

EPRI Greenhouse Gas Emissions Policy Dialogue Workshop 9 – Commercial Procurement of GHG Emissions Offsets - Washington, DC, October 28, 2010

Compliance Buyers' Strategies for procuring Offsets Required Resources and Expertise

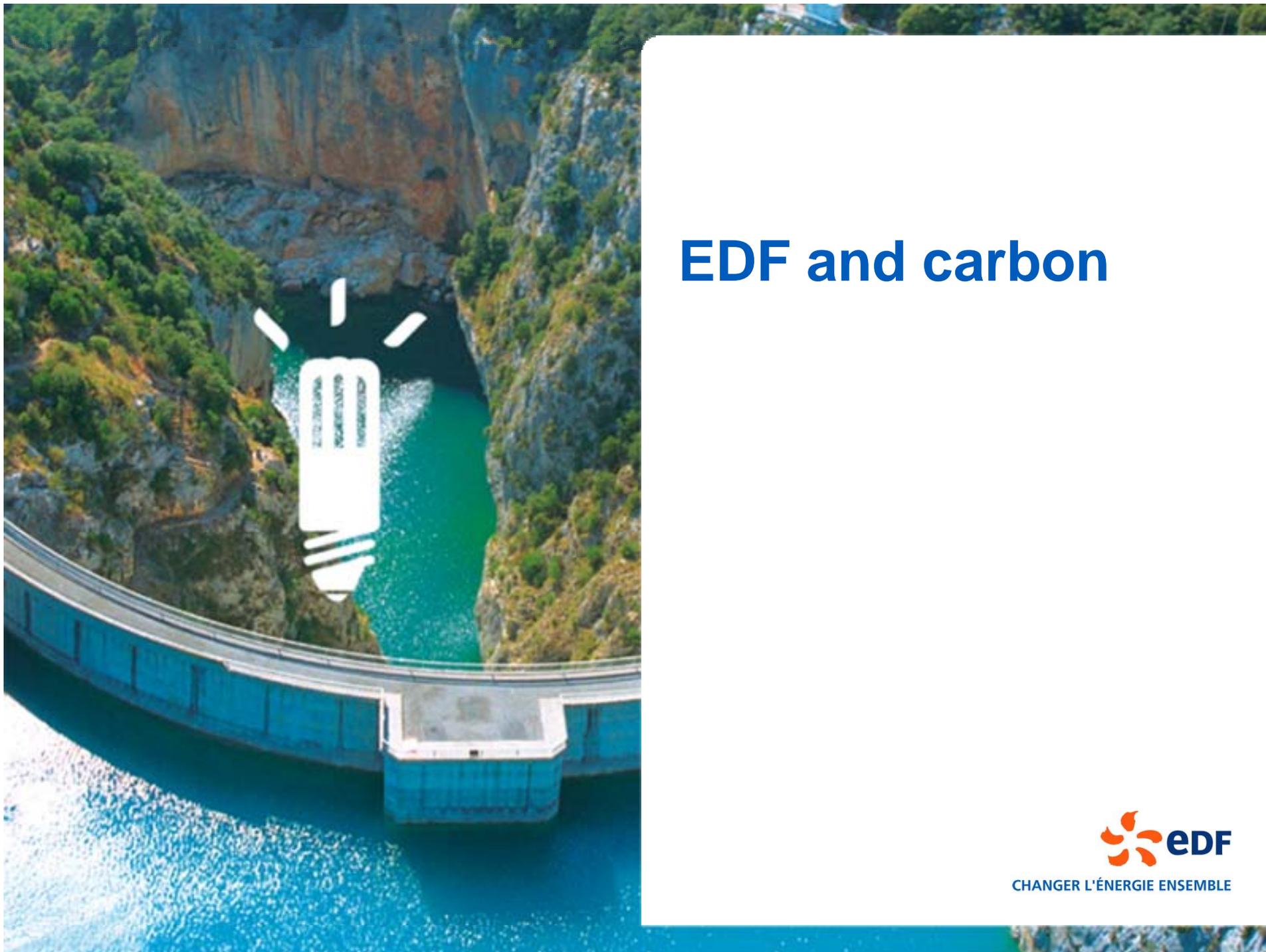
Dr. Jean-Yves CANEILL, EDF SA



Compliance Buyers' Strategies for procuring Offsets Required Resources and Expertise



- EDF and carbon
- EDF agenda towards a climate change policy regime
- The early days in offset thinking
- The first years (2005/2007 and 2008/present)
- Moving to the real climate regime
- EDF carbon credits portfolio management
- Concluding remarks

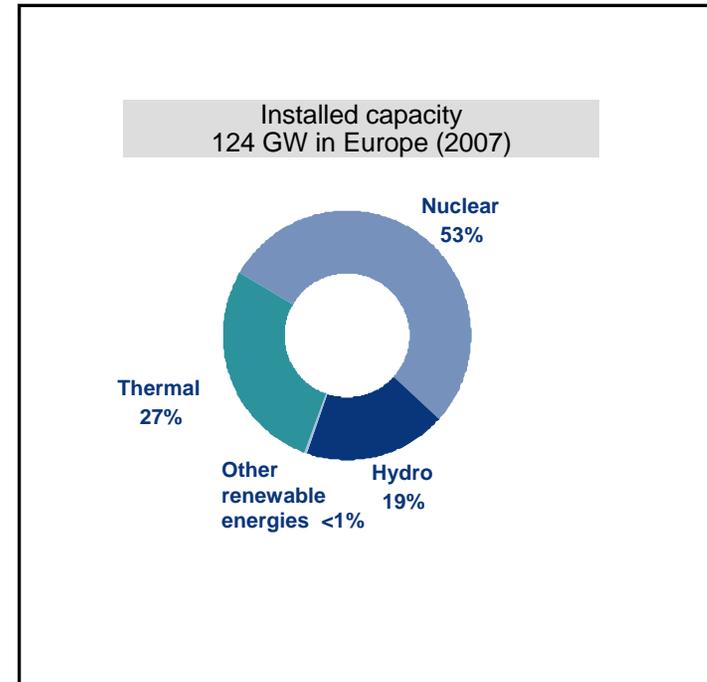
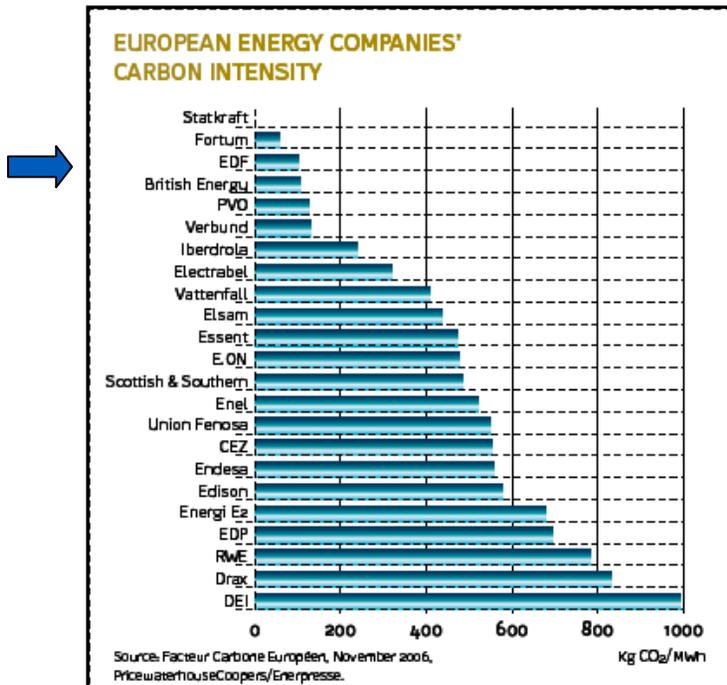


EDF and carbon



CHANGER L'ÉNERGIE ENSEMBLE

The largest and most competitive fleet in Europe with a low CO2 profile



- ▶ 124.5 GW of installed generation capacity in Europe, of which 53% is nuclear (137 GW with BE acquisition)
- ▶ 82% of output CO2 emission free
- ▶ 58 nuclear reactors in France with an average age of 22 years

European context

▪ The priorities of the European energy policy : the Lisbon Agenda

- Climate change
- Security of supply
- Competitiveness

▪ Need for investment

- Renewal of the fleets
~ 800GW
- Network development

▪ Lack of natural resources

- Renewable energy
- Nuclear power
- Energy efficiency

In 2020

- 20 % more energy efficiency
- 20 % of renewable in energy mix
- 20 % or 30% reduction of CO2 emissions

Political and industrial perspectives in key EDF markets

UK

- A new nuclear program
- Carbon Emission Reduction Target
- The question of energy prices impact on fuel pool
- Carbon capture and storage (CCS) projects
- Increasing obligation to supply electricity from renewables as well as new Feed-In-Tariffs
- A target of 20% renewables in 2020 (which seems to be a minimum with recent governmental declarations)
- A « minimum price » for carbon securing conditions of nuclear investment

Italy

- The nuclear debate is open
- A gap between generation and demand
 - A huge expectation on energy efficiency and renewables
- The constraint of 17% renewables in 2020 will be very strong
- Nuclear will be necessary to reach CO2 objectives.

France

- The “Grenelle de l’environnement”
- The under-allocation of the reserve to new entrants
- The NOME law and tariffs regulation
- The 2nd period of White certificates (CEE)

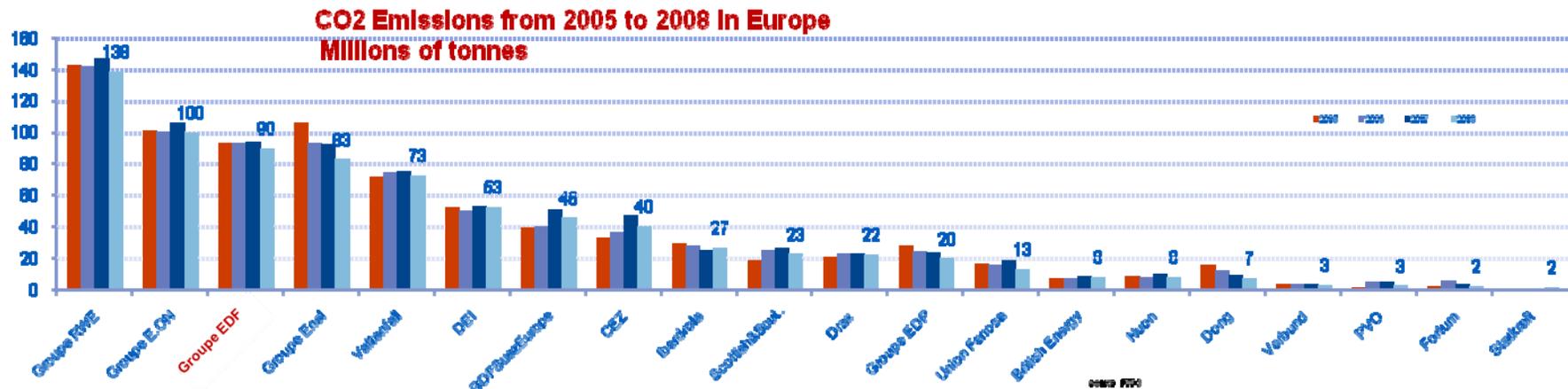
Germany

- A very delicate sensitivity to environmental issues
 - Particularly about climate change
 - Up to -40% reduction in carbon emissions
 - 30% of renewables in energy mix
- Nuclear as « transition technology » according to last decisions
 - A nuclear tax to finance renewables investment and nuclear reactor life time extension
- Very strong commitment in renewable and energy efficiency
- CCS could become a very important topic in the German context

Poland

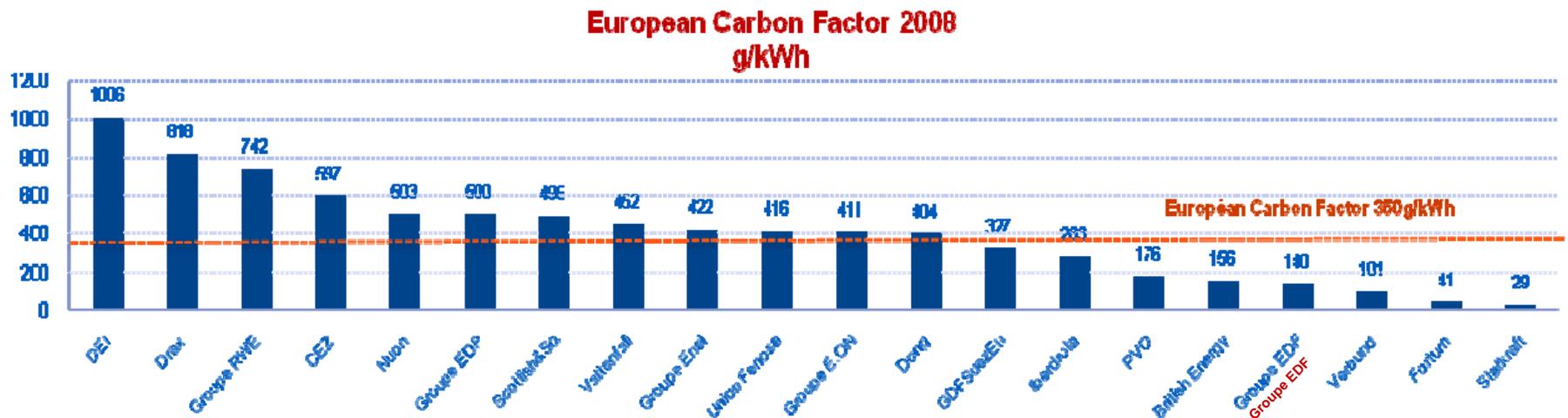
- A country with huge coal resources
 - An installed capacity of 36 GW in 2008, from which 33,5 GW fossil fuels
- An very high energy demand
 - 1,5 GW to be built / year until 2020
- Present and future drivers
 - Use of biomass and natural gas
 - Nuclear in discussion
 - CCS, which could become necessary
- Opportunities: CO2 free allocations
 - Concession made to Poland is a « little good news »: it only concerns existing parts. Charge lightening will be from 200 to 300 M€ in 2013, decreasing to 0 in 2020
 - Carbon constraint will favour nuclear option emerging in Poland in 2020

EDF Group among European energy utilities



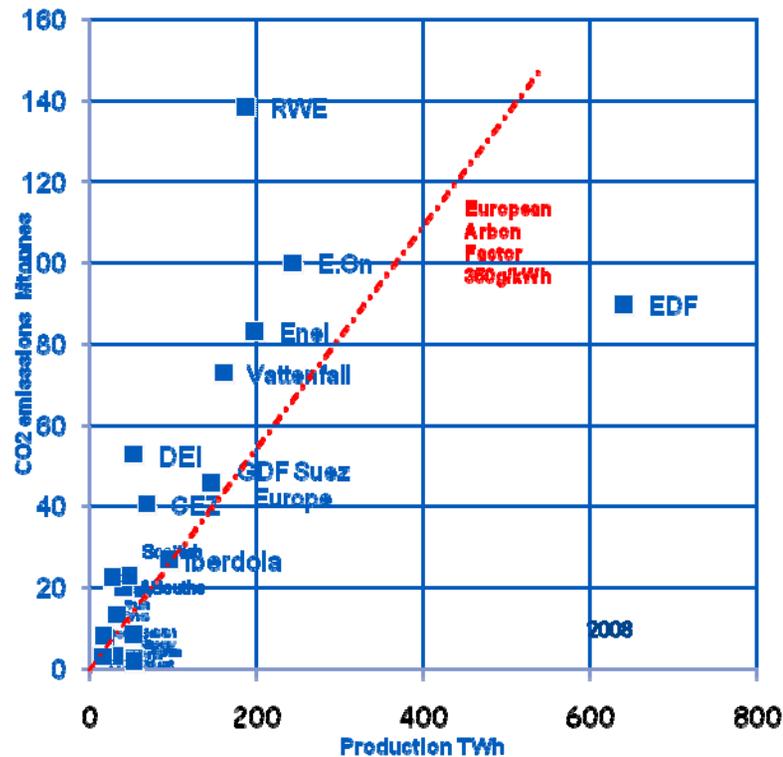
EDF is both the 3rd CO2 emitter in absolute value

...and the lowest CO2 emitter in specific value (g/kWh) among major European energy utilities



A diversity of situations... but regulation is key

▶ EU utilities : emissions vs. generation



▶ European governments are facing difficult choices

- A high carbon price passed through in electricity prices will encourage emissions reduction, but will have social impacts (fuel poverty) and economic impacts (loss of short-term competitiveness for industries exposed to international competition)

▶ EU-ETS system has been improved but could be weakened by national public policies ...

- Supporting CO2 reductions can be especially expensive (1000 €/t avoided CO2 for PV)
- Or making CCS mandatory (and making the CO2 market out of its role)

▶ ...and inconsistencies should be avoided

- Member States are reluctant to create hedging products (forwards) following mistrust vis-à-vis financial derivatives and fear of a more complex system

▶ Over taxation of low carbon electricity

- The current discussion in Germany over taxation of nuclear power is the most current example



EDF agenda towards a climate change policy regime



CHANGER L'ÉNERGIE ENSEMBLE

EDF agenda towards a climate change policy regime - Thinking

- ▶ **1990 - Launching «climate science» concern in R&D Division**
- ▶ **1992 - Creation of E7 - EDF is a member - Commitment on sustainable development principles**
- ▶ **1995 - « science awareness » is translating in « policy concerns » : attending UNFCCC process and first involvement in AIJ pilot phase**
- ▶ **1996/97 - preparing for the Kyoto Conference, the turning point**
- ▶ **1998/99 - With EURELECTRIC, launching GETS concept (GETS1)**
- ▶ **2000 - GETS-2 and attending WG1 on emissions trading within ECCP with Eurelectric**
- ▶ **2001-2002 - GETS 3 and 3bis with Eurelectric**

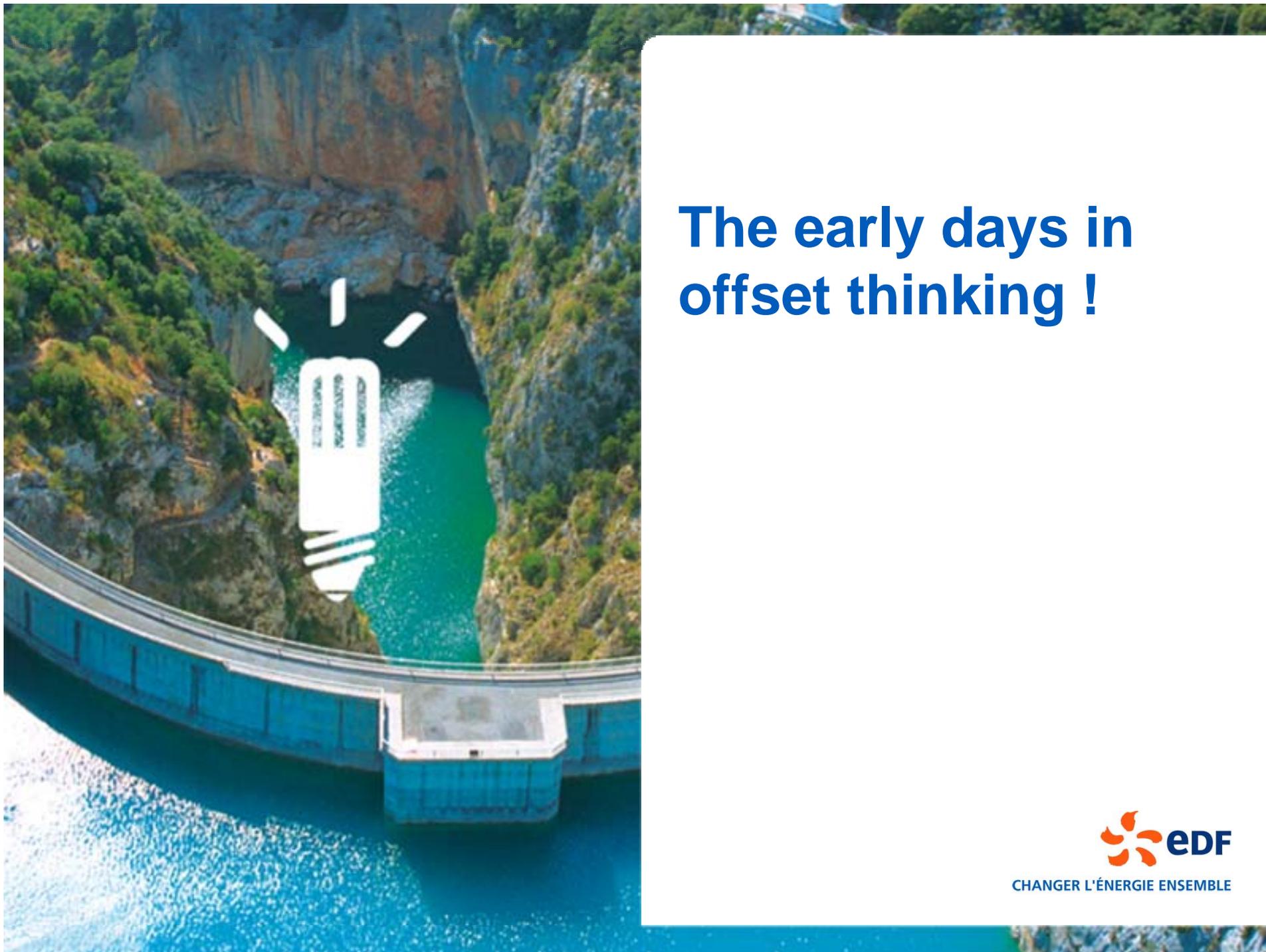
The GETS experiments

« Greenhouse gas emissions and
Energy (Electricity) Trading Simulations »

- ▶ Early in the process EURELECTRIC decided to set up a learning by doing process to understand better market instruments
- ▶ EDF was strongly involved in this awareness process
- ▶ The different market experiments described hereafter (GETS 1 and GETS 2) helped the actors to become familiar with the use of an emissions market, and put the electricity sector in a good stakeholder position in the discussions with the Commission
- ▶ EURELECTRIC was invited in the ECCP Group devoted to emissions trading
- ▶ Following studies (like GETS 3) brought the right matter to pursue a continuous dialogue with EC
- ▶ Without any doubts, proactivity of the electricity sector, helped to channel right informations for the EU ETS design

EDF agenda towards a climate change policy regime - Acting

- ◆ **December 2001 - Publishing the EDF Agenda 21**
- ◆ **2001-2002 - awareness within the Group and the Company (a R&D project on consequences of emissions trading on multiannual management of generation facilities)**
- ◆ **Participation in AERES (French voluntary commitment system)**
- ◆ **Investigating CDM and JI projects (The Koudia Al Baïda / Access Program)**



The early days in offset thinking !



CHANGER L'ÉNERGIE ENSEMBLE

***Environmentally Efficient Projects
CDM + JI - The Kyoto Project Mechanisms***



***The Koudia al Baïda project (Morocco)
(AIJ Pilot Phase)***

Environmentally Efficient Projects

CDM + JI - The Kyoto Project Mechanisms

Origin of the Koudia al Baïda wind farm project

- Socio economic context of Morocco
- Energy sector context : needed diversification in the framework of a sustainable development policy
- Environmental strategy

lead to decision to launch the project

- Financed and operated by a Moroccan company (CED) which EDF is partner with and a supply contract signed with ONE (for 19 years after which the facility will belong to ONE)

Environmentally Efficient Projects

CDM + JI - The Kyoto Project Mechanisms

Characteristics of the Koudia al Baïda wind farm project

Geographical location:

20 km north of Tetouan, 30 km east of Tangiers

Number of air generators:

84 spread out along a crest 8 km long at an altitude of between 370 and 560 m

Capacity:

600 kW each

Total installed capacity:

50.4 megawatts

Construction time:

from March 1999 to July 2000

Environmentally Efficient Projects

CDM + JI - The Kyoto Project Mechanisms

Relevance to Kyoto Mechanisms of the Koudia al Baïda project

- Concern with the project mechanisms was initiated in early 1998, after the adoption of the Kyoto Protocol and at the occasion of a business meeting with African countries proposed by the Chairman of SBI
- Decision was taken to put this project in the framework of the pilot phase of Activities Implemented Jointly (AIJ Pilot Phase)
- Interests from the various stakeholders (Countries policies, EDF strategy,..) lead to bring successfully the project in the AIJ projects list of UNFCCC in June 2002
- Capacity building operation for all the actors of the project
- Morocco is now a country ready to have CDM projects

Environmentally Efficient Projects

CDM + JI - The Kyoto Project Mechanisms

Relevance to Kyoto Mechanisms of the Koudia al Baïda project

- **Baseline of the project : calculated on the basis of the ad hoc CO₂ content of the energy mix taking into account the future evolution of the latter at long term**

Evolution of the interconnected electricity sector emissions (ONE)

Years	2000	2002	2004	2007	2010
Tons of CO ₂ per GWh (without wind power)	784	712	693	648	646
Evolution index / year 2000	100,0	90.8	88.4	82.7	82.4

Environmentally Efficient Projects

CDM + JI - The Kyoto Project Mechanisms

Relevance to Kyoto Mechanisms of the Koudia al Baïda project

➤ Taking into account this dynamic baseline it can be shown that the wind power farm of Koudia al Baïda allows an important reduction of greenhouse gas

on the average of **140 000 tons of CO2 per year**

with

a **cumulated total of 2 578 000 tons of CO2**
on a 19 years period

ACCESS Program

Goal : 400 000 persons having access to electricity and energy services in 2005 in rural areas of developing countries

The way forward :

- > Take into account the client needs in order to propose suitable services policy (electricity, water, communications)
- > Responsibility and implication of local stakeholders
- > Facilitate local development and capacity building
- > Insure economic viability of projects
- > Special stress on renewable energies (photovoltaic, micro-hydro)

Main tool : decentralized services companies

Ongoing programs :

Mali (2 programs : 8 000 et 67 000)
Morroco (80 000)
South Africa (90 000)

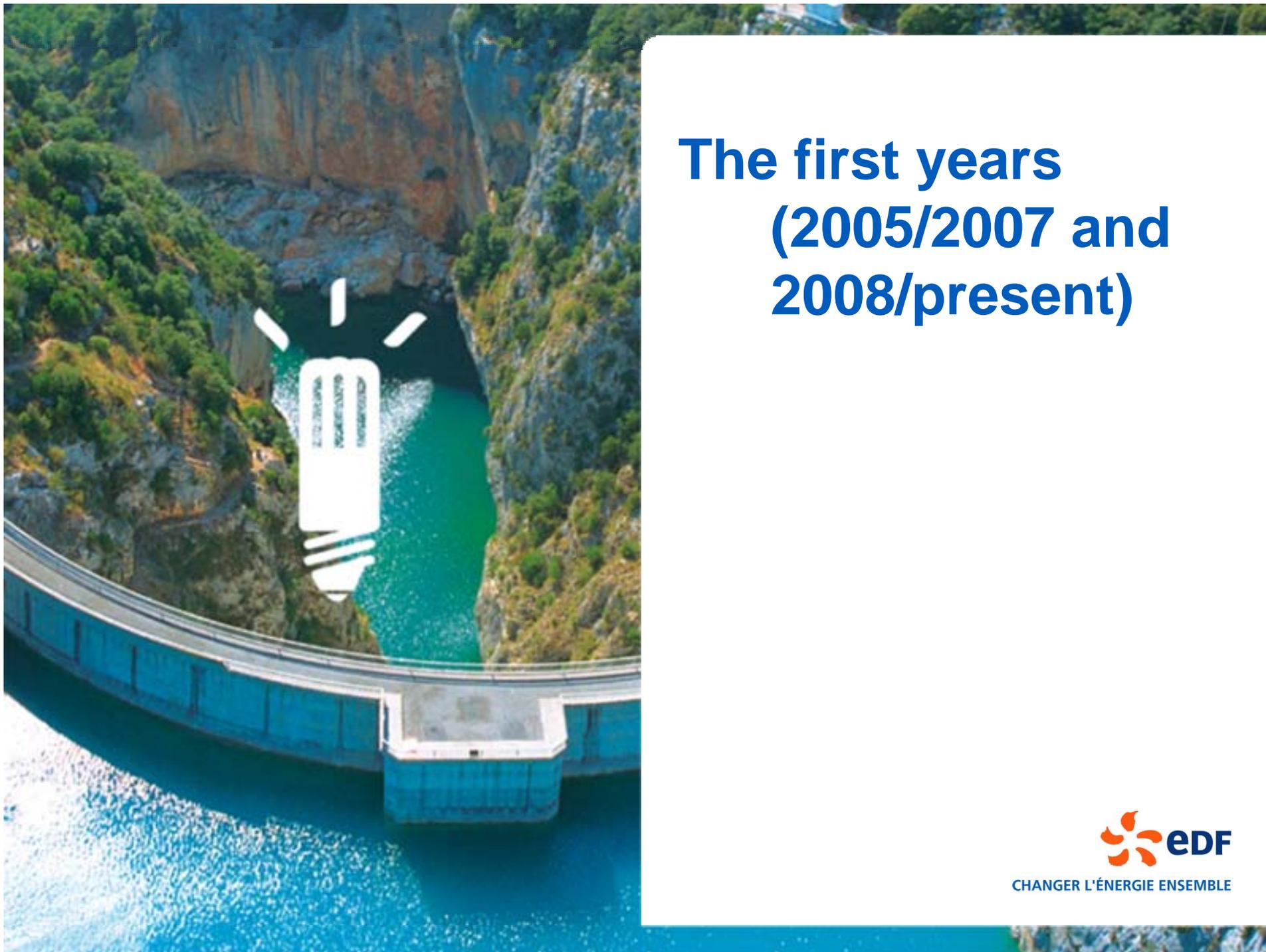
Development program in Laos :

(100 000 persons)

CDM investigation on these projects

Some remarks

- ▶ Early awareness of the climate change issue has been of great help to prepare the company for this new carbon market
- ▶ EDF became in the nineties an international group with a special focus on sustainable development
- ▶ Expectation to use market mechanisms in the near term, starting with projects
- ▶ Experience with the pilot phase and the early CDM involvement gave us a mixed feeling on the efficiency of these instruments



The first years (2005/2007 and 2008/present)



CHANGER L'ÉNERGIE ENSEMBLE

Where the EU ETS comes from ?

- ▶ The adoption of the KYOTO PROTOCOL in late 1997 acted as a revolution in the EU thinking
 - emergence of the market instruments
 - a logical consequence of the cap

- ▶ After one year of « silence » EU Commission took the lead of the preparation of EU ETS
 - a green paper in 2000
 - a stakeholder consultation
 - a legislative proposal in Fall 2001

- ▶ EU ETS Directive adopted in December 2003

EURELECTRIC (the European association of electricity utilities) been quite close to the EU debate and EDF was strongly involved in the latter

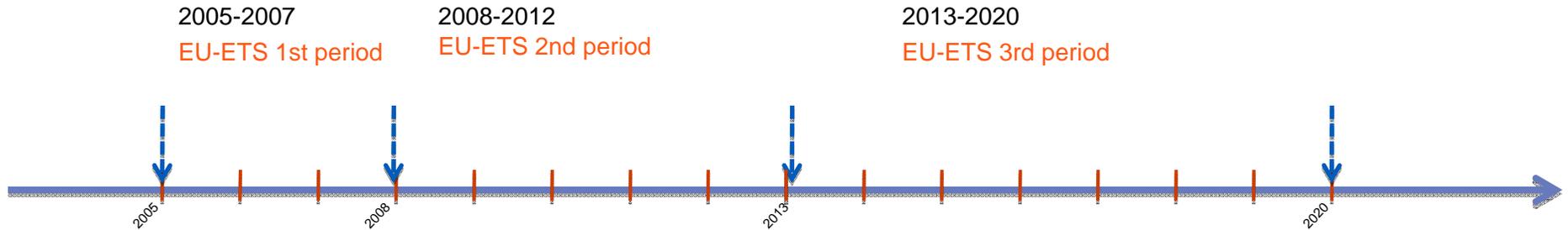
How it was designed (1) ?

- ▶ The EU ETS started in January 2005 and includes the 27 countries of the European Union
- ▶ The EU ETS was designed with two phases
 - Phase 1 (2005–2007) was intended to be a trial period
 - Phase 2 (2008–2012) coincides with the Kyoto commitment period.
- ▶ The cap covers only carbon dioxide (CO₂)
- ▶ More than 10,000 CO₂ emissions sources are covered by the cap
 - accounting for some 45 % of EU CO₂ emissions (iron and steel, cement, glass, and ceramics, pulp and paper, and energy, - electric power generation and refineries).
- ▶ Each country submitted a National Allocation Plan for approval for Phase 1 (2005/2007)
- ▶ A similar process was launched for the second phase (2008/2012) with a stronger scrutiny from the EC level

How it was designed (2) ?

- ▶ EU ETS rules allowed countries to auction an upper bound
 - 5% of the allowances in the first period
 - 10% in the second period
- ▶ Emissions sources covered by the EU ETS may satisfy their commitments
 - by surrendering allowances in an amount equal to their emissions
 - may supplement the EU-ETS allowances with JI (Joint Implementation) and CDM (Clean Development Mechanism) credits (generated by undertaking CO2 reduction projects outside the European Union in accordance with Kyoto Protocol rules.)
- ▶ For this last purpose a so called “linking directive” was adopted as to describe the conditions under which Certified Emissions Reductions from CDM and/or JI projects might be used for compliance within EU ETS, (in some member states also “domestic projects” have been proposed using the Joint Implementation concept)

2013: a breakdown in the regulation of CO2 for all but even more for electricity producers



- Allowances are attributed by member states in PNAQ under European Commission approval

- Free Allocations for all sectors

- **Over-allocation** in almost every country (except UK)

- Allowances are attributed by member states in PNAQ under European Commission approval

- Free Allocations for all sectors, but reduced in comparison with 1st period

- **Under-allocation** of the power sector

- European Commission will attribute allowances as a whole

- But member states will get the money resulting from auctioning

- Free Allocations for all industrial sectors, reduced according to BAT principle (Best Available Technology). The missing allowances be auctioned

- No free allocation for the power sector : allowances auction system (except partially for the new members states)

- Rules are unclear :

- For industry : what does BAT mean

- For everybody : auctioning regulation framework not yet in place

Emitters covered by the EU ETS may satisfy their commitments by surrendering allowances in an amount equal to their emissions or supplement the EU-ETS allowances with JI (Joint Implementation) and CDM (Clean Development Mechanism) credits (generated by undertaking CO2 reduction projects outside the European Union in accordance with Kyoto Protocol rules.)

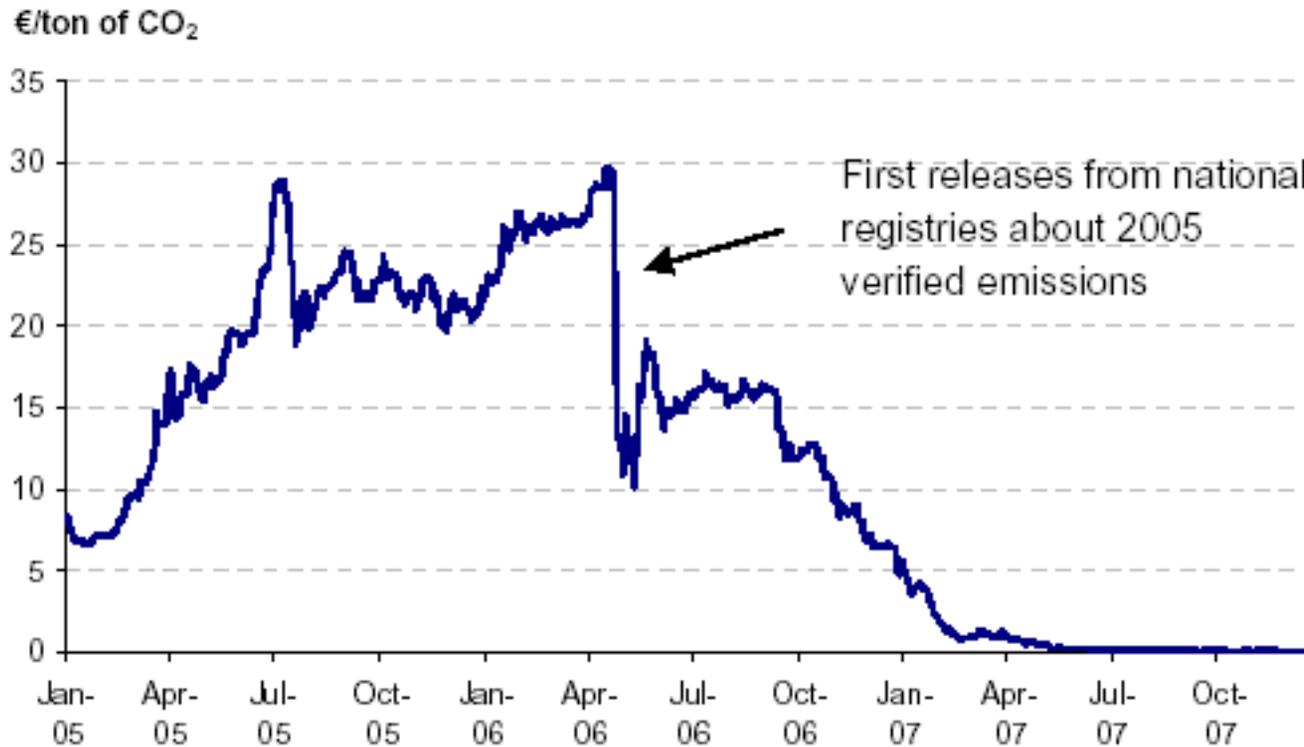
EU climate Energy Package

The EU ETS rules have changed significantly compared to phases 1 and 2 for the period post 2012

	EU ETS Phases 1&2	EU ETS Phase 3
	2005-2007 and 2008-2012	2013-2020
Duration of the period	3 and 5 years	8 years
Allocations to existing installations	Free	General rule : auctions
Allocations to new projects	Free	Auctions except for Some rare exceptions
Subsidiarity	High (National Allocation Plans)	Low or non-existent in the long term
Banking	Generally not authorised between phase 1 and 2	Authorised as of phase 2

How the market behaved ?

- ◆ In the first period ? Strong volatility was observed and this might not be desirable from an investment perspective

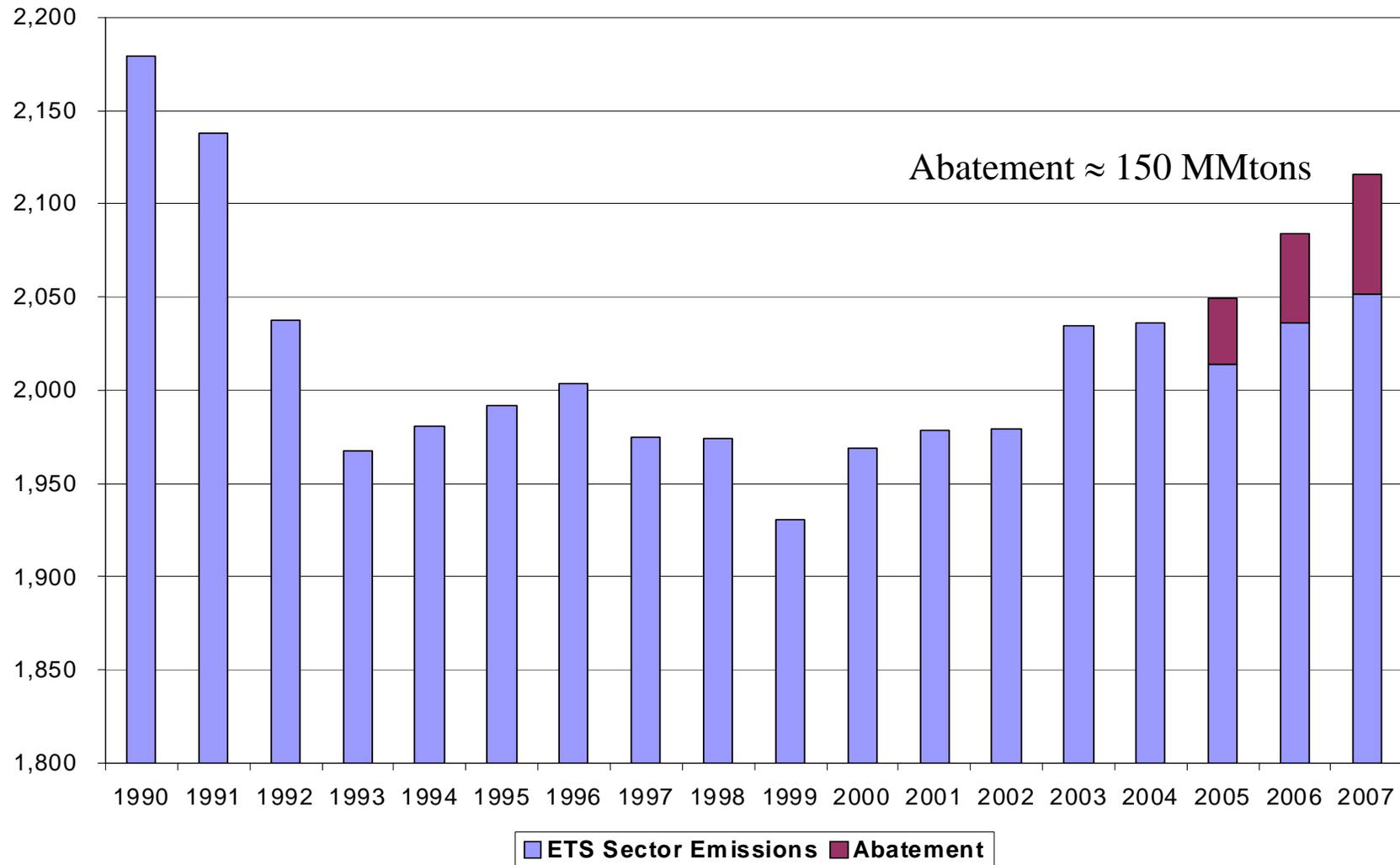


Source: BlueNext, PointCarbon.

Did the market deliver reductions ?

CO₂ Emissions and Abatement : EU25 ETS Sectors

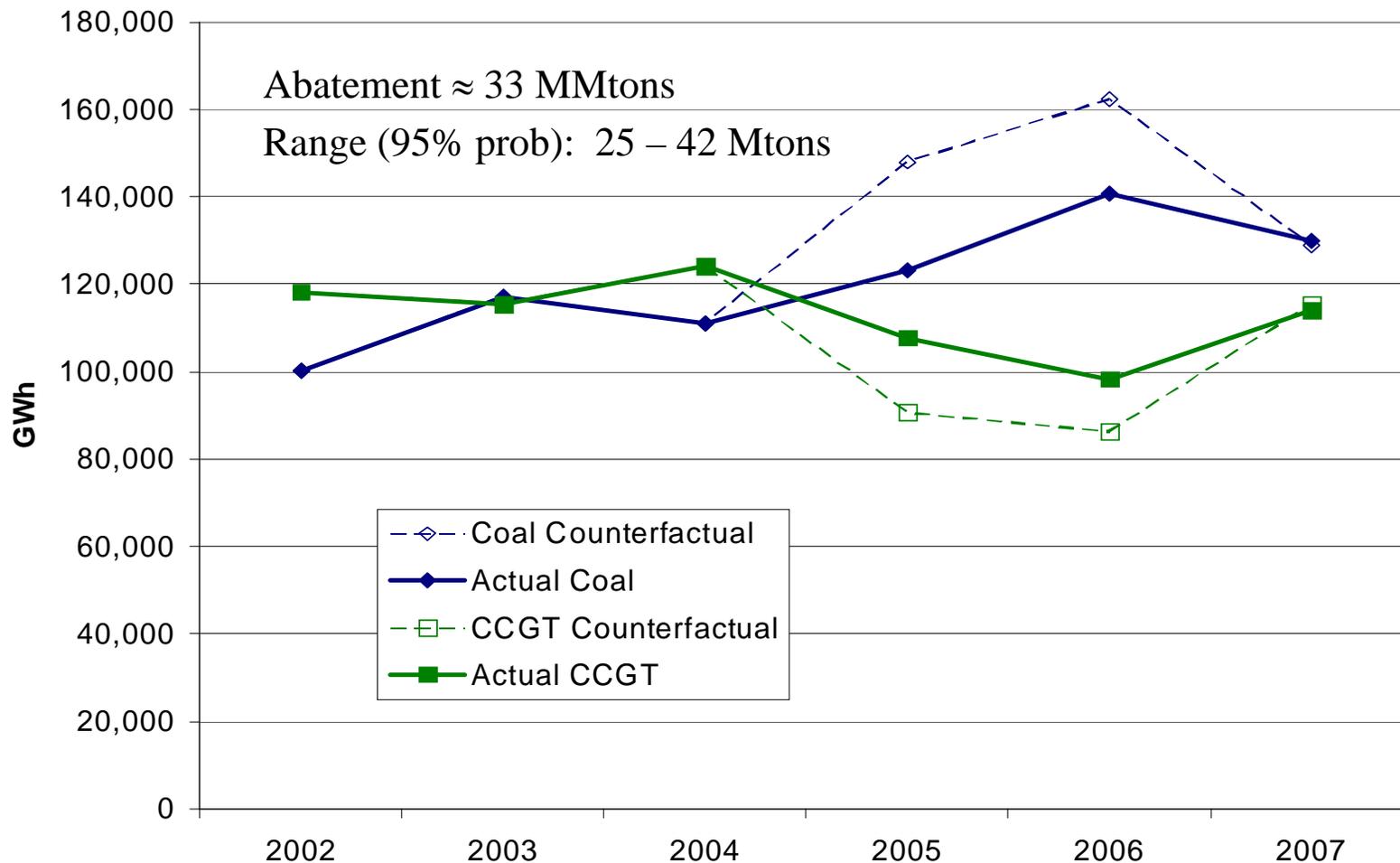
(From « Pricing Carbon » a study by D. Ellerman, Ch. De Perthuis, F. Convery)



Did the market deliver reductions ?

Coal and Gas Generation: All Major Plants in UK

(From « Pricing Carbon » a study by D. Ellerman, Ch. De Perthuis, F. Convery)





Moving to the real climate regime



CHANGER L'ÉNERGIE ENSEMBLE

Impact of CO₂ emissions trading

- ▶ **The burden of CO₂ reductions has fallen** mainly to the electricity industry
- ▶ **As in most commodity markets**, prices are set by the marginal plant
- ▶ Opportunity cost is a real cost
- ▶ **CO₂ is one of the many factors that** influence short-term marginal operational costs **and hence wholesale prices**
- ▶ **Ultimately, and in the longer term**, electricity prices must cover long-term marginal costs, **including capital costs**
- ▶ Signal to invest in low carbon technologies

Impact on electricity companies

Additional factor in changing electricity industry environment

Key elements to be addressed:

- Climate strategy and risk management system
- Financial and accounting arrangements
- Taxation requirements (Corporate, capital gains, VAT)
- Legal, permitting issues
- Investment planning
- Production planning
- Organisation and administration (monitoring, reporting, verification, allowance recording, trading)
- IT systems
- Communication

Company compliance strategies as a whole

Three basic options:

1. Internal abatement
 - Efficiency improvements, fuel switching (if portfolio allows) in short term
 - Repowering, restructuring plant portfolio, carbon capture and storage in longer term

2. Use of ETS market
 - Spot trading of EU allowances (active / passive)

3. Hedging
 - EU allowance forward contracts / derivative products
 - CERs (and ERUs post 2008): bilateral and/or funds
 - But limited availability of CERs in pilot period

Balance for each company based on own circumstances

EDF Group Carbon Strategy

Remain the lowest emitter (g CO₂/kwh) among the major European energy utilities

Our generation

« remaining the lowest CO₂ emitter among the major European energy utilities »

- Investing in nuclear energy and renewables (hydro, wind, photovoltaic, biomass...)
- Using high efficiency generating technologies
- Implementing R&D programs on low carbon technologies
- Developing « smart grids » and energy storage solutions

Our employees

Making our employees examples of "climate change ambassadors" and EDF Group strategy ambassadors

- By acting on private energy consumption and CO₂ emissions of our employees
- By developing motivation, education, training, and communication actions

Ours investments

- Integrate carbon in the decision-making process

Our clients

Promoting eco-efficient end-use of electricity

- Innovative appliances and decentralised generation
- Demand side management
- Smart grids and smart meters

and investing in R&D for fuel displacement by low carbon electricity

- High temperature heat pumps
- Hybrids cars, electric cars

Our operational CO₂ emissions

Reduce our direct & indirect CO₂ emissions

- From our buildings
- From our cars
- Generated by transportation and purchase

Our CO₂ emissions

Managing carbon risk

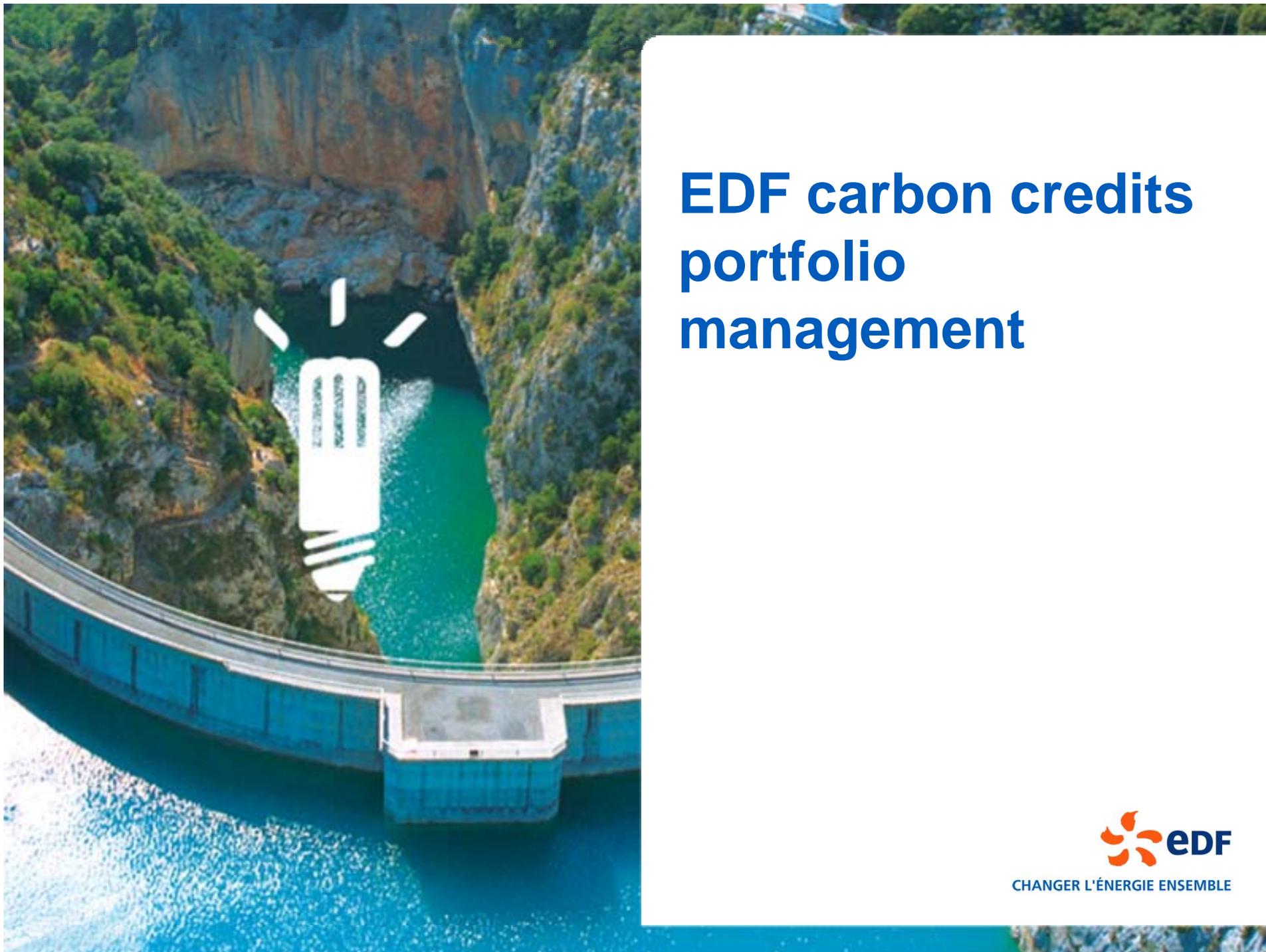
- Carbon risk policy
- Compensation policy
- Carbon fund

EDF group's carbon strategy and development strategy

- The development in Europe will be a combination of
 - Evolution of our existing fleets
 - Changing the perimeter of the group (acquiring and/or changing share into a company)
 - Increasing capacity on our fleets to meet increasing demand
- Impact has to be measured regarding absolute and specific emissions
- Compatibility with EDF ambition will be assessed regarding
 - National energy policy contexts
 - Position of the project regarding this context
 - Contribution to the Group emissions
 - Profitability and carbon risk (integrating CO2 price signal in the financial assessment)

EDF Group and the Carbon Market

- ▶ The corporate level draws the corporate strategy
 - taking into account national circumstances
- ▶ Carbon constraint is integrated
 - within the risk policy of each entity of the Group, in order to optimise at the best, the use of the generation units
 - in the analysis of investments portfolios
- ▶ Synergies are activated appropriately
- ▶ A Carbon Fund managed by EDF T, our trading company
 - in order to cover a part of the CER's needs

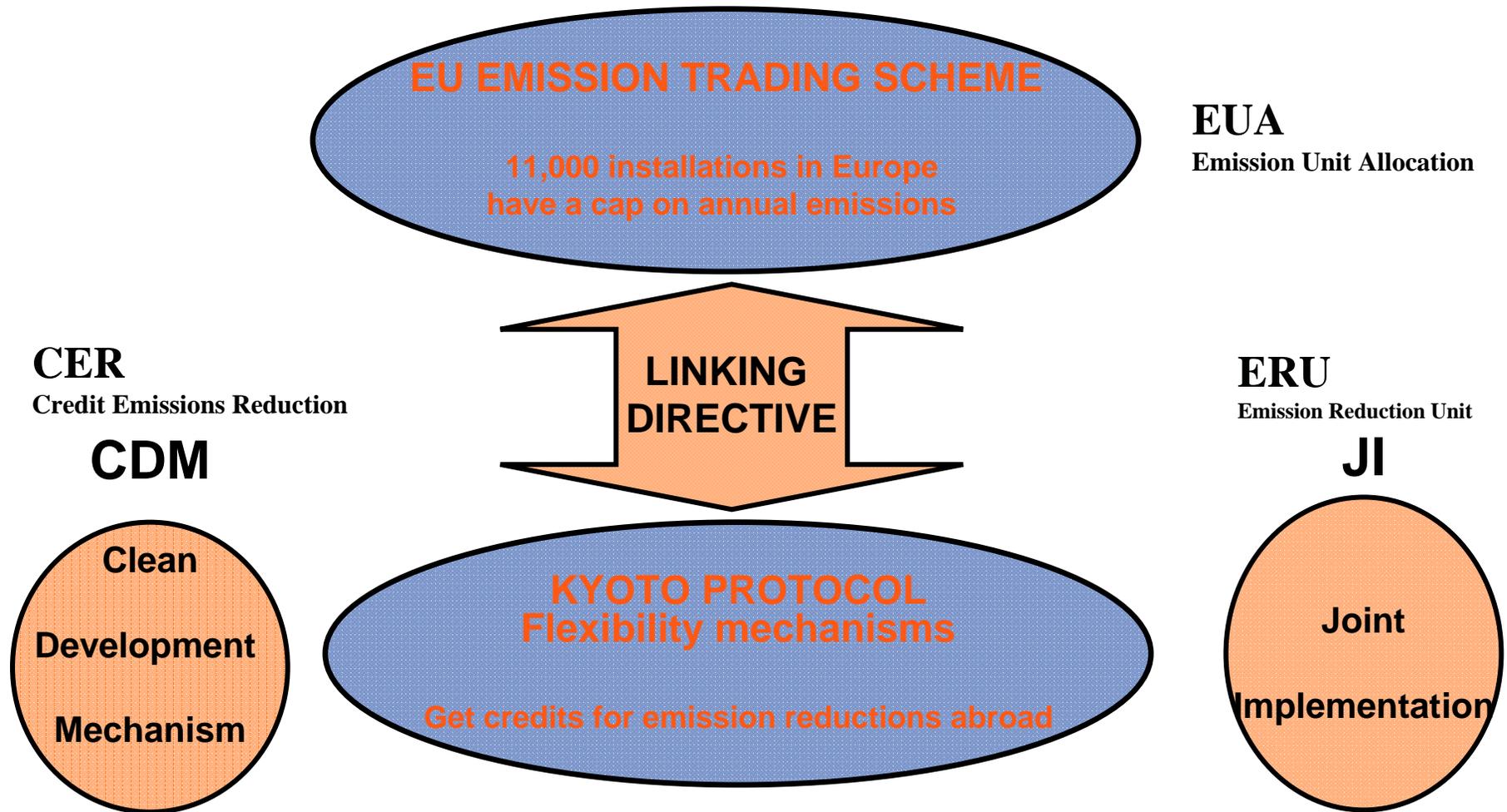


EDF carbon credits portfolio management



CHANGER L'ÉNERGIE ENSEMBLE

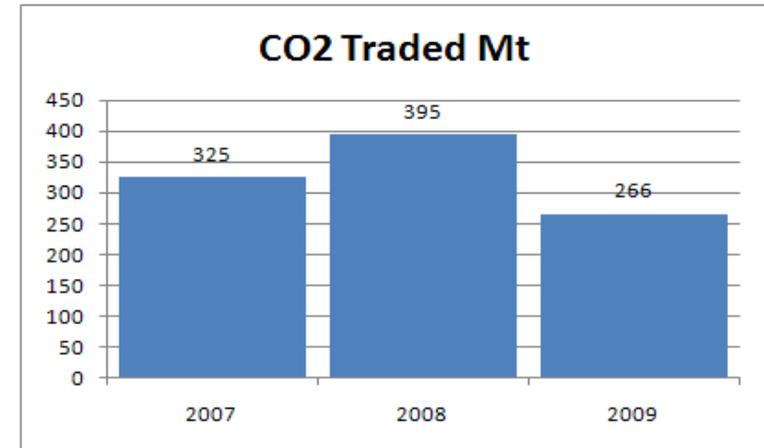
Kyoto project mechanisms



A unique positioning in the environmental product space driven by EDF's ETS compliance needs

EDF Trading active in all carbon market segments

- ▶ 260 Mt CO₂e traded in 2009
 - European ETS EUAs and Secondary CERs
- ▶ One of the largest credit buyers with 160+ projects
 - Global primary CER Origination
 - ERU Origination
- ▶ Executing management of group compliance position
- ▶ Supply of credit to EDF industrial client base



Top CDM Buyers	No. Projects
Ecosecurities + JP Morgan	302
Barclays + Tricorona	195
EDF Trading + ESI	161
ENEL + Endesa	112
Vitol	121
Mitsubishi	103
RWE	99

EDF's involvement in the CDM with EDF Trading

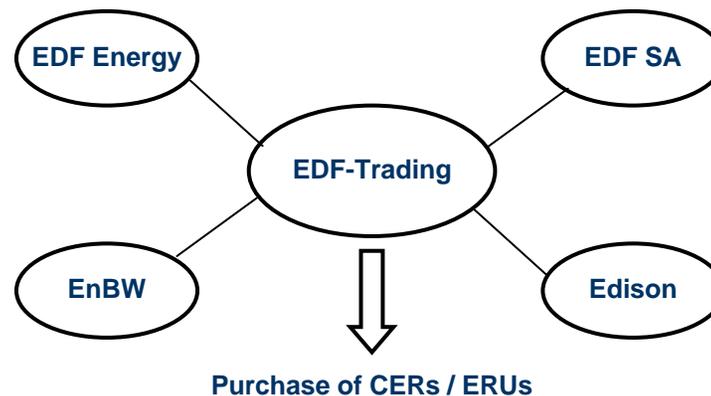
- 161 projects (following the acquisition of ESI in June 2010)
- 85% registered
- 15 methodologies, 15 countries
- Projects in Brazil, Mexico, Colombia, Peru, Cuba, Dominican republic, Honduras



The EDF-T Carbon Fund

total purchasing pool of about 290 M€

- ▶ Investment Supervisory Committee
 - ▶ Structure: bilateral agreements
 - ▶ Delivery 2008-2012
- Risk diversification (country, technology, counterparts...)



Success story

Pioneering Indian DSM campaign

Replacing domestic incandescent lamps with CFLs to achieve CO₂ reductions

- ▶ Campaigns of exchange of ICLs for CFLs in rural villages across four Indian States
 - 82 projects
 - Ca. 14 million households
 - 33 million CFLs to be mobilized
 - 14 million CER expected
- ▶ Partnering with 8 electric utilities and an Indian project developer, Banyan
- ▶ EDF Trading and Banyan in charge of CDM cycle, investment, and CFL sourcing and distribution
- ▶ Challenges
 - CDM approach: small or large scale? PoA?
 - Logistics: From factory to lamp socket
 - Social impact and community participation
 - Data management: implementation, monitoring



Results in
Reduced kWh Demand
&
CO₂e



RAJASTHAN - 7 projects

UTTAR PRADESH - 31 projects

CHATTISGARH
• Rajnandgaon Pilot Project
• 16 projects

ORISSA - 14 projects

ANDHRA PRADESH - 16 projects

EDFT's integrated functions dedicated to building and managing a portfolio of offset projects

Origination

(6 people)

Role

- ▶ Identification and assessment of projects
- ▶ Contracting with project developers (mainly off-take agreements), including options

Competence

- ▶ Technical, project finance and CDM skills
- ▶ Local experience
- ▶ Contract negotiation

Portfolio Management

(3)

Role

- ▶ Monitoring and assistance of projects through cycle
- ▶ Issuance performance projection
- ▶ Position hedging decisions
- ▶ Exercising options

Competence

- ▶ Thorough understanding of project & CDM cycle risks
- ▶ Financial optimisation and risk management
- ▶ Offset market dynamics

Trading

(2)

Role

- Access to markets
- Analysis of market trends
- Execution of hedging strategy

Competence

- Fundamentals of carbon markets
- Energy/environmental commodity trading



Concluding remarks



CHANGER L'ÉNERGIE ENSEMBLE

Concluding remarks

- ▶ Climate change challenge is becoming an important driver of the economic activity, and « carbon » has to be included now in any long term strategy
- ▶ Managing offsets is part of the risk hedging strategy of the Group
- ▶ Along the lines which were chosen, using CDM as a compliance tool under the auspices of EU ETS, one had to develop specific expertise to achieve this goal
- ▶ The competencies that have been developed have helped to build a common understanding within the Group about the use of these new instruments
- ▶ At last one has been able to develop a significant portfolio of projects in line with the drivers of our overall strategy
- ▶ As one of the world's premier energy firms, EDF wants to be part of the solution to the climate/energy challenge the world is facing through :
 - Appropriate investments
 - Improving energy efficiency
 - Motivating all employers and clients to contribute
 - Contributing to the International debate

Predictability is essential.

What does that mean :

- **Clear visibility**
- **Forward price curve for carbon**
- **A stable regulatory framework which gives clear indication of allocation rules and methodologies over time (2030)**
- **Offsets are and will remain an integrated part of the compliance**