Jurgen Ganzevles en Rinie van Est

ENERGY IN 2030

Busting the myths

Energy in 2030. Busting the myths

Jurgen Ganzevles and Rinie van Est

Rathenau Instituut
Anna van Saksenlaan 51
P.O. Box 95366
2509 CJ The Hague
The Netherlands
Telephone: +31 70 342 15 42
Telefax: +31 70 363 34 88
E-mail: info@rathenau.nl
Website: www.rathenau.nl

Publisher: Rathenau Instituut
Cover: mariëtte jongen vormgeving
Cover illustration: Moker Ontwerp

Preferred citation:
Jurgen Ganzevles and Rinie van Est, *Energy in 2030. Busting the myths*, Rathenau Instituut, The Hague, 2013.

.

Content

Energy in 2030. Busting the myths[1]

Everyone agrees on the main objectives of energy policy: energy has to be affordable, reliable and clean. But in practice this aim gives rise to intractable problems that involve ongoing conflicts of interests and values. Who will bear the burden? Which citizens will end up with a wind park or a coal-fired power station on their doorstep? What are the social and ecological effects of importing solar panels from China or gas from Russia? And who benefits? Achieving an even-handed distribution of the benefits and the burden, on both a national and international scale, is difficult, politically charged and often socially controversial.

In the short term, until 2020, the affordability and reliability of the Netherlands' energy supplies are more or less guaranteed. But the energy we use is far from clean. For the period after 2020, it would seem the challenges we face will only grow. In all likelihood, the Netherlands' energy supplies are set to become more polluting and less profitable in the long term. In 2030, the regular production from our gas fields will only be a quarter of what it was in 2009 (EZ 2009). This will be a major drain on the treasury, amounting to billions of euros. On a global scale, there are still sufficient minerals in the ground to provide the entire planet with energy for hundreds of years to come. The burning question is how affordable it will be to ensure that we can obtain these raw materials in Europe. And how raw materials that are becoming ever more difficult to mine and extract can be obtained and turned into energy that is usable and clean.

The challenges that face the Netherlands cannot be seen as separate from changes throughout the world. Energy is closely related to economics, finance, raw materials, the climate, sustainability, international cooperation and security. The challenges in these various areas amplify one another. At a global and European level, there are various institutions in which states and companies coordinate international policy with regard to energy. Relevant forums include the European Union, the World Trade Organization (WTO), the International Energy Agency (IEA), the International Energy Foundation (IEF), the Gas Exporting Countries Forum (GECF) and NATO. Researchers at the Clingendael International Energy Programme (CIEP) have observed that "[i]n all kinds of areas, the certainty of old coalitions has become weaker, while new coalitions have yet to emerge with sufficient clarity" (CIEP 2011).

What course does the Netherlands plan to steer amid such global uncertainty? It is an issue of the utmost urgency, even though it does not emerge as such in the current general energy debate. Social unrest regularly arises in relation to specific energy projects but unrest of this kind does not prompt a widespread feeling of urgency with regard to energy problems.

The essays in this book, the expert meetings we organized and the discussions we had with experts reveal that this lack of a sense of urgency is a result of seven persistent myths which determine the

[1] This text was previously published in Dutch as final chapter of the book "Energie in 2030. Maatschappelijke keuzes van nu" (Boxtel: Æneas, 2011).

nature of the energy debate. These energy myths (see the box on the next page) present us with a carefree transition towards sustainable energy supplies. In doing so, they obscure our view of the major challenges and painful political choices which are needed in order to keep our energy supplies affordable and reliable and to make them cleaner.

In this book, we have been searching for socially acceptable ways in which the Netherlands can secure its energy economy in 2030 and beyond. How can the support base for energy developments grow? In setting out to achieve this goal, we have investigated the three mainstays of our energy supply: conventional energy sources, renewable energy and energy saving. We held them up for scrutiny in relation to the social criteria of being affordable, reliable and clean.

We conclude that there is no clear answer regarding the extent to which our energy supplies meet these social criteria now and will be able to do so in the future. As a society, we have no clear vantage point from which to regard these issues. We simply do not know enough about which developments contribute to making energy more affordable, reliable and clean and which developments are counterproductive. This lack of understanding makes it difficult to generate support for specific energy projects.

Our research resulted in five recommendations aimed at initiating a process of knowledge development and policy development to ensure that we can gain an ever greater understanding of how to reach the social energy targets mentioned above. That understanding can also help us to increase the sense of urgency and to form of a support base within society on the road to reliable, affordable and clean energy in 2030.

Seven myths in the energy debate

1. Fossil energy has had its day
2. Renewable energy is an infinite resource
3. Greater energy efficiency leads to less energy consumption
4. The government only sets the parameters for a free market
5. We are on the road to CO_2 neutrality
6. Dutch sustainability efforts are sustainable.

Myth 1: “Technology will solve the energy problem”

The number of technological promises for our energy supplies is growing. Shale gas production in Brabant can secure gas supplies for the Netherlands now that the natural gas fields in Groningen are running out. Machines are becoming more energy efficient every year. Engineers are developing new nuclear power plants which are “inherently safe”. Wind power at sea will surpass land-based wind power in the long term. CO_2 capture and storage will make coal a “clean fossil fuel”. Looking even further into the future, we can harvest sun in the Sahara for the European

market. And by that time, nuclear fusion will probably solve all our remaining problems. That was the good news.

The disturbing message, however, is that all of these technological avenues of opportunity are controversial from a social perspective. The essays in this book, which deal with *all* energy sources, demonstrate this in detail. Controversy is not limited to nuclear energy. The same applies to coal-fired power stations, underground CO_2 storage, biofuels and countless specific land-based wind energy projects. Technological promises consistently lead to social debate.

When thorny social issues arise, as a rule the myth of technological solubility is kept alive in two ways. The first is to propose an alternative energy mix or mix of energy technologies. In 2010, for instance, the Dutch government under the leadership of Prime Minister Mark Rutte diluted its predecessor's renewable energy ambitions and wanted to give nuclear energy a greater role in the mix. Secondly, we can see that new technological promises arrive on the scene even before previous promises have had the chance to prove themselves. Land-based wind energy is one such promise. As this option gradually becomes more affordable, social resistance is growing in proportion to its large-scale implementation. Now wind-power at sea has become the new promise for the future, but this technology is far more expensive. The trend is to "escape into the future", towards other, newer technological solutions. Another example is the second generation of biofuels, intended to erase the memory of the unsustainable abuses of the preceding generation. But this tendency ensures that the energy debate retains its noncommittal nature.

Gulf between politics and the public

The message that the energy problem can be warded off with technology and without making all too many sacrifices is at odds with another image presented to the public by the media: the visible public resistance to specific energy projects. The myth of painless technological solutions offers reassurance and requires no involvement whatsoever from the public. The resistance to specific projects, on the other hand, demonstrates in no uncertain terms the involvement of local citizens and civic organizations when they are confronted with the disadvantages and uncertainties of those projects. It then becomes clear that technological feasibility is not the only factor but that public support is of primary importance.

For this reason, it is vital that politicians change their tune and communicate a more realistic message. The message is that the energy problem does present us with painful choices and expenses, and that the real challenge is to ensure a socially acceptable mix of energy technologies. This is fraught with difficulty, since each and every energy option always ties in with at least four social themes: is it affordable, reliable, clean and feasible in terms of spatial planning?

Innovations that score well on all four fronts will be able to count on widespread support in society. But in practice, these four themes are often at odds with one another. For example, clean energy is often still more expensive – take solar panels for heavy industrial use and geothermal sources, for instance. And reliable energy often takes up more space – as evidenced by the expansion of electricity networks. The plans to make the Netherlands a natural gas distribution hub has serious implications for spatial planning: what effect will natural gas storage have on the substratum? And what does "affordable" actually mean: a lower energy bill for the consumer or higher energy benefits for the State? Should we define the notion of "clean energy" solely in terms of lower CO_2 emissions? Or does this concept centre on a wider view of corporate social responsibility?

Myth 2: “Fossil energy has had its day”

The policy aims for energy saving, the proportional contribution of renewable energy and CO_2 reduction create the impression that fossil fuels have had their day. The same applies to the widely accepted idea of an “energy transition”, which implies that the need for fossil and nuclear energy will only last for a given period to bridge the gap until the dawn of a fossil-free and nuclear-free world. In absolute terms, however, the amount of energy generated by fossil fuels continues to grow unabated, not only throughout the world but also in the Netherlands. And the end of this trend is nowhere in sight.

Rising costs

The steady growth of fossil fuels has major disadvantages. Not only is there the threat of energy sources becoming much more expensive due to the increasing focus on the negative ecological, but they are also becoming more difficult to mine and extract.

The Dutch government’s *Energy Report* from 2008 is based on the assumption of increasing scarcity on the world energy market (EZ 2008). Europe has to do battle with the world’s developing economies, which are scouring the planet in search of energy. The International Energy Agency is concerned that the investments for the extraction, conversion and distribution of fossil fuels and uranium cannot keep up with the increase in demand, primarily caused by China, India, Russia and Brazil (IEA 2009; IEA 2010). In the short term, energy prices will be subject to considerable fluctuations. The expectation for the long term is that the price of fossil fuels will rise because they are becoming increasingly difficult to obtain. This is the direct consequence of the economic logic of the mining sector: easily accessible minerals are extracted first. Technological innovation in the form of improved mining and extraction techniques can delay this process but not reverse it.

It is becoming ever more difficult to obtain petroleum and natural gas. Some of this fuel can no longer be obtained using standard technology, for example because it is more inaccessibly encased in sand or stone, or has to be extracted at greater depths or in more remote places. This trend also applies to natural gas in the Netherlands. Experts predict that conventional gas production will have halved in 2025, compared with 2009. Around 2030 our gas fields will only be operating at between twenty and thirty per cent of their 2009 capacity (EZ 2009; EL&I 2011, p. 18). The Netherlands has large reserves of shale gas in the ground (TNO 2009), in addition to coal deposits, but mining on a large scale would require considerable investments.

Greater environmental risks

The economic costs are not the only thing on the increase; so too are the environmental risks. Nation states and multinationals are mapping out the mineral deposits under the North Pole (USGS 2008). This illustrates the fact that ecologically vulnerable areas will not necessarily be spared. Meanwhile increasing amounts of energy and materials are necessary to ensure that the energy equivalent of one barrel of crude oil reaches the customer. As long as fossil fuels are used to power mining activities and transportation, this also means that the CO_2 emissions per unit of energy supplied will rise.

For difficult extraction methods, the environmental risks are considerable. The disaster involving BP’s deep-sea oil operations in the Gulf of Mexico is a prime example. Extracting oil from tar sand involves the use of chemicals, which can end up polluting groundwater or surface water. The

extraction process itself also requires large quantities of water, which can impact groundwater levels in the surrounding area. By means of a closed system, in which the materials are refined in a factory, every attempt is made to minimize unfavourable effects on the environment.

Similar risks are present in the extraction of shale gas (Veringa 2011; Schneider 2010). This process also requires water, which is injected into deep layers of shale at high pressure along with sand and chemicals to force out the gas. Some researchers warn that this process might release radioactive material deep in the soil and that this may reach drinking water above through the waste water. In addition, part of the methane (the main component of the natural gas being extracted) dissolves in the waste water and can rise to the surface along with it. Methane is a more powerful greenhouse gas than CO_2 – although it is quicker to break down in the atmosphere. These risks are mainly present in the United States, where the shale gas can be found closer to the surface than in Europe. Nevertheless, interested parties are concerned about such operations in Europe.

The worldwide rise in coal is increasing the burden on the environment. Compared to petroleum and uranium, there are still a large number of deposits which are relatively easy to access. The problem is that coal generates high CO_2 emissions and contains harmful substances. Coal-fired power stations emit around twice as much CO_2 as natural gas-fired power stations – 740 grams per kWh as opposed to 350 (ECN 2007). According to the US-based Clean Air Taskforce, a coal-fired power station in the United States represents a greater risk to humankind and human health than any other industrial source of pollution (CAT 2010).

With the construction of a number of new coal-fired power stations, the Netherlands' energy supply will become dirtier instead of cleaner in the years to come. The technology to capture the CO_2 released when coal is burned and to store it underground is still in its infancy. From a financial perspective, it is cheaper to do this on land, in order to avoid the transport costs to sea, but most of the Netherlands is densely populated. Local interest groups are wary of this solution because there are no direct advantages for them but there are risks and inconveniences. The decision to abandon pilot projects for CO_2 storage near Barendrecht and in Drenthe illustrates the social unrest prompted by this issue.

Lastly, nuclear energy is low in CO_2 emissions but inspires fierce protests due to safety issues and the unsolved problem of how to dispose of nuclear waste. Following the disaster that befell the Japanese nuclear plants at Fukushima, Germany decided to shut down its older nuclear facilities and to phase out its newer plants in the longer term (*NRC* 2011). The people of Switzerland voted in a referendum to phase out nuclear energy within 20 years. In Italy, the electorate voted against the reintroduction of nuclear energy (Bogtstra 2011). However, it is likely that much of the resulting shortfall in generating power in Germany will be made up for with electricity generated by fossil fuels.

Myth 3: "Renewable energy is an infinite resource"

People and organizations who are keen to support the environment want to expand renewable energy as rapidly as possible. Ideally they would like to see 100% renewable energy in 2050 (Nederland krijgt Nieuwe Energie 2010). For them, the renewable nature of the energy production is a weighty argument. It creates green employment opportunities and economic opportunities into the

bargain (SEO 2010). But such a scenario is not as evident as it may seem. For renewable energy is by no means an infinite resource. In the short term, limitations are set by a lack of willingness to invest. In 2010, the government of the Netherlands scaled back its predecessor's national ambition to achieve a 20% share for renewable energy in 2020 to the European minimum requirement of 14%. According to the Netherlands Environmental Assessment Agency (PBL) and the Dutch Energy Council, there are even doubts as to whether this less ambitious target will be met (PBL 2010; AER 2011a). Not least because, in the new Stimuleringsregeling Duurzame Energieproductie Plus (SDE+, Sustainable Energy Production Stimulation Scheme Plus), the government has proposed lowering the subsidy budget from 7.4 billion euros in 2010 (AgentschapNL 2010) to 1.5 billion euros in 2011 (Verhagen 2010a). The share of renewable energy fell from 4.2% in 2009 to 3.8% in 2010 (Compendium 2010).

Scarcity and environmental burden

In addition to cost-related arguments, there is another reason why large-scale expansion of renewable energy is not evident. Renewable energy is not necessarily sustainable. As with conventional energy, it consumes raw material and calls for major investments in infrastructure. The general trend is that energy consumption drives up material consumption and vice versa, and renewable energy is no exception in this respect (Diederen 2010; OECD 2008; V&J 2010; Kleijn & van der Voet 2010; Kramer 2011). Bulk materials (such as steel and copper) are needed to increase the size of wind parks and electricity networks. And the large-scale production of biomass involves the use of fertilizer, agricultural land, fresh water and pesticides. When the demand for these raw materials increases, they become a more attractive investment for manufacturers, governments and developers. Mines and factories will be opened. Additional agricultural land will be made available. One way or another, the production of all these raw materials will have an impact on the environment. It will also result in CO_2 emissions, as long as fossil fuels are burned as part of the production process.

The availability of infrastructure for renewable energy is very much part of the energy debate. In the short term, access to the electricity and gas networks has been arranged by giving priority to renewable production (Rijksoverheid 2011a&b). In the longer term, much remains unclear. An expansion of district heating networks in the Netherlands can increase the market opportunities for geothermal heating systems and heat and cold storage, but that does not appear to be the trend at present.

As regards electricity, discussion is currently under way regarding the extent to which smart networks or energy storage will be needed in the long term. Smart networks can, for example, control washing machines or driers so that they only start running when solar panels and wind turbines are able to supply large amounts of energy, depending on the weather. However, the disadvantage is that energy sources cannot simply be "switched on" when you wish to make use of them. Others talk about the long-term need to create a European super network to connect wind parks on the North Sea with large solar mirror generators in Southern Europe and North Africa. In order to turn such a vision of the future (Desertec 2010; ECF 2010) into reality, substantial investments are needed and far-reaching international partnerships between network companies which are now largely organized on a national scale. In addition, a super network of this kind also increases the market for power stations that run on coal, natural gas or nuclear energy. It is therefore doubtful whether the creation of such a European super network will increase the market opportunities for renewable energy or those of fossil fuels and nuclear energy.

Entirely dependent on imports

The use of renewable energy sources, like the use of fossil fuels and uranium, also creates new geopolitical dependencies. At European level, the focus on natural resources is increasing (EC 2011a). A clear illustration of this is the dependence on rare earth metals imported from elsewhere; 97% of global production is in Chinese hands (EC 2011b), which means the European Union is entirely dependent on imports in this regard. It is a relatively small market, compared to the tons of steel and copper traded around the world. Yet these raw materials are of essential importance in the production of certain types of wind turbines and solar panels, for example, in which neodymium, indium, tellurium or selenium are used. In the United States, Australia and Canada, there are plans to open new mines for rare earth metals, with the aim of reducing dependency on China in this area (Oakdene Hollins 2010).

Lastly, there is the question of whether factories and agricultural land will be available in time to meet the rising international demand for renewable energy. In the long term, there is a genuine risk that international waiting lists for renewable energy will form. Some experts acknowledge the notion of peak oil, which is the idea that worldwide oil production will reach a maximum at a certain point. But the idea of a possible ceiling to the production of energy from biomass, wind or solar power is not yet accepted.

Myth 4: “Greater energy efficiency leads to less energy consumption”

Since the 1970s, energy savings have been an undisputed component of energy policy. As recently as April 2011, the Dutch Energy Council (AER) observed that saving energy would be just as effective for CO2 reduction as encouraging renewable energy (AER 2011a). However, from a policy perspective, energy savings do not represent a reduction in national energy consumption but only improved energy efficiency. This entails “carrying out the same activities or fulfilling the same functions with lower energy consumption” (ECN 2001). The Dutch government’s Energierapport 2011 states: “Improving energy efficiency is one of the most cost-effective options for reducing dependency on fossil fuels. Efficient energy use improves the competitiveness of companies and leads to lower energy bills for the consumer” (EL&I 2011, p. 42). The European Commission also places considerable emphasis on improving energy efficiency (EC 2008). The central promise is that this policy will result in a painless exchange between the environment and the economy. In other words, if we use energy ever more efficiently, our energy consumption and CO_2 emissions will decrease, while the economy can continue to grow.

Rebound effect

The assumption that handling energy more efficiently is equivalent to a decrease in consumption is regularly criticised by researchers (for an overview, see Owen & Keulemans 2011). There is already evidence that efficiency policy actually stimulates the economy, with higher consumption of energy and materials as a result. This phenomenon is known in the literature as the “rebound effect” or the “Jevons paradox” (see for example Sorrell 2007). The nature of the net effect depends heavily on the assumptions that underlie the calculations. If we limit ourselves to direct rebound effects, then efficiency does indeed lead to savings. People may be inclined to leave an energy-saving light bulb burning longer than an old fashioned bulb, but the household’s annual electricity consumption for lighting will nevertheless decrease. But the more indirect effects are taken into account, the more

the savings benefits evaporate. One indirect effect is that, with energy-saving light bulbs, it becomes a more attractive proposition to add extra lighting in the garden. An effect of an even higher order is that energy savings result in financial gain. Sooner or later, that money will always find its way back into the economy, with the consumption of energy and materials as a result.

From a policy perspective, the insight that efficiency policy could just as easily drive up national energy consumption instead of decreasing it is still not given much emphasis. Energy efficiency only means that the amount of energy per product or service decreases in a certain category of luxury goods. In the meantime, the number of products and services in society increases as we benefit from every higher levels of comfort. In this regard, efficiency policy not only leaves the economy free to grow but actually encourages growth. More economical energy conversion makes it more attractive to manufacture larger televisions, homes and cars or to book a flight more often. The energy saving policy is a boon for prosperity but paradoxically raises concerns in terms of energy and material production.

Current energy saving policy does not therefore lead to a painless exchange between environment and economy. The economy benefits while environmental interests suffer. In the long term and from a broad social perspective, efficiency policy is therefore not a reliable energy option. A 20% improvement in efficiency does not mean an imminent 20% drop in our energy consumption, regardless of whether the energy is generated by fossil fuels or renewable sources.

Myth 5: “The government only sets the parameters for a free market”

The interaction between supply and demand on the market is supposed to make energy supplies as cheap as possible. With this ideal in mind, the European Union began to phase in a free electricity and gas market from 2004. Since then, the energy debate has focused on the parameters that governments set for the market.

In practice, the situation is far more complex. The government’s influence extends much further than the term “parameters” suggests. Far-reaching regulations and subsidies are needed to achieve European ambitions for generating renewable energy and reducing CO_2. Without a strong role for the government, these targets cannot be met.

Powerful government influence

The government’s influence as a company shareholder is also very powerful. National, regional and local governments are still major shareholders in energy companies. These shares are not limited to electricity and gas networks. Governments also control considerable chunks of the companies that deal in the energy that travels via the networks. In the energy debate, the shareholdings of governments and the opportunities and limitations they represent in terms of management are not given much focus.

A number of examples illustrate the far-reaching intervention of foreign governments in the Dutch market. Energy company EDF is interested in building a second nuclear power plant in the Netherlands; 84.5% of shares are in the hands of the French state (Reuters 2011). Vattenfall, which has taken over Nuon, is owned entirely by the Swedish government (Vattenfall 2011). Abu Dhabi,

one of the Arab Emirates, has a 51% share in Taqa Energy (Taqa 2011), a company keen on investing in gas storage near the Dutch town of Bergen. European players Electrabel, E.ON and RWE are all investing in new coal-fired power stations in the Netherlands. Electrabel is fully owned by GDF Suez, in which the French state participates. The shareholder structure of German-owned E.ON and RWE is less transparent.

Meanwhile, the Dutch government has been active on foreign energy markets for decades, especially in the field of gas trading and export. The structure of public-private cooperation in and around gas extraction and supply in the Netherlands has changed since the energy market was liberalized, but supply to other countries continues unabated. More recently, network company Tennet, which is entirely owned by the Dutch state, took over large sections of the German electricity network (Tennet 2010/2011).

Major shareholders
At regional level, provinces and municipalities are still major shareholders. The lower levels of government have sold some of their shares (Commissie Publiek Aandeelhouderschap Energiebedrijven 2008), but by no means all of them. A number of municipalities toyed with the idea of investing the profits from this sale in setting up a new municipal energy company with the aim of encouraging the development towards more renewable energy (Tensor Energy 2009). However, not much headway has been made on this development.

The liberalization of the European energy market has in fact led to a concentration of market power in the hands of a small number of large-scale parties operating internationally. The Dutch energy market is home to a limited number of dominant players as opposed to a free market with plenty of competition. In the Netherlands Nuon, Essent and Eneco supply approximately 75% of all of the country's electricity and gas (RWE/Essent 2009).

Myth 6: "We are on the road to CO_2 neutrality"

The national climate objectives give the impression that we are on our way to achieving a CO_2-neutral society. But international climate agreements – and their translation into the Dutch context – have not yet done much to alter the trend of growing CO_2 emissions from fossil fuels. Since 2004, there appears to have been a slight fall in CO_2 emissions, partly as a result of the economic recession (ECN 2011; Compendium 2009). Even so, the Netherlands is in danger of not achieving the 2020 objective for emission reduction (ECN/PBL 2010). By their very nature, annual figures give a skewed impression. Even if this year's emissions are lower than last year's, they add to the emissions of previous years, which have not suddenly disappeared from the atmosphere.

In practice, the market opportunities for low-CO_2 energy supplies are smaller than they appear. A level playing field does not exist. The Netherlands remains an attractive base for coal-rich industries. Politicians, researchers, social organizations and the green business sector have put forward a variety of suggestions to reduce the differences, see for instance the Position Paper by *De Groene Zaak* – an organization of entrepreneurs working for a sustainable economy (2011). As long as an incentive policy does not do enough to correct this situation, CO_2-rich energy supplies are effectively being encouraged.

CO_2-rich industry

The Netherlands remains an attractive business location for internationally operating companies that earn their money obtaining, converting and supplying non-renewable, CO_2-rich energy sources. Our geographical location on the North Sea has enabled Rotterdam to develop into one of the world's leading oil ports. Cooling water for power plants is readily available in many parts of the country. Ships can unload large quantities of coal in Dutch ports. The electricity markets in Northwest Europe are becoming ever more closely interlinked – both in terms of network connections and trade (CIEP 2010; ECN/PBL 2010). Gas supplies are also organized at an international level. Thanks to the underground storage of imported natural gas and the distribution of liquid gas transported to the country by ship, the Netherlands has the potential to become the gas distribution hub for Western Europe. The Netherlands nurtures this ambition, even though it involves major investments with uncertain returns and neighbouring countries harbour similar ambitions (Verhagen 2011a&b; Brattle Group 2010). The popular opposition to underground storage of natural gas and to shale gas operations form an additional source of uncertainty.

Despite such uncertainties, business operations based around fossil fuels have a pre-existing chance of continuity or even growth. For low-CO_2 industries, the chances are less favourable. In this area there is a tradition of "wait and see" and innovation is only subsidised in dribs and drabs and, more to the point, inconsistently. The hope of building a national wind energy industry, which the Netherlands still cherished in the 1980s and 1990s, now seems to have faded forever. This is in contrast to larger countries such as Germany and China, where strong government intervention has built industries that enable innovation processes to take flight. In 2010, the Dutch government made a conscious and explicit decision to only encourage the cheapest and most immediately marketable forms of renewable generation (Verhagen 2010a). To this end, the *Stimuleringsregeling Duurzame Energieproductie Plus* (SDE+, Sustainable Energy Production Stimulation Scheme Plus) no longer allocates an annual budget to various renewable energy technologies in advance, but instead allows them to compete with one another. This means that the cheapest technologies will be first to be earmarked for a budget (EL&I 2011, p. 23). These are waste incineration, biomass, green gas and wind turbines. This results in subsidies for projects such as wind turbines primarily benefitting foreign companies building wind turbines in the Netherlands. The fact that this approach results in relatively little innovation and employment in the Netherlands is something the government is prepared to condone in these times of major cutbacks in expenditure. However, the Ministry of Economic Affairs, Agriculture & Innovation has intensified its focus on green energy policies that can profit the Dutch economy: what it calls a Green Deal (Regeerakkoord 2010; Ecorys 2010; Roland Berger 2010; SER 2010; SEO 2010; EL&I 2011, p. 44-45).

Please In My Back Yard

It is not unusual for market parties to compensate local residents for the extraction of fossil fuels. The residents of the town of Schoonebeek still show considerable goodwill to the oil industry in their area, thanks to generous deals to buy up farmland for production locations, the jobs created in the area and the oil company's proactive decision to generously compensate the town when there was a blow-out on 8 November 1976 (*NRC* 2011b). With regard to any future shale gas production on Dutch soil, the Dutch Energy Council has proposed allowing landowners to share in the profits (AER 2011b). This could result in a *Please In My Back Yard* (PLIMBY) effect.

However, compensation for any disadvantages does not feature at all in plans for low-CO_2energy technologies. The reasoning appears to be that the solutions to a public problem (i.e. climate change) automatically enjoy public support. For projects that offer little or no financial profit, the

government and the companies involved expect an altruistic attitude from local stakeholders. They are expected to do their bit for the noble cause. This expectation is often in stark contrast to reality. The issue of where to locate wind turbines has proved to be a persistent problem for decades. Pilot projects for underground CO_2 storage have met with a similarly dogged *Not In My Back Yard* (NIMBY) response.

We have a tendency to export the spatial-planning issues associated with low-CO_2 technology. For instance there is much debate about the safety issues surrounding a second nuclear power station in the Dutch province of Zeeland, while the import of low-CO_2 nuclear energy from France and Belgium, which primarily poses a risk to the people there, is hardly ever raised. In addition, CO_2 storage and wind parks at sea hold greater appeal than their land-based equivalents. But operations at sea involve far greater transport costs and the sea too is subject to competing claims for space.

Hidden subsidies

The continued dominance of CO_2-rich energy is also due to the hidden subsidies for fossil fuels. These include tax breaks on wholesale energy consumption. For fossil fuels, society foots the bill for all kinds of “external costs” in relation to energy supplies (CE Delft 2007). These include health costs and the costs of modifications related to climate change. Some of these costs are passed on in energy prices, for example due to the fact that power stations are obliged to purchase CO_2 emission rights, but many are not. The environmental movement therefore consistently argues that the “polluter pays” principle should be applied much more rigorously.

Financial research bureau Bloomberg has calculated that the worldwide subsidies that governments give on fossil fuels outstrip those given to renewable energy by ten to one (Bloomberg 2010). The International Energy Agency too is calling for the worldwide subsidies on fossil fuels to be phased out (IEA 2010). According to the Dutch government's *Energierapport 2011*, there are no financial incentives encouraging the use of fossil fuels in the Netherlands (EL&I 2011, p. 39). Yet it would appear that the practical application of subsidies in the Netherlands is skewed in a number of ways (van Beers et al. 2007; van Beers & van de Bergh 2009; *de Volkskrant* 2010; Ecofys/CE Delft 2011). For instance, import tariffs apply to bio-ethanol but not to fossil fuels (WTCBE 2011). The Netherlands also grants favourable financial and tax deals to certain user categories, such as greenhouse farming. In the Senate of the Dutch Parliament at the end of 2010, the State Secretary for Finance agreed to an investigation into subsidies for the use of fossil fuels (Verhagen 2010b). Furthermore, the *Energierapport 2011* points out that a further examination of the taxes on energy products and CO_2 is being carried out in fellow EU member states (EL&I 2011, p. 40). Among other things, this is important to the international competitiveness of companies in the Netherlands.

As long as there is no consensus on hidden subsidies for fossil fuels and nuclear energy (UCS 2011; Jelsma 2008), it should come as no surprise that many market parties and the government itself continue to look on renewable energy first and foremost as a cost item. The SDE+ scheme, which encourages the generation of renewable energy, is a much more visible form of subsidy. In the longer term, the government is planning to finance this scheme through an additional charge listed on electricity bills, so that citizens can see directly what they are paying to encourage renewable energy.

Myth 7:“Dutch sustainability efforts are sustainable”

The issue of sustainability is often narrowed down to target percentages that have to be met within the Netherlands. In the Netherlands there are countless initiatives aimed at promoting green jobs, energy savings and renewable energy as much as possible (Rathenau Instituut 2009). A public-private initiative called Energy Transition has the aim of making the Netherlands’ energy supplies more sustainable. Such an approach at national level makes sense given that the European Union requires the Netherlands to achieve a 20% CO_2 reduction (compared to levels in 1990), a 14% share for renewable energy in the year 2020 and a 20% increase in energy efficiency in 2020.

Abuses

But when we take into account the international chains of production, it is largely impossible to work out how clean certain sources of energy are. The policy aims in this regard are far more loosely formulated. In 2010, the energy section of the Dutch Government Coalition Agreement showed that the government wanted to expand the *Initiatief Duurzame Handel* (Sustainable Trade Initiative) to include CO_2-intensive sectors (Regeerakkoord 2010). In the summer of 2011, the energy sector had yet to sign up to this initiative (IDH 2011). The current regulations for ecological and social responsibility for the energy supply chain are both reactive and selective. The underlying principle for this policy is that abuses need to be identified before concrete policy demands can be made on sustainability. However, this principle does mean that abuses automatically lead to stringent regulations; it transpires that commercial interests are too important to allow this to happen.

Yet the focus on sustainability throughout the energy chain has increased considerably in recent years. In terms of policy too, significant steps have been taken. This has been prompted by the robust public debate about the use of biomass for producing biofuels. It is now politically accepted that such sources should not be exploited at the expense of biodiversity and food production. In addition, across the entire chain there has to be a real reduction in CO_2 emissions (EL&I 2011, p. 23-24). This has resulted in sustainability criteria for the use of biofuels (Corbey 2011). At European level, only some of the proposed “Cramer criteria” have found their way into regulations. The concrete sustainability criteria from the European Commission’s *Renewable Energy Directive* (EC 2009) are ultimately limited to biodiversity and CO_2 efficiency (Corbey 2009). This means that aspects such as working conditions and the use of pesticides when cultivating biomass fall outside the scope of the regulations.

Leaking pipelines

To date, only sustainability criteria for the use of biofuels have been enshrined in regulations. Yet steps are being taken with regard to a variety of chains. The present Dutch government has stated its aim that the co-firing of biomass, which is gradually being made mandatory, takes place sustainably (Verhagen 2011c). For the manufacture of Chinese solar panels, for example, there is no sustainability legislation. But on a voluntary basis, the sector is taking genuine steps. In the area of fossil fuels and uranium, the signs are also hopeful. Various mining companies operate under ISO 14001 certificates, in which the steps of the process are defined with the aim of monitoring environmental performance. Steps are also being made in the area of corporate social responsibility, to which the ISO 26000 guidelines apply. However, these norms are all voluntary in nature. Across the board there is still little prospect of compliance with sustainability demands and claims. In fact we still have little idea of working conditions and the effect that fossil fuels and uranium are having on the people and the environment in other parts of the world. One case that

has received major media coverage is the leaking of oil pipelines in Nigeria, partly due to sabotage by locals out to gain financial compensation for the lucrative oil operations being carried out in their region by Western companies (UN 2011, *NRC* 2011c, *Trouw* 2009). Such reports are a clear indication that abuses occur. But they still provide little insight into the knock-on effects elsewhere in the world which can be attributed to the daily use, conversion and transit of oil, gas and electricity in the Netherlands.

In the debate on a possible second nuclear power plant in Borssele, the government proposed that the operator should take into account the environmental effects of the entire uranium chain and not only the direct environmental effects on the area around the plant (Commissie MER 2009). In addition, the Lower House of the Dutch parliament held a debate in 2010 on the social conditions relating to the mining of the coal used in Dutch power stations. This contributed to the setting up of a Coal Dialogue Group, in which major suppliers and end-users of coal are working on improvements together with unions, environmental organizations and social organizations (CDG 2011). And at the start of 2011, a number of MPs proposed a motion to apply the Cramer criteria, drawn up for biomass, to fossil fuels in the European context – although this demand was later withdrawn in an amended motion (Tweede Kamer 2011a; 2011b).

Recommendations – Towards social transparency in energy policy

The energy myths described above create the illusion that we will have an affordable, reliable and clean supply of energy in the future. In reality, our energy will generate more pollution, cost more money and in all likelihood become less reliable.

- *Fossil energy*, contrary to what people often think, is not losing ground.
  If anything, the use of fossil fuels is growing. We are using more of these fuels and they are becoming increasingly difficult to obtain, thereby leading to a rise in both economic and environmental costs.

- *Renewable energy* is not an infinite resource. In practice, renewable sources such as biomass, solar energy and wind energy will not be able to avoid the drawbacks of scarcity and environmental problems in the long term. In addition, little is known about the actual sustainability of renewable energy. “Our solar panels” may seem like a “clean energy source”, but what do we actually know about how well or how badly the Chinese labourers who manufacture them are treated?

- *Energy efficiency* turns out not to be a guarantee for a saving that can ease the challenge of a sustainable energy supply. For, contrary to popular belief, higher energy efficiency does not automatically lead to a reduction in energy consumption at national level.

In practice, therefore, the challenges for fossil fuels and nuclear energy, for renewable energy and in the field of energy savings are increasing – contrary to what the myths suggest.

The government is facing the major challenge of not only keeping the Netherlands' energy supplies affordable and reliable in 2030 and beyond, but also of ensuring that they become cleaner. This requires a socially acceptable mix of energy technologies.

However, the unsettling message of the essays in this book, in which *all* energy sources are dealt with, is that all forms of energy are controversial from a social perspective. Nuclear energy is not the only sensitive issue. The same applies to coal-fired power plants, underground CO_2 storage, biofuels and countless specific land-based wind energy projects. Technological solutions for the energy issue consistently lead to social debate. The trend is to "escape into the future", towards other, newer technological solutions. Examples of this tendency include second-generation biofuels, which are intended to erase the memory of the non-sustainable abuses of the first generation.

But, sooner or later, the government will have to communicate the message that painful and far-reaching interventions in energy policy are necessary. These will be expensive measures that affect a great many parts of society.

Fortunately, society's resilience in order to deal with these challenges is considerable (PBL 2011b). In the Netherlands and elsewhere in the world, many regions are attempting to transform concerns about the future into opportunities (Rathenau Instituut 2009; Hopkins 2008; Urgenda 2011). Examples include the Rotterdam Climate Initiative, Duurzaam Texel, Energy Valley and kiEMT. History teaches us that major changes in energy supplies can be implemented rapidly when the will and the momentum are present. When natural gas was discovered in the Netherlands in the late 1950s, an extensive gas distribution network was established within two decades and almost every Dutch household made the transition to gas. And working groups from various political parties have joined forces for a follow-up to the joint plan *Nederland krijgt Nieuwe Energie* (New Energy for the Netherlands) published in 2010.

In order to widen support within society for further government interventions and to enable it to grow, it is important to pursue a clearly defined energy policy. Another necessary condition is a transparent energy market. How are we going to keep our energy supplies clean, affordable and reliable beyond 2030?

The recommendations we present below, with the aim of making both policy and the market more socially transparent, are not easy to implement. These are processes that take many years and often call for international coordination. They therefore demand concerted, long-term political efforts. In the short term, they could even lead to a drop in support for specific energy projects.

Nevertheless, these are the paths we must pursue in order to bring a broader support base in society closer. As long as we fail to do what is necessary to obtain the knowledge we need, the debate will continue to be dominated by energy myths. The result will be a lack of clarity about the social challenges, not to mention economic uncertainty and a lack of political leadership.

Recommendation 1.

Bust the energy myths

Collective knowledge about the urgency of the energy issue can increase understanding and support for policy measures.

“Technology will solve the energy issue." ... "Fossil fuels have had their day." ... "Renewable energy is an infinite resource."... “Greater energy efficiency leads to less energy consumption.” ... “The government only sets the parameters for a free market.”... “We are on the road to CO_2 neutrality.” And “Dutch sustainability efforts are sustainable.”

These are the seven myths that promise us a carefree transition to sustainable energy supplies. None of them are rooted in reality, as we have seen above. We are all too ready to believe in these myths but they are like a veil of mist that robs us of a clear perspective on our present and future energy supplies. They stand in the way of genuine, sustainable reform of the Netherlands’ energy economy. The longer we continue to believe in a happy ending to the energy issue, provided by some new or alternative technology, by efficiency or by supposedly infinite renewable energy, the greater the gulf between the dream and reality will become.

Here too the old adage “desperate times call for desperate measures” applies. In other words, half measures only make the problem worse. An imbalance between energy objectives and reality will create an unnecessary rise in social unrest and the associated challenges for public administration. Lack of knowledge and awareness of the energy problem among the general public will lead to protests and court battles as the challenges turn out to be greater than people have been led to expect for years.

It is only right that the government is choosing a path of new realism in which painful decisions are not sidestepped. For instance, the possibility of introducing and developing a suppliers’ obligation for renewable energy are being discussed with the energy sector (EL&I 2011). This would legally oblige energy suppliers to provide a certain percentage of renewable energy to their customers. It is a move that would necessarily entail an increase in people’s energy bills, since suppliers will pass on the additional costs. Nevertheless, this line is being taken with a view to bringing renewable energy targets within striking distance.

Another example is the policy initiative to make the Netherlands a gas distribution hub for North West Europe. This corresponds well with the existing economic and physical reality. The gas industry is a major employer and the Netherlands possesses internationally recognized expertise in this area. Increasing gas imports and exports means that much of the infrastructure can remain in use, even when domestic natural gas operations go into decline. In cooperation with the industry and in a dialogue with the Lower House of Dutch Parliament, the government is searching for solutions to the concerns about the underground storage of imported gas. The potential risks involve earthquakes and ground subsidence (AO Energie 2011).

It is a wise choice to continue this realistic approach. If we want to stay one step ahead of an energy crisis in the long term, we need a greater collective awareness of the urgency of the energy

issue, with the prospect of closer involvement and a more active role for the general public, local government, industry, SMEs and environmental or human rights organizations.

A necessary condition in this regard is that the government should be prepared to jettison the energy myths once and for all. The inevitability of painful measures needs to be made clear, along with that message that it makes good sense to start preparing policy measures today.

If citizens know that this is what it takes to ensure that we continue to have access to affordable and reliable energy in the future, and that this energy is clean, it will increase their understanding and acceptance of the interventions. If only because there will be better guarantees that the investments and sacrifices will lead to genuine improvements.

Recommendation 2.

Make a move towards reducing national energy consumption

The less energy we consume, the easier it will be to keep our future energy consumption affordable, reliable, clean and feasible in terms of spatial planning. We need to seriously examine the utility and need for raising energy prices.

Energy savings have been an important policy instrument for decades. Current policy is geared towards energy efficiency. But this is not leading to a situation in which we in the Netherlands consume less energy: our national consumption continues to rise. Lower energy bills thanks to more efficient appliances means that we are more likely to purchase larger televisions and homes, to install lighting in our gardens or to book an extra holiday flight.

It is therefore important to discover how we can actually go about reducing our national consumption. For the less energy we consume, the easier it will be to keep our future energy consumption affordable, reliable, clean and feasible in terms of spatial planning. Genuine energy savings not only reduce the size of the energy problem but also provide an enormous boost to low-energy innovation.

Genuine energy savings call for clear limitations to our growing energy consumption. At first glance, such an absolute limit to energy consumption would appear to be politically unfeasible. But the government and politicians do have experience of setting hard and fast limits. A prime example is the absolute limit on national CO_2 emissions. For the Netherlands as a whole, emissions will have to be 20% lower in 2020 than they were in 1990 (EC 2011c). Recently, in Britain an All-Party Parliamentary Group on Peak Oil explored the possibilities of setting limits on national energy consumption (Fleming & Chamberlin 2011). Ways to reduce national energy consumption include increasing consumer awareness, introducing legislation and raising energy prices.

We would advise the government to seriously investigate the instrument of raising energy prices (see also CE Delft 2000). Raising consumer awareness is a non-committal approach: there is no way to predict the result. And it is impractical to introduce standards and energy labels for all appliances and for services in all sectors. In order to explore the desirability of raising energy prices, it is important to calculate how high and for how long energy prices will have to rise in order to

achieve a significant reduction in energy consumption in the Netherlands. This requires current research into the price elasticity of energy.

Recommendation 3.

Take into account the fact that the availability problem affects all energy sources

The physical availability of energy sources is not the problem, now or beyond 2030. Scarcity is determined by geopolitical relations, economic willingness to invest and social parameters, particularly with regard to environmental and social circumstances. This applies to fossil fuels, nuclear energy and also to renewable energy.

The worldwide hunger for energy is growing – per country and per person – and especially in upcoming economies such as India and China. The main question is whether in the longer term enough energy can be produced to satisfy this hunger. New geopolitical dependencies will arise, among which the Netherlands must find a way to secure its interests.
The government is responding to this challenge. Since the oil crises of the 1970s, Dutch policy has taken account of its geopolitical dependency on the countries that supply it with oil. As recently as the *Energierapport 2011*, oil shortages have been an important focus, and rightly so (EL&I 2011, p. 35-36). The strategy over the past 40 years has been to spread the country's risks (increasing the share of coal and nuclear power) and to exercise greater restraint in managing the country's natural gas reserves.

The Netherlands' declining gas reserves and the challenges that surround shale gas production will probably mean that the Netherlands will also become more dependent on imported gas. Dutch policy is responding to this, partly by positioning the Netherlands as the gas distribution hub of North West Europe. Active energy diplomacy is also being carried out with the aim of securing the certainty of supply (EL&I 2011).

But energy diplomacy alone is not enough. In looking at each type of energy, we also have to ask whether there is sufficient capital and production capacity. Who will shoulder the investments for the Netherlands' gas distribution hub? Even if worldwide demand increases, are there sufficient factories and ships to develop wind energy at sea on a large scale? And is there enough agricultural land available for the production of biomass? It is not unreasonable to suppose that scarcity of capital and production will unleash a competitive battle between countries for the realization of energy projects. This perspective is often overlooked in discussions about scarcity and geopolitical dependencies.

In addition, energy and the natural resources needed to produce it are becoming more difficult to obtain and deploy, while demands regarding safety, the climate, the environment and sustainability are becoming more stringent than ever before. The steady underlying trend is for mining to become increasingly arduous, despite innovative extraction methods and fluctuations in price. The extraction and use of fossil fuels and uranium is accompanied by increasing environmental and climate risks. This puts further pressure on both people's quality of life and on ecologically vulnerable areas. Renewable energy does not escape these challenges, since it too requires natural resources,

materials and space. In addition, a reliable energy supply is also dependent on the need for food and water. In research and policy, these factors – often referred to as “interference” between various categories of scarcity – are becoming increasingly acknowledged (VROM/BuZa 2009; Tweede Kamer 2010; PBL 2011). The above-mentioned challenges amplify one another. Together they ensure that the availability of energy will come to depend more and more on the secondary effects that society is prepared to tolerate.

Recommendation 4.

Work towards sustainability certification for all energy chains

The Netherlands wants to make energy supplies more sustainable. Steps towards international sustainability criteria for all energy sources can help achieve this goal. They make the sustainability or unsustainability of energy sources more visible and easier to compare. Sustainability is becoming a key factor in the competition between companies.

In order to achieve energy supplies that are truly sustainable, we need to obtain a clear picture of the ecological and social effects of all energy sources. In many countries we can see a growing demand among politicians and society at large for greater openness regarding the sustainable origins of products or the lack of sustainability in this regard (Rathenau Instituut 2011). The call for a “raw materials ombudsman” to monitor where the Netherlands obtains its raw materials from reflects this trend (GLM 2011). The Netherlands Environmental Assessment Agency (PBL) argues in favour of “public data”, in line with a US, British or Japanese model (PBL 2011b, p. 67). Central government can ask companies and organizations to publish their data on issues such as emissions, so that they can be held accountable to the general public. And the US Dodd-Frank Act, which came into force at the end of 2011, stipulates that oil and gas companies have to state how much they pay governments for oil and gas. This makes it clear to what extent companies are helping to finance dictatorial regimes (*de Volkskrant* 2011).

Sustainability criteria, included in a certificate or a sustainability label and including supervision or compliance, make it possible to measure the effects and to come up with possible measures for improvement. They keep us vigilant. Certification for all forms of energy will also advance the market competition between various energy options. After all, it can help make sustainability a demonstrable sales argument.

From a political point of view, it will be very difficult and may take decades to achieve, implement and monitor such a system of certification at national and international level. It will be a learning process. Yet it is nevertheless advisable to follow this route. Without taking steps in the field of certification for all energy sources, it will be difficult to demonstrate how clean and/or sustainable a certain type of energy is and we will continue to grope in the dark in our efforts to achieve sustainability.

In this learning process, we can make grateful use of the experiences which already exist. Steps in this direction have already been made, for instance in the context of the *Nationaal Programma Natuurlijke Hulpbronnen* (National Programme for Natural Resources) (Huizinga-Heringa 2010) and the *Kabinetsbrede Initiatief Duurzame Ontwikkeling* (KADO, Government-wide Sustainable

Development Initiative) (Huizinga-Heringa & Verhagen 2010). A certification programme for biomass has already been launched. The suppliers of solar panels are concerning themselves with the production process in other parts of the world. In the previously mentioned Coal Dialogue Group, suppliers, end-users, unions, environmental organizations and social organizations are working on improvements (CDG 2011). As previously stated, the operators of a possible second nuclear power plant in Borssele will be asked to look at the environmental effects of the entire uranium chain. In addition to this, we can build on experiences in other domains, including the food sector and other chains which are signed up to the *Initiatief Duurzame Handel* (Sustainable Trade Initiative) (IDH 2011).

Sustainability certification for renewables

The robust public discussion on the use of biomass for biofuels has made it clear that renewable energy is not necessarily sustainable if we look beyond the borders of the Netherlands. In the future, renewable energy – like fossil energy and uranium – will increasingly result in environmental burdens and concerns about social conditions. It will have an additional impact on the already fragile support base for specific energy projects in the Netherlands – in addition to the disputes about the spatial planning aspects of renewable energy, which are particularly difficult in the Netherlands.

Sustainability criteria for renewable energy can stop us from simply farming out our social problems to other countries. A quality label could involve requirements regarding environmentally friendly mining for the steel that is used in the construction of “our” wind turbines. And it could forge a link between local green developments and international solidarity. Many cleaner energy initiatives are primarily geared towards local issues (Rathenau Instituut 2009; Hopkins 2008; Urgenda 2011). Certification can enable regions in the Netherlands, for example to start a “fair trade” partnership with the Chinese region where solar panels are made, so that sustainable production can be implemented there too, ensuring that local workers are treated decently for instance.

Sustainability certification for fossil fuels and nuclear energy

For decades, the world will continue to depend heavily on fossil fuels and uranium for nuclear energy, while the environmental risks associated with their extraction will continue to grow. For this reason it is important that the government should make a concerted effort to introduce sustainability certification for petroleum, natural gas, coal and uranium.

A sustainability label for fossil fuels and nuclear energy can create room for manoeuvre in the social energy debate because it addresses the concerns and wishes of environmental and human rights organizations and socially aware consumers. It also provides opportunities to make fossil energy and nuclear energy demonstrably more sustainable. “Fair trade” gas, fuels and electricity generated by non-green means may be a category that does not exist as yet, but it is a category with a great deal of potential.

Sustainability labels will also make it clear to consumers how clean and/or sustainable a certain energy option actually is, thus enabling them to make a well-founded choice. It is important that consumers are able to keep track of the range of labels. In this regard, labels in the food sector, such as EKO and Max Havelaar, provide a possible example to follow.

Recommendation 5.

Develop an accounts book for the energy economy until 2030

In order to build support within society for our energy economy, it is important that the cash flows in our national energy balance are clearly identified. At present, there is still a lack of information. How much does the government invest in energy and what are the returns? What does it cost the citizens and what do they get in return?

The socially desirable transition to a clean energy supply represents a huge challenge from an economic perspective. A challenge that can be interpreted in two ways. On the one hand, the cost of generating clean energy must be kept affordable. On the other hand, this transition offers considerable opportunities to make money from energy, both within the Netherlands and on the world market.

The government rightly states in its *Energierapport 2011* that the energy transition also has to benefit the Dutch economy. It's all about the combination of "green and growth" (Dutch Ministry of Economic Affairs, Agriculture and Innovation 2011, p. 2). The government is seeking to expand the Netherlands' future earnings model from fossil fuels towards renewable energy, energy savings and CO_2 reduction and has earmarked the energy sector as one of its top economic prospects. In doing so, its strategy includes both conventional and renewable energy sources (Dutch Ministry of Economic Affairs, Agriculture and Innovation 2011).

The controversial issue is how much it is going to cost the government and the general public and what the ultimate benefits will be. Existing studies and exploratory research (see for example SEO 2010 and ECN 2006) provide a fair indication. They form a basis on which to build, with the purpose of obtaining a clearer picture of the national cash flows.

Billions of euros

Due to the fact that the energy is a multi-billion euro sector, with an eye to "green and growth" it is of particular strategic importance that the government puts its energy-economy accounts in order. It is a necessary but difficult job. Macro-economic forecasts are always beset by major uncertainties. Assumptions about the development of energy prices and emission rights, and future European regulations for mandatory generation of electricity from renewable energy sources have a strong effect on the outcomes of the calculations. In addition, the problem of hidden subsidies exerts a further influence on the principles underlying economic models. Furthermore, a move towards sustainability certification will have an impact on the competition between energy suppliers and on the competitiveness of the Netherlands as a whole.

Nevertheless, it makes sense to study the national energy accounts in greater detail in light of a number of scenarios, in order to facilitate the debate on these issues. In doing so, the cash flows and the costs and benefits of the Netherlands' energy supplies, both now and in the period up to 2030, should be mapped out.

Despite being surrounded by uncertainty, the export of CO_2-rich energy carriers (natural gas; electricity from natural gas and coal; petroleum products) has a reasonable chance of continuity or even growth. There are opportunities for the Netherlands to develop into a natural gas distribution hub for Northwest Europe. But the investments in the necessary infrastructure are still very much

uncertain, not least because neighbouring countries have similar ambitions. And at present there is a lack of broad social support for the necessary gas storage and possible extraction of shale gas.

For low-CO_2 innovation, such as wind parks and CO_2 storage, the opportunities appear to be less plentiful. The Netherlands does not have an impressive track record on low-CO_2 innovation, largely due to the inconsistency of its approach to date. What is more, the market opportunities for low-CO_2 energy supplies are less promising than they appear. In no way can the situation in relation to conventional energy be described as a level playing field. Local residents or other stakeholders do not receive financial compensation for the disadvantages, inconvenience and risks of wind parks or CO_2 storage, though such compensation has been proposed in relation to any future shale gas extraction. The hidden subsidies for fossil fuels also put low-CO_2 energy technology at a disadvantage. The low-CO_2 option of nuclear energy is mired in controversy. As long as policy incentives do not do enough to correct this situation, the result is a status quo which primarily promotes CO_2-rich energy supplies.

Clear overview

Another important aspect of this accounting process is a clear overview of the shareholder status and associated profits for the Dutch government in relation to various forms of energy production, energy processing and energy delivery on our supposedly “free” energy market. It is important to remember that the influence of the government as a shareholder in energy companies is still very large indeed. This brings opportunities – but also limitations – in relation to management and control, and these are often forgotten in practice.

In those accounts, it is also useful to show the costs and benefits that citizens are liable to face in their role as tax payer, consumer and possibly as local resident in relation to an energy project.

One thing is certain: the billions of euros in revenue from traditional natural gas will gradually decline over the next twenty years. The debate centring on a number of future scenarios will have to lead to a balanced economic policy that ensures that our energy remains affordable and reliable, and becomes cleaner, while at the same time continuing to provide us with a source of income.

References

AER (2011a). *Briefadvies beleidsinstrumenten hernieuwbare elektriciteit.* Den Haag: Algemene Energieraad, 6 April 2011.

AER (2011b). *Briefadvies opkomst onconventioneel gas.* Den Haag: Algemene Energieraad, 8 februari 2011.

AgentschapNL (2010). 'Stimulering Duurzame Energieproductie (SDE)'. http://regelingen.agentschapnl.nl, last retrieved: 24 November 2010.

AO Energie (2011). 'Algemeen Overleg Energie', Tweede Kamer, 22 June 2011.

van Beers, C. et al. (2007). 'Determining the Environmental Effects of Indirect Subsidies: Integrated Method and Applications to the Netherlands.' In: Applied Economics, vol. 39, pp. 2465-2482.

van Beers, C. & van den Bergh, J. (2009). 'Environmental Harm of Hidden Subsidies: Global Warming and Acidification'. In: *Ambio*, vol. 38, no. 6.

Bloomberg (2010). 'Fossil Fuel Subsidies Are Twelve Times Renewables Support'. http://www.bloomberg.com, 29 July 2010.

Bogtstra, F. (2011). 'Ook Italië wil geen kernenergie'. http://kernenergiehoezitdat.nl, 14 June 2011.

Brattle Group (2010). *Economic Impact of the Dutch Gas Hub Strategy on the Netherlands.* Londen: The Brattle Group, December 2010.

CAT (2010). *The Toll From Coal. An Updated Assessment of Death and Disease from America's Dirtiest Energy Source.* Boston: The Clean Air Taskforce, September 2010.

CBS (2009). *Monitor Duurzaam Nederland 2009.* Den Haag: Centraal Bureau voor de Statistiek.

CDG (2011). *Nederlandse Steenkool Dialoog: Werken aan onderling begrip en bijdragen aan verbeteringen Bespreking van de eerste fase en aanbevelingen voor de tweede fase.* Coal Dialogue Group, 4 February 2011.

CE Delft (2000). *De prijs van groeiend energieverbruik. Prijsmechanismen achter het toenemend gebruik van energie.* Delft: CE Delft, December 2000.

CE Delft (2007). *Nieuwe elektriciteitscentrales in Nederland. De 'vergeten' kosten in beeld.* Delft: CE Delft, April 2007.

China Daily (2010). ‘China to Reduce Rare Earth Export Quotas’. http://www.chinadaily.com.cn. Bijgewerkt op 19 October 2010.

CIEP (2010). *Energiebeleid en de Noordwest-Europese markt. Brandstofmix en infrastructuur.* Den Haag: Clingendael International Energy Programme, February 2010.

CIEP (2011). *Het Internationale Energiebestuurssysteem. Hoe navigeert Nederland naar betaalbaar, duurzaam- en voorzieningszekerheid in een onzekere wereld?* Den Haag: Clingendael International Energy Programme, June 2011.

Commissie MER (2009). *Realisatie tweede kerncentrale te Borssele. Advies voor richtlijnen voor het milieueffectrapport.* Utrecht: Commissie voor de Milieueffectrapportage, 3 December 2009.

Commissie Publiek Aandeelhouderschap Energiebedrijven (2008). *Publiek aandeelhouderschap energiebedrijven,* 26 June 2008.

Compendium (2009). ‘Emissies naar lucht, 1990-2009’. http://www.compendiumvoordeleefomgeving.nl

Compendium (2010). ‘Verbruik van hernieuwbare energie 1990-2010’. http://www.compendiumvoordeleefomgeving.nl

Corbey (2009). ‘Opdracht’. Commissie Duurzaamheidsvraagstukken Biomassa (Commissie Corbey). http://www.corbey.nl, last retrieved: 25 April 2011.

Corbey (2011). *Duurzaamheid en daadkracht. Advies over een duurzame bio-economie.* Commissie Duurzaamheidsvraagstukken Biomassa.

Desertec (2010). ‘Key Technologies for Desertec’. http://www.desertec.org, last retrieved: 24 April 2011.

Diederen, A. (2010). *Global Resource Depletion. Managed Austerity and the Elements of Hope.* Delft: Eburon.

EC (2008). *Energie-efficiëntie: verwezenlijking van de 20%-doelstelling.* Brussel: Europese Commissie, 13 November 2008.

EC (2009). *Richtlijn ter bevordering van het gebruik van energie uit hernieuwbare bronnen.* Brussel: Europese Commissie, 23 April 2009.

EC (2011a). *A resource-efficient Europe. Flagship initiative under the Europe 2020 Strategy.* Brussel: Europese Commissie, 26 January 2011.

EC (2011b). *Tackling the Challenges in Commodity Markets and on Raw Materials.* Brussel: Europese Commissie, 2 February 2011.

EC (2011c). ‘Europe 2020 Targets.’ http://ec.europa.eu

ECF (2010). *Roadmap 2050.* Den Haag: European Climate Foundation.

Ecofys/CE Delft (2011). *Overheidsingrepen in de energiemarkt. Onderzoek naar het Nederlandse speelveld voor fossiele brandstoffen, hernieuwbare bronnen, kernenergie en energiebesparing.* Utrecht/Delft: Ecofys/CE Delft, June 2011.

Ecorys (2010). *Versterking van de Nederlandse Duurzame Energiesector.* Rotterdam: Ecorys, 7 December 2010.

ECN (2001). *Protocol monitoring energiebesparing.* CPB, ECN, Novem en RIVM, December 2001.

ECN (2006). *Historische analyse van kosten & opbrengsten van de Nederlandse energievoorziening. Vergelijking met EU-lidstaten.* Petten: Energieonderzoek Centrum Nederland, December 2006.

ECN (2007). ‘Vragen over nieuwe kolencentrales in Nederland’. http://www.ecn.nl, 13 December 2007.

ECN (2011). ‘Broeikasgasemissies. Alle sectoren – Historie’. http://monitweb.energie.nl, ontwikkeld door het Energieonderzoek Centrum Nederland (ECN), last retrieved: 22 April 2011.

ECN/PBL (2010). *Referentieraming Energie en Emissies 2010–2020.* Petten/Den Haag: Energieonderzoek Centrum Nederland/Planbureau voor de Leefomgeving, April 2010.

EL&I (2011). *Energierapport 2011.* Den Haag: Ministerie van Economische Zaken, Landbouw & Innovatie, June 2011.

EZ (2008). *Energierapport 2008.* Den Haag: Ministerie van Economische Zaken.

EZ (2009). *Delfstoffen en aardwarmte in Nederland. Jaarverslag 2009.* Den Haag: Ministerie van Economische Zaken.

Fleming, D. & Chamberlin, S. (2011). *TEQs: Tradable Energy Quotas. A Policy Framework for Peak Oil and Climate Change.* Londen: House of Commons, All Party Parliamentary Group on Peak Oil & The Lean Economy Connection, January 2011.

GLM (2011). ‘Het energiebeleid van Rutte 1. Kernenergie in de lift?’ In: GroenLinks Magazine, April 2011.

Groene Zaak (2011). *Position Paper Green Level Playing Field.* Den Haag: De Groene Zaak, February 2011.

de Groot, K. & le Pair, C. (2009). 'De brandstofkosten van windenergie. Een goed bewaard geheim'. In: *Spil* 263-264, nr. 5, pp.15-17.

Huizinga-Heringa, J. (2010). *Brief aan de Tweede Kamer. Betreft: Aanbiedingsbrief Nationaal Programma Duurzame Hulpbronnen.* Den Haag: Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer, 11 October 2010.

Huizinga-Heringa, J. & Verhagen, M. (2010). *Brief aan de Tweede Kamer. Betreft: Voortgang Kabinetsbrede aanpak duurzame ontwikkeling (KADO),* Den Haag: Ministeries van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer, en Buitenlandse Zaken, 17 May 2010.

Hopkins, R. (2008). *The Transition Handbook. From Oil Dependency to Local Resilience.* Londen: Green Books.
IDH (2011). 'Initiatief Duurzame Handel', http://www.duurzamehandel.com, last retrieved: 24 August 2011.

IEA (2009). *World Energy Outlook 2009.* Parijs: OECD/International Energy Agency.

IEA (2010). *World Energy Outlook 2010.* Parijs: OECD/International Energy Agency.

Jelsma, J. (2008). 'Een kerncentrale is niet te verzekeren.' In: *NRC Handelsblad*, 3 September 2010.

Klein, R. & van der Voet, E. (2010). 'Resource Constraints in a Hydrogen Economy Based on Renewable Energy Sources: An Exploration'. In: *Renewable and Sustainable Energy Reviews 14*, pp. 2784 – 2795.

Kramer, G.J. (2011). *The Accidental Cathedral. Thoughts on Rebuilding the Energy System.* Oratie uitgesproken bij de aanvaarding van het ambt van hoogleraar op het gebied van Sustainalbe Energy aan de Universiteit Leiden, 18 March 2011.

Nederland krijgt Nieuwe Energie (2010). *Nederland krijgt nieuwe energie voor welvaart en welzijn in de 21e eeuw. Een Partijoverstijgend voorstel voor een Deltaplan nieuwe energie.*

NRC (2011). 'Duitsland stopt met kernenergie, politieke reactie op ramp Fukushima'. In: *NRC Handelsblad,* 30 May 2011.

NRC (2011b). 'In het land van de ja-knikkers'. In: *NRC Handelsblad*, 5 February 2011.

NRC (2011c). 'Dure rekening voor Shell in Nigeria'. In: *NRC Handelsblad*, 4 August 2011.

Oakdene Hollins (2010). *Lanthanide Resources and Alternatives. Sustainable products, clean technologies, resource efficiency.* Aylesbury Buckinghamshire: Oakdene Hollins, 26 May 2010.

OECD (2008). *OECD Environmental Outlook to 2030.* Parijs: Organisation for Economic Co-operation and Development.

Owen, D. & Keulemans, M. (2011). 'Besparen met de kraan open.' In: *NWT Magazine*, April 2011.

PBL (2010). *Brief aan de Secretaris-generaal van het Ministerie van VROM, ir. J. van der Vlist. Onderwerp: Analyse Regeerakkoord.* Den Haag: Planbureau voor de Leefomgeving, 12 October 2010.

PBL (2011). *Scarcity in a Sea of Plenty? Global Resource Scarcities and Policies in the European Union and The Netherlands.* Den Haag: Planbureau voor de Leefomgeving.

PBL (2011b). *De energieke samenleving. Op zoek naar een sturingsfilosofie voor een schone economie.* Den Haag: Planbureau voor de Leefomgeving.

Rathenau Instituut (2009). *Energietransitie begint in de regio. Rotterdam, Texel en Energy Valley onder de loep.* Den Haag/Delft: Rathenau Instituut/CE Delft, 17 June 2009.

Rathenau Instituut (2011). *Naar de kern van de bio-economie. De duurzame beloftes van biomassa in perspectief.* Den Haag: Rathenau Instituut.

Regeerakkoord (2010). *Vrijheid en verantwoordelijkheid.* Regeerakkoord VVD-CDA.

Reuters (2011). 'France's Sarkozy Backs State as EDF Shareholder'. http://www.cnbc.com, 3 May 2011.

Rijksoverheid (2011a). *Wet van 2 december 2010 tot wijziging van de Gaswet en de Elektriciteitswet 1998.* Staatsblad van het Koninkrijk der Nederlanden.

Rijksoverheid (2011b). *Besluit van 27 december 2010, houdende vaststelling van het tijdstip van inwerkingtreding van enkele onderdelen van de wet tot wijziging van de Gaswet en de Elektriciteitswet 1998.* Staatsblad van het Koninkrijk der Nederlanden.

Roland Berger (2010). *Stimulering van de economische potentie van duurzame energie voor Nederland.* Amsterdam: Roland Berger Strategy Consultants, February 2010.

RWE/Essent (2009). 'Facts and figures'. http://www.rwe.com, 2 June 2010.

Schneider, K. (2010). 'A High-Risk Energy Boom Sweeps Across North America'. In: *Yale Environment 360*, http://e360.yale.edu, 30 September 2010

SEO (2010). *Investeren in een schone toekomst.* Amsterdam: SEO Economisch Onderzoek, July 2010.

SER (2010). *Meer chemie tussen groen en groei. De kansen en dilemma's van een biobased economy.* Den Haag: Sociaal Economische Raad, December 2010.

Sorrel, S. (2007). *The Rebound Effect: an Assessment of the Evidence for Economy-Wide Energy Savings From Improved Energy Efficiency.* Sussex: UK Energy Research Centre, October 2007.

Taqa (2011). 'About Us'. http://www.taqa.ae, last retrieved: 22 April 2011.

TenneT (2010). *Taking Power Further.* Arnhem: TenneT TSO B.V., November 2010.

TenneT (2011). 'TenneT Holding B.V.' http://www.tennet.org, last retrieved: 19 May 2011.

Tensor Energy (2009). *Onderzoek gemeentelijke energiebedrijven.* Rotterdam: Tensor Energy.

TNO (2009). *Inventory Non-conventional Gas.* Utrecht: TNO, 3 September 2009.

Trouw (2009). 'Shell laat lekkage olie in Nigeria sloffen'. In: *Trouw*, 19 February 2009.

Tweede Kamer (2010). *Brief van de ministers van VROM en EZ. Betreft: aanbieden publicatie 'Schaarste en transitie, kennisvragen voor toekomstig beleid'.* Kamerstuk 31793-39, 30 March 2010.

Tweede Kamer (2011a). *Motie van het lid Van den Berge c.s.* Kamerstuk 32357-17, 26 January 2011.

Tweede Kamer (2011b). *Gewijzigde motie van het lid Van den Berge c.s. ter vervanging van die gedruk onder nr. 17*. Kamerstuk 32357-26, 17 February 2011.

UCS (2011). *Nuclear Power. Still Not Viable Without Subsidies.* Cambridge: Union of Concerned Scientists/Earth Track Inc.

UN (2011). *Environmental Assessment of Ogoniland.* Nairobi: United Nations Environment Programme.

Urgenda (2011). 'Icoonprojecten'. http://www.urgenda.nl, bekeken op 4 May 2011.

USGS (2008). *Circum-Arctic Resource Appraisal: Estimates of Undiscovered Oil and Gas North of the Arctic Circle. Fact Sheet 2008-3049.* US Geological Survey.

V&J (2010). *Nationale risicobeoordeling. Bevindingenrapportage 2010.* Den Haag: Ministerie van Veiligheid en Justitie, 30 November 2010.

Vattenfall (2011). 'Shareholder and Shareholder's Meeting'. http://www.vattenfall.com, bekeken op 22 April 2011.

Verhagen, M. (2010a). *Brief aan de Tweede Kamer. Betreft: SDE+.* Den Haag: Ministerie van Economische Zaken, Landbouw en Innovatie, 30 November 2010.

Verhagen, M. (2010b). *Beantwoording vragen naar aanleiding van het wetgevingsoverleg energie op 6 december 2010.* Den Haag: Ministerie van Economische Zaken, Landbouw en Innovatie, 10 December 2010.

Verhagen, M. (2011a). *Brief aan de Tweede Kamer. Betreft: reactie op het rapport naar de economische effecten van de gasrotondestrategie op de Nederlandse economie.* Den Haag: Ministerie van Economische Zaken, Landbouw en Innovatie, 13 January 2011.

Verhagen, M. (2011b). *Brief aan de Tweede Kamer. Betreft: schriftelijk overleg gasrotonde en splijtstoffen.* Den Haag: Ministerie van Economische Zaken, Landbouw en Innovatie, 31 January 2011.

Verhagen, M. (2011c). Toezegging van de minister over de duurzaamheid van bij- en meestook biomassa tijdens het Algemeen Overleg Energie in de Tweede Kamer op 22 June 2011.

Veringa, H. (2011). 'Hoe gevaarlijk is het boren naar Brabants schaliegas?' In: *Cursor. Informatie- en opinieblad van de Technische Universiteit Eindhoven*, 3 March 2011, p. 7.

de Volkskrant (2010). 'Fiscus ontziet 'fossiele subsidies'. In: *de Volkskrant*, 16 October 2010.

de Volkskrant (2011). 'Publicatiegebod zit Shell dwars'. In: *de Volkskrant*, 16 August 2011.

VROM/BuZa (2009). *Schaarste en transitie. Kennisvragen voor toekomstig beleid.* Den Haag: Ministeries van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer, en Buitenlandse Zaken, November 2009.

WTCBE (2011). *Naar groene chemie en groene materialen. Kennis- en innovatieagenda voor de Biobased Economy.* Den Haag: Wetenschappelijke en Technische Commissie voor de Biobased Economy, March 2011.

Who was Rathenau?

The Rathenau Instituut is named after Professor G.W. Rathenau (1911-1989), who was successively professor of experimental physics at the University of Amsterdam, director of the Philips Physics Laboratory in Eindhoven, and a member of the Scientific Advisory Council on Government Policy. He achieved national fame as chairman of the commission formed in 1978 to investigate the societal implications of micro-electronics. One of the commission's recommendations was that there should be ongoing and systematic monitoring of the societal significance of all technological advances. Rathenau's activities led to the foundation of the Netherlands Organization for Technology Assessment (NOTA) in 1986. On 2 June 1994, this organization was renamed 'the Rathenau Instituut'.