NATIONAL MARINE SCIENCE SYMPOSIUM
Energy Security

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Advice, coordination and support for Australia’s seas and oceans
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Australia’s marine jurisdiction
Marine nation – how much do we know?

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Marine nation – how much do we know?

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Primary energy production - Australia

a. Primary energy production in Australia by fuel, 2010–11 (16640 PJ)

- Coal: 59%
- Uranium: 20%
- Oil: 6%
- Gas: 13%
- Renewables: 2%

b. Primary energy consumption in Australia by fuel, 2010–11 (6194 PJ)

- Coal: 35%
- Oil: 36%
- Gas: 25%
- Renewables: 2%
Energy Security – what does it mean? (1)

External

• Secure reliable supplier of energy to regional neighbours
• Secure supplier of LNG – $13.4 B; supplying 107 Mtpa by 2034
• Reduced global emissions from gas
  – “Every million tonnes of LNG that is used in Asia instead of coal to produce electricity is the equivalent carbon benefit of taking 900,000 cars off the road”. DAVID KNOX, CEO Santos, The Australian, November 2014,

Dependencies: sovereignty*, secure shipping, infrastructure*, continued exploration & production*
Energy Security – what does it mean? (2)

Internal
- Export revenue and jobs - $ 69 Billion, 120,000 jobs (2012/13)

Low emissions energy options
- Transport fuels? [net cost petroleum imports $15.4 Billion in 2013-2014]
- Electricity supply – from natural gas; wave and offshore wind energy;
- Disposal of CO2 in offshore geologic basins from coal-fired and industrial sources (CCS)

Dependencies: sovereignty, legal framework*, infrastructure*, continued exploration & production*, environmental* and competing requirements e.g. food* – an integrated systems approach
Dependencies

Sovereignty, Security

ENVIRONMENT & SECURITY

Environment & Food

Infrastructure

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Wave energy

Offshore Wind energy


Developing low emissions energy options

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Offshore wind energy Europe – are we ready?

- 293 new offshore wind turbines, in 9 wind farms, representing investments of around €3.4 to €4.6 Billion, were fully grid connected between 1 January and 31 December 2012, adding 1,166 MW, 33% more than in 2011.

- cumulative capacity in Europe to 8.3 GW (by 2014)

- Location: average water depth 22 metres, at an average distance to shore of 29 km.

Western Australia wave energy project on the brink of commercialisation

CSIRO (2012): wave energy could produce approximately five times Australia's current energy demand (over 1,300 TWh per year). Estimated that by 2050, wave energy could supply about 10 per cent of the country's energy.


theguardian.com, Wednesday 9 April 2014 16.28 AEST
Offshore CO$_2$ disposal – part of low emissions future

- Carbon Storage Taskforce 2009 source – sink matching
- World first offshore acreage release for CO$_2$ storage – one permit taken up
- Bonaparte, Browse, Gippsland basins

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Known offshore gas reserves

Gas resources (in PJ):
- Conventional gas resources
- Coal seam gas resources
- Past production
- Gas pipeline
- Gas pipeline (proposed)
- LNG processing plant (operating)
- LNG processing plant (committed)

Production and imports from JDPA

Exports
Domestic consumption

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Current Permits and Release areas

- Less than 20% of basin areas under permit
- Less than 11,000 conventional wells onshore and offshore
- Pre-competitive data essential
Marine reserves, current permits, and release areas
Energy extraction - system science

Dependencies

Security
Infrastructure – including HPD/HPC
Environment
Competing commodities and access
National coordinated program underpinning energy development

Actions

• Rank offshore areas for energy extraction potential and CO$_2$ disposal
System science - analyses

• Current knowledge; data access, energy source -type
• Identify key questions to reduce exploration risk/understanding uncertainty (Industry/PFRA/Academia)
• Techniques and tools required for analysis (remote sensing/rock sampling /drilling/geochemistry/etc.)
  – Access to national facilities RV Investigator/RV Solander/IODP DV Chikyu
• Skills required; dependencies understood

  National planning, consultation, coordination, cooperation

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Australia’s offshore frontier basins

- Four sectors
- < 20% by area under Permit
- No offshore wind farms (yet)
- One wave energy project nearing completion
- **Access to pre-competitive data essential**

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Australia’s offshore frontier basins

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Pre-competitive data – acquisition & outputs

Sub-surface, seabed and water column:

- 2D and/or 3D seismic
- OBS/refraction seismic
- Gravity, magnetics – shipboard, airborne
- Multibeam bathymetry, sub-bottom profiler, side-scan sonar
- Seabed samples (dredge, core, grab) and observations

Sampling for: geochemistry, biostratigraphy, geochronology, rock properties
Work flows for basin analysis

**Focus**
- Marine environmental surveys and data
- Seismic surveys and data

**Methods**
- Cores
- Underwater imagery
- Sub-bottom profiles
- Seismic
- Geomagnetics and gravity

**Goals**
- Establish environmental baselines to understand ecosystem processes
- Assess potential sites

**HC/CCS**
- Monitoring
- Risk assessment and mitigation strategy
- Site selection
Energy security – environmental considerations

National planning consultation, coordination, cooperation

Deliverables

• baseline knowledge, effective management;
• increasing efficiency of industry, pre-competitive data,
• reducing red/green tape
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<thead>
<tr>
<th>Time Horizon</th>
<th>Energy Security - Questions</th>
<th>Science outputs</th>
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<tbody>
<tr>
<td>5 years</td>
<td>What are the linkages between seabed communities and environments and what do they tell us about offshore prospectivity?</td>
<td>Complete three exemplars of high resolution seabed mapping for environmental and resource assessment.</td>
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<td>What are the long term effects of offshore exploration and production on marine organisms?</td>
<td>Determine the effects of noise generated by exploration and development of resources on marine life.</td>
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<td>Establish ecotoxicology affects on marine life of hydrocarbons from known producing fields, and discoveries</td>
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<td></td>
<td>Develop HPC/HPD services to synthesise, analyse, and access regional seabed, subsea, and satellite data to assist Industry</td>
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<td>10 years</td>
<td>How can remote sensing technologies be developed to improve our understanding of offshore prospectivity?</td>
<td>Complete seabed mapping of un-explored areas of the Australian Marine Jurisdiction</td>
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<td>Complete wave and wind energy profiles adjacent to existing and developing energy sinks (ports, cities)</td>
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<td>Develop and apply a robust methodology to rank Australia’s offshore geologic basins for energy resource assessment.</td>
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<td>Establish a program to systematically and routinely assess fluid and gas seepages from the seafloor.</td>
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<td>How does the dynamic geological history of Australia affect the relative prospectivity of offshore sedimentary basins?</td>
<td>Determine the hydrodynamic history of Australian offshore sedimentary basins to assess affects on productivity of conventional hydrocarbons and disposal of CO₂</td>
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<td>How resilient is the marine environment to resource development and unplanned incidents?</td>
<td>Establish a monitoring program to assess exogenous noise in the marine environment.</td>
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<td>20 years</td>
<td>What are key indicators required to monitor and ensure sustainable development of energy resources?</td>
<td>Complete environmental modelling for Australia’s marine jurisdiction: remote monitoring of CO₂ storage sites and performance of wave and wind platforms</td>
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<td>How can we apply HPC/HPD to better predict energy prospectivity and CO₂ storage capacity to ensure long term energy security?</td>
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