GEOTHERMICA

HEATSTORE

HIGH TEMPERATURE UNDERGROUND THERMAL ENERGY STORAGE (HT-UTES)

KNOWLEDGE SHARING AND MONITORING MEETING, 28. OCTOBER 2020

PER ALEX SØRENSEN & DANIEL TRIER, PLANENERGI

heatstore

High Temperature Underground Thermal Energy Storage

ROLE OF PLANENERGI IN HEATSTORE

- Contribution with State of the art and General specifications and design for Danish BTES and PTES (Brædstrup, Marstal and Dronninglund) in D1.1 and D1.2 (https://www.heatstore.eu/downloads.html)
- Benchmarking and improving models of subsurface heat storage dynamics (Calculation of BTES and PTES using TRNSYS software). Report ready
- PlanEnergi contributes with monitoring data from Danish PTES and BTES sites and analyses efficiency compared to model estimates in the design phase.
- Record of best practise stakeholder engagement (ready end 2020)
- Contributions to Roadmap for flexible energy systems with UTES in Europe (ready end 2020?)

MONITORING RESULTS

- STORAGE TYPE: PTES
- LOCATIONS: MARSTAL, DRONNINGLUND, GRAM
- PERIOD: SINCE LAST MEETING IN JUNE 2019

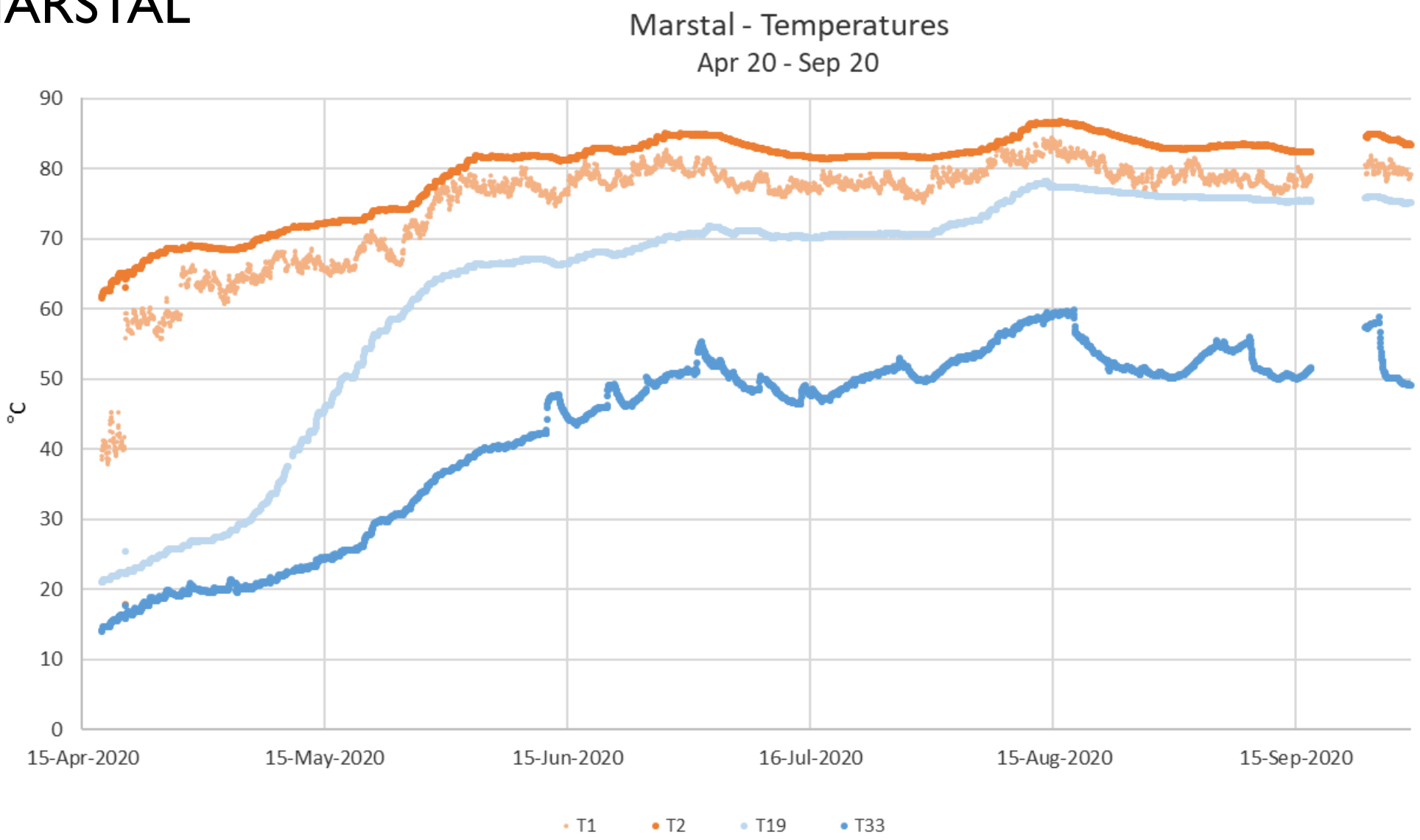
- DEFINITIONS:
  - Qin Energy supply to storage
  - Qout Energy extracted from storage
  - ΔQint Change in internal energy over period
  - Energy unit: MWh
  - Temperature unit: °C

MARSTAL

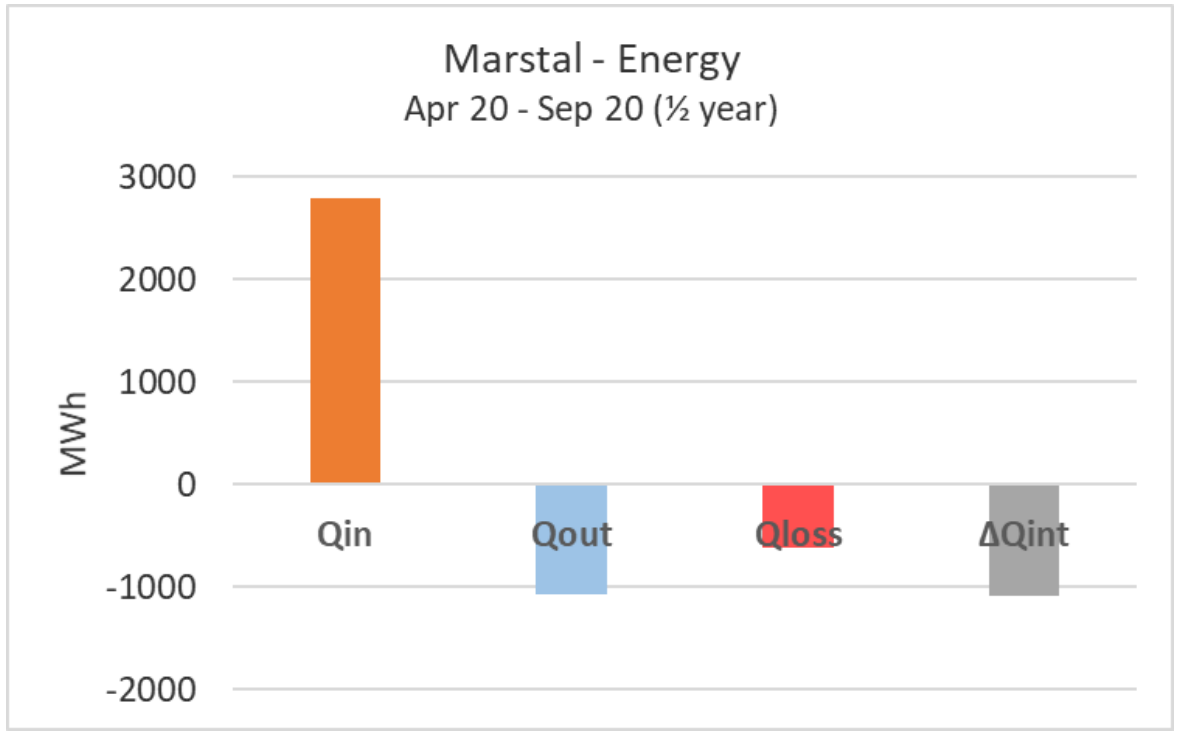
- DATA CHALLENGES:
  - ”Heavy maintenance” during 2019
  - New lid from May 2020
  - Charging already in March 2020
  - Currently no functioning monitoring data gathering and processing

- PERIOD WITH RELEVANT DATA:
  - ~ ½ year, mid April – end of September

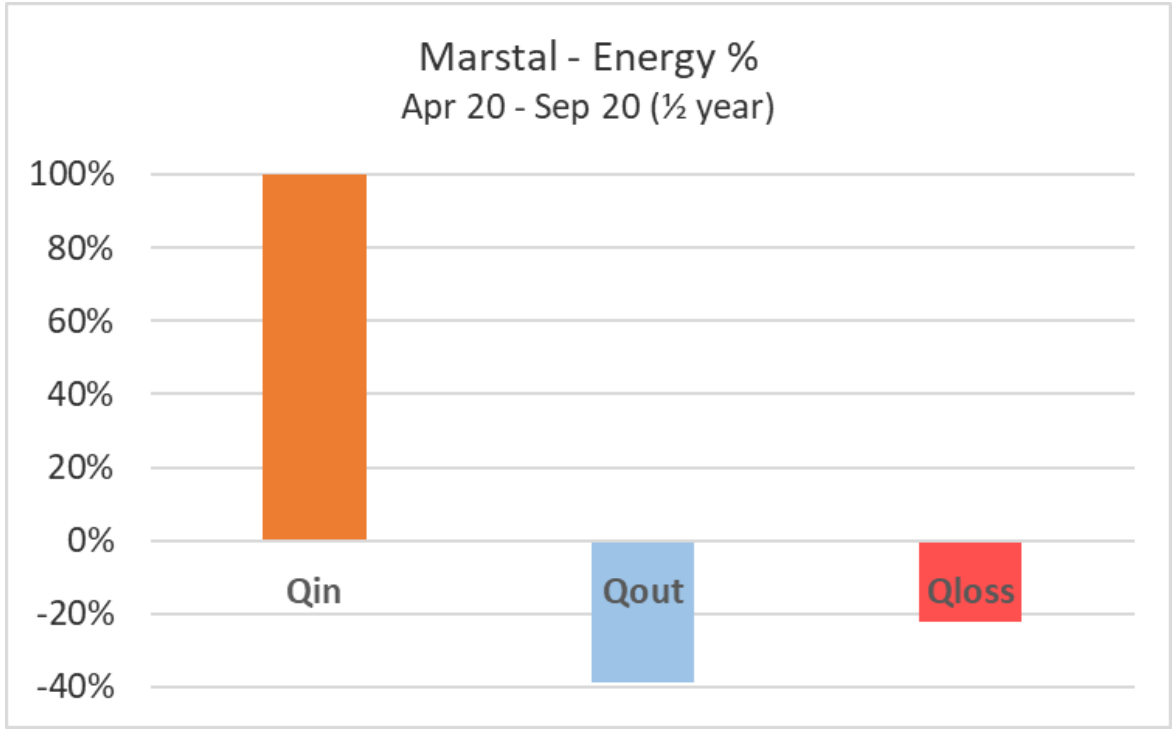
MARSTAL


Marstal - Temperatures
Apr 20 - Sep 20
°C
90
80
70
60
50
40
30
20
10
0
15-Apr-2020
15-May-2020
15-Jun-2020
16-Jul-2020
15-Aug-2020
15-Sep-2020
T1
T2
T19
T33

MARSTAL



- Qin Energy supply to storage
- Qout Energy extracted from storage
- Qloss Energy losses
- ΔQint Change in internal energy over period



- No. of storage cycles: 0.2
- 22% losses
- 39% energy out
- 39% internal energy increase

(Only 6 months!)

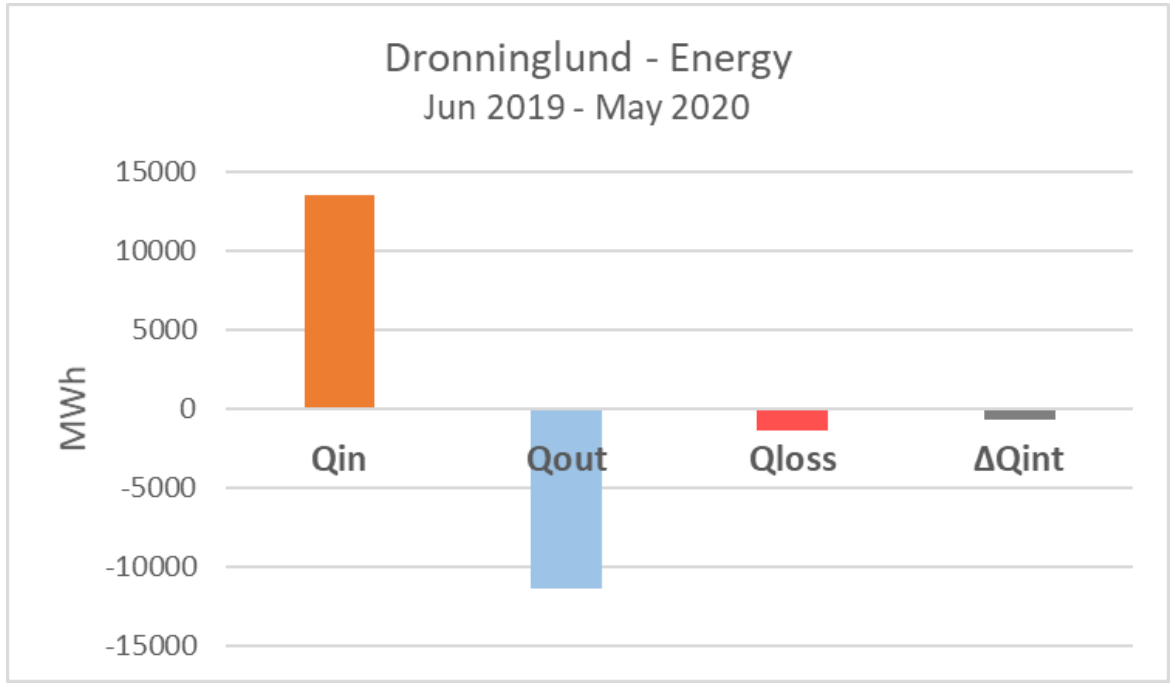
DRONNINGLUND

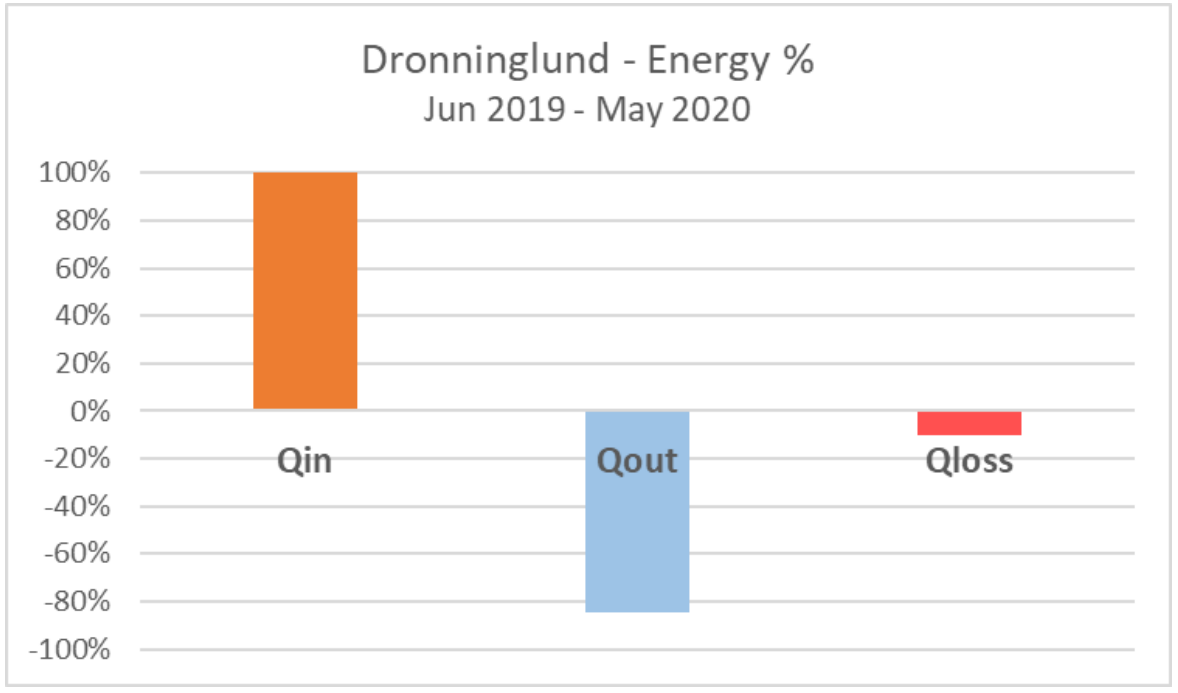
- DATA CHALLENGES:
  - No critical issues

- PERIOD WITH RELEVANT DATA:
  - June 2019 – May 2020 (one full year continued from previous meeting)
  - ...or June 2019 – September 2020...

DRONNINGLUND

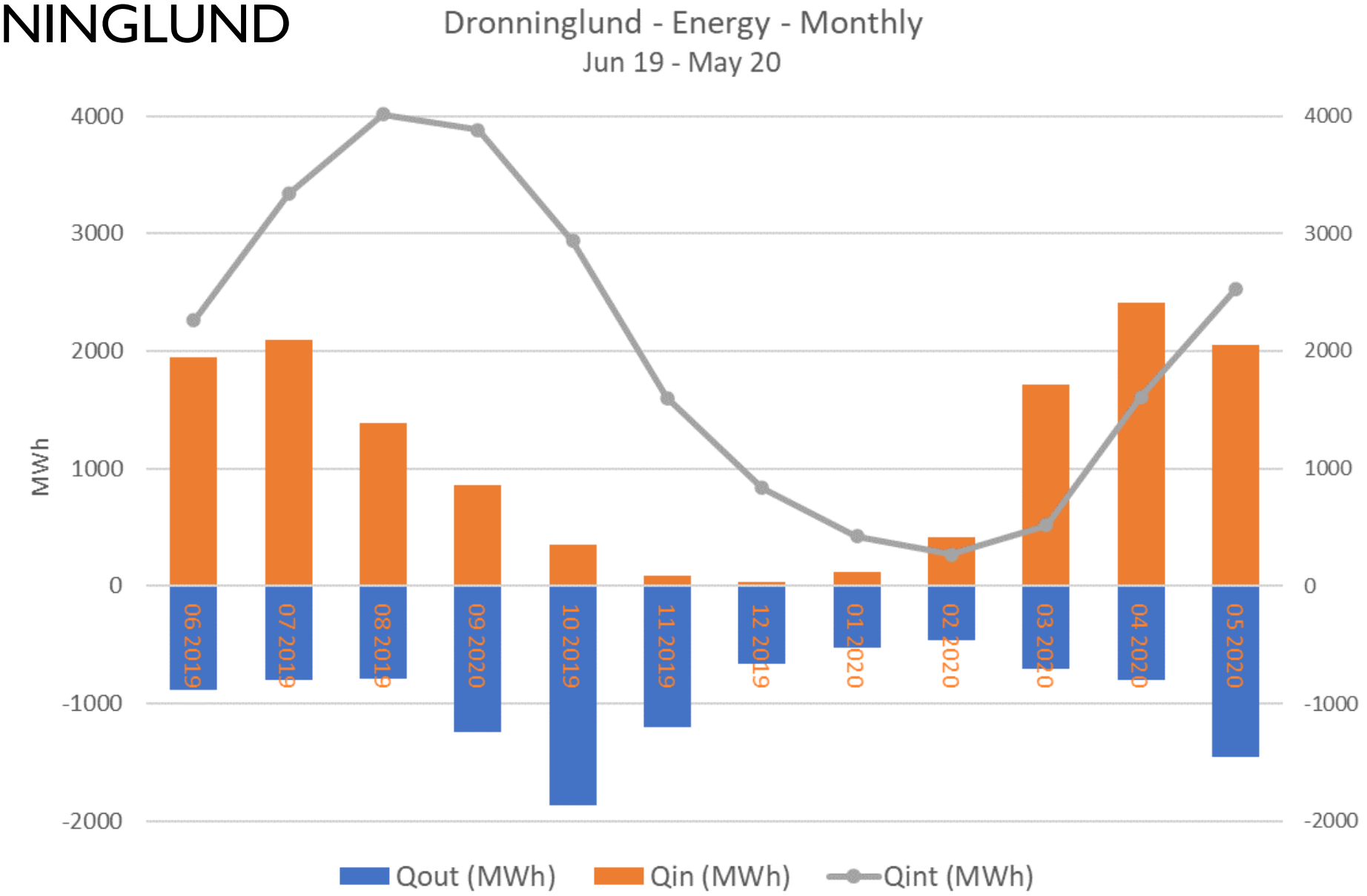
- Qin Energy supply to storage
- Qout Energy extracted from storage
- Qloss Energy losses
- ΔQint Change in internal energy over period



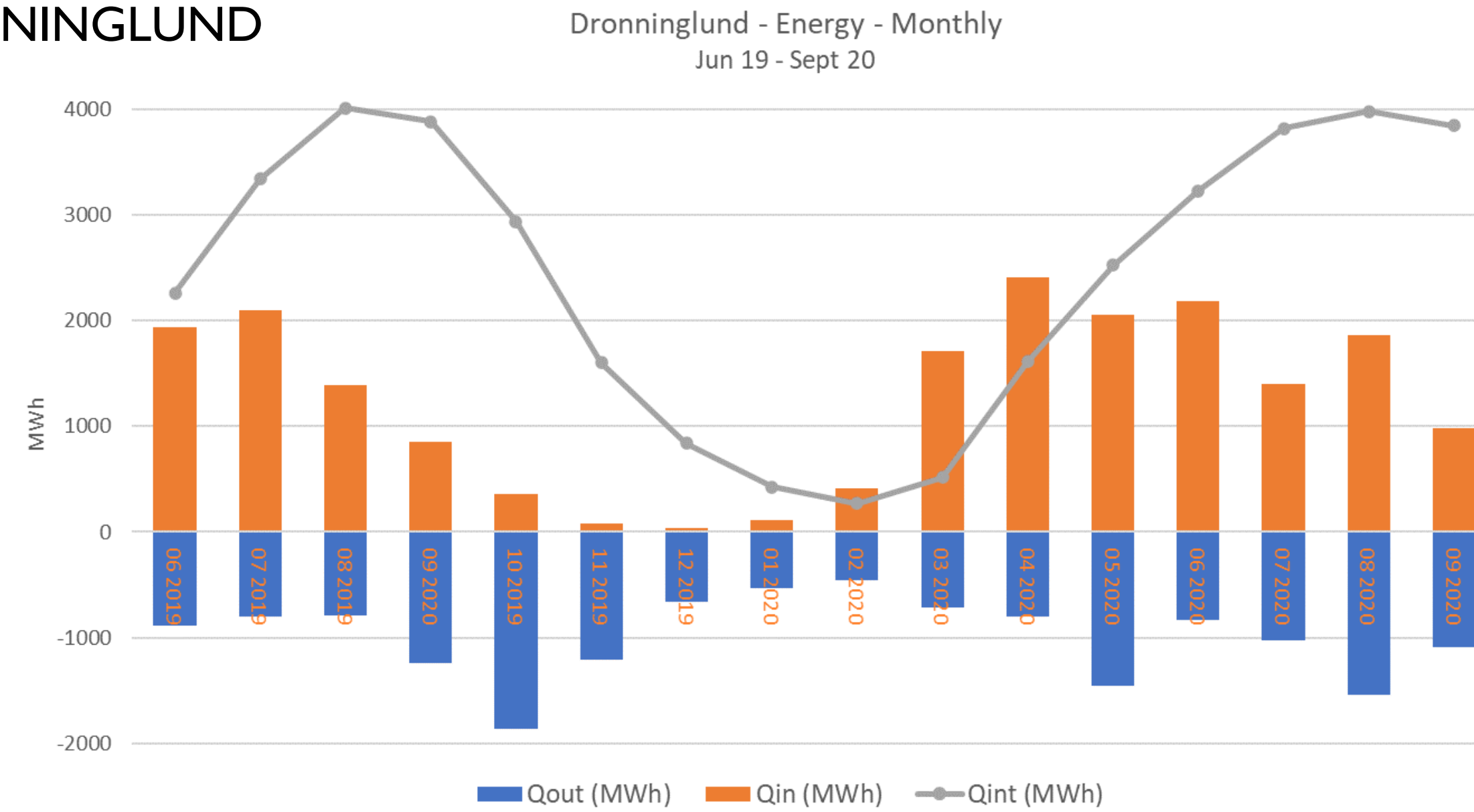


- No. of storage cycles: 2.0
- 10% losses
- 85% energy out
- 5% internal energy increase

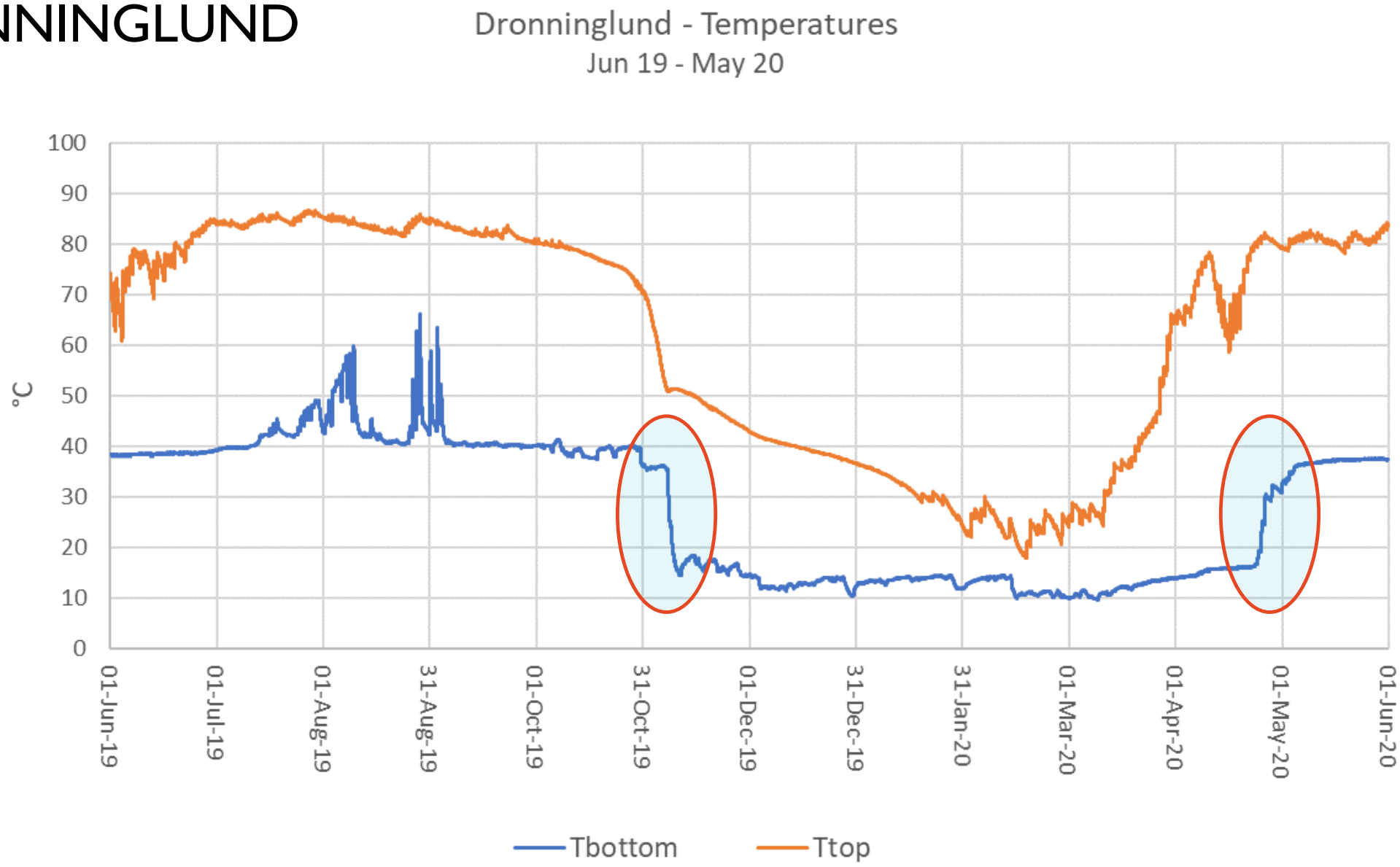
DRONNINGLUND



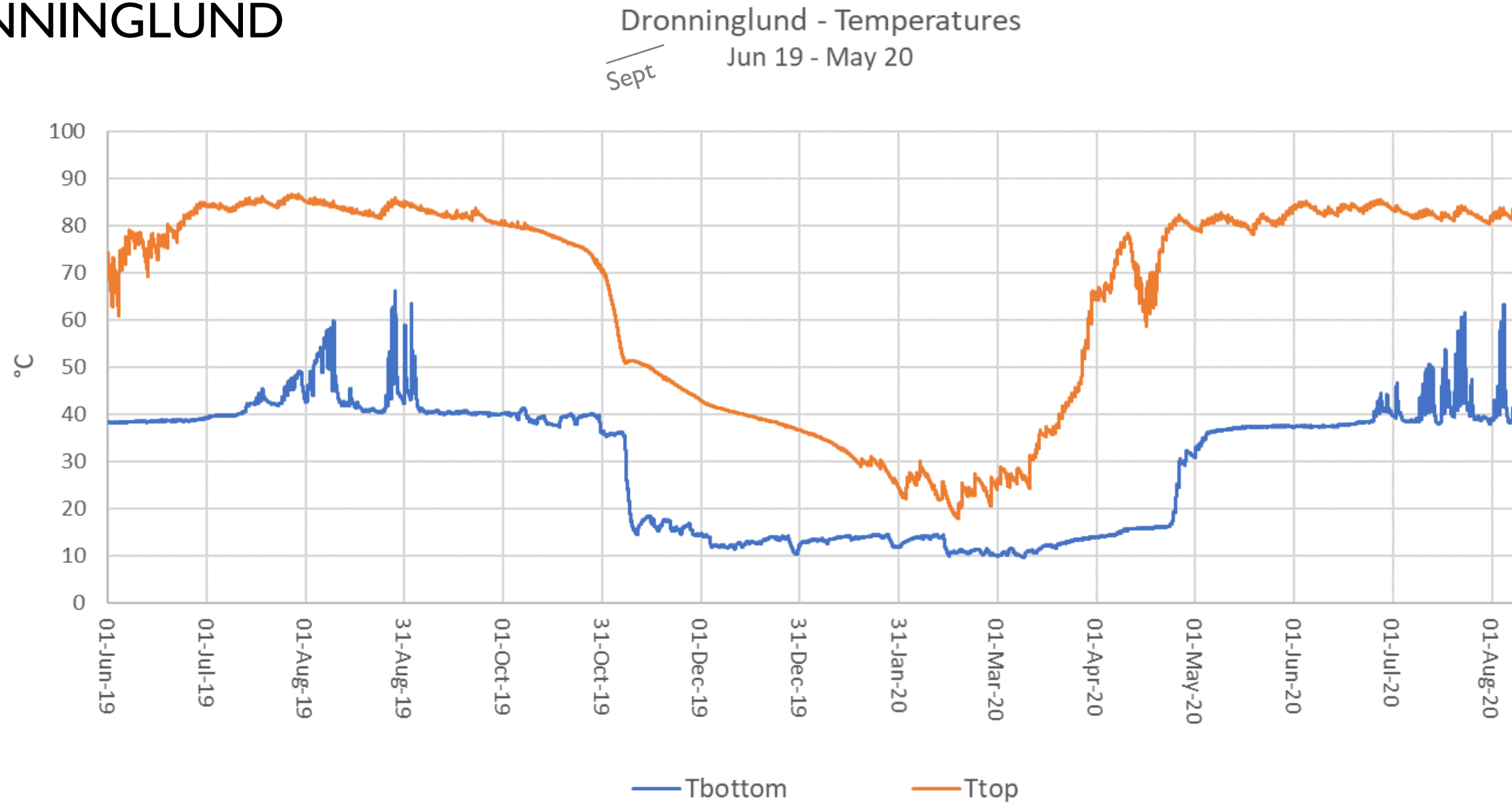
DRONNINGLUND



DRONNINGLUND



DRONNINGLUND

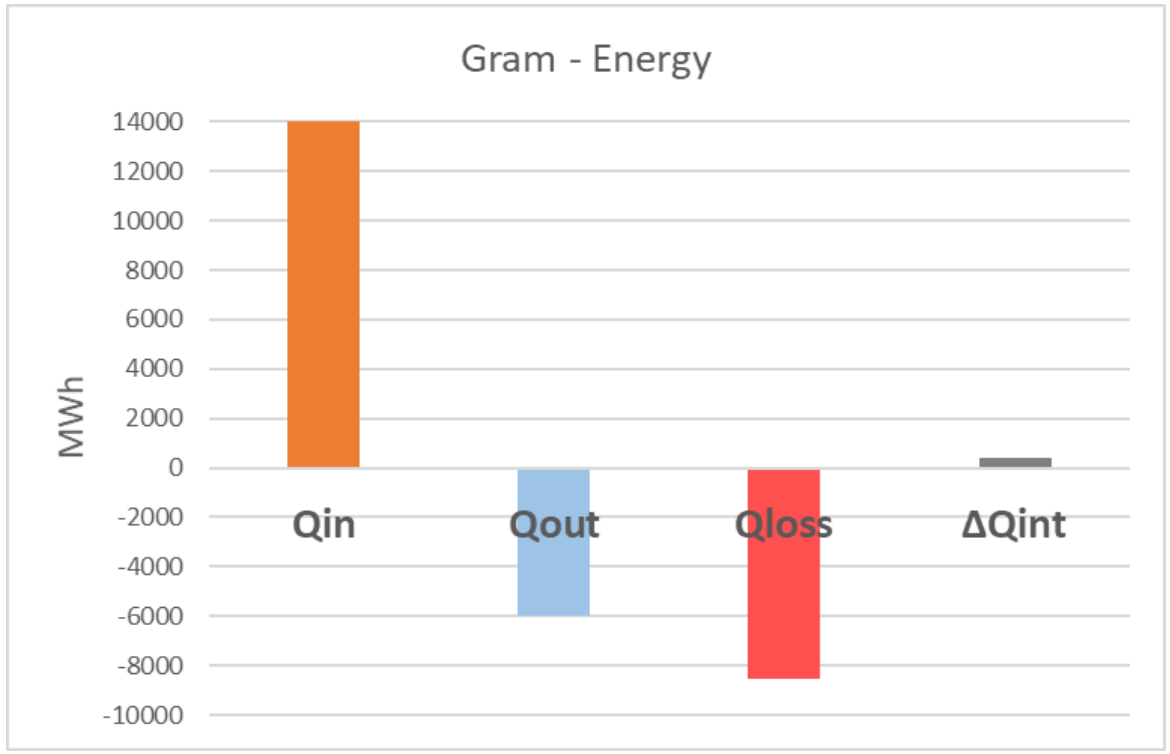


GRAM

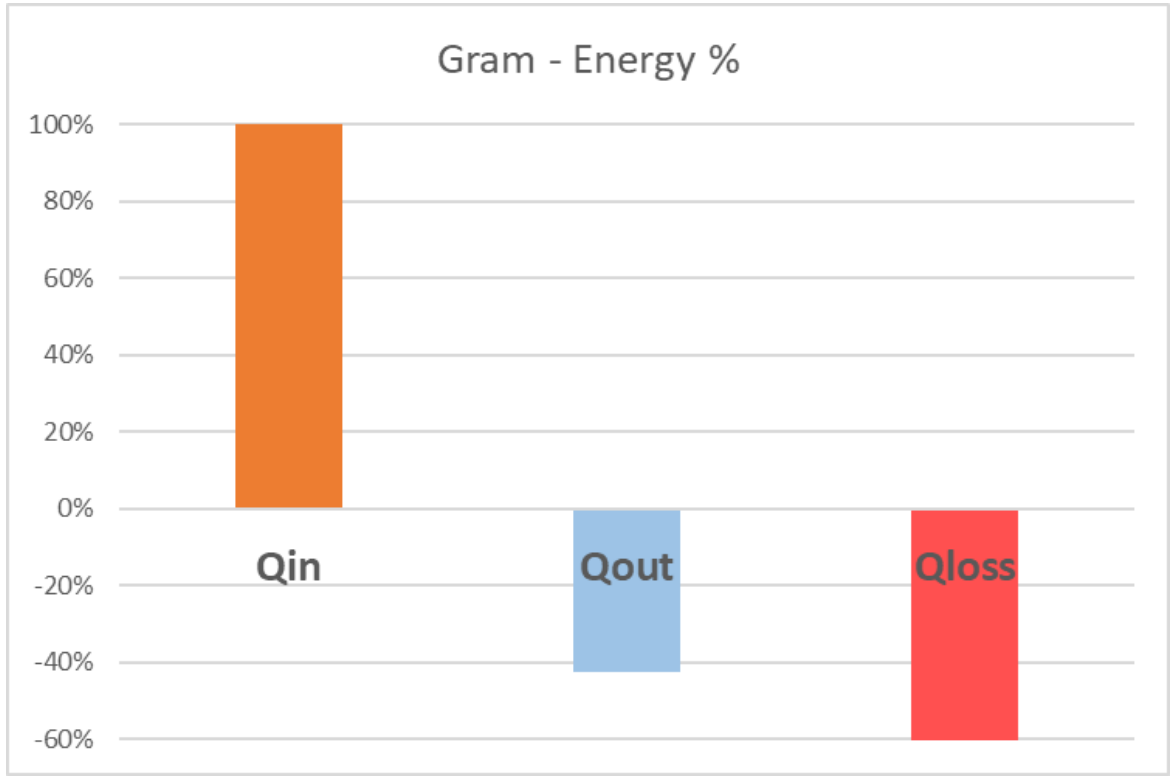
- DATA CHALLENGES:
  - Lid issues
  - Data monitoring errors

- PERIOD WITH RELEVANT DATA:
  - June 2019 – May 2020 (one full year continued from previous meeting)
  - (or June 2019 – September 2020)

GRAM

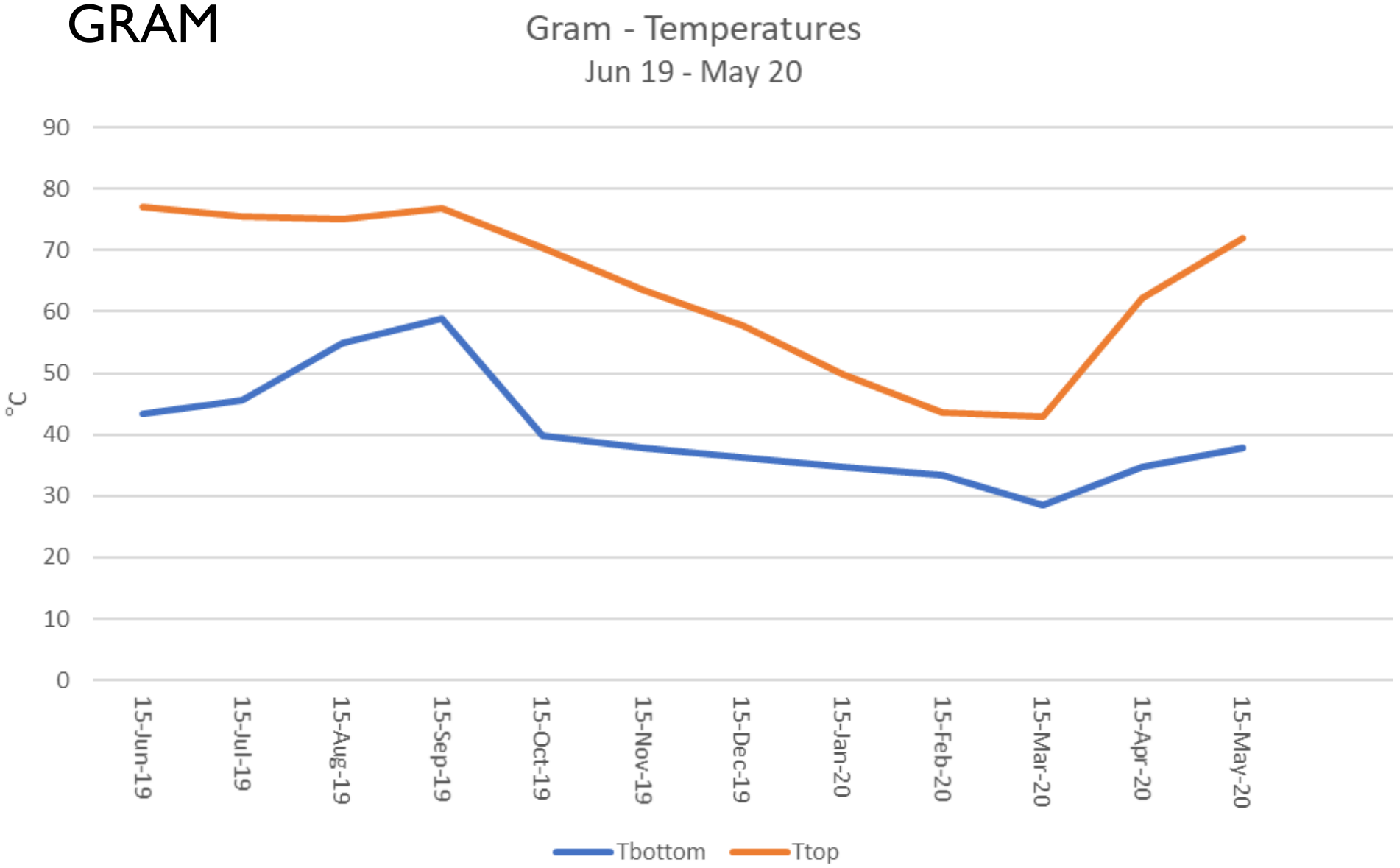


- Qin Energy supply to storage
- Qout Energy extracted from storage
- Qloss Energy losses
- ΔQint Change in internal energy over period

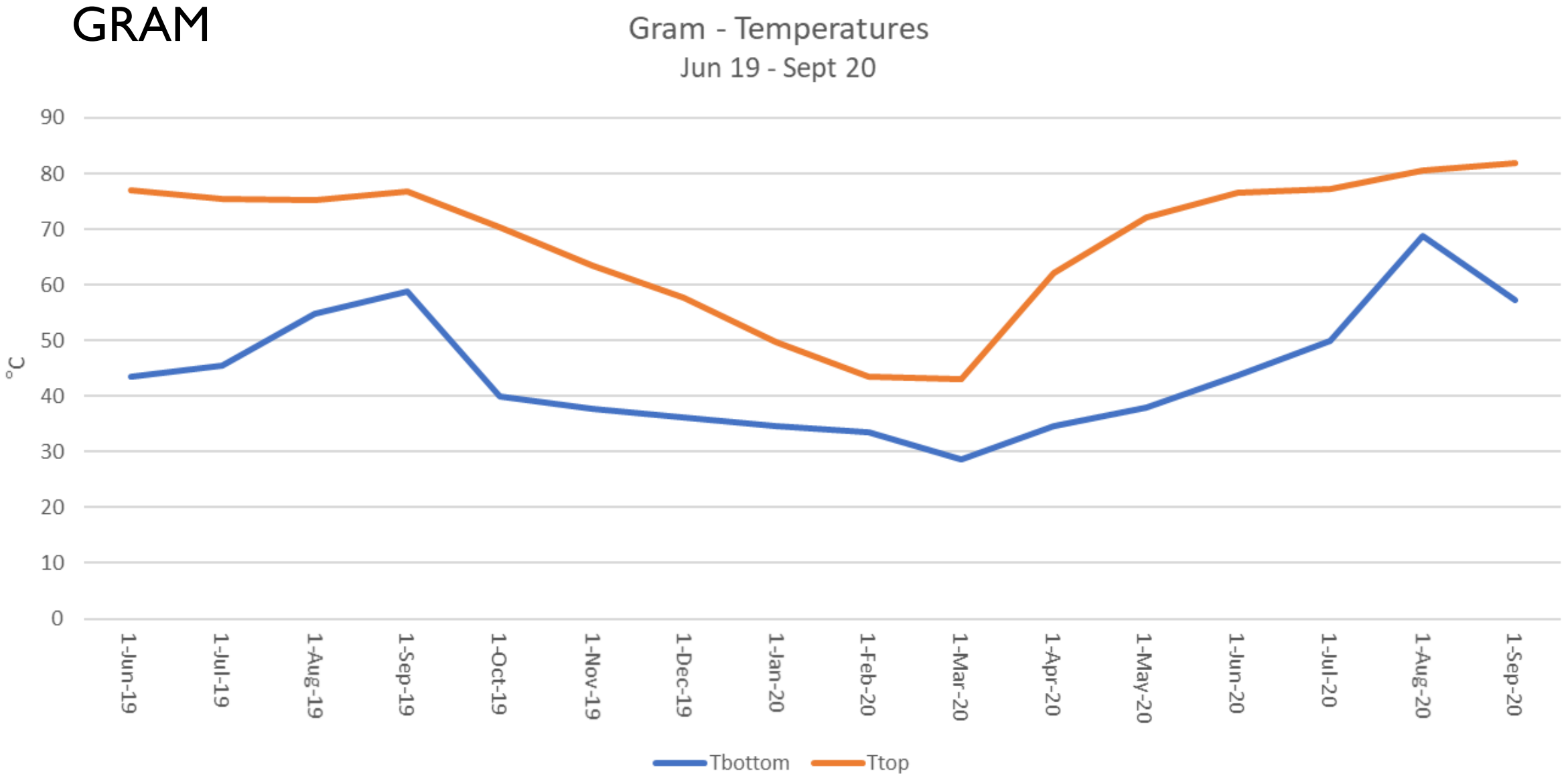


- No. of storage cycles: 0.6
- 61% losses
- 42% energy out
- 3% internal energy reduction

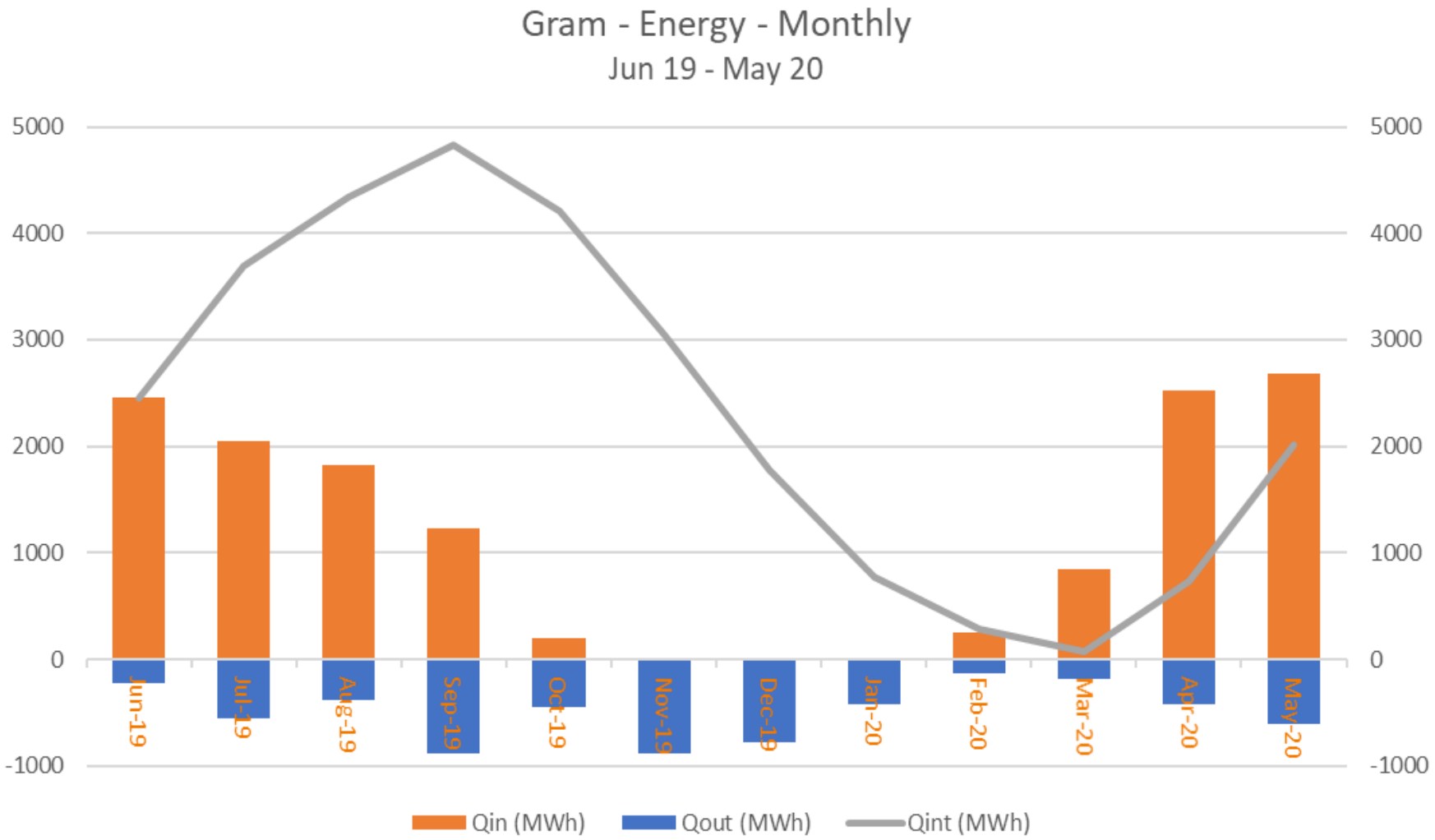
GRAM

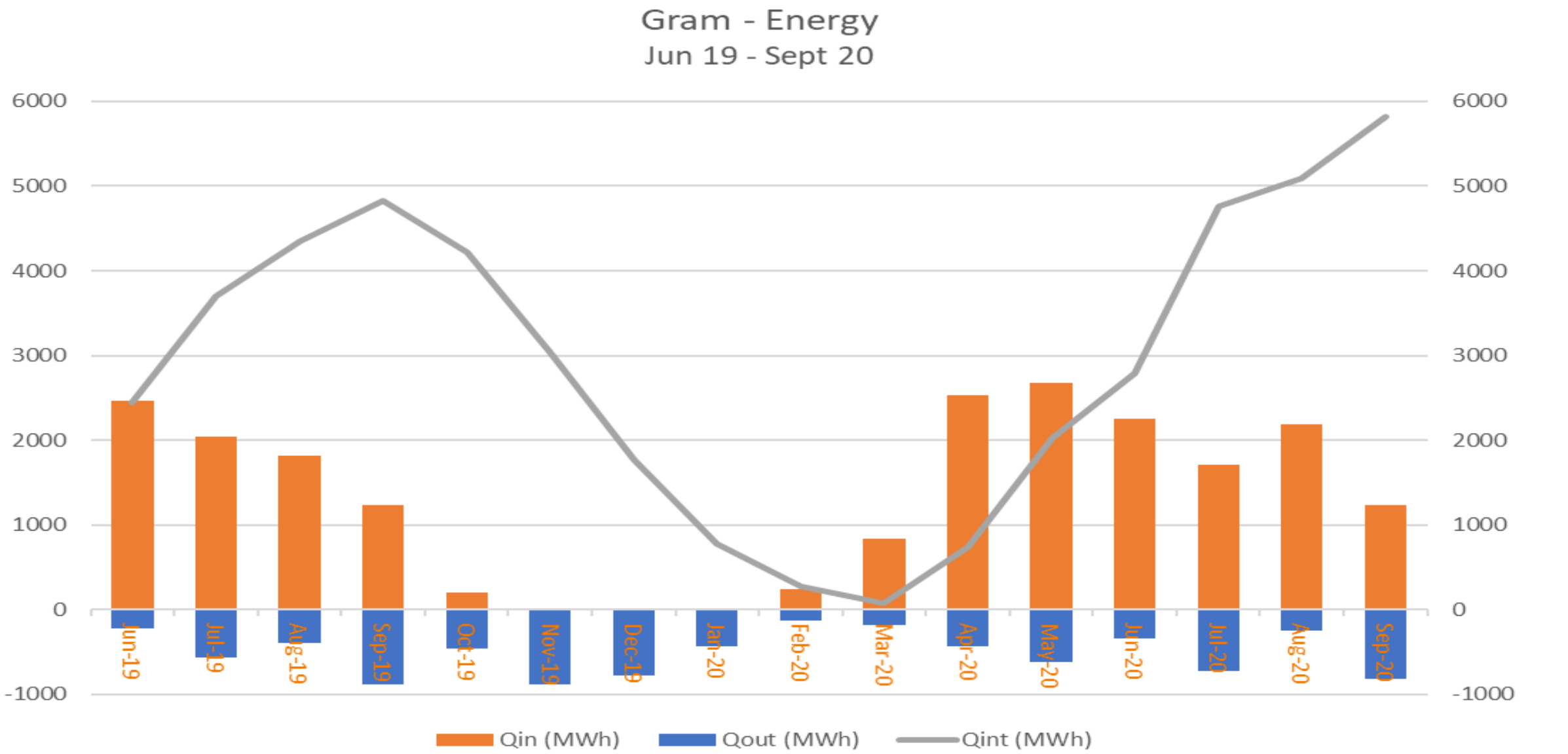

Gram - Temperatures
Jun 19 - May 20
°C
90
80
70
60
50
40
30
20
10
0
15-Jun-19
15-Jul-19
15-Aug-19
15-Sep-19
15-Oct-19
15-Nov-19
15-Dec-19
15-Jan-20
15-Feb-20
15-Mar-20
15-Apr-20
15-May-20
Tbottom
Ttop

GRAM


Gram - Temperatures
Jun 19 - Sept 20
°C
90
80
70
60
50
40
30
20
10
0
1-Jun-19
1-Jul-19
1-Aug-19
1-Sep-19
1-Oct-19
1-Nov-19
1-Dec-19
1-Jan-20
1-Feb-20
1-Mar-20
1-Apr-20
1-May-20
1-Jun-20
1-Jul-20
1-Aug-20
1-Sep-20
Tbottom
Ttop

GRAM


Gram - Energy - Monthly
Jun 19 - May 20
5000
4000
3000
2000
1000
0
-1000
Jun-19
Jul-19
Aug-19
Sep-19
Oct-19
Nov-19
Dec-19
Jan-20
Feb-20
Mar-20
Apr-20
May-20
Qin (MWh)
Qout (MWh)
Qint (MWh)


Gram - Energy
Jun 19 - Sept 20
6000
5000
4000
3000
2000
1000
0
-1000
Jun-19
Jul-19
Aug-19
Sep-19
Oct-19
Nov-19
Dec-19
Jan-20
Feb-20
Mar-20
Apr-20
May-20
Jun-20
Jul-20
Aug-20
Sep-20
Qin (MWh)
Qout (MWh)
Qint (MWh)

THANK YOU FOR YOUR ATTENTION

www.heatstore.eu

HEATSTORE (170153-4401) is one of nine projects under the GEOTHERMICA – ERA NET Cofund aimed at accelerating the uptake of geothermal energy by 1) advancing and integrating different types of underground thermal energy storage (UTES) in the energy system, 2) providing a means to maximise geothermal heat production and optimise the business case of geothermal heat production doublets, 3) addressing technical, economic, environmental, regulatory and policy aspects that are necessary to support efficient and cost-effective deployment of UTES technologies in Europe. The three-year project will stimulate a fast-track market uptake in Europe, promoting development from demonstration phase to commercial deployment within two to five years, and provide an outlook for utilisation potential towards 2030 and 2050.

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