





# **AREVA, a global leader in solutions for CO<sub>2</sub>-free power generation**

**Creating a worldwide reference in renewable energies**

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## ▶ Forward-looking statements

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# Agenda



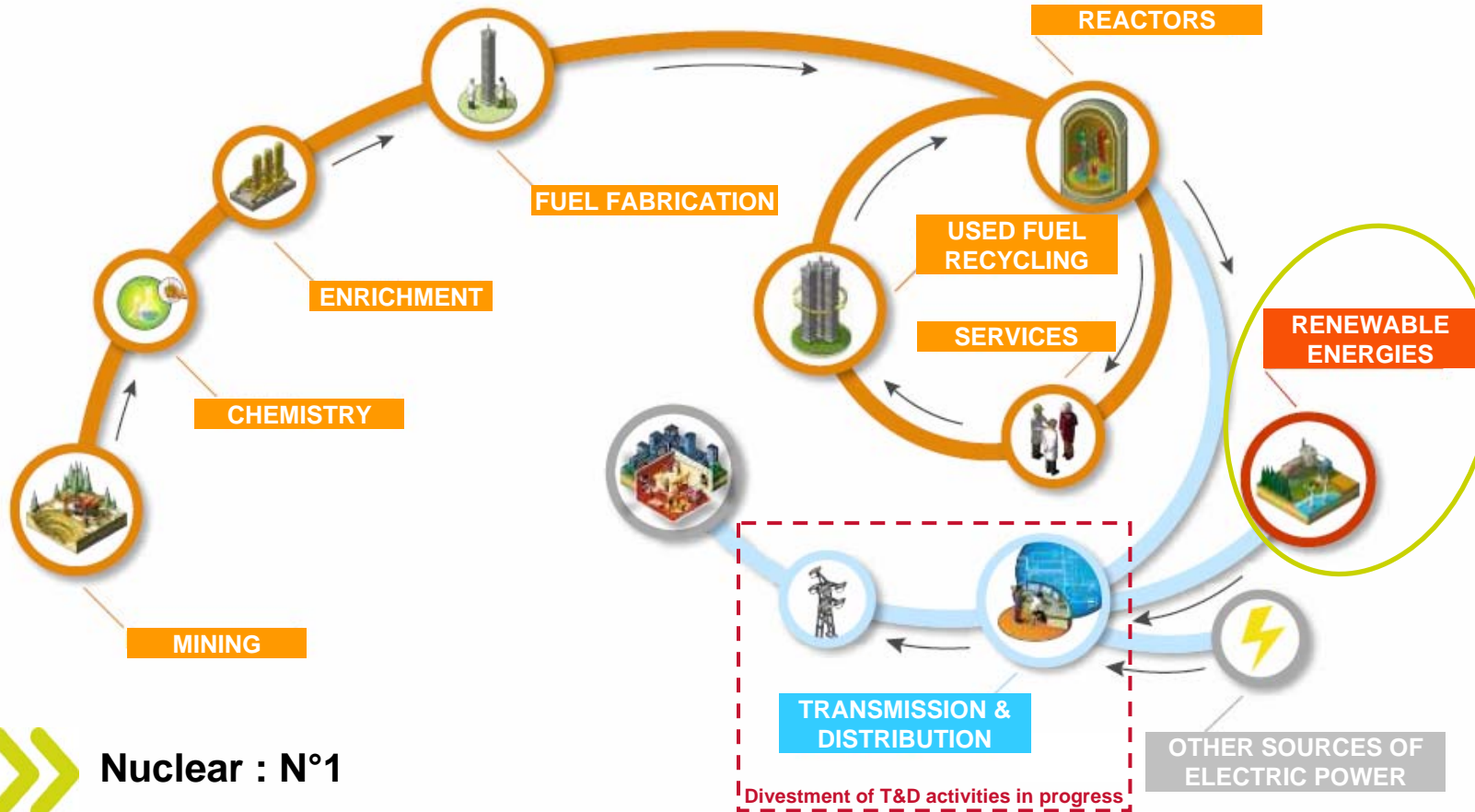
- ▶ **AREVA at a glance**

- ▶ **Renewable market perspectives and drivers**

- ▶ **Developing a worldwide reference in renewable energies**

- ▶ **Conclusion**

# AREVA is a global leader in solutions for CO<sub>2</sub>-free power generation



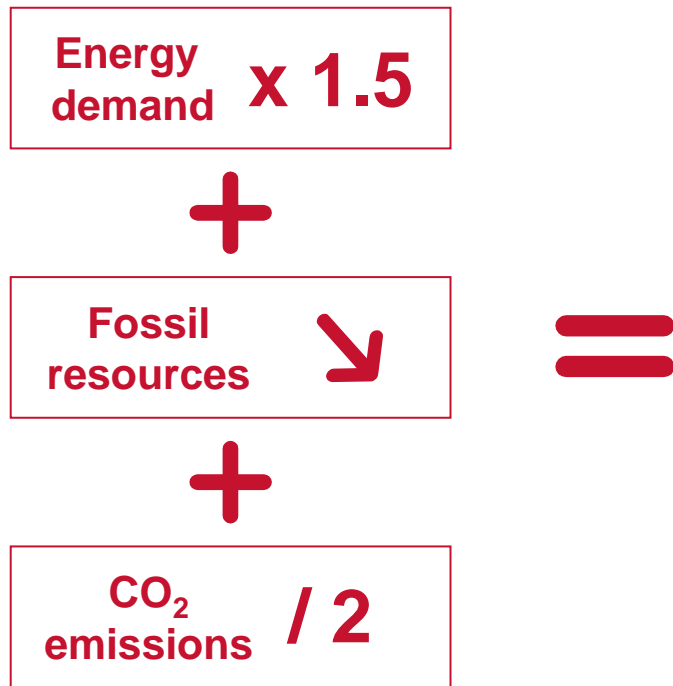
» Nuclear : N°1

Renewable :  
on the road  
to leadership

» €13,160M sales (2008)

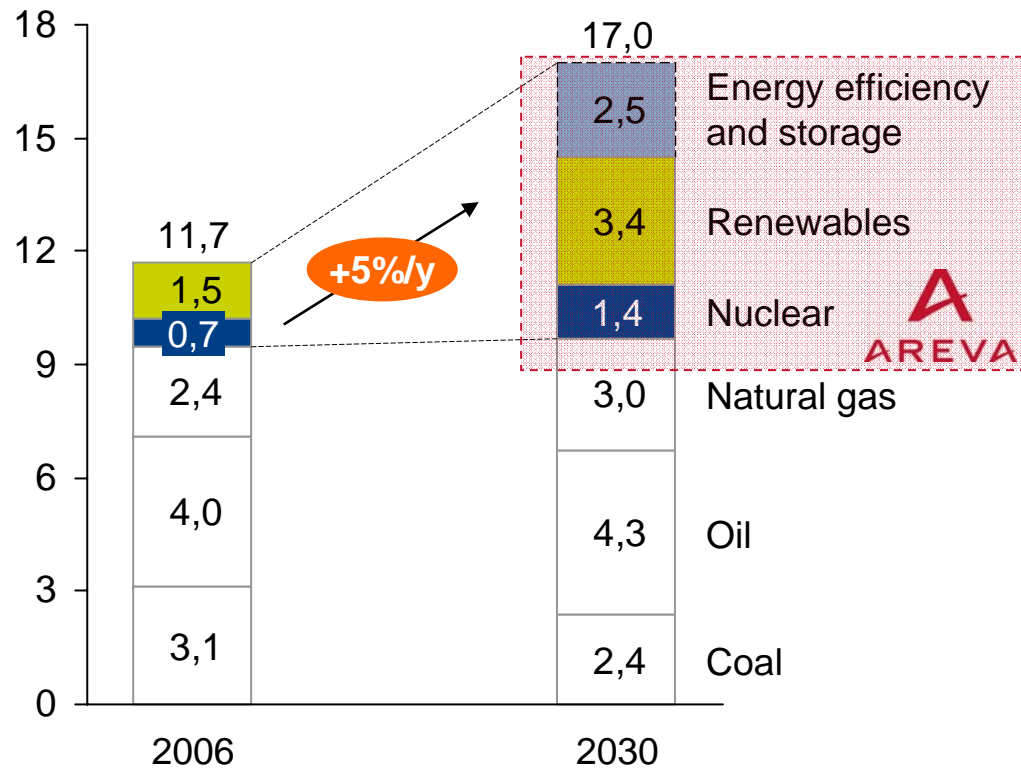
» 75,400 people

# AREVA captures growth through its low carbon strategy aligned with world energy challenges



## Global energy mix

Billions of metric tons of oil equivalent / year

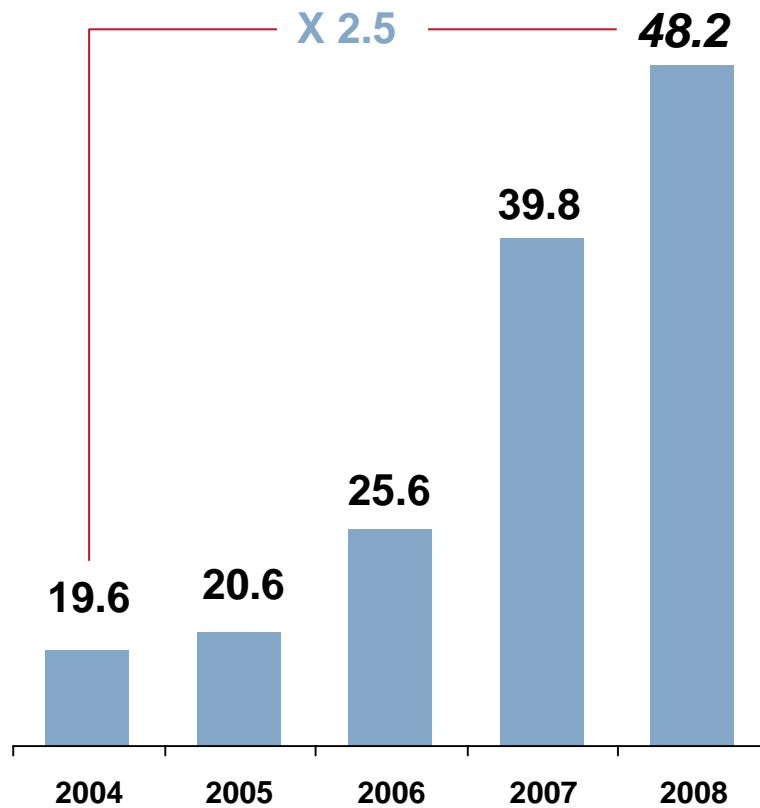


Source: World Energy Outlook 2008 stabilization 450 ppm" scenario, AREVA

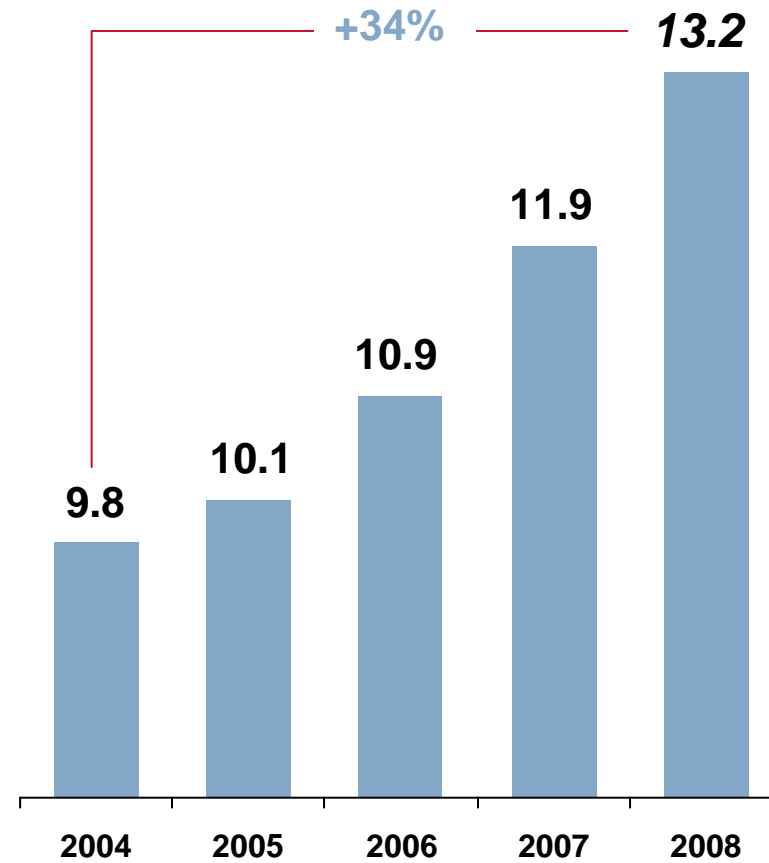
# Sustained growth



### Backlog (€Bn)\*



### Revenue (€Bn)\*

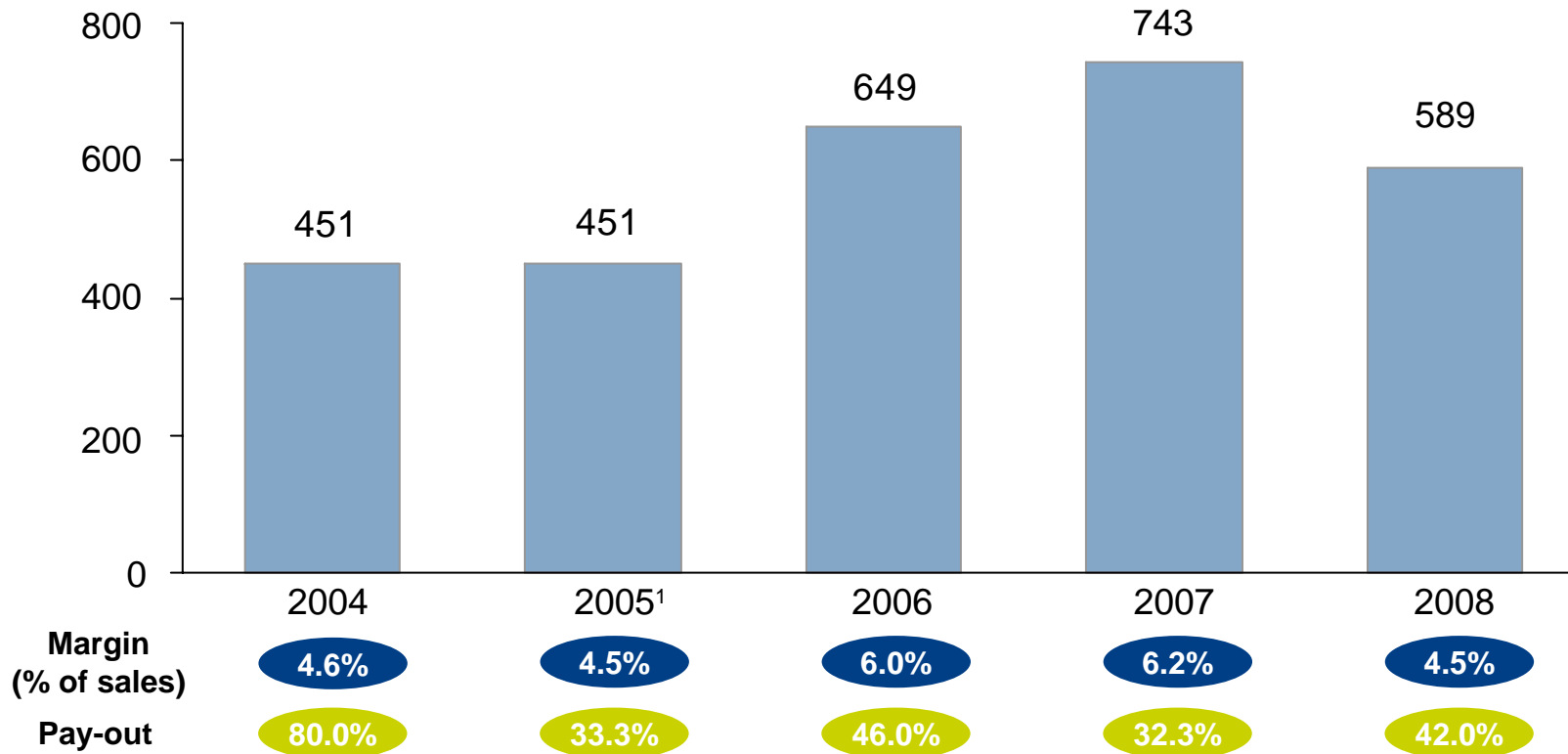


\* excluding FCI – Connectors division

# AREVA creates value for its shareholders



AREVA net income 2004-2008  
(€M)



**AREVA has paid its shareholders more than €2.6Bn since 2001**  
**From 2001 to 2008, the invested rate of return for the investment certificate comes to 16.7%**

1. excluding FCI - Pôle Connectique disposal

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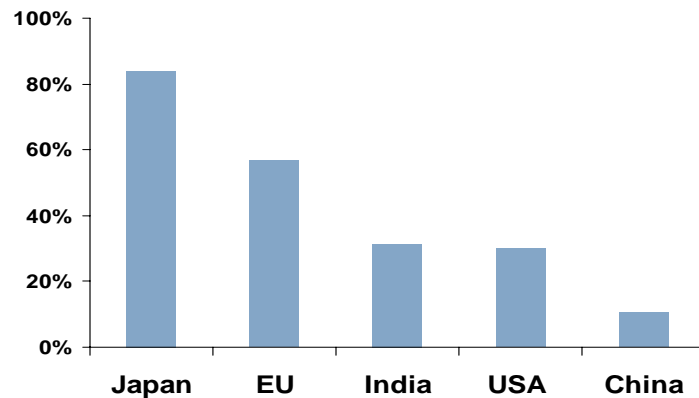
▶ **Conclusion**

# Renewable energy is an answer to 3 major concerns and a factor of local industrial development



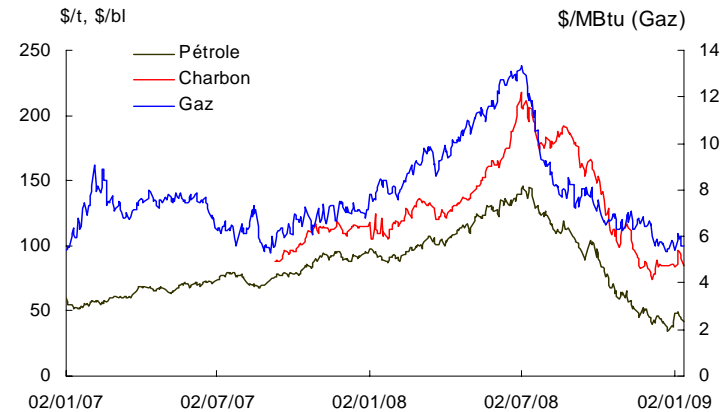
## Energy dependence

Import part of country energy consumption



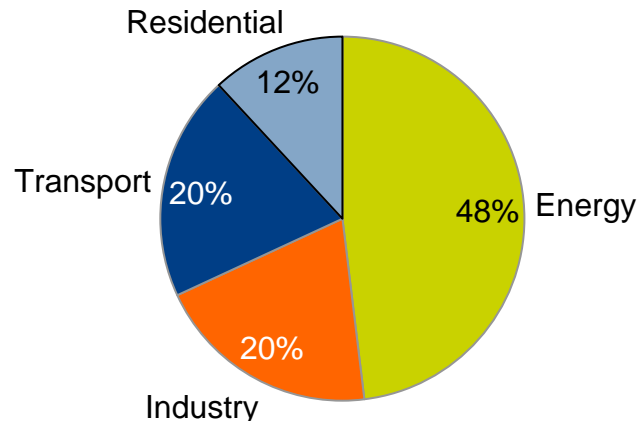
Source : BP Statistical Review 2008, AREVA

## Fossil energy price volatility



Source : Bloombera. AREVA

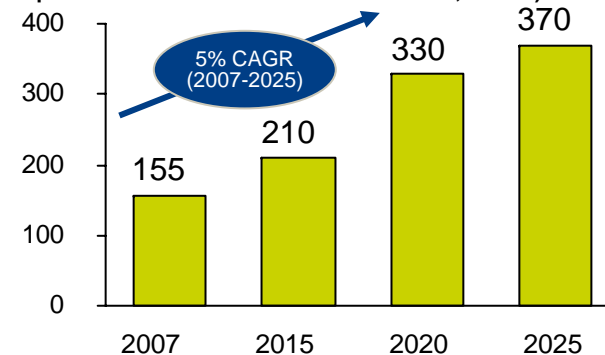
## CO<sub>2</sub> world emissions



Source : AIE 2008, AREVA

## Local industrial development

(Example of on-shore and off-shore wind in EU ; in '000)



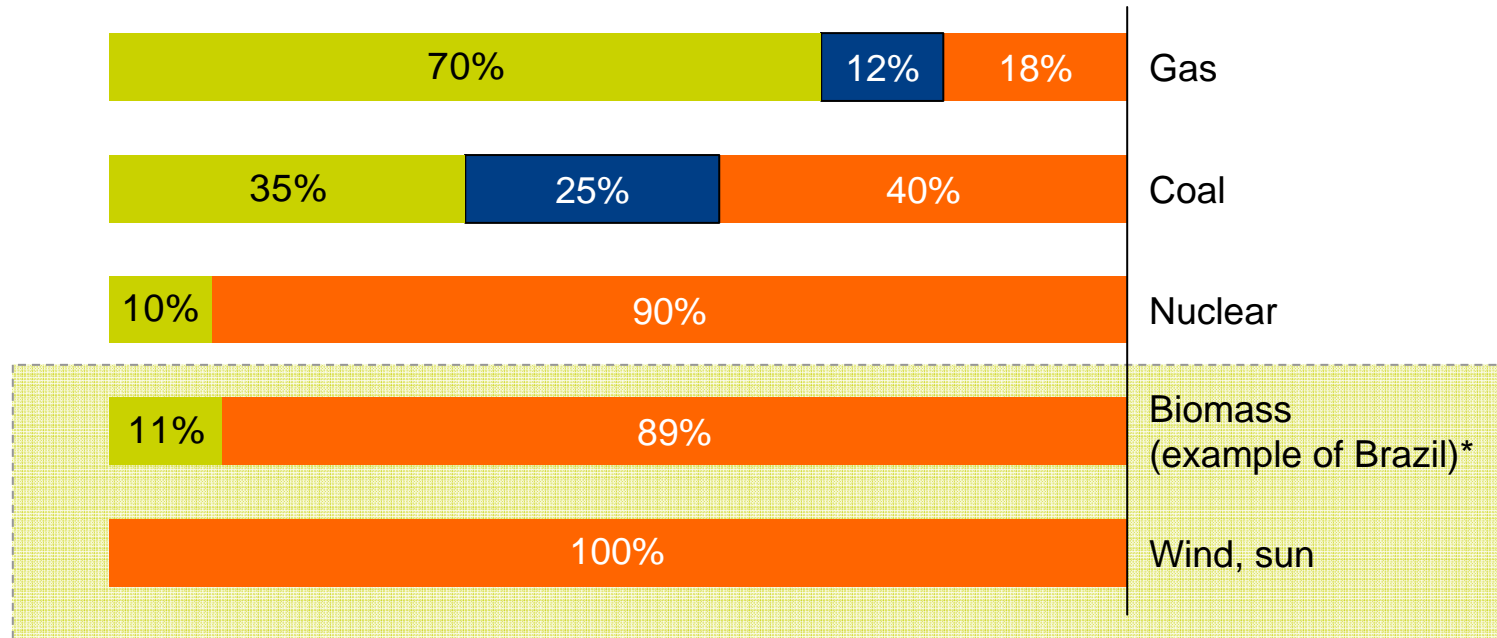
\* Direct and indirect employment in Europe for on-shore and off-shore wind sector. Includes direct and indirect employment in component manufacturing, utilities, developers, O&M, engineering and consultancy, R&D, financial, etc. (source: European Wind Energy Association, Jan. 2009)

# Renewable energies, as Nuclear power, are little dependent on fuel prices



## Electricity cost breakdown

- CAPEX and other OPEX
- Carbon
- Fuel cost



\* Fuel cost can even be negative in the case of waste

Source : Based on d'E-On estimations for Europe (January 2009), using carbon cost of 20 €/t ; AREVA's estimation for biomass

# Throughout the world, governments are supporting the development of renewable energies



## France

### Targets by 2020:

- » > 20% of renewable energies in the energy mix by 2020

### Incentives:

- » Off shore: stimulation to favor national champions
- » Biomass: feed-in tariffs (between 49€/MWh and 113€/MWh)

## USA

### Targets by 2020:

- » 14-15% reduction of GHG below 2005 levels by 2020 (proposal in Copenhagen)

### Incentives:

- » Over \$60 billion in clean energy investments (American Recovery and Reinvestment Act) : loan guarantees, tax incentives and public investment)

## Europe (excl. France)

### Targets by 2020:

- » E.U. targets: renewables = 15% of renewable in energy consumption mix (i.e. 40% of electricity production)

### Incentives:

- » Off Shore: stimulation policies (e.g. UK : in 2008 site pre- selection + subsidiaries for investment + tax exemption)
- » Biomass: attractive basic purchasing rate (e.g. up to 267€/MWh in Germany)

## China

### Targets by 2020:

- » Renewable energy consumption = 10 % of the total energy cons° by 2010 and 15% by 2020 (30GW of wind power & 24GW of Biomass)

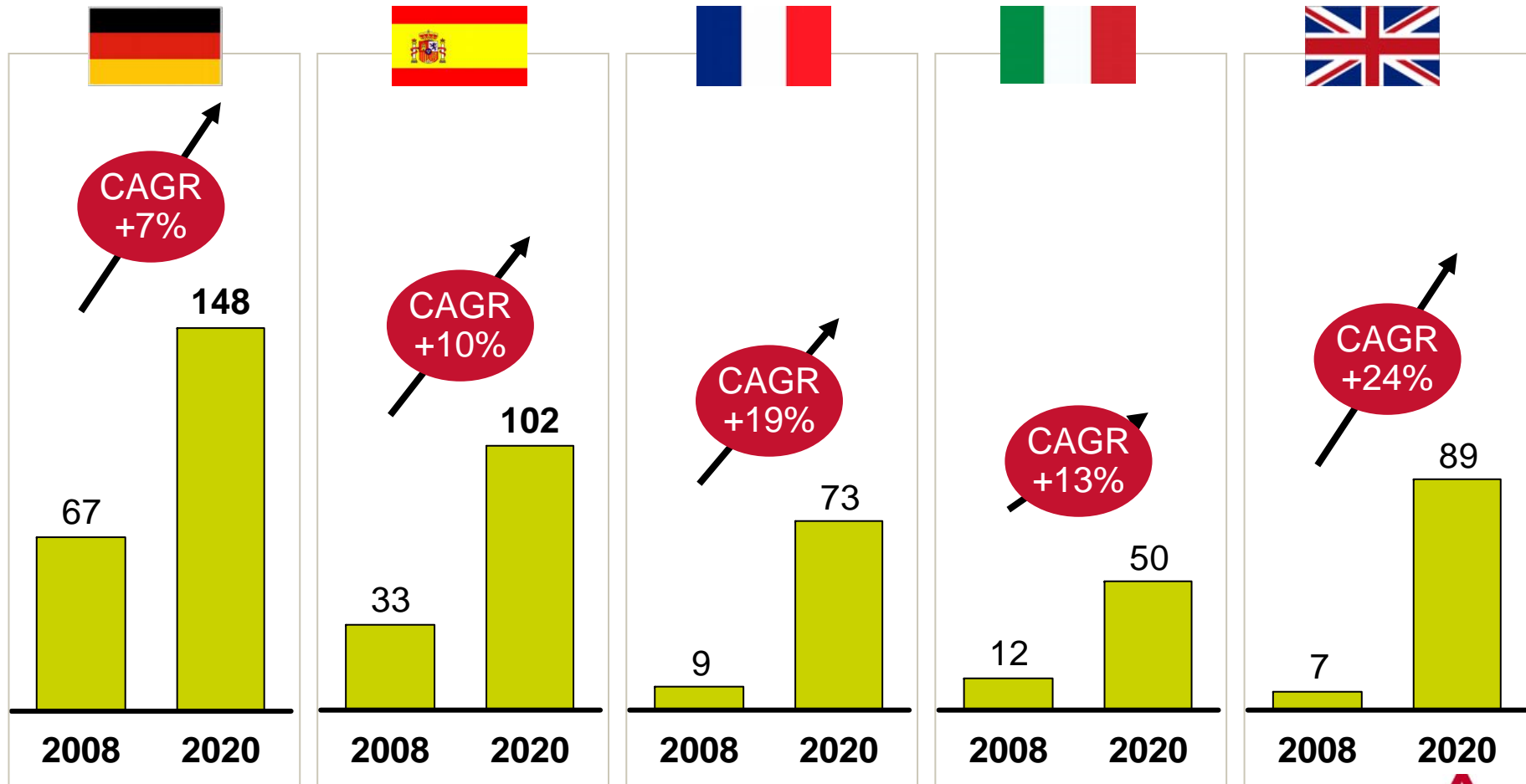
### Incentives:

- » Central government financial authority's renewable energy fund to support renewable energy development
- » Biomass: (e.g. subsidy of 0.25 yuan (US \$0.03) per kilowatt-hour for biomass)

# Very strong growth required to match 2020 European commitments



Production from renewables excluding large hydro, TWh

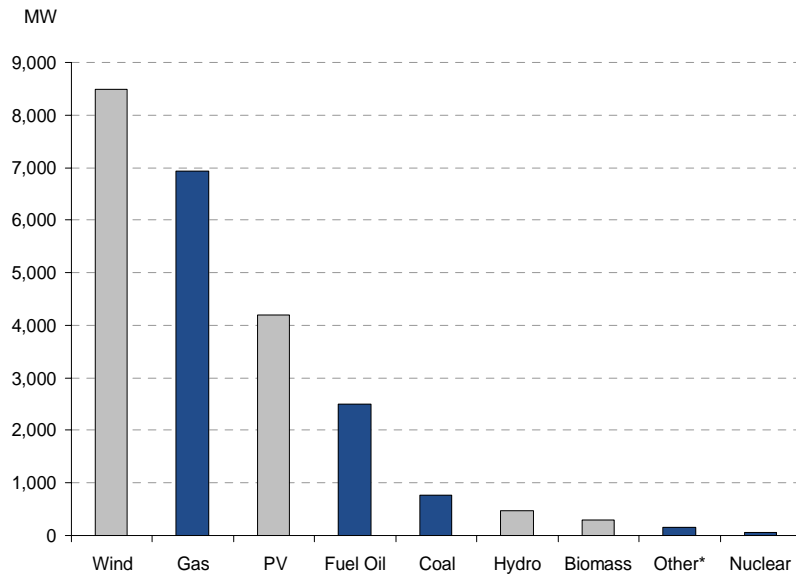


SOURCE: Current national plans and analyses on governments' declarations

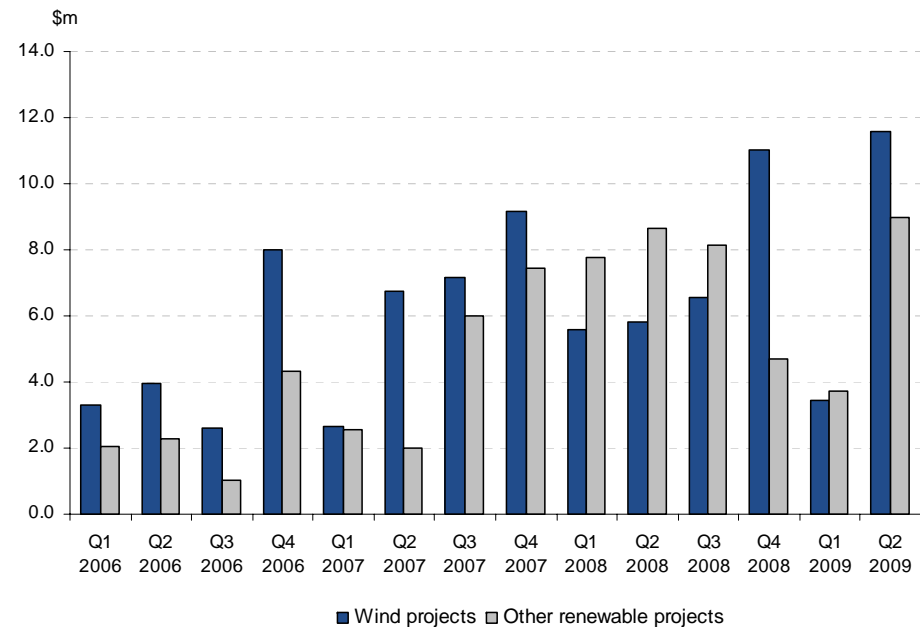
# Wind is the fastest growing electricity source in EU...



New power capacity installed in EU 2008



Wind vs. other renewables financing in EU\*\*



Source: AUGUSTA & Co, European Wind Energy Association, NEF

\*Geothermal, peat and waste, \*\*Asset Financing includes equity and debt with refinancing of projects

# ...with Offshore wind presenting the best IRR



	Onshore	Offshore
EPC Cost € '000/MW	~ 1,400	~ 3,000 *
Capacity Utilization	20 - 35%	30 - 45%
Investment Costs €/kWh <sup>1)</sup>	~ 80 - 46 €c	~ 114 - 76 €c
Operating Cost	1.5 - 1.8 €c/kWh	~ 2.2 - 2.8 €c/kWh
Debt Service Cover Ratio @ P90	1.25	1.3 - 1.5
Proj. Fin. Leverage	70 - 75%	55 - 65%
Equity IRR @ P50	9 - 12 %	14 - 18%

Source : AUGUSTA & Co, Sept 09

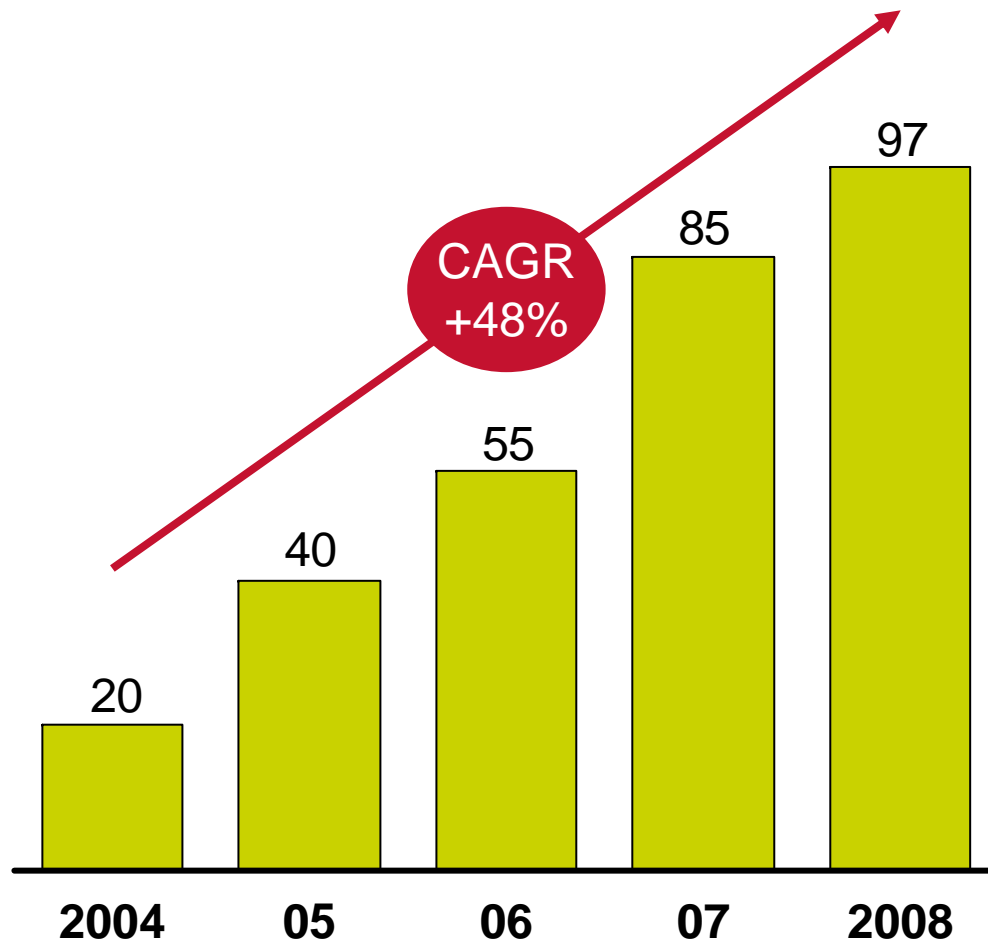
\* Site dependent

<sup>1</sup> kWh per annum (Cap. Util. \* 8,760 \* 1000) / EPC Cost (EPC Cost \* 1,000)

# Very strong increase of global investments in renewable energy

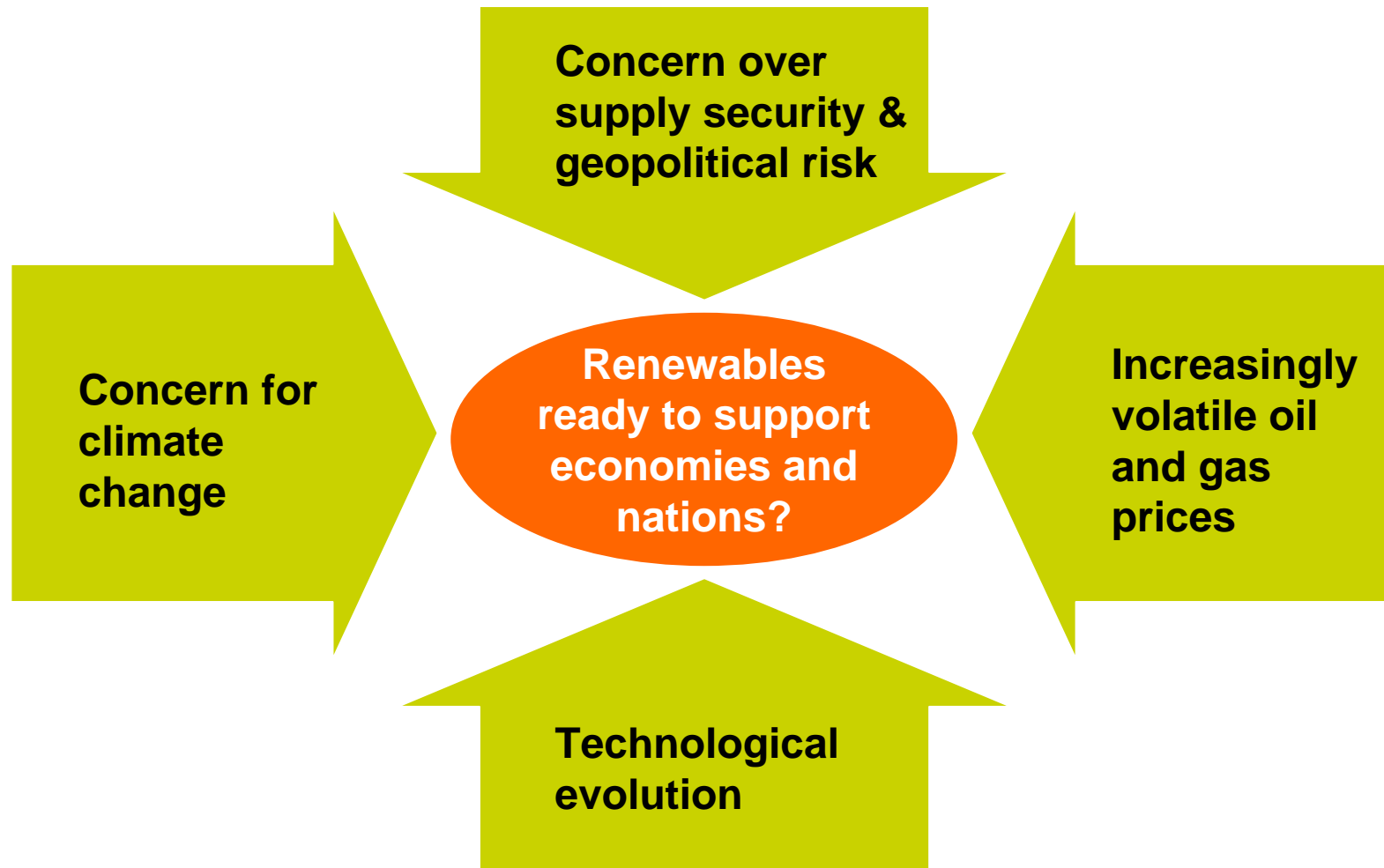


Investment in new renewable energy producing infrastructure, US\$ billions



Renewables account for 30% of total investment in power generation worldwide, >50% in Europe

# Fundamental and sustainable forces driving future development



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## Key deliverables required by 2012 time-frame:

- ▶ Comprehensive 'bankable' business models
  
- ▶ Competitive technologies: scalable and global
  - ◆ Predictable performance, availability and cost throughout life-cycle
  
- ▶ Grid-parity solutions
  - ◆ Base-load and Peak-load
  - ◆ Hybrid Renewables generation
  - ◆ Co-generation with fossil fuel sources
  - ◆ Renewables fully integrated with dispatch policy of the country's GRID

# AREVA Renewable Energies Portfolio



## WIND POWER



- ♦ Off-shore wind turbine designer and manufacturer
- ♦ Vertically integrated in blades

## BIOENERGIES



- ♦ Specialized engineering company (EPC) for turnkey delivery of biomass fired power plants
- ♦ Ownership of range of critical technologies (combustion, gasification, etc.)

## ENERGY CARRIER AND STORAGE

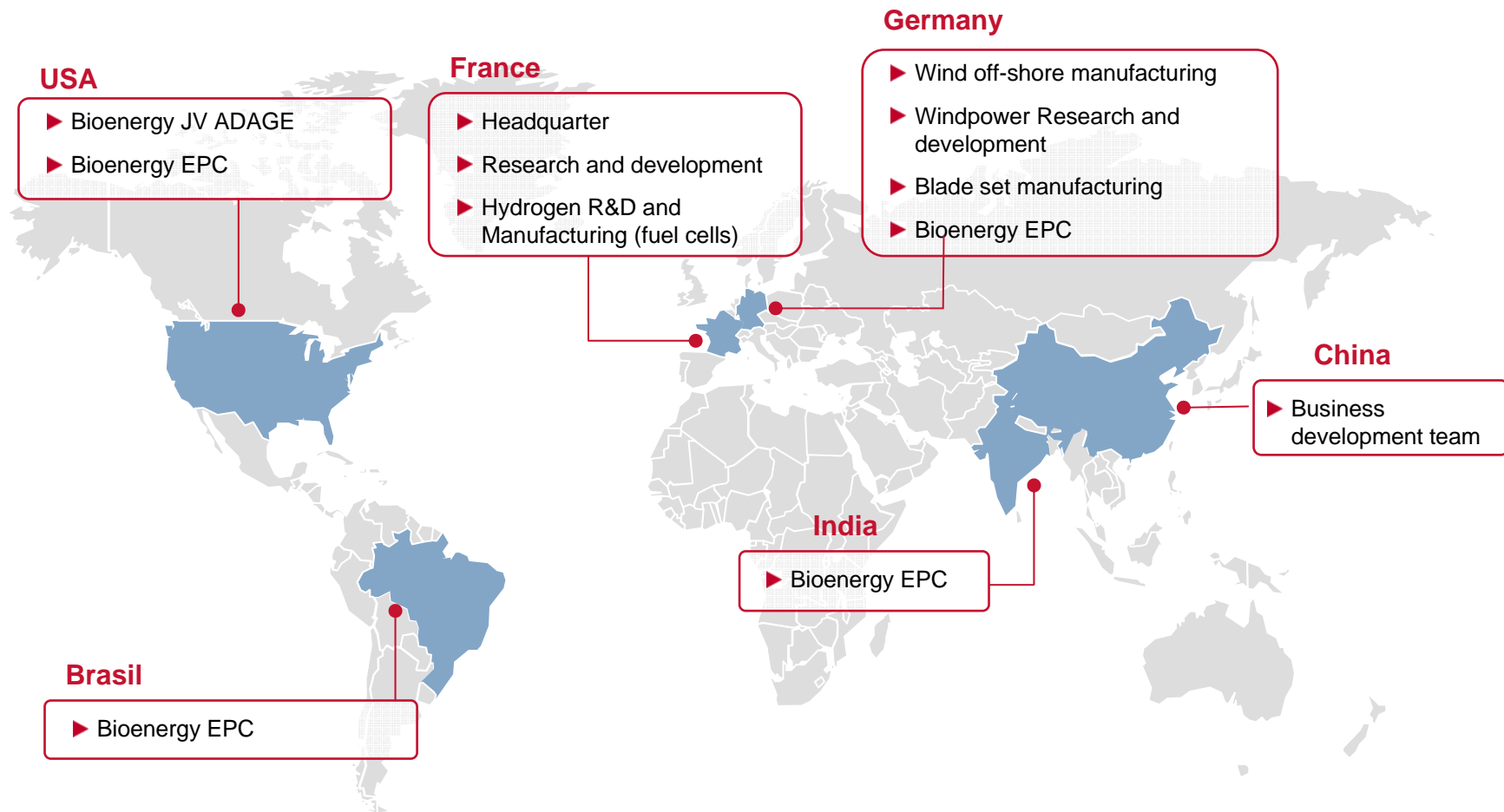


- ♦ Energy storage solutions
- ♦ Stationary back-up solutions (fuel cells)
- ♦ Equipment for production of hydrogen (electrolyzers)



AREVA is looking for opportunities to leverage its EPC know-how into solar thermal

# Geographical footprint aligned with market opportunities



# Strategic objectives per business segments



WIND POWER



BIOENERGIES



ENERGY CARRIER  
AND STORAGE



► Strategic objectives for all business segments:

- ◆ Market objectives aligned with customer's expectations
- ◆ Robust Industrialization
- ◆ Lead with Innovation



# Wind Power deliverables and strategic objectives: From a startup to strong industry leader



## Market objectives aligned with customer's expectations

- ▶ Leverage our wind turbine design specific for off-shore and providing at this point the highest off-shore capacity (5MW)
- ▶ Develop industry-leading comprehensive business model, leverage first off-shore installation in North German sea and largest contract in the industry
  - ◆ Performance curve and Availability standards
  - ◆ Certified interfaces and deliverable with off-shore Logistics, Foundation types and O&M
  - ◆ Commissioning, Warranty and full-life cycle services
- ▶ Become a leader in offshore wind market by 2014

## Robust Industrialization

- ▶ Dual-sourcing for all components to be completed by 2009
- ▶ Upstream in-house integration of Blade and Gearbox by 2010
- ▶ Engineer processes for better replication and quality: set-up second Assembly unit in late 2010

## Lead with Innovation

- ▶ Deliver first commercial floating turbine for deep sea applications
- ▶ Change the game through hybrid modular design for large capacity On & Off shore to deliver least cost per KWH Turbine in 2012



# Design, assembly and delivery of wind turbines





# Bioenergies deliverables and strategic objectives: Enhance and Consolidate leadership



## Market objectives aligned with customer's expectations

- ▶ **Deploy 'fleet' of power plants to optimize total cost of ownership in the industry, leverage 3GW install base know-how in range of feed stocks and countries**
  - ◆ Wrap around Carbon credit service in emerging markets
- ▶ **Selectively deploy integrated EPC and minority equity business model (ADAGE like) to secure profitable high feedstock availability projects in all target markets**
- ▶ **Become a world leader in all target markets (US, Brazil, South-East Asia, India) by 2014**

## Robust Industrialization

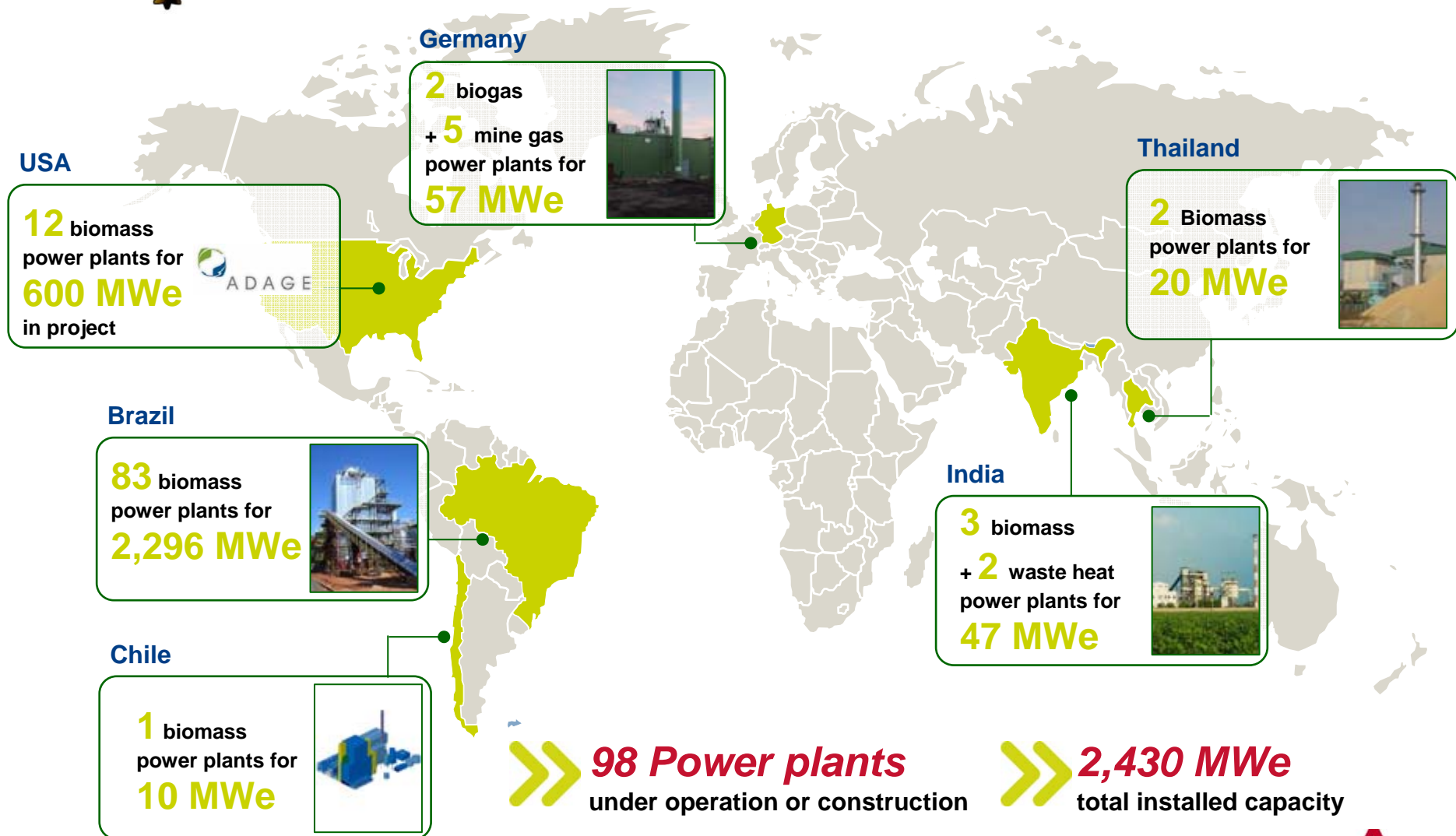
- ▶ **Own and standardize technology design for key feedstock, localize Boiler manufacturing**
- ▶ **Secure worldwide sourcing of key components like Turbines and Electricals**

## Lead with Innovation

- ▶ **Develop and deploy hybrid Bio power plant in Brazil and Asia**
- ▶ **Deploy pilots projects for Pyrolysis and Urban waste**
  - ◆ Business case for select Technology acquisition upon successful and profitable deployments



# Main references around the world





# Energy carrier and storage deliverables and strategic objectives: help Renewables deliver GRID parity in cost and load factor



**Market objectives aligned with customer's expectations**

- ▶ **Reduce CO2 emission related H2 production and consumption**
  - ◆ Deliver CO2-free distributed H2 production units by 2011
- ▶ **Deliver Integrated Storage & Electricity generation module to complement Renewable energies generation**
  - ◆ Deliver greater than 50% net efficiency through intelligent integration of H2 production, H2 Storage and Fuel cells
  - ◆ Premium pricing linked base-load and peak-load dispatch to the GRID
  - ◆ Attractive returns for Peak-load balancing

**Robust Industrialization**

- ▶ **Industrialize size and volume for high pressure standalone Fuel Cells for power backup applications**
- ▶ **Develop rugged integrated unit 'Electrolyzer, H2 Storage and Fuel cells'**
  - ◆ Safety and environment certification

**Lead with Innovation**

- ▶ **Development of High Pressure and High Temp Electrolyzer for industrial scale production of Hydrogen**
- ▶ **SCADA and O & M module integration with GRID policy for distributed electricity generation**

# Key hydrogen technologies



**Electrolyser**



▶ **Hydrogen Production**

**H2 storage**



▶ **Hydrogen carrier and storage**

**Fuel cell**



▶ **Electricity generation**



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## Conclusion



### ► Our key strengths

- ◆ Valuable assets and expertise
- ◆ Portfolio approach across wide range of technologies combined with global market reach
- ◆ Synergies with Group's Nuclear activities

### ► Our key opportunities

- ◆ US market/stimulus package
- ◆ Wind Offshore/NW Europe
- ◆ With crisis receding, surging oil prices
- ◆ Technologies enabling storage/hybrid renewable solutions