DIGITALISATION
& THE IMPACTS ON ENERGY MARKETS

2018 PIDX EUROPEAN CONFERENCE
EMERGING DIGITAL TRANSFORMATION STRATEGIES IN OIL & GAS

DIETER HELM
5th JUNE 2018
# AGENDA

**DIGITALISATION & THE ECONOMY**

**DIGITALISATION & TRADE**

**DIGITALISATION & ELECTRICITY**

**DIGITALISATION & OIL AND GAS TECHNOLOGIES**

**DIGITALISATION & ENERGY SYSTEMS**

**DIGITALISATION, SMART CONSUMPTION & TRANSPORT**

<table>
<thead>
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<th>GENERAL DEMAND</th>
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<td><strong>DIGITALISATION &amp; THE ECONOMY</strong></td>
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<th>ENERGY SUPPLY</th>
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DIGITALISATION, THE ECONOMY & TRADE

ROBOTS

3D PRINTING

ARTIFICIAL INTELLIGENCE

Smart Meters

Surprises

Graphene

Next Generation Solar

Batteries

Robotics

Large Scale Storage

Electric Cars

Smart grids
DIGITALISATION & TRADE

**US**
- Reshoring
- Shale
- Energy Independence

**EUROPE**
- Reshoring
- Low fossil fuel exposure

**CHINA**
- Threat to export model
- Cheaper energy

- MIDDLE EAST
- AFRICA
- INDIA
“Everything digital is electric”

“All Change”

“Transport goes electric”

“Petrochemicals: From oil to gas to new materials”
## DIGITALISATION & OIL & GAS

<table>
<thead>
<tr>
<th>Shale revolution</th>
<th>10 years old</th>
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- Changes to full supply chain and co-systems

- Oil to gas
DIGITALISATION OF ENERGY SYSTEMS

DIGITALISATION
- Robots
- 3D printing
- AI

ELECTRICITY
- Electric cars
- Storage and batteries
- Smart demand side
- Smart systems

System Operators
- Zero Marginal Costs
- Equivalent Firm Power Auctions

Energy Sources
- Renewables
- Nuclear
- Gas
- Coal
- Oil

Questions
- ?
BREAKTHROUGHS

Solar panels to solar film

Light spectrum opened up
DIGITAL ENERGY SYSTEMS

<table>
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<tr>
<th>System Operators</th>
<th>Distribution - Supply - Generation</th>
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<tr>
<td>Smart Networks</td>
<td>AI controlled</td>
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<tr>
<td>Smart Meter</td>
<td>Big data comes to electricity</td>
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<tr>
<td>WHAT DOES THIS MEAN FOR OIL &amp; GAS?</td>
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<td><strong>Share of electricity ↑↑</strong></td>
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<td><strong>Gas has transitioning role in generating electricity</strong></td>
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<td><strong>Oil loses out in transport</strong></td>
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<td><strong>Gas also loses out in transport</strong></td>
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<td><strong>Gas gains from ’oil’ in petrochemicals</strong></td>
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BURN OUT SCENARIES

- Demand for oil gradually tails off

- Demand for gas increases and then tails off

- Price of oil (and then gas) goes down
THE LONG RUN PRICE OF OIL

BP OUTLOOK
OIL PRICE (BRENT CRUDE, 2014$/BBL)

Source: BP and Thomson Reuters
CONCLUSIONS

• It is a radical revolution
• It is about zero marginal costs
• It is about capacity not energy
• It is a very gradual **BURN OUT**
FOR INFORMATION

- Not so smart – what has gone wrong with the smart meter programme and how to fix it, Paper 23, Mar 2017
- Are the electricity price increases justified? Paper 22, Feb 16
- Energy and climate policy after BREXIT, Paper 21, Oct 16
- Greg Clark's energy agenda, Paper 20, Sep 16
- Flawed in almost all its parts – the final CMA report on electricity markets, Paper 19, Jul 16
- After Hinkley – how to contract for the rest of the nuclear programme, Paper 18, Apr 16
- The CMA Energy Market investigation: Companies 5-0 CMA? Paper 17, Mar 16
- The new normal – oil prices after the crash, Paper 16, Feb 16
- Stranded Assets – a deceptively simple and flawed idea, Paper 15, Oct 15
- Reforming the FITs and capacity mechanisms, Paper 14, Sep 15
- The first 100 days of Conservative energy policy, Paper 13, Aug 15
- Penalty tariffs, open ended regulation and embedding overcharging. Paper 12, Jul 15
- British energy policy- what happens next? Paper 11, Jun 15
- Energy Policy and the Coalition, Paper 10, March 15
- What should oil companies do about climate change? Paper 9, Feb 15
- Competition in the British electricity sector: a set of practical measures, Paper 8, Feb 15

Energy Futures Network
BREXIT and its implications for the British Energy Market
Dieter Helm
April 2018

Energy Futures Network
Paper 25.
Peak oil demand and oil prices – a critique
Dieter Helm
Jan 18

Energy Futures Network
Paper 24.
Why intervention on electricity prices is needed and how to do it without undermining competition
Dieter Helm
April 2017

Cost of Energy Review
Dieter Helm
29th October 2017