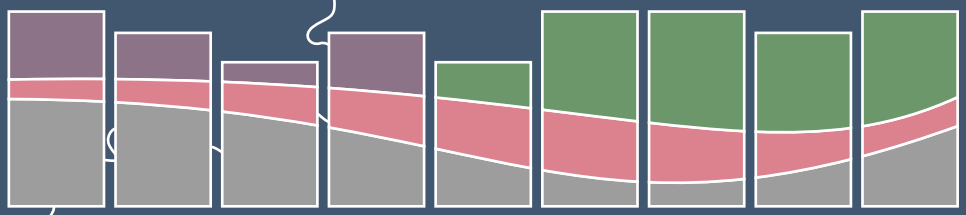
Ministry of Economic Affairs and Climate Policy

Pre-publication Chapter 4



Natural resources and geothermal energy in the Netherlands

Annual review 2020

4. Subsurface storage

4.1 Introduction subsurface storage

Subsurface storage is a particularly space-effective method for storing very large quantities of substances. Various forms of storage are possible in the Dutch subsurface. For example, storage in porous layers (e.g. the space between sand grains) of depleted gas fields and in aquifers or in constructed cavities, such as caverns in rock salt or mine galleries in coal seams.

These storage systems can be used as a temporary stock or buffer (such as for natural gas, hydrogen and nitrogen), but they can also be used for the permanent storage of substances (such as CO_2 and saline water).

A storage licence is required to store substances in the subsurface and the licence holder must have an approved storage plan. The storage plans provide information about the geological setting and the process of storage. In certain cases, the injection or the storage of substances into the subsurface is subject to a different legal regime than the Mining Act: for example, injecting nitrogen to prevent subsidence (De Wijk gas field) is part of the production plan. The injection of formation/process water as undesired co-produced substances reside under the environmental legislation.

In addition to the present storage facilities, the Dutch subsurface provides space for various new forms of sustainable energy storage. Future energy scenarios foresee an increasing demand for large-scale subsurface storages to buffer energy to match supply and demand. Energy carriers could be clean gasses obtained from electricity surplus from renewable sources or sustainable heat. The most concrete developments are hydrogen storage, compressed air storage (CAES), underground pumped accumulation (O-PAC) and high temperature heat storage (HT-ATES).

4.2 Overview licences

In 2020 there were no new applications for storage licences. As of January 1, 2021, nine storage licenses were in force. The storage licence P18-4 for CO_2 that has been granted is not yet in force. In 2020 the operator requested to postpone the start date to January 1, 2026.
An overview of all storage licenses can be found in Table 4.1, Overview I and Overview Q.

During several decades the seasonal variation in gas demand (winter/summer) was balanced by adjusting the level of gas production of the Groningen field. An important reason for this was that the small fields could be produced without being disturbed (as part of the small fields policy). As the pressure in the Groningen field decreased over time the flexibility of the Groningen field gradually declined accordingly. In order to maintain sufficient flexibility to be able to balance the fluctuation in gas demand and thus guarantee the security of gas supply, four underground gas storage facilities have successively been put into operation since 1997.

The storage facilities of Norg and Grijpskerk have served as a buffer for the Dutch gas system to cope with seasonal fluctuations in demand since 1997. With increased demand, particularly in the winter, extra natural gas is supplied from Norg and Grijpskerk. The storage facilities in Alkmaar and in Zuidwending are primarily to accommodate peak demands of one or more days. Together with the Bergermeer storage facility, which is primarily aimed at trading gas and operates on the gas market on its own initiative, five natural gas storage facilities (UGS – Underground Gas Storage) are currently operational in the Netherlands.

The natural gas is stored in (former) gas fields, except in Zuidwending where storage takes place in salt caverns.

Table 4.1 Storage licences, onshore and offshore the Netherlands.

Licence	Awarded	Operator	Product	Status
Alkmaar	01-04-2003	TAQA	Gas	Effective
Bergermeer	08-01-2007	TAQA	Gas	Effective
Grijpskerk	01-04-2003	NAM	Gas	Effective
Norg	01-04-2003	NAM	Gas	Effective
Zuidwending	11-04-2006	EnergyStock	Gas	Effective
Twenthe-Rijn de Marssteden	02-10-2010	Nouryon Salt B.V.	Oil	Effective
Winschoten II	15-11-2010	Gasunie (GTS)	Nitrogen	Effective
Winschoten III	15-11-2010	Nouryon Salt B.V.	Nitrogen	Effective
Andijk	12-12-2019	PWN	Saline water	Effective
P18-4	20-07-2013	TAQA	Carbon dioxide	Awarded

Figure 4.1 shows the volume of natural gas discharged from the 5 underground storage facilities from 2003 to 2020. From 2015 the used capacity of the storage in Norg has risen sharply after the production and swing capacity of Groningen was reduced.

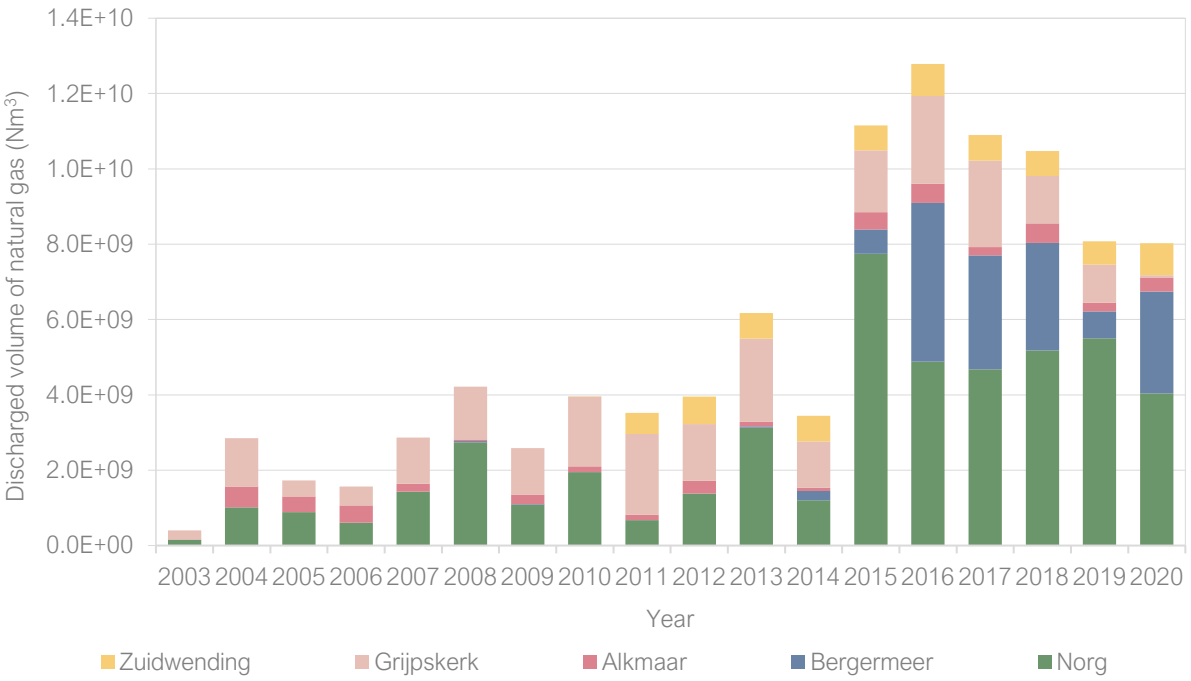


Figure 4.1 Discharged volume of natural gas per UGS from 2003 to 2020.

In addition to the underground storage facilities for natural gas, liquefied natural gas (LNG) is stored in tanks at surface at terminal on the Maasvlakte. This terminal, owned by Gasunie and Vopak, also plays a role in gas supply in times of high peaks in gas demand, for example on very cold winter days.

In the Netherlands, the subsurface is used for the storage of other substances as well. This concerns, for example, the salt caverns that are used for the storage of nitrogen and oil. In Twente (Twenthe-Rijn de Marssteden storage licence) a strategic oil supply is stored in one of the salt caverns, while in Winschoten (Heiligerlee) nitrogen used to convert high-calorific gas to low-calorific Groningen quality gas is stored.

There are advanced plans to use depleted offshore natural gas fields in the coming years to provide significant capacity for the permanent storage of CO_2. A storage licence has already been granted for the depleted gas field P18-4, which is located just off the coast of South-Holland, but it is not yet in force. The licence for P18-2 is applied for in 2021.

The Andijk storage licence is intended for the permanent storage of the filter residue formed during the purification of saline groundwater producing drinking water. This concentrated salt water is injected into a deeper groundwater package. Because this aquifer is deeper than 100 meters, this activity requires a storage licence under the Mining Act.

Two previous licence applications, one for the storage of salt filter residue and one for filler in an abandoned salt cavern, were withdrawn in 2020.

4.3 Subsurface storage in 2020

The monthly quantities of natural gas and nitrogen that were stored in the subsurface and consequently discgarched in 2020, are listed per licence in Table 4.2 to Table 4.5. The information has been provided by the license holders.

Table 4.2 Stored natural gas (in million Nm^3).

Licence	Operator	Total	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Alkmaar	TAQA	479	0	0	0	103	131	14	116	114	0	0	0	0
Bergermeer	TAQA	1,939	0	5	6	338	397	465	90	26	300	229	83	0
Grijpskerk	NAM	280	0	0	0	0	0	0	0	0	280	0	0	0
Norg	NAM	4,831	0	0	0	581	938	848	872	814	778	0	0	0
Zuidwending	Gasunie	933	16	32	62	118	59	72	69	87	124	112	101	83
Total		8,462	16	37	68	1,139	1,525	1,399	1,147	1,042	1,482	341	184	83

Table 4.3 Discharged natural gas (in million Nm^3).

Licence	Operator	Total	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Alkmaar	TAQA	372	0	0	331	0	0	0	0	0	0	0	29	13
Bergermeer	TAQA	2,704	1	208	456	0	0	0	258	272	27	200	235	1,047
Grijpskerk	NAM	64	2	0	0	0	0	0	0	6	0	11	17	29
Norg	NAM	4,039	1,020	1,131	533	47	0	0	0	0	2	383	255	666
Zuidwending	Gasunie	845	109	128	44	23	61	46	43	60	84	77	84	85
Total		8,023	1,132	1,467	1,364	70	61	46	302	338	114	670	620	1,840

Table 4.4 Stored nitrogen (in million Nm^3).

Licence	Operator	Total	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Winschoten II	Gasunie	59.3	11.6	2.1	0.8	3.6	4.7	6.3	7.7	2.8	2.8	2.4	6.6	7.9

Table 4.5 Discharged nitrogen (in million Nm^3).

Licence	Operator	Total	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Winschoten II	Gasunie	48.2	0.0	0.9	8.8	7.6	7.6	1.2	0.0	2.3	2.3	5.8	6.6	5.1

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