



The Resources Trilemma between Efficiency, Social Justice and Security

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The following text is based on a speech by Jeroen van der Veer at the St.Gallen conference, 31 May 2007. In it, he discusses three hard truths that will cause some turbulence in the global energy system in the coming decades: accelerating energy demand, the difficulty of meeting that demand with “easy” conventional oil and gas, and rising CO₂ emissions as a consequence of increased coal use. While the three hard truths have a dynamic of their own, a cooperative world could mitigate some of the uncertainties through effective and stable regulatory frameworks. These measures should serve to enhance energy efficiency, promote alternative energy, and promote the capture and storage of CO₂.

Scenarios

Let me thank the organisers for the invitation to speak to you today as the representative of business.

In the energy industry we make multi-billion euro investments for projects that often have a lifespan of 30 years or more. So for us, thinking about the future isn't just a hobby – it's an absolute necessity.

This is especially true now that the world is both hungry for energy and worried about greenhouse gas emissions. The energy challenge is made even more challenging by three medium- to long-term trends. I call these the three “hard truths”. Before I address these hard truths, let me explain how Shell uses scenarios.

Scenarios help us to understand the global political and business environment we operate in. And they improve our capacity to adapt to changing circumstances. Having established an understanding of what's going on in the world around us, we can formulate or fine-tune our strategy.

Our Global scenarios to 2025 are called Flags, Low-Trust Globalisation and Open Doors. They are based on the complex interplay of market efficiency, national security, and social justice. The *Flags* scenario emphasises security and group identity at the expense of market efficiency and social cohesion. The *Low-Trust Globalisation* scenario sees strong states placing great stress on compliance to national rules and regulations, as well as intrusive checks and controls. The *Open Doors* scenario emphasises cooperation and free trade; it fully unleashes the power of globalisation and innovation. While no scenario can ever be entirely dominant, I'd say we are living in a world that is a combination of

Low-Trust Globalisation and Flags. And we're moving towards, rather than away from, Flags, unfortunately. I believe the world deserves better than that . . . and needs better than that.

Once we move the debate away from politics to energy and take a look at the three hard truths, it becomes very clear that a cooperative world stands a better chance of meeting the global energy challenge than a polarised world.

Three Hard Truths

So let me now discuss the three hard truths:

First, the global demand for energy is accelerating . . . not just growing, but accelerating. The reason is that China and India in particular are entering the energy-intensive phase of their development.

Second, the growth rate of supplies of “easy oil” will struggle to keep up with growing energy demand.

And, third, increased use of coal, plus the overall dominance of fossil fuels, will cause higher CO₂ emissions, possibly to levels we deem unacceptable.

Accelerating Energy Demand

Zooming in on the first hard truth, we see that the consumption of energy in 2050 could be at least twice as high as it is today.

The two main drivers for accelerating energy demand are population growth and greater wealth, driven by the globalisation of markets. Population growth translates into greater economic activity. Economic activity translates into higher demand for energy. Higher energy consumption based on fossil fuels translates into higher CO₂ emissions. The world's population could well reach 9 billion by the middle of this

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century. That means there would be three times as many people on the planet in 2050 as when I was born. Think about it: 3 billion new participants in the global economy between now and 2050.

The second driver of energy demand is economic growth, fuelled by the globalisation of markets, in particular finance, information, communication, technology and production.

Globalisation is the great driving force behind the speedy economic development of China and India. It allows these countries to attract capital, expand manufacturing and keep the brains. As a result, hundreds of millions of people are being lifted out of poverty and middle classes are growing rapidly.

Until recently, the Chinese economy grew faster than China's energy consumption. Between 1990 and today, the average Chinese person doubled his income while increasing his energy consumption only 15%.

But now both China and India are entering the energy-intensive phase of their development. It's when people buy their first television, motorcycle, or car, and start consuming much more transport fuel and electricity than they used to. It's the phase where industrial expansion takes root.

To give you an idea of the speed of development: after 60 years of prosperity, today there are 46 million cars in Germany. In China today there are 40 million cars, that is 3 for every 100 people. By 2020, the forecast is that China will have 150 million cars. Fuelling these cars will require an additional 2-3 million barrels of oil per day, equivalent to the current demand of South Korea.

If China follows the development path of South Korea, China's energy consumption will be double that of today by 2020. Some estimates have China consuming 16% of the world's primary energy by 2020.

The trend is clear: more people, more wealth, more energy.

The decline of "easy oil"

This brings me to my second truth: the decline of "easy oil". ("Easy oil refers to

conventional oil and gas that are relatively easy to extract.)

At exactly the moment that demand for energy is surging, more and more of the world's conventional oil fields are going into decline. Hence, the growth rate of supplies of "easy oil" will struggle to keep up with growing energy demand.

The problem is not the availability of resources as such. Overall, measured in barrels of oil equivalent, the International Energy Agency believes there could be roughly 10 trillion barrels of conventional oil and gas in place, and at least as much unconventional oil and gas. That makes for at least 20 trillion barrels of oil equivalent - equal to about 400 years of global oil and gas consumption in 2006 . . . theoretically.

In practice, only 5-10 trillion barrels can be recovered with existing technology. Many of the world's future resources are located in the arctic or offshore under deep water. And much of it is in oil shales and oil sands that are more difficult and therefore more costly to recover.

The IEA believes 20 trillion, or 20,000 billion, dollars need to be invested in the energy sector in the period 2005-2030 to secure sufficient supplies.

Apart from the availability of capital and resources, what matters is the rate at which they can be found, produced, refined and transported. The world now produces roughly 135 million barrels oil equivalent a day of oil and natural gas. We can raise that number, but we'll have to do that much faster than we used to and even then we cannot push up production levels indefinitely.

Let me illustrate this point by looking at OPEC's likely contribution to the growth of conventional supplies of the period up to 2030. The IEA assumes in its reference scenario an average annual growth of oil production of 1.7% up until 2030 for the world as a whole. At first sight, this seems a reasonable estimate. During the past 25 years, the average annual rate of production growth of oil indeed was 1.7%. However, this average was reached

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because *non*-OPEC production grew at 1.9%. OPEC production only grew one-third as fast as this.

By using the 1.7% growth rate, and with non-OPEC production levelling off, the IEA seems to assume that the growth of OPEC production will pick up speed after 2015, reaching 3-4% a year, or six times the growth rate of OPEC-production during the past 25 years. This figure may be too optimistic.

Saudi Arabian Oil Minister Ali al-Naimi recently gave a more realistic assessment when he stated that Saudi Arabia does not foresee expanding its crude oil production capacity beyond a planned target of 12.5 million barrels per day after 2009, up from 11.3 today. He added that alternative energy would help shoulder a larger proportion of future global demand.

On balance, from the perspective of energy security, we would be wise to broaden the global energy mix as quickly as we can, including more unconventional oil and gas, alternative energy, coal and nuclear energy.

CO2 emissions

However, security of supply for the globe is not our only challenge. The third hard truth concerns the rise of greenhouse gas emissions.

As the IEA points out, growth of CO₂ emissions could outpace energy demand. In its reference scenario, the IEA has emissions rising by 55% between 2005 and 2030. In a recent study by the US Energy Information Administration, CO₂ emissions are projected to rise even faster - by 59% between 2004 and 2030.

The reason for the surging growth in CO₂ emissions is that in a business-as-usual scenario much of the demand for energy will be met by fossil fuels, including and especially coal. To be less dependent on imports of oil and gas, countries will exploit their domestic coal reserves. This is true for China and India, but also for the United States, where over 50% of electricity is generated with coal. And in the EU-27, around 36% of power is coal-fired.

But coal is at the dirty end of the fossil fuels scale. Looking at CO₂ emissions per unit of source energy - in combination with typical conversion efficiencies - coal is more than twice as CO₂-intensive as natural gas per kWh of electricity. And coal is more than twice as CO₂ intensive as *un*conventional oil per litre of liquid fuel.

Nevertheless, the energy security argument is an important one for countries, and understandably so. Coal forms about 70% of China's current primary energy mix today. But to fuel its growth, China will need to double the amount of coal used today by 2030.

China is adding more than 50 gigawatt of new electricity capacity every year, most of it coal. That is equivalent to adding almost the current generation capacity of Great Britain every year.

So using coal more cleanly by applying coal gasification and carbon capture and storage is of great importance in our battle against greenhouse gas emissions. If, instead, a coal-consuming world does not apply carbon capture and storage, CO₂ emissions will rise beyond the levels we consider acceptable.

Let me give you the challenge: to keep greenhouse gases in the atmosphere well below 550 parts per million, Shell works with models that assume carbon capture and storage is installed at 90% of all the world's coal- and gas-fired power plants by the year 2050. As a start, we should aim to have around 100 coal-fired power stations equipped with capture and storage in operation globally by 2025. Today, there are none.

Similarly, I believe it is possible to grow alternative energy from around 1 to 2% of primary energy today to around 30%. What would this mean in practice? Well, for example, there are 30,000 wind turbines in the world today. By the middle of the century there may be a million wind turbines, and they will need to have a much larger capacity than the ones we install today, from 2 megawatt to 5 megawatt.

So we have quite a task at hand in not

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just developing, but implementing the necessary legislation, regulation and technologies to boost renewable energy and capture emissions from power stations.

Implications

The challenges are clear. Shell embraces them as new opportunities. However, there is no magic solution, no silver bullet. Rather, the hard truths point to a period of turbulence in the coming decades leading up to 2050, as new ideas are tried and tested.

The magnitude of the energy challenge confronting our society means we must act in coordinated fashion. And, given the long time horizon in the energy business, we must act today to put the right policies in place and start the transition from a high-carbon world to a low-carbon world, while maintaining energy security for all.

Turbulent times can discourage investment and hamper the best functioning of the economic engine. We can mitigate at least some of this new uncertainty through clear and stable regulatory frameworks. The technologies and the economic instruments are available. And markets will direct resources to the most efficient solutions. Moreover, in a borderless world smart solutions can spread quickly.

But markets need regulations and incentives to move, especially when new technologies cannot yet economically compete with the established ones. This is where governments have a crucial role to play.

The response

Governments, not industry, decide the energy mix of their societies. They determine how to balance energy security against the economic, environmental and social interests, using laws, taxes and incentives. There are broadly three sets of standards and regulations that governments need to implement in the coming decades to meet the energy challenge.

First of all, efficiency standards. In the transport sector, we will likely see a

gradual tightening of fuels standards and vehicle efficiency standards. Similarly, I expect gradually tighter efficiency standards in the building sector, where many gains can be made through better insulation. To get a maximum response from industry, harmonised, cross-border standards created for the long term, are better than a patchwork of different national approaches. Here, I'm thinking in particular of the European Union and its 27 member states.

Second, we need long-term clarity about cap-and-trade mechanisms that put a price on carbon emissions across as many borders as possible. We need an international market for carbon emissions.

Third, if we price CO₂ emissions, we should award credit for the CO₂ that is captured and stored or re-used, as well as the emissions prevented by investments in zero-carbon alternative energy. I invite Europe, with its increasingly well-established emissions trading system, to set an example. Let me go one step further. We need full convertibility of carbon certificates: across countries, across cap-and-trade mechanisms, across industries and across energy types.

Concluding remarks

Three hard truths will create a dynamic of their own and three sets of governments policies could help us manage the coming turbulence.

I have learned to be an optimist. I believe the world can have economic growth and energy security, and at the same time manage emissions. Markets will indeed direct resources to the best innovations and the most efficient practical solutions. But I am also a realist. I know that the energy challenge can only be met if we take timely and concerted action. And I know from experience that markets can only move quickly if governments act quickly.

And, finally, a cooperative world, in which governments act as enablers of a well-functioning global market, is much better suited to address these challenges than a world that is fragmented and polarised.

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