



Demand Side Energy Situation in Hong Kong Reference to USA and European Union

by
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30 August 2007
Hong Kong

Presentation Coverage

- World Energy
 - Hong Kong Energy + Demand Side
 - European Energy
 - USA Energy
 - China Energy
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World

- By International Energy Outlook 2006 (IEO 2006), Energy Information Administration (EIA), Department of Energy (DoE), USA.



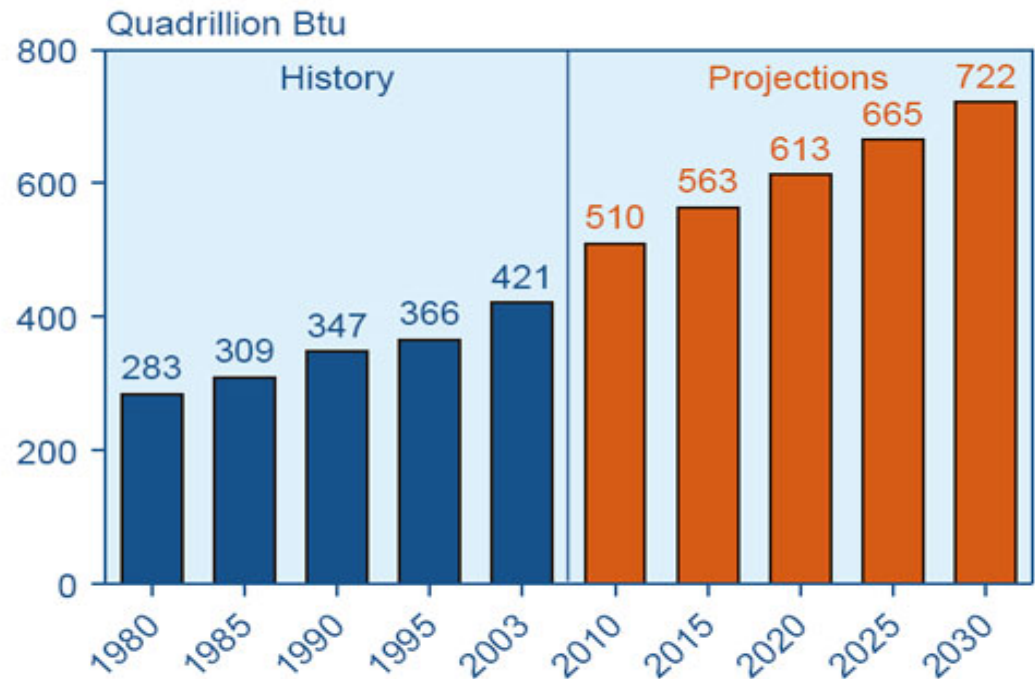
Energy Information Administration

Official Energy Statistics from the U.S. Government

World

- World Energy Increase from 421 to 722 QB from 2003 to 2030
- 71% Increase in 27 years

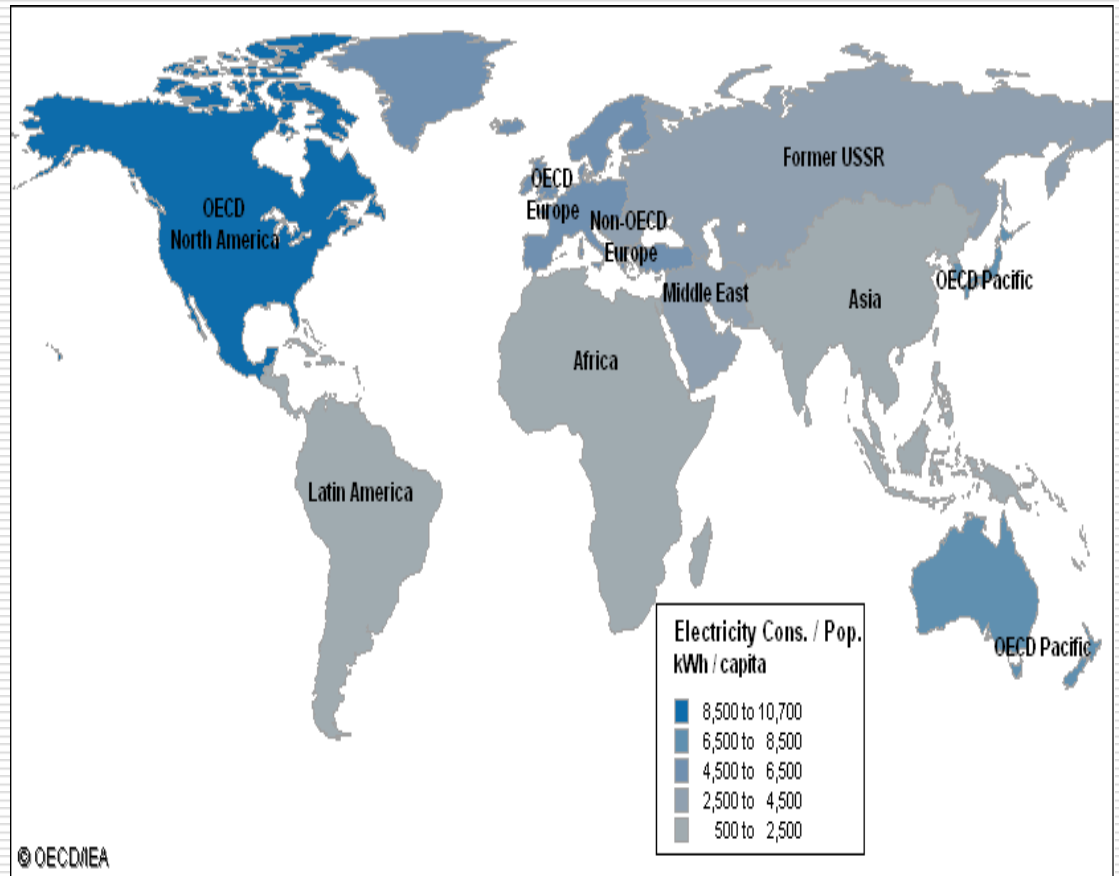
Figure 7. World Marketed Energy Consumption, 1980-2030



Sources: **History:** Energy Information Administration (EIA), *International Energy Annual 2003* (May-July 2005), web site www.eia.doe.gov/iea/. **Projections:** EIA, *System for the Analysis of Global Energy Markets* (2006).

World

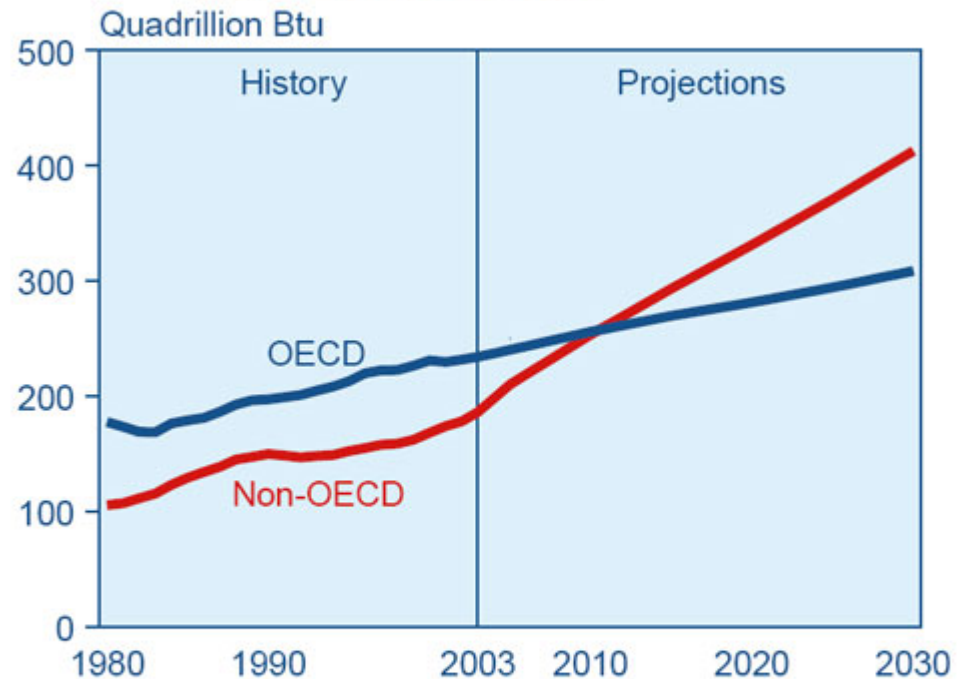
- OECD
(Organization for Economic Cooperation and Development) countries
- Non-OECD countries



World

- ❑ Non-OECD countries account for $\frac{3}{4}$ increase of energy use
- ❑ China & India
- ❑ Non-OECD 3% annual growth rate
- ❑ ODEC 1% growth rate

Figure 8. World Marketed Energy Use: OECD and Non-OECD, 1980-2030

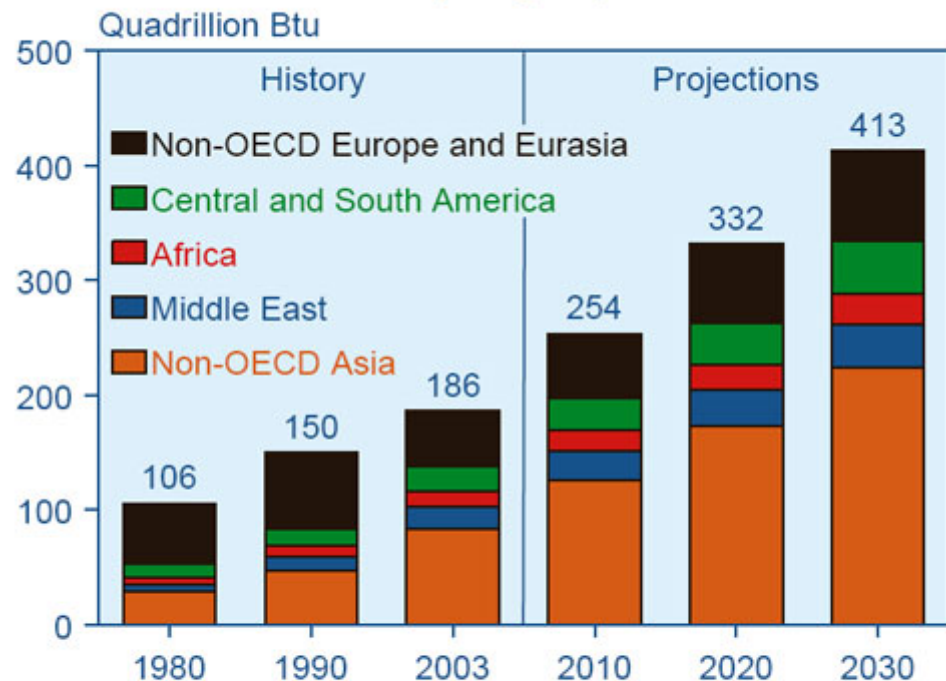


Sources: **History:** Energy Information Administration (EIA), *International Energy Annual 2003* (May-July 2005), web site www.eia.doe.gov/iea/. **Projections:** EIA, *System for the Analysis of Global Energy Markets* (2006).

World

- Energy demand in China & India almost TRIPLE in the projection period

Figure 9. Marketed Energy Use in the Non-OECD Economies by Region, 1980-2030



Sources: **History:** Energy Information Administration (EIA), *International Energy Annual 2003* (May-July 2005), web site www.eia.doe.gov/iea/. **Projections:** EIA, *System for the Analysis of Global Energy Markets* (2006).

World - Supply

- ❑ Fossil fuels CONTINUE to supply the majority of energy use worldwide
- ❑ Oil remains the DOMINANT energy source up to 2030
- ❑ However, the oil consumption share declines from 38% to 33% due to HIGH world oil prices



World - Oil

- ❑ Worldwide, TRANSPORTATION and INDUSTRY are the major growth sectors
- ❑ For TRANSPORTATION sector, NO alternatives to compete with oil
- ❑ 39% incremental demand for INDUSTRY to 2030



World – Natural Gas

- ❑ INDUSTRIAL sector remains the most important end-use consumer for Natural Gas worldwide
- ❑ 52% growth to 2030
- ❑ Natural Gas is a desirable option for electric power worldwide due to:
 - Higher efficiency to other sources
 - Low carbon content
 - Reduction of greenhouse gas emissions



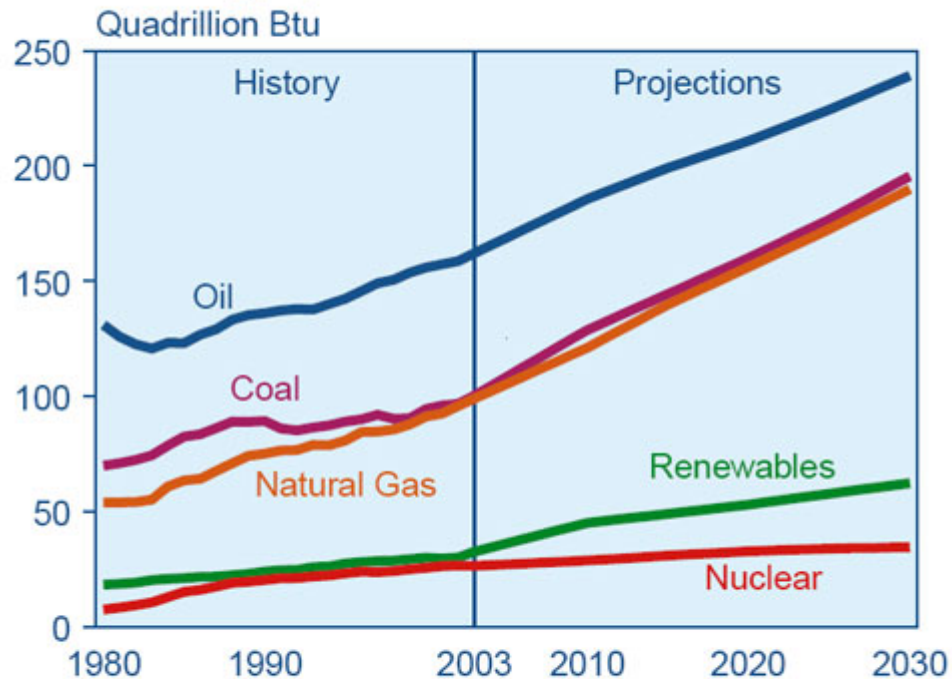
World - Coal

- ❑ All regions of the world increase the use of coal, except Japan (use natural gas & nuclear). Japan has slow population growth
- ❑ China & India are the LARGEST increases in coal use, where coal supply are plentiful
- ❑ China & India account for 70% increase in coal demand



World

Figure 10. World Marketed Energy Use by Fuel Type, 1980-2030

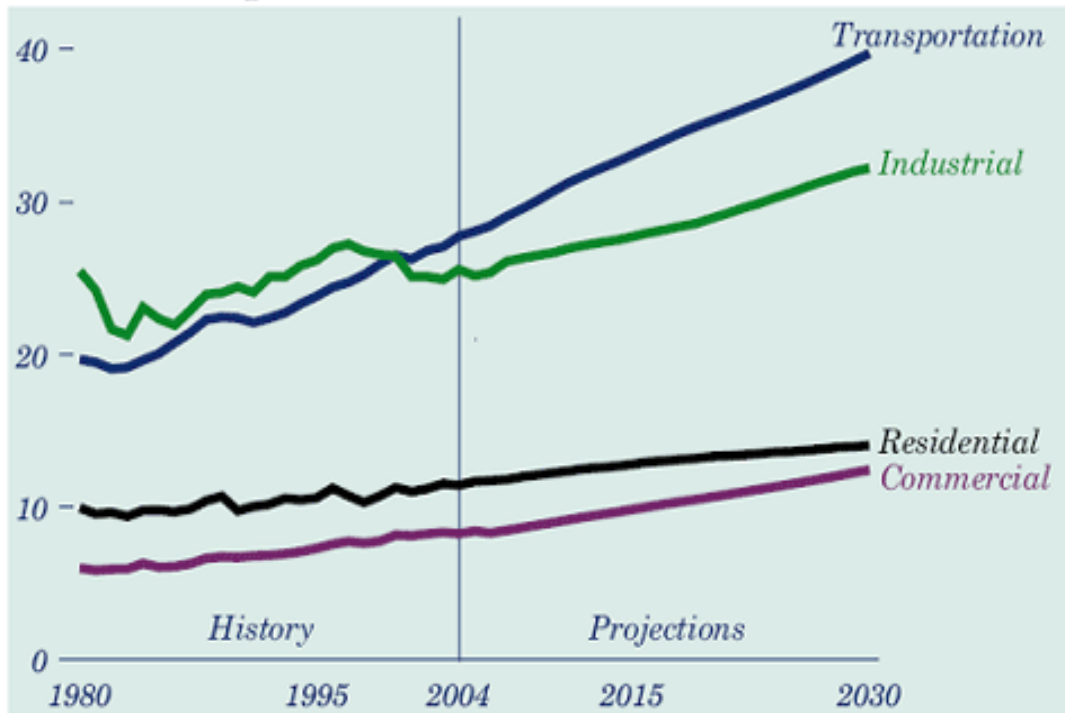


Sources: **History:** Energy Information Administration (EIA), *International Energy Annual 2003* (May-July 2005), web site www.eia.doe.gov/iea/. **Projections:** EIA, *System for the Analysis of Global Energy Markets* (2006).

USA

- AEO 2006 predicts energy consumption increases from 100 QB (2004) to 127 QB (2025) in USA

Figure 2. Delivered energy consumption by sector, 1980-2030 (quadrillion Btu)



DEMAND SIDE Energy Savings

- HVAC,
 - Electrical,
 - Lighting,
 - Lift & Escalator
 - BMS
 - Building Envelope
 - Management
 - Others
-

HVAC

- ❑ Ventilation – Free Cooling, CO2 Control [20-30%]
 - ❑ Variable Speed Drives [40-65%]
 - ❑ Water-cooled chillers [25-40%]
 - ❑ Motors [15-35%]
 - ❑ Management [10-20%]
 - ❑ System Re-commissioning [10-35%]
-

Lighting, Electrical & Others

- T5 tubes [60-90%]
 - LED lights [70-90%]
 - Phase Balance [20-40%]
 - BMS [15-25%]
 - Re-commissioning [15-25%]
-

Hong Kong



Energy Efficiency Registration Scheme for Buildings

- ❑ Launched in 1998, the Scheme serves to promote the application of the Building Energy Codes.
 - ❑ 5 Codes cover lighting, air conditioning, electrical and lift & escalator installations
 - ❑ A registration certificate will be issued to a building that successfully meets the Code standards.
 - ❑ A registered building can also use the Scheme's "Energy Efficient Building Logo" on their documents to publicize their achievement on energy efficiency.
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Energy Efficiency Registration Scheme for Buildings

The Hong Kong Energy Efficiency Registration Scheme for Buildings

The Hong Kong Energy Efficiency Registration Scheme for Buildings

www.ees.gov.hk

Energy Efficiency EMSD

The Hong Kong Energy Efficiency Registration Scheme for Buildings

Certificate of Registration

This is to certify that

"Energy Efficient Building" (specimen)

has participated in the scheme under this registration to:

"1000"

and is in compliance with the

"Performance-based Building Energy Code" (specimen).

(Original will be signed)

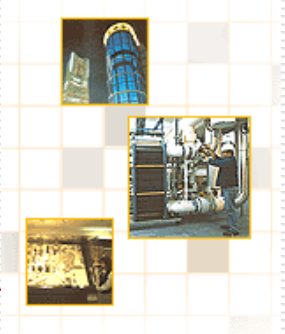
(Off Targeting)

By Director of Environmental and Natural Services

Date of Issue
1 April 2004

EMSD

Water-cooled Air-conditioning



- In 2000, a pilot scheme on the wider use of fresh water for water-cooled air conditioning in non-domestic buildings in 6 designated areas in Hong Kong.
 - As at the end of November 2005, 39 water-cooled air-conditioning installations using evaporative cooling towers registered under the Pilot Scheme were completed.
 - 25-40% energy savings are anticipated to use from air-cooled to water-cooled.
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Energy Efficiency Labeling Scheme

- ❑ For the public to choose energy efficient products
- ❑ EMSD operates a voluntary Energy Efficiency Labelling Scheme for appliances and equipment used both at home and office as well as for vehicles.
- ❑ 10 Electrical appliances including refrigerators, room coolers, washing machines, electric clothes dryers, compact fluorescent lamps, electric storage water heaters, electric rice-cookers, dehumidifiers, television sets and electronic ballasts. 6 office equipment include photocopiers, multifunction devices, laser printers, LCD monitors, computers and fax machines.



Hong Kong – Electricity Consumption

- ❑ In 2004, the electricity consumption by residential, industrial and commercial buildings in Hong Kong is 136,234 Terajoules (TJ), = 38 Billion KWh.
 - ❑ One Terajoule is equivalent to 10^{12} Joules.
 - ❑ From 1994 to 2004, the electricity consumption by buildings in Hong Kong has a 35% increase in 10 years.
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European Union



Statement

- *Energy is central to our lives. We rely on it for transport, for heating our homes in winter, cooling them in summer and running our factories, farms and offices. However, fossil fuel is a **finite resource and is a major cause of global warming**. So we can no longer take energy for granted. EU leaders agreed in **March 2007** that the time has come for an **integrated energy and environment policy** based on clear targets and timetables for cutting fossil fuel use, saving energy and developing alternatives.*
-

EU Countries

- ❑ 25 including:
 - ❑ Germany 82.5m people
 - ❑ France 60.9m people
 - ❑ UK 60.4m people
 - ❑ Italy 58.8m people
 - ❑ Spain 43.8m people
 - ❑ EXCLUDING Russia, Norway, Turkey, Swiss, etc.
 - ❑ TOTAL POPULATION: 390m
-

Fact

- Some 80% of the energy the EU consumes is from fossil fuels – oil, natural gas and coal. A significant and increasing proportion of this comes from outside the EU, making the EU vulnerable to reductions in supply or higher prices. Dependence on imported oil could rise to 93% and on imported gas to 84% by 2030 if energy consumption is not checked and the fuel mix changed. This fuel mix is also unsustainable if the EU wants to reduce the impact of climate change.
-

Way Forward

- ❑ saving 20% of energy consumption compared to projections for 2020;
 - ❑ increasing to 20% by 2020 the share of renewable energies in overall energy consumption;
 - ❑ increasing to at least 10% the share of biofuels in overall petrol and diesel consumption by 2020;
 - ❑ cutting greenhouse gas emissions by at least 20% by 2020;
 - ❑ better integration of EU energy markets;
 - ❑ better integration of EU energy policy with other policies, such as agriculture and trade;
 - ❑ more international cooperation: if the EU can take a common approach on energy, and articulate it with a common voice, it can lead global debate.
-

1. Imports remain essential

- Long-term security of supply means not being over-dependent on a few countries for supplies, or compensating for that dependence by close cooperation in investment and transfer of technology with countries such as Russia (a major source of fossil fuels and potentially of electricity), and oil and gas producing countries of eastern Europe, north Africa and the Gulf region.
-

2. Changing the fuel mix

- None of this will be enough. If climate change is to be stopped, the EU must play its part alongside other countries and regions. The EU's aim is by 2050 to obtain more than 50% of the energy it uses in power generation, industry, transport and the home from carbon-free sources, i.e. from sources other than fossil fuel.
 - Switch to wind (particularly offshore wind), biomass, hydro and solar power and bio-fuels from organic matter. The following step could be to become a hydrogen-based economy.
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3. Caring for the environment

- ❑ Caps apply on the amount of emissions of carbon dioxide (CO₂) and this helps stem global warming. Companies are given a quota of emission allowances.
 - ❑ Encourages more efficient energy use, cuts pollution and helps keep the promise the EU has made in the Kyoto Protocol on climate change to cut emissions by 8% from 1990 levels by 2008-2012.
 - ❑ EU has made a firm independent commitment to achieve a reduction of at least 20% by 2020 compared with 1990.
-

4. Saving energy by using it more efficiently

- Energy use is particularly inefficient in buildings, and to combat this, the EU has agreed energy performance standards and certification requirements for buildings, compulsory regular inspections of boilers and air-conditioning systems, and standards for energy-using equipment, such as household appliances.
-

5. Using energy more intelligently

- EU's Intelligent Energy Programme has €730 million to spend between 2007 and 2013 to support research into energy saving, energy efficiency, renewable energies and the energy-related aspects of transport in the EU.
-

6. The single energy market

- ❑ The EU facilitates competition with funding to connect isolated networks and improve cross-border interconnections, both within the EU and with supplier countries. For their part, all suppliers have guarantees under single energy market rules that they can have access to the distribution grid and pipeline networks of other EU countries, and that access charges will be fair.
 - ❑ The process of opening up energy markets has been progressive, starting with large businesses and ending with residential consumers.
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**** Energy Efficiency: Energy Performance of Buildings

- The Member States must apply minimum requirements as regards the energy performance of new and existing buildings, ensure the certification of their energy performance and require the regular inspection of boilers and air conditioning systems in buildings.
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ACT



- Directive [2002/91/EC](#) of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings.
-

Approval Process

- ❑ On February 14, the European Parliament adopted a non-binding resolution demanding that the key proposal to cut carbon emissions by 20% should be increased to 25%.
 - ❑ The proposals were debated and approved, including the 20% cut in carbon emissions originally proposed, at a meeting of the European Council on March 8 and 9, 2007.
-



Content – 4 Directives

- a common **methodology** for calculating the integrated energy performance of buildings;
 - minimum **standards** on the energy performance of new buildings and existing buildings that are subject to major renovation;
 - systems for the energy **certification** of new and existing buildings and, for public buildings, prominent display of this certification and other relevant information. Certificates must be less than five years old;
 - regular **inspection** of boilers and central air-conditioning systems in buildings and in addition an assessment of heating installations in which the boilers are more than 15 years old.
-

Methodology & Standards

- The common calculation methodology should include all the aspects which determine energy efficiency and not just the quality of the building's insulation. This integrated approach should take account of aspects such as heating and cooling installations, lighting installations, the position and orientation of the building, heat recovery, etc.
 - The minimum standards for buildings are calculated on the basis of the above methodology. The Member States are responsible for setting the minimum standards.
-

Certificates, minimum standards and inspections




- ❑ Energy performance certificates should be **made available** when buildings are constructed, sold or rented out.
 - ❑ The Directive specifically mentions rented buildings with the aim of ensuring that the **owner**, who does not normally pay the charges for energy expenditure, should take the necessary action.
 - ❑ Furthermore, the Directive states that **occupants** of buildings should be enabled to regulate their own consumption of heat and hot water, in so far as such measures are cost effective.
 - ❑ The Member States are responsible for drawing up the minimum standards. They will also ensure that the **certification and inspection of buildings are carried out by qualified and independent personnel**.
-



Buildings in EU


- This Directive states that certification of the energy efficiency of buildings is considered equivalent to an **energy audit** for micro, small and medium-sized firms.
 - Furthermore, such certification is equivalent to an energy audit with the recommendations which result in terms of **cost-effectiveness**.
-

Energy Efficiency Rating

	Current	Potential
<i>Very energy efficient - lower running costs</i>		
(92-100) A		
(81-91) B		
(69-80) C		70
(55-68) D		70
(39-54) E	52	
(21-38) F		
(1-20) G		
<i>Not energy efficient - higher running costs</i>		
UK 2005	Directive 2002/91/EC 	



Environmental (CO₂) Impact Rating

	Current	Potential
<i>Very environmentally friendly - lower CO₂ emissions</i>		
(92-100) A		
(81-91) B		
(69-80) C		
(55-68) D		63
(39-54) E		
(21-38) F	37	
(1-20) G		
<i>Not environmentally friendly - higher CO₂ emissions</i>		
UK 2005	Directive 2002/91/EC 	

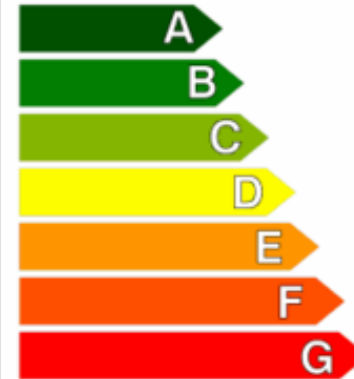


Energy

Washing machine

Manufacturer
Model

More efficient



B

Less efficient

Energy consumption
kWh/cycle

1.75

(based on standard test results for 60°C cotton cycle)

Actual energy consumption will depend on how the appliance is used

Washing performance

A B C D E F G

A: higher G: lower

Spin drying performance

A B C D E F G

A: higher G: lower

Spin speed (rpm)

1400

Capacity (cotton) kg

5.0

Water consumption

5.5

Noise
(dB(A) re 1 pW) Washing
Spinning

5.2

7.6

Further information contained in product brochure



USA



Energy Policy Act 2005

- ❑ Signed by US President Bush on 8 August 2005 into “law”
 - ❑ Comprehensive & Long Range energy policy
 - ❑ Incentives for
 - Traditional energy production
 - New, efficient energy technologies
 - Conservation
 - ❑ 1,700 pages long
 - ❑ Hundreds of Provisions
-

EPACT 2005 (Selected Items)

- Energy Tax Incentives – Commercial Building Deduction for energy efficient improvements in buildings
 - Tax breaks for home energy improvements
 - Tax credit up to \$3,400 for hybrid vehicles
 - Loan guarantees for “innovative technologies” to avoid greenhouse gases
 - Subsidy wind energy
 - Promote Ocean energy including wave and tidal powers
-

EPACT 2005 (Selected Items) cont.

- Make geothermal energy more competitive
 - DOE to study natural energy resources
 - Subsidy for oil companies
 - Set Federal Fleet standards regulating electrical grid (Blackout in N America 2003)
 - Nuclear Specific Provisions
-

Energy Tax Incentives – Commercial Building Deduction for energy efficient improvements in buildings

- ❑ Energy Improvement 2006 & 2007, tax deduction \$1.80/sq.ft.
 - ❑ Incentives on improvements to lighting, HVAC & building envelope
 - ❑ Improvements compared to ASHRAE 2001 standards
 - ❑ Others
-

IMPACT

- ❑ Great Business Opportunities to individuals, contractors, product suppliers & corporations.
 - ❑ Individuals – Energy Professionals & Consultants
 - ❑ Contractors – Contracts
 - ❑ Product Suppliers – Sell more energy saving equipment
 - ❑ Corporations – power plants, resources managements
-

FUTURE

- A positive impact on energy practitioners, corporations, environmental and business opportunities in the coming AT LEAST 25 years.
 - The rest of the world will surely benefit from the impact by ways of learning, incorporations, conservations, new product research and many business opportunities.
-

China, US, EU, HK & World

(unit in Billion KWh)

Country	Population (A)	Electricity use 2003 (B)	Electricity use 2030 (C)	(C) / (A)	(B) / (A)	Factor ^
USA	300M	3,670	5,620	19	12	1.6
EU	390M	3,100	4,600	12	8	1.5
China	1,230 M	1,670	5,920	5	1	5
World	6,550 M	14,800	30,100	5	2	2.5
HK	7 M	38	70	10	5	2

World Energy Consumption Ranking

- 1. USA
 - 2. China
 - 3. Japan
 - 4. Russia
 - 5. Canada
 - 6. India
 - 7. Germany
 - 8. France
 - 9. Brazil
 - 10. UK
 - 15. Taiwan
 - 46. HK
 - Total No. of country 196
 - Most energy consumed country per capita is Iceland, next Norway
-

Thank you
