Colocation of national e-infrastructure for high performance computing and storage

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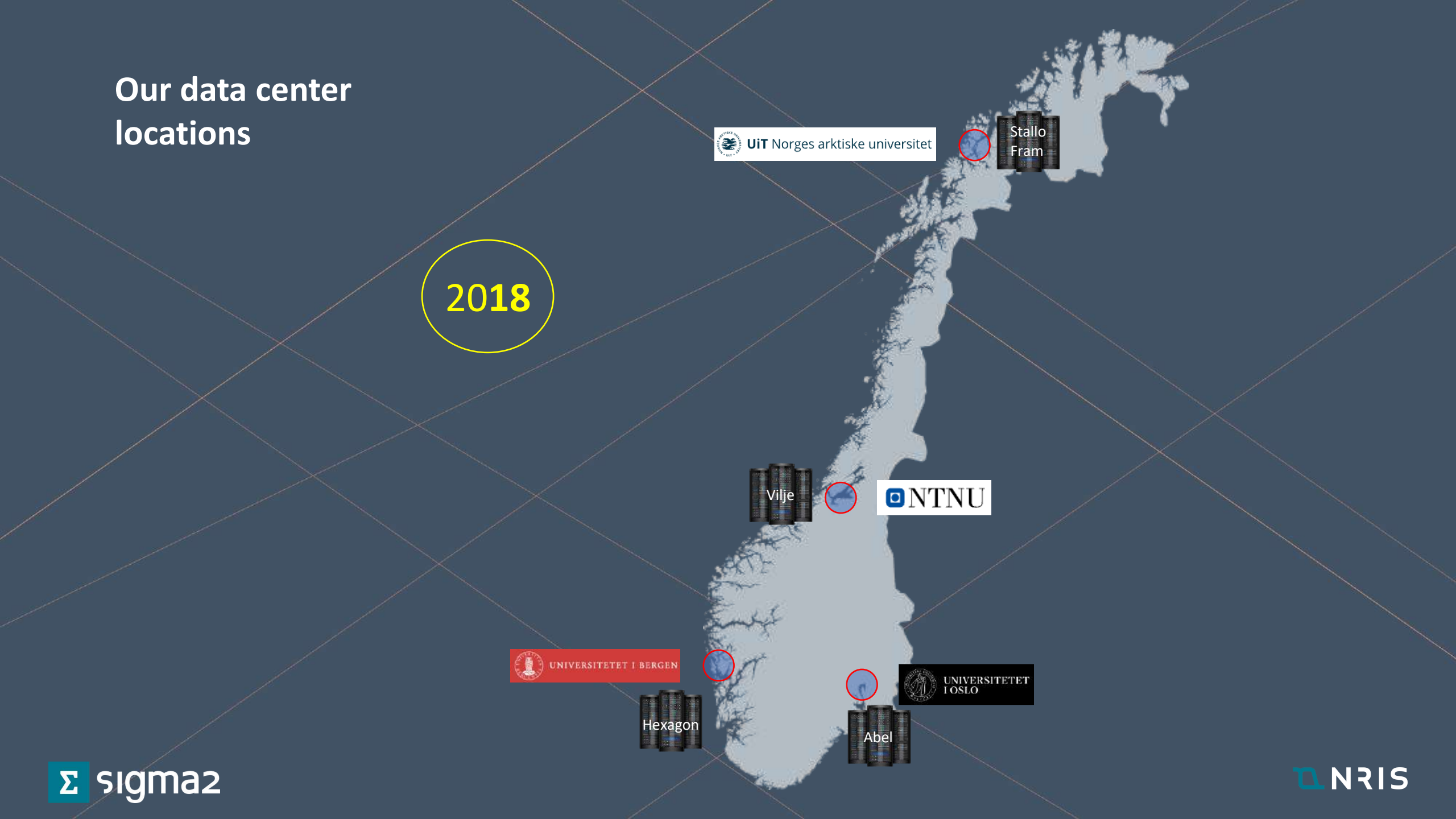
sigma2

Who we are - and what we do

Sigma2 has strategic responsibility for and manages the national e-infrastructure for large-scale data- and computational science in Norway.

Sigma2 collaborates with the Universities in Bergen, Oslo, Tromsø, and Trondheim to provide the Norwegian research infrastructure services (NRIS).

Our data center locations



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Our data center locations

2023

UiT Norges arktiske universitet

- Fram HPC
- NIRD data storage (old)

Finland

City of Kajaani

- LUMI

NTNU

- Betzy HPC
- Saga HPC
- NIRD data storage (old)

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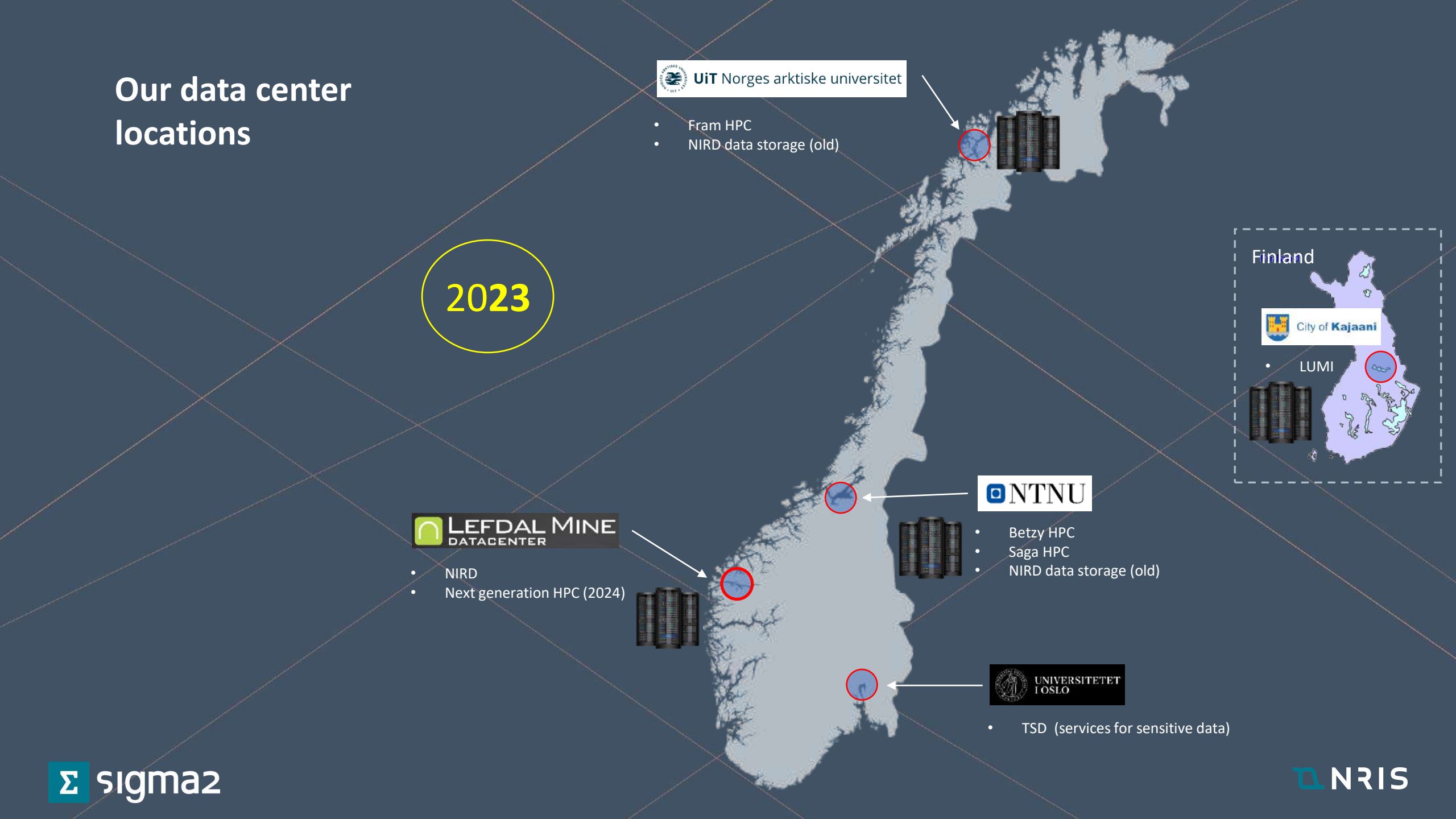
- NIRD
- Next generation HPC (2024)

UNIVERSITETET I OSLO

- TSD (services for sensitive data)



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Our data center locations

2025

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Atos
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NRIS
NTNU
BETZY

Traditional
server-rack (air cooled)
5-30 KW pr rack

Direct liquid
HPC rack
50-150 KW pr rack

Direct liquid
Pre-exascale/exascale
HPC rack
150-500 KW pr rack

Raised floor for high density HPC must
now be ready for 3 tons pr. square meter

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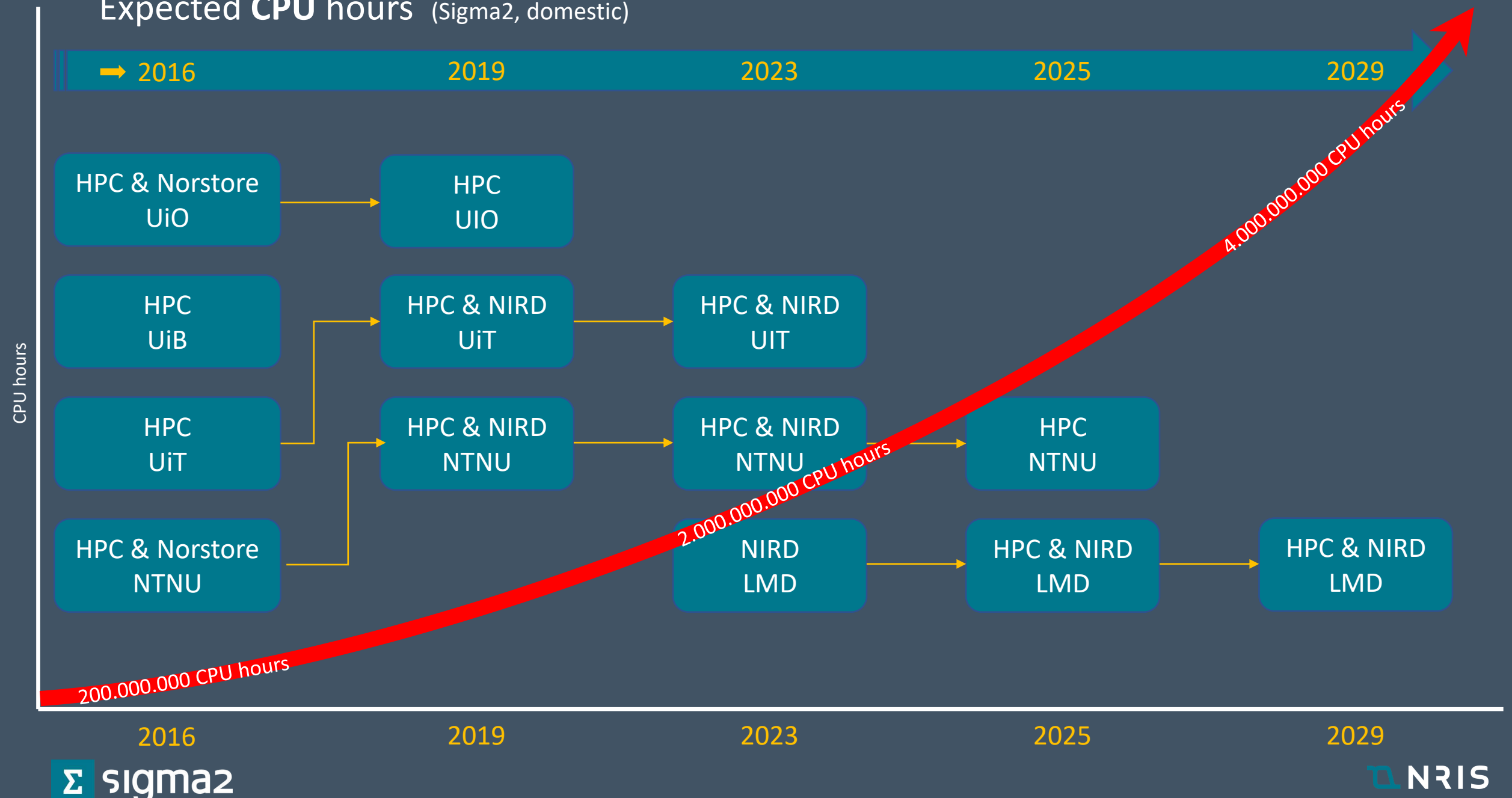
Expected **CPU** hours (Sigma2, domestic)



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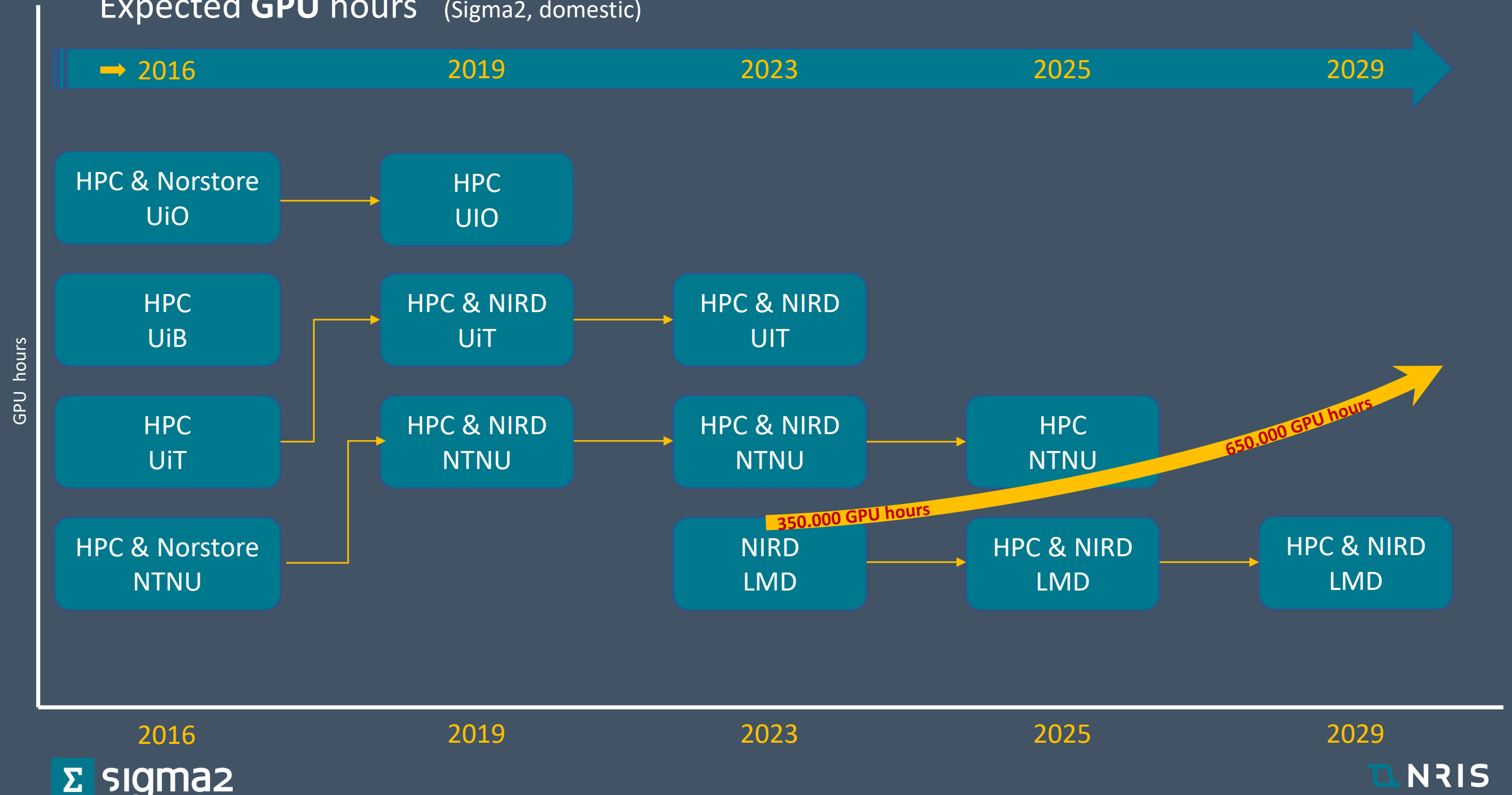
Expected **GPU** hours (Sigma2, domestic)



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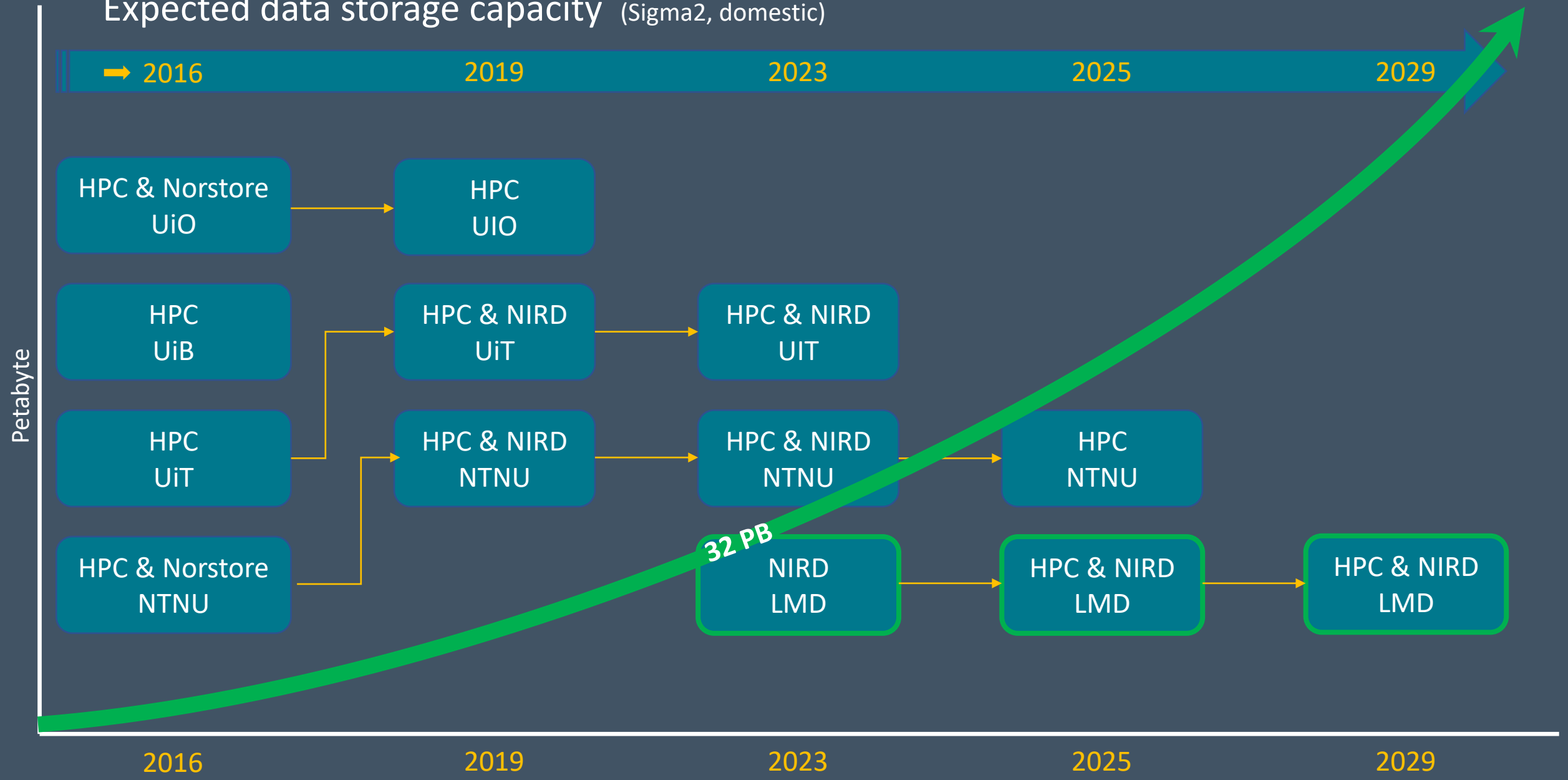
Expected data storage capacity (Sigma2, domestic)



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IMPLEMENT
CONSULTING GROUP_

Rapport

DATASENTRE I NORGE

Ringvirkningsanalyse av gjennomførte og potensielle etableringer

Kommunal- og distriktsdepartementet

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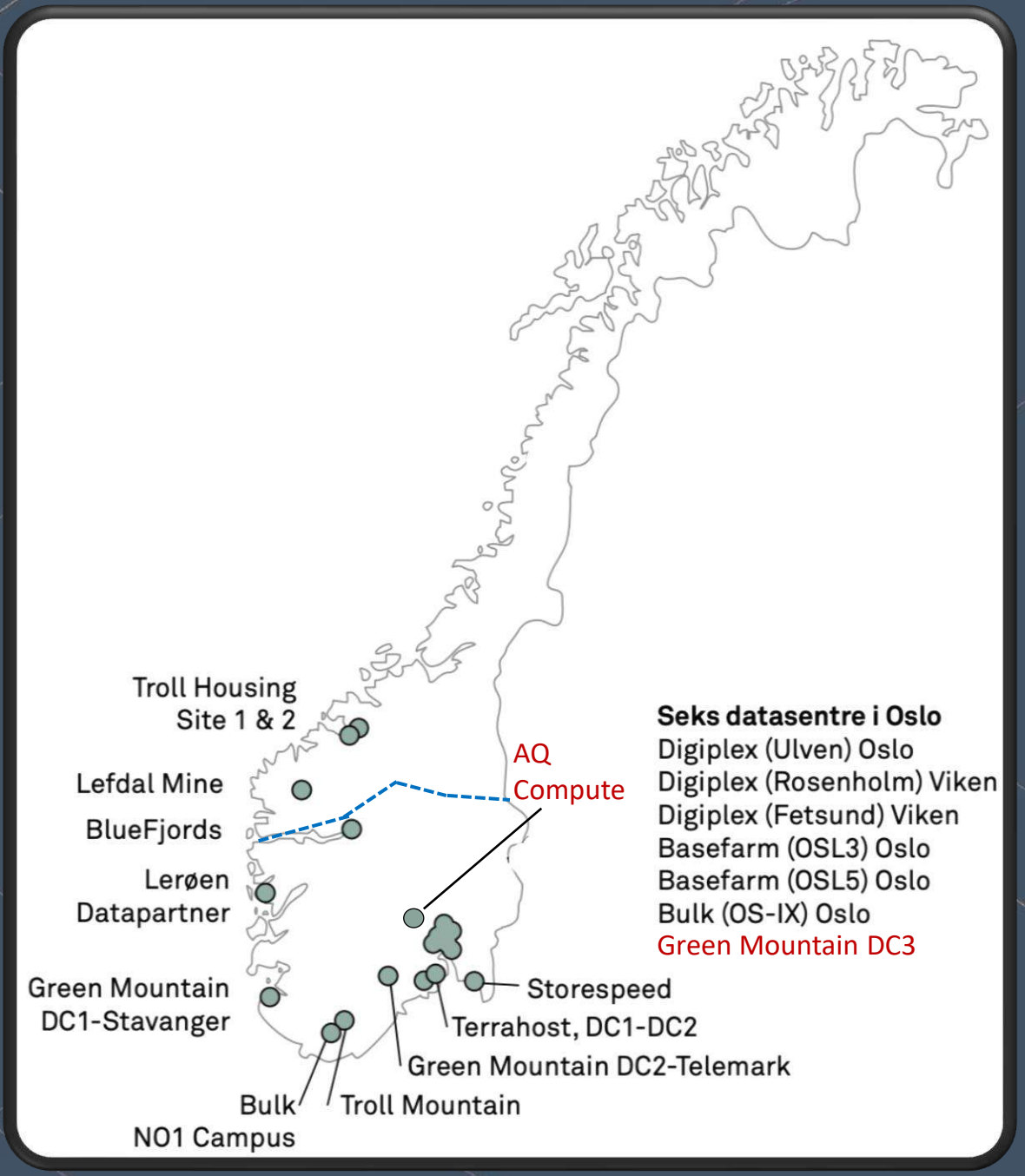
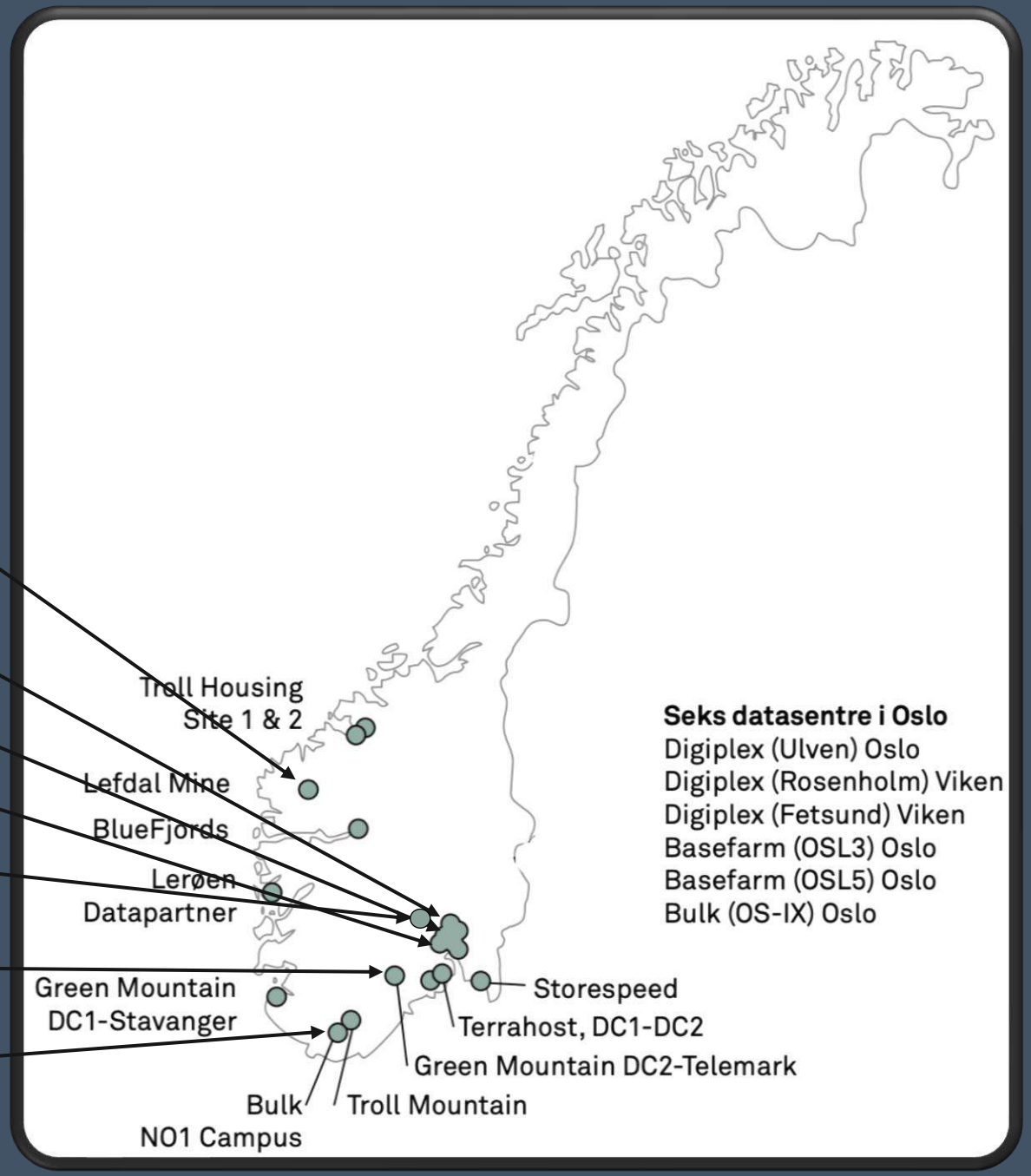
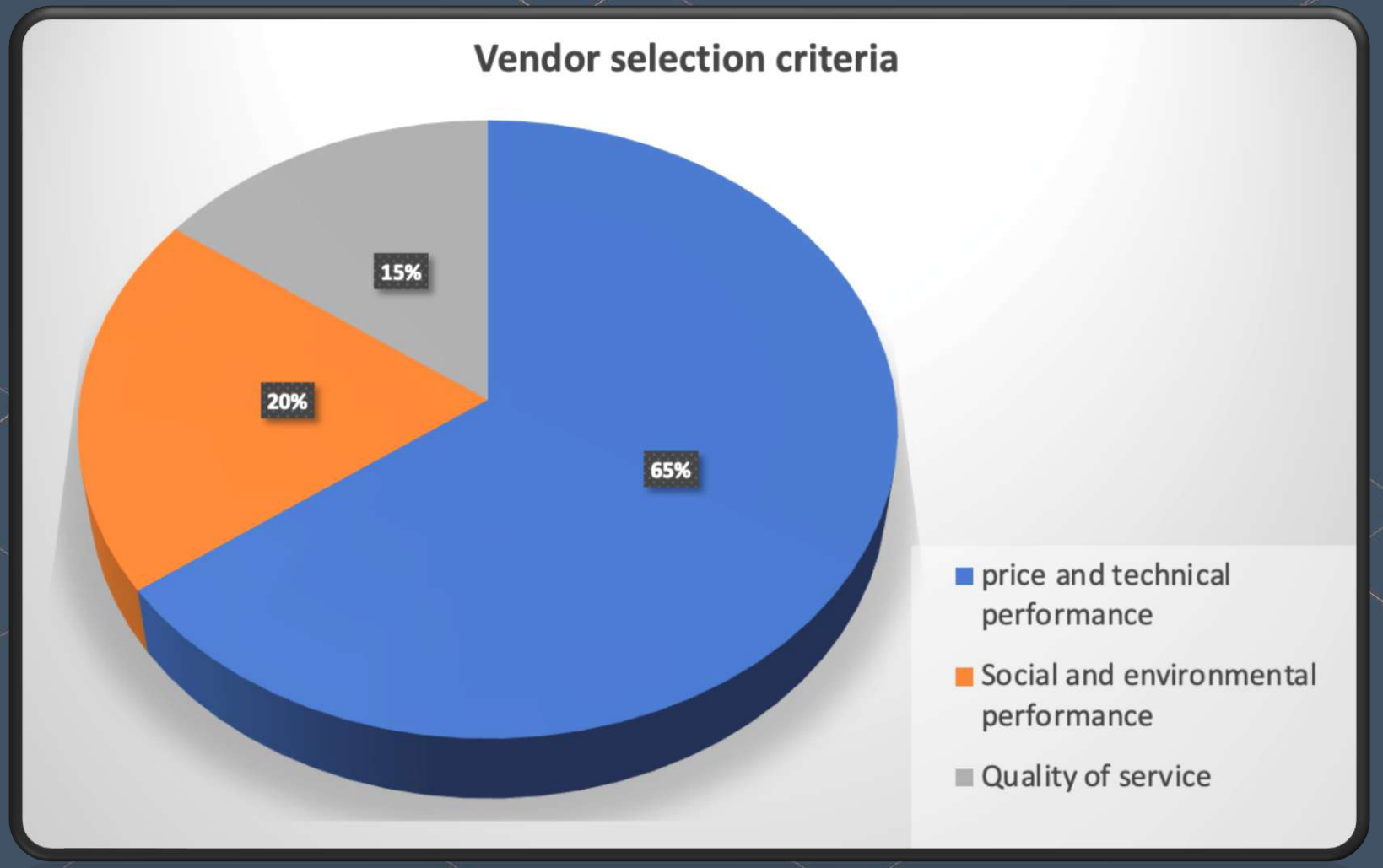
CONSULTING GROUP_

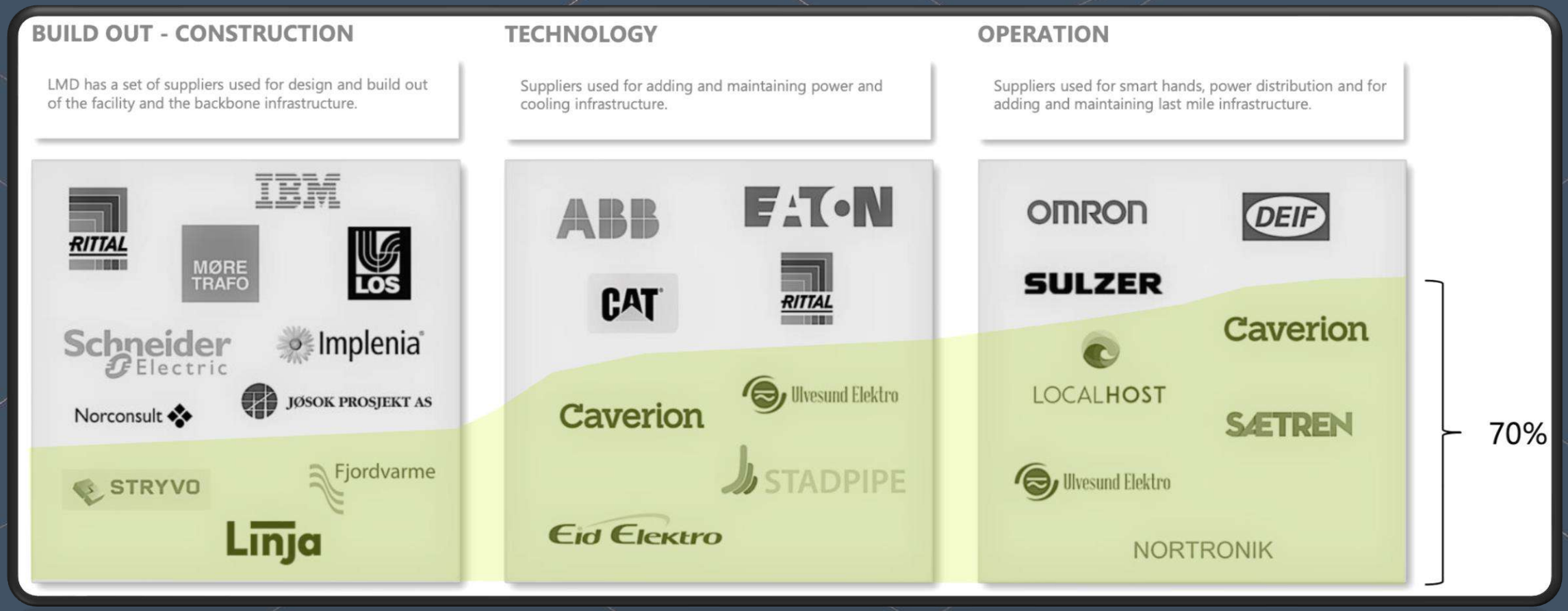


Participants in the competition




Vendor selection criteria
15%
20%
65%
price and technical performance
Social and environmental performance
Quality of service

70% of infrastructure suppliers involved at Lefdal Mine Datacenter are local



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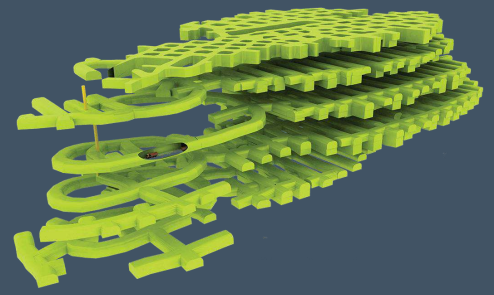
Why Lefdal Mine Datacenter ?



- Infinite ... and predictable scalability in terms of area, electrical power and cooling.
  This also contributes to increased cost control.
- Highest level of physical security, 700 meters inside the mountain, behind several security gates.
- Reuse of excess heat for fish farming (2024).
- Excellent separation between colocation customers inside the mine. Each customer can establish an increased adapted level of physical security around their own area.
- Containers for the NIRD installations mean adapted physical security, but also a short distance between the containers and the HPC hall gives significant synergies for rapid data transfer.

Other synergies when colocation HPC and data storage

- Improved user experience
  - Easy data staging, even seamless
  - Low latency, high-speed connections in all directions

Remote HPC and data storage management by

NRIS

Sigma2 and the universities in Bergen, Oslo, Tromsø, and NTNU (NRIS) collaborate on providing the Norwegian research infrastructure services

- NIRD
- Next generation HPC

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Inside **NIRD**
Tiered Storage
container

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Safe hardware maintenance with use of AR technology

Hololens (AR - augmented reality) is a very useful addon tool for Smarthands onsite the datacenter and remote experts from Sigma2/NRIS and hardware suppliers

- MS Teams client / Remote Assist app
- Sharing of presentations, how-to´s, service manuals
- OneDrive access for shared info
- Connected through eduroam WiFi with excellent quality and stability
- Reduces risk of misunderstandings between experts and Smarthands

Closeup view through Hololens, a label from a fiber cable

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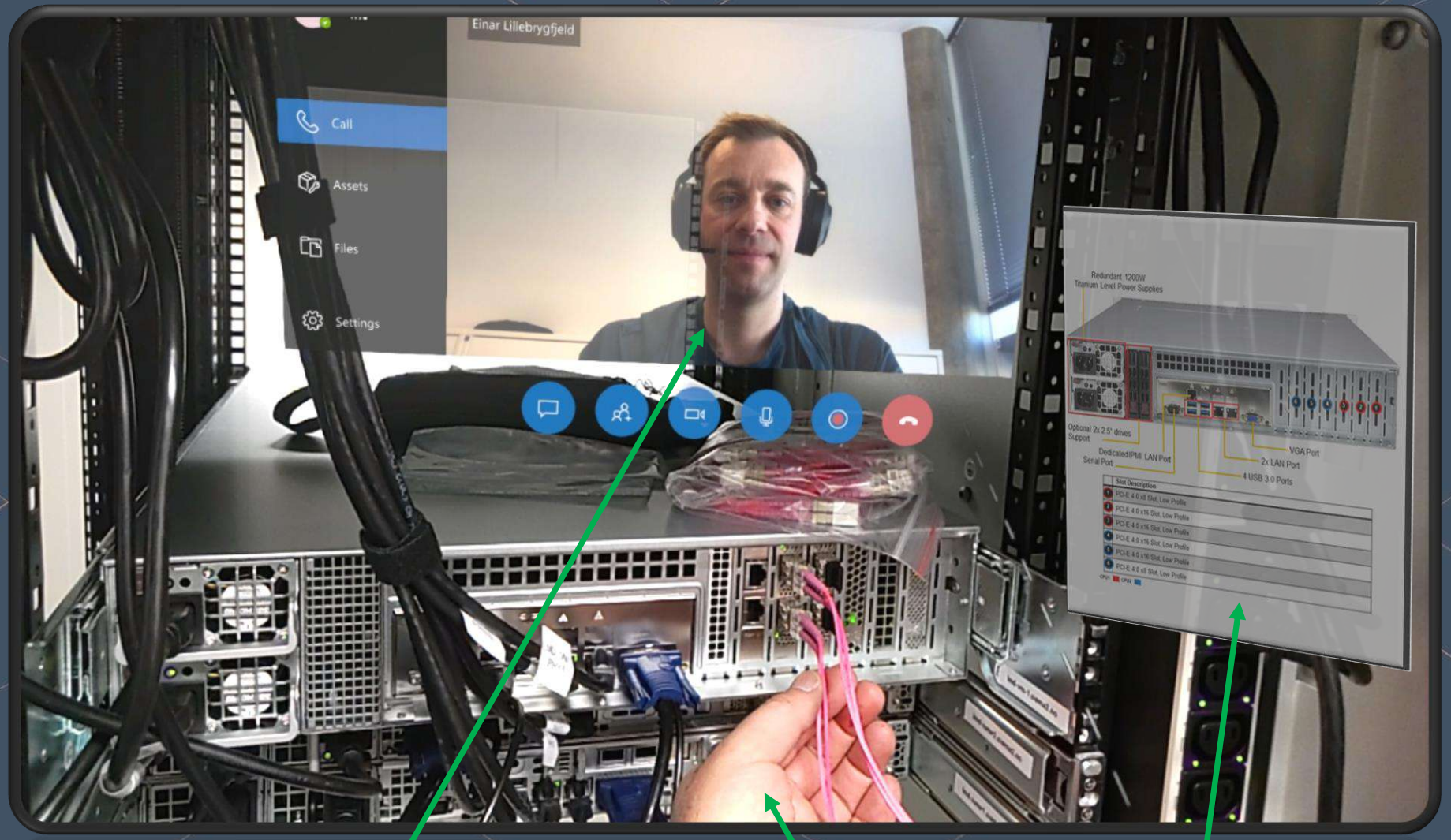

Expert, remote

Smarthands, local wearing Hololens

How-tos

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LIVE to LMD

NIRD hardware maintenance

CRU – customer replacement unit
Replacement done by LMD Smarthands

Non CRU – non customer replacement unit
Replacement done by IBM

LMD Smarthands doing CRU work

Sigma2: AR assistance
to smarthands when needed

IBM «call home»
hardware failure detection

IBM «call home»
sparepart on its way

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IBM

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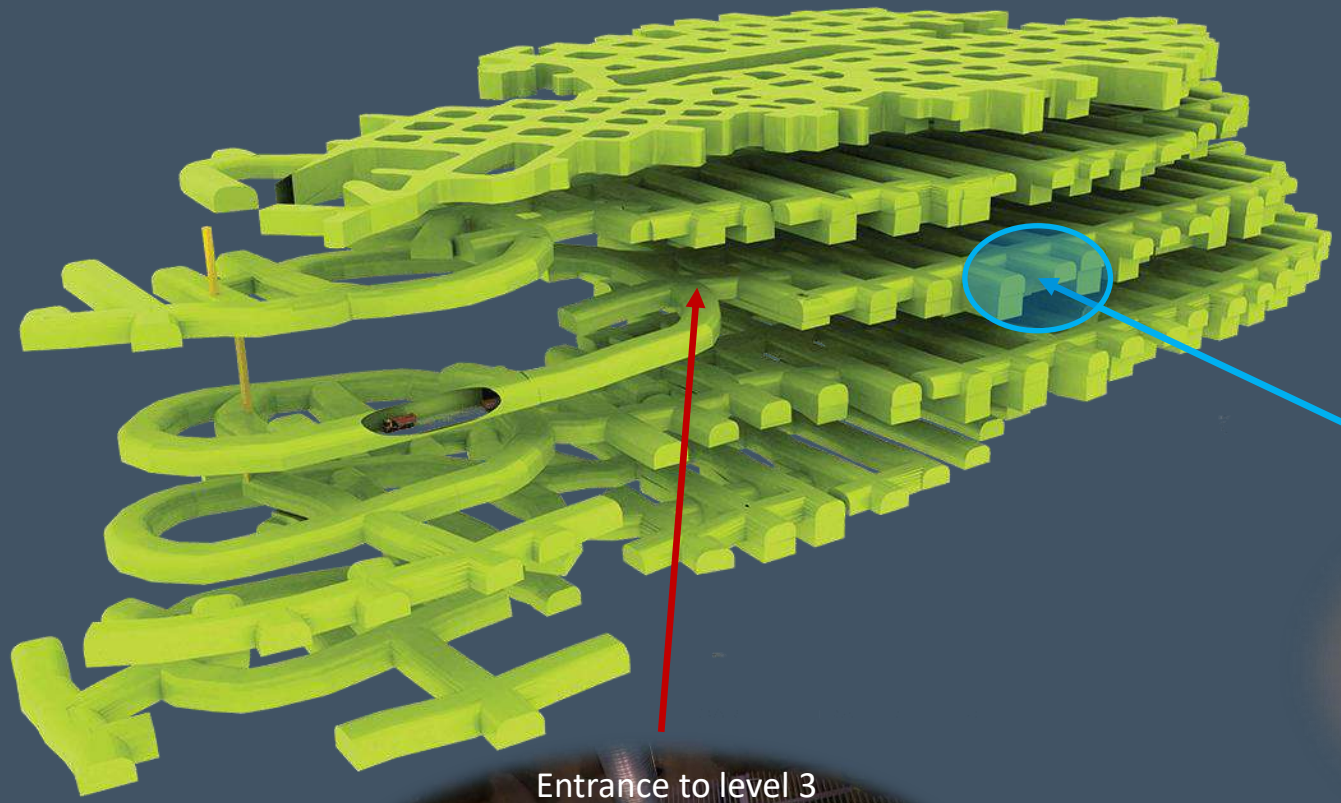
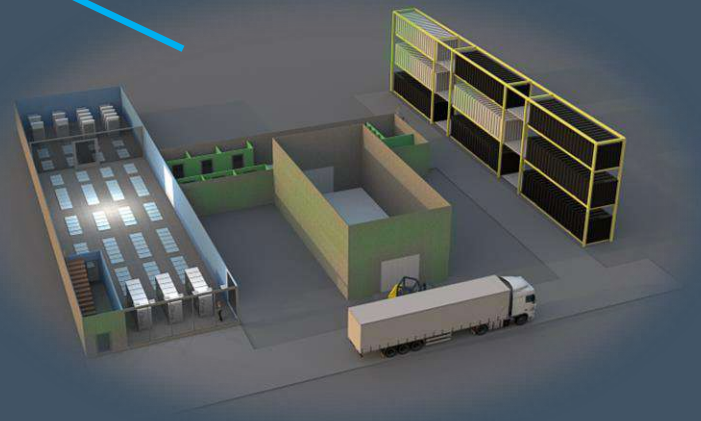
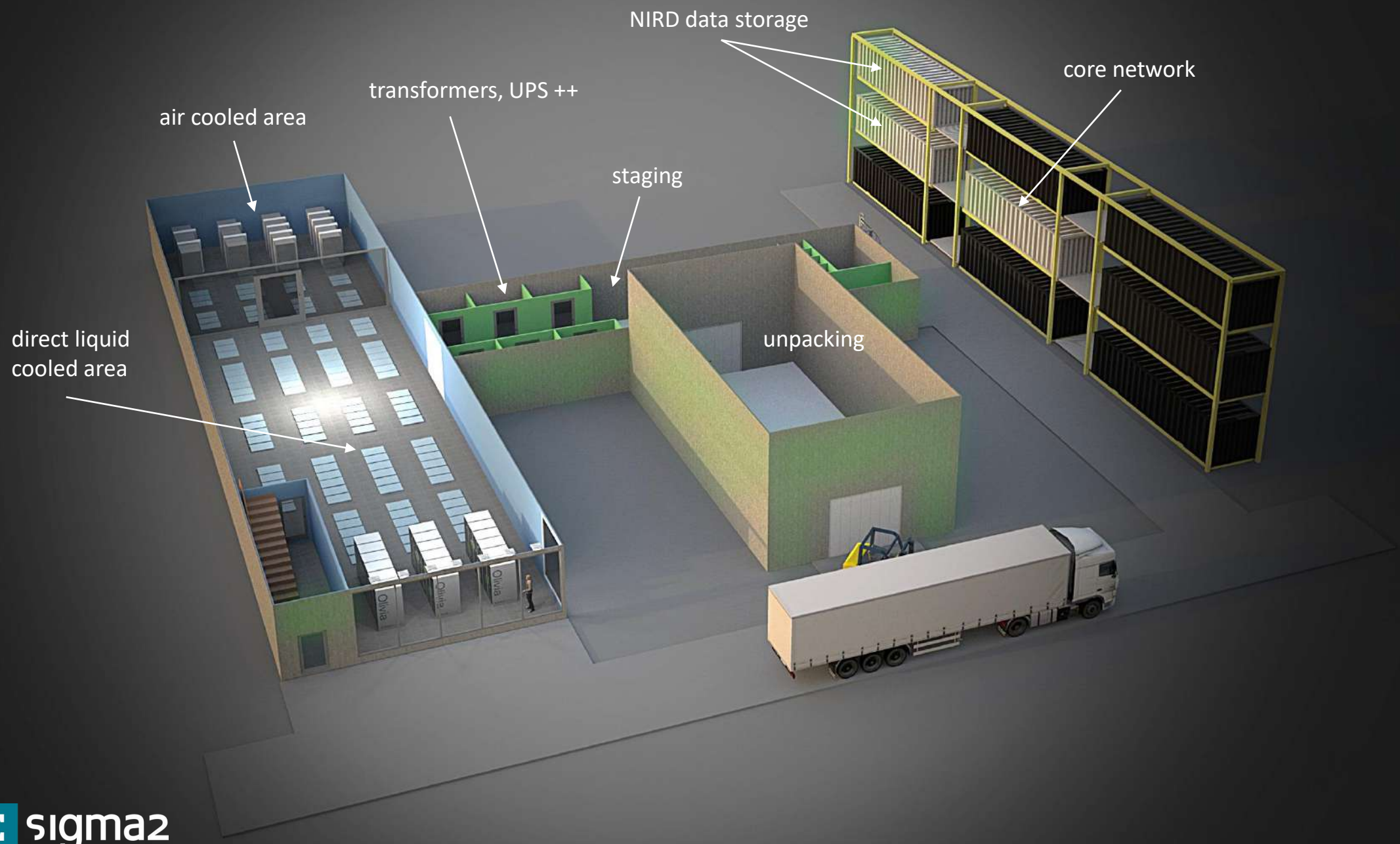


Sigma2 / NRIS area



Entrance to level 3


NIRD data storage
core network
transformers, UPS ++
air cooled area
staging
direct liquid
cooled area
unpacking

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March 2022

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March 2023

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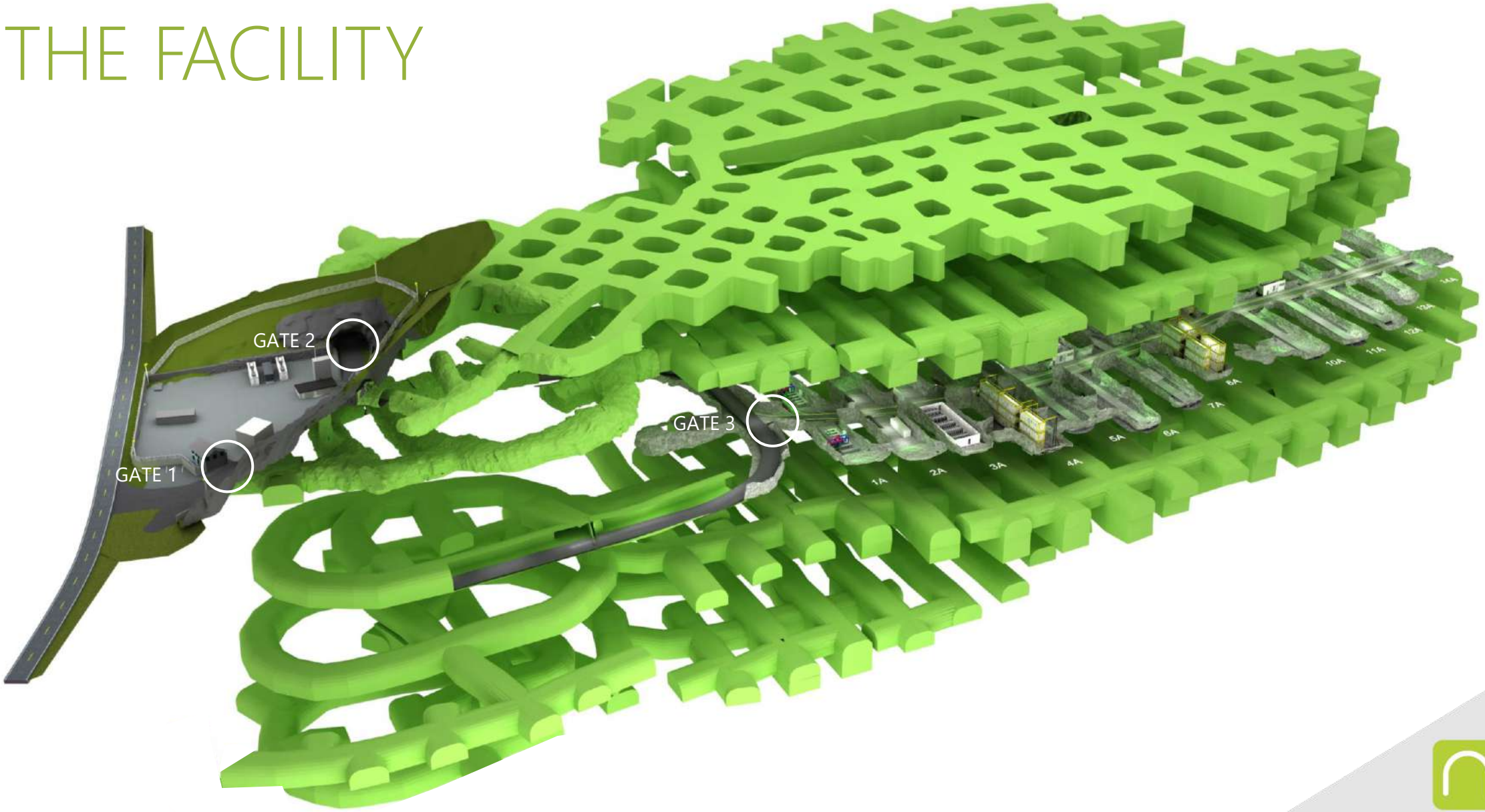
THE FACILITY



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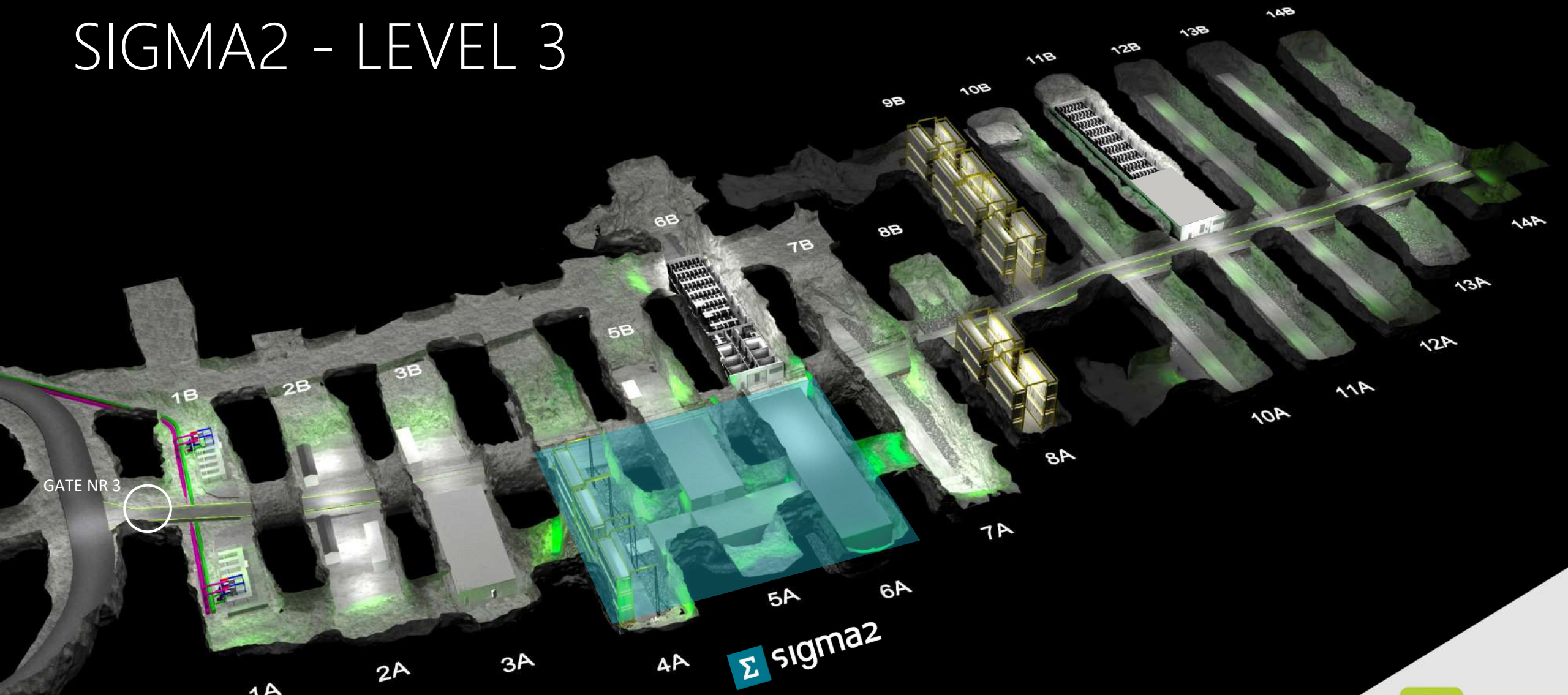
SIGMA2 - LEVEL 3



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“Lefdal Mine Datacenter offers one of the most **cost-effective, secure, flexible and green** data center solutions in Europe”

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Thanks for your attention!

Colocation of national e-infrastructure for high performance computing and storage

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