



Shell Dialogues

**Addressing the Energy-Water-Food
challenge webchat**

27th September 2012

Morning Session

Meet the Panel

Dick Benschop

President Director Shell Netherlands

A former Deputy Minister for Foreign Affairs in the Netherlands, Dick joined Shell Energy Europe in 2003. In 2006 he moved to Kuala Lumpur to oversee Shell's Gas & Power business in Malaysia where he spent 3 years. Today, he lives in The Hague with his wife and children.



Jeremy Bentham

Vice President, Global Business Environment

Jeremy has been in the energy business for over 30 years and joined Shell in 1980. Since 2006 he has been responsible for Shell's Global Business Environment team, which is best known for developing forward-looking scenarios to support strategic thinking and direction-setting.



Grahame Buss

Principal Researcher, Biodomain

Formerly in GameChanger, a team set out to explore the latest developments in science and innovation, and the Fuels group Grahame moved over to the Biodomain department to manage a range of projects on biomass feedstock availability and supply. He has a strong interest in land use and sustainability, and has advocated on these issues within Shell since this time.



Adam Newton

Projects Manager, Shell Strategy and Scenarios

Adam has been leading scenarios projects for Shell since early 2010. He established the team's work to manage Food, Energy and Water stresses and understand social and cultural impacts from rapid urbanisation. A former BBC journalist, Adam joined Shell in 2007 as the Senior Group Spokesman for Exploration and Production.



Albert Janssen

Senior Research Engineer Water Treatment, Water Handling

Albert joined Shell in 2004 in the role of Senior Technologist Energy, Water and Waste Services. He is currently responsible for managing the newly established Water Technology Platform, which coordinates all water R&D efforts within Shell.



Maike Boggemann

Project Manager, Strategy and Scenarios

Maike is deeply engaged on Shell's internal policy, technology and capability discussions as well as external collaborations on the energy-water-food nexus. Since 2010 she has been leading Shell's work on water-energy linkages.

**Jack Barnes**

Senior Energy Advisor, Global Business Environment

Jack has over 15 years experience in upstream oil and gas, having worked in various technical, operational and commercial upstream roles across Europe. Jack is responsible for developing Shell's long term energy outlook and evaluating its impact on oil and gas pricing.

**Sergio Kapusta**

Chief Scientist Materials and Corrosion, Materials and Physics

Sergio has worked at Shell for over 25 years, holding positions in Research, Engineering and Operations, across all major segments of the oil and gas business.

**Suman Bery**

Chief Economist, Global Business Environment

Suman worked with the World Bank in Washington DC before acting as a consultant for the reserve bank of India. He then moved to Delhi to serve as Director-General of the National Council of Applied Economic Research and joined Shell in February 2012.



First Session:

Introductory Question

What is the current status of alternative green fuel for automotive?

Graham Buss

Cars in the future will probably be powered by a variety of sources, such as petrol, diesel, electricity, hydrogen, and greater use of biofuels. At Shell, we are working to make fuels today more efficient and are investing in lower carbon alternatives such as biofuels which we believe present the most practical way to reduce CO₂ in the transport fuels sector over the next 20 years. To find out more, check out:

http://www.shell.com/home/content/future_energy/smarter_mobility/smarter_products/

Introductory Question

What is shell's current water foot print worldwide and in China specifically?

Thekla Teunis

Without going into specifics, one obstacle in the industry has been a lack of hard data and consistent ways to measure fresh water use in industrial settings. Shell has recently published an article in which a methodology to measure industrial water footprint is proposed. In this paper, we also provide a perspective on the water-energy nexus, as it shows the water intensity of different energy pathways. You can find the article here:

<http://www.sciencedirect.com/science/article/pii/S0921344911002783>

We are also taking our work a stage further. We're factoring our data on water use into our scenarios models. In this work, particular focus is put on China, since the Chinese energy system is largely dependent on coal, which is much more water intensive than natural gas.

Bjornhammer

A large proportion of the developing world's food production goes to waste. In India, the figure has been calculated to be 48%. The largest opportunity to maintain adequate food supply is surely better storage and in particular cooling provision. Is this aspect being considered?

Graham Buss

Thanks for the question. This sounds like a great idea; there are many opportunities to reduce waste by improving the efficiency of food production and delivery. At Shell, we're currently working to better understand the links between energy, water and food and believe for example, that designing smarter, energy-efficient cities could help reduce waste and the demand for energy and water.

donaldN

Any predictions on the availability of water and food due to climate change impacts into the future? What about going Solar in large scale for energy needs? Dharma, Australia

Albert Janssen

While renewable energy technologies are still expensive in comparison to fossil fuel energies, costs are coming down which means that in the future we should see a greater mix of energy sources to meet the world's demand including solar.

donaldN

First, shall we examine Carbon Free solutions. For Carbon is the nature's choice carrier of energy. Immense nature cooperates with us in this carbon cycle, converting from Carbon Dioxide to organic carbon. If we use hydrogen, then we need to create it artificially, and worse, hydrogen will escape to the out space and we are left with less water, more oxygen - like Mars. If we agree, then is which carbon to use, for food, for production, for irrigation...

Jack Barnes

Carbon-free energy solution, such as wind and solar, have grown at more than 25% per year. However, it will take many years of high growth for these energy sources to become a material contributor to global energy simply because of the immense size of the energy system. Meanwhile, we will continue to rely heavily on fossil fuels. One of the fastest ways to reduce CO2 output however is to replace coal-fired power generation with gas-fired power, which can reduce CO2 emissions by around 50%.

Orffyeus

Is there any progress made in harvesting wave energy in the world?

Graham Buss

There are several pilot projects around the world looking at harnessing both wave and tidal energy. At the moment there are a number of competing technologies. As well as trying to find the best technology, these projects currently struggle to compete with other forms of renewable energy, such as wind and solar on costs.

inspector gadget

Surely the only issue is we need more clean green renewable energy? If we have an abundant energy supply, the water problem is solved by distillation or filtering of sea water, and with plenty of fresh water, we can grow abundant food supplies. The water can be piped to where it is needed.

Thekla Teunis

Renewable energy sources have grown by more than 25% a year. It will however take many years of high growth for these sources to become a material contributor to global energy supply, due to the size of the energy system and their high cost in comparison to fossil fuels. As a result, in the short term, we need to look at where we can identify faster ways to reduce CO2 output such as growing the share of gas-fired power electricity generation.

Saquib

What is Shell's estimation of the availability of the world's oil and gas reserves at a business as usual scenario and what efforts are being made to pump up investments in clean tech? I would appreciate a comparative analysis of oil and gas with renewable resources including some numbers.

Jack Barnes

Thank you for your question. It is difficult to give a detailed answer to your question. Estimates for remaining oil and gas vary because of the uncertainty around undiscovered resources. The International Energy Agency estimates that there are around 50 years of remaining oil reserves and around 250 years of gas. For Shell's perspective, please refer to the latest scenarios

publication, Signals and Signposts, which you can find on the Shell web:

http://www.shell.com/home/content/future_energy/scenarios/

Starfire

Good morning. I'm student of Industrial Ecology, and a popular case in the topic is Kalundborg; you may know that in Kalundborg (Denmark), the water is reused between industries. A power plant gives the output of cooling water to a near refinery, in that way they achieve impressive savings in water.

Albert Janssen

Thank you for your contribution. It's always great to hear about initiatives such as these. At Shell, we are looking at where we can improve water usage in the areas that we can control such as the efficiency of our operations.

Luca

European water resources are under increasing stress due to extractions for drinking water supply, agriculture and industry predominantly. For the required economic growth, industries do need more water. What concrete short term developments do you expect in European water legislation impacting industrial water extraction/consumption?

Albert Janssen

In the area of water Shell is working together with public and private organisations alongside Governments and other heavy users of water such as the agriculture industry, to look at how we can make better use of this precious resource. In our own business, we are trying to improve the areas which we can control, such as efficiency of our operations.

Dharma

If world has to survive then energy cost has to come down drastically using technology such as solar, renewable or fusion etc. Energy, Water and Food are interlinked and natural cycles provide us enough resources to enable our world to sustain. How long we shall have to wait for above developments to occur?

Jeremy Bentham

Renewables such as wind and solar have grown at more than 25% per year. These types of technologies are still expensive however, in comparison to fossil fuel energies. But costs are coming down which means that in the future we should see a greater mix of energy sources to meet the world's demand.

WTAng

There is a new green automotive fuel using alcohol plus solvents after 28 years of development. Would Shell be interested to know about it?

Graham Buss

Absolutely. We're always interested to hear about new, innovative solutions that will limit CO2 emissions in transport. At Shell, we run a 'Smarter Mobility' programme aimed at developing more energy efficient fuels and lubricants; investing in lower carbon alternatives; offering drivers

fuel-saving tips; and helping reduce CO2 emissions from road-building. To find out more information check out: http://www.shell.com/home/content/future_energy/smarter_mobility/

ankit

What is the company's policy/approach on carbon capture and storage? Is it here to stay?

Dick Benschop

At Shell, we believe that carbon capture and storage (CCS) is the only technology available to mitigate emissions from large-scale fossil fuel use.

As a result, we are actively involved in developing technologies and in running demonstration projects around the world to test the capture and storage of CO2. You can find out more information on our website at:

http://www.shell.com/home/content/environment_society/environment/climate_change/ccs/

Marcel Hofman

What are Shell's ambitions and related strategies to improve the environmental consciousness of the general public?

Thekla Teunis

Shell takes its role in informing and educating the public about its work in the area of environment and sustainability very seriously. We publish for example an annual Sustainability Report (available at: <http://reports.shell.com/sustainability-report/2011/servicepages/welcome.html>) and regularly participate in public debates and forums with all speeches available to download on our website.

CPope

What is Shell doing to reduce the usage of water, specifically in the context of fracking operations and nonconventional exploration?

Dick Benschop

With the right standards and practices we believe that fracking can be done responsibly and safely. We actively support regulation and have published our Onshore Tight Gas Operating Principles available at <http://www.shell.us/>

kmeda

Given that many emerging economies have inadequate centralized infrastructure to deal with energy and water requirements, what are your thoughts on how distributed energy and water solutions can help increase food production?

Thekla Teunis

Thanks for your question. As you may be aware, the biggest user of water is agriculture, and typically 75% of the cost of transporting and treating water is energy, so a good place to start is with developing efficient irrigation. Where possible, we also believe that designing smarter, energy-efficient cities could help reduce waste and the demand for energy and water.

BrianW

Fracking... allows access to a whole new supply of fossil fuel but at the cost of polluting the ground. Please disclose all chemicals in fracking fluids. And stop this exploration & invest in renewable energy.

Dick Benschop

Thanks for your comment. At Shell, we believe that with the right standards and practices fracking can be done responsibly and safely. We actively support regulation and have published our Onshore Tight Gas Operating Principles available at <http://www.shell.us/>

warren

Hello panel, thank you for hosting this webchat. I am a research associate leading a program in bioenergy from marine plants. Our technology fits very well with bioremediation of waste water and biomass conversion to energy. I have previously been told Shell do not collaborate on projects in Australia. Are there opportunities to pursue funding from Shell and if so how would you recommend I approach you?

Albert Janssen

Dear Sir, the best thing to do is for you to send your proposal through using the Contact us section of the <http://www.shell.com/> website and we will consider your proposal.

BrianW

Tar Sands oil production is particularly energy/CO₂ intensive, increasing effective tail pipe emissions by, how much 30% 50%? & using huge amounts of water. Wouldn't Shell be better to stop Tar Sands extraction & invest this money in Renewable energy?

Dick Benschop

Renewables can – and will - grow rapidly however even with decades of double digit growth, it will take a long time for it to be a significant percentage of global energy consumption. We believe therefore that oil and tar sands, which contain a vast amount of potential resource, are an important tool in tackling the world's energy challenges. Our Athabasca Oil Sands Project in Canada represents around 2.5% of our total oil and gas production. This has expanded to around 4% since our expansion project began operations in 2010-2011.

We are very aware of the impact that projects like this have on local communities. The Athabasca Oil Sands project has created thousands of jobs and brings economic benefits. We also work closely with local communities to understand their concerns about the project and to tackle them together. For more info of the project and how we work alongside local communities, please visit:

http://www.shell.com/home/content/aboutshell/our_strategy/major_projects_2/athabasca/

samaiin

On the panel i notice no African experts to give insights on first hand forward looking perspective on strategies to support creative dynamic approach to spread awareness? Shell affect millions of lives in Nigeria, SHELL is known for CRUDE OIL, MONEY FOR THE ECONOMY, POLLUTION, SAFETY....can Shell raised the alarms on energy-water-food nexus?

Jeremy Bentham

Shell has become increasingly involved in the public discussion on the energy-water-food nexus, helping to raise awareness about society's future challenges and the kinds of collaborations needed to respond to them. Over the past two years, Shell has organized and participated in a number of events to inspire new ideas and collaborations that address the stresses on our planet. We welcome any suggestions on any collaborations we can form to spread awareness on this in Africa and Nigeria.

Introductory Question

What is the Energy-Water-Food challenge?

Jeremy Bentham

The world's water, energy and food systems are tightly linked. Water is needed for almost all forms of energy production; energy is needed to treat and transport water; and both water and energy are needed to grow food. In the coming decades these vital resources will come under greater pressure. The world's growing population and increased prosperity will push up global demand for energy, as well as food and water supplies. This relationship between vital resources, the so-called "energy-water-food nexus", is moving higher on the agendas of governments, NGOs and businesses, including Shell.

bjornhammer

I would like to know if and in case how Shell is working together with governments/countries on the topic; especially in countries where water resources (will) face scarcity?

Dick Benschop

Because of climate change, the world will be faced with increasing water scarcity and floods, in specific locations. We have seen the effects of this for example during the droughts in the US last summer. Droughts can have a big impact on food security, especially in more vulnerable regions where food producers are smallholder farmers. However, to really understand these interlinkages a lot of work still needs to be done. Shell is working together with other companies and the academic world to develop deeper insight in this area.

DonaldN

It seems that water distribution really hasn't changed much since the roman times, with channels, canals, rivers and aqueducts used to move it. Why isn't any effort being made to reduce evaporation during movement or to take better advantage of rain catchment or condensation capture?

Albert Janssen

Thanks, that's a great question. One obstacle to addressing future fresh water challenges has been a lack of hard data on industrial water use. Using a new methodology to measure water use in industry developed by Shell, the World Business Council for Sustainable Development and the University of Utrecht, we can now estimate more accurately the amount of water needed to generate energy from different sources – including oil, gas, coal, nuclear and biofuels – using different technologies and in different locations. In Shell, movement of water mostly takes place in closed pipelines that do not suffer from evaporation.

DonaldN

Food waste in developing countries has been put at a staggering 40%. Why isn't more research being made into packaging and food handling techniques that extend shelf life while reducing packaging waste?

Graham Buss

This is certainly an important point to make because it is estimated that food waste alone in Europe and the USA could feed 1.5 billion people.

At Shell, we're currently working to better understand the energy-water-food nexus and believe for example, that designing smarter, energy-efficient cities could help reduce waste and the demand for energy and water

Starfire

Is Shell interested to partner with other companies, NGOs and Innovators to find solutions in new alliances?

Thekla Teunis

Yes, we believe collaboration may create an enhanced awareness of the linkages between water, energy and food, in addition to inspiring innovation and new ways of working together. Shell is already working with organisations in the water and food sectors to improve our understanding of the nexus like the World Business Council for Sustainable Development and World Economic Forum. We are also helping to develop on the ground projects with other companies to try to get the ball rolling in new important areas.

Luca

Isn't the actual problem that there are too many people around?

Jeremy Bentham

I think the pressure comes more from the positive development that on average people are becoming more prosperous as hundreds of millions are moving from poverty and experiencing a little of the well-being that others have already experienced. This is a good thing of course, but brings pressures as well.

CVarela

Many times I hear how hard it is to get this kind of symbiosis Kalundborg was unplanned, but seems much harder to plan it from zero. How do you perceive these opportunities of reusing water? Do you think it may have a key role in the future of the energy industry?

Albert Janssen

Thank you for your question. It's always great to hear about initiatives such as these. At Shell, we are looking at where we can improve water usage in the areas that we can control such as the efficiency of our operations.

Chris Baker

Recognising that water dependent ecosystems or wetlands play a significant role in underpinning food security for many millions of people and that energy production (extractive and biofuel)

may seek to access the same water resources, how does Shell see ecosystems in the wfe nexus and how can they best ensure a balanced access to water?

Graham Buss

Thanks for your question. As you will be aware, the biggest user of water is agriculture, and typically 75% of the cost of transporting and treating water is energy, so a good place to start is with developing efficient irrigation.

Biofuels may offer the fastest route to CO2 emissions reductions in the road transport sector. But growing biofuels feedstocks in water-stressed areas could mean that their overall social and environmental impact is far from positive. That's why it's preferable to source feedstocks in countries like Brazil, where agricultural systems are fed mainly by rainwater, rather than irrigation.

brice cabibel

During the 6th World Water Forum, held in Marseille in March, extensive work has been done on the theme "Harmonize water and energy", one objective being to increase collaboration between the water and energy sectors. This was partly achieved, through the participation of oil and gas actors. How can this collaboration be upscaled to really address these challenges together?

Thekla Teunis

Thank you for drawing our attention to the discussions hosted during the World Water Forum. Collaboration on the water-energy is critical to be able to effectively address these challenges. As the energy demand and water use will increase, more will be needed in the future and Shell is very committed to be part of this.

d.f.

How is Shell thinking of collaborating with NGOs and governments to tackle the problems described?

Thekla Teunis

We are always looking for opportunities to collaborate with NGOs, governments and other corporates on this issue. On May 16 2012, our CEO, Peter Voser and Rotterdam Mayor Ahmed Aboutaleb co-hosted the Powering Progress Together forum which brought together more than 15 thought leaders and experts from business, academia and civil society for an interactive brainstorm on the world's growing energy, water, food and climate challenges to inspire new ideas and collaboration to address the complex issues posed by this nexus.

stijnvanzon

Dear Panel, thank you for taking the time to answer our questions. My question relates to which institution(s) are and which should be taking the lead in driving change in the face of the Energy-Water-Food nexus.

Firstly, who IS CURRENTLY taking the primary lead in addressing the Energy-Water-Food challenge: national governments, international organizations or multinational corporations?
Secondly, who SHOULD BE taking the primary lead in addressing the Energy-Water-Food challenge: national governments, international organizations or multinational corporations?

Clearly, a combined effort is necessary, yet my interest goes out to your opinion on who should be taking the lead in this combined effort. Thank you.

Thekla Teunis

Thank you for your question. The so-called “energy-water-food nexus”, is moving higher on the agendas of governments, NGOs and businesses, including Shell. For years, policymakers have spoken of the need for a more integrated approach to tackle the world’s environmental challenges. But delivering concrete progress has proved notoriously difficult. And the overwhelming tendency is still to consider each issue in isolation. Society needs a holistic approach to managing the nexus and the related issue of climate change. Shell brought together academics and experts from industry, government and non-governmental organizations in 2011 and is continuing to make progress in collaboration on the ground.

nsirui

There must come a point when both energy and water become harder and harder to come by. Would this in turn affect the production of biomass which plays a part in sustaining the energy-water cycle?

Graham Buss

That’s an interesting point. Here is one example of how we continue to reduce water requirements in manufacturing. At our Pearl gas-to-liquids plant in Qatar, we use a highly integrated system that means we do not need to draw on Qatar’s scarce water resources. Pearl uses water and heat generated from GTL chemical reaction to make steam, which is used to drive the plant’s equipment. On your second point, most biomass gets its water from rain. How rainfall patterns may shift in the future is an active area of climate research.

samaain

How can hydro-fuel affect the energy-water-food nexus?

Graham Buss

All sustainable sources of energy will be needed to help meet growing demand for transport with lower carbon dioxide (CO₂) emissions. Electric vehicles and hydrogen fuel cells will play an increasing role in the future. For example, Shell has opened demonstration hydrogen filling stations in the USA, Europe and Asia.

kapiteinkrul

How can Shell claim to be able to safely drill in the Arctic, when even a mere live chat organized by you brings instant technical difficulties?

Jeremy Bentham

Unfortunately we did experience some technical difficulties during yesterday’s morning session. We would like to offer our sincere apologies and hope we have been able to answer all of your questions from this session in the transcript.

BrianW

The Arctic is crucial to weather patterns & food production. Climate change is melting the Arctic faster than predicted. I ask shell to recognise the climate emergency & stop Arctic Exploration & use the money to cut CO2 emissions.

Jeremy Bentham

Thank you for your great question. We're here today to discuss how we can address the energy-water-food challenge but if you'd like to know more about what Shell is doing in the Arctic, please see here: http://www.shell.com/home/content/future_energy/meeting_demand/arctic/

Peam

Could biomass be the answer for Energy-Water-Food challenge? Thank you very much.

Dick Benschop

Biomass has a role to play, but only if managed responsibly as there can be competition between fuel, food and water use. We support sustainable use of biomass in biofuel, such as using rain fed irrigation, and sources that wouldn't otherwise be used for food.

ARTEMIS

Good morning. We are about to face a great challenge of dry period(s) in the South Europe, and especially the Balkans region. Does your team have a forecast of water challenges in the South Europe? If yes, how do you propose that we are to deal with it? By desalinization? Combined with power producing plants? Artemis Damigos from Greece

Albert Janssen

To better understand the energy-water-food nexus, Shell brought together academics and experts from industry, government and non-governmental organisations in 2011. This diverse group's research activities highlighted two main ways to help tackle the stresses on energy, water, food and climate: sustainable urban development and regulation of greenhouse gas emissions through carbon pricing.

For example, designing smarter, energy-efficient cities could help reduce demand for energy and water. Such cities would integrate transport, energy, water and waste systems much more effectively than today's cities.

And greenhouse gas emissions regulation can spur energy efficiency and increased use of new technology. Without such regulation, climate change could have a significant impact, causing dry regions to get drier, affecting agriculture and encouraging more people to move into cities.

burak.sen

What is SHELL's opinion on Germany turning its face to Renewable Energy planning to shut down all of the country's reactor by 2022 and on the USA not giving anymore permission to planting a new reactor unless the solution of how to deal with nuclear waste is found as well as on the new nuclear power plant which Rosatom is projected to build in Akkuyu, Mersin, TURKEY? Does SHELL believe in that Renewable Energy could response the future's energy demand? What does SHELL understand from 'Green Business'?

Jack Barnes

Thank you for your question, it's good to hear about the goals of countries to help meet future energy demand. At Shell we believe in a long-term and sustainable energy mix. Fossil-based energy will remain the bulk of energy supply for a number of years still to come. However while renewable energy technologies are still expensive in comparison to fossil fuel energies, costs are coming down which means that we are looking to see a greater mix of energy sources in the future.

Giovanni

In Central Asia the Energy-Water-Food challenge is particularly acute with some observers considering it has potential for actual conflict. Water is crucial for summer irrigated agriculture in the downstream countries while it is the main source for power generation in the upstream countries with the peak need in winter, creating a conflict situation. The development of unconventional gas may have at least two important consequences for this region: it would make cheaper energy more accessible for countries upstream and it would decrease the revenue of energy-exporting countries downstream. Do you consider that the development of unconventional gas has the potential to change the current situation?

Dick Benschop

You make some very interesting points in your question. We at Shell believe that it is the power sector that will continue to account for the majority of energy-related freshwater use, so growing the share of gas-fired power could help to reduce the overall freshwater intensity of electricity generation. Replacing a coal-fired power plant with a similar-sized gas-fired one can also help to reduce CO2 emissions by around half.

burak.sen

What does SHELL think about GMO - a solution to the scarce of food in future or a wrong strategy of modern agriculture?

Graham Buss

It is a fair question to ask because the World Economic Forum predicts that by 2030 there will be a 50% growth in food needs, with demand for beef increasing by more than 80%. Genetically modified crops are already a reality in modern agriculture. Many people argue that GMOs will help meet that growing demand and prevent the expansion of agriculture into grasslands and forests. We believe that there are strong linkages between water, energy and food and not one issue can be looked at in isolation. Designing smarter, energy-efficient cities could help reduce demand for energy and water for such cities. We can integrate transport, energy, water and waste systems much more effectively than today's cities and spur more energy efficient behaviours.

Ilyna

What influence can have Shell company on the issue? Companies can do nothing globally according to antimonopolistic policies of the majority of countries; whatever corporations do will be implemented in specific sector of their own business. A company can make a research of the question, but are not hundreds of scientists in governmental structures doing the same? A company can start implementing the research results, but finally it will meet the antimonopolistic regulators. Why not to use Norwegian experience for energy utilization; Chinese experience in food production; and Israel experience in water treatment?

Jeremy Bentham

Thank you for your question, you raise some great points. At Shell we believe collaboration may create an enhanced awareness of the linkages between water, energy and food, in addition to inspiring innovation and new ways of working together. Shell is working with organisations in the water and food sectors to improve our understanding of the nexus like the World Business Council for Sustainable Development and World Economic Forum. We are also helping to develop active on the ground projects with other companies to try to get the ball rolling in new important areas.

On May 16 2012, our CEO, Peter Voser and Rotterdam Mayor Ahmed Aboutaleb co-hosted the Powering Progress Together forum which brought together more than 15 thought leaders and experts from business, academia and civil society for an interactive brainstorm on the world's growing energy, water, food and climate challenges to inspire new ideas and collaboration to address the complex issues posed by this nexus.

MSKrabbe

Dear expert panel,

When you are talking about a looming water crisis are you projecting that such a crisis will hit only certain affected regions (already it is of course a huge problem in Africa) or will the crisis be so severe that a water crisis will hit globally. Thank you. Mads S. Krabbe

Jeremy Bentham

The water crisis will be a global issue, for all for the world's water, energy and food systems are tightly linked. Water is needed for almost all forms of energy production; energy is needed to treat and transport water; and both water and energy are needed to grow food. In the coming decades these vital resources will come under greater pressure as growing population and increased prosperity push up global demand for energy, water and food supplies. If current water consumption trends continue, the world could face a 40% shortfall between global freshwater demand and supply by 2030 according to the World Economic Forum, so as you can see, this will be an issue for the world.

MichaelR

We have demonstrated low cost a solar powered cooling system. Is there a route by which Shell could finance the making of a food storage system using the same technology?

Graham Buss

At Shell we are constantly looking at new ways to innovate. Last year we brought together academics, industry experts, government and non-governmental organisations to help solve the stress nexus between energy, food and water.

Project and Risk Management Professional

Whilst it is a fact that the Stress (Water-Energy-Food) Nexus is going to be a big challenge in the next 3-4 decades, a flash point that quickly comes to mind is the wastage in food. According to 'The Guardian' sometime in September 2009, it was estimated that food wastage in Europe and the USA only could feed 1.5 billion people. Development of strategies aimed at reducing food waste will contribute in addressing the Stress Nexus.

Does SHELL believe in that, in the future, such big countries as the USA, China, Japan and France, Germany, England under the name of the EU would attack the countries that have giant water resources by telling that they do it in the name of democracy and freedom?

Graham Buss

Thank you for your question. We're here to discuss the energy-water-food challenge today and cannot comment on the potential objectives of individual countries, perceived or otherwise.

Solvere

Agreed with Peam, and Jeremy. There is this concept of Energy Pyramid. Use only the best for food, the next for animal feedstock, next for printing, packaging, construction material, only the waste, wormed, plagued, poisons we burnt for energy. Chinese central government has enacted the law. MIT Energy Team led by Hockfield on Jan 22, 2009 was shown this too. Agriculture industries produce a lot of waste, one ton of wheat produce 7 tons of hays.... they can be used for packaging, etc, before sending to burn for fuel. Clean burning is very very important. Is the key to resolve energy, environment, rural poverty, hostile terrain management (counter desertification by cultivating thorns). Do you agree, Jeremy?

Jeremy Bentham

Where possible, the use of clean technology and renewable energy is preferred. Renewable energy sources have grown by more than 25% a year. It will however take many years of high growth for these sources to become a material contributor to global energy supply, due to the size of the energy system and their high cost in comparison to fossil fuels. As a result, we need to look at where we can identify faster ways to reduce CO2 output such as growing the share of gas-fired power electricity generations.

HK

Don't think we came to this stage of energy crisis without realizing it would come. Have we been growing our economies at the expense of our natural resources without the slightest clue? But then again, we are not slowing down using them, can we? Is there a way out of this cycle?

Suman Bery

There are three separate issues here: existing energy use patterns; the change in those patterns; and growth in poor countries. Rich countries have different levels of energy intensity, reflecting historic land-use choices and abundant energy. While their energy intensity of output is typically higher than that of poor countries, in most of them energy intensity is declining. Poor countries need growth in order to address problems of poverty. This requires affordable energy, which for the present is still most conveniently provided by the fossil fuels of coal, oil and natural gas. Renewable energy sources are still expensive in comparison to fossil fuel energies – as their costs decline renewables will play a greater role in the global mix of energy sources.

Kris

Most companies are also talking about global trends (energy, water, food) and sustainability, so how does Shell differentiate yourself from your competition?

Jeremy Bentham

These are indeed areas that lots of organisations are talking about, rightfully so given their importance. Shell is particularly focused on understanding these stresses and, importantly, how

they link together. An example of this is the work we carried out in 2011, working with the World Business Council for Sustainable Development and the University of Utrecht, to develop a new methodology to improve the measurement of water use in industry. Now we can estimate more accurately the amount of water needed to generate energy from different sources, using different technologies and in different locations. We are sharing our data with the wider business sector and the International Energy Agency.

stephanie

What is Shell intending to do about the Energy-Water-Food challenge?

Thekla Teunis

Thanks for your question. One of the things we are trying to do, working with experts from government and non-governmental organisations, is to understand the linkages between these areas even more. This year we co-hosted the Powering Progress Together forum, bringing together thought leaders and experts from civil society to brainstorm and find new ideas and opportunities to collaborate to address the issues posed by the Energy-Water-Food Nexus.

In addition, one major obstacle to addressing future water challenges has – up until now - been a lack of hard data on industrial water use. We worked, alongside the World Business Council for Sustainable Development and the University of Utrecht, to develop a new methodology to measure water use in industry, and we can now estimate more accurately the amount of water needed to generate energy from different sources – including oil, gas, coal, nuclear and biofuels, using different technologies and in different locations.

We are also looking at our own operations and how water is used within them and are already getting better at recovering and recycling water, including water from communities close to our operations. At our Pearl gas-to-liquids plant in Qatar, we use a highly integrated system that means we do not need to draw on Qatar's scarce water resources. Pearl uses water and heat generated from the GLT chemical reaction to make steam, which drives the plant's equipment.

Su Liu @ Civic Exchange

Can Shell demonstrate the energy-water-food nexus quantitatively? Such as produce 1 ton of crude oil, consumes how many tons of water on average, to obtain 1 ton of water, consumes how much energy, etc.?

Thekla Teunis

Shell worked together with Utrecht University on an academic paper in which the water demand for different energy pathways is examined. You can find the article here:

<http://www.sciencedirect.com/science/article/pii/S0921344911002783>

eoghancifford

Is there a danger that increasing technology and/or climate change effects (e.g. easier access to Polar regions or the ability to access shale oils) will prolong the move from non-renewable to renewable energy sources? Surely companies such as Shell should be doing more to push the move to renewable resources and agree not to pursue non-renewable resources when it is clear climate change/global warming is accelerating?

Suman Bery

Thanks for your question. Shell is committed to making energy accessible and affordable in a responsible manner. Given current and future need for energy and the depletion of existing

reserves, meeting this goal requires support for both renewables (such as biofuels) and replacement fossil fuel resources. Given their small current scale and relatively high cost, even by 2050 only about 30% of the world's commercial energy is expected to be provided by renewables. Fossil fuels and nuclear will have to play an important role in providing the rest of the energy. At Shell we are finding ways to provide energy from cleaner sources and help customers use energy more efficiently.

Scott Northcott

Scott Northcott Visionary & Founder of The QU Consortium & The ARK Foundation, Buckinghamshire, England. Good morning Dick Benschop & Jeremy Bentham, plus all colleagues at Shell. My question is what is Shell doing verses other corporation to exceed & excel in attaining or working towards equilibrium & balance to safe guard our depleting natural finite resources?

Dick benschop

Hi Scott, thanks for your question. Through partnerships with environmental experts and by using new technologies we are finding ways to help reduce the impact of our operations on the environment. We plan to spend \$100 billion from 2011-2014 to support new energy production. We are entering more challenging environments to unlock new resources and boosting production from existing fields so that the rate of depletion might not be that once thought. At the same time, we are using new technologies and an innovative approach to limit our impact on the environment and find effective ways to engage with communities near to our operations. Considering our impact on the environment runs through everything we do.

virendra_nathin

How confident you are about the having solution of this problem if not why? If yes, how?

Jeremy Bentham

Thanks for your question. We are very focused on finding the solution to the energy-water-food challenge and are working with academics and experts from industry, governmental and non-governmental organisations to help achieve this.

Between now and 2050 it's estimated that \$300 trillion dollars of investment will be required for city infrastructure. Designing smarter, energy efficient cities could help reduce demand for energy and water. Meanwhile, greenhouse gas emissions regulation can spur more energy efficient behaviours and technology deployment. Smart investment and regulation will also have a huge impact on this situation. But we need to get work together to find solutions as the problems that we face cross many traditional boundaries in both the private and public sectors.

Saravana S

Hi, we are a Textile processing unit (S P Textile processors) from India. We are recovering 99% of water through our zero liquid discharge. This is reused back in our process. In this process we are also recovering more than 90% salt which is reused back in process. But we expend a lot of energy in terms of electricity and steam (from burning biomass) to achieve this level of recovery. So my question what is the trade off point between water recovery and carbon foot print? Can we also reduce our carbon footprint in this process? Please explain how.

Albert Janssen

Thanks very much for your question, and it is great to hear about your initiatives to save water and salt. The trade-off between water recovery and carbon foot print depends on a number of factors, including the technologies used and the location. This article maybe helpful, when considering how these factors interrelate:

<http://www.sciencedirect.com/science/article/pii/S0921344911002783>

Energy reduction efforts rely on the type of energy generation. Co-generation, ie combined production of heat and electricity can be a method to optimize water recovery and carbon footprint.

mspoonia

In another 30 years, what types of energy will the world use, and how much? How will new technologies, efficiencies and policies impact the market?

Jeremy Bentham

Here at Shell, we use scenarios to explore the future. Our scenarios are not mechanical forecasts. They recognise that people hold beliefs and make choices that can lead down different paths. They reveal different possible futures that are plausible and challenge people's assumptions.

Our latest publication, Signals and Signposts, considers how events have unfolded since the 2008 publication of our Shell Energy Scenarios to 2050 and offers our understanding of the changes brought about by the global economic crisis. More information can be found here:

http://www.shell.com/home/content/future_energy/scenarios/

Rainer

Will Shell play a more active role in the water business in the future?

Thekla Teunis

Yes, together with partners Shell will increasingly be involved in the water business. Increase in energy demand will put pressure on the demand for water. Not all people know that when we produce energy we are in fact also producing water. This provides challenges and opportunities. Water is never an isolated issue; we need to collaborate with partners in watersheds to find the most effective solutions for water sourcing, treatment and transportation. Shell recently established a Water Technology Platform, in which expertise on water management within the company is addressed.

NickMeeten

What will it take to really kick start action in resolving the problems with water & wastewater infrastructure? In most developed countries it has long been subject to underinvestment and is now aging & crumbling. In developing countries the infrastructure is not yet there.

Albert Janssen

For our new projects Shell like the Pearl-GTL plant in Qatar, Shell developed a so called Zero Liquid Discharge (ZLD) plant. Water that is produced during the so called Fischer-Tropsch process is being used as cooling water; thereby we do not need to draw on Qatar's scarce water resources.

Mandy

Hello, Albert. Could you help us know what is the major role water technology platform?

Albert Janssen

Technology will be essential in tackling the energy-water-food challenge. This article is a good place to start when considering the role of technology in water accounting for (agro)industrial operations and its application to energy pathways:

<http://www.sciencedirect.com/science/article/pii/S0921344911002783>. As water is across our business, one of the roles of the water TP is to ensure that there is no duplication and maximize synergies.

Divyam

Among the first things that come to my mind when you mention the link between Energy-Water-Food are biofuels. Given the ongoing debate on how much of a role food-crop derived biofuels can play in a low carbon world and EU's recent announcement of limitation on biofuel procurement from unsustainable sources, is this the end of road for biofuels emerging as a major alternative to gasoline or diesel?

Graham Buss

Shell sees a strong future for biofuels. Biofuels can be produced sustainably from many biomass types and if done well will significantly reduce the CO2 emissions from road transport. Indeed, biofuels may offer the fastest route to CO2 emissions reductions in the road transport sector, so Shell sees this as an important fuel to develop.

We understand, however, the concerns that growing biofuels feedstocks in water-stressed areas could mean that their overall social and environmental impact is far from positive. That's why it's preferable to source feedstocks in countries like Brazil, where agricultural systems are fed mainly by rainwater, rather than irrigation

To find out more about what Shell is doing with biofuels, please visit:

http://www.shell.com/home/content/environment_society/environment/climate_change/biofuels_alternative_energies_transport/biofuels/

andrea-pangea

What is the position of Shell with regard to the link between biofuel production, water consumption and food security? What do you think are the main challenges for the coming years?

Graham Buss

Hi. There have been a number of questions today relating to biofuels and a link between their production, water consumption and food. I am glad that you use the phrase 'food-security'.

Biofuels offers the fastest route to CO2 emissions reductions in the road transport sector. Shell sees this as an important fuel to develop.

On water consumption. Water to grow crops is the dominant part of water use in biofuels. We support rainfed crops, such as sugarcane in Brazil. Manufacturing use is considerably less and can be further reduced through efficiency gains and technology

Biofuels must not compete with food security, and done well it will not, indeed it can support it by bringing work and wealth to a community, and as you will know the primary source of food insecurity is poverty. www.shell.com/biofuels/

samaiin

How sustainable is biofuel in the long run?

Graham Buss

Biofuels can be produced sustainably and without conflict to food, feed and fibre. We are working to ensure that this outcome is achieved.

To find out more about what Shell is doing with biofuels, please visit:

http://www.shell.com/home/content/environment_society/environment/climate_change/biofuels_alternative_energies_transport/biofuels/

BrianW

Jeremy, with a q of 73 questions u have only said "thanks for highlighting the Olympics". We are faced with global weather ocean freshwater food supply destruction & sea level rise because of YOUR policies. WHEN, WHAT YEAR WILL SHELL STOP FOSSIL FUEL PRODUCTION?

Jeremy Bentham

Thank you for your question. Renewable energy sources have grown by more than 25% a year, but it will take many years of high growth for these sources to become a material contributor to global energy supply, due to the size of the energy system and their high cost in comparison to fossil fuels.

We therefore see fossil fuels being a major part of the solution to the world's energy challenges but we are looking at where we can identify faster ways to reduce CO2 output such as growing the share of gas-fired power electricity generation. For more information about our views of the future, please look at the latest scenarios publication, Signals and Signposts, which you can find on the Shell web: http://www.shell.com/home/content/future_energy/scenarios/

BrianW

The Major oil companies are making huge profits from the market driven oil price. They are in the position to choose between a fossil future leading to climate change & food shortages or reinvestment in renewable energy & a sustainable future. Which will it be?

Suman Bery

Thank you for your question. I'm afraid the global energy challenge is not as clear cut. Renewable energy sources have grown by more than 25% a year, but it will take many years of high growth for these sources to become a material contributor to global energy supply, due to the size of the energy system and their high cost in comparison to fossil fuels.

We therefore see fossil fuels continuing to play a role in meeting the world's energy challenges but are looking at where we can identify faster ways to reduce CO2 output such as growing the share of gas-fired power electricity generation. Shell is investing a huge amount of money into

R&D (\$1.1bn in 2011, more than any of our independent energy company peers), in order to quicken this process.

For more information about our views of the future, please look at the latest scenarios publication, Signals and Signposts, which you can find on the Shell web:

http://www.shell.com/home/content/future_energy/scenarios/

BrianW

Tar Sands directly destroys the food supply of indigenous people. Will you stop & call other oil companies to stop?

Dick Benschop

Oil and tar sands contain a vast amount of potential resource and we see them as an important tool in tackling the world's energy challenges. Our Athabasca Oil Sands Project in Canada represents around 2.5% of our total oil and gas production. This has expanded to around 4% since our expansion project began operations in 2010-2011.

We are very aware of the impact that projects like this have on local communities. The Athabasca Oil Sands project has created thousands of jobs and brings economic benefits. We also work closely with local communities to understand their concerns about the project and to tackle them together. For more info of the project and how we work alongside local communities, please visit:

http://www.shell.com/home/content/aboutshell/our_strategy/major_projects_2/athabasca/

Edna

Hello everyone, I wanna know to what extreme biofuel energy can affect the quality of regular food that human consume. Are the crops genetically modified to produce optimum amount of output energy to a level where it compromises humans need.

Graham Buss

Thanks for your question. The answer to this is no. Bioenergy crops are not produced to the detriment of human (I presume you mean food, as fuel is also a human need). High yielding crops are too our benefit and let us not forget that there are synergies with animal feed production. The overall benefit could be very positive.

We are currently building our biofuels capacity and working to make them more sustainable, for example by developing advanced biofuels that use the land more efficiently so that overall less is needed, and using new conversion processes that have the potential to offer fewer CO₂ emissions and can be blended in higher proportions with petrol and diesel than today's biofuels.

To find out more, check out:

http://www.shell.com/home/content/environment_society/environment/climate_change/biofuels_alternative_energies_transport/biofuels/

socioeco

Is there a big connection with shale gas- it need a lot of water, land (i.e irrigation land for food) to produce gas (energy) - it appears energy-water-food is at the centre of shale gas? Gas prices

have dropped but majority of people who have to choose between 'eat or heat' have not benefitted-how can we bring cheap gas benefits to consumers.

Dick Benschop

Many thanks for your question. We understand there is concern around the development of shale gas and in 2011 made publically available our Global Onshore Tight/Shale Oil and Gas Operating Principles.

Shell has a rigorous set of five global operating principles that provide a tested framework for protecting water, air, biodiversity, and the communities in which Shell operates.

As an example of how we deliver these principles, Shell mandates a stringent well construction standard that focuses on the use of safe drilling and completion processes, including reducing the risk of water contamination.

If you would like to find out more and read the principles in full, they are available online at:
http://www.shell.us/home/content/usa/aboutshell/shell_businesses/onshore/principles/

BrianW

Food is both an issue for Humans & Animals, Arctic Oil Exploration risk pollution in an area where clean up is impossible, poisoning food chains for rare animals & the indigenous people of the area. Will you stop?

Jeremy Bentham

We believe that developing the Arctic could be essential to securing energy supplies for the future. We recognise however its fragile ecosystem and take a responsible approach to unlocking this new energy resource.

Read more about how we operate in the Arctic, in particular our oil spill prevention and response commitments, how we protect biodiversity, and respect our neighbours here:
http://www.shell.com/home/content/future_energy/meeting_demand/arctic/?gclid=CIXZ8aSE3rICFXIQtaodWn0AqQ

Saquib

Releasing documentaries which show the harmful effects of using excess of these resources. Excess energy usage leads to environmental problem, excess water leads to war, as they say that the third world war will be on it, and finally food, whose excess consumption leads to health problems. Creative advertisement and marketing can help out!

Jeremy Bentham

Thanks for your comment. We agree that energy has huge impacts on the world around us, and are very vocal about the need for energy efficiency across every aspect of life. Our goal at Shell is to always work to make our operations more energy efficient and help customers to go further on less fuel. To find out more about Shell's work in this area, please visit:
http://www.shell.com/home/content/aboutshell/lets_go_tpkg/energy_efficiency/

BrianW

If Shell & other oil companies don't move away from fossil fuel, sea level rise will flood much of the world's farm land, food shortage will be a reality. How long does shell plan to produce fossil fuel for?

Jack Barnes

Thank you for your question. Tackling the global energy challenge is complex. Renewable energy sources have grown by more than 25% a year, but it will take many years of high growth for these sources to become a material contributor to global energy supply, due to the size of the energy system and their high cost in comparison to fossil fuels.

We therefore see fossil fuels playing an important part in meeting the world's energy challenges but are looking at where we can identify faster ways to reduce CO2 output such as growing the share of gas-fired power electricity generation.

For more information about our views of the future, please look at the latest scenarios publication, Signals and Signposts, which you can find on the Shell web:

http://www.shell.com/home/content/future_energy/scenarios/

BrianW

Ocean Acidification from CO2 release is damaging fish stocks & will destroy reefs round the world. Food shortages, loss of lively hood, extinctions. What is Shell doing to stop CO2 emissions from its processes & fuels?

Suman Bery

Thanks for your question. We see fossil fuels playing an important part in meeting the world's energy challenges but are looking at where we can identify faster ways to reduce CO2 output such as growing the share of gas-fired power electricity generation and creating fuel oil that can cut soot emissions from oil-burning factories by up to 75%. Our coal gasification technology even transforms coal into synthesis gas that burns as cleanly as natural gas to produce energy.

Shell is investing a huge amount of money into R&D (\$1.1bn in 2011, more than any of our independent energy company peers), in order to quicken this process and develop more ways to reduce CO2 emissions. For more info on some of the projects mentioned, please visit:

http://www.shell.com/home/content/aboutshell/lets_go_tpkg/tackling_emissions/

Mayowa

On water, energy and food issue, any vacancies for private partnership?

Again, what are we doing in managing the outcomes of the development from the powering progress together forums? And lastly for progress and development works on the issue of water, food and energy, what help and assistance in managing the achieved ion support and funding in regions?

Jeremy Bentham

We are always looking for opportunities to collaborate with partners, whether private companies, NGOs, or governments on this issue.

The Powering Progress Together forum in Rotterdam in May this year brought together more than 15 thought leaders and experts from business, academia and civil society for an interactive

brainstorm on the world's growing energy, water, food and climate challenges to inspire new ideas and collaboration to address the complex issues posed by this nexus.

We are keen to take this forward and get the most out of potential collaborations. Shell is already working with organisations in the water and food sectors to improve our understanding of the nexus like the World Business Council for Sustainable Development and World Economic Forum. We are also helping to develop active on the ground projects with other companies to try to get the ball rolling in new important areas, but - of course - more can always be done to tackle such an important global issue.

jawhara

If China citizen decided to consume energy just 1/2 of what American does, and I'll not now talk about African or others, what would it be the solutions?

Shell's scenario planners believe that if we continue to use energy as we do today, energy demand could rise as much as three times by 2050, from its level in 2000. And you're right to say that China will be a big focus for this demand growth, both in population and energy consumption per capita.

But China itself is taking big moves to cut its emissions, for example, as part of its Five Year Plan, it is planning to reduce its CO2 emissions per unit of GDP by 17%. It is already attempting to move away from its heavy reliance on coal-fired power plants, which currently provide 80% of its electricity. It is investing heavily in natural gas, the cleanest burning fossil fuel, is rapidly deploying renewable energies like wind and solar, and is a world leader in developing battery technology for vehicle electrification.

Such steps taken by China, where energy demand is expected to double over the next 40 years could make a big difference.

Many similar themes have been investigated as part of Shell's scenario planning. For more information, please visit: http://www.shell.com/home/content/future_energy/scenarios/

zippy13

Hi Dick! It's pretty clear why Shell is interested in the connections between energy and water. I'm curious about how you got interested in the food aspect of this triangle. Could you give us a feel for why Shell is looking at food too? [Which is great, by the way...]

Dick Benschop

Good to hear from you! Both energy and food have a considerable water footprint. It makes sense to analyze the way in which these systems overlap and compete, and where they can support each other in new ways. Bio-energy and biofuels are a point in case. They have to take land use issues into account. Dick

MarcoKooiman

Hello everyone. I'm Marco Kooiman, working on the Dutch Olympic Plan 2028 for the City of Amsterdam.

Do you believe the Olympic Games and other major events can be a driver for change, able to help addressing the Energy-Water-Food challenge?

Jeremy Bentham

There was a question about the Olympics as a mode to spread awareness of key issues. I agree that awareness is a key factor in building momentum for progress, and public events have a role in this. We are trying to do our bit to shift the stress nexus from the background to the foreground of awareness. Thanks for highlighting the Olympics