Arab Aviation Summit – SHELL Presentation notes

It is first important to provide some context to the discussion. In Shell we sum up the energy challenge that the world is facing in five words, "More energy, less Carbon Dioxide". Our response is to this challenge can be summed up using 5 simple steps called 3-2-1-6-5. These steps are relevant for all sectors including aviation.

3 – The Three Hard Truths

This covers the Three Hard Truths of the energy challenge:

1. Increasing demand for energy: Global energy demand is set to double by 2050 due to increasing population and rising prosperity.
2. Supply will struggle to keep pace: conventional oil and gas and indeed all energy sources together, cannot meet this unconstrained demand.
3. Increasing environmental stresses: More energy means more CO2 emitted at a time when climate change is a global critical issue. The societal imperative of less than 550ppm CO2 needs strict management of CO2 from both the production of energy and its use by consumers.

2 – Possible future energy scenarios

To help think about the future of energy, Shell has developed two scenarios that describe alternative ways that it may develop:

1. In the first scenario called "Scramble", policy makers pay little attention to more efficient energy use until supplies are tight. Likewise, greenhouse gas emissions are not seriously addressed until there are major climate shocks.
2. In the second scenario, "Blueprints", growing local actions begin to address energy and environmental challenges. A price is applied to a critical mass of emissions, stimulating the development of clean energy technologies and energy efficiency measures. The result is far lower CO2 emissions.

1 – Our preferred scenario

Shell is determined to provide energy in a responsible way and serve our customers and investors as effectively as we can. In our view, the Blueprints scenario offers the best hope for a sustainable future.

6 – The number of CO2 reduction pathways

1. Increasing the efficiency of our operations, seeking to be first quartile.
2. Establishing a substantial capability in CO2 Capture and Storage.

3. Continuing to research and develop technologies that increase efficiency and reduce emissions in hydrocarbon production.
4. Aggressively develop low-CO2 sources of energy, including low-CO2 fuel options.
5. Help manage energy demand by growing the market for products and services that help customers use less energy and emit less CO2.
6. Work with governments and advocate the need for more effective CO2 regulation.

5 – Our core messages to the regulator

Governments need to develop internationally aligned policies to meet the energy challenge and address climate change without distorting competition among companies. No one single instrument, whether a carbon tax or emissions trading scheme, will be effective for <u>all</u> sectors. Shell's key advocacy objectives are:

1. "Cap and Trade" systems for large stationary emissions sources like power stations, thereby effectively creating a global carbon dioxide market.
2. Clear incentives for Carbon Capture and Sequestration.
3. A simple and credible target for the share of renewables in our energy supply.
4. Separate measures in the transport sector such as vehicle efficiency standards; vehicle/road use programmes for modal switch; and broadening the fuel pool by incentivising the use of fuels based on their ability to deliver reductions in CO2 based on well-to-wheels.
5. A series of robust energy standards for buildings and appliances with incentives to retrofit existing infrastructure.

The Three Hard Truths and Aviation

So there we have it, 3-2-1-6-5. But what does this mean for aviation? Lets start off with the Three Hard Truths:

Aviation could be seen as a victim of its own success. Aircraft have about the same efficiency as cars, but they travel a lot further a lot quicker. Therefore people use them. As a result a family that chooses to go on an intercontinental holiday can easily double its annual CO2 emissions. As the world globalizes, demand will continue to grow for aviation travel.

On the supply side, new sources of energy are becoming increasingly hard to find. Possibly more worrying for aviation is that many of the new sources of hydrocarbon such as Condensates and synthetics are not necessarily ideal for the production of Kerosene. Even much talked about Biofuels are often not suitable for kerosene production.

And as demand grows, aviation's proportion of CO2 emissions is likely to increase. Hence the Three Hard Truths are very relevant for the aviation industry.

Scenarios

If we turn to the Shell scenarios, there are pockets of activity where industry players are working together. In the AACO region, Shell is part of a consortium in Qatar including Airbus, Qatar Airways, Qatar Petroleum and Rolls-Royce researching the use of synthetic fuels for aviation use. This consortium recently flew an Airbus A380 using a blend of 40% GTL (Gas to Liquid) Jet Fuel with regular jet fuel. Approvals for the use of synthetic jet fuel blends are expected next year.

However, if the aviation industry is to address the energy challenge, then clear guidance from the regulator will be required. For example, is the main issue local emissions, global emissions or noise pollution? Can a global emissions target be established in the aviation industry? Aviation is a truly global industry. Addressing the aviation aspects of the global energy challenge will require global alignment and co-operation, consistent with our Blueprints scenario.

Emission Reduction Pathways for Aviation

Below are three examples of Shell's aviation activities that fit into our 6 CO2 emission reduction pathways:

1. Increasing the efficiency of our operations: Shell is committed to ensuring top quartile performance. For us, this means improving efficiency in all areas of our business, from investing in the latest refueling equipment at the airport, to designing and operating more efficient storage and hydrant systems to improving our back office and invoicing systems. The airline industry itself has seen dramatic increases in efficiency
2. Using R&D to increase efficiency still further. For example, Shell has recently announced the launch of the first next generation Turbine Engine Oil called AeroShell Ascender. This allows OEMs to improve the overall efficiency of the engine as it can run at hotter temperatures. Interestingly since the birth of the jet engine, fuel usage has reduced by about 70%
3. Aggressively developing sources of low-CO2 energy, including low-CO2 fuel options: Shell is one of the world's leading biofuels distributor with an extensive R&D programme in second generation (non-food crop, sustainably derived) biofuels. However, biofuels are mainly driven by the desire for them to be used in ground applications. Indeed, most natural biofuels are more suited to produce diesel or gasoline components as opposed to fuels suitable for use in a jet engine. However, Shell is able to lever its extensive ground transport biofuel programme for aviation

purposes. Examples are our Biomass to Liquids partnership with Choren in Germany. We will start the world's first demonstration BTL plant in 2010 and can produces cuts such as naphtha, kerosene and diesel. In Hawaii we have an R&D partnership with Cellana where we are constructing a pilot plant that will convert marine algae to biofuel. Algae is attractive as it can produce 15 times more oil than land based alternatives such as palm, soy or jatropha. However, it is still a long way off. Another example is our partnership with Virent where we will produce a jet component from lignocellulosic material such as straw using a catalytic process. All of these projects are exciting, could lead to the production of low-CO2 aviation fuels, but will take time.

Advocacy positions

Shell believes the Aviation industry can help mitigate global CO2 impact by entering into emissions trading systems. This will offer the industry a clear emissions price signal, which will encourage emissions management and lead to mitigation projects. These will fall in three key areas:

1. Energy efficiency projects, for example new fleets, something that is happening in this region
2. Alternative fuels, but recognizing that this is a long-term option
3. Modal changes, for example the shift away from very short haul flights (difficult in some of the region), new scheduling and new air traffic control rules

The EU is leading an effort to include the European Aviation industry in the European Emission Trading Scheme in 2011. Under the Scheme, all flights (including those flown by non EU carriers, i.e. including carriers from the AACO region) coming into and out of the EU Member States will be required to use carbon allowances to cover their CO2 emissions. In response to this, Shell can offer two carbon offset mechanisms, which will enable aircraft operators to offset their emissions in a clear and auditable manner:

1) We can facilitate the establishment of a registry account and source carbon credits (e.g. Certified Emission Reductions) for customers themselves to retire as appropriate in line with their fuel consumption; or,

2) We can 'embed' the carbon credits in the fuel sold – Shell will source and retire the appropriate number of credits in line with the physical fuel consumption, offering several pricing options – spot, fixed, or floating; this option is likely to offer the best flexibility and least administrative burden for most of our Middle East based customers

There is also potentially a role for Airport Authorities to play in the promotion of alternative fuels that reduce local and/or global emissions from the aviation sector. At least one major airport in the Middle East region is contemplating ways of

incentivising the use of alternative fuels in order to address emissions (local / global) issues whilst recognizing that alternative fuels are always likely to be more expensive than conventional jet fuel.

So in summary, the energy challenge of "More energy, less carbon dioxide" is a global challenge not just an Aviation challenge. The Aviation industry's response should be guided by a clear global framework that promotes efficiency encourages the development of alternative fuels, recognizing that this will be a long-term challenge and supports modal changes and more efficient air traffic control rules.

As aviation emission Trading systems start-up, Shell Aviation is committed to helping our customers with the administration of your CO2 compliance requirements. Shell is committed to keeping our operations and systems as efficient as possible and to lever our extensive R&D programmes to develop new more efficient greases, lubricants and fuels to sustainably power your aircraft into the future.

If you would like to know more about the Shell Future Energy scenarios and how they can help your business, please visit http://www-static.shell.com/static/aboutshell/downloads/our_strategy/shell_global_scenarios/SES booklet 25 of July 2008.pdf.

Thank you.