IGas hydrogen proposal: Bletchingley

SCC Ref 2021/0145

Land at Kings Farm, Tilburstow Hill Road, South Godstone, Surrey RH9 8LB

This Planning Application is to produce high carbon, 'grey' hydrogen at two sites in Bletchingley. This form of hydrogen production would add considerably to the greenhouse gas emissions in Surrey. This is incompatible with the county's climate emergency declaration and its Climate Change Strategy.

IGas claim that this proposal is in line with the government's 10 Point Plan (Paragraph 1.7) and support the government's drive for carbon reduction (paragraph 1.8) This is not the case and these claims and others in their planning application are highly misleading.

Statements in the planning application that we consider incorrect and/or misleading.

In paragraph 4.10 of the application, it states that "*There will be no increase in gas production at the site to serve the SMR units*". Does this mean that gas is being produced at the sites at present? If this is so, then where is the gas going? If it is going to the gas grid, why can this not continue? However, if gas is not being produced at present, and this is the implication as the gas to wire has not been implemented, then there **will** be an increase in gas production to serve the SMR. Moreover, in an IGas RNS[1] in September IGas announced their intention to increase hydrogen production at this site to 6,000kg per day, depending on the reserves.

The application claims that there is a strong potential for Carbon Capture, Use and Storage (CCUS) at a second stage and that they are actively pursuing this matter (paragraph 4.21). Hydrogen production with CCUS is considered low carbon. As yet it is a technology in development, and it is only in the last two years that the government has started to actively develop its possibilities. It is also controversial with very recent scientific research showing that it may prove not to be low carbon at all[2]. We consider that IGas' claim to be pursuing this technology is unlikely to be based on a realistic plan to deliver this for many years to come.

It is important for the Planning Authority to note that planning applications must be assessed on the merits or otherwise of the current proposal (which in this case is for the installation of a Steam Methane Reformation unit) and not on any future changes which, in themselves, may well require their own planning applications.

[1] https://ir.q4europe.com/Solutions/IGas/3994/newsArticle.aspx?storyid=15192358

[2] https://onlinelibrary.wiley.com/doi/epdf/10.1002/ese3.956

CCUS is, at present a very costly and energy intensive process. The government is concentrating on the large industrial clusters to take advantage of economies of scale. Local, large scale, industries will benefit directly from the hydrogen produced within a cluster but must also have particular access to abandoned North Sea wells to use for carbon storage[3]. This is very different from the IGas facility at Bletchingley and we doubt that the conditions are right here for CCUS.

We think the planning office should question the claims about a second phase closely. Is this merely an empty claim or are there concrete realistic plans? CCUS would involve considerable capital expense. It would also involve a considerable proportion of the gas being used to drive the CCUS process which adds to the expense. Even if CCUS could be delivered it would probably be too expensive for the volume of hydrogen that could be produced at these two sites.

- Can IGas present these plans and some details?
- What is the timescale they are looking at?
- Would their plans be ready by 2035, the timing of the sixth carbon budget which requires 78% emission reductions?
- What percentage of CO_2 do they propose to store? The most advanced and costly CCUS systems can, in theory, store up to 95% maximum, but the two working sites that do exist in N America[4] store considerably less than this.
- Where could they store this carbon dioxide? Presumably not at the site as the carbon dioxide could infiltrate their methane source. Would this mean transporting it to somewhere like Southampton? Is this practicable considering the costs and emissions from the transport, and what is the timescale for a Southampton cluster to be ready to take it?

National Planning Policy Framework (July 2021)

The applicant refers to the NPPF citing Paragraphs 211 and 215. Both refer to mineral extraction, but this application is not for extraction. Oil and gas are already extracted at the Bletchingley sites and planning permission for this already exists. This application is for production of hydrogen on site. No new drilling is required. These references to the NPPF are irrelevant to this application, as are the subsequent references to Written Ministerial Statements on shale gas and oil and energy imports. We consider these have been included to add some spurious legitimacy to this application.

Ten Point Plan for a Green Industrial Revolution (Nov 2020)

In Paragraphs 5.20 to 5.24 the applicant quotes sections of the Ten Point Plan implying they support this application. **They do not.**

[3] https://www.gov.uk/government/publications/cluster-sequencing-for-carbon-capture-usage-and-storage-ccus-deployment-phase-1-expressions-of-interest/update-on-phase-1-eligible-clusters-and-phase-2-timeline

[4] https://onlinelibrary.wiley.com/doi/epdf/10.1002/ese3.956

The Ten Point Plan[5] has two key proposals for **low carbon** hydrogen production.

Hydrogen production from fossils fuels but with Carbon Capture use and Storage (CCUS). Here most of the emissions will be captured and not released into the atmosphere. This is commonly known as low carbon or "blue' hydrogen.

The UK government has recently started investing in developing this technology in six low carbon hubs[6] as recommended by the Committee on Climate Change (CCC) in their 2018 report[7] They are all large industrial clusters with very high rates of industrial emissions. It is the scale of the projected emissions savings and the importance of the industries and jobs in these clusters[8] that justifies both government and industry investment. Two of these low carbon hubs are projected to be completed in the mid 2020s and a further two by 2030. These are all in the north of the country. The only planned cluster for the south will be at Southampton, but this is still at the very early stage of feasibility studies.[9]

The other main source of hydrogen in the Ten Point Plan is low carbon, "green" hydrogen production; that is **hydrogen produced from water using electrolysis.** Where the electricity comes from renewable resources it results in very low emissions indeed.

This planning application is for neither of these options, it is for high carbon 'grey' hydrogen.

Energy White Paper: Powering our Net Zero Future (Dec 2020)

In paragraph 5,25 the applicants claim that their proposal is supported by the Energy White Paper as it supports new hydrogen technologies. However, the White Paper clearly supports low carbon hydrogen technologies which are new and still in development. This application is for a high carbon hydrogen that has been produced for decades, mostly in support of the fossil fuel industry itself and responsible for 830 million tonnes of CO_2 per year, equivalent to the emissions of the UK and Indonesia combined[10].

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[5] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/936567/10_POINT_PLAN_BOOKLET.pdf

[6] https://www.gov.uk/government/news/green-boost-for-regions-to-cut-industry-carbon-emissions

[7] https://www.theccc.org.uk/publication/hydrogen-in-a-low-carbon-economy/

[8] https://www.zerocarbonhumber.co.uk/

[9] https://www.greeninvestmentgroup.com/en/news/2020/port-of-southampton-targeted-for-a-flag-ship-uk-hydrogen-hub.html

[10] https://www.iea.org/reports/the-future-of-hydrogen

The white paper defines clean hydrogen as "*Hydrogen that is produced with significantly lower greenhouse gas emissions compared to current methods of production – methods include reacting methane with steam to form hydrogen and then capturing the carbon dioxide by-product (steam methane reformation with CCUS) or using renewable electricity to split water into hydrogen and oxygen (electrolysis).*"

While the remainder of the comments are true of the White Paper, they are not true of the high carbon hydrogen proposed in this application.

Decarbonising Transport- A Better, Greener Britain (July 2021)

This document also has a commitment to the use of low carbon hydrogen in transport. On Page 174 of this document, it states "*We are well positioned to lead In transport, our focus is on the use of genuinely 'green' hydrogen, maximising its opportunities so that it can play a full part in our renewable energy system.*"

And "*on the production of green hydrogen with significant technical expertise in electrolysers from world leading companies such as ITM Power, and the potential to generate significant quantities of renewable energy from offshore wind. …. Our unparalleled access to carbon capture and storage sites is an enabler for the production of blue hydrogen*."

In fact green hydrogen using offshore wind is already happening in the south of England. In Kent[11] Ryse Hydrogen are building a plant in Herne Bay, using electricity from the nearby wind farm. They expect to be in production by 2022. This will be truly low carbon hydrogen.

UK Hydrogen Strategy (August 2021)

Early in the Hydrogen Strategy, on Page 8, it states "*Today most hydrogen produced and used in the UK and globally is high carbon, coming from fossil fuels with no carbon capture; only a small fraction can be called low carbon*.

For hydrogen to play a part in our journey to net zero, all current and future production will need to be low carbon " (our emphasis)

Consequently, the remainder of the applicants references to this White Paper are irrelevant to this application. Until the applicant has concrete plans for CCUS and can put forward a planning application that specifically provides for this, this application is incompatible with current government policy.

Committee on Climate Change: Hydrogen in a Low Carbon Economy (2019)

This report by the CCC was actually published in 2018 not 2019 and almost a year before the government changed the law and committed the UK to a Net Zero carbon.

[11] https://rysehydrogencanterbury.co.uk/about-the-scheme

In Paragraph 5.46 of this planning application it states that "*In order to achieve this however, the report states that deployment of hydrogen must start now* "

However, the actual quote on P.6 of the CCC report is " If hydrogen is to play a substantial long-term role, progress towards deployment of ***low-carbon hydrogen at scale*** *must start now "* (Our emphasis)

Moreover, the conclusions in the report include the statement,

"*However, the vast majority of hydrogen is currently produced in a high-carbon way, from fossil fuels without CCS****. This will need to change*** *(our emphasis) for hydrogen to contribute to decarbonisation. There are three main routes to producing hydrogen in a sufficiently low-carbon way for it to contribute by 2050: electrolysis using low-carbon electricity, bioenergy with CCS and fossil fuels with CCS. "*

In paragraph 5.49 the applicant refers to the need to increase hydrogen production and implies that their proposal would do this. However, the CCC paper is clear that it proposes hydrogen production in industrial clusters close to potential carbon storage facilities such as depleted North Sea oil wells. Plans for the first of these are now well advanced[12].

In paragraph 5.51 the applicant refers to concerns to use existing infrastructure to support the new hydrogen economy, implying that this would include their Bletchingley wells. In fact, the CCC report mainly refers to existing infrastructure in terms of distribution and use of hydrogen. It voices concerns about the need to change many of the pipes in our gas network if we were to switch to 100% hydrogen as hydrogen is very corrosive. Nowhere in the report is onshore natural gas production mentioned.

Local Strategies.

The Surrey Mineral Plan was produced in 2011, well before the national commitment to Net Zero. Surrey is in the process of developing a new plan. Presumably it will be in line with their commitment to " *Pursue the transition to clean growth, through the decarbonisation of all major sectors and investment in the development of clean technologies and industries that create jobs and improve the quality of life for our residents*."[13]

Green House Gas Assessment

The application refers to the government's sixth carbon budget in support. A key requirement in this is the cutting of emissions by 78% by 2035. This is an enormous cut and will be very difficult to achieve. It would certainly not accommodate 60 years

[12] https://hynet.co.uk/

[13] https://www.surreycc.gov.uk/people-and-community/climate-change/what-are-we-doing/climate-change-strategy

of high carbon hydrogen production that this application seems to be seeking. (See Table 9.copied below)

The technology proposed to produce hydrogen at this site is inherently carbon intensive. Throughout the report the CCC refers to hydrogen in the context of low carbon energy. At no point does it have a role for the high carbon hydrogen proposed in this application.

The chemical reaction of the Steam Methane reformation (SMR) process is

$$CH_4 + 2H_2O \rightarrow \mathbf{CO_2} + 4\ H_2$$

Equation 1.

Carbon dioxide is an unavoidable biproduct. Every Kg of hydrogen produced in the SMR process there will also produce 9.3 kg of carbon dioxide produced and this will be released into the atmosphere[14]. The planning application states that the site would have the capacity to produce 2,000 Kg of hydrogen per day

That would result in an additional 18,600 Kg of carbon dioxide per day. This is over 18 tonnes a day.

This does not include controlled gas releases and fugitive emissions. Fugitive emissions are methane emissions their carbon dioxide equivalent is very high (see below). Nor does it include the emissions from the compression and transport of the gas, so it is reasonable to assume that actual emissions are likely to be higher.

In paragraph 6.44 the applicants claim, “In terms of the assessment of significance, the proposed development will lead to less than 1% of the local authority budget for Tandridge, less than 0.1% of the regional budget “This leaves us slightly puzzled as in their application for hydrogen at Albury, which is to produce half the amount of hydrogen than this proposal, the applicants state, in paragraph 6.81*” The proposed Development will lead to less than 1% of the local authority carbon budget for Guildford, less than 0.1% of the regional budget”.*

How can a site that would produce twice as much hydrogen than proposed for Albury produce emissions less than 1% of the carbon budget for Tanbridge when half the amount also produces less than 1% of the carbon budget for Guildford? Less than !% could be a very small amount indeed, in which case this should be made clear, or this is an educated guess on the part of the applicants. A more precise estimate is needed.

[14] **https://www.forbes.com/sites/rrapier/2020/06/06/estimating-the-carbon-footprint-of-hydrogen-production/?sh=34c0626f24bd**

Surrey's Climate Change Strategy states that it will use up its whole carbon budget in just over eight years if it continues the present level of emissions.[15] Consequently Surrey has set out a strict pathway with regular targets to achieve net zero by 2050. These will be difficult to achieve and leaves little room for new, additional sources of carbon emissions. Any additional emissions in one area will mean that emissions must be cut in another. If permission is granted, in which area will the emissions be cut to balance these hydrogen production emissions? The application states that the hydrogen produced would power 50-100 buses a day. Does that justify this 1% + increase when other, low forms of hydrogen production are available, such as In the Ryse Hydrogen project in Herne Bay, Kent[16] This is the kind of emissions reduction in transport that is promoted by numerous government documents, and which would result in a genuine reduction in transport emissions.

Greenhouse Gas Assessment by Air Pollution Services.

The present climate emergency means we cannot overstate the need to reduce GHG emissions. Numerous studies show that global emissions, at present, are continuing to rise and not to fall[17]. Reports like the UN Emissions Gap Report [18]state we are heading towards a 3^0C rise by the end of this century, and this will make large parts of the planet uninhabitable. Earlier this year the UN posted a "Red Alert" stating that emissions must be slashed by half by 2030. This really is not the time to permit projects that will not, in real terms, cut emissions, but actually increase them instead.

The Air Pollution Services Assessment, in Table 9 below, concludes that there will be an annual GHG emissions savings of 7.765 tonnes $CO_{2\text{-eq}}$ per annum and 465,893 $CO_{2\text{-eq}}$ over the lifetime of the project. We consider this misleading.

Table 9 below estimates 100Kg CH_4 controlled emission per annum. This does not take account of uncontrolled emissions. All natural gas facilities are notorious for their levels of fugitive emissions[19]. These fugitive emissions can escape through valves and connections, and the more of these there are between the gas extraction to the final product, in this case hydrogen, the more opportunities there are for the gas to escape. It is estimated that as much as 20% of methane emissions are fugitive emissions from fossil fuels[20]. Consequently, it is reasonable to assume that

[15] https://www.surreycc.gov.uk/__data/assets/pdf_file/0003/225615/Surreys-Climate-Change-Strategy-2020.pdf

[16] https://rysehydrogencanterbury.co.uk/about-the-scheme

[17] https://www.theenergymix.com/2021/10/13/breaking-iea-urges-faster-fossil-phaseout-more-renewables-investment-to-keep-1-5c-within-reach/

[18] https://www.unep.org/emissions-gap-report-2020

[19] https://www.carbonbrief.org/explained-fugitive-methane-emissions-from-natural-gas-production

[20] https://ec.europa.eu/info/sites/default/files/energy_climate_change_environment/events/presentations/speaker_intervention_-_european_university_institute.pdf

the real level of methane release is significantly higher than 100Kg CH_4. However, fugitive emissions are difficult to measure accurately, and we have no actual data so, for the moment, we will use, but not accept, the 100 kg figure.

Regulated GHG Emissions

Table 9: Annual GHG Emissions from Proposed SMR

Process Activity	Emission Rate (kg/annum)	CO_2-eq Factor	GHG emissions (tonnes CO_2-eq)
SMR Combustion Process [a]	7,373,000	1	7,376
SMR Controlled CH_4 Releases [b]	100	28	2.8
Removal of Two Gas Generators [c]	-15,140,684	1	-15,141
Annual Total			-7,765
Lifetime Total			-465,893

Table notes:

a. Gross CO_2 emission rate stated by BayoTech to be 10.1 kg/kg of hydrogen and each SMR will output 1,000 kg/day.

b. Up to 50 kg of CH_4 may be released annually from each SMR.

c. Combustion parameters of the gas generators have been taken from the previous air quality assessment produced for the gas generators (SOCOTEC, 2019) and CO_2 emissions calculated based on these combustion parameters.

The table uses a $CO_{2\text{-eq}}$ factor of 28. This means that natural gas (methane) has 28 times the warming potential of carbon dioxide. However, this is the warming potential over 100 years. Methane degrades into carbon dioxide over time, with a half-life of just over 9 years. This is significant. It means that in the first year the warming potential is very high but becomes less each subsequent year. Over 100 years the accumulated heating will be 28 times more than for $CO2$. However, over the first ten years that the methane is in the atmosphere it will have over 100 times the warming effect of Co_2. Over 20 years the warming effect is about 84 times greater. Consequently, each year of production the emissions from both the controlled methane releases and the fugitive emissions will have a very high warming effect.

Climate scientists are now beginning to use the 20-year time frame in their calculations because of the immediate urgency to drastically reduce GHG emissions[21]. If we use this 20-year metric the $CO_{2\text{-eq}}$ emission become 8,400 kg $CO_{2\text{-eq}}$ per annum or 8.4 tonnes.

According to Table 9 the lifetime of the site will be 60 years, which is, of course well beyond the Net Zero target of 2050, let alone the Sixth Carbon Budget. Using the 20 year metric the $CO_{2\text{-eq}}$ emissions from released methane over the lifetime of the site would be the equivalent of 504 tonnes of carbon dioxide. Climate science now focusses on the next nine years as the last window in which to avert climate disaster,

[21] https://www.bbc.co.uk/news/science-environment-58174111

so it seems reasonable to use this figure when judging the effect on Surrey's climate emission.

The final row in this table calculates a figure based on the removal of the two gas generators. However, as the application makes clear these generators have never been brought to the site and they have never generated these emissions[22]. We accept that these figures were part of the company's response to the pre-application advice from the Planning Authority, but the fact remains that they have chosen not to buy and install these generators and, as yet there are no emissions being generated from two them. The emissions arising from the production of high carbon, grey hydrogen would not be replacing any existing emissions, they will simply be new emissions adding to the county's carbon footprint. We have not seen how the emissions from electricity generation have been calculated and so we cannot comment on their accuracy, but they do look remarkably high to us.

We are not clear why IGas has chosen to look for alternative uses for their gas rather than selling and using it directly, although paragraph 3.14 of the planning statement does state that "it had been found that the gas to grid element was unviable due to constrained grid capacity". In the light of the present (October 2021) gas shortages and gas prices this might now be a better alternative. Burning gas directly is less carbon intensive than both hydrogen production and electricity generation as both involve considerable energy losses.

With these adjustments in mind, this is how we think Figure 9. should look.

Process Activity	**Emissions rate kg/annum**	**$CO_{2\text{-eq}}$ factor**	**GHG emissions (tonnes $CO_{2\text{-eq}}$)**
SMR Combustion Process	7,373,000	1	7,376
SMR Controlled CH_4 releases	100	84	8.4
Removal of Two Gas Generators	0	o	0
Annual Total			+7,384
Lifetime Total			+443,064

Therefore, we consider the actual warming effect of this project, based on actual emissions, would be an increase of at least 7,384 tonnes of $CO_{2\text{-eq}}$ or more and that this would be the amount produced every year in the lifetime of the project.

Conclusions.

- This proposal to produce high carbon, "grey" hydrogen at this site should be refused.
- Numerous claims in this application are misleading and some are untrue
- The production of high carbon "grey" hydrogen is likely to increase the carbon footprint locally and to add to climate change.

[22] Planning Statement. Paragraph 3.15

- It is questionable given their high costs, and local conditions, whether carbon capture technologies will be adopted at this site. Until concrete proposals are available this application should not even be considered.
- Government energy and climate change policies do not support this form of hydrogen production