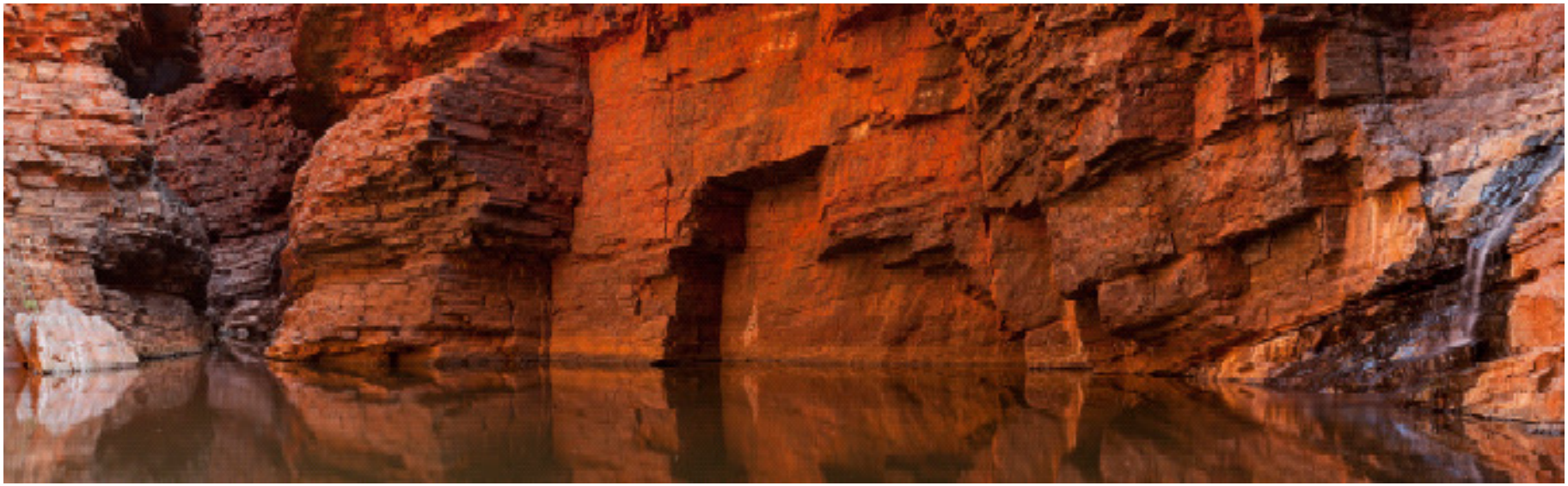
28th February 2013

Perth Innovation Centre, Bentley

Work-Group Session Findings

Smarter Energy, Water & Waste



Expert Presentations & Introductory Sessions

Aim: Identify Opportunities for integrated energy, water and waste management

- Glen Garner from IBM provided global examples to get audience thinking. Overarching question - Energy in the Pilbara: will we be price takers or price settlers?
- When it comes to energy. Source of energy and wind – no source commodity cost so why not renewable sources?
  - Wind resources in the South West
  - Geothermal resources in Australia.
- Renewables will need some way to manage load.
- Managing energy storage: James Cook University water cooling example to get people thinking. ***Principle:*** *Chill water after hours, store and use during normal day hours, from a central tank. 60% of energy was being used for air-conditioning so this effectively relaces that energy use to same effect.*
- The mining supply chain is energy intensive.
- The biggest user of water is energy. Electrical energy created by renewable – we have a competitive edge as an export commodity with the minerals as we have a strong energy presence (water + wind).

- *New kinds of instrumentation, interconnection, intelligence in energy and utilities.*
- Instrumentation: Remote monitoring and control devices are installed across the grid.
- Interconnection: Critical data captured and aggregated in real time.
- Intelligence: Continuous analysis drives targeted actions and response.

1. Australia can value add with energy in the Pilbara
2. Australia's ***renewable's*** are a ***sustainable*** competitive edge
3. Renewable's are our way of *conserving water* in the Pilbara
4. The energy system needs *storage*, and we need new approaches
5. Energy ***conservation*** and ***load shifting*** is required in energy delivery
6. The energy system needs variable loads → *water systems*
7. *Water conservation* and ***correlation with energy*** system needs to be built into our city systems and delivery mechanisms in the Pilbara

Case Study: Malta

Integrated Utility Business System

Michael Valocchi - IBM

Location: 95km South of Italy, 290km North African coast
Structure: Archipelago: Malta, Gozo and Comino
Climate: Mild winters and hot dry summer
Area: 316 Km2
Language: Maltese, English
Population: 410,290

Situation

- Constrained energy resources. Generated electricity via imported fossil fuel
- Used water from underground fresh water and more than half its water supply by electrically powered desalination plants.
- Enemalta and Water Services joined forces in 2009 and launched the IUBS program with the aim to:
  - Reduce commercial & technical losses
  - Improve Customer Service
  - Improve Operational Efficiencies
- The 5 year program includes deployment of Smart Meters for both Water and Electricity, implementation of a SCADA system and the transformation of the meter-to-cash and asset management processes and systems.

Benefits:

- To the utilities:
  - Decreased cost of managing metrics, precise bills with rich history of consumption, reduced outages, eradicated thefts and fraud
- For consumer:
  - Less customer disturbance – through remote operations
  - Change details of contract by phone call
  - Billing aligned with the real consumption
  - Energy plan to fit consumption pattern
  - Decrease in customer dissatisfaction and disputes
  - Flexible tariff structures
  - Virtual transactions vs physical transactions
  - Flexibility of billing periods
  - Overall improved service
- For the Community:
  - Reduction in outages and black-outs reduces the risk of disruptions to the economy

Expert Presentation - Horizon Power

Greg Will, Horizon Power

Story of the average Pilbara Residential Customer

- Number of residential houses in Karratha 5215
- Number of residential houses in Port Hedland 5477
- Annual average energy consumption 10736kWh per residential house
- Average house power demand 7-10kW
- Annual average cost $2219
- Majority of Pilbara Customers are Resource Company and Government Employees receiving electricity subsidy
- Typical subsidy – 3 bedroom house 20,000kWh, apartment 18,000kWh
- Results are Karratha has 23 solar systems installed and Port Hedland 76 only. Karratha and Hedland network could host 970 and 915 installation respectively

<u>Summary</u>

- Pilbara Residential Customers: huge power energy consumption
- Barrier to solar is that government subsidises energy consumption.
- Only 23 solar systems installed in Karratha, 76 only in Port Hedland.

Expert Presentations- Water Corporation

Paul Vanderwal, WATER CORPORATION
Summary and barriers in the Pilbara:

1.Town and industry demand increasing

2.groundwater and surface water sources traditionally used,

3.future water sources limited and becoming more remote,

4.increased costs,

5.unpredictability of demands.

▪Port Hedland is supplied via borefield sources and is reaching capacity. WC is looking at next source. Possible that they might use desalinisation
Port Hedland Regional No of Services saw a 300% growth. Port Hedland has double the energy consumption than Perth.
Of note: West Pilbara Water Supply Scheme

Short term solutions:

▪Expand existing sources

▪demand management

▪water recycling

Long Term solutions:

▪Demand management/recycling

▪desalination

▪major remote water sources

Opportunities:

▪New technologies,

▪Private water schemes (Industrial and miners sharing water supply schemes),

▪Power and water supply, demand mgmt.

Expert Presentations – Waste Authority

Wendy Muir: Waste Management Infrastructure -
WASTE AUTHORITY, STATE GOV

Constraints and Limitations

1. Majority of landfills nearing full capacity
2. Some Pilbara landfills don't meet industry standards (significant amount of industry waste production in Pilbara is trucked back to Perth rather than managed locally.)
3. No Class IV Landfill capacity in Pilbara (for hazardous)
4. Tyranny of distance – transport costs
5. Exponential growth in resources sector
6. Capital expenditure is limited
7. Recruitment and retention of staff

Solutions:

1. Waste as a RESOUCE.
2. Proposed Waste to Energy Plant in Port Hedland (Increased recycling and energy production)
3. More jobs in waste recycling and reprocessing compared to landfill (Improves liveability)
4. Chevron Wheatstone project
5. Collaboration between neighbouring governments - Economies of Scale

Pilbara Integrated Energy, Water and Waste Management

Challenges / Issues: **Integrated Energy, Water, Waste**

Overview

- No correlation between respective services from planning to operations
- To operate water to satisfy peak power and load shifting.
- To use waste to generate energy

- Siloed between each of the Government Service agencies and even the resources companies.
- The BHPs, RIOs, Chevron's, etc., do their own thing within their own footprint

- Waste prevails – no need to mitigate the water waste or the electricity waste. Subsidies are prolonging this .

Energy

- Access to water supplies is crucial.
- Peak demand management is key

Pilbara Residential Customers are huge energy consumers Barrier to solar is that government subsidises energy consumption. No incentive.

Only 23 solar systems installed in Karratha, 76 only in Port Hedland.

Pilbara Integrated Energy, Water and Waste Management

Challenges / Issues: **Integrated Energy, Water, Waste (general)**

Water

- Town and industry demand increasing especially with increasing population
- groundwater and surface water sources traditionally used are limited until further capital upgrades, i.e. future water sources limited and becoming more remote including increased costs.
- Unpredictability of demand -
- Port Hedland supplied via bore-fields but will need new sources to supply growing population
- Reaching capacity, looking at next source. Possible : desalinisation
- Port Hedland Region (number of services) saw a 300% growth.
- A householder in Port Hedland has double the water consumption than a person in Perth.

Waste

- Waste as a Resource. Proposed Waste to Energy Plant in Port Hedland (Increased recycling and energy production)
- More jobs in waste recycling and reprocessing compared to landfill (Improves liveability)
- Chevron Wheatstone project
- Collaboration between neighbouring governments

Government

- No strategic infrastructure plan for 10 years
- No coordinated approach

Brainstorm: Success Strategies - voted by E&U team prior to Dragons' Den

Idea		
1	Information is power	• Use sensors, new sensors, use to make decisions and drive behaviour, tariffs • SCADA data
2	Residential	• Demand management, reduce energy and water, (may or may not involve removing subsidies) - Dubuque/ Townsville smart meter trial with Horizon Power and Water Corp
3	Container Hub in Pilbara	• Feasibility study on container hub in Pilbara. Imports and exports , shift load from Fremantle • Economic diversity
4	Innovation Centre	• Business case of developing an Innovation Centre • Bing partners together • Economic diversity • Removes silos across government • Leverage Solar Array • Agriculture
5	Inconvenient Strom	• Extreme weather detection and modelling to improve response times for citizens /community/ industry. Safety reasons and financial reasons are strong drivers here.
6	Future Farm – Farm to Fork	• Leverage mine dewatering and water from West Canning Basin to produce food supplies for the Pilbara and export to Asian region. • Back to historical position as pastoral region - create a new industry – have access to water. • Access for agribusiness and employment in the region + creating sustainable ecological and environment report.
7	Integrated water and energy – smart planning	• Integrated waste, water and energy solution. • Focus on inefficiencies through an integrated approach (plan, provision and operate)
8	New Investment model	• Increase economic diversity and increase innovation - establish Pilbara specific investment markets to benefit the region (normalise the economy) • Pilbara Venture capital market • Pilbara Energy Market and • Pilbara Water Market

Brainstorm - Strategies for Success - Smarter Energy, Water & Waste

General discussion from Red Group breakout session
Alternative ideas / areas to examine (sticky notes)

- Off grid power supply for smart connected and sustainable homes with balance of power being produced outputted to the North West Integrated System
- Creation of a water bank
- Explore algal blooms for new fuel uses
- Agricultural biomass production
- 10-year alternative energy development plan and blueprint for the region
- MOU across Pilbara – all new permanent dwellings to have 1.5kw – 3kw systems
- Dust suppression – out targets on KL/Tonne of water being sprayed on stockpiles to drive different behaviour
- Centre for renewable energy in industry
- Clear separation of operations and residents
- Separate Development of the towns away from the mining funding
- Land availability – release/cost – to make Pilbara attractive for technology development
- Average Pilbara Water use is double Perth use so we need to get it down to Perth level!
- Smart Phone Game/app as a smart meter - use GPS and network data
- Develop and off-grid house!
- Realistic expectations of Lifestyle – no front lawn because no water!
- Phase out electricity subsidies 1 – 5 years
- Leverage existing Gas Power with an integrated solar combined cycle
- Carbon farming initiative
- Use dewater for Agriculture to grow crops for energy generation and BIO Diesel near mine operation
- Use West Canning basin for Agriculture
- All new houses have to have solar power and water tank, self-sufficient
- Marine observations systems – cyclones, fauna, water quality, etc
- Pilbara innovation incubator – research linkages
- Ocean monitoring – cyclones, fauna, water quality
- Manage weather events – Centre of international excellence
- Streamline regulatory approvals for water/power through ERA.
- Design of housing and community buildings to suit climate and reflect Pilbara
- Technology for visual assessment of planning process.
- PUMP treated waste into aquifers
- Special economic zone
- Tidal Power
- Online landing page for Pilbara region
- Incentives for Private sector water investigative in the Pilbara in the Hinterland …

Brainstorm - Strategies for Success – Smarter Energy, Water & Waste

Alternative ideas / areas to examine (Sticky notes)		
Investment	**Infrastructure**	**Investment 2**
•Bundling of projects to increase attractiveness •Trading RECs for renewable energy – foreign companies •Private public partnerships •Designated investment zone •Create Pilbara water market •Pilbara energy market network •SME business incubator •International attraction for business •Sources of venture capital •Capital efficiency •Investment through Sister City engagement •Renewable energy management •Leveraging tourism •Pilbara venture capital market	•DC link to NT •Energy efficient precincts (POC with Horizon) •Sustainable integrated energy solution •Sustainable waste management •Demonstration of integration renewable to mining operations •Combining water electricity (new energy comp) •International airport •Transformation renewable projects •Micro-grids/ distributed generation •Showing of infrastructure •EOI for class 4 waste facility •Solar suburb/precinct •Base load energy •Rationalize utility infrastructure	1. We could use a new investment model that creates new Industries and improves productivity 2. Lack of industry diversity , lack of innovation, high cost of infrastructure and services Innovation: • Sustainability outside of current resources driven market • Alternative growth model • New investment opportunities • Access to capital (new capital market) • Large demand for investment – lowers cost • Normalise the economy Value: • Lowers input cost (utility , infrastructure, living) • Job creation • Long term security for citizens (sustainability) • Capital efficiency • Attractive place to live for families

Brainstorm - Strategies for Success – Smarter Energy, Water & Waste

<table>
<tr><th colspan="3">Alternative ideas / areas to examine</th></tr>
<tr><th>Policy / Regulatory / Governance</th><th>Alternative technologies & solutions</th><th>Residential / ground-up</th></tr>
<tr>
<td>•Start a new energy efficient town site
•Integration of services into new housing supply requirements
•Whole of government approach to facilitating change
•Enable 3rd party solutions to be introduced and to be provide with the seeding capital
•Mining companies combining to build/use a waste scheme
•Make it easy to connect through access arrangements</td>
<td>• Biodiesel
• Water recycling for external house usage
• Reticulation of grey water throughout South Hedland
• Power/water interface – store excess power from alternative fuels in mine dam, store potential energy
• Options for dust suppression
• Waste/sewerage to power
• Water - desalination plant

Data and Information Optimisation

Gather data – supply/demand, Kw, Kwh, emissions intensity
Process – better understanding of supply and demand
Data capture and analysis
Make demand and consumption data accessible (network and premises)
Understand the real cost of supply</td>
<td>• Integrated design for housing and network
• New connection contact for customers with new tariffs.
• Residential DSM through smart meters
• Partners with resource costs
• PV batteries and demand response in new residential developments
• Find a way to incentivise households to save energy and H2O
• Understand the cost of alternative solutions e.g. H2O and energy efficiency
• Residential users paying the cost of utilities
• Leverage solar cities learnings re: residential behaviour change
• Pay for PV rather than ongoing subsidies and energy (residential)
• New housing residential trial
• Create demo facility – 100% renewable – PV, wind, biomass
• Review commercial arrangements with inclusivity?</td>
</tr>
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Brainstorm - Strategies for Success – Smarter Energy, Water & Waste

Alternative ideas / areas to examine			
Water supply / re-use	**Renewables**	**Govt regulation**	**Partnerships**
•Managed aquifer recharge to store run-off between cyclones •Use waste products to desalinate water •Replace subsidy on water - transfer to recycled water •Water treatment use of nanotechnology for producing aircon cooling - zero discharge •Natural power transport to move water •Nanotechnology use in sewerage treatment	• Solar ponds – algae, biodiesel • Incentives for companies who subsidizes employee, energy /water to install solar • Replace subsidy of traditional power in Pilbara with solar subsidy • Incentives allow customers the opportunity to supply themselves • Use crown land to build solar arrays • Develop revolutionary energy products where customers' network supply is limited • Govt and industry to co-invest in solar towers across Pilbara • Tyre processing – reusing old tyres into a fuel • Allow community solar farm to supply the towns	• Remove subsidies / CSOs, transfer to efficiency infrastructure fund • Streamline government red-tape to allow innovation • Take a regional approach to waste management	• Interconnect the mining companies and transmission lines • Reduce costs by developing a collaborative / unregulated energy., water, waste market • Learn from past generations "custodians" to be ore sustainable • Bring in the local council, resource companies and people together • Pilbara industry exchange of by-products or waste • Share Govt infrastructure – education • Facilitate innovative partnerships y showing "what's in it for me" • Influence to enable more specific focus on the Pilbara • Facilitate a whole of Govt approach to achieve outcomes and get better results • Identify and promote benefits across different stakeholders

Brainstorm - Strategies for Success – Smarter Energy, Water & Waste

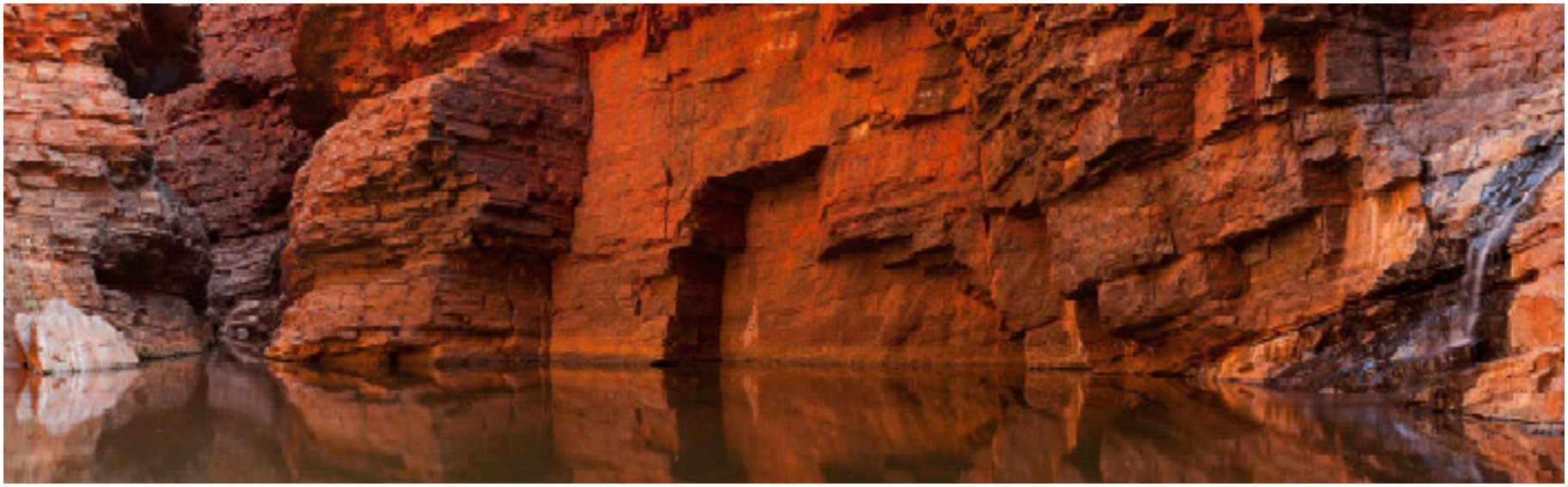
Alternative ideas / areas to examine		
Innovation	**Community / Housing / Lifestyle / Education:**	**Power and Energy / Infrastructure:**
• Integrated monitoring system with multiple users esp remote sensing and digital aerial photography • Private public innovation • SKA as a pilot for remote energy • Provide a test-bed for pilot projects • Videogame technology to recreate/ analyse • Manage organic waste locally and produce quality compost • Levy on waste sent to landfill at Pilbara instead of being re-used, re-cycled, re-processed • University innovation for energy renewables/ research	• Community based social marketing – community engagement • Education centre to keep kids in the Pilbara • Program to save electricity/ recycle goods to subsidise housing for basic services • Establish café strip at Port Hedland e.g., Matso's brewing from Broome • Low cost housing system. Factory- Port Hedland – Free up land for positioning the houses • Design infrastructure considering life cycle analysis – informed decisions • Build more energy efficient houses • Economic cost for all projects should be eco/social cost • Change design of housing to suit the environment – building materials to suit the heat • New agriculture and industries to learn from Gaswyn-Murch and Camballin experiences • Use mine dewater supply to develop agriculture in the Pilbara • Aquaculture using mine dewatering e.g. barramundi • Container Port for Port Hedland (can ship recycled material to China) • Back loading on rail/ ships • Turn ex-mine sites into new industries to maintain population and economy • Port Hedland to be hub for shale gas in Canning basin •	• Build aspirational infrastructure not just minimum required today • Link to SKA project • Infrastructure high temperatures e.g. Pawsey centre • Magnetic levitation 'Maglev' transportation system powered by renewables • Area power station fro area C – Yandi area multi company

Brainstorm - Strategies for Success – Smarter Energy, Water & Waste

Alternative ideas / areas to examine		
Community:	**Technology:**	**Governance**
• Community driven innovation for sustainable wast management • Focus on higher level education(energy focus) • Incentivise residential energy efficiency • Demand side management for water • Infrastructure provisioning with indigenous camps	• Smart metres for water and energy efficiency • Data collection fro mining companies • COE for sustainable development • 'Frequent Flyer' points for energy reduction	• Essential services utility • Clarity and confidence on govt processes • Better co-ordination of funding mechanisms • 'Time of use' tariffing • Landfill levy • Baselineother development regions in the world • Strategic government planning • Tax holidays for innovative investment • Co-ordination of govt strategic plans • Efficiency incentives • Fed govt policy planning • Legacy issues in Pilbara (who owns what) • Co-ordination of resource and govt strategy • Collaboration of private and govt to attract L4R programme • Strategic forecasting of growth for Pilbara

Dragons Den Finalists

Energy, Water & Waste



DRAGONS' DEN

Innovation Opportunity – Innovation Centre

Idea Name: Innovation Centre

Group: Team Blue

Idea Description	**Provide a centre of innovation in the Pilbara**
Innovation Proposal	**Structure with shared funding between private and government organisations, where new ideas can be presented and piloted for future innovative development**
Value: **-Society** **-Business** **-Brand**	**Assists with brand** **Bring highly skilled people to generate ideas for Pilbara** **Partners together – public and private** **Share risks through collaboration / agreement** **Helps generate new economic diversity ideas (agriculture, etc)** **Gathers new ideas about housing and education** **Removes silos across business and government** **Cut through red tape, particularly for immediate benefits** **Allows local people to have a voice**

DRAGONS' DEN

Innovation Opportunity – Team Yellow
Idea Name: Integrate Water and Energy

Idea Description	**Support integration of waste, energy and water infrastructure solutions for the community and organizations in the Pilbara.** **Inefficient and unsustainable approach**
Innovation Proposal	**- Collaborative approach for provisioning of services** **- First-of-a-kind to build a risk averse sustainable solution** **- Meet the high demand, security of supply, and support Pilbara Cities growth initiatives.**
Value: **-Society** **-Business** **-Brand**	**Sharing of infrastructure, efficient use of capital, lowering costs.** **Efficiency to end users, contributes to services and amenities, improved quality of life.** **Provides citizens with options.** **Supports new industry development, Investment in new industry, jobs, local solutions.** **Showcases Pilbara at the leading edge of innovation, increases attractiveness, demonstrates a sustainable growth opportunity for residents. Quality place to live, work and invest.**

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Innovation Opportunity – Team *Yellow*
Idea Name: New Investment Model

Idea Description	**We could use a new investment model that creates new industries, promotes innovation and improves productivity** **Lack of industry diversity** **Lack of innovation** **High cost of infrastructure and services**
Innovation Proposal	**Sustainability outside of current resource driven market (Alternative growth model)** **New investment opportunities** **Access to capital (new capital market)** **Large demand for investment** **Lowers cost** **Normalise economy**
Value: **-Society** **-Business** **-Brand**	**1) Lowers input cost (utilities, infrastructure, living costs)** **2) Job creation** **3) Long term security for citizens (sustainability)** **4) Capital efficiency** **5) Attractive place to live**

Innovation Opportunity

Idea Name: Farm to Fork (farming the Pilbara)

Group: Red Group

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Idea Description	**Introduce a new industry to the Pilbara as an alternative and complementary to the current focus on mining. Taking water from demining and from the ground water resources (such as West Canning Basin) and using it for agricultural purposes.** **Leads to the creation of new industries, jobs, environment and ecological diversity and carbon sequestration.**
Innovation Proposal	**Not currently implemented in Pilbara in a substantive manner** **New industry with new technology applications to offset Diesel usage for power generation.** **Technology exists and needs to be proven in the Pilbara environment for jobs.** **Some examples starting to emerge but a game plan for the strategic direction needs to be in place.**
Value: **-Society** **-Business** **-Brand**	**Create employment opportunities to support residential growth** **Prove indigenous employment opportunities** **New business enterprises** **Energy offset savings** **Provides and support residential growth**

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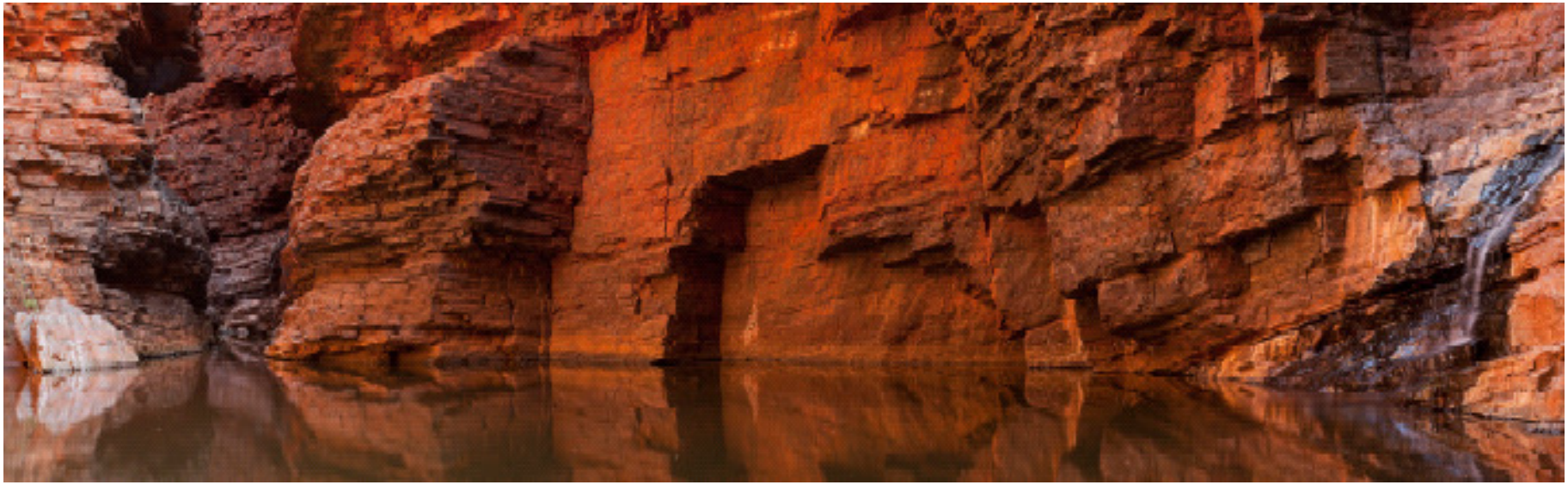
Other Ideas – Energy, Water & Waste



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Innovation Opportunity
Idea Name: An inconvenient Storm
Group: Red Group

Idea Description	**For industry and Pilbara communities to be able to better predict and model extreme weather events and to more accurately plan and manage their activities.** **Current situation doesn't allow for strategic and accurately predict over a long period, e.g. too precautionary** **Enhance accuracy of predictions (more finite decision making – not just cyclones but all weather, seas, tides, etc)**
Innovation Proposal	• **Doesn't currently exist only BOM advice** • **The region , the climate, the remoteness, the economic imperitive, and first** • **The vulnerability of communities** • **Monitoring them will have flow on effetcs for the developing economies of the world.** • **Uncertianty costs!** • **Dollars and lives … (Biz and community perspectives)**
Value: **-Society** **-Business** **-Brand**	• **The economic value** • **Safety considerations** • **Flow-on effect for developing nations.** • **International local Centre of excellence to boost Pilbara brand and relevance in global economy – provide mature identity**

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Innovation Opportunity Team 2
Idea Name: Information is Power
Group: Green

Idea Description	**Using a combination of sensors and analysis develop an in depth understanding of supply/demand profile for water and power.** **This addresses the lack of accurate supply/demand information**
Innovation Proposal	**This is very achievable and will have a dramatic impact on the feasibility of any other solutions** **Stakeholders assume that this has already been done** **Technology will allow a more accurate picture**
Value: **-Society** **-Business** **-Brand**	**This data and information underpins all other potential solutions** **Brings together a diverse group of stakeholders** **Helps plan and manage assets** **Helps develop tariffs that drive specific behaviors** **Provides a better understanding of costs** **BETTER DECISIONS**

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Innovation Opportunity

Idea Name: – Container Hub in the Pilbara

Group: Team Blue

Idea Description	**Container hub in the Pilbara** **Problem to solve: What happens in the Pilbara after mining**
Innovation Proposal	**Doesn't exist today, potential economic diversification in the future** **Feasibility to support the business case**
Value: **-Society** **-Business** **-Brand**	**Industrial infrastructure** **Employment** **Import / Exports** **Integrates to common use facility** **Shifts the load from Fremantle** **Proximity to China**