



Towards
a low carbon
future

Tools for Informed Energy Technology Policies
and Evaluations

**The SET-Plan Information System -
Supporting and Monitoring a Policy Process**

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EUROPEAN COMMISSION





- I. Context: the EU Strategic Energy Technology Plan**
- II. The SET-Plan Information System (SETIS)**
- III. Mapping energy R&D capacities**
- IV. Assessing the performance of implementation: Key Performance Indicators**
- V. Model-based assessments: developing tools for assessing the impact of R&D**
- VI. Conclusions and Outlook**



EU's Strategic Energy Technology (SET) Plan: The 'Technology Pillar'



European energy and climate policy targets:

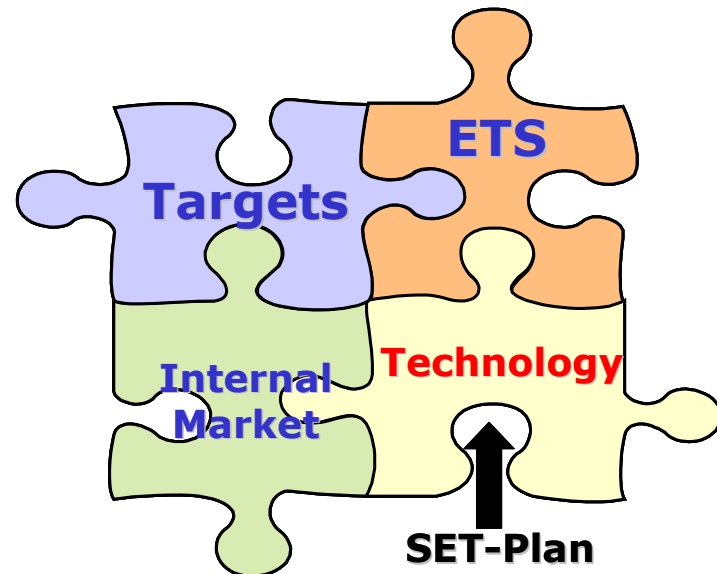
By 2020:

- 20% reduction in greenhouse gas emissions compared to 1990 levels (30% if global agreement)
- 20% reduction in global primary energy use (through energy efficiency)
- 20% of renewable energy in the EU's final energy mix

By 2050 : indicative 60 to 80% reduction in GHG

→ The SET-Plan forms the technology pillar of the European energy and climate strategy

SET-P communication COM(2007)723
COM(2009)519 – Investment Com





Lines of action of the SET-Plan



Joint strategic planning

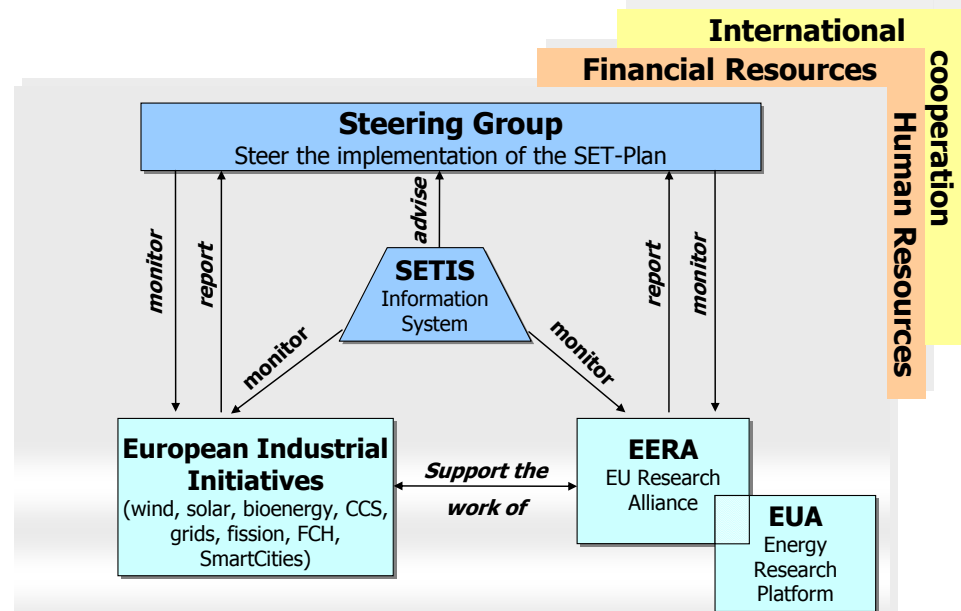
Steering Group and SET-Plan information system; annual 'summits'

Effective implementation (focus):

- **European Industrial Initiatives**: strategic technology research & development industry-led partnerships
- European Energy Research Alliance: joint programmes led by research institutes
- Trans-European Energy Networks and Systems of the Future – transition planning

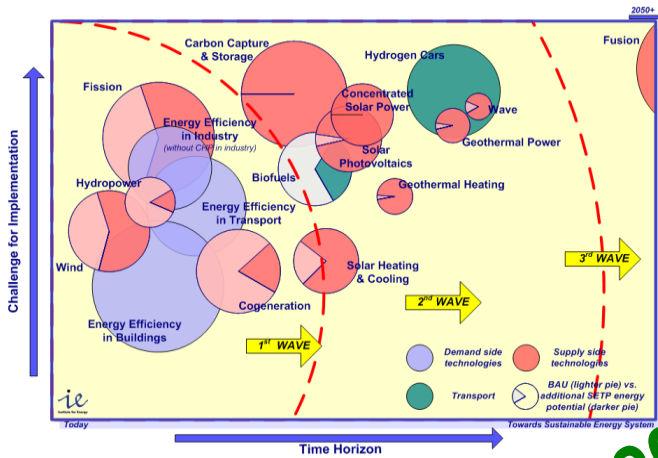
Increase in resources, both financial and human

Reinforcement of international cooperation





The SET-Plan development – Different stages, different monitoring tools



2009

2010-

2007-8

PRIORITIES PLANNING

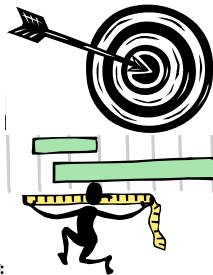
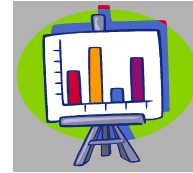
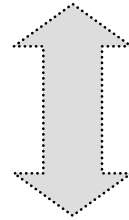
IMPLEMENTATION

- SET-Plan Governance
- First Technology Priorities
- Launch of the EERA
- Setup of SETIS

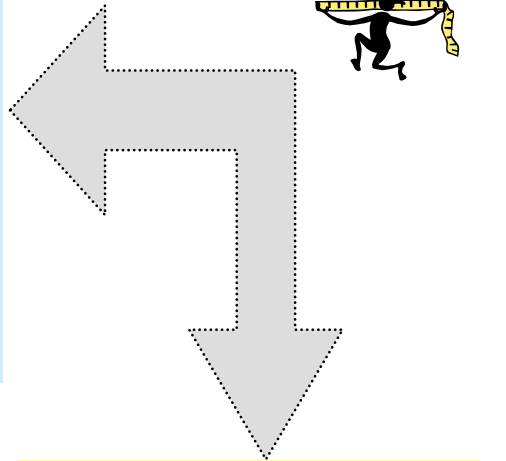
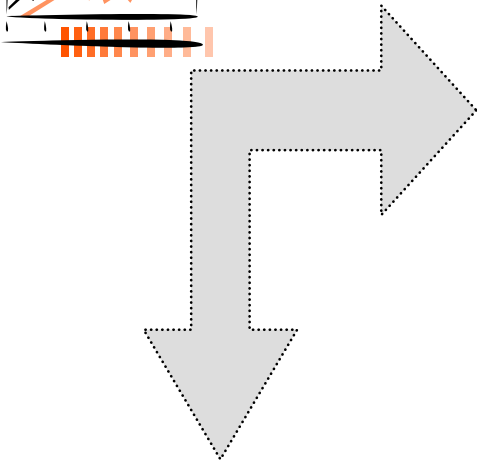
- Roadmaps
- Investment Gap
- SETIS Website

- Launch of first Initiatives
- Monitoring and Review
- Impact Analysis

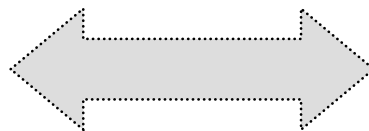
European Community SET-Plan Steering Group



- ✓ Technology Map
 - ✓ Capacities Map
 - ✓ Monitoring & Review of progress, KPIs
 - ✓ Assessment of Impact on Policy Goals
 - ✓ Evaluation of New Priorities
 - ✓ Dissemination: SETIS – web portal
- SETIS**



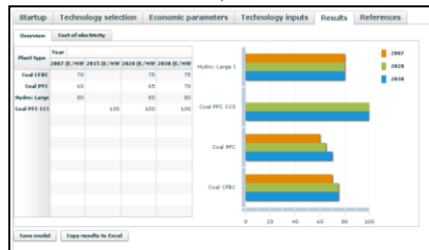
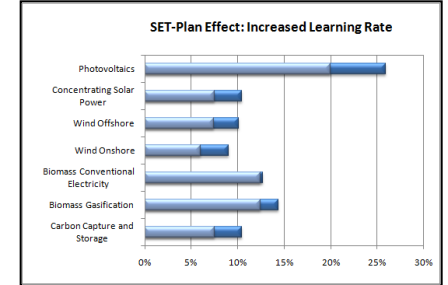
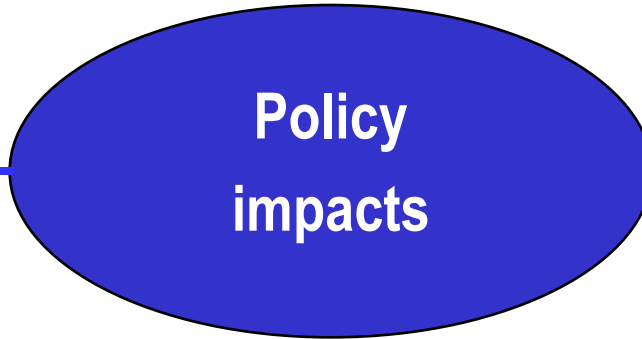
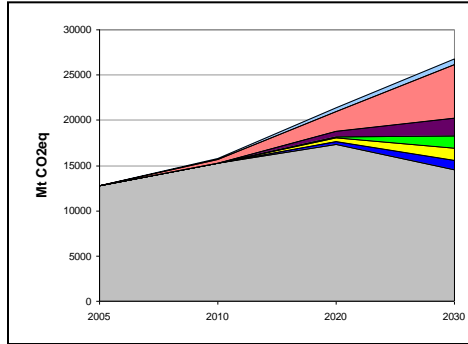
**Member States,
Industry & Research
Communities**



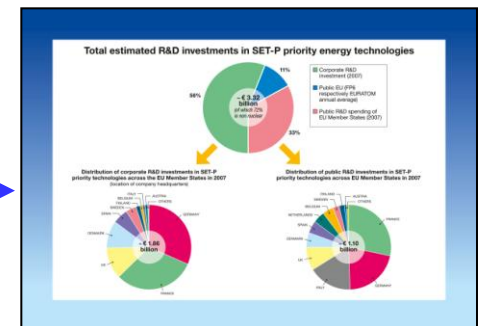
**European
Industrial Initiatives,
EERA Joint Actions**



SETIS: Tracking Progress



EU Team

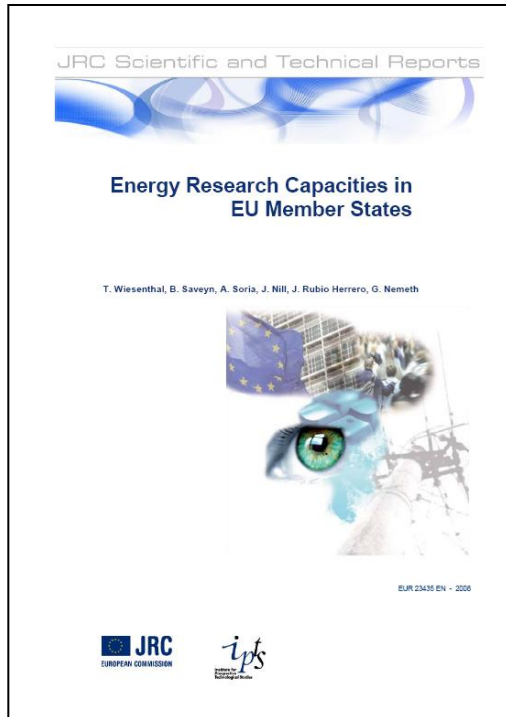




Mapping energy R&D capacity: Defining the starting point (Capacity Map 2007)



Input to SET-Plan
SEC (2007) 1511



Aim: Status quo of the public national systems of energy-related R&D in the EU

- Institutional set-up
 - Literature review
 - Own research
 - Feedback from EU Member States
- R&D budgets and priorities
 - Eurostat GBAORD; GERD
 - IEA R&D statistics (19 EU MS)
- Corporate energy R&D expenditures
 - Eurostat BERD
 - EU Industrial R&D Investment Scoreboard

→ Status Quo analysis based on available information, qualitative & quantitative

Input to Financing Com
COM(2009)519 final



Aim: Estimation of current corporate and public research investment in low-carbon technologies

- Focus on low-carbon technologies for which EII/JTI are proposed by the SET-Plan
- Public: EU and MS national budgets
 - IEA R&D statistics
 - FP6 commitments
 - MS consultation
- Corporate R&D investment
 - No systematic data available (BERD misses detail)
 - Information seen as confidential or strategic
 - R&D Investment Scoreboard misses detail
 - novel methodology developed: combination of available info, assumptions, expert opinions, direct contact

→ Quantitative assessment: development of monitoring tools



Mapping energy R&D capacity: novel methodologies necessary



1

Identification of key industrial players and their suppliers for the sector of analysis

Sources: barometers from EUROSERV'ER, Technology Platforms or associations, expert knowledge, individual companies' internet website

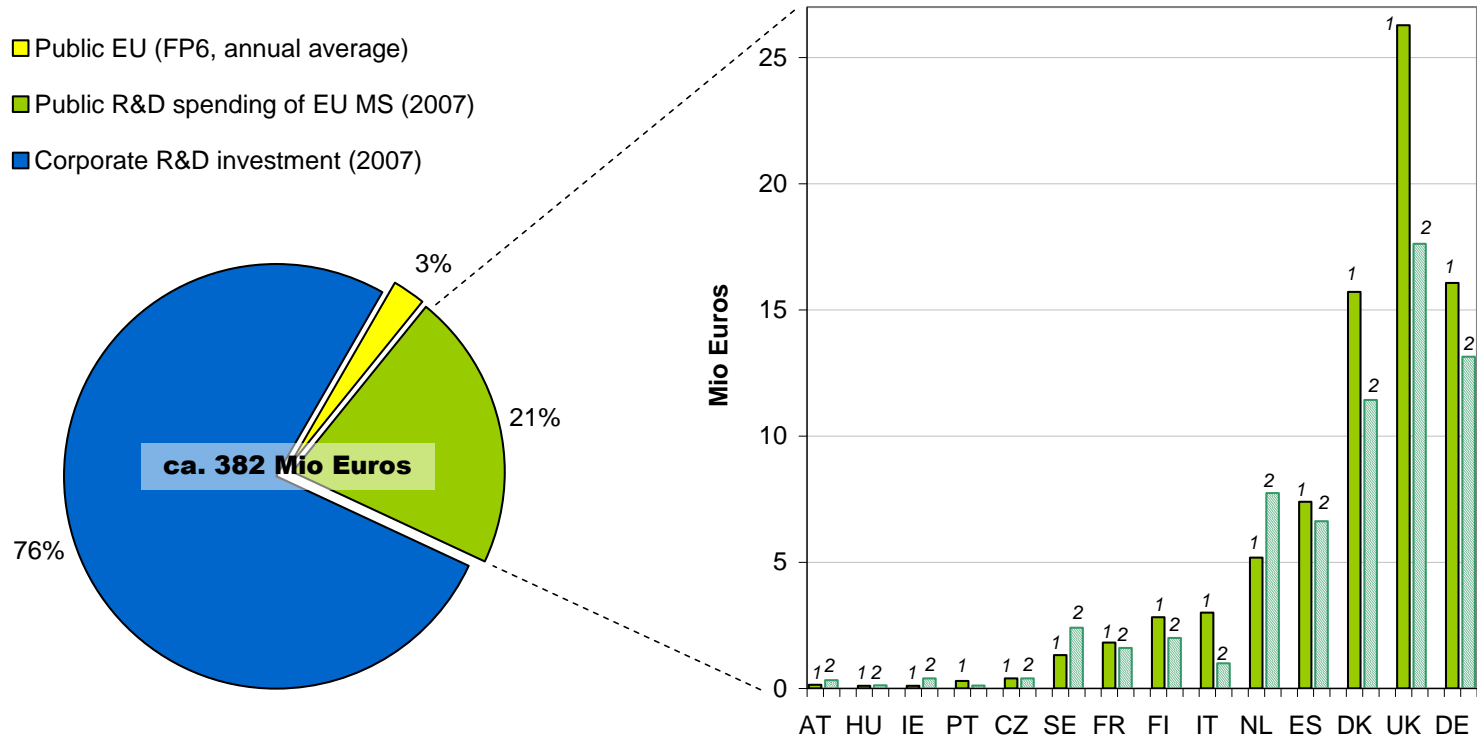


Mapping energy R&D capacity: results illustrated for wind energy



Approximate R&D investment in wind energy

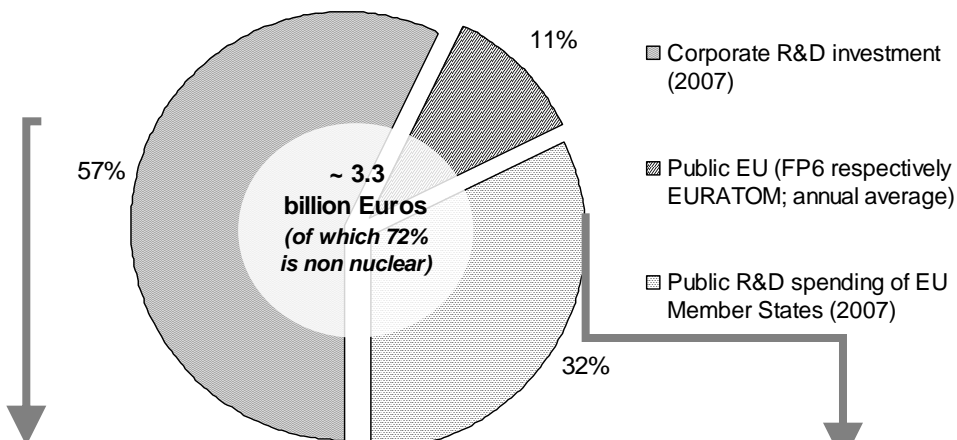
Public R&D spending of EU MS: 1- 2007 data (gap-filled); 2- Annual average over the period 2002 - 2007



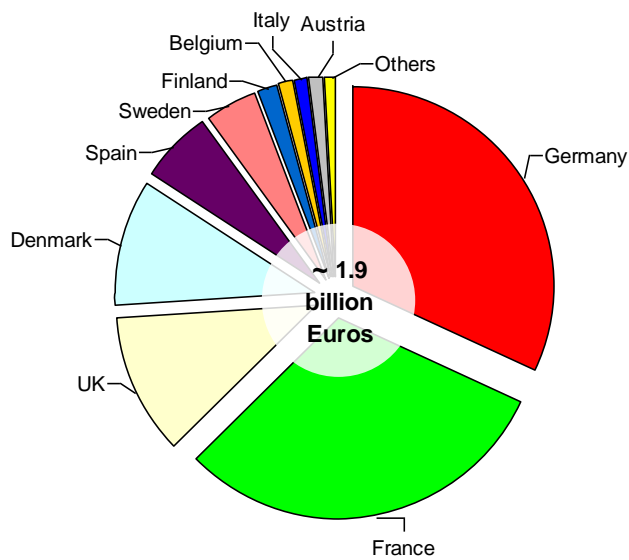
- Corporate R&D investments account for ¾ of total → applied research & demonstration
- Concentration of public and industrial R&D investors in (more or less) the same MS
- Reasonable estimation: R&D intensity industry 2.9-3.2%; other studies ~ 180 Mio Euros (compared to 292 Mio Euros of present study)

Mapping energy R&D capacity: Total R&D investments to low-carbon techs.

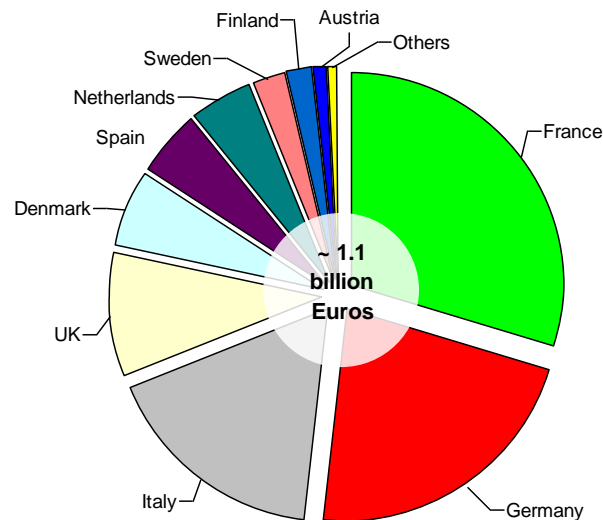
Total estimated R&D investments in SET-P priority energy technologies



Relative distribution of corporate R&D investments in SET-P priority technologies among EU Member States in 2007 (location of company headquarters)



Relative distribution of public R&D investments in SET-P priority technologies among EU Member States in 2007





Objectives

- Led by industry
- Boost research and innovation
- Accelerate development of technology
- Define & realise clear targets (quantified objective)
- Deliver progress beyond business-as-usual
- Contribute to political goals
- Foster Public Private Partnership

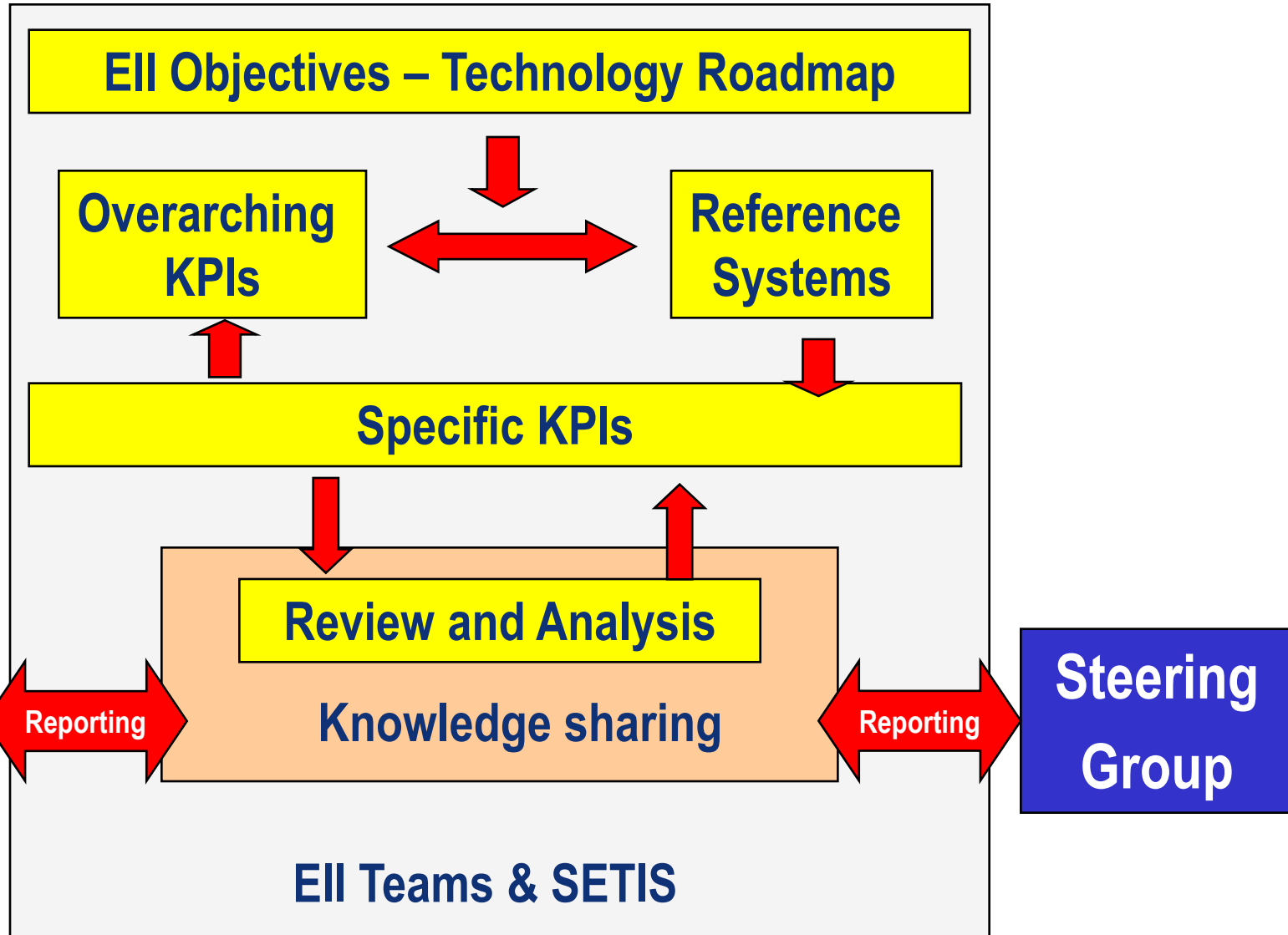
Implementation and management

- Appropriate to break-down into 2-3 year's Implementation Plans (2010 – 2012) ; derived from the Technology Roadmap
- Taking into account the existing EC financial contributions (FP7, Recovery Plan,...)
- Estimate the budgets (Member States, EC, industry)
- Monitoring through Key Performance Indicators
- Management through flexible governance architecture

Status quo

Wind, Solar (PV, CSP), Electricity Grids, CCS Initiatives launched June 3th, 2010
Imminent launch – Bioenergy, Nuclear Fission; in preparation: Smart Cities

Monitoring Progress: Ells Monitoring & Review Approach





Monitoring Progress: The example of wind energy



Overarching KPI Levelised cost of electricity production

New turbines & components

- Test turbines up to 20 MW
- Power output
- Availability
- Weight on top of mast per kWh
- MW and square meters of blades manufactured
- ...

Offshore structures

- Amount of material per turbine per depth
- Meters of substructures produced per year
- ...

Grid integration

- Ratio of wind farm power output to total electricity volume in transit
- Distance of HVDC cables per capacity
- ...

Resources & spatial planning

- Measurement points and DB use and accessibility
- Parties involvement in spatial planning
- ...

Specific KPIs



In-process evaluation of potential impact of policies

Two main questions investigated:

- What is the change in technology investment costs of selected SET-Plan priority technologies if accelerated RD&D efforts are implemented?
- Can an increase in RD&D investments along the lines of the SET-Plan help in reducing the costs of achieving the European energy and climate targets by 2020 and beyond and does it contribute to bringing new technologies onto the market?

<http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=3719>





Model-based Impact Assessment: Scope and limitations



Assess the impact of increasing RD&D efforts on several SET-Plan priority technologies at the same time in Europe?

Methodological problem: Can we establish a quantified relationship between R&D efforts and technology development?

Data challenge: How to calibrate such an equation? Are sufficient historic data available?

Implementation challenge: Can we model this RD&D impact?

Definition problem: What means 'increasing RD&D efforts'? What are baseline efforts, what does the SET-Plan imply on RD&D investments?

► **Modeling challenge:** Ensure that the model present well these (novel) technologies.

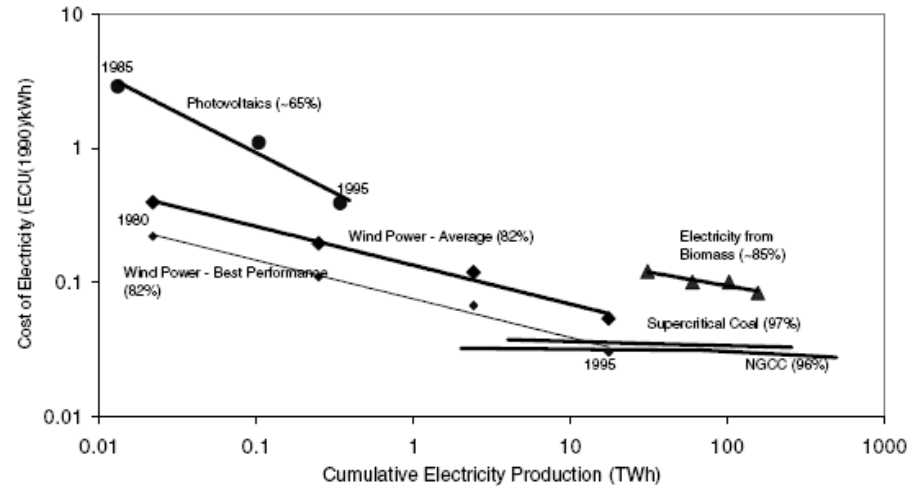
Methodological, data and model challenge: Learning effects are global –need to have data and a model that allows for a global assessment while having the necessary detail on the EU.



Model-based Impact Assessment: Methodology



Well established: Unit costs are reduced with increasing production volumes



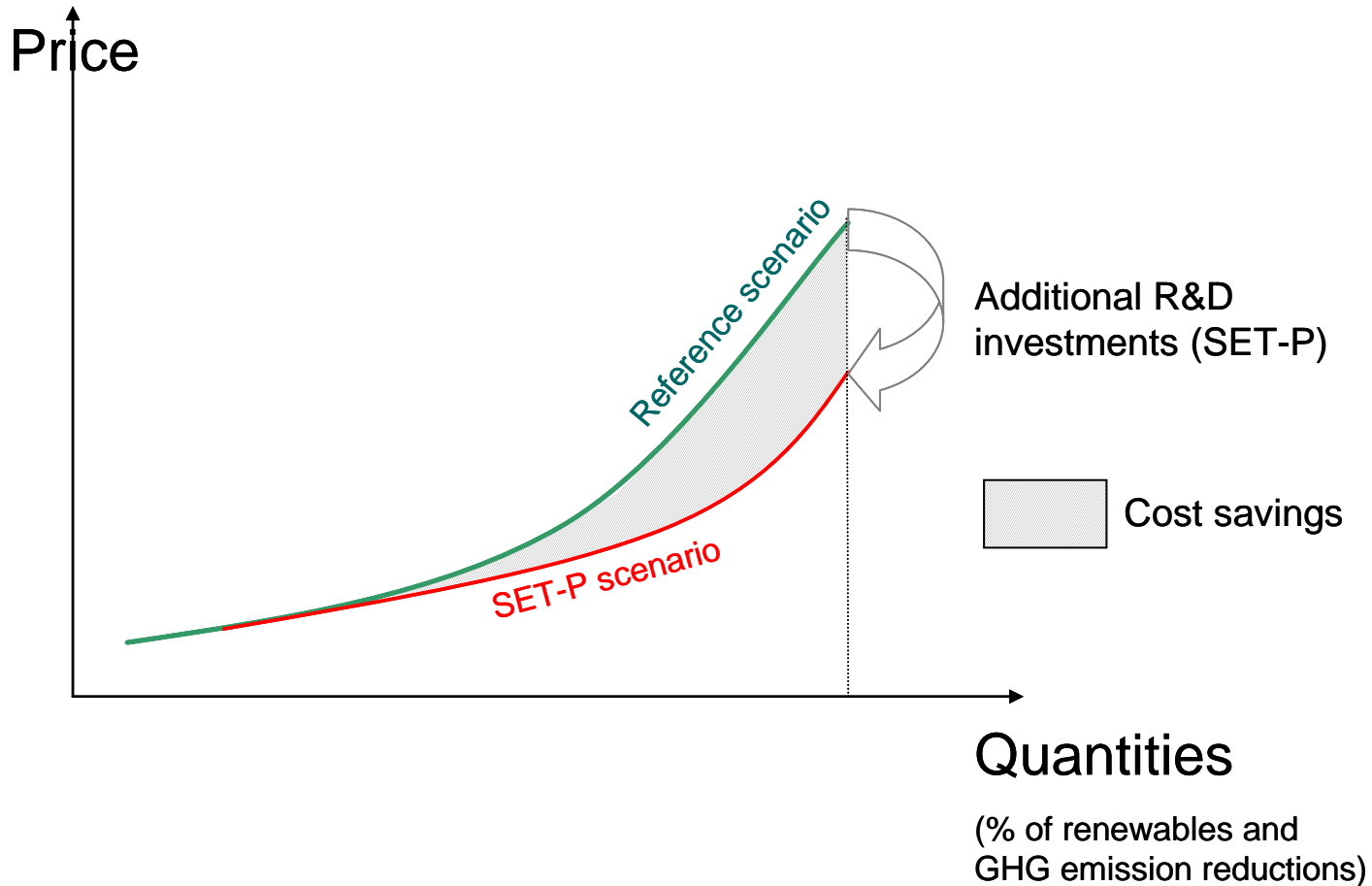
Two-Factor-Learning Curve: Establishes a relation between cumulative production, knowledge stock and technology costs

$$C(Q, KS) = aQ^{-\alpha} KS^{-\beta}$$

- With C = Costs of unit production
- a = Costs of the first unit produced
- Q = Cumulative Production
- α = Elasticity of learning by doing
- KS = Knowledge stock
- β = Elasticity of learning by researching



Model-based Impact Assessment: Scenario definition

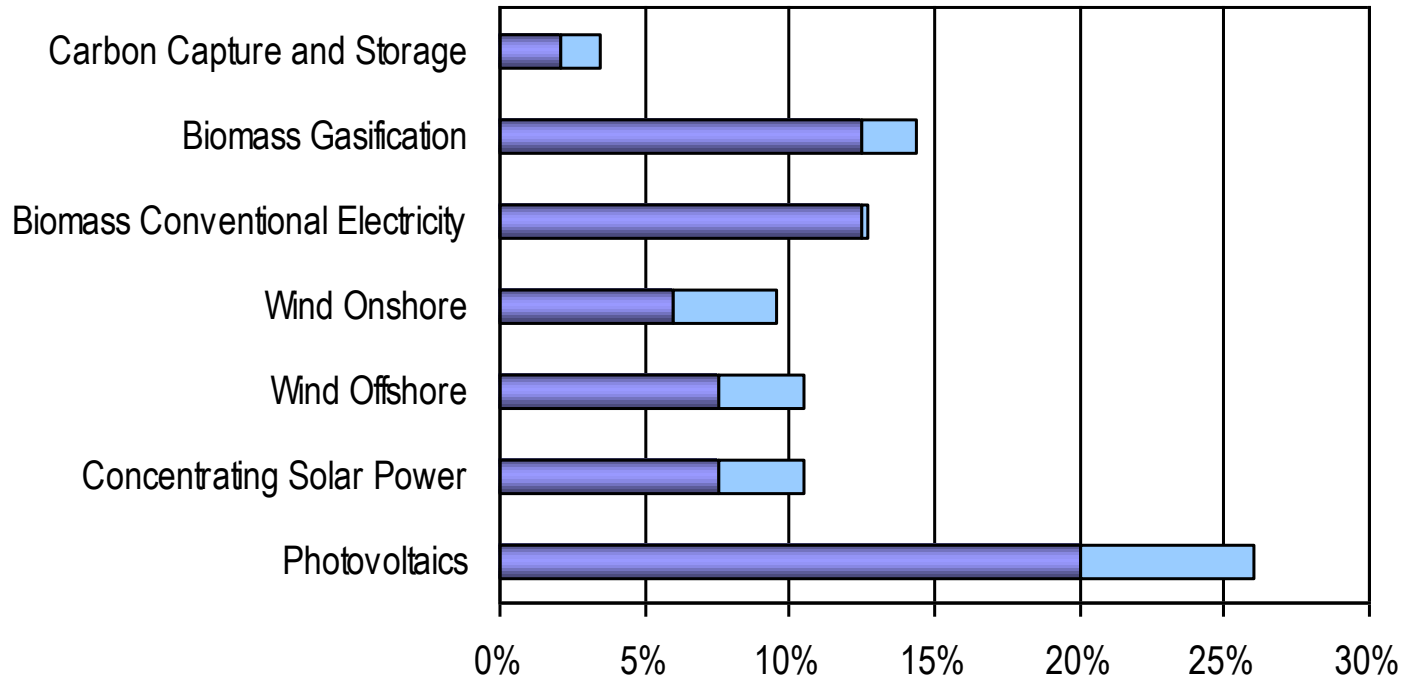




Model-based Impact Assessment: Results: Increased learning



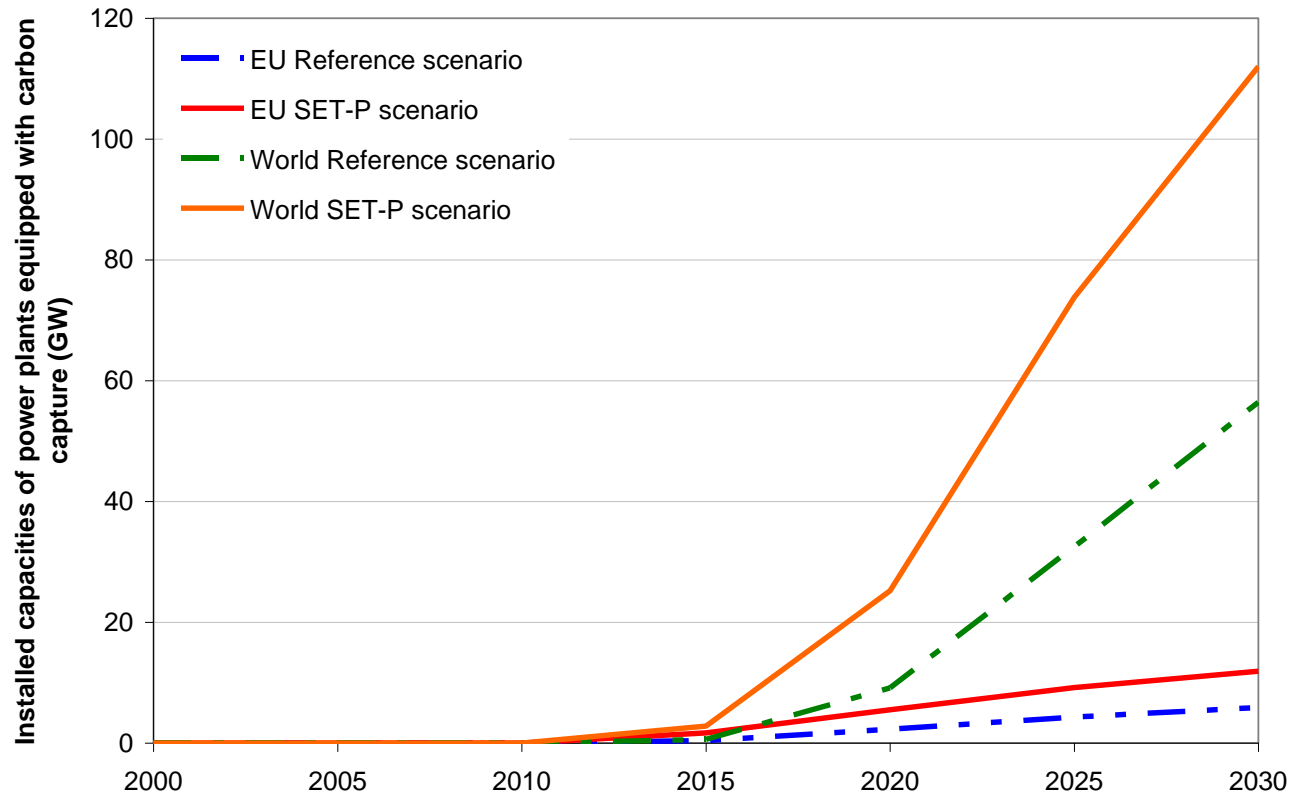
SET-Plan Effect : Increased Learning Rates



→ **Significantly accelerated technology learning due to additional RD&D investments**

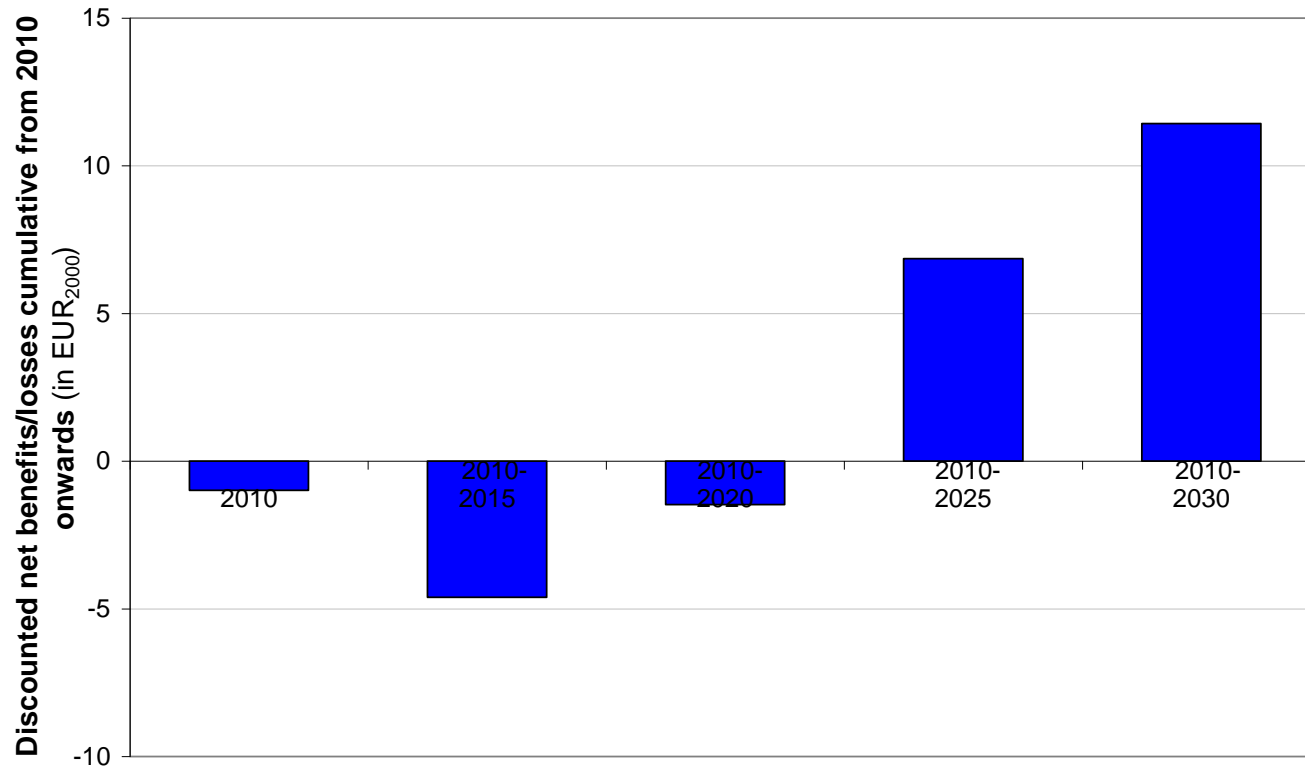


Model-based Impact Assessment: Results: Accelerated market uptake



Changes in installed capacities between the Global SET-Plan, the SET-Plan fixed price and the reference scenario in 2020 and 2030 in the EU

Discounted (3%) net benefits cumulated from 2010 onwards, EU-27



- ✓ Cumulative net benefit by 2030, 11.5 bn€₂₀₀₀
- ✓ 15% IRR over 2010 - 2030



Model-based Impact Assessment: Results: Key messages



- Investing in RD&D at global level in line with the SET-Plan lowers the cost of innovative low-carbon technologies, hence improves the economics of the transition towards a low-carbon power sector in the long run and benefits both to the consumers and industry.
- Up to 2030 and beyond, increased RD&D investment levels in line with the SET-Plan result in a positive Internal Rate of Return. Yet, these benefits will materialise mainly in the time horizon beyond 2020. Considering the shorter-term nature of corporate R&D investments, this suggests a need for public action - as the SET-Plan.
- This economic aspect combined with the role of the SET-Plan to ensure the availability and enhanced performance of new technologies confirms the enabling role of the SET-Plan for the transition of the energy sector towards the EU 2050 vision of a decarbonised energy system.
- The above effects are triggered by an ambitious increase in global research efforts, extrapolating the efforts done in the EU with the SET-Plan to other world regions. This highlights the need for a worldwide approach with respect to low-carbon research, as proposed in the SET-Plan and in the declaration of the leaders of the Major Economies Forum on energy and climate change (2009).
- Ancillary benefits to consumers and industry beyond the power sector can also be expected, such as cost reductions in other sectors due to the lower CO₂ prices. Moreover, positive spill-over effects on the innovation in other sectors, such as transport and informatics, are likely to occur.



- Monitoring and assessing progress of a policy process (instead of a single project) requires a broad variety of quantitative and qualitative tools that flexibly adapts to distinct phases of the policy process:
 - assessment of status quo
 - estimation of impacts
 - monitoring of specific actions
- A stable monitoring architecture is needed to ensure continuity in expert knowledge and facilitate a systematic exchange with experts, stakeholders, Member countries etc.
- There is a necessity for ‘tailor-made’ tools to adequately meet the needs of specific policy questions.
- Monitoring and review are key element in every single phase of the policy. They are explicitly pointed out in planning and implementation.
- The SET-Plan set up SETIS as a monitoring tool from the very beginning. Since then, SETIS actively interacts with all stakeholders to adapt the set of qualitative and quantitative tools needed to monitor progress.



THANK YOU

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<http://setis.ec.europa.eu>