Shell Dialogues

Addressing the Energy-Water-Food challenge webchat

27th September 2012

Afternoon 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 e 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 Sh ell 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 t he 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.

Second Session:

Dick Benschop
Hello everyone. Welcome to today's webchat, “Addressing the Energy-Water-Food challenge” I'm Dick Benschop, President Director Shell Netherlands and I and our team of experts look forward to answering your questions. We thank you for your time and interest.

Introductory Question
How can we reduce demand for energy and water?

Jeremy Bentham
That's a big question!!! We have to understand that global demand growth is being driven to a considerable extent by the very positive forces of economic development in the emerging economies, representing growing well-being among previously disadvantaged people. So the question is really about moderating the resource intensity of growth, which means a combination of awareness, public policy, business partnership, and the application of appropriate technologies. We need to work together on this one!

ggood2
In the areas where you drilling is it possible to also create an agricultural area around the wells so that the land is serving a "dual purpose"?

Albert Janssen
In principle this is possible provided that you are far enough away from the well to avoid safety issues. It also depends on the back produced water properties climate conditions, type of crop that you want to grow and the soil conditions.

Introductory Question
Can we spur more energy efficient behaviours?

Jack Barnes
Increasing the efficiency with which we use energy is perhaps one of the fastest ways to reduce energy demand. New technologies can help increase fuel efficiency in vehicles, buildings etc but there is much to be gained by simply improving the use of best available current technologies. Governments, companies and individuals all have a role to play in this.

Pablo Jejcic
Can you explain which are the main areas of innovation to cope with Energy and Water shortage in developing countries?

Jeremy Bentham
Pablo - thanks for the Q. 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 efficient irrigation. But another good place to look is city design and integration of water and energy systems. A well designed city area and urban transportation system can have a big impact on energy efficiency.

JP Isham
What are the company’s plans to create engaged community development focusing on Clean Water for food and local usage. How are you measuring community impact of clean water/food and are you

committed to ensuring the communities where you are producing power have adequate clean water/food support from your business in the form water reclamation.

Sergio Kapusta
Shell brought together specialists from the energy, water and food industries along with experts from governments and non-governmental organisations. The aim was to better understand the connections between energy, water and food systems in the knowledge that climate change will intensify the stresses. There is no commonly agreed methodology to quantify the impact of energy activities on water and food, and vice versa. That is why we are dedicating some efforts to get that understanding and identify what specific actions can be taken to reduce the impact.

fraserporter
Do you believe water should be monetized?

Grahame Buss
Many water sources do have a cost. So the general answer is yes. Should this be universally the case is less clear. Where water is scarce and there are multiple demands on its use then a value helps users to plan and supports allocation.

JP Isham
Do you know what types of solutions you are looking for in the area of water reclamation to enhance the quality of water, food and life for your community engagements? What elements in the ground water after the process would need to "scrubbed" to make it useful for population and irrigation?

Albert Janssen
There is many levels of water quality. Re-use of water for human consumption is only feasible if the right treatment steps are taken in order to meet the drinking water specifications. For example, in Bangladesh the water contains arsenic. Obviously this has to be removed first.

AldrichSJ
Do you think we've reached a tipping point where businesses more generally recognize the need for smarter use and reuse of resources, and the logic of nexus thinking, or is government policy still a necessary driver?

Dick Benschop
From your question I guess that you think so or are at least hoping this is the case. I think so as well. Many businesses have a long term focus and take resource constraints very seriously, including the opportunities they provide for innovation. Governments and business will have to work together, putting sensible frameworks in place with the right incentives and drivers.

Danyal
I would like to know about Shell's "nano" program

Sergio Kapusta
Great! I am very happy to talk about nano. We have several projects in a wide range of areas. What is your specific interest?

Flavio Oliveira
What about smart grids, could it help to make energy usage more efficient, somehow reducing demand for fossil fuels, using more green renewable energy?

Jack Barnes
Dear Flavio,
with the growing share of renewable energy in the power mix, managing intermittency in the power grid will become more challenging. Smart Grids do indeed play an important role in helping manage and balance power supply and demand. New technologies for power storage, such as hydrogen may also be an important part of the solution.

ggood2
Shell, more and more is becoming an energy company rather than just an oil and gas company. In countries like China and India, which are both striving to reduce their carbon footprint with the use of alternative energy, what roll is Shell playing in assisting in those efforts? A cleaner environment leads to a healthier food supply.

Jeremy Bentham
Hi - indeed we see ourselves as an energy company, although, like the global energy system, fossil fuels like oil and gas remain the backbone. Renewables can, will, and must grow rapidly, but even with decades of double digit growth it will take a long time to be a significant percentage of global energy consumption. We have activities in areas like biofuels and wind, and have close contacts with the government of China in discussing the development of their energy system, including the attractiveness of lower carbon fuels like natural gas (half the emissions of coal).

sunstate
Is growing more food using 90% less water, energy and labour one way to reduce the demands? What is being done to spur innovation in this area?

Sergio Kapusta
I think that growing food using much fewer resources might mitigate the challenge. Do you have specific ideas of how to do this?

Rama
How can we as students contribute?

Adam Newton
Hello Rama - thanks for your question. Academic institutions and research students have a huge part to play in this space. It's clear that a range of innovation - both in technology and in business model innovation - will unlock huge efficiencies in areas like low-water use crops for food lower energy production and power generation methods and of course lower water intensive forms of energy production.

This is not a challenge that Shell alone can unravel. We already work with a number of leading universities around the world in looking at some of these issues and I think it is fair to assume that this will only increase over time. For more information on career options, etc please look in the Shell website. Thanks and good luck! Adam

mlavelle
There's no question that fossil fuels helped power the "Green Revolution" in agriculture, feeding millions around the globe. But by boosting food production in this manner, do we risk contributing to unsustainable population growth?

Maike Boggemann
These types of questions are at the heart of the water-energy-food nexus. There are no easy answers. It requires an improving understanding of the linkages and potential reinforcing relationships.

Professor James Woudhuysen
Why begin with this question? Reducing demand will likely improve impossible. Especially from Shell, and indeed from anyone rational, I would like to hear how we can vastly increase the supply of energy. The developing world, and even the recessionary developed world, will need a lot more energy in future. Or can someone really point to an occasion when energy demand in a country has durably decreased in peacetime?

Jeremy Bentham
Thanks for your response. I completely agree. Extraordinary supply acceleration will be needed alongside extraordinary demand intensity moderation. The most significant new opportunity is through the tight gas revolution, driven by technology breakthroughs

John Kelly
Has Shell considered taking the lead in the provision of water in stressed regimes e.g. the Middle East where oil and gas operations have a large use of water but there is also a great local need?

Albert Janssen
When we design new projects we always take local water conditions into account. For instance, in Qatar our GTL plant is a net water producer and therefore we do not need to draw on Qatar's scarce water resources.

Aman Singh
What about the growing trend of companies reporting on their sustainability targets and efforts, i.e., voluntary disclosure? Do you see this trend spurring innovation in addressing the challenges of energy, water and food or simply being a short term gimmick for benchmarking/PR?

Dick Benschop
Aman, The sustainability reports, like Shell's, are a tremendous source of information on the efforts companies put in place and the results they achieve. Always look for the section where independent experts give their opinion. No gimmick!

Jandoe
What ways have Shell adopted in reducing production of produced water or what sort of actions have been taken to better manage and/or dispose of the produced water?

Sergio Kapusta
We are very interested in reducing the amount of water that we produce particularly as a by-product of oil and gas production. Several technologies including well placement and water recycling try to address this issue. We work closely with our technology partners in water treatment, well completions and facilities design to achieve these goals. I am particularly excited about developments in membrane

filtration which have the potential for better separation of water, with the possibility of down hole separation or better recycling or reinjection of the produced water.

Frank
The problem with energy and food is clear. About our personal saving responsibility I am not so sure that in my life I can really directly affect the water availability of others people. Let me explain. If I would live in a valley in the Italian Alps, where water is flowing 365 days per year near my house in the beautiful small river, does my behaviour really affect the water wastage? If I clean my car with the water every day, does it change something to the water cycle?

Maike Boggemann
There is the water you use in your household and if indeed you are in a place with abundant water supply, the impact you have on water availability to others can be limited. However, the largest part of the water you consume is hidden in your consumption pattern of food and energy. If for instance you consume meat, this has a significant water footprint. If this meat is produced in a water scarce area, then through your consumption you can have an impact on the water availability to others.

Gary Lawrence
Carbon-based fuels are used in many aspects of the nexus - production, logistics, pumping water, fertilizers, etc. In many cases improvements are to be found best at the intersections of all of these systems. How ought we work together to master the complexity of these intersections to reduce overall demand?

Adam Newton
Gary - I think you hit the nail on the head.

We only began really to understand the nature and depth of connectivity in this nexus when we worked with Eric Berlow from the University of California at Berkley last year on mapping the Energy Food and Water Nexus.

After several days of crunching data and analysis it became clear that not all elements of this web are equal in importance.

Certainly policy mechanisms to manage greenhouse gas emissions and other resource stresses are an impasse that has to be addressed.

In other areas it was really interesting just how important urban design solutions could be. When you recognise that cities are places where the stresses in the nexus aggregate it's clear that identifying smarter urban design and development solutions could make a huge impact on reducing future footprint - - after all there will be 6.5 billion people living in cities by 2050.

Thanks again. Adam

toto
Hi Shell why no interest about hydrogen?

Jeremy Bentham
Toto - my previous job was CEO of Shell Hydrogen, so we have been very active. We continue to research, and develop partnerships. We've tried to match the pace of our developments with the pace of technology development elsewhere in fields like fuel cells. I anticipate hydrogen will play a role in future.

E Wijnands
Do you think it will be feasible in the future to use industrial produced water for agricultural irrigation?]

Albert Janssen
We have a nice example in Oman where we, together with PDO, feed reed beds with produced water from an oil reservoir. The crop can be used as a biofuel.

GuyHutton
What are the most successful models of transparent and fair tax systems on multinational oil companies, so that oil wealth can be translated to public services for citizens (including improved water and sanitation)?

Dick Benschop
Guy, we believe that transparency, as promoted by Transparancy International, is a key factor in realizing the societal benefits of oil and gas production.

JLAWLOR
Would the use of GM food reduce energy needs?

Grahame Buss
Jlawlor, If I understand your question - the roll of genetic modifications in foods is frequently to improve yields by for example improving pest resistance. This reduce farm energy inputs and so reduces energy needs for a given amount of food production

Percival
Now we have an out-of-the-box solution for addressing this challenge. Conversion of cellulose to starch at very low costs. Is Shell interested in supporting this commercialization, like the case of ammonia synthesis supported by BASF. (If Shell is willing to do it for humankind for charity, I am willing to give up my patent).

Sergio Kapusta
Thank you for your offer. We are interested in cellulose conversion as part of our biofuels program. Your comment includes a question that relates to business decisions that I cannot address in this forum. But I encourage you to contact Shell for instance through our Gamechanger or Biodomain contacts, reachable through the Shell.com website, to explore your ideas.

yingshan
Food, energy, water - all these take up space, be it for crop production, reservoirs, building of pumping stations, generators. Quality of life and ecology around all these should also be ensured, e.g. water quality, biodiversity (monocultures are poor in biodiversity), etc. How does Shell see private companies (like itself) working with governments and land use planners to ensure that space is used in an equitable and ecologically-sound manner, that also does not compromise on the livelihoods of, say, the original land owners (who might be indigenous peoples)?

Jeremy Bentham
The stresses cross traditional boundaries - national, public-private, and industry sectors. So we are actively developing forms of partnership across these boundaries. This is actually a new form of R&D in partnership development.

Madhwesh
can efficient waste management contribute to achieving a balance between food-water-energy?

Albert Janssen
Efficient waste management helps to minimize energy needed for treatment methods like incineration. For example, bio sludge can be converted to methane gas that is being used for energy production.

energy thinker
for water produced/used in energy production how much is the cost to clean and re-use for agriculture?

Sergio Kapusta
There is not a single answer to your question as it is very much location specific: sources of produced water, water quality specifications, volumes, etc.

lmno250
can Pakistan over come the energy and water problem in future?

Suman Bery
I am not an expert on Pakistan, but I imagine the problems are similar to other countries in South Asia. The core issues have to do with relationships between provinces and the pricing of electricity. It is worth looking to the experience of dry parts of the United States or Australia to see that the problems can be solved with sufficient political will.

RAAckerman
The problem with monetization is that - with industrial discharge- most of them are handled by the corporation. Their failure (or success) to adequately treat the water then becomes a find-em, fine-em system. That has proven to be inefficient.

Grahame Buss
I accept that this requires a regulatory framework with typically a regulatory agency that monitors this. This is normal practice.

Deolu Adeyemi
How can Shell help to meet the growing energy demand of developing countries while still being a responsible carer for the environment and GHG emissions?

Jack Barnes
Dear Deolu,

Developing countries typically see a rapid increase in energy demand as they grow their industry and manufacturing base. Securing access to energy resources in an environmentally responsible way will be a challenge for many developing countries. Shell has a role to play by helping secure access to cleaner forms of energy. We have wind and biofuels businesses and are increasing our production of gas, which is a cleaner burning source of power than, for example, coal.

Nihit
Could you tell us a bit about the steps Shell is taking to tackle this challenge?

Maike Boggemann
Shell is starting to work together with organisations in the areas of water and food to understand the linkages better. We are exploring new ways of collaboration. For example, we are working with local water authorities to reduce the impact our operations have. In the recent sustainability report you can find some examples.

viarenuble
What is Shell doing to conserve/reuse local water sources that have shown significant levels of depletion?

Albert Janssen
We have examples where we re-use treated wastewater for steam production, like our steamflood project in Schoonebeek (NL).

JQ
Given rising energy demands and the pressing need for deepwater offshore exploration/production, can emerging water technologies like ocean current turbines (driven by sub-surface currents) be a part of the solution? The OCT's would provide power to platform operations in deepwater (provided current flows are suitable - North Sea/GOM and others places).

Sergio Kapusta
We are interested and involved in several initiatives to provide power to our offshore installations using for instance waves or solar power. As we venture into new frontiers the needs for power generation will grow. OCT's are possibly one of the options.

Terra Incognita
There are no silver bullets. Seeing as more than 50% of the world's pop are members of Abrahamic faiths, what can Shell do to encourage young theologians to develop and publish pertinent perspectives on creation care?

Jeremy Bentham
I believe that is an important perspective. Stewardship is a relational issue, and we do try to encourage awareness of issues and the importance of working together to address them. I'd be happy personally to talk with people who want to explore this perspective.

DougM
Fracking activities are generating much concern in agricultural communities where farmers and others are expressing concern at the potential for contamination of aquifers, long-term damage to aquifers and the management of wastewater containing chemical mixes that could do irreparable harm to water supplies and the surrounding agricultural environment. Is the oil and gas industry managing the rapid expansion of this sector of the industry in a manner that will ensure no long-term damage to aquifers, surface water systems and associated ecosystems?

Dick Benschop
Doug, with the right standards and practices fracking can be done responsibly and safely. Shell is actively contributing to this. We support regulation and we have published our Onshore Tight Gas Operating Principles. Have a look at **www.shell.us**.

Eric
How can a Multinational like shell address food security issues and diversify its sources of energy?

Grahame Buss
Eric, a great question. It is clear that the primary source of food insecurity is poverty. A well managed biofuels industry for example, will be jobs and wealth to a community. In this way biofuels can be part of the solution to food security.

james.webster
Hi. Many of the world's large metropolitan areas in developing countries are growing so rapidly that their transportation infrastructure is overwhelmed making it more and more difficult to get produce, oil, etc. into city centers. What is Shell doing to help address this energy-food-transportation challenge?

Adam Newton
Thanks James. It's a good point.
The organic growth of many city areas - the Chinese call it a big flat pancake model - sees many cities encroaching ever outward. Anyone that has visited megacities - not just in China but also in the Americas and even Africa, will relate to your comments.

Working with the Shell Downstream organisation the Scenarios Team are considering a range of trends and ideas which could play out in this space.

Among them are smarter urban design solutions with the ability better to integrate different infrastructure systems - transportation, water, waste, etc.

Secondly understanding the movement of goods and people in and around cities is important. Again this is an area of keen interest to Shell as an energy company.

We have to recognise the benefits that mobility bring to billions of people but the challenges that sustaining ever greater demand on infrastructure present. As such, schemes which consider aggregation of things like freight and better use of smart technology to manage demand are important considerations too.

Petro-Consults
Good Evening and Thank you for Organizing such interesting webchat.
I was two weeks ago in Istanbul. A wonderful town. But like many other metropoles in the world the city suffers from traffic congestion. Normally it took me 5 minutes walk from my hotel to the congress center. But the last day I had to carry some luggage and decided to catch a taxi. Well, the taxi took 55 minutes to reach the congress center that by walking could be reached in 5 minutes. Ergo: The communication infrastructures play an important role in an efficient gestion of the energy resources.
Question: which is the real efficiency of energy sources in terms of potential output minus dissipation which put severe environmental issues ?

Sergio Kapusta
You address a very real and growing challenge: rational planning of infrastructure, traffic in your example, will play a crucial role in how we use our resources. The example can be extended to water and energy, which are the main topics of this webchat. City planning, smart grid, smart traffic, and smart water are names of some of the technologies that are being developed and deployed. We work with some of our technology partners to understand the issues and decide how we can contribute to their resolution. I would be happy to hear ideas of how we can better plan our energy infrastructure to address this growing challenge.

SSaunders@arup
Have Shell considered using their expertise and pipeline knowledge to transport water alongside oil and gas pipelines to provide water where it is needed. Is there an economic tipping point for this being viable?

Albert Janssen
There are examples where we transport water for our own operations (eg cooling water) in which a portion of the water is also used by a local community.

Jason
What is your perspective of China energy demand in next few years .and what would Shell would to extend the market in China thank you

Jack Barnes
Dear Jason,

China continues to grow at a rapid rate, recently its economy has been growing at over 10% per year. Much of this growth is in manufacturing and industry that is relatively energy intensive. With growing wealth also comes growing demand for energy for homes and vehicle transport. So, indeed, China's energy demand will probably continue to grow for quite some more time. Shell is already active in China. We have onshore gas production, chemicals manufacturing and retail businesses in China. China is an important and growing market. We are also exploring for more gas in China.

Ricardo
Do you foresee in the short-term a secure “fracking” technology for shale gas and shale oil that does not use water or where water can be recycled 100% ?

Dick Benschop
Ricardo, with the right standards and practices fracking can be done responsibly and safely. Take a look at our Onshore Tight Gas Operating Principles (**www.shell.us**). You are right, there will be a lot of further technology development in this area. Always difficult to put a date to it!

Percival
Sergio, Our idea is to convert more abundant cellulose to starch. I can share our paper manuscript before submission. For me, transformation is No. 1.

Sergio Kapusta
Thank you for your follow up comment. I would be happy to help and connect you with the people working on cellulose conversion. Any paper that you share should be non-confidential, please.

ahuds
Is the energy-water-food perspective valuable when discussing resource management, or does its complexity force a lot of important details out of the picture?

Maike Boggemann
When discussing resource management it can be important to be aware of the linkages between resources. These linkages can be different depending on geography and whether you discuss resource

management for a city, a country or a business. The scope you choose is important for the complexity of the picture.

Abdul
The consumption of energy is not homogeneous, regardless of industry-settled areas ? What are reasons?

Suman Bery
Hi Abdul, you are absolutely right, and part of Shell's research is to understand the fundamental drivers of energy intensity for a given level of per capita income. We have found that the pattern of urbanisation is a major shaper of energy demand in transportation. As a result we are paying particular attention to urban design issues in emerging markets and developing countries. Pricing policy plays some role as well.

Bob
Albert, We have a patented process for inland desal with a cogen application which provides a viable alternative source of potable water from the saline aquifer which underlies 60 percent of the US. Is this an area that Shell is exploring? Best, Bob

Albert Janssen
Hi Bob, thanks for your question. Indeed this is an area of our interest.

Mayank
Resource Intensity of Growth. That is a key phrase. Many of emerging economies have focused on growth in telecommunication technology (cellular, broadband services) which is a less resource intensive industry. It has made a big difference in services and job creation. Everyone seems to have a mobile/cell phone these days in countries like India. How do we moderate resource intensity of traditional industries?

Jeremy Bentham
You'd be surprised at how much energy is actually used by telecoms. Technology is very helpful in improving efficiency, and there is much to be done, but you eventually run into the laws of nature (thermodynamics). Integration and design are keys. What is waste heat from one process (e.g. power generation) can be usefully used elsewhere. Similarly, the energy intensity of well designed compact cities with good public transport is much, much lower than that of sprawling cities.

Jooske van de Graaf
How can we increase awareness and support for these challenges, which are long term and global risks (compared to safety for instance)?

Dick Benschop
Jooske, Taking a long term view is indeed essential. What we hope to achieve is that pilot projects will show results and that best practices will emerge that can be shared. Successes will appeal!

Aman Singh
And what about the role of public policy [For example, we posted this recently [http://www.csrwire.com/blog/posts/550-suicide-democracy-the-climate-wars] which cites Shell CEO Peter Voser. Thoughts?

Adam Newton
Policy and policy makers of course play a valuable role in this debate. We recognise the challenge of overcoming the deep complexity which is posed by many of the issues being discussed today and it's all too easy to shrug and say 'over to the politicians.'

When we looked at the Food Water and Energy nexus, policy considerations and action to address not just CO2, but also water and other resources were incredibly important and like many companies we're continuing to advocate for a carbon price and factor the costs of CO2 into all our projects.

But policy is not always the answer. IN fact less policy and regulation can also be a huge enabler of credible change. As we look forwards one thing is clear to us: no, one single organisation or institution has a monopoly on untangling the nexus. A new spirit of collaboration and partnership is required meaning businesses innovate to find new approaches to working together - we are looking closely at this currently.

samaiin
what is shell doing about the energy for the future aside hydrocarbon?

Jack Barnes
Dear Samaiin,

Besides our oil and gas business, Shell has businesses in biofuels in Brazil and wind in the USA. Additionally, our R&D team continue to research other possible new energy solutions, for example hydrogen.

Ivo
Increasing the supply of natural gas seems to have caught the attention of many energy companies. The latest gas reserves have become accessible through the use of fracking. What are your views on fracking and pumping water mixed with other substances deep underground? What are the possibilities of contamination of the water table, despite the fact that most of the gas fields are below the water table.

Dick Benschop
Ivo, with the right standards and practices fracking can be done responsibly and safely. Have a look at our Onshore Tight Gas Operating Principles on **www.shell.us**.

SurinderH
Businesses in each energy, water & food sector are addressing challenges in their own way - in a compartmentalized piecemeal way. Nothing wrong with that. But if there is to be real change, then we know single sector approaches are not enough - and more would be achieved if the sectors collaborated - took a more cohesive, systemic & systematic approach - at the global and local level - in practical ways. Would you agree there is scope for more cross-sector collaboration & if so, how should Shell contribute to that?

Maike Boggemann
Cross-sector collaboration may create an enhanced awareness of the linkages between water, energy and food. It could also inspire innovation and new ways of working together. Shell is proactively working with organisations in the water and food sectors to improve our understanding of the nexus.

DON MAYNARD
Are technologies which foster frac water recycle of interest to Shell and what entity within Shell would vet and support investment in such technologies?

Sergio Kapusta
Technologies that foster water recycle are of interest to the oil industry and to Shell. Since you seem to have a specific technology in mind perhaps you can connect by email and I can direct you to the people working on that topic.

Fred Le Ballois
Hi again, for enhanced recovery of oil Shell uses water...(my assumption) is this water fully wasted or could be tapped into at later stage?

Albert Janssen
Hi Fred,

We are developing water reuse schemes to minimimize water intake and avoiding discharge into the environment.

Flavio Oliveira
How Shell understands the role of Education - to teach society about Energy use and new developments - and Communication? Does Shell agree that through Education - and Science, of course - is the only way to have a sustainable growth and Communication will play a key role in spreading the news using the right speechs/languages?

Dick Benschop
Flavio, I agree with you and activities like today's webchat are a small contribution in that direction.

rasfuentes
I know that Shell uses future scenarios, in 2008 your views to 2050 was two: scramble and blueprint. In which of them do you believe we are now?

Jeremy Bentham
Thanks for knowing our work - as head of scenarios I appreciate that. The pace of development in policy and the deployment of technology is often going in the right direction, but proceeding currently much slower than Blueprints (although not quite as slow as Scramble). Have you read our Signals & Signposts review on the web? Also - Watch out for our new scenarios next year!

Eric
@ Sunstate and Sergio Kapusta Why not blend some fertilizers in the countries where they are used instead of transporting them (they include sand) in developing countries like Sub-Sahran Africa? That would save lot of boat fuel to start with.

Sergio Kapusta
Sounds like an interesting proposition. We are not directly working on that issue but agriculture and fertilizer companies are a good starting point.

JerryStG
Has Shell considered utilization of inland saline aquifers as a viable source for potable water through use of Multi-stage Flash Evaporation in a cogeneration process?

Albert Janssen
Hi Jerry,

Multi-stage flash is a commonly applied process for water desalination and is also considered by Shell.

Hubert Spruijt
A question from the Independent Student Energy Platform from the Netherlands: Which role can the Netherlands play in the solution for this water, food and energy problem and how does this differ from other Western European countries?

Dick Benschop
Hubert, The Netherlands can play a special role give its history in managing water challenges and its expertise in various knowledge institutions (like Wageningen) in all three areas: energy, water and food.

JP Isham
Jeremy - based on your 1st answer: How are you moderating the resource intensity of growth, which means a combination of awareness, public policy, business partnership, and the application of appropriate technologies. Are you involved with organizations like the United Nation Global Compact who champion water and food issues globally?

Jeremy Bentham
We are participating in numerous collaborations, including 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.

yingshan
Wouldn't increasing efficiency with which we use energy make it cheaper and more easy to consume energy and therefore increasing energy consumption?

Jack Barnes
Dear yingshan,

In our Signals and Signposts publication we deal with this question. In short, supply will not be able to keep up with the natural pace of demand growth over the coming 30-40 years. So, both supply-side measures (more energy) and demand-side measures (efficiency and efforts to reduce demand) will be necessary. You can read the Signals and Signposts material via our scenarios website:
http://www.shell.com/home/content/future_energy/scenarios/

Ivo
I know that Shell is championing the use of bio-fuels. What's the impact of bio-fuels on agriculture, energy and water use and food prices?

Grahame Buss
Hi Ivo, a lot of points. I'll make a few remarks. Our Raizen joint venture in Brazil makes ethanol form sugarcane and is in a region without water stress - the crops are all grown in regions with plentiful rainfall. Biofuels done well will be beneficial to agriculture - providing jobs and bringing wealth from

which rural economies will benefit. Biofuels need not adversely or significantly affect food prices, but this is a complicated equation.

Kabir
How you assess cumulative effect of the Hydraulic Fracture operations on the Groundwater in long run?

Dick Benschop
Kabir, with the right standards and practices fracking can be done responsibly and safely. Please have a look at our Onshore Tight Gas Operating Principles on **www.shell.us**.

fraserporter
How do you develop scalable, urban deployable solutions to these problems when the nexus is global? What types of cross discipline research are you employing to meet the needs of all citizens, rural, municipal, and urban? I would love to see urban agriculture develop, which would solve water issues as much inefficiency exists in large scale water application in agriculture.

Sergio Kapusta
You address a very interesting point: water issues are local but the impact is felt globally. For a company like Shell, with a very broad presence, this represents a particularly challenging question. Shell has brought together specialists from the energy, water and food industries along with experts from governments and non-governmental organisations. The aim is to better understand the connections between energy, water and food systems in the knowledge that climate change will intensify the stresses. with a growing urbanization of the population, cities are especially affected by these changes.

Rodrigo
We are examining the water-food-energy-climate nexus from the perspective of urban metabolism with a multi-sectoral model, i.e., a model of flows of C, N, P, water, and energy around the energy, water, food, waste-handling, and forestry sectors, Is Shell engaged in similar modelling/systems studies?

Adam Newton
Rodrigo. Interesting work. Our future energy technologies group have looked at and continue to examine a wide range of areas where cities and their energy use (in the broadest sense) align.

Whilst I am not aware of explicit research ongoing in this area currently, understanding them is naturally an important part of finding lasting solutions. Our city partners - like the Center for Liveable Cities in Singapore - also provide a valuable source of access to new and innovative research in this exciting space. Good luck with the research. Adam

fraserporter
Have you considered adopting a water neutral position in all your operations? Do you think a water neutral position is necessary in times of climate change

Albert Janssen
Climate change is a global problem whereas water scarcity is more of a local issue. Hence, a water neutral position in our projects and operations should be evaluated case by case.

Martin Raphael
Is realistic is it to address the growing demand of energy making the refineries more efficient? What are the possibilities in this area of research?

Dick Benschop
Martin. In a sense it is all of the above" and becoming more efficient is certainly an important pathway. That replies to refineries as well. But more will have to be done.

gpenard
Which activities does Shell have in the arena to convert biomass to energy and more valuable products?

Grahame Buss
Hi gpendard, you know about Raizen of course - we sugarcane in Brazil, turn the sugar into ethanol, burn much of what is left to make electricity and put the rest back on the field.

Jeroen van Dishoeck
(@ Mr. Bentham)I completely agree on the urge of awareness. Although I feel that this awareness lives within the industry, I am wondering how Shell sees its responsibility to generate a broader awareness among the public. Especially among the younger part of the society, since they will be major shareholder behind one of the biggest drivers of the nexus, namely population growth.

Jeremy Bentham
If you follow our speeches and involvement in public platforms, as well as our commitment to supporting education, you'll see that we take our participation in important debates seriously as well as paying attention to the next generation. You can download copies of speeches on water-energy-food by people like our CEO and myself from our website.

pfolger
What countries or parts of the globe would Shell place the highest priority for reducing energy costs and water demand? Is this a developed countries issue primarily or should the emphasis be on developing countries, countries with the highest food costs, or least availability of water, or some combination?

Maike Boggemann
Resource scarcity has multiple perspectives, for instance social, environmental, and economic. Those perspectives will lead government and businesses to focus on specific geographies or stakeholders.

Rae
How do you see K-12 schools teaching on issues related to the Energy-Water-Food challenge to develop our next generation of leaders and innovators?

Suman Bery
Rae: the exciting thing about this area is that it is brand new. Even at Shell, the awareness that these issues needed to be looked at holistically is relatively recent, and most governments are not there yet. The linkages and messages need to be sharper and better grounded before they are ready for school education. But I wouldn't be surprised if someone soon devises a videogame or app that helps kids and adults grapple with the tough issues that need to be addressed.

Percival
As I mentioned before, if we can convert cellulose to starch. We will not use lots of fresh water for irrigation for cultivating starch-rich crops. Therefore, enzymatic conversion of cellulose to edible starch is a game changer solution.

Grahame Buss
Percival, I agree - the cellulose in biomass is a great source of sugars from which to make biofuels. Generally, you also get some lignin and this can be used to make power.

samaiin
Can shell create more awareness on the energy-water-food nexus where she operate? And can shell work with local communities, NGO and local government in these areas as it is impacting on it operations now and in future?

Adam Newton
Hello Samaiin. Ensuring that our own house in order is a really important part of the work currently ongoing. The research undertaken recently by the group to understand the water intensity of different energy sources is an important piece of this. I and my colleagues have already begun making inroads into how this can be applied not just to Shell's own operations but to the wider operating environments where energy companies and other industries can be found working together.

Alexandre Troppi
In SHELL OUTLOOK 2030 there is quite no mention to oil reserves limitation when other studies that about 43 years at current consumption level. Oil being mostly used in transportation, and SHELL being very present as a retailer for transport what is SHELL forecast for the NEXT fuel for vehicles after oil? In what domain does SHELL invest? What does SHELL do as pilots with car manufacturers? Electricity - battery business ? Gas as such ? Gas for fuel cell? Hydrogen tanking?

Jack Barnes
Dear Alexandre,
There is much to be gained by improving the fuel efficiency of Internal Combustion Engines. But, as you, say, eventually other forms of vehicle energy will be required. Perhaps the first shift will be to Compressed Natural Gas or Liquefied Natural Gas. Already there is increasing use of gas in transport. As for electric vehicles, no doubt these too will be important, but there are many cost, technology and infrastructure challenges to be met in delivering this. Electric vehicles will probably start in large cities that choose to invest in necessary infrastructure early.

Joe Carella
What role do energy companies have in co-ordinating energy/food/water conservation efforts?

Jeremy Bentham
We can't do it alone, but we have a role as energy is an important part of what we call the "water-energy-food “stress nexus. We want to be on the front foot in raising awareness and also working with others to develop constructive responses.

R advocaat
With the costs of wind and solar energy quickly coming down and the opportunities that these renewable and sustainable energy sources offer why does Shell not offer this kind of generating of energy in South Africa, that is water scarce, and where is land is needed for food production. Instead you offer fracking, which is controversial to say the least and an energy source that is not sustainable. Gas might be cleaner to burn in comparison to coal, but in order to get it out of the ground the carbon footprint will be way above coal due to (waste)water, sand, chemical transport and flaring.

Dick Benschop

I am sure South Africa will develop wind and solar as you say. Given the demand growth in the country and the fact that coal is indeed the alternative natural gas will be very beneficial for South Africa, both from an economic and an environmental perspective. Gas emits around half of the CO2 in power generation compared to coal. Tight and shale gas can be developed responsibly and safely. At Shell we have developed Onshore Tight Gas Operating Principles for that.

Chuck
As 8-10% of the urban energy budget is for the treatment of potable water and treating of waste water in the U.S.. As lower quality water used as a potable source and as we treat waste water to higher levels, this ratio will likely rise over time. What is shell energy systems doing to make this process more energy efficient?

Sergio Kapusta
Our expertise and focus is in one part of the energy sector, related to oil, natural gas and fuels. We aim to provide clean and abundant energy to address some of the issues that you mention in your note. Natural gas is one of the cleanest and more abundant sources of energy. We are making large efforts to maintain and increase the supply of natural gas to customers in the electric power and water treatment industries.

Percival
The abstract of our manuscript: To meet the world's future food security and sustainability needs in biofuels and renewable materials, the production of starch-rich cereals and cellulose-rich bioenergy plants must grow substantially while minimizing agriculture's environmental footprint and conserving biodiversity. A synthetic enzymatic pathway in one pot including extracellular and intracellular enzymes enabled to transform cellulose to amylose, high-value linear starch. Future cellulosic biorefineries would address the food, bioenergy, and environment trilemma.

Grahame Buss
Percival, I agree - thank you for this point.

Fred Le Ballois
Hi,
We know that we have reserve of energy for X years... What is the status with water? which one should we focus on first energy or water...?

Jeremy Bentham
I'm afraid it's not either-or, but and-and! These work together and affect each other. But our starting point as Shell will naturally be an energy perspective so we can contribute our experience.

RobertRussell
I like shell, it brings many benefits to my family and friends with getting jobs, but when they stop fracking for a couple months' people lose their jobs. Also Shell isn't very clean when it comes to waste water. 28 cows were quarantined in tioga county Pennsylvania for drinking waste water. How can shell be more safe with its various employees and sub-contractors in this area?

Dick Benschop
Robert, we operate under strict standards and practices. If incidents occur we apply the learning's from those incidents across our operations.

Flavio Oliveira

Dear Mr. Benschop.. Thank you for your answer.. We had the chance to meet quickly during the NRG Battle in Kuala Lumpur last June, I was participating in one of the Shell teams.. I wonder if a network of students/young professionals interested in working for a better world within the Energy sector could be created. We could keep the dialogue active with monitoring by someone appointed by Shell, perhaps in a Facebook closed group, to discuss the water-energy-food challenge on a daily basis, rewarding best ideas and establishing a rank with something like "top thoughts of the month". I would be pleased to cooperate with this idea as an International Communication expert.. Thank you for your attention!

Dick Benschop
Flavio, The Battle was fun! Good to hear from you. I will give your suggestion to the Communication folks.

Ricardo
Does Shell believe that there is an important shareholder value risk increased by trends in the world related to water scarcity, environmental litigation risks, and food crisis accelerated by climate change?

Jeremy Bentham
Yes there is a risk, but our attention is more driven by recognising the potential problems and looking at how we can not only respond to them but also uncover opportunities.

JP Isham
What role is shell playing in Innovation around these issues? Are there incubators/accelerators that you work with to develop ideas or vet emerging technologies? How are you funding next generation technologies to improve waste water from frakking, contaminated aquifers and ground water supplies?

Sergio Kapusta
Our Gamechanger program is one of the best avenues to bring ideas that can radically change the future of energy. It provides a forum for accelerating the development of ideas into projects or products. I encourage you to contact the Shell Gamechanger website for more information, to submit ideas, or in general to learn about the ways in which we foster open innovating.

Joe Carella
It seems that many of the fellow participants are concerned with the impact of fracking and shale gas on the environment. What role does Shell take in the industry towards driving common standards?

Dick Benschop
Joe, We have published our Onshore Tight Gas Operating Principles and support regulation to create the right regulatory environment for all players.

water-energy-food.org
What is the specific interest of Shell as a global energy company in the W-E-F Nexus? And how do you envisage the interplay and collaboration of the corporate sector (incl. YOUR specific role) with governments, UN and international organizations and science for (better) management of the three resources?

Maike Boggemann
Through an improved awareness of the nexus linkages, we may better understand the society in which we operate and will operate in the future. This understanding can support us in developing the capabilities, relationships and technology that are important for the future. The relationships between the private and public sector are part of that.

Jandoe
What are your thoughts on biofuel specifically algae biofuel, is it feasible in a company as large as Shell?

Grahame Buss
Jandoe, yes it is, but it is some way off at scale and reasonable costs. I favour photosynthetic pathways - but this brings its own set of problems to solve of course.

bpdronkers
Gas is clearly a clean alternative to coal and even various other fuels commonly used to produce power. In North America gas is super cheap now. But how to ensure that the energy and water associated with burning this gas displaces dirtier sources of energy vs even cleaner technologies which may be more expensive?

Dick Benschop
Gas uses much less water in electricity production compared to coal (and emits only around half of the CO2). The combination of gas and renewables is key to the energy future of Europe.

bpdronkers
Urban populations are predicted to grow significantly through to 2050. As such the demand for energy and water resources may or may not shift away from rural areas to these urban centres. Which way do you see this shift moving and why? What kind of impact do you see on the supply chain due to this shift?

Jeremy Bentham
Urbanisation is the great social phenomenon of our time, so the big differences in potential outlooks can be driven by urban policy and choices. But also significant is how agriculture (rural areas) can become more efficient in irrigation.

kiriakos
People use inefficient energy and resources in their households and probably the same happens in agriculture. Do you believe that there is an absence of adequate information? And what is Shell's part in this topic?

Adam Newton
Kiriakos.

I think the picture is a mixed one. It's important to recognise that progress towards greater energy efficiency has been made through a combination of policy and behaviour adaptation in certain parts of society. Whilst I can't speak directly to other industries I know for Shell that efficient operations - like and efficiently run home - make sense economically as well as contributing to a bigger cause of reducing energy use overall. So we invest in ensuring our operations perform to high operating standards.

On the adequacy of information - how much is enough/how much is too much? Giving people information and expecting a change in behaviour does not mean we will automatically witness behavioural change.

In our 2011 Signals and Signposts book - available at **www.shell.com/scenarios** we look at some innovative approaches to reducing energy demand which we call 'Gaming' and 'Shaming' - exposing people to information about their neighbours energy use for example, can have a big impact on household consumption. Fuel efficient driving appears to correlate with the amount of driver information on real time fuel consumption is available - the so called Prius Effect.

I think there is a place for all of these things!!

Thanks

kiriakos
Can the technology of solar stills be further improved to be an inexpensive solution for a large scale production of drinking water?

Jack Barnes
Dear Kiriakos,
I do not know the current state-of-the art in solar still technology, but I would imagine that the ability to scale this technology to meet demand levels is a big challenge. However, if this can be solved then it could well be important for water production in hot, water scarce regions like the gulf states. Currently these countries produce fresh water through energy hungry reverse osmosis, so this could help reduce energy demand in the region too.

Percival
Sergio, BASF may be interested in our technology, when I talked my talk in Germany Annual ChemEng and Biotechnology on Sept 14, 2012.

Sergio Kapusta
Thanks!

A. Walker
Does (and if so how does) Shell measure its water footprint and risk to operations from water scarcity?

Albert Janssen
Hi,
Measuring water footprint is not a straightforward thing to do. Several methods have been published but none of them are suitable for our industry. Hence, Shell developed together with the university of Utrecht a new water accounting method. The next step, is to apply this method across our sector. For more information see: http://www.sciencedirect.com/science/article/pii/S0921344911002783

rasfuentes
Thanks Jeremy, I'll read too

Jeremy Bentham
Thanks :-)

RobertRussell
Why can't natural gas be used as fuel for cars? If the US has enough natural gas to last us for over 100 years, why not tap into it now and use if for cars and save the economy? Or is our government too greedy?

Dick Benschop
Robert, Yes - gas is being used in transport. The latest development is the use of Liquefied Natural Gas in heavy duty vehicles and marine transportation. Something to watch.

JP Isham
Could talk about EOR results to date - what type of recovery rate are you getting out of your stripper wells currently?

Sergio Kapusta
I prefer not to give specific results as there is a wide range of factors that affect recovery.

andrelim
Hello Sergio we met in Singapore. How could we make govt officers eg in Singapore - people who goes around giving fines think about what they are doing is pro or against environment, example recently I was hauled up for a fine for drying leaves and tree trunks in front of my house when I was trying to increase the calorific value for better efficiency in Waste to energy plants. Its seems also the Singapore govt discourage the growing of trees as we are made to pay transport and disposal charges at close to $90 per ton for tree cuttings. thanks please keep well.

Sergio Kapusta
Hi, good to hear from you! I appreciate your interest in Shell and in our Webchat. I hope to reconnect when I visit Singapore, always a very friendly and welcoming place.

R advocaat
Mr Benschop, we all know that fracking is a new way of getting and more and more scientific research comes out against the procedures as it poses serious danger to water. In Wyoming it has been proven in the meantime that diesel (fracking liquid) comes back in the aquifer and pollutes the water. Even the EU has come out with a major warning particularly for fracking in dry areas like the Karoo in SA. That is not very promising and this should encourage Shell to come with more sustainable energy solutions that will not harm the drinking water and water needed for agriculture.

Dick Benschop
Fracking can be done in a responsible and safe manner. We apply our Onshore Tight Gas Operating Principles and support regulation by governments.

Professor James Woudhuysen
To believe Jack Barnes, I would have to disbelieve William Jevons and his doctrine that increases in energy efficiency lead to more, not less, use of energy. A comprehensive review of opinion on this was published in the New Yorker on http://www.newyorker.com/reporting/201 0/12/20/101220fa_fact_owen It concluded that energy efficiency could NOT be relied upon to reduce energy demand. McKinsey and the International Energy Agency all look to efficiency. But insulation programmes in already-built housing, for example, promise to be very labour intensive and expensive. Why not build a new, cheaper, less polluting supply?

Jack Barnes
Dear Prof Woudyuysen,

You are right, increasing efficiency can lead to additional demand if prices fall as a result of the lower demand. However, our work on long term energy scenarios **http://www.shell.com/home/content/future_energy/scenarios/** suggests that even with reduced demand through efficiency supply will still struggle to meet demand. Therefore, all sources of supply as well as efforts to reduce demand will be necessary.

Martin Raphael
At our urban research studio we were wondering if there are some possibilities to recycle oil, so that this finite energy resource could be used more efficiently and the waste could be minimized.

Albert Janssen
Hi Martin,

In our oil refineries we increase energy efficiency by heat integration of our processes. Also oil is removed from water streams and used for energy production.

JP Isham
What are you next steps in advancing your understanding of the nexus and what the critical components will be for modelling next generation water/energy systems that have the most efficient impact on communities regarding water/food.

Maike Boggemann
Shell has published research on the water needs for different energy forms. These water needs are now included in our energy modelling to understand the water implications of different energy scenarios. This is an example. There are many water-energy-food modelling initiatives underway globally, each addressing a part of the puzzle. We have started to connect with other modelling initiatives to learn from each other.

nklmll
Natural gas production, specifically hydraulic fracturing, is already using sufficient water in the US state of North Dakota to seriously lower water tables and stream flows that farmers use for irrigation. How does Shell or others recommend resolving such conflicts? Simply monetizing water supplies will likely lead to water being diverted to energy production over agricultural.

Dick Benschop
That is exactly the type of competition we want to address in this work on the relationship between energy, food and water. Where can synergies be developed? What are the focus areas for innovation.

Pablo Jejcic
Can you elaborate on how much Shell has improved/reduced its carbon footprint and water/energy usage on the last decade? Which one had been the bigger areas ? and how much of that do you think are related to more awareness and how much of that is related to better tech?

Jeremy Bentham
Pablo - like many industries, there's much to be done here. Until recently there wasn't even an industry standard for accounting for water footprint. We have worked with WBCSD and the university of Utrecht to develop a standard methodology, which has now been published in a peer-reviewed journal. Footprints have improved, but will come under pressure because the important frontiers in energy development often have slightly higher resource intensity. That's the nature of the nexus of water-energy-food pressures.

Eric
Some scientists claim that some deserts (Gobi,Sahara...)have underground oceans that would be supply hundreds of years of water supply for only 1 Meter depth used. Does Shell has a program to diversify its drilling from Oil to water in the long run? 60 % of the remaining arable land in the world are in Africa so

using those oceans with efficient irrigation systems would definitely be of great help on the food security agenda. What do you think?

Albert Janssen
Hi Eric,

Shell does not have a program like you are referring to.

Martin Raphael
Are you expecting the increase of energy demand to expand as well the system of gas pipelines or will there mostly be a rise of number of oil and LNG tankers on the world seas? I'm specially thinking of the region of the straits of malacca and Singapore. Thank you

Dick Benschop
Martin, both, but it depends on the local situation as well - how much infrastructure is already in place. Singapore has developed a LNG regasification terminal for example.

gpenard
Typically one is thinking about energy solutions that are rather large in scale. Therefore energy from Bio-mass is often only feasible when thinking about making liquids in large, cost effective plants that are easily transportable and feed into existing infrastructure. Logistics often become complex and expensive. What technologies do you see for bio-mass to energy solutions that can be used for local communities using their own biomass to generate energy for local needs? Note: Logistic costs should be minimal and manufacturing scale smaller, avoiding logistic expense and a reduction in use energy for transport

Sergio Kapusta
This is a very good point. Biomass logistics could indeed be different from the traditional oil refining logistics, therefore lending itself for distributed or regional processing. There is a very delicate economic balance between efficiency of scale and efficiency of transportation. Each situation is somewhat different, therefore hard to make a general statement. I have seen and reviewed several technologies which seem efficient also for small to medium scale. In fact, one of my son's projects at the university was to evaluate the conversion of uprooted trees to fuel after a Gulf Coast hurricane! That was not only local but also temporary.

Martin Raphael
In what region of the world is SHELL expecting the most increase of the demand in energy terms and what role is south east Asia playing in that new configuration of demands?

Jack Barnes
Dear Martin,

Our long term energy scenarios clearly point to growth in energy demand in the developing nations, particularly China, India and South East Asia over the coming decades. In OCED countries, demand is likely to be flat or slowly declining.

ChiccaCappuccino
I am an environmental economist. I was wondering whether, with regard to making (business) decisions based on the energy-water-food nexus, Shell has engaged in assessing the importance of these components using economic valuation techniques?

Suman Bery
Chicca, economic methodologies are obviously critical to choosing among priorities. However, it is not clear that these techniques are well tuned to deal with issues of inter-generational equity. Shell's strength is more in developing affordable and scalable technological solutions and to leave it to public authorities to do the necessary decision analysis. We do use physical metrics in assessing the impact of our own projects.

Alexandre Troppi
Biofuel have created some years ago economic issues in poor countries by absorbing resource to product it (water and land) in competitiveness with food. What is SHELL policy about Biofuels?

Grahame Buss
Alexandre, biofuels can be done well or not. Our policy is to make biofuels sustainably with respect for the environment and society. It is important to remember that the demand for biofuels is primarily driven by government mandates. In time we hope to see biofuels everywhere become a viable large scale business.

R advocaat
Mr Benschop you are avoiding all the transport that fracking in South Africa will bring with it. Calculations have shown that fracking is worse in CO2 than coal. One cannot just put aside everything that comes with the fracking, like the transport. One should measure the CO2 from cradle to grave.

Dick Benschop
Indeed - that is included in the well to wire analysis. Be aware that the majority of the emissions take place in the power generation part of the chain. Therefore gas emits around half of the CO2 compared to coal.

Neil
I have read where Mobil once had a natural gas to liquid fuel plant in, I believe New Zealand. Can you comment on the energy balance/cost effectiveness of this technology?

Dick Benschop
Neil, on that one you have to ask Exxon Mobil!

Chigozie
It appears inevitable that Natural gas will play an important role in the future Energy Mix. Therefore the water intensive shale gas drilling programs are expected to pick up not just in the US but all over the world where this resource is available. Can you roughly quantify the potential impact on water demand increase due to future shale gas drilling?

Maike Boggemann
Unconventional gas requires more water than conventional gas but interestingly enough the water intensity of unconventional gas is relatively low compared to that of other energy forms. You can find data in a **report on water accounting for energy pathways** which Shell co-authored.

JP Isham
What geographical locations harbour the most extreme cases of poor water/food quality management now in the shell pipeline and what steps are you taking to engage the community, government and businesses to ensure stewardship of the areas in which you operate?

Adam Newton
JP
With a global portfolio operating on almost 100 countries around the world it's difficult here to give a detailed assessment. However it is clear that certain regions exhibit more stresses in the nexus than others and where feature of the nexus are more routinely part of business planning.IN the middle east for example water shortages require careful management - that is something Shell and others have been tackling for a long time.

For new and emerging parts of the portfolio, there's a lot of work ongoing to ensure we are efficient in our use of water for onshore gas production for example. Biofuels production like our project in Brazil are water intense but of course benefit from equatorial rainfall for a large part of their water needs.

Taking a step back to a global perspective on the issue, a couple of points: water, if managed, is a renewable resource - so we have to find ways to ensure it's not lost in the system (and the same has to apply in power generation and food production). We believe that greater collaboration between energy companies and other industries can drive better practice and address some of the stresses more effectively than going it alone.

JP Isham
How are you currently committed to delivering quality water and food in the communities you currently operate in? Do you have metrics for success? What innovations are available that could be utilized i.e. "aqua-lexus" to eliminate ground water contamination for toxic ground chemicals/elements?

Sergio Kapusta
We are working with partners in industry, academic, government and non-government organization to develop a commonly accepted methodology to measure the impact of energy activities on water supply, and vice-versa. This is fairly complex topic since water issues are local, therefore a universal approach would need to be adapted to local conditions. On your second question, there are several technologies that we are evaluating to improve the quality of produced water and allow reuse or reinjection.

Hubert Spruijt
What do you think of electric cars: threat or opportunity and why?

Jeremy Bentham
Electric cars (battery, hybrid, and fuel-cell) will have a role to play in future alongside liquid fuels, although it will take a long time for the stock of vehicles to turn over. We are an energy company and intend to develop an attractive role in these mobility areas.

sunstate
Sergio - sun state Organics vertical growing solution achieves those goals - anywhere - in or out - on or off the grid. http://sunstateorganics.com How can we work together to reduce energy and water usage while providing for safer, more secure food?

Sergio Kapusta
Interesting. I will check the website and other information outside of this forum.

bpdronkers
Regarding quality of energy and water. Depending on the source, using energy more efficiently could mean using energy closest in form to its native source (before losses in energy conversions degrades

quality). Similarly, efficient use of water means using appropriate water sources (at varying qualities) for the most appropriate demand. (Demand and Supply quality matching). Is this considered in Shell scenarios? Models for reducing demand?

Jeremy Bentham
Yes indeed - energy demand reduction possibilities and pathways are carefully considered in our scenarios.

Joe Carella
Mr Benschop - thanks for your reply. I was wondering if you could offer more insight into what steps Shell has taken in supporting regulation for tight gas. I am curious as to what you consider to be the right approach to be taken in this area. Thanks!

Dick Benschop
Joe, we work constructively with regulators about best practices in industry and about best practices in regulation as well.

FeliciaLambe
There seems to be movement towards public-private water management schemes, like Jordan's JRSP. Do you see a role for energy companies in that type of water project investment?

Albert Janssen
Hi Felicia,

I see a role for energy companies to collaborate with water treating companies. There is a nice example in the Netherlands where we use effluent from a wastewater treatment plant to produce steam for Enhanced Oil Recovery.

Z Erdal
With the increasing economic stress and the current state of the global state of the public utilities (water.wastewater, power services) it is becoming more apparent that public-private partnerships will have to play a greater role in revamping the aging infrastructure and to bring in sustainable smart-cities concepts in the process. How can a large private multinational company like shell play a role in this challenge? Please provide perspectives relevant to USA as well as elsewhere. Thanks.

Suman Bery
Erdal, in many ways the US is among the more advanced societies in being willing to use private companies to solve public problems. At present Shell is more involved in understanding the links between urbanization and energy efficiency than in commercial opportunities in this area

Abdul
Is it a good idea to shift electricity production from fossil to nuclear to much extent ?

Jack Barnes
Dear Abdul,

Nuclear energy is an important part of the electricity production in many countries, for example France. Following the tragic Tsunami in Japan and the damage to the nuclear plant there different countries are pursuing different strategies. Some, like Germany have decided to end nuclear production. Others, like China and the UK are continuing with their programmes. Shutting down and replacing nuclear power with

other sources is not something that can be achieved overnight. Solutions will need to be carefully planned and executed over many years.

JP Isham
Sergio --- EOR from aqua-lexus is showing 100-600% increase in recovery rates for stripper wells --- please look into this technology that the UNGC feels could be a "GAMECHANGER".

Sergio Kapusta
Thanks! This is an ambitious goal. I will review outside this forum.

Ron
What non-fossil fuel substitutes are you looking at to produce oil? E.g. feedstock from plastics to synthetic oil, corn to biofuel, etc. as a part of your overall commercial output?

Grahame Buss
Hi Ron, primarily biomass. Plastic are of course usually made from oil, but when they are waste products they can be depolymerised to make oils. We keep an eye on this technology but are not currently pursuing it.

AldrichSJ
With respect to the question by sunstate, and Sergio Kapusta's response, it was interesting and exciting to see what Houweling's greenhouses did recently here in the States to make their closed environment agricultural operations even more efficient in terms of energy, water and food production efficiency. http://www.environmentalleader.com/2012/08/23/houwelings-installs -10-6-mw-chp-capturing-carbon-for-fertilizer/

Sergio Kapusta
Thanks for bringing this information to our attention.

filipe_Silva
For most of us, it's clear that Shell is anticipating the challenge of providing energy for new generation of people around the globe by unlocking energy with advanced and new technologies such as FLNG and arctic exploration. Since projects are even more driven by communities what are the impact or the co-projects in the water and food demand for the next decade that Shell is providing to new generation, understanding us that it's not in your core business?

Jeremy Bentham
I agree that technology is key to unlocking possibilities. We are cooperating with companies outside the energy business to try to address some of the emerging stresses.

liviabellina
Excuse me, but I am seeing all talking about energy, waste, and environment....I think that all matter are linked strongly with the health. If you have people with several concerns for several pathologies, or without a complete wellness (the new concept of HEALT) how it is possible think to live ? How you think about a safe, right health for all without consider a holistic vision of the human IN the environment? What you do for educate the people to healthy and safe live? I am available..... Livia Bellina M D, Founder and President of MobileDiagnosis®- Non Profit Association, for the Global Access to Care and education.....thanks a global network..... http://www.mobilediagnosis.net

Suman Bery
livia all of these concerns are indeed about improved quality of life, of which health is a critical ingredient

Hubert Spruijt
Another question: Since Shell does a lot of advertising in creating a sustainable society with sustainable energy, how would you realize this and which steps will Shell take to meet the promises made in these ads, since your renewable energy portfolio is marginal?

Dick Benschop
We invest huge amounts in natural gas (that can replace coal in power generation) in second generation biofuels and in carbon capture and storage. Those are the topics we talk about in our advertising as well.

yingshan
Scrambles or Blueprints, it is likely that carbon emissions will still be higher than needed for managing climate change. Does Shell have any plans to steer the global community towards a more Blueprints-type (or better) scenario? If so, what are they?

Adam Newton

Thanks Yingshan

Our 2008 scenarios - Scramble and Blueprints - painted a picture of two worlds. And as you note, Blueprints was identified as a better outcome for our business and wider society.

Aside from advocacy activities which promote the adoption of lower CO2 natural gas over coal in power generation and towards more regulated CO2 markets our Downstream business is engaged in a number of product-based and initiative-based activities which are designed to improve the use of fuels - get more out of the tank .

Our work in the field of urbanisation - a subject close the Centre for Liveable Cities agenda - is also aimed at capturing the spirit of 'Blueprints' in promoting public and private collaborations towards better planned, lower resource consuming cities

Thanks for the question.

A

rasfuentes
We've a structural failure in credit carbon emission concept. Firms must pay a market price for emission, in this market there isn't a price support. Have Shell an idea to promote other ways in this sense?

Dick Benschop
We support CO2-pricing, especially through a trading mechanism that is market based and technology neutral. In Europe the current ETS needs to be reformed.

rasfuentes
Many others renewable energies such as wind or sun power could be use to substitute carbon emission energies and these alternative energies use less water, but it's true that these are inefficient in several

ways. What do you think about do a huge investment in this kind of energies to cope the water-energy issue?

Jack Barnes
Dear rasfuentes,

Yes, many renewable energy technologies are expensive compared to fossil fuel energies. But, as they grow costs will continue to come down. However, this will take time. We see renewable energy continuing to grow at high rates for many years to come. Nevertheless, fossil-based energy will remain the bulk of energy supply for many years to come.

Sravya
What strategies or plans does Shell have to address the challenges in each of these sectors?

Jeremy Bentham
Energy is of course our core business and strategy. But we are developing our thinking and awareness of all these connections, and collaborating with partners in other industries and governments as well.

relliott
What are some of the most promising, high impact solutions that Shell is developing or implementing that directly address the energy-food-water stress nexus? Is Shell doing it solely or in collaboration with other entities or governments, and do these solutions have regional or global application?

Maike Boggemann
One of the areas of interest are the water-energy linkages. You can find some examples of solutions on the **Shell website**. In the area of water Shell is working together with public and private organisations who are engaged on the water topic, both at global and local levels.

leralex
What is Shell opinion on nuclear power ?

Jack Barnes
Dear leralex,
Please see my earlier comment on nuclear.

RobertRussell
This chat was very informative, Thank you to everyone on the panel for putting this on, and thank you for answering my questions! :)

rasfuentes
Thanks Mr. Benschop and Mr. Bentham and the all of panel team to offer an opportunity like this. My congrats.

andrelim
Thanks Sergio I have always been a supporter of Shell You have my name card. I am out of time to type a real question lets discussed it. see you.

Flavio Oliveira
Thank you all for such an interesting dialogue.. I do hope we can do this more frequently and perhaps establish a network of students/young professionals around the globe to keep this discussion active, proposing new ideas and technologies to make our future brighter, safer and with resources available for everyone. Wish you all an excellent day and hope to talk to you again soon. Best, Flavio

DougM
Beyond conservation and efficiency efforts, is Shell exploring other options to increase water supply in water stressed regions? If so, what areas are being explored?

Sergio Kapusta
We are trying to improve the areas which we can control, such as efficiency of our operations. We are exploring ways in which we can collaborate with agriculture and other users of water to make better use of this precious resource.

JerryStG
Mr. Janssen, Thanks for the response. I phrased the question poorly, let me clarify. Has Shell considered utilization of the MSF process at in-land locations for production of large quantities of potable water by using the substrata saline aquifers that cover major portions of most continents?

Albert Janssen
Jerry,
This is a very specific question. We evaluate MSF but also MED, membrane processes etc. for desalination of salty water.

Jason
Compare with the new innovation way to produce the clean energy and the money the energy company spend on protect the environment ,which one cost more money ?

Suman Bery
jason: research and commercialisation of renewables is still relatively expensive. but for Shell it is not a choice between these, it is to do both.

Martin Raphael
What ideas has shell to reduce CO2 emissions caused by vessels transporting oil?

Dick Benschop
Look at the development of LNG fuelled ships!

energy thinker
When is energy from ocean currents going to break through?

Jeremy Bentham
I think there are useful developments, but as a derivative and diffuse energy source it will be very challenged to grow to become a significant contribution to the energy system at global scale.

mmeehan

One of the biggest problems for companies launching energy efficiency or awareness initiatives is engaging the consumer - communicating the value of the programs so that it achieves results. How is Shell engaging its customers so these initiatives are successful?

Adam Newton
Thanks

You are right. Simply presenting people with facts and expecting a change is not a realistic outcome. Work to engage people - we call them 'energy concerned consumers' is an important part of our external engagement.

At the end of the day efficiency makes economic sense - the more people feel an economic benefit the more they are likely to opt-in. Particularly in these challenged economic times.

A product like Shell's Fuel Save gasoline and diesel tries to combine cleaner fuel products with a strong message on driver performance with the aim of reducing overall consumption.

Percival
Maike Boggemann, There is an easy solution for energy-water-food nexus. The key is whether we are open enough to hear it and accept it.

Rama
Thank you Shell. The webchat was very informative and motivating.

JP Isham
Understanding the need to engage communities, government and business to build the next generation nexus, what organizations are you participating in to accomplish these goals in the areas or water/food?

Jeremy Bentham
JP - quite a lot as outlined in other answers. Hope those cover your question.

Mayank
How about choosing poverty as a living option? May be that is genius of countries we call now as poor...What do you think?

Sergio Kapusta
This is a philosophical question which is outside my expertise. I guess that it is OK as a personal choice. But I personally believe that improving standards of living and quality of life is a worthy societal goal.

rasfuentes
As Shell has an important share on the energy market, if Shell adopts a radical and innovative policy, the spill over effect on the rest of market companies could be longer. What do you think about "take the baton" in this way?

Jeremy Bentham
I think we are trying to be a responsible industry thought leader as best we can. Thanks for the encouragement.

ttreanor

Hi Jack, you said, "increase fuel efficiency in vehicles" is one of the fastest ways to reduce energy demand. Is there a Shell point of contact responsible for investing (equity or R&D resources) in such technologies from a cleantech company? If so, could you provide contact information? -Ted

Jack Barnes
Dear ttreanor,

You can send enquiries to Shell via the website: **www.shell.com**

MaryB
Is there not a conflict between biofuels and food, water, energy shortages? When you consider the balance of available arable land and the fuel and water needed to grow biofuels, are they a viable option? Which biofuels do you think are most promising?

Grahame Buss
Hi Mary, there is clearly a tension between land uses - food, feed, fibre and fuel all compete for our finite agricultural lands. The question is can these uses by managed harmoniously. The answer to this is yes - but I fully recognise that this does not mean they will be. It is up to us to help make it work. We could produce a very significant part of our transport fuels from biomass but it depends on decisions that society makes - do we want to continue to intensify agriculture and how will our diets change over the next 40 years as we become wealthier and our numbers continue to grow?

deteme
Can you explain us what are critical challenges in terms of CSR in developing countries?

Suman Bery
Deteme, I think the main challenge is to persuade the public that the actions are being done in the public interest.

JP Isham
Thanks to the Panel for your time and the opportunity to pose some difficult questions in public. This is a great forum and I appreciate your time and consideration. JP Isham Head of Operations (415) 244-4518 direct/cell JP.Isham@StrategicInnovationWorks.com

Sergio Kapusta
Thank YOU for participating in this event and for your interest in Shell!

Percival
Why not consider the electricity-hydrogen-carbohydrate as a whole cycle for secondary energy conversions? When we have it, most problems for energy-water-food is solved.

Sergio Kapusta
Interesting. We have looked at the whole energy cycle. but I would be interested in your insights. What can you share?

Jeremy Bentham
Good folks - thank you for joining us today. We hope you have enjoyed the webchat and that we've provided answers to at least some of your questions The team enjoyed your thought-provoking contributions and we hope you will share your thoughts by completing our survey. As a last point, we are

deeply saddened by the sudden loss of our colleague Henry van Straten who passed away on Sept 25th. He was due to join us on the panel today to add his experience. We dedicate this webchat to him.