10 years of coal related research funded through the RFCS programme

Alan Haigh,
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DG Research and Innovation
Residual funds from the ECSC treaty (European Coal and Steel Community) allocated to DG ECFIN and RFCS in the treaty of Nice in 2002

- \( \approx 55 \text{ M€ per year (72\% steel, 28\% coal)} \)
- \( \approx 50 \text{ grant agreements per year} \)
- 350 running contracts, (50 in 50 out)
- Supporting the competitiveness of European sectors
- Research, pilot and demonstration projects
Total RFCS funding allocation for COAL projects from 2003 to 2012: 148 M€

<table>
<thead>
<tr>
<th>Activity</th>
<th>Percentage</th>
<th>Funding (M€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOURCING</td>
<td>40%</td>
<td>59</td>
</tr>
<tr>
<td>CONVERSION</td>
<td>18%</td>
<td>26</td>
</tr>
<tr>
<td>COMBUSTION</td>
<td>42%</td>
<td>63</td>
</tr>
</tbody>
</table>
Coal Extraction (mining)

- **Improved mining technology**
- **Automation/Communication and sensors**
- **Improved modelling of geology and rockburst**
- **Better working conditions, emergency modelling, safety**
- **Geological storage of CO2**
- **Land recovery and post mine usage**
Coal Conversion

- **Efficiency on coke-making process (exploring alternatives)**
- **Coke-battery optimisation and life extension**
- **Gasification technology (SYNGAS)**
- **Coal to Liquid/Chemical**
- **Underground Coal Gassification**
Coal Combustion/Utilisation

- **Efficiency in boiler technology (high temperature operations)**
- **CO2 lean technologies**
- **CO2 capture retrofitting options**
- **Chemical Looping for CO2 capture**
- **Coal/biomass optimisation**
The RFCS Programme

After 10 years of research, has it been worthwhile?

What are the main benefits of the programme?
Monitoring and Assessment

RFCS Legal basis (2008/376/EC)

Article 38

- Monitoring exercise of the programme
  Report was published in 2013

- Assessment of benefits from projects closed between 2002 and 2010
Today, the RFCS Monitoring and Assessment report is published and available from:

EU Bookshop, or

RFCS web site
Experts Committee ExCo appointed by the:
• European Commission, Directorate General for Research and Innovation, Research Fund for Coal and Steel RFCS
• Nominated by the Coal and Steel Advisory Groups
Assessment Screening of All Projects - Selecting Process

198 projects closed between 2003 and 2010. All projects were assessed.

78 projects identified by Technical Groups as promising for benefit evaluation.

46 projects selected for in-depth assessment.

23 projects assessed in detail.

Global screening by TG experts with short questionnaire (2011)

Projects described and analysed by TG Rapporteurs (2011)

In-depth Assessment by TG Rapporteurs

- interview coordinators
- long questionnaire (2012)
In-depth assessment of the selected projects - Financial Returns

Financial Returns estimated at the project level for the beneficiaries
- productivity improvement
- cost reduction - resource savings (energy, materials, workforce)
- new market share

Quantified proven benefit evaluated by beneficiaries

Conservative assumptions concerning possible dissemination in EU

POTENTIAL benefit for the EU Coal and Steel Sectors
Examples of financial returns (Coal sector)

**Coal Mining (NEMAEQ)**
- **New mechanisation and automation of longwall mining equipment**
  - Productivity increase with a fully automated shearer loader system
    - 1.5 M€/y/longwall; potential 45 M€/y (EU)
  - Cost reduction: decrease of labour cost, increase of running time
    - 0.1 M€/y/longwall; potential 3 M€/y (EU)

**Coal Conversion (IMPECABL)**
- **Improving coke battery life through integrated monitoring**
  - Capital cost net reduction of 10% at the beneficiary. This is a contribution to the total production cost.
  - Based on the European coke production and assuming only 5% reduction for the sector
    - potential 0.75€/t or 32.25 M€/y

This exercise can be repeated for each of the 23 projects
Benefits from the 23 selected projects

Quantified benefits at the level of the **beneficiary**
From **31M€** of RFCS co-funding → **103M€ per year** real benefits
Each **1 €** of RFCS co-funding → **3.3 € per year**

Based on reasonable assumptions by independent experts, the potential benefits from the 23 projects → **684M€ per year**

**Estimated** benefits across the **sector**
**55 M€ per year of RFCS** co-funding → **684M€** potential benefits
Top 5 Benefits for the Coal and Steel Sectors and society
From the in-depth assessment of the selected RFCS projects

1. Development of new knowledge, training and education
2. Enhancement of European competitiveness, economical benefit
3. Environmental benefit, sustainability (use of coal & steel)
4. Development of new applications and new market share
5. Improvement of health, safety, working conditions
NEMAEQ 2006-2009 2.2 Mio€ -
A fully automated coal shearer and collection system for longwall mining

Coal/rock distinction; collision avoidance, less maintenance and downtime

Used a wide variety of sensors: Infra red; RADAR; impact sound sensors.

Wireless communication and when necessary fibre-optic links.

Networked sensors and dedicated software.

Cost reduction through: productivity increase; decrease of labour cost, increase of running time
OPTIMINE 2011 - 2014

Process Optimisation and increased efficiency through electronic ICT

2.3 Mio€

A demonstration project, which aims at integrating, installing and operating the newest ICT applications at an industrial-scale.

Active location tagging, Personnel tracking, access control, machine communication, conveyor monitoring etc.

Internet technology applied to optimise the efficiency and safety of mines.
Funding Coal Projects 2003 - 2013

Millions

| Country | AT | BE | BG | CZ | DE | DK | EE | ES | FI | FR | GR | IT | NL | PL | PT | RO | SE | SI | SK | UK |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
|         | 3,31 | 1,050 | 60 | 1,90 | 0,78 | 0,02 | 2,38 | 8,32 | 5,84 | 10,99 | 14,56 | 1,70 | 0,20 | 2,14 | 1,07 | 0,11 | 30,03 |
Success Stories


**CFB800 – An effective option for cleaner coal plants**
Cleaner, cheaper, more effective, secure and independent. Have you ever heard about "Circulating Fluidised Bed" (CFB) technology?

**OXYMOD – Cleaner power thanks to mathematics**
Mathematical modelling has in recent years proven to be a useful and cost-cutting tool for designing and modernising coal-fired power plants. The OxyMod project – supported by the European Union (EU) Research Fund for Coal and Steel (RFCS) – has striven to extend existing combustion modelling capabilities to oxy-fuel combustion conditions. This should lead to pre-engineering of large demonstration power plants in Europe using modern and clean oxy-fuel CO2 capture technology in the near future.

**LIGPOWER – Cost-saving cleaning in power plants**
Lignite is a soft brown fuel with the characteristics of coal and turf combined. It also plays an important role as a competitive energy source in the power generation of many European countries. However, the specific properties of lignite lead to relatively low softening and melting temperatures, resulting in deposits forming in the boiler during combustion. Machines known as sootblowers have traditionally been used to alleviate the situation but were not entirely effective. A new solution was urgently required.

**HUGE – How underground coal fires are spurring clean energy**
Coal is seen today as the ugly sister of power sources: it is old-fashioned, dirty, costly to mine, and the most easily accessible supplies are close to exhaustion. But a research project could change that by offering a mining prospect that is safe, based on abundant resources, and promises clean fossil fuel energy for generations. And it would do that by igniting a coal seam deep underground.
Project Synopses


- **Summaries of RFCS Projects : 2003–2012**
  
  Please note that in this Summaries you will find a direct link to the final reports published by the EU Publication Office on EU Bookshop (http://bookshop.europa.eu/)

Collection of about 550 projects (2003 – 2013), Completed projects have direct link to final report.