The Energy Connection

- Need for energy – replacement & expansion of supply
- Mining Institute track record covers energy production from subsistence economy to today
- Experience is held within the Membership
- Common features of major forms of energy production – coal, oil & gas, nuclear
- Connection with the Industry – UK & Overseas
- Alternative energy resources – Institute expertise?
- Metal & minerals connection – to support cleaner/greener energy
Time Out For Safety (TOFS)

- All energy industries invest in energy to produce energy
- Coal extraction
  - Human energy
  - Energy for light (initially independent illumination)
  - Electrical energy – light, ventilation, power, pumping
  - Mechanical/Hydraulic energy – roof support, motive power, coal production
- Oil & Gas production
  - Human energy
  - Electrical energy – light, power, pumping
  - Mechanical/Hydraulic energy – machinery & equipment
- Nuclear Power
  - Human energy
  - Electrical energy – reactor power control & instrumentation
  - Mechanical/Hydraulic energy – machinery & equipment
All energy industries need to control energy output

Coal extraction
- Overburden pressure
- Prevent gas ignition
- Prevent coal ignition

Oil & Gas production
- Pressure of the well fluids
- Prevent loss of integrity
- Prevent ignition of well fluids

Nuclear Power
- Pressure generated by reactor system
- Prevent loss of control of nuclear reaction
- Prevent harmful exposure to nuclear reaction
All energy industries need to:

- Manage the energy inputs
- Manage the energy outputs
- Require work in an area of increased hazard
- People become accustomed to working in an area of increased hazard

All energy industries require:
Management System
Safety Management System
Energy

- Innovation is required in order to progress
- Innovation can disturb the systems until is embedded
Time Out For Safety (TOFS)

- No item on the list is a priority – it is a balance:

  Management System - Safety Management System - Energy

  In order to progress:
  Management - Safety Management - Energy - Innovation
  System           System
Access to Production Location
Allocation of Authority

Main Drift & Working Face Schematic

- Each area controlled by officials
- Officials appointed by the Mine Manager
- Workforce/Management move/work in areas under official's control
- Mine Manager's authority delegated to officials he appoints

Coal Face

Approx 400m

Working District

1/2 miles

UPCAST SHAFT

RETURN AIRWAY

DOWNCAST SHAFT

FRESH AIRWAY

MAIN DRIFT TO PRODUCTION AREA

(SEVERAL MILES)
Innovation - Coal

- Mining of coal from deeper seams - more difficult, more gas production
- Existing mining methods need innovation to allow further exploitation (Necessity)
- Development of the miners safety lamp concept
  - Sir Humphrey Davy (Chemist & Inventor)
  - Dr Clancy (Physician & Inventor)
  - George Stephenson (Civil & mechanical engineer)
  (The Team)
- Introduction of the safety lamp using gauze principal– Initial success
  (The Innovation)
- Increase in number of ignitions – upon loss of containment of flame & heat
  (The application)
- Further understanding of ignition is developed – gas & the more powerful coal dust explosion
  (Rate of learning increases)
- Further methods of lighting developed – introduction of electricity with mechanisation
- Technology adapts or becomes redundant – reliable gas detector, symbol of authority
- Understanding gained of ignition process – further safety barriers developed to reduce & suppress ignition hazard
Production Pioneering
Loss of control – energy output
Hazardous Environment - Pioneers
Innovation – Oil & Gas

- Production from deeper wells – higher pressure & rates
- Methods need to be developed to bring wild wells under control and understand the causes for further exploitation (Necessity)
- Development of wild well control techniques
  - Myron Kinley (well blasting background)
  - Red Adair (bomb disposal US Army)
  (The Team)
- Develop method of removing oxygen & fuel from combustion process – Initial success
  (The Innovation)
- Early years – success but high injury/loss rate amongst wild well fire fighters
  (The application)
- Further understanding of pressure and ignition control and suppression is developed
  (Rate of learning increases)
- Further methods are refined and developed
- Pioneers able to identify key people characteristics to work in this environment
Loss of all management
Mentoring & Focus of Effort

Red, Brian and Raymond setting up water flow.
Allocation of Authority

Oil and gas gathering system.

Piper Alpha production platform.
Innovation - Nuclear

- Discovery of energy source and early application
- No initial necessity for power application (No Necessity)

- Development of knowledge and potential applications for energy source
  - Madame Curie (Chemist & physicist) Ernest Rutherford (physicist)
  - Niels Bohr (physicist) Albert Einstein (physicist) Leo Szilard (physicist)
  - Enrico Fermi (physicist) Robert Oppenheimer (physicist) Edward Teller (chemist & physicist)

- Warfare and requirement to be first to create nuclear device (Necessity)

- Nuclear weapons developed using fission by Manhattan Project (The Team & The Innovation & The application)

- Further understanding is developed – fusion bomb (Rate of learning increases) (The Team)

- Peaceful development for power generation lead by Enrico Fermi (The Team & The Innovation & The application)

- Technology adapts or becomes redundant – some reactor types no longer utilised, Pressurised Water Reactor dominant (Fermi)

- Understanding gained of ignition process – further safety barriers developed to reduce & suppress ignition hazard

- Reactor waste material (high, medium & low level) disposal issues remains
Mining Institute Connections

- COAL – Connected
- METALS/MINERALS – Connected
- Oil & GAS – Connected to P&DE
  Need to make connection with SPE & IoE
- NUCLEAR – Initial connection
Caged Roostabout
Intrinsic competence
2.2. Check the atmosphere in the pile is safe enough

After the air in the pile is replaced, a chicken will be used to check the air inside is safe or not. See the following drawing:

![Diagram showing the process of checking air in a pile]

**Drawing 2**

CHECK AIR IN THE PILE IS SAFE OR NOT
Energy Utilisation

- **PRESENT** – Power Generation
  - Dominated by Coal, Gas & Nuclear
  - Mobility
    - Internal combustion dominated by oil

- **FUTURE** – Power Generation
  - Coal, Gas & Nuclear - reduce and control waste products
  - Alternatives Energies - input to grid market driven
  - Mobility
    - Desire to replace internal combustion where possible
    - Battery technology
Wind turbines

- Visual impact
- Rotating machinery
  - long term exposure
  - Cyclical loading
Wind Turbines

- Rotating Machinery – Long term exposure/cyclical loading
Coal Bed Methane Development

Rapid Growth Driven by:

- Decline of mature basins
- Coal seams near markets
- Only Victoria gas fields similar proximity
- Gas suppliers diversifying source of supply
- Technical/commercial innovation evolves
- Steady increase of production and reduction of costs
Similar Drivers? Similar Results?
Car parts stolen for scrap

HIGHWAY ROBBERY

POLICE today warned motorists that they were the latest target for thieves looking to cash in on the high price of scrap metal.

A spate of thefts of catalytic converters has been reported in the Newark area.

Materials whose vehicles are fitted with them are being urged to mark them with their details and postcode.

The information will help trace them if they are stolen.

One Newark scrapyard accepted 10 catalytic converters in a month, having no reason to believe they were stolen.

By DAN CHURCHER

The catalytic converters are worth £90 each as scrap.

The converters are valuable for the small pieces of platinum, palladium and rhodium they contain.

The metals are used, along with charcoal, to purify air from car exhausts and reduce the emission.

NATIONWIDE

Chief Inspector Chris Harmer of Nottinghamshire Police said:

"International prices of these metals have risen dramatically over the past two years and metal theft has now become a nationwide problem.

"In Nottinghamshire I would say metal theft is currently our fastest-growing crime trend.

"Thefts of catalytic converters is a relatively new trend and we want to do all we can to prevent it. By offering people advice and practical guidance.

"In one instance a car in a compound by the A1 at Holton-le-Clay, Band, was turned on its side by thieves so they could remove the exhaust.

A minibus belonging to Newark's Magistrate School had its catalytic converter stolen while it was parked at the school's East Avenue site.

Another was stolen from a car in the Potashmoor carpark, Newark, and another was taken from a car in the carpark at Bingham Court shopping centre, Balderton.

Others have been taken from garages at the Waitrose carpark in Newark, where thieves have crawled under customers' cars and snipped off the exhaust.

The Newark Police chief inspector Martin Holford, said thieves were using special battery-powered clamping devices with a cutting blade that could shear an exhaust in a matter of seconds.

WRONG (Necessity)

Seeing someone beneath a car is that it is their car and there is something wrong with it," said Inspector Holford.

"With what is happening at the moment I would advise people to take steps to protect their vehicles now."