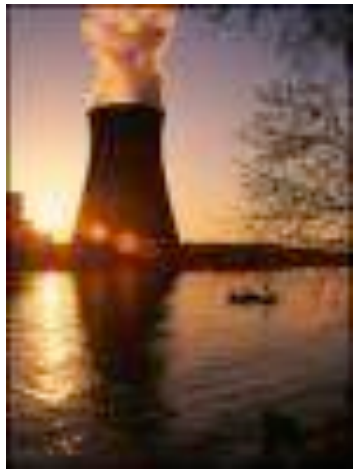
Major Challenges to New Nuclear Plants

- "Renaissance" of nuclear power in United States: More fragile than commonly assumed
- Major challenges
  - Financing: Cost of nuclear projects dwarfs market value and balance sheets of companies planning to build
  - Licensing process is a moving target: Lack of certainty, stability
  - Infrastructure: Workforce, equipment
  - Spent nuclear fuel management



Source: Briefing 31 August 2006

Market Values[1] of Companies Planning Nuclear Projects

Excelon	*$34.3 billion*
Duke Energy	*$27.8 billion*
Dominion	*$27 billion*
Southern	*$24.9 billion*
FPL	*$17.3 billion*
Entergy	*$15.9 billion*
Progress Energy	*$11.1 billion*
Constellation	*$9.9 billion*
NRG	*$6.5 billion*
SCANA	*$4.7 billion*

Electric power companies are small relative to the size of the $3-4 billion nuclear power projects they intend to build.

Some energy companies (e.g., ExxonMobil with market cap of $397 billion) routinely build $3-4 billion projects. All the companies planning new nuclear plants in the United States have a combined market cap of $179.4 billion, less than one-half the market cap of ExxonMobil.

1. Market value or market capitalization = number of shares outstanding times share price on 7.20.2006

Financial Risks Already Artificially Limited: Example Price-Anderson Act USA

"No other industry has ever been so thoroughly insulated from financial risks."

Jill Lancelot
President of Taxpayers for Common Sense

Source: http://www.taxpayer.net/energy/priceanderson.htm

Energy Policy Act of 2005: Investment Stimulus for New Plants

- **Federal loan guarantees**
  - Covers up to 80% of project cost
- **Production tax credits**
  - $18/MWh for up to 6,000 MW
  - Worth up to $125 million in tax credits per year for 8 years for 1,000 MW of capacity
- **Federal standby support**
  - $2 billion of risk coverage for first six plants
  - Covers delays resulting from licensing or litigation

OECD-IEA World Energy Outlook 2006

*"**Economics is not the only factor** determining the construction of new nuclear power plants. Safety, nuclear waste disposal and the risk of proliferation are real challenges which have to be solved to the satisfaction of the public, or they will hinder the development of new nuclear power plants.*

*Public concerns must be addressed, but **nuclear power will only become more important if private investment is facilitated** by the governments of countries where nuclear power is acceptable."*

"If governments do not facilitate the investment, I don't think nuclear will fly."

Fatih Birol
Chief Economist
OECD International Energy Agency

Source: The Economist, 9 November 2006

Nuclear Capacity Under OECD-IEA Scenarios

Region	Nuclear capacity (GW)			Share of nuclear in electricity generation (%)		
	2005	2030 Reference Scenario	2030 Alternative Policy	2005	2030 Reference Scenario	2030 Alternative Policy
OECD	**308**	**296**	**362**	**22%**	**16%**	**22%**
OECD North America	112	128	144	18%	15%	18%
OECD Europe	131	74	110	28%	12%	20%
OECD Pacific	65	94	108	25%	32%	41%
Transition economies	**40**	**54**	**64**	**17%**	**18%**	**23%**
Developing countries	**19**	**66**	**93**	**2%**	**3%**	**5%**
China	6	31	50	2%	3%	6%
India	3	19	25	2%	6%	9%
Other Asia	5	10	10	4%	3%	4%
Latin America	3	4	6	2%	2%	3%
Middle East and Africa	2	3	3	1%	1%	1%
World	**368**	**416**	**519**	**15%**	**10%**	**14%**

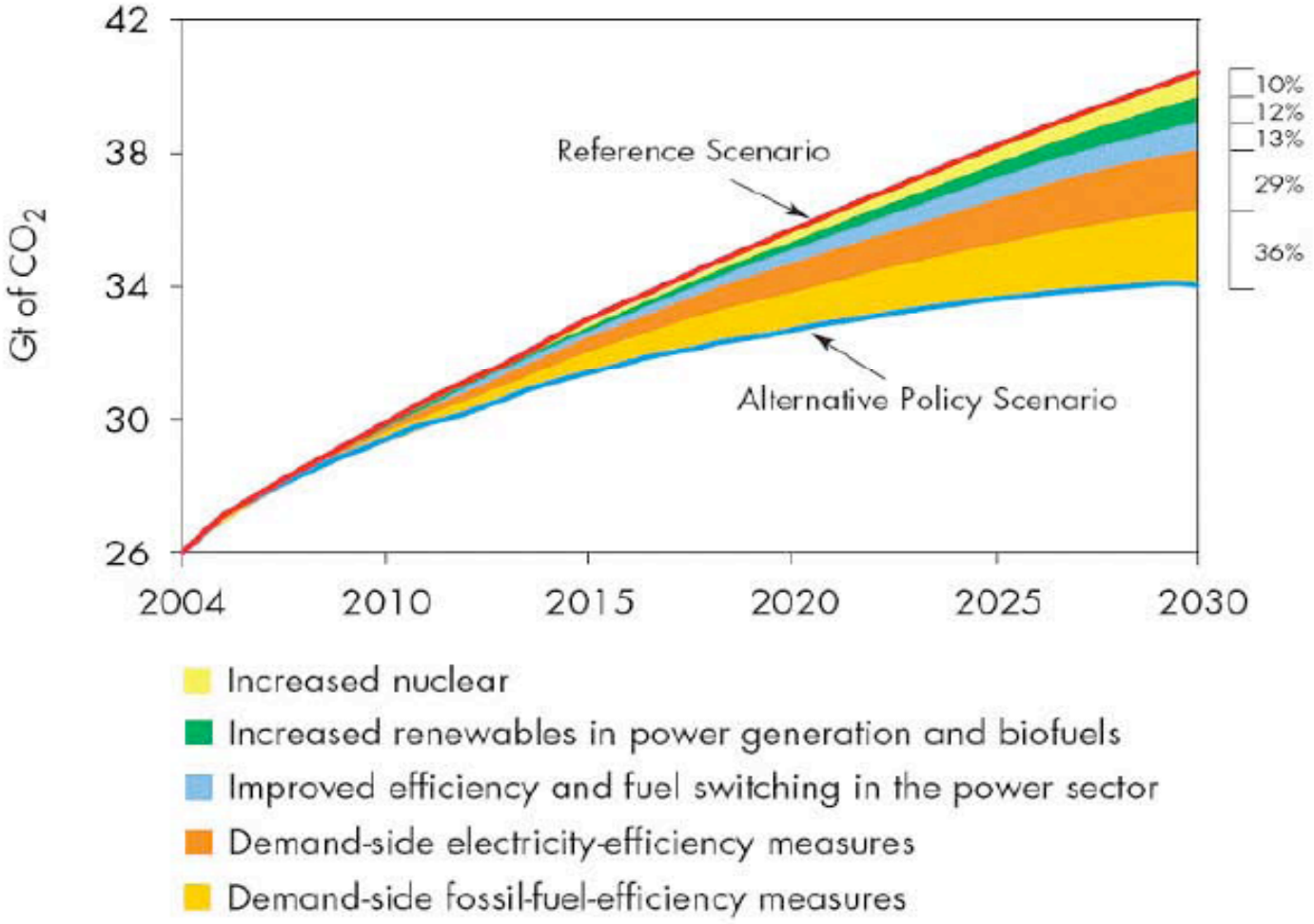
Sources: OECD-IEA, WEO 2006

Chinese Fantasies

Chinese Forecasting	Capacity Planned	Capacity Installed	Share Realised
in 1985 for 2000	20,000 MW	2,168 (in 15 Years)	11%
in 1996 for 2010	20,000 MW	max.10,282 (in 25 Years)	51%
in 2006 for 2020	40,000 MW	+30,000 ? (in 10 Years?)	?

Source: Mycle Schneider Consulting

Global Savings in CO_2 Emissions in the Alternative Scenario Compared to the Reference Scenario



World Energy Outlook 2006

INTERNATIONAL ENERGY AGENCY

Nuclear Energy and Supply Security

"First, almost no oil is used to generate electricity in the U.S. and this fact is not likely to change in the future.

Second, (…) new nuclear plants primarily are substitutes for new coal plants.

As a result, the investment in nuclear capacity does not have a significant impact on imports of oil or liquefied natural gas (LNG), which is forecast to grow rapidly over this period.

Accordingly, there does not appear to be an "energy security" case for investment in new nuclear plants."

Paul L. Joskow, MIT
December 2006

Workforce Crisis in the US Utility Industry

"The utility industry is facing the most significant and complex threat to its survival ever. From the Executive Suite down to the lineman, significant numbers of mission-critical employees are rapidly approaching retirement eligibility. On average, these employees are older than their counterparts in other industries and represent approximately 50% of their industry's knowledge assets.
Over the next four years, a substantial number of senior professionals—in key roles ranging from the Chief Executive Officer and Senior Management to Senior Engineers, Operations Managers, Nuclear Operators, Gas Transmission Specialists, and Control Supervisors—will likely take advantage of their ability to retire from their current companies and explore new career and life opportunities."

Bay Group, *Workforce Trends to Deliver Utility Industry a Knockout Blow,* 2005

"The electric and gas industries could easily collapse if they don't put a plan in place for staffing, retention, recruitment and training.

"We need to seriously question if we will be able to keep the lights on in the next 10 years."

Mike Brown
Senior Consultant and Utilities Sector Leader
Hay Group

Source: Power Engineering International, 17 January 2007

Nuclear Education Crisis at British Universities

Conclusions by 2002 Nuclear Installation Inspectorate Study

1. If nuclear education were a patient in a hospital it would be in intensive care.
2. Its health seems to depend more on the enthusiasm of individuals than the commitment of institutions.
3. Although nuclear courses are taught at 22 of the 130 or so universities in the UK the level of nuclear teaching is very low at many of them and at 7 teaching is likely to disappear in the next few years. (…)

8. In many universities the facilities for nuclear teaching, whilst serviceable, are old; such an image of decaying elegance is unlikely to attract students.
9. It seems unlikely that, unless action is taken, nuclear education will be robust and flexible enough to support the industry as it evolves.

Source: HSE-NII, *Nuclear Education at British Universities*, Feb 2002

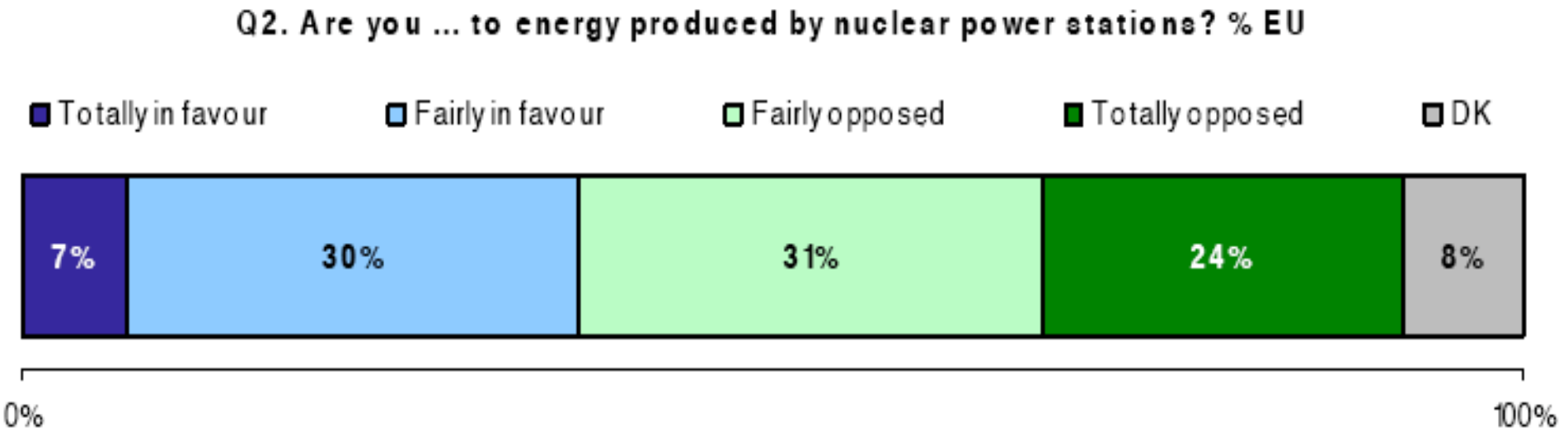
Nuclear Competence Crisis in Finland, Germany, South Korea, UK, USA…

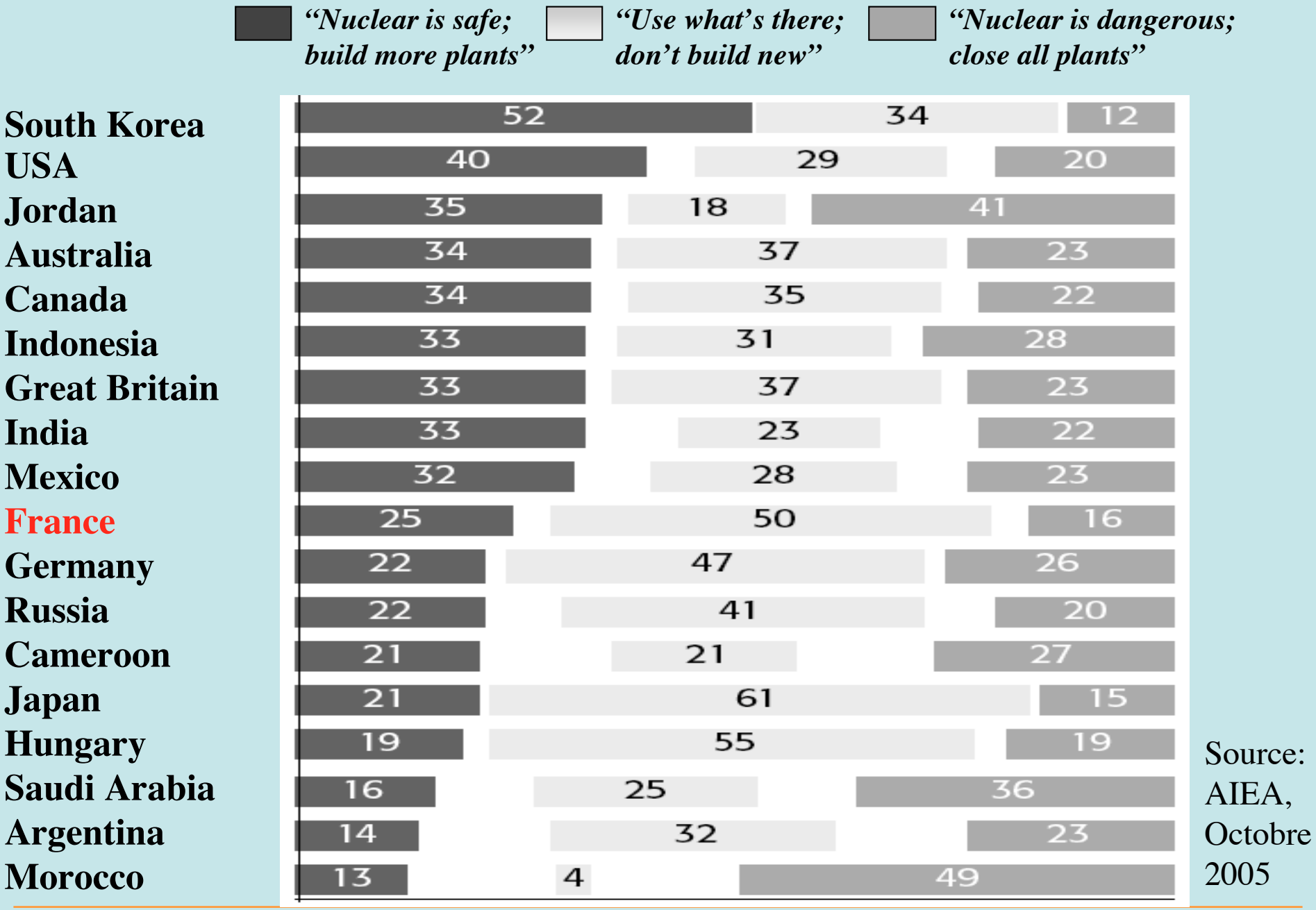
These national surveys show that employers require more engineers and scientists having a nuclear component to their education than those graduating. The proportion of nuclear engineers and scientists graduating each year expressed as a percentage of the number of mechanical engineers graduating each year in countries such as Finland, Germany, United Kingdom and the United States of America, is less than 1%. In Korea, it is much higher at 13%. Yet, the estimated required mix of new engineers and scientists working in the nuclear sectors of these countries is about 30% nuclear to 70% non-nuclear.

OECD Nuclear Energy Agency

Source: OECD NEA, *Nuclear Competence Building*, 2004

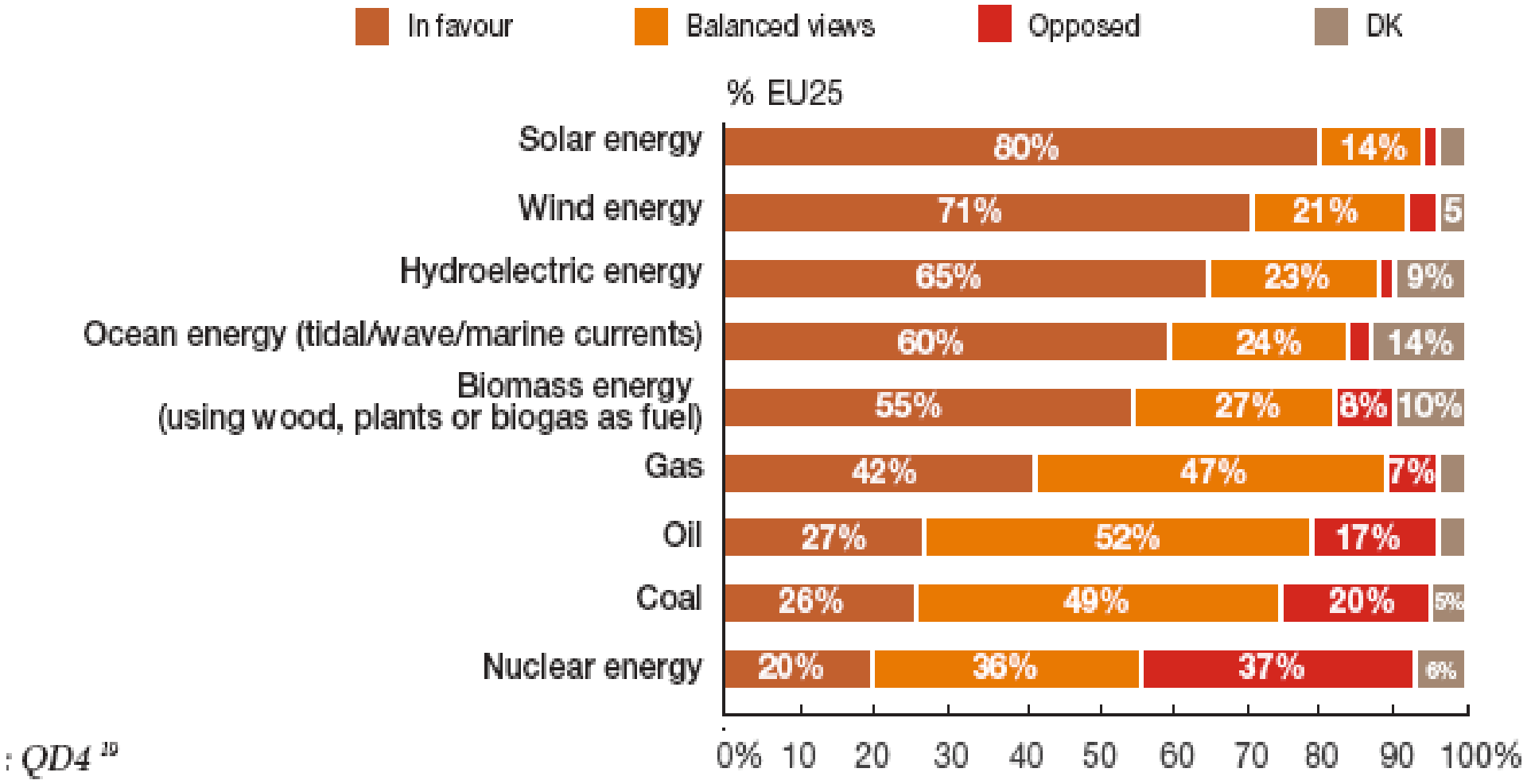
Public Opinion Survey
Eurobarometer EU-25 September 2005





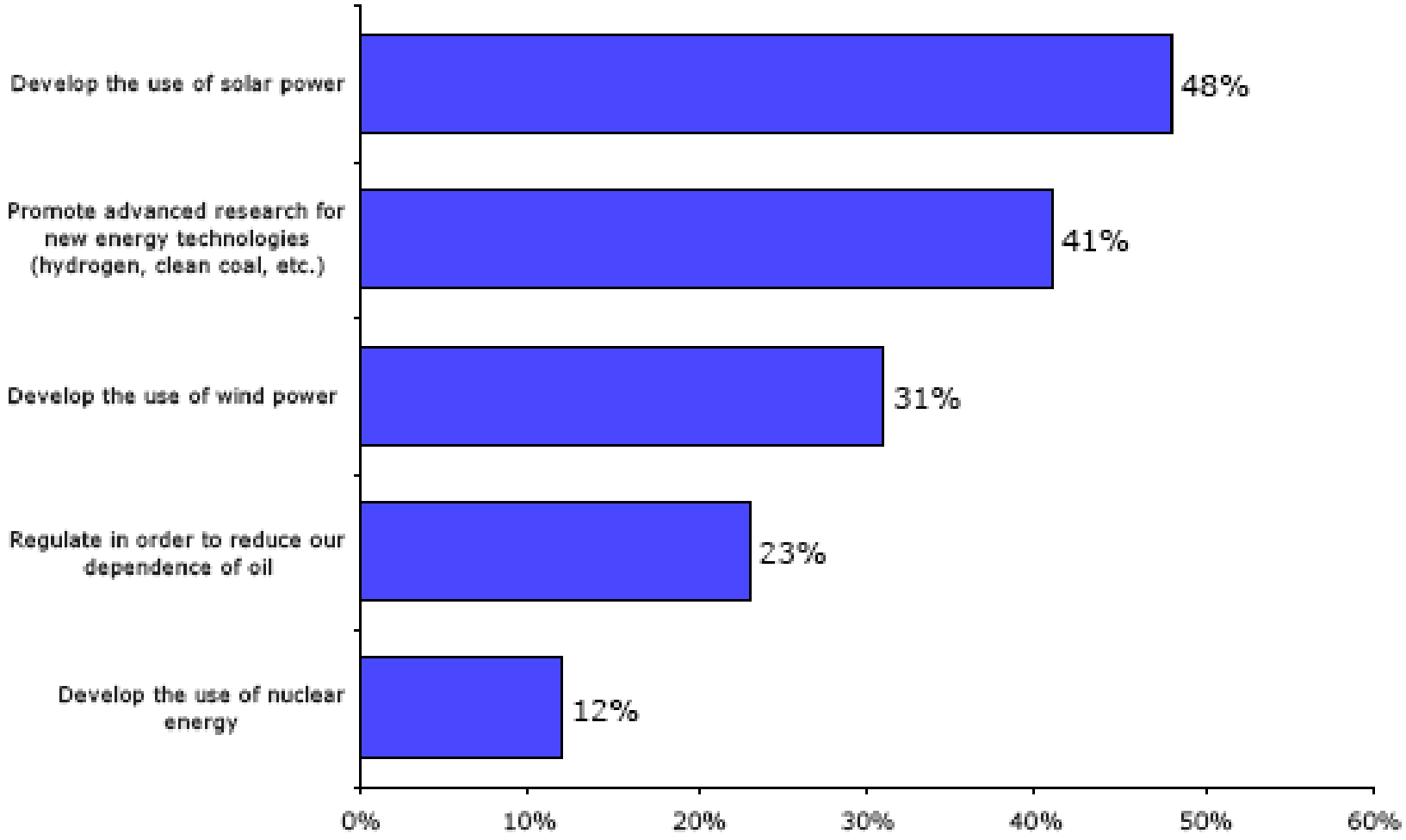
Source: AIEA, Octobre 2005

Are you in favour or opposed to the use of these different sources of energy in your country?



Source: Eurobarometer January 2007

QA65.To reduce our dependency on imported energy resources, Governments have to choose from a list of alternatives, sometimes costly solutions. Which of the following should the (NATIONALITY) Government mainly focus on the years to come? (MAX. 2 ANSWERS)

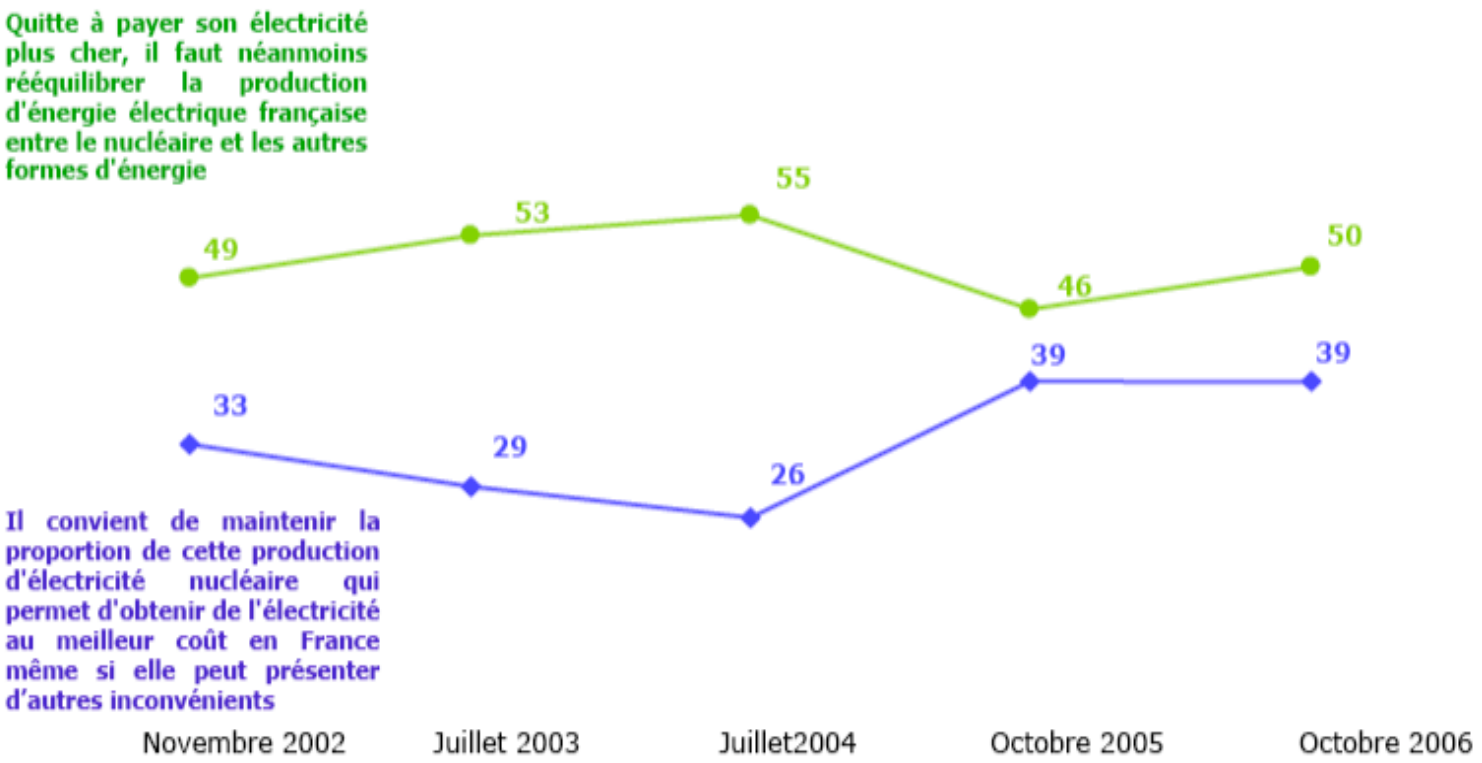


Source: Eurobarometer 1/06

	Promote advanced research for new energy technologies (hydrogen, clean coal, etc.)	Regulate in order to reduce our dependence of oil	Develop the use of nuclear energy	Develop the use of solar power	Develop the use of wind power
EU25	41%	23%	12%	48%	31%
NL	62%	10%	14%	47%	42%
DK	61%	13%	4%	45%	59%
SE	55%	25%	32%	31%	41%
FI	54%	18%	27%	38%	41%
DE	52%	21%	17%	55%	26%
BE	46%	20%	11%	51%	49%
CZ	46%	35%	17%	41%	25%
LU	46%	18%	7%	62%	36%
➔ FR	43%	21%	8%	63%	38%
SI	42%	29%	5%	60%	39%
SK	42%	39%	19%	44%	23%
IT	41%	26%	13%	41%	15%
IE	40%	29%	7%	32%	52%
PT	39%	31%	5%	37%	34%
EE	37%	14%	8%	35%	54%
HU	37%	16%	9%	43%	37%
LV	36%	37%	8%	25%	39%
AT	36%	36%	5%	54%	35%
UK	36%	17%	18%	43%	39%
PL	33%	27%	10%	37%	30%
LT	32%	27%	21%	16%	22%
ES	27%	25%	4%	50%	28%
CY	25%	51%	2%	76%	22%
MT	23%	34%	2%	58%	32%
EL	22%	37%	2%	70%	44%

French Would Pay More to Reduce the Nuclear Share in Power Mix

Question : En France, 75% de l'électricité produite est d'origine nucléaire. A ce propos, laquelle des opinions suivantes se rapproche le plus de la vôtre ?



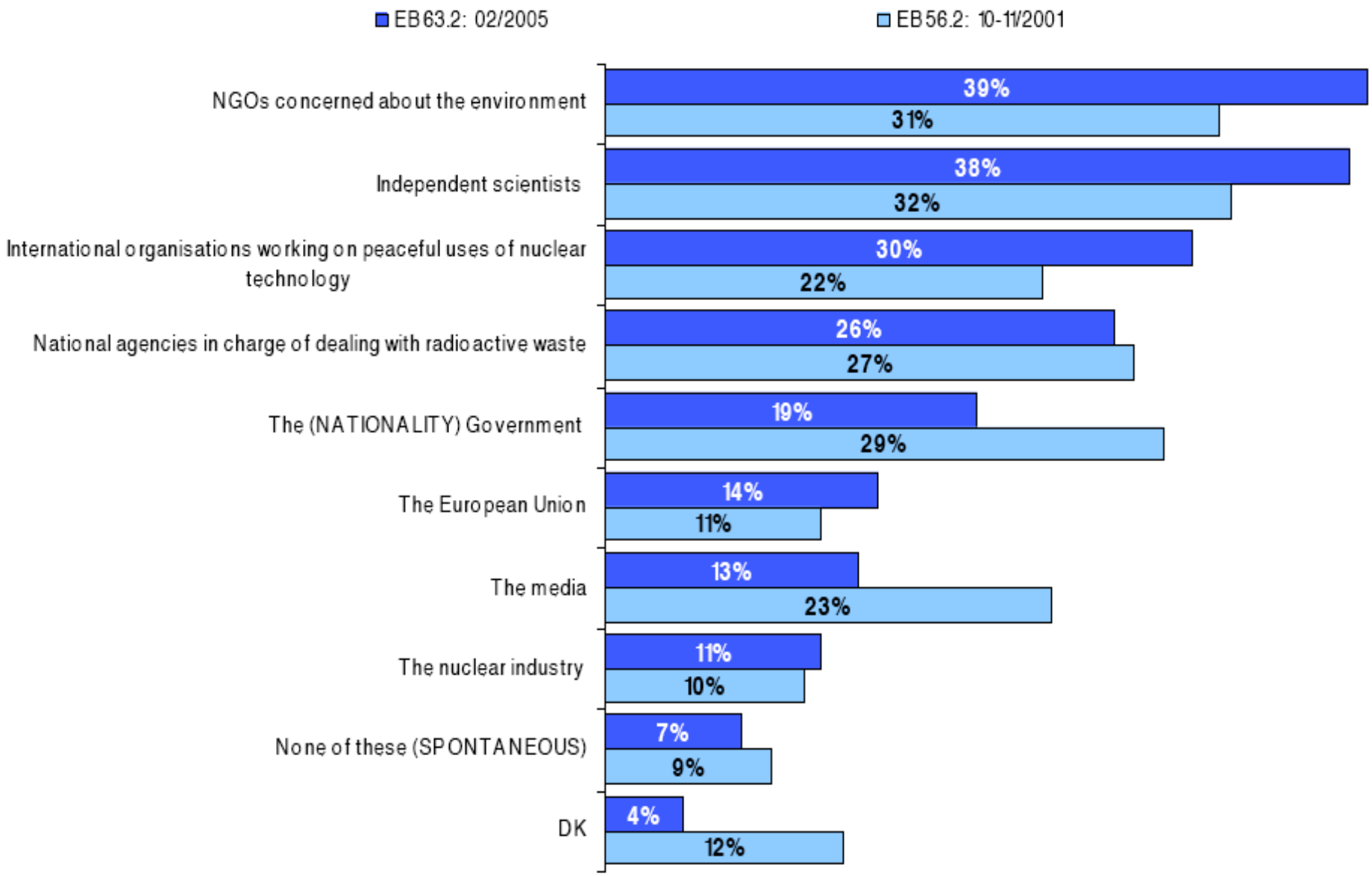
Ifop pour le Ministère de l'Economie, des Finances et de l'Industrie – Les Français et l'énergie – Novembre 2006

Major hurdles to public acceptance

- Waste management remains main concern
- Nuclear safety has to be ensured = not a decisive issue, but precondition to public acceptance
- Nuclear security = growing concern since 9/11
- Proliferation issue = growing concern
- Problem of trust = nuclear industry not trusted as a reliable source of information

Source: FORATOM, 21 June 2006

Q12. Which of the following, if any, would you trust to give you information about the way radioactive waste is managed in (OUR COUNTRY)? % EU



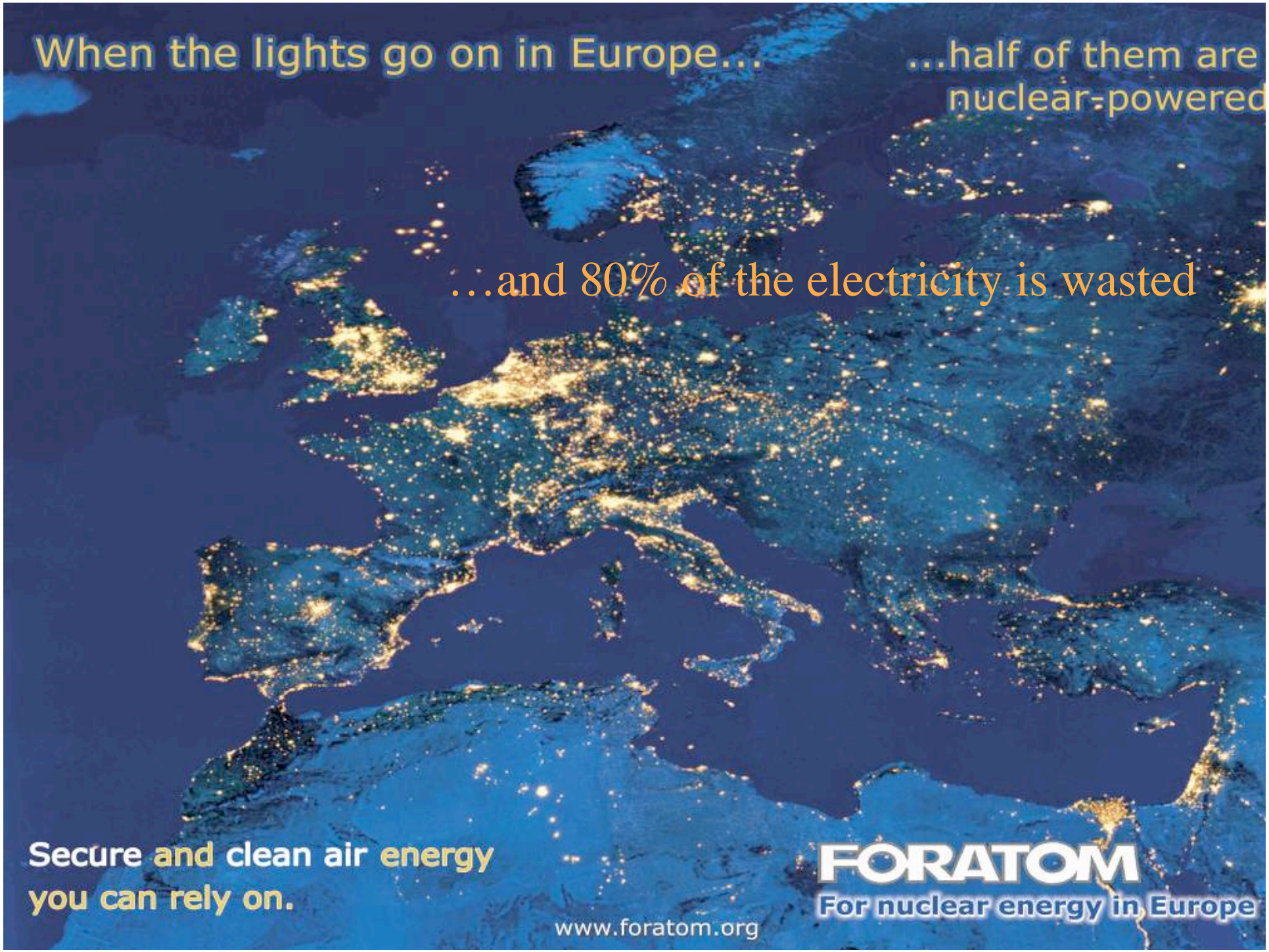
Conclusions

• Nuclear power plays a limited role. It is highly likely that it will further decline.
• The industry has a a long term workforce problem and will struggle to maintain competence levels for existing facilities.
• The nuclear industry is not trusted by the public.
• Public opinion in the EU remains critical towards nuclear power and has a strong preferance for other energy forms.
• The nuclear industry has failed to deliver in the past. Large budget overruns, construction delays and excessive overall lead times. Much of this had to be covered by the tax-payer.
• Problems with recent new build projects indicate that there is no change to be expected.
• Nuclear energy will rather hinder than favour reliable, sustainable energy policies.

Finally,

- one more serious nuclear accident
- one event involving a dirty bomb
- one major attack on a nuclear facility or shipment
- one credible threat with a nuclear explosive device

and what is now perceived by some as contributing to "energy security" will turn into a nightmare of ball and chain.


When the lights go on in Europe...
...half of them are nuclear-powered
...and 80% of the electricity is wasted
Secure and clean air energy you can rely on.
www.foratom.org
FORATOM
For nuclear energy in Europe

The Future Will Be Energy Intelligent or Will Not Be

Thank you for your attention!

mycle.schneider@orange.fr