

# Energy Developments Limited

## The Leader in Methane Emissions Abatement

Presentation to Coal Mining Methane Abatement Seminar

CMATSP Sydney Sept 2012

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leaders in clean energy



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# Key Messages

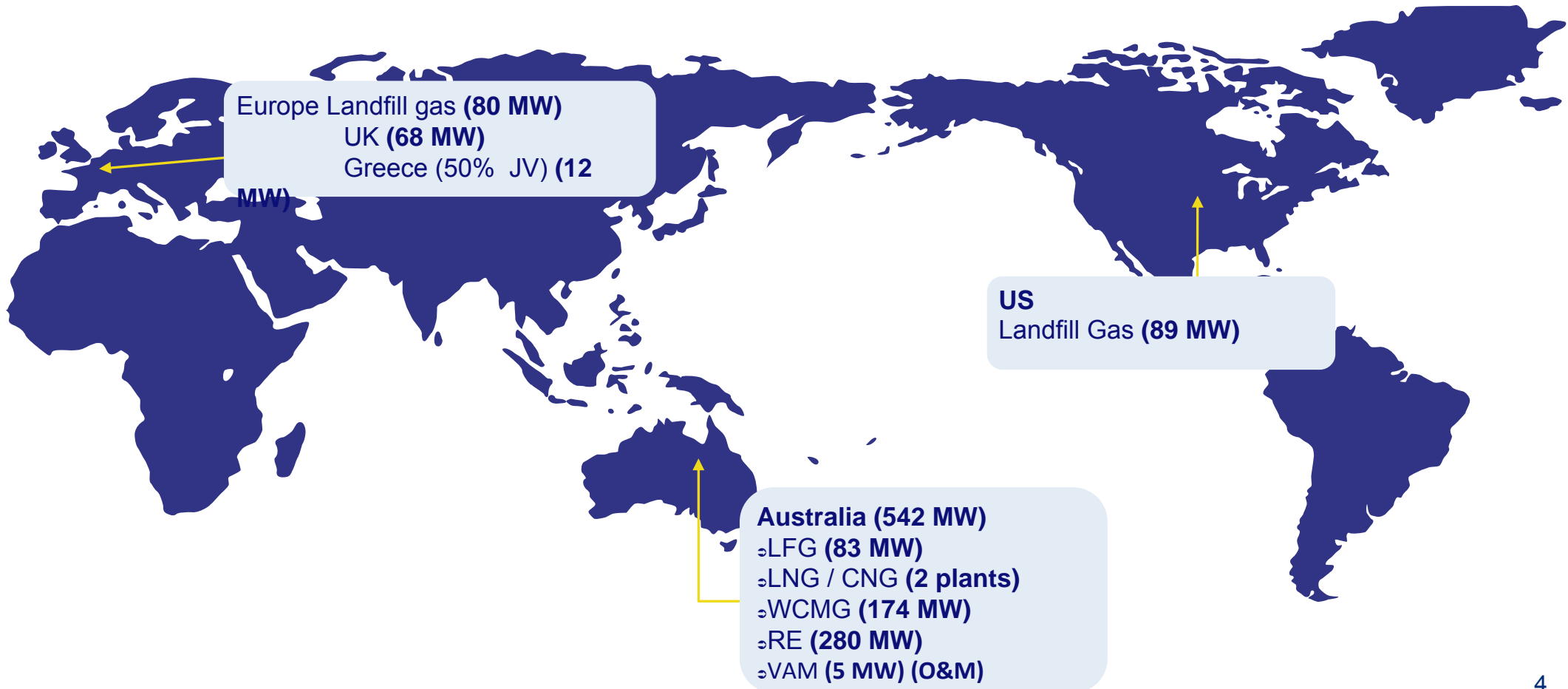
**EDL is a long established company with a demonstrated record in methane abatement and generation and beyond. We can offer:**

1.	Safe, reliable, and competitive BOO service provision to the mining industry
2.	Well capitalised service provider with LT contracts and renewal record providing an investment base to expand existing and new business
3.	History of technology development and adaptation to offer value adding customer solutions
4.	Leadership position in Waste Coal Mine Gas and Land Fill Gas abatement and generation
5.	Experience in various technologies for VAM abatement
6.	“Best Applicator” and “Best Technology” Partnership with Dürr for delivery of BOO VAM abatement utilising EcoVAM® RTO technology



# EDL – A Global and Diverse Portfolio

- Worldwide Clean Energy operations abate and avoid ~10 million t/CO<sub>2</sub> equivalent per year (2 million cars)
- A global generation portfolio of 711MW capacity
- Combination of contracted revenue, capacity based contracts and track record of renewals provides solid investment base for additional business





# EDL in Australia

**Largest Clean Energy provider utilising fugitive methane emissions**  
**Largest Remote Energy provider in the 1 - 100MW sector**

Entrusted by miners, utilities and landfill operators across 59 sites, including:

  
Appin / Tower – 97MW  
Cannington – 40MW

  
German Creek – 32MW  
Moranbah North – 45MW

  
Sunrise Dam – 28MW

  
Darlot – 12MW



  
Jundee – 21MW

  
Pine Creek – 35MW  
McArthur River – 21MW

  
West Kimberley Power Projects – 70MW  
Remote towns and communities – 89MW

  
McArthur River

# EDL Waste Coal Mine Gas History



## Appin and Tower Power Station

- Located in the NSW Southern Coal Fields
- Operates at Mines run by BHP Illawarra Coal
- Total 97MW
- Commissioned 1996



## German Creek Power Station

- Located in the Bowen Basin
- Operates at Grasree Mine owned by Anglo American
- Total 32MW – expansion to 45MW now underway (Jan 2013)
- Commissioned 2006



## Moranbah North Power Station

- Located in the Bowen Basin
- Operates at Moranbah North Mine owned by Anglo American
- Total 45MW
- Commissioned 2008



## WestVAMP VAM Abatement

- Located in the NSW Southern Coal Fields
- Owned by BHP Billiton Illawarra Coal
- Operated and Maintained by EDL
- 5MW steam turbine power generation
- Commissioned 2007

EDL plans to expand further into BOO VAM abatement services

# What can EDL bring with WCMG Abatement Service

As the largest provider of BOO WCMG power generation EDL provides a cost effective solution to carbon abatement.

**EDL can leverage synergies with existing coal mine operations through:**

- Operation and manning
- Spare parts management
- Emergency response
- Training
- Asset management

**EDL's services provide a hedge against rising energy costs**

- We can convert your gas into your electricity and deliver it across your portfolio using the NEM
- Supply electricity behind-the-breaker to meet on-site load
- Sell electricity to the NEM and pass back NEM revenue to coal miner
- Island configuration options can protect mine production from forced outages due to power grid unreliability

**Trusted Partner – EDL has a long history with the mining industry with numerous contract extensions demonstrating performance**

As a trusted energy and abatement partner, EDL:

- Can provide safe, reliable and cost effective abatement solutions across the portfolio
- Looks for the opportunity to add value to customer through new technology; additional services; NEM market participation



Moranbah North Power Station



German Creek Power Station

# EDL VAM Abatement Experience

## WestVAMP (O&M contract)

- Westcliff Colliery
- NSW Southern Coalfields
- 5.8 MW steam turbine
- Co-commissioned by EDL
- Operated by EDL
- Owned by BHP Billiton Illawarra Coal
- Commissioned 2007



## Appin

- EDL pioneering WCMG power generation project included VAM capture and utilisation
- 54MW reciprocating engine capacity project
- VAM as supplementary fuel through air inlet incorporated in initial design
- Project demonstrated that VAM can be utilised in reciprocating engines
- Project ran for several years pre carbon tax
- Field test site of EDL's carburetted gas turbine (CGT) VAM abatement and utilisation demonstration unit
- CGT fuelled with 1.6% CH<sub>4</sub> technically challenging, project currently idle



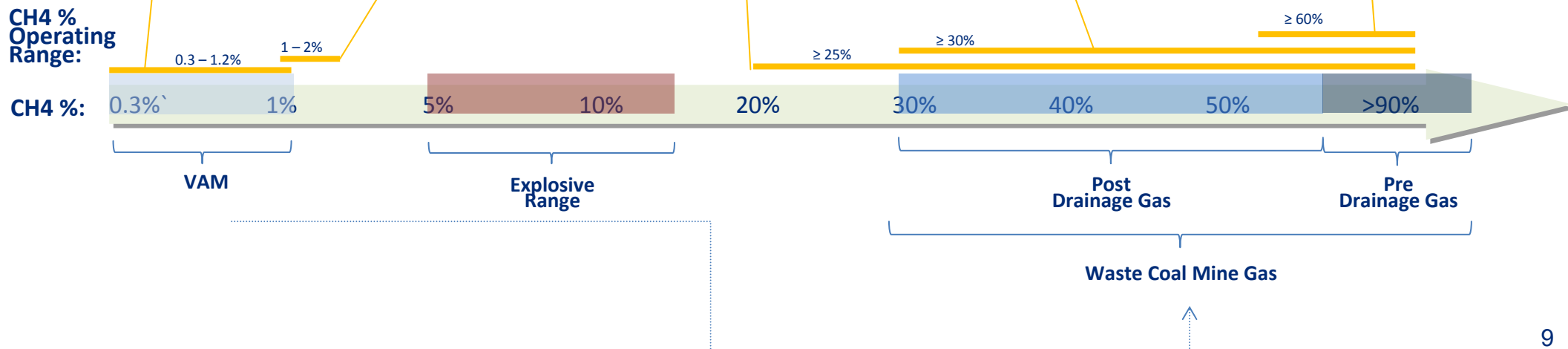
**EDL has more experience in VAM abatement and utilisation than most**





# EDL Technology Overview

Methane gas abatement, combustion and generation technologies and where they are applicable



# Introduction to EDL - Dürr Alliance

- EDL identified Dürr as preferred partner
  - Competitive and efficient technology design
  - Extensive experience in design, construction and installation of RTO technology
  - Depth of experience in environmental emissions control
  - Depth of capacity in group – both technical and financial
- EDL and Dürr have teamed up to offer Australian miners a single interface, flexible VAM abatement and utilisation solutions service utilising Dürr's EcoVAM® abatement technology
- Dürr is a diversified global provider of industrial systems including automation and emission control with over 1000 RTO and 3000 air purification systems installed worldwide
- EcoVAM® unit developed for VAM abatement installation in West Virginia (75m<sup>3</sup>/s) and China (under construction 300m<sup>3</sup>/s)
- EDL and Dürr have entered an exclusive distribution agreement for EcoVAM® in Australia
- EDL positioned to offer Build Own Operate service which will
  - Reduce mine costs by reducing carbon liability
  - Reduce mine's capital cost of abatement
  - If applicable include generation or other utilisation
  - Integrate with WCMG abatement services
  - Allow miner to focus on coal production



Dürr EcoVAM® McElroy Mine West Virginia

# Consortium Strengths

- Mine safety is the highest priority
  - EDL has been safely operating gas plants and power stations connected to operating mines for over 20 years
  - Dürr RTO units have been connected to hazardous processes for more than 35 years
- EDL and Dürr have proven design and operational expertise to ensure that VAM abatement projects will achieve maximum equipment reliability and high VAM abatement destruction efficiency, without impacting mining operations

**1 + 1 = >2**

- EDL & Dürr will provide the capability to deliver RTO solutions fully compliant with relevant Australian statutory and Australian Coal Industry requirements (when finalised)
- Our primary offering is a build, own and operate VAM abatement service, allowing the miner to focus on its core business of mining coal
- We will focus on energy efficiency, waste heat recovery and utilisation where commercially feasible, not just VAM abatement:
- Dürr has multiple RTO installations already operating that include heat recovery and utilisation

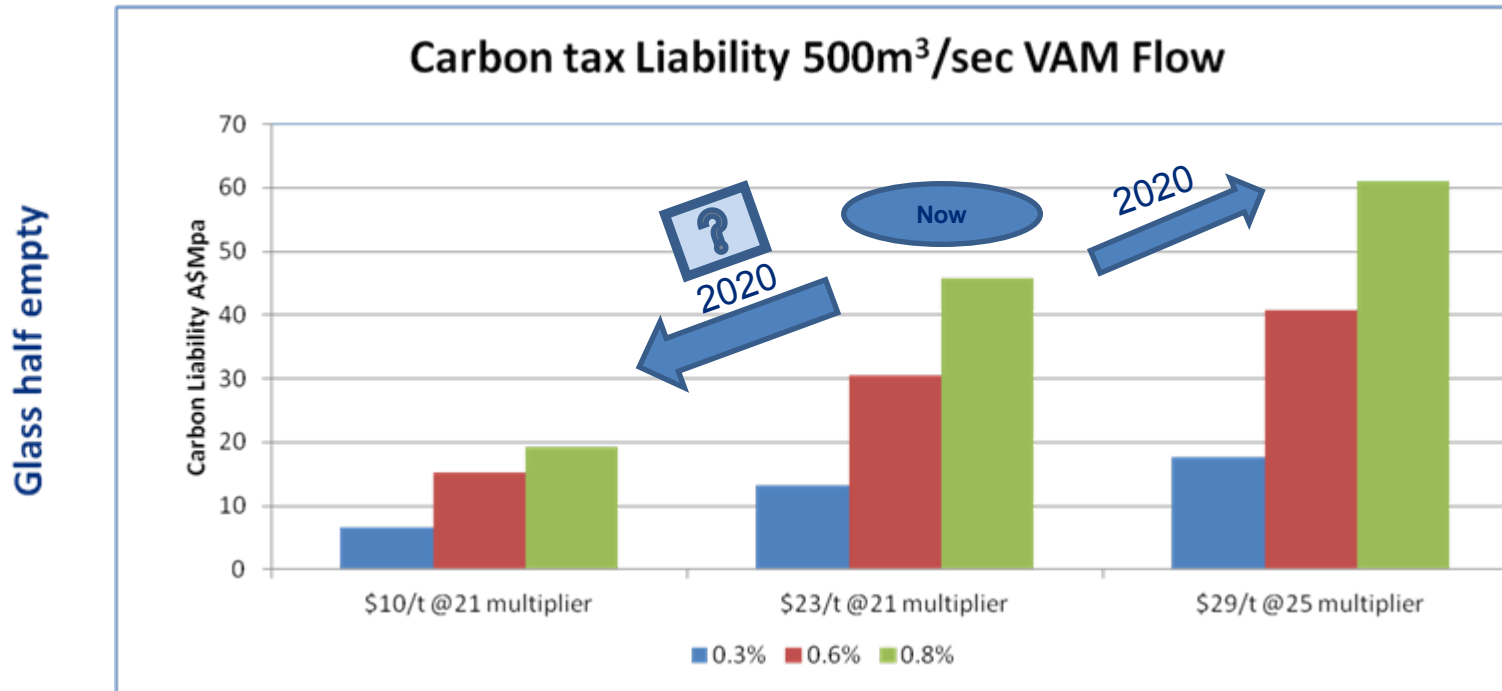


Almost 60 years combined experience in emissions abatement / power generation



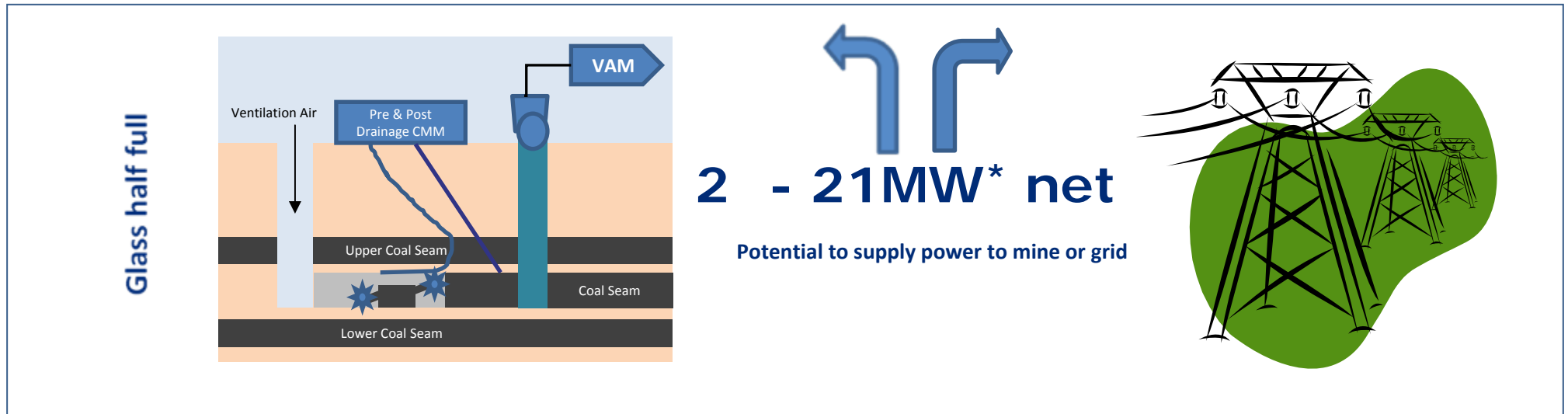
# Commercial Incentives for VAM Abatement - Problem or Opportunity?

The carbon tax has made VAM a substantial liability...



# Commercial Incentives for VAM Abatement - Problem or Opportunity?

...but VAM represents a larger potential energy source than WCMG in many mines – the opportunity



**EDL can provide optimisation services between WCMG; VAM; self reliance vs. imported power**

Note: \* Based on 500m<sup>3</sup>/sec @0.3-0.8% CH<sub>4</sub> @ 20% efficiency



# Summary

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- EDL is the leading player in Australian methane abatement and utilisation
- We have a long and well established track record of safely adapting and applying technology to the long term benefit of our customers
- EDL has the capacity and appetite to continue to grow its WCMG and VAM business
- VAM abatement represents a logical, technical and commercial fit with EDL's WCMG business enabling us to offer operational efficiencies in any integrated solution
- EDL with Dürr is positioned to offer competitive BOO VAM abatement and utilisation services offering
  - **Reduced costs**
  - **Reduced Capital**
  - **Focus** on the matters that are a distraction for the coal miner

**We are here to help and add value**



# Questions

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# Notes pages

## SLIDE 4

- The 711MW installed generation capacity across a range of fuels from WCMG, LFG; LNG, CNG Natural Gas and diesel is supported by a sound commercial position
- >88% contracted revenue with >50% being capacity based
- EDL has established new funding facilities totalling approx. \$450M over the last year – an indication of the underlying strength of the operations which provided an EBITDA of \$135M in 2011/12

## SLIDE 5

- EDL's customer base comprises a number of the multinational mining companies and State Government utilities
- Many of these are long term relationships which have seen the business grow and contracts renewed and extended
- EDL's operations are often embedded in the mining operations and EDL's safety systems meet the expectations of and are compatible with the expectations of the Australian mining industry
- With many of our customers solely reliant on EDL performance for their operations or to keep the lights on, EDL understands the importance of and has a track record of reliability of performance
- The recent announcement last month of our involvement in the expansion of Xstrata's McArthur River expansion involving a new power station after providing power to that mine since 1996 is a demonstration of safe, reliable and competitive performance

## SLIDE 6

EDL was a pioneer in the capture and utilisation of land fill gas (LFG)  
Introduced modifications to standard reciprocating engines adapting them to utilise the lower and variable quality land fill gas  
Received no support from OEMs in early days so EDL took on the technical risk  
EDL now has >250MW of capacity fuelled by LFG globally

EDL built on LFG to pioneer Waste Coal Mine Gas (WCMG) utilisation  
The Caterpillar 3520 CMM engine was developed in conjunction with EDL  
Appin & Tower – **97MW** commissioned 1995  
German Creek – **32MW** commissioned 2006  
Moranbah North – **45MW** commissioned 2008  
German Creek expansion and islanding project – 2012 project underway

EDL's Australian methane abatement business now includes:

- Clean Energy power generation
- Waste coal mine gas (174MW capacity)
- Landfill gas (83MW capacity)
- Mine ventilation air methane destruction (VAM) – O&M contract at WestVAMP



## **SLIDE 7**

Under the new carbon legislation, there are no specific green credits available for new WCMG generation projects.

From an abatement perspective flaring WCMG achieves the same emissions reduction as WCMG generation

WCMG generation carbon intensity is around 25% less than the current NEM average which provides a competitive advantage.

The current wholesale electricity market is not conducive for investment although expectations for higher prices as the carbon tax and higher gas prices take effect.

The increasing gap between wholesale and retail prices does raise opportunities for WCMG utilisation even in the current wholesale environment.

As the dynamics of the WCMG and LFG industry have changed so EDL has looked to increase its scope of services. The extent to which these services can add value will depend on the mine's power contract situation with respect to network and stability of gas curve.

EDL offers islanding services; the option to reduce or even eliminate reliance on the network through "behind the breaker services". The cost of each power outage requiring mine evacuation can be substantial. Particularly in Queensland where transmission and distribution constraints are foreshadowed to be ongoing for some years, the benefits of eliminating outages through islanding can be substantial.

EDL is positioned to be able to offer retail services thus providing the option for the miner to cover its portfolio from utilisation of its own gas whether through the NEM or through supply behind the breaker.

Ultimately the value of the benefit is dependent on the ability to predict and control the flow of gas.

## **SLIDE 8**

The Appin WCMG power station was designed to feed VAM through the air inlet of the reciprocating engines providing supplementary fuel for generation. Providing +/- 10% of fuel this offers efficient VAM abatement and utilisation.

The project operated for several years but the commercial environment at the time meant that the benefit of the additional fuel did not offset the cost of additional filter maintenance.

The VAM reticulation infrastructure remains in place at Appin except for the original capture hood. This can be inspected by those who are participating in the field trip on Thursday.

EDL has been involved with the WestVAMP project since commissioning. EDL has the O&M contract for this operation and it is appropriate that I leave it to our next speaker to speak on this and of course there is a field visit to the site on Thursday.

## SLIDE 9

•Over the last 2 years EDL has been evaluating the various technologies that could be applied to VAM abatement and methane abatement generally. We have focussed on those that are proven and could be used now or show potential to get to this point within 3-5years. We are not an R&D group we are an applier of technology.

•In summary our conclusions are:-

•VAM carbon tax liability can be substantially reduced using currently available and well proven Regenerative Thermal Oxidiser (RTO) technology that offer low cost abatement solution. Utilisation of process heat is a secondary issue.

•Full scale RTO systems will be able to meet industry's expectations for safe and efficient operations

•Alternative technologies are either partial solution only; unproven or less competitive

- VAM to reciprocating engine air inlet is an efficient abatement and utilisation option; not a full scale solution (relative volumes VAM to WCMG); requires adjacency
- Catalytic oxidisers more complex; vulnerable to poison; higher cost but operate at lower temperature
- Lean Burn Turbines – small scale, impractical numbers required for large flow abatement; require a source of and sub optimal use of rich gas; not fully commercialised and very high unit cost. With efficiencies of around 20% the LGT's are a suboptimal use of WCMG or rich gas. The scale of LGT projects to date are too small and for them to become a viable alternative they will need to be scaled up to meet the typical flows and to reduce their current high capital cost / MW capacity.
- Large Scale industrial turbines – EDL proposed research project to test VAM as intake air. Advantages are better match for full scale VAM; competitive scale power generation in mining area. Disadvantages are need for filtration and large source of rich gas.

## SLIDE 10

Having come to the view that RTO technology offered a technologically proven and commercial VAM abatement option, EDL reviewed the population of RTO technology suppliers.

EDL considers RTO technology a well proven, robust technology that has already been shown to be suitable for VAM abatement. We are not looking to develop our own technology.

We were looking for a party that could not only offer the technology but also the capability to adapt its technology to the challenges of full scale VAM abatement in Australia, very large flows; stringent safety expectations and high construction and operating cost environment.

The Durr Group meets these criteria being a long established supplier of RTO technology to numerous industry sectors where it has provided safe; reliable and effective abatement solutions in harsh and volatile operating environments.

Jim will be introducing you to the VAM Durr technology after me so I will leave it to him to describe the technology, Durr the company and its activities in more detail.

Our assessment is that the EcoVAM offers a well designed technology with low power consumption and flexible utilisation options supported by a well resourced diverse global company with a significant presence the region.

## SLIDE 11

Safety matters had to be addressed when flaring of WCMG was first introduced.

The introduction of Reciprocating Engines for WCMG utilisation also raised safety concerns.

Both activities were treated with considerable caution when introduced but are now accepted as normal part of mine infrastructure services.

Rightly the industry is approaching the introduction of VAM abatement technology with similar caution.

EDL can bring to the table its experience in WCMG, LFG and LNG. Durr can bring its offshore VAM experience together with its depth of knowledge gained through RTO installations in other potentially hazardous industrial applications.

To date both EDL and Durr have followed ACALET's VAM safety study and await the opportunity to provide feedback on its recommendations.

While RTO technology is well proven & mature, the challenges of its application to full scale VAM abatement are still to be met particularly in the Australian context.

EDL and Durr bring an unparalleled depth of design and operational experience to apply the RTO technology safely, efficiently and reliably.

Integration with WCMG utilisation will increase the efficiency of the process of minimising emissions liability and maximising use of the substantial energy contained in WCMG AND VAM.

## SLIDE 12

Typical flow rates from Australian ventilation shafts are >300m<sup>3</sup>/sec at concentrations between 0.5 and 1%.

Notwithstanding last weeks change to the floor price, current carbon liabilities for VAM emissions are \$15-40M per annum. Under Treasury's forecasts this is only just the beginning.

EDL is not and is not intending to be a carbon speculator. We are a service provider that is prepared to offer a BOO service to the coal mine for non core activities. Prepared to put up capital; and accept technical and operating risk.

While the near term direction and form of the cost of carbon is uncertain this is just another step in the communities expectations on industrial emissions. Whether it be considered the issue of CO<sub>2</sub>e, odour, or a wasted energy source the industry's social licence to operate is trending upwards.

VAM abatement and utilisation can moderate this trend.

## SLIDE 13

The tax on VAM brings the potential for Focus, technology application and innovation that provides the opportunity to finally harness the inherent energy currently being vented by almost every UG coal mine.

Use of VAM in air intake for reciprocating engines is an efficient solution offering both abatement and utilisation at relatively high efficiency (>40%) and should be considered in conjunction with WCMG abatement but:-

- It is not a full solution relative volumes of respective gases are unmatched
- Requires WCMG facility adjacent to vent shaft

Using process heat from RTO for generation or other use is technically feasible

- Utilisation should be evaluated on incremental basis to abatement
- RTO process heat should be considered a free, zero emission energy source. Under carbon tax regime, no green credits are available but utilisation of this heat does offer zero CO<sub>2</sub>e emission electricity
- Steam turbine technology @ 20-25% less efficient in typical size range
- Variable VAM concentration will have impact on reliable performance – could not solely rely on output for mining
- Enriching VAM with WCMG or pipeline gas can address this but is sub optimal solution for rich gas

Use of ORC, absorption chillers etc. are all potential alternatives to be considered if there is a use. Much will depend on mine location and cost and reliability of imported electricity and the extent network charges can be avoided through generation from VAM

The availability of funding for the CMATSP and Clean Energy Finance Corporation, together with the transition arrangements provides support for the introduction of new technology applications and innovation that could see an opportunity from VAM rather than adversity.

EDL and Durr can provide the focus to apply and adapt technology to achieve this.