Outburst Threshold Limits
Current Research Outcomes

PhD Research Project
- Factors affecting the drainage of gas from coal and methods to improve drainage effectiveness
  - Specific emphasis on improving gas drainage from CO2 rich and generally difficult drainage zones present in the Bulli seam
  - Detailed analysis of gas testing data (fast desorption method) identified strong relationships among test results
  - Non-Bulli seam mines were approached and provided data to expand the analysis

Bulli seam Threshold Limit (Lama, 1995)
- Level 1 threshold: 6.4 m3/t (CO2) & 9.4 m3/t (CH4)
  - In close proximity to geological structures
  - Development rate up to 50 m/day
  - If development rate limited to 10-12 m/day the Level 1 TLV could be safely increased by 20%
- Level 2 threshold: 10.0 m3/t (CO2) & 12.0 m3/t (CH4)
  - When no geological structures are present within 5.0m of the excavation during roadway development
  - Safety factor of 19% - considered higher than gas content measurement error (Lama)

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  - Peabody Energy
  - Xstrata Coal
- Supply of gas data
  - GeoGAS

Outburst Risk
- Gas content – considered the major outburst risk factor
  - Gas content, Saturation, Permeability, Coal Strength
- Gas content reduction – principal risk reduction action

Bulli seam Threshold Limits (DMR s.63)
Outburst Threshold Limits – non-Bulli seam

- Description Rate Index (DRI) proposed by Williams and Weissman (1995)
  - DRI – related to gas volume liberated from a 200 gram coal sample after crushing for 30 seconds
  - Dataset presented (Gas Content V DRI) – notable difference between CO2 and CH4
- Bulli seam TLV (CH4) of 9.0 m3/t corresponds to DRI of 900
- Bulli seam TLV (CO2) of 6.0 m3/t corresponds to DRI of 900
- DRI900 methodology accepted by Industry for determining OB TLV for non-Bulli seam mines

Outburst Threshold Limits – Recent Changes

- Two Bulli seam mines have increased outburst TLV
  - New TLV in place for about 5 years
  - No outburst incidents (where gas content reduced below TLVs)
- Effective outburst management plans
- TLV (normal mining) – effectively unchanged
- Additional TLVs added – subject to additional controls
  - Not greater than the Level 2 TLV proposed by Lama (1995)

Outburst Threshold Limits

1995-2000
- TLV very effective in managing outburst risk
- No fatalities since introduction of TLV
- Prevailing mine conditions enabled relatively easy compliance – TLV generally accepted

2005-2010
- Mines are encountering more difficult conditions
  - Additional drilling
  - Production delays
  - Loss of reserves
- TLV now being questioned - considered conservative
- Reviews underway to support raising TLVs

- Are the 1995 s.63 TLV’s really too conservative?

Significant Questions

1. Given recent increases to Bulli seam TLV should the DRI methodology be reviewed?
2. Does DRI900 continue to be an appropriate basis for determining TLV for non-Bulli seam mines?
3. Has the relationship between Gas Content and DRI, for CH4 and CO2 changed (from 1995)?
4. Is the relationship between Gas Content and DRI, for CH4 and CO2 representative of all Bulli seam conditions?

Impact of increased Bulli seam TLVs

- Assume relationship between Gas Content and DRI, for CH4 and CO2, remains valid
- Bulli seam CH4 TLV (12.0 m3/t) corresponds to DRI of 1200
- Bulli seam CO2 TLV (8.0 m3/t) corresponds to DRI of 1200
- DRI1200 replaces DRI900 as the Index value for use in determining TLVs for non-Bulli seam mines

Relationship between Gas Content and DRI

- Does the Gas Content V DRI relationship (CO2 & CH4) remain valid for current Bulli seams conditions
- Extensive analysis of core sample gas content test results
- Representative dataset compiled
  - 8 Australian undergrounds mines
  - 4,785 samples

- Gas composition >90% CH4 – 575 samples
- Gas composition >90% CO2 – 2,903 samples
Conclusions

- Extensive data analysis – 8 mines & thousands of samples
- Analysis indicates DR900 is no longer a valid index value for determining TLV for non-Bulli seam mines
- Strong relationship between QM and DRI
  - Independent of coal properties, including gas composition
  - QM = 0.008 x DRI applies to 6 mines analysed
  - Separate DRI values for CH4 and CO2 TLV
- TLV applicable to the Bulli seam is directly transferrable to non-Bulli seam mines
- Areas requiring further research
  - Expand QM-DRI database – additional Australian underground mines
  - Analyse mining experience in areas of high gas content (close to and above current TLV)