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Ken Cronin

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Keynote speech

Rupert Turner

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Decarbonising Ireland Roundtable

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Decarbonising Ireland

Kevin McPartlan

Fuels for Ireland

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Decarbonising Ireland

Mark Doyle

Firebird
The Future of Home Heating

Mark Doyle

Managing Director

10/04/2024

Decarbonising Rural Ireland and the use of HVO

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The Future of Home Heating

Kingspan®

WORCESTER
Bosch Group

CARBERY
PLASTICS
Ireland's Leaders in Plastic Innovation

WARMFLOW

GRANT IRL
Efficient Heating Solutions

Harlequin®
MANUFACTURING FOR TOMORROW

ROI fuel mix

No central heating	1%	21,254
Oil	39%	714,177
Natural Gas	33%	601,339
Electricity	12%	216,075
Coal (incl. anthracite)	3%	63,437
Peat (incl. turf)	4%	67,891
Liquid Petroleum Gas (LPG)	1%	11,874
Wood (incl. wood pellets)	2%	31,854
Other fuels	1%	16,916
Not stated	5%	91,911

c.700 homes using a liquid fuel

CSO – 2022

ROI Policy

Climate Action Plan 2023, which provides a detailed overview of how the Government intends to achieve a 51% reduction in greenhouse gas emissions by 2030.

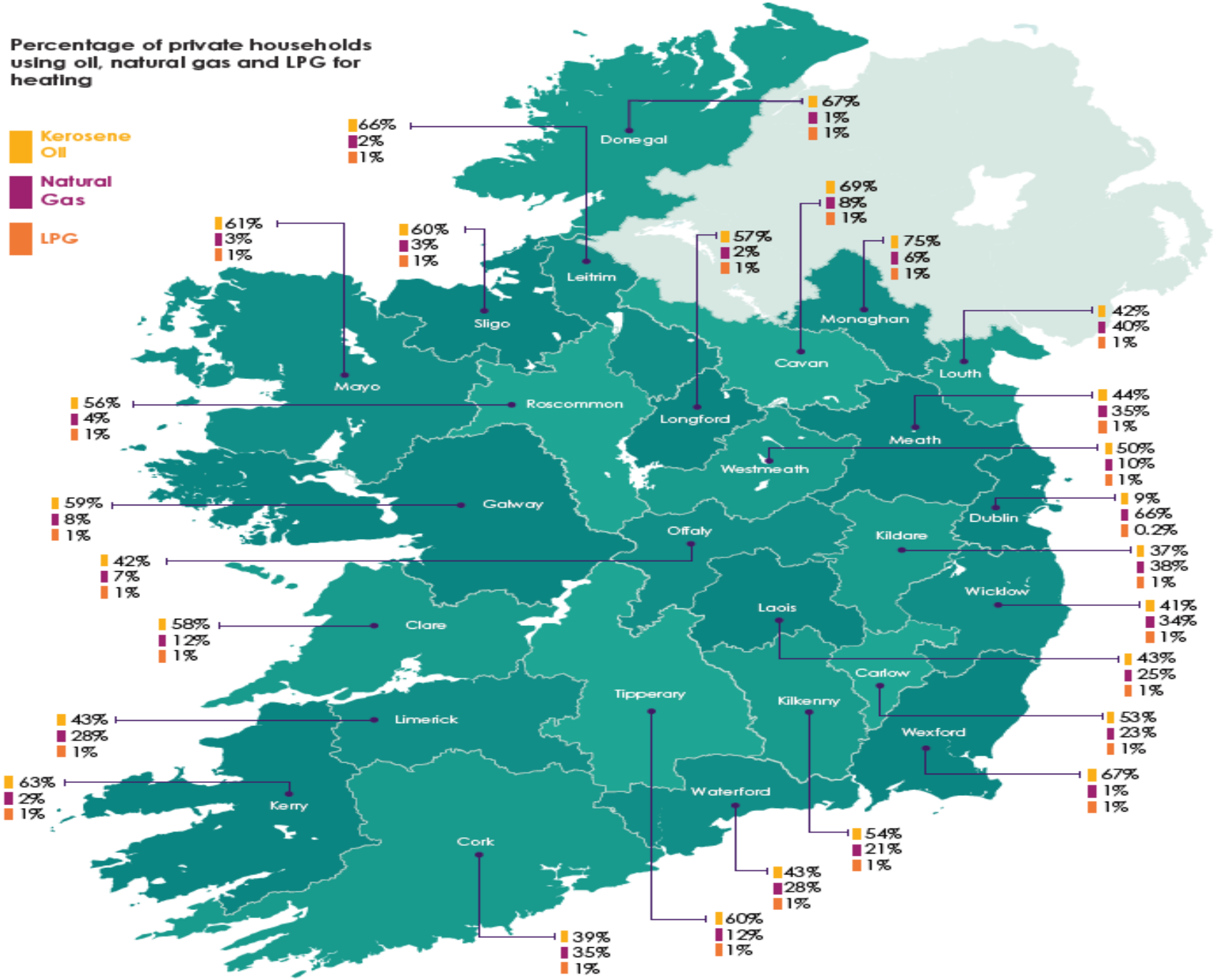
40% reduction of GHG emmissions in residential heating

As outlined before, the Government is committing to retrofit 500,000 homes by 2030, and installing 400,000 heat pumps in existing premises by that point.

This electrification is the only option for rural Ireland in this plan

CSO - 2016

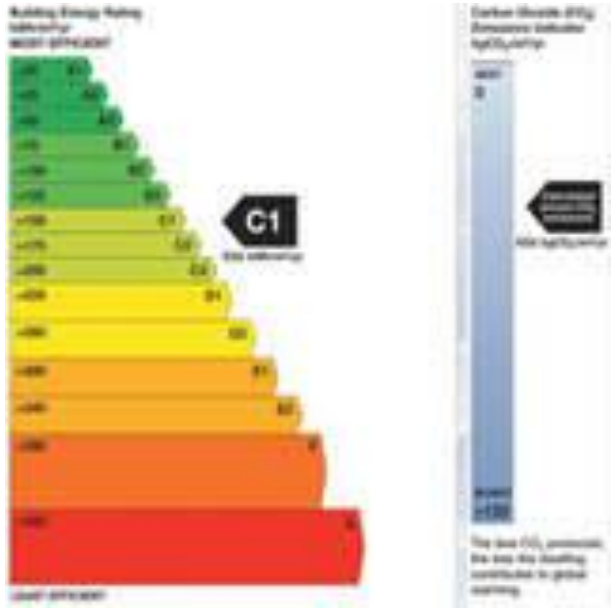
OFTEC Ireland



The Problem……

ROI Housing Stock

- 90% of off grid homes in ROI are below BER rating C1 so the upgrade works required is very expensive and dispersed



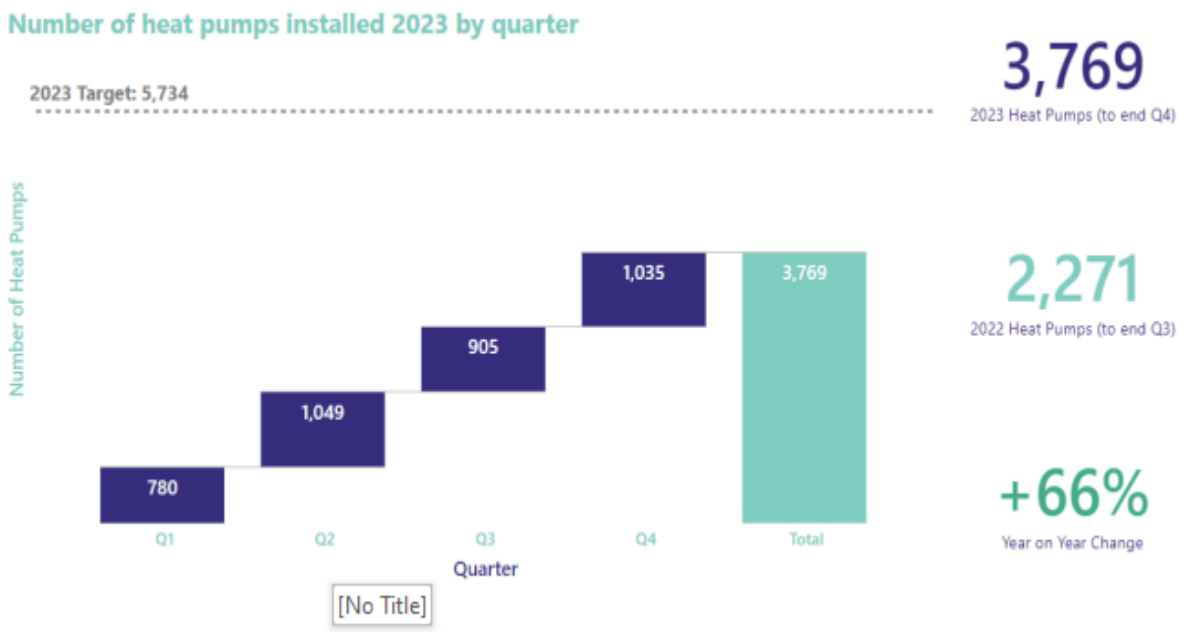
*superhomes.ie

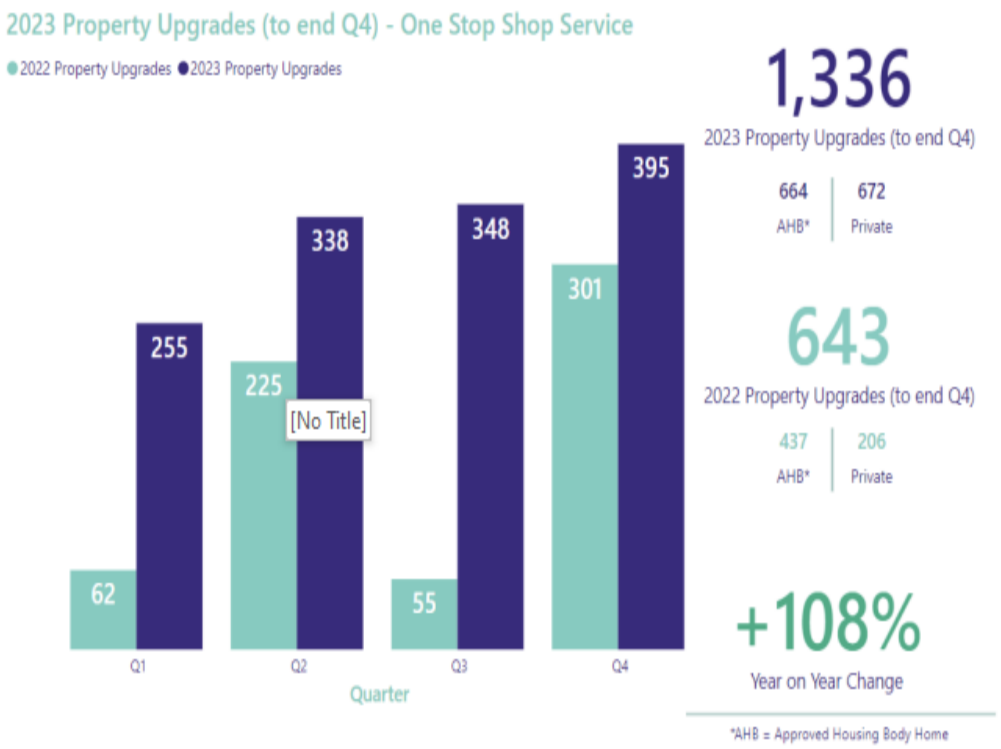
The Problem…..

Where to find the customer desire…

Goal is 400,000 heat pumps by 2030

This is 1,000 heat pumps per week from 2023 to 2030, every week.





The challenge…..

Consumer attitude

Willingness to pay

The average cost of a full scale deep retrofit in 2023

1. 4% <€30,000
2. 30% are between €30,000 & €50,000
3. 41% are between €50,000 & €75,000
4. 25% > €75,000

(Per SEAI Home Energy webinar Oct 23)

*superhomes.ie

We have a Solution….(HVO)

Why HVO?

HVO offers net GHG CO_2 reduction of c90% vs fossil Kerosene

HVO is manufactured from 100% renewable waste derived raw materials, accepted by the Road Transport Fuel Obligation and certified by the ISCC.

HVO allows simple and cost-effective retro fit to make existing equipment operate on the fuel & drives innovation at manufacturer level to improve efficiencies of boiler and liquid fuelled heating systems

HVO gives significant reductions in noxious emissions.

HVO replacements takes less than an hour with an upfront investment of £500

OFTEC Member

Figure 14: Example tank conversion label

- All boiler manufacturers tested HVO
- Successful outcome
- Tanks - no material compatibility issues
- Flash point >70C.

Where are we now?

Sustain..ability
Avail..ability
Afford..ability

Where are we now?

Industry Strategy to achieving 40% emissions targets

Industry Strategy to achieve 40% GHG emissions reduction

i. Blend 20% HVO with Kerosene (20%)

1. Industry is ready, distributers set up to do this blend.
2. Cost increase over Kerosene today is practically the same as Kerosene is getting a carbon tax and HVO is not.
3. The “Renewable heat obligation scheme 2024” being issued by the government is far too unambiguous with a target of 2%
4. We specify 20% as this is the point where it is cost neutral (ish!!!). We can easy increase the blend to achieve more and more CO_2 saving but we are initially using 20% as a cost neutral model
5. CO_2 reduction of 20% over the 700,000 homes

ii. Upgrade appliance to high efficiency boilers (10-15%)

1. Total liquid fuel boiler in rural Ireland is 700,000
2. Total Standard efficiency (working at 60%-70% efficient) is 300,000.(10
3. Upgrade these 300,000 appliances, relatively inexpensively to high efficiency boilers greater that 95% efficient.
4. CO_2 reduction of 15% over the 700,000 homes

iii. Retrofit homes with Air source Heat pumps. (5-10%)

1. If we give rural Ireland a choice, there is a natural demand for deep retrofits of about 5-10%
2. This is mainly ,
3. Home being passed down the generations.
4. Farm home being passed on to the daughters and sons.
5. People just upgrading their homes.

Summary – What we need from Government

- Introduce an aggressive Renewable heat Obligation scheme for liquid fuel heat , up to 20%. Not the 2% identified in the Government consultation paper

- Reintroduce the SEAI grant to upgrade the 300,000 Standard efficiency boilers to high efficiency boilers. This will result in a reduction of a further 15% of GHG emissions.

- Redefine HVO as a biofuel and not a “Substitute” fuel. Currently HVO is subject to mineral oil tax. This was identified by Minister O’Donoghue in November 2022.

- Update the Climate action plan to allow the use of biofuels in line with the transport section of the CAP

Summary – What we need from Government

15. Transport

Key Messages

Sectoral Emission Ceilings

- Carbon Budget 1: 54 $MtCO_2eq$.
- Carbon Budget 2: 37 $MtCO_2eq$.
- Emissions Abatement (on 2018): 50%
- Emissions up to 2021: 10.9 $MtCO_2eq$.

Trends in the Sector

- The constraints on travel in 2020 as a result of COVID-19 resulted in transport sector emissions levels falling to 10.3 Mt CO_2eq., relative to its 12.2 Mt CO_2eq. emissions baseline. 2021 saw a 6.1% increase in emissions over 2020 levels, largely driven by the cessation of public health restrictions that had artificially reduced transport demand
- 20.2% of the first sectoral carbon budget was expended in 2021. While this level is consistent with the sector being compliant with its carbon budget to 2025, a further increase in transport emissions is expected in 2022. Though not yet at risk of a projected failure to comply with its sectoral emissions ceiling, the need to substantially accelerate transport emissions abatement is clear
- This update to the 2021 Climate Action Plan (CAP21) transport decarbonisation pathway has been informed by two core analyses of the Irish transport system undertaken over the past year: the Organisation for Economic Co-operation and Development's (OECD) Redesigning Irish Transport review, undertaken at the request of the Climate Change Advisory Council; and refreshed transport decarbonisation pathway modelling, undertaken by the National Transport Authority's modelling team and the Department of Transport

Targets

- Meeting our 2030 transport abatement targets will require transformational change and accelerated action across all key decarbonisation channels. The key performance indictors provided in Table 15.6 illustrate the level of change required
- CAP21 targets have been revised to meet this higher level of ambition, including a 20% reduction in total vehicle kilometres, a reduction in fuel usage, and significant increases to sustainable transport trips and modal share
- Fleet electrification and use of biofuels will continue to provide the greatest share of emissions abatement in the medium term, and vehicle targets, while unchanged, have been reframed as a percentage share of total fleet and new registrations, to better embed our vehicle strategy within our wider Sustainable Mobility Policy

Measures and Actions

- In recognition of the OECD report's findings that the Irish transport system embeds car-dependency and increased emissions by design, the Avoid-Shift-Improve framework for transport sustainability has been applied to categorise all actions, emphasising the crucial role of spatial and land-use planning in designing transport systems that can support our net-zero ambition
- Key policies and strategies that will support the sector's decarbonisation have been identified, and all the main work programmes and high impact actions are summarised in Table 15.7

14. Built Environment

Key Messages

Sectoral Emission Ceilings

- Carbon Budget 1: Residential: 40 $MtCO_2eq$. / Commercial/Public: 7 $MtCO_2eq$.
- Carbon Budget 2: Residential: 23 $MtCO_2eq$. / Commercial/Public: 5 $MtCO_2eq$.
- Emissions up to 2021: Residential: 7 $MtCO_2eq$. / Commercial/Public: 1.5 $MtCO_2eq$.

Trends in the Sector

The built environment accounted for 12.3% of Ireland's greenhouse gas emissions in 2021, down from 13.6% in 2020

Key Targets

- All new dwellings designed and constructed to Nearly Zero Energy Building (NZEB) standard by 2025, and Zero Emission Building (ZEB) standard by 2030
- Equivalent of 120,000 dwellings retrofitted to BER B2 or cost optimal equivalent by 2025, and 500,000 dwellings by 2030
- Up to 0.8 TWh of district heating installed capacity by 2025, and up to 2.7 TWh by 2030
- 170,000 new dwellings using heat pumps by 2025, and 280,000 by 2030
- 45,000 existing dwellings using heat pumps by 2025, and 400,000 by 2030
- Up to 0.4 TWh of heating provided by renewable gas by 2025, and up to 0.7 TWh by 2030

Measures and Actions

- An ambitious National Residential Retrofit Plan
- Strengthening our existing Building Regulations
- Supporting the growth and development of district heating, electrification of heating and geothermal energy
- A roadmap to support the decarbonisation of commercial buildings
- Supports for the public sector to decarbonise its building stock

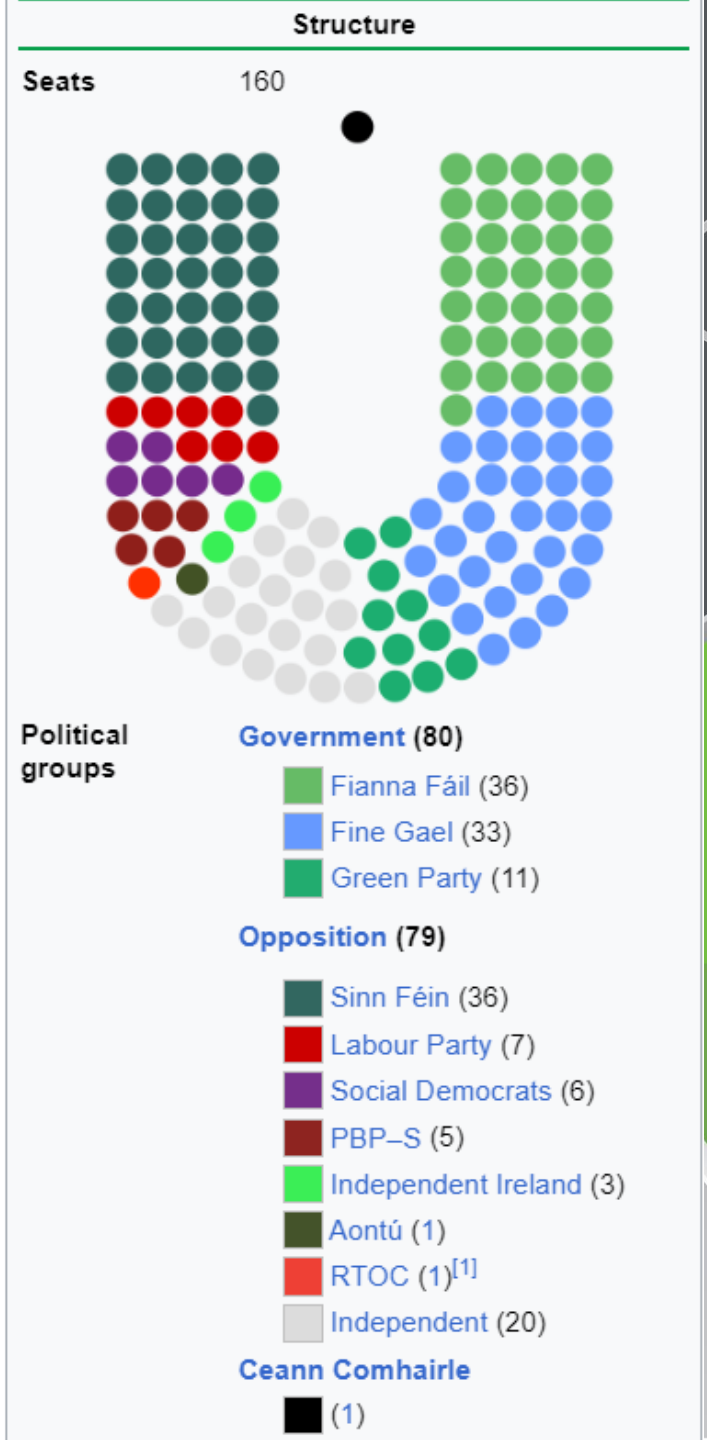
Immediate action

this is Election time!!

Local elections and European elections taking place in June.

General Election within the next 12 months

WE NEED TO ENSURE OUR STRATEGY IS ON THE POLITICAL PARTIES MANIFESTOS, NOW!!



Firebird
The Future of Home Heating

Thank You for your attention

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Decarbonising Ireland

Pat Murnane

Tria

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Decarbonising Ireland

Laura Byrne

certa

certa

HVO

Hydrotreated Vegetable Oil

FUELLING GROWTH.
SUSTAINING OUR FUTURE.

- Company Overview
- Certa HVO transition
- Case Studies
- Market Overview

CONNACHT GAA

Electric Picnic
MUSIC AND ARTS FESTIVAL

19th-21st September 2023
NATIONAL PLOUGHING CHAMPIONSHIPS
MACHINERY & LIVESTOCK EXHIBITION
Rathenisks, Co. Laois

BUILDERS SISK CONTRACTORS

GMC

DUBLIN PORT Co

The Family Bakers Brennans
TODAY'S BREAD TODAY

amazon

coillte

Microsoft

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David Blevings

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Harnessing the Power of Data

Gordon Hyland

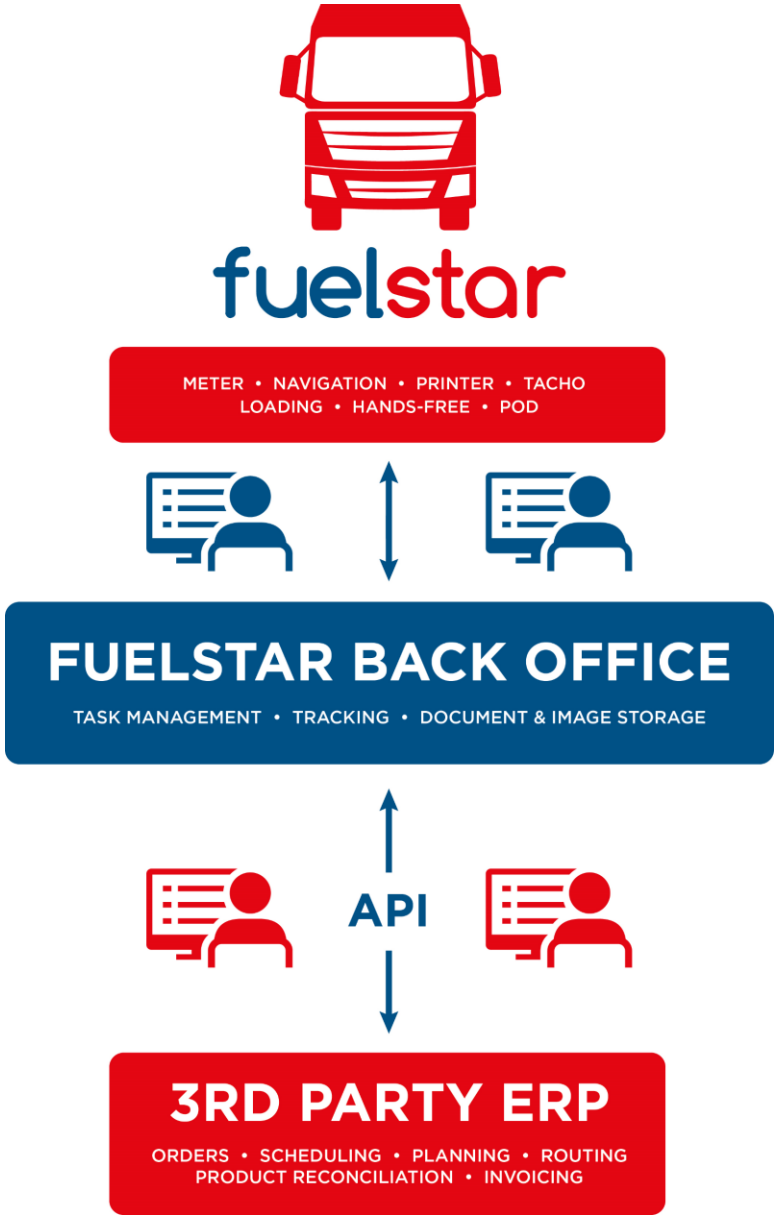
touchstar technologies ltd

touchstar

Fuel Logistics Digitisation

www.fuelstar.co.uk

FuelStar Architecture



touchstar plc

touchstar plc

Case Study 1 – Retail Forecourt Delivery – Health & Safety

- Aim:
  - To reduce slips, trips, falls and manual handling incidents
  - To improve safety compliance and hazard reporting levels
  - To improve workplace reporting culture
  - Build confidence of Drivers to support positive hazard reporting culture
  - To identify low level issues, to allow proactive approach

Case Study 1 – Retail Forecourt Delivery – Health & Safety

- Manual reporting
  - Low speed
  - Low accuracy
  - Low follow through

Case Study 1 – Retail Forecourt Delivery – Health & Safety

- Digitised reporting (through FuelStar)
  - Removal of manual data input
  - Avoid delays & quick triage of issues (info to correct stakeholder and actioned accordingly)
  - 43% Increase in hazard reporting
  - Reduction in time losing injuries to less than 1% per 100,000 hours worked

touchstar plc

Case Study 2 – Heating Oil Delivery – Health & Safety

- Working at hight – Helping Drivers make good decisions
- Digitized decision tree, embedded within FuelStar, delivery process
- Enhanced compliance & reduced incidents

touchstar plc

Point of Work - Working at Height Risk Assessment
Stop - Think - Act

Item	Question	Response		Action
1	Can the delivery be made at ground level?	Yes	No Go to 2	Complete safe delivery report process. **Record any additional control measures required needed to make safe delivery when compared to risk assessment and SOP on Delivery Point Risk Report**
2	Do you need to work at height to make the delivery?	Yes Go to 3	No	Complete safe delivery report process. **Record any additional control measures required needed to make safe delivery, when compared to risk assessment and SOP on Delivery Point Risk Report**
3	Is there an overhead power cable within 6 metres of the delivery point	Yes	No Go to 4	Don't Make delivery. Contact site manager. Complete **Delivery Point Risk Report** and record issues identified with delivery
4	Is there a fixed working platform provided with edge protection and access stairs in a serviceable condition?	Yes	No Go to 5	Complete safe delivery report process. **Record any additional control measures required needed to make safe delivery when compared to risk assessment and SOP on Delivery Point Risk Report**
5	Is there a fixed ladder provided that is in a serviceable condition and safe to use?	Yes	No Go to 6	Complete safe delivery report process. **Record any additional control measures required needed to make safe delivery, when compared to risk assessment and SOP on Delivery Point Risk Report**
6	Can alternative access equipment be used instead of Ladders e.g. mobile tower?	Yes Go to 7	No Go to 7	Complete safe delivery report process. **Record any alternative access equipment that could be used for the delivery, when compared to Risk Assessment and SOP on Delivery Point Risk Report**
7	Will working at height be less than 30 minutes for the delivery?	Yes Go to 8	No	Don't Make delivery – Ladders not suitable for Delivery point Go to step 6 Contact site manager. Complete **Delivery Point Risk Report** and record issues identified with delivery
8	Can the delivery be made without standing on any of the top 3 rungs of the ladder provided by RP?	Yes Go to 9	No	Don't Make delivery. Contact site manager. Complete **Delivery Point Risk Report** and record issues identified with delivery
9	Can the delivery be made with no more than 4 metres of hose being needed from the base of the ladder to the fill point	Yes Go to 10	No	Don't Make delivery. Contact site manager. Complete **Delivery Point Risk Report** and record issues identified with delivery
10	Can the ladder be secured at the top to prevent slippage(rubber strips or ladder standoff)	Yes Go to 11	No Go to 11	Complete safe Delivery Point Risk Report and record issues identified with delivery
11	Can the base of ladder be prevented from slippage and placed on a firm level surface? e.g. clear area, use ladder mat	Yes Go to 12	No	Don't Make delivery Contact site manager. Complete **Delivery Point Risk Report** and record issues identified with delivery
12	Can you maintain 3 points of contact with the ladder e.g. whilst going up and down?	Yes Go to 13	No	Don't Make delivery Contact site manager. Complete **Delivery Point Risk Report** and record issues identified with delivery
13	Is the ladder provided suitable for use and in good condition?	Yes Go to 14	No	Don't Make delivery Contact site manager. Complete **Delivery Point Risk Report** and record issues identified with delivery
14	Are you confident in your ability to be able complete the delivery safely?	Yes	No	Don't Make delivery Contact site manager. Complete **Delivery Point Risk Report** and record issues identified with delivery

- ***Record any additional control measures required needed to make safe delivery, when compared to risk assessment and SOP on safe delivery report***

touchstar plc

Capture Site Declaration

Yes

Does a site declaration need to be captured before product discharge occurs?

No

Working at Height Risk Assessment

yes

Are you required to work at height?

No

Working at Height Risk Assessment

yes

Any overhead power cable within 6 metres of the delivery point?

No

Working at Height Risk Assessment

Don’t Make delivery. Contact site manager. Complete Delivery Point Risk Report and record issues identified with delivery

Ok

Working at Height Risk Assessment

Complete safe delivery report process. Record any additional control measures required needed to make safe delivery when compared to risk assessment and SOP on Delivery Point Risk Report

Ok

Working at Height Risk Assessment

yes

Is there a fixed working platform with edge protection and access stairs?

No

Working at Height Risk Assessment

yes

Is there a fixed ladder provided that is safe to use?

No

Working at Height Risk Assessment

yes

Will you be working at height for less than 30 minutes?

No

Working at Height Risk Assessment

yes

Can the delivery be made without standing on any of the top 3 rungs of the ladder?

No

Working at Height Risk Assessment

yes

Can you maintain 3 points of contact with the ladder at all times?

No

Working at Height Risk Assessment

yes

Are you confident in your ability to complete the delivery safely?

No

Conclusions

- Driver tablets are powerful tools for data to and fro
- H&S is just one aspect for consideration
- Many processes can be improved & captured in realtime
- Templates, photos, videos
- Enforcement vs. encouragement
- Buy in to management vision

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Fuel Logistics Digitisation

www.fuelstar.co.uk

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Harnessing the Power of Data

Sven Munk

FoxInsights

FoxInsights
Data Geeks Panel
UKIFDA 2024

Sven Munk

Vice President
Sales & Marketing

FoxInsights

GARTNER says:
Top Strategic Technology Trends 2024

1. AI Trust, Risk and Security Management
2. Threat Exposure Mangement
3. Sustainable Technology
4. Platform Engineering
5. AI-Augmented Development
6. Industry Cloud Platform
7. Intelligent Applications
8. Democratised Generative AI
9. Augmented Connected Workforce
10. Machine Customers

AI needs DATA

DATA needs AI

Your environment and challenges today

World Economy Disruptions

Wars, Pandemics, Supply Chain Crisis,
Political Regulations

High Expectations from Customers

Amazon-like services

Customers Hold Decision Power

Static customer relationships
and order streams

Rigorous Competition

High price pressure meeting
low product differentiation

High costs, uncertainty & missing ability to influence!

Interface between Distributor and Customer is inefficient!

Logistics costs escalating

Suboptimal Delivery Routes
Ad-hoc changes
Shortage on Drivers

Touchpoints not individualised

Lost potential in making touch points meaningful

Waiting for Customer to Call

Reacting instead of acting

Few Touchpoints per Year

No option to influence buying decisions

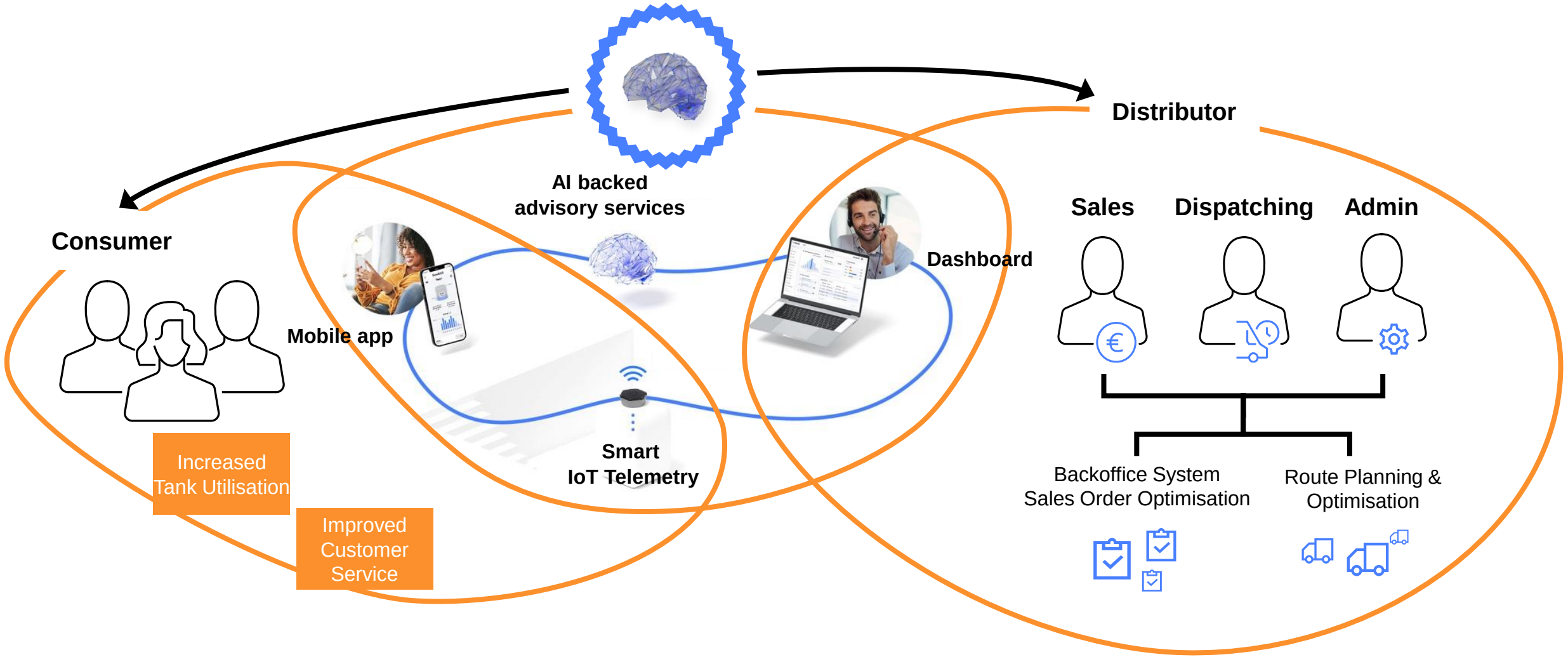
Take the decision-making power from your customers and get back into the driver seat!

Business relevant insights

+

Reliable, actionable data

… will do it!



AI-enabled technology of the future:
Data-driven, digital platform as **operating system** for recurring distributor-consumer relationship management.

Actionable data to re-define workflows in sales **(sell more)** and logistics **(spend less)**!

Sell more with less costs!

-50% costs
in logistics

5x
conversion rate in sales

Keep your customers!
-50% churn

89%
less manual work

Come talk to us at Booth 97!

Til

CEO

Sven

Vice President
Sales & Marketing

Rahul

International
Sales Manager

Jake

International
Account Manager

TELEMETRY SOLUTION PROVIDER 2024
TOP #3 IN EUROPE | TOP #5 WORLDWIDE
Berg Insight™

TOP 10 AI SOLUTION
PROVIDER IN EUROPE
2024 | CIO Applications

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Harnessing the Power of Data

Tim Buckman

BoilerJuice
Platform of Choice

BoilerJuice

Tomorrow's energy, today

UKIFDA 2024

Tim Buckman, CEO of BoilerJuice

Is data, digitalisation, & systems integration for geeks or can it help in changing times?"

#1 UK marketplace for heating oil & boiler servicing

Platform of Choice for UK fuel distributors.

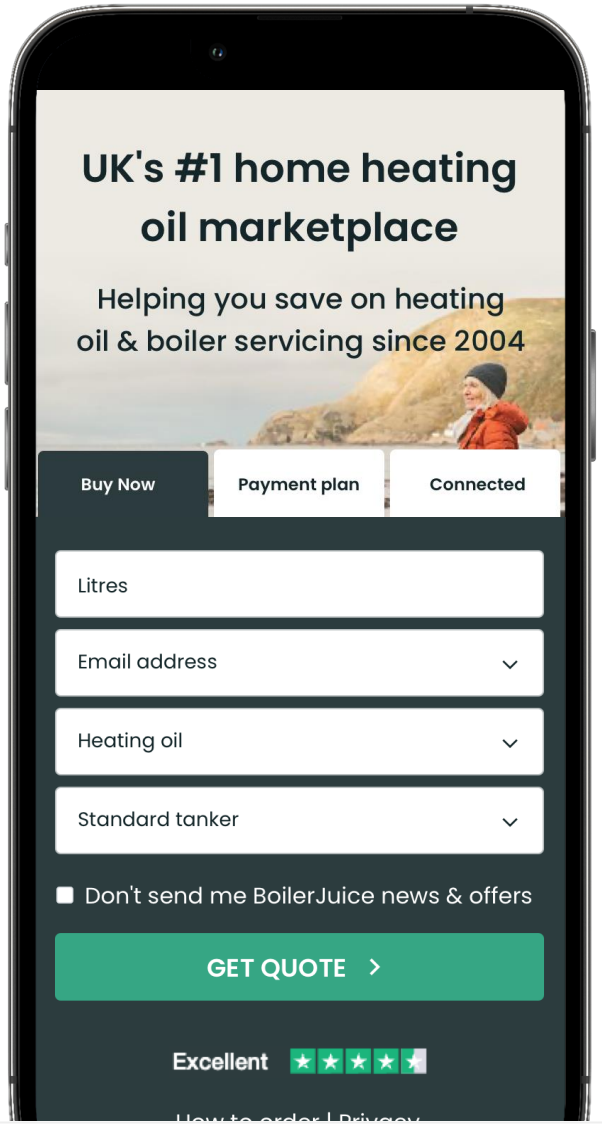
We're here to save customers time and money on their heating, providing total peace of mind.

- **60% online market share**
- **650k customer base**
- **3,000,000,000 litres sold**
- **"Excellent" Trustpilot rating**

1,500,000
Searches

300,000,000
Litres sold

4,500,000
Fuel tank readings



10,000,000
Web page views

2,300,000
Postcode prices

3,000,000
Prices generated

Customers

"When is a good time to order?"

"What are prices going to do?"

"Where is my oil?"

"How much fuel do I have?"

Boiler Juice

Suppliers

"What's the market doing?"

"How is my market share?"

"Where is there volume?"

"How can we grow revenue?"

How we use our data to solve for them, today?

Customers

Save time and money

- Historical price & order information data
- Supply systems integrations & OM tooling
- Tank telemetry & predicted order windows

Suppliers

Opportunity & efficiency

- Quote demand & conversion data
- Market pricing insights
- Lower admin/cost from reduced contact

What’s the opportunity for tomorrow?

- Live tank capacity + fuel availability & prices
- Instant routing - same day delivery
- Where’s my oil & where’s the tank!
- Dynamic market insight – data sharing

Is data, digitalisation, & systems integration for geeks or can it help in changing times?”

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Harnessing the Power of Data

Glyn Highfield

Fuelsoft
Powering your success

Fuelsoft Data Geek @ UKIFDA 2024

Glyn Highfield

Is data, digitalisation and systems integration for geeks or can it help in changing times?

In 2006, Clive Humbey, a well known data scientist, coined the phrase

“Data is the new oil”

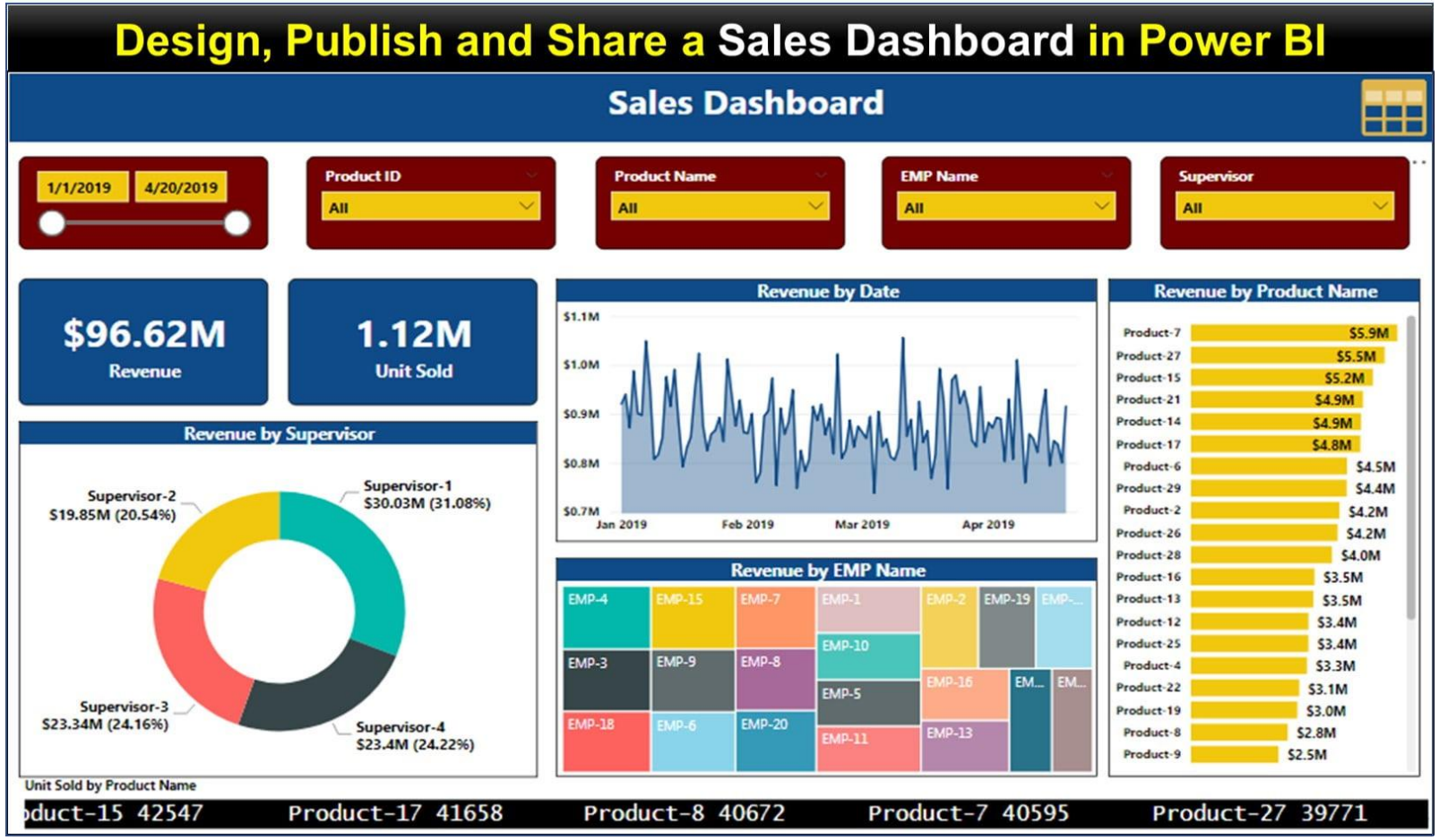
If we consider the importance of data

1) For informed decision making
2) For problem solving
3) For greater understanding
4) For improving processes
5) For understanding behaviour

How do we analyse and integrate our data

- Data Warehouse and Power BI
- Boilerjuice for order transmission
- Debit and credit card gateways for card payments
- In cab computers such as Touchstar, Dreamtec and DTS
- Sales and marketing databases such as Dynamics CRM

Power BI & Data Warehouse



How do we protect our data

1

Cyber Security

2

Encryption

3

Granular Access

4

Backup

Cyber Essentials – Is it needed

- Reassure your customers that you are working to secure your IT against cyber attack
- Attract new business with the promise you have cyber security measures in place
- You have a clear picture of your organisation's cyber security level
- Some Government contracts require Cyber Essentials certification

“If it's smart and online, it's vulnerable. It takes years to build a reputation and only a few minutes for cyber incidents to ruin it. Security should be a high priority within your business. If you can't afford security, you can't afford a data breach”

Thank you

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Harnessing the Power of Data Roundtable

Q & A

touchstar technologies ltd

BoilerJuice Platform of Choice

FoxInsights

Fuelsoft Powering your success

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What next for the markets?

James Spencer

Where next for the Oil Markets?

James Spencer, MD Portland, April 2024

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Portland

- Work across the fuel and energy sector
  - Energy Hedging for small to medium sized fuel and energy users
  - Emergency Stock Tickets / Delegations
  - Diesel & Renewable Diesel Suppliers (bulk and fuel card)
  - Renewable Fuel Certificates, Carbon Emissions and Voluntary Offsets
  - Importers and wholesalers of Automotive Urea into UK
  - Manufacturers of Diesel Emission Reducers (AdBlue) and Exhaust Fluids
  - Global Fuel Advisory Services
  - Data and Pricing Service

Energy Market Reality Check

Energy Consumption Figures: Tonnes Oil Equivalent (Billions)

Country	**1999**	**2014**	(14/Head)	**2029?**
USA	2.24	2.27	7.09	1.85
China	0.95	2.85	1.78	9.23
Russia	0.61	0.70	4.83	0.84
India	0.28	0.59	0.49	6.92
Japan	0.51	0.47	3.73	0.73
Canada	0.29	0.33	10.31	0.18
Germany	0.33	0.33	4.40	0.43
Britain	0.29	0.30	4.62	0.37
Brazil	0.18	0.28	1.39	1.16
TOTAL	**5.68**	**8.12**	**5.77*OECD**	**21.71**

Latest figures…

Country	**2022**	**% vs 2014**
USA	2.18	-4%
China	3.80	33%
Russia	0.82	17%
India	1.01	71%
Japan	0.41	-13%
Canada	0.30	-9%
Germany	0.27	-18%
Britain	0.19	-37%
Brazil	0.31	11%
TOTAL	**9.61**	**18%**

Market Driver No 1: Oil

2018

- Exploration flying / Refining stagnant
- Crude drives the markets and Chinese demand growth enormous
- Supply is struggling to keep up with demand

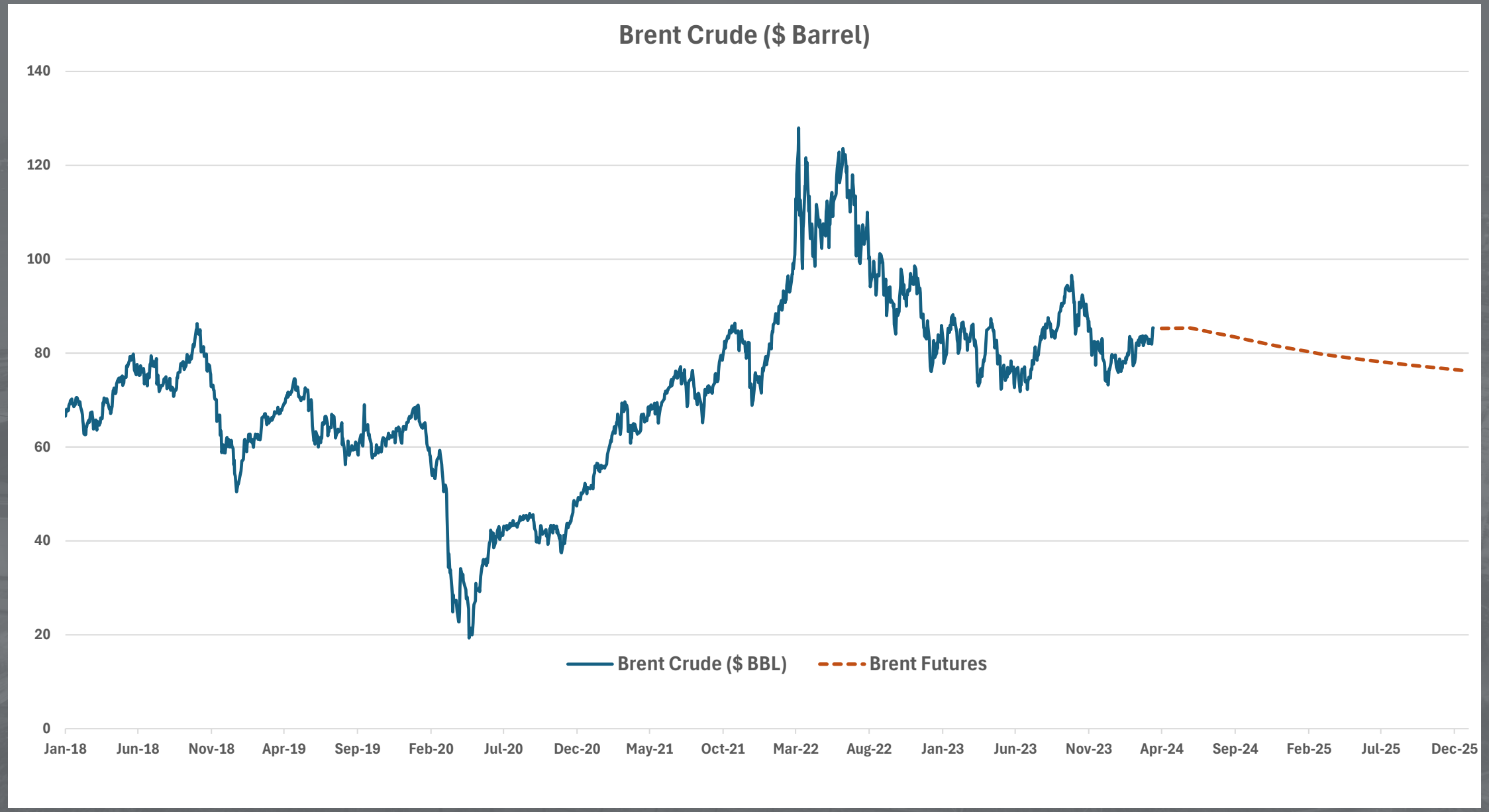
2024

- Demand growth is muted
- Lots of new oil fields coming on stream generating a surplus
- The “Golden Age” of Refining is now just the “Silver Age”
  - but still a lot better than 2018

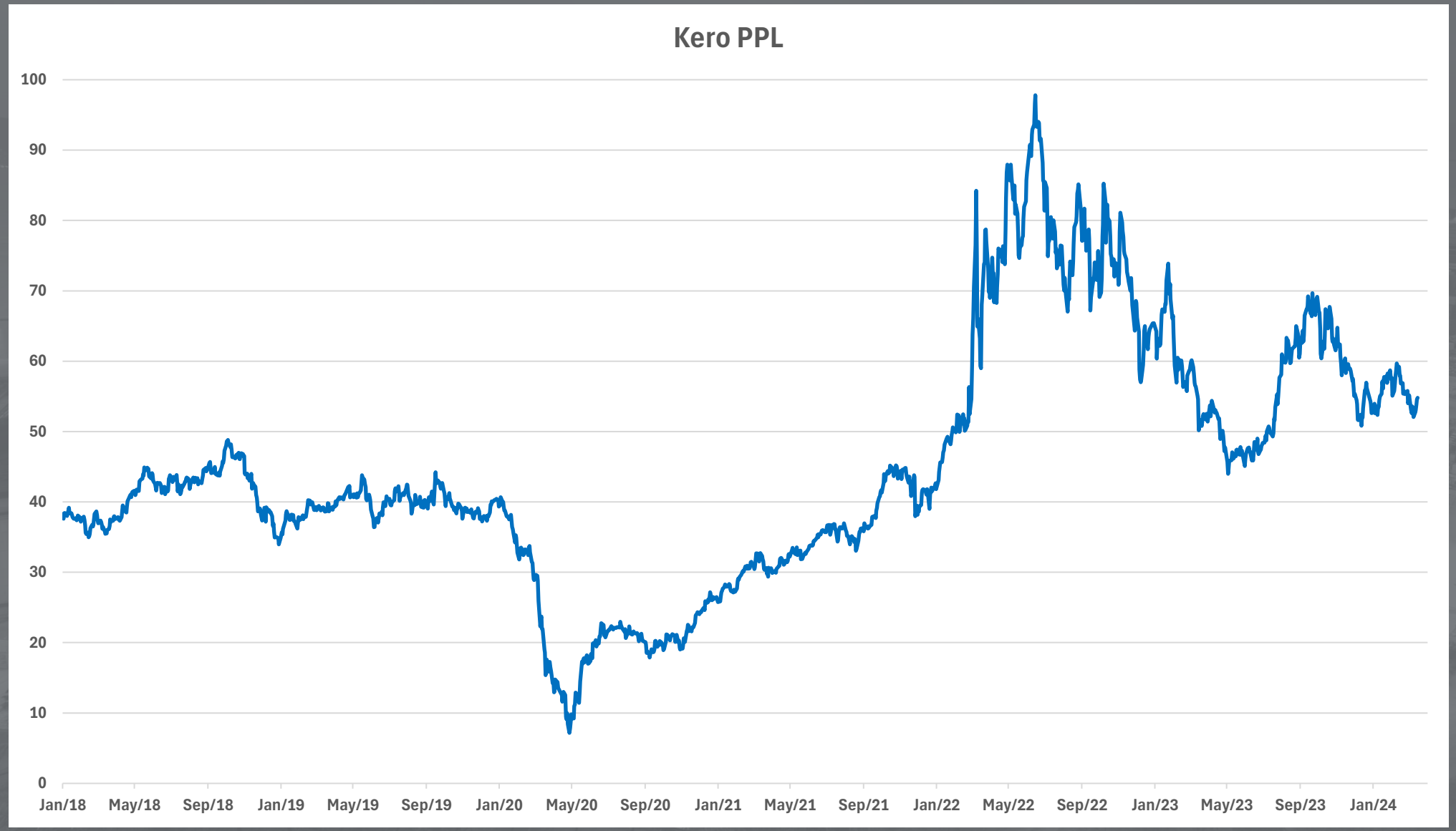
2030+

- Long-term exploration investments under pressure
- Culmination of peak demand…?
- Refining remains in a good place

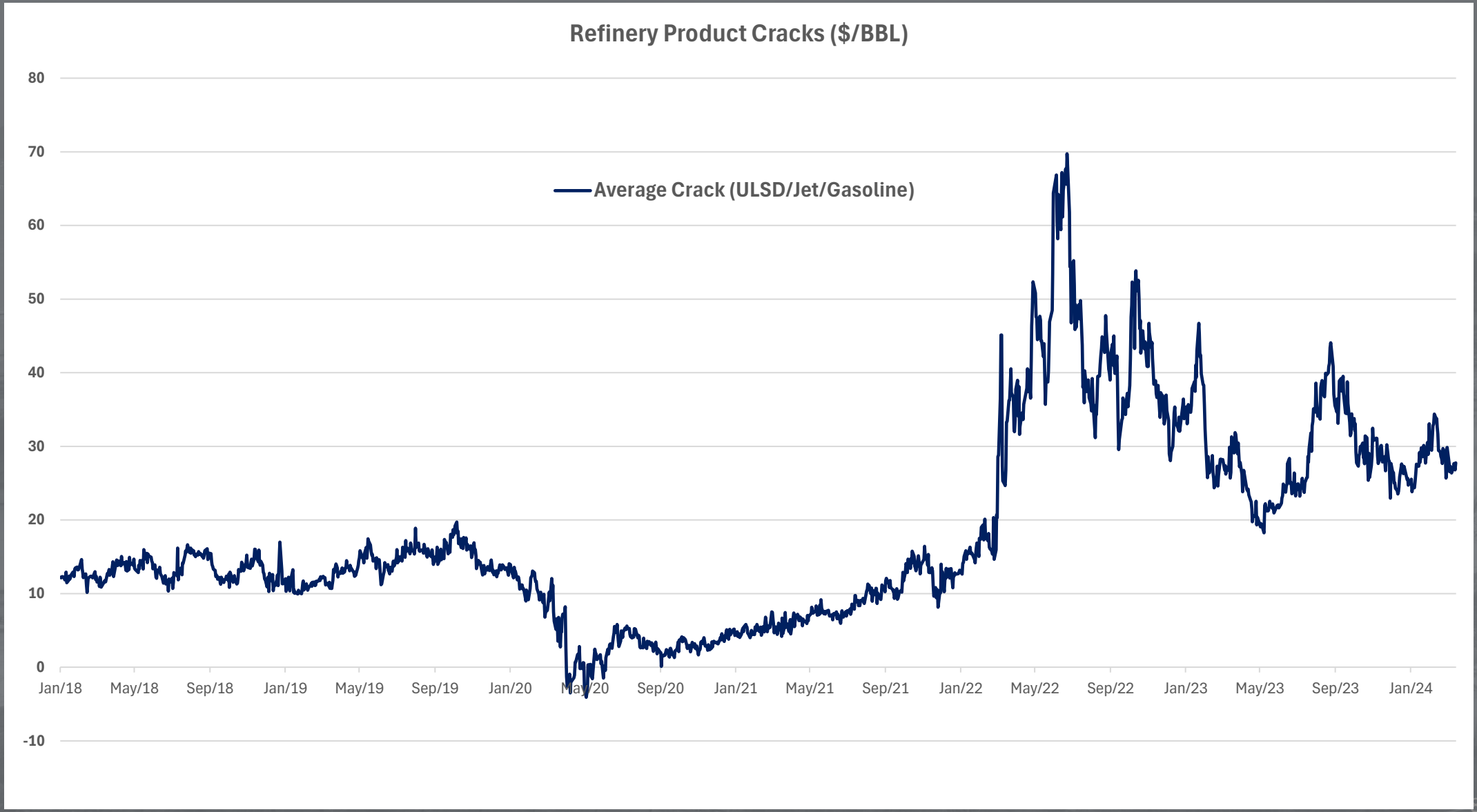
Oil Prices ($/bbl): 2018 – present day – futures (2025)



JetA1 / Kerosene Prices (ppl): 2018 – present day



Refinery Margins / Crack Spread ($/bbl): 2018 – present day



Market Driver No 2: Automotive Mobility

2018

- Most batteries expend more energy in production than they produce
- Electric bus battery costs three times more than the bus itself
- “The majority of new cars coming off production lines will be electric by 2025” JS at North American Petroleum Marketers Conference
  - ….not particularly well received!

2024

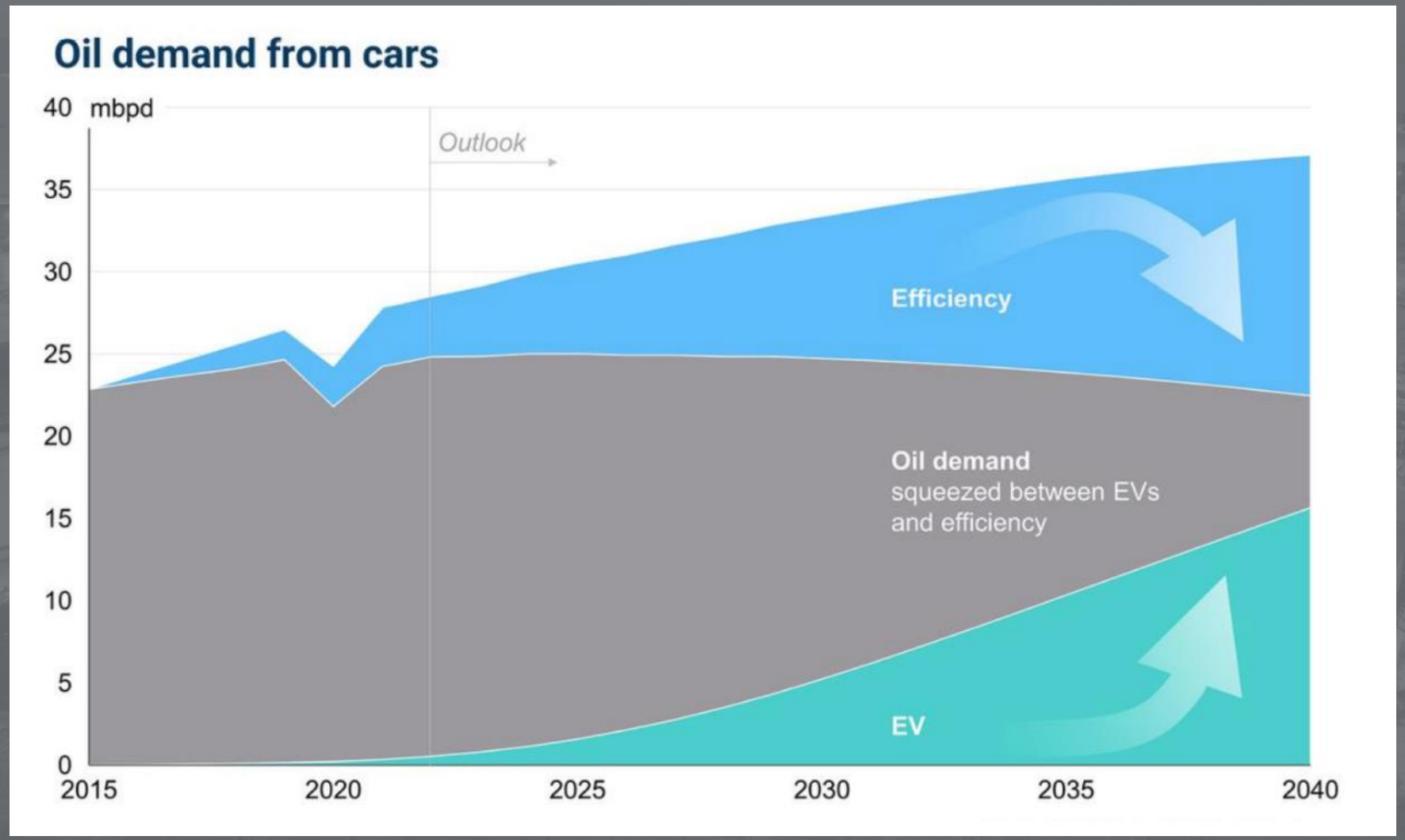
- Battery range significantly improved
- Significant reduction in cost of batteries (50%+)
  - Less so with “heavy duty” transport batteries, ie, electric bus still x2.5 more expensive than new diesel bus

2030+

- All new cars will be hybrid / electric with minimum 100m electric range
- Major environmental issues with battery metal mining and processing
- Europe to pay dearly for China’s domination of e-batteries

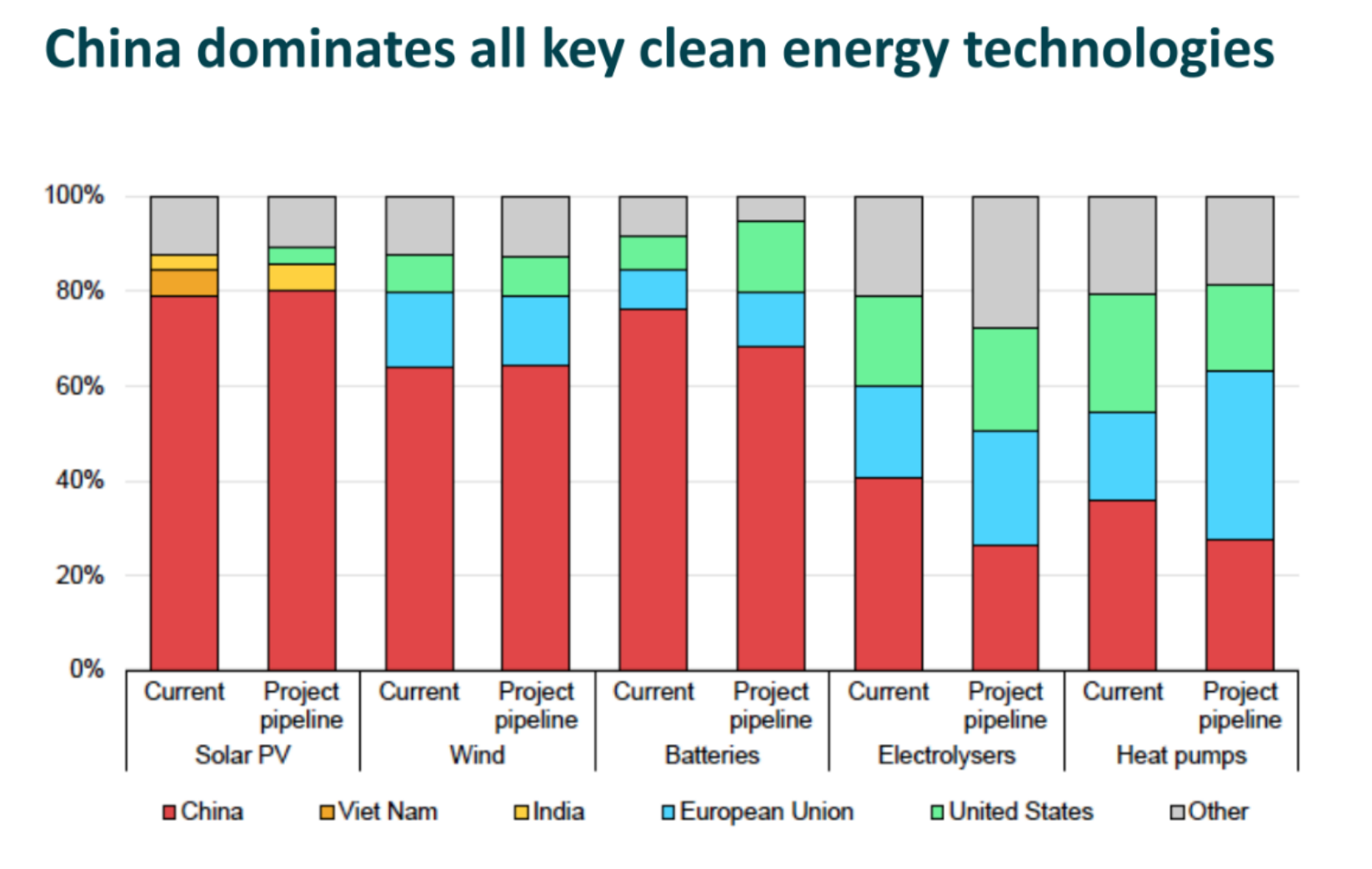
Reduced automotive oil demand

cars are more efficient and going electric...



Dangerous reliance on China for e-batteries

and every other form of renewable energy…



Market Driver No 3: Biofuels

2018

- Biofuels targets have led to mass deforestation in parts of the tropics
- “Food vs Fuel” remains controversial

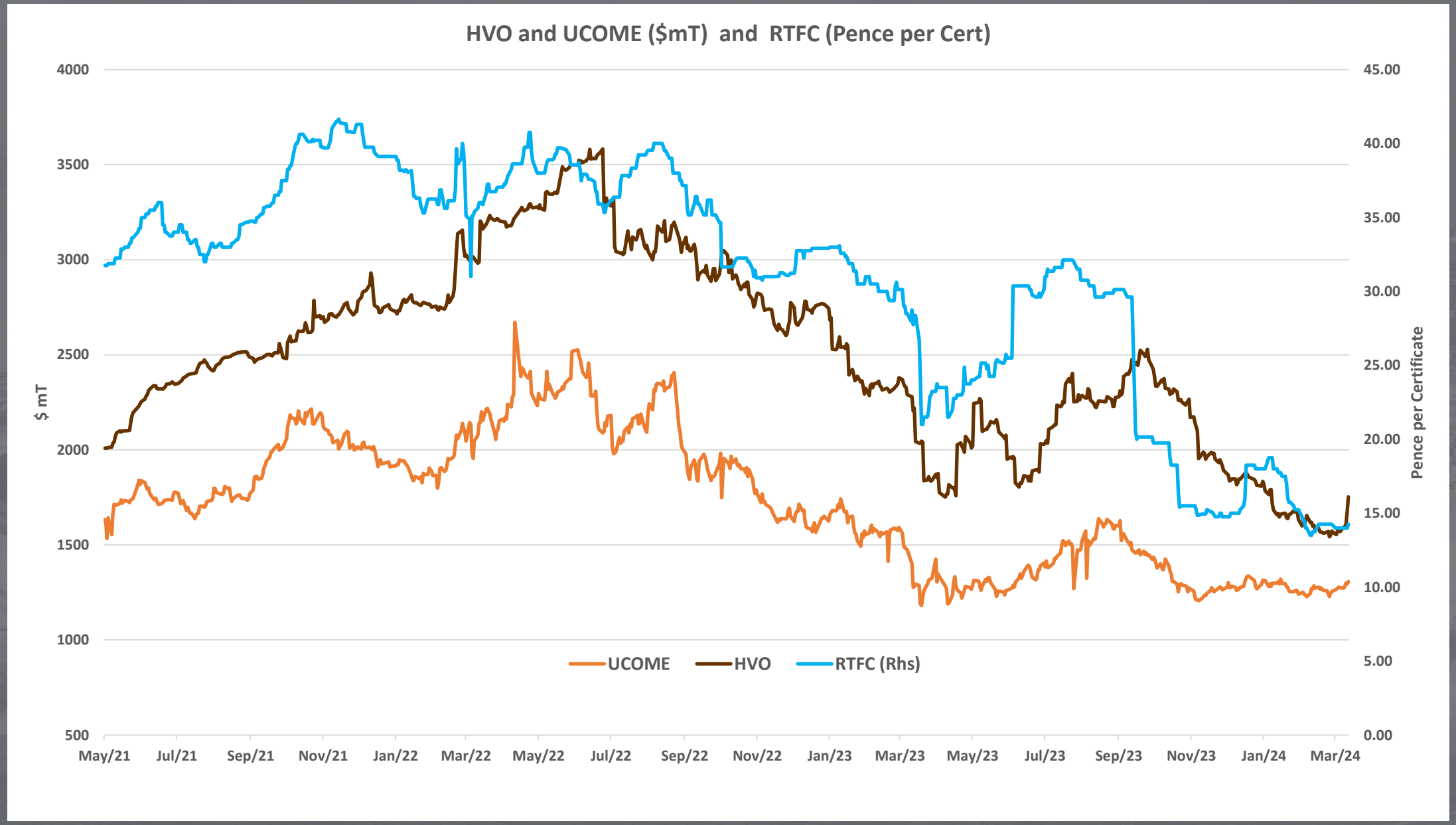
2024

- Liquid fuels still the only viable option for heavy mobility
- Tougher legislation has reduced deforestation and food vs fuel debate
  - Although still spectacular fraud in Asian used cooking oil markets
- HVO (Renewable Diesel) taking over as “biofuel” of choice

2030+

- Traditional biofuels (blended with diesel) will plateau at 20%
- HVO will account for a further 20% of heavy-duty diesel pot
- System will continue to have “scandalous” loopholes

Biofuels Prices ($/t): 2021 – present day



“Leftfield” Market Driver: Solar Power

2018

- Utilisation of the ultimate energy source, but you need the sun to shine
- Solar storage progressing rapidly
- “only 10% of energy mix (maximum) likely”, JS at York Business Event

2024

- Incredible progress in solar technology – sun no longer needs to shine!
- 80% reduction in costs of solar panels
- “Smart money” moving from wind to solar investment for power gen
  - $360bn invested in Solar in 2023 vs $220bn in wind (and $50bn in gas)
- JS 10% prediction looks plain wrong…

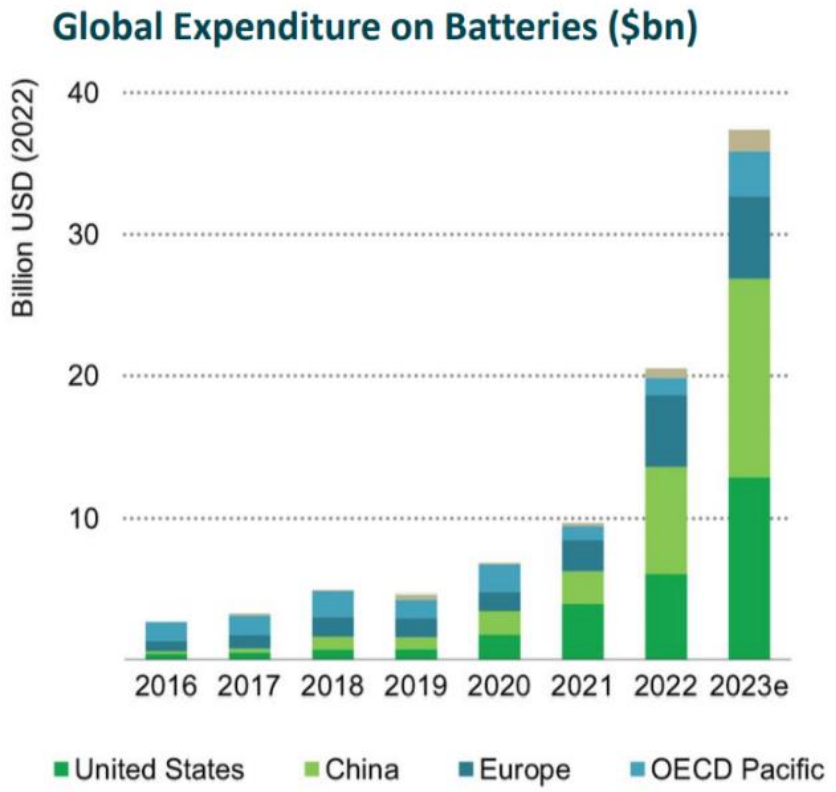
2030+

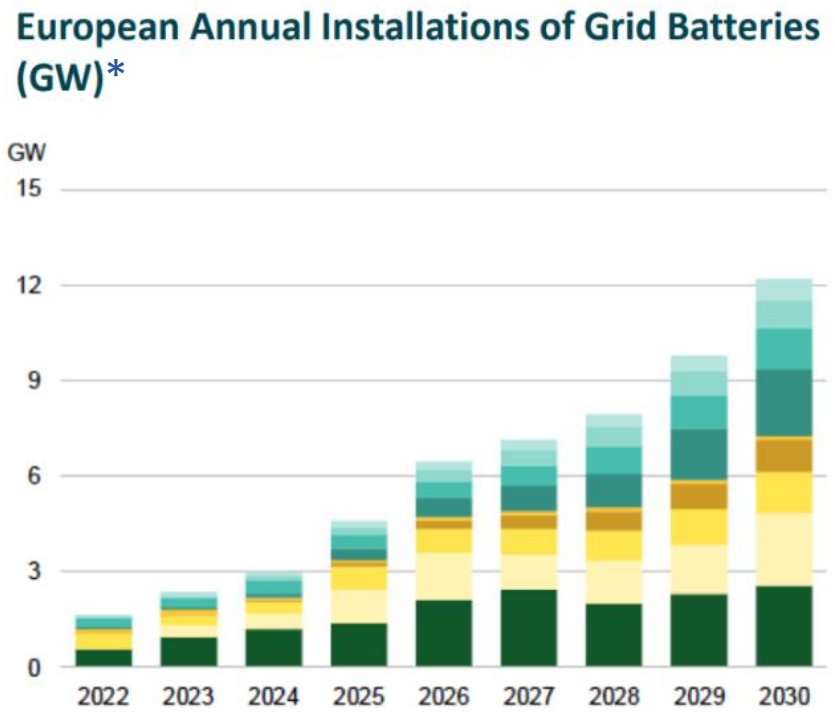
- “Scientists envision 20-fold increase in solar PV power by 2030” (GASERI)
- Relentless growth – at least 15% of electricity generation by 2030
- Coupled with exponential growth in solar battery storage

Growth in Grid scale battery storage

solar utilisation and grid balancing

Investments in grid scale batteries are booming



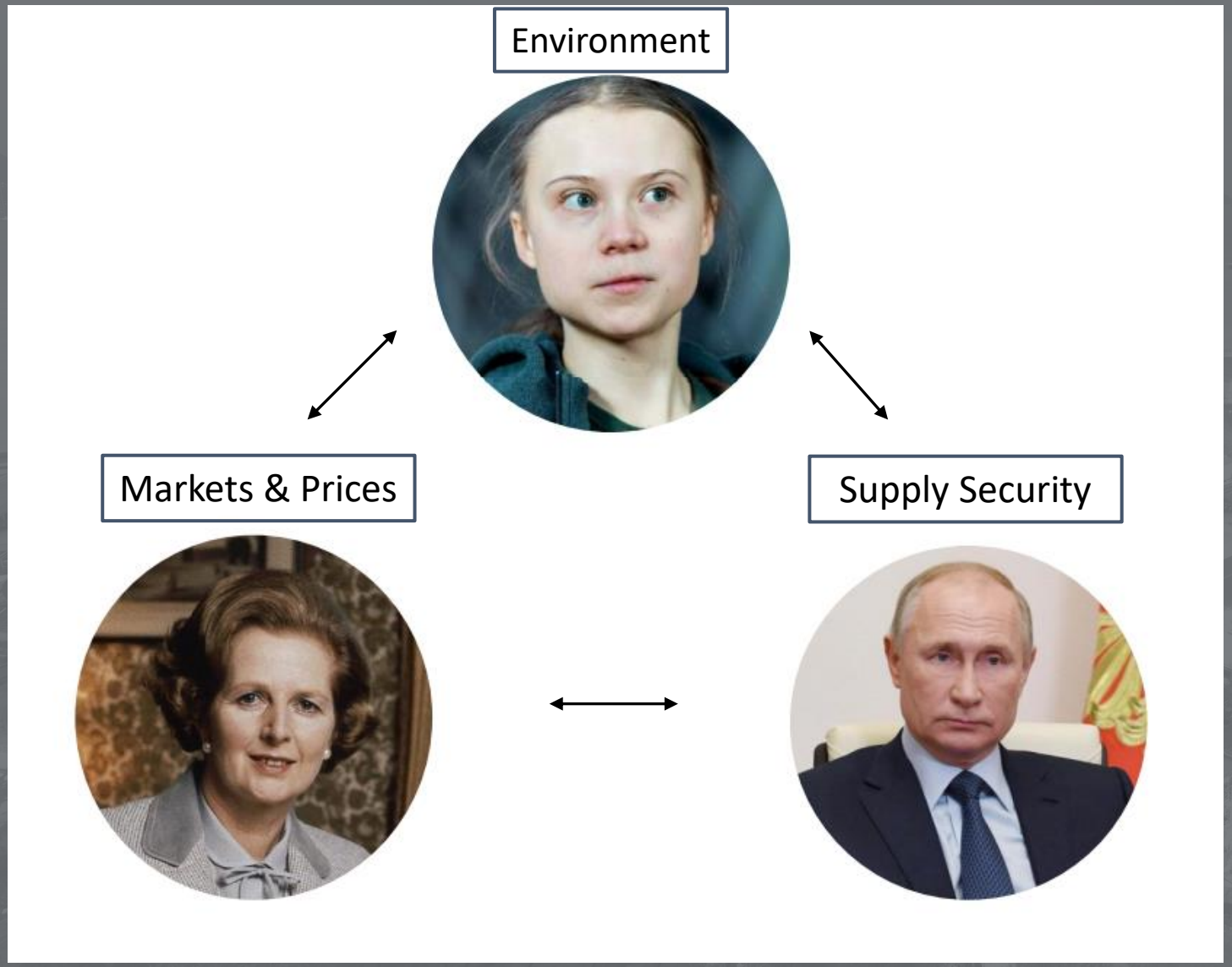


** 1GW = 1bn watts*

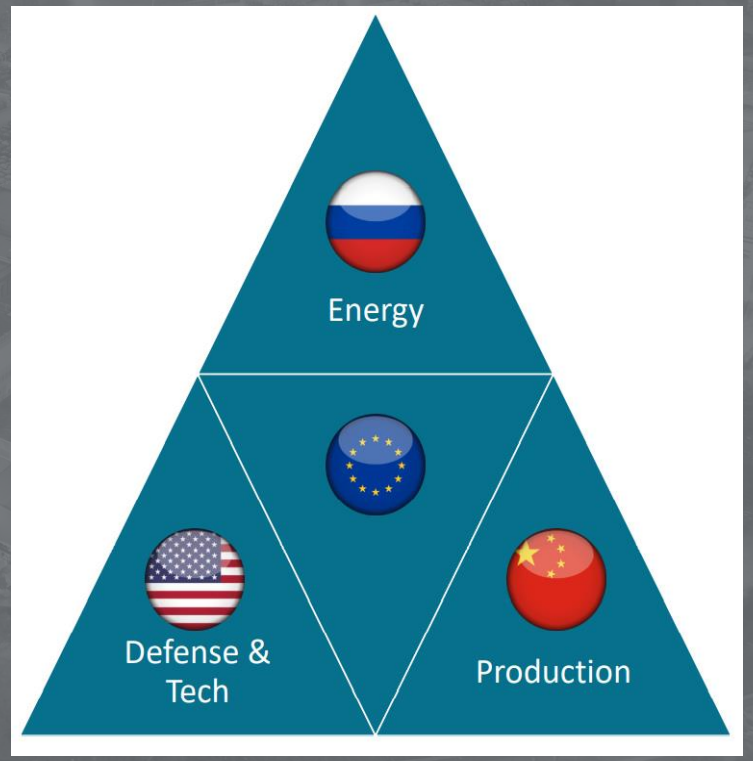
1GW = powers 750K homes pa ~ Merseyside

1.21GW = Doc Brown's DeLorean from BTTF

Macro Market Drivers: the energy "trilemma"…



…and a new one for Europe…



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