



Conseil Français de l'Énergie

**IFRI Energy Breakfast Roundtable**  
**Brussels, Friday 13<sup>th</sup> 2008**

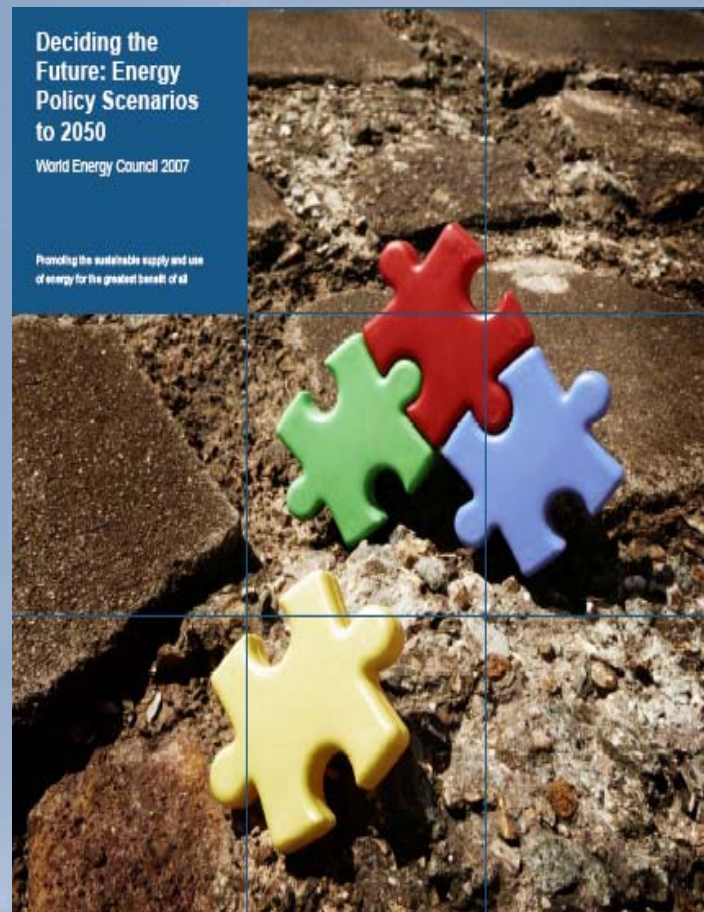
## **Deciding the Future: Energy Policy Scenarios to 2050**

**Jean Eudes Moncomble**  
**Secrétaire général,**  
**Conseil Français de l'Énergie**

**Deciding the  
Future: Energy  
Policy Scenarios  
to 2050**

World Energy Council 2007

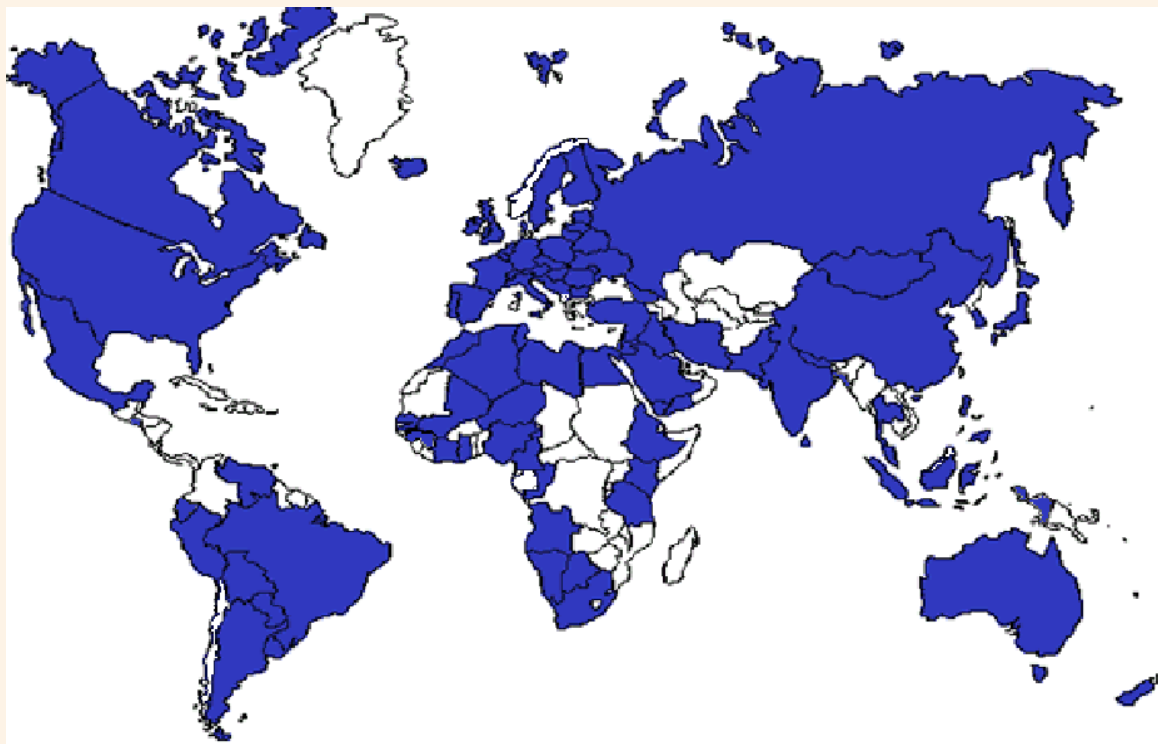
Promoting the sustainable supply and use  
of energy for the greatest benefit of all





Conseil Français de l'Énergie

## What is World Energy Council (WEC)



WEC has Member Committees in about 100 countries in the world, including most of the largest energy-producing and energy consuming countries.  
(2/3 of developing countries)

The World Energy Council (WEC) is one of the foremost multi-energy organisation in the world today. Established in 1923, the organisation covers all types of energy, including coal, oil, natural gas, nuclear, hydro, and renewables, WEC is UN-accredited, non-governmental, non-commercial and non-aligned. WEC is a UK-registered charity, headquartered in London.

***To promote the sustainable supply and use of energy for the greatest benefit of all people***



## Approach

### Traditional Approach – Top-down

- Many recent in-depth studies of the sustainability of energy systems.
- Strong top-down perspective from experts.
- Focus on macro-economic and global or regional energy aspects.

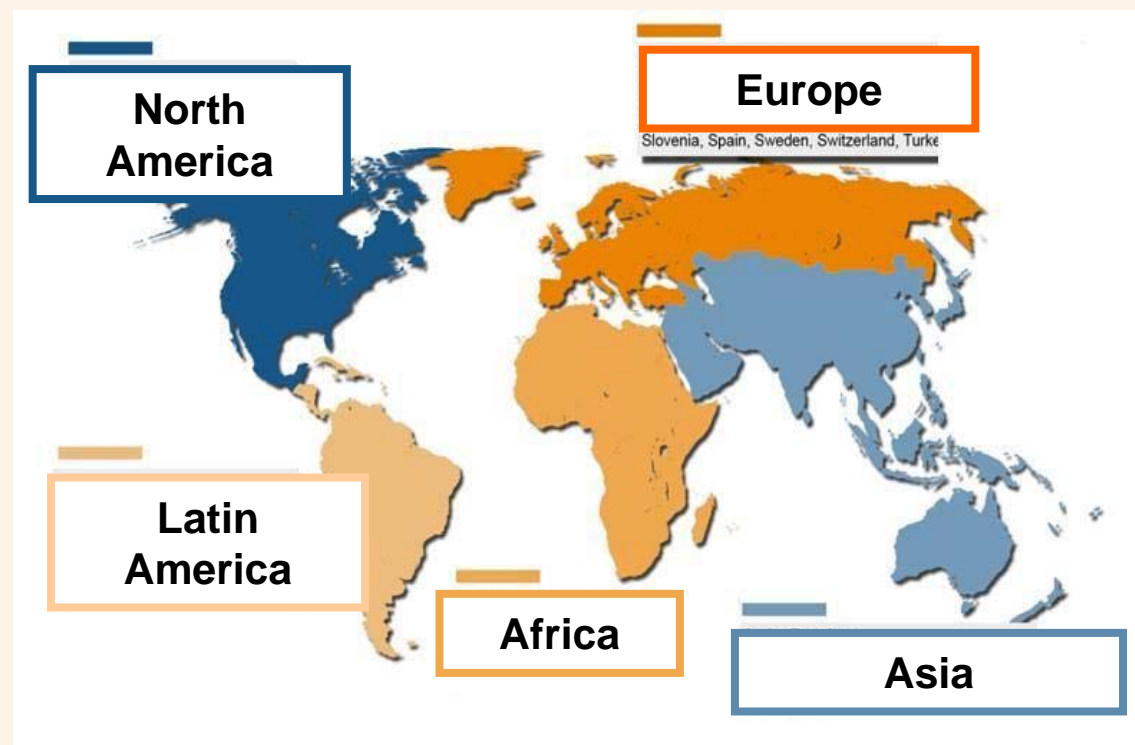
### This Study is **Different** – Bottom-up

- Conversely, it is the decision makers that influence, plan, and manage regional and local energy systems on a daily basis.
- This report captures and collates their priorities and opinions, from the bottom up, in each of the five regions of the World Energy Council.



## Extraordinary and Invaluable Participation

- 3 years of work
- 5 Regions
- almost 70 WEC Member Countries
- 400 individuals; all decision makers





## Project Organisation

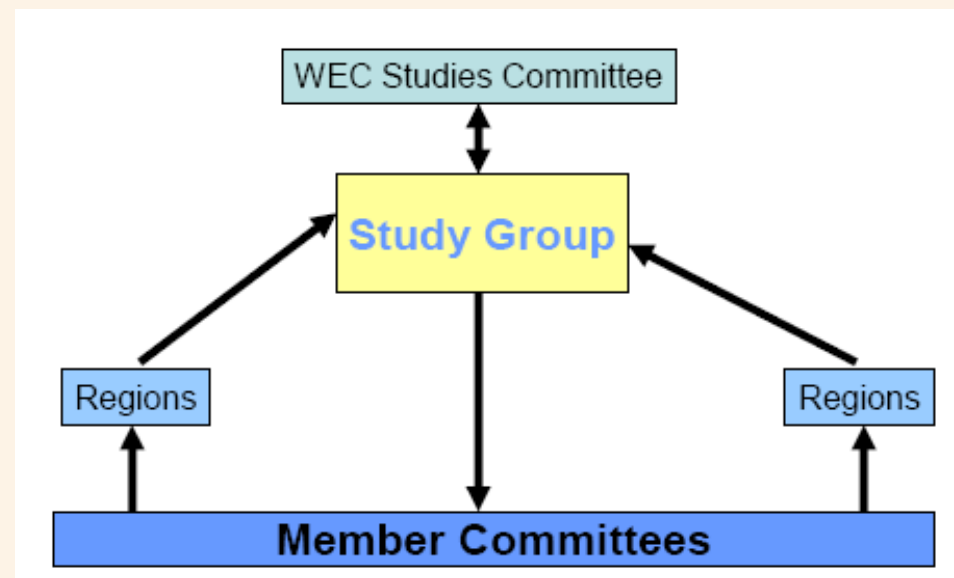
The **Study Group** provided the framework and final integration.

The **Member Committees**, with local and regional decision makers, provided the substance.

The **Regions** provided the consistency checks and primary integration.

The **Specialist Groups** brought last information on technologies and provided consistency of regional analysis.

The **Modelling Team** provided quantitative picture for all scenarios.





## Evaluation of the Scenarios

We evaluated each of the scenarios on the basis of positive and negative implications for the achievement of the WEC Millennium Goals.

### WEC Millennium Goals

**Accessibility:** access to affordable modern energy for all people

**Availability:** reliable and secure energy supply

**Acceptability:** protect and preserve the local and global environment



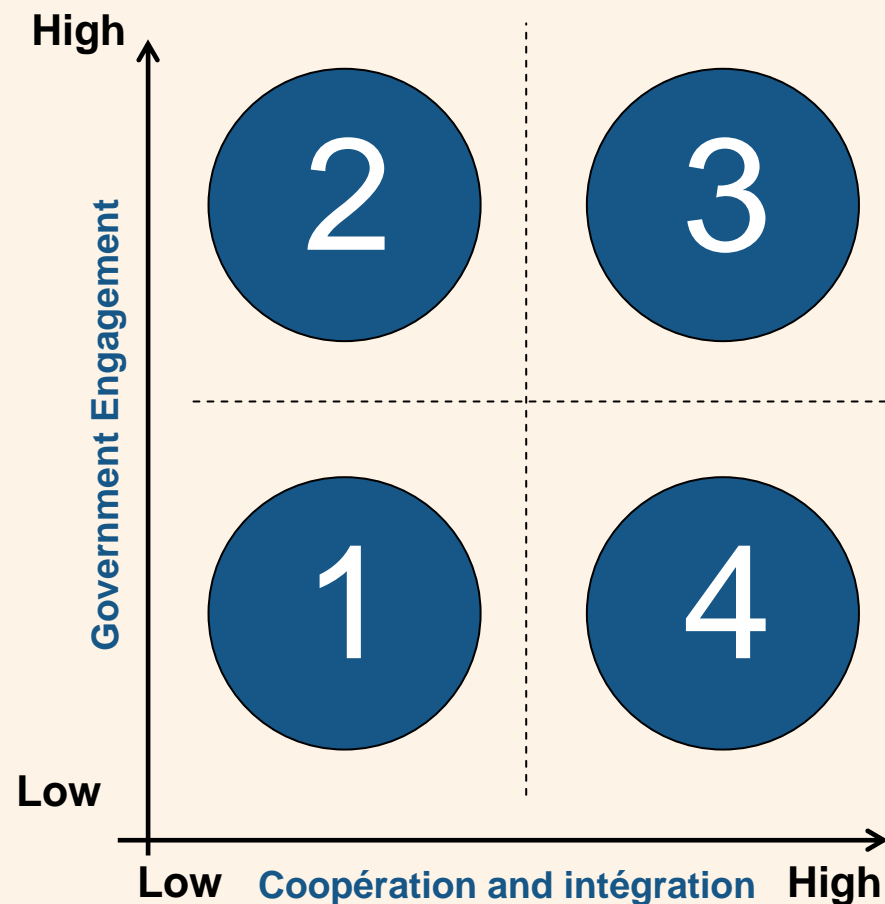
## Measures – Study Framework

We studied Energy Policy within the framework of:

- **Government Engagement (High – Low)**
- **Cooperation and Integration (High – Low)**

These dimensions have real interest across the spectrum of WEC member countries.

The study is qualitative, with some quantitative validation.





Conseil Français de l'Énergie

# Scenarios





Conseil Français de l'Énergie

**Caveat**

**Modelling gives only a quantitative illustration of WEC qualitative scenarios.**



## GDP per capita

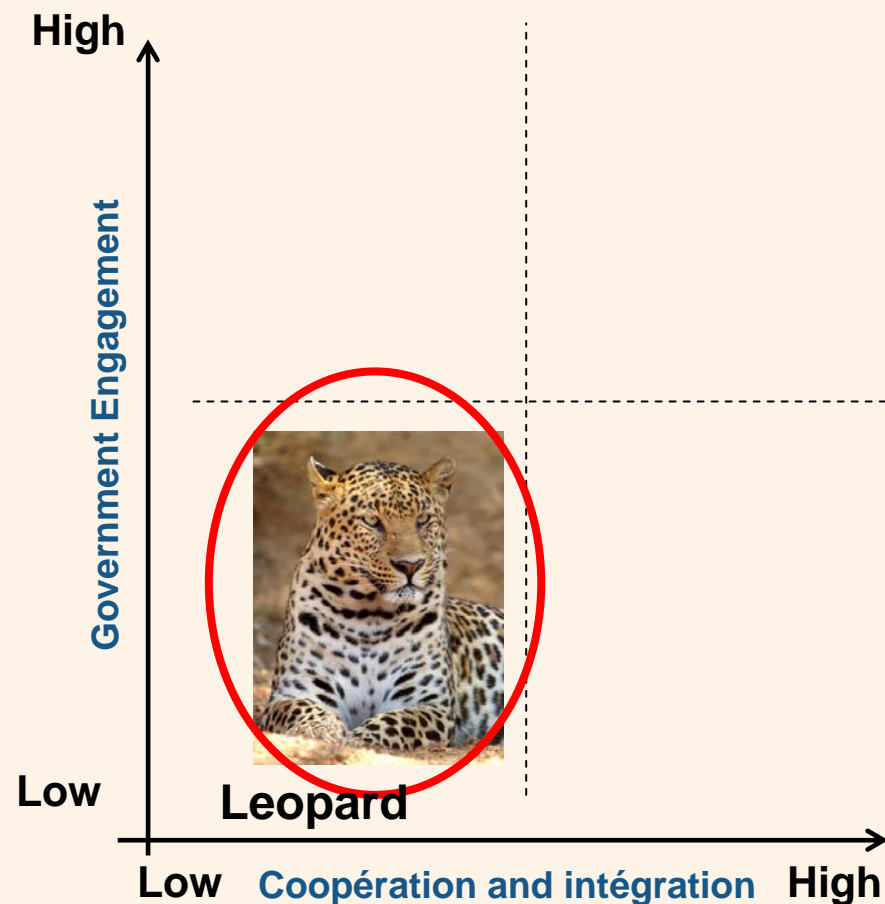
	2005	2020	2035	2050
Leopard	7,7	10,6	12,9	15,6
Elephant	7,7	10,3	11,9	13,6
Lion	7,7	11,3	15,1	19,6
Giraffe	7,7	11,5	15,7	21,4

K\$2005 ppp / cap



## Leopard (Low Government – Low Cooperation)

- Domestic economic development is the primary driver, underpinned by domestic energy security.
- Government engagement is constrained and there are few levies or subsidies.
- International treaties, where they exist, are ineffective.
  
- There is very little progress on any of the measures under this scenario.
- For the developing regions, this scenario leads to social and climatic degradation.





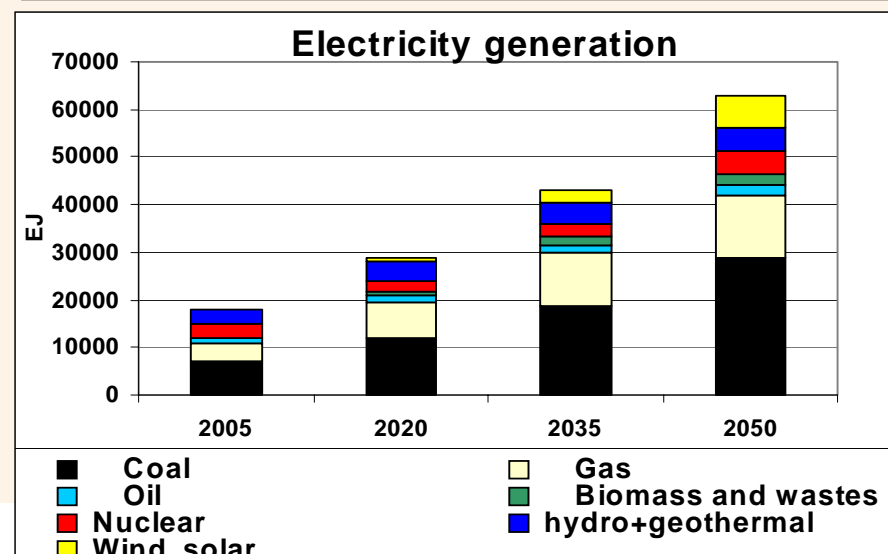
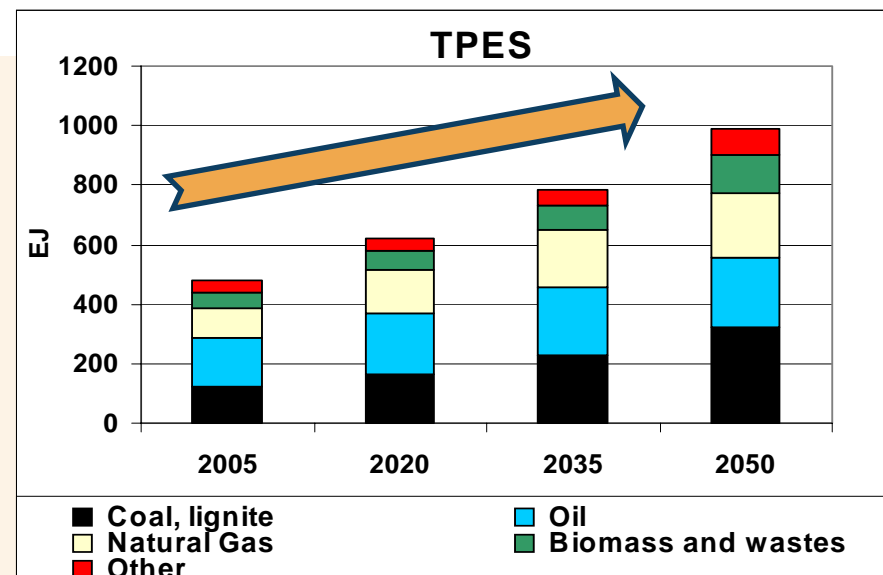
# Leopard (Low Government – Low Cooperation)

International energy prices				
	2005	2020	2035	2050
Oil (\$/bl)*	54	59	90	118
Gas (\$/Mbtu)* European market	5,4	7,3	10,6	15,3
Coal (\$/t)* European market	72	89	104	117

\* : all costs are given in constant 2005\$ PPP

Oil & gas production				
	2005	2020	2035	2050
<b>World oil production (Mbl/d), of which :</b>	<b>80</b>	<b>98</b>	<b>110</b>	<b>111</b>
Conventional, of which :				
Gulf countries	21	34	49	51
Non-conventional	2	7	12	20
<b>World gas production (Gm3), of which :</b>	<b>2818</b>	<b>4311</b>	<b>5504</b>	<b>6195</b>
Gulf countries	255	647	1291	2030
CIS	729	942	1380	1571

**World TPES doubling from 2005 to 2050**





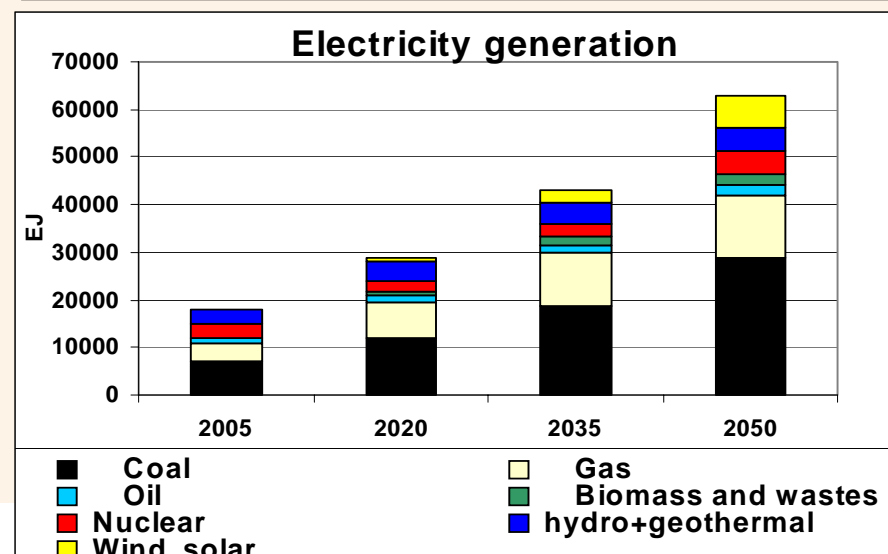
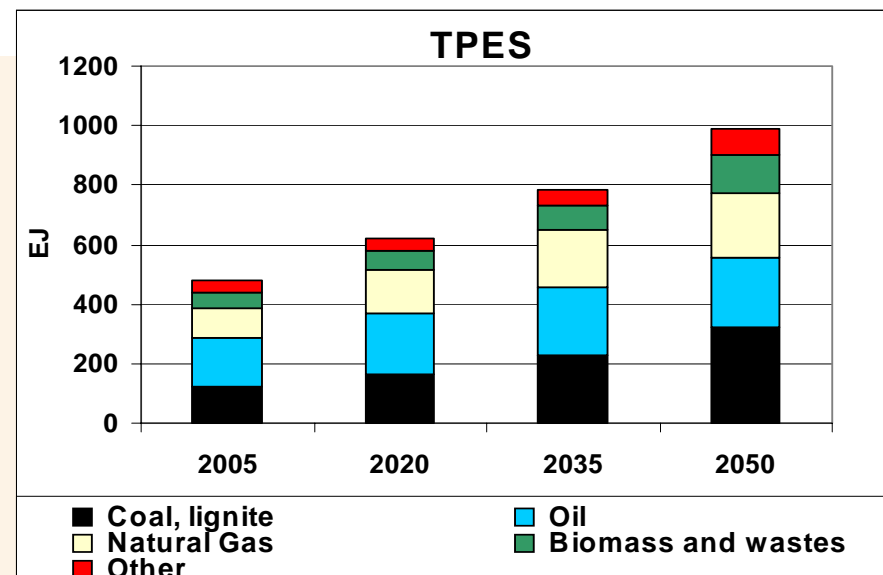
# Leopard (Low Government – Low Cooperation)

International energy prices				
	2005	2020	2035	2050
Oil (\$/bl)*	54	59	90	118
Gas (\$/Mbtu)* European market	5,4	7,3	10,6	15,3
Coal (\$/t)* European market	72	89	104	117

\* : all costs are given in constant 2005\$ PPP

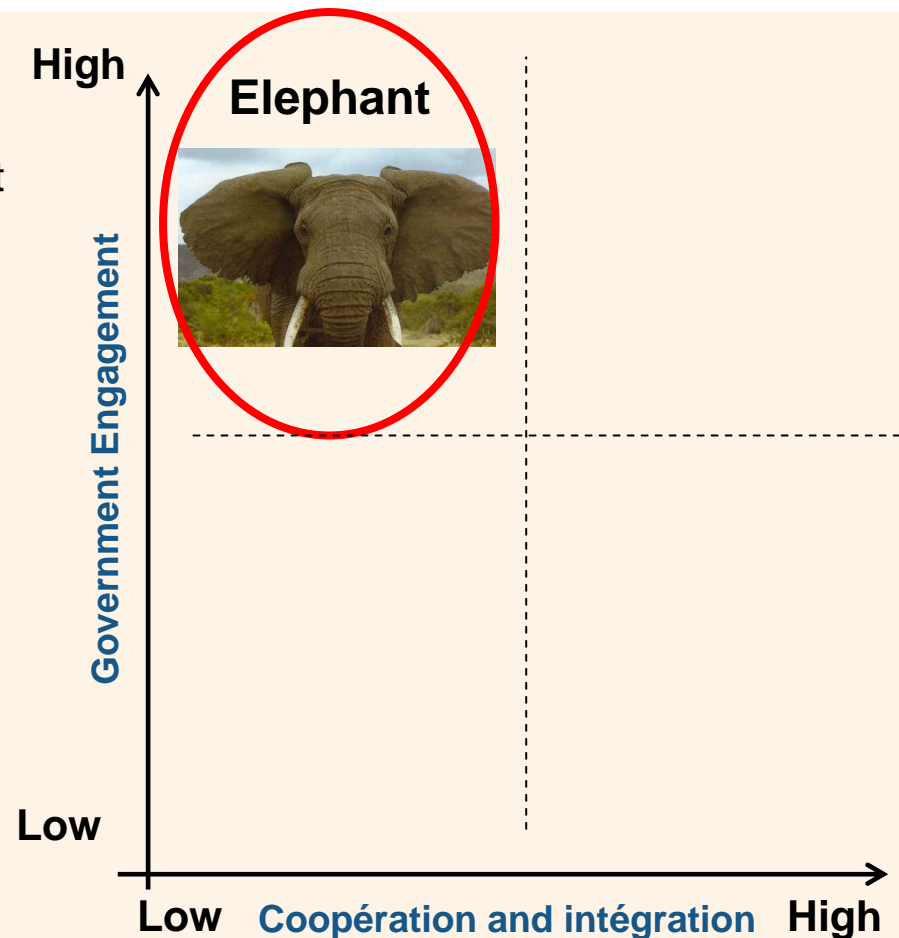
Oil & gas production				
	2005	2020	2035	2050
<b>World oil production (Mbl/d), of which :</b>	<b>80</b>	<b>98</b>	<b>110</b>	<b>111</b>
Conventional, of which :				
Gulf countries	78	90	98	91
Non-conventional	2	7	12	20
<b>World gas production (Gm3), of which :</b>	<b>2818</b>	<b>4311</b>	<b>5504</b>	<b>6195</b>
Gulf countries	255	647	1291	2030
CIS	729	942	1380	1571

- World TPES doubling from 2005 to 2050
- Peak oil (conventional) around 2030, 98 Mb/d
- Increase in fossil fuels: +85%
- Coal: 40% of power generation in 2050



## Elephant (High Government – Low Cooperation)

- Strong, hierarchical leadership from governments.
- The first priority is domestic energy security to support structured economic activity and growth.
- Focus on development, and protection, of indigenous resources.
- Limited use of international bilateral agreements.
  
- Government engagement ensures steady improvement in all the measures.
- Low cooperation inhibits progress in developing regions due to technology and resource constraints.





# Elephant (High Government – Low Cooperation)

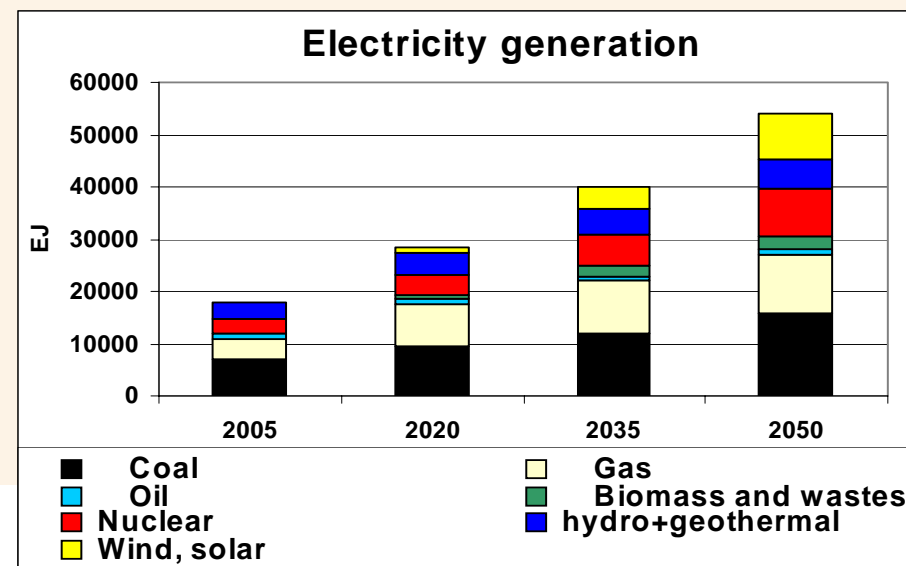
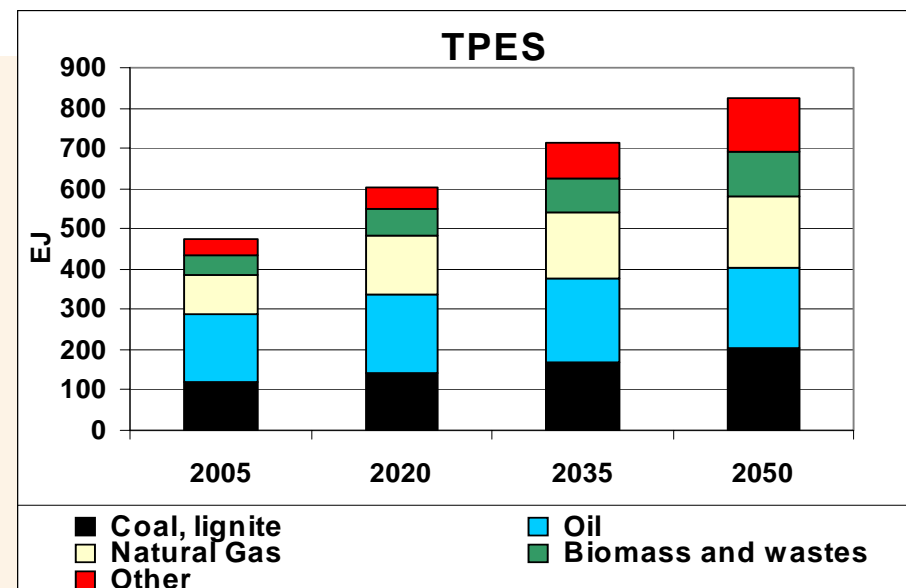
Conseil Français de l'Énergie

International energy prices				
	2005	2020	2035	2050
Oil (\$/bl)*	54	59	73	91
Gas (\$/Mbtu)* European market	5,4	6,9	8,9	11,2
Coal (\$/t)* European market	72	88	99	109

\* : all prices are given in constant 2005\$

Oil & gas production				
	2005	2020	2035	2050
World oil production (Mbl/d), of which :	80	94	101	96
Conventional, of which :	79	86	82	68
Gulf countries	22	33	42	38
Non-conventional	2	9	19	28
World gas production (Gm3), of which :	2858	4192	4724	5025
Gulf countries	259	607	979	1458
CIS	735	853	1070	1277

Peak oil (conventional)  
around 2020, 86 Mb/d





# Elephant (High Government – Low Cooperation)

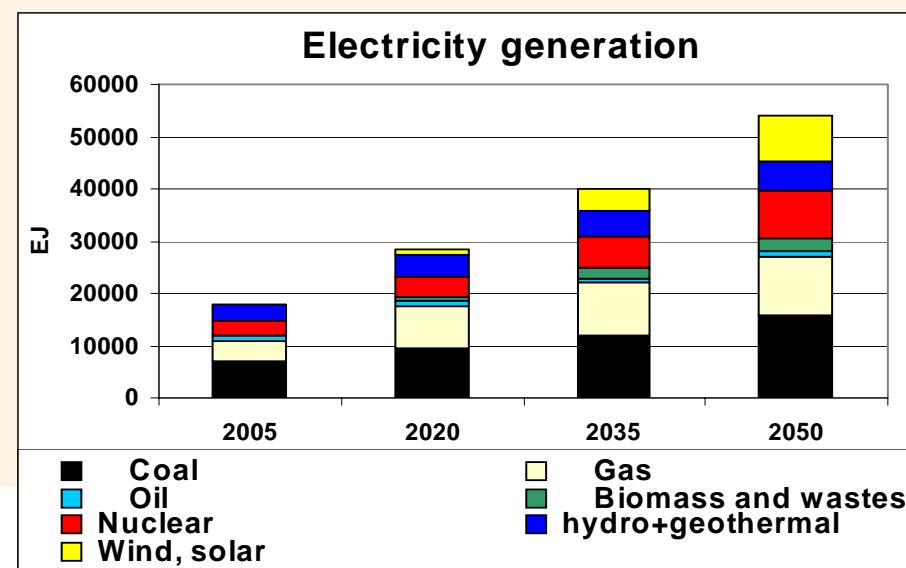
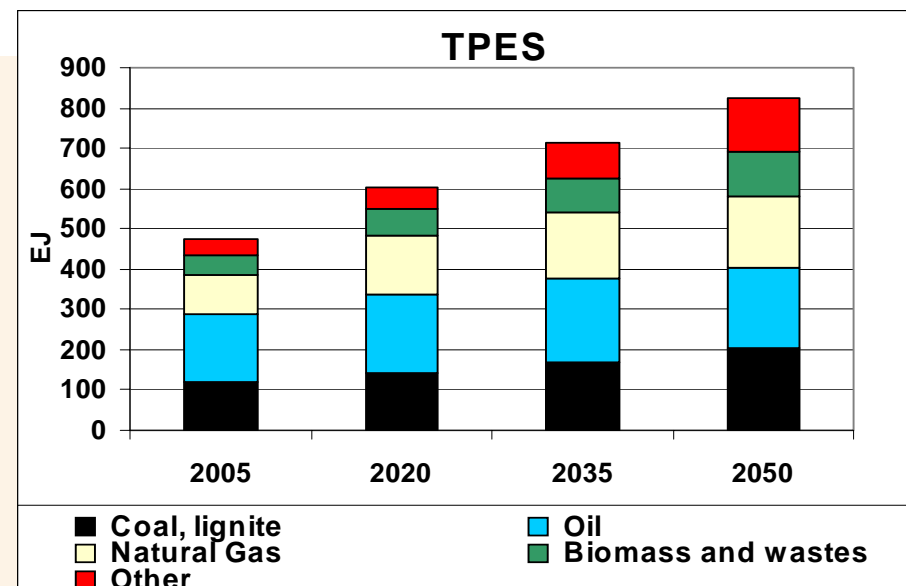
Conseil Français de l'Énergie

International energy prices				
	2005	2020	2035	2050
Oil (\$/bl)*	54	59	73	91
Gas (\$/Mbtu)* European market	5,4	6,9	8,9	11,2
Coal (\$/t)* European market	72	88	99	109

\* : all prices are given in constant 2005\$

Oil & gas production				
	2005	2020	2035	2050
World oil production (Mbl/d), of which :	80	94	101	96
Conventional, of which :	79	86	82	68
Gulf countries	22	33	42	38
Non-conventional	2	9	19	28
World gas production (Gm3), of which :	2858	4192	4724	5025
Gulf countries	259	607	979	1458
CIS	735	853	1070	1277

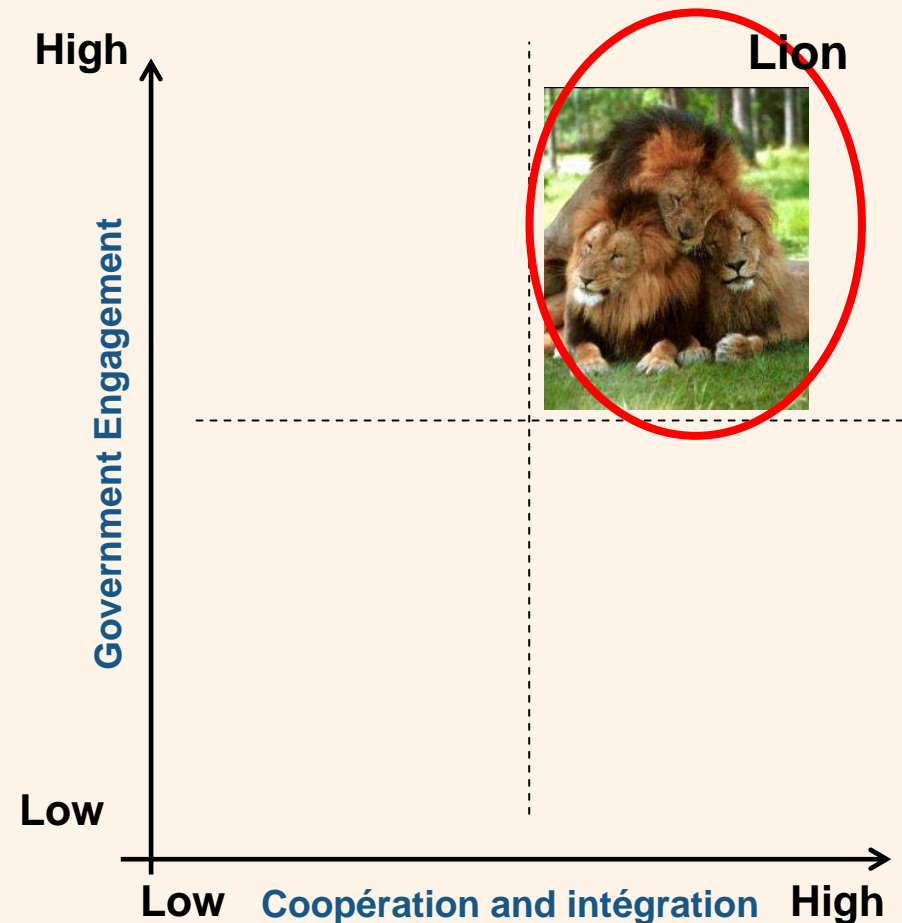
- World TPES in 2050 15% below « Leopard »
- Peak oil (conventional) around 2020, 86 Mb/d
- Increase in fossil fuels: +50%
- Power generation in 2050: 50% non fossil





## Lion (High Government – High Cooperation)

- National policies provide protection of property and commercial rights promoting international alliances.
- Governments and businesses actively share their experience and expertise.
- Public Private Partnerships ensure a focus on delivery of policy intent.
  
- Accessibility and Acceptability are global concerns.
- All 3A's make strong progress through powerful international agreements and programmes.
- This is the best scenario for developing regions.





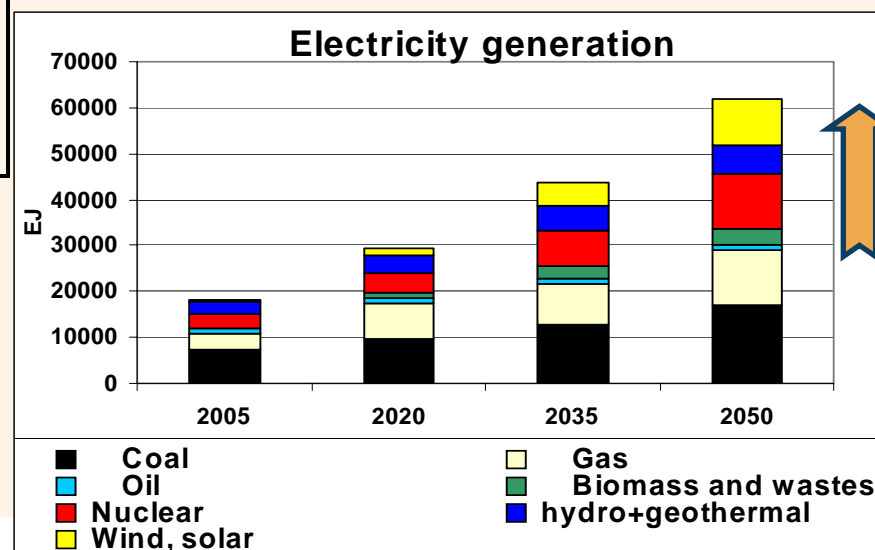
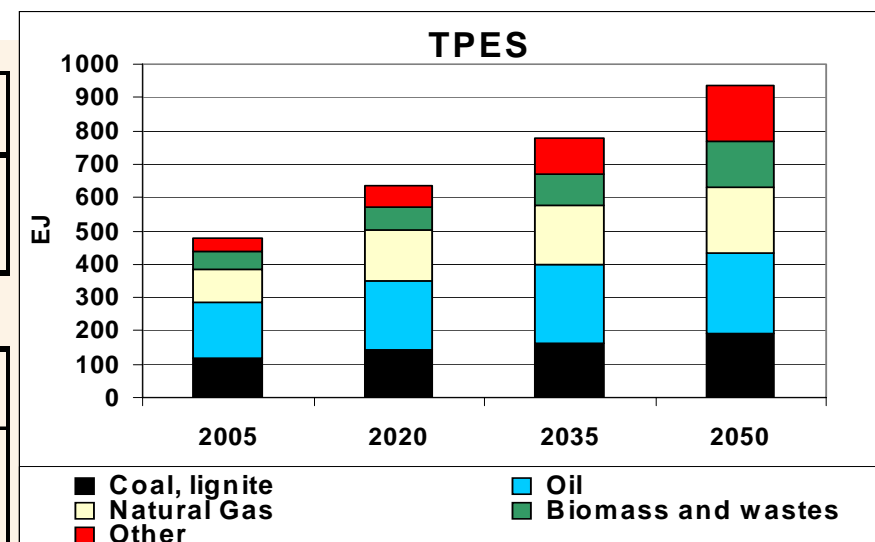
# Lion (High Government – High Cooperation)

International energy prices				
	2005	2020	2035	2050
Oil (\$/bl)*	54	54	70	92
Gas (\$/Mbtu)* European market	5,4	6,8	8,9	12,4
Coal (\$/t)* European market	72	91	112	138

\* : all costs are given in constant 2005\$ PPP

Oil & gas production				
	2005	2020	2035	2050
<b>World oil production (Mbl/d), of which :</b>	<b>80</b>	<b>101</b>	<b>115</b>	<b>115</b>
Conventional, of which :	78	90	97	91
Gulf countries	21	29	44	46
Non-conventional	2	12	18	24
<b>World gas production (Gm3), of which :</b>	<b>2829</b>	<b>4351</b>	<b>5043</b>	<b>5727</b>
Gulf countries	255	599	1003	1497
CIS	731	946	1232	1393

**Power generation in 2050: 55% non fossil**



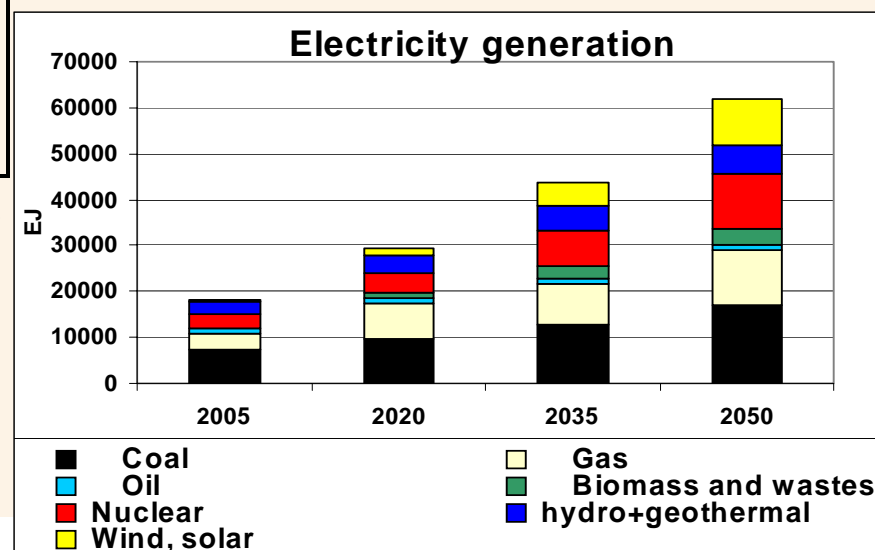
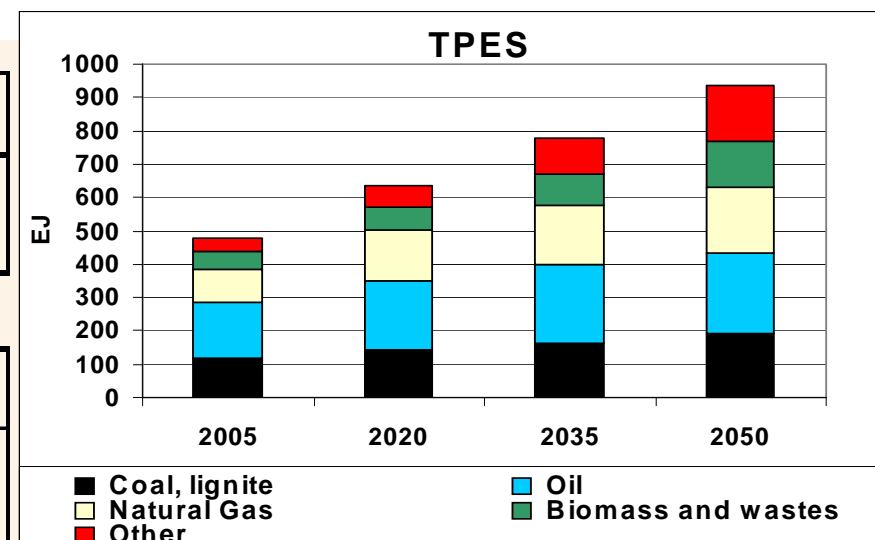


# Lion (High Government – High Cooperation)

International energy prices				
	2005	2020	2035	2050
Oil (\$/bl)*	54	54	70	92
Gas (\$/Mbtu)* European market	5,4	6,8	8,9	12,4
Coal (\$/t)* European market	72	91	112	138

\* : all costs are given in constant 2005\$ PPP

Oil & gas production				
	2005	2020	2035	2050
<b>World oil production (Mbl/d), of which :</b>	<b>80</b>	<b>101</b>	<b>115</b>	<b>115</b>
Conventional, of which :				
Gulf countries	78	90	97	91
Non-conventional	2	12	18	24
Gulf countries	21	29	44	46
<b>World gas production (Gm3), of which :</b>	<b>2829</b>	<b>4351</b>	<b>5043</b>	<b>5727</b>
Gulf countries	255	599	1003	1497
CIS	731	946	1232	1393

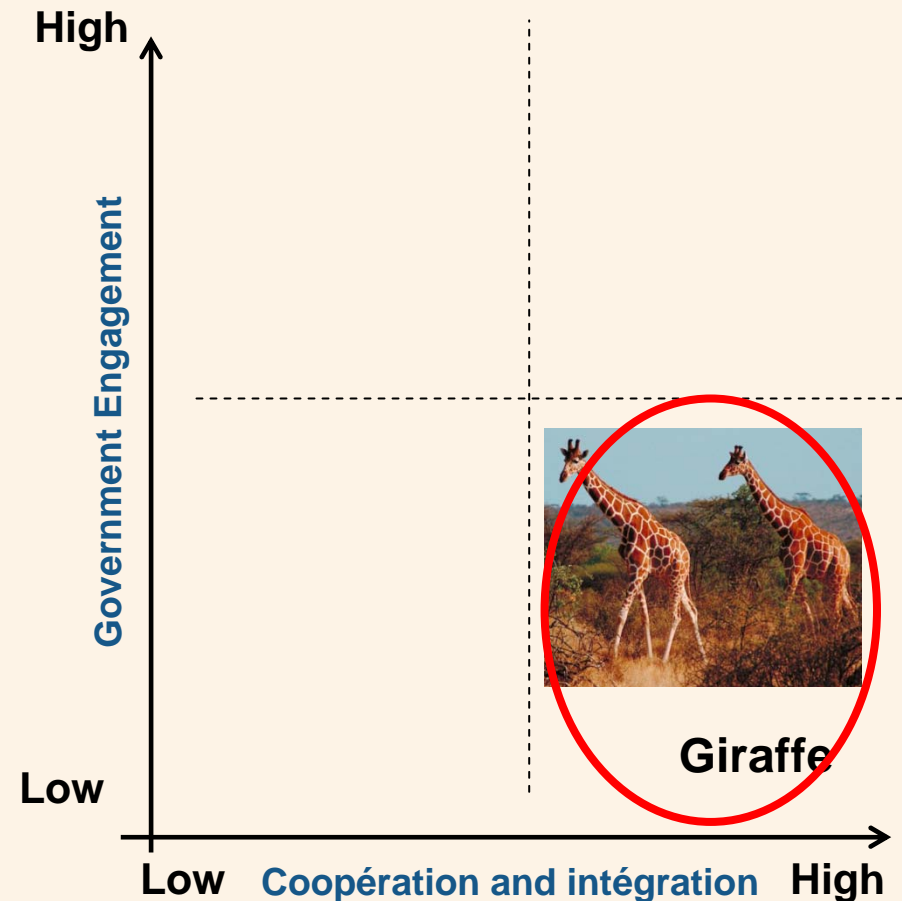


- World TPES in 2050 5% below « Leopard » despite higher GDP growth
- Peak oil (conventional) around 2035, 97 Mb/d
- Increase of fossil fuels: +60%
- Power generation in 2050: 55% non fossil



## Giraffe (Low Government – High Cooperation)

- Primary focus is economic growth, freeing up global markets to promote international trade.
- Heavy reliance on market mechanisms with limited regulation.
- Few levies and subsidies and few restrictions on global movement of goods and services.
- Availability improves dramatically as an essential enabler of economic growth.
- Accessibility and Acceptability are second order priorities in the absence of government engagement.
- Developing countries also progress due to high cooperation.





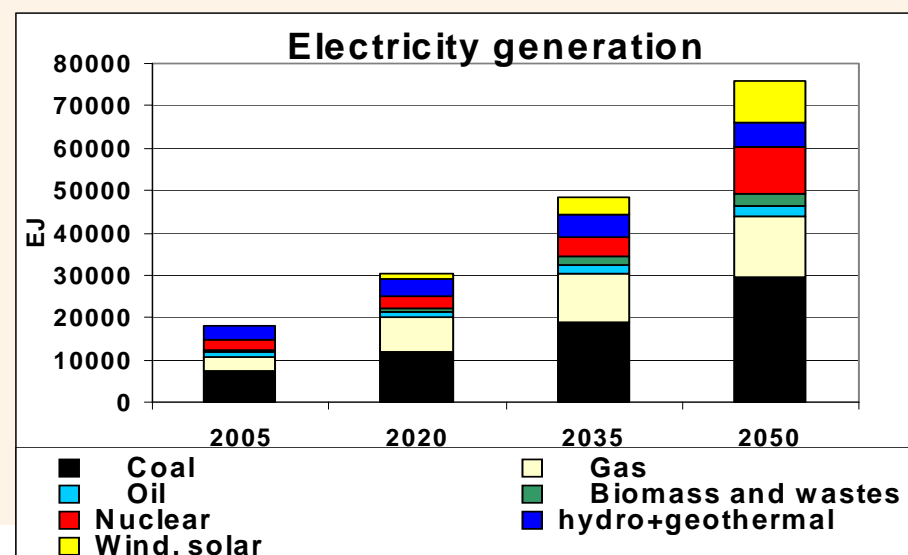
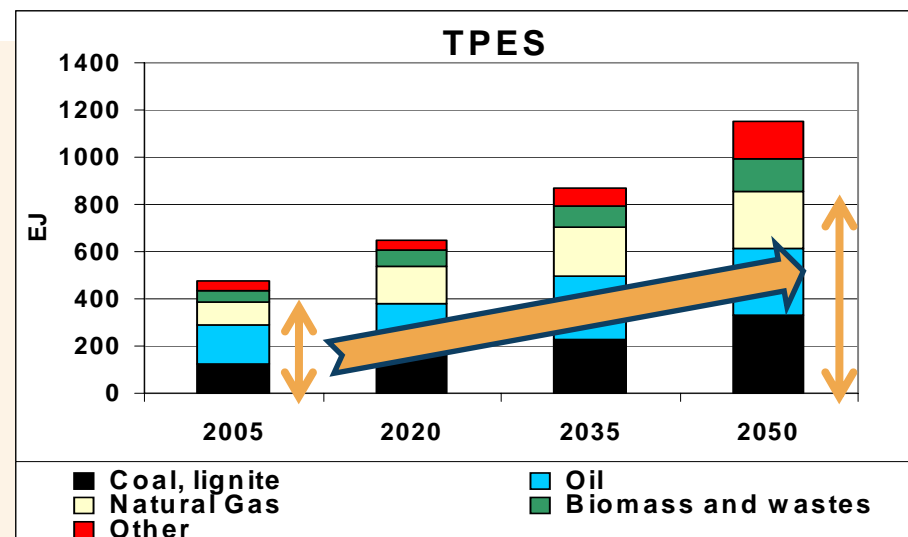
# Giraffe (Low Government – High Cooperation)

International energy prices				
	2005	2020	2035	2050
Oil (\$/bl)*	54	57	82	117
Gas (\$/Mbtu)* European market	5,4	7,4	10,4	15,7
Coal (\$/t)* European market	72	93	115	143

\*: all costs are given in constant 2005\$ PPP

Oil & gas production				
	2005	2020	2035	2050
<b>World oil production (Mbl/d), of which :</b>	<b>80</b>	<b>105</b>	<b>130</b>	<b>138</b>
Conventional, of which :	78	94	106	107
Gulf countries	21	33	49	55
Non-conventional	2	10	24	31
<b>World gas production (Gm3), of which :</b>	<b>2832</b>	<b>4543</b>	<b>5893</b>	<b>6787</b>
Gulf countries	255	667	1411	2234
CIS	735	1049	1434	1716

Increase of fossil fuels:  
**+110%**





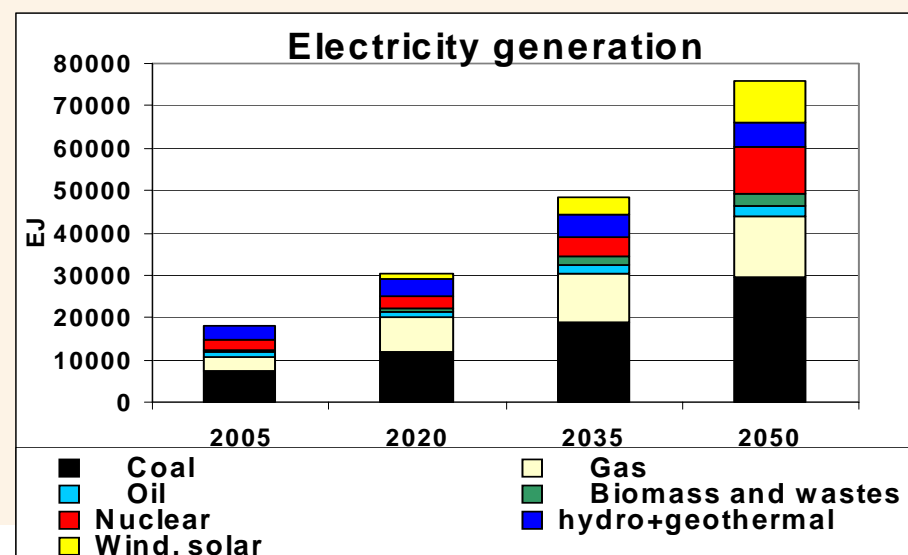
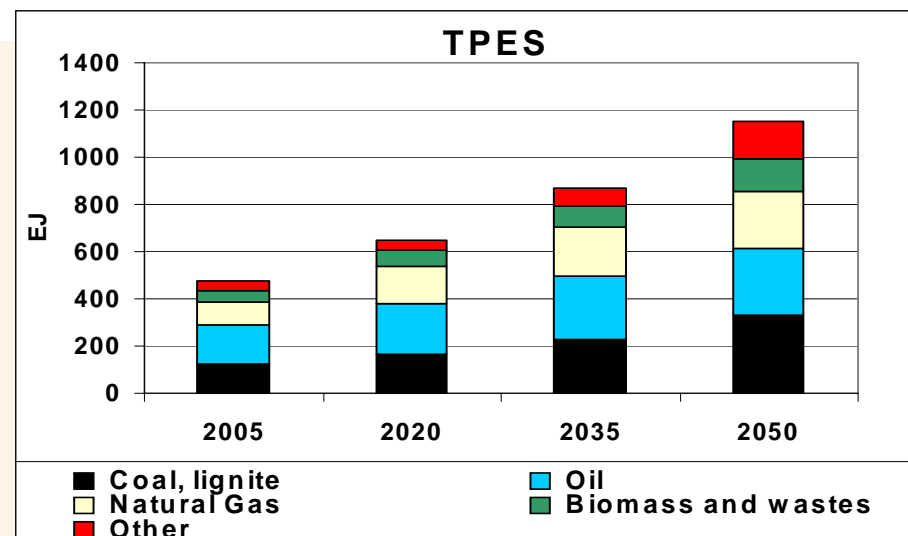
# Giraffe (Low Government – High Cooperation)

International energy prices	2005	2020	2035	2050
Oil (\$/bl)*	54	57	82	117
Gas (\$/Mbtu)* European market	5,4	7,4	10,4	15,7
Coal (\$/t)* European market	72	93	115	143

\* : all costs are given in constant 2005\$ PPP

Oil & gas production	2005	2020	2035	2050
World oil production (Mbl/d), of which :	80	105	130	138
Conventional, of which :	78	94	106	107
Gulf countries	21	33	49	55
Non-conventional	2	10	24	31
World gas production (Gm3), of which :	2832	4543	5893	6787
Gulf countries	255	667	1411	2234
CIS	735	1049	1434	1716

- World TPES in 2050 20% above « Leopard » due to higher GDP growth
- Peak oil (conventional) around 2035, 107 Mb/d
- Increase of fossil fuels: +110%
- Power generation in 2050: 45% non fossil





Conseil Français de l'Énergie

A large background image of a white wind turbine against a blue sky with light clouds. A dark blue rectangular box is overlaid on the left side of the image.

European Focus





**Elephant**



**Lion**

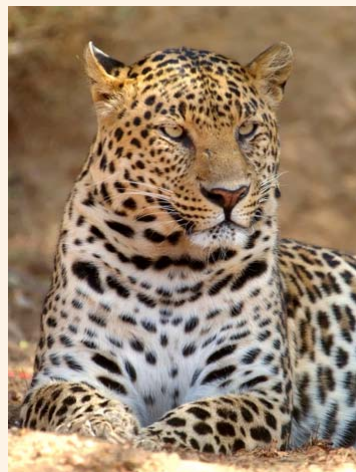


**High**

**Government Engagement**

**Low**

**Leopard**



**Giraffe**



**Low**

**Coopération and intégration**

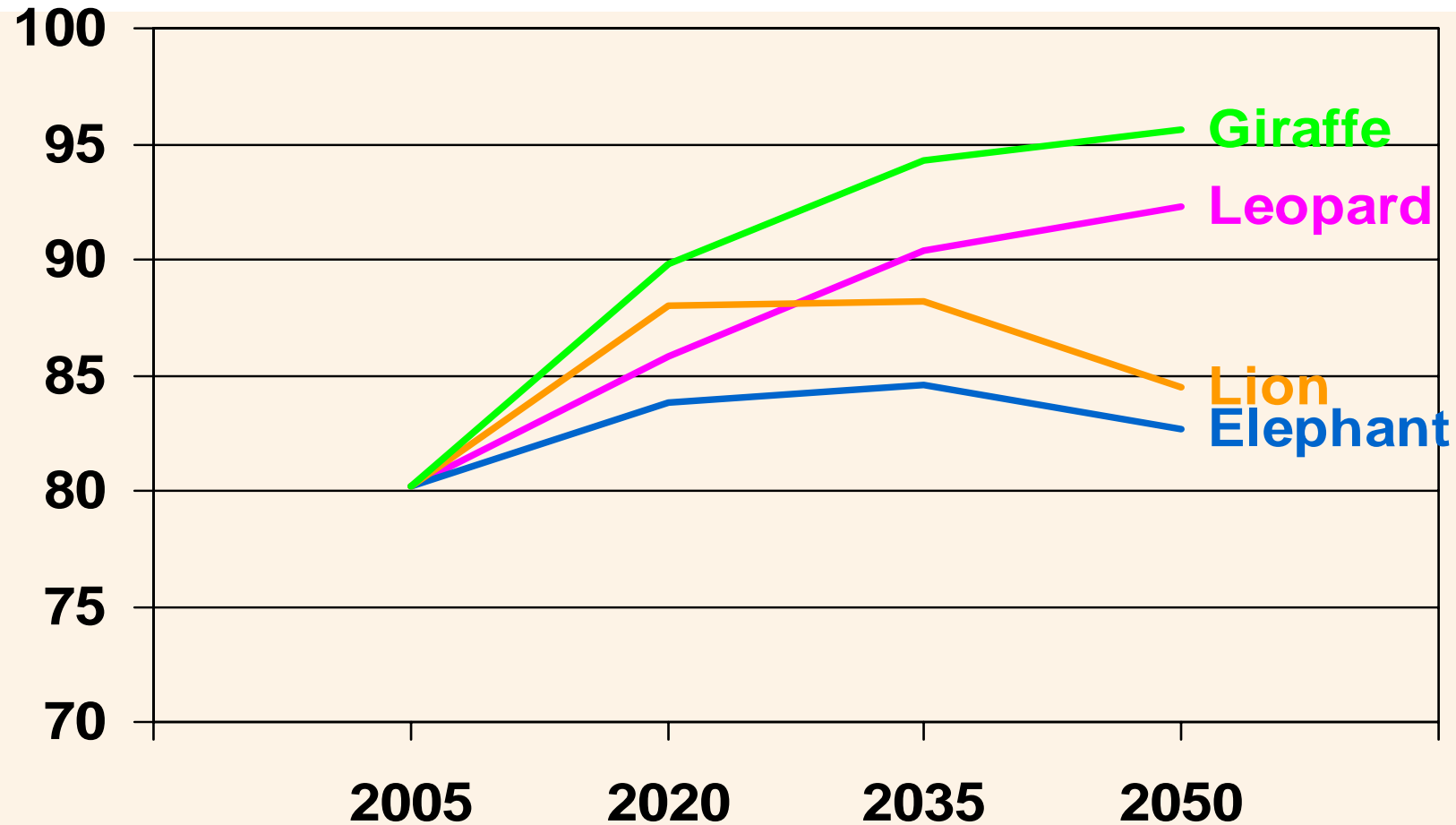
**High**



# Final Energy Demand (EJ)



Conseil Français de l'Energie



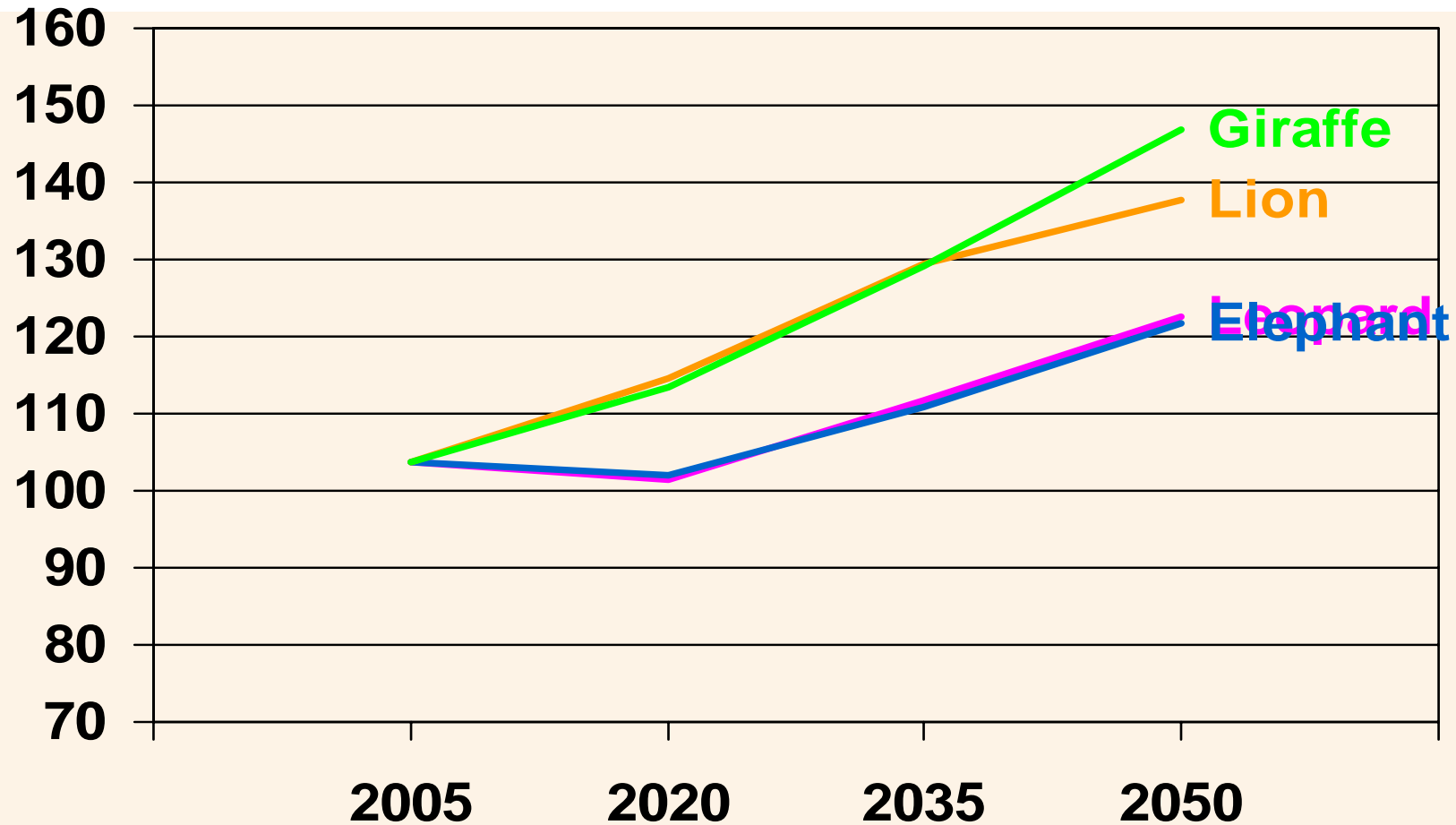
Gtep



# Primary production (EJ)



Conseil Français de l'Énergie





# TPES (EJ)

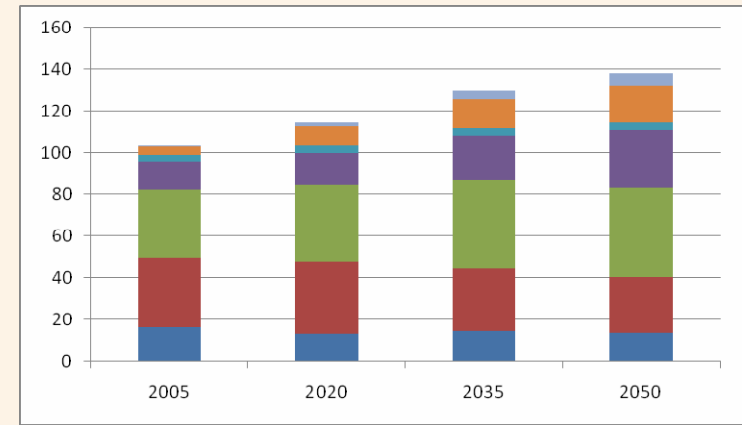
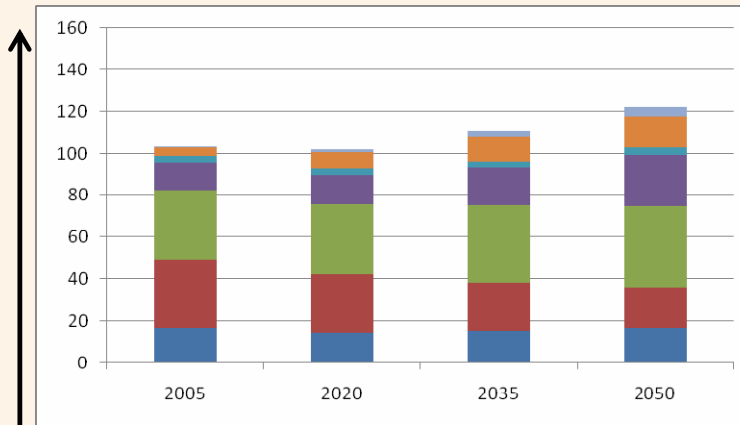


Conseil Français de l'Énergie

## Elephant

## Lion

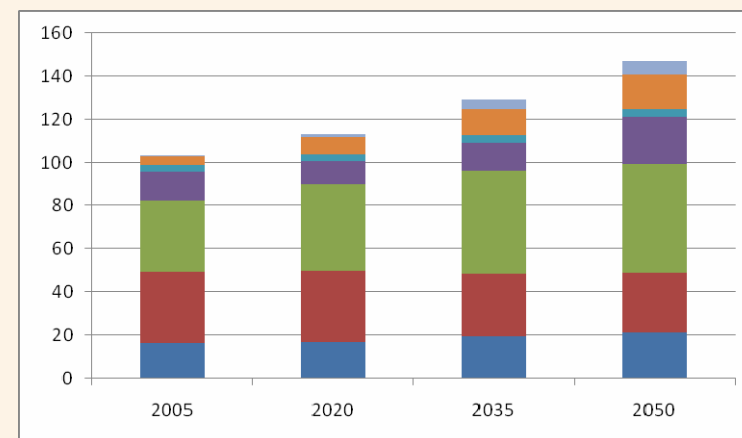
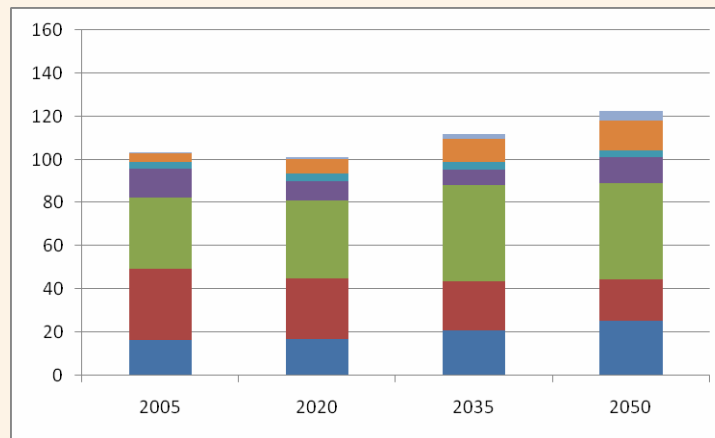
High



Government Engagement

- Wind, solar
- Biomass and wastes
- Hydro, geothermal
- Nuclear
- Natural gas
- Oil
- Coal, lignite

Low



Leopard

Low

Coopération and intégration

High

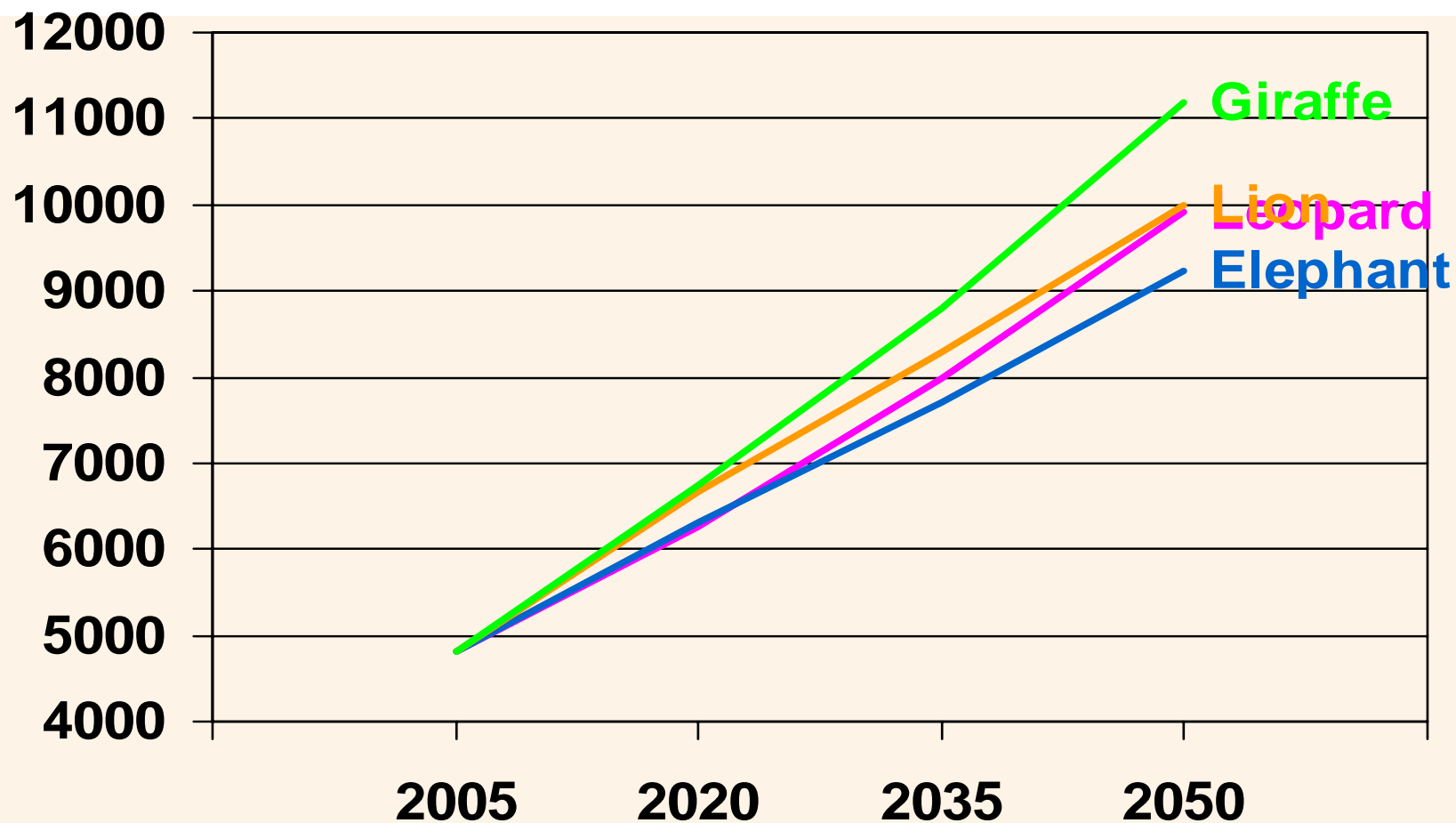
Giraffe



# Electricity generation (TWh)



Conseil Français de l'Énergie





# Electricity generation (TWh)

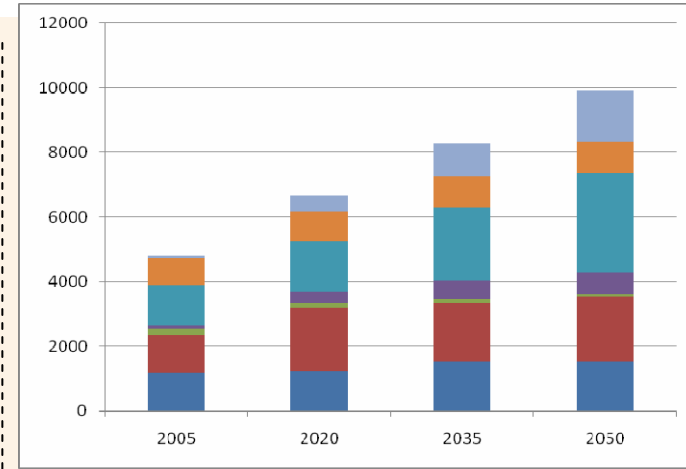
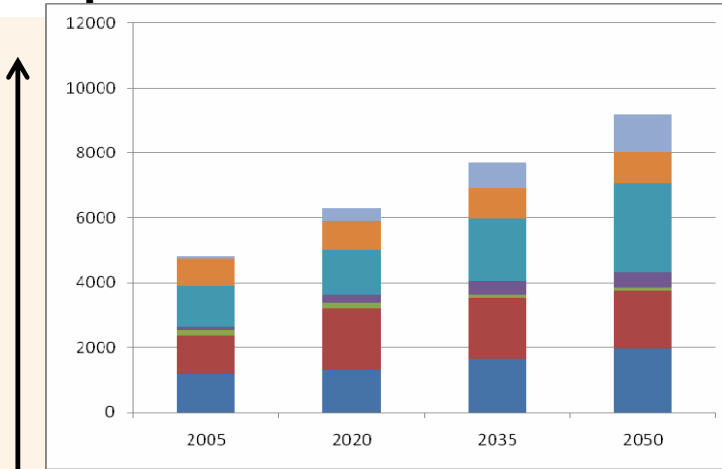


Conseil Français de l'Énergie

## Elephant

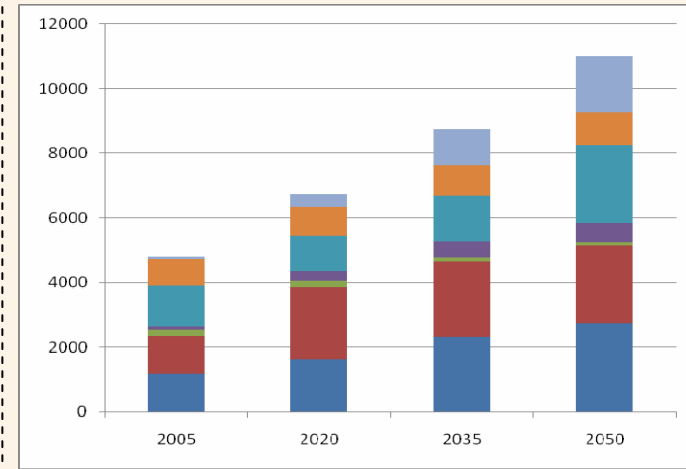
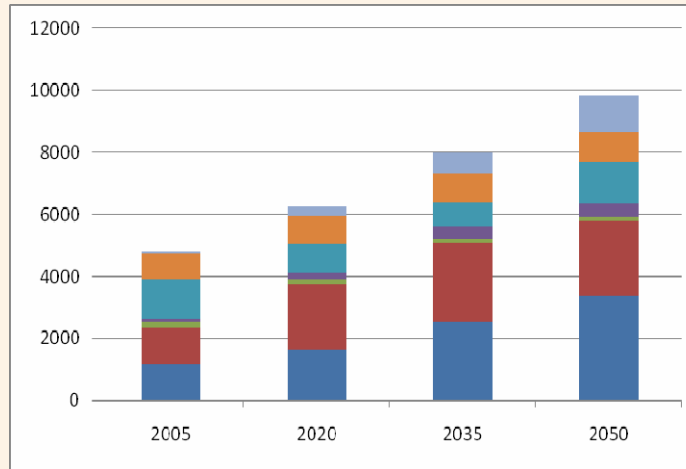
## Lion

High



Government Engagement

Low



Leopard

Low

Coopération and intégration

High

Giraffe



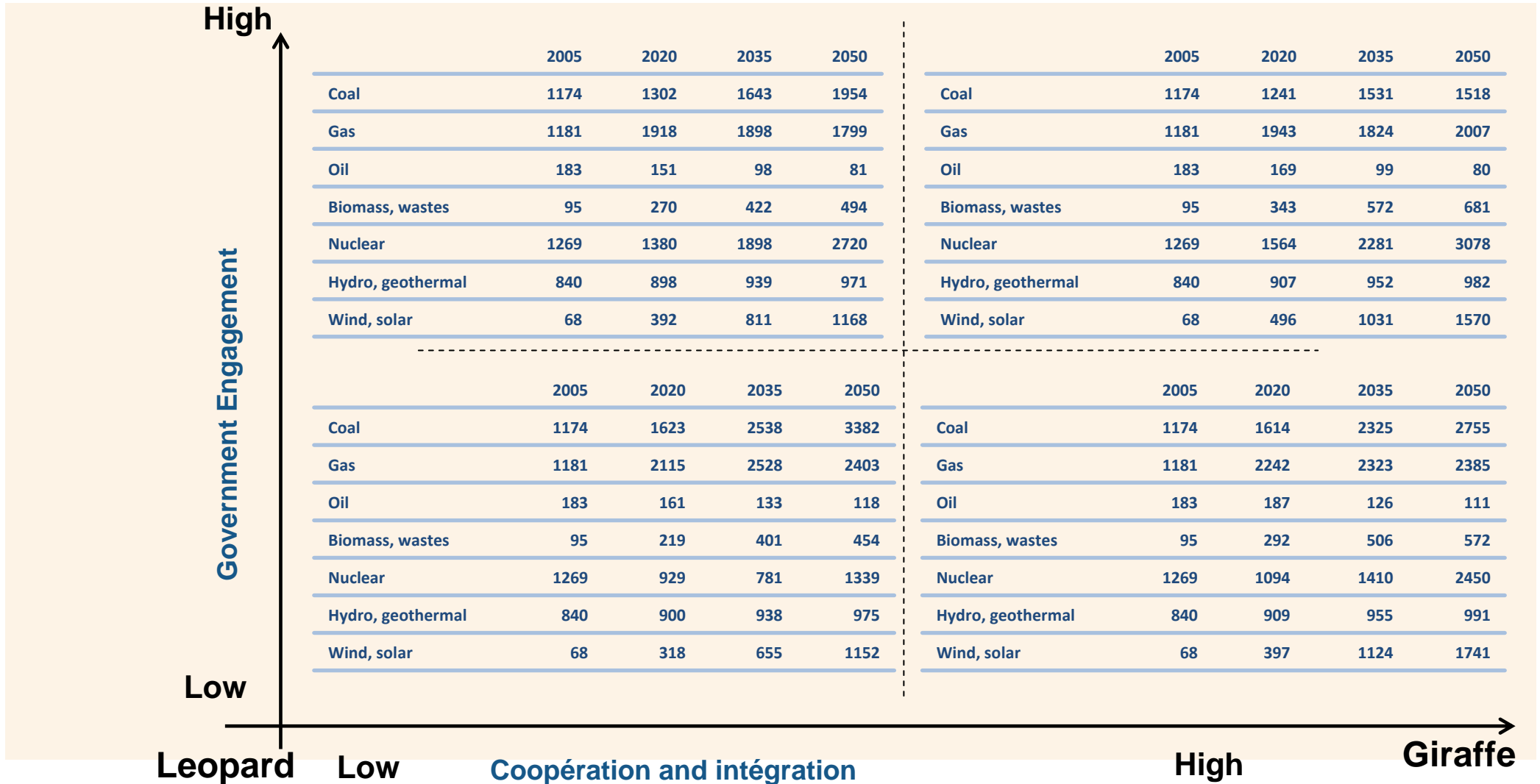
# Electricity generation (TWh)

Elephant



Conseil Français de l'Énergie

Lion





Conseil Français de l'Énergie

**Caveat (again !)**

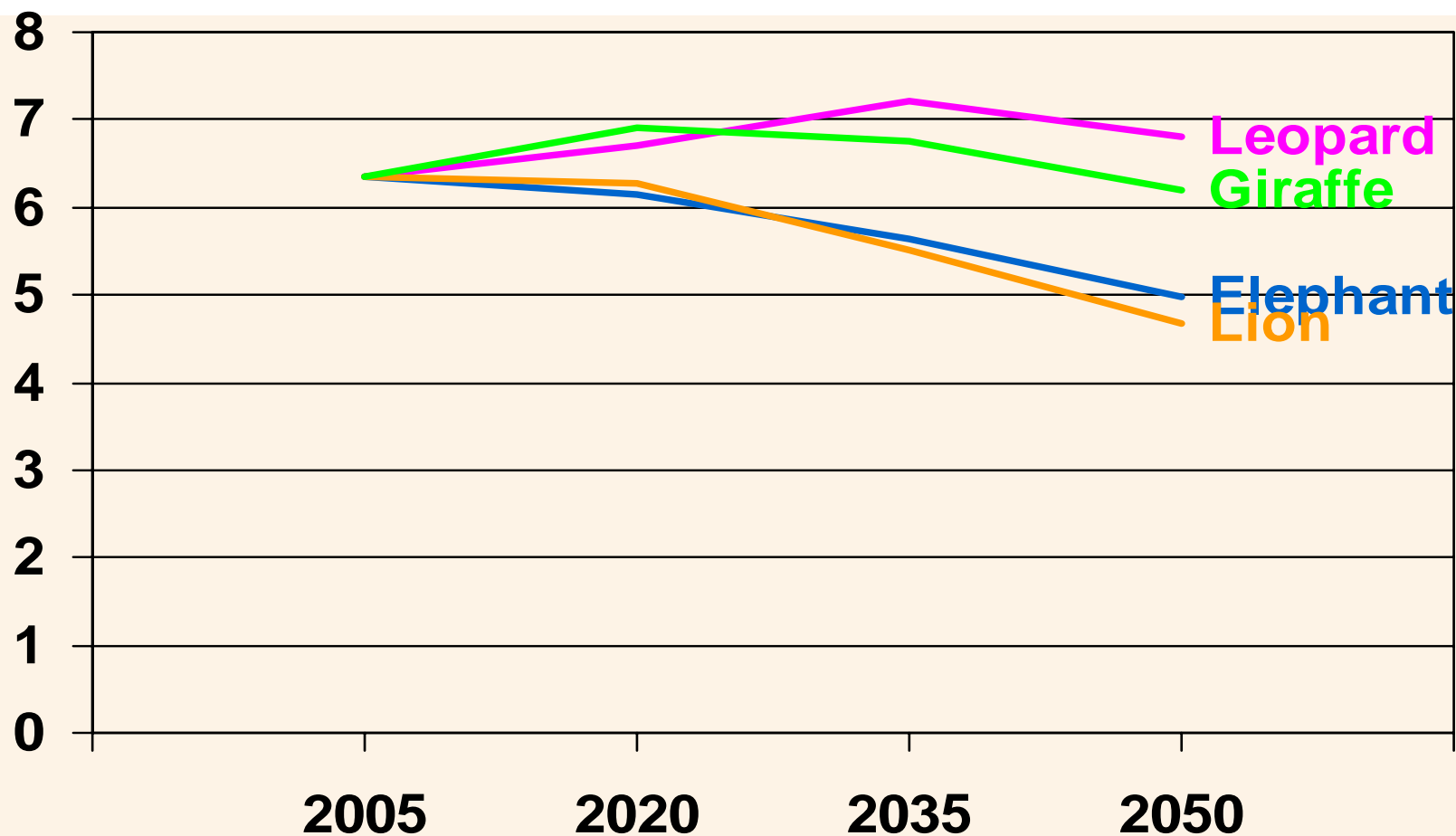
**Modelling gives only a quantitative illustration of WEC qualitative scenarios.**



# CO<sub>2</sub> emissions (Gt CO<sub>2</sub>)



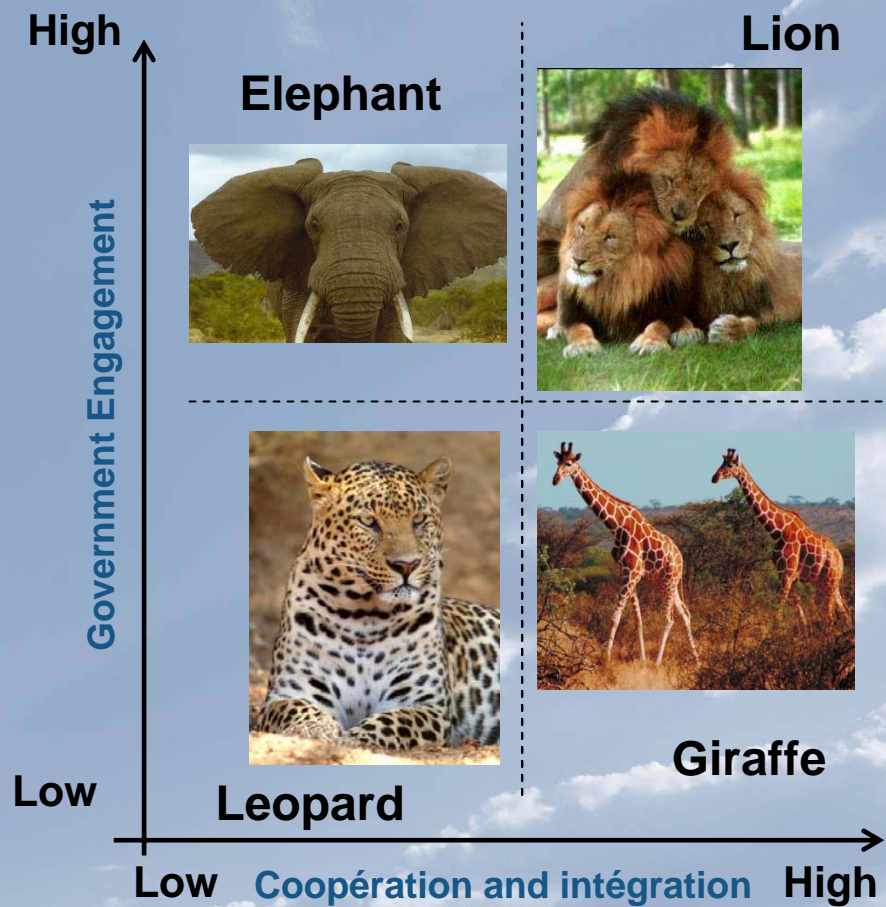
Conseil Français de l'Énergie





Conseil Français de l'Énergie

# Key Messages





Conseil Français de l'Énergie

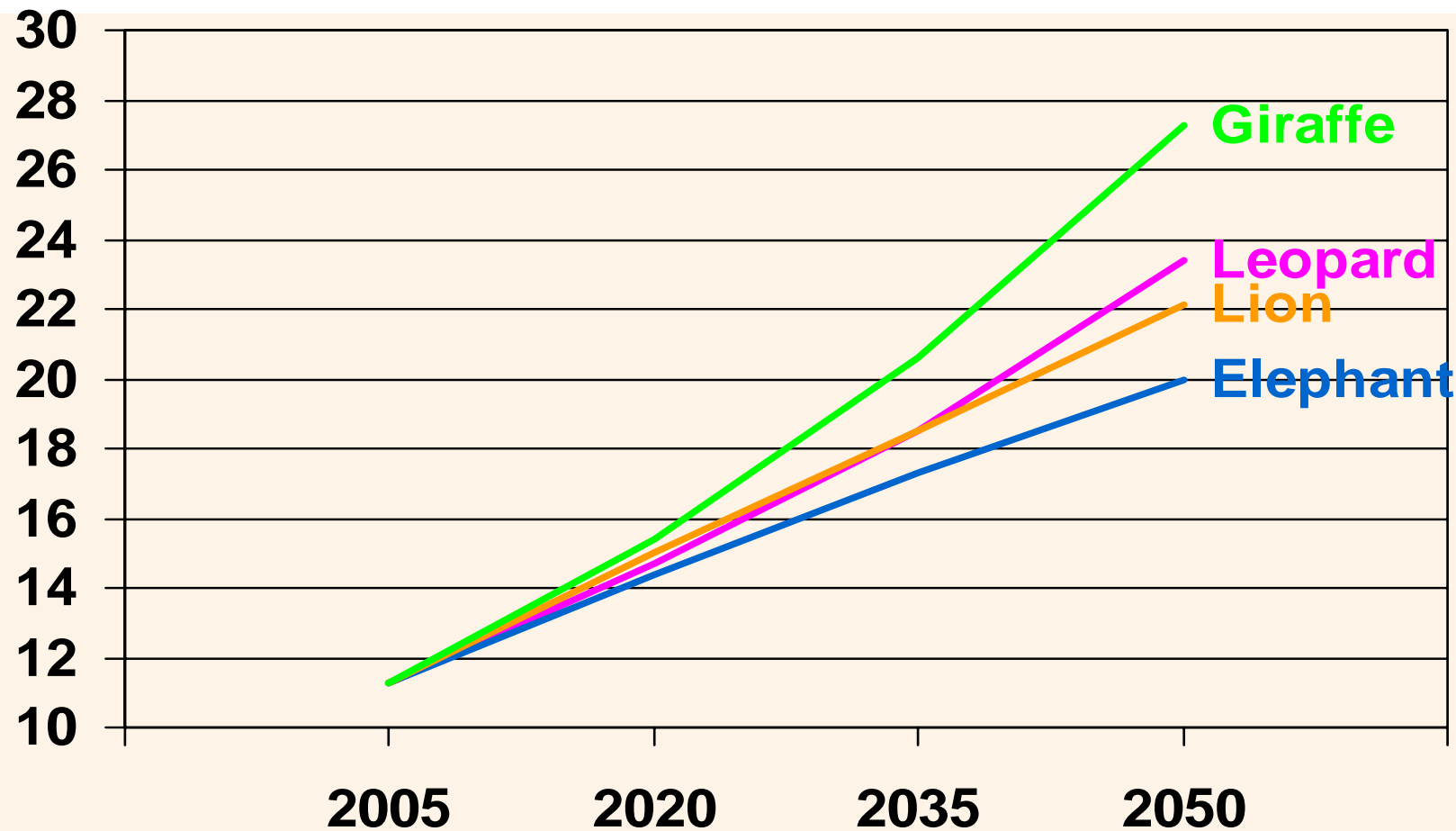
## Key Message 1

**To meet the energy needs of all the people in the world, global energy supplies will have to double before 2050.**

# TPES



Conseil Français de l'Énergie

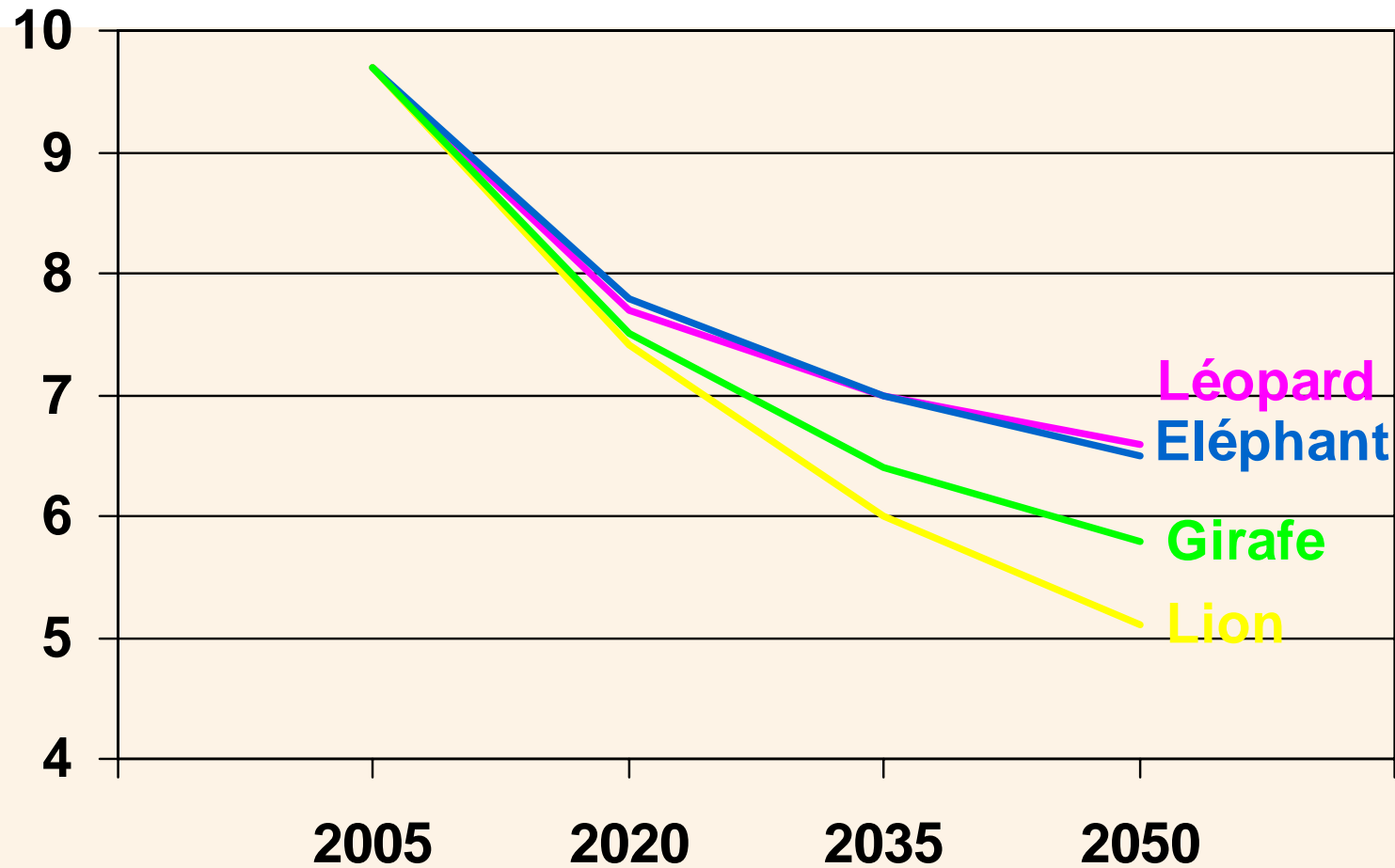


Gtep

# Energy intensity



Conseil Français de l'Énergie



MJ / \$2005 ppa



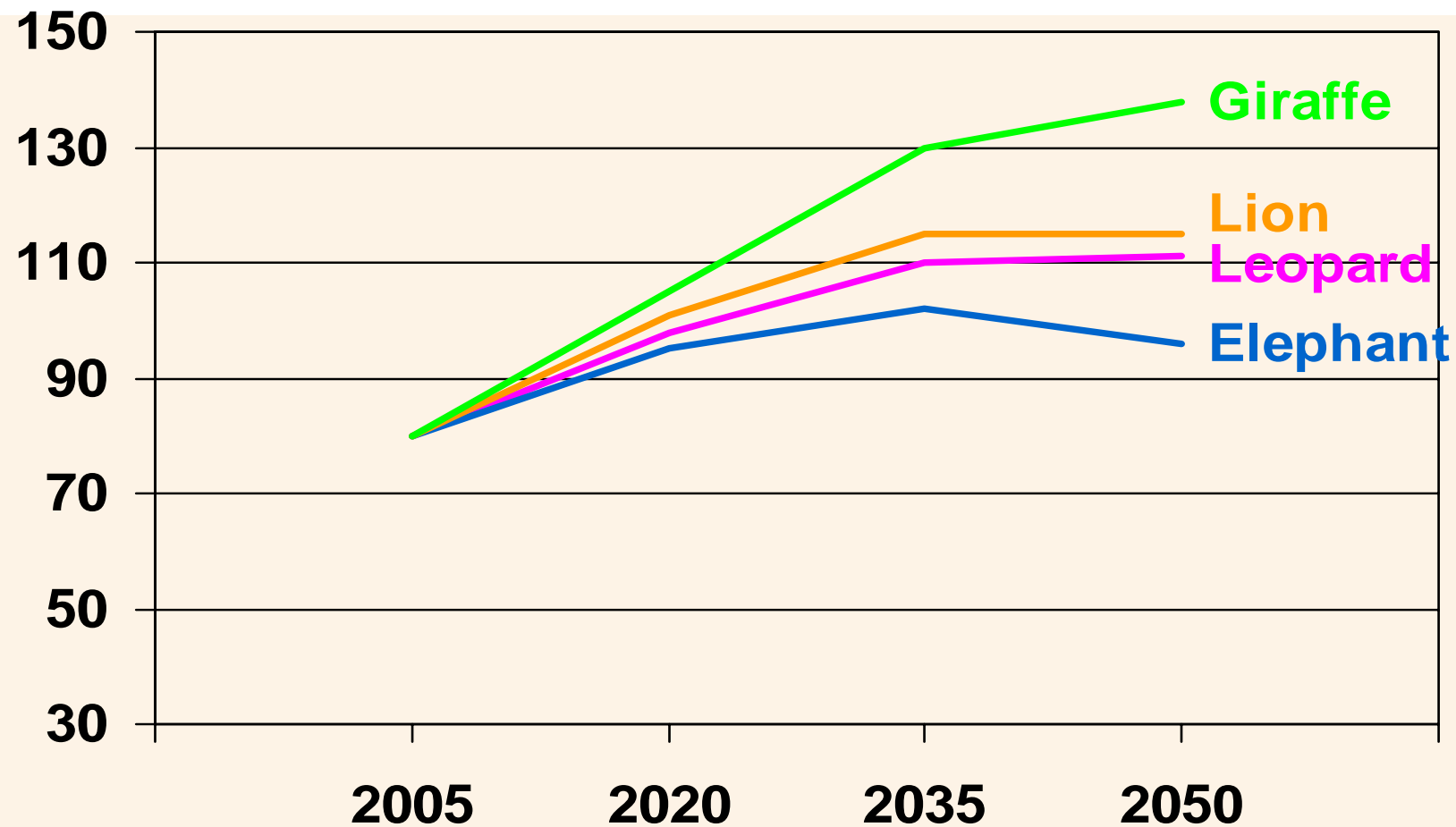
## Key Message 2

**The world has sufficient energy resources, knowledge, skills and capital to meet the supply needs; the challenge is to get them from where they are plentiful to where they are needed most.**

# Oil production



Conseil Français de l'Énergie



M bl / j



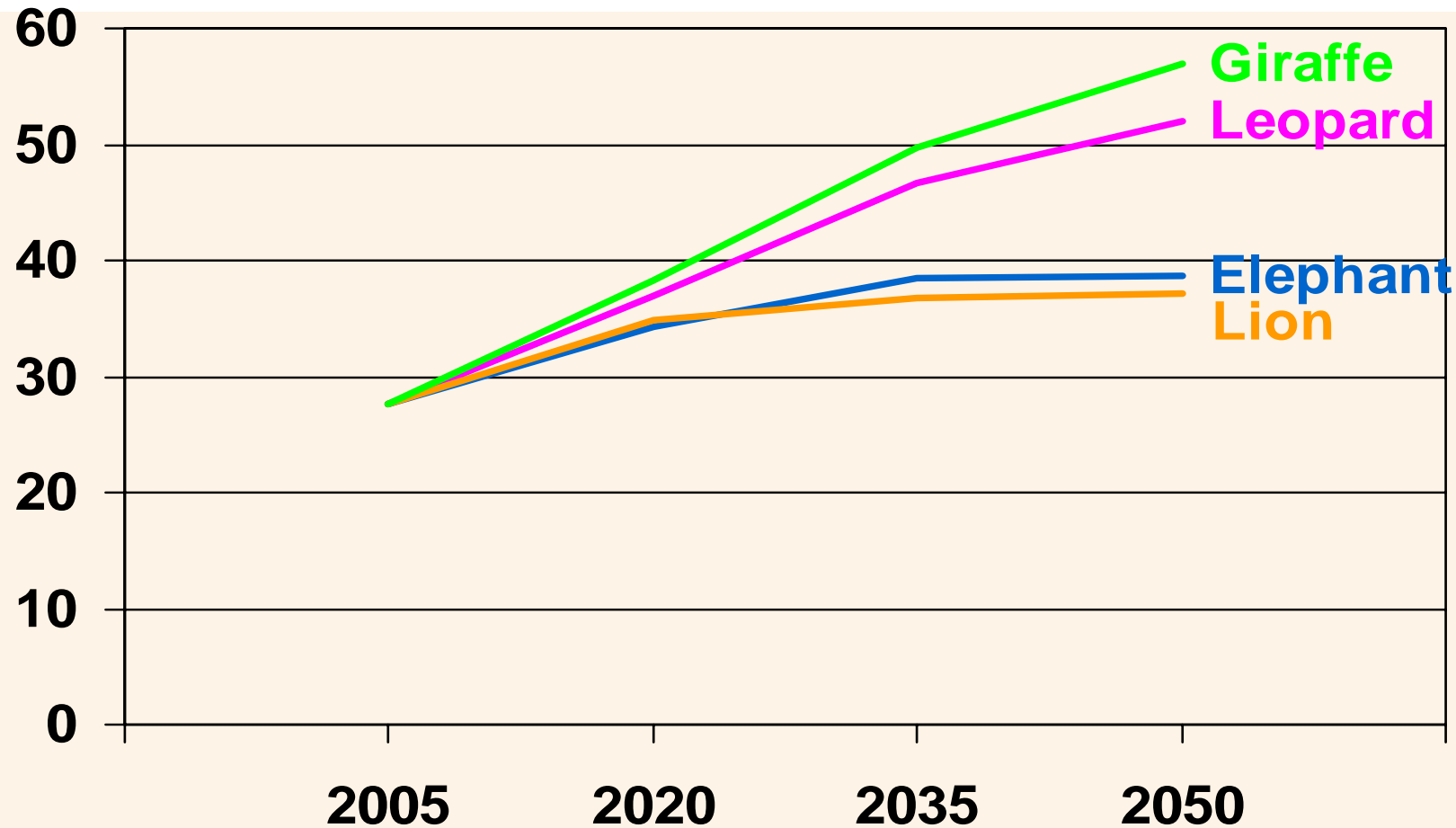
## Key Message 3

**We can address the world's accessibility needs in harmony with the effective management of acceptability, thereby mitigating against both social and environmental degradation.**

# CO<sub>2</sub> emissions



Conseil Français de l'Énergie



Gt



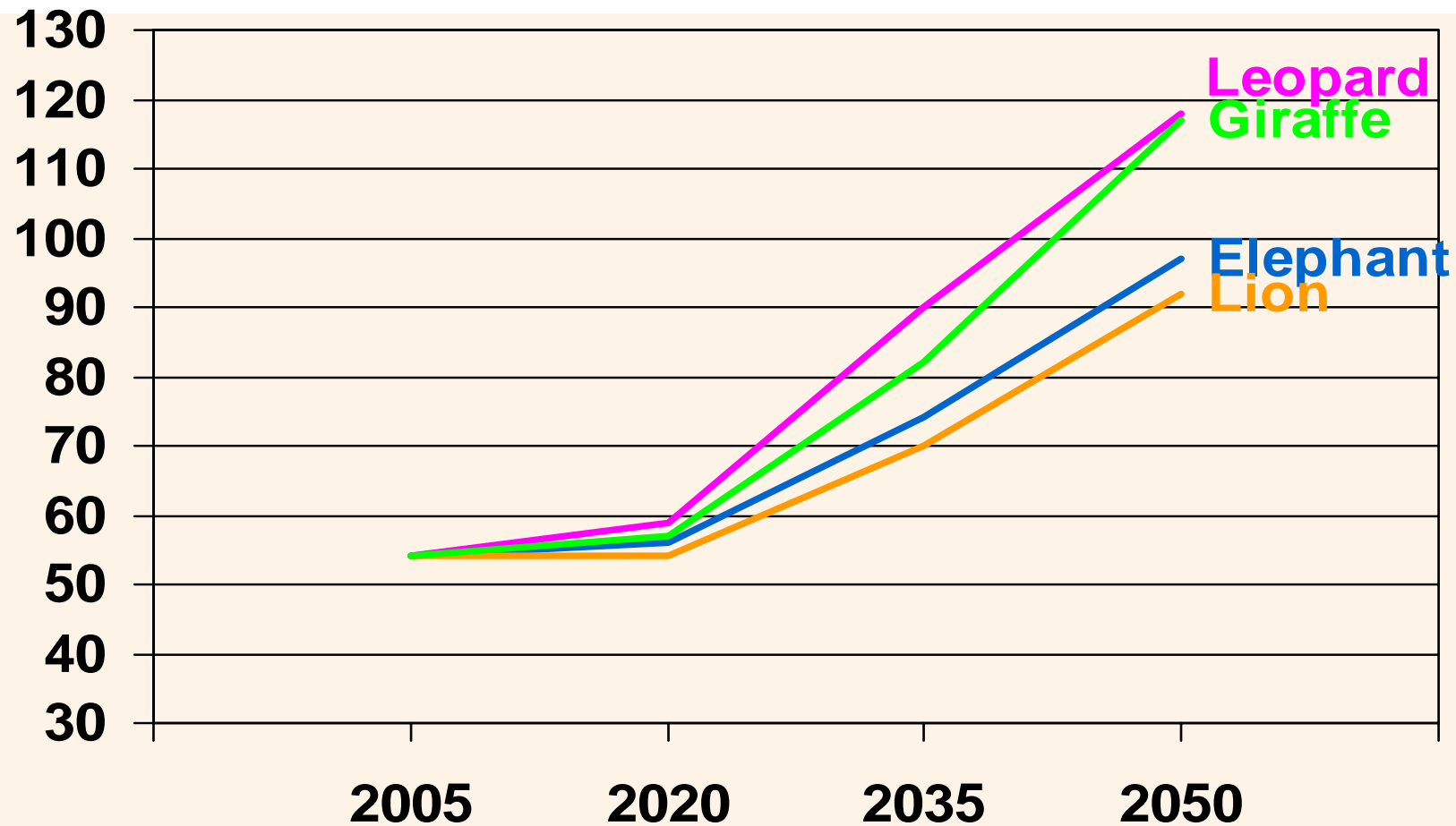
## Key Message 4

**Higher energy prices (or the specter of the same) will drive efficiency and attract capital investment in developed countries but robust international cooperation and integration is necessary to avoid unintended negative consequences and exacerbating energy poverty in developing countries.**

# Oil price



Conseil Français de l'Énergie



\$2005 ppa / bl



## Key Message 5

**Private sector engagement is essential – influencing national policy, driving business policy, and ensuring focus on sustained delivery of the policy intent.**



Conseil Français de l'Énergie

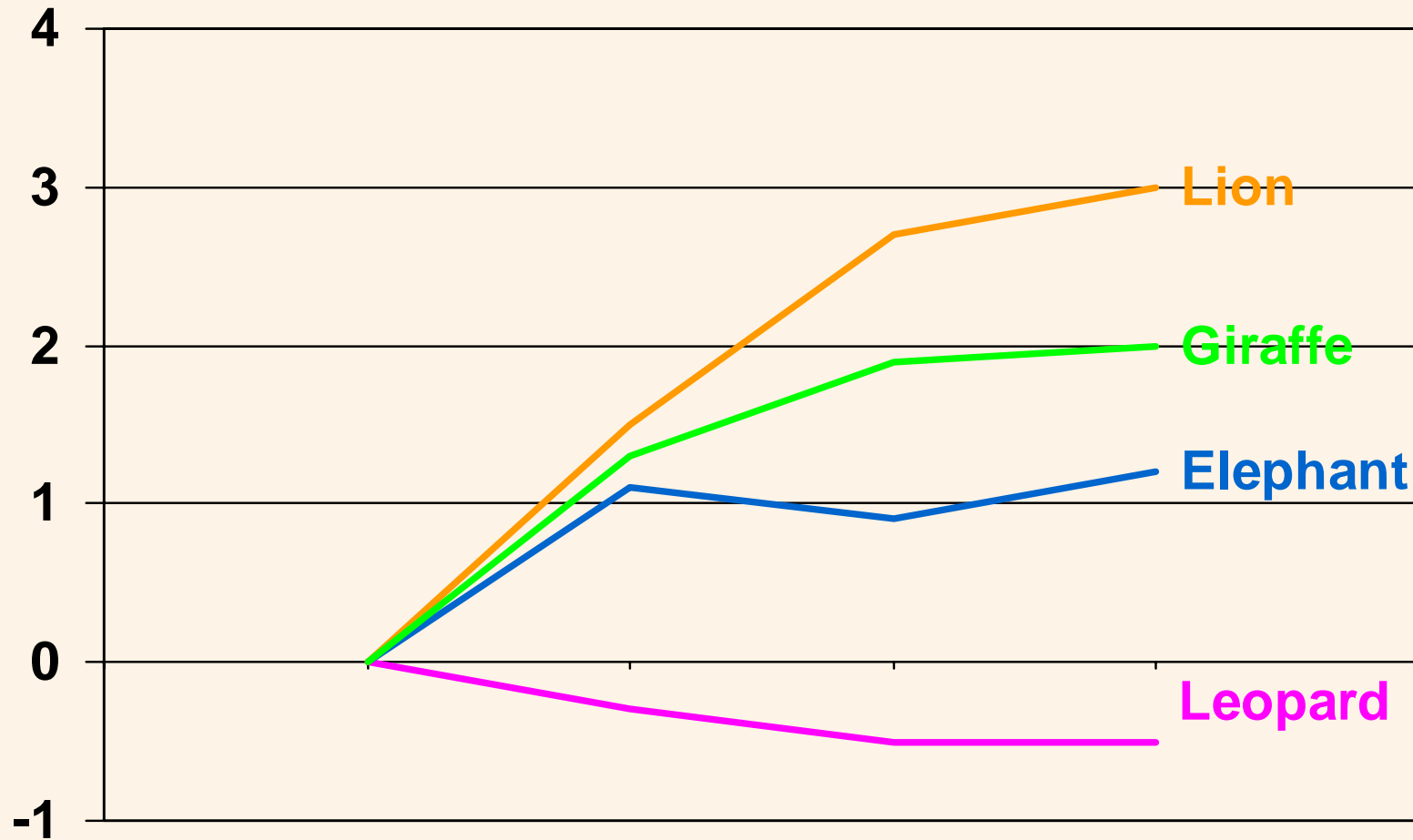


**What about WEC 3A ?**

# Accessibility



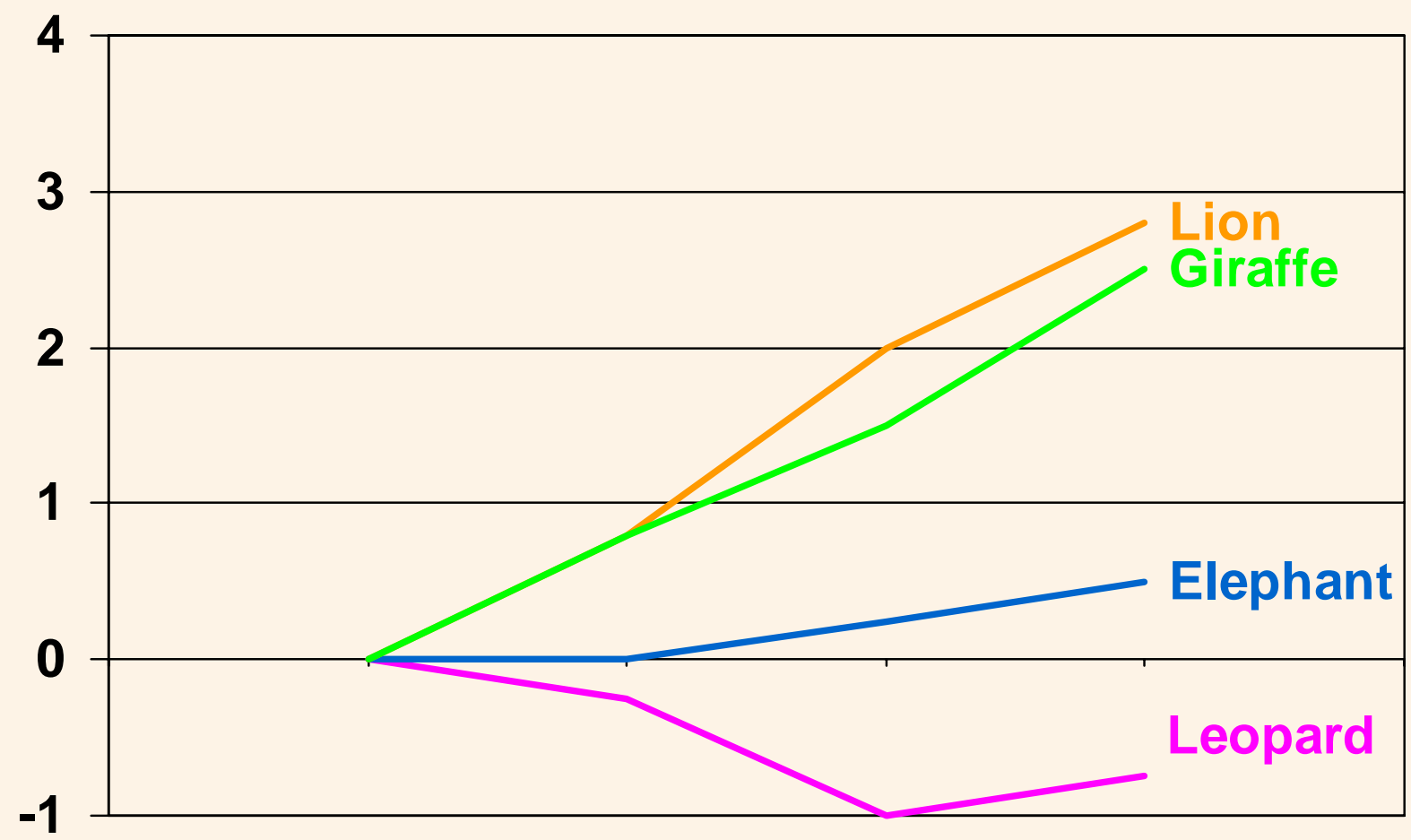
Conseil Français de l'Énergie



# Availability



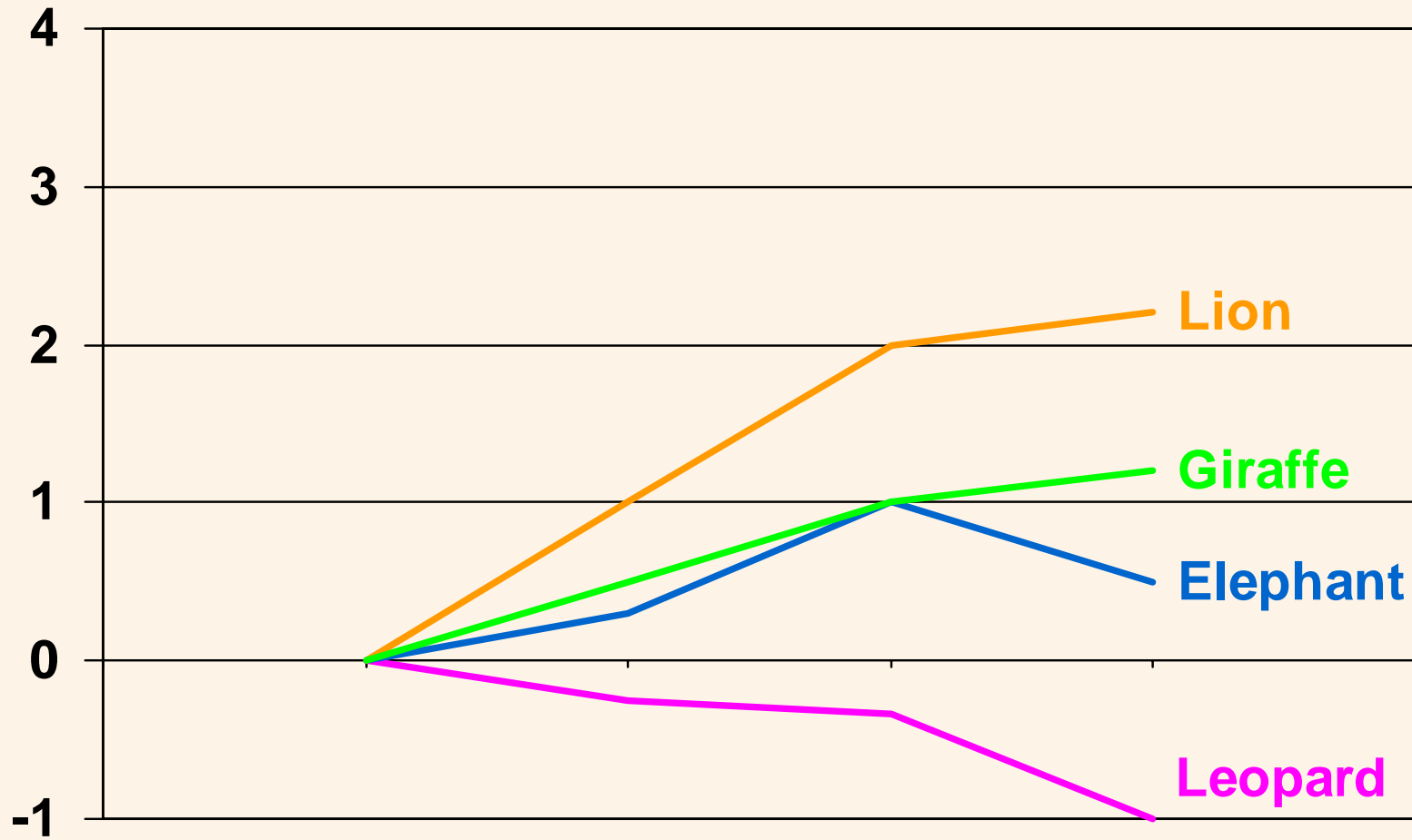
Conseil Français de l'Énergie



# Acceptability



Conseil Français de l'Énergie





Conseil Français de l'Énergie



**Making it Happen**



## WEC policy recommendations

1. Promoting energy efficiency, both on supply and demand sides
2. Raising public awareness of important role of transport sector
3. Setting a global price for carbon, not too high and not too low
4. Closer integration of energy markets, regionally and globally
5. Creating a new international framework for technology transfer
6. Global dialogue on security of supply and demand
7. Taxation, legal and commercial frameworks



Conseil Français de l'Énergie



Free download: [www.worldenergy.org](http://www.worldenergy.org)

French summary with tables and graphics: [www.wec-france.org](http://www.wec-france.org)

[moncomble@wec-france.org](mailto:moncomble@wec-france.org)



Conseil Français de l'Énergie

**IFRI Energy Breakfast Roundtable**  
**Brussels, Friday 13<sup>th</sup> 2008**

## **Deciding the Future: Energy Policy Scenarios to 2050**

**Jean Eudes Moncomble**  
**Secrétaire général,**  
**Conseil Français de l'Énergie**

**Deciding the  
Future: Energy  
Policy Scenarios  
to 2050**

World Energy Council 2007

Promoting the sustainable supply and use  
of energy for the greatest benefit of all

