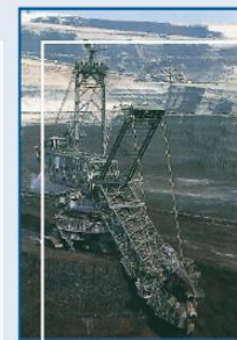
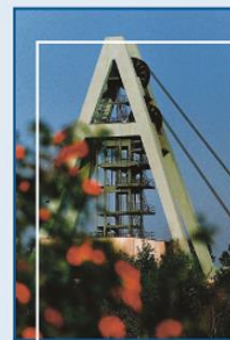


# EURACOAL

European Association  
for Coal and Lignite



## ***Changing the face of coal: an outline strategic research agenda for future coal-related RTD in the European Union***

An update report on CoalTech2051 “European Coal Research in light  
of EU Policy Objectives and future global trends in coal use”

Platform for Coal and Carbon-Intensive Regions in Transition  
Centre de conférences Albert Borschette  
Brussels

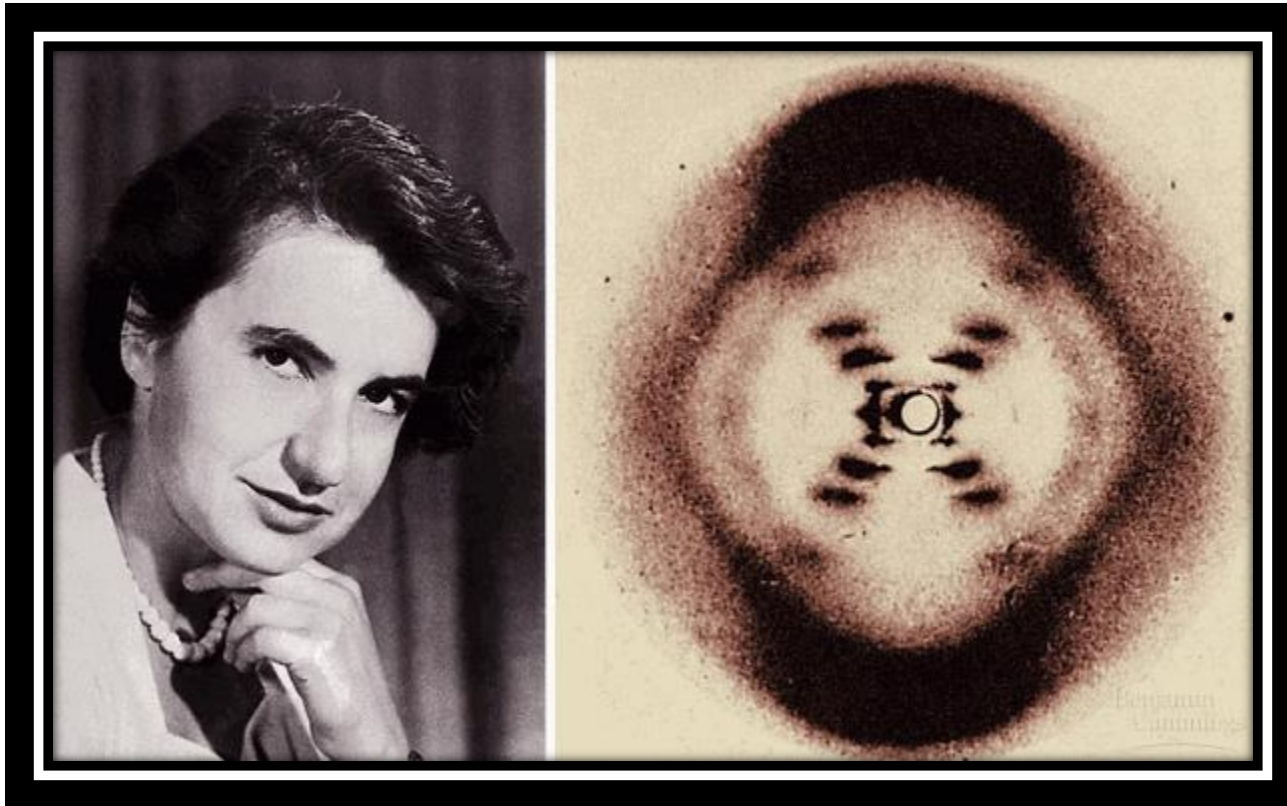
Brian Ricketts  
Secretary General  
9 April 2019

# EURACOAL: 26 members from 15 countries

- DEBRIV – Deutsche Braunkohlen-Industrie-Verein (DEU)
- GVSt – Gesamtverband Steinkohle (DEU)
- MMI – Mini Maritza Istok (BGR) - observer
- PGG – Polska Grupa Górnicza S.A. (POL)
- PPC – Public Power Corporation (GRC)
- PPWB – Confederation of Polish Lignite Producers (POL)
- ZSDNP – Czech Confederation of Coal and Oil Producers (CZE)
- CARBUNIÓN – Federation of Spanish Coal Producers (ESP)
- BAZ – Borsod-Abaúj-Zemplén County Government (HUN)
- GIPH – Górnicza Izba Przemysłowo-Handlowa (POL)
- PATROMIN – Asociația Patronală Minieră din Romania (ROU)
- VDKi – Verein der Kohlenimporteure (DEU)
- CPERI/CERTH – Chemical Process and Energy Resources Institute (GRC)
- DTEK (UKR)
- EPS – Electric Power Industry of Serbia (SRB)
- GIG – Central Mining Research Institute (POL)
- HBP – Hornonitrianske bane Prievidza (SVK)
- Lubelski Węgiel „Bogdanka” S.A. (POL)
- Premogovnik Velenje (SVN)
- RMU “Banovići” d.d. (BIH)
- TKI – Turkish Coal Enterprises (TUR)
- Finnish Coal Info (FIN)
- KOMAG Institute of Mining Technology (POL)
- Geocontrol S.A. (ESP)
- Subterra Ingeniería S.L. (ESP)
- DMT GmbH & Co. KG (DEU)

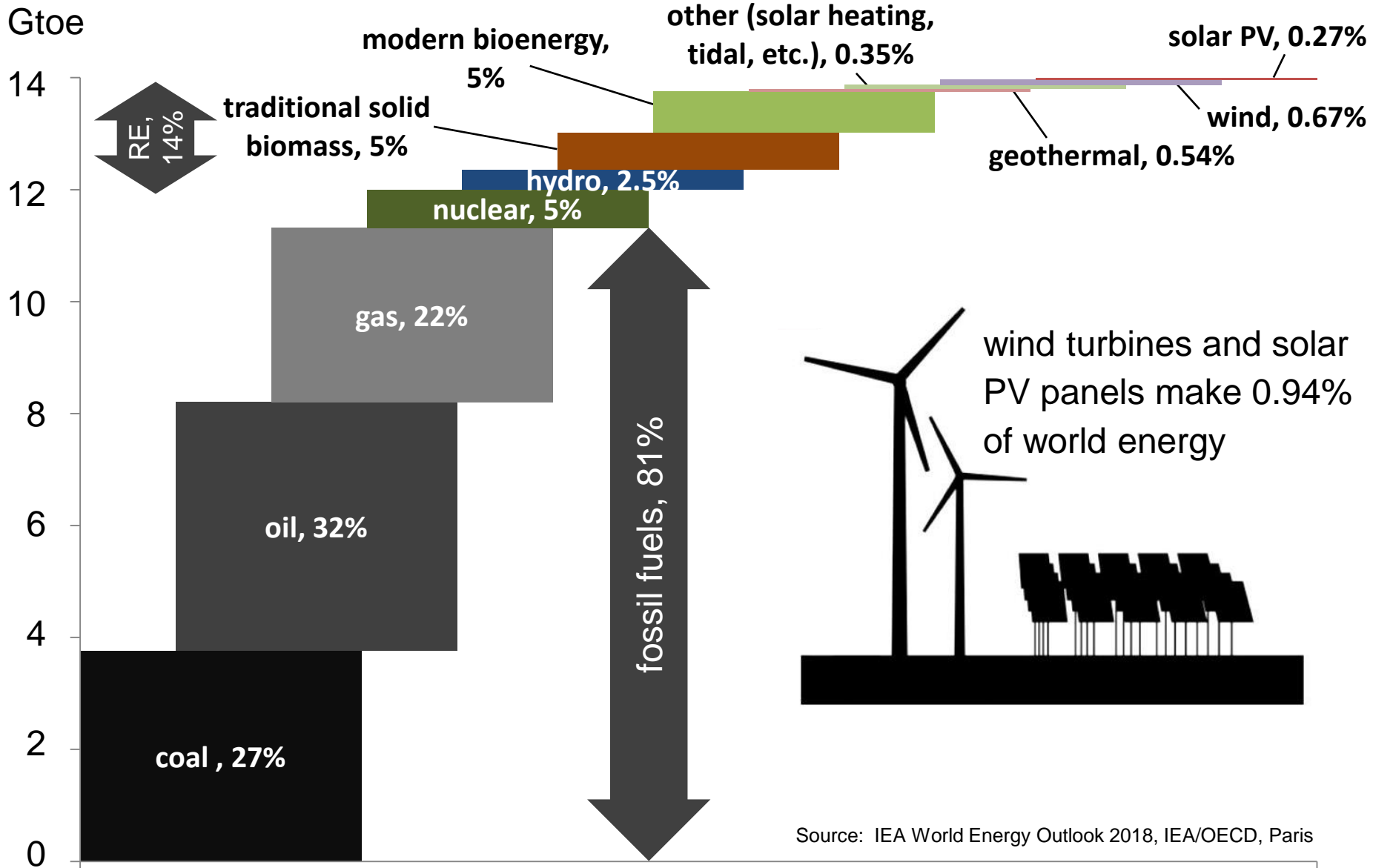


# From coal crystallography to unravelling the structure of DNA



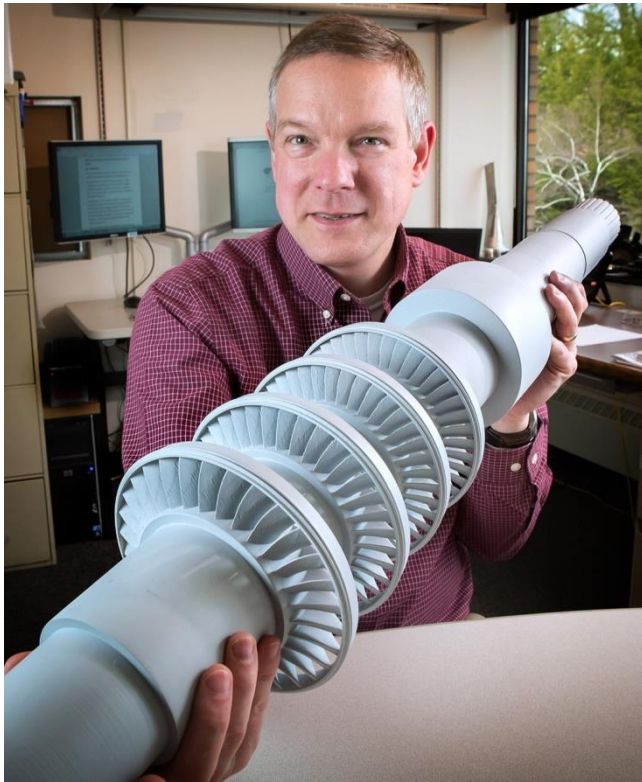
In 1941, Rosalind Franklin joined British Coal Utilisation Research Association

# Global energy mix, 2017



Source: IEA World Energy Outlook 2018, IEA/OECD, Paris

# Exciting R&D continues today with coal power



- Invented in Europe, the Allam cycle uses supercritical CO<sub>2</sub> to drive a single turbine.
  - Fuel is combusted in pure oxygen.
  - The turbine exhaust gas is cooled in a heat exchanger to condense water.
  - A small amount of CO<sub>2</sub> is removed to balance the CO<sub>2</sub> from fuel combustion – very easily used for CCUS.
  - The remaining CO<sub>2</sub> is compressed and reheated before re-entering the combustor.
  - The Allam cycle can potentially achieve efficiencies of around 51–52% (LHV) on gasified coal.
- 
- High power density, so lower capital costs for Allam cycle power plants.
  - A 25 MWe demonstration plant for electricity generation is being built in La Porte.
  - Construction started in March 2016 and the plant is now in commissioning and testing.

# Strategic research agenda for coal R&D

Coal  
Tech  
2051

## Key coal-related policy goals:

- Industry4Europe
- Climate Action
- Clean Air for Europe
- Clean Coal Technologies
- Hydrogen Economy
- Critical Raw Materials
- Smart Grids
- Circular Economy
- Health and Safety
- Post Mining
- International Co-operation



IEA  
CLEAN COAL CENTRE



**CERTH**  
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GŁÓWNY  
INSTYTUT  
GÓRNICTWA



Research Fund  
for Coal & Steel

Deliverables: strategic research agenda & network of clean coal technologists.

# The solution is a well-prepared transition with support for new technologies

## Coal Tech 2051

A two-pronged strategic research agenda for coal R&D:

- focus on research activities that support EU policy objectives;
- plus research activities that promote the necessary global response to the ongoing coal use outside of the EU.



The CoalTech2051 project has received funding from the Research Fund for Coal and Steel under grant agreement No. 794369.

# Coal research with an international outlook

## ■ Health and safety

Monitoring, assessment, prevention and mitigation of rock burst and gas outburst hazards in coal mines (MapROC)



The Lagisza Power Plant in Poland features a 460 MWe Amec Foster Wheeler supercritical, vertical-tube CFB boiler.



Physical modelling of stresses around a roadway in an underground coal mine

## ■ CCS: next steps towards global deployment

Coal combustion, clean and efficient coal technologies, CO<sub>2</sub> capture (FLEX FLORES)

With 46% (LHV) electrical efficiency, the 750 MW Lünen power plant in Germany is one of the most efficient coal-fired power plants in the world.



## ■ Clean coal technologies for lower emissions

Preparing for the commercial demonstration of coal power plants operating at 700°C (ENCIO, NIBALO725, DP700-PHASE 1)



# CCS is needed, works and will become cheaper

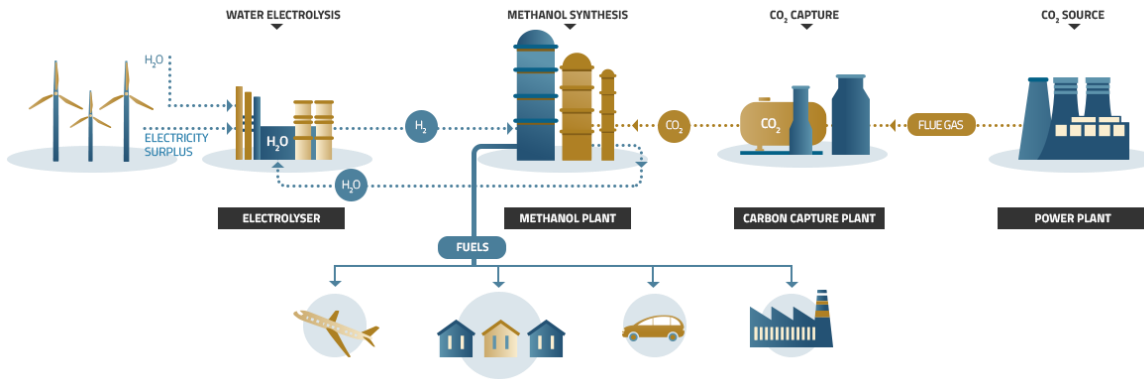


## 1<sup>ST</sup> INTEGRATED LARGE-SCALE POST-COMBUSTION CCS FACILITY

The CCS installation at Boundary Dam coal power plant in Canada has been in operation since 2014 and captures *circa* one million tons of CO<sub>2</sub> annually. CCS plants can capture up to 97% of the CO<sub>2</sub> in flue gases and second generation plants will be 67% less expensive (per ton of CO<sub>2</sub>).

# Coal R&D in support of EU policy objectives

## ■ Coal gasification and the circular economy



Oxygen plant at the Vresová IGCC power plant in the Czech Republic

## ■ Carbon capture, use and storage (CCUS)



Tomato greenhouse heated using geothermal heat and energy from waste mine water

- Energy storage to back up RES
- Geothermal energy and other renewable energy projects at mine sites



Innovative products from lignite produced in Turkey

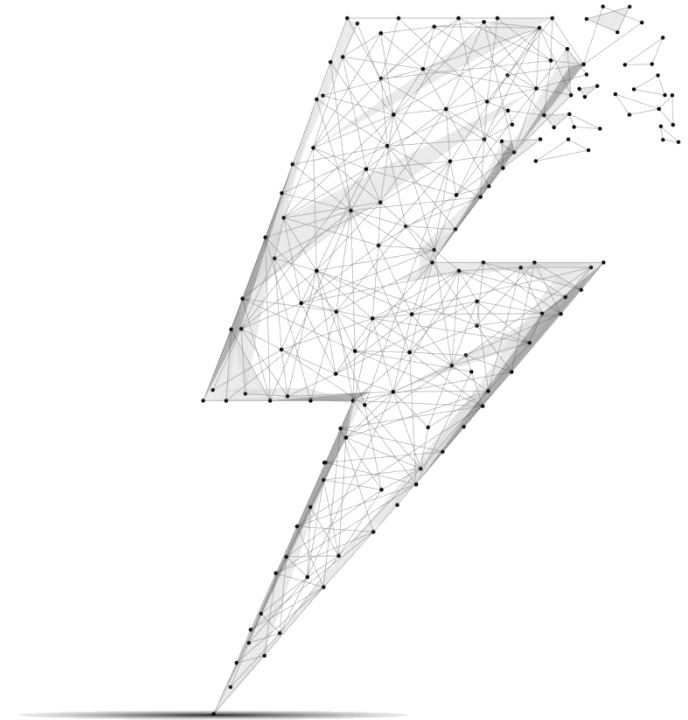
## ■ Integrated hydrogen production

## ■ Non-energy uses of coal and lignite

# Recommendations

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- The outline strategic research agenda shows that there are a number of key research topics to be pursued as part of a coherent response to the climate challenge within an international context.
- Stakeholders should unite behind a strategic support programme, managed by the Research Fund for Coal and Steel.
- Join the CoalTech2051 network at [www.coaltech2051.eu](http://www.coaltech2051.eu)



With this, policymakers would see coal heading in the right direction.

# CCT 2019 in Houston

- The 9<sup>th</sup> International Conference on Clean Coal Technologies will be in Houston, USA on 3-7 June 2019.
- A leading international event on the cleaner use of coal, covering high-efficiency plants, CCS, pollutant controls, co-firing, alternative uses of coal, and much more.
- Visits to two pioneering CCUS facilities: Petra Nova and NET Power.



Special session on CoalTech2051 included within the programme.

# EURACOAL

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## Thank you!

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