gasunie transport services

Schiphol, July 4th 2019

Additional measures and changed assumptions to minimise the Groningen production

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Legal framework - I

- Since January 1st 2019, GTS has the legal obligation to advice the Minister of Economic Affairs and Climate Policy regarding the Groningen production before February 1st of each year

- This advice concerns:
  - The required Groningen volume and capacity for the next gas year
    - Groningen volume in the form of a formula describing relation between temperature and volume ("Groningen graaddagenvergelijking")
  - The volume for the total L-gas market demand in the form of a formula comparable to the previous bullet
  - Outlook for the coming ten years regarding the
    - Required Groningen volume and capacity
    - Total L-gas demand and the demand of protected customers in the Netherlands
  - GTS is required to consult the planning assumptions with market parties

- After the gas year GTS has to report before November 1st of each year:
  - Usage of the blending facilities
  - Usage of storages and LNG
  - Green gas production

- Finally, during the gas year, GTS has to report significant deviations in the availability of the relevant blending facilities and the gas market which could affect the required Groningen production

Legal framework - II

- Role GTS
  - Based on her legal task, GTS offers in the daily operation all available quality conversion capacity to the market parties
    - This includes all nitrogen facilities
    - Nitrogen planning assumptions are based on Reliability and Availability modelling
  - Offer and/or develop facilities to support the minimalization of the Groningen production
    - For example: the additional nitrogen facility at Zuidbroek
- Role NAM
  - Produce according to the “Vaststellingsbesluit”
    - “Graaddagenvergelijking”
    - Seasonal restrictions
  - GasTerra uses the G-gas means (Groningen, Norg and Alkmaar) to balance their portfolio within the restrictions of the “Vaststellingsbesluit”
- Role market parties
  - Responsible for balancing own portfolio

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Planning “vaststellingsbesluit”

1. Advice GTS: required Groningen production/capacity (February 1st)
2. NAM: Draft operational strategy (6 wk)
3. Advice period for legal advisors (6 wk)
   - SodM, TNO, Mijnraad and local authorities
4. Ministry EA: Draft concept “vaststellingsbesluit” (6 wk)
5. Ministry EA: Publication concept “vaststellingsbesluit” (1 wk)
6. Consultation period (6 wk)
7. Ministry EA: Draft final “vaststellingsbesluit” (6 wk)
8. Ministry EA: Publication final “vaststellingsbesluit” (1 wk) before October 1st

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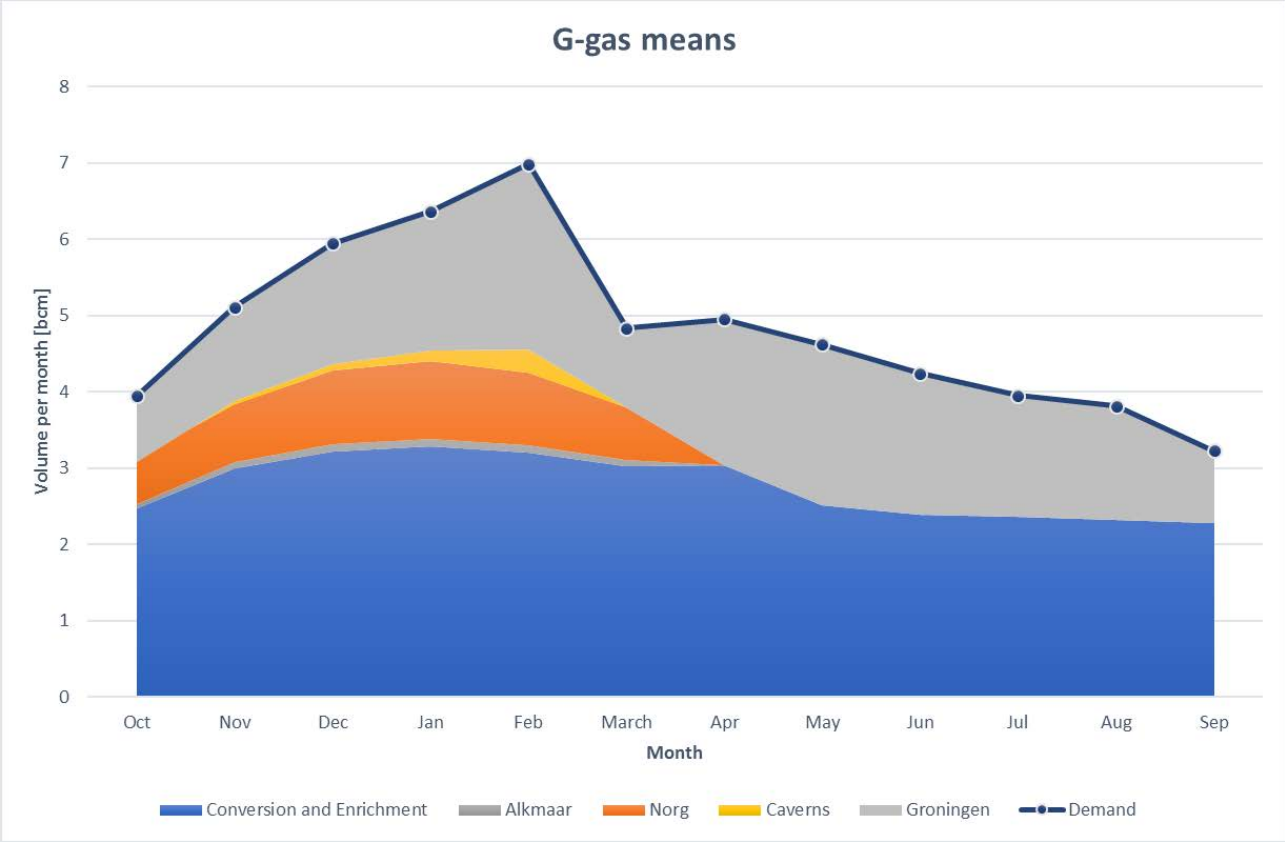
Modelling required Groningen volume
(simplified)



Example: gas year 2018/2019, without additional nitrogen, 92.5% and Groningen gas via Norg and OSZ

Assumptions: Demand

- Realized hourly temperature profiles
  - Gas year 1988/1989 until 2017/2018
  - Last 30 temperature profiles at weather station de Bilt (KNMI)
  - In order to calculate severe but realistic scenarios
  - As required by the Dutch Gas Act

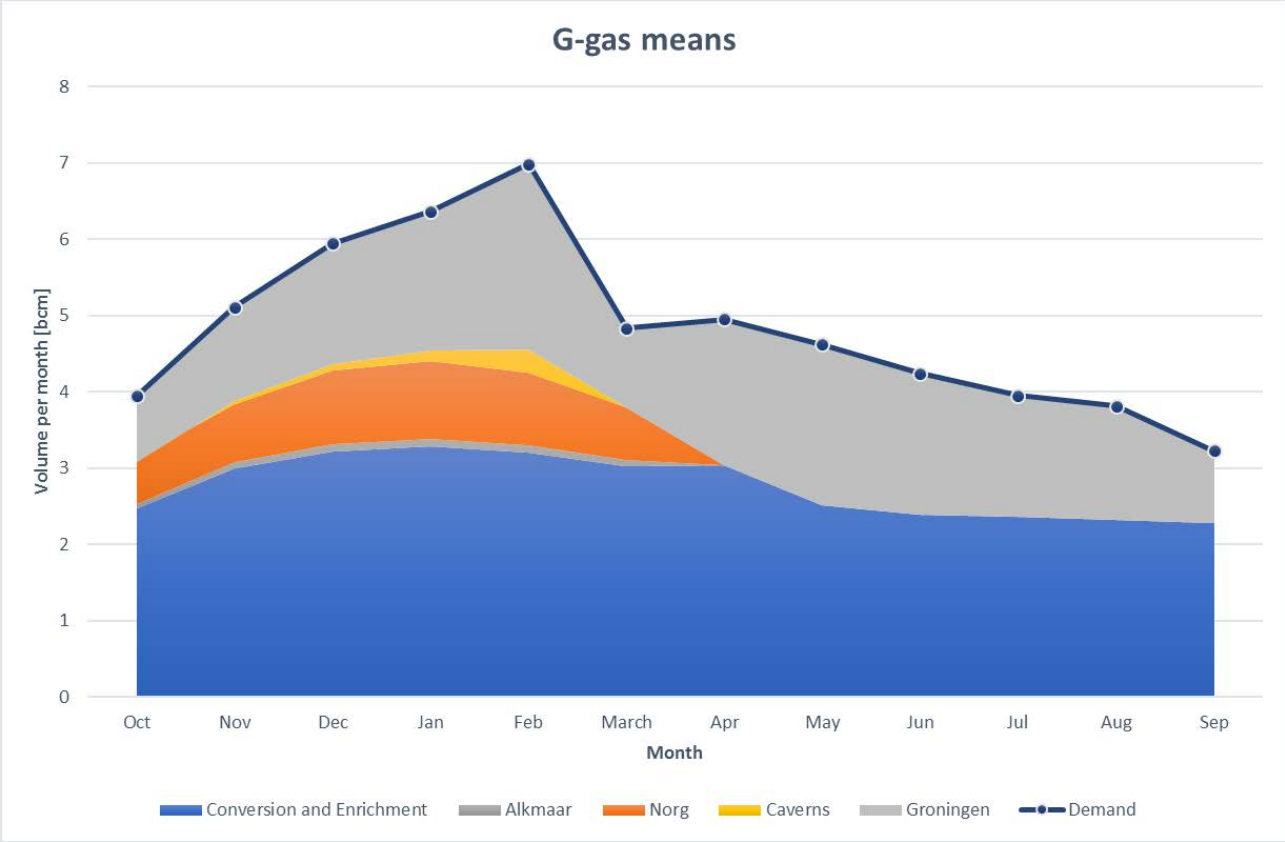
- Demand
  - Domestic consumption
    - NEV 2017
    - Conversion of nine largest L-gas industries/power plants to H-gas
  - L-gas export reduction of 10% per year (for all scenarios)
    - Belgium and France: based upon consulting L-gas TSO's
    - Germany: based upon USB2019 ("Umsetzungsbericht")

- The hourly demand is calculated by using the temperature from the temperature profile and the L-gas market demand formula. All hours together form the yearly needed volume

Assumptions: Supply

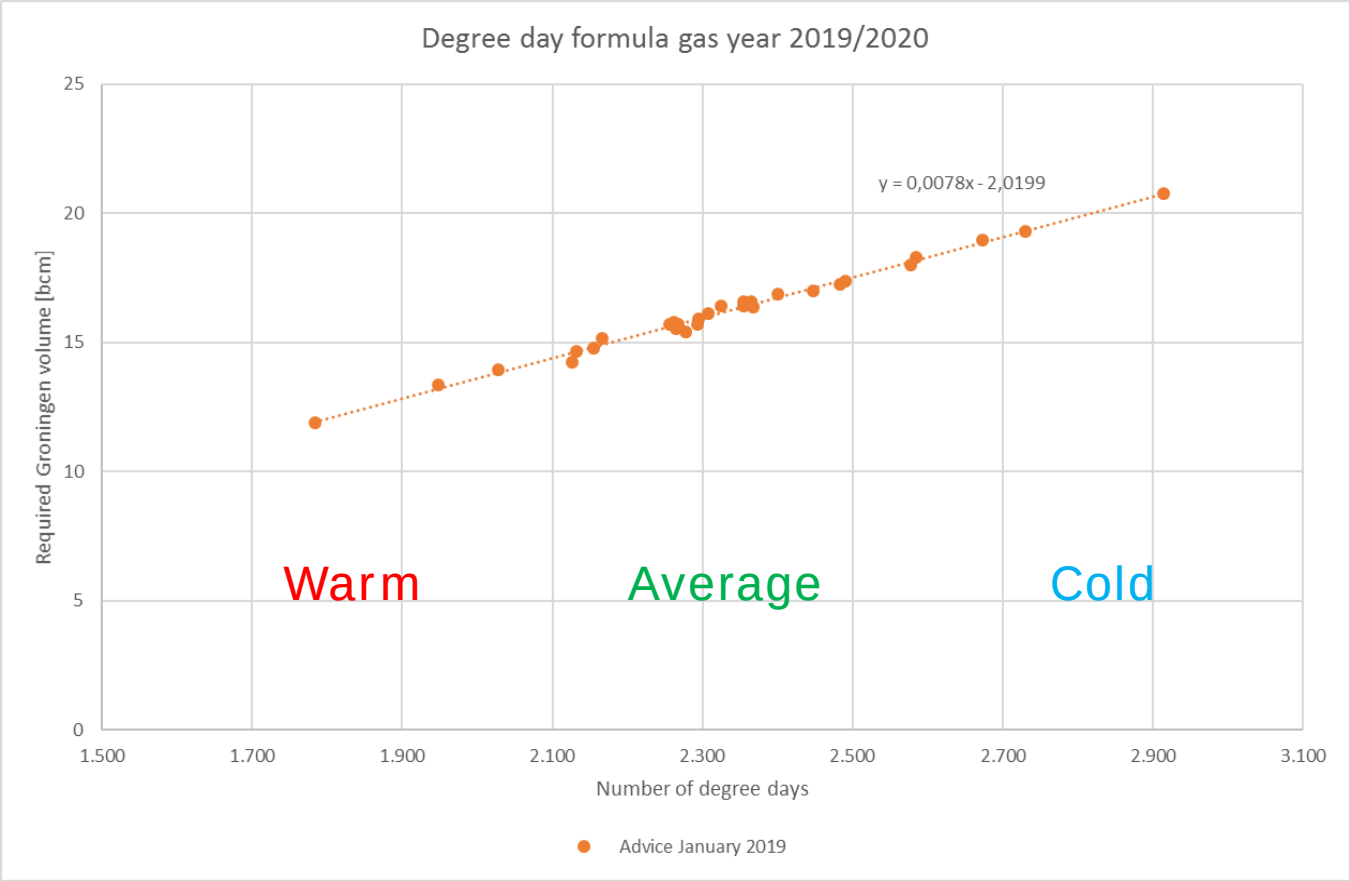
- Supply
  - Base load nitrogen facilities (100%)
    - Ommen (cap. 146,000 m^3/h N_2)
    - Wieringermeer (cap. 215,000 m^3/h N_2)
    - Additional purchase of nitrogen per January 1st 2020 (cap. 80,000 m^3/h N_2)
    - New nitrogen plant Zuidbroek per April 1st 2022 (cap. 180,000 m^3/h N_2)
  - Pernis (cap. 60,000 m^3/h N_2) and Heiligerlee (cap. 190,000 m^3/h N_2) are back-up facilities to guarantee the base load capacity
  - Norg and Alkmaar are available in all years and volume neutral by definition
  - Caverns are volume neutral by definition
    - As of gas year 2018/2019: 3 caverns available
    - 2 caverns available from gas year 2021/2022 onward
  - LNG-PS available for all scenarios and years
    - Capacity and volume depend on temperature during a gas year
  - Groningen is the balancing source in the merit order
- GTS determines the total necessary supply for gas from the Groningen system (Groningen, Norg and Alkmaar). GasTerra determines the individual distribution over Groningen, Norg and Alkmaar in order to be able to meet the instructions of the Minister concerning the variations in the Groningen production

Modelling required Groningen volume
(simplified)



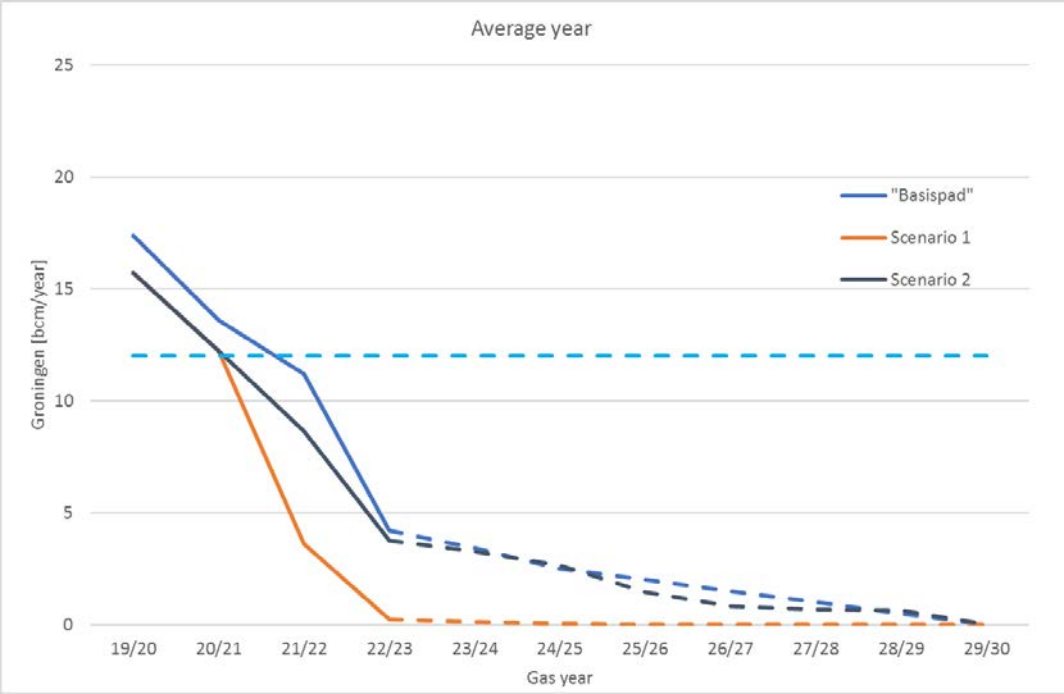
Example: gas year 2018/2019, without additional nitrogen, 92.5% and Groningen gas via Norg and OSZ

Temperature vs Groningen supply volume formula, January 2019



Advice GTS, January 31th 2019

Advice GTS January was an Groningen production of 15.9 bcm in gas year 2019/2020 (assuming a average temperature year)

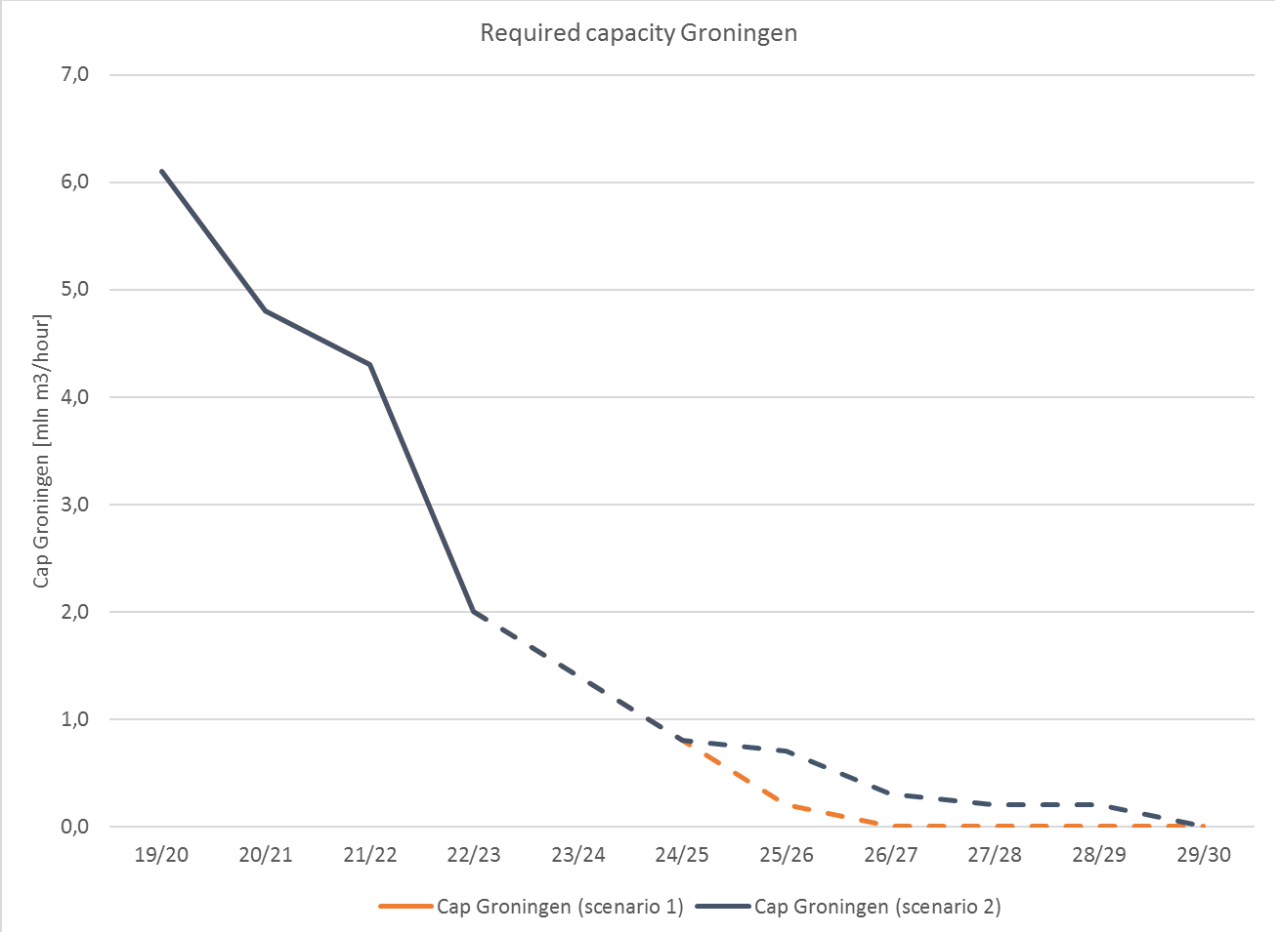


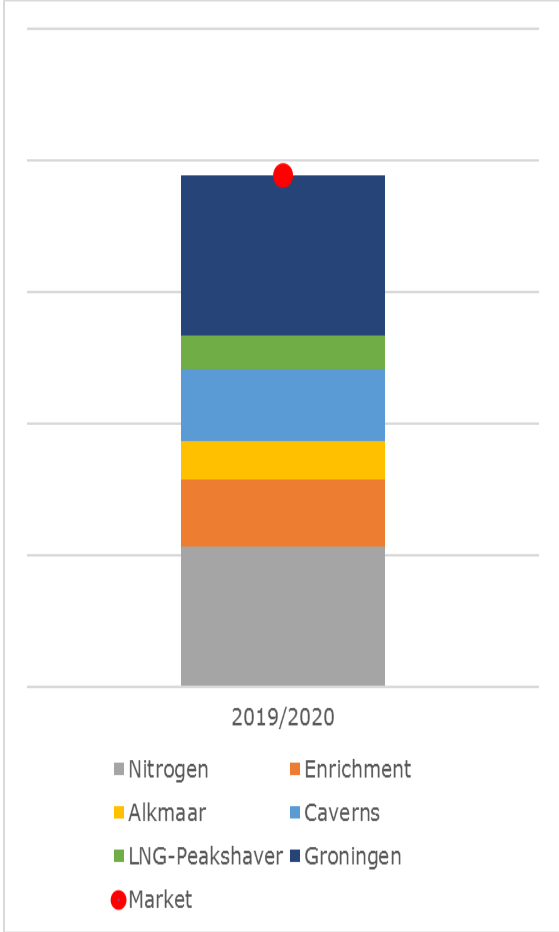
- "Basispad", Outlook Groningen production, March 2018
- Scenario 1, Oude Statenzijl and Norg supplied with pseudo G-gas, Advice January 2019
- Scenario 2, Oude Statenzijl and Norg supplied with Groningen gas , Advice January 2019

Capacity Groningen field

- Capacity Groningen
  - Required Groningen capacity based on European regulation, to safeguard the security of gas supply (25 Oct 2017, 2017/1938)
    Article 5 Infrastructure standard, clause 1:
    Each Member State or, where a Member State so provides, its competent authority shall ensure that the necessary measures are taken so that in the event of a disruption of the single largest gas infrastructure, the technical capacity of the remaining infrastructure, determined in accordance with the N – 1 formula as set out in point 2 of Annex II, is able, without prejudice to paragraph 2 of this Article, to satisfy total gas demand of the calculated area during a day of exceptionally high gas demand occurring with a statistical probability of once in 20 years. This shall be done taking into account gas consumption trends, the long-term impact of energy efficiency measures and the utilisation rates of existing infrastructure.
- Assumption:
  - Single largest infrastructure (capacity) = UGS Norg
    Once in 20 years is translated to a daily average temperature of -15.5°C
- Method:
  - Determine the market demand at a temperature of -15.5°C
  - Use all (including back-up) facilities at their technical capacity excluding UGS Norg and excluding Groningen
  - Use Groningen to close the gap between demand and supply

Required Groningen capacity





Scenario's 1 and 2 according to the advice of GTS in January 2019

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Earthquake Westerwijtwerd

- After the earthquake at Westerwijtwerd on May 22nd 2019, the State Supervision on the Mines (SODM) advised the Minister to reduce the Groningen production in gas year 2019/2020 to 12 bcm (for an average year)
- The Minister asked GTS to investigate the possibility to reduce the required Groningen production of 12 BCM for gas year 2019/2020
- In the preliminary advice of GTS to reduce the required Groningen production to 12 bcm in gas year 2019/2020, four measures were identified (GTS advice June 11th)
  1. Increase the nitrogen utilisation of Ommen and Wieringermeer to 100%
  2. Supply Oude Statenzijl with pseudo G-gas
  3. Supply UGS Norg with pseudo G-gas
  4. Fill UGS Norg with 1 bcm less than the amount that will be used in the winter 2019
- According to the Dutch Gas Act, GTS has to consult market parties when it gives an advice to the Minister
- GTS wants to use the consultation reactions in it's final advice towards the Minister in the second half of July

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Preliminary evaluation gas year 2018/2019

Estimation of the market

	Regional gas companies	Industrial end users	Germany	Belgium and France	Total market
Realisation	15	4	14.1	6.7	39.7
Model	15	3.9	14	7.1	40

- The output of our model (using temperature data until June 1st supplied by the KNMI) is compared with the realisations
- The results of our model correspond well with realisations
- GTS will update the model with the latest available data
- Until June 1st: 2001 degree days with an expected allowed Groningen production for gas year 2018/2019 of 17.9 bcm

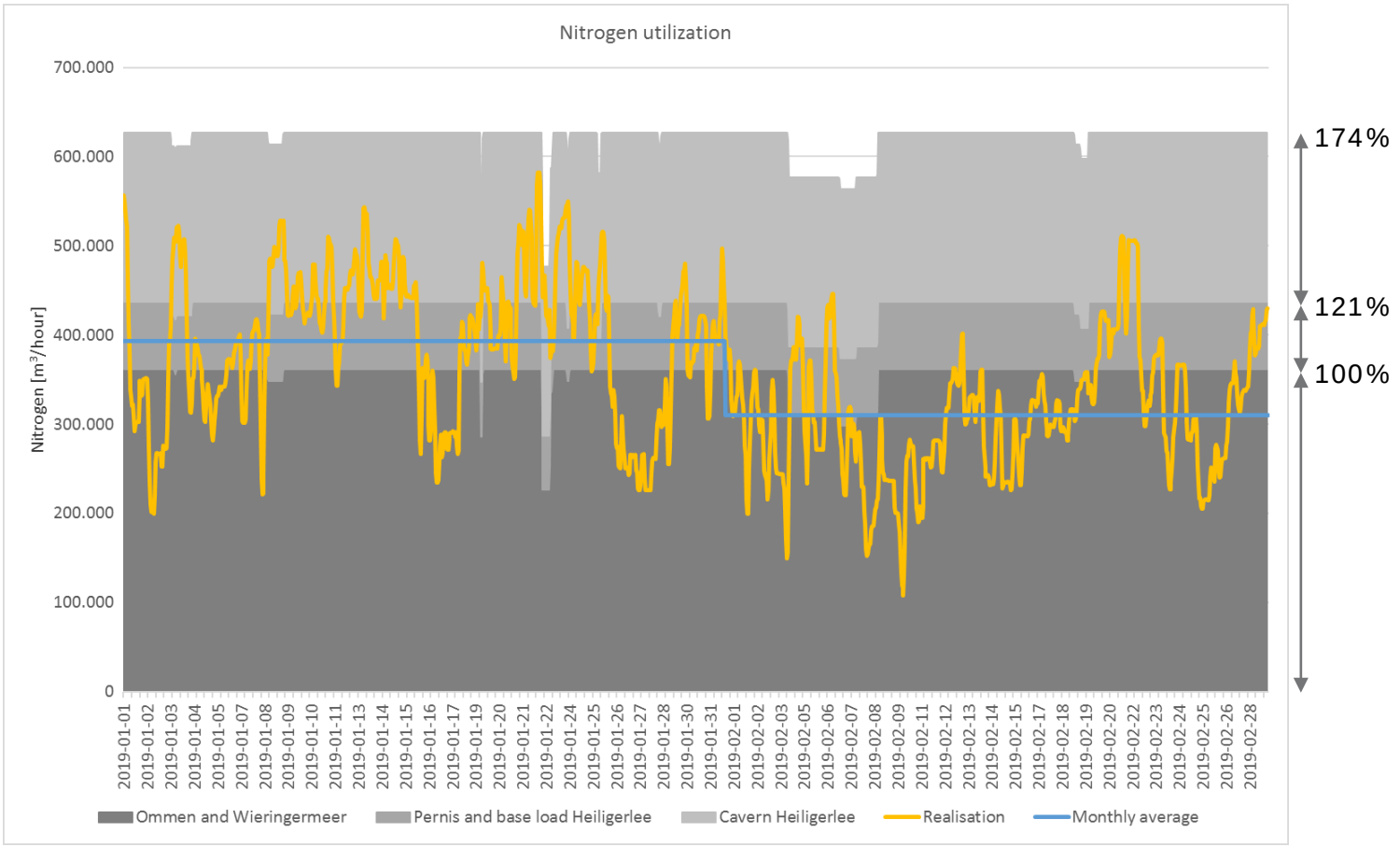
Preliminary evaluation gas year 2018/2019

Nitrogen utilization

Month	N2 Utilization [%]
October	86
November	94
December	106
January	109
February	86
March	89
April	100
May	109

- GTS offers all available nitrogen to the market parties
- The nitrogen utilization is a result of the behaviour of market parties
- Utilization above 100% means that the back-up facilities (Pernis and Heiligerlee) have been used by the market parties
- “Groningen graaddagenvergelijking” applicable from November 15th
- February and March high utilization of storage Norg
- Overall nitrogen utilization above 97% (volume weighted)

Nitrogen utilization: January-February



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Adjusted planning assumptions/measures

- Adjustment of the available average nitrogen percentage
  - Based on the market behaviour of this gas year, it is our judgement that the market is able to reach 100% average utilization of nitrogen
  - GTS is able to facilitate the market with 100% nitrogen on average
    - Back-up volume of 1.5 bcm is almost never used
  - We therefore propose to increase the average nitrogen utilization to 100% instead of 92,5%
  - This will result in a higher production of pseudo L-gas and thus a lower required Groningen production
  - With same behaviour of market parties we do not expect to issue more instructions (flow orders)
- Further measures:
  - With the higher available nitrogen, we are able to accelerate the measures which were already identified:
    - Provide Oude Statenzijl with pseudo G-gas (small measures by GTS)
    - Fill UGS Norg with pseudo G-gas (no measures by GTS)

Effect on the Groningen production

Measures	**Savings in Groningen production [bcm] (within brackets: resulting Groningen production in an average year)**
Starting point: January recommendation for an average year	15.9
Increase nitrogen from 92.5% to 100%	-1.5 (14.4)
Oude Statenzijl to pseudo G-gas (+100%)	-2.3 (13.6)
Fill Norg with pseudo G-gas (+100%)	-2.9 (13.0)
Both measures (+100%)	-3.1 (12.8)

- Additionally: once-off measure, use 1 bcm of working gas volume of Norg to supply the market. The reason for this measure is to be able to reduce the required Groningen production below 12 bcm
- The new measures will increase the seasonal fluctuations (between summer and winter), so an advice SodM concerning influence on safety will be required

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Consultation question

- The GTS model is being validated by an external party on request of Parliament

- We would like to ask your opinion/feedback on all planning assumptions, however we ask you to pay special attention to the changes:
  - Planning assumption: increase of average nitrogen utilization from 92.5% to 100%
  - Measures:
    1. Supply Oude Statenzijl with pseudo G-gas
    2. Supply UGS Norg with pseudo G-gas
    3. Fill UGS Norg with 1 bcm less than the amount that will be used in the winter 2019

Consultation Process

- Start consultation
  - June 27th 2019, GTS sent the letter of our latest advice and the slide pack discussed today
- Workshop
  - July 4th 2019, GTS presents the planning assumptions to market parties
- Consultation end
  - July 10th 2019, last day for market parties to give their written view
- Written views will be taken into account in the final advice towards the Minister
  - GTS advice finalized in the second half of July