



Energy White Paper 2014 – Issues Paper submission template

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Issues for comment are listed against each of the Chapter Headings. In making your submission, you are welcome to make comment against some or all of issues in the fields provided. A field for general comments is provided at the end of the template.

1. The Security of Energy Supplies

The Government seeks comment on:

- ways community expectations can be better understood and reflected in reliability standards;
- the value of developing fuel reserves to meet Australia's international oil security obligations, and augment domestic security;
- ways to increase new gas sources to meet demand and measures to enhance transparency in market conditions; and
- issues relating to the regulation of energy infrastructure.

Please provide any comments on The Security of Energy Supplies below:

OIL SECURITY - AUGMENTATION:

US oil security has increased materially in recent years due to a number of factors, including Enhanced Oil Recovery (EOR) using (and sequestering) CO₂.

EOR using CO₂ is an established technique that has been around since the 1970s. Simply put, CO₂ is injected down an injection well into a depleted oil reservoir. The CO₂ helps trapped oil flow to capture wells. Any CO₂ coming out of the capture wells is captured and re-injected. The bulk of the CO₂ is effectively sequestered as part of this process.

It is estimated (U.S. OIL PRODUCTION POTENTIAL FROM ACCELERATED DEPLOYMENT OF CARBON CAPTURE AND STORAGE - White Paper - Advanced Resources International, Inc. Arlington, VA USA - March 10, 2010) that an additional ~ 87.5 mbbls / year of production (and over a billion bbls in up-graded reserves) has been achieved using ~ 54 Mtpa of CO₂ in the US. Currently this CO₂ is majority (>80 %) sourced from natural sources, while the remainder is sourced from current (expensive) capture technologies largely associated with gas processing and coal gassification. EOR via CO₂ in the US is currently supported via over 5600 km of built and planned dedicated pipelines. If enough CO₂ and pipeline capacity was available, EOR - derived oil could be expected to increase by a factor of 10 to 12 - enough to add an additional 50 to 60 % to current US production rates. The problem the US faces in sourcing CO₂ is the cost: aside from natural sources the current cost of capturing CO₂ (\$70 + per tonne) far outweighs the economic incentive to inject the CO₂ (~ \$ 15 / tonne @ \$ 70 / bbl oil prices, although the CO₂ price / cost can rise as the oil price rises).

OIL AND GAS SOURCES - AUGMENTATION:

In addition to EOR using CO₂, there is a very well-established practice in enhancing tight oil and shale gas production using "fracking" - the use of a high pressure fluid such as water to fracture oil and gas-bearing rock in order to increase the void space and hence extraction rates of material. US energy security has been substantially enhanced by such techniques, to the extent that some predict that by 2020, the US will have surpassed Saudi Arabia as the world's largest oil producer, and a net exporter (<http://www.telegraph.co.uk/earth/energy/oil/10476647/Fracking-boom-frees-the-US-from-old-oil-alliances.html>). Traditionally, fracking fluids such as water have been very successfully used, however it is estimated (<http://www.usatoday.com/story/money/business/2014/02/05/ceres-report-fracking-water-supplies/5230583/>) that in the US alone, 100 billion gallons of water had been consumed since 2011 fracking approximately 39,000 oil and shale gas wells, of which an estimated 55 % were located in drought-stricken areas. Additionally, there is growing concern that the use of additives, such as solvents, in the water used in hydraulic fracking (or, more specifically, to enhance the extraction process) can contaminate aquifers.

There is a growing technical support to look at alternative fracking fluids. Using CO₂ as a fracking fluid has been demonstrated in the US, and has many advantages over the traditional "water + chemicals" approach. The CO₂, which does not require additional solvents to enhance the extraction process, can be cycled through the well during fracking and separated from the natural gas as it is extracted (there is already significant CO₂ / Natural Gas separation required in gas production now, as most natural gas

reservoirs contain material amounts of naturally occurring CO₂). Once a particular resource is depleted, the well can be capped and the CO₂ sequestered.

CO₂-EOR and CO₂-FRACKING - AUSTRALIA

Calix Limited contends that CO₂-EOR and CO₂-Fracking using (and sequestering) CO₂ could be an important strategic and economic activity in Australia - particularly for tight oil and gas production plays such as the Cooper Basin, and possibly some oil fields in Victoria. Calix Limited possesses unique, patented technologies that can capture CO₂ from natural gas, as well as from the production of building products and energy, for the lowest theoretical energy penalty (and as a result, theoretical operating cost) of any known technology, which could significantly contribute to both oil security and Australia's greenhouse gas reduction at low operating cost.

The key barrier to take up of such technologies has been the fact that CO₂ sequestration has been largely considered only as a cost-up, rather than a value-add. As has been demonstrated in the US, a CO₂-EOR and CO₂-Fracking industry could make economic sense even at very low carbon prices - provided a policy consistency and framework, as well as appropriate seed (non-market distortive) incentives for new technology to kick-start the technology are available. The proposed Government Emissions Reduction Fund Green Paper outlines a framework that is too short term for technology and major infrastructure development. Other initiatives, such as the Clean Energy Finance Corp, explicitly exclude development of sequestration applications. The development of better technologies that would support CO₂-EOR and CO₂-Fracking and the associated CO₂-reduction benefits to building and energy industries currently falls in a policy "black hole".

OIL SECURITY - IEA TREATY OBLIGATIONS:

Australia's oil production rates have been declining for most of the last decade, and are expected to continue that decline (BP STATISTICAL REVIEW OF WORLD ENERGY), creating a significant reliance on oil products imports. On-going local refinery closures, due to inability to compete on scale with regional refineries, renders any notion of an oil strategic reserve tenuous - how in reality would Australia meet its IEA treaty obligations without the ability to transform its strategic reserve oil into end-products ? The Energy White Paper - Issues Paper contention that "energy security would remain stable whether Australia imports finished product or crude oil" is thus flawed. The issues paper seems to head down a path that pre-determines that support of local refining is inefficient and that additional product strategic storage options are the only key options for consideration (albeit costing \$6.8 b). In other, arguably less strategic, industries than refining, such as car manufacturing, there has been substantial support to maintain local skills and jobs. \$6.8 b is roughly equivalent to a 4 c per litre tariff on all oil products imports for 10 years - local refiners would require far less than this to compete. Aside from the IEA Treaty, some may consider it strategically naive that an increasingly large reliance on oil product imports is sufficient energy security for this country, let alone the fact that Australia is the only IEA member to rely on commercial stock holdings to fulfill its IEA treaty obligations.

Calix Limited contends that CO₂-EOR and CO₂-Fracking using (and sequestering) CO₂ could be an important strategic and economic activity in Australia. With respect to Australia's stock obligations under the IEA treaty, this will necessarily need to be considered in conjunction with some sort of domestic strategic refining capacity.

2. Regulatory Reform and Role of Government

The Government seeks comment on:

- priority issues, barriers or gaps within the COAG energy market reform agenda;
- possible approaches and impacts of review of tariff structures including fixed network costs, further time-of-use based electricity tariffs and the use of smart meters;
- possible measures to promote greater price transparency in gas markets; and

- areas where further privatisation of government-owned assets would contribute to more effective regulatory frameworks and better outcomes for consumers.

Please provide any comments on Regulatory Reform and Role of Government below:

3. Growth and Investment

The Government seeks comment on:

- commercial or market initiatives that could enhance growth and investment in the energy and resources sectors;
- areas where approvals processes could be further streamlined while maintaining proper environmental and social safeguards;
- further ways that regulatory burdens could be reduced while maintaining appropriate levels of disclosure and transparency in energy markets; and
- the impacts of variable land access policy and ways the community could be better informed and engaged on development in the energy sector.

Please provide any comments on Growth and Investment below:

The Energy White Paper - Issues Paper contends that there is "significant opportunity for Australian business to re-orient towards developing intellectual property and value-added products".

Calix Limited contends that with respect to its own experiences and technology, the market size in Australia for new energy technology development and commercialisation is very limited. In the areas of energy savings and greenhouse gas abatement, the current thrust of the current Government's Direct Action policy suggests these longer term, but potentially higher value, opportunities will be harder to develop. Ironically, Calix is undertaking development of its hydrogen production with CO2 capture technology in the UK, with the support of the UK Department of Energy and Climate Change....an Australian company has been more successful accessing funds overseas than domestically !...inevitably this will lead to a loss of some of the value of these opportunities to overseas interests.

If the Australian Government truly wishes to develop home-grown IP and value-added products, it will look to fill the gap between its proposed Energy and Direct Action policies to incentivise longer-term investment in new technology and infrastructure that drives efficiencies. For example, the basis of any CO2-EOR and/or CO2-Fracking activity in Australia will lie in the development of the technology to efficiently capture CO2, as well as other enablers such as pipeline infrastructure to support CO2 transfers and a consistent policy background that supports resource development and energy security. The initial incentive in the US market that drove such incentives originated in the oil shocks of the '70's (ie market-driven). Strategically, the Government may not wish to wait for such extreme market circumstances to stimulate the investment required and arrest declining production / improve existing strategic reserves, as well as promote the development of these technologies.

4. Trade and International Relations

The Government seeks comment on:

- how to grow the export of value-added energy products and services;
- ways to remove unnecessary barriers to continued foreign investment in Australia's energy sector;
- ways to strengthen support for access to export markets; and
- ways to support business to maximise export opportunities for Australia's energy commodities, products, technologies and services, including the value of Australia's participation in the variety of international forums.

Please provide any comments on Trade and International Relations below:

5. Workforce Productivity

The Government seeks comment on:

- the nature of any current skills shortages being experienced and how these could be addressed by and with industry;
- the capacity of industry and education sector-led programs to meet long-term training and skills development needs of the energy and resources sectors; and
- specific long-term training and skills development needs for alternative transport fuel, renewable energy, energy management and other clean energy industries.

Please provide any comments on Workforce Productivity below:

6. Driving Energy Productivity

The Government seeks comment on:

- the current suite of energy efficiency measures, ways these could be enhanced to provide greater energy efficiency or possible new measures that would enhance energy productivity;
- the use of demand-side participation measures to encourage energy productivity and reduce peak energy use; and
- measures to increase energy use efficiency in the transport sector.

Please provide any comments on Driving Energy Productivity below:

7. Alternative and Emerging Energy Sources and Technology

The Government seeks comment on:

- ways to encourage a lower emissions energy supply that avoids market distortion or causes increased energy prices;
- the need to review existing network tariff structures in the face of rapidly growing deployment of grid-backed-up distributed energy systems, to ensure proper distribution of costs;
- additional cost-effective means, beyond current mandatory targets and grants, to encourage further development of renewable and other alternative energy sources and their effective integration within the wider energy market;
- how the uptake of high efficiency low emissions intensity electricity generation can be progressed;
- any barriers to increased uptake of LPG in private and commercial vehicles and CNG and LNG in the heavy vehicle fleet; and
- any barriers to the increased uptake of electric vehicles and advanced biofuels.

Please provide any comments on Alternative and Emerging Energy Sources and Technology below:

The Energy White Paper - Issues Paper correctly points out that fossil fuel energy sources, especially coal in the case of Australia, will continue to be a significant source of energy into the foreseeable future, and that there will be a need to develop carbon capture and storage (CCS) technologies (amongst others) if lower emissions are to be achieved from such energy sources.

However, CCS is potentially significantly market-distorting, adding considerably to the cost of power production from fossil fuels, over and above the current market price for CO₂.

Emphasising the points made under Issues 1 and 3, Calix Limited contends that avoidance of such distortions, and furthermore, an increase in energy security, may be possible by considering a CO₂-EOR and CO₂-Fracking industry in Australia, especially if better and more efficient CO₂ capture technologies can be developed. Such an industry will take some "kick-starting". In the US, this kick-start happened as a result of the oil shocks of the '70s, however that industry is expanding rapidly today on the back of developed infrastructure and as a result of sustained higher energy prices and energy security. Strategically, the Government may wish to consider alternate pathways (to economic / supply shocks) to stimulate such an industry in Australia.

Cost-effective means to promote the technical and infrastructure development of CO₂-EOR and CO₂-Fracking includes:

- reverting to the proposed quarterly R & D rebate scheme - this has been a lifeline for Calix (and, I am sure, other start-up technology companies)
- removing the prohibition for the Clean Energy Finance Corp to consider CCS technologies
- enhancing support for the CO₂ CRC and other University-Industry collaborations looking at energy efficiency and enhancing Australia's energy resources
- encouraging the Minister of the Environment to look beyond low-hanging fruit / imported technology in the proposed Direct Action Policy, and to have a longer term view of the innovation and effort required to make material and lasting change to energy efficiency and security, and the Government's role in facilitating that change.

General Comments

Any further comments?

Calix Limited wishes to thank the Minister for Industry for the opportunity to comment on Australia's Energy Policy development.