THE IRISH ACADEMY OF ENGINEERING

ENGINEERING & TECHNOLOGY

THOUGHT LEADERSHIP IN A TIME OF GREAT CHANGE

Worst ever energy crisis?

Ireland needs to act decisively and relearn lessons from previous energy shocks

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THE IRISH ACADEMY OF ENGINEERING

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The Irish Academy of Engineering
22 Clyde Road
Ballsbridge
Dublin D04 R3N2
Ireland.

Registered in Ireland: CRO 439234, CHY18046, RCN 20068455

President: Sean Finlay

Academy leadership team:

Sean Finlay, President

Seamus McKeague, Immediate Past President

David Dumigan, Hon. Secretary

Jim Browne, Hon. Treasurer

Tom Leahy, Special Advisor & Past President

This report has been prepared by a Taskforce of members of the Energy & Climate Action Committee including:

Gerry Duggan
Ria Lyden
Don Moore
Terry Nolan
Jim O'Brien
Kieran O'Brien
Neil O'Carroll
Barry J O'Sullivan
Brian Sweeney
David Timoney
Ed Walsh

Telephone: +353 1 665 1337
academy@iae.ie
www.iae.ie

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1. INTRODUCTION

The current energy crisis, arising from the bombing of Iran and the resultant targeting of oil and gas facilities across the Middle East – and following closely on the heels of the energy disruption caused by Russia's invasion of Ukraine – is, in many respects, similar to the situation in the late 1970s and early 1980s when Ireland was hit by a succession of energy shocks which caused considerable damage to the economy.

In this commentary, we review the response of the State to the various energy crises that have hit it in the past, compare it to the current response and identify options that should be pursued to minimise the potential impact of such shocks in the future.

2. IRELAND'S HISTORIC RESPONSE TO ENERGY SHOCKS

World War Two was the first crisis to hit the newly formed State. Coal imports from Britain were reduced to a trickle and petrol was even more severely rationed. At the time Ireland was a predominantly rural country, where animal power provided much of the required farm work and transport requirement and many households with turbary rights harvested indigenous turf for home use. The State's extremely brave decision to develop the Shannon scheme in the 1920s, at a cost of £10 million, meant that electricity production continued throughout the war, though supplies were limited. But coal supplies for trains and power generation were very substantially curtailed.

At the end of the war, the State adopted a programme to develop the bogs for power generation and for peat briquetting, and a series of new peat fired stations were constructed. The State also continued to develop the country's limited hydro resources, and the Erne and Lee were harnessed for that purpose.

In 1956, Egypt nationalised the Suez Canal and the UK and France invaded to reclaim their ownership of the canal. Israel also joined in. The war resulted in the blockage of the canal for a number of years. While Middle Eastern oil production was not disrupted, the world's oil tanker fleet was not sufficient to maintain the same level of oil supplies to Europe, via the much longer passage around the Cape of Good Hope, and oil supplies in Europe were restricted. In Ireland the situation was particularly acute as we depended on petrol supplies from UK refineries and these were not forthcoming. As a result, the then Government demanded that the four oil majors, who at that time had over 95% of the oil market in Ireland, establish an oil refinery here. The Whitegate refinery was developed as a result, at a cost of £12.5 million, and commissioned in 1959.

In 1973, the Yom Kippur war erupted between various Arab countries and Israel. Oil production facilities were not affected but Saudi Arabia and other countries restricted output as the US, which strongly supported Israel, was by then a significant oil importer. Global oil supplies were again restricted, including in Ireland, and crude oil prices increased fourfold, from $4 per barrel to $16 per barrel. The OECD countries responded by establishing the International Energy Agency, which, among other things, established oil sharing rules in the event of a crisis, and a requirement for nations to hold a minimum of 90 days of oil stocks. Ireland established a structure to comply with this requirement

In 1973, Marathon discovered the Kinsale gas field and Government decided that it should be developed for power generation and fertiliser production. At the time the view in the EEC was that natural gas should not be used for power generation. However, Ireland was exempted from this constraint as it did not have a significant town gas market. The development proved to be extremely fortuitous in the light of subsequent events.

The Iranian Revolution commenced in 1979. At the time, Iran was the fourth largest oil producer in the world, and Iraq was the fifth. By 1980, Iran's oil output had fallen by 75%, thereby triggering the second Oil Crisis, and prices worldwide rose to record levels in real terms. As a result, the world experienced a severe economic recession. Iraq invaded Iran in 1980, but did not enjoy the victory it expected, and its oil output also fell by 75% as a result. The combined effect was to hasten oil exploration and development in other countries and to accelerate the search for alternatives to oil.

In Ireland, the Irish National Petroleum Corporation (INPC) was established, as Saudi Arabia was offering preferential terms to National Oil Corporations. However, by the time the INPC was operational, the benefits of those deals had disappeared. The INPC acquired Whitegate Refinery, when the owning partnership planned to close it down in the early 1980s. It was subsequently given the oil stock holding responsibility, which later evolved into the National Oil Reserves Agency (NORA).

In the early 1980's, ESB commissioned the then distillate fired Aghada gas turbines on natural gas and operated them, and the steam unit at Aghada, at base load to minimise oil use for electricity generation. This was possible as the output from the Kinsale field could be increased to 70% above original plans. Marathon Petroleum sought and received undertakings from ESB that it would be compensated if the Kinsale field reservoir was damaged as a result.

The ESB was still heavily dependent on heavy fuel oil (HFO) for power generation in the late 1970s and, in 1978, decided to develop Moneypoint as a coal fired generating station with a potential output of 4 × 300 MW. Moneypoint, with 3 × 300 MW units, was completed on time and on budget, at a cost of €3 billion in present money terms. Successive units were commissioned between 1985 and 1987.

Thus, in each of the above crises the State made clear and, at times, capital intensive decisions to improve Ireland's energy security, acting as promptly as it could. In contrast, the States response to the Ukrainian and the current Gulf crises can, to date, only be described as lethargic with a decision, in principle, to establish a wholly inadequately sized LNG import facility. At the same time the State is overseeing the decommissioning of Moneypoint as a coal fired station which, if reversed, offers one of the only short term solutions to substantially improving Ireland's energy security, at relatively low capital cost.

3. WHAT IS DIFFERENT ABOUT THE CURRENT CRISIS?

The key factors which differentiate the current crisis from earlier crises are:

- Europe is now heavily dependent on refining capacity in the US, the Middle East and India, particularly for the production of middle distillates such as jet fuel, kerosene, diesel and gasoil, as well as for HFO. This is because much of the refining capacity in Europe has shut down over the past 50 years for economic and environmental reasons. In the UK, from which Ireland derives much of its petroleum product imports, where there were 23 oil refineries in the early 1970s, there are now only four. As a result, the UK, and by extension Ireland, is increasingly dependent on middle distillate imports from outside the EU.
- Prior to Russia's invasion of the Ukraine much of these imports came from Russian refineries. Now the UK is primarily dependent on the US for diesel imports and the Middle East and India for jet fuel and kerosene imports. Refineries in these latter areas have been very severely impacted by the closure of the Strait of Hormuz, hence the very steep rise in the cost of jet fuel and kerosene and uncertainty as to their future availability. The impact of the possible closure of the Strait of Hormuz has long been recognised but this threat has now materialised, for the first time.
- Following the suspension of Russian natural gas imports into Europe, as a result of its invasion and continuing occupation of parts of Ukraine, Europe is now heavily dependent on LNG imports for its gas supplies. Qatar is the world's third largest LNG exporter - behind USA and Australia - producing 20% of global supplies. The damage to approximately 20% its LNG production facilities - which it is estimated will take three to five years to repair - and the threat of further damage to these facilities, comes on top of the termination of imports of Russian gas. Taken together these represent a very severe potential dislocation to Europe's gas supplies. Recently the EU's Energy Commissioner stated that Europe faces high gas prices for years to come, even in the best case scenario.

It is this combination of factors that differentiates the current crisis and creates the consequent need for a multipronged response targeting both Ireland's gas and oil insecurity.

4. MEASURES TO MITIGATE THESE RISKS

In the following, a number of measures within the State's control are identified.

Ireland is now dependent on imports from a single source for over 80% of its gas requirements and has no indigenous storage capacity. Natural gas powers over 55% of our electricity requirements, either directly or effectively via our now substantial electricity imports from the UK. Gas is also the primary source of process heat for our critical pharmaceutical, milk processing and brewing and distilling industries.

4.1 Return Moneypoint to coal fired generation

The most feasible means of reducing this energy insecurity is to return Moneypoint to coal fired operation. ESB had obtained approval to operate Moneypoint on HFO until the end of the decade. But the recent crisis has also created a significant shortage of HFO on world markets and the current HFO storage capacity at Moneypoint is only equivalent to ten days operation on full load. ESB historically developed HFO fired stations with 90 days storage oil storage capacity.

Given ESB's decision to operate Moneypoint on HFO, it can be assumed that the main generating plant is in reasonable working order, despite being 40 years old. Indeed, coal fired generating units in the US are frequently operated for over 60 years The coal handling and related facilities may require significant investment, but the scale of the potential investment required would be small, in relation to that required for any other measure providing equivalent energy security and could be delivered in a shorter timeframe.

In practice this requires that Moneypoint is not just capable of coal fired operation, but that it regularly operates on coal. This is necessary because coal, though easy to store in large amounts, deteriorates if left in storage and operating staff need continuous operating experience, to maintain skill and safety standards.

There is a risk that this proposal might expose Ireland to even larger financial liabilities for failing to meet EU GHG targets. But energy supply security is imperative and must take priority over other considerations. Furthermore, Germany's Chancellor Merz has announced that Germany will not be moving away from coal fired generation and the Italian Government has recently decided that it will reverse its previous plan to close the last remaining four coal fired power stations in Italy in 2025 and extend their operating life to 2038. Poland has also announced its intention not to abandon coal fired generation.

Official EU data show that both Germany and Italy are set to exceed their GHG emissions targets by an even larger amount than Ireland and, consequently, face potentially larger financial liabilities. However, these countries recognise that energy security is more important than emissions targets. EU realpolitik suggests that it is unlikely that large countries such as Germany and Italy will ultimately face such large liabilities.

In Asia, coal fired generation is supplying an increasing share of electricity generation in India, Japan, Indonesia, Malaysia, Vietnam and the Philippines. These countries have a combined population of two billion. In China, by far the largest user of coal fired generation in the region, coal's share of electricity generation is declining rapidly, as China is each year installing more wind and solar generation than the rest of the world combined. Yet China continues to invest in new coal fired generation capacity, to ensure that its increasingly electrified economy is independent of energy imports.

4.2 Provide adequate LNG import and storage capacity as quickly as possible.

The proposed Floating Storage and Gasification facility at Chairacon Co Clare, in size circa 160,000 m^3, will not provide an adequate level of storage, given that natural gas boil off will diminish its already limited capacity by up to half before it is refilled. The original planning application for the proposed LNG import facility at Ballylongford in 2008 provided for up to 4 × 200,000 m^3 LNG storage tanks, which would have provided storage equivalent to 5.6 TWh, similar, in energy terms, to the coal stock levels held at Moneypoint in the past.

4.3 Develop the depleted Ballycotton gas field for large scale gas storage

ESB, Bord Gáis Energy and dCarbonX are examining the feasibility of redeveloping this reservoir for storage purposes in the Kestral project. The Ballycotton reservoir has the potential to provide 10 TWh of operational storage but would also require the injection of 5 TWh of cushion gas to provide the required minimum operational pressure. The redevelopment of the field would probably require the consortium to be joined by an operator with significant relevant experience.

4.4 Remove any barriers to offshore exploration in Irish waters

The poor success rate of offshore exploration in Ireland and the difficulties encountered by Shell in developing the Corrib field make offshore exploration in Ireland an unattractive prospect. Thus, any hope of attracting further exploration requires that an attractive as possible package is presented to potential exploration companies, including:

- Removal of the February 2021 ban on new oil and gas exploration licences
- Guaranteeing that the full range of measures identified by the *Accelerating Infrastructure Taskforce* could be availed of - both for field development and for construction of any associated onshore facilities - in the event of any discoveries.

5. URGENT NEED TO REFOCUS ON ENERGY CONSERVATION

For the past twenty years Ireland has focused on GHG reduction rather than on energy conservation. Much of this focus has been on increasing the use of renewables in the electricity sector. Substantially in excess of €5 billion has been invested in this area, with the investment underpinned through guaranteed minimum prices for new renewable generation, based on its potential output, irrespective of whether the electricity system could absorb that generation or not. Developers were, in most cases, also able to profit further, if gas prices rose and increased the cost of marginal gas fired generation, above the price guaranteed for renewable electricity. These costly measures are now being reflected in the very high electricity prices being charged in Ireland. Even larger levels of investment are planned, as offshore wind is harnessed. This will further inflate electricity prices.

But SEAI data shows that renewable electricity output accounted for less than 10% of Ireland's primary energy supply in 2024. Therefore, it is essential that our focus returns to energy conservation, across the entire energy spectrum, with financial resources targeted at areas with the largest conservation potential.

5.1 Industrial and Commercial Sectors

Experience has shown that properly engineered investment, in these sectors, results in lasting energy and cost savings. Very often the barriers to implementation are the availability of high quality independent technical advice. Thus, renewed measures are essential to guarantee that appropriately qualified expertise is available to those sectors.

5.2 Residential Sector

The recent ESRI report raised serious questions as to whether current policies in this sector will produce the desired results. In addition, it is increasingly clear that the projections for heat pump penetration in the existing housing stock will fall far short of expectations. This is because retrofitting heat pumps is very often only considered when a large retrofit program is undertaken, on change of ownership, and then only by those with significant financial resources. In addition, the experience of Storm Éowyn means that many households in rural areas may not consider being wholly dependent on electric heating systems which cannot be powered by a small back-up petrol generator.

The solution to both problems is to focus on systems whereby heat pumps are installed in parallel with existing fossil fuel heating systems, thus minimising disruption, or are provided as an integral part of a duplex system in new installations, in rural areas. This will require a higher level of technical competence and training amongst installers. But it must also be recognised that the high electricity prices in Ireland will continue to be a substantial barrier to the wide scale adoption of heat pumps.

In urban areas, with existing gas networks, grants for the replacement of oil fired heating systems by gas fired systems should be reinstated. There are an estimated 100,000 houses that could benefit from this measure, which would both reduce emissions and result in more efficient heating installations.

In the case of both of the above proposals, we need to be guided by the principle that "perfection is the enemy of progress".

5.3 Transport Sector

This sector accounted for 33% of Ireland's primary energy demand in 2024. Ireland is wholly dependent on external manufacturers for transport equipment and, consequently, has effectively no control over the technology on offer. Thus, the focus has to be on how demand can be reduced or how transport patterns can be changed. The school run has received much attention over the years, but few practical measures have been implemented to address the congestion and time loss associated with it.

Ireland's freight transport patterns have received almost no serious attention. At present over 75% of Ireland's Roll-On / Roll-Off and Lift-On / Lift-Off seaborne trade and 66% of the oil products distributed in the country are transported through Dublin Port, the Dublin Port Tunnel and via the M50. This concentration raises serious supply security risks, should longer term problems be encountered with any of,

- The channel into Dublin Port
- The Dublin Port Tunnel
- The West Link Bridge

But it also raises questions as to whether the current distribution is optimal, in terms of minimising energy use in the freight sector. Therefore, it would be appropriate for Government to fund a seriously resourced independent study, to determine whether alternative transport patterns would be more appropriate.

It is not generally recognised that the jet fuel demand in Ireland is now almost 50% larger than petrol demand. This is due to our island position, very open economy, large diaspora and our inward tourism business. Aviation traffic statistics, however, show that outward tourism plays a very significant role. Clearly the Irish are more committed to GHG reduction in principle, than in practice. An additional issue with the aviation sector is that, in contrast to other transport sectors, the aviation sector makes no contribution to NORA levies, even though the sector would, no doubt, expect to be able to draw on jet fuel stocks held by NORA, if necessary.

6. CONCLUSIONS

The main conclusion to be drawn from the above analysis is that Ireland needs to refocus on energy supply security, energy cost competitiveness and energy conservation.

PREVIOUS REPORTS OF THE ENERGY & CLIMATE ACTION COMMITTEE

	Report title	Date	Web link
1	An Existential Crisis for the EU Power Industry?	Oct-15	*link*
2	Ireland's 2030 Greenhouse Gas Emissions Target - An Assessment of Feasibility and Costs	Nov-16	*link*
3	Natural Gas - Essential for Ireland's Future Energy Security	Jul-18	*link*
4	Data Centres in Ireland	Jul-19	*link*
5	The Future of Electricity Transmission in Ireland	Oct-20	*link*
6	Sustainable Electricity in 2030	Sep-21	*link*
7	National Energy and Climate Plan - The Challenge of High Levels of Renewable Generation in Ireland's Electricity System	Mar-21	*link*
8	Europe's Energy Crisis – Implications for Ireland	May-22	*link*
9	Response to Energy Security Report	Oct-22	*link*
10	Restoring confidence in Irish energy supply	Nov-22	*link*
11	A Commentary on the Medium Term Prospects for Ireland's Hydrogen Economy	Aug-23	*link*
12	Small Modular Reactors *Ireland needs to consider small modular nuclear reactors to achieve a zero-carbon energy sector by 2050*	Jun-24	*link*
13	The Energy Transition *Wishful thinking needs to be replaced by the realities of engineering, finance and project delivery*	Apr-25	*link*
14	Rebalancing Ireland's Energy Policy *The Energy Trilemma - Project Delivery - Authority & Accountability*	Nov-25	*link*

Disclaimer

The members of the Taskforce and the contributors participated in extensive discussions in the course of a series of meetings, and submitted comments on a series of draft reports. This report represents the collective view of the Academy, and its recommendations do not necessarily reflect a common position reached by all members of the Taskforce and do not necessarily reflect the views of individual members of the Taskforce, nor do they necessarily reflect the views of the organisations to which they belong.

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