gasunie
transport services

GTS Investment Plan 2024 - 2033

Addendum

22 November 2024

Introduction

On 5 April 2024, GTS adopted the investment plan for 2024 (IP2024), as required under Article 7(a) of the Dutch Gas Act. The IP2024 offers a rundown of GTS' investments in the short and long term (through to 2033), along with details of the reasoning behind these planned investments. This document is a draft addendum to the IP2024. This draft addendum comes as there are several further intended new investments that fall into the scope of the IP2024, but that were not included in the IP2024 adopted earlier this year. With this draft addendum, GTS now submits these intended investments to the market parties, the Netherlands Authority for Consumers and Markets (ACM), and the Minister of Climate Policy and Green Growth.

Contents

This draft addendum contains five investments:

- Large-scale replacement of heating systems at gas receiving stations
- Measures to reduce methane emissions from vent stacks at compressor stations
- Peakshaver: lifetime extension programme
- Replacement of the Zoeterwoude metering and regulating station
- Replacement of odorant injection control and monitoring units and station computers with station control panels at metering and regulating stations

Process

GTS will submit the draft addendum to the market parties for consultation purposes, giving market parties four weeks to review the draft addendum. Next, GTS will process the responses received and submit, possibly with amendments, the draft addendum to ACM and the Minister of Climate Policy and Green Growth. They will review the draft addendum within the statutory term of 12 weeks, following which GTS will adopt the final addendum.

Mission

GTS delivers gas transmission services in a customer-focused and transparent way. Safety, reliability, sustainability and cost-effectiveness are central in everything we do. We serve the public interest, and work as professionals to create value for our stakeholders.

Vision

GTS aims to be an organisation that best serves the market, responds flexibly to changes in its surroundings, enables new gas flows, facilitates the introduction of sustainable energy and thus plays a key role in the north-western European gas market.

To be able to fulfil its duties with the required level of quality, GTS needs to invest in the maintenance and, where necessary, expansion of the gas transmission network. The above investments will ensure that the gas transmission network continues to meet requirements in terms of safe and reliable gas transmission.

I: Large-scale replacement of heating systems at gas receiving stations

At gas receiving stations (GRSs), the pressure of gas coming in from GTS' transmission network is reduced to the pressure needed for the distribution networks operated by the regional transmission system operators (TSOs) or connected parties. This pressure reduction also leads to a drop in the temperature of the gas. The Dutch Gas Act stipulates that gas delivered by GTS must meet certain quality requirements at the exit points. These requirements are laid down in the Ministerial Regulation on Gas Quality (Gas Quality MR)[1]. One of the quality requirements from the Gas Quality MR is a minimum delivery temperature. Meeting this minimum delivery temperature requires the gas to be heated before it can be delivered.

Since the heating boilers at around 800 GRSs have now reached the end of their technical life, they will have to be replaced over the 2025–2030 period. On top of that, the operating range of existing hot water systems at a large number of gas receiving stations is no longer adequate due to the significant decline in natural gas consumption. The current operating systems (regulating systems) were designed based on the existing configuration of heating boilers and hot water systems. As a result, regulating systems will also have to be adjusted to ensure well-functioning heating systems at gas receiving stations.

The heating system replacement strategy has been carefully weighed, based on the key criteria of operational reliability, systematic optimisation, and efficient implementation. The current heating boilers will be replaced with new conventional (gas-fired) heating boilers. In doing so, the electrical system will be replaced in such a way that the GRSs will be prepared for a possible future scale-up to a sustainable heating system (or a heat pump). This is in light of the study that GTS has commissioned, as announced in the IP2024, into a future hybrid solution (or a conventional gas-fired boiler combined with a heat pump) that will improve energy efficiency and reduce carbon emissions. The findings from this study will be taken into account in deciding on possible future investments in a hybrid solution at the stations. If such an investment is deemed necessary, it will obviously be included in a new IP or addendum to the IP.

See Appendix 1 for the assessment of the various alternatives for the large-scale replacement of the heating systems at gas receiving stations.

1 Article 11, Dutch Gas Act: https://wetten.overheid.nl/BWBR0035367/2023-12-02

II: Measures to reduce methane emissions from vent stacks at compressor stations

As announced in the IP2024, new obligations from EU legislation require GTS to invest in methane emissions reduction.

The EU Regulation on methane emissions reduction in the energy sector and amending Regulation (EU) 2019/942 (the 'Methane Emissions Regulation') is intended to reduce methane emissions in the energy sector. The Methane Emissions Regulation sets strict requirements in the area of leak detection in combination with repair obligations, as well as venting and flaring restrictions and obligations to replace certain venting and/or flaring components. The Methane Emissions Regulation came into force this year, on 4 August 2024. The Regulation requires parties in the energy sector to use the best commercially available technologies that offer sustainable protection against future leaks. The Methane Emissions Regulation does not contain a proportionality clause regarding costs, which means that it does not allow for considerations such as, for example, 'costs per ton of avoided CO_2 equivalent' as part of the alternative assessment. The regulation in its current form obliges GTS to select an alternative that achieves the maximum possible reduction.

Investments are needed to substantially reduce methane emissions, while also maintaining a focus on repairing gas leaks. In making these investments, GTS has opted for a programme-based approach. Called 'Beheerste Emissie Reductie Koers' (BERK, controlled emission reduction pathway), this programme specifies several measures that include reduction of methane emissions from vent stacks at compressor stations (CS). This accounts for a substantial part of GTS's total methane emissions.

See Appendix 2 for the assessment of the alternatives for 'Measures to reduce methane emissions from vent stacks at compressor stations'.

III: Peakshaver: lifetime extension programme

The Peakshaver (PS) is primarily used to support national gas transmission and also helps make sure there is sufficient capacity and gas at times of peak supply during extreme cold spells. The IP2020 proposed converting the PS into a mixing station. However, the loss of Russian gas flows (in 2022) and the resulting limited supply of H-gas (which is needed to meet demand for G-gas after quality conversion, among other uses) meant that the PS will be needed for longer than was foreseen a few years ago. Due to changing market conditions, investments that were initially no longer deemed necessary have now become inevitable and have to be made in the short term to guarantee the continuity and reliability of the PS installation.

Having the PS available to fall back on for longer is currently still necessary to be able to ensure (sufficient) transmission support, as part of GTS' transmission duty, so as to be able to keep transporting sufficient volumes of G-gas in the west of the Netherlands in this way. Besides for fulfilment of GTS' transmission duty, the PS can also be deployed to help GTS meet its peak supply duty by using all or part of the capacity and volume of the PS to cover periods of peak supply. Peak supply is needed on days when the mean effective 24-hour temperature falls to below −9.0°C[2].

Besides for GTS' transmission duty and peak supply duty, the PS will for the time being also be needed to ensure that the Netherlands can continue to comply with the EU infrastructure standard[3]. This infrastructure standard requires Member States to keep their infrastructure (or technical capacity) at a minimum level that guarantees a certain level of redundancy in the event of an outage of the single largest gas infrastructure. It also imposes an obligation on transmission system operators to make the investments needed to make sure of that[4]. In order to have adequate technical capacity available, the PS is and will continue to be important.

The investments proposed in this addendum are needed to be able to keep operating the PS safely and reliably, so that GTS can fulfil its statutory duties. GTS will review the nature and scope of the investment programme annually based on the (market) conditions and adjust it as necessary.

See Appendix 3 for the assessment of the alternatives for the Peakshaver lifetime extension programme.

2 https://zoek.officielebekendmakingen.nl/stb-2004-170.html
3 https://eur-lex.europa.eu/legal-content/NL/TXT/PDF/?uri=CELEX:32017R1938
4 Art. 5 VO (EU) 2017/1938

IV: Replacement of the Zoeterwoude metering & regulating station

Built in the 1960s, the Zoeterwoude metering & regulating station (M&R) exhibits multiple problems that mean that complete replacement of the station is now inevitable.

These problems include subsidence of installation components and pipelines, emitting regulating systems, and obsolete operating systems. This has meanwhile led to a real risk of an outage of the station, which could cause security of supply issues in the connected regional distribution network. The whole station needs to be replaced to tackle the problems in an efficient and effective manner.

See Appendix 4 for the assessment of the alternatives for replacement of the Zoeterwoude metering and regulating station.

V: Replacement of odorant injection control and monitoring units and station computers with station control panels at metering and regulating stations

At several metering and regulating stations (M&Rs), the station computers and the outdated odorant injection control and monitoring units need to be replaced with a station control panel.

The existing station computers and odorant injection control and monitoring units have reached the end of their technical life and are increasingly prone to problems and malfunctions. Crucial components of these systems are obsolete and no longer available. The technology used in these systems is also outdated and must, therefore, be replaced with a station control panel. A station control panel consists of an industrial-grade computer (PLC) with a standard software package that can be configured, updated, and managed remotely in the event of malfunctions.

Injecting odorant into the natural gas flow and monitoring odorant levels is essential for the safe distribution of natural gas. This makes this investment crucial for the continuity and safety of gas transmission.

See Appendix 5 for the assessment of the alternatives for the replacement of the station computers and odorant injection control and monitoring units at metering and regulating stations.

Bijlagen

Appendix 1: Large-scale replacement of heating systems at gas receiving stations

Information on major investment projects (look ahead to 2024-2033)		
a. Code	PG-I.014604	
b. TYNDP code	N/A	
c. Bottleneck	Quality bottleneck	
d. Investment classification (EI or RI)	Replacement investment	
e. Name and location of grid asset	Several GRSs nationwide	
f. Network pressure (RDN/ HPGG)	HPGG and RDN	
g. Project phase	Preparations	
h. Year of FID	2024	
i. Year of commissioning	2030	
j. Investments per year	2023: (€ thousands)	500
	2024: (€ thousands)	2,500
	2025: (€ thousands)	33,200
	2026: (€ thousands)	38,500
	2027: (€ thousands)	38,500
	2028: (€ thousands)	38,500
	2029: (€ thousands)	38,500
	Total: (€ thousands)	190,200
k. Explanation of how the investment solves the bottleneck	For the 2025-2030 period, GTS anticipates that the heating boilers of the heating systems at approx. 800 gas receiving stations will need to be replaced. These boilers are 15 to 20 years old and are reaching the end of their service life, which may lead to failure of the gas heating needed to deliver gas at the required minimum temperature. In addition, the general decline in natural gas consumption has led to existing hot water systems made up of pipelines, pumps, and valves at a large number of the gas receiving stations no longer having an adequate operating scope to ensure the required gas throughput. A drop in gas throughput can, for example, mean pumps are too big for the area they are required to service, causing them to function less well and wear faster. The current operating systems (regulating systems) were designed based on the existing configuration of hot water systems. In order to tackle the bottleneck of hot water system overdimensioning and make the best possible use of the new configuration, the operating systems will also need to be changed. Replacing the heating systems, i.e. the heating boilers and hot water and operating systems, will prevent gas heating system outages and can also eliminate the bottleneck of overdimensioning.	

Continued on next page

Information on major investment projects (look ahead to 2024-2033) continued previous page

Information on major investment projects (look ahead to 2024-2033)	
I. Alternative assessment (if not in realisation phase by 1/1/2024)	
No-action alternative	Doing nothing is not an option, because delivering gas below the minimum temperature is not permitted by law and may cause problems at the consumers' end. On top of that, the no-action alternative will not solve the bottlenecks in the hot water system.
Alternatives	Given that doing nothing is not an option, GTS has assessed the replacement strategy and options for replacement of the hot water systems. With a replacement strategy based on the 'run-to-failure' approach, the technically outdated heating boilers will remain operational until they fail and can no longer be repaired through corrective maintenance. This means that, as soon as a heating boiler fails definitively, the control organisation must immediately launch an ad hoc project to replace it with a new one. This involves a risk of the operational organisation not always being able to respond sufficiently rapidly and effectively, because multiple boilers may fail at the same time due to the advanced age of these systems. The operational organisation will, therefore, need adequate time to prepare and have temporary fallback facilities available for heat supply so that the heating system can continue to operate. Given the impact on operational reliability, optimisation, and efficiency, the chosen approach is a systematic one in the form of a large-scale replacement programme. This allows the work to be prepared on a project basis, materials to be supplied in time, and temporary heat supply facilities to be arranged and deployed efficiently. This eliminates the risk of unplanned failure. An added benefit is that a project-based approach creates an opportunity to develop more standardised solutions. The major plus points of creating more standardised heating systems are i) lower project staffing costs during the programme and ii) cost savings on GRS management and maintenance. We have compared the following four alternatives for the large-scale replacement programme: 1. Replacing only the heating boilers 2. Replacing the heating boilers and hot water systems 3. Replacing the heating boilers, hot water systems, and operating systems 4. Full replacement of heating boilers, hot water systems, operating systems, and the electrical system

Continued on next page

Information on major investment projects (look ahead to 2024-2033) continued previous page

Information on major investment projects (look ahead to 2024-2033)	
Alternatives analysis (technical, financial and social effects)	Alternative 1 will see only the boilers replaced and the existing hot water and operating systems maintained. There are several downsides to this alternative. Firstly, the current pumps will still be too big for the service area, which means a risk of wear caused by cavitation. Additionally, the current pumps consume five times more energy than modern ones. Since this alternative leaves the regulating system unchanged, the pumps cannot be controlled correctly and there is no remote energy monitoring and operation capability. Energy losses will also continue to be relatively large because this alternative does not repair the insulation of the installation components, and neither does this alternative eliminate the HSE risk caused by the asbestos and chromium-6 on-site. Alternative 1 will not resolve the bottleneck of overdimensioned components and comes with the drawback of low energy efficiency, which is why this alternative has been discarded. Alternative 2 will replace not only the boilers but also the hot water system, meaning that the outdated pumps, three-way valves, and connecting pipes will be replaced to bring the hot water system into line with the capacity of the gas receiving station. Existing insulation will be repaired and any missing insulation added. However, since this alternative will not change the regulating system, the issue of pump control and remote energy monitoring and operation will remain. The fact that not all components will be replaced limits possibilities for standardisation and prefabrication. This, in turn, means more work on-site and adds approximately one year to the programme lead time, making it seven instead of six years. Project staffing costs are relatively high as a result. This alternative does not enable full removal of the asbestos and chromium-6 on-site either. Given that this alternative will still not adequately solve the aforementioned bottlenecks in the heating system (the operating system), this alternative has also been discarded. Alternative 3 will see the boilers, hot water system, and the regulating system replaced to enable more accurate valve and pump control. This enables variable boiler water temperature with heating curve control, which will deliver considerable savings on gas consumption. It also provides remote energy monitoring, maintenance, and operation capabilities. Given the fact that alternative 3, like alternatives 1 and 2, still does not change part of the appurtenances of the GRS and the associated physical space, it would not provide an opportunity to do something about the problem of asbestos and chromium-6 at GRSs. Standardisation and prefabrication will be possible to a limited degree only, causing the lead time to be longer. A key downside to alternative 3 is that it does not prepare the heating system for a possible future scale-up to a sustainable heating system. The investments involved in alternative 3 are estimated at € 180 million.

Continued on next page

Information on major investment projects (look ahead to 2024-2033) continued previous page

Information on major investment projects (look ahead to 2024-2033)	
	Finally, alternative 4 sees the whole heating system replaced, including the electrical system. Like alternative 3, this alternative comes with the benefits of i) proper pump dimensioning, ii) improved energy efficiency, and iii) component standardisation and prefabrication. Standardisation delivers key benefits both during implementation of the programme and for GRS heating system management and maintenance. In terms of programme implementation, standardisation makes the work more efficient and reduces the lead time on-site. The fact that this alternative replaces all appurtenances means that a new system can be prefabricated elsewhere and installed and assembled on-site relatively quickly. This means less work on-site and cuts the total programme lead time by approximately one year compared to the other alternatives, making it six instead of seven years. Project staffing costs are lower as a result. As far as GRS heating system management and maintenance is concerned, a more standardised configuration means lower operating costs. On top of the benefits of alternative 3, alternative 4 also allows full remediation of the asbestos and chromium-6 at a GRS and prepares the building and electrical system for a possible scale-up to sustainable heating systems in the future. The system will then be easy to scale up to a hybrid solution with heat pumps later on, offering the opportunity to considerably reduce carbon emissions in the long term and increase energy efficiency. This paves the way for further reduction of an installation's energy costs. The investments involved in alternative 4 are estimated at € 190 million.
Support for the estimation of impacts of the alternatives	The above alternatives were carefully assessed, weighing the impact on operational reliability, management and maintenance cost savings, improved control, energy efficiency, and synergies in implementation. Since alternatives 1 and 2 do not solve the heating system bottlenecks, they have been discarded. Since alternative 3 replaces the regulating system, it delivers a significant improvement in energy efficiency compared to alternatives 1 and 2. However, the drawbacks for project implementation and lead time still remain, as does the management and maintenance issue. Compared to alternative 3, alternative 4 comes with slightly higher investment costs (approx. 5% higher). However, it does offer a solution to all of the current bottlenecks and reduces management and maintenance costs. This alternative also offers ways to scale up to a more sustainable system with heat pumps in the future, thus enabling a (significant) reduction in the energy costs at gas receiving stations.

Continued on next page

Information on major investment projects (look ahead to 2024-2033) continued previous page

Information on major investment projects (look ahead to 2024-2033)	
Rationale for selection of proposed alternative	Alternative 4 is the preferred alternative. This alternative offers opportunities for standardisation and prefabrication. Synergies during the implementation stage will cut the lead time and keep project staffing costs down. This alternative delivers the greatest energy returns and enables remote operation, management, and maintenance. The operating costs of management and maintenance are estimated to be lower because fewer outages are expected and any outages that do occur can be dealt with remotely. Finally, this preferred alternative offers opportunities to realise a more energy-efficient and sustainable solution with a smaller carbon footprint in the future.
Concerning missing information	This project is in the preparation phase for the year 2025. The stated budgets and spread over the year are expectations based on cost estimates.

Appendix 2: Measures to reduce methane emissions from vent stacks at compressor stations

Information on major investment projects (look ahead to 2024-2033)	
a. Code	PG-I.014843; PG-I.014922; PG-I.014926; PG-I.014880; PG-I.014925; PG-I.014943; PG-I.014945; PG-I.014935; PG-I.014938; PG-I.014924; PG-I.014940; PG-I.014946
b. TYNDP code	N/A
c. Bottleneck	Quality bottleneck
d. Investment classification (EI or RI)	Replacement investment
e. Name and location of grid asset	A-416 CS Scheemda A-403 CS Wieringermeer A-401 CS Ommen A-402 CS Ravenstein A-409 CS Spijk A-405 CS Beverwijk A-406 CS Zweekhorst
f. Network pressure (RDN/HPGG)	HTL
g. Project phase	Study
h. Year of FID	2024 – 2027
i. Year of commissioning	2025-2029
j. Investments per year	2024: (€ thousands) 350 2025: (€ thousands) 8,699 2026: (€ thousands) 11,246 2027: (€ thousands) 40,450 2028: (€ thousands) 4,650 Total: (€ thousands) 65,400
k. Explanation of how the investment solves the bottleneck	In light of EU legislation, and being a prudent operator, GTS is required to prevent and repair methane leaks. The investment provides a solution to methane emissions from vent stacks at compressor stations. These emissions from compressors' venting pipelines are made up of: • Methane emissions through gas compressors' seal systems (rotor seals). • Methane leaking from compressors' upstream and downstream valves. • Methane emissions from the depressurisation of system components. These emissions make up a substantial part of GTS' total registered methane leaks.
l. Alternative assessment (if not in realisation phase by 01/01/2024)	
No-action alternative	If GTS were to do nothing, it would fail to comply with EU methane emissions regulations and methane would continue to be emitted into the atmosphere, with an adverse climate impact.

Continued on next page

Information on major investment projects (look ahead to 2024-2033) continued previous page

Information on major investment projects (look ahead to 2024-2033)	
Alternatives	The results of the study and assessment of the alternatives are illustrated and explained here using the Scheemda compressor station as an example. Alternative 1) Application of zero-emission dry gas seals combined with nitrogen as a seal gas to have nitrogen instead of methane leaking into the atmosphere. This is an Original Equipment Manufacturer (OEM) solution that prevents methane emissions. In addition, a recompression plant will be installed to eliminate emissions from compressor depressurisation. Alternative 2) Recompression of gas leaking from the primary and secondary vent line of the dry gas seals, as such that the gas is fed back into a section within the gas transmission system. To achieve this, the seals will be replaced with a type of seal with improved sealing properties. This will also require installation of a low-pressure nitrogen plant that supplies the seals with seal gas. Alternative 3) Recompression of the primary vent line of the dry gas seals, as such that leaking gas is fed back into the compressor's section manifold. The dry gas seals will not be replaced. Emissions from the secondary vent line (1-2% of the total emissions) will remain. Alternative 4) Electrification using Solid Oxide Fuel Cells (SOFC), which trigger a chemical reaction that converts the emission gas from the primary vent line into electricity (60%) and heat (30%). An assessment of alternatives will be worked out and evaluated in the same way for each of the other stations. While the results of these assessments depend on the type of compressors and auxiliary systems at each of the compressor stations, the above alternatives for the Scheemda compressor station are generic to such an extent that the alternative assessments for the other compressor stations will be made / composed in the same way as the Scheemda compressor station.

Continued on next page

Information on major investment projects (look ahead to 2024-2033) continued previous page

Information on major investment projects (look ahead to 2024-2033)	
Alternatives analysis (technical, financial and social effects)	Alternative 1: the use of zero-emission dry gas seals will eliminate methane emissions from the seals for the full 100%. The investments will also go towards installing a nitrogen system and a recompression plant to eliminate vent stack emissions caused by depressurisation. Alternative 2 also eliminates 100% of methane emissions from the seals. Compared to alternative 1, alternative 2 involves greater complexity when it comes to building, maintaining, and operating the system. The investments required for in alternative 1 and 2 are both estimated at €8 million. Alternative 3 will not replace the dry gas seal with an improved version, meaning that 2% of the emissions from the secondary seal will remain. The required investments for alternative 3 are estimated at €6 million. However, the alternative is not compliant with the Methane Emissions Regulation. Given the availability of alternatives 1 and 2, alternative 3 has not been further developed and has not been budgeted with the same accuracy as alternatives 1 and 2. Alternative 4 also leaves some residual methane emissions from the primary and secondary vent line. The use of SOFC can reduce primary seal gas emissions by 92%. Since SOFC systems have only been operational for a short time and are, therefore, still an insufficiently proven technology, this alternative has not been worked out further.
Support for the estimation of impacts of the alternatives	The alternatives were compared based on emission reduction, costs, and technical complexity.
Rationale for selection of proposed alternative	Alternative 4 is discarded because SOFC is still in its infancy and a largely unproven technology. Alternative 3 only partly offers a solution because some methane emissions will remain. It has, therefore, also been discarded. Alternatives 1 and 2 are similar in terms of the investment. Both alternatives eliminate methane emissions completely. Alternative 1 is an OEM solution that involves the least installation, maintenance, and operating complexity. This makes alternative 1 the preferred alternative for the Scheemda compressor station, i.e. application of zero-emission dry gas seals combined with nitrogen as the seal gas. In addition, a recompression plant will be installed to eliminate emissions from depressurisation. When it comes to the other compressor stations, the preferred alternative will also be chosen based first and foremost on which alternative delivers the greatest reduction of emissions. If alternatives deliver the same emissions reduction, the most cost-effective alternative will be chosen as the preferred alternative. Finally, like with the alternative assessment for the Scheemda compressor station, the availability of an OEM solution may be a decisive factor in the assessment. An OEM solution is preferred because it comes with installation, maintenance, and operation benefits.
Concerning missing information	This project is in the preparation phase. The stated budgets and spread over the years are expectations based on cost estimates from preliminary studies.

Appendix 3: Peakshaver lifetime extension programme

Information on major investment projects (look ahead to 2024-2033)		
a. Code	PG-I.014952	
b. TYNDP code	N/A	
c. Bottleneck	Quality bottleneck	
d. Investment classification (EI or RI)	Replacement investment	
e. Name and location of grid asset	Peakshaver at Maasvlakte in Rotterdam	
f. Network pressure (RDN/HPGG)	HTL	
g. Project phase	Preparations	
h. Year of FID	2024	
i. Year of commissioning	2030	
j. Investments per year	2024: (€ thousands) 2025: (€ thousands) 2026: (€ thousands) 2027: (€ thousands) 2028: (€ thousands) 2029: (€ thousands) Total: (€ thousands)	4,869 8,029 4,189 3,509 1,709 1,229 23,536
k. Explanation of how the investment solves the bottleneck	Due to the gas crisis and the associated (impending) H-gas shortages, the PS will have to remain operational for longer if GTS wants to continue to meet its statutory duties with respect to gas transmission and peak supply. In order to be able to guarantee and continue to guarantee safe and reliable use of the PS, multiple projects and activities will have to be carried out as part of what is known as a 'lifetime extension programme'. This programme will see bottlenecks in the pump system, air systems, instrumentation, and evaporators eliminated. Structural components and insulation will also be repaired.	
l. Alternative assessment (if not in realisation phase by 1/1/2024)		
No-action alternative	Doing nothing would leave issues around statutory requirements (compliance), plant safety, and gas transmission network reliability unresolved. This would, in turn, mean that GTS fails to meet statutory requirements imposed by the competent authority (DCMR Milieudienst Rijnmond) and that GTS is unable to adequately, if at all, fulfil its statutory transmission support and peak supply duties. Doing nothing is, therefore, not an option.	

Continued on next page

Information on major investment projects (look ahead to 2024-2033) continued previous page

Information on major investment projects (look ahead to 2024-2033)	
Alternatives	Alternative 1 is a standard approach for the implementation of the (sub-) projects. When conducting maintenance and carrying out the investments as per the standard GTS annual planning cycle, the lead time will be longer than the lead time for alternative 2. Alternative 2 consists in planning various campaigns, i.e. periods with predefined activities, within a fixed annual programme. Each individual campaign is centred on a targeted way of working and hitting the agreed milestones on schedule. This approach reduces the lead time compared to alternative 1.
Alternatives analysis (technical, financial and social effects)	Given the longer lead time for this project approach, alternative 1 is not possible because it does not solve the PS issues in time and does not have the PS operational in time. Alternative 2 offers opportunities to, based on an approach with a dedicated team and a short cycle of preparation and implementation, resolve the issues with the highest priority quickly, adequately, and cost-efficiently. This is why this should be the preferred alternative.
Support for the estimation of impacts of the alternatives	Lead times were estimated based on prior experience with project-based and campaign-oriented implementation. Given that the two alternatives have different lead times and the fact that lead time is a crucial factor in this programme, choosing alternative 1 would mean that the quality bottlenecks would not be resolved in time.
Rationale for selection of proposed alternative	The preferred alternative is alternative 2. It involves setting the scope year by year and locking it in an annual programme, with various campaigns scheduled to carry out projects and systematic maintenance. In addition, a basic team of engineers will be added to the project organisation at the PS site to both provide support during campaigns and independently perform maintenance work. The programme is geared towards verifiably operating in line with statutory requirements and design principles, but also towards continuing to meet minimum security of supply requirements and deployment criteria.
Concerning missing information	The work as part of this programme for 2024 is in the implementation phase and the work scheduled for 2025 is in the preparation phase. The stated budgets and spread for 2025 and beyond are expectations based on cost estimates from preliminary studies.

Appendix 4: Replacement of the Zoeterwoude metering and regulating station A-115 S-107

Information on major investment projects (look ahead to 2024-2033)	
a. Code	PG-I.014881
b. TYNDP code	N/A
c. Bottleneck	Quality bottleneck
d. Investment classification (EI or RI)	Replacement investment
e. Name and location of grid asset	Zoeterwoude metering and regulating station A-115 Zoeterwoude AS S-107
f. Network pressure (RDN/HPGG)	RTL
g. Project phase	Basic design
h. Year of FID	2025
i. Year of commissioning	2026
j. Investments per year	2024: (€ thousands) 100 2025: (€ thousands) 250 2026: (€ thousands) 10,389 2027: (€ thousands) 100 Total: (€ thousands) 10,839
k. Explanation of how the investment solves the bottleneck	There are a large number of bottlenecks at the Zoeterwoude metering and regulating station: • Leaking valves and emitting gas-controlled actuators on the metering lines are leading to methane emissions at various places along those lines. • The metering lines are lopsided due to subsidence. • The exit line is lopsided due to a poor subsoil. • The operating systems at the station, the odorant system, and the telemetry are outdated. The upstream set-up has the following bottlenecks: • Valves 13 and 17 are defective. • Valves 02 and 13 are leaking on the outside. • Problems with cathodic protection due to the presence of anchor blocks, i.e. concrete structures in the ground to anchor the pipeline. The metering line malfunctions several times a year, causing the line to have to be taken out of operation. Some materials are obsolete. Components or spare parts are no longer available. Owing to its role in ensuring gas transmission security in the connected regional distribution network, the Zoeterwoude metering and regulating station cannot be taken out of operation.

Continued on next page

Information on major investment projects (look ahead to 2024-2033) continued previous page

Information on major investment projects (look ahead to 2024-2033)	
I. Alternative assessment (if not in realisation phase by 1/1/2024)	
No-action alternative	Doing nothing would mean that the bottlenecks remain, causing a major risk of station outages. • There will eventually not be any parts available for the operating systems, which will jeopardise gas transmission security. • The subsidence issue may cause inadmissible pressures in the pipelines and non-compliance with the standards. • Doing nothing would not eliminate the methane emissions either.
Alternatives	The following alternatives have been considered: 1. Partial replacement (by performing separate repairs) 2a. Complete replacement of the metering and regulating station and redeveloping the building 2b. Complete replacement of the metering and regulating station and constructing a new building
Alternatives analysis (technical, financial and social effects)	Alternative 1: partial replacement with separate repairs means more outages for the local environment. The sum of all these separate investments in repairs is comparable to the investment required to replace everything in one go. Alternative 2a: a combined approach to the bottlenecks ensures optimised use of resources, better coordination, fewer outages, and less inconvenience for the environment. In addition, the expectation is that combining the various tasks will improve efficiency in implementation costs and reduce maintenance costs. The total investment is comparable to the funds needed for alternative 1. Redeveloping the metering and regulating station building means a slightly lower investment compared to building an entirely new station, but it restricts the solution to the subsidence issue to installing separate pieces of foundation. The latter point means that this alternative will not adequately tackle the civil engineering problems caused by subsidence. Alternative 2b: a combined approach delivers the same benefits as alternative 2a. While the investment for alternative 2b is slightly higher (approx. 2% higher) than the investment for alternative 2a, it offers a much better solution to the subsidence-related bottlenecks. This is because building a new metering and regulating station comes with the added benefit that the entire site of the metering and regulating station can be redeveloped, including the foundations. Foundations can, therefore, be installed for the site as a whole, instead of installing separate pieces of foundation.
Support for the estimation of impacts of the alternatives	The assessment of the alternative looked at investment costs, efficiency, effectiveness, outages and inconvenience for the local environment, expected maintenance costs, and sustainability.

Continued on next page

Information on major investment projects (look ahead to 2024-2033) continued previous page

Information on major investment projects (look ahead to 2024-2033)	
Rationale for selection of proposed alternative	Alternative 1 does not offer a solution to all bottlenecks and residual risks. The investment amount is comparable to that of alternative 2a. Alternative 2a delivers a better solution to the equipment-related bottlenecks. However, it does not allow for an adequate response to the civil engineering issues caused by subsidence, because the foundations cannot be replaced as a whole. Given its qualitative benefits, alternative 2b is the preferred alternative. Since it involves installing foundations for the station as a whole, it resolves the subsidence issues. Additionally, combining different tasks results in a more efficient and effective way to address the bottlenecks mentioned above. Such an integrated approach also allows us to solve the other bottlenecks: • Replacing the outdated HPSD system. • Replacing the outdated low-voltage distribution system. • Removing emitting pressure safety devices (also known as 'cow horns'). • Replacing the methane blanket with a nitrogen blanket.
Concerning missing information	This project is in the specification phase. The stated budgets and spread over the years are expectations based on cost estimates.

Appendix 5: Replacement of odorant injection control and monitoring units and station computers with station control panels at metering and regulating stations

Information on major investment projects (look ahead to 2024-2033)		
a. Code	PG-I.014977	
b. TYNDP code	N/A	
c. Bottleneck	Quality bottleneck	
d. Investment classification (EI or RI)	Replacement investment	
e. Name and location of grid asset	Metering and regulating stations (47 stations)	
f. Network pressure (RDN/HPGG)	HTL	
g. Project phase	Preparations	
h. Year of FID	2024	
i. Year of commissioning	2028	
j. Investments per year	2024: (€ thousands)	560
	2025: (€ thousands)	1,947
	2026: (€ thousands)	2,080
	2027: (€ thousands)	2,080
	2028: (€ thousands)	1,536
	Total: (€ thousands)	8,204
k. Explanation of how the investment solves the bottleneck	This investment concerns the replacement of the odorant injection control and monitoring unit and the station computer at 47 metering and regulating stations. This investment will solve the following bottlenecks: • The current odorant injection control and monitoring units are increasingly showing problems and failing. As a result, gas is regularly supplied without having been odorised first, which GTS registers as non-compliance and reports to the relevant Dutch regulatory authority, i.e. the Dutch State Supervision of Mines. • Odorant injection control and monitoring systems were designed as control and monitoring units for the injection of odorant into the natural gas flow. Odorant injection control and monitoring is essential for the safe use of natural gas. • Station computers have been in use since 1985, and odorant injection control and monitoring units since 1998. The standard technical life of these kinds of systems is normally 15-20 years. • The odorant injection control and monitoring units and station computers were developed over 25 years ago. There is now only very little knowledge of and experience with these systems left at Gasunie and the supplier. In addition, a number of crucial components for odorant injection control and monitoring units and station computers have become obsolete over the past few years, including the display and controllers.	

Continued on next page

Information on major investment projects (look ahead to 2024-2033) continued previous page

Information on major investment projects (look ahead to 2024-2033)	
I. Alternative assessment (if not in realisation phase by 1/1/2024)	
No-action alternative	If we do nothing, components for odorant injection control and monitoring units and station computers will cease to be available in the short term. Currently, components are repaired and/or cannibalised from old systems, but this workaround will soon no longer be possible. The current odorant injection control and monitoring units and station computers are outdated and there is a great risk of these control units failing.
Alternatives	The following alternatives have been considered: 1. Replacing the current systems with a standard PLC solution 2. Replacing the current systems with new versions of the odorant injection control and monitoring units and station computers
Alternatives analysis (technical, financial and social effects)	Alternative 1 will see the odorant injection control and monitoring units and station computers at metering and regulating stations replaced with a standard process automation solution consisting of a PLC with standard software. This means having to maintain only one type of operating system within the population of metering and regulating station systems. This system is also used at stations that were redeveloped previously. Alternative 2 will see odorant injection control and monitoring units and station computers at metering and regulating stations replaced with a new version. These new versions are copies of the current units and computers with similar features where some of the components have been replaced with newer ones. These new versions of the odorant injection control and monitoring units and station computers were developed as a temporary back-up solution in light of an anticipated large-scale replacement of odorant injection control and monitoring units and station computers as part of a metering and regulating station redevelopment programme. However, this programme has not materialised, and experiences in the field have shown that these new versions are not sufficiently stable to be rolled out on a large scale.
Support for the estimation of impacts of the alternatives	The assessment of the alternatives looked mainly at each alternative's technical robustness and the effort required for management and maintenance.
Rationale for selection of proposed alternative	The preferred alternative is alternative 1. The work consists of replacing the odorant injection control and monitoring units and station computers with a standard process automation solution based on a PLC platform. This system is already in use on a broad scale across Gasunie, making it a valid alternative, also because: • It uses existing spare parts. • Aspects such as training, IT security, and remote access are already set up and require no further attention. • Only one single type of operating system has to be maintained within the population of metering and regulating station systems. • The metering and regulating software application requires only a relatively short software development process.
Concerning missing information	This project is in the preparation phase. The stated budgets and spread over the years are expectations based on cost estimates from the functional design.

Colophon

Design
N.V. Nederlandse Gasunie, Groningen
In cooperation with LeinDizein Grafische Vormgeving

Publishing
Gasunie Transport Services B.V.
P.O. Box 181
9700 AD Groningen
The Netherlands

Telephone +31 50 521 22 50
E-mail: info@gastransport.nl
Internet: www.gasunietransportservices.com