

# Winter is coming

Can Ireland keep the lights on and homes warm?

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Prof. Brian Ó Gallachóir

MITEI Visiting Scholar

# Three challenges coinciding this winter in a 'perfect storm'

Eat or heat?



Power cuts?



Enough gas?



## RTÉ News

ESRI says 43% of households may be in 'energy poverty'

IRELAND • 2 SEP 2022, 4:38AM

## THE IRISH TIMES

### How did Ireland almost run out of electricity?

Paul Deane and Brian Ó Gallachóir  
Opinion

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From 2005 to 2020, the success story in addressing change was in the electricity supply. PHOTOGRAPHY: ALAN BETSON

## Business Post

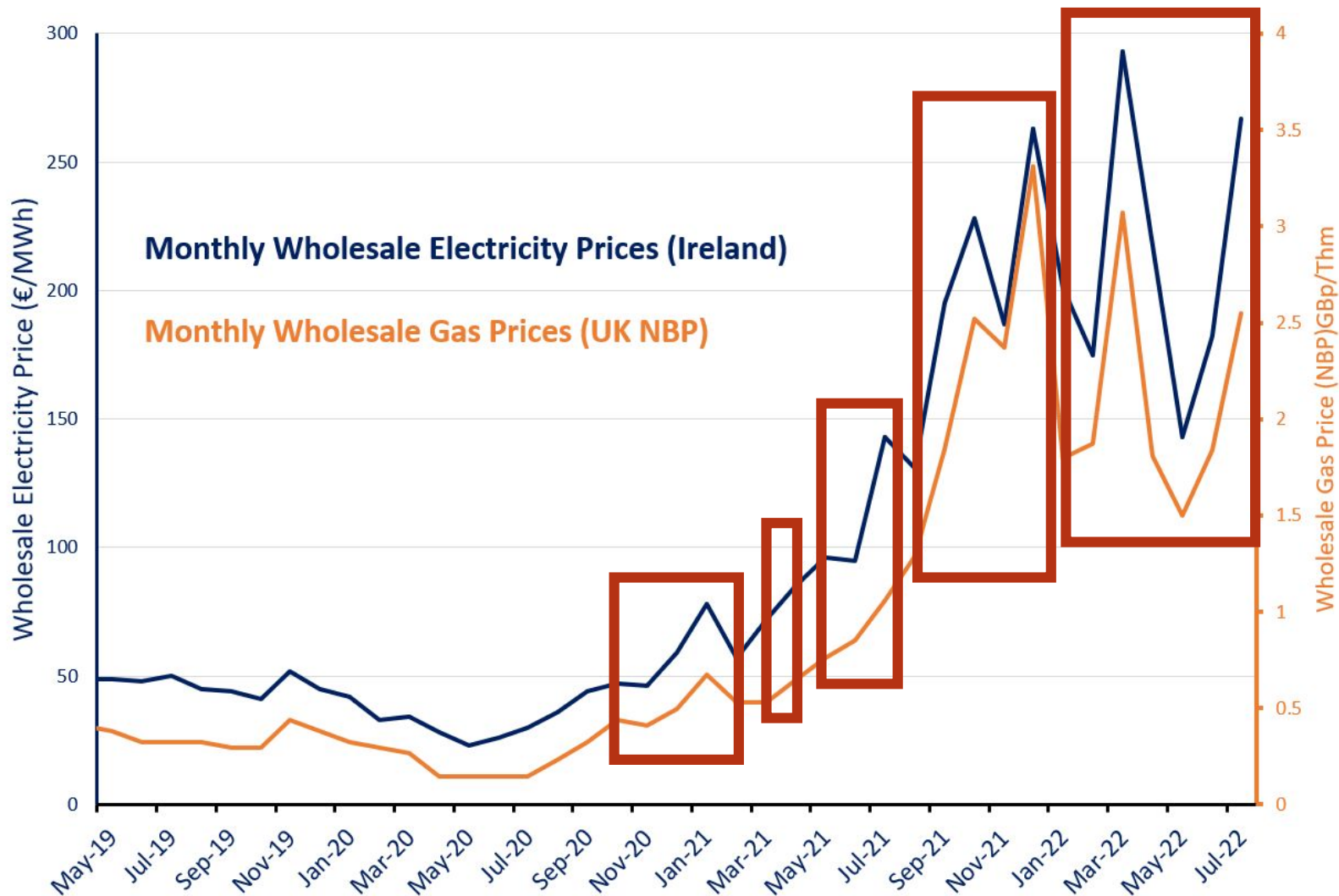
POLITICS NEWS FOCUS ANALYSIS & OPINION TECH LIFE & ARTS P

ENERGY

### Irish authorities were told gas flow could drop by 12% if Russia cuts supply to EU



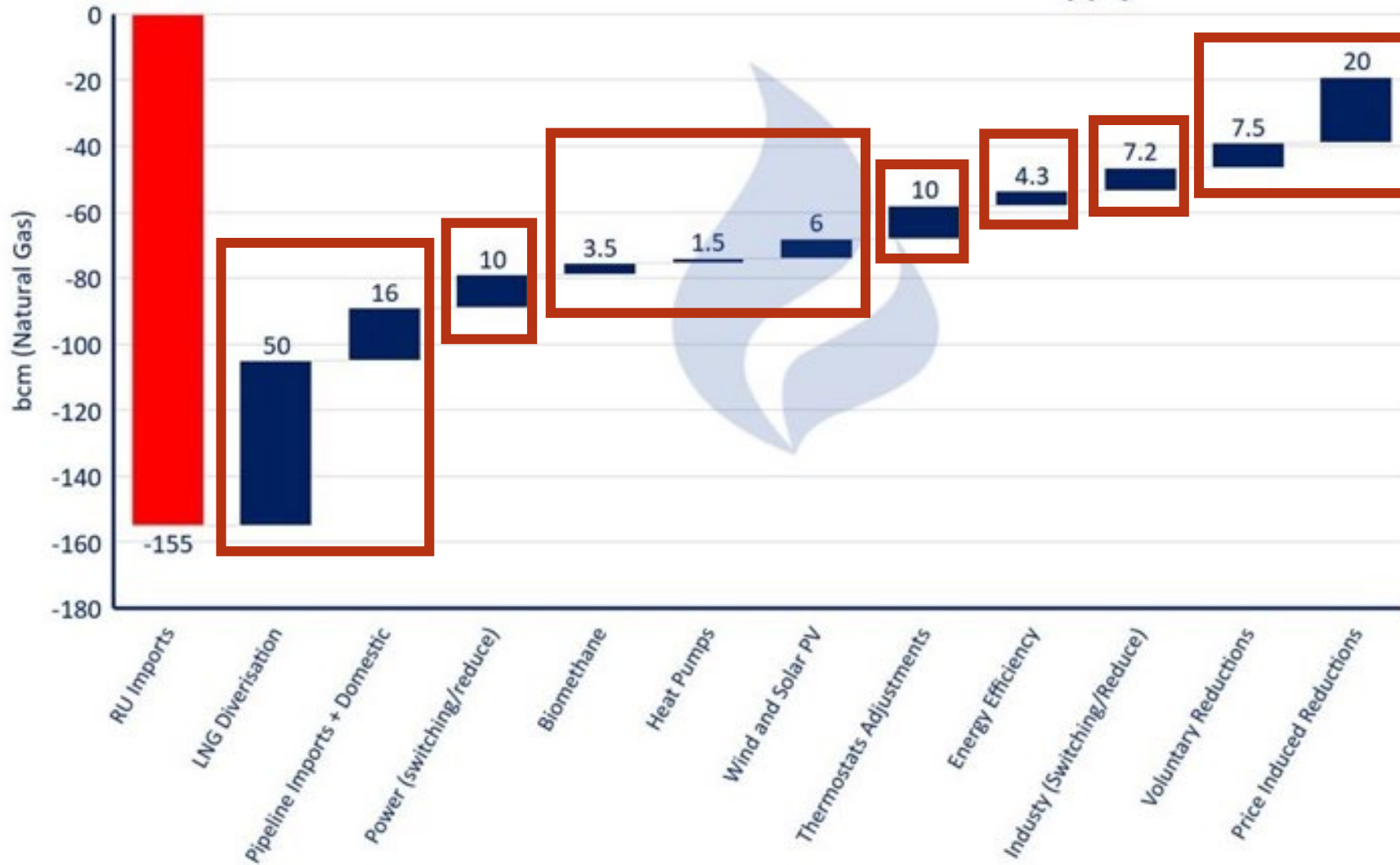
# Gas and electricity price rises are unprecedented



- Post-COVID rebound increased demand for natural gas putting upward pressure on prices
- April 2021 unusually cold in Europe limiting gas storage
- Warm summer in Asia in 2021 drove increase air conditioning and in turn drew LNG supplies from Europe, further increasing prices
- Gas storage in EU was lower than normal in winter maintaining upward price pressure
- Russia invade Ukraine in Feb 2022

# Price increases linked to EU addressing gas supply shortages

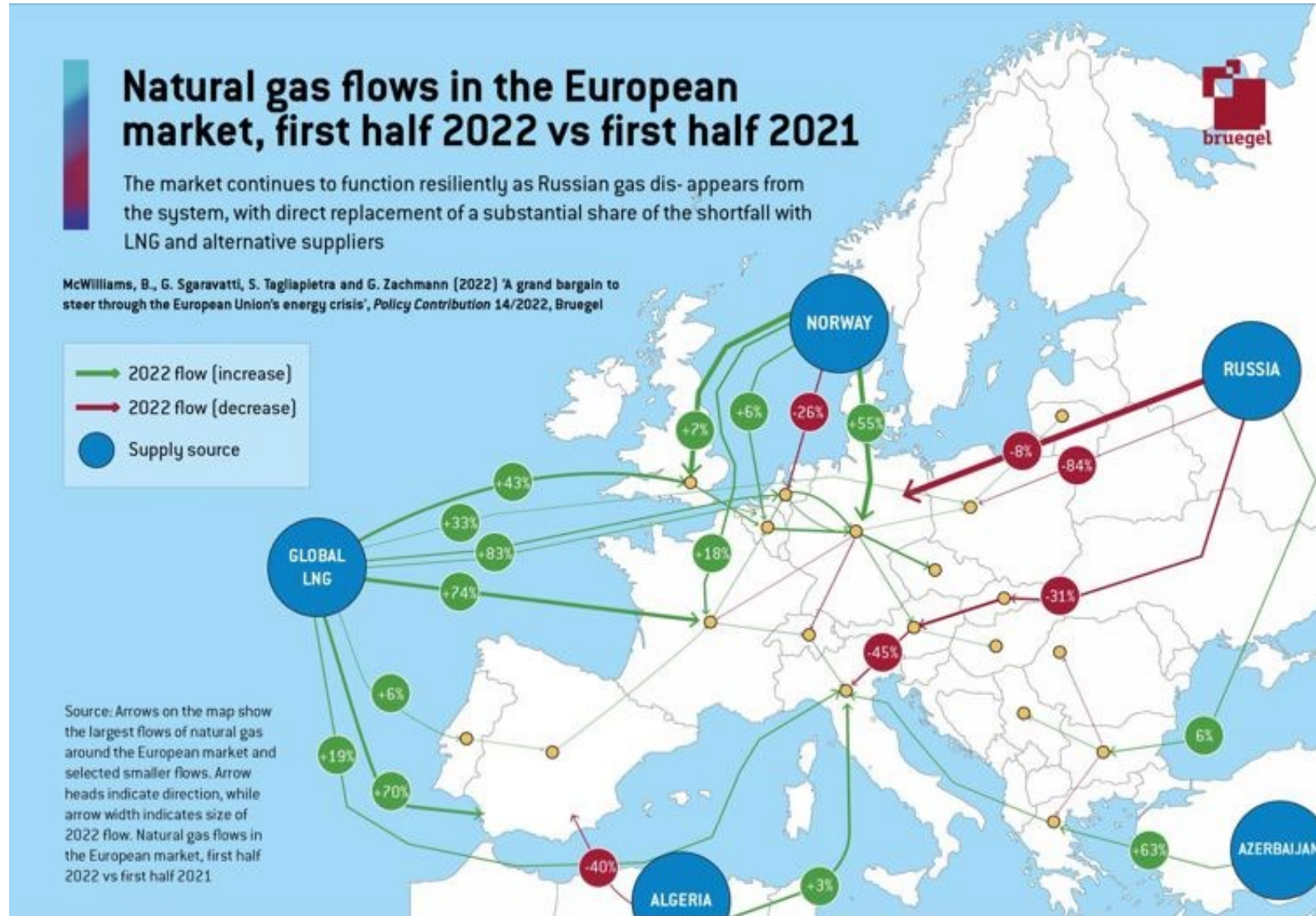
EU Measures to meet shortfall in Russian Gas Supply



## REPowerEU Plan

- Accelerate the energy transition – increase energy efficiency and renewable energy supply (14 bcm)
- Increase gas supplies from elsewhere (66 bcm)
- Gas demand reduction (38 bcm)
- Use fuels other than gas in electricity and industry (17 bcm)

# Changes in natural gas flows into the EU



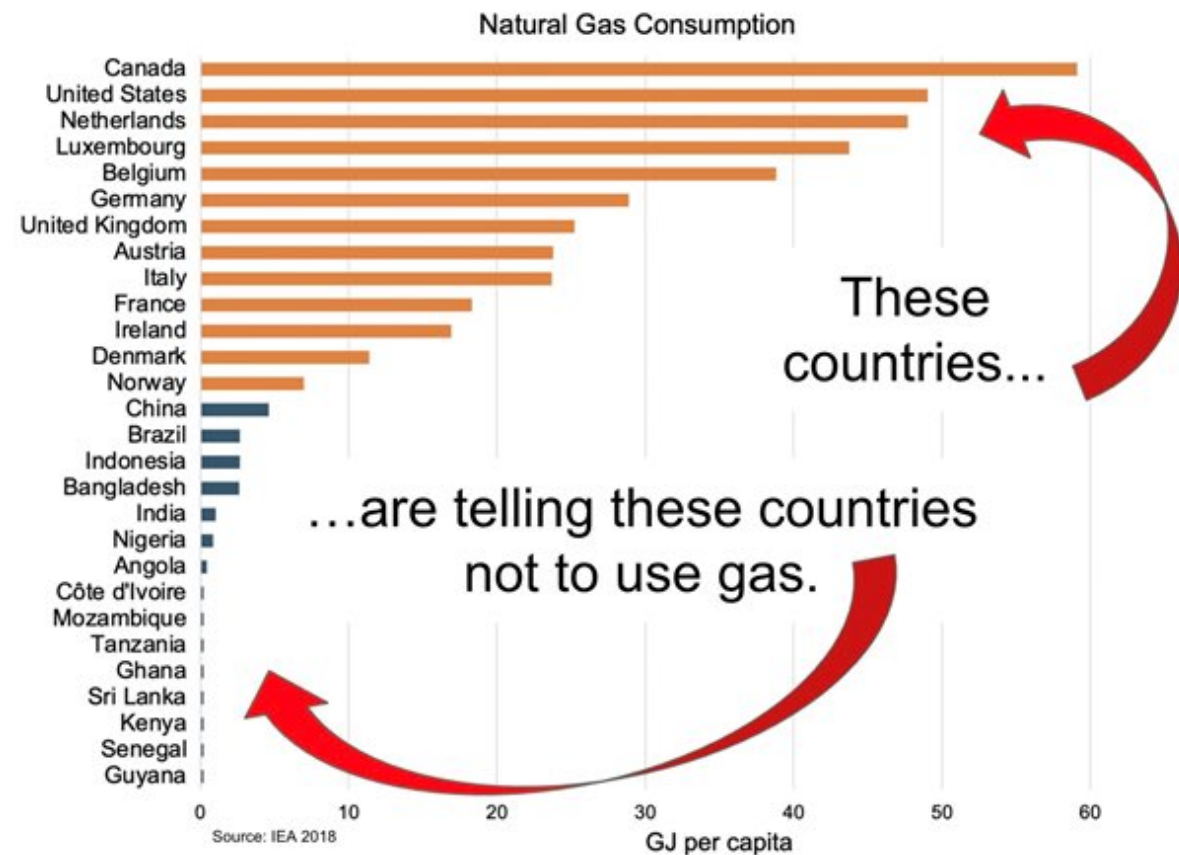
- Concentrated efforts on LNG imports proving fruitful
- Pipeline imports also increasing from Norway, Algeria and Azerbaijan
- Imports from Algeria now larger than imports from Russia
- Is it enough?



# These changes are having consequences elsewhere

## Europe's appetite for LNG leaves developing nations starved of gas

Traders look to profit from rush to secure supplies

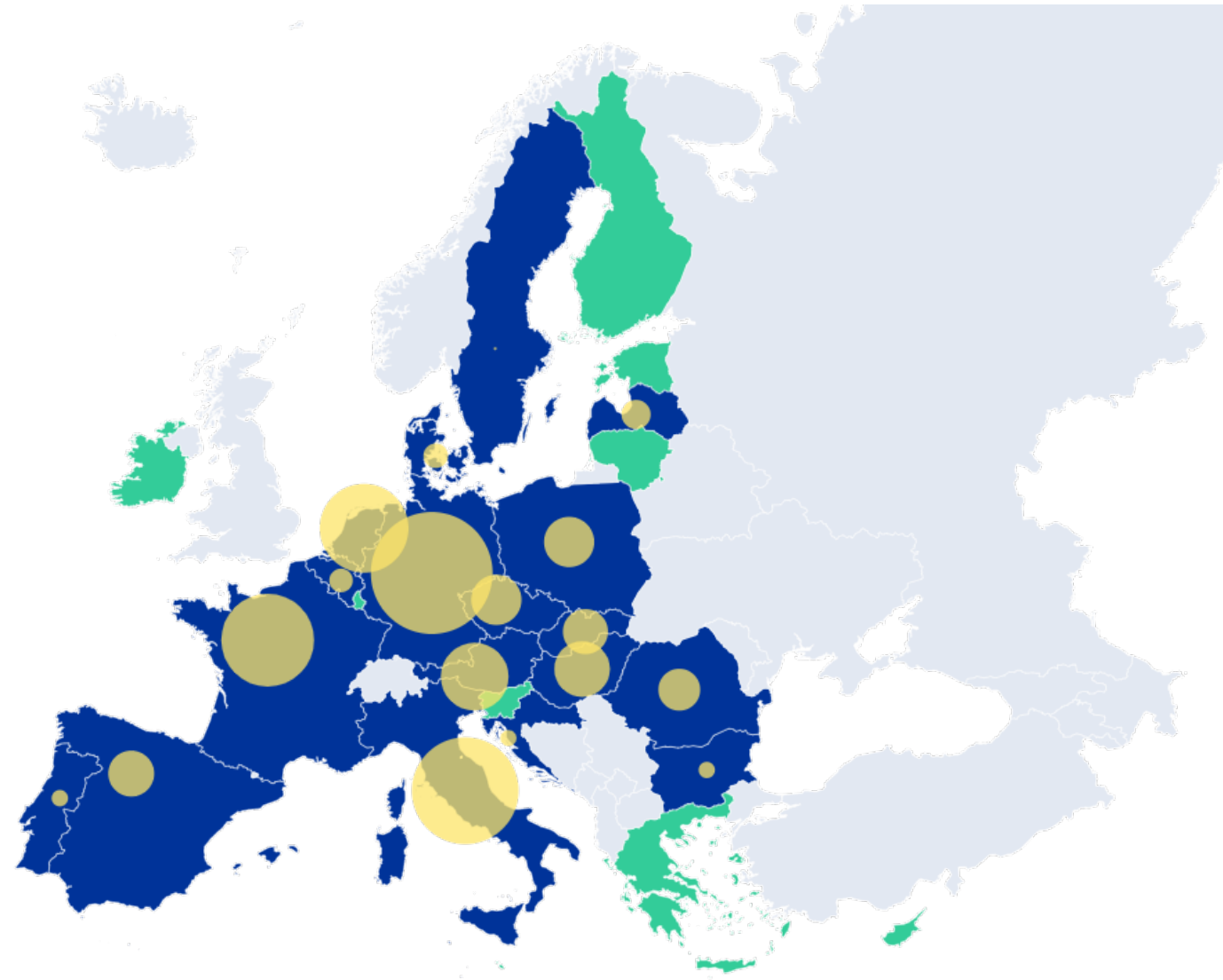


# Important to make as much use as possible of EU gas storage

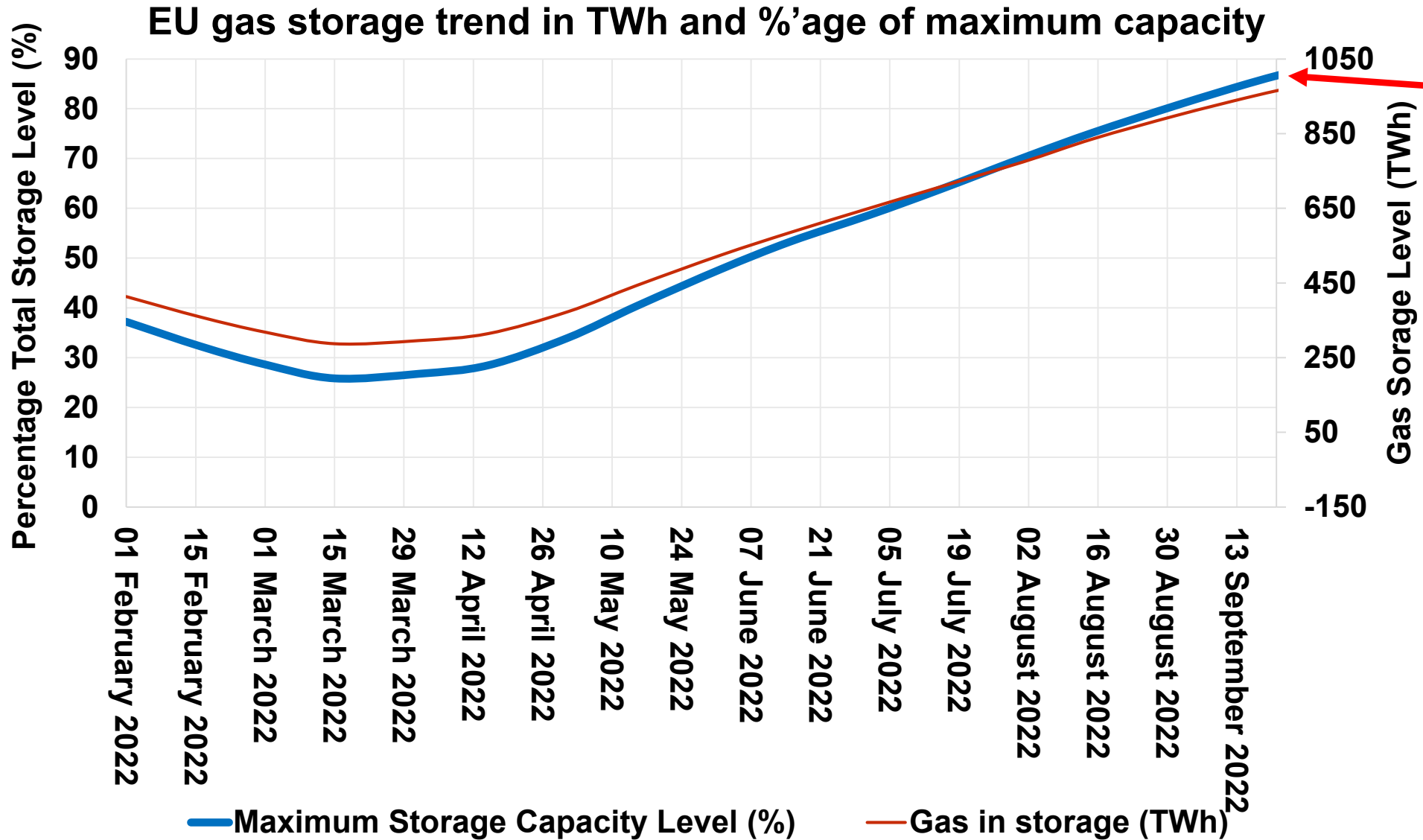
Technical working gas volume of underground gas storage facilities per country

TWh

	operational	under constr.	planned	TOTAL
Austria	95,2			95,2
Belgium	9,0			9,0
Bulgaria	5,8		4,8	10,6
Croatia	5,2		0,3	5,5
Czech Republic	43,1	0,8	0,4	44,4
Denmark	10,5			10,5
France	132,3		4,1	136,4
Germany	260,5		5,9	266,4
Greece			3,9	3,9
Hungary	69,6			69,6
Ireland				
Italy	195,4	8,6	40,7	244,7
Latvia	24,2			24,2
Lithuania				
Netherlands	144,6			144,6
Poland	38,4	0,7	9,0	48,1
Portugal	3,6			3,6
Romania	33,0		12,5	45,5
Slovakia	43,4		3,6	47,1
Spain	34,2			34,2
Sweden	0,1			0,1
<b>EU</b>	<b>1148,2</b>	<b>11,1</b>	<b>85,2</b>	<b>1243,5</b>
Belarus	15,3	5,5		20,8
Russian Fed.	23,8			23,8
Serbia	4,5			4,5
Turkey	35,0		43,2	78,3
Ukraine	327,9			327,9
UK	17,5	0,4	35,3	53,2
<b>non EU</b>	<b>424,1</b>	<b>5,9</b>	<b>78,6</b>	<b>508,6</b>
<b>TOTAL EUROPE</b>	<b>1572,2</b>	<b>16,0</b>	<b>163,8</b>	<b>1752,0</b>



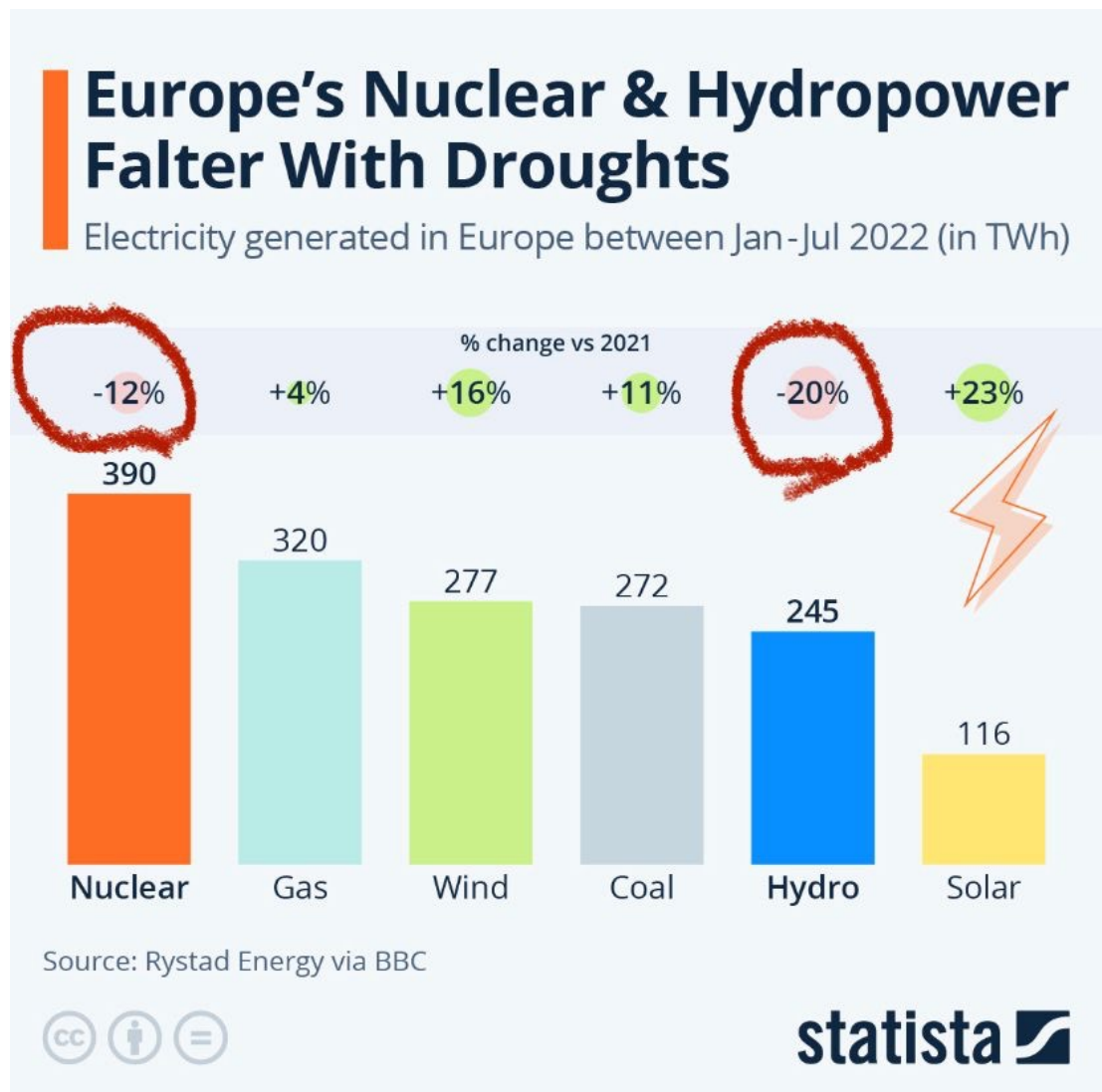
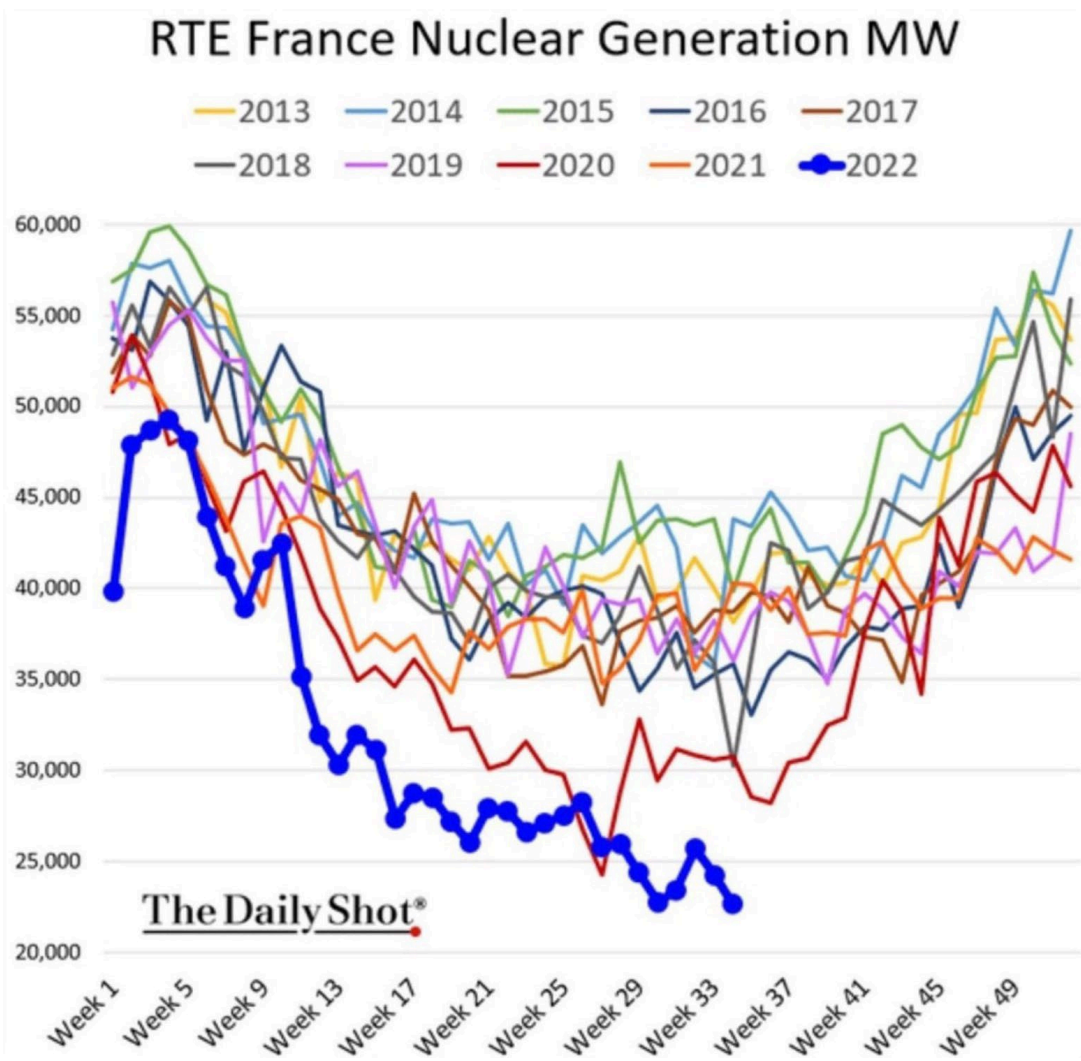
# Target of 80% by end of October met ahead of time



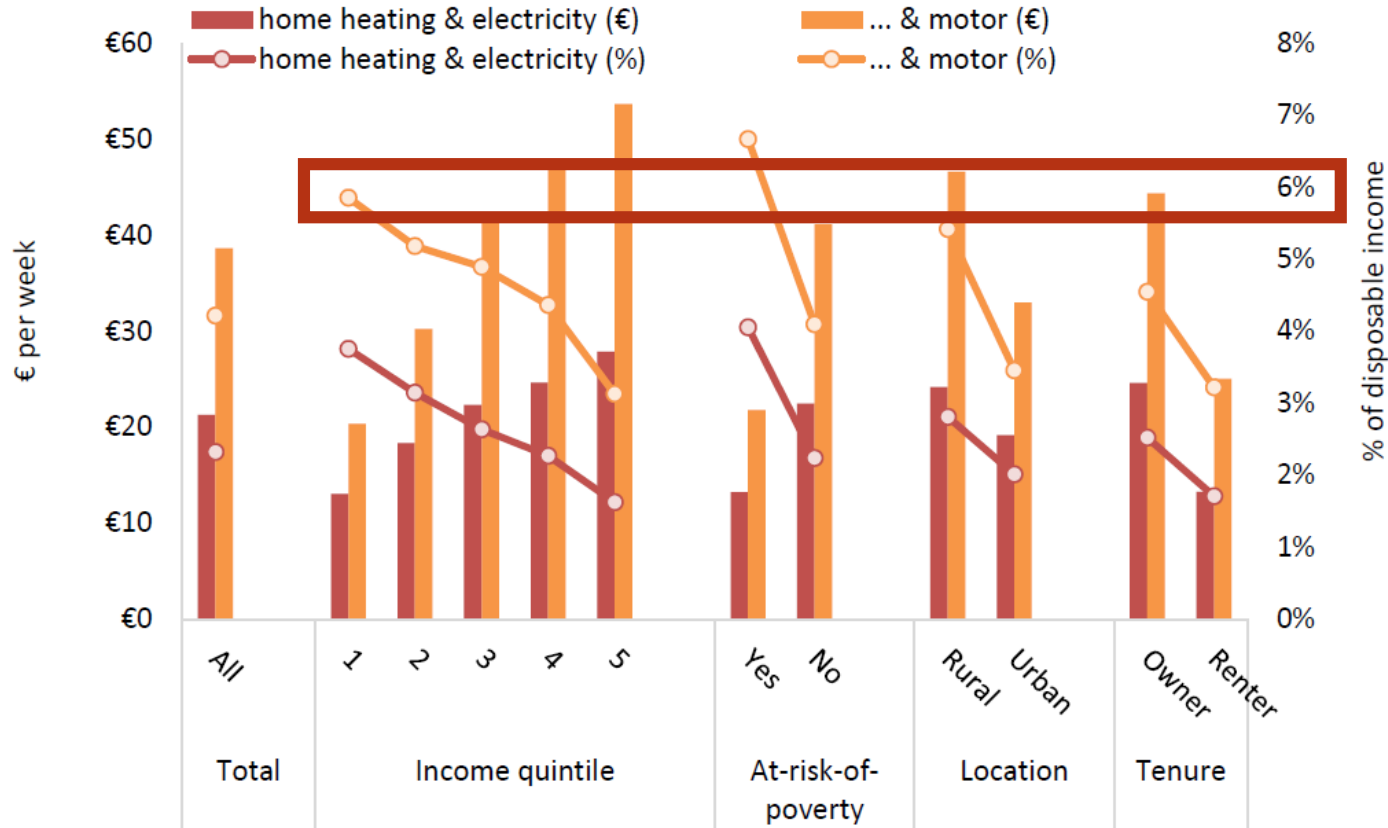
EU achieved 87% of storage capacity by September 22, 2022 despite high gas prices.



# Using fuels other than gas for electricity is proving challenging however



# Impact of price rises on energy expenditure as share of disposable income

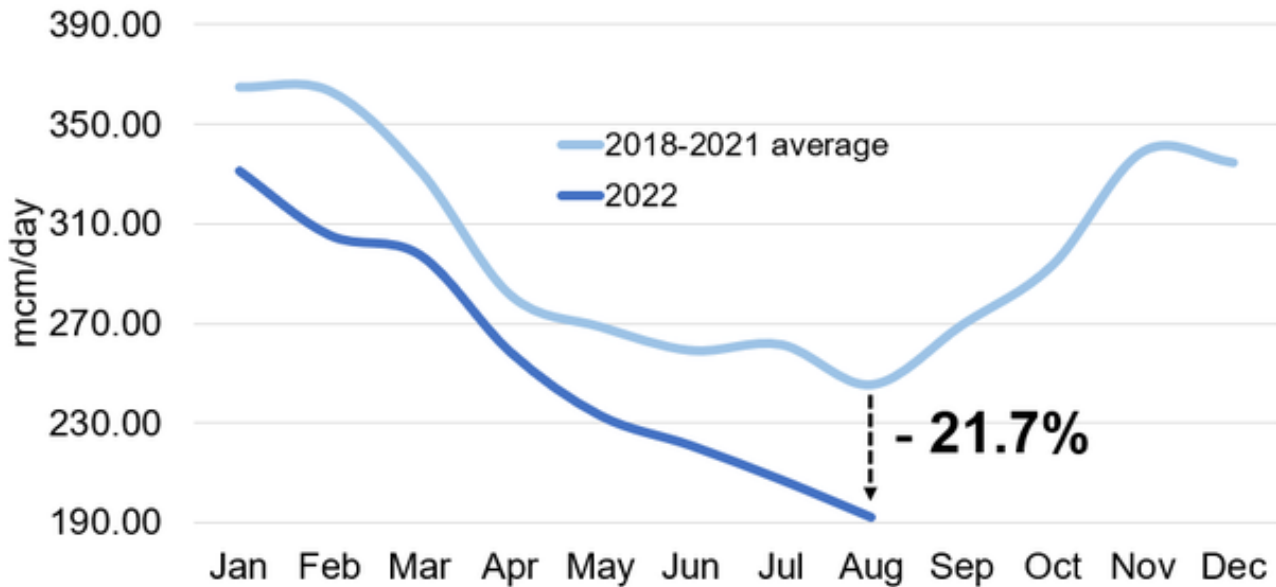


- Price increases (Jan 2021 to April 2022) have increased energy expenditure for lowest income quintile by 6% of disposable income
- Energy poverty can be defined as proportion of households spending more than 10% of disposable income on energy
- More recent price increases means likely level of energy poverty increased to 43% of households

Energy spending >10% of disposable income:	Excluding electricity	Including electricity
2015/16	5.1%	13.2%
Forecast	20.5%	43.0%

# Impacts also being felt by industry and energy suppliers

## Industrial gas demand in Western Europe\* responds to gas price hike



Source: ICIS based on grid operator and market operator data. \* West Europe: GB, NED, GER\*, IT, BEL, FRA.

≡ Independent.ie 

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Personal Finance

## Fourth energy supplier leaves the Irish market as crisis deepens





## How do we mitigate these price impacts?

- Shelter those who are most affected by these price changes
  - €1,000 to all those in receipt of fuel allowances
  - €600 to all households (could have gone to those most affected)
  - Supports up to €10k per month for businesses
  - Free boiler servicing (5%-10% saving) and accelerated free retrofits
- Demand reduction campaign for those who can reduce demand
  - Public sector
  - Promote retrofitting grant uptake
  - Tap into COVID-19 new definition of achievability
- Accelerate energy efficiency and renewable energy

# Recoup excess income from energy companies and use it to compensate

WINDFALL TAX

1. GOVERNMENT TAKES EXCESS PROFITS FROM ENERGY COMPANIES.....



2. GOVERNMENT DISTRIBUTES REVENUE TO PUBLIC....



3. PUBLIC USES THE MONEY TO PAY THE ENERGY COMPANIES.



4. REPEAT.....



OR JUST REFORM THE ENERGY MARKET.

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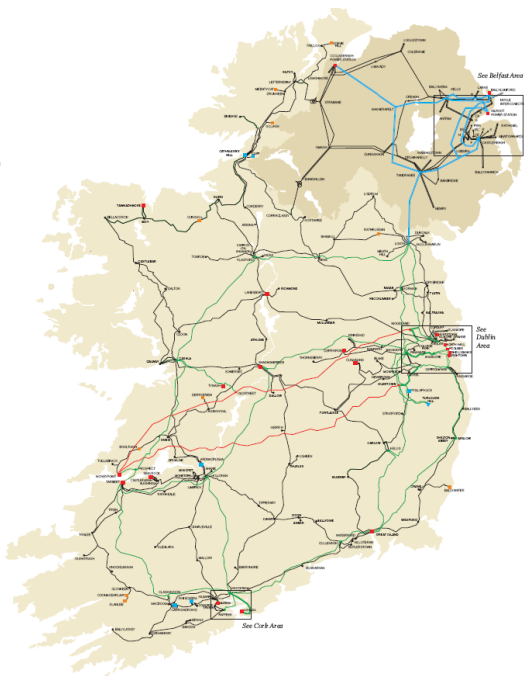
ENERGY

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# Ireland and USA

Ireland	
Population	5 M
GNI*	€231 B <i>€46k</i>
Electricity Consumption	29 TWh <i>5.9 MWh</i>
Peak Demand	5.1 GW
CO <sub>2</sub> Emissions	45 Mt <i>9t</i>
Installed Capacity	12 GW
Total Fossil Fuels	7 GW
Hydro	0.2 GW
Wind	5 GW

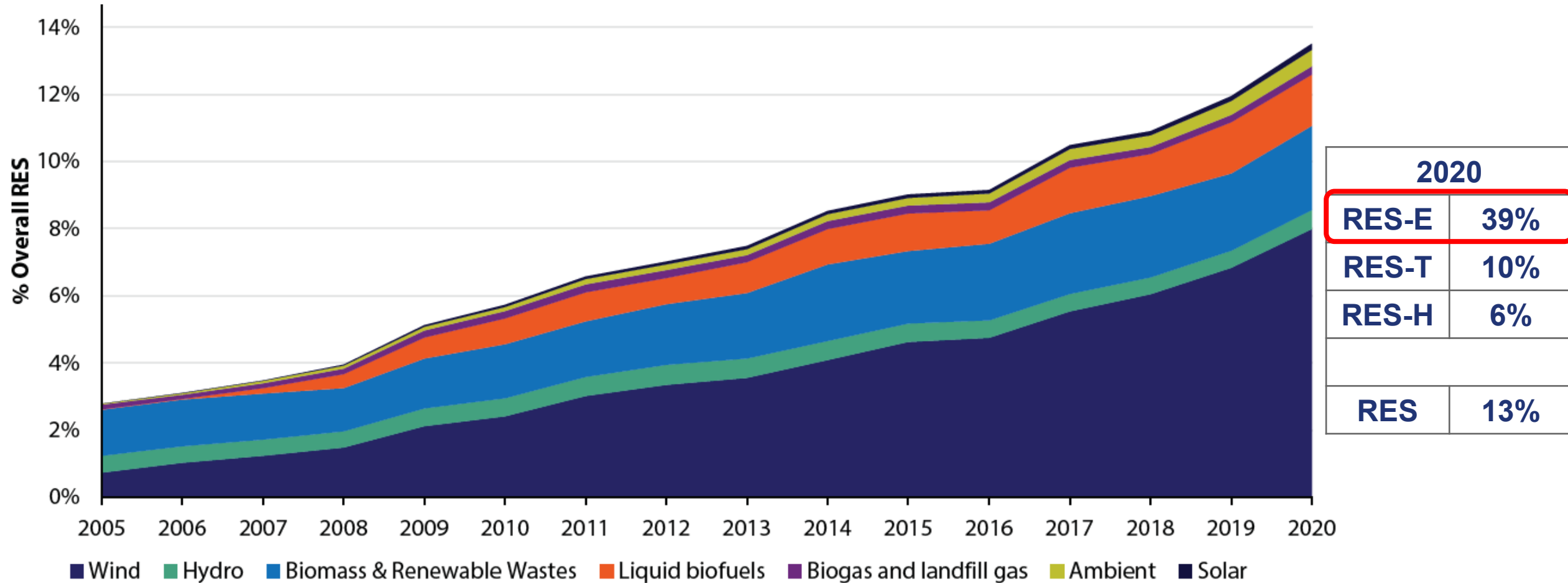


US	
Population	330 M
GDP PPP	€21 T <i>€64k</i>
Electricity Consumption	3,930 TWh <i>11.9 MWh</i>
Peak Demand	790 GW
CO <sub>2</sub> Emissions	4872 Mt <i>15t</i>
Installed Capacity	1,175 GW
Total Fossil Fuels	736 GW
Hydro	103 GW
Wind Solar	209 GW



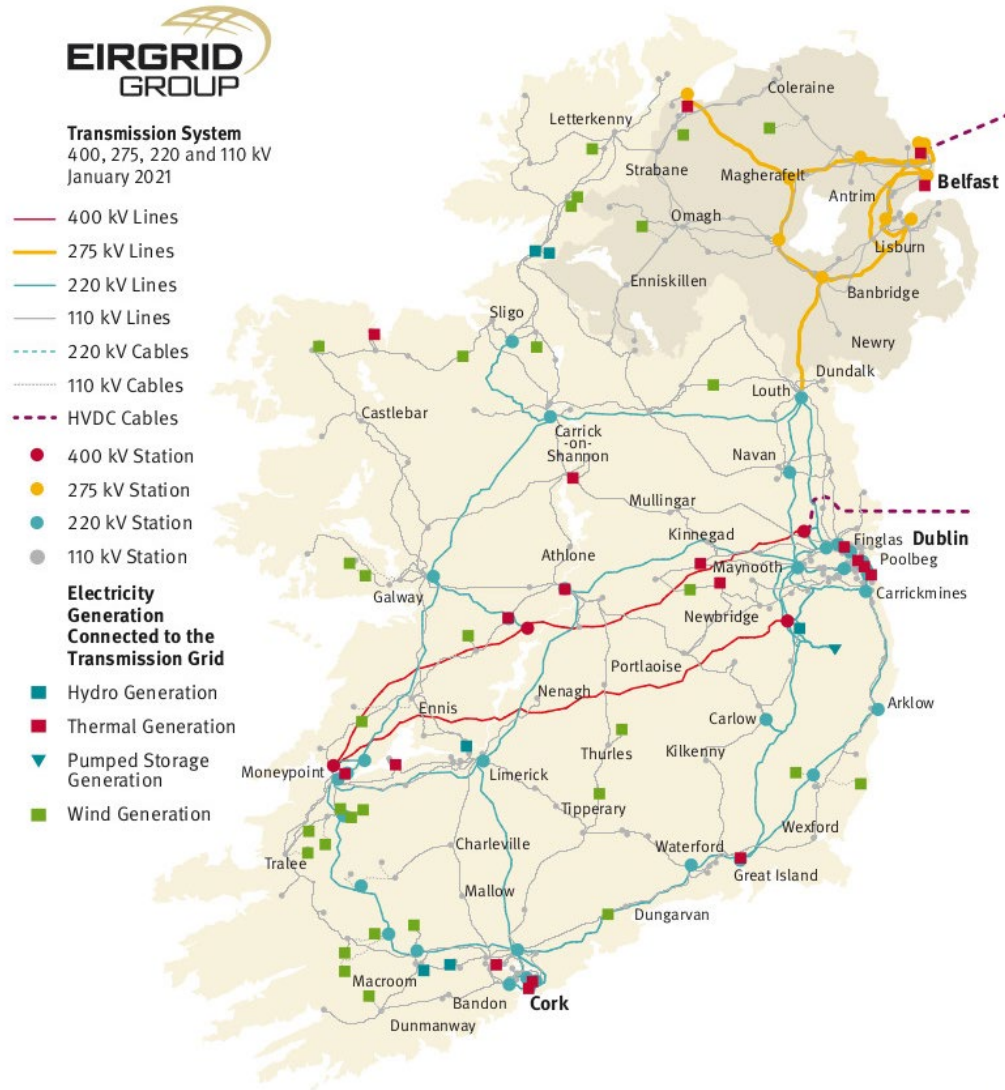
*Value in italics are per person*

# Contribution of renewable energy to energy supply



SEAI 2021 *Energy in Ireland 1990 - 2020*. Published by SEAI. Available from [here](#)

# Ireland's Electricity System



- All-Island single electricity market - two jurisdictions, two currencies, and now EU and non-EU
- Single synchronous power system
- Moyle DC inter-connector between NI and Scotland
- East-West Interconnector between Dublin and Wales
- Celtic Interconnector between Cork and France under development
- Significant system and market challenges to integrate large amounts of non-synchronous, variable renewable energy



# Technical challenges with high non-synchronous variable renewables

Achieving high levels of wind and solar requires sufficient system inertia

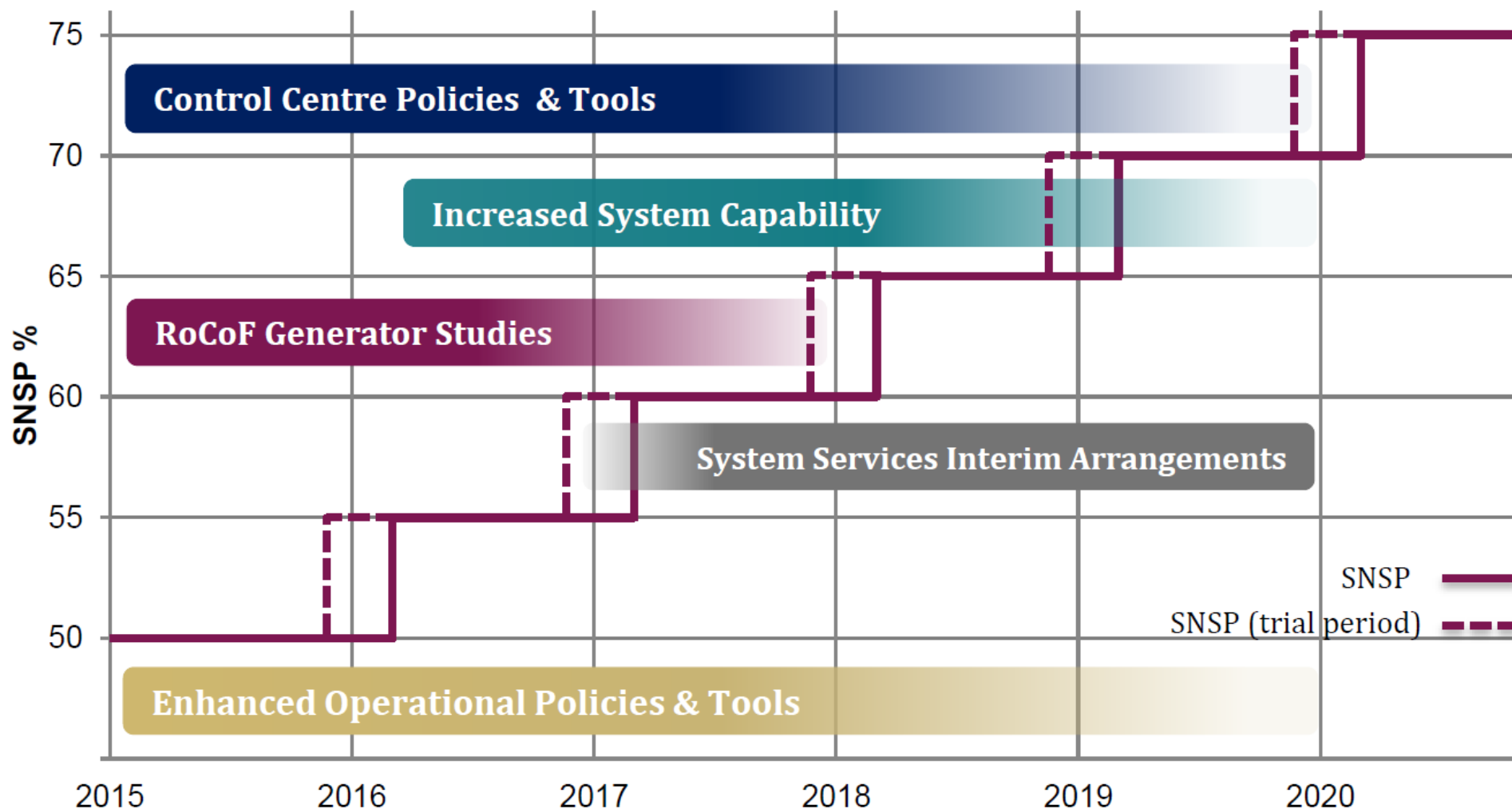
To achieve 40% RES-E on average over the year requires us to accommodate 75% VRES-E at times

To get 70% RES-E on average (our 2030 target) requires us to accommodate **>95% VRES-E at times**

We also need an increasing range of system services to support this

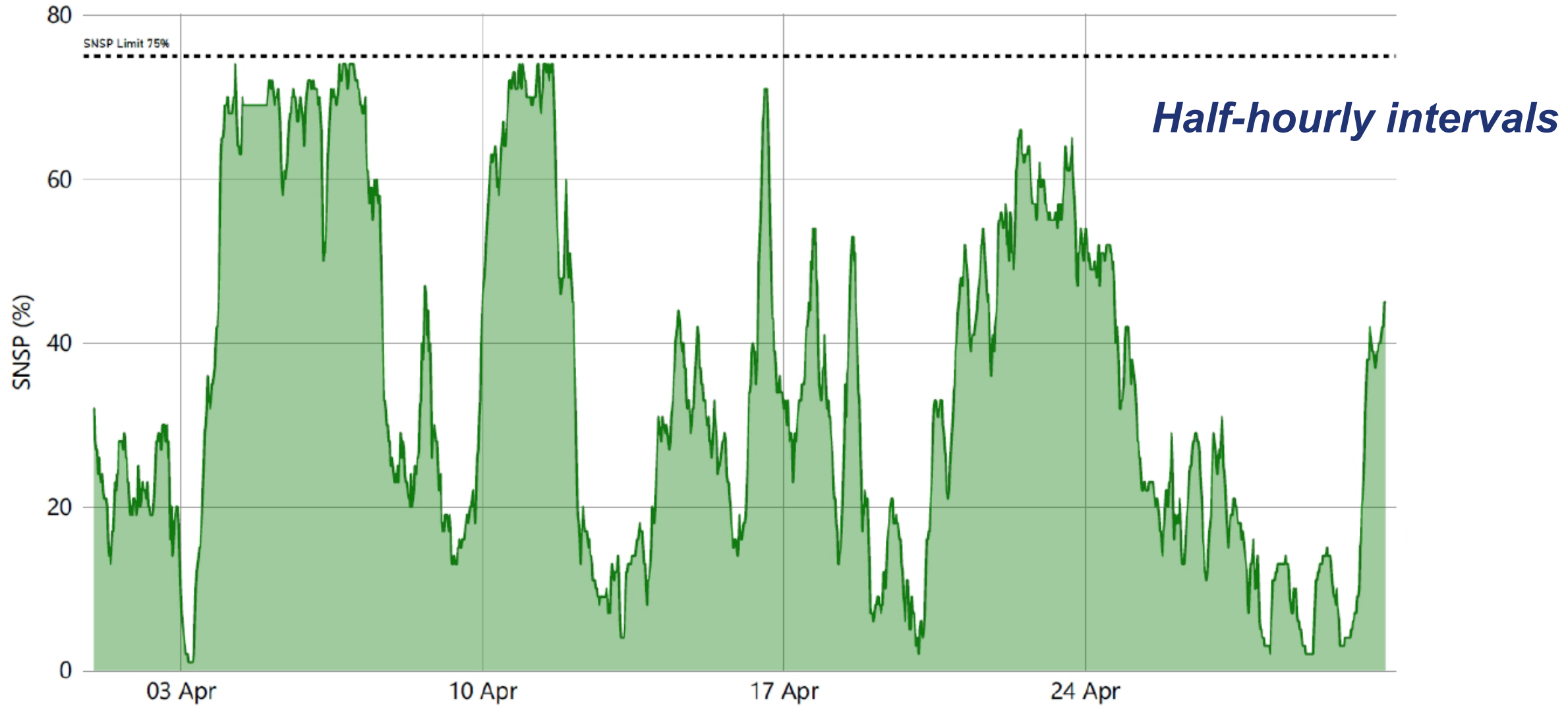
<i>Operational Change</i>	<i>Expected Delivery</i>
Implement Enduring OFGS	Q4 2019
Inertia Floor – 17,500 MWs	Q1 2020
Minimum Units Online – /	Q1 2020
<i>Operational Policy</i>	
Min Sets Policy (Voltage & Inertia)	Q2 2019
SNSP 75% Policy	Q4 2019
VDIF Policy	Q4 2019
<i>Control Centre Tools</i>	
Voltage Trajectory Tool	Q1 2020
<i>System Services</i>	
11 existing services + FFR + DRR + FPFAPR	Q3 2019

# Increasing System Non-Synchronous (i.e. wind) Penetration



EirGrid 2016 DS3 Programme Operational Capability Outlook 2016. Available [here](#)

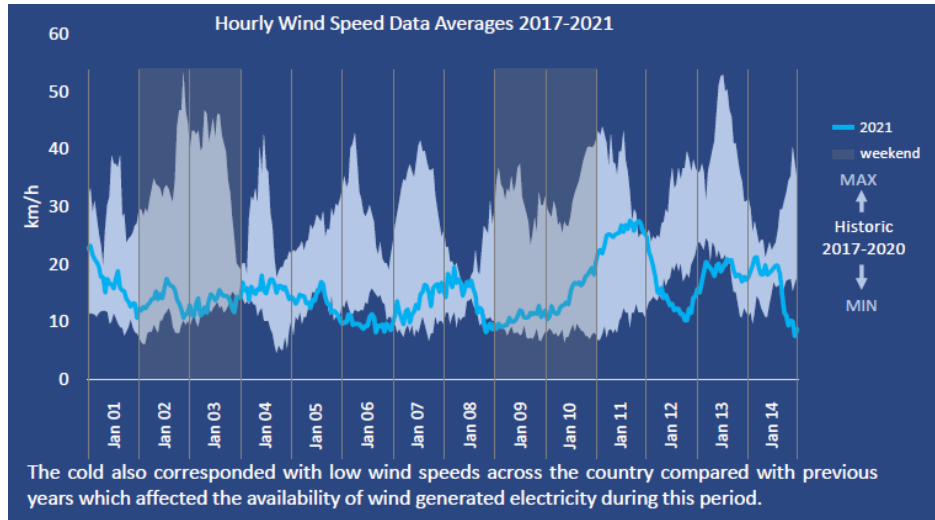
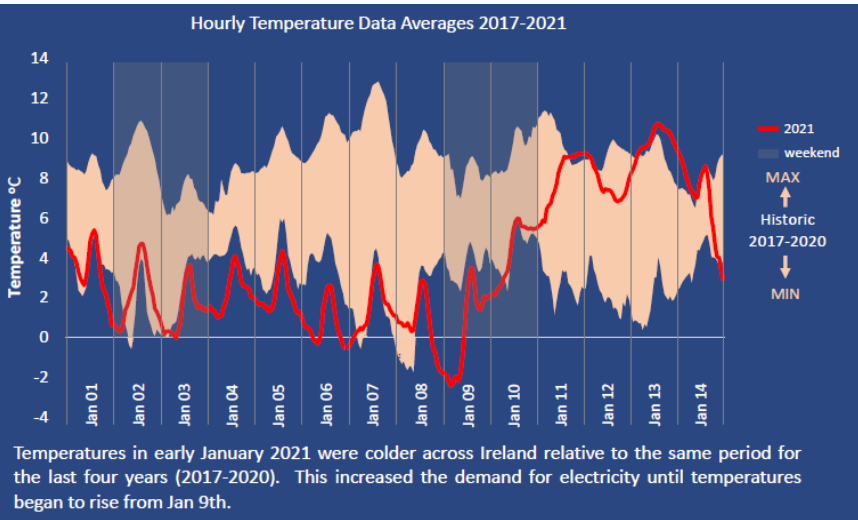
# System Non-Synchronous (i.e. wind) Penetration levels April 2022



SEM Committee 2022 SEM Monthly Monitoring Report April 1 – April 30. Published as SEM-22-043 Available from [here](#)

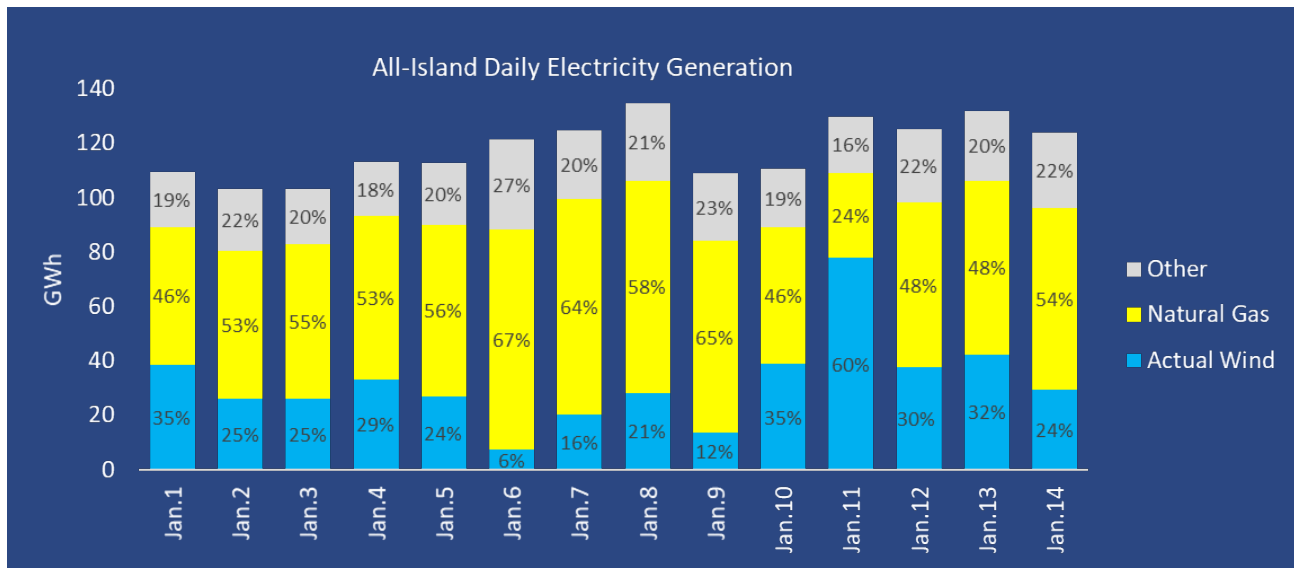


# We've been challenged - many aspects of system flexibility are 'behind the scenes'



Ireland experienced both low winds **and** cold weather in early Jan 2021.

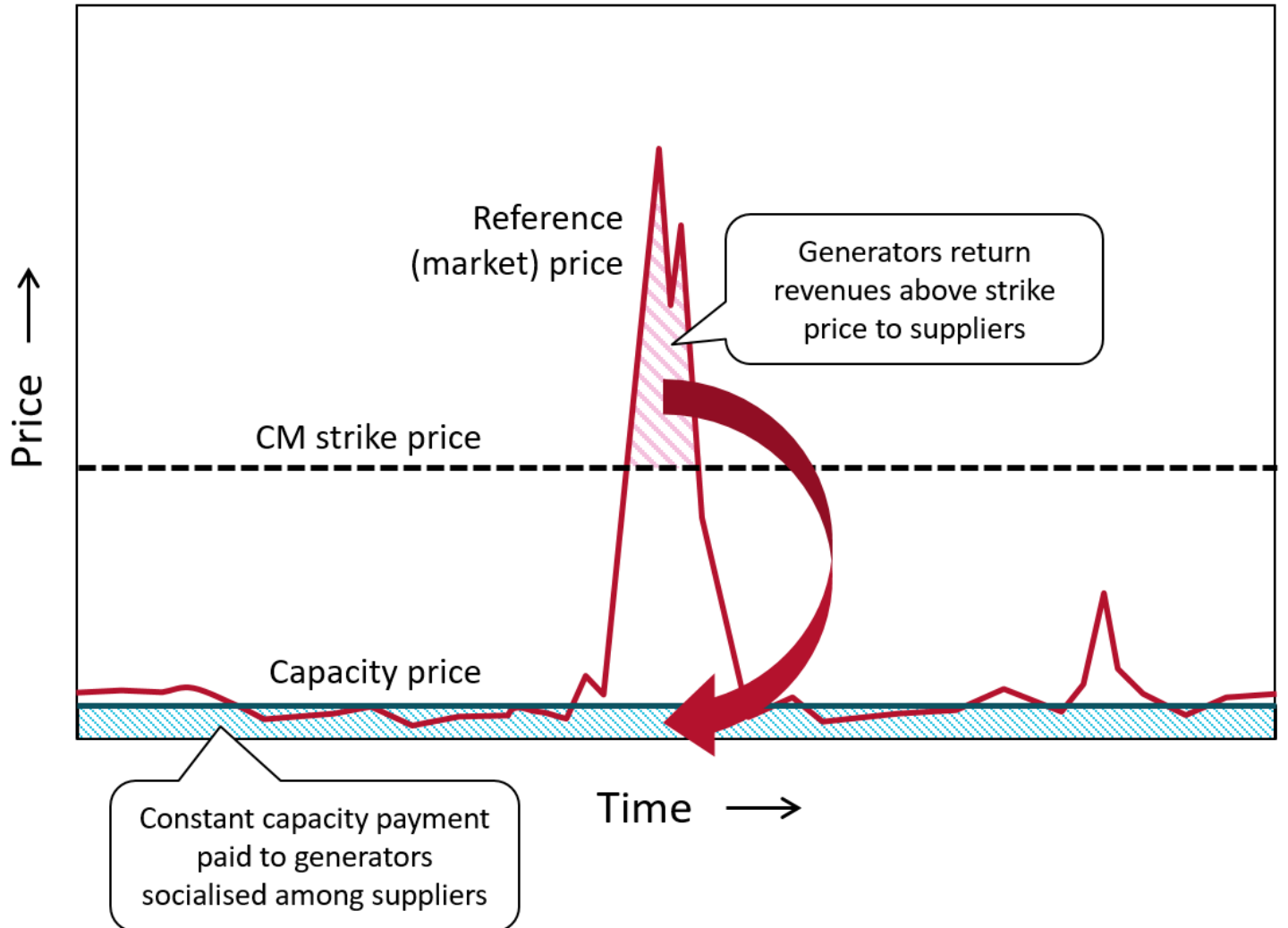
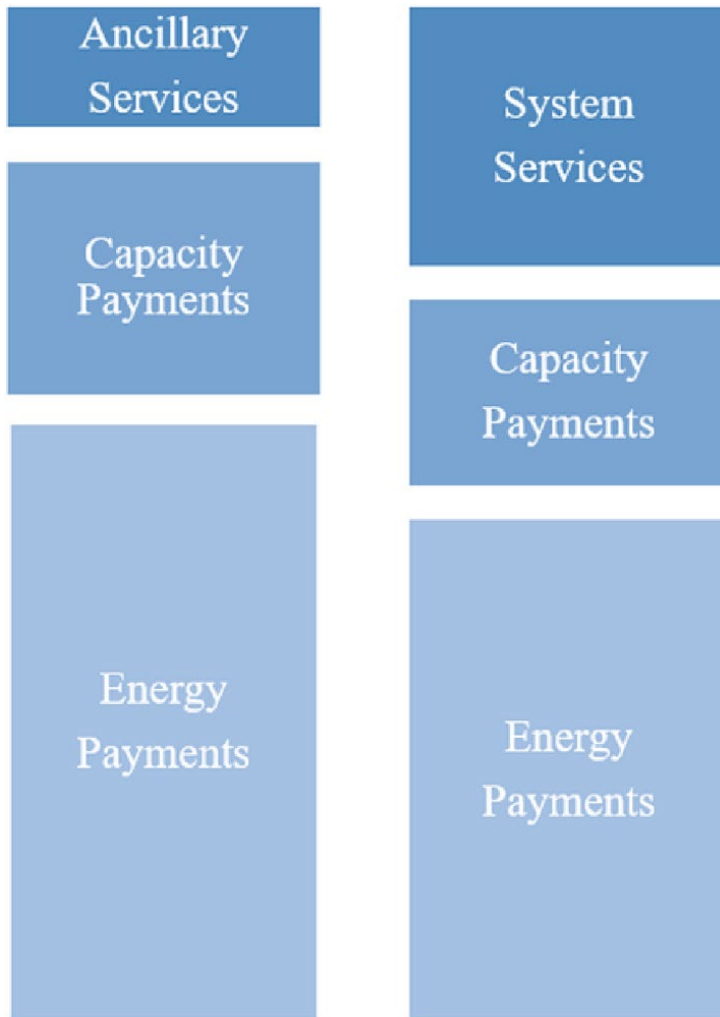
Power system compensated for the low levels of wind with increases in natural gas power.



Cold weather increased the demand for heating and gas system was also able to provide sufficient increased heating.

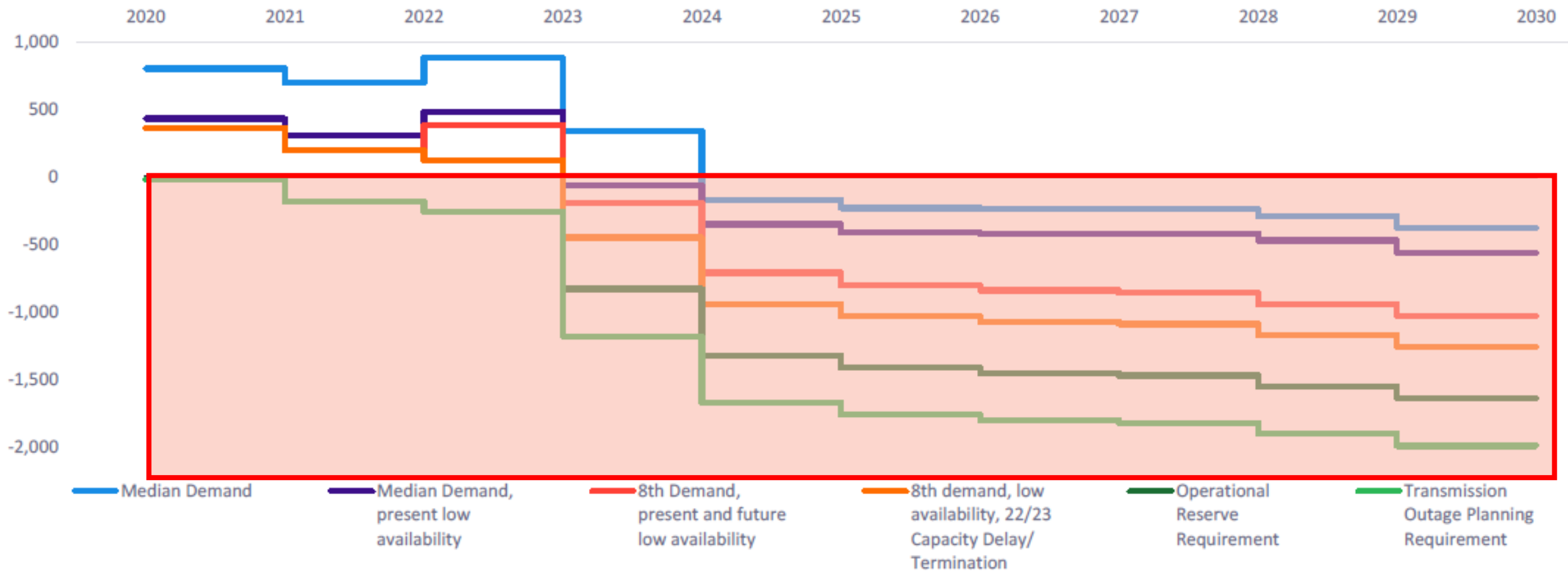
Ó Gallachóir B and Deane P 2021 *How to ensure we keep the lights on while reducing emissions?* Available [here](#)

# Transitioning to low carbon future requires market changes



Gaffney, F., Deane J.P. and Ó Gallachóir B.P. 2019 *Reconciling high renewable electricity ambitions with market economics and system operation: Lessons from Ireland's power system*. **Energy Strategy Reviews** 26 100381. Available [here](#)

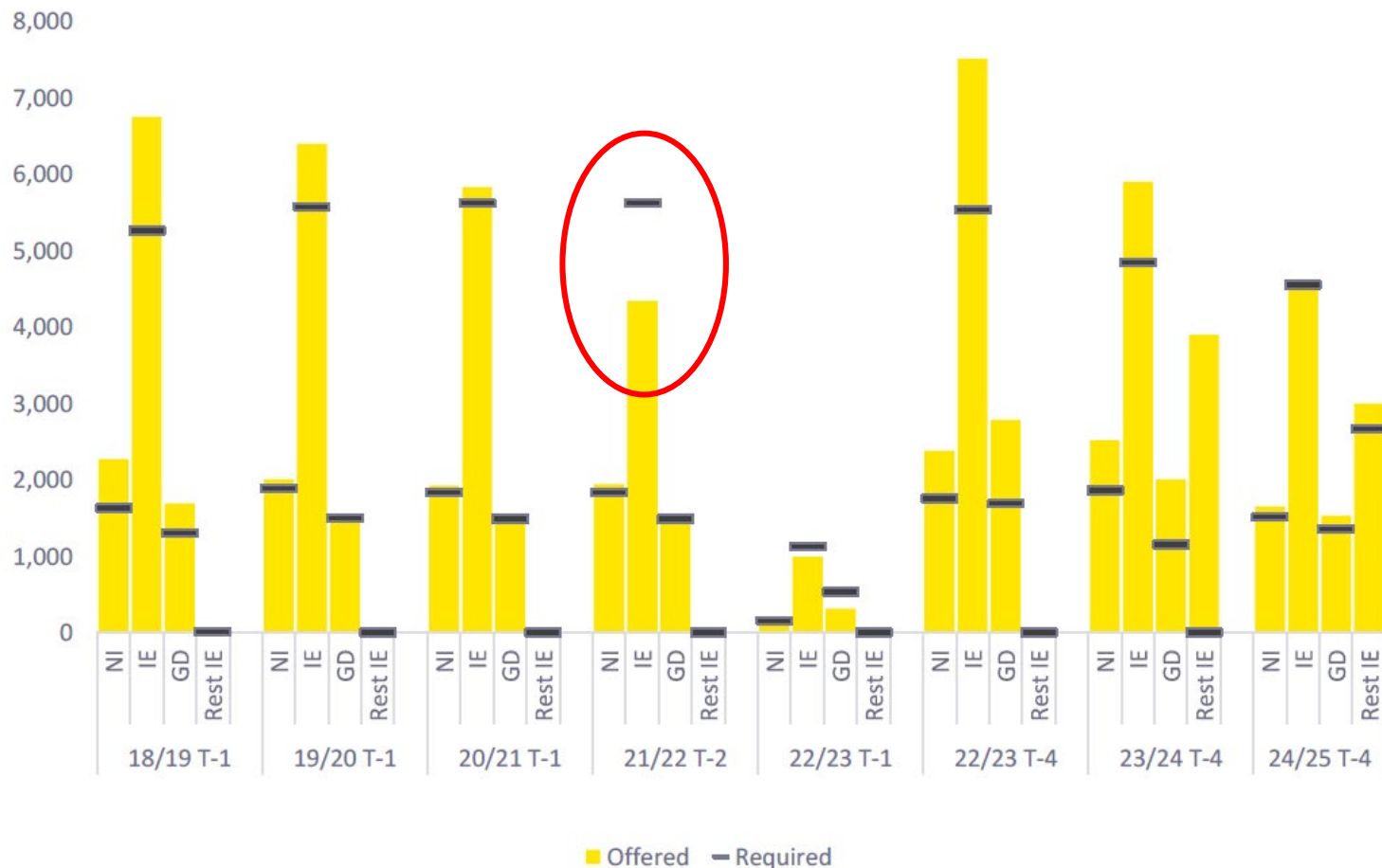
# Shortage in adequate generation capacity has been well flagged



EirGrid 2021 *All-Island Generation Capacity Statement*. Available [here](#)



# We've had auctions for capacity but failed to deliver sufficient back-up



Auction	New capacity units won in auction	Total Units Terminated	Total Amount (MW) Terminated
2018/19 T-1	25	4	17
2019/20 T-1	25	3	5
2020/21 T-1	28	2	7
2021/22 T-2	31	2	4
2022/23 T-4	32	10	513
2023/24 T-4	37	6	41
2024/25 T-4	42	4	55

**Auctions** have not always delivered as much as required

Many **awarded** contracts have not delivered

EY 2022 *Performance of the SEM Capacity Remuneration Mechanism*. Report to SEM Committee. Available [here](#)

# How do we increase electricity supply security?

- Ensure improved availability of existing power plants
  - Reduced O&M during COVID has impacted negatively
- Where can we reduce demand?#
- Penalise electricity use at times of low wind and peak demand
- Secure additional capacity
- Accelerate energy transition

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ENERGY

### Irish authorities were told gas flow could drop by 12% if Russia cuts supply to EU



# Ireland has divested, banned gas exploration and said No to 'fracked' gas (LNG)

21:21 ↖

📶 🔋

☰ **The New York Times** 👤

## *Ireland Moves to Divest From Fossil Fuels*

A bill passed in the lower house of Parliament was a victory for the global divestment movement.

📺 Give this article   ➦   📖   📖 Read in app

 **By Somini Sengupta**

July 12, 2018


Politics

## Ban on licences for new oil and gas comes into force following Cabinet decision



The Cabinet has approved a ban on licences for new oil and natural gas exploration

Kevin O'Sullivan  
Tue Feb 2 2021 - 20:43

 **Rialtas na hÉireann**  
Government of Ireland

## Policy Statement on the Importation of Fracked Gas

May 2021

*placing of a legal prohibition on the importation of fracked gas in national legislation has been considered and legal advice has been provided ... it is considered that a legal ban on the importation of fracked gas could not be put in place at this time*

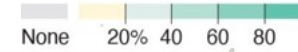
Prepared by the Department of the Environment, Climate and Communications  
[www.decc.gov.ie](http://www.decc.gov.ie)

# Ireland is 'sheltered' from Russian gas supply disruptions



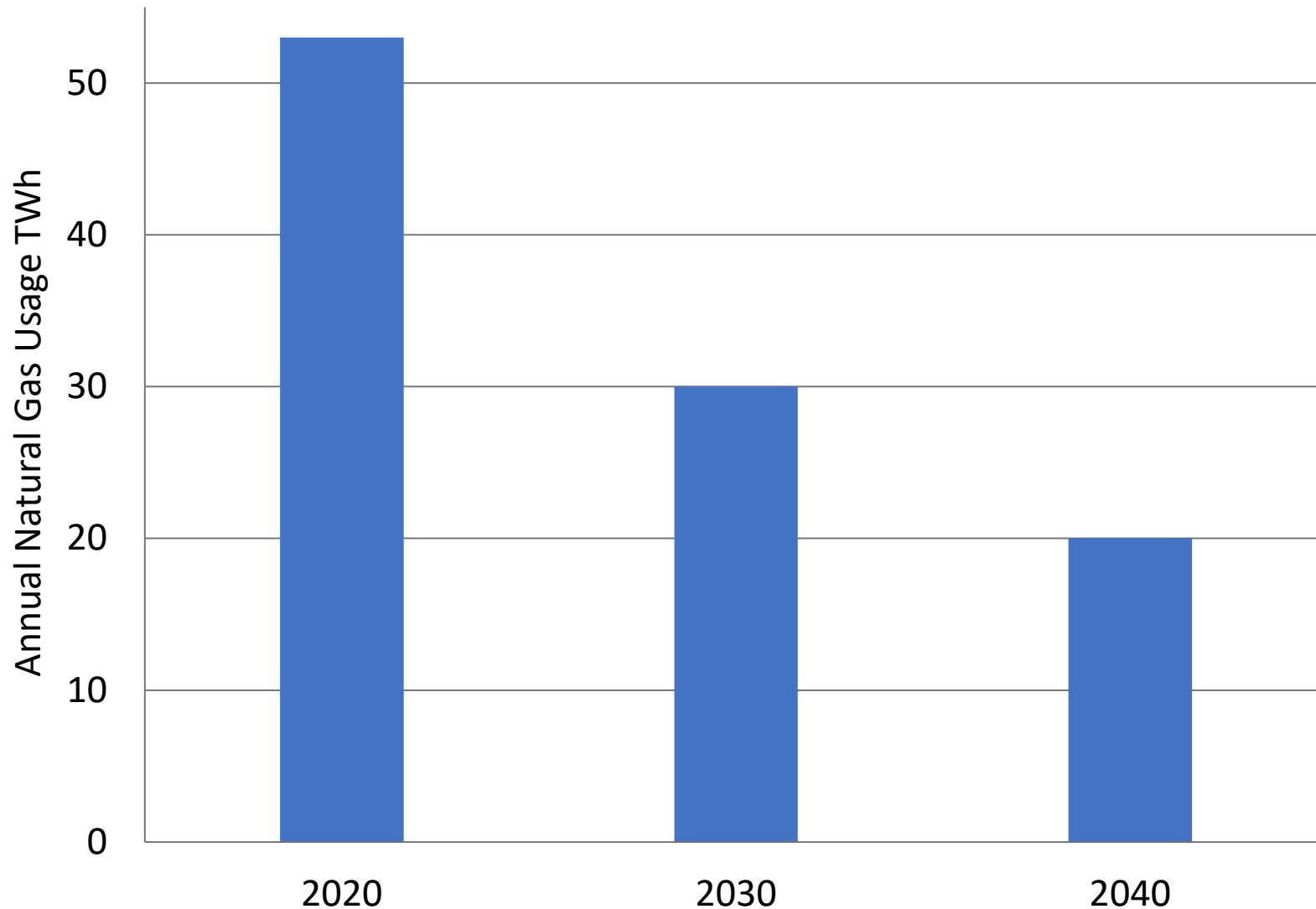
## Which EU Countries Import the Most Russian Gas

Share of country's natural gas imports from Russia, 2020



Source: EuroStat and the British Department for Business, Energy & Industrial Strategy | Note: Austria did not report the source of its natural gas imports in 2020. Data includes both piped and liquefied natural gas. THE NEW YORK TIMES

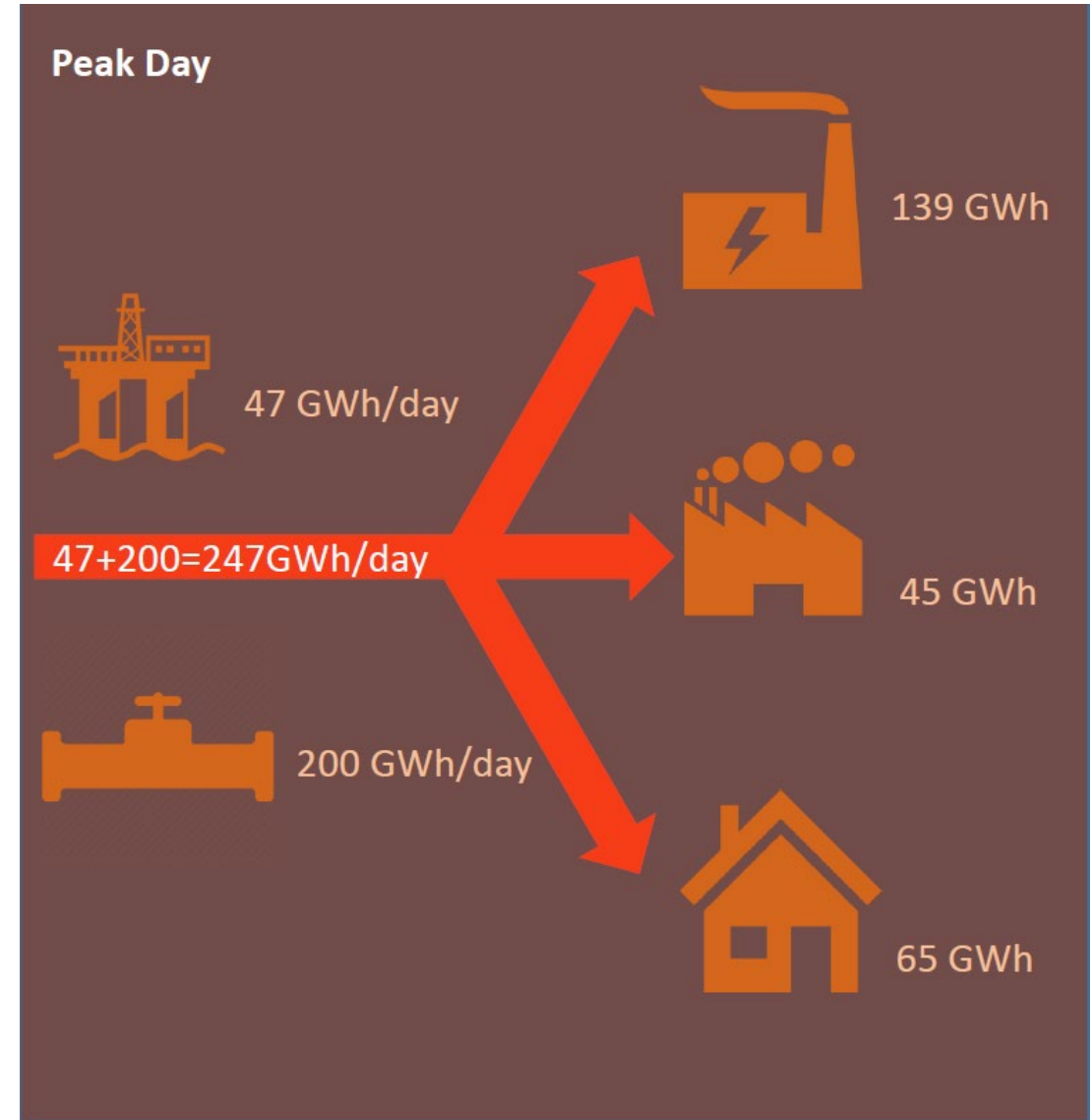
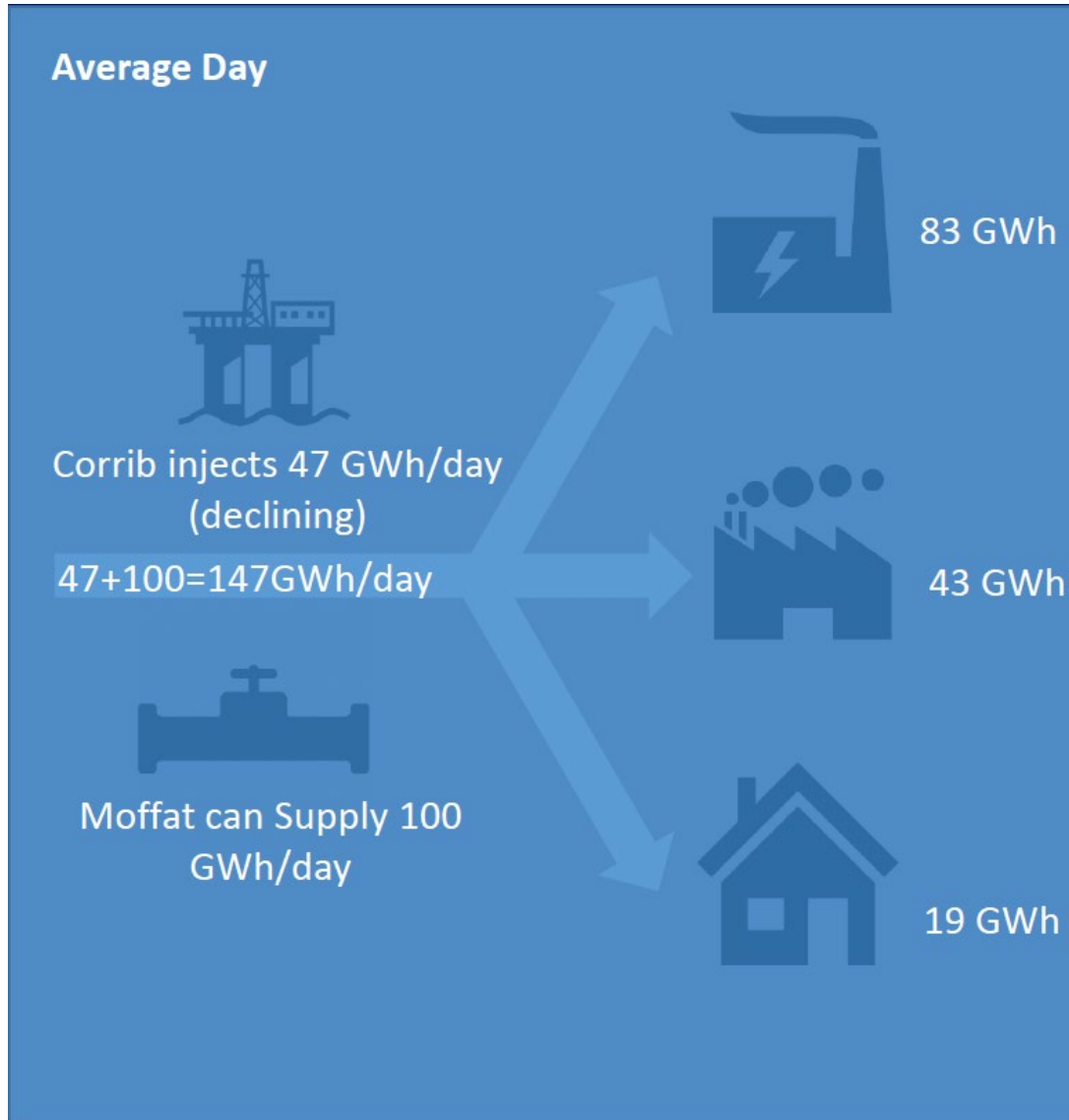
## We need to decrease gas usage and also increase security of gas supply



- On an aggregate annual basis, Ireland will use less gas over the next 10 years (40-50% less by 2030)
- ... but on individual days it will need more especially on days when heating and power demand is high and renewable output is low across IE and NW Europe
- reducing carbon budgets will in essence, 'lock out' long-term use of natural gas (15 years +)



# 'Average' use if manageable – 'peak' day gas use is challenging ...



# Closed conversations are reopening ...



Rialtas na hÉireann  
Government of Ireland

## Review of the Security of Energy Supply of Ireland's Electricity and Natural Gas Systems Consultation

19 September 2022

Prepared by the Department of Environment, Climate and Communications  
[www.decc.gov.ie](http://www.decc.gov.ie)



## Technical Analysis of the Security of Energy Supply of Ireland's Electricity and Natural Gas Systems

The Department of the Environment, Climate and  
Communications

16 September 2022



Final

1

- Floating LNG
- Gas storage

# Winter is coming

Can Ireland keep the lights on and homes warm?

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Prof. Brian Ó Gallachóir

MITEI Visiting Scholar