RenewableNI

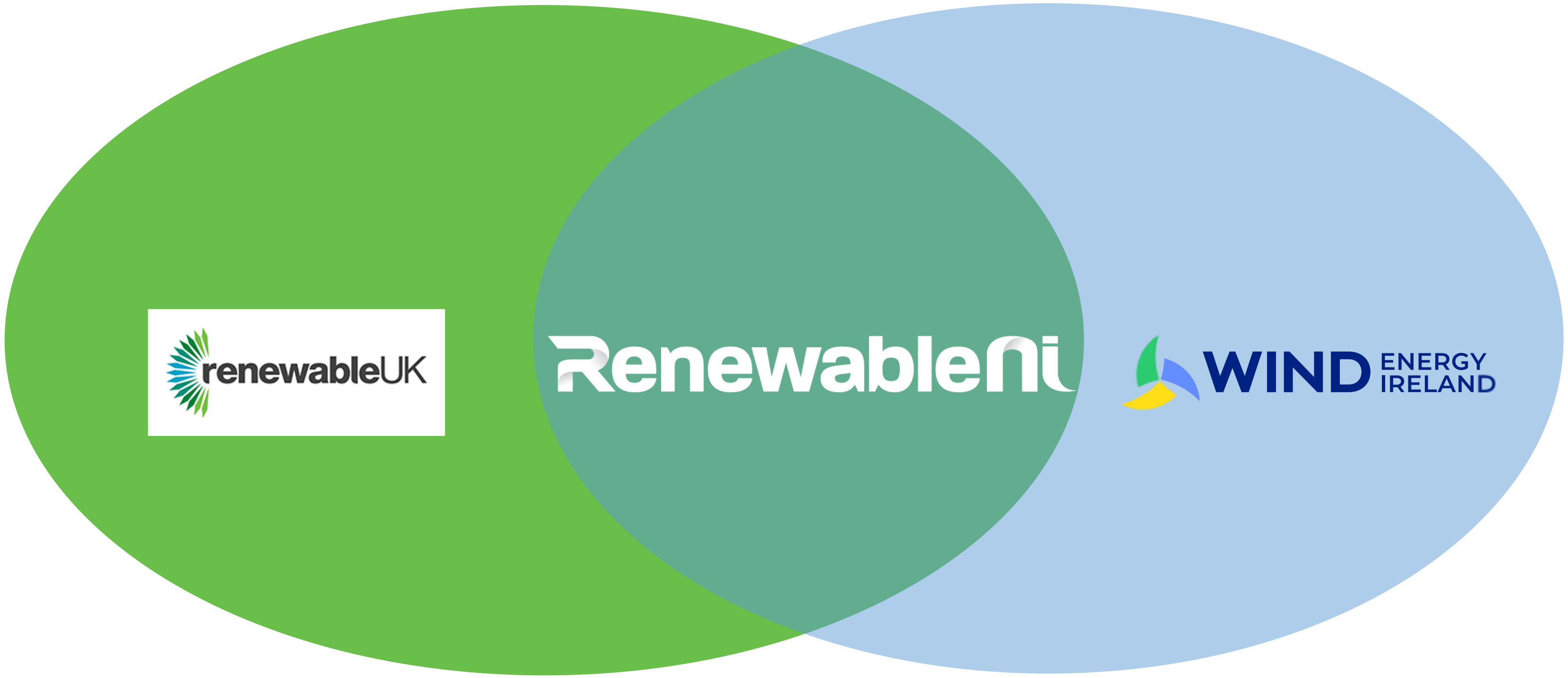
Achieving Zero

Steven Agnew, Director

RenewableNI

RenewableNI is the trade association and voice for the renewable electricity industry in Northern Ireland.

Engaged in wind, solar, tidal and battery storage, our members make up a large majority of the renewable industry supply chain.



Our Members

From 40 by 20 . . .

. . . to 0 by 50

RNI Key Objectives

- Zero-carbon power by 2035
- 80% renewable electricity by 2030

Enabled by:

- Renewable electricity support scheme
- A facilitative planning system
- NI offshore leasing round

www.RenewableNI.com/policy

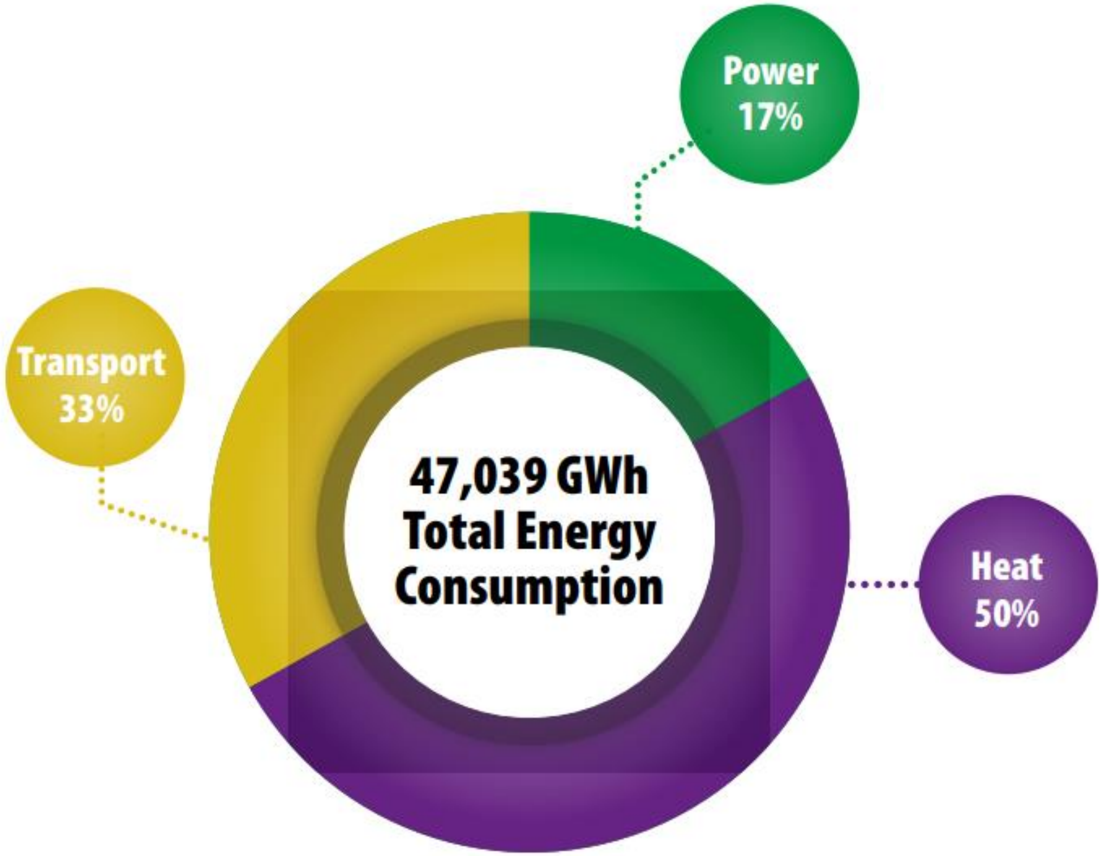
CO_2 Reductions

- Power ~45%
- Transport ~2%
- Heat ? (likely less than 5%)

From July 2021 to June 2022, 47% of total electricity consumption in was generated from renewables.

If you want to decarbonise something, put a plug on it!

Chart 5.2 Total Final Energy Consumption by Purpose in Northern Ireland, 2017



Source: DfE/NIE Networks[145], Utility Regulator[146], BEIS[147]

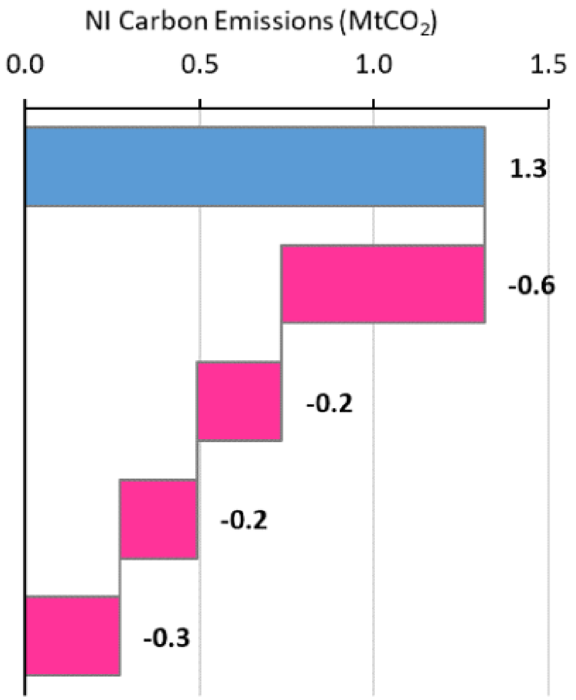
Zero-Carbon Power by 2035

The International Energy Agency Net Zero by 2050 roadmap sets 2035 as the point by which all advanced economies must achieve a fully decarbonised power system.

This target is echoed in the Committee on Climate Change (CCC) Sixth Carbon Budget.

Table 2: NI power sector RES-E and CO_2 emission savings of Phase 2 solutions

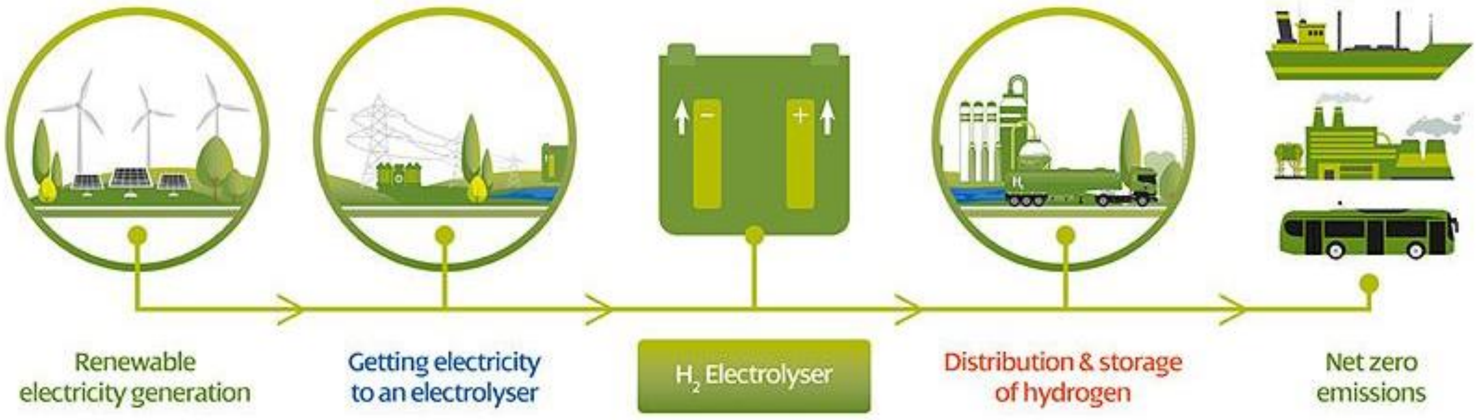
Scenario	NI RES-E Percentage	NI CO_2 Emissions
70% Alignment	69%	1.3 $MtCO_2$
80% Ambition	84%	0.7 $MtCO_2$
Aligned Carbon Price	93%	0.5 $MtCO_2$
Green Hydrogen	88%	0.3 $MtCO_2$
Zero Carbon	89%	0 $MtCO_2$



Renewable NI
Achieving Zero

Baringa

Hydrogen: Any colour so long as it's green!



Hydrogen will be needed to provide back up generation for when the sun doesn't shine and the wind doesn't blow. Of course, the hydrogen must be **green.**

Deployment of 310 MW of electrolysers in NI is able to displace 0.2 MtCO2 by producing green hydrogen, utilised in retrofitted fossil gas-fired power stations.

Powering A Green Economy

Onshore Wind

- ✓ Additional 1.1GW capacity
- ✓ Up to 1,000 additional jobs
- ✓ £3.1bn GVA

Offshore Wind

- ✓ Additional 1.5GW capacity
- ✓ Up to 1,500 additional jobs
- ✓ £2.4bn GVA

Thank you!

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RenewableNI
Achieving Zero

BUILDING BLOCKS OF A DECARBONISED NI MARKET: THE CONSUMER PERSPECTIVE

Noyona Chundur

Chief Executive, Consumer Council

Citizens are consumers

Our vision

To protect and empower consumers in Northern Ireland.

Our mission

To be the trusted go-to organisation for consumers in Northern Ireland. To work with governments and stakeholders to inform policy and decision making, using our research, insight and expertise to deliver positive outcomes for consumers.

Statutory body

Extensive general powers and areas of statutory focus that represent, protect and empower consumers, with non-statutory functions covering unfair practices in any market.

Consumer interests

Champion consumer interests by investigating complaints, carrying out research, and disseminating advice, information and outreach.

Work collaboratively

Collaborate with government, regulators, industry, academia, the third sector and civic society to safeguard and advance consumer protections in Northern Ireland.

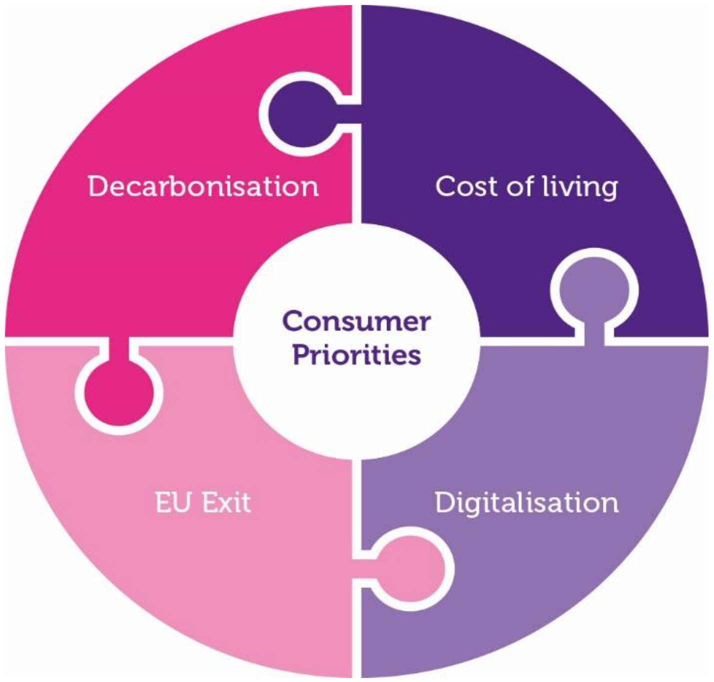
Citizen centric

Work to influence any public policy affecting Northern Ireland consumers, so it is citizen centric and supports inclusive economic recovery.

How we work

UNITED NATIONS CONSUMER PROTECTION PRINCIPLES
access || choice || safety || information || fairness || representation || redress || education

Corporate Plan 2021-2024



Strategic objectives

- **Understand** consumers
- **Influence** policy
- **Represent** consumers
- **Protect** consumers
- **Empower** consumers

Northern Ireland consumer position

Consumer context

Population	Finances	Spending
Northern Ireland has a population of just over 1.9 million with 768,900 households.	Households in Northern Ireland save £3,000 less than the UK households, and 17% are over-indebted.	In July, average weekly household discretionary income fell to £93 compared to the UK average of £204.
36% of our population live in rural areas, more than double the UK average.	44% of families in Northern Ireland have no savings compared to 16% in the UK, and 12% of adults have no savings.	In March, the Consumer Council estimated fuel poverty at 34% but by August the University of York estimated 76% of households by 2023.
Lower healthy life expectancy, almost double the disability claimants at 12.4% and reported disability of working age population is 21.7%.	74% of lowest earning household income is from social securities so withdrawal of Universal Credit uplift has had a disproportionate impact.	Average earnings in 2021 were £24,000 and when adjusted for inflation, earnings in 2021 (£21,505) are only equal to 2005 levels (£21,723).

Sources: NISRA: Census 2021 Population and Household Estimates | DAERA Key Rural Issues 2021; DEFRA Population and Migration Update, October 2021 | NISRA: UK National Welling Measures Northern Ireland Data | Asda: Asda Income Tracker July 2022; A Review of Fuel Poverty Levels in Northern Ireland, The Consumer Council, May 2022; University of York Fuel Poverty Estimates for the UK August 2022 | Importance of the Consumer to the Northern Ireland Economy, The Consumer Council, October 2022.

Consumer temperature check

During December 2021, the Consumer Council surveyed 972 Northern Ireland consumers.

Home energy price increases are the biggest concerns for 59% of respondents.

20% of respondents were not confident that they would be able to pay their bills in the next 3 months.

65% of respondents were trying to reduce their energy consumption in response to price increases.

26% of respondents were already spending over £150 a month on home energy.

To pay energy bills, 1 in 5 respondents will have to do without other essentials.

Petrol and diesel price increases were the biggest for 9% of the respondents.

Source: Consumer Council Pulse Survey Q3 2021-2022

Lowest earning households

Discretionary income per week

£230.27 - £201.41 = £28.86

Income after tax | Spending on basics | Discretionary income

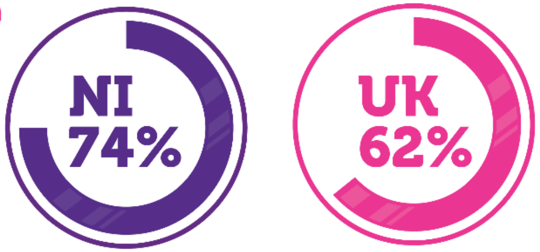
This is a reduction of £7/week (18.5%) compared to Q4 2021.

Gross household income per week

NI £234.82 | **UK £261.14**

11% lower than the UK.

Income from social securities (benefits)



Quarterly change: Q4 2021 to Q1 2022

+0.1% Income after tax	+3.5% Spending on basics	-18.5% Discretionary income
£230 to £230.27	£194.59 to £201.41	£35.41 to £28.86

Six-month change: Q3 2021 to Q1 2022

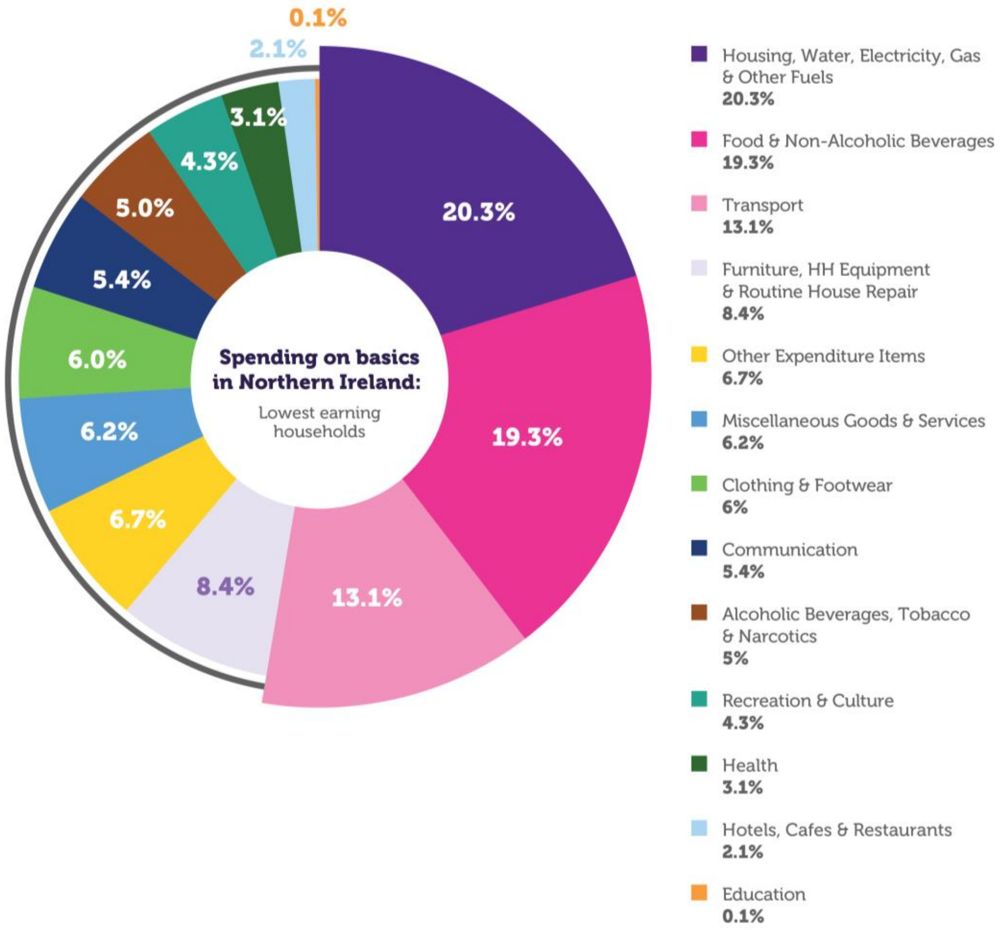
+0.3% Income after tax	+4.7% Spending on basics	-22.5% Discretionary income
£229.56 to £230.27	£192.34 to £201.41	£37.22 to £28.86

Yearly change: Q1 2021 to Q1 2022

+0.8% Income after tax	+22.7% Spending on basics	-55.1% Discretionary income
£228.39 to £230.27	£164.12 to £201.41	£64.27 to £28.86

Source: Consumer Council Northern Ireland Household Expenditure Tracker for Q1 2022, covering January to March. Average annual mid-point income for Quartile 1 households in Northern Ireland is £12,210.

Spending on basics

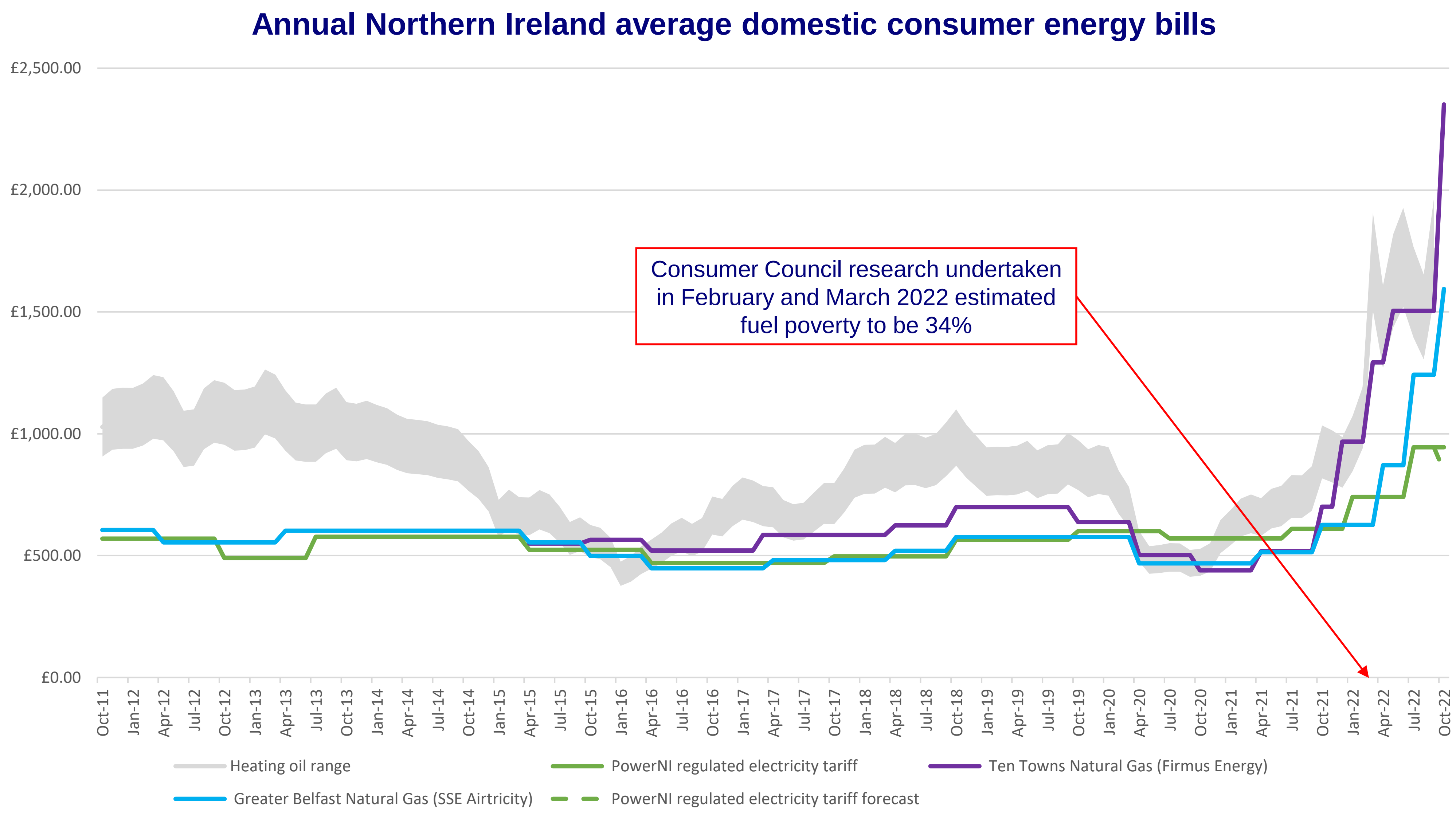


1,050 consumers were interviewed in September and October 2022 for the Consumer Council's most recent Pulse Survey:

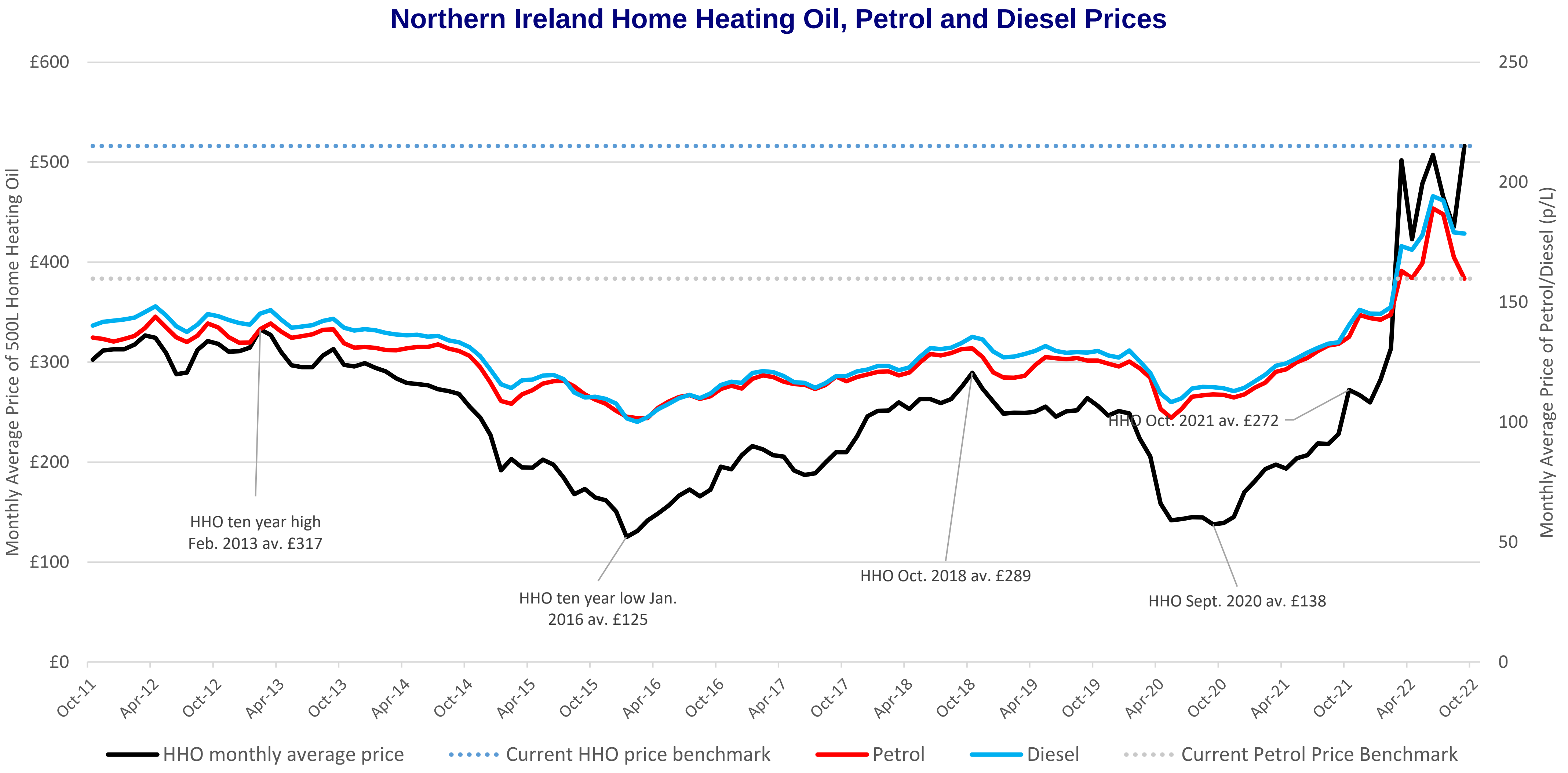
- Just over half of respondents believed they would be worse off in 12 months' time.
- 98% were concerned about the cost of home energy.
- 22% said they had £50 or less left in a typical month after paying their mortgage/ rent and essentials.
- 49% said their mental health had been negatively affected by their financial situation.

Source: Consumer Council Northern Ireland Household Expenditure Tracker for Q1 2022, covering January to March. Average annual mid-point income for Quartile 1 households in Northern Ireland is £12,210 | Consumer Council Pulse Survey Q2 2022-2023

Consumer energy bills



Home heating oil, petrol and diesel



Source: Home heating oil prices: Consumer Council data collated by tracking prices using price information sourced from suppliers via a combination of direct phone contact with suppliers or by using price information suppliers have published where it is available. We source price information from around 80 suppliers on a weekly basis to collate this data with approximately 6 suppliers surveyed per council area. | Petrol and diesel prices: The AA.

Consumers and decarbonisation

How we change hearts and minds

A SUSTAINABLE ENERGY FUTURE THAT WORKS FOR US ALL

Grow awareness and engender trust	Enable informed choices and decision making	Deliver policies to reduce fuel poverty and disruption
Influence consumer behaviours and attitudes	Meet expectations through protection and assurance	Show leadership, fairness and be open to innovation
Communicate effectively using accessible language	Offer tailored support and tangible incentives	Nurture collaboration across the whole system

Consumer attitudes to decarbonisation

Awareness	Little steps
There is a high level of awareness of climate change and the need for the world to reduce carbon emissions.	Smaller and more affordable changes are currently more palatable to people.
Alarm	**Other worries**
Climate change and news of extreme weather have alarmed people but hasn't driven those in our focus groups to action.	Health, education, and economic recovery from the pandemic are at the forefront of people's minds. Carbon neutrality comes further down the list of priorities.
Desire for direction	**Affordability**
Consumers are looking for leadership and practical things like financial help and information to help them make choices.	Cost is high on people's worry list. There's concern the better off will find change easier so help should be tailored to income.

Cost considerations for decarbonisation

Consumer	Short term support	Long term investment
Total cost of ownership is a concern covering upfront costs, cost of additional work, running costs and payback.	Consumer Council initiated fuel bank crisis support last winter, funded by industry and DfC, administered by Bryson, with similar scheme likely this year.	Cost of energy transition must be paid for in an equitable and socially inclusive manner, protecting the vulnerable.
Need to not only reduce energy bills and have greater control over how much is being spent on energy.	EPG brings unit price of domestic electricity bills down by 19.91p/kWh & unit price of gas down by 4.2p/kWh until April 2023.	An integrated energy system that is reliable, flexible and maintains security of supply at least cost to consumers.
Support covering upfront costs with the appropriate incentives (and disincentives) to nudge behavioural change.	£400 discount on electricity bill from the EBSS with additional £100 for alterative fuels, plus Cost of Living Support and Disability Benefit payments.	Empower and enable local communities to secure buy-in, and share financial rewards with them and consumers.

Steps businesses can take to help consumers

Information	Governance	Demand
Provide simple, concise information, education and technical advice to all consumers.	Enable justified confidence because robust protections are in place to prevent harm.	Make energy demand reduction and energy efficiency measures easy for consumers.
Vulnerability	**Consumer centric**	**Cost**
Protect vulnerable consumers and look for of emerging vulnerabilities.	Become ever more consumer centric in planning and delivery of products and services.	Prioritise low and no cost solutions to the benefit of company and consumer.
Tailored approaches	**Fairness**	**Risk**
Tailor your approaches for the wide range of population groups and needs you serve.	Balance the needs of micro-generators, early adopters and those at risk of vulnerability.	Work to reduce innovation and investment risk to both the company and the consumer.

The Consumer Council

THANK YOU

Enabling Green Investment

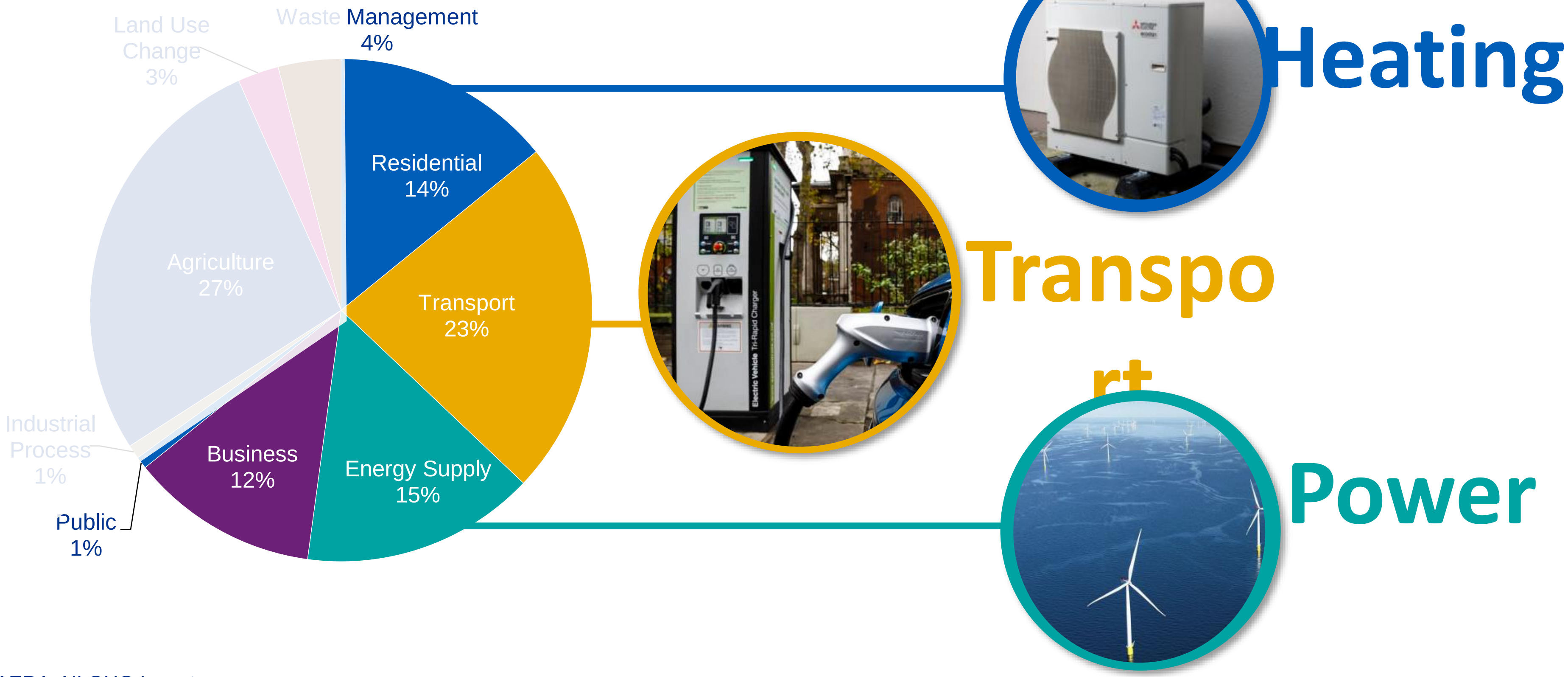
Russell Smyth

October 2022

NI’s Decarbonisation Pathway

NI Energy Strategy aims to reduce energy related emissions from 12.6MT in 2018 to 7MT in 2030

NI GHG Emissions by Sector (2018)

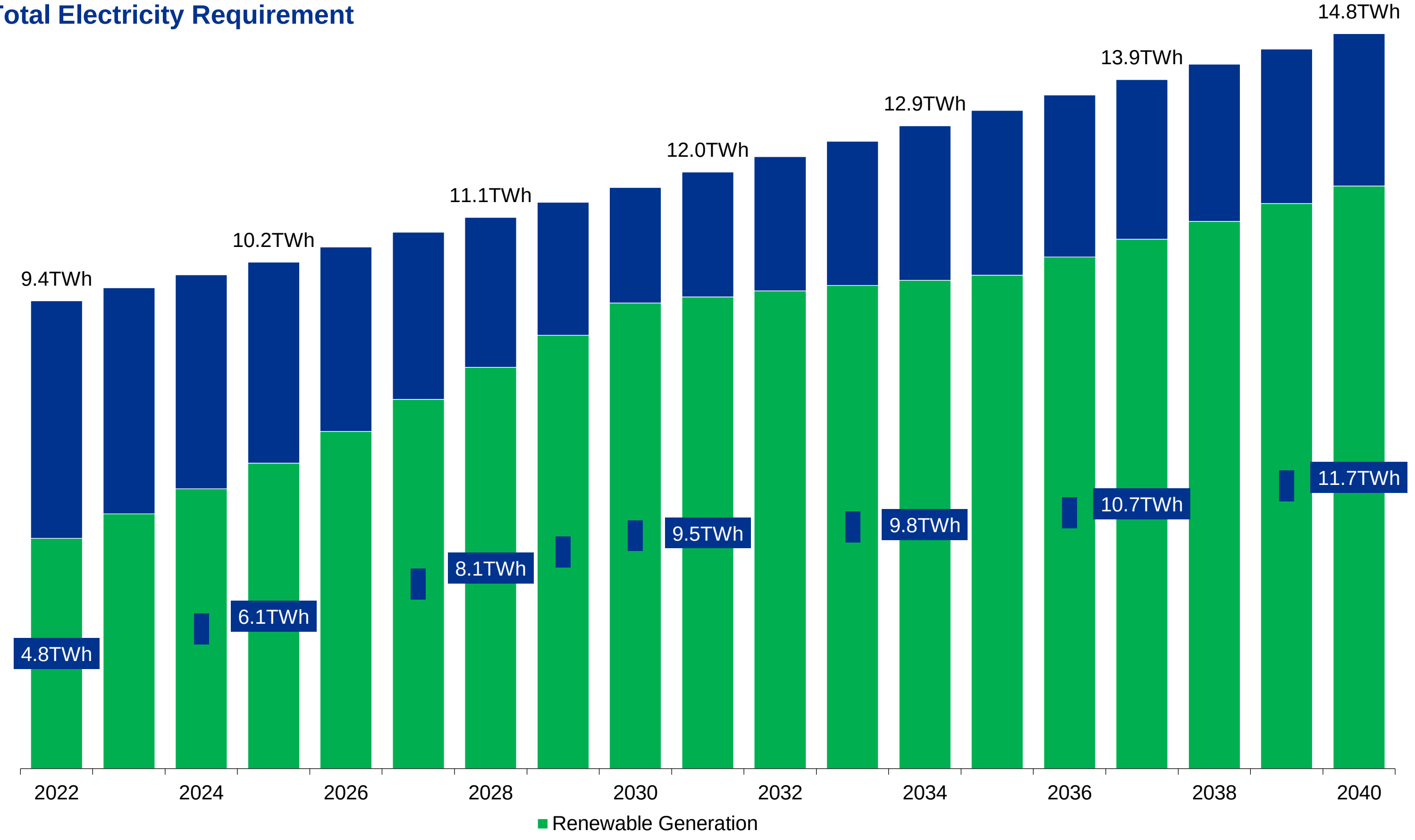


Source: DAERA, NI GHG Inventory

Power Generation Decarbonisation

- **Electrification of Northern Ireland is consistent with a target of 80% renewables** in the power generation system by 2030.
- **In the period 2022 to 2030 renewable capacity displaces fossil fuel generation from the power system** – primarily gas-fired capacity. In the following years is it meets the increasing demands of heating and transport.
- **The power network will require additional investment** to support this transformation.

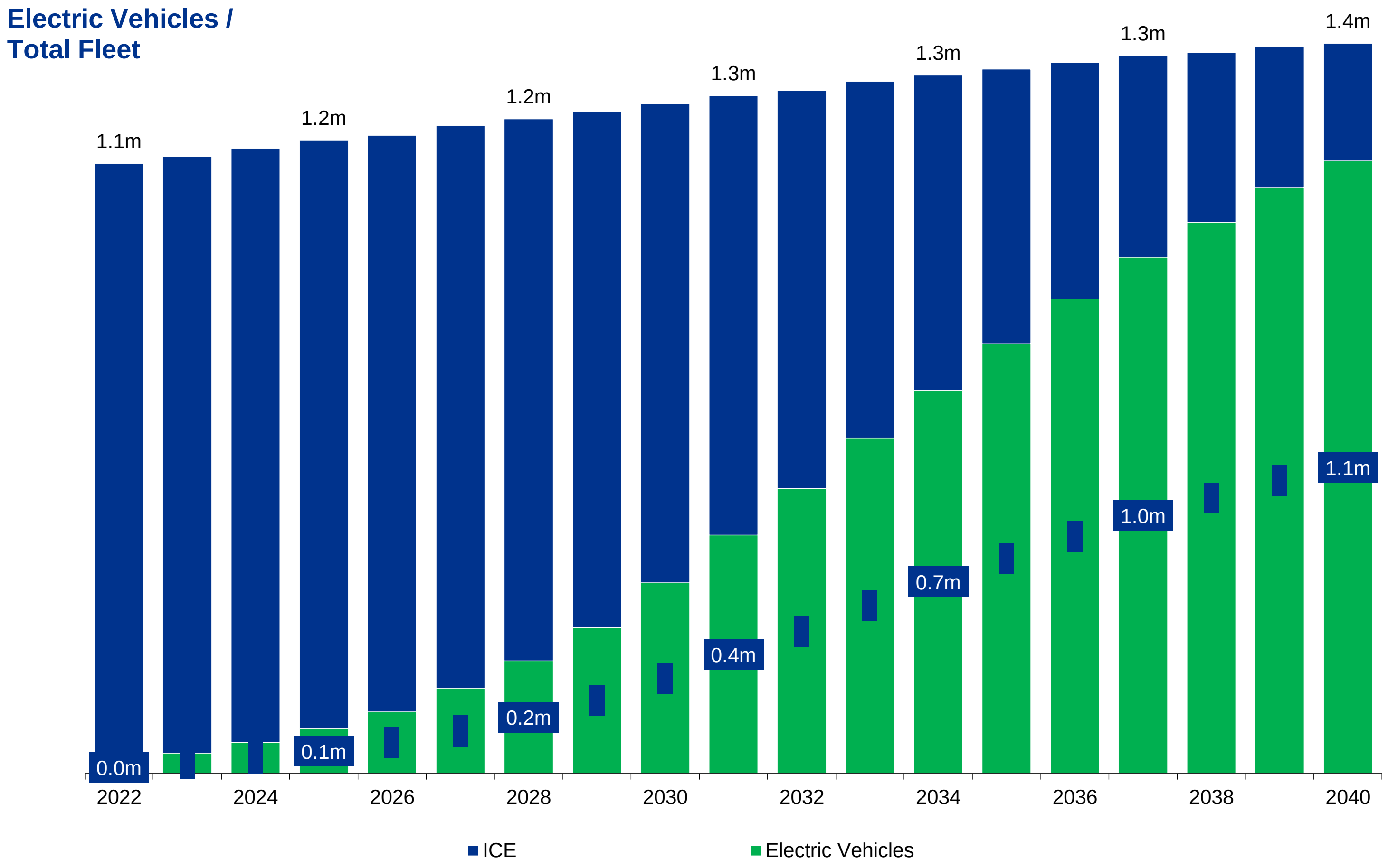
Renewable Generation / Total Electricity Requirement



Source: SONI (2021), KPMG analysis

Electrification of Transport

- **By 2040 electric vehicles could represent 84%** of all cars and taxis in Northern Ireland.
- While some new **EV stock would meet demand growth**, the vast majority would displace existing ICE stock.
- From **2035 onwards new electric vehicles would have gathered sufficient** traction that many of the newly-purchased units would be required to displace first-wave EV stock.

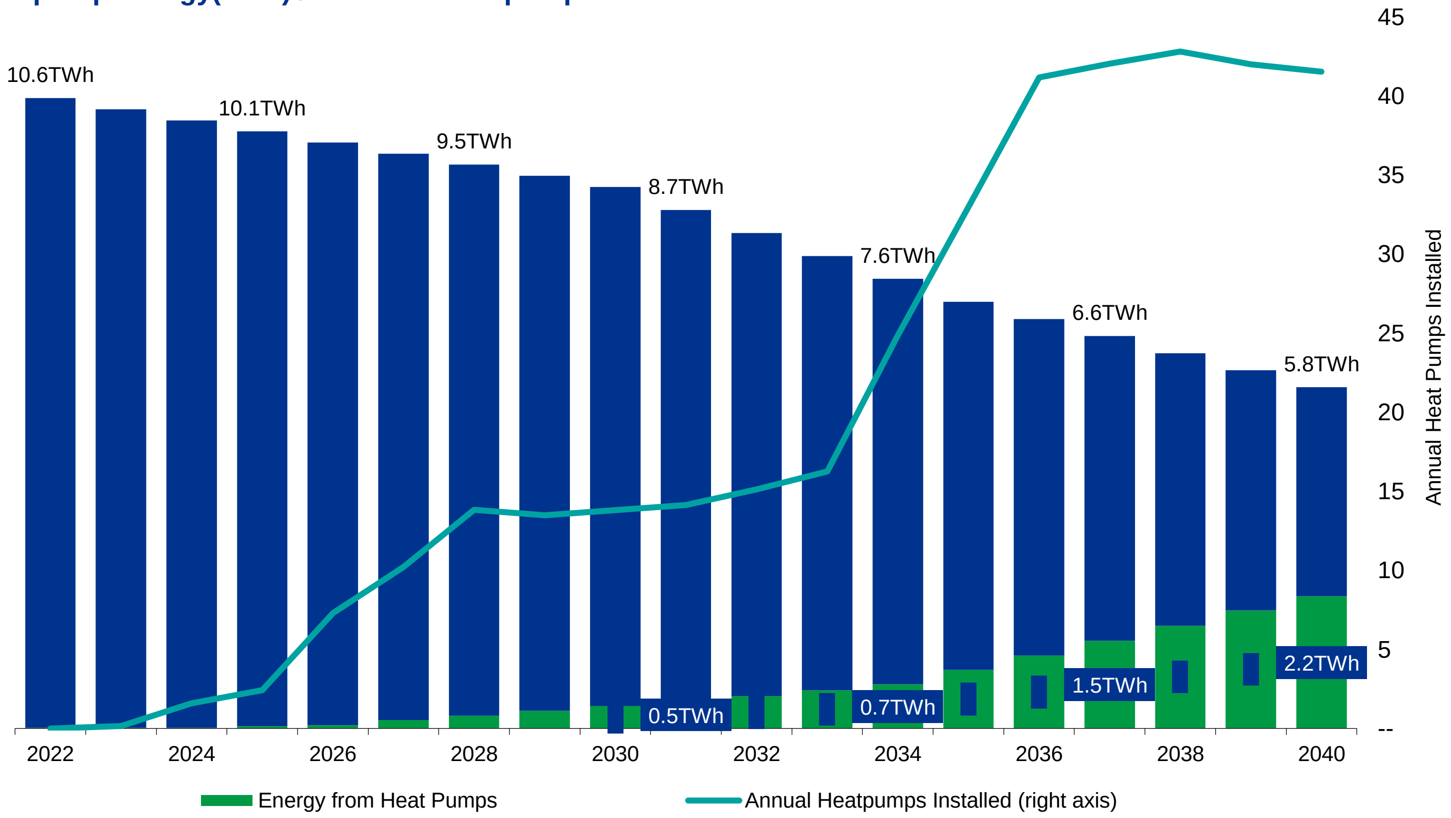


Source: Element Energy

Decarbonisation of Heat

- **Electrification of building heat could see heat pumps reach c.375k** in Northern Ireland by 2040.
- **94%** of these heat pumps are expected to **be installed in residential buildings**.
- £0.6b Investment in heat pumps

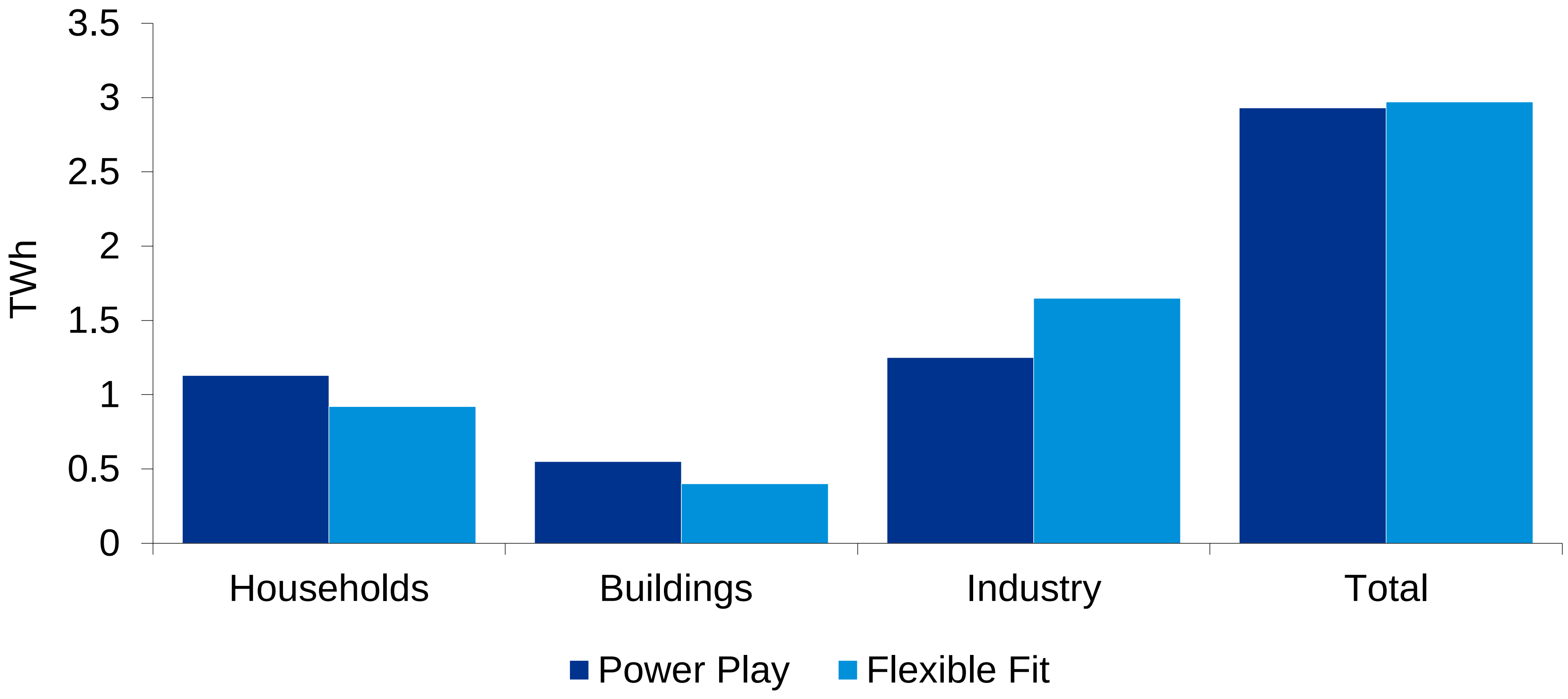
Heat pump Energy(TWh) / Installed Heat pumps



Source: SONI, Tomorrow's Energy Scenario, KPMG analysis

Biomethane is a key component of the NI Energy Strategy

Biomethane Heat Demand in the NI Energy Strategy



Source: NI Energy Strategy

Renewable Gas Report

KPMG was commissioned by **Action Renewables** to:

“Examine the potential role that renewable gases can have in NI’s decarbonisation pathways, and potential government policy mechanisms that could be introduced to stimulate its production and uptake”.

Level of Biomethane Ambition

1.4 TWh biomethane target for 2030

- NI's 80 AD plants already produce the equivalent of c.1TWh
- We have enough feedstock potential – 6.3TWh+
- Existing gas system can accommodate without change
- In-line with NI Energy Strategy Trajectory
- Requires 70 x 20GWh biomethane AD plants

Highlights from the report

1.4 TWh biomethane target for 2030

1.2 MT CO_2 savings achievable (330k tn per annum)

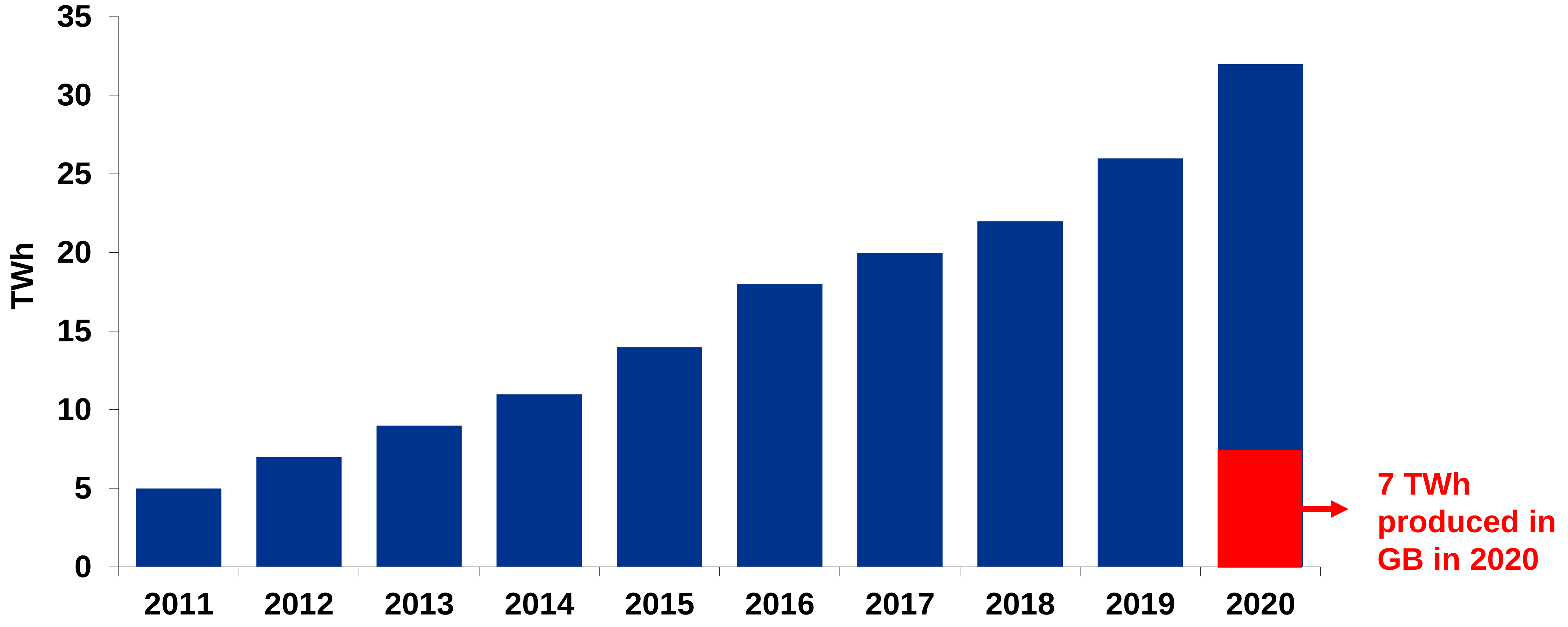
6% of Energy emissions

8.75% of natural gas displaced

1,400 jobs could be supported

Biomethane production has been growing steadily in Europe

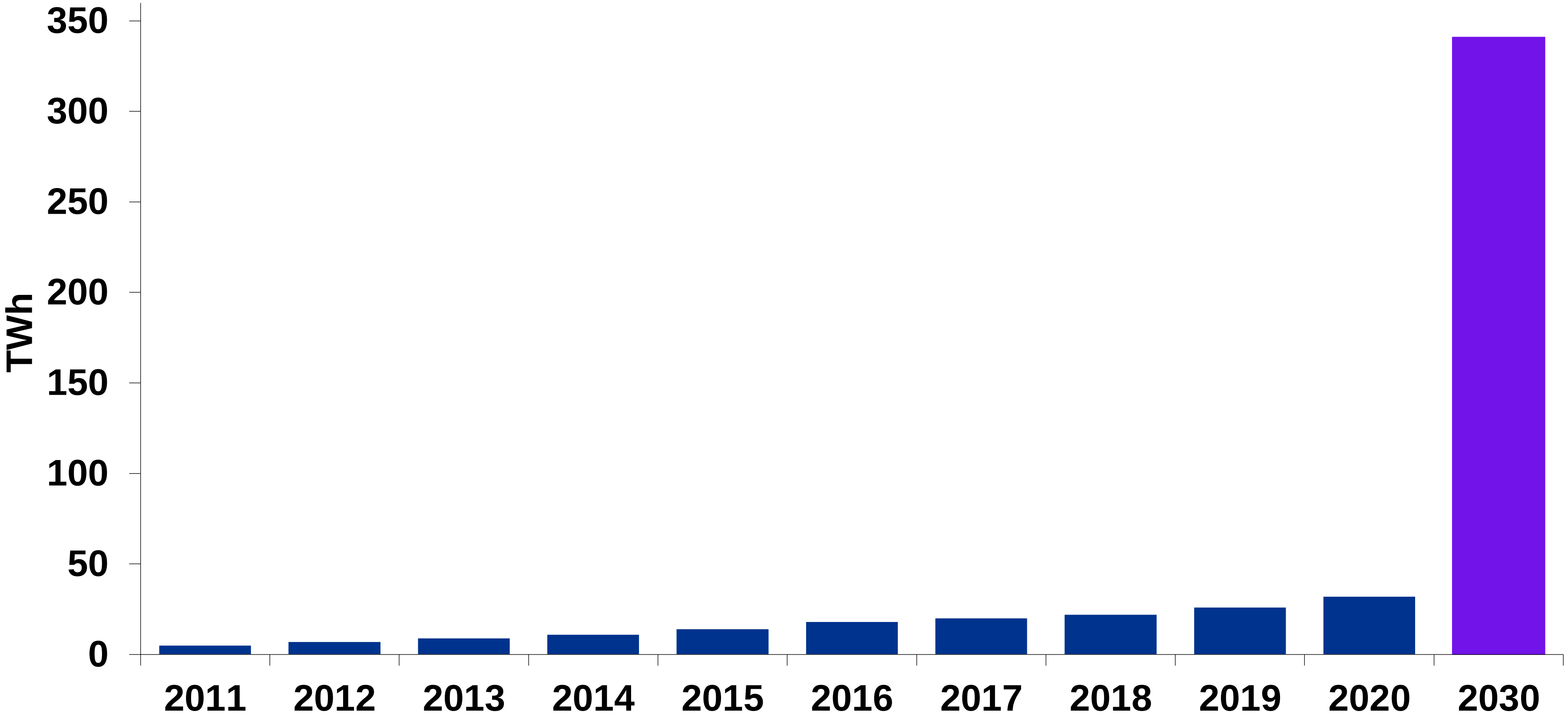
Europe produced 32 TWh of biomethane in 2020



Source: European Biogas Association

RePowerEU sets ambitious targets for biomethane production

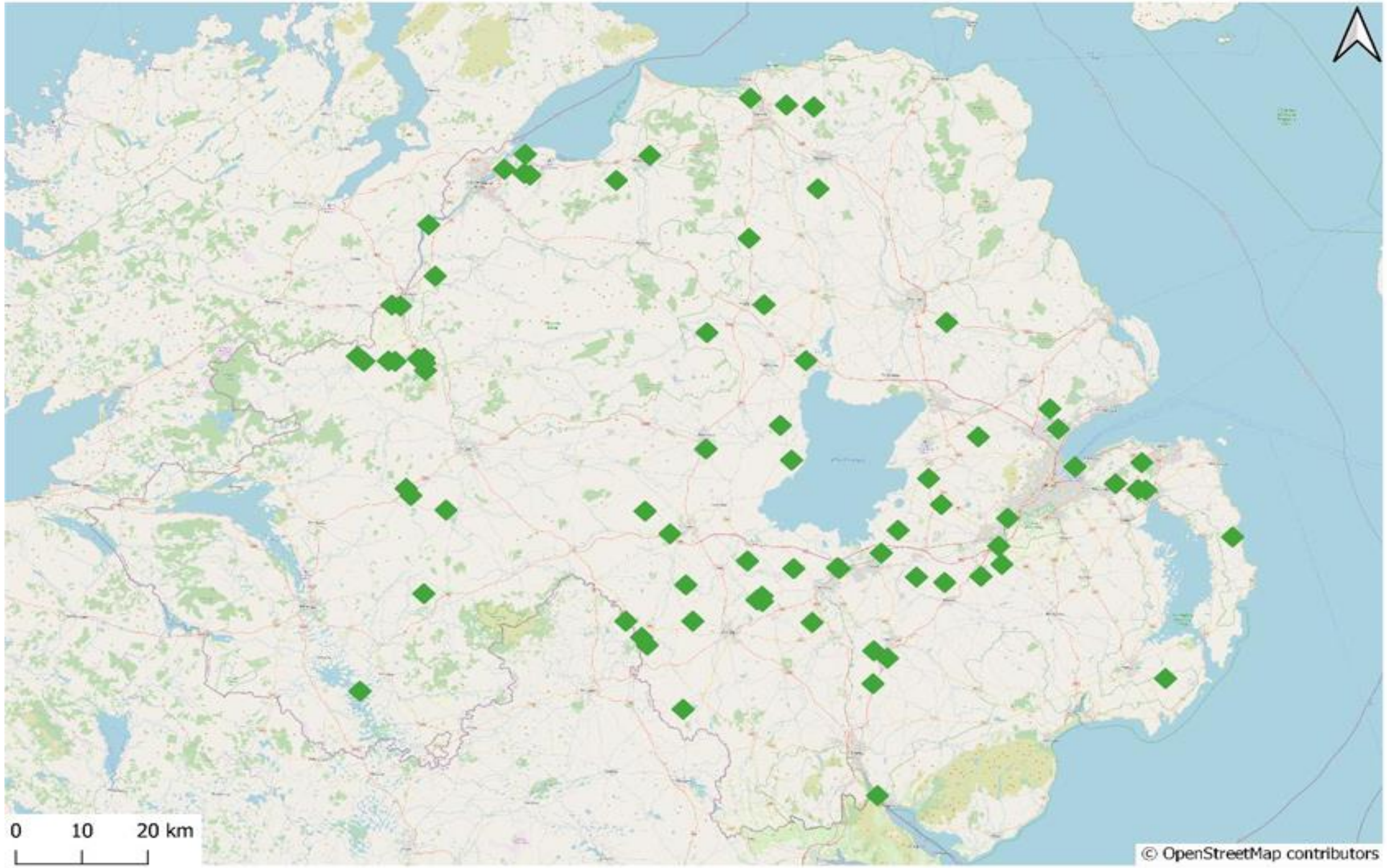
Biomethane production in Europe needs to grow 10x out to 2030



Source: RePowerEU

Biomethane Economics

Using Biomethane for Thermal Decarbonisation

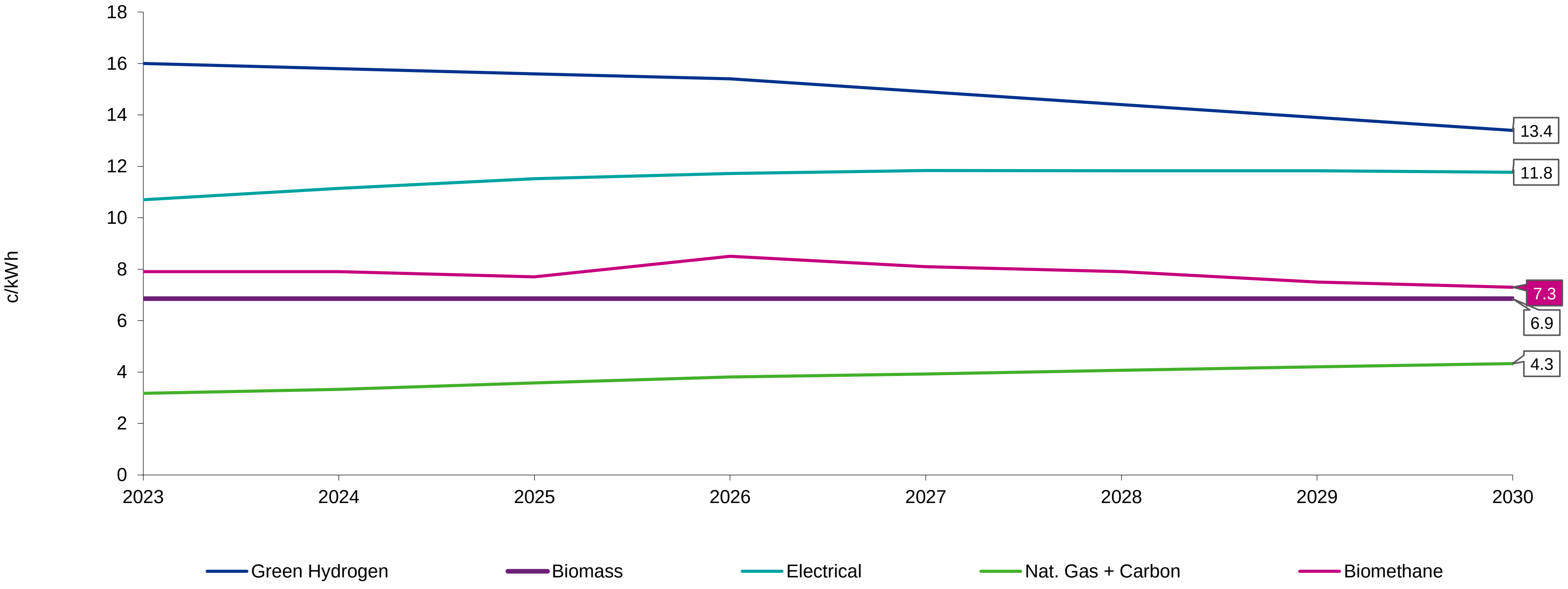


We currently have 80 x AD plants producing c.330GWh of electricity per annum

Source: Anaerobic Digestion in Northern Ireland Briefing Paper

Biomethane can be the cheapest decarbonisation option

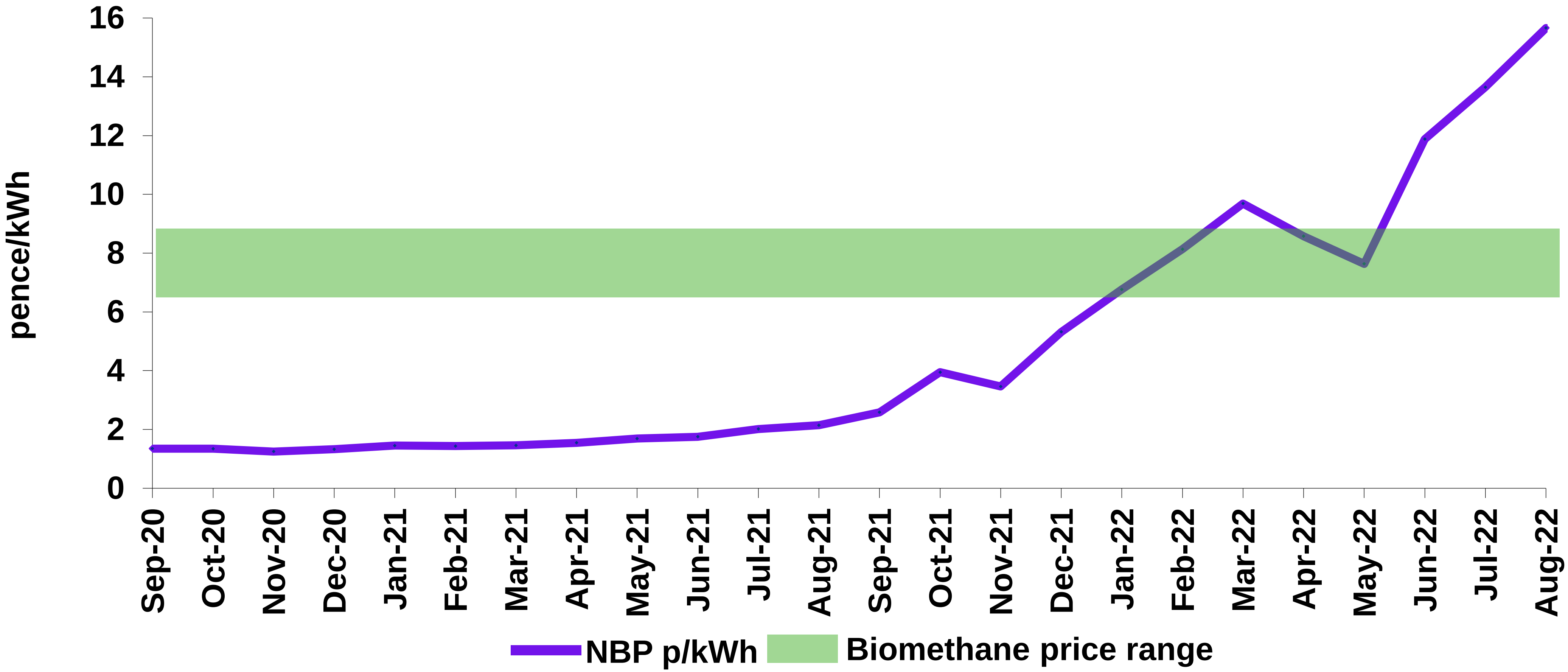
Alternative Thermal Options (c/kWh)



Source: KPMG Analysis, 2020 costs in Ireland

Currently biomethane is cheaper than fossil gas

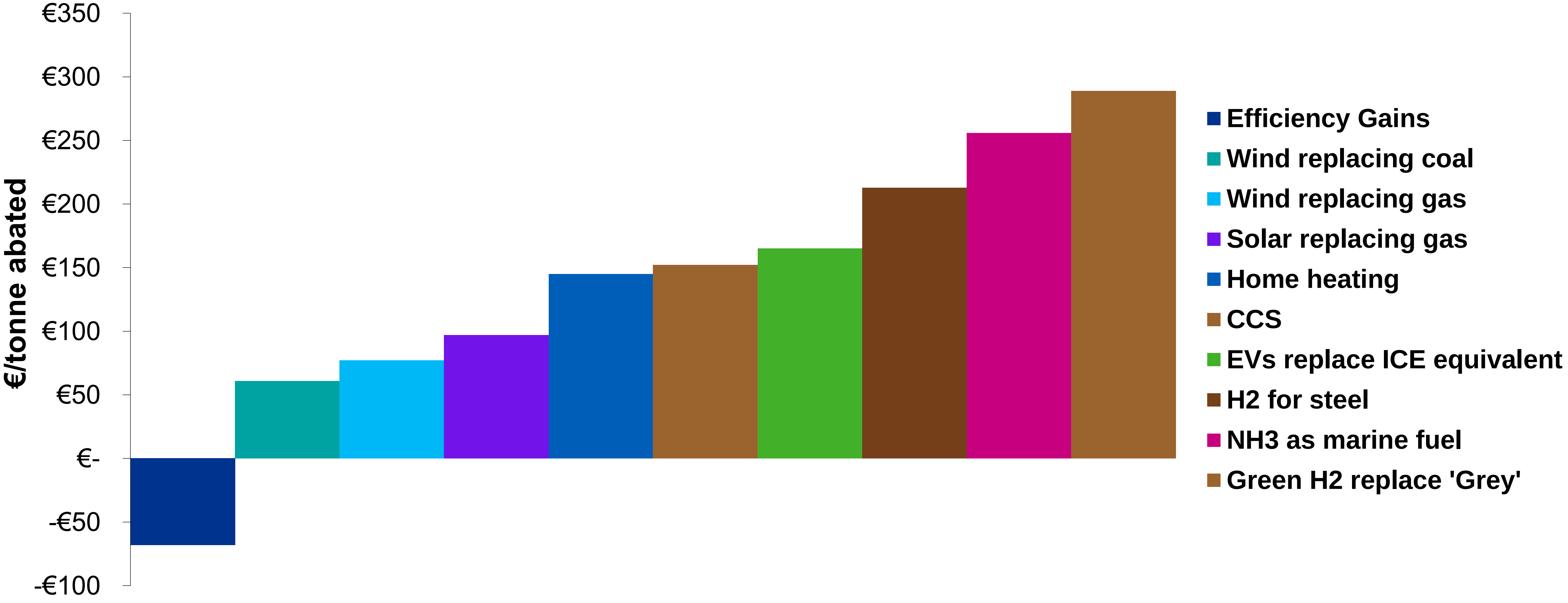
Historically biomethane cost multiples of fossil gas, now it's cheaper.



Source: Intercontinental Exchange, KPMG Analysis

Decarbonisation with low energy prices needed high CO_2 tax

CO_2 price required (pre-energy crisis) to incentivise investment in selected technologies

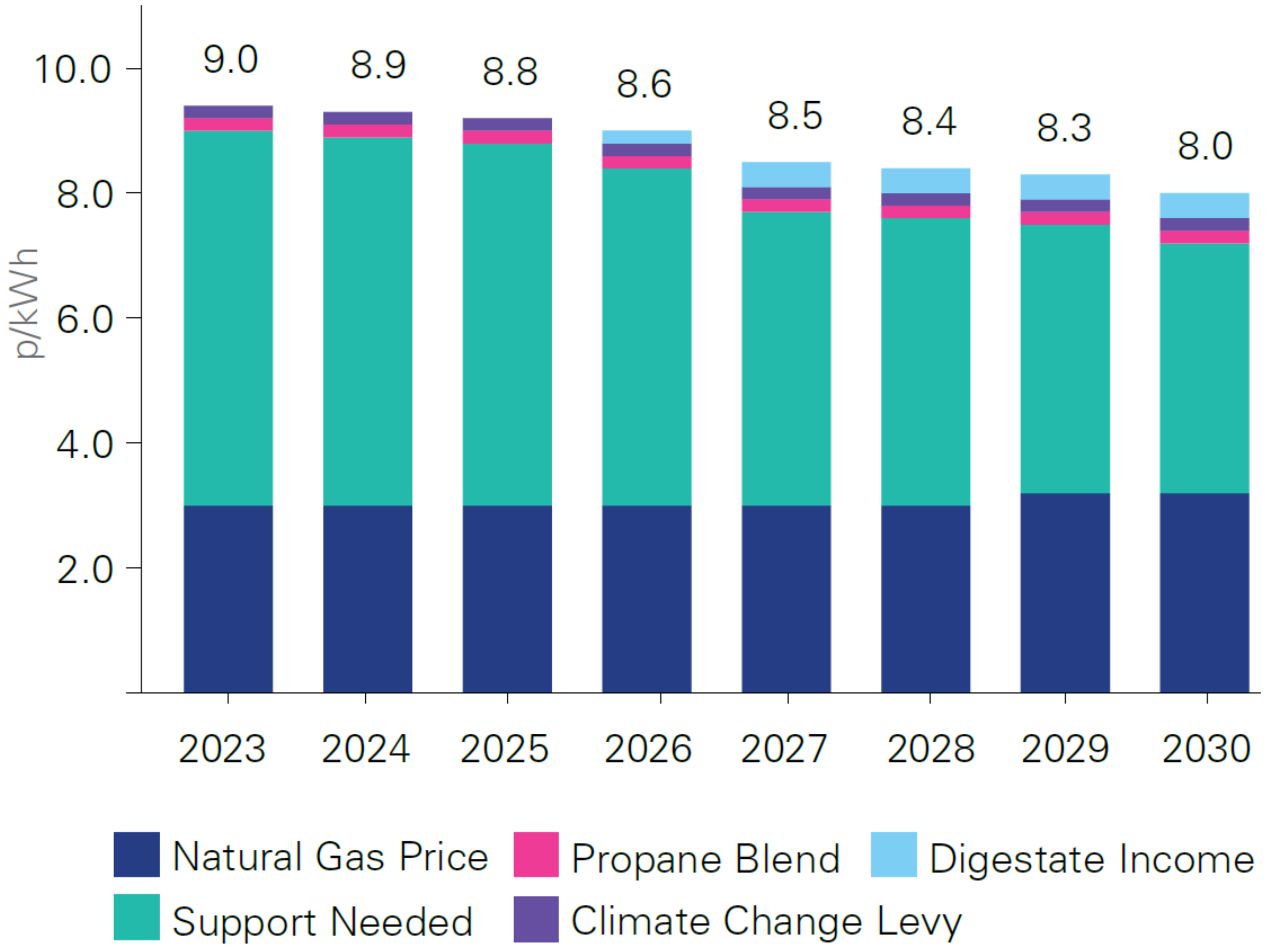


Source: High energy prices help, not hinder, decarbonisation – June 2022 CRU Group

High energy prices have shifted the carbon abatement curve

Source: High energy prices help, not hinder, decarbonisation – June 2022 CRU Group

Biomethane plant economics & funding



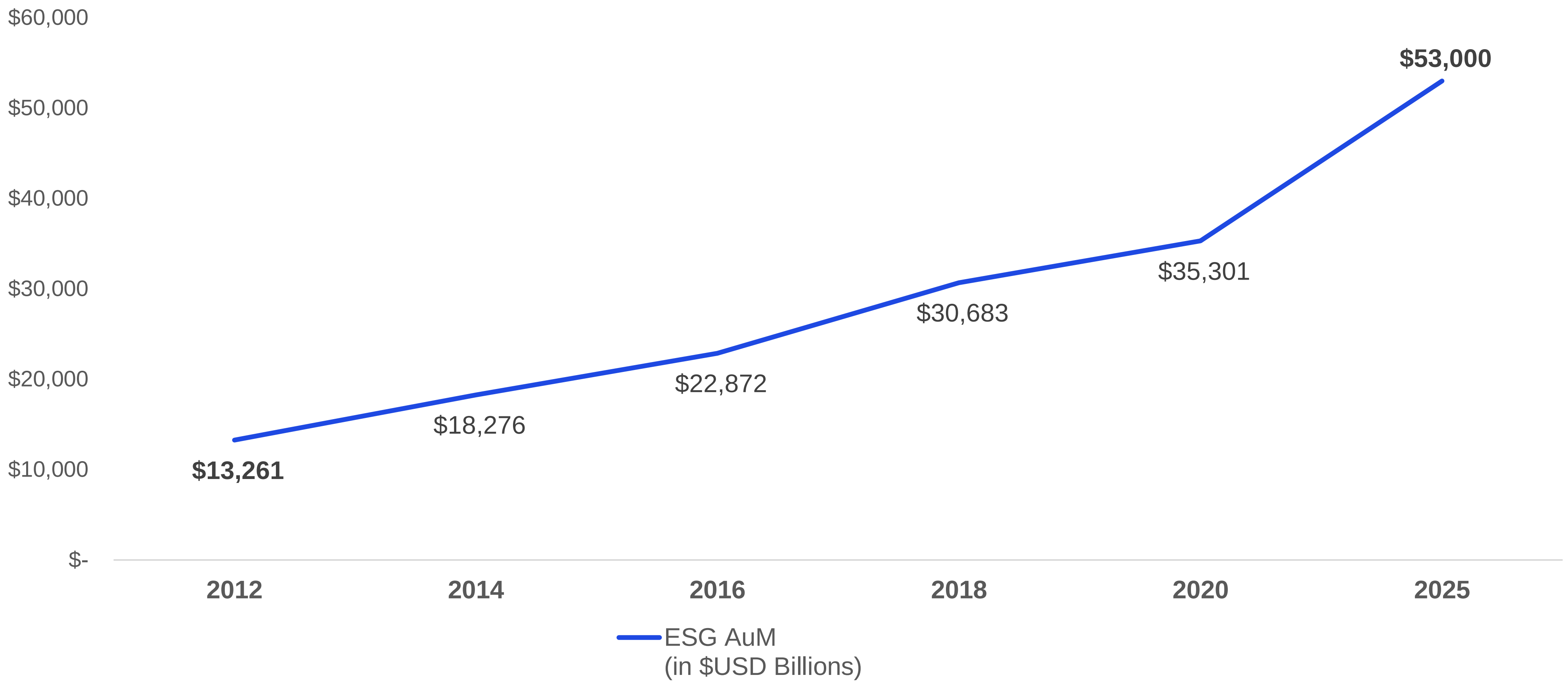
- **Scale:** 20GWh+ Plant
- **Capex:** £6m - £8m
- **Investment Return:** 8%+
- **Biomethane Support:** 9p/kWh+
- **Long-term Optimisation Potential**

Green Funding

Green Finance is in Vogue

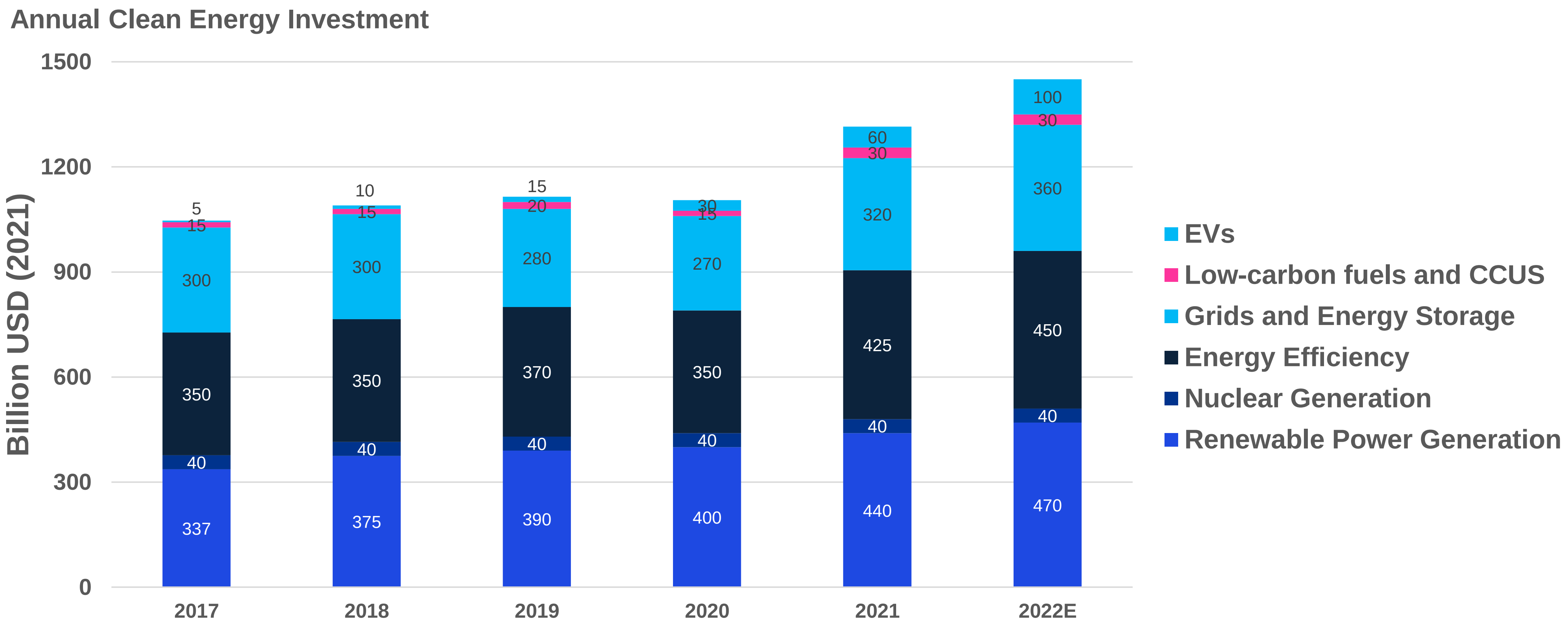
KPMG Sustainable Futures

Total Global Sustainable Assets



Source: Global Sustainable Investment Alliance, http://www.gsi-alliance.org. Studies include 2012-2020. 2025 Forecast from joint research of GSAI and Bloomberg.

Global investment in low carbon tech/renewables is growing



Source: IEA World Energy Investment 2022

Multiple pools of capital are mobilising on this agenda

KPMG Sustainable Futures

Pension Funds	**Sovereign Wealth Funds**	**Insurance / Life Companies**	**Corporates**
Governments	**Multi-laterals**	**Banks**	**Private Equity**
Oil and Gas	**Power and Utility Companies**	**High Net Worth Individuals / Family Offices**	**Foundations and Charities**

Biomethane Funding Options

KPMG Sustainable Futures

Debt

Equity

Grant

Energy Route-To-Market

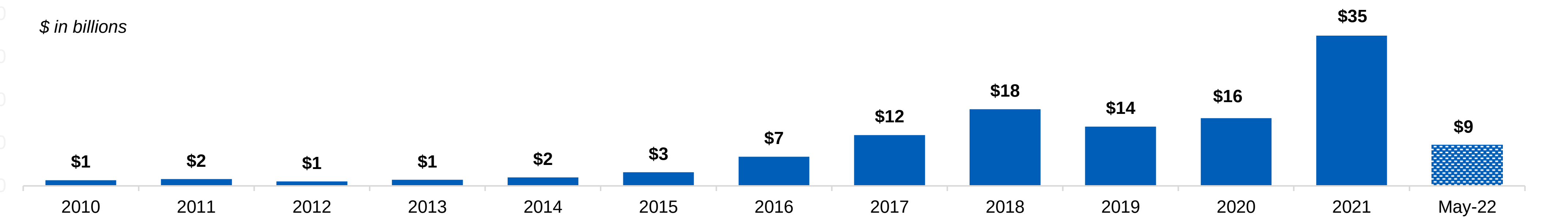
With vast flows of Private Equity capital…

KPMG Sustainable Futures

Infra / Private Equity Funds & Asset Managers

Globally, VC and growth PE funding into the Low-Carbon sector **exceeded $35 billion** in 2021, making it the best year ever for Low-Carbon investments

Global Low-Carbon Investments by VC / PE Firms[1]



PE giants globally have mobilized trillions of dollars to fight climate change and make Low-Carbon investments

APOLLO

BlackRock | TEMASEK Decarbonization Partners

Blackstone

Brookfield

CARLYLE

GENERAL ATLANTIC

KKR

TPG RISE CLIMATE

Sources: 1) Pitchbook (PE funding includes only growth and expansion funding); 2) Climate Bonds Initiative.

Corporates are providing funding to support their supply chains

Energy

bp ventures – To increase investment in Low-Carbon energy from $500M per year to $5B

Chevron – Expects to invest >$10B between 2021 to 2028 in Low-Carbon intensity projects

Constellation (An Exelon Company) – Invests up to $10M in energy technology companies through its venture arm

eni next – Eni invests in decarbonization projects and startups through its corporate venture arm

Shell Ventures – Launched a $1.4B fund in Nov-21 to fund energy transition start-ups and scale-ups

TotalEnergies – Launched a dedicated $400M energy transition fund in Oct-19 to invest in Low-Carbon technologies

Transportation and Supply Chain

Airbus Ventures – Launched a $150M initial fund in 2015 to invest in mobility technologies

BMW i Ventures – Combined capital of $900M in two funds to invest in sustainable transportation technologies

jetBlue technology ventures – Venture arm of JetBlue, investing in early-stage startups catering to sustainable transportation

Maersk – Maersk Growth is the VC arm of A. P. Moller – Maersk with the mission to decarbonize supply chains

Renault Nissan Mitsubishi – Launched Alliance Ventures in 2018 to invest up to $1B in five years in EV and sustainable mobility

Volkswagen – Launched a $350M fund to invest in decarbonization projects and start-ups

Agriculture and Industrial

BASF (We create chemistry) – Has invested $300M already in agritech-related technologies; plans to invest $250M more in the next decade

BHP – Venture arm of BHP, investing in decarbonization and sustainable resource extraction strategies

Caterpillar – Venture arm of Caterpillar, investing in energy solutions, digital products, robotics, and advanced materials

Cemex – To invest $60M annually under its Future in Action program designed to reduce its carbon footprint

Presidio Ventures (A Sumitomo Corporation Company) – Venture arm of Sumitomo – has invested >$200M in technologies disrupting the green industrial sector

XCarb (Towards carbon neutral steel) – ArcelorMittal venture arm launched in Mar-21 to invest $100M in net zero carbon steelmaking

Consumer and Technology

Apple – Launched the $200M Restore Fund in Apr-21 to fund carbon removal technologies

amazon – Launched The Climate Pledge Fund to invest an initial $2B in Low-Carbon solutions providers

IKEA – Plans to spend €1B on climate programs over the next five years to reduce greenhouse gas emissions

Microsoft – Invests in climate innovation solutions through its $1B Climate Innovation Fund

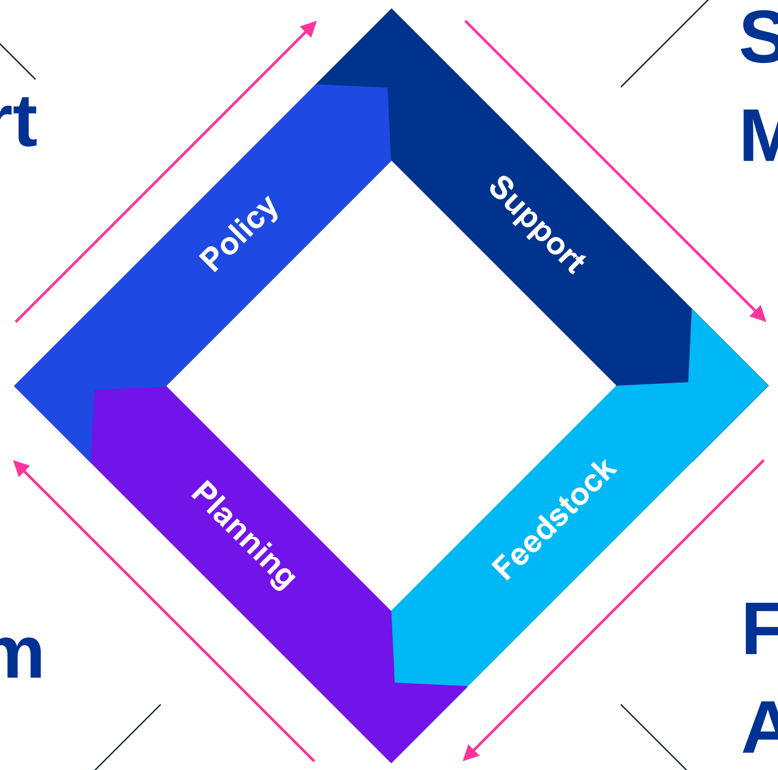
salesforce ventures – In 2021, announced $300M in grants to technologies involved in reforestation

Unilever – Launched a €1B Climate & Nature Fund to invest in landscape restoration, reforestation, and carbon sequestration

Policy change is required to deliver necessary investment

Long Term Policy Support

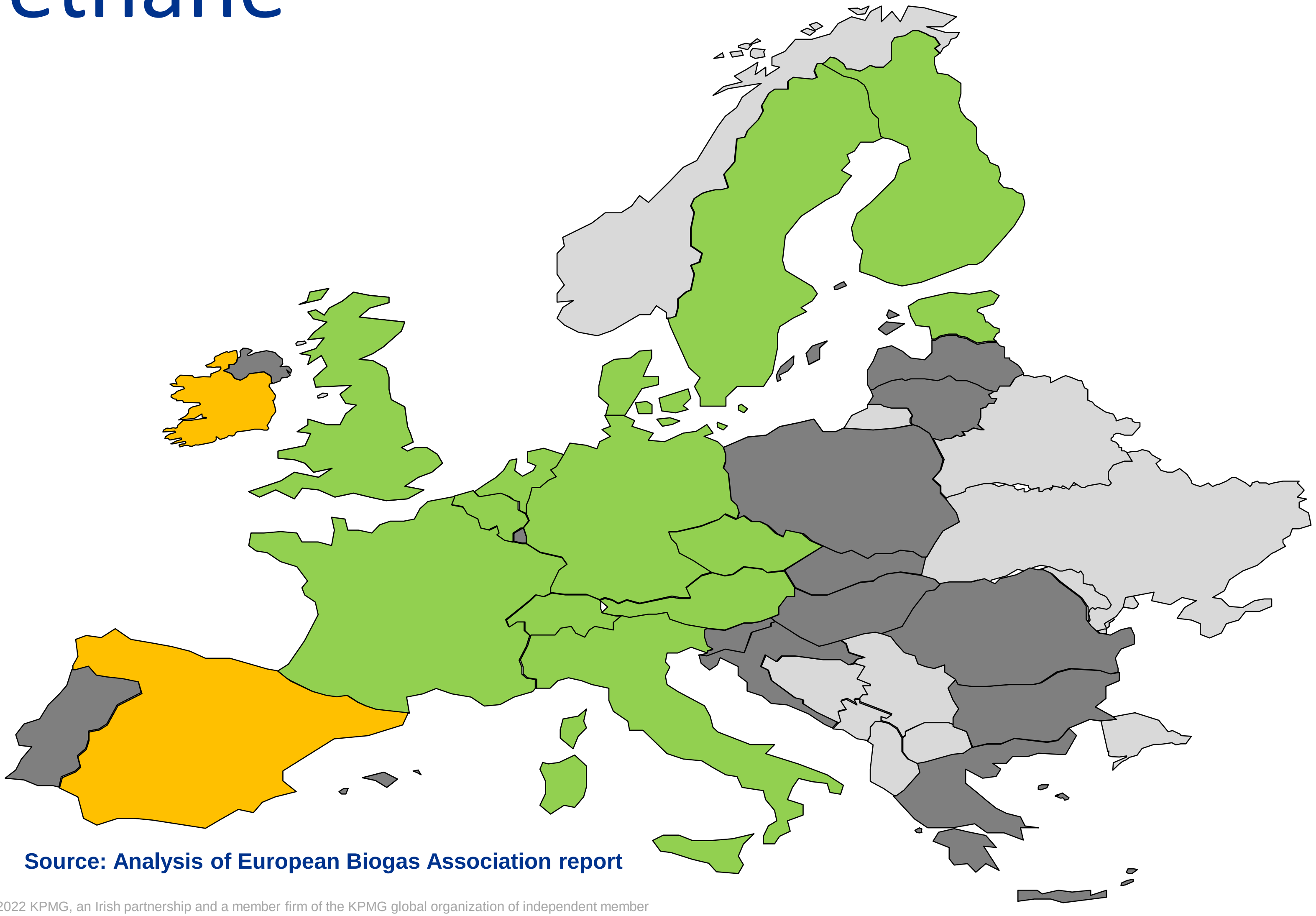
Support Mechanism



Planning System Reform

Feedstock / Agri policy

NI are outliers when it comes to supporting biomethane



No support scheme in place

Support scheme(s) in place

Support scheme due in 2022

Source: Analysis of European Biogas Association report

Options for supporting biomethane

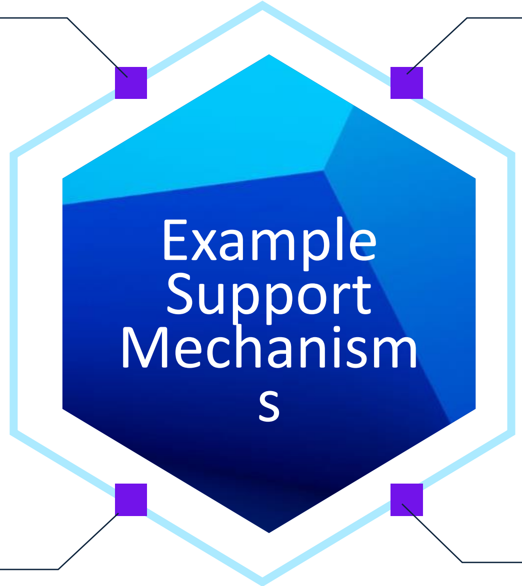
Multiple support schemes operating in Europe which can be modified to suit NI market

Feed in Tariffs

(UK, France)

Contracts for Difference

(Operates in UK Electricity Market)



Obligation Schemes

(Proposed for Ireland, operating in transport sector)

Auctions

(Denmark)

Conclusions

- Biomethane is an essential component of NI's decarbonisation pathway, with strong demand from industry;
- Using our grass-based agricultural system, NI has the potential to be a major player in biomethane production, using on-farm Anaerobic Digestion (AD), alongside waste-led plants;
- Biomethane has the potential to decarbonise some of the hardest to address carbon emitting processes at the cheapest cost;
- There is a wall of capital to fund the roll-out of the industry, however the sector however won't develop without active government policy support and a structured approach to asset development;

THOMPSONS

FEEDING INNOVATION

Securing Sustainable competitiveness

Making Power to X a reality

Who are we?

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FEEDING INNOVATION

Operations:

Europe's largest Feedmill

- *850,000T capacity*
- *10 press prodn lines*
- *Stand along blend mill.*
- *Can Peak at over 4,000T in a day.*

  – circa 300 lorry movements
- *Own energy and heat generation*
  - *4.95 mw CHP.*

The Currency of Competition

Today:- competitiveness is measured in -

Tomorrow :- a second currency will be in play -

- ***Agri-food needs to position itself today to compete in the currency of tomorrow.***

Policy - driving change

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Climate Change Committee - UK plan.

NI position

But Supermarkets set the pace

- **COP 26 Supermarket pledge to halve environmental impact sooner (Tesco, Waitrose, M&S, Sainsbury's and Co-op)**

TESCO
» *Own operations 2035*
Full footprint 2050

Waitrose
» *Net – zero carbon 2035*

MARKS & SPENCER
» *Full footprint 2040*

Sainsbury's
» *Own Operations 2040*

co op
» *Own operations 2035*

Carbon competition

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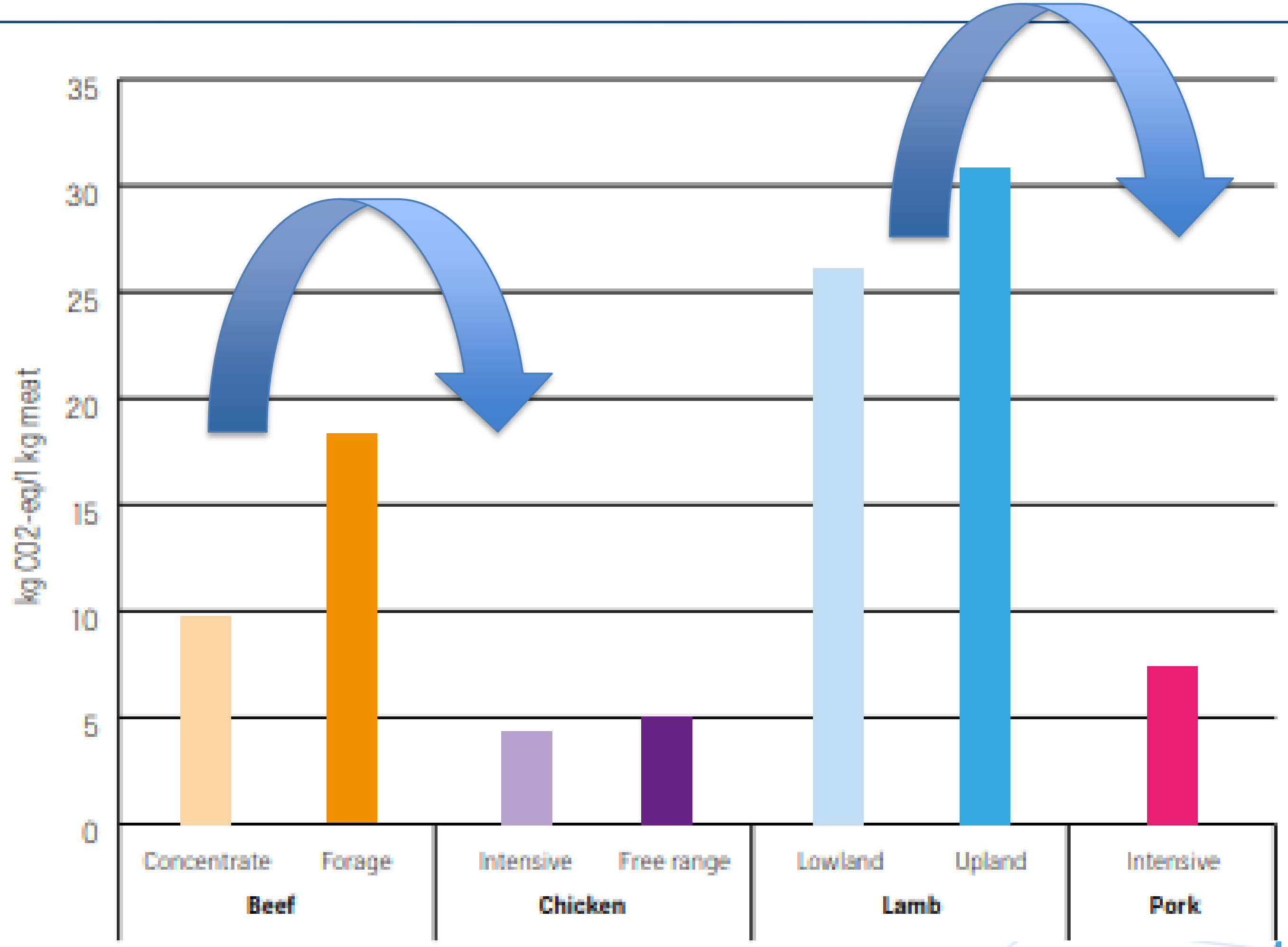
Food labelling:

- *Initially – species driven*
  - ***Meat switching?***

- *But once accreditation & measurements systems in place:*
  - **Supply chain competition within each sector**
  - **First movers likely to be pig and poultry**



Source: Centre for Innovation Excellence in Livestock

Green Technologies

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Early Agri supply chain response likely to be in

1. *Feed carbon efficiency,*
2. ***Manufacturing***
3. ***And Transport***

– but for the last 2, which technology, Biogas or Hydrogen (or both)?

Application	Biogas		Hydrogen		Comments
	Support	*Relative value*	*Support*	*Relative value*	
HGV Haulage	RTFO	✓✓✓✓	RTFO	✓✓✓✓	*Hydrogen haulage use restricted due to unability to inject into grid*
Electricity					
Heating					

(Ticks/ X's represent relative values/ costs for each application)

Projects

JT Project 1 - Green Transport

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Raw material haulage (70T pa carbon)

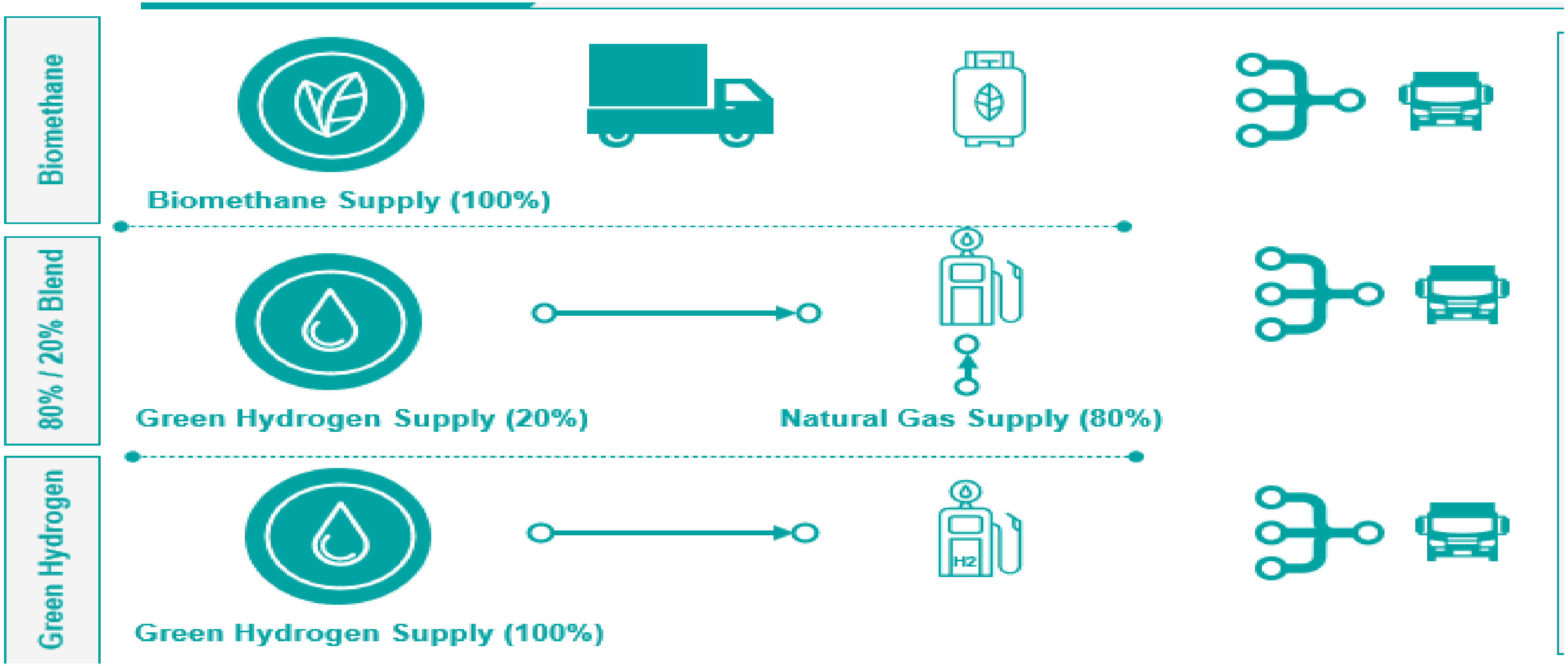
- *6 tri axile 40T articulated lorries hauling 400,000 tonnes 56,000 miles pa*
- *14,000 x 4 mile round trips*

Finished goods haulage (4,400T pa carbon)

- *Poultry 14 tri axle 40T tankers hauling 250,000T feed **1.25m miles pa,** 9, 000 trips x average 140 miles*
- *Further 40+ vehicles can be rolled out once proven. 500,000+ tonnes, 20,000 trips , **2.4m miles pa***

Options under evaluation (by KPMG)

Options under evaluation (by KPMG)



Still Need to tie in with:

1. ***Biogas partner*** *(who can access ROCs and RTFO via Thompsons and*
2. ***Haulage technology partner*** *for HGV advice (CNG v Fuel Cell Electric HGV's)*

Hydrogen Problem statement

The value of hydrogen for Electricity or heat is below the cost of production:

- ***Pure cost (energy yield and capex recovery)***
- ***Allocated cost (transmission of wind/solar through the grid)***

But what about of you could capture both heat and electricity?

Thompsons Cornerstone technology - 4.95 mw Bergin CHP

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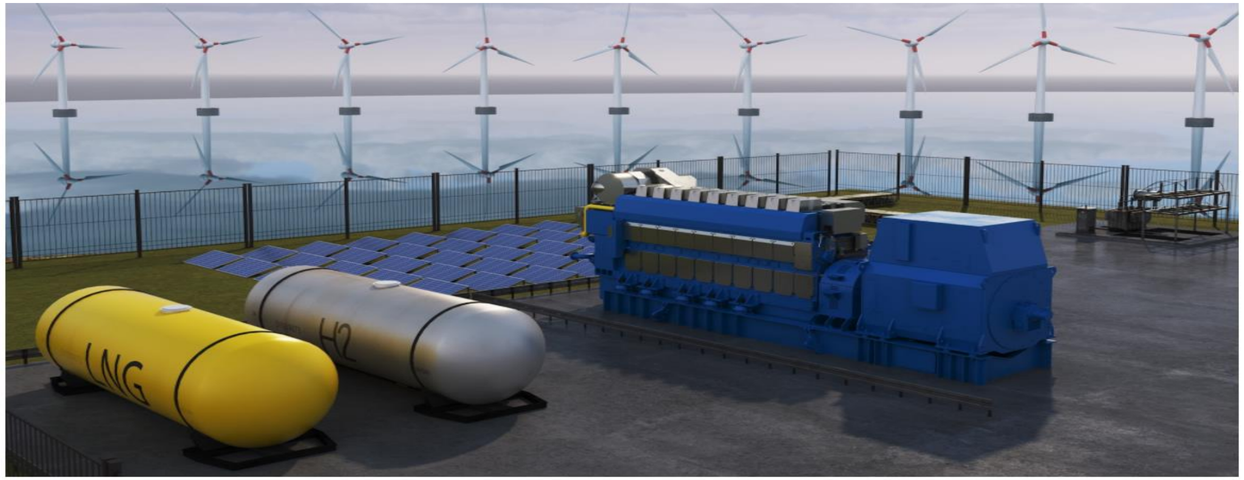
		Load follow	Max output	
Inputs - Gas - Natural or Bio		7.71	11.93	mw/h th
Electrical output	41.5%	3.2	4.95	mw/h e
High grade heat (120 degrees)	25.0%	1.93	2.98	mw/h th
Low grade heat (65 - 95 degrees)	20.0%	1.54	2.39	mw/h th



Bergen successfully runs engine on H2 blend with no hardware changes

The first tests on a B-Series Bergen gas engine, running on a blend of 15 %v hydrogen and 85 %v natural gas, have been successfully completed without any hardware adjustments.

Thompson Green Energy Hub Opportunity

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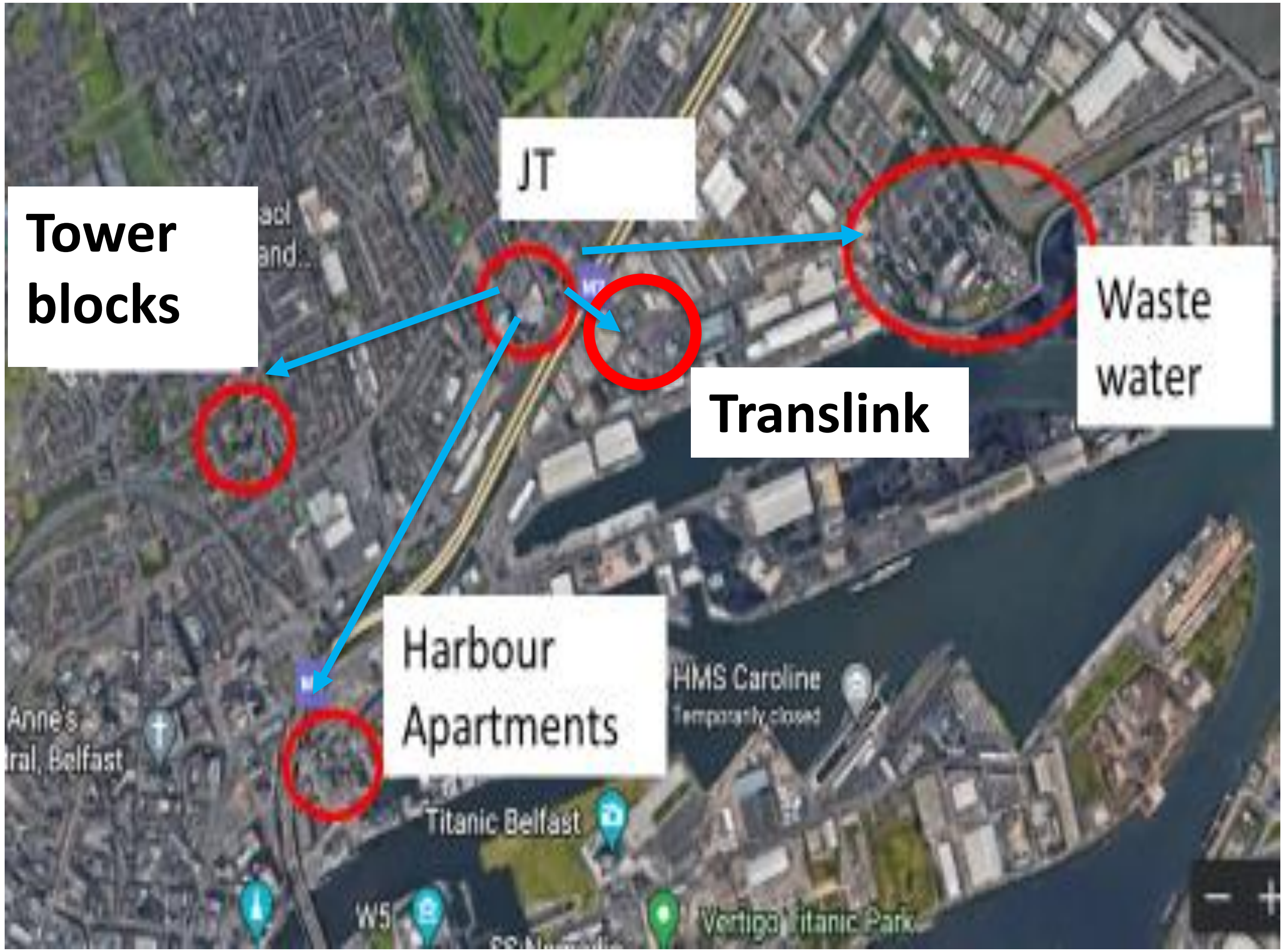

Capturing the value of Electricity, oxygen, heat and transport fuel essential to offset cost premium.

- *Short distances to major customers/ suppliers enables private gas/ electrical infrastructure.*
- *Potential to avoids public infrastructure and "Allocated" socialised costs*

Energy Collaborations

Under discussion

Project 2 – Community heating From Biogas CHP waste heat

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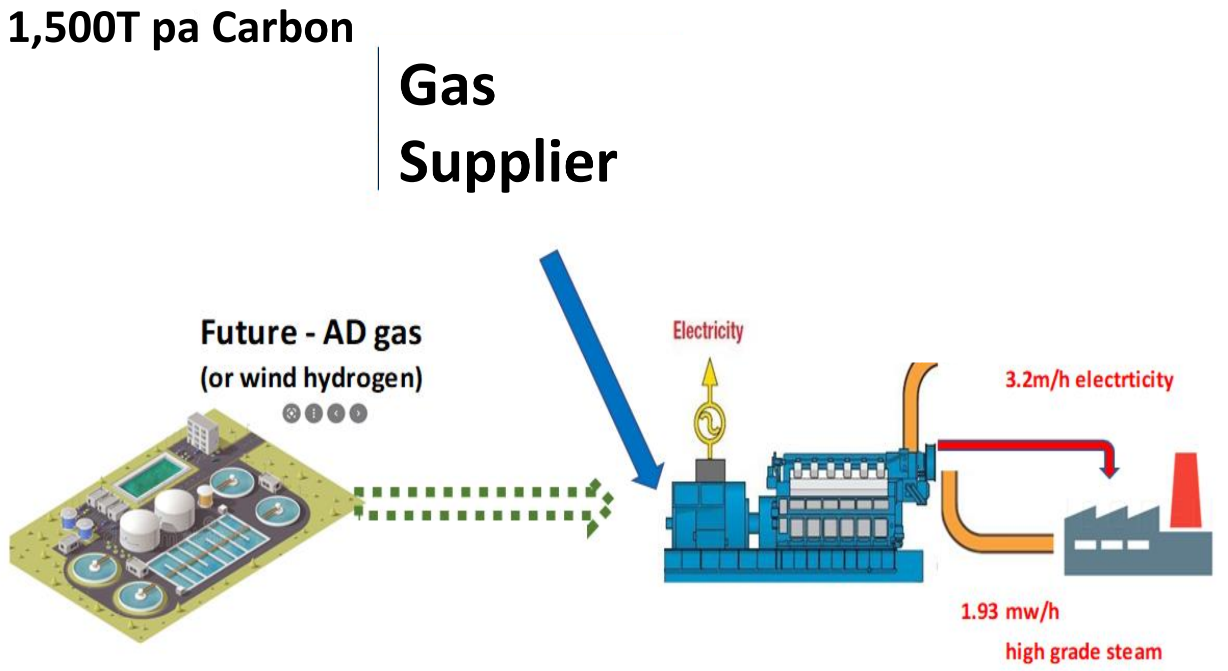
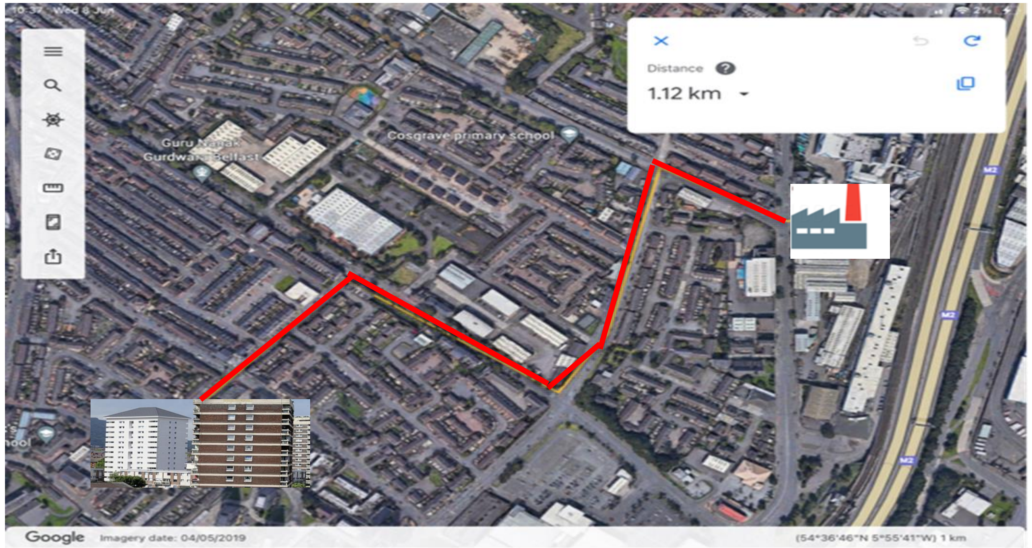
Zero carbon hydrogen circular economy proposal



Tower block heating retrofit 0.6 miles away



JT produces 3.2 mw/h of Electricity from CHP (3 ROCS qualified on Biogas). Also

- ***Currently*** *- High temp steam - 1.9 mw/h @ 120 degrees, displaces 2mw/h Nat gas*
- ***Opportunity,*** *Low temperature heat wasted, 1.5 mw/ hr (65 -& 95 degrees)*
  - ***could heat 500 + flats****)*

Project 3, Hydrogen CHP
Exporting heat and electricity

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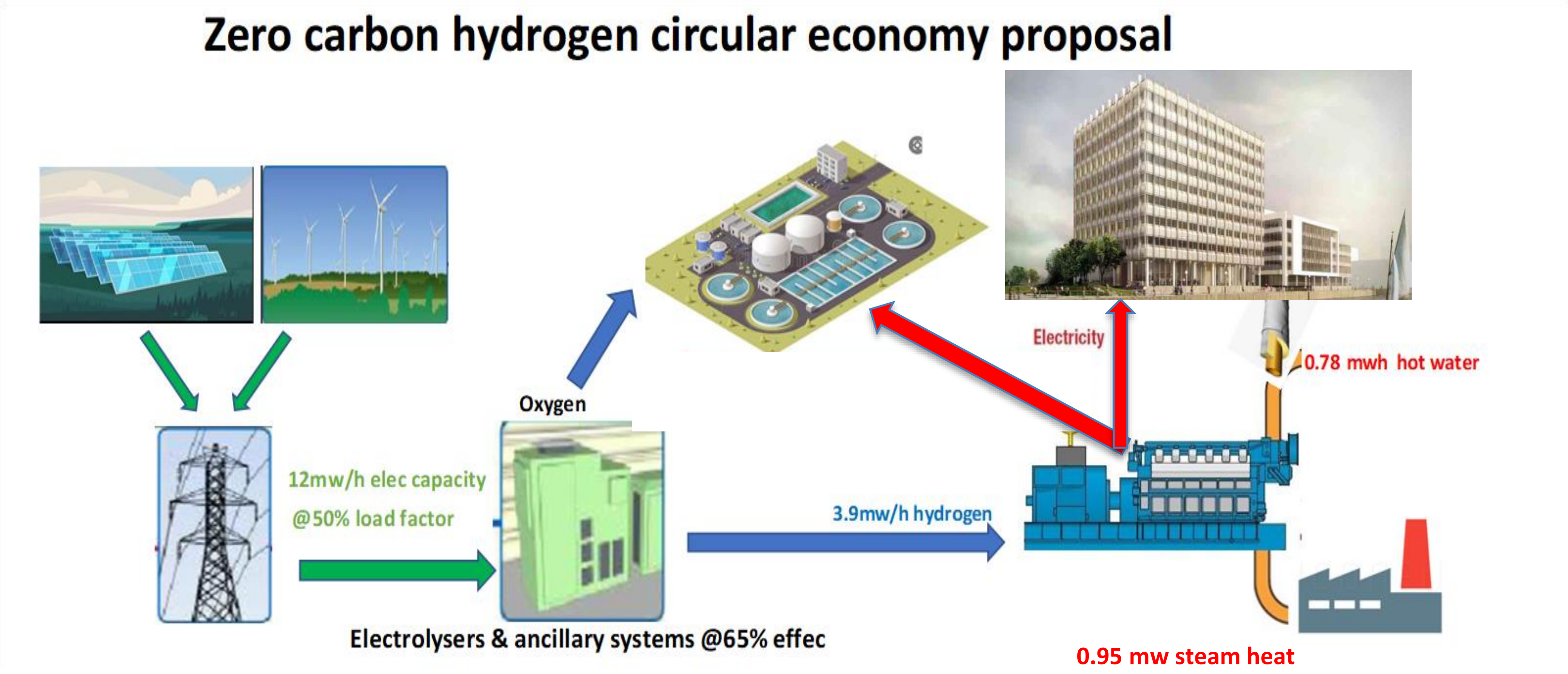
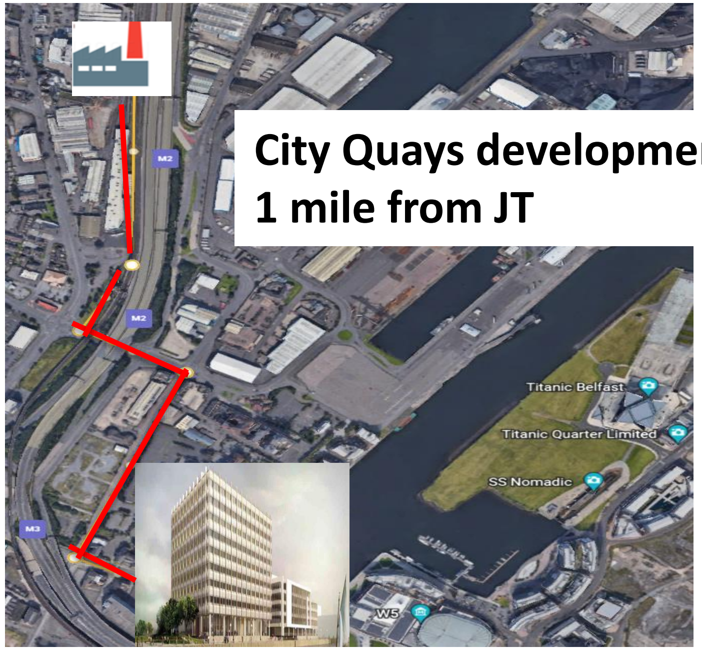
JT has a footprint for a further 1.6mw CHP

- *Hydrogen fuelled:-*
  - *oxygen for waste water treatment plant, displacing energy intensive compressed air?*
  - *high temperature green heat used by JT – displacing 1 mwh gas*
  - *1.6mw green electricity and heat exported to harbour buildings with heating loads?*





Roll out of JT demonstration

Today - Agri food.

Most food processors have a use for all Hydrogen outputs:-

- *Electricity for processing & refrigeration*
- *Hydrogen for future transport (Hydrogen fuel cell HGVs)*
- *Heat for food processing (cooking)*
- *Oxygen for own waste water treatment plants (displace energy intensive compressors).*

In the near future – Delivering on Power to Water vision?

- *NI Power to Water, Community based waste water treatment plants and heating systems & later, Hydrogen haulage?*

Current State of play

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Financial operating models

- *Currently under evaluation by KPMG - Report out October on financial viability.*

District heating

- *in discussions with **University of Ulster** on feasibility study to determine no. of flats/ houses that could be heated.*
- *Ground sourced heat-pumps considered also to buffer imbalance between supply and demand of domestic heat.*

Hydrogen manufacture for on site use:

- *In discussions with **QUB** on feasibility study on best onsite electrolyser technology to generate initial hydrogen requirements.*
- *Energy source, on site 800kva roof solar complimented by night time wind*

Footnote on rapid transition.

Regulatory framework needs to catch up

Powers to:-

- *Facilitate today's development of tomorrow's networks*
- *Ability to reflect the true economic cost of renewable wind on the network at night, to incentivise hydrogen adoption.*

  <u>Wind has near zero marginal transport cost at night</u>*, but:-*

  – *current regulated tariffs* ***will add £78/T pricing*** *onto Green electricity from Hydrogen:*

    - *Network cost circa £41 mwh x electrolyser @70% efficiency = £58/mw*
    - *Hydrogen fuel cell back into daytime electricity £58 @ 75% efficiency* ***=£78/ mw!!!***

- ***Planning changes – for over a decade, a barrier to green transition.***

Conclusion

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- **NI plc as an early mover on climate change will get market advantage:-**
  - *Regardless – it will be a pre-requisite for Supermarket business.*
- **NI plc has natural advantages:**
  - *AD plants producing Bio gas with opportunity to do a lot more.*
  - *Abundant wind (short term) – with sea windfarms to follow, if Exec grab the initiative.*
- **Ability to be world leading,**
  - **But** will depend on whether Executive (?) helps or hinders development through the regulatory framework.