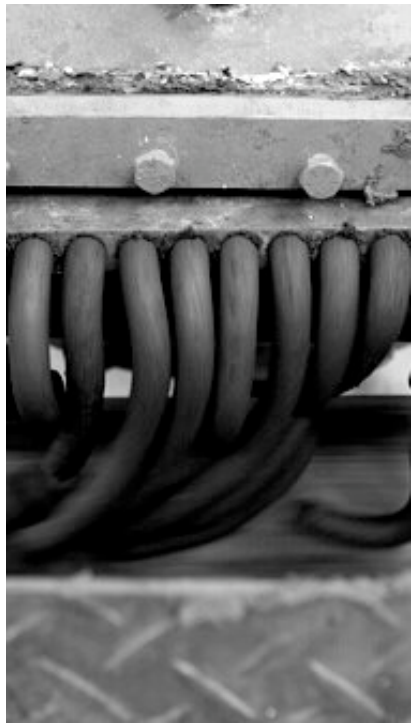
Coldry Technology in the Latrobe Valley




Presentation: CoalTech 2010
Ashley Moore, Coldry Business Manager

ECT Overview

ENVIRONMENTAL CLEAN TECHNOLOGIES LIMITED

Commercialising and selling disruptive technologies in the energy and resources sector.

Focused on delivering significant environmental and commercial outcomes.

CURRENT TECHNOLOGY PORTFOLIO

Coldry

Unique Coal Drying and Water Recovery Technology

An economic method for dewatering lignite and sub-bituminous coals, creating an energy rich Black Coal Equivalent for local consumption or transport to remote markets.

COMMERCIAL SCALE DESIGN COMPLETE

ACTIVE SALES AND MARKETING FOCUS

Matmor

Unique Iron Making Technology

A one-step method for producing low-carbon iron from abundant and low economic value brown and sub-bituminous coals and metal bearing media.

PRE-COMMERCIAL

MARKET INFORMED DEVELOPMENT

AGENDA

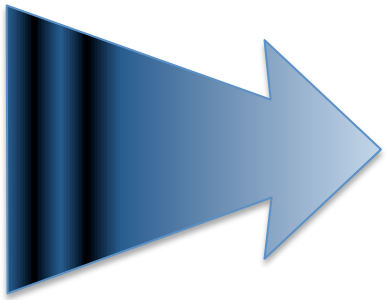
The Opportunity

Coldry Technology

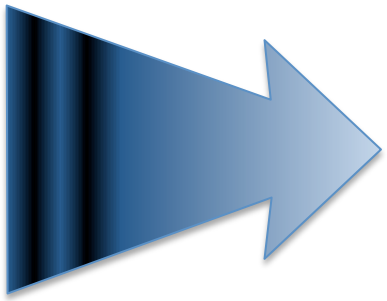
Latrobe Valley Project - VCPL

The Drivers – The Sources of Pain

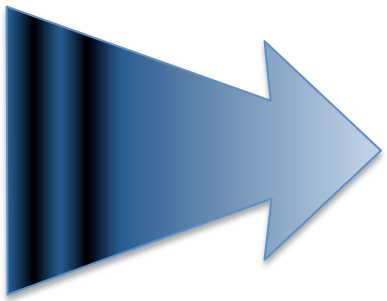
- Rising Demand for Energy
  Coal chief amongst the available sources
- Limited sources of new supply, and
  Cost of exploitation increasing for hard coals
- Reserves for Lignites and Sub-Bit coals greater than Hard coals, lower cost to exploit
- Financing pressure on existing methods of Lignite utilisation
- CO2 emissions pressure on existing Lignite utilisation methods
- High tech means of utilising Lignites requires an economic drying solution



FINANCIAL PRESSURE



SOCIAL PRESSURE



EFFICIENCY PRESSURE

The Opportunity to…

- Create new sources of exportable Primary energy supply at competitive cost, using abundant sources of Lignite
- Mitigate CO_2 emissions generated from current technologies
- Create a viable gateway to gasification and CTX technologies using the chemically most suitable coals
- Reduce and remove uncertainty associated with project financing for Lignite utilisation

BY

Efficiently and Effectively removing water from Lignite and Sub-Bituminous coals

Introducing part of the solution…

COLDRY TECHNOLOGY

Coldry Technology
Coldry Process Overview
Coldry Product Characteristics
Coldry Significant Developments

Coldry: **Unique Coal Drying and Water Recovery Technology**

Black Coal Equivalent (BCE): **Energy Rich Fuel from Lignite or Sub-bituminous Coals**

Coldry Technology

What does it do?

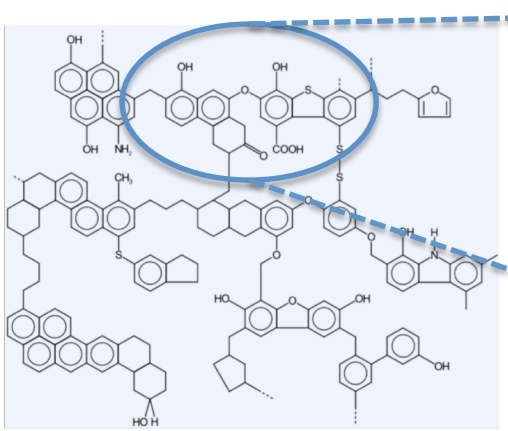
- Coldry Technology removes water from Lignite and Sub-Bituminous coals
    - Economically and Sensitive to the Environment
- Creates a high energy coal pellet – a Black Coal Equivalent
- Overcomes the tendency for spontaneous combustion
- Overcomes the tendency to reabsorb atmospheric water
- Retains the high value volatile components, useful for gasification and chemical processes
- Can recover water expelled from the coal as a pure near-potable distilled water stream

Coldry Technology

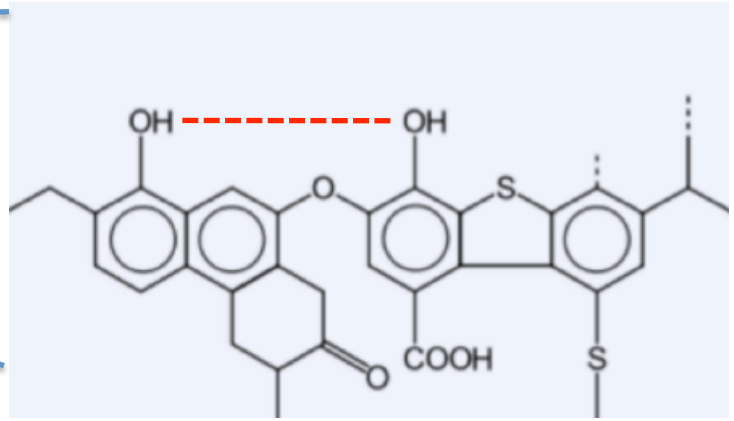
How does it do it?

- The process stimulates a natural chemical reaction within the coal
- The reaction polymerises active sites in the coal compounds, expelling chemically bound water
- The polymerisation collapses the coal pore structure, expelling the physically trapped water
- The ejected water migrates to the surface of the coal pellets
- Through utilisation of waste heat from an adjacent power station, the surface water is evaporated

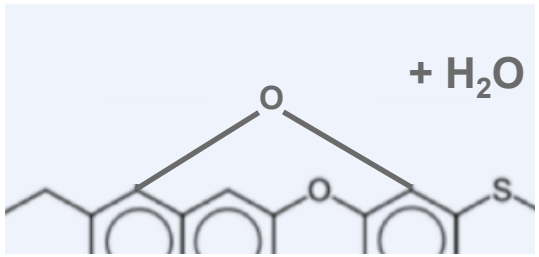
Coldry Chemistry



Coal Chemical groups are mobilised in the shearing process



Active groups begin polymerisation reactions



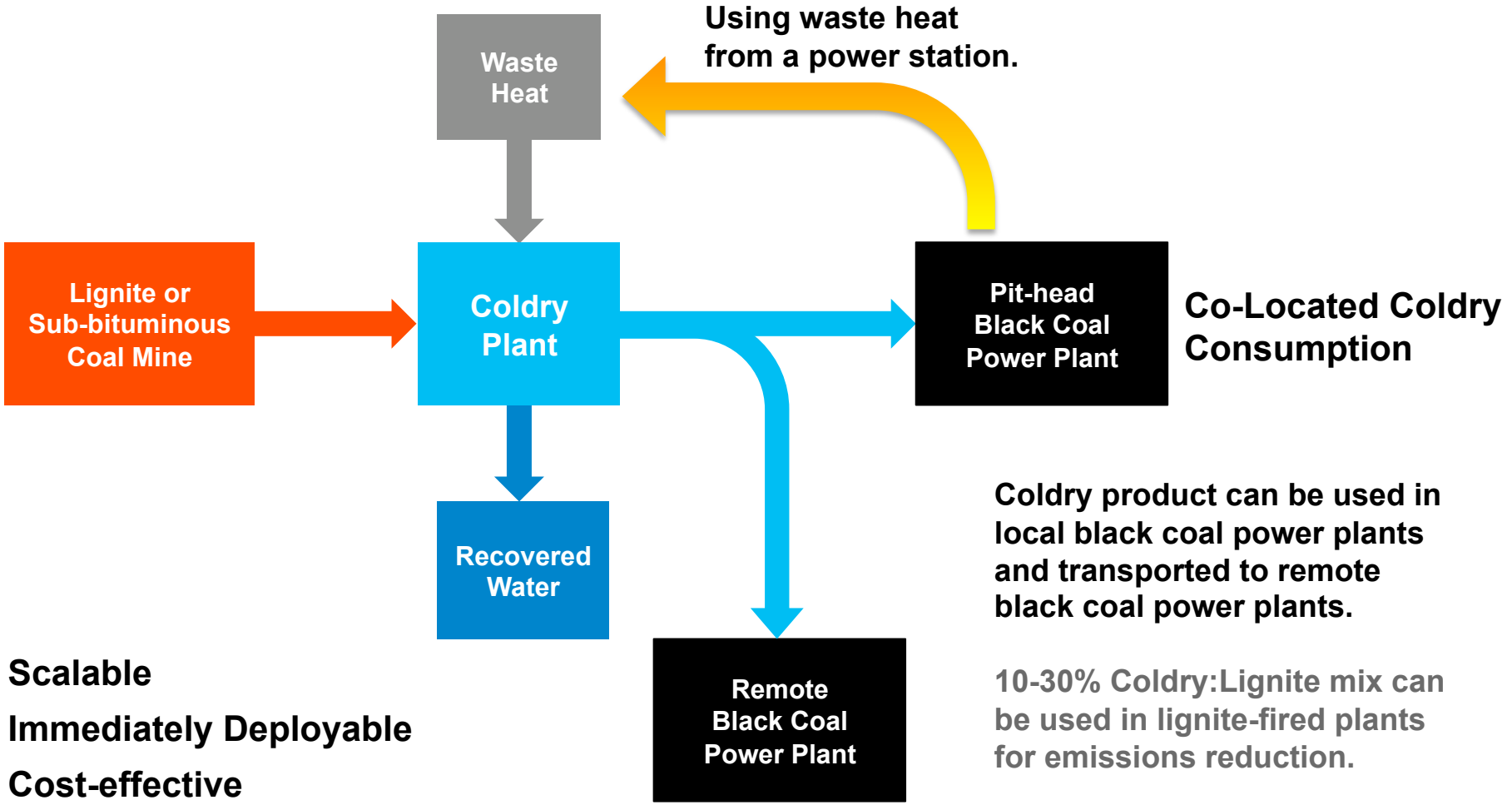
Ejecting water, and collapsing the Coal pore structure, also rejecting physically held moisture

Coldry Technology

Other benefits

- CO_2 reduction for existing Lignite power stations using a blend of Coldry pellets and Lignite without major capital expenditure
  - From 10% blends, up to 30% in some cases
  - Reducing CO_2 emissions by 5% - 15%
- Extends life of Lignite reserves through greater efficiencies in use, and/or
- Allows export revenues to be developed from otherwise stranded resources
- Enables alternative uses of candidate coals in higher value applications

Coldry Overview



Scalable

Immediately Deployable

Cost-effective

Coldry product can be used in local black coal power plants and transported to remote black coal power plants.

10-30% Coldry:Lignite mix can be used in lignite-fired plants for emissions reduction.

100% Coldry possible in significantly upgraded lignite plants.

Coldry Plant Schematic

The Coldry Process

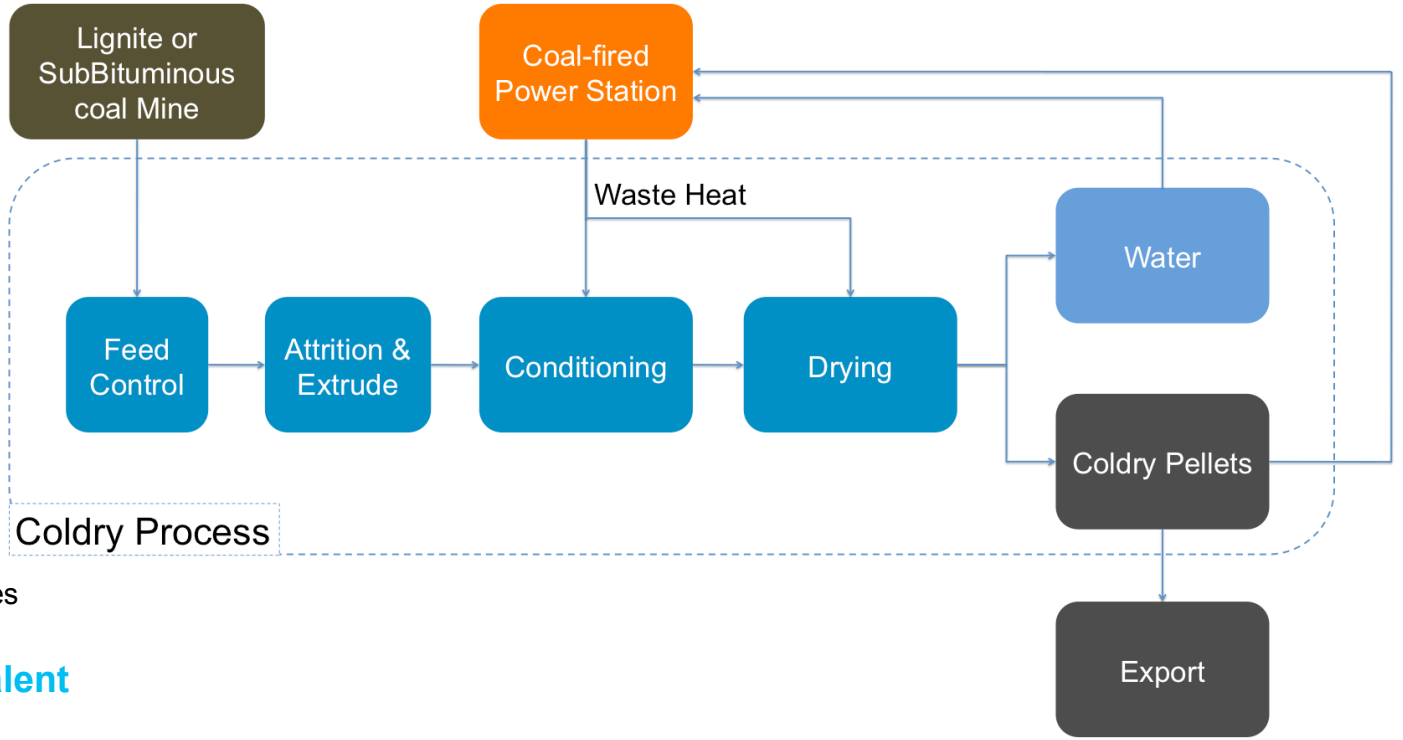
High Gains
Mechanical
Low Temperature
Low Pressure
Water Recovery options
Sensitive to the Environment

The Coldry Plant Design

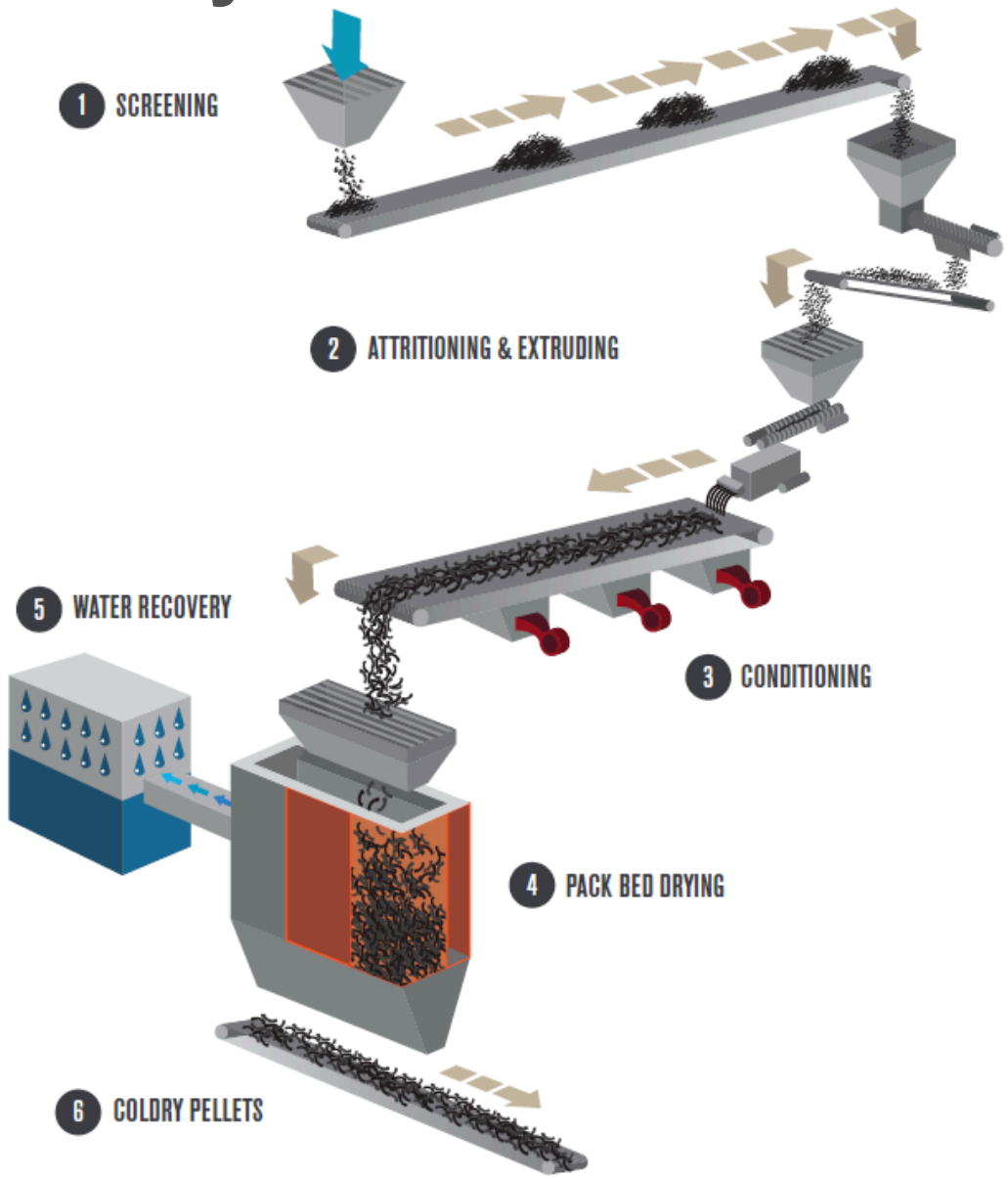
Immediately Deployable
Flexible
Scalable
Cost Effective
Power Station Integration Synergies

Coldry Black Coal Equivalent

Stable
Valuable
Versatile



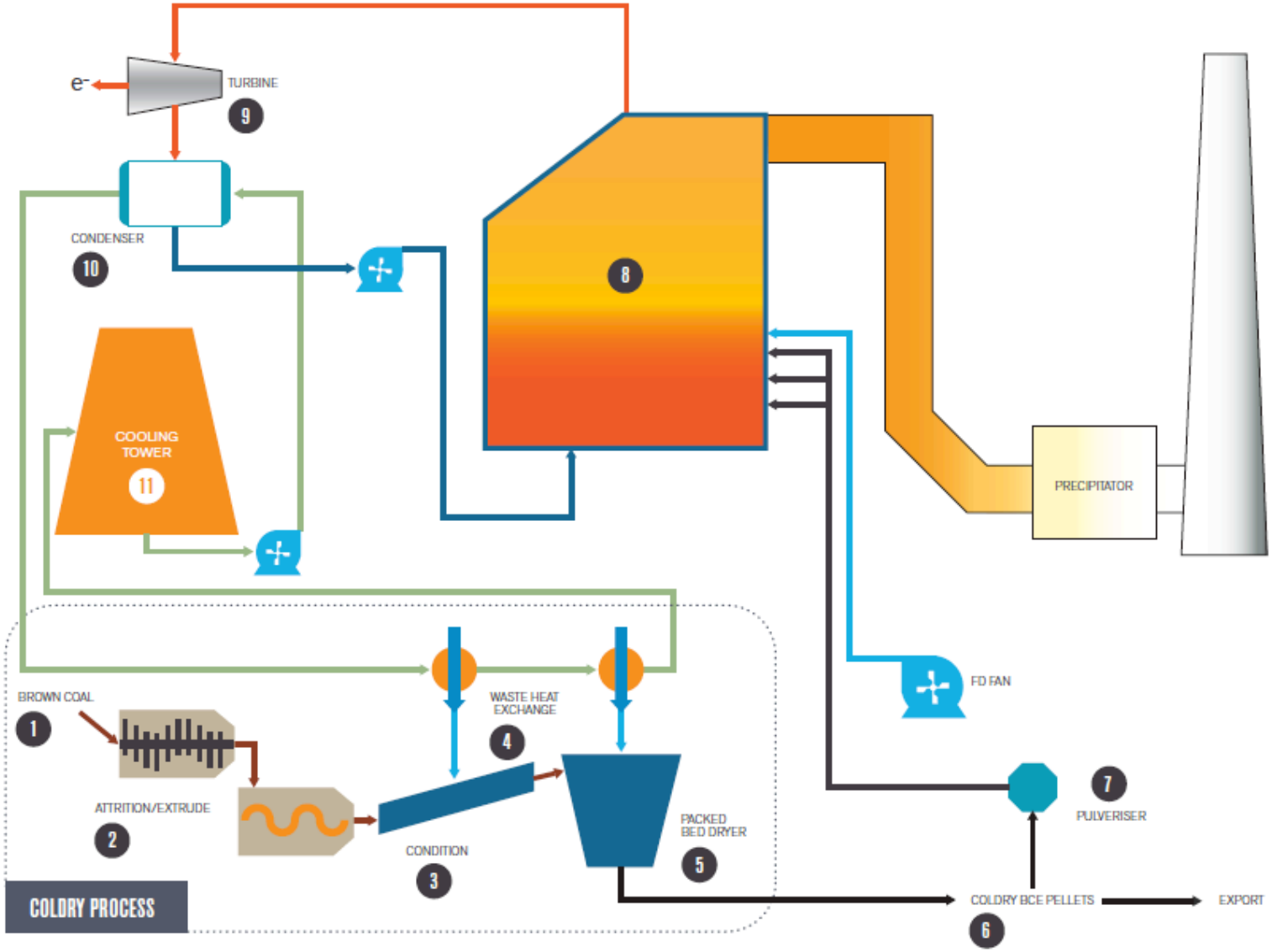
Coldry Process



Coldry is a simple, mechanical process which generates a Black Coal Equivalent energy pellet.

1. Screening and adding a small quantity of water to the raw coal
2. Initiating an exothermic chemical reaction to expel water through attritioning and extrusion of a plasticized mixture
3. Warm air toughening of extruded mixture on a conditioning conveyer prior to pack bed dryer delivery
4. Removal of moisture in a pack bed dryer
5. Recovery of water released in the drying process
6. Stockpiling of high energy Coldry pellets ready for use or transport

Coldry Integrated Power Plant



Coldry Performance Characteristics

Proximate Analysis of Coldry produced in Victoria, Australia compared to other Australian coals

Feature	Lignite (VIC)	Coldry (VIC)	Black Coal (QLD)	Black Coal (NSW)
Moisture	59.3% wb	**12% adb**	15.5% adb	3.3% adb
Volatile matter	20% wb	**48.9% wb**	22.5% wb	26.5% wb
Fixed carbon	19.9% wb	**49.1% wb**	44.1% wb	46% wb
Ash	0.9% wb	**2.4% wb**	17.9% wb	24.2% wb
NWSE	2006 kcal/kg ar 8.4 MJ/kg ar 3611 BTU/lb	**5874 kcal/kg adb** **24.6 MJ/kg adb** **10576 BTU/lb**	4800 kcal/kg adb 20.1 MJ/kg adb 8641 BTU/lb	5681 kcal/kg adb 23.8 MJ/kg adb 10232 BTU/lb

Note: NWSE – Net Wet Specific Energy, wb - wet basis, adb - air dried basis, ar – as received basis.

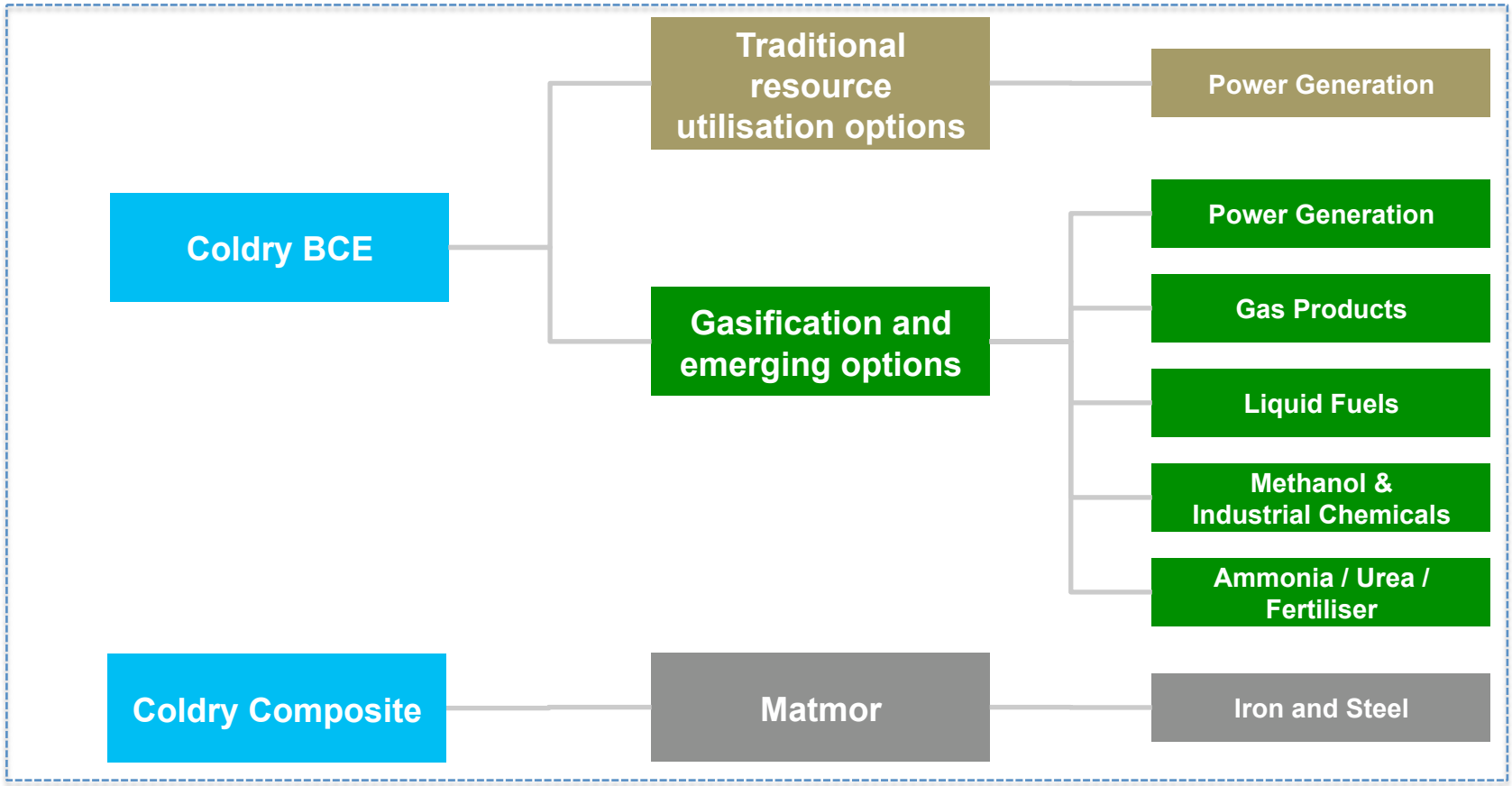
Coldry drives value creation

- **Significant increases in net energy content**
- **Retention of the valuable volatile fractions, ideal feed for gasification processes**
- **Low ash levels derived from the raw Lignite (similarly with Sulphur)**
- **Transportation effectiveness – Non-pyrophoric, Low moisture**

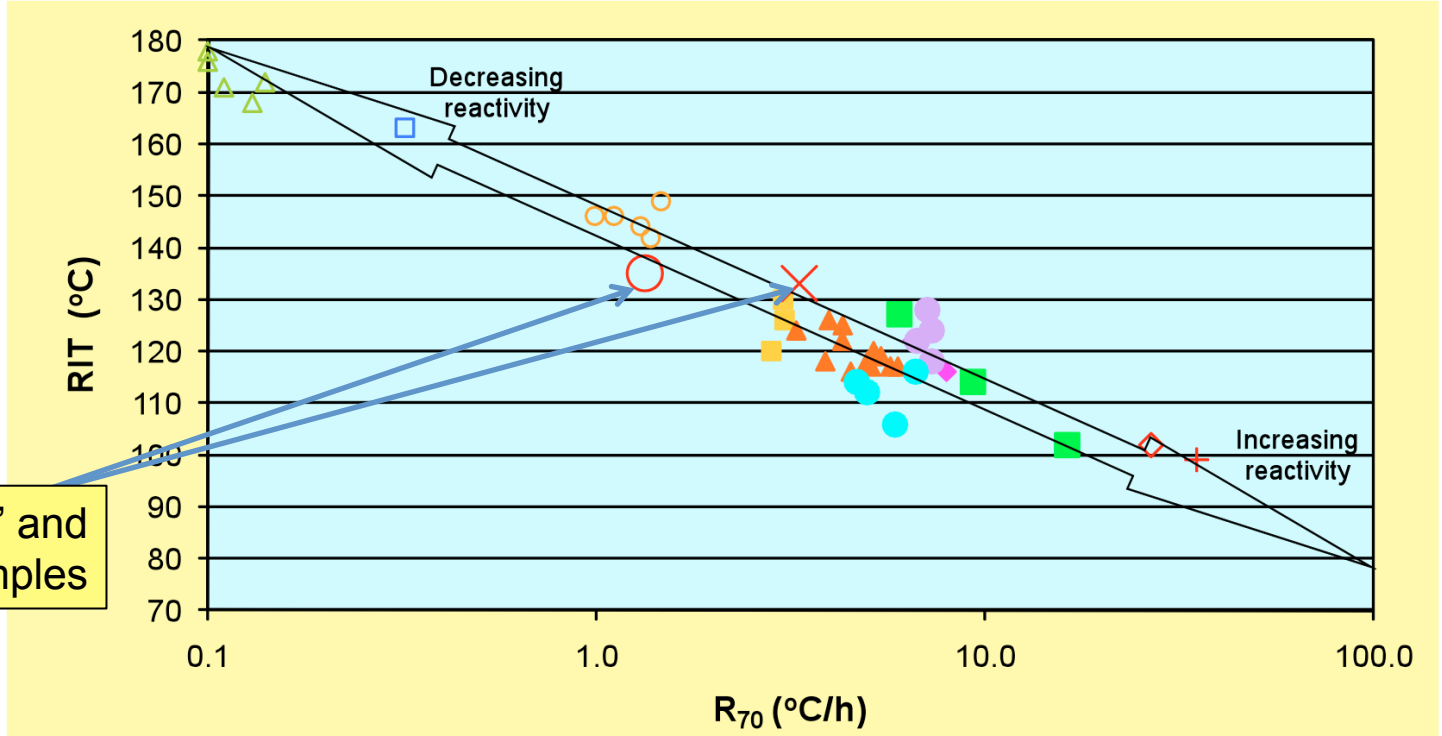
Source: Black coal (QLD – Callide, NSW – Eraring) accessed from *CSIRO Biomass Database*.

Coldry: A Gateway Technology

Once de-watered, Lignite has a wide range of high value applications beyond the traditional use in thermal power stations.



Coldry – Stable and Exportable



Coldry "fresh" and "aged" samples

Relationship between RIT (relative ignition temperature) and R_{70} self-heating rate

Coldry processing reduces Spontaneous Combustion risk to that of typical black coals – more stable than many regularly traded coals!

Coldry Process Overview

Unique Process

Low Temperature

The Coldry Process requires low temperature of around 40°C. This heat is sourced from waste heat via heat exchange from the cooling water of a co-located lignite-fired power station.

Low Pressure

Coldry extrudes the coal under low pressure, reducing the need for additional energy required in other high-pressure drying processes.

Natural Chemical Reaction

The efficient mechanical process is designed to affect the porous structure of the coal, thus liberating the moisture. At a molecular level, an exothermic chemical reaction takes place, causing the coal to cure and become dense.

Stable Product

The densification of the coal collapses the porous structure, preventing re-absorption of moisture, thus preventing spontaneous combustion.

Water Recovery

The water recovered is ready for immediate industrial use without expensive treatment. With minor filtering to remove coal dust the water becomes potable. The water can be fed to the power stations cooling circuit, reducing the need to take water from rivers, reducing the cost involved in processing river water to make it suitable for the cooling circuit and also improving operation efficiency by reducing the temperature of the water.

Superior Engineering Design

Scalable

The Coldry plant is designed to be modular. The modular approach means all sections of the plant can be fabricated off-site, then transported in containers and assembled.

Immediately Deployable

Coldry Technology is ready to deploy now. Other drying technologies are still years away from commercial deployment.

Cost Effective

The Coldry Technology efficiently creates a Black Coal Equivalent product, greatly increasing the value of lignite and sub-bituminous assets in the face of rising black coal demand and pricing.

Coldry Milestones

Pilot Plant

- Established batch production in 2004
- Underwent modification in 2007 to achieve continuous production and integration of water recovery system

Commercial-scale Design

- Pilot Plant has informed design of commercial-scale Coldry modules that underpin commercial plants
- Modular design with Containerisable components
- Up to 80% prefabricated offsite before assembly

Strategic Relationships for Commercialisation

- Entered into strategic relationships with leading organisations to advance Coldry technology:

Arup	*Coldry Core Design Partner (Global)* *Coldry Design Engineer (Global)*
McConnell Dowell	*Coldry Construction (Australia)*
Transfield Services	*Coldry O&M (Australia)*
Deloitte	*Coldry Financial Modelling (Australia)*

Strategic relationships underpin commercialisation in global markets.

Ownership of Intellectual Property Rights

- 100% ownership of Coldry intellectual property
- Covered by patents in all major markets with significant lignite deposits
- Engagement with potential partners and customers covered by standard legal agreements

Coldry Significant Developments

Project in Victoria, Australia

A Coordination Agreement with TinCom, a Vietnamese coal trading company was executed in June 2009 to conduct feasibility and establish a commercial Coldry plant.

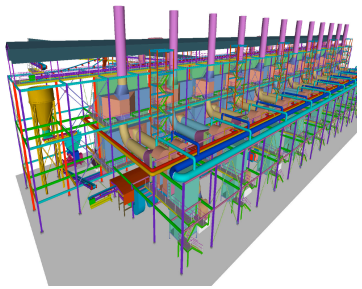
Coldry production will increase from an initial capacity of 2 MTPA to 20 MTPA in four phases over a 10-year term. Beyond this milestone Environmental Clean Technologies Limited will provide this company with a licence to produce 20 MTPA of Coldry over 50 years.

Specifically this agreement provides TinCom with:

- The first right of refusal to construct and fund Coldry Plants in Victoria, Australia,
- The non-exclusive right to construct and fund Coldry Plants in other Australian States, and
- The right to purchase up to 100 MTPA of Coldry product.

In September 2009 ECT received an in principle agreement directly from Vietnamese Prime Minister Nguyen Tan Dung to allow investment in the production of Coldry pellets in Australia. An Investment License was issued by the Department of Planning and Investment in October 2009.

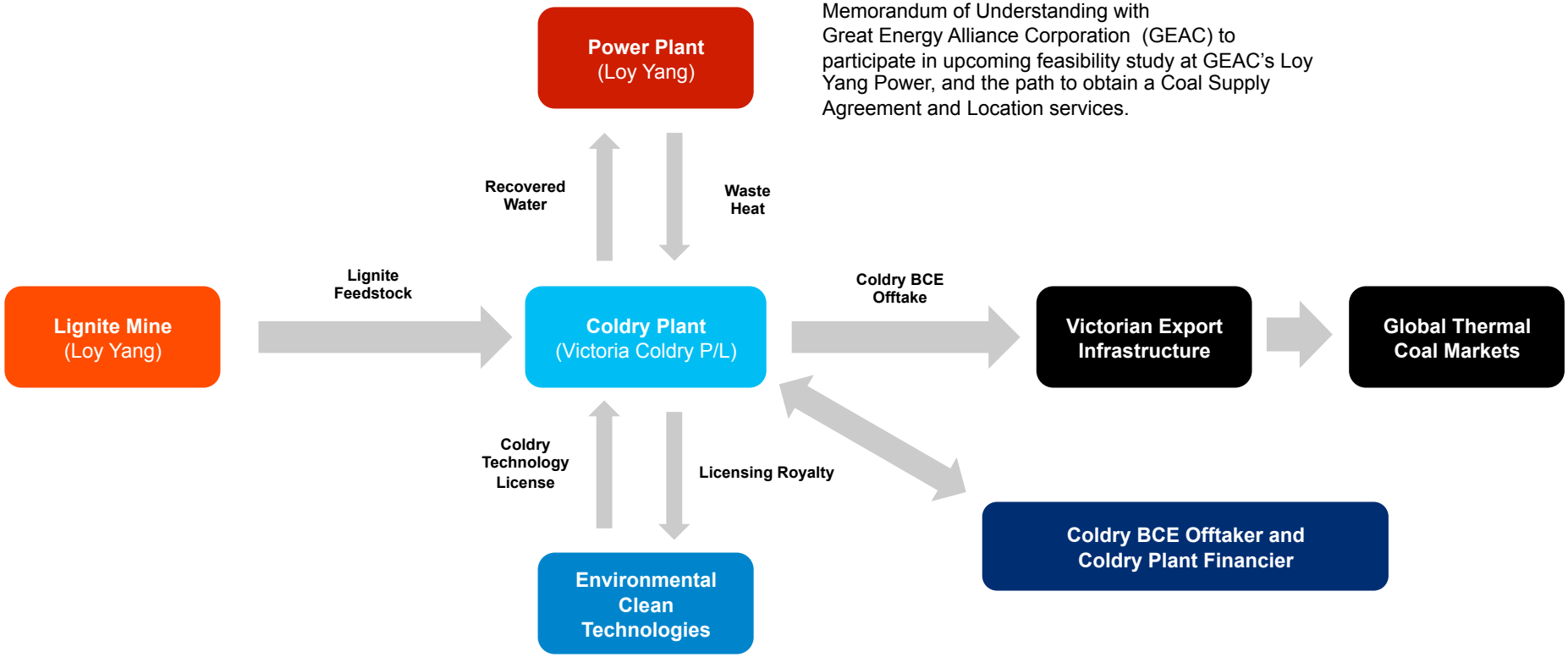
Next steps include the issuance of the Coldry Technology Licence and the finalisation of scope and commencement of the Feasibility study and Detailed design.



Victoria Coldry Pty Ltd: The Project Structure

The Project SPV

Coldry BCE production phased from 2 MTPA to 20 MTPA over 10 years.



Memorandum of Understanding with Great Energy Alliance Corporation (GEAC) to participate in upcoming feasibility study at GEAC's Loy Yang Power, and the path to obtain a Coal Supply Agreement and Location services.

Victoria Coldry: Status and Timetable

Near Term

- Licence to be issued
- Detailed agreements on Feasibility Study scope to include components and detailed design, as well as Tender package preparation
- Commencement of Feasibility study and detailed design works, with expected completion before year end 2010

Medium Term

- Phase 1 operations at 2 mtpa by ~2013
- Phase 2 expansion to 5 mtpa
- Phase 3 expansion to 10 mtpa
- Phase 4 expansion to 20 mtpa

expanding progressively over the first ten years of operation

Victoria Coldry: The Outcomes

- Coldry product produced at sub $US 40 per tonne
- Phase 1 export income for Victoria approaching $US 200 million, growing to nearly $US 2 billion when fully expanded

Coldry: Other Global Projects

GLOBAL COLDRY PROJECTS

Poland (PGE Belchatow)

- Joint Business Case development MoU signed Jan 2010.
- Project will run through 2010 to define the path forward for lignite drying at *the largest Lignite Power Station in the world*.

Coldry East Kalimantan (SPV Established)

- Heads of Agreement with Alexis Minerals International to produce Coldry BCE – production of 10 MTPA.
- Information Memorandum to be developed to attract funding for feasibility study in 2010.

GLOBAL BUSINESS DEVELOPMENT

New Opportunities

- Working vigorously with a number of qualified parties to build Business Cases to underpin feasibility investment in India, China, Indonesia and E&W Europe
- Commercialisation underpinned by Coldry Project Localisations

Coldry Growth Targets

- Targeting at least 5 Coldry BCE Plants (3 MTPA) to be in operation by 2015 across key growth markets (China, India and Indonesia).
- Significant growth potential beyond targets through project expansions and additional projects.


Thank You !