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Mr. Chairman, and Members of the Committee, I am grateful for the opportunity to come before you today to discuss the views of the International Energy Agency (IEA) on recent oil market developments and prospects for 2012. I hope that my testimony will help to inform the important work of this committee as it begins crafting policies in the new year.

A retired American diplomat with experience on Middle Eastern and energy issues, I have served as Deputy Executive Director of the International Energy Agency since October, 2008. The IEA is an intergovernmental organization that acts as an advisor to 28 member countries, including the United States, in their effort to ensure reliable, affordable and clean supplies of energy for their citizens. Founded during the 1973-74 oil crisis, the central role of the IEA was and remains to co-ordinate response measures in times of oil supply emergencies. As energy markets have evolved, however, so has the IEA. Its mandate today also incorporates work on market reform, energy-technology collaboration, climate-change policies and outreach to the rest of the world, especially major consumers and producers of energy including China, India, Russia and OPEC countries.

I will use my time this morning to focus on the oil market, which has become a focus of attention once again amid high prices and elevated tensions in the North Africa and Middle East (MENA) region. I have also attached a written appendix, covering market movements for other sources of energy, and the long term outlook for global energy.

Oil market developments in 2011

Having steadily risen from a low point of below \$40/bbl in February 2009 to a high of around \$120/bbl last spring, crude oil prices have shown a degree of stability ever since. A \$100-\$120/bbl envelope looks to have become established, with prices oscillating within that range. Of course, as we have noted before, oil prices at these elevated levels still pose significant problems for import-dependent countries, especially those which subsidise end-user prices heavily. In this regard, we estimate that the proportion of total world GDP dedicated to oil expenditures

was back up above 5% for 2011, as it was during the economic slump of 2008 and during several previous periods of severe economic downturn. High oil prices may or may not have caused these episodes of economic difficulty, but they certainly did not help.

Many have pointed to the apparent paradox of prices at or above \$100/bbl when the world apparently faces the prospect of economic slow-down and therefore diminishing levels of likely oil demand growth. The invisible hand of market speculators is often referred to as having held oil prices artificially high. And yet detailed research has so far failed to identify a smoking gun in the commodities derivatives markets:

- there is no clear link between futures market activity and oil price moves;
- market volatility has declined from 2008 highs and is not out of line with historical levels or compared with that in other commodity markets;
- evidence is slim surrounding so-called 'excessive speculation';
- and indeed, both price levels and volatility for exchange-traded commodities have been less exaggerated than they have for their non-exchange-traded counterparts.

This is not to say that interactions between physical commodity and financial markets have not increased: they have. And short term price moves at an intra-day or intra-week level may well be amplified by what is happening in the derivatives markets. But there are more obvious factors that appear to have held prices high in 2011 – the relationship between demand and supply, and a steady tightening in OECD inventory levels that has resulted from a marked imbalance between global supply and demand since early-2010.

In 2010, world oil demand grew by a near-record 2.7 mb/d as the global economy rebounded from recession. Growth was particularly strong in the non-OECD economies, which accounted for 80% of the increase. And supply was not able to keep up, rising by less than 2 mb/d. So we saw an implied global stock draw of 0.8 mb/d in 2010.

The picture however changed subtly in 2011: In fact, global oil stocks still declined by 0.5 mb/d, but this time due to severe shortfalls from the supply side, which was unable to keep up even with much more moderate oil demand growth

of only 0.7 mb/d. Firstly, a spate of unscheduled disruptions wiped-out expected growth in non-OPEC supply which, in the event, barely held steady in 2011 at 52.7 mb/d. The North Sea, Canada, Brazil, Argentina, Malaysia and China all saw a combination of technical and industrial-related production shortfalls, while political unrest sharply curbed supplies from Yemen, Syria and Sudan. All these events however pale into insignificance compared with the key oil market development of 2011 – the loss of Libyan supply. This, you will recall, was an event that prompted the IEA in June of 2011 to call for a release of 60 million barrels of strategic inventories, to act as a bridge to higher supplies from other OPEC producers, to add physical liquidity to the market (notably in the form of light-sweet crude oil), and to try to prevent a potentially abrupt drawdown in OECD inventories during the second half of 2011 if other OPEC supplies did not increase to help offset the loss from Libya.

The agency today feels vindicated. The release of stocks, particularly from the US SPR, provided short term liquidity in light-sweet crude, and allowed the re-routing of export cargoes otherwise headed to North America, back towards European refiners who most keenly felt the loss of Libyan feedstocks. To date, we estimate the Libyan crisis has cost the market 425 million barrels of lost supply, even though production has begun to recover in recent months. While other OPEC members, notably Saudi Arabia, did step in during the summer to raise production, so far their efforts and the IEA stock release combined have only managed to fill around 75% of the gap left by reduced Libyan volumes. OECD company inventories have continued to tighten, but to a much lesser degree than risked being the case back in June. We think the coordinated action by IEA members played at least a partial role in helping avoid a damaging price spike during summer 2011. Nonetheless, operating inventories, particularly for crude oil in Europe, starved of light-sweet Libyan supplies for much of 2011, stand well below the five year average.

In short, market fundamentals have continued to tighten in 2011, yet prices have been stabilized by the countervailing influence of a potentially weakening global economy on the one hand, and geopolitical instability which is raising questions about supplies from the Middle East Gulf region on the other.

How long can this apparent stability last?

We note in the latest issue of the *Oil Market Report*, our monthly assessment of recent market fundamentals and short term outlook, that this relative price calm could be fragile. While we habitually avoid making specific price prognoses, much depends on whether economic malaise or supply-side problems predominate in the next year.

Our 'base case' view for 2012 envisages global oil demand growth of just over 1 mb/d. We think that non-OPEC oil supply and OPEC gas liquids (which are not subject to OPEC's production management system) will rebound by as much as 1.6 mb/d combined, leaving OPEC producers an opportunity to trim their collective crude supply by around half a million b/d to 30 mb/d and still maintain inventory levels roughly where they are now.

But of course huge uncertainty surrounds the ability of non-OPEC supply to rebound from the awful year it suffered in 2011. We and many of our analytical peers believe it can, continuing the trend of reinvigorated growth that was seen in 2009 and 2010. Higher oil prices have seen upstream spending increase and have brought a number of tentative expansion projects back on track. And not least, favourable oil-gas price differentials and the application of the technologies deployed in the US's shale gas revolution to light tight oil (LTO) have transformed US upstream oil prospects. LTO production alone could grow by 250 kb/d to reach 870 kb/d in 2012. Consensus expectations for non-OPEC growth in 2011 range from around 0.5-1.0 mb/d, with our own at the upper end of that range. Either way, supply from the Americas (not only the US, but also Canadian oil sands and Brazilian deepwater output) generate much of the expected growth, with Russia, biofuels and natural gas liquids also expected to make significant contributions.

There may indeed be downside risks to non-OPEC supply compared with our base case, particularly if higher spending cannot offset the type of disruptions seen in 2011. But two years in a row dogged by that level of outages would be most unusual. Equally likely, oil demand might also fall short. Recently announced revisions to the IMF World Economic Outlook posit global GDP growth for 2012 at 3.3%, compared to previous levels near 3.9%. All other things being equal, this could feed through to reduce our own expectation for oil demand in 2012, although late-winter weather and the degree to which non-OECD economies continue to buck the weakening growth trend of the OECD could complicate matters. Arguably, these downside risks for demand and non-OPEC supply might

just balance each other out. So OPEC may well try to navigate through 2012 producing at or around 30 mb/d, slightly lower than the 30.9 mb/d we think they supplied to the market in December, and implying underlying spare capacity of between 3-4 mb/d.

Turning to the Iranian Question

This estimate of spare capacity may be brought into sharper focus as another looming supply-side issue for 2012 unfolds, namely that of Iran. Leaving aside the geopolitical merits of measures designed to prevent Iran from attaining nuclear weapons capability, the recently announced US sanctions on entities having financial dealings with Iran, and the upcoming EU embargo on oil imports from Iran, will clearly affect the mix of crude oil supply available on a regional basis, even if absolute levels of global crude supply may be impacted to a lesser degree.

Estimated Jan-Sep 2011 Imports of Iranian Crude			
		% Total	
	2011 Oil	% Total	
	kb/d	Demand	Exports
IEA			
Belgium	36	5%	1%
Czech Republic	5	3%	0%
France	58	3%	2%
Germany	15	1%	1%
Greece	103	30%	4%
Italy	185	13%	7%
Japan	327	7%	13%
South Korea	228	10%	9%
Netherlands	19	2%	1%
Poland	3	1%	0%
Spain	161	12%	6%
Turkey	196	29%	8%
UK	11	1%	0%
IEA Pacific	555	8%	22%
IEA Europe	792	7%	31%
IEA Total	1347	7%	53%
Others			
China	550	6%	22%
India	310	9%	12%
Other Asia	240	3%	9%
Non-OECD Asia	1100	5%	44%
Total Asia	1655		65%
South Africa	80	14%	3%
Total	2527		100%

Source: IEA databases, Lloyds/Apex

Iran exports around 2.5 mb/d of crude oil, with 65% of this going to Asia and some 30% into Europe (the bulk of this to refiners around the Mediterranean rim). A significant portion of the 1.3 mb/d of crude imported by IEA member countries is likely to be affected by at least one of these measures, even if refiners will have until June/July to source alternative barrels. The extent to which US sanctions are actually applied will depend on a Presidential determination in the spring, and the precise impact of the EU embargo has also yet to be fully assessed. But Mediterranean refiners, together with their IEA Pacific colleagues, will likely be looking

for incremental supplies from outside Iran between now and the measures' implementation in the summer. In terms of crude quality, buyers are likely to seek extra barrels from Saudi Arabia, Russia or Iraq to make up for lost sales from Iran. While Saudi Arabia has tried to reassure customers that existing and incremental requirements will continue to be met, analysts have raised questions over the extent of the Kingdom's spare capacity, the proportion of Arab Medium (a good substitute for the bulk of Iranian exports) within the Kingdom's spare capacity, and its logistical flexibility to re-orient exports in a westerly direction if European refiners in particular need extra volumes. Ultimately, we think refiners denied the ability to import Iranian oil will most likely find the extra barrels they need, albeit they may need to pay higher prices than might otherwise have been the case.

Conversely, there is a widespread expectation that Iran will try to retain or increase sales to non-OECD buyers, potentially making extra spot sales into Asia at discounted prices. The success or otherwise of the economic measures taken against Iran will therefore depend heavily on the response of China and India, which together already purchase around 860 kb/d of Iranian oil, or 34% of the country's crude exports.

Nor have the Iranian authorities been silent as these economic sanctions have been deployed. Of greatest concern for the oil market is the threat by Iran to impede traffic through the Strait of Hormuz (17 mb/d, equivalent to some 20% of global oil supplies) if an embargo is applied as well as its threat to retaliate against neighbouring producers if they try to boost exports. To a degree, such threats have already been priced into the market, while the likelihood of a prolonged stoppage for Hormuz transits is seen as being fairly low.

In conclusion

All of this suggests that those seeking a more tranquil 2012 oil market than was seen in 2011 may be disappointed. At the IEA we will continue our ongoing and detailed monitoring of oil market conditions and in particular the availability of alternative market supplies. So far there is no physical supply disruption underway. But as always the Agency will remain vigilant and it stands ready to act rapidly and decisively if a major disruption to oil supply occurs. Emergency oil stocks, as their name suggests, are for use only when the market's ability to efficiently reallocate supplies in a crisis is compromised. Ongoing investment in

new productive capacity, especially in diverse areas likely to be less susceptible to geopolitical risks, and a progressive improvement in energy and oil use efficiency provide longer term routes to greater supply security. But, if the mere availability of IEA strategic stocks helps calm otherwise jittery market nerves in 2012, so much the better.

Thank you Mr. Chairman.

Appendices:

1. Recent developments in gas, coal and power markets

Decoupling of world gas markets has reached a new level. In North America domestic production growth has accelerated. For the January – October period US gas production is up by 7-8% (40bcm), compared to growth rates between 2-3% in recent years. Abundant supply led to persistently low prices under \$3.00/Mbtu. So far, there is no sign of such low prices leading to a slowdown of production. This is most likely due to the financial benefits of natural gas liquids as well as the associated gas from light tight oil.

As a result of low gas prices, gas- fired electricity generation in the US has continuously increased its load factor at the expense of coal. Gas fired power generation in the US is likely to have exceeded 1000 Twh in 2011 for the first time in history, and gas is now 24% of US power generation, up from 21% in 2008. As a mirror image of expanding gas usage, coal-fired power generation in the US is down by 7% on a year on year basis, leading to declining coal demand. As the new IEA publication released in December 2011 (*Medium Term Coal Market Outlook*) emphasized, due to the competition with gas, US domestic coal demand, which is dominated by power generation is unlikely ever to return to its historical peak seen before the financial crisis.

Due to the continuously growing availability of cheap gas, there is an increasing interest in gas exports from the United States: the Sabine Pass project has signed export contracts for around 15 million tons of LNG supply for Western Europe (BG and Gas Natural) as well as India. The *Medium Term Gas Market Outlook*, which will be released in June 2012, will examine the prospects for US gas exports over the next five years in detail.

In a stark contrast to North America, international LNG markets have tightened. This is primarily due to increasing LNG demand in the Asia Pacific region, especially Japan. Due to safety reviews and regulatory checks affecting a

substantial part of Japanese nuclear capacity, Japanese nuclear production currently is running at less than one third of its pre-earthquake level. So far, Japan has managed to avoid blackouts by disciplined demand side management and increasing utilization of gas-fired electricity generation, leading to a substantial (10 million tons on an annualized basis) increase of its LNG imports. LNG spot prices in the Asia – Pacific region rose as well and quickly exceeded 16 USD/Mbtu; LNG tanker freight rates have doubled since last year. No major new LNG supply will be coming online in the next 3 years, so market tightness is likely to endure. More detailed IEA analysis of the structure of Asian LNG markets will be included in the upcoming Medium Term Gas Outlook

High oil prices feeding through oil indexed contracts for natural gas as well as the effect of Asia-Pacific demand on LNG markets have stabilized gas prices at a high level in Europe. High prices, economic weakness and expanding renewable production have led to falling gas demand there. This is also partly due to mild weather, but gas consumption in the April – September period was down by 7%, suggesting structural weakness. A major factor behind this is the electricity sector: OECD Europe power generation was down by 1.6% (Jan-Oct) due to economic weakness, and thermal power generation was down by 2.4%. The disproportionate impact on thermal power was due to renewables rather than nuclear: increasing French and UK nuclear production compensated for the German nuclear moratorium, leading to stable EU nuclear production.

Meanwhile, falling thermal generation cut the need for carbon credits, leading to a price collapse: the CO₂ price fell below 7 Euros/ton, compared to 2010's average of 14.3 Euros/ton. The combination of expensive gas and cheap CO₂ enhanced the competitiveness of coal in Europe: burning coal became considerably more profitable which pushed gas to the margin. As a result of low demand levels and plentiful excess conventional capacities, European power prices have remained low (hovering between 50-60 euro/Mwh) despite the German nuclear phase-out. Nonetheless, concerns persist that a combination of a colder winter and transmission congestion might lead to a tighter situation in certain regions.

Despite falling demand, EU gas imports were slightly up due to declining production and increasing stocks. Libyan gas production and exports are coming back online, and the political uncertainties in the MENA region have had no major impact so far on LNG supply.

Ramp up of non-conventional gas will likely be slow in both Europe and China in the context of heightened concerns over environmental and safety issues. To help address these concerns, the IEA will examine “*Golden Rules for the Golden Age of Gas*” in detail in a non conventional gas workshop in Warsaw in March. This workshop will feed into a chapter of the same name in the 2012 edition of IEA’s “*World Energy Outlook*”.

So far the slowdown in growth of the Chinese economy has not led to any measurable slowdown of electricity or coal demand. China still faces an electricity shortage and 90 GW coal-fired capacity is under construction. The *Medium Term Coal Market* report projects around 800 million tons coal demand increase in China till 2016. There is a large uncertainty over Chinese domestic production and consequently import needs, which could lead to market volatility. On the other hand, the increase of Indian coal import needs is almost certain as India struggles in vain to satisfy its growing demand with domestic mining. There is sufficient new coal production capacity coming to the market, but there are persistent bottlenecks in transport infrastructure.

2. The long-term outlook for global energy

The IEA’s *World Energy Outlook 2011 (WEO-2011)* identifies key medium- and long-term global energy trends based on scenario analysis. The report, released annually in November, contains detailed global projections for energy supply and demand through the year 2035. Each year, the *WEO* highlights a different region and fuel as well as other timely issues (in *WEO-2011*, special attention was devoted to Russia’s energy sector, coal markets, energy access and energy subsidies).

Background and assumptions

WEO-2011 analyses three scenarios and multiple case studies differentiated by their respective assumptions about future energy-related policies adopted by governments. The baseline for our analysis is the New Policies Scenario. Its policy assumptions take current policies as a starting point and then (cautiously) incorporate the broad policy commitments announced by countries around the world to deal with energy security, climate change, local pollution and other energy-related challenges. These commitments include targets for energy production and energy efficiency, phase-outs or additions of nuclear power, national pledges to reduce greenhouse-gas emissions and the elimination of wasteful fossil-fuel subsidies. For the United States, key assumptions in the New Policies Scenario include (1) a shadow price for carbon dioxide (CO₂) emission in the power sector, reaching \$35 per tonne CO₂ in 2035; (2) extended operating lifetimes for nuclear power stations; (3) continued financial support for renewable energy; and (4) more stringent heavy-duty vehicle efficiency standards. The policy assumptions in the New Policies Scenario differ from those in the EIA's Reference Case, which accounts for existing policies, and therefore the two sets of results are not directly comparable.

Economic growth, population growth and energy prices are other major assumptions taken in the *WEO-2011* New Policies Scenario. Worldwide, economic growth averages 3.5% per year and that the population expands by some 1.7 billion people between 2010 and 2035. In real terms, the IEA crude oil import price rises from \$78 to \$120 per barrel over the *Outlook* period; the North American natural gas import price rises from \$4.4 to \$8.6 per MBtu between 2010 and 2035, but is considerably lower than other regions given more abundant supplies; the OECD coal import price increases from \$99 to 110 per tonne. These price paths are not a forecast. Rather, they reflect our judgement of the prices that would be needed to encourage sufficient investment in supply to meet projected demand over the *Outlook* period. The New Policies Scenario assumes

limited CO₂ prices for some countries, with varying price levels, mechanisms and sectors affected.

All *WEO-2011* projections cited in this testimony, unless otherwise stated, are derived from the New Policies Scenario.

Key projections and trends in the WEO-2011

Global energy demand is projected to increase by one-third between today and 2035 as a result of economic growth and shifting demographic trends such as population growth and urbanisation. These trends are driven by non-OECD countries, which account for more than 90% of the increase in energy demand in the *Outlook* period. Given the interdependency of global energy markets, this underscores the critical importance of non-OECD energy policies in shaping our energy future.

Fossil fuels remain the dominant source of energy, however, while demand for fossil fuels continues to rise in absolute terms their share of global energy consumption declines from 81% in 2010 to 75% in 2035 as renewable energy technologies make further inroads. Renewables growth is concentrated in the power sector, where hydropower and wind are projected to account for half of new installed capacity. Natural gas is the only fossil fuel that we project to make up an increasing share of the energy mix.

Increasing demand for mobility in non-OECD countries boosts global liquids (oil and biofuels) demand to 104 million barrels per day (mb/d) in 2035, up from 88 mb/d in 2010. The total number of passenger cars worldwide will double, reaching almost 1.7 billion at the end of the *Outlook* period. The rise in liquids use comes despite impressive gains in vehicle efficiency, particularly in Europe and the United States.

On the supply side, oil companies increasingly turn to resources that are more difficult to extract and therefore costlier. Conventional crude oil in total oil supply declines slightly by the end of the *Outlook* period as natural gas liquids (18 mb/d in 2035) unconventional sources (10 mb/d) and biofuels (4 mb/d) make significant

contributions to meeting increased demand. Iraq, Saudi Arabia, Brazil, Kazakhstan and Canada account for the largest incremental gains in oil output. We calculate that 47 mb/d of gross capacity additions will be needed to replace declining production at maturing oil fields. This necessitates huge investments in upstream oil in the *Outlook* period.

With increasing dependence on a small number of oil-producing countries in the Middle East and North Africa (MENA), a shortfall in upstream investment there would have far-reaching implications for the global oil market. Such a shortfall may be prompted by higher perceived investment risks, deliberate policies to slow the development of production capacity or shifting public spending priorities. We find that, between 2011 and 2015, if upstream investment runs one-third lower in MENA countries than what is required in the New Policies Scenario (\$100 billion per year), oil prices could rise to \$150/barrel in the short-term.

The oil landscape changes positively for the United States over the next 25 years, with US oil imports shrinking to 6.2 mb/d in 2035 (lower than 1990 levels). This trend underlines the critical role of energy efficiency policies, as improved vehicle efficiency causes US oil demand to decline by 3.5 mb/d (or 20%). It also reflects the potential for expanding supply of US domestic crude oil, natural gas liquids and biofuels. US light tight oil production has shown increasing promise. Output from the Bakken, Eagle Ford and Niobrara plays alone may exceed 1.4 mb/d by 2020, with additional light tight oil resources that may yet be developed.

For natural gas, supply and demand factors indicate that the future is very bright. This conclusion echoes the main finding in our June 2011 special report, "*Are We Entering a Golden Age of Gas?*". The share of gas in the global energy mix rises to nearly surpass that of coal in 2035. About 80% of additional demand comes from non-OECD countries, including China, where a major expansion of gas use is supported by energy diversification policies.

In the United States, the combined application of horizontal drilling and well-stimulation techniques such as hydraulic fracturing has unlocked previously non-

commercial resources of unconventional gas (including shale gas, tight gas and coal-bed methane). As described above, this success has dramatically changed the global supply picture and has had positive implications for gas security. Unconventional gas, being more geographically distributed around the world than conventional resources, now accounts for half of the natural gas resource base. We project that it will account for one-fifth of global gas supply in 2035. However, this future hinges in part on the ability of governments and industry to deal successfully with the environmental concerns – air, water and land impacts – associated with unconventional gas production. The largest contributions for future gas supply growth come from Russia, China, Qatar, the United States and Australia. In our special focus on Russia, we note that it could save natural gas equivalent to its exports in 2010 if it could just increase its efficiency to levels of comparable OECD countries.

Over the last decade, coal has met nearly half of the increase in global energy demand. Going forward, coal use and its implications for energy security and the environment will depend largely on policy and technology choices. Furthermore, China and India, the two largest consumers of coal in 2035, will remain key actors in global coal markets. In our New Policies Scenario, we project continued strong growth in coal use in the next 10 years, and a levelling off thereafter as countries diversify and clean up their energy supply. In this scenario, global coal demand grows by 25% in 2035 relative to 2009. If instead we assume that current policies are maintained, global coal demand increases by 65% through 2035. We also find that deploying more efficient technologies could have a major impact on air emissions; if the average efficiency of all coal-fired power plants was raised by five percentage points in 2035 relative to the New Policies Scenario, power sector CO₂ emissions would be 8% lower (with local pollution benefits). While carbon capture and storage technologies might boost long-term prospects for coal use, economic and technical hurdles limit its deployment during the projection period in the New Policies Scenario.

Renewable energy experiences impressive growth during the *Outlook* period. The share of non-hydro renewables (primarily wind and solar) in power generation

rises from 3% in 2009 to 15% in 2035, while hydro maintains its share at 15%. Global biofuels supply triples. Cost reductions are making renewable energy technologies more competitive, but subsidies are expected to play an important role in accelerating their deployment and driving further cost reductions. When well-designed, subsidies to renewable energy can bring lasting economic and environmental gains. Even as unit subsidy costs fall, annual subsidies to non-hydro renewables and biofuels expand to \$250 billion in 2035 as deployment scales up. For comparison, global subsidies to fossil-fuel consumption are estimated at \$409 billion in 2010.

Nuclear energy production is projected to rise more than 70% through 2035, with growth concentrated in non-OECD countries. Despite the events at Fukushima Daiichi, our projection for nuclear power output is only slightly less than last year. However, to examine the possible implications of a major shift away from nuclear power we also analysed a 'Low Nuclear Case', which assumes that no new OECD reactors are built and that non-OECD countries add only half the capacity projected in our New Policies Scenario. We find that while there is some increased penetration by renewables, the gap is filled largely by coal and natural gas. This ultimately tightens markets and worsens emissions of CO₂ and local pollutants.

Finally, a few words on the projections in our 450 Scenario, which outlines an energy sector pathway for stabilising the atmospheric concentration of CO₂ emissions at 450 parts per million and targets limiting the global temperature increase to 2°C. This scenario, which the IEA has included in its *World Energy Outlooks* since 2008, is based on policies that lead us to a more sustainable future that addresses the threat of climate change. Without new policies we are on track for alarming increases in global average temperature: 3.5°C in the New Policies Scenario and 6°C or more in the Current Policies Scenario. The key message in the 450 Scenario is that we cannot afford to delay tackling climate change if it is to be achieved at reasonable cost. Nearly 80% of allowable CO₂ emissions up to 2035 are already locked in by existing power plants, buildings and factories. On current policies, this figure could reach 100% before the end of this decade. Moreover,

we estimate that for every \$1 of investment in the power sector avoided before 2020, an additional \$4.30 would need to be spent after 2020 to compensate for increased emissions.

Conclusion

Governments have a critical role in setting policy frameworks that engender a more sustainable energy future. The data, projections and analyses in the *World Energy Outlook* are intended to assist policymakers in that effort. The *WEO-2011* New Policies Scenario shows that recent global commitments added to existing policies can take us part of the way, but more must be done to achieve an energy future that balances economic growth, energy security and environmental stewardship.