



*Ministero  
dello Sviluppo Economico*



ENERGY MINISTERS MEETING 2009

**Climate Policy for Energy Ministers  
at their G8 Meeting in Rome, Italy (2009)**  
*Background paper*



International Energy Agency.....





## Key messages

*The energy world is at a crossroad. While the global economic crisis has lowered short-term supply and demand, the coming decades will need investments in energy infrastructure of unprecedented magnitude. At the same time, solving climate change requires that global emissions peak in the coming two decades. Failing to properly guide the next investment wave towards low-carbon technologies will greatly undermine an adequate response to climate change. In the near term, the economic recovery must be based on a Clean Energy New Deal, to start steering investment away from past energy practices. Beyond the recovery, ambitious climate goals will require strong policy signals across the energy sector if we are to succeed.*

*A global energy strategy to cope with climate change must combine massive improvements in energy efficiency and a move towards the decarbonisation of energy supply – especially in power generation. Such a strategy invigorates the role of energy ministries in solving climate change. It also puts them at the core of the global response to this challenge.*

*Energy efficiency is a prerequisite for a least-cost solution. Many investments in energy efficiency have attractive rates of return and relatively brief payback periods. In addition, deployment of many low-carbon energy supply technologies may require putting a price on emissions. Energy efficiency options can help consumers lower their exposure to the energy price increases that would ensue, and hence contribute to enhanced energy security.*

*Tough negotiations are needed to conclude the UN climate negotiation initiated in Bali, including a long-term goal on future emissions. While energy ministries do not always join in this debate, they will carry a large responsibility for implementation of any agreement. The urgency is clear, however, and Ministers should take action now to:*

- *Implement energy efficiency measures across the range of end-uses, taking the IEA 25 concrete recommendations into account.*
- *Guide supply-side investments towards low-carbon technologies, especially in power generation, through a visible, and long-term carbon price signal, or other measures appropriate in light of differences in regulatory frameworks.*
- *Support low-carbon technologies that have been driven by public policy in the past and suffer from the economic downturn, to avoid losing the accumulated know-how.*
- *Co-operate on technology R&D for essential, yet long-term technology options. This could start with enhanced collaboration on identifying, and then implementing technology roadmaps.*

*None of the above can be effective to combat climate change if undertaken by OECD countries alone. In absolute terms, when compared to our Reference Scenario, there is a much greater potential for emissions reductions in non-OECD countries – with a substantial contribution from energy efficiency. The International Partnership on Energy Efficiency Co-operation can facilitate this effort. How the efforts of developing countries could be supported is ultimately a matter for UNFCCC negotiations. However, energy ministries in the developing countries could pro-actively develop their low-carbon strategies, to feed into the discussion on international cooperation and finance needs.*

*Energy Ministers could also consider the usefulness of international policy coordination on the following aspects:*

- *Energy efficiency measures applying to globally traded products.*
- *The reach of carbon market mechanisms to deliver least-cost changes.*
- *Efforts to curb emissions in trade-exposed, energy-intensive industries.*



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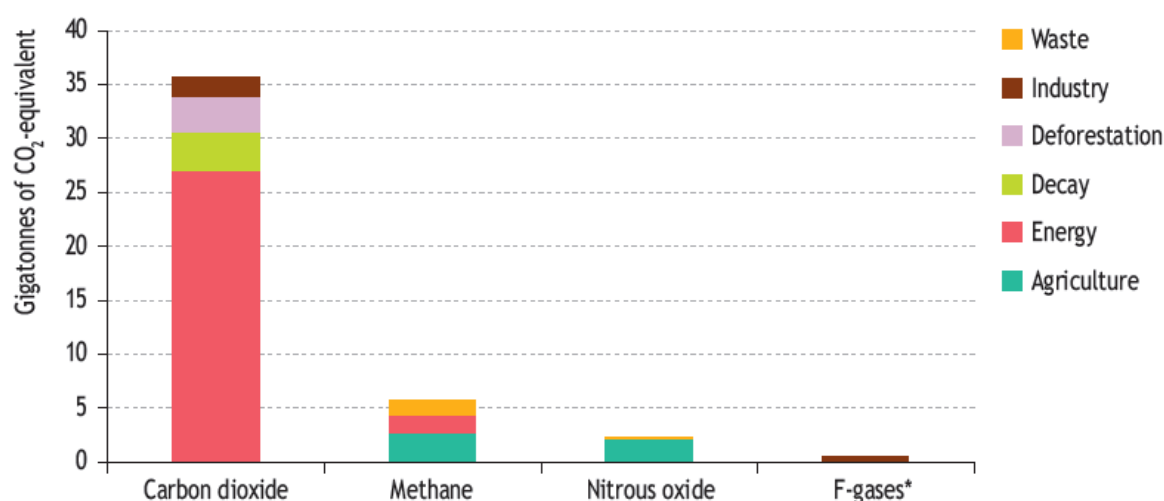
*Last, Energy Ministers can address clear messages to Copenhagen:*

- *There is a short window of opportunity to guide the next wave of investments, especially in power generation, towards low-CO<sub>2</sub> emitting capital stock. The UNFCCC negotiation should develop international mechanisms to seize this opportunity.*
- *Energy efficiency measures may need support in spite of their often large economic benefits. Targeted policy support should be considered to jump-start investment in energy efficiency, particularly in developing countries.*
- *The energy sector (from supply to demand, including equipment manufacturers) can contribute its expertise to the UNFCCC to facilitate effective greenhouse gas mitigation. Energy is at the heart of the solution to climate change; energy experts, from the private sector as well as governments, must contribute to domestic climate change strategies to ensure that these meet energy security, economic performance as well as environmental sustainability goals.*

## 1. Introduction – The energy and climate challenge

The energy sector writ-large accounts for 82% of greenhouse gas (GHG) emissions in OECD countries, and 59% in non-OECD countries.<sup>1</sup> Energy-related emissions (largely CO<sub>2</sub>, but also CH<sub>4</sub> and N<sub>2</sub>O) have been rising rapidly since 1990 (+33%), driven by the rapid economic growth of emerging economies and the availability of abundant fossil fuel resources. This has been fuelled especially by the growing use of coal in power generation, emissions from which have grown by some 70% between 1990 and 2006 worldwide, to a staggering 7.8 billion tons of CO<sub>2</sub>.

**Figure 1: World anthropogenic greenhouse gas emissions by source, 2005**



\* F-gases include HFCs, PFCs and SF<sub>6</sub> from several sectors, mainly industry.

*Note:* Industry CO<sub>2</sub> includes non-energy uses of fossil fuels, gas flaring, and process emissions. Energy methane includes coal mines, gas leakages, and fugitive emissions. Nitrous oxide from industry and waste amounts to 0.12 Gt CO<sub>2</sub>-eq.

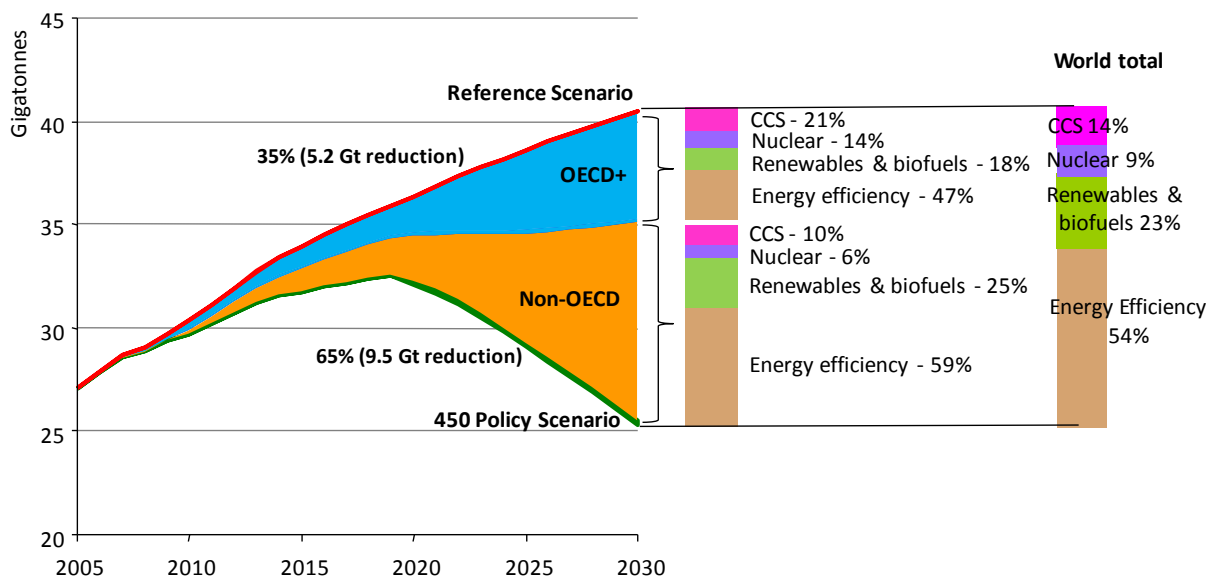
Sources: IEA, *World Energy Outlook 2008*.

**Key message: CO<sub>2</sub> from energy represents the bulk of global greenhouse gas emissions from human activities.**

<sup>1</sup> IEA (2008), *CO<sub>2</sub> Emissions from Fuel Combustion*, OECD/IEA, Paris.

Any effective strategy to mitigate climate change must depend on a rapid shift in the energy supply and demand patterns of our economies and societies. This is illustrated by IEA projections that describe the changes needed to steer away from today's unsustainable energy trend, towards one that would still meet rising energy needs and the urgency to preserve the world's climate.

**Figure 2: Reductions in energy-related CO<sub>2</sub> emissions to stabilise global concentrations at 450 ppm in CO<sub>2</sub>-equivalent**



Source: IEA (2008), *World Energy Outlook 2008*, OECD/IEA.

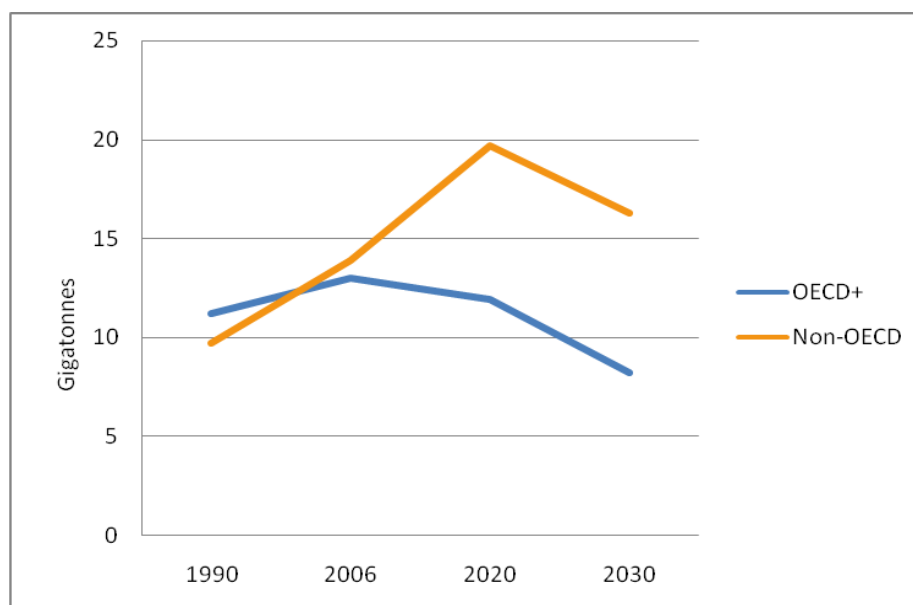
**Key message:** *OECD and non-OECD countries must act to curb global CO<sub>2</sub> emissions from energy. Energy efficiency and low-carbon electricity are essential to avoid catastrophic climate change.*

Figure 2 indicates the main components of an effective transformation of the energy sector, needed to meet the global challenge imposed by climate change. These IEA projection shows the impossibility to achieve ambitious climate change goals without the contribution from the energy sector in OECD and non-OECD countries alike. In fact, the higher GDP growth in developing countries – 4.8% against 2% per year in OECD countries – puts them on a higher emission trajectory, implying a need for more reductions in absolute terms to remain on

track with an ambitious climate stabilisation goal. By 2030, OECD countries emissions would nonetheless be 37% lower than current levels; emissions in other major economies and developing countries would be some 17% higher than current levels (Figure 3). Non-OECD countries therefore need to adopt a greener development path to achieve sustainable development goals, and OECD countries may need to partly support this path financially and technologically.

The negotiations should provide a framework to facilitate action in developing countries – how their efforts should be supported by developed countries is in fact a key element of UNFCCC discussions. The IEA policy scenarios assume a carbon price to curb CO<sub>2</sub> from power generation in all major economies, some international policy coordination on heavily traded commodities and goods, and ambitious domestic policy measures.

**Figure 3: Energy-related CO<sub>2</sub> emissions in OECD+ and non-OECD countries in a 450 ppm policy scenario**



*Note:* OECD+: OECD countries and those EU countries that are not members of the OECD.

*Source:* IEA (2008), *World Energy Outlook 2008*, OECD/IEA.

**Key message:** *OECD+ countries would undergo significant reductions from today's CO<sub>2</sub> emission levels by 2030 while non-OECD would undertake reductions only after 2020.*

Such ambitious climate policy scenario still allows for the delivery of the energy services that we need to develop economically, and to sustain strong economic growth globally – at a higher rate in developing countries than in the OECD.

Two broad areas stand out as requiring much effort:

1. Energy efficiency improvements across all end-uses: transport, heating, electricity uses, to lower the demand for primary, carbon-intensive fuels.
2. Decarbonisation of the power sector, through growing use of renewable energy sources (including hydro), nuclear power and the capture and storage of CO<sub>2</sub> from fossil-fuel based generation.

Other technology breakthroughs are needed, particularly in industry, where carbon capture and storage (CCS) could also contribute significantly.

The above projections may convey a wrong sense of certainty about the future of our energy systems under a carbon constraint: uncertainties on fossil fuel prices, on technology development, on the pace at which policies are introduced and on the private sector response to these are not to be neglected. Further, most economies leave much initiative to private sector stakeholders to direct investments to most competitive outcomes, and the results of their choices are likely to vary substantially from even the most robust projections we have today. As a result, the robustness of policy frameworks may be more important than very precise goals on specific technologies based on today's expectations. At the same time, policy frameworks should take into account the critical paths of technology solutions essential to lowering global emissions in the long run. Unfortunately, public RD&D budgets of OECD countries, in the energy field, stand today at roughly half their level 25 years ago. As a result, we are less well prepared to anticipate and accelerate future technology developments.

In practical terms, policies must be introduced to ensure that investments across the supply-demand spectrum of the energy sector promote less-CO<sub>2</sub> intensive supply technologies and more efficient use of energy now. Second, policy signals must also encourage innovation in these much needed technologies,

some of which are far from ready for commercial diffusion, yet are called on to contribute to very significant reductions in CO<sub>2</sub> emissions in the mid- to long-term. Section 2 will elaborate on ideas for a robust strategy for the energy sector.

### *Traditional energy policy goals and the climate change challenge*

A properly functioning national energy system will provide an adequate, secure, and cost-competitive supply of final energy to the whole range of end-users, from households to heavy industry and small businesses. This implies a broad portfolio of concerns and activities for energy administrations, including:

- The reliability of the energy supply chain.
- Adequate investment, including in R&D as well as infrastructure. The current crisis has brought this question to the fore (see IEA background paper provided for the G8 Energy Ministerial: “The Impact of Financial and Economic Crisis on Global Energy Investment”).
- Proper regulatory frameworks to encourage competition, cost-reflective pricing – including environmental externalities.
- Demonstrations of new technologies and the deployment of more advanced yet not fully competitive sources with a large future potential.

Economists would argue that setting the incentives right for a proper response to climate change would “simply” require putting the right price on CO<sub>2</sub> emissions. Is there, then, a need for energy ministries to engage in climate policy making? The answer is unequivocally “yes”: the magnitude of the needed changes, the wide spectrum of new energy choices and the unprecedented scale of energy infrastructure requirements demand that ministries reassess their traditional ways of doing business in light of a carbon-constrained energy system.

The following questions deserve attention:

- What should ministries' responsibilities be in a future world where the response to climate change imposes radical changes to the energy system – an energy revolution?
- Will existing policies undermine, or support efforts to prevent climate change?
- How should current policy objectives be taken into account in designing an effective strategy to reduce CO<sub>2</sub> emissions?

The robustness of energy policy responses to climate change will largely depend on finding sound answers to these questions.

Further, Energy Ministers should also reflect on how an international agreement on climate change in Copenhagen may contribute to resolving the problems faced by the energy sector in the coming decade.

## **2. An energy sector strategy to reduce GHG emissions**

The goal of modern energy policy is to ensure adequate, least-cost supply of energy services to national economies. What does this mean in a carbon constrained world? This section details the possible elements of a successful strategy.

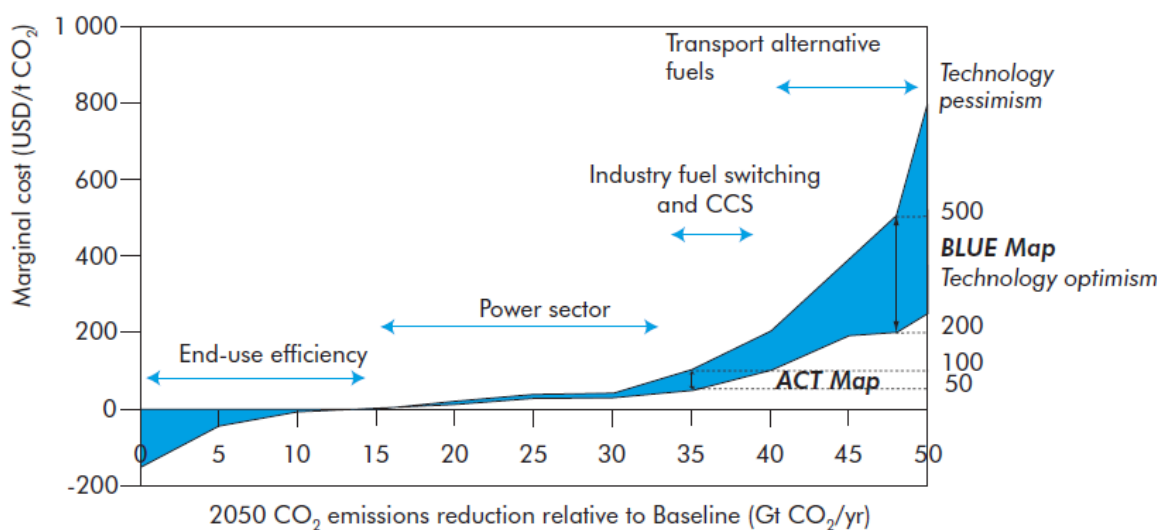
### ***The cost of reducing CO<sub>2</sub> emissions in energy***

While stopping climate change is fully justified from society's point of view by the avoided climate damage, it will require policies to encourage individual investors to divert resources towards more costly technologies than they would have chosen otherwise. The cost implications have been estimated in a number of ways, including by the IEA:

- Cutting CO<sub>2</sub> emissions by 50% from current levels by 2050 would require *additional* estimated capital expenditure of USD 14-15 trillion from 2005 to 2050.

- Putting a cost on CO<sub>2</sub> – implicit through regulation or explicit through an actual CO<sub>2</sub> price – is necessary to ensure that investment goes also towards alternative energy; IEA estimates that the cost of carbon would need to reach USD 180/tCO<sub>2</sub> at the margin by 2030, and USD 200 to USD 500/tCO<sub>2</sub> (and possibly higher) by 2050 – if the concentration of greenhouse gases in the atmosphere is to stabilise at the 450 ppm of CO<sub>2</sub> equivalent, needed to prevent catastrophic climate change (Figure 4).
- Standard macro-economic analyses of global CO<sub>2</sub> reduction scenarios project a small, yet positive GDP cost in the medium-long run (see Table 1).

**Figure 4: Marginal emission reduction costs for the global energy system, 2050**



Source: IEA (2008), *Energy Technology Perspectives 2008*, OECD/IEA.

**Key message:** Cutting CO<sub>2</sub> to 50% of current levels by 2050 requires a marginal cost of carbon of USD 200-500/tCO<sub>2</sub>;

**Table 1: Macroeconomic cost of greenhouse gas mitigation**

Source	Stabilisation level	Loss of world GDP relative to the baseline in 2030	Loss of world GDP relative to the baseline in 2050
	(ppm CO <sub>2</sub> -eq)	(%)	(%)
<i>Environmental Outlook 2008</i> (OECD, 2008)	450	0.5	2.5
	550	0.8	0.9
<i>World Economic Outlook 2008</i> (IMF, 2008)	550	-	2.6-2.8*
<i>IPCC 4<sup>th</sup> Assessment Report</i> (IPCC, 2007)	445-535	<3	<5.5
	535-590	0.2-2.5	<4

\* In 2040 (world GNP).

Source: IEA (2008), *World Energy Outlook 2008*, OECD/IEA.

**Key message:** *There is a small, although not negligible macro-economic cost associated with lowering global greenhouse gas emissions.*

These somewhat abstract orders of magnitude have nonetheless a clear implication for energy activities: the cost – and price – of a unit of energy delivered to end-users is bound to be higher than it would have been without mitigation efforts. This is illustrated in Table 2 below in the case of electricity for a 50% reduction in global CO<sub>2</sub> emissions by 2050.

Consumers would pay more for each kilowatt-hour of electricity, litre of gasoline and kilocalorie of natural gas, as all emit CO<sub>2</sub> and would be priced to reflect the cost of these emissions. Suppliers would in time turn to alternative, more expensive technologies to lower these emissions.

Unit prices are not, however, the full picture. The full energy cost faced by end-users is the result of unit energy costs and efficiency – *i.e.* the transformation of final energy into energy services: mobility, heat, light, etc. The more efficient our end-use technologies, the lower the final energy requirement to deliver the same energy service, and the lower the cost increase for final consumers.

Effective energy efficiency policies are therefore at the core of the political sustainability of energy strategies to cut CO<sub>2</sub> emissions from energy, as they will deliver a less costly transition to a different, inherently more expensive energy supply system.

**Table 2: Average electricity production cost increases by 2050 under a 50% reduction scenario, relative to a baseline scenario**

Scenario	Average increase 2030-2050 (%)
BLUE Map	90
BLUE noCCS	106
BLUE hiNUC	81
BLUE loREN	94
BLUE loEFF	108

*Notes:* Electricity production costs excluding transmission and distribution costs. BLUE MAP: Central scenario for -50% in energy-related CO<sub>2</sub> emissions by 2050; BLUE noCCS: No carbon capture and storage; BLUE hiNUC: 2 000 GW of nuclear instead of 1 250 GW maximum capacity; BLUE loREN: Assuming less cost reductions for renewable power generation technologies; BLUE loEFF: Low end-use efficiency assuming 0.3% lower annual efficiency improvement compared to MAP.

*Source:* IEA (2008), *Energy Technology Perspectives 2008*, OECD/IEA.

***Key message: Electricity production costs would increase significantly as a result of a global carbon constraint, under all envisioned scenarios.***

### ***The case for energy efficiency: securing the affordability of energy system change***

A properly functioning national energy system ensures that all end-uses can be satisfied with a portfolio of secure, least-cost supply sources and technologies. In doing so it should also seek to minimise environmental consequences, among which climate change has risen to the forefront, at least in some countries.

Of course, social/economic/technological realities vary across countries. While end-goals may be identical, solutions, paths and pace to reach them may differ substantially.

Economic projections of future energy needs under a CO<sub>2</sub> constraint concur on the main technical and policy solutions. They combine a curb on rising demand for primary energy (and particularly coal, oil, gas) through enhanced energy efficiency and, possibly, conservation, and technology solutions to “decarbonise” the supply of energy. Views differ however on whether to promote ambitious reductions early, or to wait for the development of low-carbon supply technologies. There is a fairly broad spectrum of strategies to cut future CO<sub>2</sub> emissions, anywhere between two theoretical, opposite responses:

- *An all end-use response: efficiency and conservation.* Consumers would be guided to adopt more efficient equipment (appliances, cars, buildings), and, if that is necessary, to turn to conservation (lower demand for energy services).
- *An all-supply response,* focused on ambitious R&D in clean technology, and a rapid deployment of the resulting technology innovations, once they are ready, to eliminate CO<sub>2</sub> emissions from supply. The danger with such an approach is that unchecked demand growth would require a very large shift in the supply system with concomitant large investment needs and increases in costs to consumers when the time comes to cut emissions.

Either strategy would also, almost certainly, be quite far from a least-cost solution, which should be high on any government’s list of priorities, particularly in the current economic environment. Strategies that allow for action on both supply and end-use would seem most appropriate.

In the near term, however, energy efficiency improvements appear best suited to satisfying multiple criteria. Improvements in energy efficiency would:

- Lower the end-users’ exposure to unit energy prices that are bound to grow as systems become decarbonised. In the nearer term, for some countries, this could accompany efforts to reform an energy sector often hampered in its ability to charge cost-reflective prices.

- Lengthen the period of development and experimentation of the broad set of low-carbon technologies (technology development aspects are developed farther in this paper).
- Lower the overall investment needs in new, more costly, low-carbon supply technologies, when these will have to be deployed to further lower emissions.
- Alleviate pressures on international energy markets, a growing concern as the present economic downturn and low investment in energy supply may result in extreme price volatility as soon as the global economy recovers.

A successful energy sector contribution to solving climate change must therefore have at its core enhanced investments in energy efficiency across end-uses, guided by sound policy approaches. As we explain below, this effort must also be guided by a clear economic signal that will also encourage investment in the decarbonisation of the energy system over the course of this century.

Beyond the significant policy effort needed to remove obstacles to energy efficiency, this strategy also has implications for investment in the energy sector (supply and demand) here and now:

- The push for more efficient end-use will require substantial upfront capital expenditure (*e.g.* investments in existing buildings to lower their lighting and heating costs). The difficulty in stimulating such outlays cannot be neglected, even if overall cost savings are expected through lower energy bills in the future. For some countries, capacity building is also needed as they design and introduce new energy efficiency measures.
- Transmission and distribution infrastructure must be revamped to allow a full optimisation of supply and demand systems. We project that close to USD 7 trillion will be invested globally in transmission and distribution between now and 2030 (*World Energy Outlook 2008*). These investments represent a unique opportunity to consider how to adapt networks to a

CO<sub>2</sub>-constrained energy system. They could in particular take into account:

- Decentralised and/or intermittent electricity generation, including more efficient technologies like combined heat and power and district energy.
- The minimisation of overall generation cost through more extensive transmission networks to more adequately balance the load across generators.

Some of the above elements have already been included in the stimulus packages of several countries. However effective a Clean Energy New Deal may be in steering the world's economy towards sustainability, it is not necessarily at scale with the climate change challenge and the urgency it may impose on energy systems.

#### **Stimulus packages: towards a Clean Energy New Deal**

While the proposed economic stimulus packages differ widely in their overall focus on clean energy investments, energy efficiency measures are part of many of the packages. The US stimulus package includes energy efficiency related provisions totalling about USD 45 billion covering a wide range of activities associated with energy efficiency in buildings, appliances, transport, as well as investments in smart grids. The EU stimulus plan contains about EUR 18 billion of direct energy efficiency measures, whereas the energy efficiency and other low carbon technologies portion in Japan is estimated at JPY 1,504 billion.

The skilled labour required to implement energy efficiency measures could result in the creation of millions of jobs in the new low-carbon economy. The United Nations Environment Programme (UNEP) recently estimated that close to 1 million jobs could be created by 2020 in the European Union through the 20% energy efficiency target.

As another example, Korea launched an ambitious stimulus package (USD 37 billion) that seeks to create 940 000 “green” jobs, with expenditure in green homes, subway and other rail infrastructure. The package also includes support for the development of electric and hybrid vehicles. The importance of constructing infrastructure – a CO<sub>2</sub> intensive activity in itself – is questioned by observers, although it can be seen as an investment to secure lower emissions in the future.

### **Stimulus packages: towards a Clean Energy New Deal (continued)**

The economic stimulus packages now being adopted by many governments provide an excellent opportunity to ensure cleaner, more sustainable growth in the energy sector – both through immediate measures with impacts in the near term, and by influencing longer-term investment decisions. One of the most attractive options lies with refurbishing buildings. Renovating them to meet high energy efficiency standards and replacing outdated heating systems would cut energy use dramatically while creating jobs in manufacturing and building trades. Publicly-owned buildings could be the first target. The transportation sector also holds enormous potential for energy savings.

Proposed government support for the auto industry could be designed to promote more fuel-efficient vehicles, including through scrappage and buy-back schemes. Renewable energy can also play a role, with support through tax changes and targeted investments.

There is now an opportunity to launch a Clean Energy New Deal to help set economies on the right track. Such Clean Energy New Deal is not a policy measure that substitutes for other, more long-term approaches. However, it could be the most promising and concrete way to take a determined first step to a sustainable future – from a security, environmental and affordability point of view.

*Sources:* IEA estimates based on publically available information; UNEP, Green Jobs: Toward Decent Work in a Sustainable, Low Carbon World, September 2008; *The Guardian*: “South Korea lights the way with its GPB23Bn green deal”, 21 April 2009; IEA (2009), “Ensuring Green Growth in a Time of Economic Crisis: The Role of Energy Technology”.

## **3. The policy tool-kit – Accounting for diversity**

Energy efficiency and energy system decarbonisation are the primary tools of an effective energy response to climate change – and both require urgent action. What policies and measures are, or can be put in place to urge energy decision makers to move accordingly? How can they be designed and combined to ensure a least-cost outcome?

### ***Principles for least-cost CO<sub>2</sub> emission reductions and energy sector realities***

For years, climate policy discussions have been guided by the need to minimise overall policy costs, first as a sound public policy principle, but also to facilitate more ambitious emissions reduction objectives. This requires putting a price on

the environmental “externality”, *i.e.* greenhouse gases which energy users had long been emitting, unaware of their environmental impact.

### A price signal

Economists have long recommended relying on so-called economic instruments to cut pollution at least-cost – a tax on emissions, or emission caps combined with the possibility for individual sources to trade against their respective caps (emissions trading). These instruments should ensure that no emitter pays more, at the margin, than another. The environmental goal is hence met at minimum cost for society. Both types of instruments have been introduced in a number of countries – carbon taxes since the early 1990s and emissions trading a decade or so afterwards, with diverse geographical scope and sectoral coverage.

To attain global emission reduction levels currently considered by policy makers, there is unanimity that placing a price on CO<sub>2</sub> emissions will steer investment and consumption choices away from CO<sub>2</sub>-intensive practices.

### Addressing market barriers to energy efficiency

Getting a least-cost outcome with such instruments assumes perfect market conditions, which are not always met. In many policy settings, we find that the CO<sub>2</sub> price needs additional policy support – the signal is not appropriately received by end-users, the result of several market failures and barriers. A wide range of policy instruments to promote energy efficiency are in fact justified by these barriers: consumers are not given proper options to rationalise their energy use. For instance, because appliance manufacturers, home-builders, landlords, do not pay the energy bills for the consumption of the equipment or houses that they put on the market, they will not invest in energy efficiency as much as consumers themselves would. Difficulty in securing finance or long-payback periods may also discourage consumers from investing in energy efficiency. Such market failures result in overspending on energy – a problem which will be exacerbated as energy prices increasingly reflect the cost of CO<sub>2</sub> emissions.

### Breaking the barriers to energy efficiency – the IEA 25 concrete recommendations

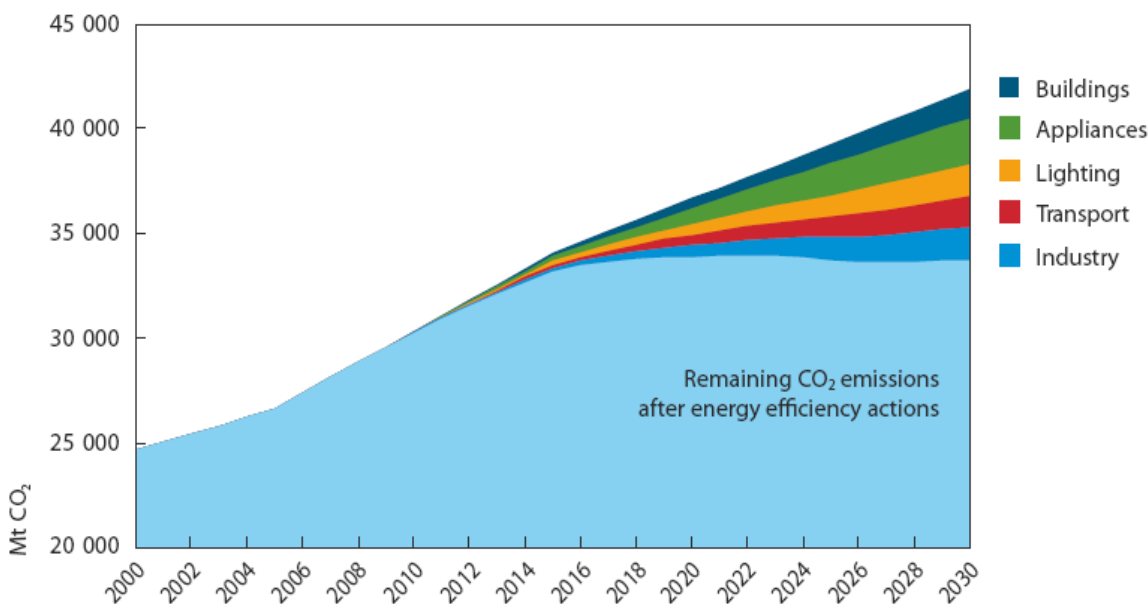
The IEA recommends that leaders adopt and urgently implement its package of measures to significantly enhance energy efficiency. This package was developed under the Gleneagles G8 Plan of Action, which mandates the pursuit of a clean, clever and competitive energy future.

All of the IEA recommendations in this package meet strict criteria. A recommendation is justified if it:

- Is likely to save a large amount of energy at low cost.
- Addresses existing market imperfections or barriers.
- Addresses a significant gap in existing policy.
- Is supported by a degree of international consensus.

The IEA recommended policy measures to the G8 Summits in 2006, 2007 and 2008. The consolidated set of recommendations from these summits covers 25 fields of action across seven priority areas: cross-sectoral activity; buildings; appliances; lighting; transport; industry and power utilities. If implemented, these policies could reduce global CO<sub>2</sub> emissions by some 8.2 GtCO<sub>2</sub>/year by 2030.

**Global CO<sub>2</sub> savings from IEA 25 concrete recommendations**



[www.iea.org/textbase/papers/2008/cd\\_energy\\_efficiency\\_policy/index\\_EnergyEfficiencyPolicy\\_2008.pdf](http://www.iea.org/textbase/papers/2008/cd_energy_efficiency_policy/index_EnergyEfficiencyPolicy_2008.pdf)

Energy efficiency policies are critical for providing the right incentives for all stakeholders in the energy end-use chain, and to ensure rational, economic energy use in light of current and expected energy prices.

The need to ensure a rational use of energy has been guiding the work of the IEA towards the 25 concrete recommendations on energy efficiency policy that were proposed as part of the G8 Gleneagles Plan of Action and backed by G8 leaders in Toyako, Japan in 2008. Governments have an essential role here in fostering change towards more efficient practices, including through financial support where high capital costs block investments in otherwise economic choices.

### Anticipating future technology needs

If such barriers to energy efficiency were duly addressed, would CO<sub>2</sub> prices then be sufficient?

The pricing mechanisms as we know them today hit another constraint: the lack of long-term visibility. Existing emissions trading markets cover either too small a share of global emissions, or too short a timeframe. It is the hope that a Copenhagen agreement would change this, but there may be a long delay between such agreement and a truly global carbon market with a price signal going out to 2020 and beyond – when new technologies need to come online. Several governments have hence decided to intervene to support energy technologies that are viewed as critical to address climate change, yet are far from competitive even where a CO<sub>2</sub> price applies to the energy sector (*e.g.* in the European Union, with the EU emissions trading system, in operation since 2005). An IEA paper provided to the G8 Environment Ministers at their meeting in Siracusa lays out clearly the technology development and deployment challenges to achieve global climate stabilisation.<sup>2</sup>

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<sup>2</sup> IEA (2009), “Ensuring Green Growth in a Time of Economic Crisis: The Role of Energy Technology”.

Feed-in tariffs, fiscal instruments, subsidies and green certificates systems have been established to encourage the deployment of renewable energy technologies at various stages of maturity. These reflect both the lack of a clearly identified CO<sub>2</sub> price path for the next three decades, and other policy priorities (energy security and diversification, local pollution). For technologies at less advanced stage of development,<sup>3</sup> a huge effort of RD&D is needed. However, public energy RD&D spending today, at some USD 10-11 billion per year, is in real terms about half its level 25 years ago.

Today's economic crisis may make this a more urgent area of attention for energy policy makers. The current credit shortage is putting many clean technology developers at risk of losing production capacity and know-how – there is hard evidence of a sharp fall in clean energy investments over the past few quarters.<sup>4</sup> In recent years, most of these activities have grown thanks to public support to market deployment, with a clear view on a long-term need; as far as climate change is concerned, the view has not changed, yet support is no longer adequate in some regions. Policies must be adjusted quickly to ensure the sustainability of these activities. Public-private partnerships can also be envisioned to play that role. It is also legitimate to ask if some international policy cooperation could achieve faster progress in this area through economies of scale and learning-by-doing.

Both energy efficiency and energy RD&D are areas under the responsibility of energy ministries, or in which energy ministries' voice is deemed legitimate. In both areas, the long-term response to climate change provides clear guidance to the energy sector in the near term.

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<sup>3</sup> *E.g.* the research and development stage for ultra-high efficiency photovoltaics or generation IV nuclear, and the demonstration stage for CCS, offshore wind, and concentrated solar power.

<sup>4</sup> The consultancy Emerging Energy Research expects a worldwide increase in wind capacity of 14 % in 2009, less than half the annual growth booked in the recent past. New Energy Finance reported recently on a 44% fall in clean energy investments in Q1 2009 compared to Q4 2008.

## CO<sub>2</sub> pricing: lessons for the energy sector

We now turn to what is both an essential driving force of CO<sub>2</sub> emission reductions, and an important element of the international policy debate: CO<sub>2</sub> pricing through emissions trading mechanisms.

The pricing of CO<sub>2</sub> and other GHG emissions through the carbon market emerged from the so-called flexibility mechanisms of the Kyoto Protocol, boosted later by the creation of the EU-wide emissions trading system (EU ETS). Other countries and jurisdictions are considering such trading mechanisms to cut greenhouse gases. If linked, these systems could provide the backbone of a global carbon market.

The Kyoto Protocol mechanisms and the EU ETS have triggered important finance flows, including towards developing countries via the Clean Development Mechanism (CDM). In 2007 the value of the EU ETS allowance market was estimated to about USD 50 billion, while the primary market for CDM certified emission reductions was estimated at USD 7.4 billion – a strong increase compared to the previous year. The recent fall in prices of EU allowances and CDM emission reductions could imply a slower growth in these markets going forward.<sup>5</sup>

The trading mechanisms and the ensuing international carbon markets have achieved two important goals:

- They have put climate change policy on the radar of private sector operators, including power generation and heavy industry. The experience of the EU ETS has been scrutinised by many energy sector decision makers worldwide.
- The trading mechanisms put a price tag on international action to cut GHG emissions.

<sup>5</sup> World Bank (May 2008), *State and Trends of the Carbon Market 2008*.

While it is too early to draw full lessons from the existing mechanisms, some important points emerge, especially from the EU ETS:

- Emissions trading systems are meant to send a price signal through the economic system, to deliver least-cost reductions overall. They are hence bound to increase prices of carbon-intensive goods and services subject to the cap-and-trade system, *e.g.* electricity. This price signal has distributive implications for other sectors of the economy that must be taken into account. This reinforces the need to diffuse more energy efficiency choices among end-users that are faced with these price increases.
- Power generation and heavy industry operate typically on long-lived physical capital. While some short-term flexibility exists, especially in power where less CO<sub>2</sub>-intensive plants can operate longer hours with a proper incentive, more significant abatement should occur as capital turns over, provided that future emission goals are clear.
- Long-term visibility is essential to an effective response to the price signal. In the face of uncertainty, investors will delay action. This will raise the cost of achieving emission reductions. In designing new systems, policy makers must seek to provide as much visibility as possible.
- The carbon market has revealed some unexpectedly large mitigation potentials (playing its role as a driver for innovation and detection of least-cost GHG reduction alternatives). However, questions are raised on the real nature of some reductions certified under the Clean Development Mechanism, as well as on its ability to steer mitigation activities to least-cost options across all sectors (see Section 4).
- Current carbon prices are too low to sustain the diffusion of more advanced technology solutions here and now (CCS, most renewables – see above discussion).
- Emissions trading systems create significant rents, which governments can collect through the auctioning of emission allowances.

- Co-ordination issues, including competitive distortions, loom large whenever the constraint on emissions – materialised by the cap – is restricted to some sectors and countries, therefore enhancing the competitive edge of those outside.

The negotiations leading to Copenhagen are building on this experience, with proposals on the table to expand the reach of the carbon market. Experience to date suggests that the large installations of some energy-sector and energy-using facilities make them likely candidates for such trading mechanisms. These could also help mobilise finance in sectors where urgent action is needed, setting aside the question of “burden sharing”, which should be determined through political negotiations. Trading mechanisms have also been attractive for this reason: the economic efficiency element is independent from the respective emission objectives of sources in the system.

Energy Ministers could consider the role of CO<sub>2</sub> pricing mechanisms such as emissions trading as an instrument to guide investment in low-carbon production choices, drawing on lessons from the Clean Development Mechanism in the energy sector.

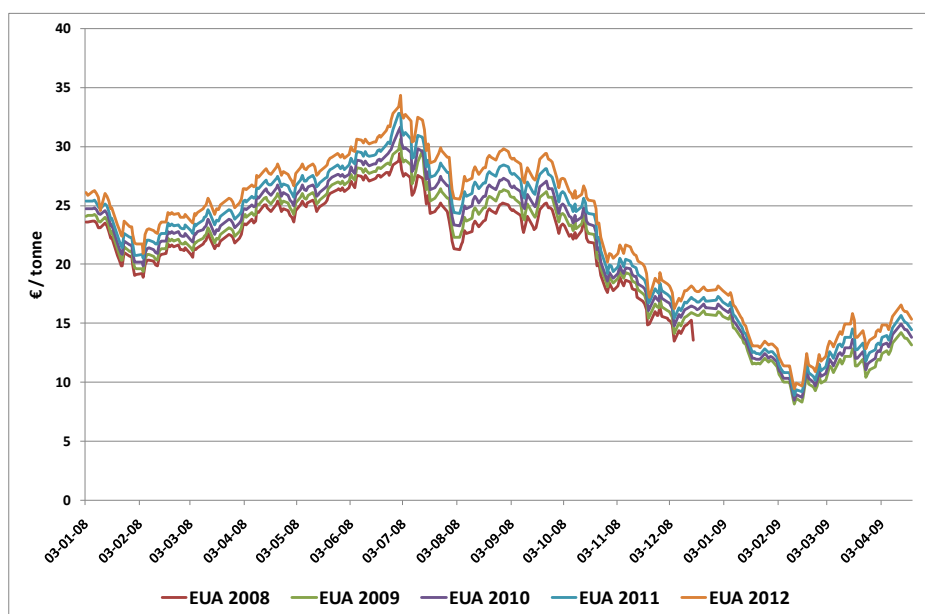
#### **Recent developments under the EU emissions trading system**

The EU ETS was initiated in 2005, for a pilot phase lasting until 2007. Emissions trading consistent with the Kyoto Protocol started in earnest in 2008. Between July 2008 and February 2009, prices collapsed by 70%, to an all-time low of about EUR 8/tCO<sub>2</sub>. This fall reflects the severe economic downturn, which significantly reduced EU industrial output, the direct emissions from these sectors as well as electricity demand and consequently CO<sub>2</sub> emissions under the ETS. Emissions data for 2008 indicate that a shift in the fuel mix in the power-generation sector away from coal in certain markets contributed to the surplus on the market (Deutsche Bank, *The Long and the Short of It: Power Sector Key to EUA & CER Prices*, 2009).

Prices have since bounced back and are now around EUR 14/t. Hedging by utilities for the year 2009, and more recently the involvement of financial participants in the market explain this increase. The upward movement may not endure, however; economic recovery is not yet in sight. Experts expect a small surplus in allowances for phase 2 (2008-2012) as a whole.

## Recent developments under the EU emissions trading system (*continued*)

### EU allowance prices variations (2008-april 2009) for various vintages



Source: [www.PointCarbon.com](http://www.PointCarbon.com) consulted on 28 April 2009.

Phase 3 (2013-2020) is projected to be significantly “short” – *i.e.* with emission trends projected today above the overall cap agreed for that period. This would imply steadily rising carbon prices in this period. In December 2008, the European Council and the European Parliament agreed on the climate change and energy package, detailing how the EU would reduce its GHG emissions by 20% by 2020. Essential in this package are amendments to the EU ETS, for the period starting in 2013. An EU-wide cap was adopted for all sectors covered, aiming for a 21% reduction by 2020 from 2005. Allocation rules were harmonised, with a focus on auctioning, and system flexibility was ensured by enabling banking and clarifying the use of international offsets.

### *The diversity of starting points*

The energy sector – from supply to demand – offers quite a diverse picture when considered globally. Some countries have adopted regulatory structures that allow a full-cost pricing of energy, including some environmental externalities. Others still subsidise certain energy uses as a social measure. The notion of CO<sub>2</sub> pricing would be at odds with such policy practices – and countries should strive to remove such subsidies when they exist. Yet the

urgency of action to curb global CO<sub>2</sub> emissions demands that energy officials consider what measures they can take in the near term, within existing policy environments, as broad policy reform will not happen overnight.

The example of IEA countries and electricity market shows that end-consumers are not always exposed to the full cost of power generation, which could greatly undermine efforts to introduce more energy efficient practices, as well as artificially lower the CO<sub>2</sub> price signal.

### **Regulatory reform in electricity markets**

Regulatory reform and the introduction of competition in the electricity market are pursued by all IEA member countries to some extent, as well as by an increasing number of non-OECD economies, including Russia, China and India. The pace and ambition has been very different and great scepticism has delayed and even reversed the process in several jurisdictions.

Competition has been allowed to develop with considerable success in a number of markets; Australia, the Nordic countries, the United Kingdom, New Zealand, Texas, the North Eastern region of the United States and Alberta in Canada are all robust markets, with relatively effective competition.

Despite the trend towards competitive electricity markets, there remain a significant number of OECD countries (and regions within larger countries, notably the United States) where electricity markets remain regulated. Great skepticism still prevails towards liberalisation, particularly in parts of North America, Japan, Korea and in some European countries. In such cases, electricity prices may still be fixed by the action of regulatory agencies, in order to “protect” customers and/or to allow utilities a fair return on investments made in the electricity supply system.

To ensure that all market players – from generation to distribution – have the right incentives to act, customers ought to be faced with the real costs of generating and transporting electricity under any specific circumstances. Cost-reflective prices facilitate informed and efficient consumption choices, they encourage behavior changes and are thus a crucial component of effective energy efficiency policy measures.

Retail market reform has an important contribution to make in this context, by offering choices and in so doing creating incentives for efficient (and least cost) end use, with implications for more productive investment (in terms of energy security), and energy efficient outcomes (with benefits for environmental sustainability and energy security).

Recent international developments (*e.g.* the creation of an international partnership for energy efficiency co-operation, IPEEC) show countries' interest to share best practice in policies aimed at solving their current energy issues. Of course, any reflection on best policy practice should not be conducted without due respect to countries' starting points. Regulatory structures differ, among industrialised and emerging countries alike. Market instruments work best in market environments; where market forces are not at play, alternative measures may be needed in the near term.

Two questions can be raised in this area:

- What are the most appropriate policy portfolios in such diverse regulatory settings, and what is needed domestically to deploy them, especially in developing countries?
- Further, can some of the policy interventions required for a transition to a low-carbon energy system also facilitate a move towards more sustainable regulatory systems? Although this last point requires in-depth analysis, it seems like the promotion of energy efficiency, by lowering final consumers' exposure to energy price, would facilitate a shift to more cost-reflective energy supply – and curb CO<sub>2</sub> emissions at the same time.

The IEA would be well placed to propose pragmatic answers taking full account of the other responsibilities of energy ministries, *i.e.* energy security, and provision of energy services at lowest possible cost.

Another issue comes from the lead-time for the development of market-based solutions as a means to send a CO<sub>2</sub> signal to energy investment. For countries that contemplate such options in the medium run, it would be useful to identify measures to facilitate such transition.

### ***Co-ordination: issues and opportunities***

We have alluded to some co-ordination issues in the above – *e.g.* competitiveness concerns. Energy Ministers may wish to reflect on some issues raised by climate policies and how solutions may be found in co-ordinating

efforts and discussions. Three dimensions of co-ordination are at play in a global energy sector response to climate change: international, domestic and sectoral.

### International aspects

#### Energy efficiency

Energy efficiency policies often rely on energy performance standards which, while applied domestically, affect foreign equipment suppliers. It is customary, when introducing such standards, to discuss with these foreign suppliers to ensure the feasibility of the announced standards and enable them to prepare for policy changes ahead.

In the cases of some appliances, a few equipment suppliers account for an important share of the global market. There may be value in governments co-ordinating minimum energy performance or other standards in a way to provide a more effective signal to manufacturers and facilitate their transition through economies of scale, rather than have them adjust to different regional standards.

Could some degree of international co-ordination even facilitate, not slow down, the emergence of appropriate standards? Ministers might ask the IEA to revisit its 25 concrete recommendations to identify those that could benefit from some co-ordination; IPEEC could also be a forum for such analysis and discussion.

#### CO<sub>2</sub> prices

Extending the reach of the carbon price to more economies and sectors is seen as a needed evolution in order to lower the cost of global emission reductions. Whether and how various domestic emission trading systems can and should be linked is not primarily an issue for energy ministries. However, as these systems would apply to the energy sector, Energy Ministers may reflect on their design to ensure their effectiveness in guiding investment decisions for achieving climate and other objectives, such as securing an adequate supply of energy.

This question is especially important in a sector like power generation – a critical component to an effective global response to climate change, and one where urgent action is needed to avoid locking-in CO<sub>2</sub>-intensive technologies. Should energy ministries be further engaged on how possible mechanisms and international efforts should be geared to best respond to the reality that this sector is also critical to the health of many other sectors in a modern economy?

### Domestic policy integration

Energy ministers rarely are involved in the regulation of end-use sectors, including those that are directly or indirectly (through their electricity use, for instance) responsible for a large share of emissions: industry, buildings, transport.

This means that other parts of governments must be actively engaged in improving the efficiency of the end-uses for which they are responsible. As we indicated earlier (Section 2), a supply-side response, the remit of Energy Ministers, will prove economically and financially unsustainable without end-use efficiency improvements. Whenever appropriate, Energy Ministers must call on their government colleagues to undertake appropriate actions in key energy consuming sectors – public private partnerships (with manufacturers and/or financial institutions) is another area of possible fruitful cooperation.

#### **Public-private partnership for energy efficiency improvements**

Public-private partnerships could also play an important role in energy efficiency. An example of a successful partnership is the Flat-35 developed in Japan; it illustrates the principle of risk-sharing agreements: the government guarantees a fixed interest rate in its loans to financial institutions, which in turn provide a fixed and reduced rate of interest to their customers in exchange for an energy consumption reduction certificate.

### Sectoral co-ordination

The unilateral introduction of CO<sub>2</sub> costs has raised competitiveness concerns among energy-intensive, trade-exposed industries that must compete with companies from countries that do not undertake similar efforts to reduce their

emissions. This issue looms large for energy-intensive sectors like aluminium smelting, iron and steel, cement or pulp and paper, where there is a concern about emissions being relocated outside the constrained regions.

Among the solutions discussed in policy circles, we find, at one end of the spectrum border tax adjustments, and at the other end, a global carbon market with a similar carbon price signal for all players in a given market. The question of international competitiveness and the effect of climate policy on this is highly sensitive, and hampers domestic efforts in industrialised countries in particular. This has prompted certain sectors and governments to reflect on how to co-ordinate action, while respecting different starting points, in the context of yet-to-be-defined sectoral agreements. In light of the importance of these sectors as end-users, this is a discussion in which Energy Ministers should take part. Sharing information on ongoing efforts – including on energy efficiency and energy management – among an extended group of countries would be a useful step to avoid harmful trade frictions that could make the formulation of sound climate policy even more difficult.

In this regard, it is worth noting incipient efforts to start homogenising the measure of energy and CO<sub>2</sub> performance in key industry sectors (*e.g.*, IEA and the International Organisation of Standardisation, ISO, have started consultations in this area) and other discussions in international industry federations.

Energy Ministers should reflect on possible collective actions along all three dimensions presented here. Another area, technology development, seems to offer much scope for international co-operation.

### *International technology co-operation*

Research and development of climate-friendly technologies – on the supply and demand side – is central to an effective and timely response to climate change. However, the vast number of sources of GHG emissions makes the full range of

needed technology development well beyond the capacity of most individual countries or companies. The need for concerted effort is clear.<sup>6</sup>

International energy technology RD&D co-operation is needed to meet this challenge. For the moment much of the necessary RD&D investment is likely to be led by governments, because most technologies are at the pre-commercialisation stage.<sup>7</sup> This is not always the case, however. In order to achieve the necessary GHG emissions reductions from Carbon Capture and Storage (CCS) – one of the most promising technologies – in an appropriate time frame, there is a need for increased international collaboration and information sharing in CCS demonstration,<sup>8</sup> as well as additional R&D on CO<sub>2</sub> capture, particularly in industry (non-power) and retrofit applications. Here, industry will have a vital role to play in providing expertise and co-financing. How to best articulate public and private resources in RD&D appears to be a critical question in managing our energy systems transition.

There are intellectual property (IP) and competition issues that will need to be addressed. The IEA currently provides a platform for government agencies, companies and academic institutions from IEA member and non-member countries to work together to achieve common technology goals. The so-called IEA Implementing Agreements have addressed some of the IP questions. They could serve as a model for establishing an international partnership on low-carbon energy technology development, or be reviewed to draw lessons on how IP and competition issues have been addressed in the past.

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<sup>6</sup> See IEA (2009), “Ensuring Green Growth in a Time of Economic Crisis: The Role of Energy Technology”.

<sup>7</sup> It is noteworthy that in the iron and steel sector, a very competitive activity globally, companies have grouped together to undertake R&D on breakthrough low-CO<sub>2</sub> technologies, under the auspices of the World Steel Association.

<sup>8</sup> The Australian Government launched recently a Global Carbon Capture and Storage Institute that aims at facilitating cooperation on demonstration projects, towards the G8 goal of 20 fully-integrated industrial-scale installations by 2020.

### **Technology co-operation focus: The IEA Greenhouse Gas R&D Programme**

The IEA Greenhouse Gas R&D Programme (IEA GHG), established in 1991, is an international collaborative research programme (Implementing Agreement) under the auspices of the International Energy Agency. IEA GHG focuses on studying technologies to reduce greenhouse gas emissions – including CO<sub>2</sub> capture and storage. The Programme aims to provide its members with informed information on the role that technology can play in reducing greenhouse gas emissions. The Programme has three main activities:

- Evaluation of technologies aimed at reducing greenhouse gas emissions.
- Promotion and dissemination of results and data from its evaluation studies.
- Facilitating practical research, development and demonstration activities (RD&D).

The IEA GHG Programme's activities cover all the main anthropogenic greenhouse gases (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O and High GWP gases). IEA GHG work currently remains focused on ways to control and reduce emissions of CO<sub>2</sub>, which is the principal greenhouse gas.

There are currently 16 member countries, 2 non-member countries, 19 multi-national industrial sponsors, the EC and OPEC participating in the Programme. Each member pays into a common research fund and has a seat on the Programme's Governing Board, or Executive Committee, which meets twice yearly.

One of the strategic objectives of IEA GHG is to assist in moving technologies towards application. One way of doing this is by encouraging practical development and demonstration (RD&D) projects. Though the IEA GHG does not fund practical RD&D projects, it can participate in these activities and in so doing gain an insight into the results obtained and feed this information back to its members and into its technical evaluation activities.

*Source: [www.ieagreen.org.uk](http://www.ieagreen.org.uk)*

There is also a need to draw a critical path for the development of key technologies to lower CO<sub>2</sub> emissions, from R&D to demonstration and full commercialisation. To this end, the IEA has initiated technology roadmaps with the goals of accelerating the overall RD&D process and advancing technology

diffusion globally. This creates a formal process for technology collaboration that can deliver an earlier uptake of the specific technology in the marketplace.<sup>9</sup>

An ambitious emissions target coming out of Copenhagen would set the stage for an accelerated global market for clean, low-carbon technologies. There is an urgent need to encourage international co-operation towards more effective technology research and development, to the benefit of all involved, with the possibility of creating a competitive environment as technology development nears commercialisation.

#### **4. How a Copenhagen Agreement can support, not hamper the energy revolution**

There may be a tendency in the climate policy community to avoid thinking about how its decisions will affect, in detail, the development of the myriad of economic activities that climate policy must re-orient. And in fact, the resources of negotiators at the UNFCCC, especially time, are limited and cannot accommodate the complexity of all sectors and activities in the run up to the Copenhagen negotiations.

The energy ministries worldwide must take the measure of their sector's responsibility in solving climate change, and send a clear message on how the international climate policy framework could help, not hamper, their development towards a low-carbon path.

The energy sector is at a turning point, partly because of the current economic crisis,<sup>10</sup> but also because it is on the verge of major new capital investment to replace old plants. Under a business-as-usual scenario, some 4530 GW of new power generation capacity would need to be installed to meet projected demand

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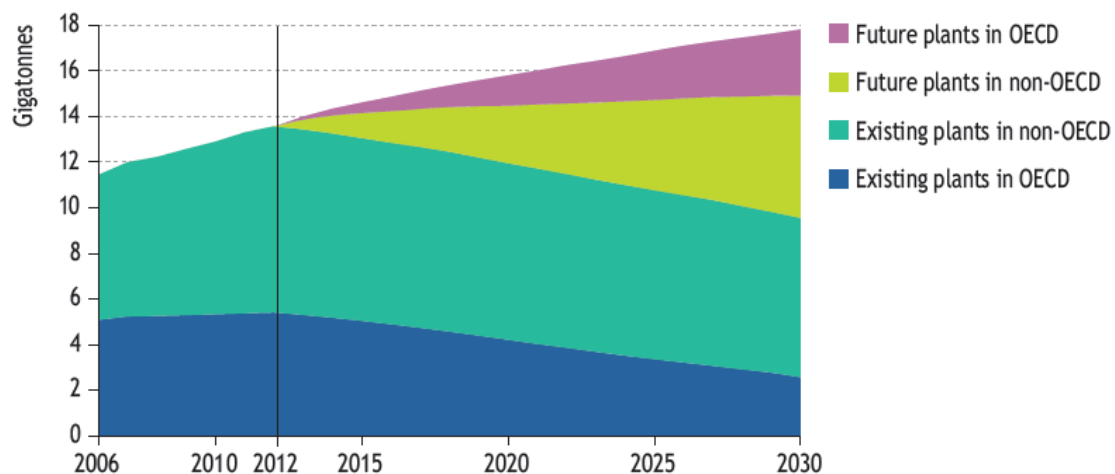
<sup>9</sup> The IEA and the Cement Sustainability Initiative of the World Business Council on Sustainable Development have started to work on a technology road-map towards low-CO<sub>2</sub> cement manufacturing.

<sup>10</sup> See other IEA paper: "The Impact of Financial and Economic Crisis on Global Energy Investment".

between now and 2030, of which about 1690 GW before 2015 – equivalent to twice the existing capacity of EU countries (Figure 5). The coming investment cycle of the electricity sector in OECD countries is quite unique in its magnitude, with an important share of its capital stock beyond the 30-year lifetime. Not acting now to guide this massive investment towards the cleanest technology in CO<sub>2</sub> terms will lock-in capital stocks that are incompatible with an adequate response to climate change.

The fast growth in electricity demand in emerging countries exposes these countries to an even more daunting risk of carbon lock-in. The World Bank projects that developing countries will install half or more of the long-lived energy capital stock over the next decade. The developing countries too must envision their own strategy for a sustainable energy system – the main components will resemble measures adopted in developed countries, and indeed open up areas for international cooperation, supporting policy as well as technological development.

**Figure 5: Energy-related CO<sub>2</sub> emissions from existing and future power plants in the Reference Scenario**



*Note:* Due to the timescales associated with planning and building new plants, all emissions up to 2012 are assumed to be locked-in.

*Source:* IEA analysis.

**Key message:** *The coming decades will see a significant renewal of the existing power generation capital stock in both OECD and non-OECD countries.*

### *How can these facts have any bearing on the Copenhagen outcome?*

First, Copenhagen should encourage the main elements of the energy response strategy to climate change laid out in Sections 2 and 3:

- An emphasis on energy efficiency. This area has met very limited success under the Kyoto Protocol's Clean Development mechanism. The international policy framework must encourage much more ambitious action on this front.
- Proper investment signals on fuel switching – including CO<sub>2</sub> pricing. The international carbon market, through the Clean Development Mechanism (CDM) is already contributing to the diffusion of low-CO<sub>2</sub> technologies in power generation, although much more is needed in this area.
- And new technology development.

Ironically, the current debate on how developed countries may support developing countries in the implementation of “nationally appropriate mitigation actions” (Bali Action Plan) carries a risk of hampering this strategy. As many energy efficiency measures appear to carry a negative economic cost (lower energy bills would offset investment outlays, often by a wide margin), they are sometimes ruled out as measures requiring support. This completely ignores both the capacity-building and the financing needs for such measures – domestic manufacturers may lack the needed skills, government procurements depend on the availability of adequate financing, etc. – however economically successful they may be down the line.

#### **What is CDM doing for energy efficiency?**

As of June 2008, roughly 15% of projects in the CDM pipeline were related to energy efficiency (UNEP Risø, June 2008). These projects were expected to deliver about 11% of the cumulative certified emission reductions (CERs) up to 2012. While the share of energy efficiency looks acceptable this category is also second in terms of rejected projects (27.3%). In addition, most energy efficiency projects focus on measures in industry. Demand-side energy efficiency projects outside of the industry sector lag behind, representing only 3% of the total number of projects.

### What is CDM doing for energy efficiency? (*continued*)

The barriers to energy demand side management in CDM is driven by a number of factors, like the small scale and scattered nature of demand-side projects, high upfront costs, difficulties and costs of monitoring, and lack of knowledge on best practice and public education and acceptance.

The introduction of programmatic CDM has addressed some of the issues by allowing greater variation and flexibility in timing and location of abatement activities which could unleash the great potential in energy demand-side management. The number of programmes approved to date, however, remains low. Nonetheless, difficulties remain, particularly the challenge of financing EE projects and the required measurement of emission reductions at each project activity, although some new methodologies are developed to overcome this problem.

A recent study estimated CDM energy efficiency projects to deliver emissions reductions of about 140 MtCO<sub>2</sub> by 2012 compared to a total delivery from CDM of around 1.3 GtCO<sub>2</sub>. A comparison with the non-OECD countries' annual emissions of more than 14 GtCO<sub>2</sub> in 2006 indicates that CDM falls woefully short in triggering the necessary transformation of the energy system – especially in terms of energy efficiency.

Some observers question whether CDM can evolve from its current project basis to a policy- or sectoral basis, to enhance the coverage of the carbon market and lower transaction costs, and increase the participation of developing countries in the global mitigation effort.

*Source: UNEP Risø Centre (June, 2008), Carbon Trust (March 2009), Global Carbon Mechanisms, Emerging Lessons and Implications; IEA (2008), World Energy Outlook 2008.*

A recent agreement between the World Bank and Mexico to support that country's National Climate Change Strategy is a hopeful sign that international finance can move beyond project-by-project support to achieve greenhouse gas reductions, and overcome barriers to more rational energy use.

This example shows how important it is for countries to identify their own strategy towards more secure and environmentally sustainable energy systems. Only then can any international co-operation be made effective, on a scale at par with the global challenge. Energy ministries should be engaged in the elaboration of these strategies, as they are at the heart of key policy priorities: energy security, economic performance, and environmental sustainability.



Second, the Copenhagen negotiation will also need to sort out how to best use the currently scarce resources for the international support of greenhouse gas mitigation policies. In addition to direct financing, the Bali Action Plan includes the use of carbon market mechanisms as a means to finance emission reductions.

One should nonetheless avoid jumping on policy solutions that are attractive because of their apparent simplicity. Current policy experience in energy efficiency shows that a market-based instrument may not be the only or even the most effective means of triggering change, depending on the stage of policy and regulatory development.

Solving the energy sector challenges of this century – security, access to resources, low-cost, and low CO<sub>2</sub> – will require primarily domestic answers. Time is, however, not on our side in this endeavor. The current financial/economic crisis will sooner or later give way to a recovery. For the energy sector, this recovery will trigger a major investment cycle. Allowing the next wave of energy investment to follow existing patterns may well be the greatest threat to an effective solution to global climate change. It would also likely lead to a failure to address the other goals of energy policy today: security of supply and the delivery of energy services at lowest possible cost.

For the energy sector, an ambitious international agreement on climate change must send a credible signal for action now. It should also encourage adequate support to countries that need it in sectors and activities that will, otherwise, hamper global progress.

### **World Bank loan to support Mexico's National Climate Change Strategy**

Mexico, the world's 13th biggest emitter of greenhouse gases (GHGs), has set a voluntary goal to reduce its carbon output by 50% by 2050. In May 2007, President Calderón announced Mexico's National Climate Change Strategy (NCCS), which will be implemented through a Special Programme on Climate Change.

The measures identified in the National Strategy with the largest emission reduction potential include energy efficiency standards and programmes, the conversion of power plants from oil to natural gas and efficiency improvements, and increasing the power generation from renewable energy sources.

As an example, the Government of Mexico intends to build one million new houses for low-income families per year, with the option of accessing a "green mortgages" mechanism whereby a family will be able to finance energy and water efficiency measures through its mortgage, and reimburse the incremental cost of these efficiency measures using their savings over time in electricity and water expenditure.

A World Bank loan of USD 501 million was signed to support the government's efforts under its National Climate Change Strategy to mainstream climate change considerations in public policy. An interesting feature of this loan is that it is financing policies rather than the traditional project financing. This is the first World Bank Development Policy Loan to focus exclusively on climate change policies.