APPENDIX 3.1
BAT
CHIREN UNDERGROUND GAS STORAGE

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INTRODUCTION

This appendix assesses application of the Best Available Techniques (BAT) for Chiren UGS. The above-ground facility of Chiren UGS falls within Appendix No. 4 to the Environmental Protection Act (EPA) and according to letter Outgoing No. OBOC-17/16.03.2021 of the Ministry of Environment and Waters (MoEW), it is necessary to prepare an application with scope and content of Appendix No. 1 of the Ordinance under Art. 119 of the EPA in compliance with the requirements of Art. 10, para. 3, item 9, "a" of the Ordinance on the terms and procedure for carrying out EIA.

Currently, at the existing site of Chiren UGS, a combustion plant of **34.66 MW** nominal heat output, including 8 gas engine compressors type ГМК -10 ГКНАМ, each of 3.88 MW heat output, are in operation. Apart from this equipment, 3 water heating boilers BUDERUS, type G 605-740/12, each 0.74 MW nominal heat output, have been installed, as well as 1 unit for regeneration of triethylene glycol of 1.4 MW output.

The investment proposal envisages Chiren UGS expansion on a new technological site adjacent to the existing one, in which a new natural gas compressor station of **89,446 MW** nominal heat output will be located, including 4 gas turbine compressor units (GTCUs), each of 18 MW thermal input. In addition will be installed 3 water heating boilers for technological and household needs of 0.1 MW heat output each; 5 gas heaters of 3.1 MW heat output each; 2 triethylene glycol (TEG) heaters of 0.7 MW output each; 4 domestic water boilers - 1 of 0.004 MW heat output, 1 of 0.042 heat output and 2 of 0.1 MW heat output each.

Following implementation of the investment proposal, the total installed nominal heat output of the above-ground facilities of Chiren UGS will be **124,106 MW**.

The combustion plants located on the existing and on the newly designed sites of Chiren UGS cannot and will not be in operation mode at the same time, for which there are technological obstacles. The technological mode of operation of the gas storage allows the respective facilities only on one of the two sites to operate in withdrawal mode or injection mode. Considering this, the total nominal thermal input of the facilities of the existing and the newly designed sites in each of the two modes will be as follows:

- Injection mode during operation of the facilities on the existing site - simultaneous operation of a maximum of five gas engine compressors, each of 3.88 MW nominal heat output or 19.4 MW total nominal thermal input, is permissible;
- Withdrawal mode during operation of facilities on an existing site - simultaneous operation of two water heating boilers, each of 0.74 MW nominal heat output and one heater for triethylene glycol regeneration system of 1.4 MW nominal heat output, is permissible. The total nominal input thermal of the existing site amounts to 2.88 MW;
- Injection mode during operation of the facilities at the newly designed site - simultaneous operation is permissible of a maximum of three gas turbine compressor units, each of 18 MW nominal heat output, two water boilers for technological needs, each of 0.1 MW nominal heat output and a water boiler for heating during winter months and production of hot water all year round of 0.042 MW nominal heat output or 54,242 MW total input thermal at the operational site (1,301,808 MWh/day or 234,171,216 MWh/y);

- Withdrawal mode during operation of facilities on the newly designed site - simultaneous operation is permissible of two water boilers for technological needs, each of 0.1 MW nominal heat output, a water boiler for heating in winter months and production of hot water all year round of 0.042 MW nominal heat output, a water boiler for heating in winter months at the access control point of 0.004 MW nominal heat output, two water boilers for heating in winter months of the GMS building of 0.1 MW nominal heat output each, one heater for the triethylene glycol regeneration system of 0.7 MW nominal heat output and four gas heaters for the gas heating system of 3.1 MW nominal heat output each. The total input thermal of the newly designed site in withdrawal mode amounts to 13,546 MW or 325.104 MWh/day and 48,765.6 MWh/y.

The investment proposal, in essence, provides for construction of a Combustion plant of total nominal input thermal equal to or above 50 MW, included in item 1.1 of Appendix No. 4 to the EPA The description of the operational site of Chiren UGS and its expansion with the construction of new above-ground facilities – a compressor station (CS) with all its auxiliary equipment to ensure reliable and continuous operation in gas injection and withdrawal modes and a new gas metering station (GMS) is presented below.

Compliance with BAT requirements refers to the activities and facility falling within the scope of item 1.1. of Appendix No. 4 of the EPA. In accordance with the Methodology for determining the best available techniques, adopted by the Minister of Environment and Waters with Order No. РД-925 of 13.12.2012 (the Methodology for determining BAT), information about Chiren UGS is presented below. It is clear from the assessment that Chiren UGS complies with the requirements of BAT and the Bulgarian legislation.

The assessment of BAT application has been prepared in accordance with **item 3.1** *"Applying BAT in construction of new facilities"* of the Methodology for determining BAT, subject to the specified sequence.

1. Applying BAT in construction of new facilities

Table 1 - Categorization of the applied technique

Classification of the proposed technique	**Tick**	**Methodology item to be completed**
The latest technique is proposed, in the sense of Art. 123a, para. 5 of the EPA	□	item 3.1.1
A technique identical to the one described in the applicable BAT conclusions (regardless of whether they were adopted by an EC Decision or not) is proposed, including its described parameters (consumption, emissions, waste, etc.) and their values	■	item 3.1.1
A technique other than that described in the applicable BAT conclusions (including EC Decisions, if any, entered into force) is proposed for the activity under consideration	□	item 3.1.2
A technique was proposed other than that described in the applicable BAT conclusions (including EC Decisions, if any, in force) for the activity under	□	item 3.1.3

Classification of the proposed technique	Tick	Methodology item to be completed
consideration as BAT conclusions (including EC Decisions, if any, in force) for the particular activity/facility do not consider all the potential environmental impacts of the activity, or do not describe all the processes applied in the facility, **or no applicable BAT conclusions are available**.		

In preparing the assessment, information was used from a BAT document (Best Available Techniques) described in the BREF documents (Best Available Techniques Reference Documents) developed by the Technical Bureau of the European Commission, namely - Decision No. 2017/1442/EU on formulation of conclusions on BAT for large combustion plants (promulgated 17.08.2017, LCP BREF).[1]

2. Description of the technique

2.1. Existing Chiren UGS site

Chiren underground gas storage is located in north-western Bulgaria, about 20 km north of the town of Vratsa and about 12 km from Vratsa - Oryahovo road. To date, it is the only natural gas storage facility in the country. It was built based on depleted gas field, and after its expiry in 1974, cyclic exploitation began. UGS serves to compensate for the seasonal fluctuation of consumption in the country, and natural gas is injected in it in the summer season and withdrawn in winter, with the purpose to fully satisfy the market in peak periods of consumption.

The main technological processes of Chiren UGS related to natural gas transportation and storage can be conditionally divided into two stages:

- Injection Mode: Inflow of natural gas to UGS technological site, purification, measurement and injection into the underground reservoir.
- Withdrawal Mode: Extraction of gas from the underground reservoir, purification, heating, pressure regulation, measurement and leaving UGS site to supply external gas pipelines.

The gas storage has a continuous two-shift/three-shift mode of operation. The injection period (three-shift mode of operation) of natural gas at UGS is the time period starting at 07:00 am on 16 April and ending at 07:00 am on 16 October. The withdrawal period (two-shift mode of operation) of natural gas at UGS is the time period starting at 07:00 am on 1 November ending at 07:00 am on 1 April of the next calendar year.

Chiren UGS operation is carried out by exploitation-injection and observation wells. So far, 24 exploitation wells have been constructed, connected by gas pipelines (gatherings) to the UGS site, as well as 14 observation wells, used to monitor the change in static levels depending on the volume of gas and its reservoir pressure in the productive horizons of the underground storage.

Currently, the following main buildings and facilities are located on the main, existing site of the Company, at an area of 53,313 m² and a built-up area of 5,174 m²:

[1] https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1503383091262&uri=CELEX%3A32017D1442

- Administrative building with canteen and kitchen;
- Company gas station;
- Compressor plant;
- Garages;
- Warehouses;
- Service-operational unit;
- Gas metering point;
- Fan cooling towers;
- Gas drying plant;
- Gas AVG and water cooling plant;
- Collective manifold;
- Pump station for industrial water;
- Storage tank for MC-20 oil, lubricating materials storage, etc.

There is a warehouse for highly flammable liquids (HFL) close to the main site, with a separate Excise tax warehouse for energy product - gas condensate, where the following are located:

- Methanol tank;
- Automatic pouring device (stand) and automatic discharge device for methanol;
- Gas condensate tank, equipped with fire extinguishing and cooling systems;
- Autofill device (stand) for gas condensate;
- Pump station for gas condensate and methanol;
- Modular moveable container to the tax warehouse, for administrative-domestic and service activities;
- Underground tank for fire-fighting water with pump station, Storz fire hydrants and nozzles;
- Underground water drainage tank.

The total installed thermal output of the currently operational site is **34.66 MW**, as follows:

- *Gas engine compressors type ГМК -10 ГКНАМ № 1÷8 with heat capacity of 3.88 MW each;*
- *Water heating boilers BUDERUS, type G 605-740/12 № 1÷3 with rated thermal input 0.74 MW each and*
- *Triethylene glycol regeneration unit No.1 of 1.4 MW capacity.*

In addition, emergency gas unit No. 1 of 1.67 MW capacity is also available at site.

Detailed information of the above-ground facilities at the currently operational site of Chiren UGS is presented below, as follows:

Individual separation The gas flow rate to each separator is (2080 ÷ 20850) Nm^3/h. Individual separation is composed of individual separators for each well, valves and pipelines. The individual separators serve to capture and separate the liquid phase and mechanical impurities from the withdrawn natural gas.

Collective manifold: It is made up of 7 groups of 4 wells. Each group flows into a common collector. Individual regulation of the gas flow from each well is carried out, and a methanol injection installation has been built.

Low pressure separation: The separation for low pressure includes three separators through which gas is additionally separated from the liquid phase at 50÷55 bar pressure.

Separation of the liquid phase: Two separators are available to separate the condensate from the formation water based on their relative weight.

Natural gas dehydration: It has the following characteristics:

- Minimum flow rate: 0,5 million Nm^3/d under standard conditions;
- Average flow rate: 2.3 million Nm3/d;
- Operating pressure: from 3.0 to 5.5 MPa;
- Temperature: from 0 to 35°C by water;
- Dew point: minus 10 °C at 3.92 MPa;
- Used operation fluid TEG (triethylene glycol).

Dew Point Control: BARTEC water dew point measurement system.

Dust collection: It consists of 2 cyclone-type dust collectors located at the entry of the storage.

Filtering system for the injected gas: This system prevents contamination of the exploitation wells' bottoms with compressor oils.

Gas compressors: Eight GEC 10 ГКНАМ have been built and are operating. The ignition of compressors is Altronic, and their cooling is by water in two circuits, open and closed cycle with cooling towers.

Power supply: The site is powered by 2 oil transformers type TM 1600/20/04 with 1600 kW power, one is in operation and the other is in "hot reserve" mode. An emergency gas unit AGA 750 kVA is available - intended for voltage supply, in case of voltage failure on both inputs.

Compressed air system for C&I: It consists of 3 pistons and 2 screw compressors, and an air drying system.

Drying gas plant and regeneration installation for TEG: The natural gas withdrawn from the underground gas storage passes through a gas separation plant to separate its water and gas condensate, but as it is saturated with moisture, it passes through drying plant, where it is dried to a dew point of minus 10ºC at a pressure of 39.2 barg.

Drying is carried out by absorption, using triethylene glycol (TEG) as an absorbing medium.

The gas drying plant consists mainly of the following units:

- Absorption column for absorbing water vapours in the gas by means of TEG;
- Regeneration plant for TEG to further concentrate the diluted TEG and the possibility of further use.

Additional systems: A boiler plant is located on the existing operational site of the Company, consisting of three water heating BUDERUS boilers, type G 605-740/12, each of 0.74 MW power. The boilers operate in 2+1 mode only during the withdrawal period, when they produce the necessary heat for production processes. During these 150 days of the year, boilers operate in continuous mode.

The site is supplied with water for drinking and household purposes from Chiren village water pipeline, while water for cooling and fire-fighting is supplied by a pump station with water from Chiren III dam.

Open warehouse for motor oil MS-20: The MS-20 oil warehouse is located in the north-eastern part of the operational site, at an approximate area of 267 m^2. The base of the warehouse is concrete, with a reinforced concrete dike separating two compartments around the oil tanks, with a capacity as follows: I – 32 m^3; II – 35 m^3. In the first dike area, there are two horizontal, above-ground, cylindrical tanks for fresh oil MS-20, with a capacity of: 24,6 m^3; 23,7 m^3, and in the second: three horizontal, above-ground, cylindrical tanks for fresh oil, each with a capacity of 10 m^3, and one horizontal, above-ground, cylindrical tank with a total volume of 4 m^3 for wasted oil storage.

Each dike area has a separate connection to the industrial sewerage to drain the rainwater collected in the dike, with separate metal grids and shut-off valves for each branch. Rainwater from the dikes is directed to a treatment facility - a mud-oil trap to contain any spilled oils.

A pump station for oils has been built outside the dike and within its close proximity. The pump station has an open shed with a flat roof, where one pump is located supplying fresh motor oil from the oil warehouse to the compressor workshop.

The MS-20 oil warehouse site is connected to the industrial sewerage for rainwater disposal to a treatment facility, as well as for oil collection in the event of spills in emergency situations.

Lubricating materials storage facility and petrol station: The company petrol station on the territory of Chiren UGS was built in 1974, with two fuel filling stations - petrol and diesel. The use of company petrol station has been suspended by a resolution of the Executive Director of Bulgartransgaz EAD of September 1, 2015.

The petrol station building is used as a lubricating materials storage facility for storage of motor lubricating oils, antifreeze, wiper fluids and greases for production needs and for the vehicle fleet.

General information system of the site: A common site information system (SCADA) was built, including subsystems for operational technological supervision, also for ongoing analysis of site's operation.

The system provides full information security for the operational activities of Chiren UGS.

Telemetry information system for individual measurement of wells' parameters (TWS): Wells subsystem is run into operation for telemetric operational current control and individual measurement of the parameters of exploitation wells. The Telemetry Wells System (TWS) of Chiren UGS serves for continuous measurement, transmission, storage, control and use for analysis of field data from UGS wells. Data from the system enters the existing SCADA system of the UGS. The base station consists of:

- Server, communication interfaces, system and application software and auxiliary equipment for implementing communications;
- Radio-communication equipment - radio modems, antenna-feeder tracts, power supply units and auxiliary equipment for realizing galvanic separation and protection of individual devices.

Warehouse for highly flammable liquids: It is located at about 190 meters northwest of the main site of Chiren UGS and near Chiren - Devene road. The following technological facilities are located on the site of the flammable liquids warehouse: a gas condensate tank of 525 m^3 volume - equipped with a semi-stable fire extinguishing installation and a stable, cooling installation, a methanol tank - of 250 m^3 volume, a pump station and an auto storage for gas condensate and methanol and a connecting piping. According to the regulatory requirements, on the territory of the warehouse for flammable liquids, an Excise tax warehouse for energy product - gas condensate is established. The Tax warehouse comprises: the condensate tank, condensate auto-filler and pump station, control and measurement equipment, a movable container for administrative and household services, in which components of the Measuring Instruments Control System (MICS) of the Customs Agency are located. Activity carried out in the tax warehouse: storage of produced accompanying excise product "raw natural gas condensate".

Gas condensate tank: The gas condensate tank has a total volume of 525 m^3 and 8800 mm diameter. The tank is installed on a reinforced concrete foundation, built above ground level, in an earth dike. Gas condensate transportation from the existing plant located on the main site to the gas condensate tank is carried out through an underground steel pipeline DN65 (ø76x4).

Methanol tank; The Methanol tank has a geometric volume of 250 m^3 and 7100 mm diameter. The tank is installed on a reinforced concrete foundation, built above ground level, in an earth dike.

Pump station for gas condensate and methanol: The pump station was built on the eastern side of the dike as part of the tax warehouse and one gas condensate pump was installed in it. This pump is used to fill the tank trucks with gas condensate;

There is one methanol pump outside the tax warehouse pump station. This pump is used to fill and unload tank trucks with methanol.

Autofill device for gas condensate: It was built on the eastern side of the dike in the tax warehouse and consists of one stationary one-sided hydrant (stand) for top filling of tank trucks.

Autofill device and automatic discharge device for methanol: It was built on the eastern side of the dike outside the tax warehouse and consists of one stationary one-sided hydrant (stand) for top filling of tank trucks.

Methanol automatic pouring device is part of the methanol stand and consists of one stationary one-sided hydrant (overloaded sleeve) DN80 for bottom unloading of tank trucks.

Between the tanks for gas condensate and methanol, pumps and automatic filling devices, an above-ground pipeline facility was built, through which the technological connections and the joint operation of the equipment are carried out.

Underground water drainage tank: The drainage tank is an underground metal tank with a total volume of V=25 m^3, manholes and a vent. The tank is designated to collect the drained precipitated water from the gas condensate tank. Possibly, contaminated waters from the dike can also flow into it.

Underground fire-fighting tank with pump station: The FF tank with pump station are intended to ensure fire-fighting water supply on site. The tank is underground, reinforced concrete, with a total useful volume of 264 m^3.

Water pipelines at highly flammable liquids site: A fire-fighting water supply was built - a closed high-pressure network consisting of one ring of pipes Ø159x4.5 and Ø133x4. Branches from the ring are used to feed the condensate tank cooling plant. Four Storz fire hydrants have been installed. The existing semi-stable fire extinguishing system of the gas condensate tank serves to supply foam solution from a fire truck.

In connection with the reconstruction of the condensate and methanol warehouse in order to bring it into line with the requirements for a tax warehouse for condensate and according to the prepared design, a new fire water pipeline with steel pipes Ø125x6 was built and it is fed by the existing system.

Lightning protection and earthing system: All non-conductive metal parts (metal structures, technological equipment structures) are grounded. Category II lightning protection has been developed for the site and external facilities, for protection in the event of direct lightning strikes on pipeline network facilities.

Measuring Instruments Control System (MICS): According to the requirements of Ordinance No. 3 of 19.02.2010 on the specific requirements and control exercised by the customs authorities on the means of measuring excise goods, a MICS was established for transmission of quantitative data in real time to the Customs Agency. The system comprises of:

- Control point 1 – located on the outlet pipeline of the condensate tank, between the inlet and outlet shut-off valves after the pump for the auto-fill stand;
- Control point 2 – located on the inlet pipeline of the condensate tank;
- Integrating Communication Device for Monitoring and Control (ICDMC) including: industrial controller (PLC), industrial computer (IPC) with installed software of the Customs Agency, GPRS module and antenna for data transmission, electronic certificate. All MICS components are powered by UPS.

2.2 Chiren UGS expansion on a new technological site

The newly designed equipment, which will ensure Chiren UGS operation, will be located at a newly designated technological site at an area of 82.24 dka in the immediate vicinity southwest of the existing one in the land of the village of Chiren with EKATTE 81400, Vratsa municipality, Vratsa district.

In Appendix 1.1 to the application for issuing of a CP, a layout is shown of the location of the current and newly designed sites of the Chiren UGS.

Setting up of the new site and deployment of the new equipment on it will not result in changing the essence of the operating processes currently taking place at the existing operational site of Chiren UGS. The planned increase in the active volume of the storage will be achieved by increasing the injection capacity of equipment mostly by a general increase in the power of compressor units used, as well as of their efficiency. The equipment consists of four gas turbine compressor units (GTCUs), including a gas turbine engine (GTE), driving two centrifugal

compressors (CC), ancillary equipment to the GTCU, individual separation unit, Gas metering station (GMS), manifold, gas purification and heating, general separation, gas drying plant, triethylene glycol regeneration plant, formation fluids separation plant. In injection mode, 3+1 gas turbine compressor units (GTCU), each with a total rated thermal input of 18 MW, will be used at the newly set up site. The fuel gas required for GTCU operation, as well as the gas for own needs, will be heated in the fuel gas preparation unit (FGPU). This process will be carried out by three water heating boilers, operating in 2+1 mode, each with 0.1 MW thermal input, and 0.3 MW total rated thermal input.

In withdrawal mode, gas will pass through a gas heating system consisting of 5 gas heaters (each with a thermal input of 3.1 MW) operating in 4+1 mode with a total installed thermal input of 15.5 MW. After depressurization, the gas will pass through a drying plant. It will consist of three absorption columns and a general system for regeneration of triethylene glycol. The TEG regeneration system will consist of two heaters (in 1+1 mode) for TEG, each of 0.7 MW power. The TEG regeneration plant will have 1.4 MW total thermal input.

Separate water heating boilers will be used for household needs at site:

- For access control point - with 0.004 MW power;
- For Production Power Unit (PPU) building - with 0.042 MW power;
- For GMS building – two boilers each with 0.1 MW power.

In addition to the above equipment, a production and energy unit (PEU), a fuel gas preparation unit (FGPU), a tank with a fire-fighting pump station, access control point and a fence are also planned to be constructed.

Inlet separation and GMS: The purpose of the inlet separation and GMS is to ensure the necessary gas purity and its metering before passing through GTCU in injection mode, as well as quality control of that gas and reducing its pressure to operating parameters in withdrawal mode.

The inlet separation system and GMS consist of two main parts - filter separators and metering lines. There will be six filter separators, vertical, cartridge type, located outdoors. The condensate collected from them will be directed by pipelines to formation fluids treatment system. In the immediate vicinity of the filter separators, a building will be built housing GMS. Metering is envisaged to be performed by six lines. The lines will be divided into two groups of three, serving respectively the directions of the pipeline network part of site: “Expansion of the gas transmission infrastructure of Bulgartransgaz EAD parallel to the north (main) gas pipeline to the Bulgarian-Serbian border“ at Valve assembly Butan-Chiren and Vratsa I/II. In withdrawal mode from Chiren UGS, the gas passes through the GMS, where its pressure is decreased to the operating parameters of the respective gas pipeline for which it is intended - 37 - 44 barg for Vratsa I and Vratsa II, and 50 - 75 barg for stage part of site: Expansion of the gas transmission infrastructure of Bulgartransgaz EAD parallel to the north (main) gas pipeline to the Bulgarian-Serbian border“ at Valve assembly Butan-Chiren, the passing gas quantity is metered and its quality is verified by a gas analyser/chromatograph.

GTCU 1, 2, 3, 4: Four GTCUs (gas turbine compressor units) are planned to be installed at the new site of Chiren UGS, each of 18 MW rated thermal input. GTCU will provide the necessary pressure increase during natural gas injection mode at Chiren UGS. The operating configuration will be 3 + 1, three operating GTCUs and one back-up. Each GTCU is equipped with a gas turbine engine (GTE), driving two centrifugal compressors (CC) via a common shaft (tandem configuration). Each

GTCU also includes an electrical and control and instrumentation building, an underground oil tank, drainage water and gas condensate, an oil cooler, a fire protection system and a fuel gas system.

The drain waters, gas condensate and oil, discharged from each GTCU, will be collected in the atmospheric reservoirs provided for each GTCU and will be treated as waste according to the Waste Management Act (WMA). The resulting condensate from the fuel gas system will be routed to the formation fluid treatment system.

Gas pipelines at site: On-site pipelines of various diameters are planned to be installed to ensure natural gas transmission between the individual units and facilities.

Individual separation The individual separation unit will be used in withdrawal mode from Chiren UGS and it will provide separation of liquid impurities from natural gas during natural gas withdrawal from UGS. The unit will consist of 28 individual vertical filter separators (one for each well). In addition to separating the liquid phase, methanol will be injected into the individual separation unit in order to prevent the formation of crystal hydrates in equipment. The separated fluid during withdrawal will be transported by pipelines to the formation fluids separation plant (three-phase separation).

A methanol tank of 30 m^3 capacity will be constructed on the new site of Chiren UGS, which will ensure the operating process for 40 days.

The individual separation will be designed for the following conditions:

- Flow rate (for one separator) - 1500 – 25000 m^3/h;
- Pressure - 60-140 barg,
- Volume of the liquid phase - 0.53 l for 1000 m^3 gas;
- Density of the liquid phase - 850-1000 kg/m^3.

Manifold: The designed manifold is a system that will ensure the separation of solid particles from natural gas (in withdrawal mode from UGS), as well as metering of the passing gas through an orifice plate. The manifold consists of 28 separate lines, one for each well. Individual separation filters will be installed on the same lines. The separation of solid pollutants from the withdrawn natural gas will be provided by cyclone separators. The separated solids and condensate will be directed to condensate tanks to the formation fluids treatment system. Manifold facilities (filters, orifice plates, adjacent fittings, etc.) will be designed for the following operating parameters:

- Flow rate (for one line) - 1500 – 25000 m^3/h;
- Temperature - +8 ÷ +55ºC;
- Pressure - 60 – 140 barg.

Gas separation and heating: Gas separation and heating group will ensure that the appropriate natural gas parameters are reached prior to the next steps of dehydration and pressure drop. This group will be designed for a flow rate of 2 000 000 – 10 000 000 Nm^3/d, 60-140 barg pressure and 8 – 40ºC temperature.

Three separators are envisaged to be installed that will run in 2 + 1 (two in operation and one in standby) mode.

Following separation, the gas will pass through a heating system. The heating system consists of five heaters (mode 4 + 1), connected to a common antifreeze tank (a mix of distilled water and propylene glycol in a ratio 62% to 38%). The heaters will be horizontal, running on natural gas and with automatic control of the burner power depending on the temperature and the amount of heated gas. The total coolant tank will have an approximate volume of 50 m^3 and will operate at atmospheric pressure.

Pressure regulation: The unit will ensure pressure drop of the gas withdrawn prior to its dehydration. The exit pressure will be within the range (55 – 80 barg) and will depend on the direction in which it will be pumped beyond the site of the UGS (Vratsa I/II or the pipeline network part of the site: "Expansion of the gas transmission infrastructure of Bulgartransgaz EAD parallel to the north (main) gas pipeline to the Bulgarian-Serbian border" at Valve assembly Butan-Chiren). To ensure the work process, two lines are provided, which will operate in 1 + 1 mode (one in operation and one back-up).

General separation: The purpose of the total separation is to capture any condensate formed after reducing gas pressure in withdrawal mode. The unit will consist of three filters in 2 + 1 configuration (two in operation and one back-up). The filters will be vertical with automatic separation of the collected condensate and its direction to the three-phase separator (formation fluids separation system).

Gas drying installation: The facility will consist of three absorption column, ensuring the natural gas dehydration. The absorbent used in the columns will be triethylene glycol (TEG). The facility is envisaged for the entire passing through gas quantity during withdrawal - 2 000 000 – 10 000 000 Nm^3/d and will consist of three absorption columns, operating in 2 + 1 mode (two in operation and one back-up). Natural gas with moisture content will enter the columns, which will be absorbed by the dehydration agent – TEG. After saturation, the triethylene glycol will be released automatically and will pass through a regeneration facility.

Triethylene glycol regeneration plant: The plant is an inseparable part of the gas drying plant and will ensure continuous feed of dry TEG to the operating absorption columns. The facility will be designed with a capacity of 1100 kg/h triethylene glycol at a pressure of 4,5 barg. The temperature range of the facility is +25 - +204ºC. Following the evaporation of the absorbed water, TEG will be cooled by about 5°C and will be pumped into the absorption columns.

Installation for separation of formation fluids: Drainage water and condensate separated in the facilities listed above in withdrawal and injection mode are collected in the formation fluids separation facility. The installation will include three drainage atmospheric tanks (each with a volume of 5m^3) and two horizontal three-phase separators operating in 1 + 1 mode (one in operation and one back-up) and with overall dimensions D = 2200 mm and L = 6900 mm. Their construction will ensure the separation of three phases - gas, gas condensate and water. The separated gas will be directed to a vent/flare located on a separate fenced site of dimensions 100 to 100 meters.

The separated formation waters and gas condensate will be supplied via pipelines to tanks located on the existing site of Chiren UGS. The gas condensate will be stored in a gas condensate tank, and the formation water will be directed to an industrial reinjected water tank and from there it will be further reinjected in well P-15.

The installation is designed for the following parameters:

- Flow rate - 4200 kg/h;
- Pressure - 3 barg;
- Temperature - -29- +60ºC.

Electrical and Control and Instrumentation buildings: Four identical buildings located next to each of the four GTCUs. Each building will house the GTCU control systems, external modules of the CS control system and the electrical equipment.

Also, three more electrical and instrumentation buildings are envisaged, which will provide the respective technological facilities - TEG regeneration facility; individual separation; manifold; separation installation, heating and regulation of gas pressure; general separation; formation fluids separation installations and gas drying.

Building for: Fuel gas preparation unit (FGPU); Workshop for Instrumentation air; boiler room for heating, seal gas preparation plant:

The building includes: Fuel gas preparation unit (FGPU), Instrumentation air room, electrical room and boiler room for heating. The construction of the building is on one level and is divided into four rooms, each with a separate entrance. The technological preparation of natural gas for its further use as fuel gas is carried out in the Fuel gas preparation unit (regarding GTVU 1, 2, 3 and 4). Three hot water boilers (2 in operation and 1 back-up) for technological and household needs of the Fuel gas preparation unit will be located in boiler room. A separate room will house two Instrumentation air compressors - one in operation and one back-up. In addition, the plant shall include filters, dryers and instrumentation air receivers. The plant will provide purified, dry HVAC air for the needs of the facilities. There will be no permanent workplace in the building.

Power Production Unit (PPU), Switchgear, Distribution switchgear (КРУ20/0,4 кV): The premises in the building are designated as: operator's, hardware instrumentation, TSV, laboratory with weighing and storage to it, changing rooms with showers, rest room and toilets, boiler room, conference room.

Emergency diesel generator: Provides emergency power supply to the CS in case of failure of the external power supply. Its nominal heat output will be about 3.3 MW.

Tank and pump station for fire-fighting water: The necessary water quantities for fire-fighting will be stored in a tank with a volume of 205 m^3. The fire tank will be covered, half-dug, monolithic, built of reinforced concrete, two-chambered, covered with soil to prevent any freezing. Such emergency fire-fighting reserve is envisaged to be restored in no more than 24 hours.

Access control point: A building with a porter and security guard with an adjoining bathroom will be located at the entrance of the new site. The building provides the control and access regime.

On-site water pipelines

→ ***Water supply on site***

There is a functioning separate water supply system on the existing site of Chiren UGS, consisting of drinking water supply, fire water supply system with installed fire hydrants and open water tank for fire and technological needs and a water pipeline.

Water for fire-fighting and cooling needs shall be supplied by the existing pump station built on the near-by dam Chiren III based on a water supply permit, while the potable and household water is fed by the local Water Supply and Sewerage company on the grounds of a signed contract.

The site water supply system of the newly constructed site will consist of three separate water pipelines:

- Water pipeline for drinking and household needs;
- Water pipeline for fire-fighting needs;
- Branch from existing water supply pipeline for fire-fighting needs from a pump station built on the nearby Chiren III dam close to the new fire-fighting tank.

A new water supply branch for potable and household water is planned to be constructed for water supply of the expansion of Chiren UGS site. It will be supplied by the existing water supply system to Chiren UGS. Water on site will be used for potable and household water needs. Regadring the existing and the newly designed site and according to the technology applied in operation of GTCUs and gas motor compressors, no water will be used for **direct** production and technological needs throughout the entire production process and no production waters shall therefore be discharged. The only needed water will be for cooling the GMC, as well as certain amounts of water for the boiler rooms at the two sites, for initial filling of the heating installations and for periodically fill in the losses.

The site water supply system for potable and household water needs is designed as a branched system and will supply the necessary water quantities to the following consumers, shown in Table 2.

Table 2 - Water quantity for drinking and household needs

Building	l/s
Production power unit (PPU)	0.25
Access control point	0.20
El. and C&I building to GTCU 1	0.10
El. and C&I building to GTCU 2	0.10
El. and C&I building to GTCU 3	0.10
El. and C&I building to GTCU 4	0.10
Boiler plant	Regular fill in

Water is needed in Boiler plant: for initial filling of the heating installation and for regular filling to cover losses with a flow rate of 0.20 l/s.

The fire-fighting tank will be supplied by a branch from water supply pipeline from an existing pump station built on the nearby Chiren III dam close to the new fire-fighting tank.

Figure 10 in the Application for CP shows the basic technological diagram of water supply of Chiren UGS.

→ ***Site sewerage system***

A separate sewage system is planned for the new site, including: building household and rain sewerage, site sewerage for domestic waste water, site sewerage for rain water, street drains, inspection man-holes, monitoring shaft. Appendix 6.2 of the Application shows a Diagram of the site sewerage.

The site household sewerage will drain the sanitary appliances from the following buildings, shown in the attached table.

Table 3 - Household waste water quantities

Building	**Qmax l/s**
Production power unit (PPU)	2.73
Access control point	0.87
El. and C&I building to GTCU 1	0.50
El. and C&I building to GTCU 2	0.50
El. and C&I building to GTCU 3	0.50
El. and C&I building to GTCU 4	0.50

The new household waste water shall be discharged to the existing shaft of the existing waste water household treatment plant. Afterwards they are directed into a mixed flow from the existing site.

The rainwater drainage system will drain rainwater that has fallen in the area of the site (from the roofs of buildings, sites, roads, sidewalks and green areas) and will discharge them in a newly designed off-site sewerage system. The 90 m long route of the newly designed off-site rainwater drainage is envisaged to be discharged together with the mixed waste water into a dry gully in Lakite area in the village of Chiren, according to Permit for waste water discharge into surface water bodies №13140017/14.06.2007.

Block diagrams of the discharge points are given in the relevant figures in the Application for CP.

Infrastructure connections

→ **Road connections**

Three access roads will be constructed to the site: a new road connection from asphalt road Chiren - Devene to the newly designed CS and the entire storage site /road connection 1/, of 6.0 m width and about 118.0 m length with asphalt pavement, and the other two access roads will begin from the existing site of Chiren UGS to the new compressor station. That road connection affects the lands of the village of Chiren, Vratsa Municipality.

→ **Gas pipeline branches, pipelines and gatherings to CS Chiren UGS:**

The following gas pipeline branches will be designed in the lands belonging to the village of Chiren:

- A gas pipeline branch connecting the existing gas pipeline Vratsa 1 to the newly designed CS with a length of about 266 m and a diameter of DN 500 mm;
- A gas pipeline branch connecting the existing gas pipeline Vratsa 2 to the newly designed CS with a length of 35 m and a diameter of DN 500 mm;
- Gas pipeline connection between the new site and the site of the new flare with a length of 160 m, consisting of pipelines for - fuel gas (DN25), instrumentation air (DN25), natural gas released from the facilities with a diameter of DN250;
- Gatherings (28 gatherings) connecting the site of the CS to the existing ones of the exploitation wells with lengths varying from 400 – 500 m and a diameter of DN 150 mm;
- Displacement of the route of an existing gas gathering to Well 28, running through the territory of the new technological site to the CS with a length of 620 m and a diameter DN 150 mm;
- Displacement of the route of an existing gas gathering to Well 23, running through the territory of the new technological site to the CS with a length of 180 m and a diameter DN 150 mm;
- Displacement of the route of an existing gas pipeline Nivego with a length of about 840 m and diameter DN 50 mm, owned by Nivego OOD;
- Drainage condensate pipeline with a length of about 845 m and a diameter of DN 100 mm between the new site and the fiscal warehouse;
- Formation water pipeline of about 350 m length and DN 100 mm, which will exit the new site to the existing one of Chiren UGS.

→ **Supply water-main for potable and household water to Chiren UGS**

A new water supply branch for potable and household water is planned to be constructed for water supply of the new site of Chiren UGS. It will be supplied by the existing water supply system to Chiren UGS. It is intended to supply buildings and facilities at compressor station site with potable and household water.

→ **Rainwater drainage from Chiren UGS**

The route of the newly designed off-site rainwater drainage, draining rainwater from the site, is envisaged to be 90m long and to be discharged together with the mixed waste water into a dry gully in Lakite area in the village of Chiren, according to Permit for waste water discharge into surface water bodies №13140017/14.06.2007.

→ **Technological site for flare system**

A new technological site for a flare system used for gas burning is planned to be constructed. The gas released by the various systems and devices during repair activities and normal operation will enter the flare system through a gas pipeline.

The flare system will be used to burn natural gas from:

- Purging of technological lines;
- Pressure release (manually and emergency).

All emergency and automatic release will be performed by vents. The amount of gas to maintain the flame for combustion will be about 10 Nm^3/h in both UGS operation modes (withdrawal and injection).

→ **Anode grounding devices**

Regarding the electrochemical protection of all underground steel pipelines (gatherings to the drilling wells), routes of anode grounding conductors outside the technological site are planned to be constructed. The routes will be located east and west of the site. They will pass through the land of the village of Chiren, .

3. Comparison of Chiren UGS with a decision to formulate BAT conclusions for large combustion plants

Compliance with BAT requirements refers only to the activities and facility falling within the scope of Appendix No. 4 of the EPA.

3.1. General conclusions on BAT

3.1.1 Environmental management systems

BAT 1.

In order to improve the general environmental indicators BAT, it is necessary to introduce and comply with an environmental management system (EMS) - **In order to improve the general environmental results at the site of Chiren UGS, an environmental management system (EMP) will be introduced and complied with**, which brings together all the components specified, as follows:

i) *involvement of management, including senior management* - **since 2016 Bulgartransgaz EAD has implemented and certified an environmental management system in accordance with the requirements of ISO 14001:2015.**

ii) *determination by the management of an environmental policy for continuous improvement of the environmental indicators of the facility* - **Environmental management as Bulgartransgaz EAD commitment will be part of Chiren UGS management**.

iii) *planning and establishing the necessary procedures, objectives and tasks, together with financial planning and investments* - **Bulgartransgaz EAD will set short-term and medium-term objectives and tasks. Financial planning will be carried out on the company's investment programme related to Chiren UGS.**

iv) *implementation of the procedures*, paying special attention to:

a) the structure and responsibilities - **according to the requirements of ISO 14001:2015**;

b) hiring, training, awareness and competence - **external and internal trainings are planned, with external trainings being more prevalent (conferences, visits, seminars, etc.)**;

c) communication - **operational and informal meetings of various structural units (departments/sectors) in Bulgartransgaz EAD are planned to be held to discuss environmental issues**;

d) employees involvement - **trainings of emergency situations such as spills of oil, fuel, etc. will be held, according to the Emergency Plan of Chiren UGS and annual schedules for such emergency situations trainings**;

e) *documentation* - **the documentation of Chiren UGS (instructions, operational documents, logs) will be prepared and available at site**;

f) *effective management of the technological process* - **control over effective execution of the processes at site will be exercised by applying instructions, filling in forms, logs and operational documents**;

g) *programmes for planned regular programme maintenance* - **systems will be available at site that will indicate certain issues, need for replacement or repair of facilities/equipment, etc**. **A general site information system (SCADA) has been built on the existing site, including several dozen subsystems for operational and technological control, also for ongoing analysis of site's operation, as well as for the area's commercial activities. The system provides full information security for the operational, commercial and management activities of Chiren UGS. The information system will be used also after expansion of Chiren UGS site.**

h) emergency preparedness and response - **trainings of emergency situations such as spills of oil, fuel, etc. will be held, according to the Emergency Plan of Chiren UGS and annual schedules for such emergency situations trainings**. **The following instructions will be developed and implemented:**

- **for spills removal of substances/products that may contaminate the soil/groundwater;**
- **on risk assessment of accidents in making organizational and technical changes;**
- **with measures to prevent, control and/or removal consequences of accidents;**

i) *ensuring compliance with environmental legislation* - **Annual Environmental Reports (AERs) and Annual Waste Information Reports will be prepared**. **Monthly internal inspections will be carried out by the staff responsible for implementation of the conditions of the complex permit. Emissions control will be carried out in accordance with the conditions of the CP monitoring. A periodic assessment will be made on the availability of new regulatory provisions for operation of Chiren UGS facilities resulting from new regulatory acts and the necessary organizational/technical actions will be taken to achieve compliance with these regulatory provisions.**

v) Verification of execution and taking corrective action, paying particular attention to:

a) *monitoring and measurement* (see also the Reference Report on the monitoring of emissions to air and water from installations, regulated by the Industrial Emissions Directive - Reference Report on Monitoring (ROM) - **Own periodic measurements (OPM) by accredited laboratories are envisaged**;

b) *corrective and preventive actions* - Periodic assessments will be carried out under the terms of the CP. **The following instructions will be developed and implemented:**

- **on conformity assessment of the measured/calculated amounts of electricity with the specified in the CP, including establishing the causes of the discrepancies and taking corrective actions to remove them;**

- **on conformity assessment of the measured/calculated amounts of electricity with the specified in the CP, including establishing the causes of the discrepancies and taking corrective actions to remove them;**
- **for periodic assessment of the presence of sources of diffuse emissions on site, establishing the causes of diffuse emissions from these sources and taking measures to limit them;**
- **for periodic assessment of compliance of the measured values of the controlled parameters with the emissions limit values defined in the permit, establishing the reasons for discrepancies and undertaking corrective actions;**
- **for periodic assessment of compliance of the own monitoring results with the individual emission limit values, establishing the reasons for discrepancies and undertaking corrective actions;**
- **for periodic assessment of compliance of the preliminary storage of waste with the conditions of the CP, of the reasons for the discrepancies found and undertaking corrective actions;**
- **on conformity assessment of the established equivalent noise levels along the border of the operational site and in the place of impact with the permitted ones, establishing the reasons for discrepancies and undertaking corrective actions.**

c) *maintenance of documentation* - **the documentation will be available at the UGS site and will be kept up-to-date**. **Logs, report books and operational documents will be completed;**

d) *the independent (where applicable) internal and external auditing* in order to determine whether the EMS complies with the planned regulation and whether it has been implemented and maintained correctly - **will be carried out**:

- **monthly internal inspections by the personnel in charge of implementation of the CP conditions;**
- **external audits according to the requirements of ISO 14001:2015;**

vi) *review by senior management of the EMS and its suitability, adequacy and effectiveness* - **once a year, the EMS will be examined by the management and a Management Review Protocol will be prepared**;

vii) *taking account of the development in the field of cleaner technologies* – **internal and external trainings will be conducted, with external trainings being more prevalent**. **The development of technologies shall be monitored through participation in thematic conferences, subscriptions to scientific journals, etc.;**

viii) *consideration of environmental impact* in case of possible decommissioning of the facility as early as the stage of its design and throughout its operational life, including:

a) *avoidance of underground structures* - **will be provided for in the technical design of Chiren UGS expansion**;

b) *incorporation of components that facilitate disassembly* - **will be provided for in the technical design of Chiren UGS expansion**;

c) *selection of surface coatings that facilitate cleaning* - **will be provided for in the technical design of Chiren UGS**;

d) *applying such a layout of the facilities that minimizes the retention of chemical substances and facilitates drainage or cleaning* - **will be provided for in the technical design of Chiren UGS expansion**;

e) *design of adaptable, independent units that allow for phased closure* - **will be provided for in the technical design of Chiren UGS expansion**;

f) *use of biodegradable and recyclable materials, where possible* - **will be provided for in the technical design of Chiren UGS expansion**;

ix) *regular implementation of sectoral indicative indicators* - **Once a year, the management will make a review on objectives' implementation and a Management Review Protocol will be prepared**.

For this sector, in particular, it is also important to consider the following EMS indicators, described where appropriate in the relevant BAT:

x) *quality assurance/control programmes to ensure that the characteristics of all fuels are fully defined and controlled* (see BAT 9) – **The following will be performed**:

- **complete fuel characterization using at least the following parameters – DTI, CH4, C2H6, C3, C4+, CO2, N2, Wobbe index, in compliance with EN standards.**
- **regular fuel quality testing to verify compliance with the initial characterization, taking into account the design specifications of the installation.**
- **If necessary - adjusting UGS settings.**

xi) *a management plan to reduce emissions to air and/or water under conditions other than normal, including start-up and shutdown processes* (see BAT 10 and BAT 11) –

It will be laid down in the technical design of Chiren UGS expansion. A special preventive maintenance plan will be developed for the relevant UGS systems. Own periodic measurements (OPM) of emissions in the air and waste waters are planned to be carried out by accredited laboratories. An instruction will be developed for monitoring and recording of emissions caused by Other than Normal Operating Conditions (OTNOC) and undertaking corrective actions if necessary. An instruction will be developed for periodic assessment of the total emissions during OTNOC (e.g. frequency of events, duration, quantification of emissions) and implementation of corrective actions if necessary.

xii) *waste management plan in order to ensure the avoidance of waste generation, the reuse of waste, its recycling or recovery, including applying of the techniques specified in BAT 16* - **Provision is made for collection, temporary storage and transportation of industrial and hazardous waste at the site of Chiren UGS, with the purpose of its treatment or disposal in a way enabling utilization of their useful components and/or properties.**

xiii) *a systematic method for identifying potentially diffuse and/or accidental emissions into the environment, as well as for dealing with such emissions, in particular* - **Own periodic measurements (OPM) of emissions in the air and waste waters are planned to be carried out by accredited laboratories**:

a) *emissions into the soil and groundwater due to handling and storage of fuels, additives, by-products and waste* - **development and approval of an Emergency Action Plan for Chiren UGS site is envisaged**;

b) *emissions related to self-heating and/or self-ignition of fuel during storage and handling* - **development and approval of an Emergency Action Plan for Chiren UGS site is envisaged**;

xiv) *dust management plan* - to prevent or, if this is not possible, to reduce diffuse emissions from loading, unloading, storing and/or handling fuels, residues and additives - **instruction will be developed for periodic assessment of the presence of sources of diffuse emissions on site, establishing the causes of diffuse emissions from these sources and taking measures to limit them;**

xv) *noise management plan* where harmful long-term noise impact on sensitive receptors is expected or already present, including:

a) a protocol for conducting noise monitoring within the borders of the facility;

b) noise abatement programme;

c) a noise incident response protocol containing appropriate actions and deadlines;

d) *review of previous noise-related incidents*, the measures taken in relation to them, and dissemination of information about noise-related incidents to affected parties;

The preparation of a Noise Management Plan is not applicable to Chiren UGS, as the characteristics of equipment do not imply noise pollution. The distance from the currently operating Chiren UGS site to the nearest settlement - the village of Chiren is about 1500 m, and the distance from the borders of the new site of the gas storage to the nearest settlement - the village of Chiren is about 1200 m.

According to the calculation models made (Appendix 8.1 to the application for CP) of noise levels from the newly designed site in the area of the nearest subject of protection - a residential building located in the village of Chiren, it is evident that the maximum expected sound assessment level is 19.09 dB(A), which is approximately 2.35 times below the noise limit values for residential areas for night time and 2.88 times below the daytime levels. No increase in the background noise is expected in the residential area (for settlements without significant noise sources, the background noise is around 30 dB(A)). At present, there is no evidence of an increase in the background noise in the area of Chiren village from the existing site.

No change in the acoustic situation at the impact site (Chiren village) is expected after IP implementation.

xvi) *in relation to combustion, gasification or co-firing with fuels of substances with an unpleasant odour, an odour management plan* including:

a) a protocol for conducting odour monitoring;

(b) if necessary, an odour abatement programme designed to identify and eliminate or reduce odour emissions;

c) odours incident recording protocol containing appropriate actions and deadlines;

d) review of previous odours-related incidents, the measures taken in relation to them, and dissemination of information about odours-related incidents to affected parties.

Where there is an assessment which shows that some of the elements listed in sub-items (x) to (xvi) is not required, the decision shall be recorded, including the reasons therefore.

The preparation of an Odour Management Plan is not applicable to Chiren UGS, as the characteristics of equipment do not provide for burning of fuels with substances of unpleasant smell.

Applicability: The scope (e.g. level of detail) and nature of the EMS (e.g. standardized or not) in most cases depend on the nature, size and complexity of the facility and the extent of environmental impacts it may have.

Conclusion: Compliance with **BAT 1** has been established.

3.1.2. Monitoring

BAT 2.

BAT is to determine the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the gasification, IGCC and/or combustion units by carrying out a performance test at full load (2), according to EN standards, after the commissioning of the unit and

after each modification that could significantly affect the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the unit. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.

Fuel for equipment of the facility falling within the scope of Appendix 4 to the EPA is natural gas that is compressed and withdrawn from the facility under Appendix 4 to the EPA and used as fuel gas at the Company's operational site, without being stored there. Natural gas compression is necessary for injection into the porous-fractured-cavernous space of the underground collector by means of exploitation wells located outside the boundaries of the above-ground operational site. The maximum amount of natural gas that will be used by Chiren UGS is 7,83x10^{-4} mil.Nm3/ MWh of heat generated or 45.77 mil.Nm3/y. Following equipment commissioning at the new UGS site and after any modification that may significantly affect the net total fuel use, a full-load performance test in accordance with EN standards is provided for.

Conclusion: Compliance with **BAT 2** has been established.

BAT 3.

BAT is to monitor key process parameters relevant for emissions to air and water including those given below.

Flow	Parameter	Monitoring	Applicability to Chiren UGS
Flue gas	Flow rate	Periodic or continuous determination	Periodically when carrying out OPM
	Oxygen content, temperature and pressure	Periodic or continuous determination	Periodically when carrying out OPM
	Water vapour content (moisture content)(1)		Not applicable
Waste water from flue gas treatment	Flow rate, pH and temperature	Continuous measurement	Not applicable
(1) If flue gas samples are dried prior to analysis, it is not necessary to make continuous measurements of the water vapour content (moisture content) of flue gases.			

Conclusion: Compliance with **BAT 3** has been established.

BAT 4.

BAT is to monitor emissions to air with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.

Substance/parameter	**Fuel/process/type of combustion plant**	**Total nominal input thermal power of the combustion plant**	**Standard(s) ([1])**	**Minimum monitoring frequency ([2])**	**Monitoring regarding**
NH_3	— When SCR and/or SNCR is used	All sizes	Generic EN standards	Continuous ([3])([4])	BAT 7
NO_X	—Coal and/or lignite including waste co-incineration — Solid biomass and/or peat including waste co-incineration — HFO- and/or gas-oil-fired boilers and engines — Gas-oil-fired gas turbines — Natural-gas-fired boilers, engines, and turbines — Iron and steel process gases — Process fuels from the chemical industry —Integrated gasification combined cycle (IGCC) plants	All sizes	General standards EN	Continuous ([3])([5])	BAT 20 BAT 24 BAT 28 BAT 32 BAT 37 BAT 41 BAT 42 BAT 43 BAT 47 BAT 48 BAT 56 BAT 64 BAT 65 BAT 73
	—Combustion plants on offshore platforms	All sizes	EN 14792	Once every year([6])	BAT 53
N_2O	—Coal and/or lignite in circulating fluidised bed boilers —Solid biomass and/or peat in circulating fluidised bed boilers	All sizes	EN 21258	Once every year([7])	BAT 20 BAT 24
CO	—Coal and/or lignite including waste co-incineration — Solid biomass and/or peat including waste co-incineration — HFO- and/or gas-oil-fired boilers and engines — Gas-oil-fired gas turbines — Natural-gas-fired boilers, engines, and turbines — Iron and steel process gases	All sizes	Generic EN standards	Continuous ([3])([5])	BAT 20 BAT 24 BAT 28 BAT 33 BAT 38 BAT 44 BAT 49

Substance/parameter	**Fuel/process/type of combustion plant**	**Total nominal input thermal power of the combustion plant**	**Standard(s) ([1])**	**Minimum monitoring frequency ([2])**	**Monitoring regarding**
	— Process fuels from the chemical industry —IGCC plants				BAT 56 BAT 64 BAT 65 BAT 73
CO	—Combustion plants on offshore platforms	All sizes	EN 15058	Once every year([6])	BAT 54
SO_2	—Coal and/or lignite including waste co-incineration — Solid biomass and/or peat including waste co-incineration — HFO- and/or gas-oil-fired boilers — HFO- and/or gas-oil-fired engines — Gas-oil-fired gas turbines — Iron and steel process gases — Process fuels from the chemical industry used in boilers Integrated gasification combined cycle plants	All sizes	Generic EN standards and EN 14791	Continuous([3])([8])([9])	BAT 21 BAT 25 BAT 29 BAT 34 BAT 39 BAT 50 BAT 57 BAT 66 BAT 67 BAT 74
SO_3	—When SCR is used	All sizes	No EN standard available	Once every year	-
Gaseous chlorides, expressed as HCl	—Coal and/or lignite — Process fuels from the chemical industry used in boilers		EN 1911	Once every three months([3])([10])([11])	BAT 21 BAT 57
	—Solid biomass and/or peat	All sizes	Generic EN standards	Continuous ([12])([13])	BAT 25
	—Waste co-incineration	All sizes	Generic EN standards	Continuous ([3])([13])	BAT 66 BAT 67
HF	—Coal and/or lignite — Process fuels from the chemical industry used in boilers	All sizes	No standard available	Once every three months([3])([10])([11])	BAT 21 BAT 57
	—Solid biomass and/or peat	All sizes	No standard available	Once every year	BAT 25
	—Waste co-incineration	All sizes	Generic EN standards	Continuous ([3])([13])	BAT 66 BAT 67

Substance/parameter	**Fuel/process/type of combustion plant**	**Total nominal input thermal power of the combustion plant**	**Standard(s) ([1])**	**Minimum monitoring frequency ([2])**	**Monitoring regarding**
Dust	—Coal and/or lignite —Solid biomass and/or peat — HFO- and/or gas-oil-fired boilers — Iron and steel process gases — Process fuels from the chemical industry used in boilers Integrated gasification combined cycle plants — HFO- and/or gas-oil-fired engines — Gas-oil-fired gas turbines	All sizes	Generic EN standards and EN 13284–1 and EN 13284–2 standards	Continuous ([3])([14])	BAT 22 BAT 26 BAT 30 BAT 35 BAT 39 BAT 51 BAT 58 BAT 75
	—Waste co-incineration	All sizes	Generic EN standards and EN -13284 -2 standard	Continuously	BAT 68 BAT 69
Metals and metalloids except mercury (As, Cd, Co, Cr, Cu, Mn, Ni, Pb, Sb, Se, Tl, V, Zn)	—Coal and/or lignite —Solid biomass and/or peat — HFO- and/or gas-oil-fired boilers and engines	All sizes	EN 14385	Once every year([15])	BAT 22 BAT 26 BAT 30
	—Waste co-incineration	< 300 MW_{th}	EN 14385	Once every six months([10])	BAT 68 BAT 69
		≥ 300 MW_{th}	EN 14385	Once every three months([16])([10])	
	—Integrated gasification combined cycle plants	≥ 100 MW_{th}	EN 14385	Once every year([15])	BAT 75
Hg	—Coal and/or lignite including waste co-incineration	< 300 MW_{th}	EN 13211	Once every three months([10])([17])	BAT 23
		≥ 300 MW_{th}	Generic EN standards and EN 14884	Once every year ([13]) ([18])	
	—Solid biomass and/or peat	All sizes	EN 13211	Once every year([19])	BAT 27

Substance/parameter	**Fuel/process/type of combustion plant**	**Total nominal input thermal power of the combustion plant**	**Standard(s) ([1])**	**Minimum monitoring frequency ([2])**	**Monitoring regarding**
	—Waste co-incineration with solid biomass and/or peat	All sizes	EN 13211	Once every three months([10])	BAT 70
	—Integrated gasification combined cycle (IGCC) plants	≥ 100 MW_{th}	EN 13211	Once every year([20])	BAT 75
TVOC	— HFO- and/or gas-oil-fired engines — Process fuels from the chemical industry used in boilers	All sizes	EN 12619	Once every six months([10])	BAT 33 BAT 59
	—Waste co-incineration with coals, lignites, solid biomass and/or peat	All sizes	Generic EN standards	Continuously	BAT 71
Formaldehyde	—Natural-gas in spark-ignited lean-burn gas and dual fuel engines	All sizes	No EN standard available	Once every year	BAT 45
CH_4	—Natural-gas-fired engines	All sizes	EN ISO 25139	Once every year([21])	BAT 45
PCDD/F	— Process fuels from the chemical industry used in boilers —Waste co-incineration	All sizes	EN 1948–1, EN 1948–2, EN 1948–3	Once every six months([10])([22])	BAT 59 BAT 71

([1]) Generic EN standards for continuous measurements are EN 15267-1, EN 15267-2, EN 15267-3, and EN 14181. EN standards for periodic measurements are given in the table.
([2]) The monitoring frequency does not apply where plant operation would be for the sole purpose of performing an emission measurement.
([3]) In the case of plants with a rated thermal input of < 100 MW operated < 1 500 h/yr, the minimum monitoring frequency may be at least once every six months. For gas turbines, periodic monitoring is carried out with a combustion plant load of > 70 %. For co-incineration of waste with coal, lignite, solid biomass and/or peat, the monitoring frequency needs to also take into account Part 6 of Annex VI to the IED.
([4]) In the case of use of SCR, the minimum monitoring frequency may be at least once every year, if the emission levels are proven to be sufficiently stable.
([5]) In the case of natural-gas-fired turbines with a rated thermal input of < 100 MW operated < 1 500 h/yr, or in the case of existing OCGTs, PEMS may be used instead.
([6]) PEMS may be used instead.
([7]) Two sets of measurements are carried out, one with the plant operated at loads of > 70 % and the other one at loads of < 70 %.
([8]) As an alternative to the continuous measurement in the case of plants combusting oil with a known sulphur content and where there is no flue-gas desulphurisation system, periodic measurements at least once every three months and/or other procedures ensuring the provision of data of an equivalent scientific quality may be used to determine the SO2 emissions.

([9]) In the case of process fuels from the chemical industry, the monitoring frequency may be adjusted for plants of < 100 MWth after an initial characterisation of the fuel (see BAT 5) based on an assessment of the relevance of pollutant releases (e.g. concentration in fuel, flue-gas treatment employed) in the emissions to air, but in any case at least each time that a change of the fuel characteristics may have an impact on the emissions.
([10]) If the emission levels are proven to be sufficiently stable, periodic measurements may be carried out each time that a change of the fuel and/or waste characteristics may have an impact on the emissions, but in any case at least once every year. For co-incineration of waste with coal, lignite, solid biomass and/or peat, the monitoring frequency needs to also take into account Part 6 of Annex VI to the IED.
([11]) In the case of process fuels from the chemical industry, the monitoring frequency may be adjusted after an initial characterisation of the fuel (see BAT 5) based on an assessment of the relevance of pollutant releases (e.g. concentration in fuel, flue-gas treatment employed) in the emissions to air, but in any case at least each time that a change of the fuel characteristics may have an impact on the emissions.
([12]) In the case of plants with a rated thermal input of < 100 MW operated < 500 h/yr, the minimum monitoring frequency may be at least once every year. In the case of plants with a rated thermal input of < 100 MW operated between 500 h/yr and 1 500 h/yr, the monitoring frequency may be reduced to at least once every six months.
([13]) If the emission levels are proven to be sufficiently stable, periodic measurements may be carried out each time that a change of the fuel and/or waste characteristics may have an impact on the emissions, but in any case at least once every six months.
([14]) In the case of plants combusting iron and steel process gases, the minimum monitoring frequency may be at least once every six months if the emission levels are proven to be sufficiently stable.
([15]) The list of pollutants monitored and the monitoring frequency may be adjusted after an initial characterisation of the fuel (see BAT 5) based on an assessment of the relevance of pollutant releases (e.g. concentration in fuel, flue-gas treatment employed) in the emissions to air, but in any case at least each time that a change of the fuel characteristics may have an impact on the emissions.
([16]) In the case of plants operated < 1 500 h/yr, the minimum monitoring frequency may be at least once every six months.
([17]) In the case of plants operated < 1 500 h/yr, the minimum monitoring frequency may be at least once every year.
([18]) Continuous sampling combined with frequent analysis of time-integrated samples, e.g. by a standardised sorbent trap monitoring method, may be used as an alternative to continuous measurements.
([19]) If the emission levels are proven to be sufficiently stable due to the low mercury content in the fuel, periodic measurements may be carried out only each time that a change of the fuel characteristics may have an impact on the emissions.
([20]) The minimum monitoring frequency does not apply in the case of plants operated < 1 500 h/yr.
([21]) Measurements are carried out with the plant operated at loads of > 70 %.
([22]) In the case of process fuels from the chemical industry, monitoring is only applicable when the fuels contain chlorinated substances.

BAT 4 Emissions into the ambient air from natural gas combustion process in the plant under Appendix 4 of the Environmental Protection Act are controlled according to the Ordinance on medium combustion plants (MCPs) and Ordinance 1/2005, respectively:

According to the *Ordinance on limitation of emissions of certain pollutants into the air from* ***medium combustion plants***, the pollutant to be regulated and is subject to emission control is only nitrogen oxide in the flue gases of:

→ the 8 gas motor compressors (GMCs) and of the triethylene glycol (TEG) regeneration plant at the *existing site*;

→ the 4 gas turbine compressor units (GTCUs) and of the 5 natural gas preheating boilers *at the new site*.

Although there is no emission limit value (ELV) for carbon monoxide in the MCP Ordinance, the operator shall monitor this pollutant as well in accordance with Annex 2(H) of the MCP Ordinance. Sulphur dioxide emissions shall not be monitored.

Pursuant to ORDINANCE No 1 of 27 June 2005 *on emission limit values for harmful substances (pollutants) emitted into the atmosphere from sites and activities with stationary emission sources*, the pollutants which are limited and subject to emission control are sulphur and nitrogen oxides and carbon monoxide in the flue gases of:

→ the TEG regeneration plant (until the provisions of the MCP Ordinance come into force in 2030 and at the discretion of the competent authority, if it is operating by then, and the 3 water heating BUDERUS boilers, type G 605-740/12, *at the existing site*,

→ the 2 pre-heaters of the TEG regeneration system at the new site at the discretion of the competent authority.

Figure 11 and Appendix 5.2 of the Application for CP provide a diagram of the exhaust devices at all point sources that release emissions to the ambient air (**controlled under the MCP Ordinance and Ordinance 1/2005**) from the natural gas combustion process.

Conclusion: ***The technique is not applicable to Chiren UGS.***

BAT 5.

BAT is to monitor emissions to water from flue-gas treatment with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.

Conclusion: ***The technique is not applicable to Chiren UGS.***

3.1.3. General environmental performance and combustion performance

BAT 6.

In order to improve the general environmental performance of combustion plants and to reduce emissions to air of CO and unburnt substances, BAT is to ensure optimised combustion and to use an appropriate combination of the techniques given below.

Technique		**Description**	**Applicability**	**Applicability to Chiren UGS**
a)	Fuel blending and mixing	Ensure stable combustion conditions and/or reduce the emission of pollutants by mixing different qualities of the same fuel type	Generally applicable	Not applicable
b)	Maintenance of the combustion system	Regular planned maintenance according to suppliers' recommendations		All CS components are supplied with operating instructions for the equipment, the necessary stock of repair kits for the start-up and warranty period of its operation. According to the operating instructions and maintenance plans of equipment, warranty and out-of-warranty service will be performed.
c)	Advanced control system	See description in Section 8.1	The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system	Not applicable
d)	Good design of the combustion equipment	Good design of furnace, combustion chambers, burners and associated devices	Generally applicable to new combustion plants	After filter-separators, the purified natural gas flows through a pipeline and enters the respective centrifugal compressor. Centrifugal compressors are driven by gas turbine engines located in a container. Each GTE is equipped with

Technique		Description	Applicability	Applicability to Chiren UGS
				a fuel air filter and an exhaust system/stack. For centrifugal compressors' protection from "surge" mode, two valves are installed after each centrifugal compressor. The first is an anti-surge valve and the second, a valve for quick shut down/off of the GTCU. Anti-surge valves are control valves with pneumatic-electric positioner, position transmitter and 3-way solenoid valve. They open if there is a risk of "surge" in all operating modes of the CC. Anti-surge valves are controlled by an anti-surge system of each GTCU.
e)	Fuel choice	Select or switch totally or partially to another fuel(s) with a better environmental profile (e.g. with low sulphur and/or mercury content) amongst the available fuels, including in start-up situations or when back-up fuels are used	Applicable within the constraints associated with the availability of suitable types of fuel with a better environmental profile as a whole, which may be impacted by the energy policy of the Member State, or by the integrated site's fuel balance in the case of combustion of industrial process fuels. For existing combustion plants, the type of fuel chosen may be limited by the configuration and the design of the plant	Not applicable

Conclusion: Compliance with **BAT 6** has been established.

BAT 7.

In order to reduce emissions of ammonia to air from the use of selective catalytic reduction (SCR) and/or selective non-catalytic reduction (SNCR) for the abatement of NOX emissions, BAT is to optimise the design and/or operation of SCR and/or SNCR (e.g. optimised reagent to NOX ratio, homogeneous reagent distribution and optimum size of the reagent drops).

The operation of Chiren UGS does not provide for use of selective catalytic reduction (SCR) and/or selective non-catalytic reduction (SNCR), which does not imply release of ammonia emissions to the air. BAT 7 is therefore not applicable, considering the description of applicability in the EC Decision.

Conclusion: BAT 7 is not applicable.

BAT 8.

In order to prevent or reduce emissions to air during normal operating conditions, BAT is to ensure, by appropriate design, operation and maintenance, that the emission abatement systems are used at optimal capacity and availability.

BAT 8. In Chiren UGS, the organised sources of gaseous emissions - sulphur oxides (SOX), nitrogen oxides (NOX) and carbon monoxide (CO) are the existing ones (at the current UGS site) and the ones planned to be located on the new site, south of the existing one, namely:

Existing sources:

- 8 gas motor engines (GME) of compressors (type ГМК -10 ГКНАМ), operating in optimal mode 5+3, of 3.88 MW heat capacity each. Flue gases are discharged through own exhaust devices (ED).
- 1 exhaust device of Triethylene glycol regeneration plant (TEG) of 1.4 MW capacity. Flue gases are discharged through an own exhaust device.
- 1 emergency gas unit of 1.67 MW capacity – not regulated.
- 3 BUDERUS water heating boilers, type G 605-740/12 in 2+1 mode, of 74 MW rated thermal input each. Flue gases are discharged through own exhaust devices.

New sources:

- 4 gas turbine engines (GTEs) of the gas turbine compressor units (GTCUs) in 3+1 mode, of 18 MW thermal capacity each. Flue gases are discharged through own exhaust devices.
- 5 natural gas heaters, running in 4+1 mode, each of 3.1 MW capacity. Flue gases are discharged through own exhaust devices.
- 2 TEG regeneration system heaters, running 1+1, each of 0.7 MW capacity. Flue gases are discharged through own exhaust devices.
- 3 water heating boilers for technological and household needs of the fuel gas preparation unit, each of 0.1MW capacity, 2 in operation and 1 backup. Flue gases from natural gas burning are discharged through own exhaust devices.

- 4 water heating boilers for household needs: 1 for the access control building 0.004 MW, 1 for the production and energy unit (PPU) – 0.042 MW and 2 for the GMS building, each – 0.1 MW. Flue gases are discharged through own exhaust devices.
- 1 emergency diesel generator of 3.3 MW capacity – not regulated.
- Flare - in UGS operating mode (injection and withdrawal) a three-phase separation system runs as well that separates formation waters, gas condensate and natural gas. The separated amounts of natural gas are minimal and are directed and burnt in a flare located on a designated outdoor site. The estimated (expected) annual gas consumption is 26 250 Nm3.

The flare is an emergency safety device and is not subject to control measurements, there are no emission limit values as no sampling point is provided for it. Monitoring or control consists of documenting the gas flow.

According to the *Ordinance on limitation of emissions of certain pollutants into the air from* ***medium combustion plants***, the pollutant to be regulated and is subject to emission control is only nitrogen oxide in the flue gases of:

→ 8 gas motor compressors (GMCs) and the triethylene glycol (TEG) regeneration plant at the existing site at the discretion of the competent authority.

→ The 4 gas turbine compressor units (GTCU) and the 5 natural gas preheating boilers at the new site.

Although there is no emission limit value (ELV) for carbon monoxide in the MCP Ordinance, the operator shall monitor this pollutant as well in accordance with Annex 2(H) of the MCP Ordinance. Sulphur dioxide emissions shall not be monitored.

Pursuant to ORDINANCE No 1 of 27 June 2005 on emission limit values for harmful substances (pollutants) emitted into the atmosphere from sites and activities with stationary emission sources, the pollutants which are limited and subject to emission control are sulphur and nitrogen oxides and carbon monoxide in the flue gases of:

→ the TEG regeneration plant (until the provisions of the MCP Ordinance come into force in 2030 and at the discretion of the competent authority, if it is operating by then, and the 3 water heating BUDERUS boilers, type G 605-740/12, *at the existing site*,

→ 2 pre-heaters of the TEG regeneration system at the new site, Where the competent authority considers.

Table 16 of the Application for CP presents the discharge devices of Chiren UGS and the controlled pollutants, according to the requirements of the regulatory framework, which demonstrates that the operator ensures compliance with the emissions' restrictions and is committed to keep values that do not exceed the statutory ones.

Table 4 - Discharge devices of Chiren UGS and pollutants

Discharge device No	Polluting substances *(to be listed sequentially for each individual discharge device)*	Emission						
		Actual flow rate of waste gases		Maximum concentration	Regulatory restriction	Deposition rate	Maximum mass flow	
		m^3/h	m^3/s	mg/Nm^3	mg/Nm^3 or other	m/s	g/s	kg/h
Existing site								
Gas motor compressor (GMC)								
1÷8	**NO_X**	11,078	3.10	190	190	0	0.2692	0.97
TEG regeneration system								
1	**NO_X**	1,686	0.47	250	250	0	0.0611	0.22
	SO_X			35	35		0.0086	0.03
	CO			100	100		0.0244	0.09
Water heating boilers BUDERUS,								
1÷3	**NO_X**	758	0.21	250	250	0	0.0361	0.13
	SO_X			35	35		0.0051	0.02
	CO			100	100		0.0144	0.05
New site								
Gas turbine compressor units (GTCUs)								
1÷4	**NO_X**	**248,260**	**69.0**	50	50	0	**1.2022**	**18.7**
Pre-heaters of the TEG regeneration system								
1÷2	**NO_X**	**1,445**	**0.40**	250	250	0	**0.0556**	**0.72**
	SO_X			35	35		**0.0078**	**0.10**
	CO			100	100		0.0222	0.29
Natural gas pre-heaters								
1÷5	**NO_X**	**15,073**	**4.19**	100	100	0	**0.1389**	**1.80**

The basic technological process does not envisage use of abatement facilities at the discharge devices.

All CS components are supplied with operating instructions for the equipment, the necessary stock of repair kits for the start-up and warranty period of its operation. According to the operating instructions and maintenance plans of equipment, warranty and out-of-warranty service will be performed, which will guarantee their normal parameters.

Conclusion: Compliance with **BAT 8** has been established.

BAT 9.

In order to improve the general environmental performance of combustion and/or gasification plants and to reduce emissions to air, BAT is to include the following elements in the quality assurance/quality control programmes for all the fuels used, as part of the environmental management system (see BAT 1) - **EMS will be developed for Chiren UGS operation, part of which will be associated with control of the natural gas quality entering the combustion plants (see BAT 1)**

Conclusion: Compliance with **BAT 9** has been established.

BAT 10.

In order to reduce emissions to air and/or to water during other than normal operating conditions (OTNOC), BAT is to set up and implement a management plan as part of the environmental management system (see BAT 1), commensurate with the relevance of potential pollutant releases, that includes the following elements:

- appropriate design of the systems considered relevant in causing OTNOC that may have an impact on emissions to air, water and/or soil (e.g. low-load design concepts for reducing the minimum start-up and shutdown loads for stable generation in gas turbines),
- set-up and implementation of a specific preventive maintenance plan for these relevant systems,
- review and recording of emissions caused by OTNOC and associated circumstances and implementation of corrective actions if necessary, — periodic assessment of the overall emissions during OTNOC (e.g. frequency of events, duration, emissions quantification/estimation) and implementation of corrective actions if necessary.

BAT 10. During the technical design phase for Chiren UGS, a management plan will be set up as part of the EMS (see BAT 1).

Conclusion: Compliance with **BAT 10** has been established.

BAT 11.

BAT is to appropriately monitor emissions to air and/or to water during OTNOC.

Description-The monitoring can be carried out by direct measurement of emissions or by monitoring of surrogate parameters if this proves to be of equal or better scientific quality than the direct measurement of emissions. Emissions during start-up and shutdown (SU/SD) may be assessed

based on a detailed emission measurement carried out for a typical SU/SD procedure at least once every year, and using the results of this measurement to estimate the emissions for each and every SU/SD throughout the year.

BAT 11 - Emissions to air

*At Chiren UGS, **emissions** to the ambient air will be **monitored** under SOx, NOx and CO indicators (see VAT 4). Figure 11 and Appendix 5.2 of the CP Application provide a diagram of the exhaust devices that emit emissions to ambient air (controlled under the MCP Ordinance and Ordinance 1/2005, respectively) from the natural gas combustion process. The relevant outlet flow rates, heights, internal diameters and temperatures are detailed in Section **5.2 - Exhaust Emissions from Point Source of the CP Application.***

A plan showing the location of all dischargers (organised sources) of emissions into the ambient air is provided in Appendix 5.1 to the CP Application.

BAT 11 - Emissions to water

*At Chiren UGS, **emissions** to water will be **monitored**. In Appendix 6.1 of the Application for CP there is a map showing the site, the discharge points with geographic coordinates and the locations for own monitoring.*

During OTNOC, the cooling waters described in item 6.2 of the Application for CP can be accounted for:

Once every few years, during withdrawal, when compressors are not operating, the fire-fighting pool, containing conditionally clean water, shall be drained in order to clean it. The released waters, as described above, are part of Flow 1 and shall be discharged in Discharge point 1.

When cooling water is released from boiler plant, in the event of emergency and/or during scheduled repair works, its flow is included in rainwater drain, both for the existing site of Chiren UGS, and for the site for the new IP for Chiren UGS expansion. Together with the household fecal, production and rain water, the cooling water shall be discharged by means of an off-site sewer at Discharge point No. 1. The water discharge point and its coordinates are indicated in Appendix 6.1. Discharged cooling water does not contain substances included in Appendix No. 8 of the Environmental Protection Act. The discharged cooling water does not need to be purified before discharge into a dry gully in Lakite area through Discharge point No. 1.

Start-up and shut-down periods of water treatment facilities are short-term (described in the Application for CP). Instructions for start-up and shut-down of the installations/facilities, as well as instructions for water treatment facilities, will be prepared as part of the EMS.

Conclusion: Compliance with **BAT 11** has been established.

3.1.4. Energy efficiency

BAT 12.

In order to increase the energy efficiency of combustion, gasification and/or IGCC units operated ≥ 1 500 h/yr, BAT is to use an appropriate combination of the techniques given below.

Technique		**Description**	**Applicability**	**Applicability to Chiren UGS**
a)	Combustion optimisation	See description in Section 8.2* Optimising the combustion minimises the content of unburnt substances in the flue-gases and in solid combustion residues	Generally applicable	Not applicable.
b)	Optimisation of the working medium conditions	Operate at the highest possible pressure and temperature of the working medium gas or steam, within the constraints associated with, for example, the control of NOX emissions or the characteristics of energy demanded		Not applicable.
c)	Optimisation of the steam cycle	Operate with lower turbine exhaust pressure by utilisation of the lowest possible temperature of the condenser cooling water, within the design conditions		Not applicable.
d)	Minimisation of energy consumption	Minimising the internal energy consumption (e.g. greater efficiency of the feed-water pump)		Not applicable.
e)	Preheating of combustion air	Reuse of part of the heat recovered from the combustion flue-gas to preheat the air used in combustion	Generally applicable within the constraints related to the need to control NOX emissions	Not applicable.
f)	Fuel preheating	Preheating of fuel using recovered heat	Generally applicable within the constraints associated with the boiler design and the need to control NOX emissions	Not applicable.
g)	Advanced control system	See description in Section 8.2. Computerised control of the main	Generally applicable to new units. The applicability to old units may be	Not applicable.

Technique		Description	Applicability	Applicability to Chiren UGS
		combustion parameters enables the combustion efficiency to be improved	constrained by the need to retrofit the combustion system and/or control command system	
h)	Feed-water preheating using recovered heat	Preheat water coming out of the steam condenser with recovered heat, before reusing it in the boiler	Only applicable to steam circuits and not to hot boilers. Applicability to existing units may be limited due to constraints associated with the plant configuration and the amount of recoverable heat	Not applicable.
i)	Heat recovery by cogeneration (CHP)	Recovery of heat (mainly from the steam system) for producing hot water/steam to be used in industrial processes/activities or in a public network for district heating. Additional heat recovery is possible from: —flue-gas—grate cooling—circulating fluidised bed	Applicable within the constraints associated with the local heat and power demand. The applicability may be limited in the case of gas compressors with an unpredictable operational heat profile	Not applicable.
j)	CHP readiness	See description in Section 8.2	Only applicable to new units where there is a realistic potential for the future use of heat in the vicinity of the unit	Not applicable.
k)	Flue-gas condenser	See description in Section 8.2	Generally applicable to CHP units provided there is enough demand for low-temperature heat	Not applicable.
l)	Heat accumulation	Heat accumulation storage in CHP mode	Only applicable to CHP plants. The applicability may be limited in the case of low heat load demand	Not applicable.
m)	Wet stack	See description in Section 8.2	Generally applicable to new and existing units fitted with wet FGD	Not applicable.
n)	Cooling tower discharge	The release of emissions to air through a cooling tower and not via a dedicated stack	Only applicable to units fitted with wet FGD where reheating of the flue-gas is necessary before release, and where the unit cooling system is a cooling tower	Not applicable.
o)	Fuel pre-drying	The reduction of fuel moisture content before combustion to improve combustion conditions	Applicable to the combustion of biomass and/or peat within the constraints associated with spontaneous combustion risks (e.g. the moisture content of peat is	Not applicable.

Technique		Description	Applicability	Applicability to Chiren UGS
			kept above 40 % throughout the delivery chain). The retrofit of existing plants may be restricted by the extra calorific value that can be obtained from the drying operation and by the limited retrofit possibilities offered by some boiler designs or plant configurations	
p)	Minimisation of heat losses	Minimising residual heat losses, e.g. those that occur via the slag or those that can be reduced by insulating radiating sources	Only applicable to solid-fuel-fired combustion units and to gasification/IGCC units	Not applicable.
q)	Advanced materials	Use of advanced materials proven to be capable of withstanding high operating temperatures and pressures and thus to achieve increased steam/combustion process efficiencies	Only applicable to new plants	Not applicable.
r)	Steam turbine upgrades	This includes techniques such as increasing the temperature and pressure of medium-pressure steam, addition of a low-pressure turbine, and modifications to the geometry of the turbine rotor blades	The applicability may be restricted by demand, steam conditions and/or limited plant lifetime	Not applicable.
s)	Supercritical and ultra-supercritical steam conditions	Use of a steam circuit, including steam reheating systems, in which steam can reach pressures above 220,6 bar and temperatures above 374 °C in the case of supercritical conditions, and above 250 – 300 bar and temperatures above 580 – 600 °C in the case of ultra-supercritical conditions	Only applicable to new units of ≥ 600 MWth operated > 4 000 h/yr. Not applicable when the purpose of the unit is to produce low steam temperatures and/or pressures in process industries. Not applicable to gas turbines and engines generating steam in CHP mode. For units combusting biomass, the applicability may be constrained by high-temperature corrosion in the case of certain biomasses	Not applicable.

Note: * 8.2. Techniques for energy efficiency increase

Technique	**Description**	**Applicability to Chiren UGS**
Advanced control system	See description in Section 8.1**	Not applicable.
Readiness for Combined Heat and Power (CHP)	Measures taken to enable subsequent supply of useful heat to an off-site heat consumer so as to achieve at least a 10% reduction in primary energy use compared to separate production of electricity and heat. This includes identifying and maintaining access to specific points in the steam piping system where steam extraction can take place, as well as providing sufficient space to allow the subsequent installation of equipment, e.g. piping, heat exchangers, additional chemical water treatment capacity , backup boiler plant and back pressure steam turbines. Possible upgrade of auxiliary systems as well as control/monitoring systems. Subsequent connection of back-pressure steam turbines is also possible	Not applicable.
Steam-gas cycle	A combination of two or more thermodynamic cycles, e.g. Brayton cycle (e.g. gas turbine/internal combustion engine) with Rankine cycle (steam turbine/boiler) to convert the flue gas heat loss from the first cycle into useful energy from the next cycle(s)	Not applicable.
Combustion optimisation	See Section 8.1	Not applicable.
Flue-gas condenser	A heat exchanger where water is heated with flue gases before feeding the steam condenser. The water vapour contained in the flue gases condenses as it is cooled by the heated water. The flue gas condenser is used both to increase the energy efficiency of the combustion plant and to remove pollutants such as particulate matter SO_X, HCl and HF in flue gases	Not applicable.
Process gas control system	A system enabling iron and steel process gases that can be used as fuels (e.g. blast furnace gas, coke gas, converter gas) to be directed to combustion plants depending on the presence of these fuels and the type of combustion plant in metallurgical plants	Not applicable.
Supercritical steam conditions	The use of steam tracts, including steam heating systems, where it can reach pressure above 220.6 bar and temperature > 540 °C	Not applicable.
Ultra-supercritical steam conditions	The use of steam tracts, including steam heating systems, where it can reach pressure above 250– 300 bar and temperature above 580– 600 °C	Not applicable.
Wet stack	Stack design intended to enable water vapour from wet flue gases to condense and thus avoid installation of a flue gas pre-heater after wet FGD	Not applicable.

Conclusion: **BAT 12** is not applicable.

3.1.5. Water use and water emissions

BAT 13.

In order to reduce water usage and the volume of contaminated waste water discharged, BAT is to use one or both of the techniques given below.

Technique		**Description**	**Applicability**	**Applicability to Chiren UGS**
a)	Water recycling	Residual aqueous streams, including run-off water, from the plant are reused for other purposes. The degree of recycling is limited by the quality requirements of the recipient water stream and the water balance of the plant	Not applicable to waste water from cooling systems when water treatment chemicals and/or high concentrations of salts from seawater are present	The cooling waters are in a closed circulation cycle, in order to minimize their discharge to the sewerage. Fresh water is added to the cooling water cycle to cover evaporation losses. Fresh water in the systems will be added only to cover evaporation losses and only in case of emergency and/or scheduled repair works - for initial filling of the installation.
b)	Dry bottom ash handling	Dry, hot bottom ash falls from the furnace onto a mechanical conveyor system and is cooled down by ambient air. No water is used in the process.	Only applicable to plants combusting solid fuels. There may be technical restrictions that prevent retrofitting to existing combustion plants.	Not applicable.

Conclusion: Compliance with **BAT 13** has been established.

BAT 14.

In order to prevent the contamination of uncontaminated waste water and to reduce emissions to water, BAT is to segregate waste water streams and to treat them separately, depending on the pollutant content.

BAT 14 A segregated sewage system is planned at Chiren UGS site.

→ ***Emissions to water***

The following types of water streams will be formed as a result of the activities following IP implementation:

- Industrial waste water generated by activities at the existing site, including washing the floor of compressor workshop, flushing the circulating water filters, waste water from car wash[2], industrial waste water contaminated with condensate and petroleum products from draining pipes, fittings and technological equipment of individual separation plant, inhibitor plant, condensate separation plant, gas drying plant;
- Cooling waters in a closed cycle (circulating waters): at the existing site, a waste stream is formed from the cooling system of the compressor workshop only when the circulating water supply is drained and there are emergency leaks. Cooling water can also include water from emergency leaks or as a result of any scheduled maintenance of:
  - boiler plant of the already existing site;
  - the fuel gas preparation unit (FGPU), part of the newly designed site and
  - boiler plant for heating of Access control building and the one for heating and domestic hot water to Power production unit (PPU), both of them for the new IP for Chiren UGS expansion.
- Domestic and faecal waste water from the administrative building and kitchen, auto garages, repair workshop, boiler plant, C&I and Automation, Automatic telephone exchange (ATC), electric substation and compressor workshop - from the existing site as well as from the sanitary units of the Power Production Unit (PPU), access control point and electrical and C&I buildings of GTCU 1 to GTCU 4 of the new IP for Chiren UGS expansion. All domestic waste water will be discharged in the existing domestic waste water treatment plant.(WWTP);
- Conditionally clean rainwater from the electrical substation, auto garages and auto repair shop and the area around them, overflow and drainage waters from the fire fighting pool and cooling water and rainwater from the site of Chiren UGS expansion.
- Contaminated atmospheric water from technological sites.

In general, waste water from the site form four waste water streams. Waste water from the site is collected in Stream 1 and Stream 2, and water is discharged through off-site sewerage systems to discharge points into surface water bodies - dry gullies.

[2] Currently, the car wash at the existing site is not subject to regular operation. Washing cars on it and, accordingly, formation of waste water occurs in rare cases.

Through Stream 3 the sewerage system discharges conditionally clean rain waters from the condensate and methanol storage site Stream 3 discharges into the tailing of Chiren III dam, Livadeto area in the land of the village of Chiren.

The discharge into the surface water bodies from Stream 1, Stream 2 and Stream 3 is made in accordance with the Permit for use of a water body for the discharge of waste water №13140017/14.06.2007, issued by the Basin Directorate Danube Region (BDDR) – the town of Pleven. The two dry gullies and Chiren III dam fall within water body, code BG1OG400R1219.

Stream 4 is formed from the liquid phase (formation water) separated from the natural gas during withdrawal, which is piped to a treatment facility - a mud-oil trap with a perlite filter. From there, it flows into an industrial tank, wherefrom it is re-injected by a pumping station and pipeline into Well P-15. For the re-injection activities there is a permit issued by BDDR - Pleven № 12570003/16.12.2015, amended by Decision № 2757 of 30 September 2019.

A detailed description of waste waters by streams is given in item 3.3. of the Application for CP.

Treatment facilities for industrial waste water

Treatment facilities for industrial waste water drained by Stream No. 1

The location of industrial waste water treatment facilities is given on the general plan in Appendix 6.2 of the application.

Three treatment plants are used to treat industrial waste water

• Separator No. 1/ Mud-oil separator with coalescent filter/;

• Mud-oil trap (MOT) for cleaning process and polluted rainwater from a compressor workshop;

• Local grease trap of car wash.

Water from the area south of the Compressor plant, before entering Separator No. 1 treatment facility, pass through a treatment facility mud-oil trap, after which, together with polluted rainwater from the north side of Compressor plant, they are redirected to Separator No. 1 (Mud-oil separator with coalescent filter), to undergo further cleaning.

Industrial waters treated in Separator No. 1 are contaminated rainwater, industrial waste water from Compressor plant. These waters may be contaminated with petroleum products and gas condensate, and a modular coalescent separator was built for their purification. The capacity of the separator for purification of petroleum products is 100 l/s.

Waste water enters the separator by gravity. The principle of operation of the treatment facility (Separator No. 1) is based on the difference between the density of water and its components. Petroleum products, being lighter, float to water surface, while sand, mud, etc. heavier ones fall to the bottom. An advantage of coalescent separators is that they operate on the coalescence principle, i.e. it is possible small drops to connect into larger ones. Thus, even the smallest drops of petroleum products can be captured, by merging with others, enlarge and float to the surface from where they can be removed. Periodically retained petroleum products, etc. mechanical impurities are removed.

More information on the method of treatment of this waste is given in item 7 Waste management activities of the Application.

The separator is a steel tank with separate technological spaces. A float gauge is installed on the outlet pipe, and when oil level rises above the limit, the outlet pipe is closed, indicating that the separated oils must be withdrawn. The separator is equipped with a warning system. The warning system is designed to measure the oil/grease layer thickness above water in the oil trap and to signal when the maximum level is reached. The system also indicates if normal water flow is obstructed, due to hydraulic overload in heavy rain, a dirty coalescent filter.

Lamellar material is placed in the separator, in a coalescent chamber. If the coalescent filter is clogged, it must be removed from the coalescing chamber and cleaned. The coalescent material should be inspected at least once every six months.

The separators shall be periodically emptied. No more than 80% of their volume should be filled in. Sludge and retained oil products shall be transported by a licensed company authorised to carry out such activity. If it is necessary to replace the coalescent filter with a new one, then according to the Waste Management Act, the old one is handed over to a company for subsequent treatment. More information on the method of treatment of this waste is given in item 7 Waste management activities of the Application.

At the existing site there is a separate car wash for washing the cars from the car fleet. The water supply is existing, provided by a ½" tap with a hose connection, fed from the water supply network. Water removal from washing the cars takes place by means of a ditch with a metal grid, through a floor siphon 100/100, located at a height above the mud volume in the ditch, a sewage pipe f100 PVC to a sludge oil trap and then through concrete pipes F 200 to the existing site sewerage to waste Stream 1 of Chiren UGS.

Waste water from washing are treated in a modular Oleopator - B/K NG3 SF 650 mud-grease trap. The total capacity of the mud-oil trap is 0.884 m^3 per day. It is equipped with an automatic float gauge, which closes the outlet of the facility when a limit amount of petroleum products accumulates in the facility. A stainless steel coalescent filter is installed at the outlet to filter water. The coalescent filter can be removed for cleaning without having to drain water from the separator. Capacity for separated oil products 160 l.

Treated industrial waste water is discharged by gravity into the sewerage and through an off-site sewerage to discharge point #1.

Treatment facilities for industrial waste water discharged to Stream #2

One treatment facility is used to treat waste water from site washing.

- Separator No. 2 / Mud-oil separator with coalescent filter / indicated on the site general plan

Waste water enters the separator by gravity. The principle of operation of the treatment facility (Separator #2) is identical to that of the above-described Separator #1

The purified industrial waste water from washing the sites are drained by gravity into the sewerage and through an off-site sewerage, together with conditionally clean rainwater from the territory of the company, discharge into Discharge point (DP) in Stream #2, with the water intake being a dry gully

in area Kraev tryn in the land of the village of Chiren, for which Permit No. 13140017/14.06.2007 has been issued to the company by Basin Directorate Danube Region (BDDR).

Treatment facilities for industrial waste water to Stream #4

The industrial waste water to Stream #4 include the liquid phase (formation water) separated during natural gas withdrawal by individual separation plant, condensate separation plant and gas drying plant. The liquid phase separated by the separation during natural gas withdrawal, both at the existing site and at the one planned for construction, enters successively into a degasser and separators, where it is separated into formation water and gas condensate. After the separators, the formation water enter a degasser, and from there a treatment facility, then enters an industrial water tank and is re-injected into the subsoil through a pressure pipeline, in accordance with an effective permit for use of an underground water body for water re-injection No. 12570003 of 16.12.2015, amended by Decision 2757 of 30 September 2019.

The treatment facility is a four-section concrete tank and a system of overflows and barriers where, on the principle of different densities of incoming water with pollutants, they are stratified and separated. Petroleum products and light insolubles float as a top layer, and heavy insolubles fall as sediment to the bottom of the tank.

The retainer consists of four concrete sections of 30 m^3 total volume. Contaminated water enters sedimentation chamber 1 of 10 m^3 through a pipeline with a shut-off valve. Here, the supplied amount of mixture of petroleum products, mechanical impurities and water remain for a minimum of 2 hours for separation of the different layers. There is a semi-submerged partition at the chamber entry for better and more complete separation. The oil products and light insoluble substances separated as upper layer overflow through a cut half-pipe into a 2.5 m^3 receiver tank. The separated oil products are removed by closing a shut-off valve, thus raising the level in the sedimentation chamber and oil products entering the receiver through the half-pipe. This process is continuously monitored and when waste water begins to overflow into the receiver, the valve is opened again.

After the sedimentation chamber, waters pass through a 0.3/2.2 m bottom hole in a 10 m^3 section, where they are further purified through 3 perlite cages and the filtered waters are collected in a 2 m^2 chamber. Then, through the shut-off valve and through a pipeline, they enter a collection tank for industrial waters, from where they are injected with a pump into Well No. 15.

The separated oil products and part of the floated light insoluble substances pass through the half-pipe into a 2.5 m^3 receiver from where the oil products are withdrawn with a pump upon reaching a level of 150 cm.

Treatment plants for cooling water (after being used for cooling)

No chemicals or biocides are used for cooling water treatment. The same are considered conditionally clean and are not subject to purification before and after their flow in the site rain water sewerage, as well as before discharge into the water intake.

Treatment facilities for domestic and faecal waste water

Domestic and faecal waste water enter the existing domestic waste water treatment plant (DWWTP). Domestic waste water flow by gravity through a separate site sewerage of concrete pipes F200 towards the site of the treatment plant.

The treatment plant operates on the principle of a conventional activated sludge (CAS) treatment process. In this process, operational issues and excess sludge issues are minimized. These facilities are capable of reducing insolubles and BOD by 90-99%.

DWWTP consists of modular treatment facilities where processes of aeration, sedimentation, disinfection, sections for aerobic stabilization and a control room are carried out.

In front of the facility, a levelling tank (pump shaft) was built into which waste water flow. As waste water characteristics and flow rate change during the day, the water leveller reduces the negative effect of this fluctuation and enables uniform supply of these waters to the treatment facility.

DWWTP contains the following modules

- **Grid basket:** Filters waste water from the waste contained therein - food particles, plastics, polyethylene, wood, roots, cloths, etc. In order to protect the facility from any direct contact with this waste, a grate for manual cleaning is placed at the entry. The perforated grid is installed in the pump shaft - leveller.
- **Aeration:** By means of an air blower, tiny air bubbles are formed in the lower part of the tank, which rise to the surface. In this section, by means of air, bacteria multiply and develop, during which biomass increases and the water purification processes themselves take place. Aerobic bacteria (activated sludge) and other organisms grow during their movement in the aeration tank. With enough oxygen and food (the waste water), they multiply rapidly. Over time, waste water reach the end of the tank. Bacteria use almost all the organic matter in water to produce new cells. This is called a liquid solution containing undissolved substances with a large population of microorganisms and a small amount of solution with soluble BOD.
- **Sedimentation and disinfection:** From the aerator section, water rich in activated sludge (bacteria) enters for settling, where the activated sludge settles under the action of sedimentary processes, and the clean water remains on the surface of the section. Clean water pours out of the system from a pipe located at the top of this section. When the activated sludge becomes more than permissible, part of it is removed. The clarified water then enters a chlorination tank where chlorine solution is injected. Liquid sodium hypochlorite (bleach) is used for disinfection. The chloride concentration in this solution is 9%. Dosage is approximately 4-6 mg/l for the facility effluent. In addition, besides disinfection, chlorination also contributes to the reduction of BOD. The liquid chloride is placed in a 100 litre PE tank. The staff in charge of the facility periodically monitors the tank level (once per week). Chlorination is carried out on demand and in case of an epidemic.
- **Stabilized sludge storage tank (silo)**: The characteristics of the purified water (BOD, COD, HB) must be determined periodically in laboratory conditions. Then the operator can determine the amount of excess sludge in the facility. The specified amount of this sludge is removed from the system in this aerobic stabilization tank. The sludge is discharged with

faecals. More information on the method of treatment of this waste is given in item 7 Waste management activities of the Application.

- **Engine room:** all the mechanical part necessary for the process is installed in this room. The blower, chlorinator pump, electrical control panel, etc. The engine room is located next to the DWWTP.

Purified water enters the sewerage by gravity and flows to the discharge point (DP No.1) through an off-site sewerage.

Treatment facilities for rain water

Treatment facilities for rain water discharged to Stream #1

Part of the rain water falling in the area of Compressor plant is contaminated, so they undergo purification together with the industrial water of Compressor plant. The relevant information is provided in item 6.1.1 of the Application for CP.

Treatment facilities for rain water discharged to Stream #2

These are contaminated rain water from the technological sites of an individual separation plant, a collective manifold, a condensate separation plant, a gas drying plant, a water cooling plant, an oil storage and a pipe storage. This rain water is diverted for purification to Separator #2 (Mud-oil separator with coalescent filter). Conditionally clean surface atmospheric waters from the area of the pump station for industrial water, the petrol station and the electric substation are also included in the purified rainwater of Stream 2 after Separator No. 2. This water enters the existing sewerage through grid ditches, street drains and sewerage branches routed along the fence.

The formation of the types of water streams from Chiren UGS activities and the treatment of waste water from the site are described in detail in Section 6 of the CP Application. Appendix 6.2 of the Application shows a site plan with the sewage systems, and Appendix 6.1 provides a map showing the site, the discharge points with geographical coordinates, and the locations for own monitoring.

Conclusion: Compliance with **BAT 14** has been established.

BAT 15.

In order to reduce emissions to water from flue-gas treatment, BAT is to use an appropriate combination of the techniques given below, and to use secondary techniques as close as possible to the source in order to avoid dilution.

Conclusion: BAT 15 is not applicable to Chiren UGS.

3.1.6. Waste management

BAT 16.

In order to reduce the quantity of waste sent for disposal from the combustion and/or gasification process and abatement techniques, BAT is to organise operations so as to maximise, in order of priority and taking into account life-cycle thinking:

a) waste prevention, e.g. maximise the proportion of residues which arise as by-products;

b) waste preparation for reuse, e.g. according to the specific requested quality criteria;

c) waste recycling;

d) other waste recovery (e.g. energy recovery), by implementing an appropriate combination of techniques such as:

BAT 16.

Four GTCUs (gas turbine compressor units) are planned to be installed at the new site of Chiren UGS, each of 18 MW rated thermal input. Each GTCU also includes an electrical and control and instrumentation building, an underground oil tank, drainage water and gas condensate, an oil cooler, a fire protection system and a fuel gas system. The drain waters, gas condensate and oil, discharged from each GTCU, will be collected in the atmospheric reservoirs provided for each GTCU and will be treated as waste according to the Waste Management Act (WMA). The resulting condensate from the fuel gas system will be routed to the formation fluid treatment system.

General separation is envisaged to capture any condensate formed after reducing gas pressure in withdrawal mode. The unit will consist of three filters with automatic separation of the collected condensate and its directing to the three-phase separator (formation fluids separation system).

Formation fluids separation unit will include three atmospheric condensate tanks (each of $5m^3$ volume) and two horizontal three-phase separators. Their construction will ensure the separation of three phases - gas, gas condensate and water. The separated gas will be directed to a vent/flare located on a separate fenced site. The separated formation waters and gas condensate will be supplied via pipelines to tanks located on the existing site of Chiren UGS. The gas condensate will be stored in a gas condensate tank, and formation waters will be stored in an industrial re-injected waters tank and from there it will be further re-injected in well P-15.

The new facility includes also a manifold system that will ensure the separation of solid particles from natural gas (in withdrawal mode from UGS), as well as metering of the passing gas through an orifice plate. The manifold consists of 28 separate lines, one for each well. Individual separation filters will be installed on the same lines. The separation of solid pollutants from the withdrawn natural gas will be provided by cyclone separators. The separated solids and condensate will be directed to condensate tanks to the formation fluids treatment system.

Treatment of the waste generated during operation will be arranged by their subsequent hand-over for treatment to licensed companies holding the necessary permits under the Waste Management Act.

Until the time of their hand-over, waste will be preliminary stored at special locations within the boundaries of the site of Chiren UGS. Records will be kept of the generated quantities of waste and of those handed over for subsequent treatment.

Conclusion: Compliance with **BAT 16** has been established.

3.1.7. Noise emissions

BAT 17.

In order to reduce noise emissions, BAT is to use one or a combination of the techniques given below.

Technique		**Description**	**Applicability**	**Applicability to Chiren UGS**
a)	Operational measures	These include: —improved inspection and maintenance of equipment, —closing of doors and windows of enclosed areas, if possible, —equipment operated by experienced staff, —avoidance of noisy activities at night, if possible, —provisions for noise control during maintenance activities.	Generally applicable	Regular inspections of UGS equipment are planned, according to the operating instructions. UGS staff will be specially trained.
b)	Low-noise equipment	This potentially includes compressors, pumps and disks	Generally applicable when the equipment is new or replaced	The main installations and facilities that generate noise within the boundaries of the existing site of Chiren UGS are the gas motor compressors and their auxiliary facilities, including mainly cooling towers and vehicles, ensuring the underground gas storage operation during withdrawal and injection periods. Regarding the newly designed site of Chiren UGS, the main sources of noise are: gas turbine engines, centrifugal compressors, air-cooled heat exchangers, emergency gas generator in case of failure of the backup power supply. Each GTCU is equipped with a soundproof cabin reducing the noise level emitted from it, and a silencer installed in the device for discharge of exhaust gases into the atmosphere.

Technique		Description	Applicability	Applicability to Chiren UGS
				With expected noise levels in the range of 80÷90 dB(A) from the facilities, the expected noise levels at the operational site, 2 m away from the enclosing structures, will be from 45 dB(A) to 55 dB(A). There are no other industrial sources of noise in the vicinity of Chiren UGS.
c)	Noise attenuation	Noise propagation can be reduced by inserting obstacles between the emitter and the receiver. Appropriate obstacles include protection walls, embankments and buildings	Generally applicable to new plants. In the case of existing plants, the insertion of obstacles may be restricted by lack of space	On the territory of the operational site between the outdoor noise sources and its border, there are various facilities and buildings that will serve as shielding and sound dispersing elements. Therefore, the expected noise levels from these sources along the contour of the operational site, following IP implementation, will not exceed the permissible regulatory requirements.
d)	Noise-control equipment	This includes: —noise-reducers, —equipment insulation,—enclosure of noisy equipment, —soundproofing of buildings	The applicability may be restricted by lack of space	Each GTCU is equipped with a soundproof cabin reducing the noise level emitted from it, and a silencer installed in the device for discharge of exhaust gases into the atmosphere.
e)	Appropriate location of equipment and buildings	Noise levels can be reduced by increasing the distance between the emitter and the receiver and by using buildings as noise screens	Generally applicable to new plants. In the case of existing plants, the relocation of equipment and production units may be restricted by lack of space or by excessive costs	The distance from the currently operating Chiren UGS site to the nearest settlement - the village of Chiren is about 1500 m, and the distance from the borders of the new site of the gas storage to the nearest settlement - the village of Chiren is about 1200 m, which does not imply change in the acoustic situation at the impact site (Chiren village).

Conclusion: Compliance with **BAT 17** has been established.

4. BAT conclusions for the combustion of gaseous fuels

4.1. BAT conclusions for the combustion of natural gas

BAT 40.

In order to increase the energy efficiency of natural gas combustion in gas turbines, BAT is to use an appropriate combination of the techniques given in BAT 12, and the techniques below.

Technique		Description	Applicability	Applicability to Chiren UGS
a)	Steam-gas cycle	See description in Section 8.2	Generally applicable to new gas turbines and engines except when operated < 1 500 h/yr. Applicable to existing gas turbines and engines within the constraints associated with the steam cycle design and the space availability. Not applicable to existing gas turbines and engines operated < 1 500 h/yr. Not applicable to mechanical drive gas turbines operated in discontinuous mode with extended load variations and frequent start-ups and shutdowns. Not applicable to boilers	Not applicable.

BAT-associated energy efficiency levels (BAT-AEELs) for the combustion of natural gas

Type of combustion unit	BAT-AEELs ([1])([2])					
	Net electrical efficiency (%)		Net total fuel utilisation (%)([3])([4])		Net mechanical energy efficiency (%)([4])([5])	
	New unit	Applicability to Chiren UGS	New unit	Applicability to Chiren UGS	New unit	Applicability to Chiren UGS
Gas engine	39.5–44([6])	no	56–85([6])	no	No BAT-AEEL	no
Gas-fired boiler	39–42.5	no	78–95	no	No BAT-AEEL	no
Open cycle gas turbine, ≥ 50 MWth	36–41.5	no	No BAT-AEEL	no	36.5–41	no
Combined cycle gas turbine (CCGT)						
CCGT, 50–600 MWth	53–58.5	no	No BAT-AEEL	no	No BAT-AEEL	no
CCGT, ≥ 600 MWth	57–60.5	no	No BAT-AEEL	no	No BAT-AEEL	no

Type of combustion unit	BAT-AEELs ([1])([2])					
	Net electrical efficiency (%)		Net total fuel utilisation (%)([3])([4])		Net mechanical energy efficiency (%)([4])([5])	
	New unit	Applicability to Chiren UGS	New unit	Applicability to Chiren UGS	New unit	Applicability to Chiren UGS
CHP CCGT, 50–600 MWth	53–58.5	no	65–95	no	No BAT-AEEL	no
CHP CCGT, ≥ 600 MWth	57–60.5	no	65-95	no	No BAT-AEEL	no

([1]) These BAT-AEELs do not apply to units operated < 1 500 h/yr.
([2]) In the case of CHP units, only one of the two BAT-AEELs 'Net electrical efficiency' or 'Net total fuel utilisation' applies, depending on the CHP unit design (i.e. either more oriented towards electricity generation or heat generation).
([3]) Net total fuel utilisation BAT-AEELs may not be achievable if the potential heat demand is too low.
([4]) These BAT-AEELs do not apply to plants generating only electricity.
([5]) These BAT-AEELs apply to units used for mechanical drive applications.
([6]) These levels may be difficult to achieve in the case of engines tuned in order to reach NOX levels lower than 190 mg/Nm3.

Conclusion: BAT 40 is not applicable to Chiren UGS.

4.2. NOX, CO, NMVOC and CH4 emissions to air

BAT 41.

In order to prevent or reduce NOX emissions to air from the combustion of natural gas in boilers, BAT is to use one or a combination of the techniques given below.

Technique		Description	Applicability	Applicability to Chiren UGS
a)	Air and/or fuel staging	See description in Section 8.3.* Air staging is often associated with low-NOX burners	Generally applicable	Not applicable.
b)	Flue-gas recirculation	See description in Section 8.3*		Not applicable.
c)	Low-NOX burners (LNB)			Not applicable.
d)	Advanced control system	See description in Section 8.3.*	The applicability to old combustion plants may be constrained by the need to	Not applicable.

Technique		Description	Applicability	Applicability to Chiren UGS
		This technique is often used in combination with other techniques or may be used alone for combustion plants operated < 500 h/yr	retrofit the combustion system and/or control command system	
e)	Reduction of the combustion air temperature	See description in Section 8.3.*	Generally applicable within the constraints associated with the process needs	Not applicable.
f)	Selective non–catalytic reduction (SNCR)		Not applicable to combustion plants operated < 500 h/yr with highly variable boiler loads. The applicability may be limited in the case of combustion plants operated between 500 h/yr and 1 500 h/yr with highly variable boiler loads	Not applicable.
g)	Selective catalytic reduction (SCR)	See description in Section 8.3.*	Not applicable to combustion plants operated < 500 h/yr. Not generally applicable to combustion plants of < 100 MWth. There may be technical and economic restrictions for retrofitting existing combustion plants operated between 500 h/yr and 1,500 h/yr	Not applicable.

Note: * 8.3. Techniques to reduce emissions of NOX and/or CO to air

Technique	Description	Applicability to Chiren UGS
Advanced control system	See Section 8.1	Not applicable.
Air staging	The creation of several combustion zones in the combustion chamber with different oxygen contents for reducing NOX emissions and ensuring optimised combustion. The technique involves a primary combustion zone with substoichiometric firing (i.e. with deficiency of air) and a second reburn combustion zone (running with excess air) to improve combustion. Some old, small boilers may require a capacity reduction to allow the space for air staging.	Not applicable.

Technique	Description	Applicability to Chiren UGS
Combined techniques for NO_X and SO_X reduction	The use of complex and integrated abatement techniques for combined reduction of NOX, SOX and, often, other pollutants from the flue-gas, e.g. activated carbon and DeSONOX processes. They can be applied either alone or in combination with other primary techniques in coal-fired PC boilers.	Not applicable.
Combustion optimisation	See Section 8.1	Not applicable.
Dry low-NOX burners (DLN)	Gas turbine burners that include the premixing of the air and fuel before entering the combustion zone. By mixing air and fuel before combustion, a homogeneous temperature distribution and a lower flame temperature are achieved, resulting in lower NOX emissions.	Not applicable.
Flue-gas or exhaust-gas recirculation (FGR/EGR)	Recirculation of part of the flue-gas to the combustion chamber to replace part of the fresh combustion air, with the dual effect of: cooling the temperature and limiting the O_2 content for nitrogen oxidation, thus limiting the NO_X generation. It implies the supply of flue-gas from the furnace into the flame to reduce the oxygen content and therefore the temperature of the flame. The use of special burners or other provisions is based on the internal recirculation of combustion gases which cool the root of the flames and reduce the oxygen content in the hottest part of the flames.	Not applicable.
Fuel choice	The use of fuel with a low nitrogen content.	Not applicable.
Fuel staging	The technique is based on the reduction of the flame temperature or localised hot spots by the creation of several combustion zones in the combustion chamber with different injection levels of fuel and air. The retrofit may be less efficient in smaller plants than in larger plants.	Not applicable.
Lean-burn concept and advanced lean-burn concept	The control of the peak flame temperature through lean-burn conditions is the primary combustion approach to limiting NO_X formation in gas engines. Lean combustion decreases the fuel to air ratio in the zones where NOX is generated so that the peak flame temperature is less than the stoichiometric adiabatic flame temperature, therefore reducing thermal NO_X formation. The optimisation of this concept is called the 'advanced lean-burn concept'.	Not applicable.

Technique	Description	Applicability to Chiren UGS
Low-NO_X burners (LNB)	The technique (including ultra- or advanced low-NO_X burners) is based on the principles of reducing peak flame temperatures; boiler burners are designed to delay but improve the combustion and increase the heat transfer (increased emissivity of the flame). The air/fuel mixing reduces the availability of oxygen and reduces the peak flame temperature, thus retarding the conversion of fuel-bound nitrogen to NO_X and the formation of thermal NO_X, while maintaining high combustion efficiency. It may be associated with a modified design of the furnace combustion chamber. The design of ultra-low-NO_X burners (ULNBs) includes combustion staging (air/fuel) and firebox gases' recirculation (internal flue-gas recirculation). The performance of the technique may be influenced by the boiler design when retrofitting old plants.	Not applicable.
Low-NO_X combustion concept in diesel engines	The technique consists of a combination of internal engine modifications, e.g. combustion and fuel injection optimisation (the very late fuel injection timing in combination with early inlet air valve closing), turbocharging or Miller cycle.	Not applicable.
Oxidation catalysts	The use of catalysts (that usually contain precious metals such as palladium or platinum) to oxidise carbon monoxide and unburnt hydrocarbons with oxygen to form CO2 and water vapour.	Not applicable.
Reduction of the combustion air temperature	The use of combustion air at ambient temperature. The combustion air is not preheated in a regenerative air preheater.	Not applicable.
Selective catalytic reduction (SCR)	Selective reduction of nitrogen oxides with ammonia or urea in the presence of a catalyst. The technique is based on the reduction of NO_X to nitrogen in a catalytic bed by reaction with ammonia (in general aqueous solution) at an optimum operating temperature of around 300–450 °C. Several layers of catalyst may be applied. A higher NO_X reduction is achieved with the use of several catalyst layers. The technique design can be modular, and special catalysts and/or preheating can be used to cope with low loads or with a wide flue-gas temperature window. ‘In-duct’ or ‘slip’ SCR is a technique that combines SNCR with downstream SCR which reduces the ammonia slip from the SNCR unit.	Not applicable.

Technique	Description	Applicability to Chiren UGS
Selective non–catalytic reduction (SNCR)	Selective reduction of nitrogen oxides with ammonia or urea without a catalyst. The technique is based on the reduction of NOX to nitrogen by reaction with ammonia or urea at a high temperature. The operating temperature window is maintained between 800 °C and 1 000 °C for optimal reaction.	Not applicable.
Water/steam addition	Water or steam is used as a diluent for reducing the combustion temperature in gas turbines, engines or boilers and thus the thermal NO_X formation. It is either premixed with the fuel prior to its combustion (fuel emulsion, humidification or saturation) or directly injected in the combustion chamber (water/steam injection).	Not applicable.

Conclusion: BAT 41 is not applicable to Chiren UGS**.**

BAT 42.

In order to prevent or reduce NO_X emissions to air from the combustion of natural gas in gas turbines, BAT is to use one or a combination of the techniques given below.

Technique		Description	Applicability	Applicability to Chiren UGS
a)	Advanced control system	See description in Section 8.3. This technique is often used in combination with other techniques or may be used alone for combustion plants operated < 500 h/yr	The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system	The gas turbine engine uses automatic electronic valve actuators providing both main and pilot fuel flow and those venting excess air for the current combustion mode. To prevent unstable combustion modes, a dynamic pressure probe is used to monitor for instabilities in fuel pressure
b)	Water/steam addition	See description in Section 8.3	The applicability may be limited due to water availability	Not applicable.
c)	Dry low-NOX burners (DLN)		The applicability may be limited in the case of turbines where a retrofit package is not available or when	The GMC and GTCU are designed to practically meet all air pollutant emission standards under normal operation at 50 to 100% engine load. Pre-mixing of air and

Technique		Description	Applicability	Applicability to Chiren UGS
			water/steam addition systems are installed	fuel (lean mixture) is provided for before feeding them into the combustion chamber, thereby achieving a uniform temperature distribution and a low flame temperature.
d)	Low-load design concept	Adaptation of the process control and related equipment to maintain good combustion efficiency when the demand in energy varies, e.g. by improving the inlet airflow control capability or by splitting the combustion process into decoupled combustion stages	The applicability may be limited by the gas turbine design	At the new UGS site, 4 new GTCUs will be installed in a scheme of three operating and one in reserve. In the event of a reduction in transportation for any reason, a number of measures are provided for: - Reduce power of the operating compressors within certain limits - Switching off individual or, if necessary, all compressors - Opening the station anti-surge valves, thereby part of the transported natural gas recirculates in the Compressor Station
e)	Low-NOX burners (LNB)	See description in Section 8.3	Generally applicable to supplementary firing for heat recovery steam generators (HRSGs) in the case of combined-cycle gas turbine (CCGT) combustion plants	The GMC and GTCU are designed to practically meet all air pollutant emission standards under normal operation at 50 to 100% engine load. Pre-mixing of air and fuel (lean mixture) is provided for before feeding them into the combustion chamber, thereby achieving a uniform temperature distribution and a low flame temperature.
f)	Selective catalytic reduction (SCR)		Not applicable to combustion plants operated < 500 h/yr. Not generally applicable to existing combustion plants of < 100 MWth. Retrofitting existing combustion plants may be constrained by the availability of	Not applicable.

Technique		Description	Applicability	Applicability to Chiren UGS
			sufficient space. here may be technical and economic restrictions for retrofitting existing combustion plants operated between 500 h/yr and 1,500 h/yr	

Conclusion: Compliance with **BAT 42** has been established.

BAT 43.

In order to prevent or reduce NO_X emissions to air from the combustion of natural gas in engines, BAT is to use one or a combination of the techniques given below.

Technique		Description	Applicability	Applicability to Chiren UGS
a)	Advanced control system	See description in Section 8.3. This technique is often used in combination with other techniques or may be used alone for combustion plants operated < 500 h/yr	The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system	The gas turbine engine uses automatic electronic valve actuators providing both main and pilot fuel flow and those venting excess air for the current combustion mode. To prevent unstable combustion modes, a dynamic pressure probe is used to monitor for instabilities in fuel pressure
b)	Lean-burn concept	See description in Section 8.3. Generally used in combination with SCR	Only applicable to new gas-fired engines	Not applicable.
c)	Advanced lean-burn concept	See description in Section 8.3.	Only applicable to new spark plug ignited engines	Not applicable.
d)	Selective catalytic reduction (SCR)		Retrofitting existing combustion plants may be constrained by the availability of sufficient space. Not applicable to combustion plants operated < 500 h/yr. here may be technical and economic restrictions for retrofitting existing combustion plants operated between 500 h/yr and 1,500 h/yr	Not applicable.

Conclusion: Compliance with **BAT 43** has been established.

BAT 44.

In order to prevent or reduce CO emissions to air from the combustion of natural gas, BAT is to ensure optimised combustion and/or to use oxidation catalysts - See descriptions in Section 8.3.

BAT-associated emission levels (BAT-AELs) for NOX emissions to air from the combustion of natural gas in gas turbines

Type of combustion plant	**Combustion plant total rated thermal input (MWth)**	**BAT-AELs (mg/Nm3)([1])([2])**			
		Yearly average([3])([4])	**Applicability to Chiren UGS**	**Daily average or average over the sampling period**	**Applicability to Chiren UGS**
Open-cycle gas turbines (OCGTs)([5])([6])					
New OCGT	≥ 50	15–35		25-50	
Existing OCGT (excluding turbines for mechanical drive applications) - all but plants operated < 500 h/yr	≥ 50	15-50	no	15-55([7])	no
Combined-cycle gas turbines (CCGTs)([5])([8])					
New CCGT	≥ 50	10-30	no	15-40	no
Existing CCGT with a net total fuel utilisation of < 75 %	≥ 600	10-40	no	18-50	no
Existing CCGT with a net total fuel utilisation of ≥ 75 %	≥ 600	10-50	no	18-55([9])	no
Existing CCGT with a net total fuel utilisation of < 75 %	50 - 600	10-45	no	35-55	no
Existing CCGT with a net total fuel utilisation of ≥ 75 %	50 - 600	25–50([10])	no	35–55([11])	no
Open- and combined-cycle gas turbines					
Gas turbine put into operation no later than 27 November 2003, or existing gas turbine for emergency use and operated < 500 h/yr	≥ 50	No BAT-AEL	no	60–140([12])([13])	no
Existing gas turbine for mechanical drive applications - All but plants operated < 500 h/yr	≥ 50	15–50([14])	no	25–55([15])	no

([1]) These BAT-AELs also apply to the combustion of natural gas in dual-fuel-fired turbines.
([2]) In the case of a gas turbine equipped with DLN, these BAT-AELs apply only when the DLN operation is effective.
([3]) These BAT-AELs do not apply to existing plants operated < 1 500 h/yr.

([4]) Optimising the functioning of an existing technique to reduce NOX emissions further may lead to levels of CO emissions at the higher end of the indicative range for CO emissions given after this table.
([5]) These BAT-AELs do not apply to existing turbines for mechanical drive applications or to plants operated < 500 h/yr.
([6]) For plants with a net electrical efficiency (EE) greater than 39 %, a correction factor may be applied to the higher end of the range, corresponding to [higher end] × EE/39, where EE is the net electrical energy efficiency or net mechanical energy efficiency of the plant determined at ISO baseload conditions.
([7]) The higher end of the range is 80 mg/Nm3 in the case of plants which were put into operation no later than 27 November 2003 and are operated between 500 h/yr and 1 500 h/yr.
([8]) For plants with a net electrical efficiency (EE) greater than 55 %, a correction factor may be applied to the higher end of the BAT-AEL range, corresponding to [higher end] × EE/55, where EE is the net electrical efficiency of the plant determined at ISO baseload conditions.
([9]) For existing plants put into operation no later than 7 January 2014, the higher end of the BAT-AEL range is 65 mg/Nm3.
([10]) For existing plants put into operation no later than 7 January 2014, the higher end of the BAT-AEL range is 55 mg/Nm3.
([11]) For existing plants put into operation no later than 7 January 2014, the higher end of the BAT-AEL range is 80 mg/Nm3.
([12]) The lower end of the BAT-AEL range for NOX can be achieved with DLN burners.
([13]) These levels are indicative.
([14]) For existing plants put into operation no later than 7 January 2014, the higher end of the BAT-AEL range is 60 mg/Nm3.
([15]) For existing plants put into operation no later than 7 January 2014, the higher end of the BAT-AEL range is 65 mg/Nm3.

As an indication, the yearly average CO emission levels for each type of existing combustion plant operated ≥ 1 500 h/yr and for each type of new combustion plant will generally be as follows:

- New OCGT of ≥ 50 MWth: < 5–40 mg/Nm^3. For plants with a net electrical efficiency (EE) greater than 39 %, a correction factor may be applied to the higher end of the range, corresponding to [higher end] × EE/39, where EE is the net electrical energy efficiency or net mechanical energy efficiency of the plant determined at ISO baseload conditions.
- Existing OCGT of ≥ 50 MWth (excluding turbines for mechanical drive applications): < 5–40 mg/Nm^3. The higher end of this range will generally be 80 mg/Nm^3 in the case of existing plants that cannot be fitted with dry techniques for NOX reduction, or 50 mg/Nm^3 for plants that operate at low load
- New CCGT of ≥ 50 MWth: < 5–30 mg/Nm^3. For plants with a net electrical efficiency (EE) greater than 55 %, a correction factor may be applied to the higher end of the range, corresponding to [higher end] × EE/55, where EE is the net electrical energy efficiency of the plant determined at ISO baseload conditions.
- Existing CCGT of ≥ 50 MWth: < 5–30 mg/Nm^3. The higher end of this range will generally be 50 mg/Nm^3 for plants that operate at low load.

– Existing gas turbines of ≥ 50 MWth for mechanical drive applications: < 5– 40 mg/Nm^3. The higher end of this range will generally be 50 mg/Nm^3 for plants that operate at low load.

In the case of a gas turbine equipped with DLN burners, these indicative levels correspond to when the DLN operation is effective

BAT-associated emission levels (BAT-AELs) for NOX emissions to air from the combustion of natural gas in boilers and engines

Type of combustion plant	**BAT-AELs (mg/Nm3)([1])([2])**			
	Yearly average([1])		**Daily average or average over the sampling period**	
	New plant	**Applicability to Chiren UGS**	New plant	**Applicability to Chiren UGS**
Boiler	10-60	Not applicable	30-85	Not applicable
Engine**([4])**	20-75	Not applicable	55-85	Not applicable
Explanations to (2) (3) and (5) refer to existing plants. ([1]) Optimising the functioning of an existing technique to reduce NO_X emissions further may lead to levels of CO emissions at the higher end of the indicative range for CO emissions given after this table.. ([2]) These BAT-AELs do not apply to plants operated < 1 500 h/yr. ([3]) For plants operated < 500 h/yr, these levels are indicative. ([4]) These BAT-AELs only apply to spark-ignited and dual-fuel engines. They do not apply to gas-diesel engines. ([5]) In the case of engines for emergency use operated < 500 h/yr that could not apply the lean-burn concept or use SCR, the higher end of the indicative range is 175 mg/Nm3.				

As an indication, the yearly average CO emission levels will generally be:

– < 5–40 mg/Nm^3 for existing boilers operated ≥ 1 500 h/yr,

– < 5–15 mg/Nm^3 for new boilers,

– 30–100 mg/Nm^3 for existing engines operated ≥ 1 500 h/yr and for new engines.

Conclusion: BAT44 is not applicable to Chiren UGS.

BAT 45.

In order to reduce non-methane volatile organic compounds (NMVOC) and methane (CH4) emissions to air from the combustion of natural gas in spark-ignited lean-burn gas engines, BAT is to ensure optimised combustion and/or to use oxidation catalysts.

See description in Section 8.3. Oxidation catalysts are not effective at reducing the emissions of saturated hydrocarbons containing less than four carbon atoms.

BAT-associated emission levels (BAT-AELs) for formaldehyde and CH_4 emissions to air from the combustion of natural gas in a spark-ignited lean-burn gas engine

Combustion plant total rated thermal input (MWth)	**(BAT-AELs (mg/Nm^3)**			
	Formaldehyde		**CH_4**	
	Average over the sampling period			
	New or existing plant	Applicability to Chiren UGS	New plant	Applicability to Chiren UGS
≥ 50	5–15([1])	no	215–500([2])	no
([1]) For plants operated < 500 h/yr, these levels are indicative. ([2]) This BAT-AEL is expressed as C at full load operation.				

Conclusion: **BAT 45** is not applicable to Chiren UGS.

5. Conclusion of the assessment

The assessment shows that there is compliance with all BAT described in the European Commission Decision.

5.1. Consumption of water, energy, raw materials and auxiliary materials

The tables below show a comparison of the consumption of water, energy, raw materials and auxiliary materials, as well as emissions of harmful substances into the ambient air and of harmful and hazardous substances into the waste water and the types and quantities of waste generated at the Chiren UGS, which falls within the scope of Appendix 4 to the EIA, and the values of those, according to the data in the Decision establishing BAT conclusions for large combustion plants. The consumption values in the tables are calculated on the basis of the design capacity of the UGH per MWh of heat produced.

Table 5 - Resource consumption.

Indicator	**Value according to the selected technique**	**Value/scope Values according to BAT conclusions, including adopted by EC Decision**
Water consumption:		
Water consumption to produce a unit of product (m^3/unit of product), including		There is no value set in the EC Decision establishing BAT conclusions.
1. Total for the installations, including:	***55,978.58 m^3/y***	
Gas engine compressors 8pcs.	*0.67 m^3/MWh heat generated* ***55,851 m^3/y***	
Water heating boilers 3 pcs.	*0.023 m^3/MWh heat generated* ***120.9 m^3/y***	
Boiler room, including 3 water heating boilers for technological needs and 4 boilers for domestic needs	*0.004 m^3/MWh heat generated* ***6.68 m^3/y***	
Heat energy consumption:		
Heat energy consumption to produce a unit of product (kWh/unit of product)	Chiren UGS has no heat energy consumption.	The EC Decision sets no cost-efficiency standard for heat consumption.
Electricity consumption:		
Electricity consumption to produce a unit of product (kWh/unit of product) including:		The EC Decision sets no cost-efficiency standard for electricity consumption.
Existing site: Gas engine compressors type ГМК -10 ГКНАМ № 1÷8	**2500000 kWh /y** *0.03 MWh /MWh heat generated*	
New site: Compressor station for natural gas, including 4 gas turbine compressor units (GTCU) with GTE	**4425000 kWh /y** 0.02 MWh /MWh heat generated	
Total for the installations	**6925000 kWh /y**	
Harmful substances consumption		

Indicator	**Value according to the selected technique**	**Value/scope** **Values according to BAT conclusions, including adopted by EC Decision**
Consumption of **hazardous substances** (raw materials, auxiliary materials and/or fuels) to produce a unit of product: Natural gas H220 Extremely flammable gas P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking. P222 Do not allow contact with air. P242 Use only non-sparking tools. P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely. P381 Eliminate all ignition sources if safe to do so.	*$7.83x10^{-4}$ [mil.Nm3/ MWh heat energy generated]* **45.77 mil.Nm3/y**	The EC Decision sets no cost-efficiency standard for hazardous substances consumption.
Basic raw material consumption		
Basic raw material consumption to produce a unit of product including	The production activities at the Company's site do not involve the use of raw materials	The EC Decision sets no cost-efficiency standard for basic raw material consumption.

5.2. Harmful substances emissions into the ambient air

Figure 11 and Appendix 5.2 of the CP Application provide a diagram of the exhaust devices that emit emissions to ambient air (controlled under the MCP Ordinance and Ordinance 1/2005, respectively) from the natural gas combustion process. The relevant outlet flow rates, heights, internal diameters and temperatures are detailed in Section ***5.2 - Exhaust Emissions from Point Source of the CP Application.***

A plan showing the location of all dischargers (organised sources) of emissions into the ambient air is provided in Appendix 5.1 to the CP Application.

Table 6 - Total emissions of pollutants (organised and fugitive, including area and/or linear) emitted to ambient air from the installation

No	Pollutants	Emission value according to the selected technique			Emission value/scope values according to BAT conclusions, including adopted by EC Decision		
		mg/Nm^3	kg/h	t/y	mg/Nm^3	kg/h	t/y
1	**Sulphur species**						
1.1	SO_2 (Sulphur dioxide)	**35**	**0.14**	**0.51**			
1.2.	SO_3 (Sulphur trioxide)						
1.3	H_2S (Hydrogen sulphide)						
1.4	CS_2 (Carbon sulphide)						
1.5	(others)						
2	**Nitrogen compounds**						
2.1	NO_X (oxides of nitrogen)	***TOTAL***	***28.57***	***120.91***			
	Gas motor compressor (GMC) *- existing site*	**190**	**7.75**	**33.49**	**190**	**7.75**	**33.49**
	Gas turbine compressor units (GTCUs) *- new site*	**50**	**17.31**	**74.79**	**50**	**17.31**	**74.79**
	• TEG regeneration unit - *existing site* • Water heating boilers BUDERUS– *existing site*. • Heaters to the TEG regeneration unit - *new site*	**250**	**1.01**	**3.64**			
	Natural gas preheating boilers - *new site*	**100**	**2.50**	**9.00**	**100**	**2.50**	**9.00**
2.2	NH_3 (ammonia)				-	-	-
2.3	HNO_3 (nitric acid)						

No	Pollutants	Emission value according to the selected technique			Emission value/scope values according to BAT conclusions, including adopted by EC Decision		
		mg/Nm^3	kg/h	t/y	mg/Nm^3	kg/h	t/y
2.4	N2O (dinitrogen oxide)				-	-	-
3	Carbon monoxide (CO)	**100**	**0.40**	**1.45**	-	-	-
4	Volatile organic compounds (VOC)						
4.1	Total organic carbon						
4.2	Benzene (C6H6)						
4.3	NMVOC (non-methane VOC)						
5	Dust (dust substances)						
5.1	Total dust						
5.2	PM10						
6.1	Cd and its compounds						
6.2	Pd and its compounds				-	-	-
6.3	Ni and its compounds						
6.4	Hg and its compounds						
6.5	Al and its compounds						
6.6	Cu and its compounds						
7	Asbestos (suspended fibre particles)						
8	Cl and its compounds						
9	F and its compounds						
10	As and its compounds						
11	Cyanides						
12	Substances or products with proven carcinogenic properties						
13	Substances or products with proven mutagenic properties						
15	Substances or products proven to affect reproduction						
16	Dioxins/furans						
17	Polycyclic aromatic hydrocarbons (PAHs)						

TABLE 1.1 - Organised emissions of pollutants emitted to ambient air from the installation.

No	Pollutants	Emission value according to the selected technique			Emission value/scope values according to BAT conclusions, including adopted by EC Decision		
		mg/Nm^3	kg/h	t/y	mg/Nm^3	kg/h	t/y
1	**Sulphur species**						
1.1	SO_2 (Sulphur dioxide)	**35**	**0.14**	**0.51**			
1.2.	SO_3 (Sulphur trioxide)						
1.3	H_2S (Hydrogen sulphide)						
1.4	CS_2 (Carbon sulphide)						
1.5	(others)						
2	**Nitrogen compounds**						
2.1	NO_X (oxides of nitrogen)	***TOTAL***	***28.57***	***120.91***			
	Gas motor compressor (GMC)* *- existing site*	**190**	**7.75**	**33.49**	**190**	**7.75**	**33.49**
	Gas turbine compressor units (GTCUs)* *- new site*	**50**	**17.31**	**74.79**	**50**	**17.31**	**74.79**
	• TEG regeneration unit - *existing site* • Water heating boilers BUDERUS– *existing site.* • Heaters to the TEG regeneration unit* - *new site*	**250**	**1.01**	**3.64**			
	Natural gas preheating boilers* - *new site*	**100**	**2.50**	**9.00**	**100**	**2.50**	**9.00**
2.2	NH_3 (ammonia)				-	-	-
2.3	HNO_3 (nitric acid)						
2.4	N2O (dinitrogen oxide)				-	-	-
3	Carbon monoxide (CO)	**100**	**0.40**	**1.45**	**-**	**-**	**-**
4	Volatile organic compounds (VOC)						
4.1	Total organic carbon						
4.2	Benzene (C6H6)						
4.3	NMVOC (non-methane VOC)						

No	Pollutants	Emission value according to the selected technique			Emission value/scope values according to BAT conclusions, including adopted by EC Decision		
		mg/Nm^3	kg/h	t/y	mg/Nm^3	kg/h	t/y
5	Dust (dust substances)						
5.1	Total dust						
5.2	PM10						
6.1	Cd and its compounds						
6.2	Pd and its compounds				-	-	-
6.3	Ni and its compounds						
6.4	Hg and its compounds						
6.5	Al and its compounds						
6.6	Cu and its compounds						
7	Asbestos (suspended fibre particles)						
8	Cl and its compounds						
9	F and its compounds						
10	As and its compounds						
11	Cyanides						
12	Substances or products with proven carcinogenic properties						
13	Substances or products with proven mutagenic properties						
15	Substances or products proven to affect reproduction						
16	Dioxins/furans						
17	Polycyclic aromatic hydrocarbons (PAHs)						
Existing site							
Gas motor compressors (GMC) 1÷8							
Until 1 January 2030							
2.1	NOX (oxides of nitrogen)	**None**	**-**	**-**	**None**	**-**	**-**
After 1 January 2030							

No	Pollutants	Emission value according to the selected technique			Emission value/scope values according to BAT conclusions, including adopted by EC Decision		
		mg/Nm^3	kg/h	t/y	mg/Nm^3	kg/h	t/y
2.1	NOX (oxides of nitrogen)	**190**	**0.97**	**4.19**	**190*** **	**0.97**	**4.19**
TEG regeneration unit - 1 pcs							
Until 1 January 2030							
1.1	SO2 (Sulphur dioxide)	**35**	**0.03**	**0.11**	**35*** **	**0.03**	**0.11**
2.1	NOX (oxides of nitrogen)	**250**	**0.22**	**0.79**	**250*** **	**0.22**	**0.79**
3	Carbon monoxide (CO)	**100**	**0.09**	**0.32**	**100*** **	**0.09**	**0.32**
After 1 January 2030							
1.1	SO2 (Sulphur dioxide)	**None**	**-**	**-**	**None**	**-**	**-**
2.1	NOX (oxides of nitrogen)	**250**	**0.22**	**0.79**	**250*** **	**0.22**	**0.79**
3	Carbon monoxide (CO)	**None**	**-**	**-**	**None**	**-**	**-**
Water heating boilers BUDERUS - 1÷3							
1.1	SO2 (Sulphur dioxide)	**35**	**0.02**	**0.07**	**35*** **	**0.02**	**0.07**
2.1	NOX (oxides of nitrogen)	**250**	**0.13**	**0.47**	**250*** **	**0.13**	**0.47**
3	Carbon monoxide (CO)	**100**	**0.05**	**0.19**	**100*** **	**0.05**	**0.19**
New site							
Gas turbine compressor units (GTCUs) - 1÷4							
2.1	NOX (oxides of nitrogen)	**50**	**4.33**	**18.70**	**50*** **	**4.33**	**18.70**
Heaters of the TEG regeneration unit - 1÷2							
1.1	SO2 (Sulphur dioxide)	**35**	**0.03**	**0.10**	**35*** **	**0.03**	**0.10**
2.1	NOX (oxides of nitrogen)	**250**	**0.20**	**0.72**	**250*** **	**0.20**	**0.72**
3	Carbon monoxide (CO)	**100**	**0.08**	**0.29**	**100*** **	**0.08**	**0.29**
Natural gas preheaters - 1÷5							
2.1	NOX (oxides of nitrogen)	**100**	**0.50**	**1.80**	**100*** **	**0.50**	**1.80**

Notes:
** For each source*
*** According to ORDINANCE No 1 of 27 June 2005 on emission limit values for harmful substances (pollutants) emitted into the atmosphere from sites and activities with stationary emission sources.*
*** According to *Ordinance on the limitation of emissions of certain pollutants released into the air from medium combustion plants*
Decision No 2017/1442/EU establishing best available techniques conclusions for large combustion plants (promulgated 17 August .2017, LCP BREF) does not contain any applicable standards for the Chiren UGS facilities.

Table 7 - Fugitive emissions of pollutants emitted to ambient air from the installations - none

No	Pollutants	Emission value according to the selected technique			Emission value/scope values according to BAT conclusions, including adopted by EC Decision		
		mg/Nm^3	kg/h	t/y	mg/Nm^3	kg/h	t/y
1	**Sulphur species**						
1.1	SO_2 (Sulphur dioxide)						
1.2.	SO_3 (Sulphur trioxide)						
1.3	H_2S (Hydrogen sulphide)						
1.4	CS_2 (Carbon sulphide)						
1.5	(others)						
2	**Nitrogen compounds**						
2.1	NO_X (oxides of nitrogen)						
2.2	NH_3 (ammonia)						
2.3	HNO_3 (nitric acid)						
2.4	N2O (dinitrogen oxide)						
3	Carbon monoxide (CO)						
4	Volatile organic compounds (VOC)						
4.1	Total organic carbon						
4.2	Benzene (C6H6)						
4.3	NMVOC (non-methane VOC)						
5	Dust (dust substances)						
5.1	Total dust						
5.2	PM10						
6.1	Cd and its compounds						
6.2	Pd and its compounds						
6.3	Ni and its compounds						
6.4	Hg and its compounds						
6.5	Al and its compounds						
6.6	Cu and its compounds						

No	Pollutants	Emission value according to the selected technique			Emission value/scope values according to BAT conclusions, including adopted by EC Decision		
		mg/Nm^3	kg/h	t/y	mg/Nm^3	kg/h	t/y
7	Asbestos (suspended fibre particles)						
8	Cl and its compounds						
9	F and its compounds						
10	As and its compounds						
11	Cyanides						
12	Substances or products with proven carcinogenic properties						
13	Substances or products with proven mutagenic properties						
15	Substances or products proven to affect reproduction						
16	Dioxins/furans						
17	Polycyclic aromatic hydrocarbons (PAHs)						
17.1	Indeno(1,2,3-cd)pyren						
17.2	B(k)F						
17.3	B(b)F						
17.4	B(a)P						

Data from the mathematical modelling of the concentrations of individual pollutants in the air are available in section 5.5 of the CP Application.

5.3. Emissions of harmful and hazardous substances in waste water

The formation of the types of water flows from Chiren UGS activities and the treatment of waste water from the site are described in detail in Section 6 of the CP Application. Appendix 6.2 of the Application shows a site plan with the sewage systems, and Appendix 6.1 provides a map showing the site, the discharge points with geographical coordinates, and the locations for own monitoring.

The following tables show data only for the production water generated by the installation under Appendix 4 of the EIA

Table 8 - Emissions of harmful and hazardous substances in waste water

Indicator/Pollutant type	**Emission value according to a selected technique**	**Emission value/scope Values according to BAT conclusions, including adopted by EC Decision**
Organohalogen compounds and substances, which may form such compounds in aqueous media	No emissions	No requirement
Organophosphorus compounds	No emissions	No requirement
Organotin compounds	No emissions	No requirement
Substances and mixtures with proven carcinogenic properties	No emissions	No requirement
Substances and mixtures with proven mutagenic properties	No emissions	No requirement
Substances and mixtures proven to affect reproduction through the aquatic environment	No emissions	No requirement
Sustainable hydrocarbons and sustainable and bioaccumulatable organic toxic substances	Petroleum products 5 mg/l	No requirement
Cyanides	No emissions	No requirement
Metals and their compounds	No emissions	No requirement
Arsenic and its compounds	No emissions	No requirement
Biocides and other plant protection products	No emissions	No requirement
Suspended materials	Undissolved substances- 50 mg/l	No requirement
Substances contributing to eutrophication (in particular nitrates and phosphates)	No emissions	No requirement
Total nitrogen	No emissions	No requirement
Total phosphorus	No emissions	No requirement
Substances having an adverse impact on oxygen balance (and can be measured with parameters such as BOD, COD, etc.)	COD 70 mg/l	No requirement
BOD_5	15 mg/l	No requirement
pH	6.0-8.5	No requirement

- Discharge of waste water into surface water bodies

Table 9 - Parameters of waste water discharged into surface water bodies

Indicator/Pollutant type	**Emission value according to a selected technique**	**Emission value/scope Values according to BAT conclusions, including adopted by EC Decision**
Substances within the scope of Ordinance 6/2000 on emission standards for the permissible content of harmful and hazardous substances in waste water discharged into water bodies (or other legislation in force supplementing/replacing the above)	According to the following table	No requirement
Other substances for which restrictions have been set in the relevant BAT conclusion	None	

Notes: The values given in the table are for the waste water flow to be discharged off-site at the discharge points with the geographical coordinates: N=43.349972 E = 23.590222, N= 43.349361 E = 23.595444, N=43.354889 E=23.585778.

Table 10 – Emission values of waste water discharged into surface water bodies

Discharge point Serial No.	**Substance (pollution indicator)**	**Value after treatment**	
		mg/l	**t/g**
Discharge No.1 /Flow No.1 Mixed flow of domestic and faecal waste water, industrial waste water, polluted atmospheric water, conditionally clean rain water and cooling water	Active reaction pH	6.0-8.5	-
	Undissolved substances	50	-
	BOD5	15.0	-
	COD (dichromate)	70	-
	Petroleum products	5.0	-

- Discharge of waste water into sewerage systems of settlements

Table 11 - Discharge of waste water into sewerage systems of settlements

Indicator/Pollutant type	**Emission value according to the selected technique (existing production)**	**Emission value/scope values according to BAT conclusions, including adopted by EC Decision**
Substances within the scope of Ordinance 7/2000 on the terms and procedure for discharge of waste water into sewage systems of settlements (or other regulation in force replacing the above)	There is no discharge of waste water into sewerage systems of settlements.	No requirement

- Discharge of waste water into groundwater

Table 12 - Discharge of waste water into groundwater

Indicator/Pollutant type	**Emission value according to the selected technique mg/l**	**Emission value/scope values according to BAT conclusions, including adopted by EC Decision**
Substances prohibited for discharge into groundwater according to Appendix 3 of Ordinance No 1 of 10 October 2007 on exploration, use and protection of groundwater	None	No requirements in the EC Decision.
Substances which can be discharged into groundwater according to Ordinance No 1 of 10 October 2007 on exploration, use and protection of groundwater	In accordance with the permit No. 12570003 of 16 December 2015 for the use of a groundwater body for re-injection of water, as amended by Decision 2757 of 30 September 2019, the maximum permissible concentrations of substances in the re-injected water are: Undissolved substances - 130 mg/l Dissolved substances - 33,000 mg/l Ammonium – 70 mg/l Barium – 10 mg/l Manganese – 3 mg/l Iron – 140 mg/l Chromium - 0.05 mg/l Aluminium – 1 mg/l Copper - 0.2 mg/l Zinc – 1 mg/l Lead - 0.01 mg/l Cadmium - 0.005 mg/l Fluorides - 4 mg/l Sodium – 13,000 mg/l Phosphates - 6 mg/l Chlorides - 18,000 mg/l Sulphates – 700 mg/l	
Other substances for which restrictions have been set in the relevant BAT conclusion	None	

- **Waste generation**

The following tables show data only on the waste generated as a result of the operation of the installation under Appendix 4 of EIA

Table 13- Waste generation

Waste		**Maximum quantity**		**Subsequent treatment****	**Recovery, reuse or recycling****	**Disposal****
Name	**Code**	**Generated per unit of product***	**Year t/y**			
Saturated or spent ion exchange resins	19 09 05	2.42x10-5 t /MWh heat generated	2.2	Pre-storage on site No 2	Recovery1 by a specialized company (R13) off-site	no
Mineral-based non-chlorinated engine, lubricating and gear oils	13 02 05*	5.68x10-5 t /MWh heat generated	18	Pre-storage on site No 6 and on the site of generation	Recovery1 by a specialized company (R13) off-site	no
Organic wastes containing hazardous substances	16 03 05*	0.006 t /MWh heat generated	47	Pre-storage on site No 11	Recovery1 by a specialized company (R13) off-site	no

Note:
[1] it is also possible to hand it over to a specialized company for reuse (recovery or recycling)
* Values are given in t/unit of product or t/MWh of heat generated
** Type (method), installation, location (on-site or off-site), operator - the information is provided regardless of whether the activities are/will be carried out on the same site or another site

- **Prevention of accidents**

On the territory of Chiren UGS site - Chiren village, chemical substances and mixtures classified as both hazardous and non-hazardous substances or mixtures according to Regulation (EC) No 1272/2008 [CLP] are stored.

Only turbine lube oil T 32, a colourless amber liquid, used for lubricating and cooling of the sliding bearings of the GTCU, as well as engine oil MS-20, a light brown liquid, used for lubricating the current compressors are directly used in the operation of the installation covered by Appendix 4 of the EIA. Antifreeze, a colourless liquid mixture of water and propylene glycol, is also used for the operation of the gas preheating system to be built at the new site. Safety data sheets are available for the turbine lube oil used, as well as for the engine oil and propylene glycol, which is the main component of the antifreeze used, and these are classified as non-hazardous according to Regulation (EC) No 1272/2008 [CLP].

The following **hazardous chemical substances** will be stored on the existing and newly designed site:

Methanol

Stored at flammable liquids warehouse:

The warehouse is located within the boundaries of Land Plot 81400.37.179. There is 1 tank with a volume of 250 m^3 *(197.5 t at a methanol density of 0.79 g/cm³).*

Storage at the existing production site *(Land Plot 81400.86.196)*:

Methanol storage tank available at the collective manifold assembly with a volume of 2 m^3 (*1.58 t*)

Storage at the newly build production site *(Land Plot 81400.125.283, 81400.86.270, 81400.86.194, 81400.86.267, 81400.86.268, 81400.86.269*):

One new tank with a volume of 30 m^3 *(23.7 t at a methanol density of 0.79 g/cm³)* will be built.

Gas condensate

Stored at flammable liquids warehouse:

There is a tax warehouse on the territory of the flammable liquids warehouse, equipped with a tank with a total volume: 525.5 m^3 (*413.7 t*)

Motor fuels:

Storage in fuel tanks at the existing company's gas station:

- Underground petrol tank with a total volume of 17.4 m^3 (*13.3 t*);

- Underground diesel fuel tank – 5.2 m^3 (*4.4 t*).

Natural gas

The main activity of the Chiren UGS is related to compression for the purpose of injection and storage of natural gas in the porous- fractured-cavernous space of the underground reservoir, as well as subsequent withdrawal. The injection is carried out by means of exploitation wells outside the boundaries of the production site. Currently, Chiren UGS has a total capacity of 1.302 billion Nm^3 gas of which 752 million Nm^3 is a buffer gas and 550 million Nm^3 is the active volume. On this basis,

the total amount of natural gas available and stored has been determined: 911,400 t (*at gas density of 0.7 kg/m^3 at 0°C and 101.325 kPa*).

Following the IP implementation and increasing the reservoir pressure of up to 150 bar (now 110 bar); the total storage capacity will increase to 1.950 billion *Nm^3* of natural gas (*1,365,000 t*), of which 1 billion *Nm^3* active volume (*700,000 t*).

Antifreeze, hydraulic oil, emulsion oil - Finish 1M, winter wiper fluid and sealing lubricant for connecting pipes

The company has been classified as an enterprise with high risk potential in view of its activities and the hazardous chemical substances and mixtures stored on site under Appendix 3 of the EIA, as well as the estimated quantities of methanol in the feed pipes ½ for the individual separation installations, the collective manifold at the existing and newly designed sites and the separation sites, and the quantities of gas condensate in the underground condensate lines.

The classification of the enterprise will remain unchanged following the IP implementation.

At present, major accidents at the Company's new production site are expected to occur as a result of earthquakes, floods, fires, acts of terrorism and industrial accidents involving explosive, flammable and toxic substances. The emissions expected to be generated into the environment, including air, water and soil, are not expected to differ from those currently indicated in the CP Application, and their concentrations will be significantly above the ELVs under the current national regulations. To be updated: Safety Report including Major Accident Prevention Policy Report and Internal Emergency Plan of the Storage Facility, which will be submitted to the EIA Report at a later stage. Appendix 4.8 provides an updated classification notice of the storage facility under Article 103 of the EPA.

Appendix 4.7 provides a master plan of the newly established site of the Chiren UGS with the location of the warehouses for auxiliary material and fuel storage and the tanks for storage of liquid hazardous chemical substances and mixtures.

Table 14 - Prevention of accidents

Criterion	**Maximum quantity**	**Information in BAT conclusions, including adopted by EC Decision**
Does the proposed technique fall within the scope of Section I of Chapter Seven of the EPA for the prevention of major accidents involving hazardous substances.	Natural gas is the only hazardous chemical substance used directly in the operation of the installation under Appendix 4 of the EPA. It is used as a fuel for the operation of the facility, part of the installation. It is not stored on the Company's site.	No requirements in the EC Decision.

CONCLUSION:

Following the IP implementation, there will be no environmental factors and components and parameters of the technique applied by the operator on which the Chiren UGS will fail to meet the requirements of the EC Decision and/or national legislation.