

# **Some like it hot - for others warm will do: the role of geothermal energy in decarbonising the UK's petroleum industry and UK's heating bill**

Insight Discussion 9<sup>th</sup> November 2021

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## Fuelling the UK

**1.5 billion boe = approx.  $2.5 \times 10^9$  MWh**

50% of energy use for heat generation

66% of heat generated by burning fossil fuels directly + 11% indirectly

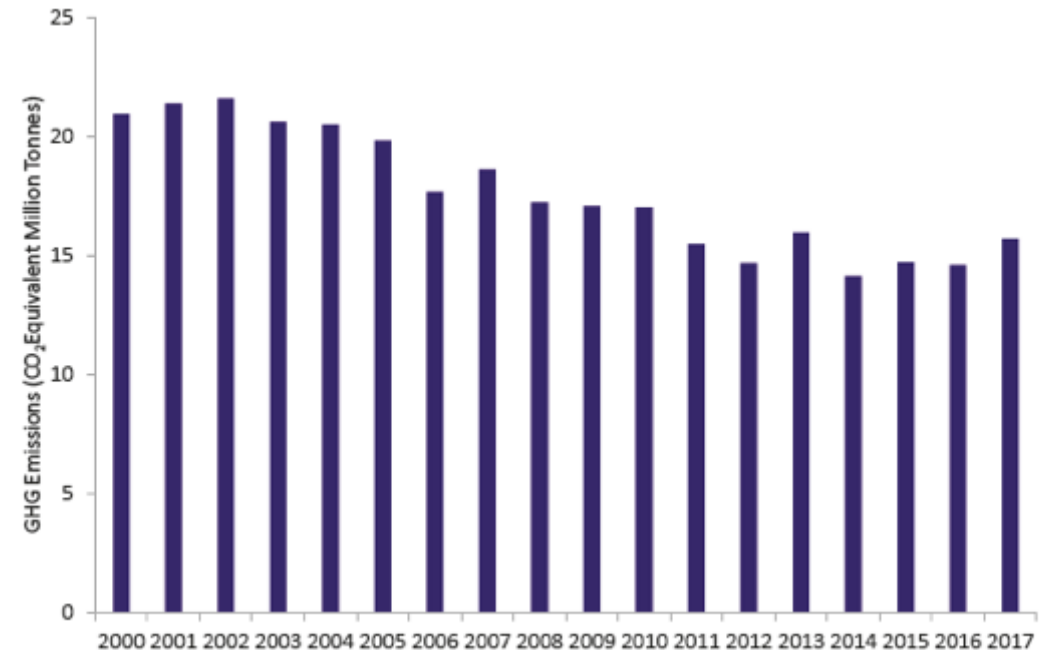
Emissions  $364 \times 10^6$  tonnes CO<sub>2</sub>eq

>30% of UK GHGs from heat generation

### UK upstream petroleum industry

$16 \times 10^6$  tonnes CO<sub>2</sub>eq

Approx 30% of total emissions from Scotland

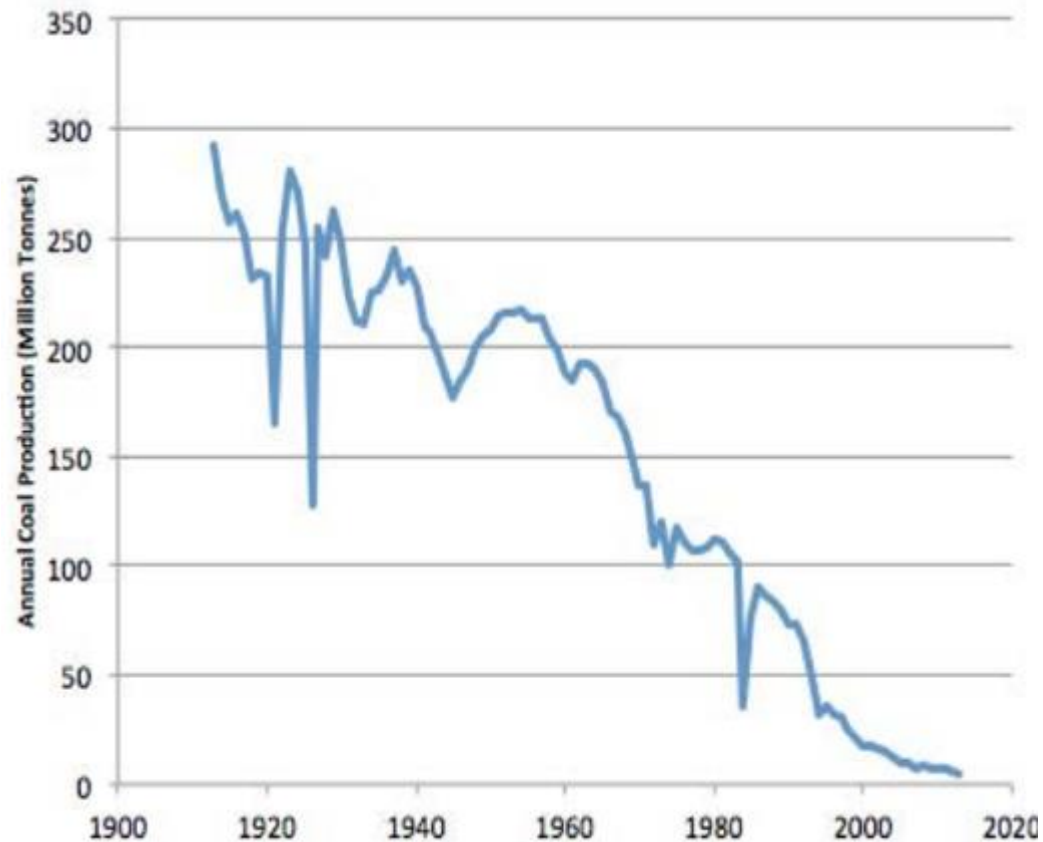


Source: EEMS October 2018

## Agenda – geothermal energy & beyond...

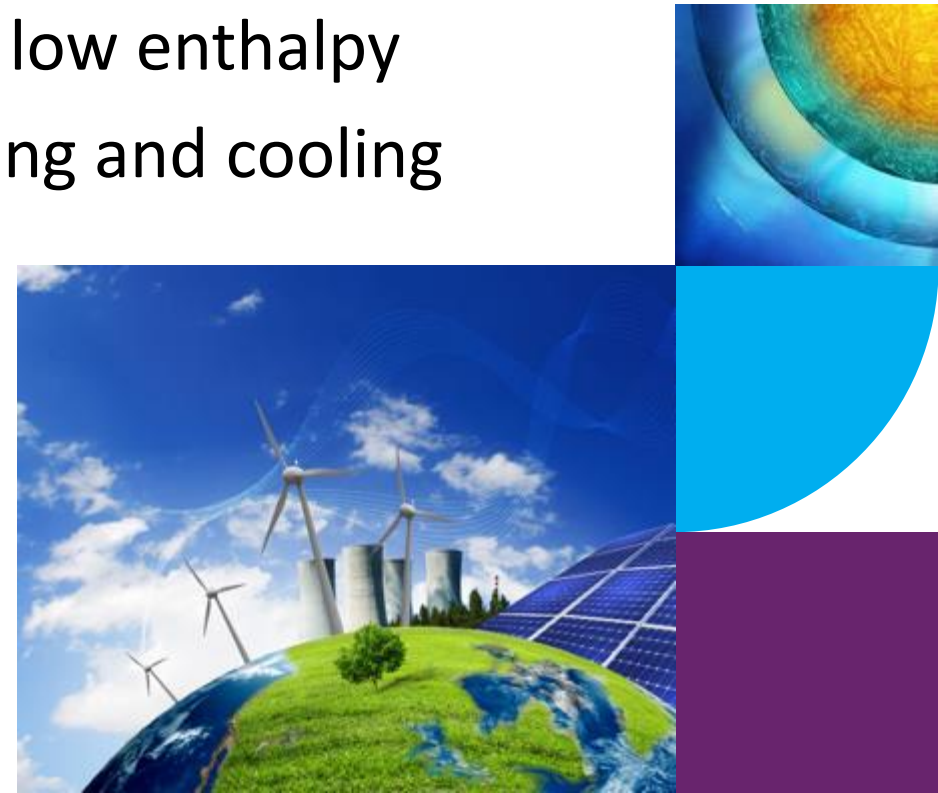
- Cool Running- mining for heat
- The Big Heat - onshore UK petroleum
- Some Like it Hot – giving oil a helping hand

## Cool Running - Abandoned Coal Mines



UK coal production 1900-2020

- 15bn tonnes coal mined
- 2bn m<sup>3</sup> water
- 38,500TJ of heat in place
- Ultra low enthalpy
- Heating and cooling



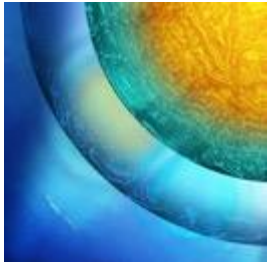
## Distribution of coal and people



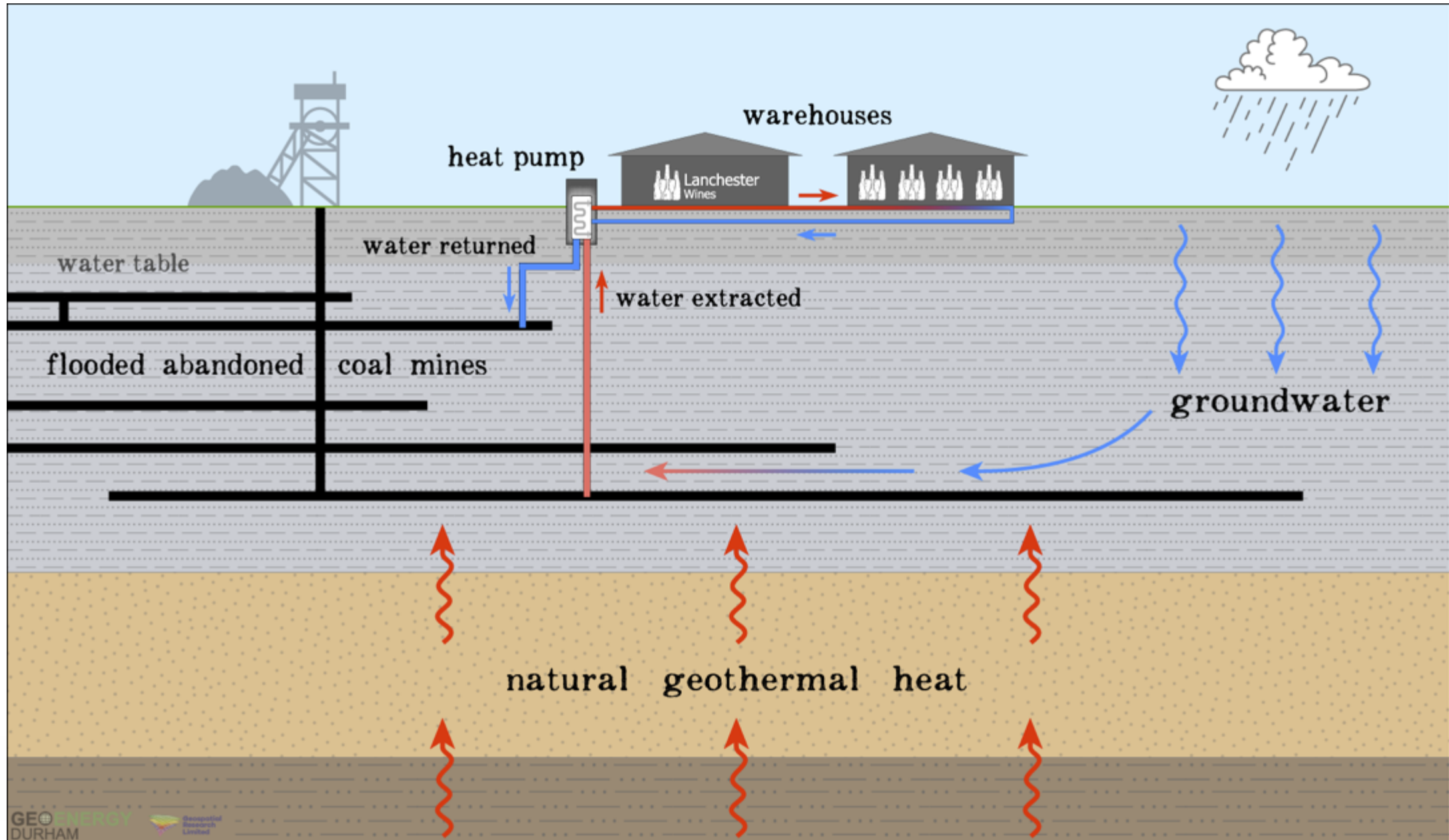
UK former coal mining areas



England heat demand



# Mine Energy – how it works





# Mine Energy – where it works



**Lanchester Energy**

Lanchester Wines, Gateshead



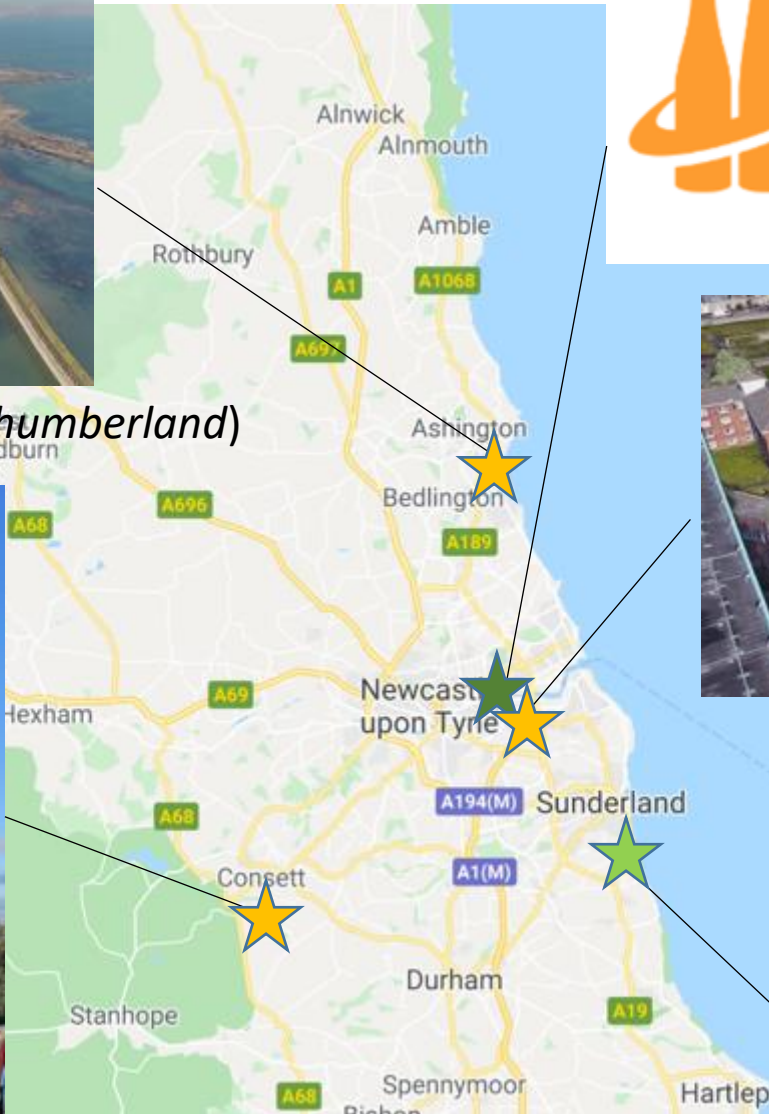
Energy Central, Blyth (*image Advance Northumberland*)



Hebburn, South Tyneside



Louise Centre, Stanley



Seaham Garden Village, Durham (*image Coal Authority*)



Operational



In development



Probable

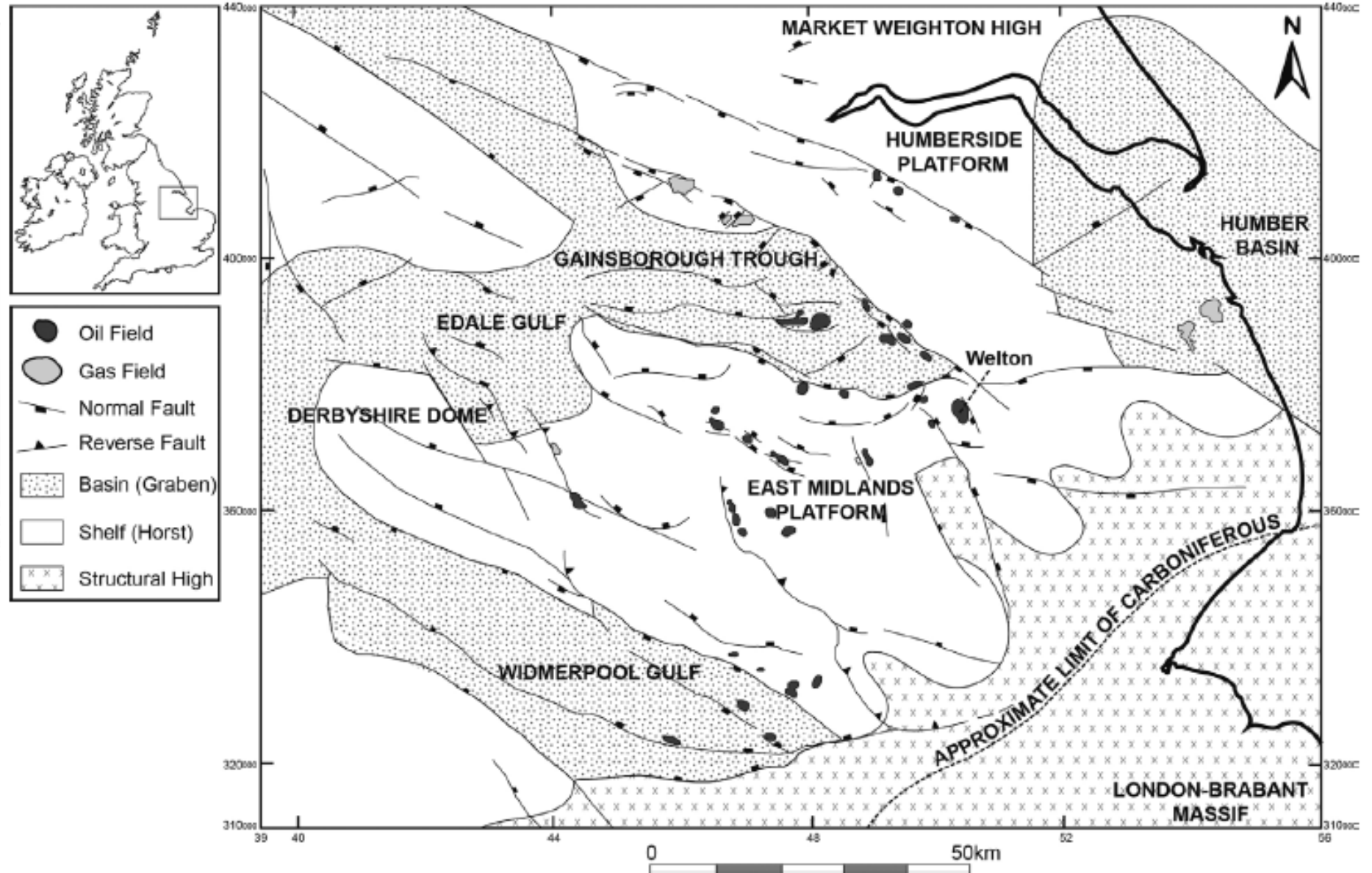




# The Big Heat - Ageing onshore oilfields – UK East Midlands



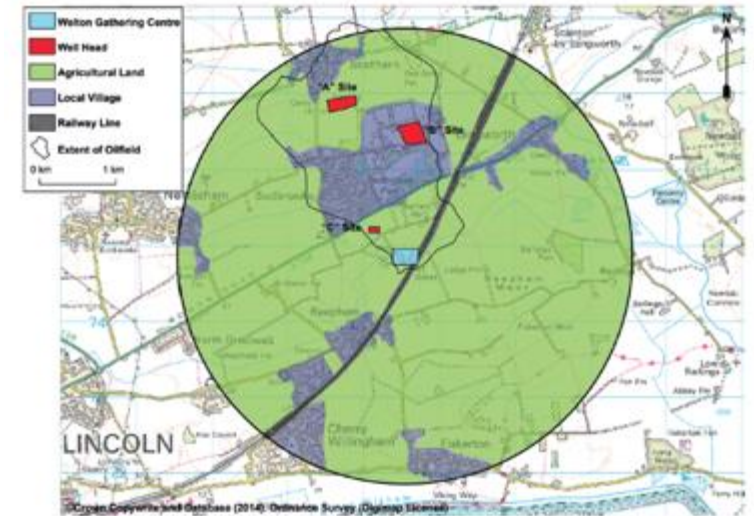
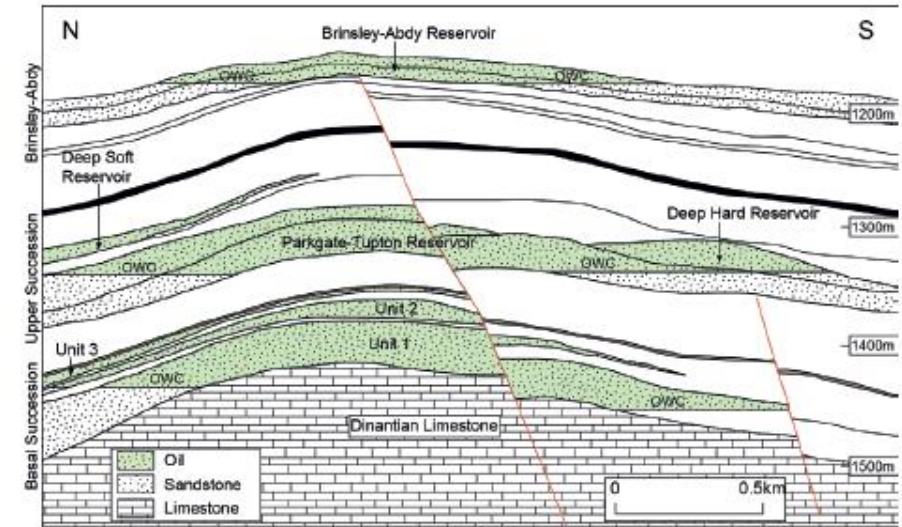
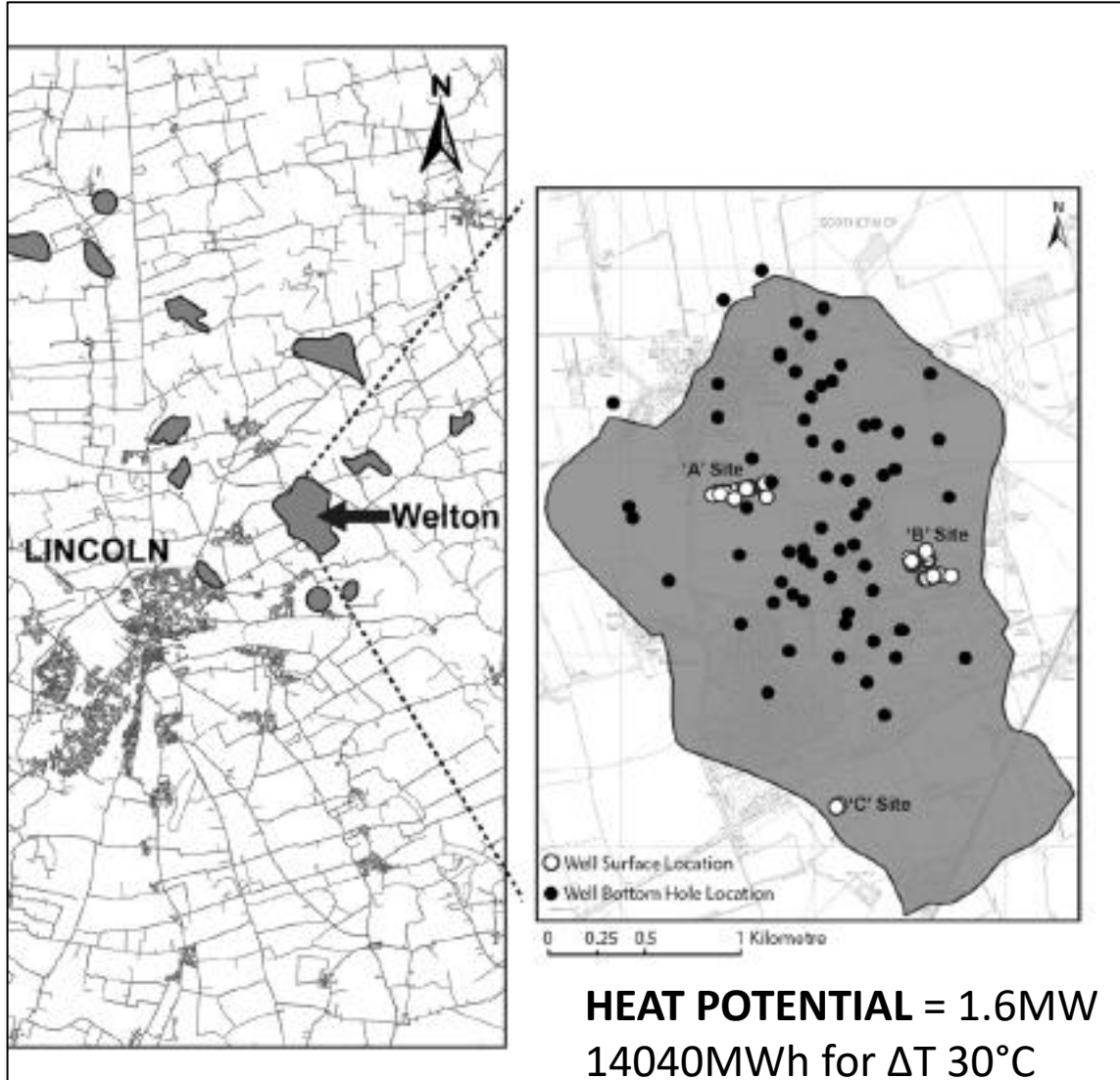
Hardstoft No1 1919  
From Craig et al 2014



From Hirst et al 2015

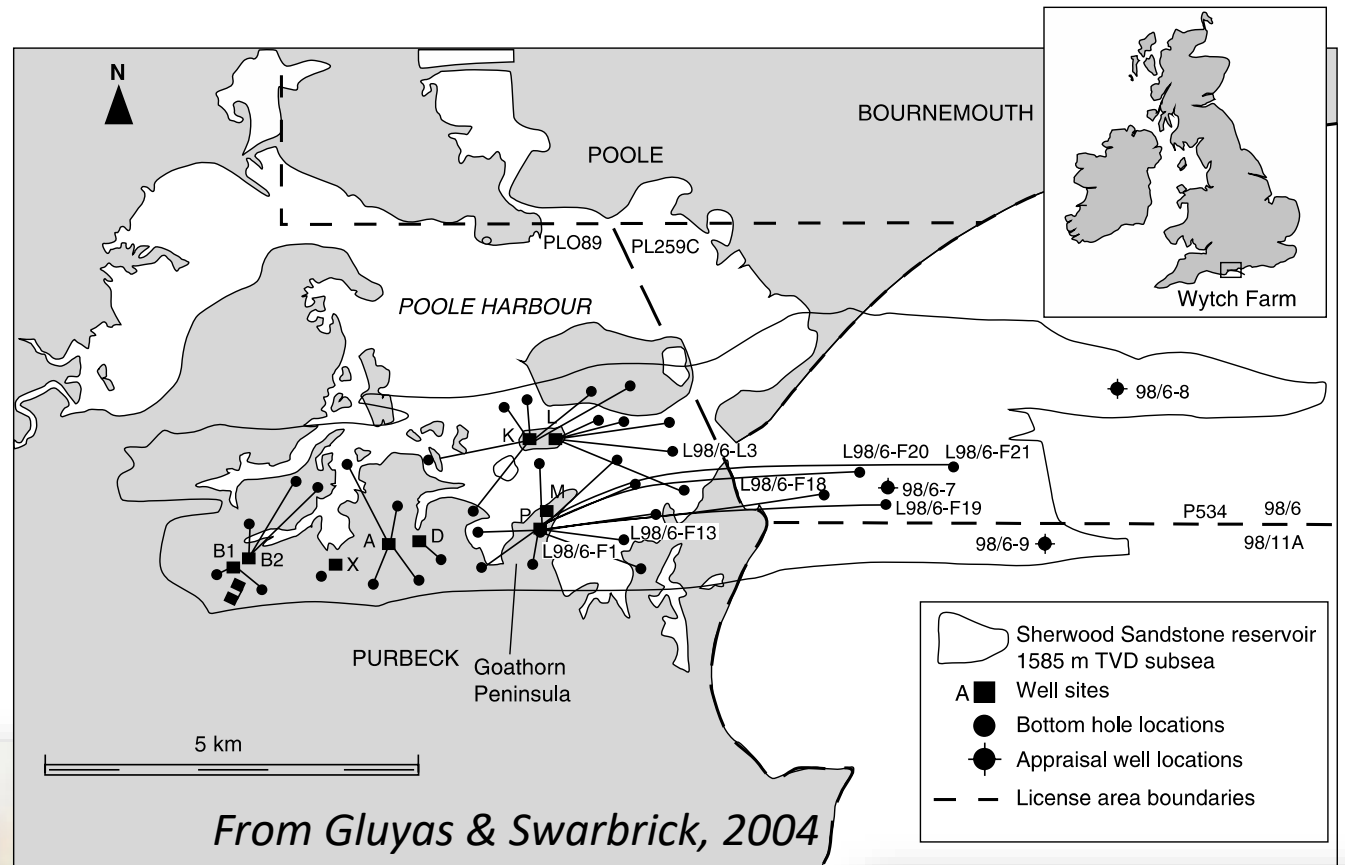


# The Welton Field



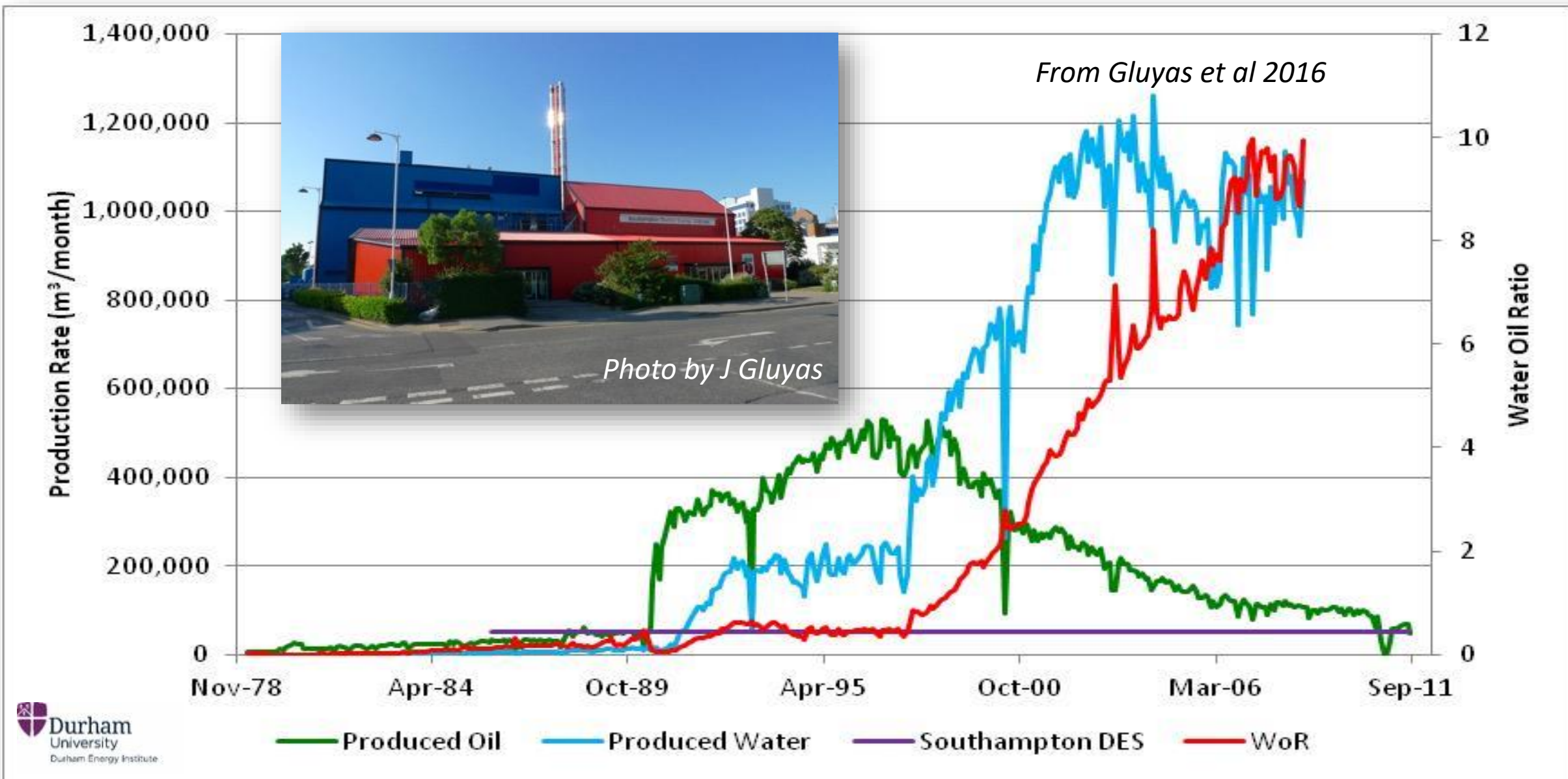
From Hirst et al, 2015

# Wytch Farm Dorset, Southern England



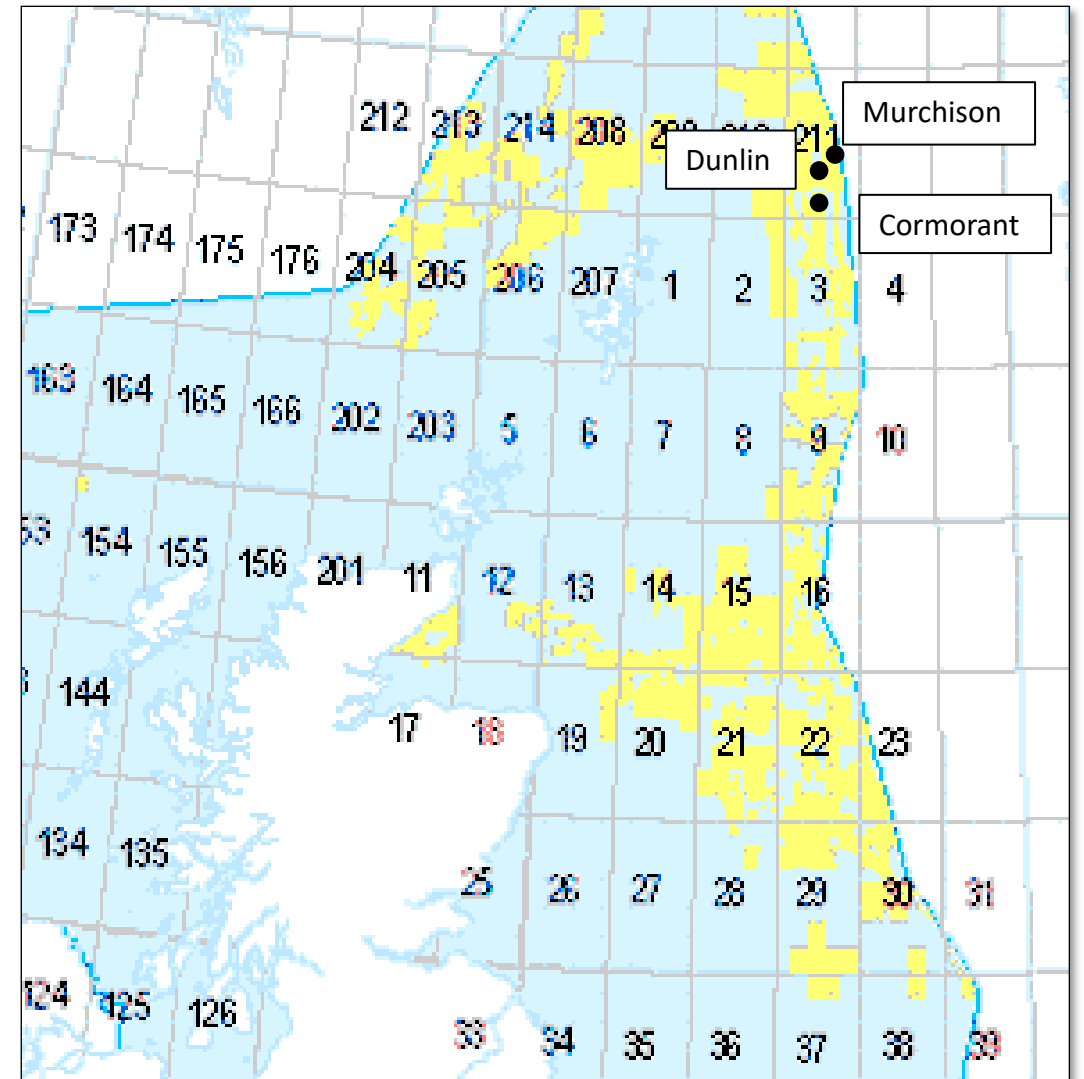


# Southampton District Energy Scheme, Southern England



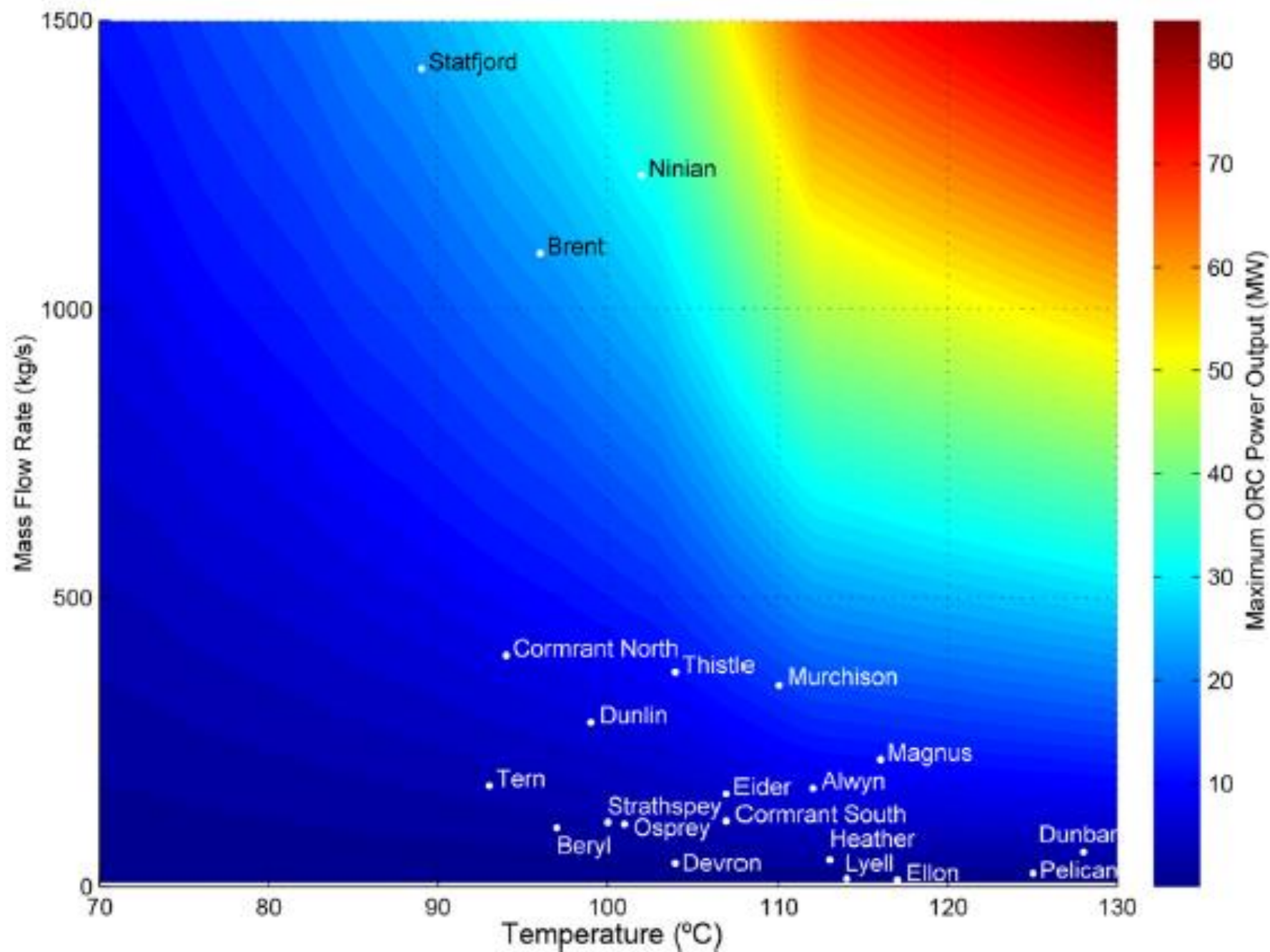
## Some Like it Hot – Heat to power, North Viking Graben

- Old fields
- Low & falling oil production
- High & falling water production
- WOR typically > 10
- Low gas production
- Power depleted



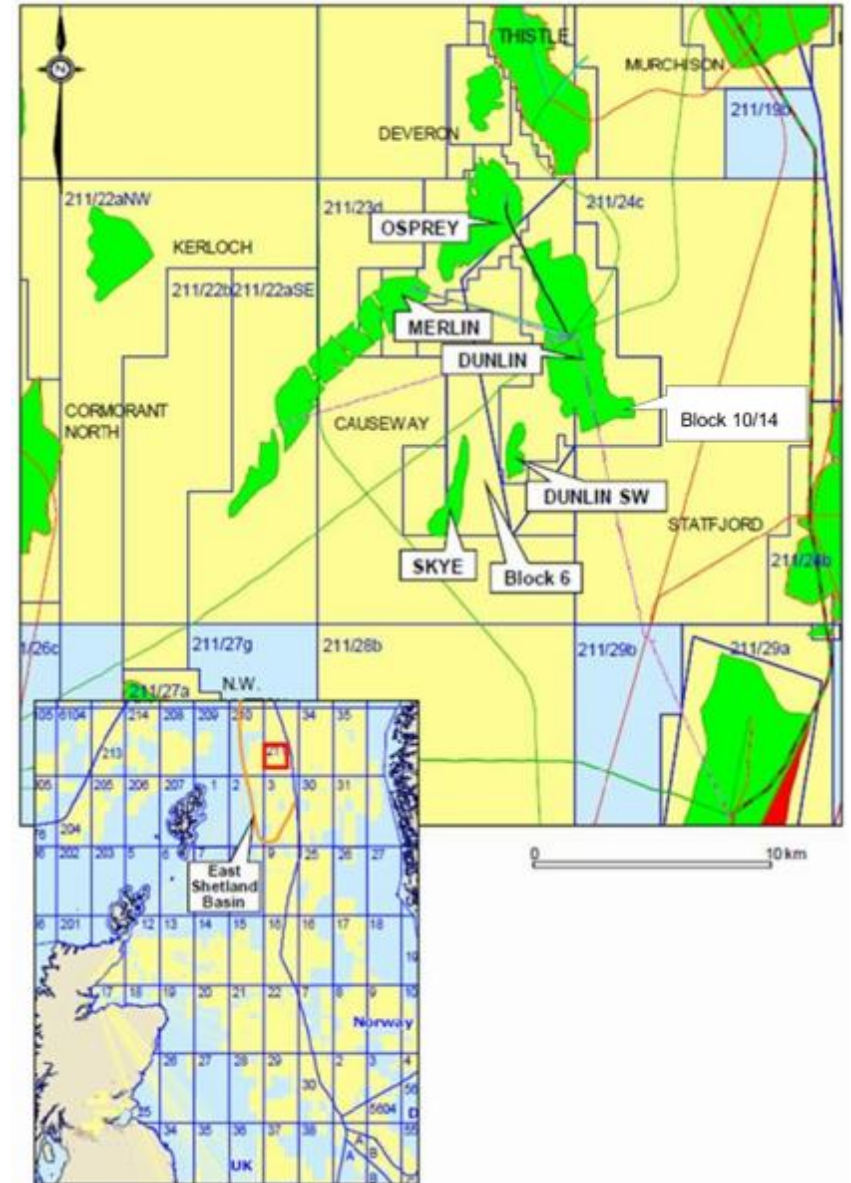
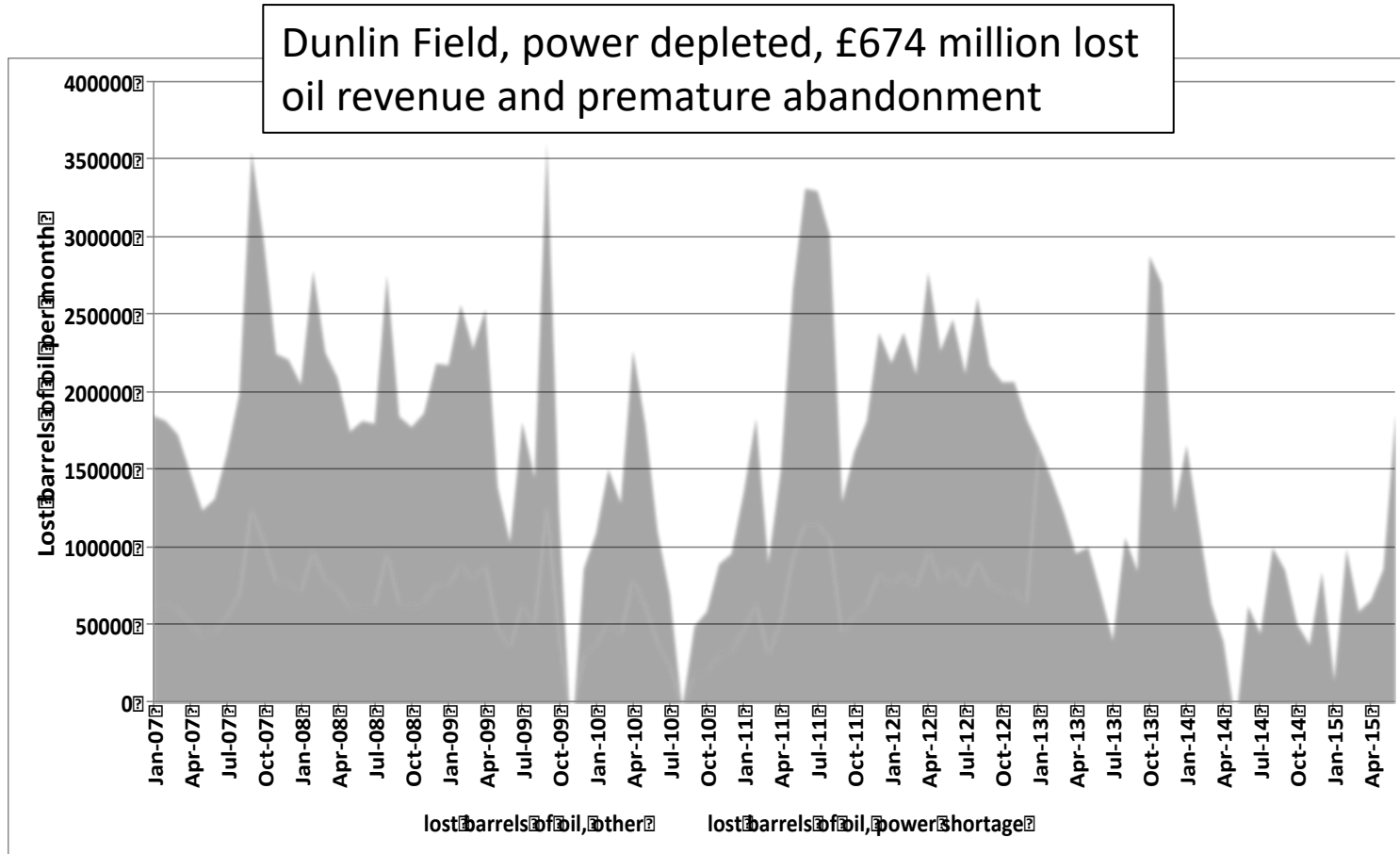


## Produced water: power potential



*From Auld et al, 2014*

# How significant is the power production potential?



Graphic from Gluyas & Swarbrick, 2020, Petroleum Geoscience Ed 2

# Potential impact of brine geothermal on OPEX & ABEX

- Power production from waste water (commoditise heat)
- Export co-produced gas rather than burning it (value add)
- Don't burn gas (emissions reduction)
- Don't import diesel (emissions reduction, remove environmental threat)
- Reinject cooled water (improve mobility ratio, possibly reduced injection pressure due to thermal fractures)
- Overall extend field life, improve MER, reduce emissions, reduce OPEX, defer ABEX

## Co-produced water – the global story

- 3.9 billion tonnes of oil produced p.a.
- 7-38 billion tonnes of co-produced water
- ~100°C
  
- 800,000 – 4,500,000 MW power
- ‘Lost’ power > global geothermal industry

*From Gluyas et al 2018*





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# THANK YOU

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