ANU Energy Update 2015
ANU Energy Change Institute

Tuesday 8 December, 9am - 5.15pm, followed by drinks
H.C. Coombs Lecture Theatre (Building #8A), Fellows Road, ANU

WEO2015 theme - Unconventional gas:
Unconventional Gas Production
Looking after our Land and Water resources

John Williams, Adjunct Professor ANU Crawford School
Former NSW Natural Resources Commissioner
Former Chief CSIRO Land and Water
An analysis of coal seam gas production and natural resource management in Australia

Issues and ways forward

A report prepared for The Australian Council of Environmental Deans and Directors
by
John Williams Scientific Services Pty Ltd

October 2012
Conventional and Unconventional Gas

World Shale Gas Resources
(Australia gas consumption: 1.38 tcf/y)

Estimates of technically recoverable shale gas resources (trillion cubic feet, tcf) based on 48 major shale formations in 32 countries (EIA 2011) Russia, Central Asia, Middle East, South East Asia and central Africa were not addressed in the Energy Information Administration report from which this data was taken.

Source: EIA 2012
Figure 6.2 Unconventional gas production by key country in the New Policies Scenario

- Rest of world
- Mexico
- Argentina
- Australia
- Canada
- China
- United States
Previous World Energy Outlook analysis, has underlined how the future for unconventional gas depends on whether it can be developed profitably and in a socially and environmentally acceptable manner.

Neither of these elements can be taken for granted.
The costs of producing unconventional gas have continued to come down in the United States, but they remain stubbornly high in many parts of the world that are just starting development.

And while regulation and industry practice in tackling social and environmental impacts have continued to evolve and improve – and more is known about the hazards and how they can be mitigated….

public opinion about the balance of risks and benefits remains sceptical in many countries; in some cases, public opposition effectively precludes any spread of the unconventional gas revolution.
Measure, disclose and engage, involving meaningful and timely engagement with local communities, establishing key environmental baselines before drilling and disclosure of key operational data, including on hydraulic fracturing.

Watch where you drill, taking into account established settlement patterns and local ecology, plus key geological and hydrological factors, such as the presence of faults or water supplies and sources.

Isolate wells and prevent leaks, through ensuring well integrity and preventing and containing surface spills.

Treat water responsibly, by reducing freshwater use, and paying close attention to treatment, storage and disposal of waste water.

Minimise air emissions, by reduced flaring, eliminating venting and careful attention to other emissions.

Consider the cumulative and regional effects of large-scale drilling and production operations, especially for water.

Ensure consistently high, ongoing environmental performance, with properly resourced regulators, encouraging performance-based regulation and full cradle-to-grave regulation.
An Australian perspective on Governance and Regional Strategic Planning

- It is clear that mining for gas extraction, coal seam or shale gas has the potential to put at risk the function and value of key long term renewable natural resources assets and use such as:
  - Water resources and aquatic ecosystems
  - Agricultural land use thus food and fibre production
  - Biodiversity and landscape function via vegetation and habitat management
Coal seam gas in Queensland

Shale gas in the USA

The footprint of unconventional gas
Water

- The volume of water used for shale gas fracking can be large; the total amount of water produced over the life of the project is small; The reverse is true for CGS.

- Fracking fluids predominantly water, with approx 1% sand and chemicals.

- Full disclosure of the fracking chemicals used is the expectation.

- Disposal of fluids has to be carefully managed to avoid contamination of surface and ground waters.

- Disposal and management of produced water is of major importance particularly in CGS. If treated the resultant salty brines become a challenging yet to be resolved.

- Protection of aquifers from contamination from well failure is very important.
Water

The volume of water used for shale gas fracking is large; the total amount of *water produced* over the life of the project is small; the reverse of CSG

<table>
<thead>
<tr>
<th>Parameter (unit)</th>
<th>Quantity for One Well</th>
<th>Annual Well Development</th>
<th>Coal Seam Gas</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Number of Wells</td>
<td>1</td>
<td>20</td>
<td>500</td>
</tr>
<tr>
<td>Water Consumption (ML)</td>
<td>15</td>
<td>300</td>
<td>7,600</td>
</tr>
<tr>
<td>Flowback (ML)</td>
<td>7.5</td>
<td>152</td>
<td>3,800</td>
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<tr>
<td>Produced Water (ML)</td>
<td>0.28</td>
<td>5.7</td>
<td>142.5</td>
</tr>
</tbody>
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NSW Government, Managing Coal Seam Gas Produced Water
Integrated action, based on sound science, to manage water in the landscape for all users, for now and the future
Figure 4  Changing the focus of planning efforts

CURRENT PLANNING EFFORT

- Strategy
- Typical planning system
- Development Assessment

GOAL FOR PLANNING EFFORT

- Strategy
- Typical planning system
- Development Assessment

An Australian perspective on Governance and Regional Strategic Planning

• It is folly to secure one natural resource while putting at risk renewable long term resource use. The need is paramount for:
  • good long term regional land use planning to avoid such perverse outcomes
  • Recognition of limitation of EIS approach…leads to death by 1000 cuts!
  • Need non statutory regional and landscape planning to inform statutory planning
An Australian perspective on Governance and Regional Strategic Planning

• From any understanding of how the Australian landscape functions it is possible to use principles of Integrated Catchment (Watershed) Management to create a mosaic of appropriate land uses given the underlying capacity of natural systems to support desired set of values.
CAPs as a mechanism for aligning plans and values

Multi-scale adaptive management

National and state priorities for NRM

Legislation → Targets → Policies

Community values and priorities → Science

Catchment Action Plans

- Regional Strategies
- Regional Conservation Plans
- Water Sharing Plans
- Local Government Community Strategic Plans
- Local Environment Plans
- Links to other CAPs
- Links to other NRM Plans

Mechanism of aligning plans and values

Guides investment at catchment scale

CMA Investment Programs → Agency Results and Services Plans → Third party investment

On ground delivery
An Australian perspective on Governance and Regional Strategic Planning

• It is possible and desirable to use our knowledge of landscape process to work out upfront where we can safely mine and where mining would compromise agriculture, water resources, biodiversity other land uses and landscape environmental function.
An Australian perspective on Governance and Regional Strategic Planning

• Good regional and catchment action planning (CAP) with appropriate spatial definition should be able to identify
  • no go areas for mining for gas and coal
  • go with care areas in which mining can be conducted without unacceptable perverse outcomes within a regulation framework.
I see a urgent need for ‘a whole-of-system analysis’ and ‘cumulative risk assessment’ for regions prospective for unconventional gas.

The approach used for assessing unconventional gas developments (and any other developments) should be:

- First, to understand regional landscape capacity, and then to determine if there is capacity for the development without crossing landscape limits which impact on long term landscape functionality.

- Secondly that the current development approval processes should be updated to approve new developments only on the basis of landscape limits and the expected cumulative impacts of the existing and proposed developments.