Island Gas Limited

Albury Wellsite

Production Operations Incorporating Hydrogen Production

Environmental Permit Application

Non-Technical Summary

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1. INTRODUCTION

Island Gas Limited (IGas) is a leading onshore oil and gas exploration and production business, holding a portfolio of exploration and production assets focused on three regions: the North West, East Midlands and the Weald Basin in Southern England. The business has more than thirty years' experience of successfully and safely extracting and producing hydrocarbons onshore in the UK.

IGas is engaged in the exploration and production of petroleum onshore United Kingdom and holds 100% interest in Development Licence DL004 within which it holds Operator status and proposes to commence hydrogen production using gas produced from the pre-existing Albury 1 well (ALB-1).

The purpose of this document is to present the contents of the application, the permitting history of the site and a summary of the proposed activities, both currently permitted and proposed. IGas are proposing to add a single installation activity to its current Albury permit (EPR/EB3100FC).

IGas is the holder of a number of Environmental Permits issued by the Environment Agency in accordance with EPR2016. The current activities permitted to be undertaken by IGas at the Albury Wellsite are presented in Table 1.1.

Permit Number	Reference	Description
EPR/EB3100FC	A1	The incineration of hazardous waste in a waste incineration plant or waste co-incineration plant with a capacity exceeding 10 tonnes per day.
	A2	A mining waste operation for the management of extractive waste including gas from prospecting for mineral resources, not involving a waste facility.
	SR2018 No1	Operation of one or more medium combustion plants.
EPR/SB3796DT	SR2014 No4	To operate a standard facility described in standard rules SR2014 No4: accumulation and disposal of radioactive waste from NORM industrial activity of the production of oil and gas.

Table 1.1: Current Permitted Activities

As the development continues to progress, an additional permitted activity has been identified. As a result, IGas have prepared an application to vary the environmental permit EPR/EB3100FC with the purpose of gaining permission to produce hydrogen using a process known as Steam-Methane Reformation (SMR).

2. SCOPE

This Non-Technical Summary is applicable to the Albury Wellsite and all operations permitted therein. It is applicable to IGas, its contractors and subcontractors and can be used in support of applications to the Environment Agency under EPR2016.

3. DEFINITIONS

ALB-1:	Albury 1 Well
ALB-2:	Albury 2 Well
DL:	Development Licence
DNO:	Distribution Network Operator
EPR2016:	Environmental Permitting (England and Wales) Regulations 2016, as amended.
IGas:	Island Gas Limited
Km:	Kilometre
M:	Metre
MCP:	Medium Combustion Plant
MCPSG:	Medium Combustion Plant & Specified Generator
Mm:	Millimetre
MW:	Megawatt
NORM:	Naturally Occurring Radioactive Material
PEDL:	Petroleum Exploration and Development Licence
SNCI:	Sites of Nature Conservation Importance
SG:	Specified Generator
SMR:	Steam-Methane Reformation
UK:	United Kingdom
WR11:	Notice of Intention to Drill for Minerals Form

Table 3.1: Definitions

4. ENVIRONMENTAL LEGISLATION AND APPLICABILITY

The Albury Wellsite is the subject of several activities which, under current environmental legislation, requires an environmental permit. The Environment Agency regulate all permitted activities under the Environmental Permitting (England and Wales) Regulations 2016, as amended (EPR2016). Under EPR2016, Operators are required to submit environmental permit applications to the Environment Agency to seek approval to undertake such activities.

Onshore oil and gas developments are the subject of the environmental permitting regulations, as such a number of environmental permits have already been obtained. This Non-Technical Summary provides an update on the proposed operations to be conducted at the Albury Wellsite and provide an explanation as to which additional permitted activities will be required/applied for.

4.1 Environmental Permitting (England and Wales) Regulations 2016

The Environment Agency regulate all permitted activities under EPR2016 and require 'Operators' to submit environmental permit applications to seek approval to undertake such activities. IGas has assessed the activities associated with the proposed operations and considers certain activities to fall within the scope of EPR2016 and therefore require the necessary environmental permits.

4.1.1 Industrial Emissions Activity

Schedule 1, Part 2 of EPR2016 details a number of activities that are classified as an Industrial Emissions Activity including 'Energy Activities' (Chapter 1), Chemical Industry (Chapter 4) and 'Waste Management' (Chapter 5). Energy Activities include the storage of crude oil, Chemical Industry includes hydrogen production, whilst Waste Management includes the incineration of waste.

4.1.1.1 Oil Storage

This activity is cited under EPR2016, Schedule 1, Part 2, Chapter 1, Section 1.2, Part A(1) (e)(i).

'The loading, unloading, handling or storage of, or the physical, chemical or thermal treatment of crude oil.'

The current and future proposed operations do not have the potential to involve the handling and storage of crude oil within the site, as such the permit will not be varied to facilitate oil storage.

4.1.1.2 Production of an Inorganic Chemical

This activity is cited under EPR2016, Schedule 1, Part 2, Chapter 4, Section 4.2, Part A(1), (a)(i).

'Producing inorganic chemicals such as gases (for example, hydrogen).'

It is proposed that the natural gas (methane) produced from the Albury Wellsite will be used for the production of hydrogen by means of Steam Methane Reformation. Based on conversations with the Environment Agency it is considered that this activity will require an application to permit this particular activity.

4.1.1.3 Incineration of Natural Gas

This activity is cited under EPR2016, Schedule 1, Part 2, Chapter 5, Section 5.1, Part A(1) (a).

'The incineration of hazardous waste in a waste incineration plant or waste co-incineration plant with a capacity exceeding 10 tonnes per day.'

The proposed operations will not involve the incineration of natural gas exceeding 10 tonnes per day. Activity A1 of environmental permit EPR/EB3100FC is not being varied as there will be no changes to the incineration operations. However, the activity is being retained, and is not being surrendered at this time.

4.1.2 A Mining Waste Activity

Schedule 20 of EPR2016 defines a mining waste operation as being the management of extractive waste, whether or not it involves a waste facility. An environmental permit is required to authorise a mining waste operation.

The Albury operations will continue to involve the management of extractive waste not including a waste facility. Activity A2 of environmental permit EPR/EB3100FC is not being varied as the type, volume and management of extractive waste will remain the same. For clarity the Albury Wellsite produces natural gas as a product and is not a waste, therefore the use of SMR technology for natural gas is not a waste management technique, but as part of the Operators decision to produce Hydrogen as part of the Company's business plan.

4.1.3 Water Discharge Activity

Schedule 21 of EPR2016 relates to water discharge activities, including the discharge or entry to inland freshwaters, coastal waters or relevant territorial waters of any trade effluent. For clarity the discharge of clean surface run-off water is considered a trade effluent for the purpose of onshore oil and gas permit applications.

Surface run-off water at the Albury Wellsite is collected within the containment ditches for subsequent removal via road tanker and disposed at an Environment Agency licenced waste facility. No discharges will take place at the Albury Wellsite during the operations, therefore a water discharge activity will not be applied for.

4.1.4 A Groundwater Activity

Under Schedule 22 of EPR2016, an activity that could involve the discharge of pollutants into groundwater must be notified to the Environment Agency, together with the nature of these pollutants. The Environment Agency will then determine whether the groundwater activity needs to be permitted. For clarity, no activities involving the discharge of pollutants to groundwater will take place and therefore a groundwater activity permit will not be applied for.

4.1.5 A Radioactive Substances Activity

Schedule 23 of EPR2016 provides for the control of Naturally Occurring Radioactive Material (NORM). Schedule 23 defines the production of oil and gas as a NORM industrial activity and therefore any accumulation of radioactive waste, which exceeds concentrations set out in Table 1 of Schedule 23 of EPR2016. IGas have previously obtained a SR2014 No.4 permit (EPR/SB3796DT) which remains relevant to the proposed activities and therefore no application is being made to undertake further radioactive substances activities.

4.1.6 Medium Combustion Plant and Specified Generators

Schedule 25a of EPR2016 considers activities which involve the operation of Medium Combustion Plants (MCP), specifically MCPs with a rated thermal input equal to or greater than 1 megawatt but less than 50 megawatts. Such plants are required to operate within the set Emission Limit Values as cited by EPR2016, as amended.

Schedule 25b of EPR2016 considers activities which involve the operation of combustion plants which is used for the purpose of generating electricity, but does not consider mobile units unless they are connected to an electricity transmission system or distribution system or fulfilling the role of a static generator. These Specified Generators (SG) fall in scope of this Schedule if they have a rated thermal input equal to or greater than 1 megawatt but less than 50 megawatts.

Operators of MCP and SG (MCPSG) that are in scope will require an environmental permit under schedule 25A and 25B of EPR2016, as amended. A permit to operate both is determined by the capacity, emissions and operating hours of the plant.

The Albury Wellsite currently holds a SR2018 No.1 permit for the operation of the existing medium combustion plant. Through discussions with the Environment Agency is has been identified that the current permit is not suitable to the existing MCPSG due to the NOx emission limit (95mg/m^3) being unachievable for the existing plant. As such, following consultation with the Environment Agency, IGas is now applying for a bespoke permit to facilitate the MCPSG operations, specifically to operate within a NOx limit of 190mg/m^3. The Environment Agency Screening Tool has confirmed that the activity is considered a 'simple bespoke'. The current SR2018 No.1 permit will be surrendered by IGas upon completion of the bespoke permit determination.

4.2 Water Resources Act 1991 (as amended by the Water Act 2003)

Under Section 199 of the Water Resources Act 1991 (as amended by the Water Act 2003), a notice of the intention to construct or extend a boring for the purpose of searching for or extracting minerals must be submitted to the Environment Agency using form WR11. The WR11 requires that a method statement, including drilling and casing designs, together with storage and use of chemicals and drilling muds, accompanies the WR11 application form. No additional wells are currently being planned and therefore it is not foreseeable that the Albury Wellsite will be the subject of a WR11 application at this stage.

5. DESCRIPTION OF THE FACILITY

5.1 Wellsite Location

The permitted activities will be undertaken at the following location:

Albury Wellsite
East of New Road
Albury
Surrey
GU5 9DA

National Grid Ref: TQ 06175 47197
Site Area: 1.51 hectares

The green line boundary below incorporates the current permit boundary.

Figure 5.1: Albury Wellsite Location (Source: Google Earth May 2021)

Albury Wellsite is located approximately 7km south-east of Guildford town centre in Surrey, between the villages of Albury and Albury Heath. The centre of the wellsite is at National Grid Reference: TQ 06175 47197.

The site is located within the Albury Estate in an area of established woodland, with a tree canopy typically in excess of 12m in height. The site is accessed off New Road (D194), which links Albury Heath to the A248, via a gated forestry track serving Albury Park. The wellsite, track and access to the public highway lie at an elevation of 109m – 110m AOD, with the surrounding land rising to the north and falling to the south and west.

The land surrounding the site is undulating, forming part of the Albury Estate and containing replanted ancient woodland. A public right of way (Public Footpath 239) runs north-west-south-east through Albury Park, approximately 200m to the northeast of the wellsite.

The nearest residential property is Keepers Cottage, located on lower lying ground approximately 220m to the northwest of the centre of the site. Opposite the entrance to the access road on New Road is a dwelling known as The Bungalow, approximately 270m from the site centre. Further residential properties lie to the south, on Park Road, with the closest being some 300m to the southeast.

Three Sites of Nature Conservation Importance (SNCI) are located within one kilometre, with the site lying within Albury Park SNCI, which is noted primarily for its importance to epiphytic lichens. Other SNCIs in the area include Laceys Field, Albury Warren, Albury Heath, and Kiln Rough SNCI, all of which are found to the west of New Road, between 200m and 450m from the site.

A desktop study was undertaken to identify any designated sites which may be affected by the proposals. The results of the desktop survey using the Multi-Agency Geographic Information for the Countryside (MAGIC) interactive mapping tool have been provided within Table 5.1.

Designated Site	Search Radius	Name	Location from Site
RAMSAR	10km	-	-
Special Area of Conservation	10km	-	-
Special Protection Areas	10km	Thames Basin Heaths	9.08km Northwest
Marine Protection Areas	10km	-	-
Sites of Special Scientific Interest	2km	Combe Bottom	1.40km Northeast
		Blackheath	1.54km Southwest
		Coylers Hanger	1.98km Northwest
Schedule Ancient Monuments	2km	Bowl Barrow on Shere Heath	0.9km East
National Nature Reserve	2km	-	-
Local Nature Reserve	2km	Shere Woodlands	1.4km Northeast

Table 5.1: MAGIC Desktop Study Results

5.2 Historic Developments

Historical maps show the site area as woodland until the 1989 map which first shows the existing gas wellsite. The Albury wellsite was constructed following permissions from the planning authority in 1987.

The current compound contains two wells (ALB-1 and ALB-2), which are located in the central section of the site and are surrounded by an impermeable concrete well cellar. An electricity transformer (sub-station) and switchroom are located in the northeastern corner of the site, with the only other built development being a fire water tank located immediately to the west of the compound entrance.

The original soils stripped from the site are stored in peripheral bunds up to three metres in height which help screen the operational area from the surrounding woodland. To the south of the site entrance, two third party telecommunication masts approximately 30m in height, which are situated within small compounds either side of the access track.

The wellsite surface consists of a layer of sand across the subsoils overlain with a non-woven geotextile membrane. A damp proof course was overlaid on top of the geotextile membrane with a further non-woven geotextile membrane completing the site containment design to protect the damp proof course against damage. The site surface was then completed using 400mm of limestone chippings.

Two wells have been drilled from the wellsite Albury-1 Well (ALB-1) and Albury-2 Well (ALB-2). ALB-1 is currently producing natural gas for the purpose of generating electricity and for export to the national grid via dedicated pipeline (and DNO approved entry-kiosk), with ALB-2 suspended.

6. PRODUCTION OPERATIONS

Section 6.1 details the activities currently being undertaken/permitted to be undertaken at the Albury Wellsite. It is considered that these activities will not be the subject of any variations as part of the application process as they will remain and continue to be undertaken in accordance with the issued environmental permit.

Section 6.2 details the additional activities that are being proposed as part of the next phase of development, namely the production of hydrogen using SMR technology.

6.1 Currently Permitted Activities

6.1.1 Mining Waste Operation

The Albury Wellsite is currently permitted to conduct mining waste operations including the management of extractive waste produced as a result of its ongoing activities. IGas shall continue to operate its mining waste operations in accordance with the environmental permit EPR/EB3100FC. The waste streams identified include:

- Well Suspension Brine;
- Formation Water (with the potential for NORM); and
- Waxes built up in the well.

For clarity, any natural gas produced during operations is not considered a waste as it is a product produced for serving a specific purpose, i.e. electricity/hydrogen production, or export.

6.1.2 Incineration of Hazardous Waste in excess of 10 Tonnes per day.

Whilst the incineration of hazardous waste in excess of 10 tonnes per day is a permitted activity and will remain so, there are currently no plans to incinerate natural gas as part of any clean up proposal or otherwise. It is not foreseeable that any waste gas will be produced from the site. Should natural gas be unable to be used for either hydrogen production, electricity production or exportation, the well will be shut in.

6.2 Additional Permitted Activities

6.2.1 Operation of a Medium Combustion Plant

As stated within Section 4.1.6 the current MCPSG permit is not suitable for current activities. On the advice from the Environment Agency, IGas are applying for a simple bespoke permit to operate the currently existing MCPSG. The MCPSG is currently being used to provide electricity to the site, enabling it to become independent from the national grid. This activity is already being undertaken currently as it is an existing plant, which falls under the definition of Tranche B however to ensure the activity is regulated under the correct permit full details of the MCPSG and the impact on the environment is being provided.

A Gas Management Plan has been produced providing a more in depth description of the MCPSG.

6.2.2 Hydrogen Production

IGas will continue to produce natural gas from the ALB-1 well in accordance with environmental permit EPR/EB3100FC. The natural gas, once at surface shall continue to be treated by means of separation from any produced fluids before being the subject of chemical scrubbing, including the removal of sulphur compounds, to ensure the natural gas is in optimum condition prior to being used as a fuel (for either MCPSG or SMR).

IGas is seeking permission to produce hydrogen from the natural gas by using SMR technology, specifically the use of a single BayoTech SMR H2-1000 Generator. A modular unit confined to a 40ft container with a production capacity of up to 1000kg of hydrogen per day, with produced hydrogen being compressed and loaded into dedicated transportation trailers and ready for collection on an as needs basis.

The purpose of the natural gas (methane) is twofold, both energy and feedstock. Within the SMR plant, methane will be separated, with a small fraction being used to generate heat within a furnace to heat water and produce steam. This, along with the remaining volume of methane shall be co-mingled in the presence of catalysts in a series of reactors, where the following chemical reactions take place.

Steam-Methane Reforming Reaction

Methane (CH_4)	+	Steam (H_2O)	+	Heat	=	Carbon Monoxide (CO)	+	Hydrogen ($3H_2$)

Water-Gas Shift Reaction

Carbon Monoxide CO	+	Steam H_2O	=	Carbon Dioxide CO_2	+	Hydrogen H_2	+	Heat

The Gas Management Plan provided in support of the application provides further information on the hydrogen production process.

The hydrogen is then compressed and stored within purpose-built transportation trailers (gas cylinders) pending collection by a dedicated licenced haulier for delivery to the receiving facility.

This technology, which has been in use since the 1920's, has recently been developed further to facilitate hydrogen production on a much smaller scale, enabling Operators, like IGas, to convert natural gas to hydrogen at the wellsite; rather than in largescale, centralised, facilities, e.g. refineries. This offers the potential to provide it much closer to the point of use, for either public vehicles, HGVs, or mass-transport vehicles, or for availability to the open market, providing the opportunity to reduce CO_2 emissions and the production of combustion by-products (particulates and Nitrogen/Sulphur Oxides) through the displacement of diesel fuels, and so contributing to the UK's target of achieving carbon neutral status by 2050.

6.2.2.1 Hydrogen Production and Green House Gas Emissions

Whilst the production of hydrogen from the SMR process will increase the localised production of carbon dioxide within the site boundary, it is necessary to consider the use of the produced hydrogen. The hydrogen fuel will be used to replace conventional use of hydrocarbon fuels (such as natural gas and petroleum), thereby offsetting emissions produced by the SMR process.

It is anticipated that the emissions would likely be used to fuel HDVs, particularly buses. In 2019 GHG emissions from surface transport accounted for 22% of the UK's total emissions, which has been typical since the 1990s. A breakdown of the 2019 emissions are presented in Figure 6.1. This shows that buses currently account for approximately 3% (3 Mt CO_2-eq)) of all UK emissions, which are predominantly in the form of CO_2 from diesel combustion.

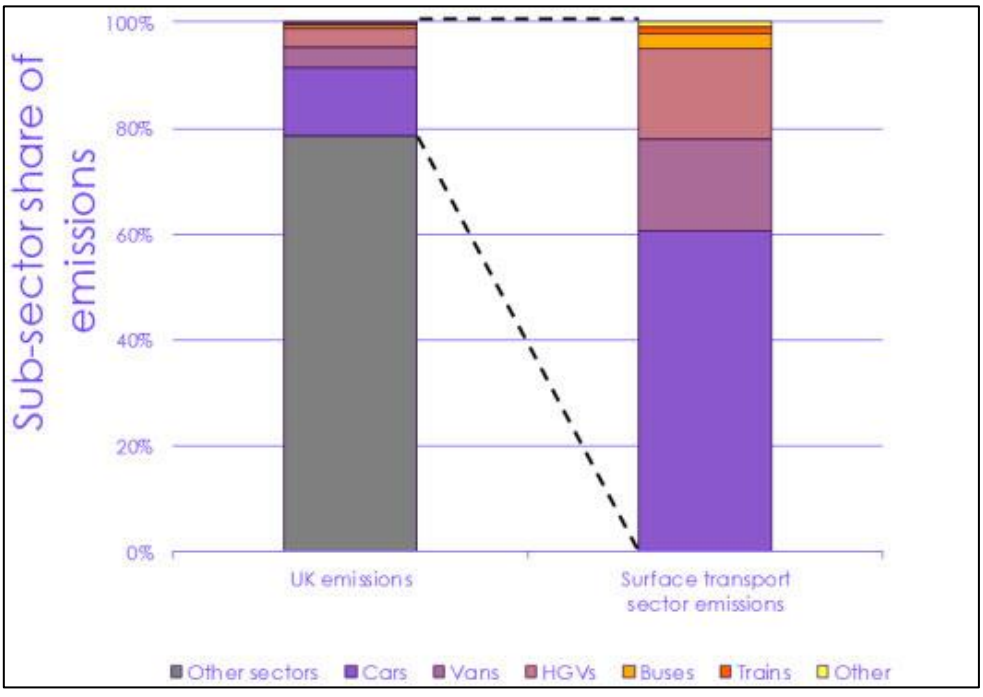

Figure 6.1: Breakdown of Surface Transport Emissions (2019)
(Source: BIES(2020) Provisional UK greenhouse gas emissions national statistics 2019; CCC analysis.)

Battery-electric busses are already being deployed, often due to local authority efforts to reduce air pollution. However hydrogen offers the closest user experience to current diesel operations. Given sufficient hydrogen refuelling infrastructure, fleet operators would be able to fill up vehicles either in-depot or from filling station on-route as currently, or both. Hydrogen is also a particularly attractive solution for vehicles requiring longer independent range. The sixth carbon budget methodology report explains that hydrogen uptake could be relatively quick, reaching 77% of larger HGV's by 2035 and 99% by 2040 (CCC,2021). London currently has eight hydrogen buses operating, and UK manufacturer Wrightbus recently announced plans to manufacture 3,000 hydrogen buses. Hydrogen bus sales couple increase relatively quickly, potentially reaching up to 69% of all sales by 2030 and 95% by 2035 (CCC,2021).

The production of hydrogen fuel is therefore highly important to enable the Government to progress with their plans to achieve the sixth carbon budget and their path to Net Zero. It is thus considered that taking account of how the hydrogen produced from the proposed development will be used is an integral part of assessing the overall impact of the development.

The likely greenhouse gas emission savings from using the hydrogen produced as a fuel have been determined by comparing it with diesel fuelled buses and other low carbon alternatives. The comparison is set out in Table 6.1 below.

Fuel[a]	Emissions Rate (gCO_2eq/km)[b]	Annual Journey Length (km)[c]	Tonnes CO_2eq per year	Tonnes CO_2eq Sixth Carbon Budget	Lifetime Mt CO_2eq
Hydrogen	-	2,433,333	0.00	0.00	0.00
Diesel	1,138.02	2,433,333	2,769.17	13,845.86	0.17
B100 Biodiesel	899.57	2,433,333	2,188.96	10,944.79	0.13
Compressed Natural Gas	0.005	2,433,333	0.01	0.06	<0.01
Biomethane	0.005	2,433,333	0.01	0.06	<0.01
Biogas	0.005	2,433,333	0.01	0.06	<0.01
Hybrid	711.34	2,433,333	1,730.93	8,654.64	0.10
Fuel Cell Electric Vehicle	-	2,433,333	0.00	0.00	0.00

Table Notes:

a. Emissions account only for those released from buses, not the production or transport of fuel.

b. Emission rate calculated using DEFRA's EFT for a single bus travelling at 20kph.

c. The consumption of hydrogen per bus is 9-10 kg/100km for a 18m articulated bus (NewBusFuel,2017). Since the SMR will produce 1,000kg of hydrogen per day (365,000 per year), it is estimated that buses could travel at least 2,433,333km per year using the hydrogen produced from the Proposed Development.

Table 6.1 Comparison of bus GHG emissions for different fuels (Source: APS - Greenhouse Gas Assessment: Albury Park (2021)

This demonstrates that the hydrogen produced from the proposed Albury development may lead to a reduction of up to ~2,769 tonnes CO_2-eq per year and ~13,846 CO_2-eq within the sixth carbon budget.

Putting this into context of what emissions would need to be offset, the Proposed Development is estimated to exceed the 1% criteria at a local scale during the sixth carbon budget by 3.36 tonnes CO_2-eq. This is significantly smaller than the conventional emissions from diesel, biodiesel and hybrid buses.

Overall, the Proposed Development is expected to lead to a reduction of at least 0.1 Mt CO2-eq over the lifetime of the site. Taking account of this saving, the Proposed Development will have net positive effect and is considered not significant.

7. SUPPORTING DOCUMENTATION

In line with the requirements of EPR2016 the following documents have been prepared in support of an application for an Environmental Permit under EPR2016.

7.1 Site Plans

Site Plans have been provided to illustrate the location of the wellsite, together with an indicative layout plan illustrating the location of significant equipment.

7.2 Waste Management Plan

The Waste Management Plan is a principal document of the Albury environmental permit application. It is specifically drafted for an application to operate a Mining Waste Operation, whether or not it includes a Mining Waste Facility. Although there are no changes to the mining waste operations or the incineration of natural gas, as the principal 'Operating Technique' as referenced within permit EPR/EB3100FC, the Waste Management Plan is being revised to update the development, namely the production of hydrogen.

7.3 Gas Management Plan

The Gas Management Plan is a principal document of the Albury environmental permit application. It is specifically drafted for an application to operate an Installation Activity, specifically the production of a single inorganic chemical, in this case Hydrogen. The activity is not a waste management technique and as such the Gas Management Plan does not provide Best Available Technique (BAT) Assessment.

The Gas Management Plan has been developed to describe the production process and how the natural gas will be used across all scenarios within the proposed development, including maintenance and emergency scenarios.

7.4 Site Condition Report

The Site Condition Report has been prepared as a record of the site condition prior to commencing hydrogen production operations. It will continue to be updated as the operations progress and will be used to identify any changes to the environment as a result of the operation when surrendering the environmental permit.

7.5 Environmental Risk Assessment

The Environmental Risk Assessment is applicable to the Albury wellsite and all operations permitted therein, in accordance with planning consent. The structure of the Environmental Risk Assessment is consistent with the Environment Agency guidance using a source pathway receptor model.

The Environmental Risk Assessment has included the following items, which have been reviewed for applicability within the Albury hydrogen production operations.

- Accidents & Incidents;
- Air emissions;
- Dust;
- Fugitive emissions;
- Global warming potential;
- Light;
- Noise;
- Odour;
- Releases to water; and
- Waste.

The Environmental Risk Assessment has concluded that the risk to the environment is 'not significant' based on the control measures implemented by IGAS, including a contained wellsite incorporating an impermeable membrane and externally audited Environmental Management System.

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APPENDIX 1 - INDICATIVE STEAM-METHANE REFORMATION BLOCK DIAGRAM

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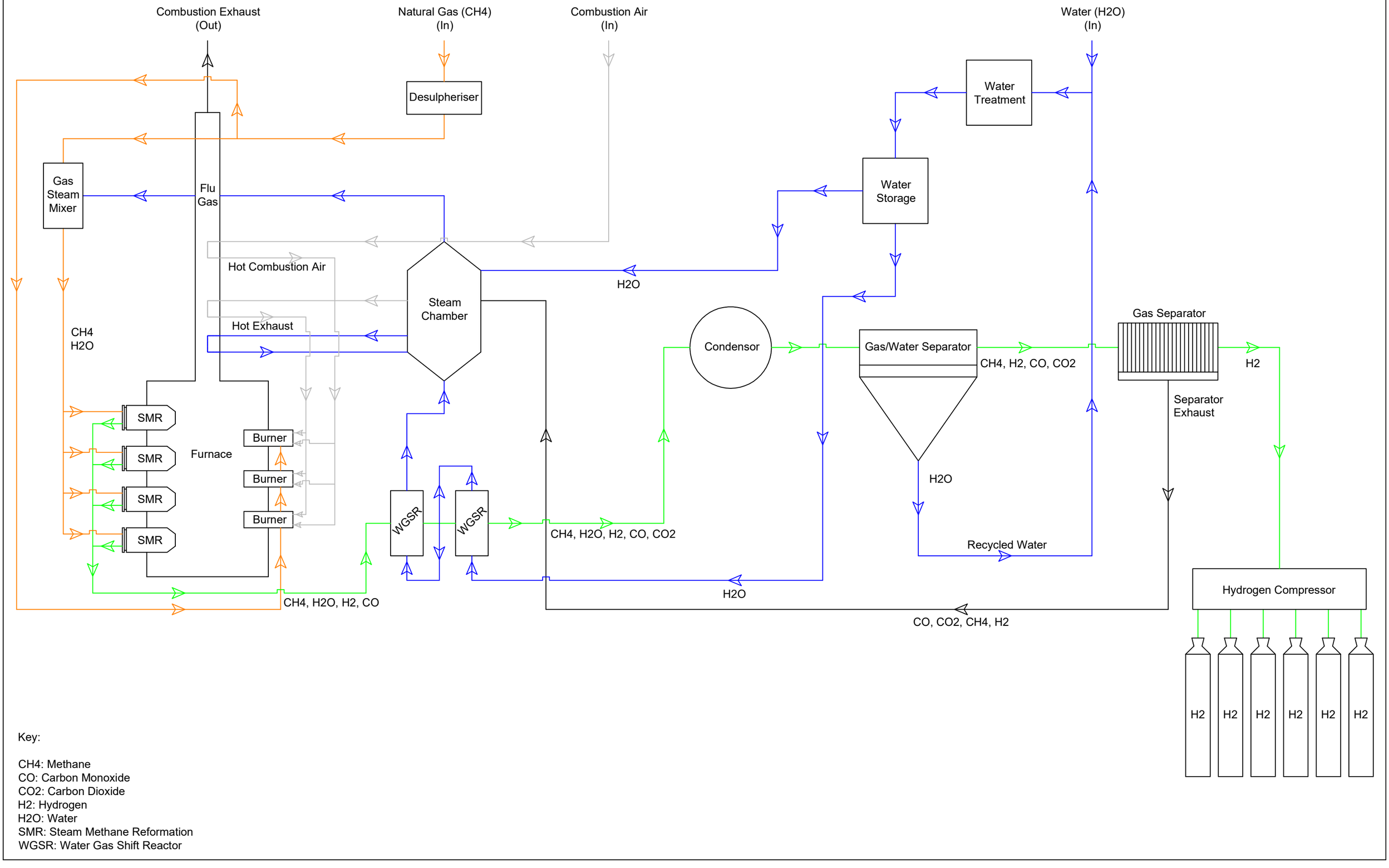

Key:

CH4: Methane
CO: Carbon Monoxide
CO2: Carbon Dioxide
H2: Hydrogen
H2O: Water
SMR: Steam Methane Reformation
WGSR: Water Gas Shift Reactor