Briefing

Prospects for Grangemouth: risks, opportunities and policy options

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green alliance...

Summary

The industrial complex at Grangemouth in Scotland has repeatedly hit headlines over the past year. Petroineos, the owner of the refinery at the site, announced in 2023 it was considering using it just as an import and distribution hub rather than modernising the ageing plant. It confirmed the decision a year ago and has since laid off more than 400 workers in a community already facing wider job losses.

The move has been blamed on net zero by some commentators. While it's true that demand for refinery products will fall over time as more of the economy electrifies, Petroineos has said that the site's age and configuration meant it was not competitive and losing money. This trajectory has been clear for a long time. Transition planning and support for workers and the community is now gaining pace, but far too late.

On the positive side, Grangemouth's workforce, infrastructure and access to low carbon power make it an ideal hub for the growing clean industries of the future. The UK and Scottish governments have set aside money to support a transformation of the site.

However, many of the ideas on alternative industries the site could host are quite speculative and will take time to emerge. Others are suboptimal from an environmental perspective.

Urgent government action on a series of 'no regrets' measures is needed to secure jobs rapidly and provide valuable resources for further investment. New markets are needed to drive demand for the next generation of products the site could offer.

The unfolding situation at Grangemouth is a reminder that climate action can provide new opportunities for businesses and communities that host

ageing industrial sites. But also that policy makers need to identify sites at risk far earlier and co-create solutions with workers and communities.

What is needed to improve prospects at Grangemouth:

- **Continuing engagement with local communities and the workforce** on the future they want for the site and job opportunities in the wider area. Some aspects of transition planning have been consulted on but the government-funded Project Willow research, intended to explore options for the site's future, was conducted in secret with little consultation.
- **Rapid progress to create short term, no regrets infrastructure** and other jobs locally while longer term plans are implemented. The 'no regrets' developments we recommend are: anaerobic digestion (AD) using local biomass; extending small scale hydrogen production; carbon capture demonstration projects; and local renewable power.
- **Revenues to counterbalance the costs of supporting fossil free fuels and chemicals by taxing aviation –** one of the industrial buyers of fuel from Grangemouth – at a level reflecting its climate impact.
- **Markets created for additional low carbon products.** As a first step, the UK government should introduce a green carbon mandate on chemicals products.
- **Opportunities to underwrite power purchase agreements** (PPAs) for the energy intensive industries at Grangemouth and elsewhere in the country to help address the issue of lower wholesale energy costs in competitor countries like France and Germany.

Context

The Grangemouth industrial cluster is at a crossroads. A string of plants have closed, most prominently the Petroineos refinery which led to more than 400 job losses when it shut earlier this year. The site is largely based around the chemicals and oil and gas industries, neither of which are on a stable long term footing; oil and gas is insecure because the North Sea basin's resources are in decline and fossil fuels will eventually need to be phased out entirely; and the chemicals sector is suffering from uncompetitive European gas prices.

Both of these sectors are also experiencing aging assets, with newer, more efficient plant being installed in other countries. Petroineos was very clear that the refinery's age and layout were leading to millions of pounds of losses

and that it couldn't compete with newer facilities in the Middle East, Asia and Africa.

However, Grangemouth is well placed to become a future hub for the development and production of the clean fuels and chemicals of the future. It has a port and pipelines for the delivery of aviation fuel to Edinburgh, Glasgow, Aberdeen and Newcastle airports. It also has a skilled local workforce and is well located to use low carbon power from North Sea offshore wind.

The UK and Scottish governments have committed money to revitalise the site and the wider area but much of this remains unallocated. The past few months have also seen a just transition plan and a longer term strategy for the industrial cluster published.

To inform their planning, the UK and Scottish governments funded Project Willow, an investigation by PwC into alternative industries for the Grangemouth site, published in March 2025. This highlighted nine possible low carbon industries that could be combined across the site to provide 1,000 or more jobs. However, the earliest construction foreseen on any of these was 2028. More worrying is that most of them are either suboptimal from an environmental perspective, suggesting they might also have a limited lifespan, or would require some kind of new government incentive to create a viable market.

At one of end of the spectrum is anaerobic digestion to make biogas, for which there is already a market through measures like waste recycling requirements and the Green Gas Support Scheme; the chemical recycling of plastics is also incentivised through the plastics tax; and sustainable aviation fuel (SAF), where a government mandate is creating a market, although a tentative one because of SAF's cost.

At the other end of the spectrum are synthetic chemicals and plastics made using green hydrogen as a building block rather than fossil fuels. Virtually no market exists at present for chemicals created using greener feedstocks than fossil fuels. The UK government has not even discussed a mandate or any other form of support to stimulate it.

SAF production is the solution most often raised as an option. But some types of SAF are more sustainable than others. The cheapest are HEFA (Hydroprocessed Esters and Fatty Acids) – made using primarily waste oils

and fats – which are particularly problematic. A cap on HEFA's use to meet the SAF mandate will start to apply from 2030. Much of the raw material comes from overseas where verification of sustainable sourcing is hard to determine and competition for the same material is growing locally. Under Project Willow, PwC suggests local crops could provide an alternative but notes, like other observers, that this could interfere with UK food production.

Other forms of SAF, containing, for example, carbon directly captured from the air or extracted from biomass, are expensive and use scarce resources that could provide greater carbon savings used elsewhere. They may also be superseded by the development of hydrogen and battery powered flight.

More detailed planning is now underway, investors are being sought for early projects and a case is being made for infrastructure, like hydrogen pipelines that would support the transition at Grangemouth. One new plant has been announced, making bio-based fuels for the road and construction sector, but it seems this has not been through the processes set up by government.

The overarching conclusion is that this is all happening too late, with jobs already lost.

Situations like this at Grangemouth and the steelworks under threat of closure at Scunthorpe point to a need for more rapid learning. Effort should be made to identify already declining industrial sites or those without a long term future far earlier and co-ordinate and plan transitions with local communities. For example, there are lessons from how the phase out of coal mining in the Ruhr was managed positively by the German government and industry.

As this hasn't happened at Grangemouth, rapid action is needed to bring new jobs to the site and signal to the local community that all plans and proposals are more than just fine words.

Short term, 'no regrets' options

The immediate priority to support Grangemouth is to secure investment in scalable no regrets projects that can be implemented fast. These should avoid locking in poor choices while laying the groundwork for deeper transformation through the development of skills, infrastructure and institutional capacity.

Recommended areas to focus on are:

1. **Anaerobic digestion (AD) using local biomass**

- Collecting farm, forestry and food waste across Scotland for AD processing at Grangemouth could generate biogas and organic fertiliser, reducing methane emissions and displacing fossil fuels. PwC estimates 150,000-200,000 tonnes a year of material is available within 20km of the site.
- Biogas production is already incentivised and the digestate can be sold as a fertiliser if it meets quality standards. Financial incentives should remain modest, so the 'waste hierarchy' (which determines the best route to waste avoidance) is not upset and the production of additional waste is not encouraged.
- AD can be combined with green hydrogen to create fuels and chemicals.
- AD facilities must be carefully monitored to prevent methane leaks.

2. **Expand small scale green hydrogen production**

- Producing green hydrogen using surplus renewable energy could displace some 'grey' hydrogen (produced using fossil fuels) in onsite chemical processes. It would also provide a lower carbon fuel for use at Grangemouth and in the local area.
- A small green hydrogen plant is already being built at the site to supply Ineos's operations, with expansion options being discussed. Electrolyser plants can be modular and scaling them up more rapidly will provide more jobs in the short term and give options for supply to other processes in coming years.
- Subsidy is available for hydrogen production and the UK emissions trading system is an incentive for it to be used as an industrial fuel.
- Over the longer term, with the right incentives, hydrogen could be used to make fossil fuel-free ammonia for fertiliser or shipping fuel, as an aviation fuel or combined with carbon from AD or direct air capture (DAC) to produce power-to-liquid aviation fuels and fossil fuel-free chemicals feedstocks. Potential challenges with storing large volumes of hydrogen onsite may make ammonia production appealing as ammonia can be easier to store.
- A market for fossil free chemicals and fertilisers and incentives to trial hydrogen as an aviation fuel would help to drive other uses of green hydrogen.

3. Carbon capture demonstration projects

- The Climate Change Committee's seventh carbon budget advice suggests eight million tonnes of carbon dioxide a year will need to be removed directly from the air and stored by 2050 to achieve net zero. Removal from seawater is now emerging as a promising alternative. Both capture techniques can also be used to provide carbon for synthetic fuels or in chemicals feedstocks.
- An additional and related option would be capturing carbon from other industrial processes at the site such as AD or existing ethylene production. Trials in the UK have been limited, but in other countries Lanzatech is capturing carbon rich gases from steel mills and refineries which it uses to make chemicals and SAF. This option would need to be managed carefully to avoid carbon capture being used over the longer term as a justification for continued production of fossil fuel based chemicals. Some funding would be available via the UK emissions trading scheme
- Grangemouth is not located near the most developed of the UK's carbon storage networks but its location makes it an excellent choice for trialling carbon capture for use in fuels and chemicals.
- R&D support is needed as carbon capture is expensive and jobs would initially be relatively limited. But early investment could give the UK a technological leadership position.

4. Local renewable power

- Opportunities for local onshore wind projects and other renewables with private wire connections should be explored to provide power to the site as a whole and support green hydrogen and carbon capture trials, particularly during peak periods.
- Onsite renewable power, and power supplied through private wire connections, can lead to cheaper and more stable power prices and build capability for further clean power integration over time.
- The government is looking at ways to facilitate corporate power purchase agreements of this kind.

Long term vision: a clean industrial hub backed by new markets

Grangemouth has many of the characteristics needed to put it at the heart of the transition to clean, and locally sourced, fuels and chemicals. But providing one-off injections of money for capital projects won't be enough to enable this.

The governments in Scotland and the UK need to rapidly develop and bolster new markets for fossil-free fuels and chemicals to help overcome higher initial running costs than plants producing fossil-based alternatives. These kinds of incentives exist already for some technologies but there is nothing, for example, that would help create a business case for investment in cleaner chemicals.

Proposed next steps for Grangemouth from the UK and Scottish governments:

- **Genuine engagement with local communities and the workforce** on the future they want for the site and job opportunities in the wider area. Project Willow was conducted secretly with little consultation.
- **Rapid progress to create short term, no regrets infrastructure** at Grangemouth, and other jobs locally, while a longer term plan is developed and implemented. The 'no regrets' developments we recommend are: AD using local biomass; extending small scale hydrogen production; carbon capture demonstration projects; and local renewable power.
- **Raise revenues to counterbalance the costs of supporting fossil-free fuels and chemicals** by taxing aviation – one of the industrial buyers of fuel from Grangemouth – at a level reflecting its climate impact.
- **Create markets for additional low carbon products.** As a first step, the UK government should introduce a green carbon mandate on chemicals products.
- **Consider opportunities to underwrite power purchase agreements** (PPAs) for energy intensive industries at Grangemouth and elsewhere in the country to help them address the issue of lower wholesale energy costs in competitor countries like France and Germany.

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