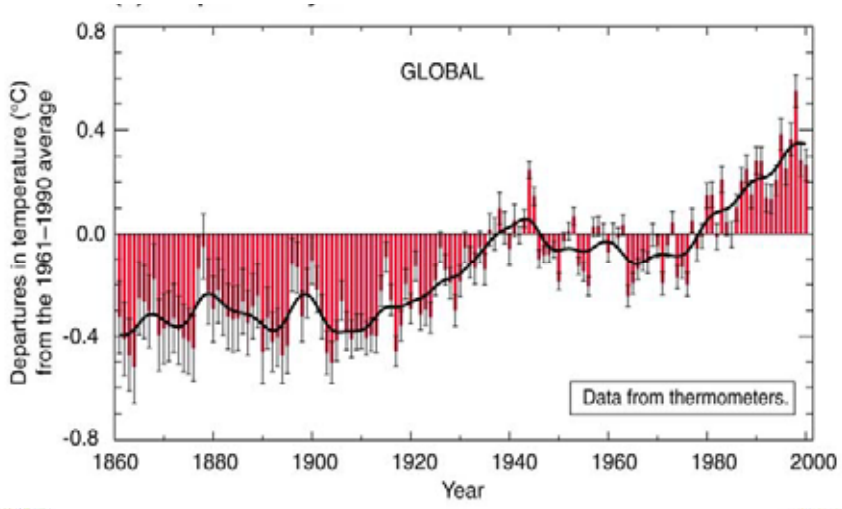
Global Primary Energy



Atmospheric CO_2 Concentration



Variations of the Earth's Surface Temperature
for the past 140 years



WMO INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC) UNEP

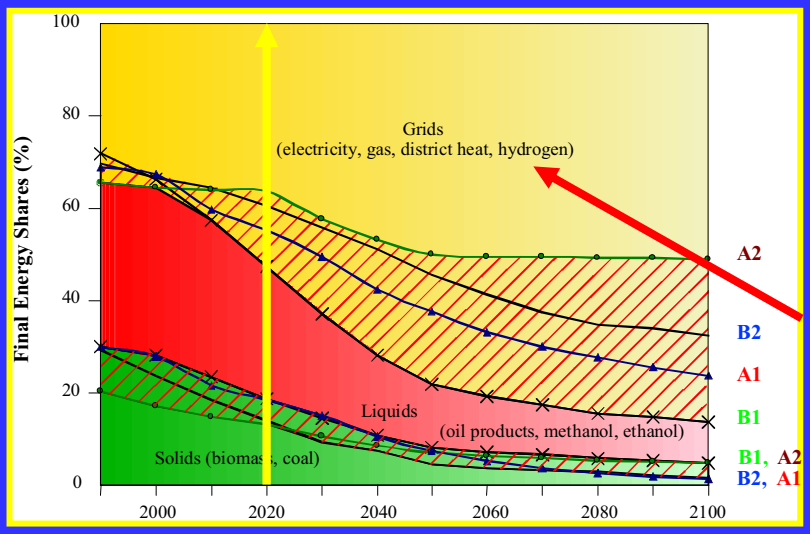
Summary of Scenario Characteristics

	1800	Factor	2000	Factor	2050
Population (billion)	1	x6	6	x1.5	9
GDP (trillion 1990 $)	0.3	x100	30	<x3 x4	85-110
Primary Energy (EJ)	13	x30	420	x1.5 x2.5	600-1040
CO_2 Emissions (GtC)	0.3	x20	6.4	<x1 x3	5-15
Mobility (km/person/day)	0.04	x1000	40	x3 x4	120-160

Nakicenovic #8 TU 2006

Global Final Energy by Form

IIASA IPCC SRES Scenarios



Carbon Reservoirs

Atmosphere 800 GtC (2004)

Biomass
~500 GtC

Soils
~1,500 GtC

N. Gas
~260 GtC

Oil
~270 GtC

Coal
5,000 to 8,000 GtC

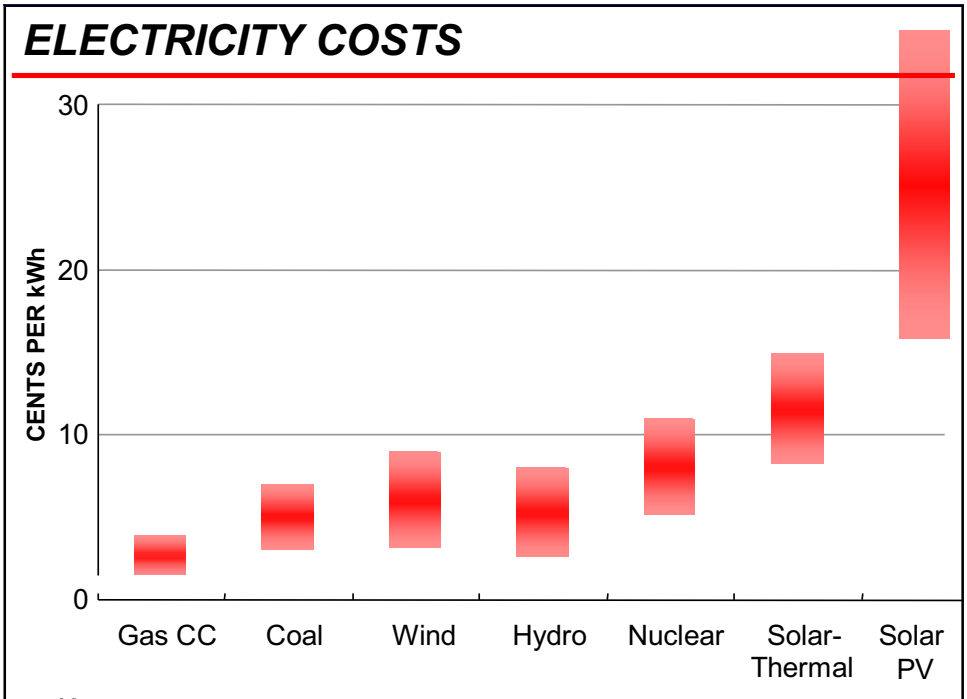
Unconventional Fossil Fuels
15,000 to 40,000 GtC

Source: Edmonds, 2005

Methane Hydrate

Nakicenovic #11 TU 2006

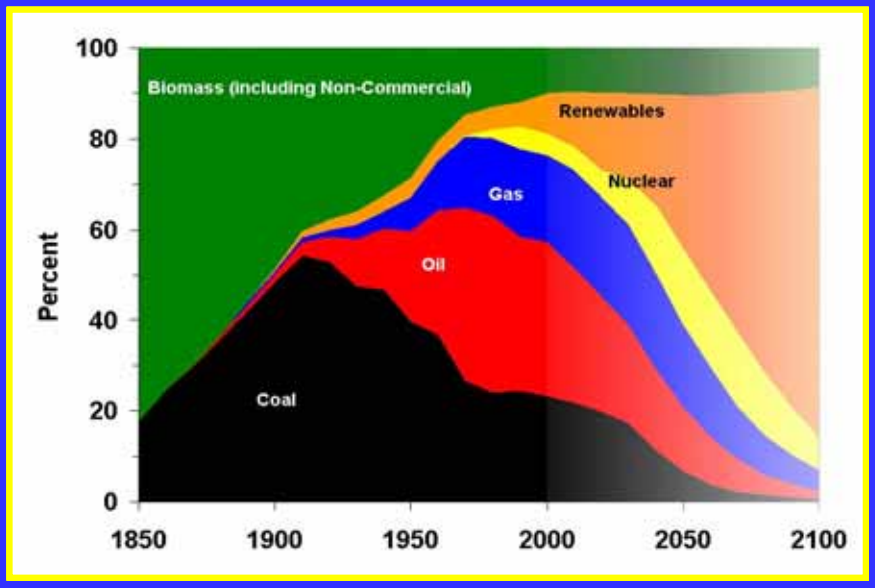
ELECTRICITY COSTS



16

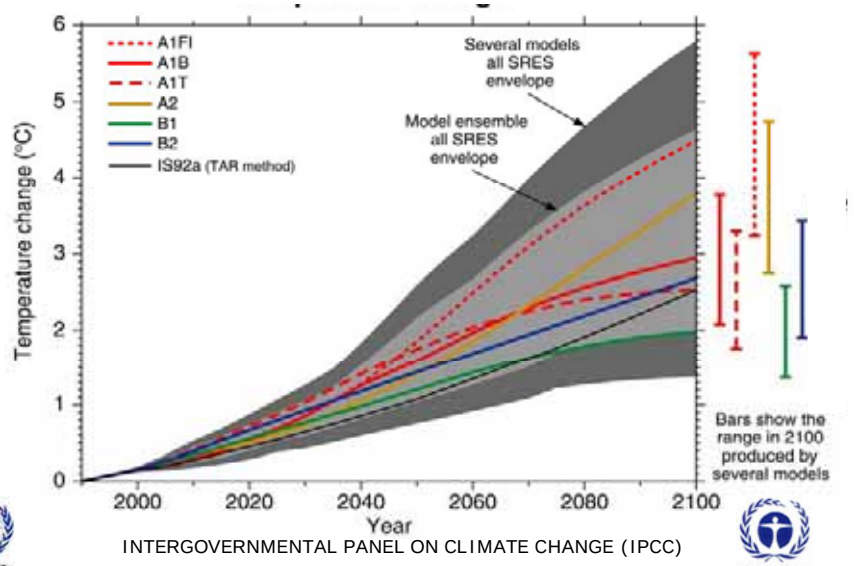
Source: Kheshgi, Exxon Mobil (2002)

Evolution of Global Primary Energy



Global Mean Temperature Change

Six illustrative SRES scenarios, full range



INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC)

WMO UNEP

Decarbonization Strategies

Reduce net carbon emissions to zero

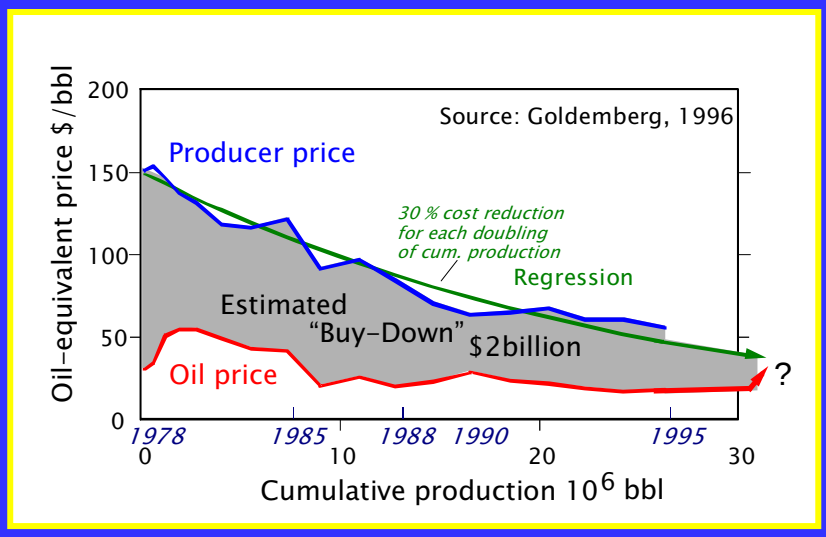
- Improve energy efficiencies & end use
- Introduce zero-carbon technologies
- Decarbonize hydro-carbon sources
  - Store carbon over geological time <0.1%/yr
  - Develop electricity & hydrogen economy

The Innovation Chain

World Energy Assessment

- Research and Development
- Demonstration projects
- Early deployment (cost buy-down)
- Widespread dissemination

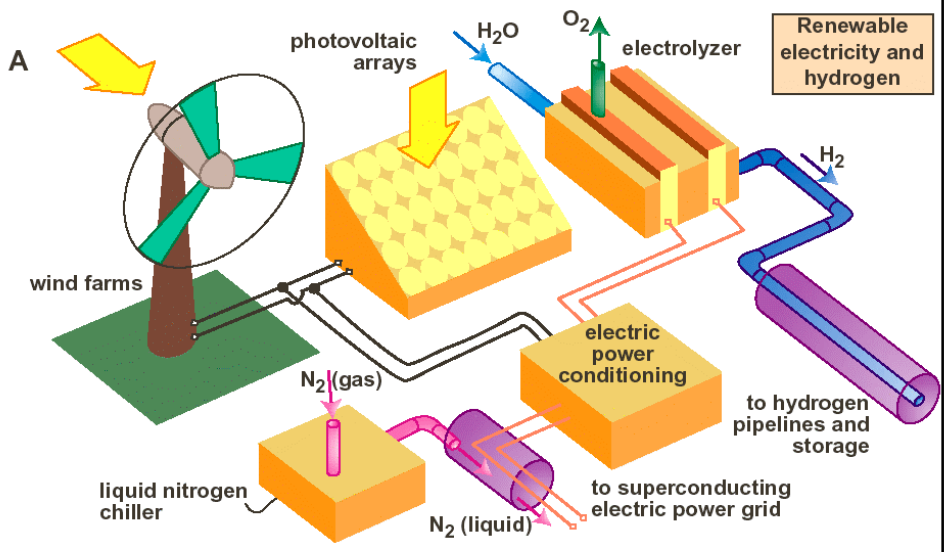
Brazil – Ethanol Learning Curve



Usina Santa Elisa mill in Sertaozinho, Brazil

RENEWABLES

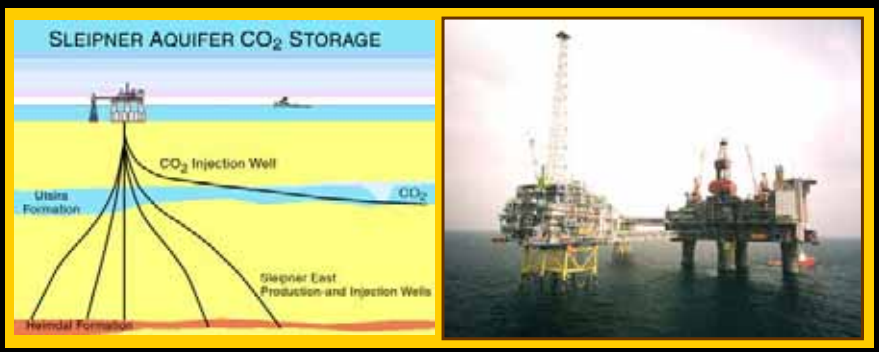
Hoffert et al., Science, 2002



Nakicenovic # 19 IIASA&VUT 2003

Existing and Planned Projects

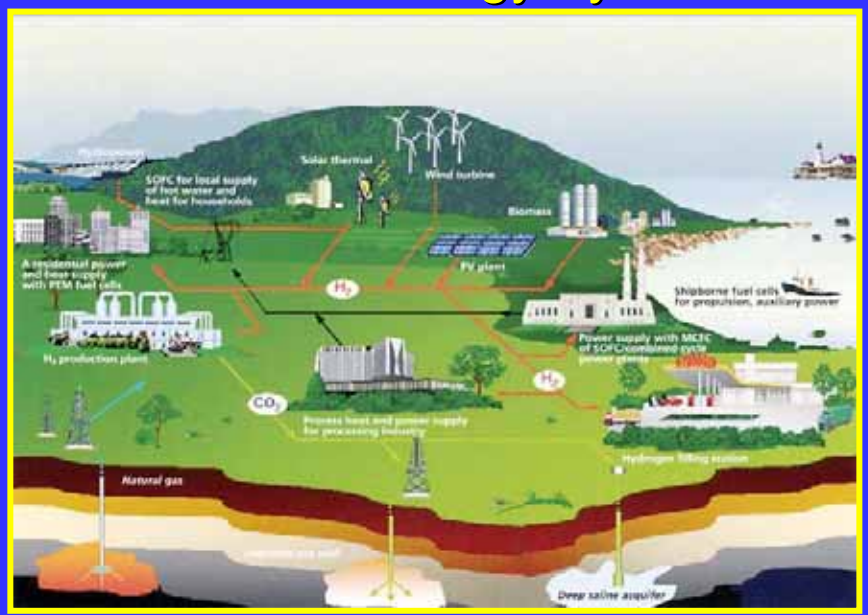
- **Sleipner Project, saline formation, North Sea**
- **Weyburn, EOR, Saskatchewan, Canada**
- **In Salah, gas reservoir, Algeria (development)**
- **Snohvit, off-shore saline formation, North Sea**
- **Gorgon, saline formation, Australia (planning)**



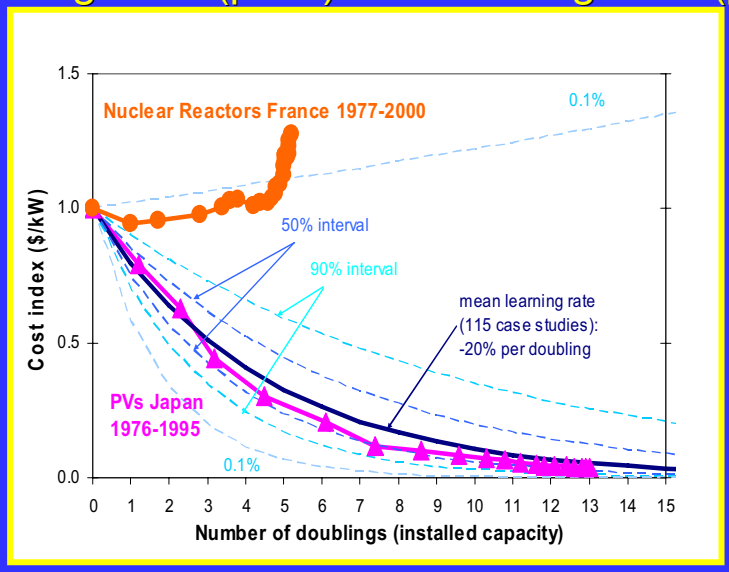
Nakicenovic #20 Source: Sally Benson, 2003

Hydrogen Airplane Design

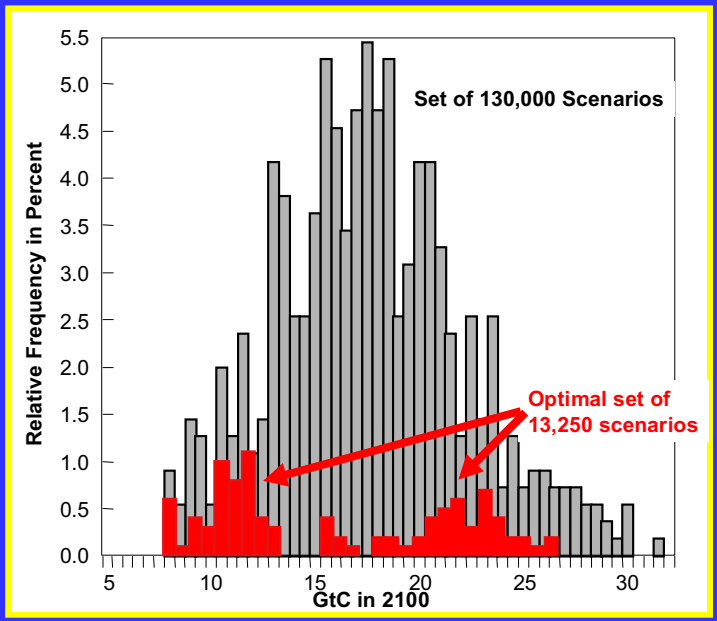
A Future Energy System



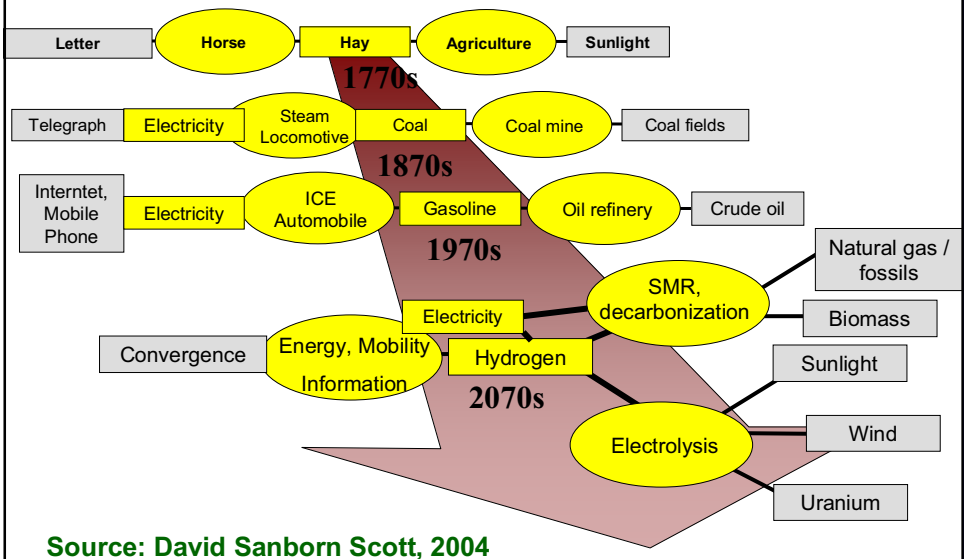
Technological Uncertainties: Learning rates (push) and market growth (pull)



CO_2 Emissions from Scenarios with Technological Uncertainty



Energy Services Through Time



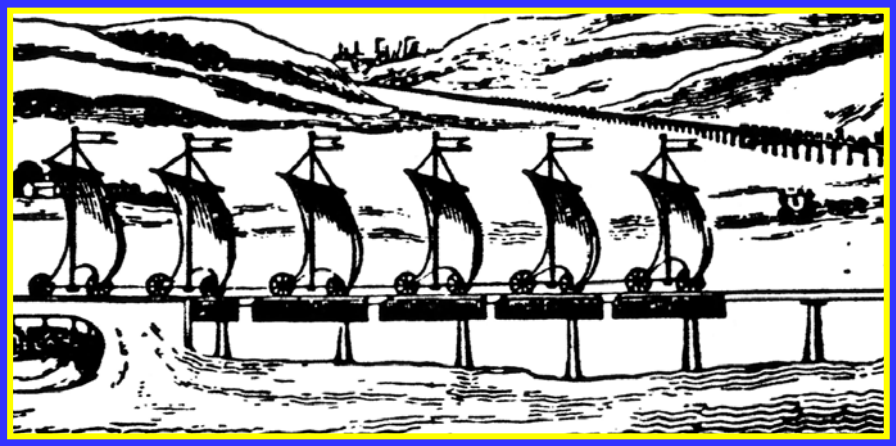
Source: David Sanborn Scott, 2004

Global Energy Assessment:
Towards a more Sustainable Future

- The *magnitude* of the change required is *huge*
- The challenge is to find a way forward that addresses all the issues *simultaneously*
- A paradigm shift is needed: energy end-use efficiency, renewables, new nuclear and carbon capture and storage.

Vision of a Sailing Railway

Monorail using sails proposed by Henry R. Palmer in 1828



Nakicenovic #27 Source: Marshall, 1938

Add as many mail coaches as you please, you will never get a railroad by so doing
Joseph A. Schumpeter

- A new paradigm is needed with convergence of innovative technologies.


naki@iiasa.ac.at

"UK's energy future – towards a low carbon future"

Graham White
Director, Energy Strategy Unit
Department of Trade and Industry

16 March 2006

Today's discussion

- Overview of current energy policy
- The Energy Review
- Progress and challenges on climate change
- Low carbon electricity generation
- Reducing energy demand
- The international challenge

The Energy White Paper set ambitious, complementary goals for the UK

- Getting on a path to cut the UK's CO_2 emissions by 60% by 2050
- Maintaining the reliability of energy supplies
- Promoting competitive markets in the UK and beyond
- Ensuring that every home is adequately and affordably heated

Aim is to achieve these together

3

There has been good progress but further efforts are needed

- The UK has already met its Kyoto target of reducing greenhouse gas emissions to 12½% below 1990 levels.
- Reliability of our gas and electricity systems has improved with a 30% reduction in outages since 1990
- The UK is the most competitive market in Europe with substantial gas infrastructure investment of £10 billion coming forward
- The number of households in fuel poverty fell sharply, from 6½ million to 2 million, between 1996 and 2003
- But we are facing a number of challenges on security of supply, prices, and in meeting our environmental and social objectives

4

Energy Review launched

- Review progress against 2003 Energy White Paper goals
- Look at energy security of supply
  - Growing UK oil and gas import dependency
  - Need to replace 30% of electricity generation capacity (coal and nuclear) in next 15 years
- We will look at what more action we might do to make further progress against our climate change goal
- How to step up progress on energy efficiency
- Risk of rising and volatile prices

5

Energy Review time-scales

- Consultation exercise launched on 23 January, closes 14 April
- Series of seminars, workshops etc
- Review will report to the Secretary of State and Prime Minister in early Summer and Prime Minister has stated that proposals will be brought forward this year
- Parallel work under the Stern Review is looking at the economics of global climate change – report in the Autumn

6

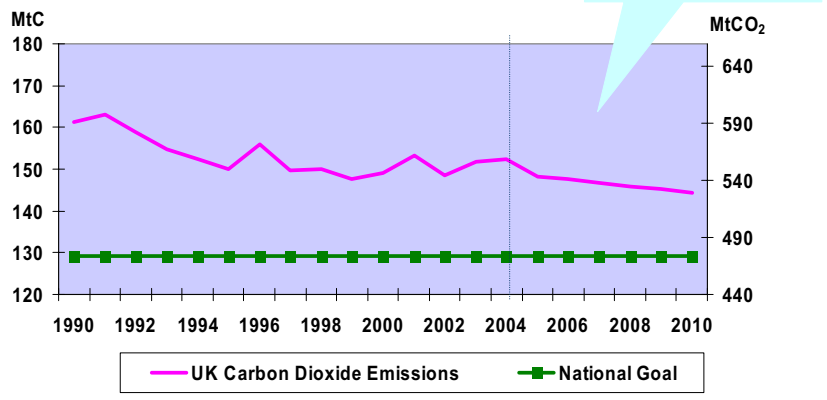
A number of key mechanisms are to contribute to lower CO_2 emissions

Government target for 2010	Key mechanisms (not exhaustive)
Reduce CO_2 emissions from 1990 levels by 20%	• EU ETS • CHP measures • CAT strategy • CO2 from cars
Generate 10% of electricity from renewables	• Renewables Obligation
Deliver savings through energy efficiency	• Energy Efficiency Commitment • Building regulations • Climate Change Agreements • Enhanced Capital Allowances • Fuel poverty programmes

7

Emissions have declined, but reaching the 2010 goal may be a challenge

Historical and projected CO_2 emissions in the UK
MtC, $MtCO_2$



Source: 1990-2004 NETCEN, 2005-2010 DTI Projection

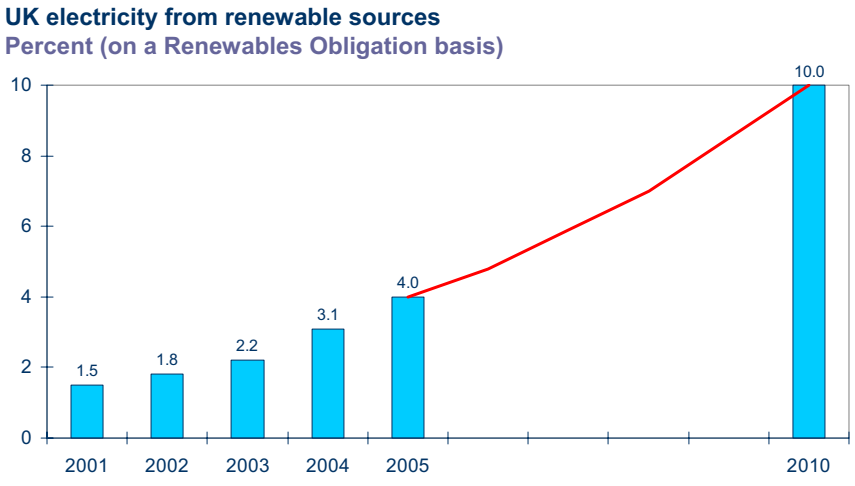
8

EU ETS is key - Phase I launched Phase II taking shape, need to think about Phase III

- Phase I successfully underway, with active trading in carbon allowances. Important to get proper analysis on how Phase I is working
- UK progressing with Phase II National Allocation Plan – currently consulting on emissions projections; intend to issue a draft policy NAP before Easter
- Commission due to review EU-ETS Directive this year. Important that this considers key issues such as greater long term certainty and increased harmonisation

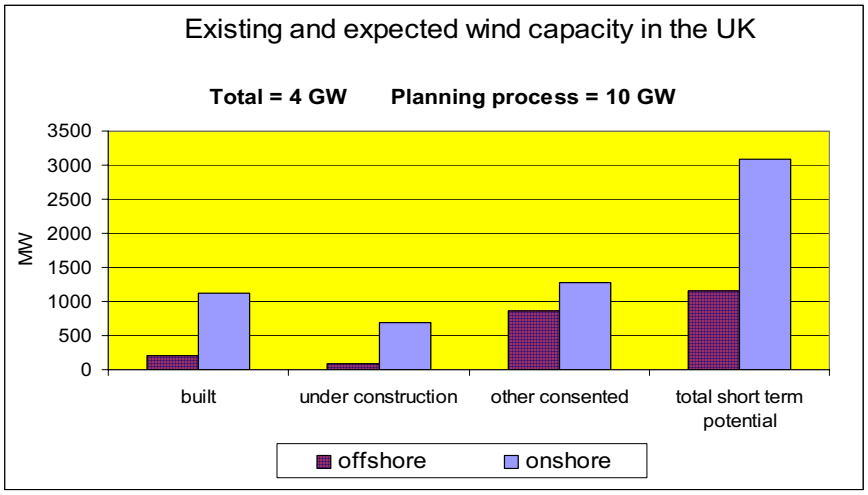
9

An increasing amount of electricity is being generated from renewable sources



10

And new wind generation capacity is being built at a promising rate



11

Other renewable technologies also have a role

- If we wish to meet our renewables goals for 2020 and beyond we must invest in research to realise the full potential of developing technologies, such as biomass, wave and tidal, photovoltaics and the hydrogen economy

- Marine Renewables Deployment Fund (£50 million)
- Bioenergy Capital Grants Scheme (£66 million)
- Low Carbon Building Programme (£30 million)
- Hydrogen Strategy – demonstration programmes for hydrogen and fuel cells (£15 million)

12

But we can also reduce carbon through carbon abatement technologies

- In June 2005 DTI launched a £35 million Carbon Abatement Technology Fund
- Aim to improve the efficiency and co-firing of existing power plant with low carbon alternatives such as biomass
- Explore the feasibility of demonstration of carbon capture and storage

13

The potential of carbon capture and storage

- Carbon Capture and Storage (CCS) has the potential to cut power plant CO2 emissions by up to 85%
- Carbon has been captured and stored in a number of places around the world. Large-scale carbon capture from electricity generation has not yet taken place
- BP/Millfield Project Proposal – this would be the world's largest demonstration of CCS applied to a 350 MW power station.

14

The role of energy efficiency

Energy efficiency contributes to:

- **Reducing energy demand and carbon emissions**
- **Security of supply – the less we use the less we need to import**
- **UK competitiveness – through reducing business costs**
- **Reducing the cost of keeping warm and fuel poverty**

15

Measures and sectors contributing to reduced demand in 2010

- **Range of measures to reduce demand are expected to contribute some 8% of reduction on 1990 level by 2010 (excluding EUETS).**

Expected lower energy demand from:

- **Households: about 1/4 through Energy Efficiency Commitment, tighter building regulations, product labelling etc.**
- **Business :about 2/5 through Climate Change Levy and CCA voluntary agreements, building regulations, emissions trading (UK and EU)**
- **Transport : about 1/3 through voluntary agreements, 10 Year Plan, company car tax, fuel duty escalator etc.**

16

The international challenge

- Climate change is a global problem – needs global action
- UK only contributes 2% of global greenhouse gas emissions
- International action helps the competitiveness of business
- Action required by developed and developing countries – subject to their common but differentiated responsibilities
- Action needed on both mitigation and adaptation

17

The international agenda going forward

- Convention process – long term co-operative action (all countries)
- Kyoto protocol – post 2012 commitments (Kyoto countries to discuss)
- G8 Gleneagles Dialogue – Mexico Ministerial
- G8 Summit – St Petersburg, July 2006
- EU – Energy Green Paper
- UK Stern Review, Energy Review, Climate Change Programme Review

18

Summary

- Significant progress is being made towards the Government's energy and climate change policy objectives
- On balance, markets and market instruments are delivering progress on a range of policies
- However, the major transition to a lower carbon economy will inevitably present some challenges
- The Government's role remains not to intervene but to ensure the right policy, incentives and regulatory frameworks are in place
- But countries cannot move alone, there has to be global action

19

ENERGY EFFICIENCY AGENCY

ENERGY PATHS – HORIZON 2050

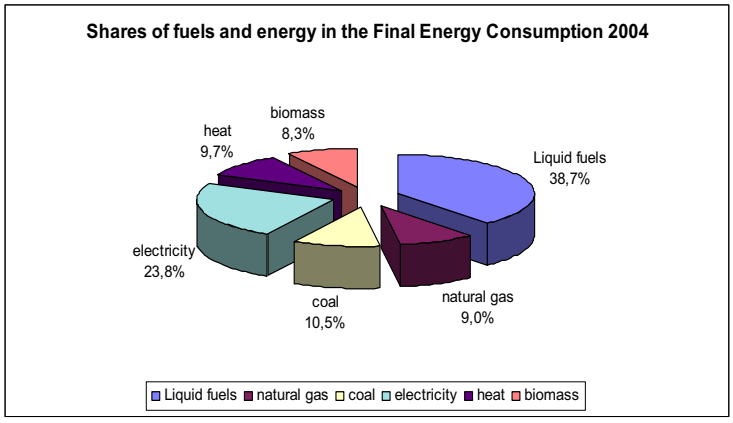
International Conference within the Austrian EU Presidency

Thursday, 16 March 2006

Palais Auersperg, Auerspergstrasse 1

A-1080, Vienna, Austria

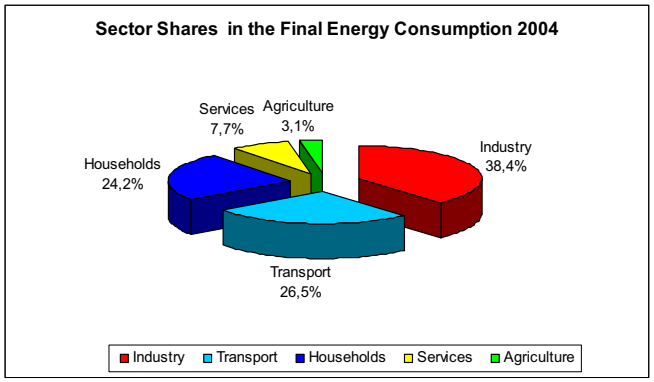
Current Situation - FEC, Bulgaria



The biomass share 8.3% (mainly wood) in Final Energy Consumption (FEC) in 2004 is comparable with the shares of natural gas and heat energy.

The power produced from other kinds of Renewable Energy Sources (RES) is insignificantly small and without a real share in the country energy balance.

Energy Consumption - Recent Official Data



Households and transport consume more than 50% from the FEC – the largest part of this energy does not produce added value.

The approximate evaluation of energy saving measures in industry has reached up to 30% of the present specific energy consumption.

The approximate evaluation of energy saving measures in households has reached up to 40% of the present specific energy consumption.

3

Energy Efficiency in Bulgaria

Current situation

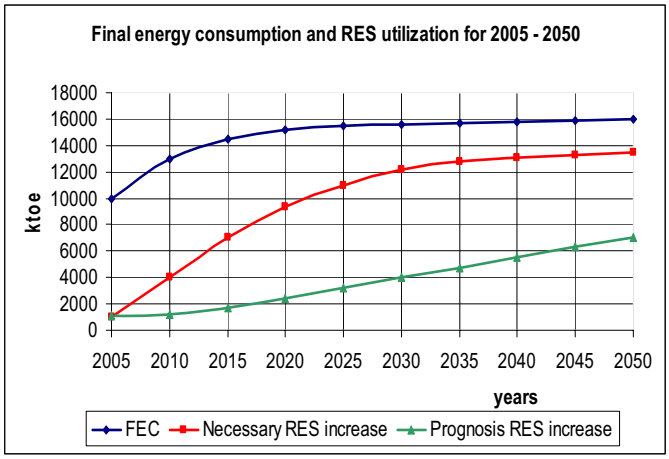
- Primary Energy Intensity (2004) ~ 0.336 koe/€2000 ppp
- Final Energy Intensity (2004) ~ 0.158 koe/€2000 ppp
- Ratio ~ 0.468

The Bulgarian economy remains energy intensive to a significant extent.
Bulgaria has vast potential for implementation of profitable EE measures.

There is a need to develop a more aggressive strategy to improve energy efficiency.

4

Target -Sustainable and Secure Energy Future



Tasks

• Governments should promote RES utilization

• Combination of introducing RES with EE measures.

• Application of measures for sustainable energy development

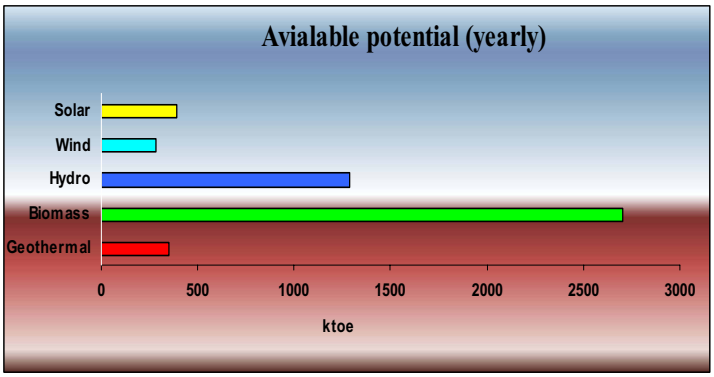
The increase of energy from RES till 2050 is insufficient to achieve sustainable energy development

In the forthcoming years, EE measures will be more efficient than measures for RES utilization.

5

Basic Conditions for Sustainable Energy Development

Available energy potential of today's technologies

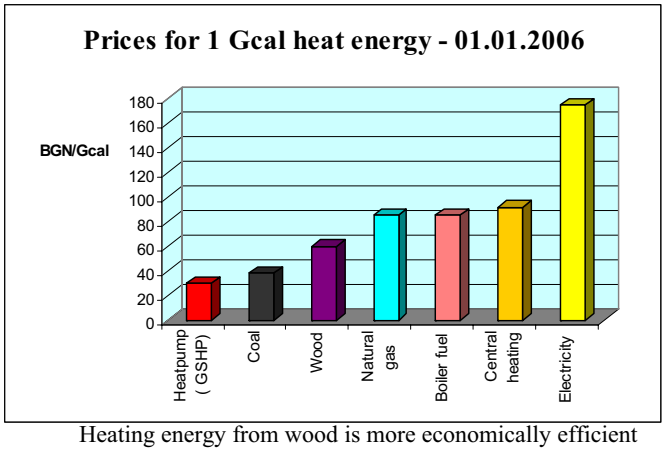


The available RES potential in Bulgaria is considerable.

Wood – with major share within all RES in the Energy Balance of the country.

6

Economic Preconditions for the Present and Future Use of Wood in Bulgaria



Heating energy from wood is more economically efficient

A special interest for investments in future will be production, processing and burning of wood and its derivatives.

7

Elements of Effective National Sustainable Development Strategies

At first – to reach the targets of the Long-term EE and RES programs (developed by EEA)

Assessment of measures to be implemented

Partnership with EU countries for development and RES utilization

Enhance scientific and technical exchange *with EU countries*

8

Future Utilization of Renewable Energy Sources

Total utilization of the energy potential of firewood – main objective

- For heating.
- For electricity production.
- Replacing the consumption of liquid fuels by firewood
- Utilization of wood for co-generation.

Rapidly increasing the bio-energy production.

Implementation of heat pumps.

Utilization of geothermal resources.

9

Implementing new Technologies

Amount of the investments for incorporation of hydrogen into vehicles

Fuel cells have the potential to power cars, trucks, and buses without emitting harmful emissions

Distributed generation (DG) , Co-generation, Three-generation

Photovoltaic systems

Stirling engines - powerful alternative to the internal combustion engine

New generation heat pumps

10

Targets

- **Increasing of wood consumption for energy purposes.**
- **Considerable power generation with biomass utilization.**
- **Mass utilization of earth and water connected heat pumps.**
- **The utilization of liquid fuels for generation of heat power should be stopped.**
- **The production of liquid bio-fuels must sharply be increased.**
- **Re-orientation of end consumers (especially the industry) towards alternative fuels and energies.**

Thank you for your attention !

STodorov@SEEA.government.bg

Shell Global Scenarios 2005

Wim Thomas
Head Energy Analyses
Shell Scenario Group

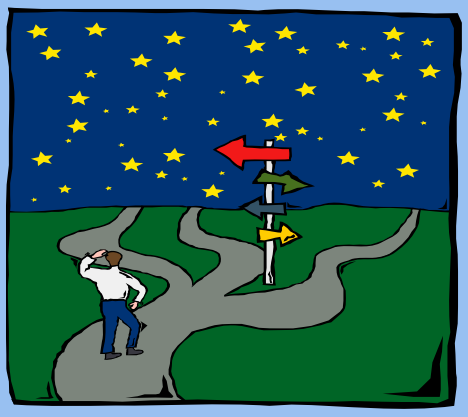
March 2006

The Shell Global Scenarios

The companies in which Royal Dutch Petroleum Company and The "Shell" Transport and Trading Company, p.l.c. directly or indirectly own investments are separate and distinct entities. The expressions "Royal Dutch/Shell Group" and "Group" are used to refer to the companies of the Royal Dutch/Shell Group as a whole. The words "Shell", "we", "us" and "our" are used in some places to refer to the Group and in others to an individual Shell company or companies where no particular purpose is served by identifying the specific company or companies.

The information contained in this presentation is, to the best of our knowledge, true and accurate although the forward looking statements herein are by their nature subject to risk factors which may affect the outcome of the matters covered. None of Shell International Limited, its affiliates and their respective officers, employees and agents represents the accuracy or completeness of the information set forth herein and none of the foregoing shall be liable for any loss, cost, expense or damage (whether arising from negligence or otherwise) relating to the use of such information. Permission should be sought before any part of this presentation is reproduced, stored or transmitted by any means. Trilemmap is a Shell trademark.

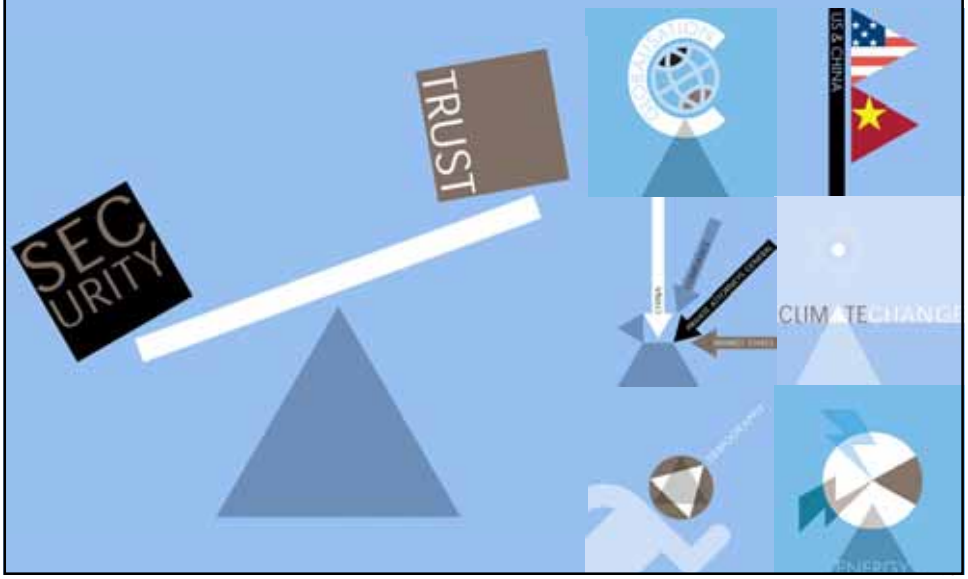
What are scenarios?

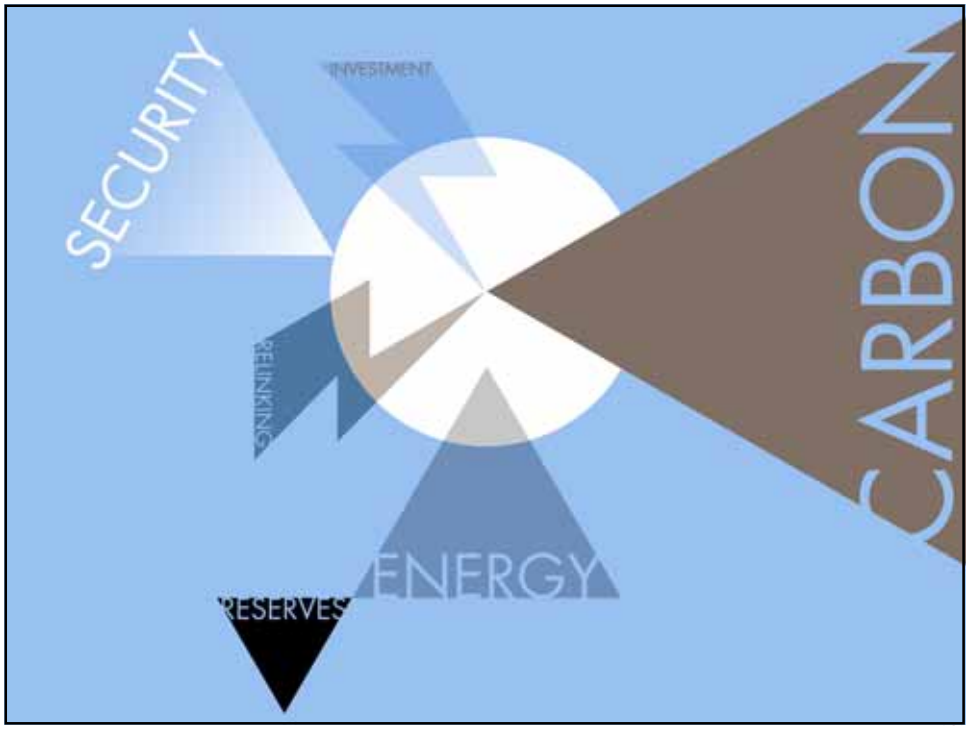


- NOT projections, predictions or preferences
- Alternative futures
- What if questions, NOT answers
- Challenge assumptions
- Relevant to business
- Develop strategies & test plans

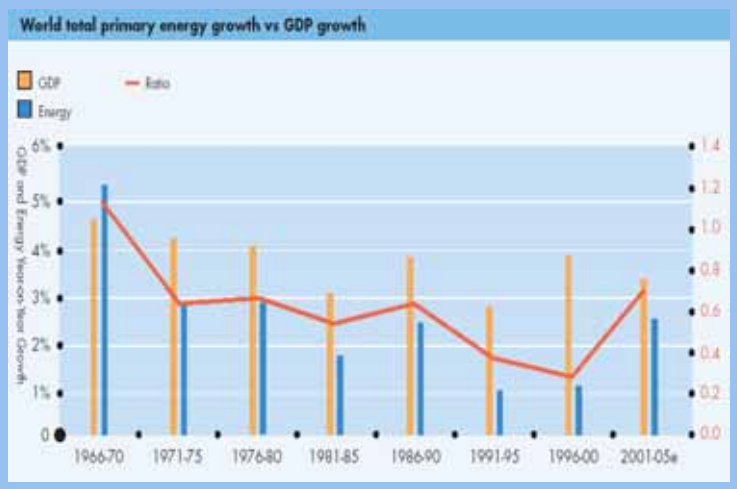
3

Shell's Global Scenarios 2005
The dual crisis of 'Security' and 'Market Trust'

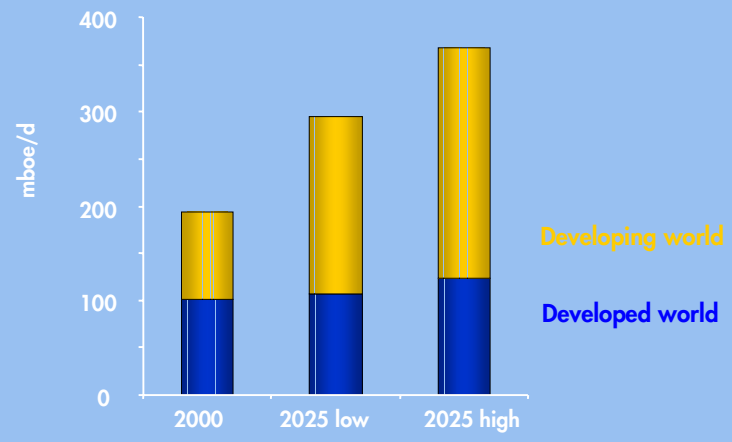




Increasing energy intensity of global economy

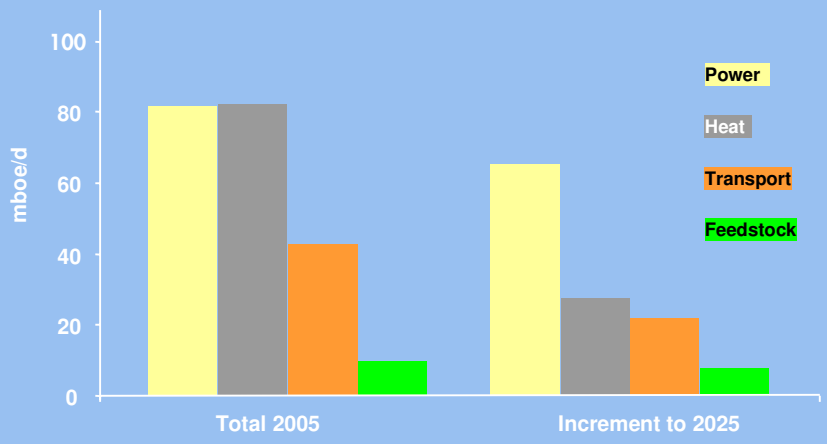


Energy demand growth primarily in developing world



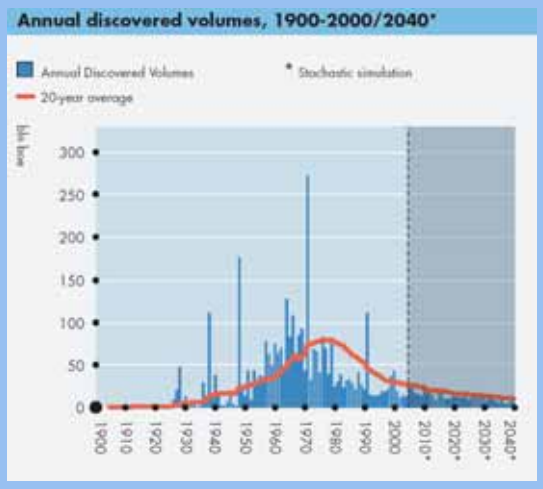
7

Power demand growth 3 times higher than Transport or Heat



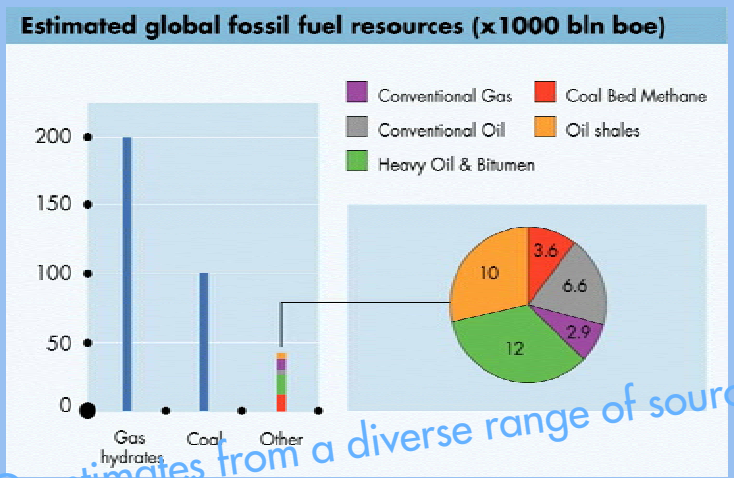
8

Decreasing exploration potential …



9

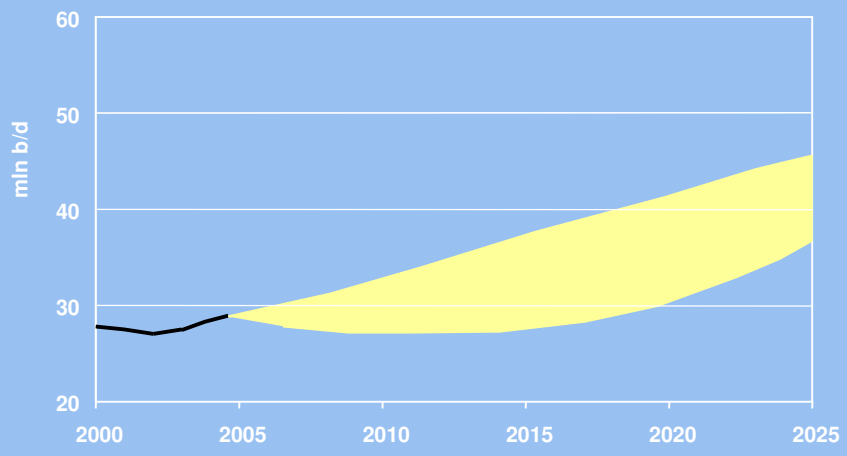
Unconventional scope dwarfs Conventional Resources - potentially



Guestimates from a diverse range of sources

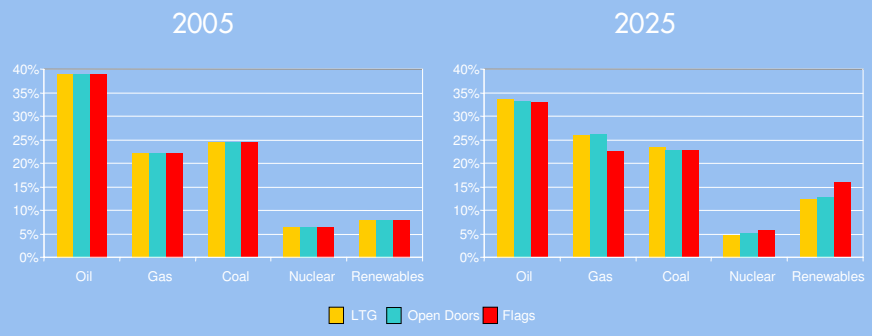
10

Call on OPEC (Crude)



11

Market share Primary Energy

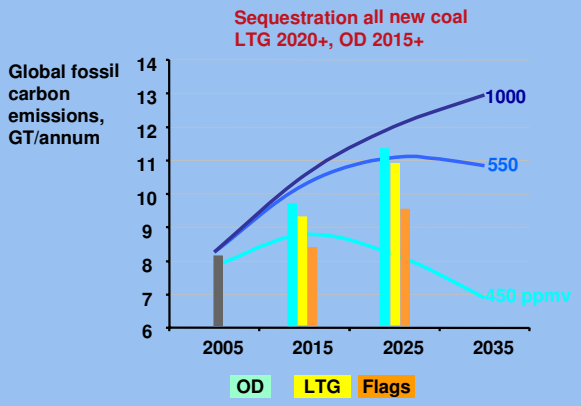


12

Carbon
Worrisome CO_2 Trends

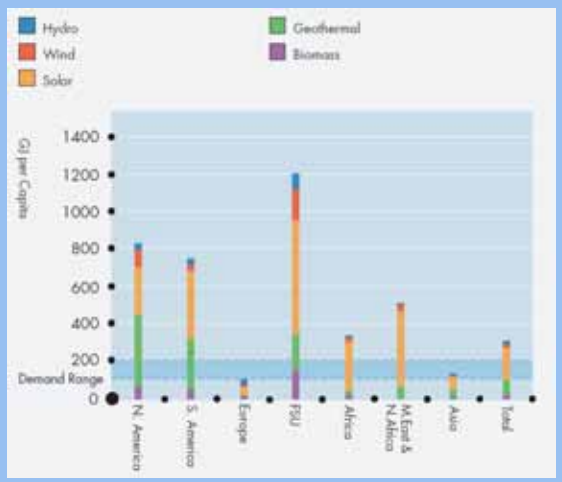
Energy intensive economic growth can make GHGs emissions a major threat

By 2025, emissions limiting technology has gained limited impact



13

Potentially sufficient renewable resources for 10 bln people …



… but intermittency and conversion into liquid fuels will prove a technological challenge.

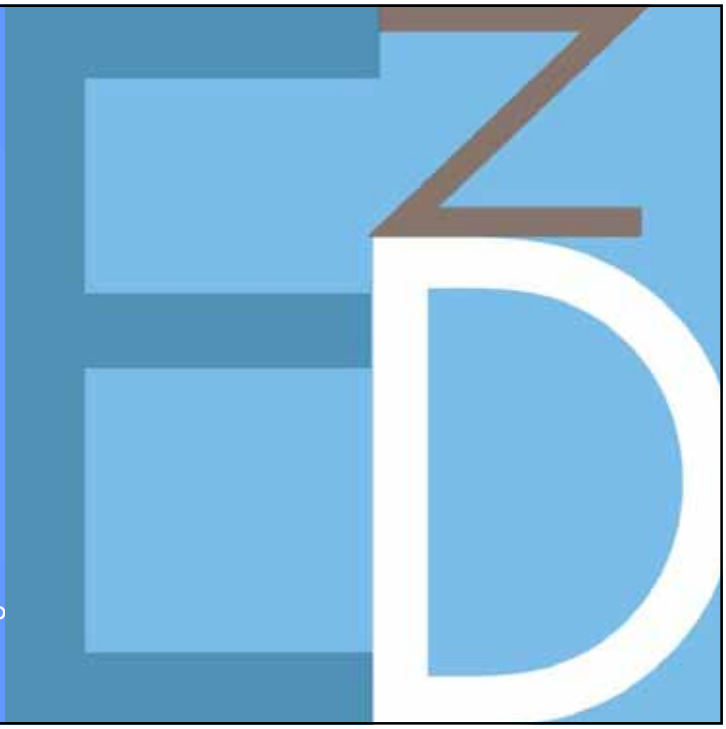
14

Shell Global Scenarios 2005

www.shell.com/scenarios

Wim Thomas
Head Energy Analyses
Shell Scenario Group

March 2006



VATTENFALL EUROPE

„Balancing the triangle of economy, security and environment in an open European energy market“

Energy Paths – Horizon 2050

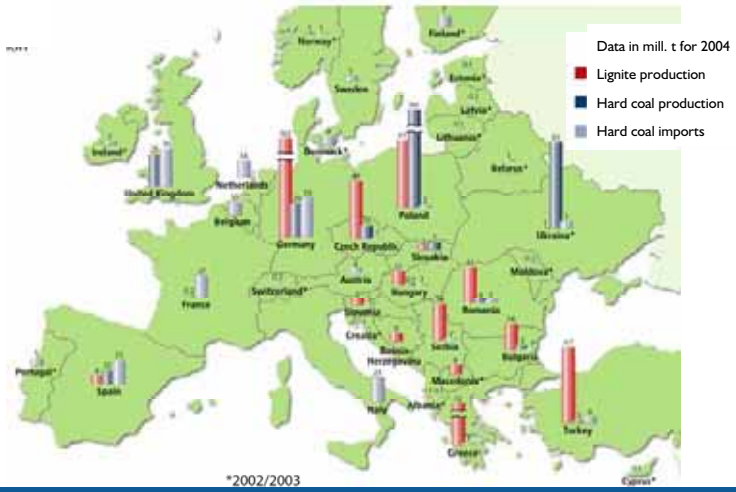
Thursday, 16th March 2006 Vienna, Austria

Professor Dr.-Ing. Dr. h.c. Kurt Häge

VATTENFALL

VATTENFALL EUROPE

Europe is the world‘s third largest consumer of coal behind China and the US



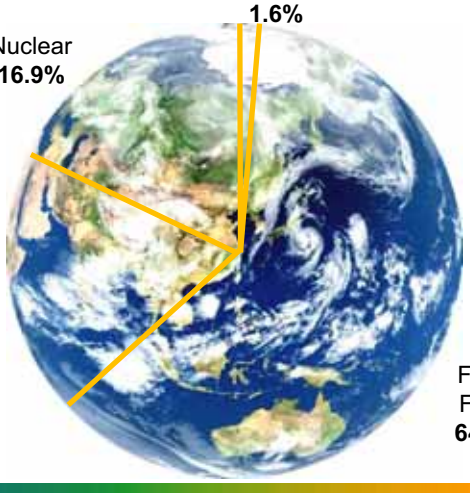
About 490 mill. t/a hard coal and 550 mill. t/a lignite in Europe

picture 1

VATTENFALL

Fossil Fuels – indispensable for a long time

Share of different primary fuels for electricity generation



picture 2

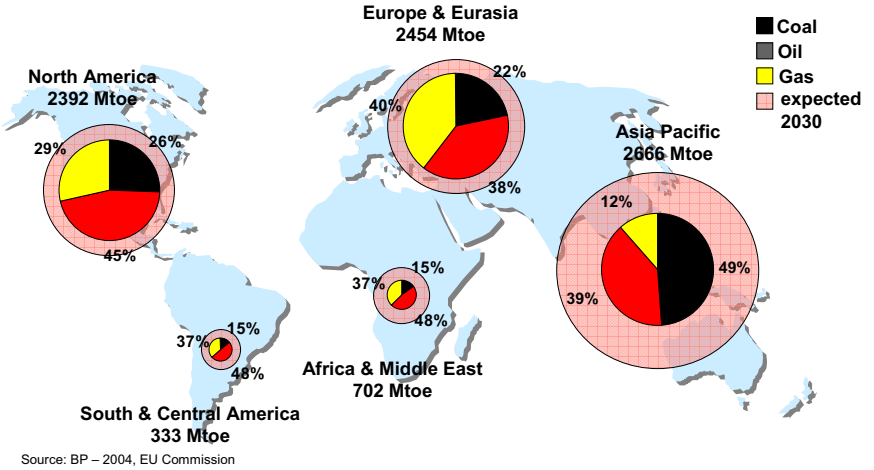
Fossil fuels will be needed – Coal has an essential role

- Fossil fuels – global use will increase during the next decades
- The CLEAN COAL concept fits in the context of climate protection as well as security of supply
- Vattenfall wants to give a major thrust to the development of the CO_2-free power plant.

picture 3

Coal is a key part of the world's energy mix – and growing

in Mtoe



Source: BP – 2004, EU Commission

Primary Energy Consumption of Fossil Fuels – 2003 to 2030

picture 4

Vattenfalls ambition – the goal

Development of a **reliable** and **economic feasible** generation technology for coal under the condition of ambitious CO_2-reduction targets in the future

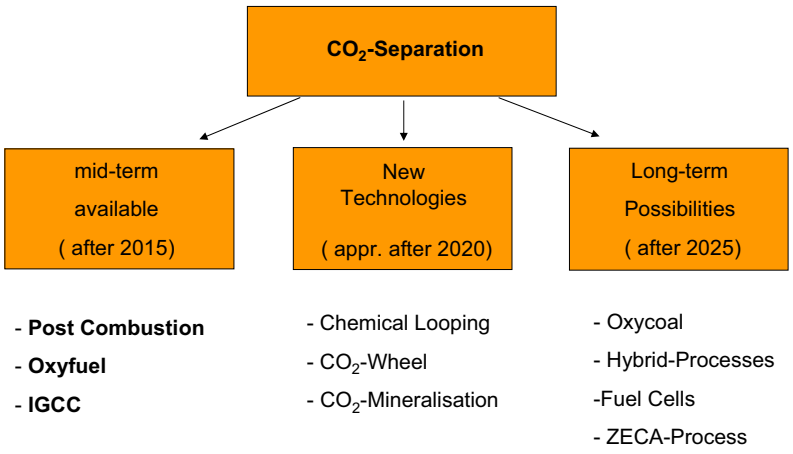
picture 5

Further development - two ways are needed

1. According to what we know today, efficiencies of coal-fired power plants of approx. 53% can be attained by 2020:
   - Integration of coal drying in lignite-fired power plants
   - Increase in process parameters – the 700°C power plant
   - Optimised hook-up of the heat systems
   - Advancement of combined processes
2. A new step will be to design power plant concepts featuring CO_2 sequestration envisaged for implementation after 2020 according to the following principles:
   - Combustion with pure oxygen (Oxyfuel process)
   - Coal gasification (IGCC)
   - CO_2 sequestration from flue gas (post-combustion)

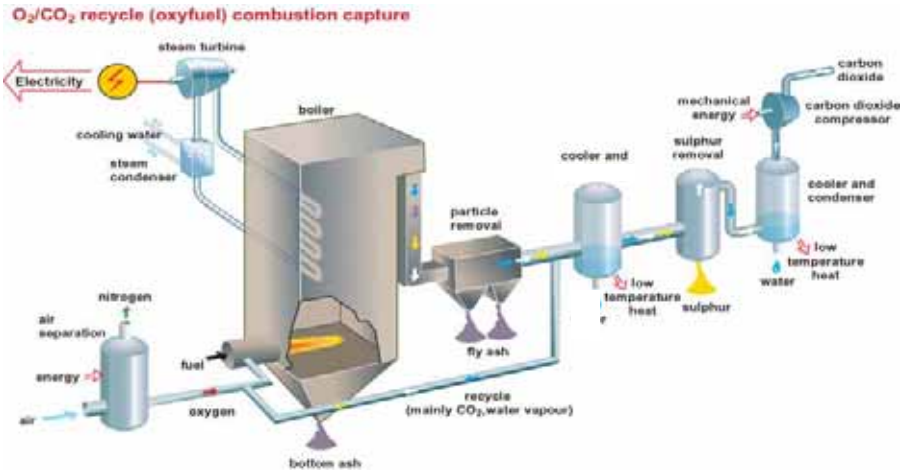
picture 6

Carbon Capture Technologies - overview



picture 7

The Oxyfuel-Process - O_2/CO_2- Recirculation



picture 8

VATTENFALL

The Pilot Plant - Boundary conditions

Why Oxyfuel?

- Process with high efficiency potential
- Vattenfall Knowledge regarding pulverized firing and flue gas cleaning systems
- Production of CO2 with necessary purity for storage

Why 30 MW thermal?

- Combustion chamber as big as needed and as small as possible
- Scale-up-Possibilities for Demo Plant (600 MWth)

What are the possibilities?

- Testing of the whole process (coal feed in till CO2 liquefaction and compression)
- Use of “Lausitzer Braunkohle” (also possible for hard coal)
- Possibilities for reconstruction and exchange of components (e.g. Burners)

picture 9

VATTENFALL

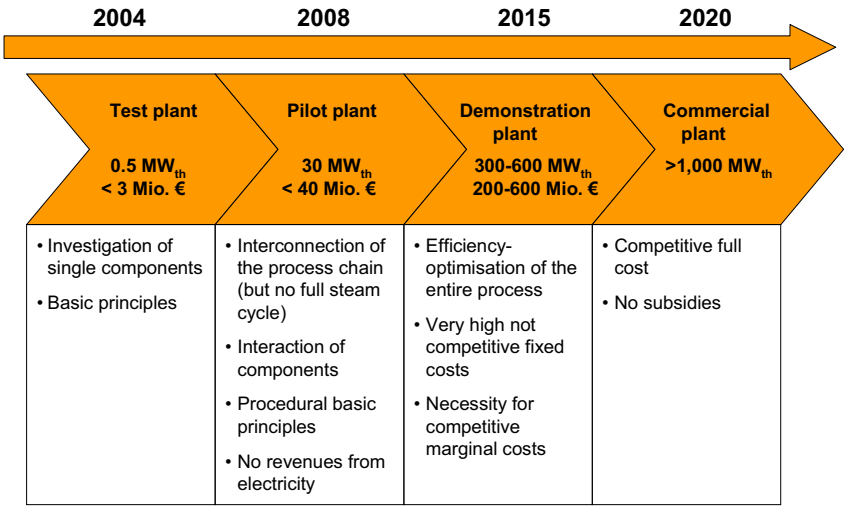
Location for the pilot plant – Key elements

- Industry location (Permission)
- Use of the infrastructure of a Power station (Supply and disposal, cooling water, water treatment …)
- Possibilities for steam supply for an industrial park
- Production of dry lignite at the site (VE-Mining)

picture 10

VATTENFALL

The foresight - upscaling

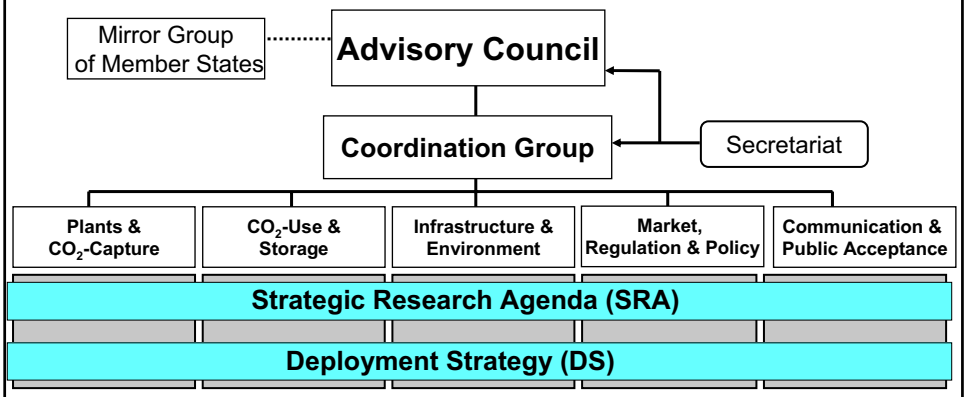


picture 11

VATTENFALL

Technology Platform ZEFFPP:
Organisational Structure

ETP ZEFFPP
Advisory Council #5
Brussels 22nd February 2006



picture 12

VATTENFALL EUROPE

A Three Phase Argumentation

I. Reducing emissions and increasing efficiency in ecologically and economically optimized steps
   - Modernization of existing plants: SO_2, NO_x, dust, retrofit
   - Construction of new state of the art power plants

II. Development of high-efficiency power stations with the aim to minimize consumption of resources and reduce specific emissions, particularly those of CO_2

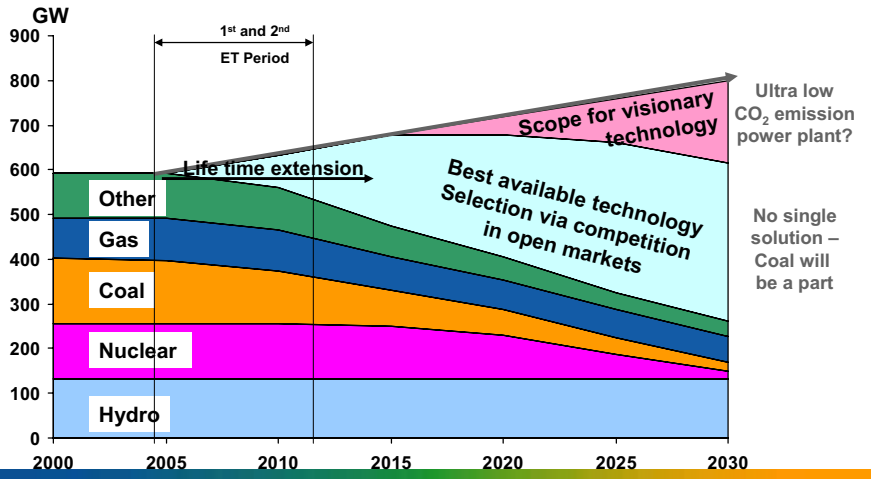
III. New Technologies for CO_2 capture and storage

picture 13

VATTENFALL

European Power Plant Portfolio
Power generating capacity in EU 15

Power plants younger than 40 years



picture 14

Towards Zero CO_2 Emission Power Generation

CO_2-capture
- pre-combustion at gasification plants
- post-combustion at conventional plants
- oxy-fuel combustion

CO_2-storage
- depleted oil and gas fields
- deep saline aquifers
- unmineable coal seams
- mineralisation

Some technologies are well-proven, others need significant R&D. All require demonstration with monitoring & verification of storage sites.

Research in both areas with the same effort. There will be no acceptance for a near zero emission power station without CO_2 storage possibilities

picture 15

VATTENFALL EUROPE

Thank you for your attention

VATTENFALL

Energy Paths – Horizon 2050
Vienna
16th March 2006

Future Technologies for Power Generation

"Key Challenges in the Transition towards Zero Emission Fossil Fuel Power Generation"

Nick Otter
Director of Technology and External Affairs, ALSTOM Power Ltd

ALSTOM

Contents of Presentation

ALSTOM

- AN INDUSTRY POINT OF VIEW
- IMPLICATIONS AND CHALLENGES
- NEED FOR AN INTEGRATED APPROACH
- THE TECHNOLOGIES
- SOME CONCLUDING REMARKS

Viewpoint

ALSTOM

- **Energy Equipment/Systems Supply Company**
  - ALSTOM Power : world-wide supplier of power generation systems/services
- **UK Advanced Power Generation Sector**
  - UK Advanced Power Generation Technology Forum (APGTF)
  - UK DTI Advisory Committee on Carbon Abatement Technologies (ACCAT)
- **European and an International Context**
  - Active in EC arena, especially ETP on Zero Emission FF Power Plant
  - Involved in IEA Zero Emission and associated actions
  - UK representative on the Carbon Sequestration Leadership Forum (CSLF)

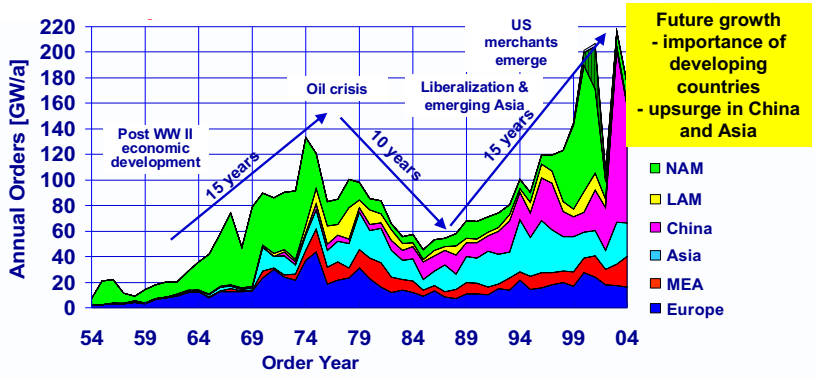
ALSTOM

AN OVERALL PERSPECTIVE

Near Term Global Position

ALSTOM

Market Development
50 Years of Order Volumes by Regions

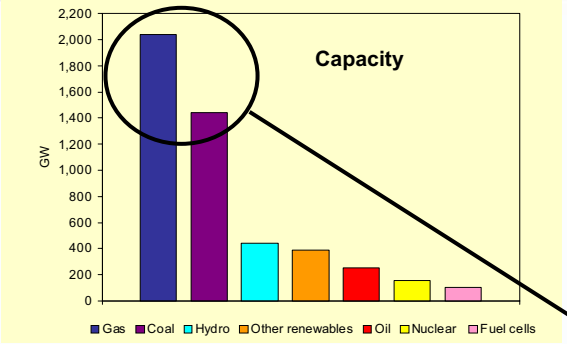


Future growth
- **importance of developing countries**
- **upsurge in China and Asia**

Significant market changes ……increased liberalisation, de/re-regulation and privatisation

Long Term Energy Market

ALSTOM



IEA projections of global power station build to 2030

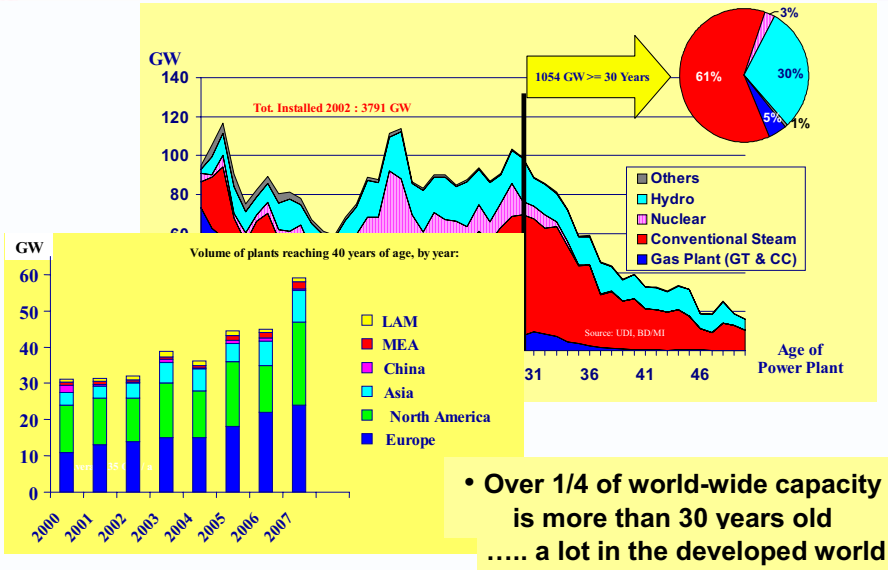
IEA World Energy Outlook 2004

- **Different needs world-wide**
  - uneven access to modern energy
- **Growth of Renewable Energy and potential resurgence of nuclear but ….**

Continuing reliance on fossil fuels
– especially likes of China and India

Installed Base Capacity - Aging Fleet

ALSTOM



- Over 1/4 of world-wide capacity is more than 30 years old
  ….. a lot in the developed world

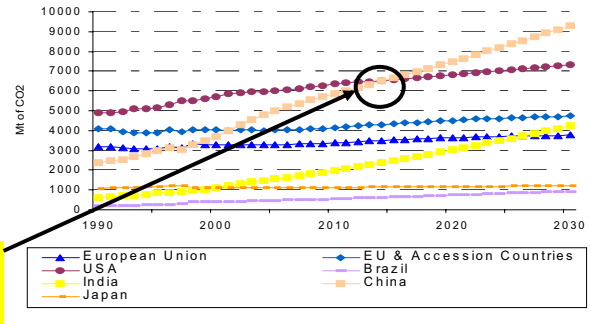
Environmental Issues - `longer term` aspects

ALSTOM

- **Environment**
  - What happens post 2012?
  - 60% GHG reductions by 2050?

Forecasted CO_2 Increases
Source: EC/EEA, 2004

China will overtake US as biggest CO_2 emitter by 2015



importance of engaging Emerging Market Economies

IMPLICATIONS and CHALLENGES

Implications

- **Importance of clean use of fossil fuels**
  - a critical transitional issue in getting to a sustainable energy future
  - an essential part of the portfolio
- **Importance of accelerating the take-up of clean fossil**
  - need for incentives for early action on `zero emission` power plant
  - stable financial and regulatory framework to get “many of a kind”
- **Importance of engaging Emerging Market Economies**
  - use of high efficiency technologies, and …….
  - ……. prepare the way `zero emission`
    - retrofitting of high efficient coal plant for CCS to avoid “carbon lock-in”
    - how to ensure new plant is “capture ready”

Technology/Research Challenges

ALSTOM

- **Environmental**
  - near zero emission but ……
  - ……. not just CO2, other emissions as well
- **Economics**
  - competitive conversion and performance costs
  - fuel flexibility : gas, coal, cofiring, ……..
  - optimisation of overall system and components
- **Operability**
  - highest reliability and availability
  - cost effective maintenance and performance

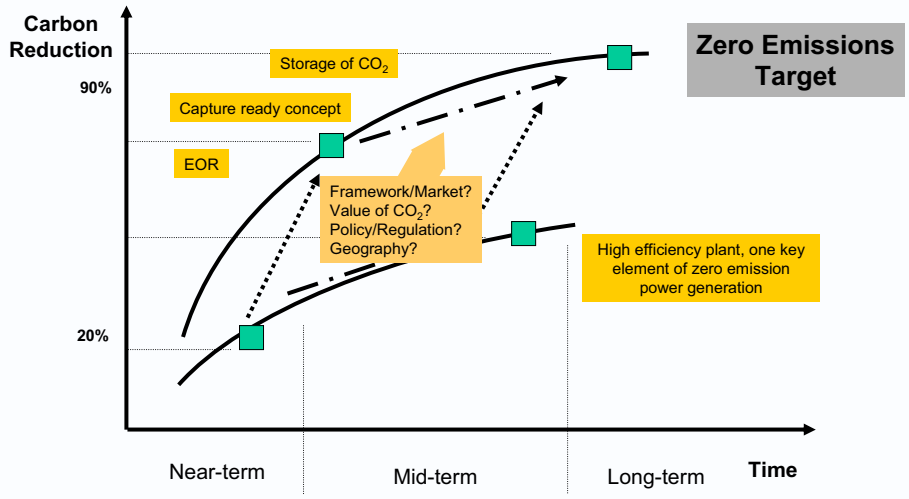
Need for an integrated strategy to get to "zero emission"

ALSTOM

AN INTEGRATED APPROACH

Pathway to zero emission power for fossil fuels

ALSTOM

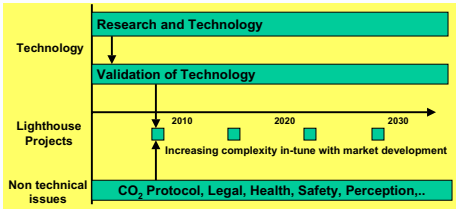


Approach needs to be compatible with other emission requirements

Elements of Integrated Approach

ALSTOM

- Must be developed with the following in mind
  - Long term time frame : out to 2030 and beyond
  - Technology needs to be `in-tune` with market to engage investors
  - Needs of different markets and countries
- Must contain the overall approach of
  - Increased efficiency, fuel flexibility and re-powering
  - Near-zero emission with CO_2 capture and storage
  - Link to Hydrogen issues or long term sustainable `vision`
- Must include aspects of
  - Research and technology development
  - Component and system validation
  - Demonstration/`Lighthouse` Projects
  - Deployment mechanism



Must embrace non-technical issues as well as technical

EC FP7 Content Draft : Energy EC Proposals 6Apr05

ALSTOM

7 year Energy programme of ~3b euro over 2007-2013 being sought

- **9 Major Themes in FP7**
  - Health
  - Food, Agriculture and Biotechnology
  - Information and Communication Technologies
  - Nanosciences/technologies, Materials and New Production
  - **Energy**
  - **Environment and Climate Change**
  - Transport
  - Socio-economic Sciences and the Hu
  - Space and Security Technologies

9 Key Topics

- **Hydrogen and Fuels Cells**
- **Renewable Electricity Generation**
- **Renewable Fuel Production**
- **Renewables for Heating and Cooling**
- **CO_2 Capture and Storage for ZEPG**
- **Clean Coal Technologies**
- **Smart Energy Networks**
- **Energy Savings and Efficiency**
- **Knowledge for Energy Policy Making**

EC wish to align Themes with European Technology Platform approach

Critical Mass European Action : 21June05

ALSTOM

- **ETP "Zero Emission Fossil Fuel Power Plants"**
  - **Advisory Council** formed 21Jun05
    - **6 Generators** : EoN, Endesa, ENEL, RWE, Vattenfall, Energie E2
    - **6 Equipment suppliers** : Ansaldo, ALSTOM, Air Liquide, Foster Wheeler, Mitsui Babcock, Siemens
    - **5 oil/gas companies** : BP, Shell, Statoil, Total, Schlumberger
    - **4 researchers** : BGS, CIRCE, IFP, Polish CMI
    - **3 NGOs** : Bellona, CAN Europe, WWF
  - EU agenda setting out to 2030-2050
  - Major input to EC FP7 (2006-2013)
    - **Strategic Research Agenda (SRA)**
    - **Deployment Plan (SDD)**

Vision Statement

To enable European fossil fuel power plants to have zero emission of CO_2 by 2020

Chair : Haege/Vattenfall (Germany)

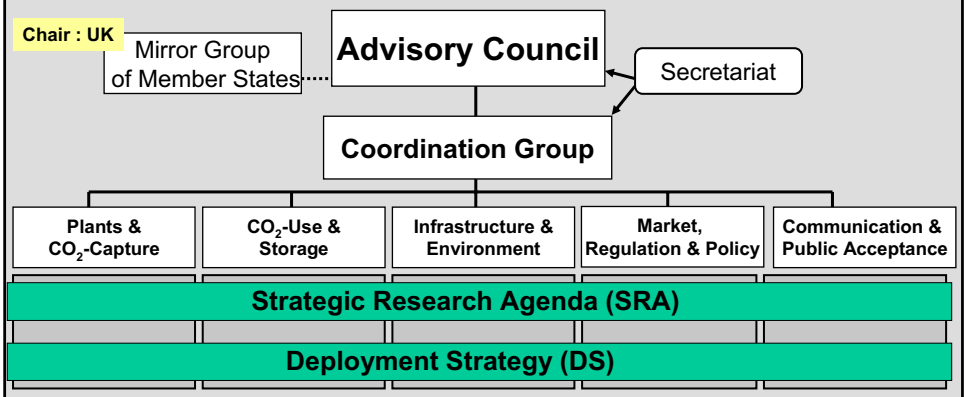
Vice Chairs : Appert/IFP (France)
Hill/BP (UK)
Valero/CIRCE (Spain)
Soothill/ALSTOM (UK)

Good industry support

Critical Mass European Action :
Organisational Structure : 2Dec05

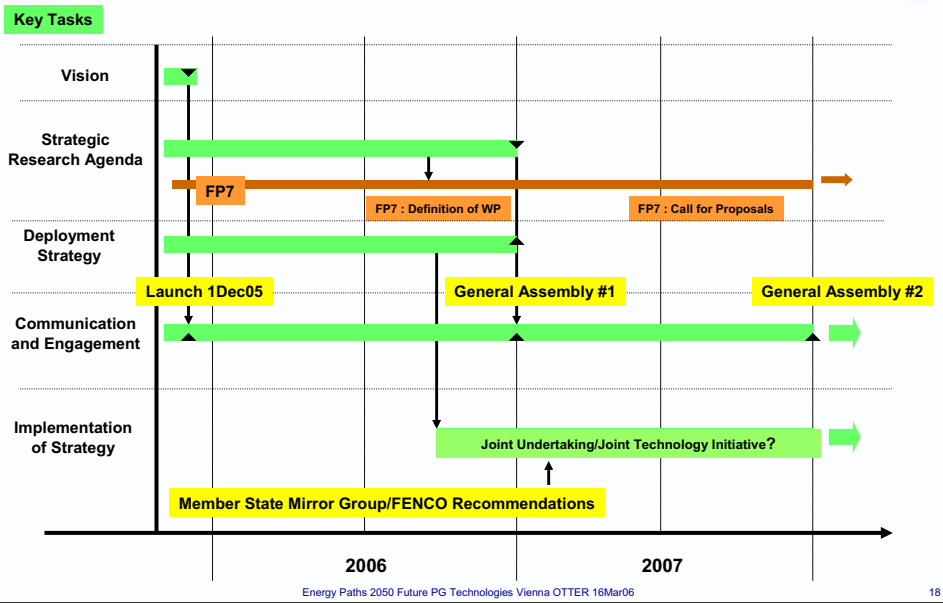
ALSTOM

Technology Platform Structure
Zero Emission Fossil Fuel Power Plant



ZEFFPP ETP Action Plan :
High Level 2-Year Milestones and Timing

ALSTOM



Worldwide Engagement

- **Carbon Sequestration Leadership Forum (CSLF)**
  - Technology Route Map
  - Project Initiation and Review Team
  - Stakeholder engagement through projects
- **G8 Action Plan**
  - Financial Mechanisms/World Bank
  - `Capture Ready` Technology/IEA
- **EU/UK China Zero Emission Plant**
  - DEFRA/DTI Initiative through EC
  - Feasibility study leading to demonstration of Near Zero Emissions Coal plant (NZEC)
- **IPCC Special Report on CCS**
  - Summary for Policy Makers agreed Sept05

Australia	Japan
Brazil	Mexico
Canada	Netherlands (new)
China	Norway
Colombia	Republic of Korea (new)
Denmark (new)	Russian Federation
European Commission	Saudi Arabia (new)
France (new)	South Africa (new)
Germany (new)	UK
India	USA
Italy	Greece (applied)

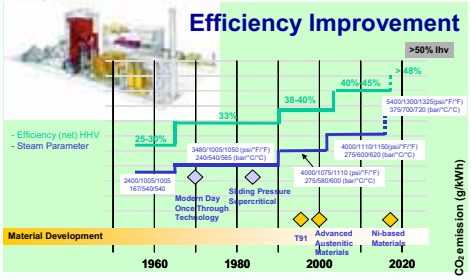
Thrust for co-ordination and interaction internationally

THE TECHNOLOGIES

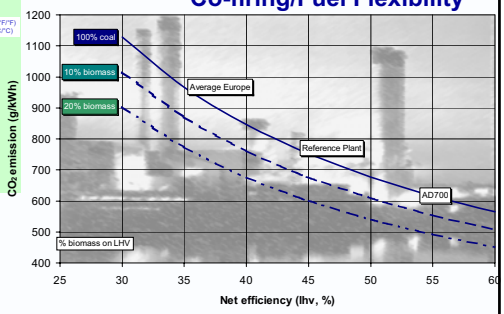
Carbon Abatement Technologies

ALSTOM

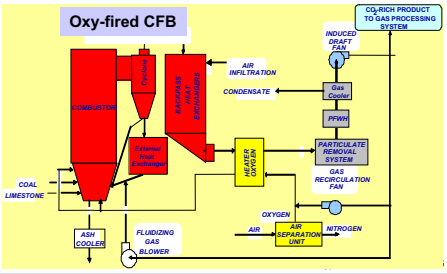
Efficiency Improvement



Co-firing/Fuel Flexibility



Oxy-fired CFB

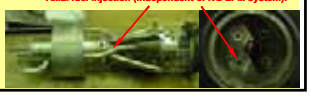


Towards zero emission with CO_2 capture and storage

ENCAP: pre-combustion carbon capture.

- Goal: Develop lean-premixed H_2 burner
  - fuel-flexibility ($NG/oil/H_2/syngas$)

Axial fuel injection (independent of NG LPM system).



Technologie

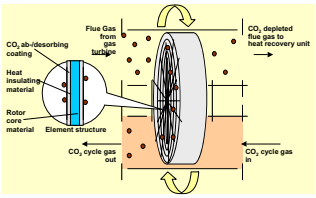
Post Combustion :
Alternate Paths to CO_2 Capture

ALSTOM

- **Amine Based Systems**
  - Further Improvements in Solvents
  - Application of Membranes Technologies

New plant and retrofit application

- **Ammonia**
  - 10 % of Amine Cost and 1/3 of Amine's Steam Use
- **Frosting**
  - Uses refrigeration principle to capture CO_2 from Flue Gas.
- **CO_2 Wheel**
  - Use Regenerative Air-Heater-Like Device with Solid Absorbent Material to Capture ~ 60% CO_2 from Flue Gas.



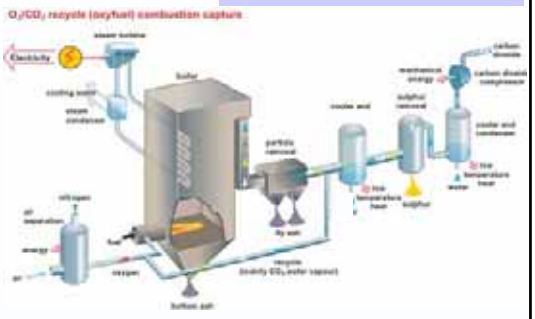
Focused on Reducing Cost and Power Usage

Oxygen-Fired Combustion

ALSTOM

- **Near-term solution for CO_2 capture**
  - Uses commercially available air fired PC technology
  - O_2 production by commercial cryogenic air separation
  - CO_2 cleanup, compression, and liquefaction
  - Intermediate step leading to advanced processes

30 MWth Schwarze Pumpe Vattenfall

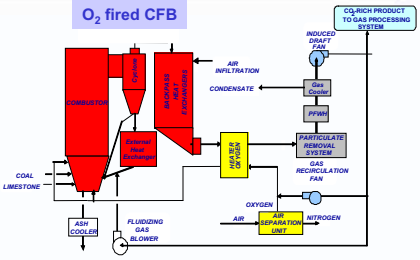


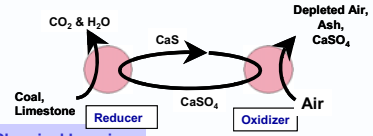
Advanced Processes

ALSTOM

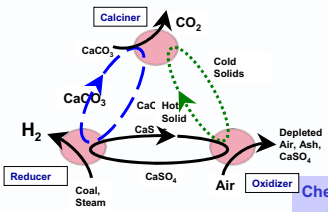
- **Oxygen Fired CFB**
- **Chemical Looping**
  - Combustion
  - Gasification

O_2 fired CFB





Chemical Looping Combustion



Chemical Looping Gasification

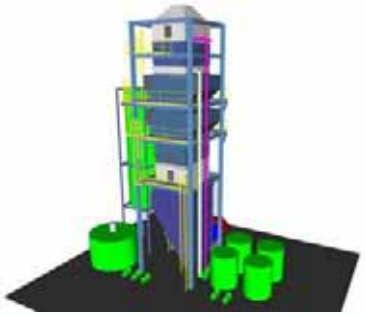
Long–Term Development Technology for CO_2 Capture, Hydrogen Economy, and Power Generation

Multi-pollutant Control Systems

ALSTOM

- Integrated APC system based around commercially proven and reliable technologies
- Uses readily available reagents
- Produces reusable byproduct(s)
- Superior cost/performance ratio:
  - Extremely compact design
  - Fewer moving parts reduces maintenance
  - Superior environmental performance

- **Targeted emissions levels:**
  - **SO_2: 0.02 lb/MMBTU (> 99.5%)**
  - **Hg: 1.0 lb/TBTU (> 90%)**
  - **PM: 0.01 lb/MMBTU (99.99%)**
  - **NO_x: 0.05 lb/MMBTU w/SCR**

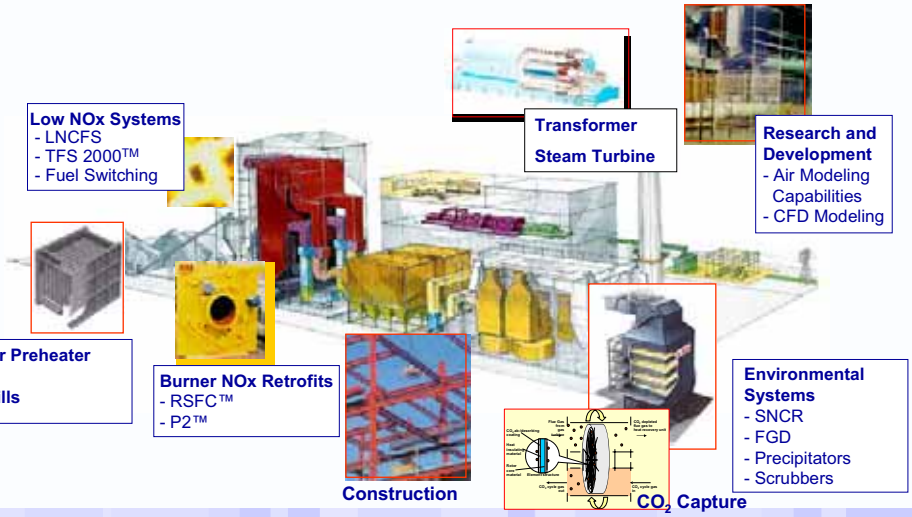


Controls SO_x, $PM_{10}/PM_{2.5}$
Mercury & NOx

Control outlet emissions to 'near zero' levels

Overall System Performance

ALSTOM



Importance of System Integration

Some Concluding Remarks

Final Concluding Thoughts

- **The need for clarity in the future**
  - difficult to forecast future; no one single winning technology; broad balanced portfolio approach
  - need for stable regulatory/fiscal framework to encourage investment
  - impact of ETS and value for CO_2 : visibility into the future
- **The need for clean fossil fuel technology**
  - will continue to play a major role for decades yet
  - clean use of fossil will be paramount : a key element in the mix
  - a global issue : importance of engaging emerging market economies
  - retrofit application and new (capture ready) plant approach
- **The need for accelerated action**
  - maintain the impetus of 2005
  - work towards an agreed post-2012 position as soon as possible

Innovation and continued technology development will be essential to meet complex demands of the future


ALSTOM
www.alstom.com

Association of British Insurers

Financial Risks of Climate Change

Jane Milne
Priority Leader, Climate Change
Association of British Insurers

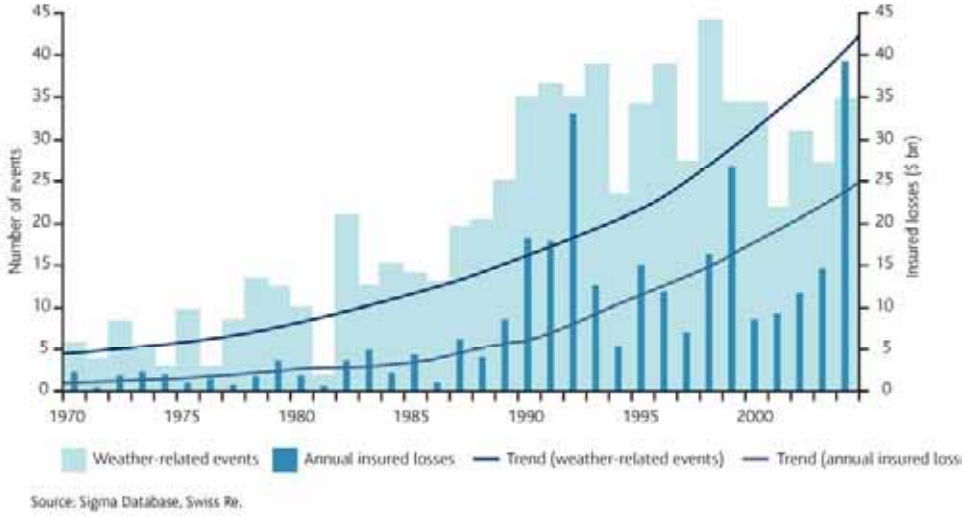
www.abi.org.uk/climatechange

Role of Insurance in Weather Protection

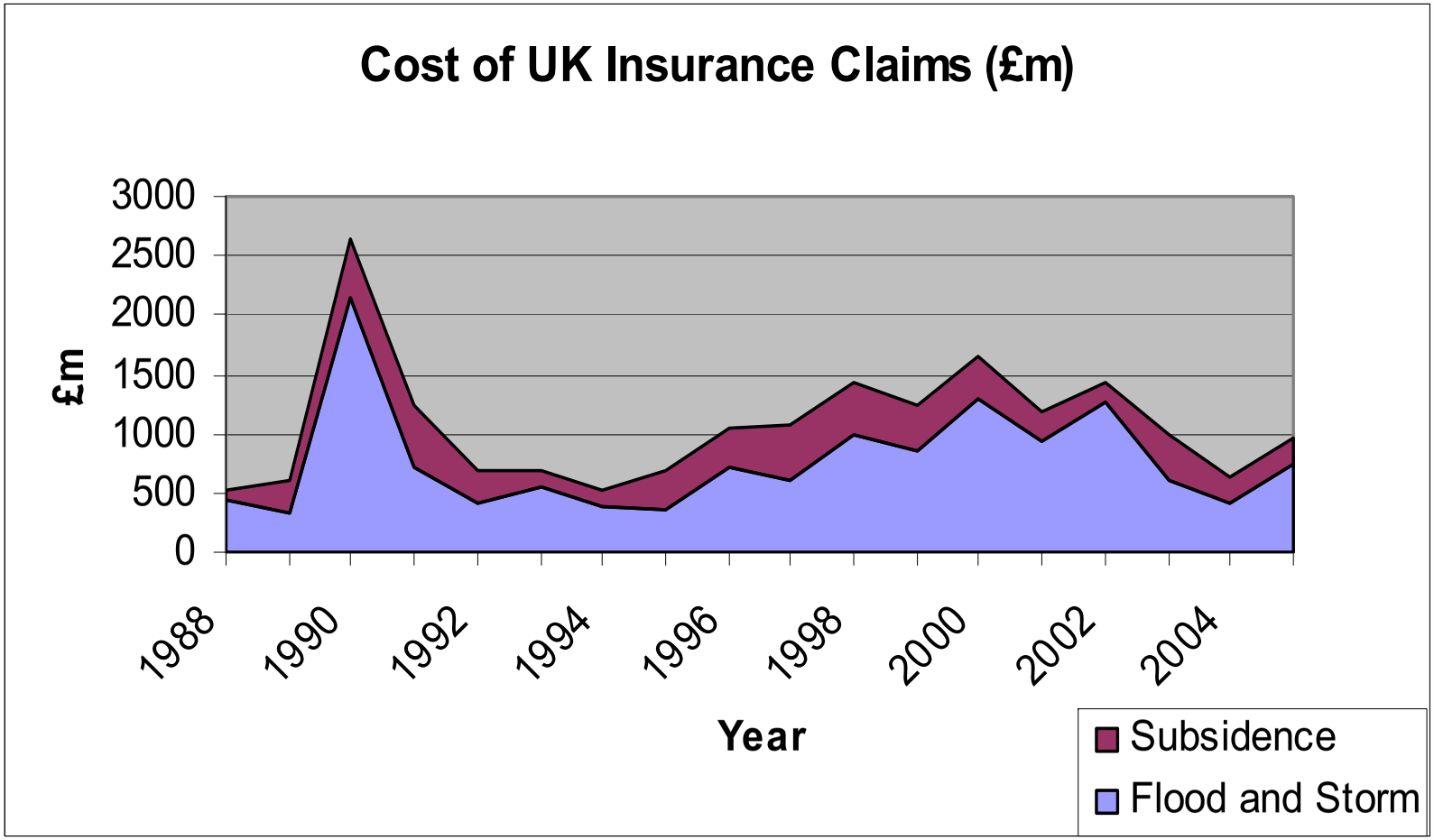
- Spreading risk
- Protection for occasional weather damage, not inevitable
- Risk needs to be managed
- Costs borne by society
  - Insured
  - Tax-payer
  - Individual

Changing costs of extreme weather

- Costs doubling each decade
- Since 1990, $16 bn each year on average
- 2004 was costliest year on record: $40 bn insured losses….
- …. until 2005 reached a new record of $83 bn



UK Weather Damage Claims



Climate change and extreme storms

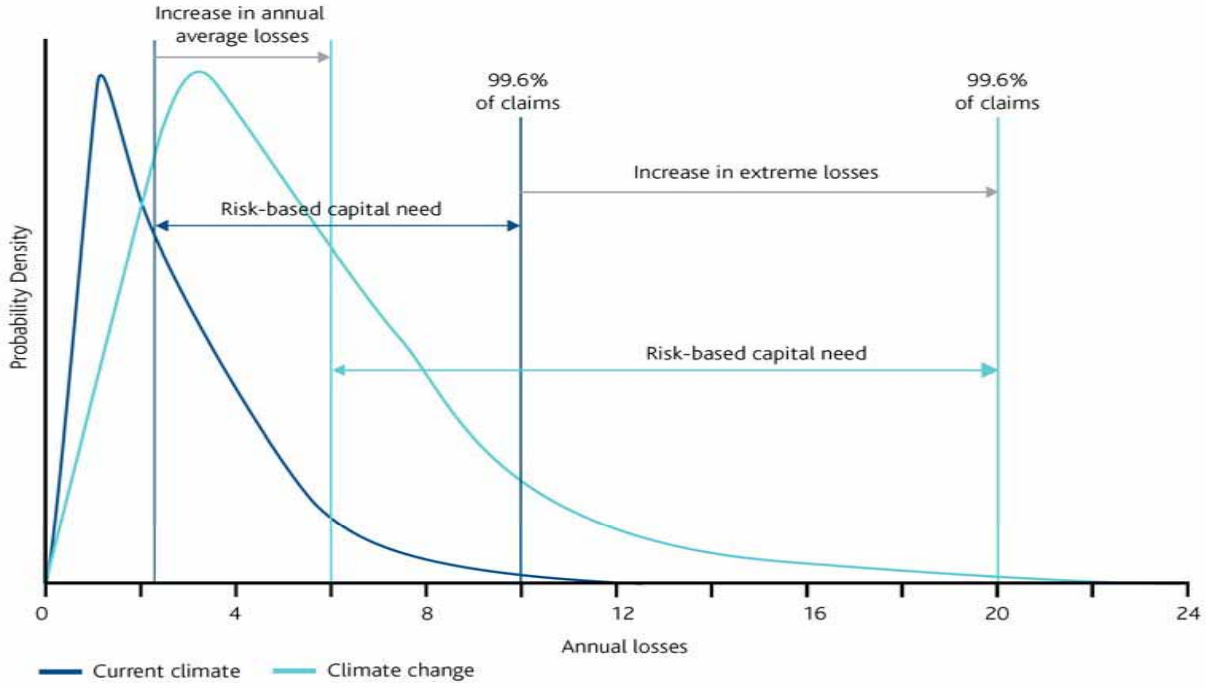
Weather Feature	Region	Stress-test[a]	Key References
Hurricane	US	Increased average wind-speed by 6%, with sensitivity tests for +4 to +9%	Third Assessment Report, Intergovernmental Panel on Climate Change, 2001, http://www.ipcc.ch Knutson and Tuleya (2004) Journal of Climate, 17(18): 3477–3495.
Typhoon	Japan	Increased average wind-speed by 6%, with sensitivity tests for +4 to +9%	
Windstorm	Europe	Increased frequency of storms that occur once every 20 years (or less) by 20%	Leckebusch and Ulbrich (2004) submitted to Global and Planetary Change. Kuzmina and others (2005) submitted to Geophysical Research Letters.

Future prospects: US hurricane losses

	Increase in windspeed	Average annual losses ($bn)	Losses with 1:100 year frequency ($bn)	Losses with 1:250 year frequency ($bn)
Potential impact of climate change	6%	+ 4.0	+ 41	+ 62
Range in sensitivity analysis	4-9%	2.5 to 6.5	27 to 68	42 to 98

Implications for global capital markets

Capital required could rise by two-thirds to $200 bn, increasing costs of capital



European Flood Risk

Annual costs could rise to €100 – 120 bn

Managing climate risks: Emissions scenarios and US hurricane losses

Emission scenario	Average annual additional loss (above current)	Losses with 1:100 year frequency	Losses with 1:250 year frequency
High (810 ppm)	$4.5bn	$45bn	$67bn
Medium-High (715 ppm)	-20%	-20%	-15%
Medium- Low (562 ppm)	-65%	-70%	-65%

Managing climate risks: Reducing vulnerability

Managing climate risks: Financial impact of adaptation

Scenario	UK river and coastal flooding	UK intra-urban flooding	Subsidence
Current	$1.8bn	$0.6bn	$0.6bn
2080 High	$28.3bn reduces to $5.1bn	$13.4bn reduces to $6.1bn	$0.9bn reduces to ?
2080 Low	$9.1bn reduces to $3.6bn	$4.3bn reduces to $1.2bn	$0.4bn reduces to ?

Managing climate risks: Reducing flood risks - options

Can site/properties be located outside the floodplain?

If not…

Can properties be located in the lowest flood risk areas?

If not…

Can occupied areas be raised above flood heights?

If not…

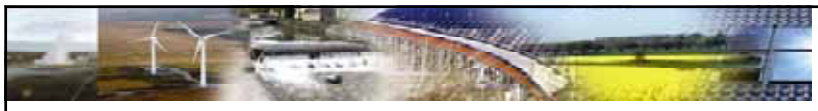
Are flood defences feasible/ cost effective?

If not…

Identify relevant property resilience options and examine alternative flood alleviation measures.

Insurance as a messenger of change

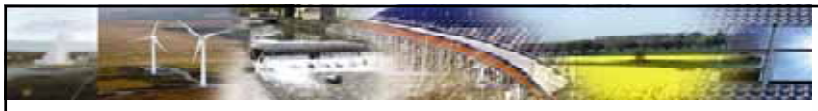
Source: Munich Re



Energy Paths – Horizon 2050
International Conference within the Austrian EU Presidency

Renewable Energy Scenario to 2040
Half of the Global Energy Supply from Renewables in 2040

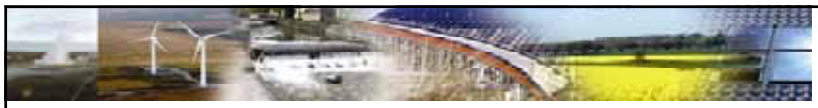
Prof. Arthouros Zervos, President
EREC
European Renewable Energy Council



EREC – European Renewable Energy Council

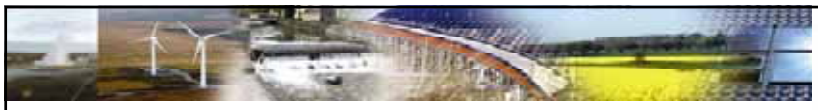
Umbrella organisation representing all RES sectors:

✓ **AEBIOM**	European Biomass Association
✓ **EGEC**	European Geothermal Energy Council
✓ **EPIA**	European Photovoltaic Industry Association
✓ **ESHA**	European Small Hydropower Association
✓ **ESTIF**	European Solar Thermal Industry Federation
✓ **EUBIA**	European Biomass Industry Association
✓ **EWEA**	European Wind Energy Association
✓ **EUREC Agency**	European Renewable Energy Research Centres Agency



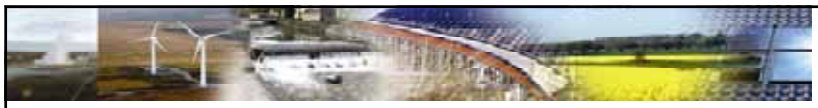
EREC – activities

- To act as a forum for exchange of information and discussion on issues related to RES
- To provide information and consultancy on renewable energies for the political decision makers on local, regional, national and international level
- Information dissemination on RES issues (organisation of conferences, workshops, publications, etc.)
- To promote European RES equipment, products and services on world markets



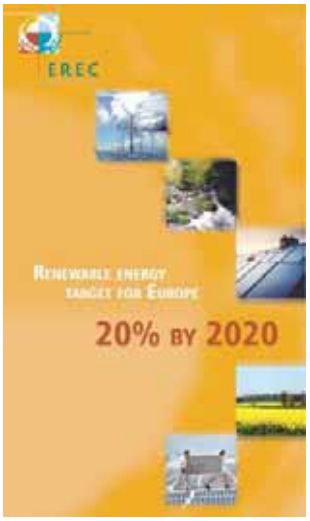
Renewable Energy House

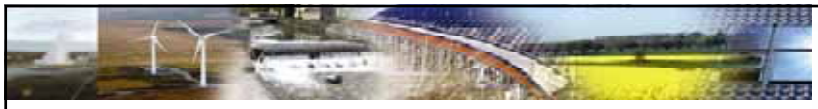
- Central meeting point for RES issues in the heart of Brussels
- Headquarters for the European renewable energy sector
- Ambitious energy concept for renovation of monument protected building (RES & RUE measures)
  - Insulation of roof and façade
  - Double glazing
  - 100 % RES heating and cooling supply from RES (pellets, solar thermal, geothermal installation)
  - Electricity production with PV (modules, semi-transparent, thin film)



RES target for Europe

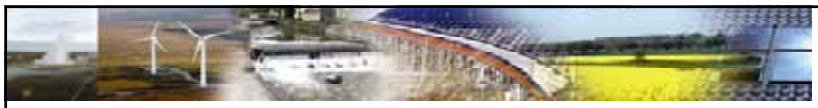
20 % by 2020 in Europe



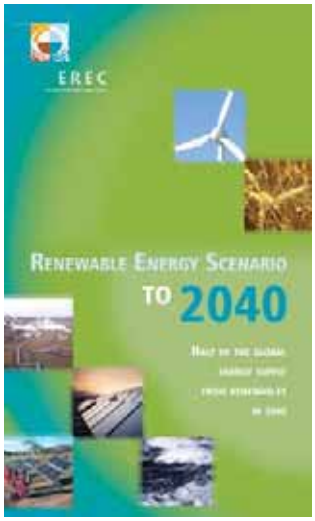


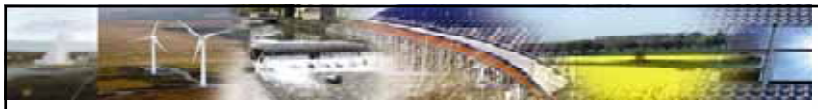
Benefits of 20 % target

- Total RES investment of 443 billion € in the period 2001-2020
- 126,7 – 323,9 billion € of cumulated avoided external costs between 2001 and 2020
- 728 million tons/year of CO2 emission reduction in 2020
- 115,8 billion € of cumulative avoided fuel cost reduction in EU15 (2001-2020)
- Creation of more than 2 million full time jobs until 2020



Renewable Energy Scenario to 2040

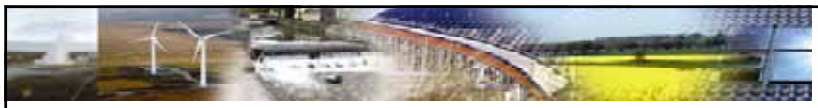




Why a Scenario ?

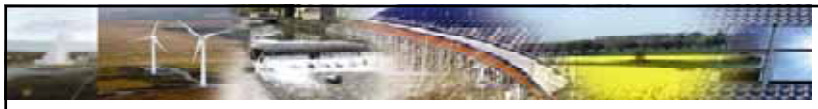
- images of alternative futures
- neither predictions nor forecasts
- image of how the future could unfold
- useful tools for investigating alternative future developments and their implications

Scenarios can create a vision for the future



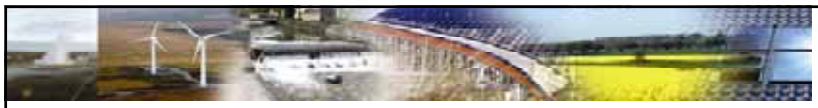
The Advanced International Policies Scenario (AIP Scenario)

Half of the global energy supply by renewables in 2040



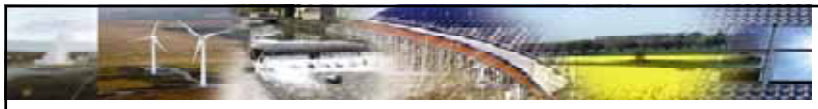
AIP Scenario assumptions

- ambitious growth rates
- additional support measures
- regions already active in the promotion of renewables will increase their efforts
- Higher prices for conventional energy supply
- growing support for electrification of the poor regions by renewables
- Implementation of the Kyoto protocol and additional measures
- International cooperation
- total energy consumption are based on a scenario from the IIASA

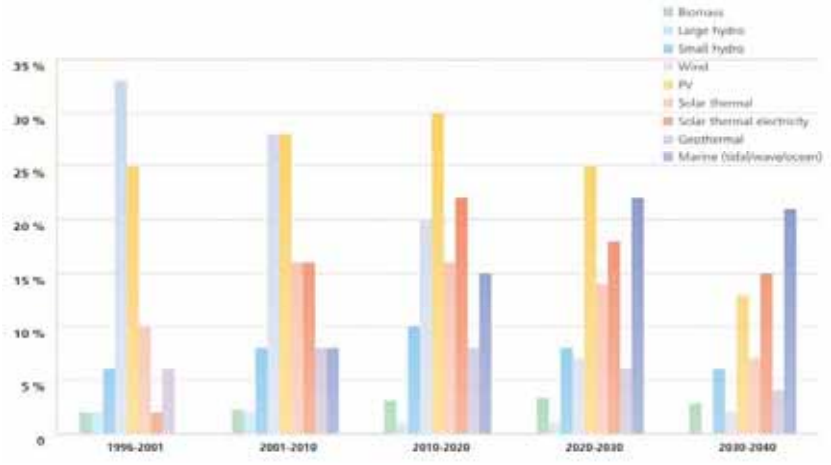


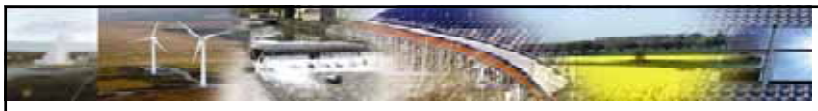
Growth rates of different technologies in AIP Scenario

	1996-2001	2001-2010	2010-2020	2020-2030	2030-2040
Biomass	2%	2.2%	3.1%	3.3%	2.8%
Large hydro	2%	2%	1%	1%	0%
Small hydro	6%	8%	10%	8%	6%
Wind	33%	28%	20%	7%	2%
PV	25%	28%	30%	25%	13%
Solar thermal	10%	16%	16%	14%	7%
Solar thermal electricity	2%	16%	22%	18%	15%
Geothermal	6%	8%	8%	6%	4%
Marine (tidal/wave/ocean)	-	8%	15%	22%	21%



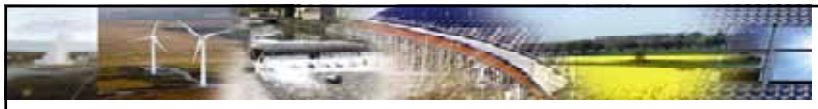
Growth rates of different technologies in AIP Scenario



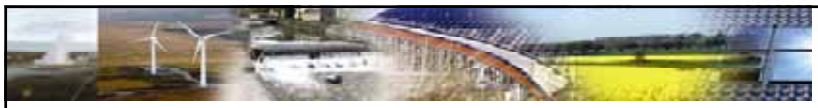


The contribution of Renewable Energy Sources to the world energy supply in 2040 – Projections in Mtoe – Advanced International Policy Scenario

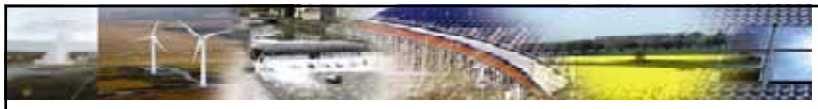
	2001	2010	2020	2030	2040
Total Consumption in Mtoe (IIASA)	10038.3	10549	11405	12352	13310
Biomass	1080	1313	1791	2483	3271
Large hydro	222,7	266	309	341	358
Small hydro	9,5	19	49	106	189
Wind	4,7	44	266	542	688
PV	0,2	2	24	221	784
Solar thermal	4,1	15	66	244	480
Solar thermal electricity	0,1	0,4	3	16	68
Geothermal	43,2	86	186	333	493
Marine (tidal/wave/ocean)	0,05	0,1	0,4	3	20
Total RES	1364,5	1745,5	2694,4	4289	6351
RES Contribution	13,6%	16,6%	23,6%	34,7%	47,7%



The contribution of Renewable Energy Sources to the world energy supply in 2040 – Projections in Mtoe – Advanced International Policy Scenario

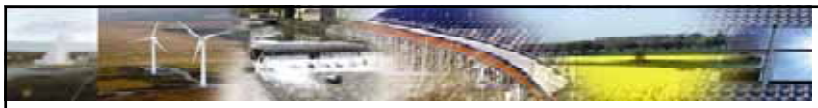


Electricity Scenario – Advanced International Policies

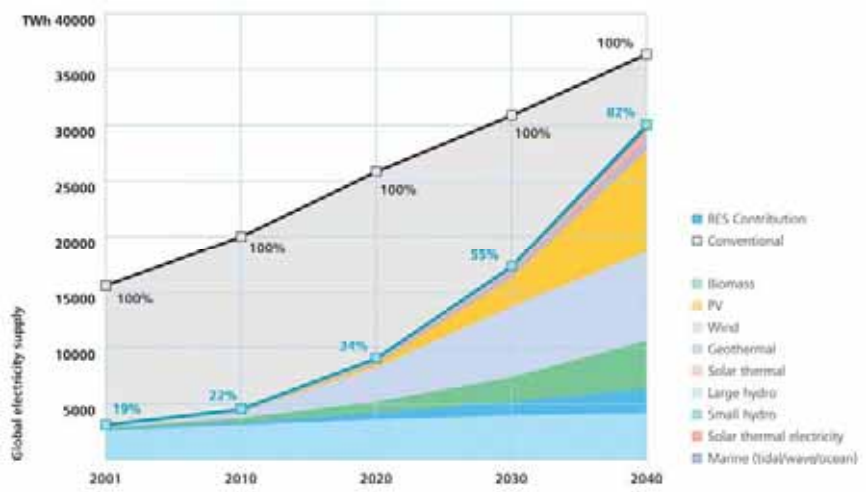


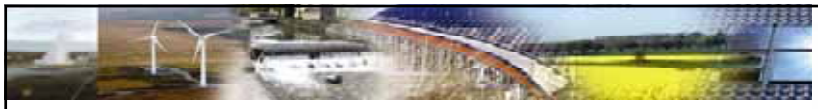
Exemplary detailed scenario for electricity – AIP scenario

	2001	2010	2020	2030	2040
Total Consumption in TWh (IEA)	15578	19973	25818	30855	36346
Biomass	180	390	1010	2180	4290
Large Hydro	2590	3095	3590	3965	4165
Small Hydro	110	220	570	1230	2200
Wind	54,5	512	3093	6307	8000
PV	2,2	20	276	2570	9113
Solar Thermal	1	5	40	195	790
Geothermal	50	134	318	625	1020
Marine	0,5	1	4	37	230
Total RES	2988,2	4377	8901	17109	29808
RES Contribution	19,2%	21,9%	34,5%	55,4%	82,0%

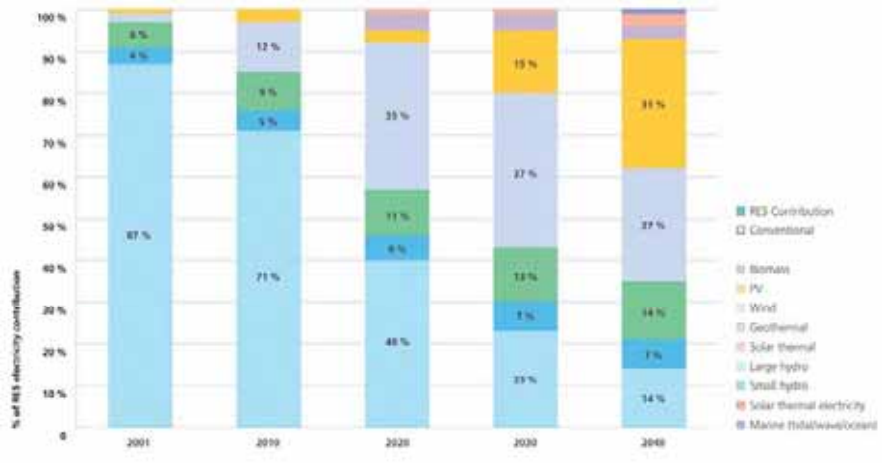


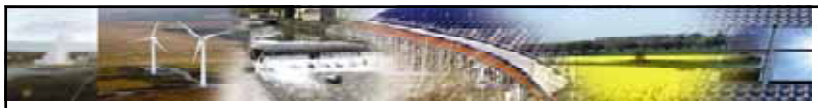
Exemplary detailed scenario for electricity – AIP Scenario



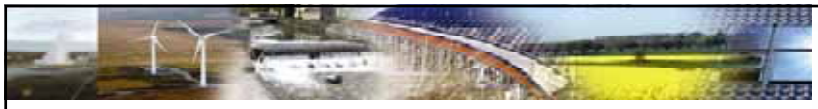


The contribution of RES to the world energy supply in 2040 - AIP



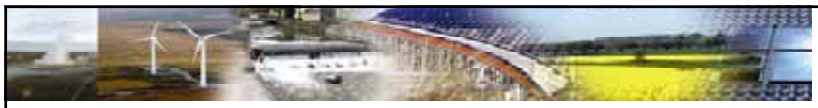


Dynamic Current Policies Scenario



DCP Scenario assumptions

- Does not mean „business as usual“
- Model based on less international co-operation that in AIP scenario
- Expects amibitious policy measures on national level at least in the industrialised part of the world
- additional support measures
- total energy consumption are based on a scenario from the IIASA, but higher consumption is assumed

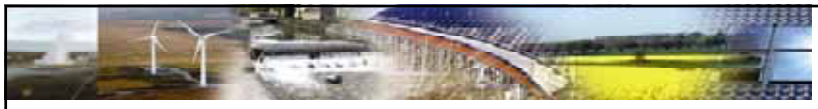


EREC

Growth rates of different technologies DCP Scenario

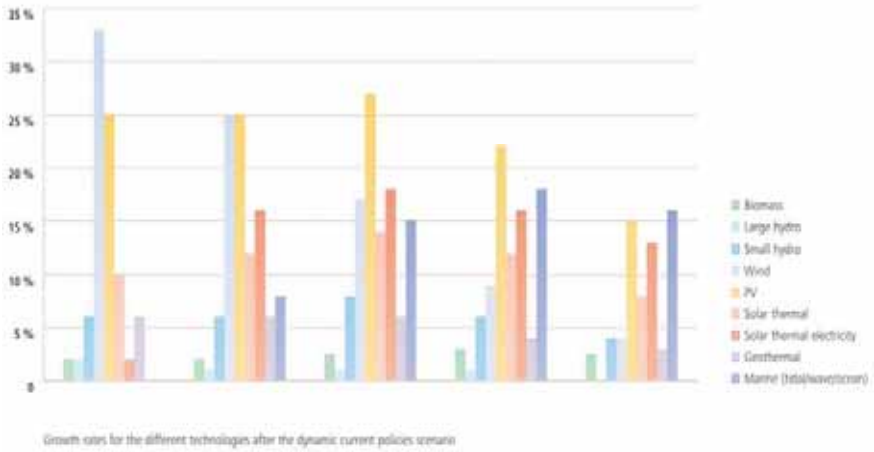
	1996-2001	2001-2010	2010-2020	2020-2030	2030-2040
Biomass	2%	2%	2.5%	3%	2.5%
Large hydro	2%	1%	1%	1%	0%
Small hydro	6%	6%	8%	6%	4%
Wind	33%	25%	17%	9%	4%
PV	25%	25%	27%	22%	15%
Solar thermal	10%	12%	14%	12%	8%
Solar thermal electricity	2%	16%	18%	16%	13%
Geothermal	6%	6%	6%	4%	3%
Marine (tidal/wave/ocean)	-	8%	15%	18%	16%

Growth rates for the different technologies after the current international polices scenario

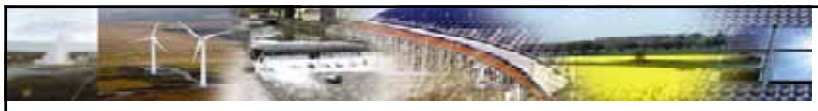


EREC

Growth rates of different technologies DCP Scenario

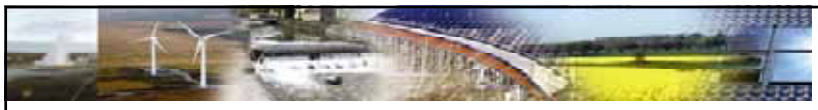


Growth rates for the different technologies after the dynamic current policies scenario



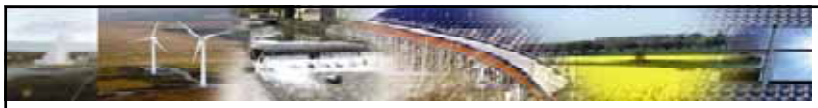
Dynamic Current Policies Scenario (projection in Mtoe)

	2001	2010	2020	2030	2040
World Primary Energy Consumption (Mtoe)	10038,3	11752	13553	15547	17690
Biomass	1080	1291	1653	2221	2843
Large Hydro	222,7	255	281	296	308
Small Hydro	9,5	16	34	62	91
Wind	4,7	35	167	395	584
PV	0,2	1	15	110	445
Solar Thermal	4,1	11	41	127	274
Solar Thermal Power	0,1	0,4	2	9	29
Geothermal	43,2	73	131	194	261
Marine (tidal/wave/ocean)	0,05	0,1	0,4	2	9
TOTAL RES	1364,5	1682,5	2324,4	3416	4844
RES Contribution	13,6%	14,3%	17,1%	22,0%	27,4%



Summary

- RE has the technological potential to play a leading role in the energy mix of the future.
- RE is integral part of the energy supply in many countries today.
- RE has tangible economic, ecological and social benefits.
- **BUT: RE market development depends on a coherent, predictable, supportive political & legal framework.**



Thank you for your attention!

For more information

www.erec-renewables.org

EREC - European Renewable Energy Council
Renewable Energy House
Rue d'Arlon 63-65, B-1040 Brussels, Belgium
T: +32 2 546 1933 - F: +32 2 546 1934
erec@erec-renewables.org

E^nR's Vision for a Sustainable Energy System

Dr. Håvard Solem, Enova SF

E^nR President 2006

Energy Paths – Horizon 2050

Spearheading Environmentally Sound and Rational Use of Energy

Outline

1. E^nR
2. Enova SF
3. Enova SF – E^nR interaction

EnR – a short introduction

European Energy Network, established 1991

Voluntary network of organisations with a national responsibility for energy efficiency and renewable energy

23 member organisations:

ADEME (France), CEA (Czech Republic), CRES (Greece), EST (UK), IDEA (Spain), STEM (Sweden), …

Spearheading Environmentally Sound and Rational Use of Energy enova

EnR – a short introduction

Goal

"EnR is always an authoritative contributing partner to the improvement of policy making and the development and implementation of RUE and RES programmes and climate change abatement activities, both on a national and European level."

Vision

"EnR's vision is to be at the forefront of Europe's drive towards increased energy efficiency and use of renewable energy sources by enhancing the role of its members through communication, coordination and collaboration and by acting as a bridge between national activities and those of the European Community and other relevant international bodies."

Enova SF

State enterprise owned by the Ministry of Petroleum and Energy

Funds originate from a levy on transmission of electricity for domestic consumption, app. 70 mill Euro per year

Funds are channeled into an Energy Fund, Enova acts as the fund manager

Spearheading Environmentally Sound and Rational Use of Energy enova

Enova SF

Vision 2050:
"A driving force towards a sustainable energy system"

Main challenges

Increase production of renewable energy
Decrease growth in energy consumption

Main policy instruments:

- Closing the efficiency gap
- Removing barriers
  - Technology
  - Information
  - Normative measures

EnR

WG Renewable Energy
WG Energy Efficiency
WG Labelling
WG Behavioural Change

Tomorrow's decision-makers determines our future

Regnmakerne – "The Rainmakers"

- A national concept for children
- The goal is to involve and create interest and engagement in energy related subjects among children and young people.
- Children in Norway between the ages of 6 and 15 can meet the Rainmakers on www.regnmakerne.no, on national TV and in primary school

Spearheading Environmentally Sound and Rational Use of Energy

Enova – EnR interaction

Kids4future (EUSAVE)

Based on the Rainmakers concept

Partners from Belgium, Finland, Greece, Poland, Slovenia, Spain, Sweden, and Slovakia

Develop a common European platform:

- Activities in primary school
- Book about the Rainmakers
- Children's programme on national TV
- Website

Concluding remarks

Success criteria for policy development in 2050

Taking diversity into consideration
- National energy and environmental issues
- Economic situation
- Legislation
- Culture

Benchmarking and exchange of information on best practice
- Among members
- Between E^{n}R and the European Commission

Spearheading Environmentally Sound and Rational Use of Energy enova

Thank you for your attention!

Responsibility and Coordination

Dr. Gerald Vones
Austrian Federal Ministry of Economics and Labour
Division Energy – Technology and Safety

Dipl.Ing. Theodor Zillner
Austrian Federal Ministry of Transport, Innovation and Technology
Division Energy and Environmental Technologies

Venue

Palais Auersperg
Auerspergstrasse 1, 1080 Vienna

Conference Fee

Participation in the conference is free.
Please note that the registration procedure requires an invitation from the organisers.

Poster Exhibition

In the hall of the conference venue an exhibition of selected posters presenting projects, concepts and research programmes can be visited throughout the conference.

Evening Programme

All participants are invited to attend the conference reception on
16th March 2006 beginning at 7 p.m.

Location: Cafe Atelier
Augustinerstraße 1, 1010 Vienna

Hotel Rooms

A limited amount of hotel rooms at a reduced price is pre-reserved.
Please consult the website below.

Website for Registration and further Information

www.energyagency.at/services/veranst/zenergyaustria.htm

For registration please fill in and submit the form on this website until 3rd March 2006 at the latest. Your registration needs to be confirmed by an invitation from the organisers.

Organisers
Austrian Federal Ministry of Economics and Labour
Austrian Federal Ministry of Transport, Innovation and Technology

in cooperation with:
Austrian Energy Agency

AUSTRIAN ENERGY AGENCY

BUNDESMINISTERIUM für WIRTSCHAFT und ARBEIT

bmvit
Federal Ministry for Transport, Innovation and Technology