

Insights from the UK's conversion from manufactured gas to North Sea Gas, 1966-1977

Peter J G Pearson
Imperial College London
p.j.pearson@imperial.ac.uk

8th European Energy Forum
The Cost of European Energy Transitions
11-12 June 2019, Paris

Background

- Draws on research into the UK gas industry history, transitions & prospects, with Dr Stathis Arapostathis, National & Kapodistrian University of Athens, & others
- This presentation examines one episode in the industry's history, because of its resonance with issues facing the industry today in the non-carbon transition.

Structure of the talk

- Pathways to a non-carbon transition include several ways of replacing fossil-fuelled heat
- I highlight features of the UK's past transition from manufactured gas to North Sea natural gas (NG) & the industry's programme to convert gas-burning appliances
- Then compare & contrast aspects of the conversion with today's need to convert away from natural gas
- Because juxtaposing the similarities & differences is instructive & thought-provoking
- UK as an example - but the issues resonate with those in other countries

Decarbonising the gas industry: 2008-2050

- UK 2050 climate change targets mean 80% decarbonisation
- In the UK & many countries, most gas is used for heating
- Pathways to decarbonize this heat supply include:
 - Replace NG with non-carbon/renewable gases not yet produced at scale in UK, including
 - » hydrogen, bio-methane from AD & decarbonized bio-synthetic natural gas
 - Decarbonise NG via Carbon Capture & Storage
 - Switch to heat from non-carbon electricity, with implications for decommissioning NG networks
 - Develop decentralised non-carbon local options
 - Reduce heat demand

Who will steer the decarbonisation and how?

- All these options pose technical, economic, cultural & regulatory challenges
- None is costless in the short-run & all challenge the gas industry's future
- An overarching issue for the UK gas industry: who will steer the transition & how might it be governed?
- The past transition to natural gas is not a blueprint for this transition
- But fruitful to juxtapose & compare them:
 - Points up the nature & scale of the challenges facing industry, government & the energy-using public

UK Gas Industry 1945-1965: State-led reorganisation; new processes; imported LNG

- 1945: post World War II Labour (Socialist) Government
- 1948/49: nationalisation, reorganisation & new processes
- New state-owned company, led by Gas Council, rationalised industry, with 12 regional Area Boards & vertical integration
- Accepted need to respond on supply & demand sides to competition & cost challenges
 - Experimented with new technologies/feedstocks, including imported LNG from Algeria - built pipeline to deliver re-gasified LNG at high pressure to regional Area Boards
 - Promoted central & space heating services
 - 1960-65: gas sales grew by one third
- 1965 'Window of opportunity' - North Sea gas discoveries

1966-1977: North Sea Gas & system conversion

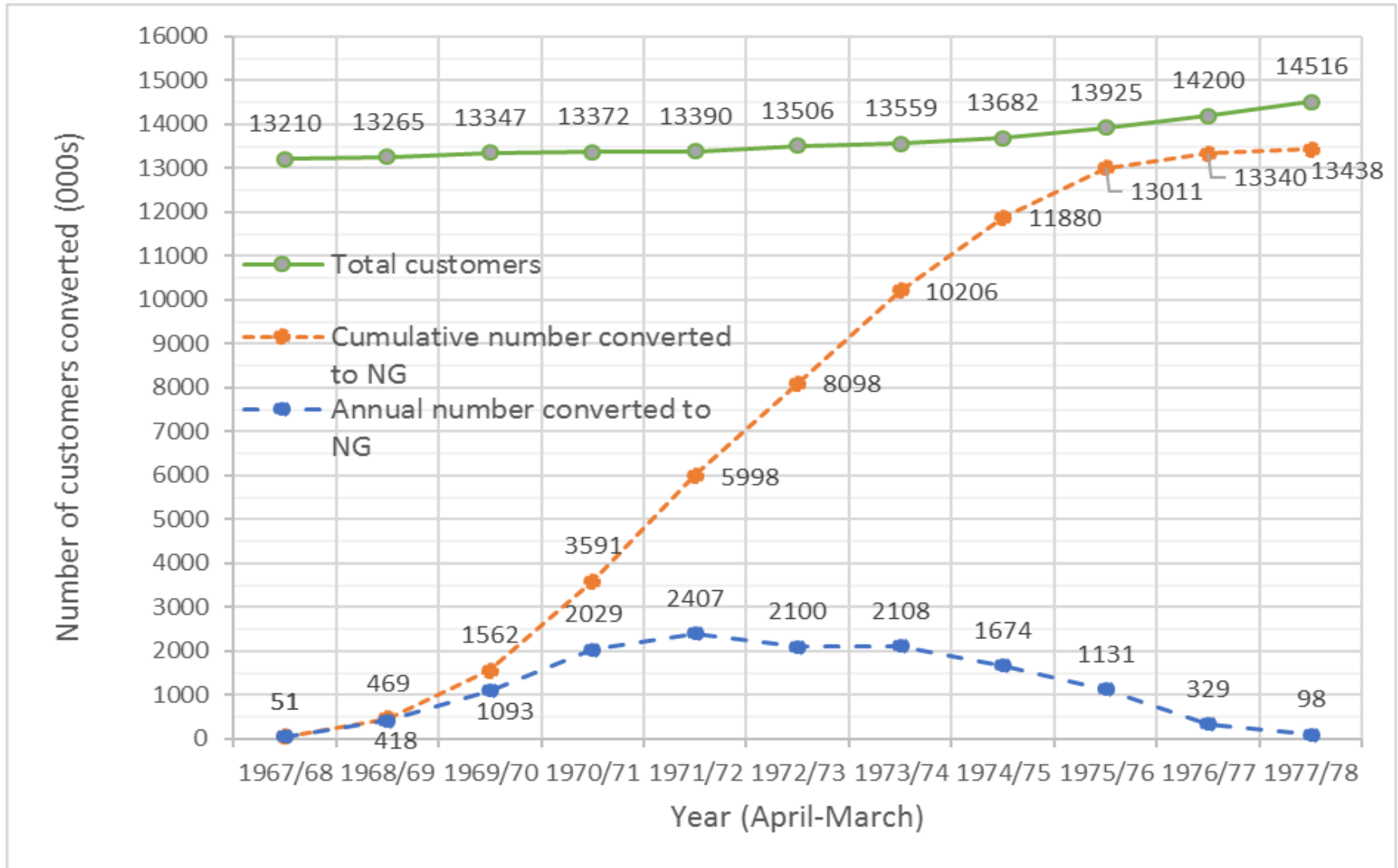
- 1966 decision: convert system & appliances to natural gas
 - Gas Council reorganised industry, via 2 Acts of Parliament
 - Worked harmoniously with government
 - Built terminals & national gas grid from LNG ‘backbone’ pipeline
- 1967-77: national appliance conversion programme
 - » 2X higher calorific value of natural gas, so more linepack storage, **but** appliance burners must be changed
 - » Trained new workforce to modify 35 million appliances in 13 million homes & 440,000 commercial & industrial premises, in phased regional & local switching process by 1977 (**graph**)
 - » Major PR & information initiatives
 - » Faced & overcame many initial complaints & problems
- 1969: ‘Guaranteed Warmth’ advertising campaign
- 1966-77: sales up nearly 400%; price/therm down 16%

Pre-conversion census of UK domestic appliances

- National surveys: just for domestic appliances (gas cookers, water heaters, boilers & fires):
- 7976 different models were in use
 - For which 3957 different standard conversion sets and 1406 conversion procedures were devised
- For each appliance model, the standard conversion set contained the components & conversion instructions.
 - Depending on the number of burners, their design and type, methods of ignition and controls, a set might contain 20 or more components (**pictures**)
 - Natural gas required larger combustion chambers and taller flameport orifices than for town gas

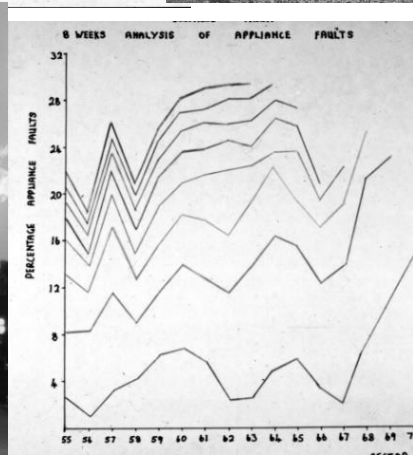
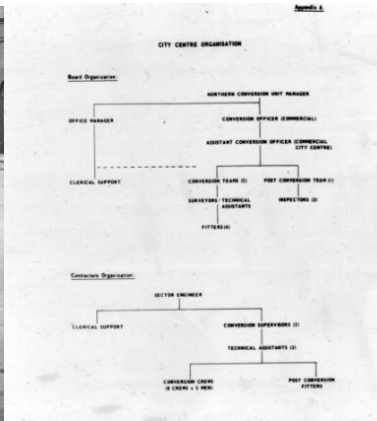
Progress of conversion to natural gas (1967-77)

Customers converted (000s)



Note: total customers include those acquired during the conversion who used natural gas from the outset. All customers originally on manufactured gas were converted by September 1977. **Data Source:** Peebles (1980, Table 2.1).

The Conversion Process 1976-77: <http://www.oldflames.org.uk/NG2/Conversion.html>



UK Gas industry:1947–1977

State-led response, experiments & natural gas transition

- The gas industry (Gas Council & Area Boards)
 - Had recognised industry's challenges & need to cut costs
 - Reorganised & carried out extensive RD&D
 - Encouraged niche experimentation – explored options
 - Worked effectively & closely with government
 - Took & managed risks of natural gas conversion
 - 'Stranded' >1000 town gas plants
- Monopoly state ownership & government support for the transition to natural gas enabled:
 - Close co-ordination & control of actors
 - To achieve a transition government & industry wanted
 - Imposed change on initially reluctant consumers, via national conversion programme (but NG cheaper)

Decarbonising the industry: 2008-2050

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The Transition (2008-2050) – Issues?

- Speed of moves from natural gas to low carbon heat (& transport?)
 - How much hydrogen or bio-methane could the system absorb?
 - How financed, made, distributed & used?
 - Will consumers embrace or resist the conversions?
- Gas decarbonisation also depends on development of CCS
 - R&D? Costs? Public acceptability of CO₂ transport/storage?
- The gas industry has proved a resilient industry
 - How might it respond to or resist the low carbon challenge?
- Much will depend on government & governance:
 - Will UK governments continue to guide & incentivise the low-carbon transition & in what ways?
 - Contrast with consistent government enthusiasm & support for North Sea gas & the conversion.

Aspects of the low-carbon transition resonate with the natural gas transition & conversion (but **no** blueprint)

- Will involve:
 - Potentially disruptive conversion &/or replacement of natural gas-fuelled appliances like boilers & cookers, or of devices like ICE vehicles
 - Acceptance of the alternative fuel
 - Developments & changes in transmission and /or distribution networks and storage arrangements.
- Raises issues analogous to those faced in steering the natural gas transition & conversion
 - With the extra challenge that the energy services received may initially cost more than before, unlike with natural gas

Example: switch to hydrogen for heat & transport

- Growing UK interest in hydrogen, especially for heating services (& vehicles)
- A 2016 study of developing gas appliances/burners to operate on 100% hydrogen, proposed activities similar to those of the conversion, with similar challenges
- But Keay (2018) argues that market forces & fiscal signals alone unlikely to ensure heat decarbonization by hydrogen:
 - ‘...the degree of government intervention required ...might ultimately be incompatible with any sort of liberalised market’

Comparing the natural gas transition & the low-carbon transition

- 1960s British Gas was a vertically-integrated, state-owned monopoly: today's industry & value-chain are no longer integrated
 - Many privately-owned, national & international companies
 - With shorter planning/financing horizons, differing incentives & with opportunities in less carbon-constrained markets
 - Competing with policy-supported renewables & nuclear
- Its disparate leaders lack the authority, agency & power to 'steer' the transition, so who will steer it & how?
- Before North Sea gas, the industry acknowledged it faced technical, commercial, financial & institutional challenges
 - The industry has only recently acknowledged the low-carbon challenge, perhaps because as yet it only bites in the 2030s & 40s

Comparison between the 5th and 7th transitions (ii)

- Today's industry actors have not done organisational, RD&D & marketing activities comparable to those that made the 1960s industry ready to exploit the North Sea gas discoveries.
 - Partly because the low-carbon transition offers more clouded, uncertain market prospects than did natural gas.
- The relationship between industry & government is fundamentally different & less close than in the 1960s
 - Each has less & different influence over the other since 1987 privatisation
- Although all political parties supported the 2008 Climate Change Act, recent governments have given more nuanced signals of commitment to hitting its targets

Concluding comments (i)

- In UK, governments & industry haven't yet created a transformative, attractive vision of a low-carbon UK gas industry & a heat transformation
 - Of the kind that enabled the industry's feedstock & 35 million appliances to be successfully converted from town gas to 'North Sea gas - the fuel of the future'.
 - So who will 'steer' the low-carbon transition & how?
- The experience of the natural gas transition shows that
 - while rapid, planned transitions are achievable, they may require complex, demanding forms of 'steering' & governance that could prove hard to achieve in today's context & conditions

Concluding comments (iii)

- The natural gas transition & conversion don't offer a blueprint for steering & governing the UK's low-carbon transition in gas
 - But do help to highlight the challenges.
- And we might build on insights from the natural gas transition/ conversion
 - To help think about & develop hybrid forms of steering, governance & management in a much-changed socio-technical context
 - It seems likely that the UK government will need to play a more assertive, active role in steering the heat transition

Some sources & references

Acknowledgement: This talk draws on research carried out in the *Realising Transition Pathways project*, funded by UK EPSRC. [Grant EP/K005316/1] and its predecessor *Transition Pathways project*

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Thank You!