

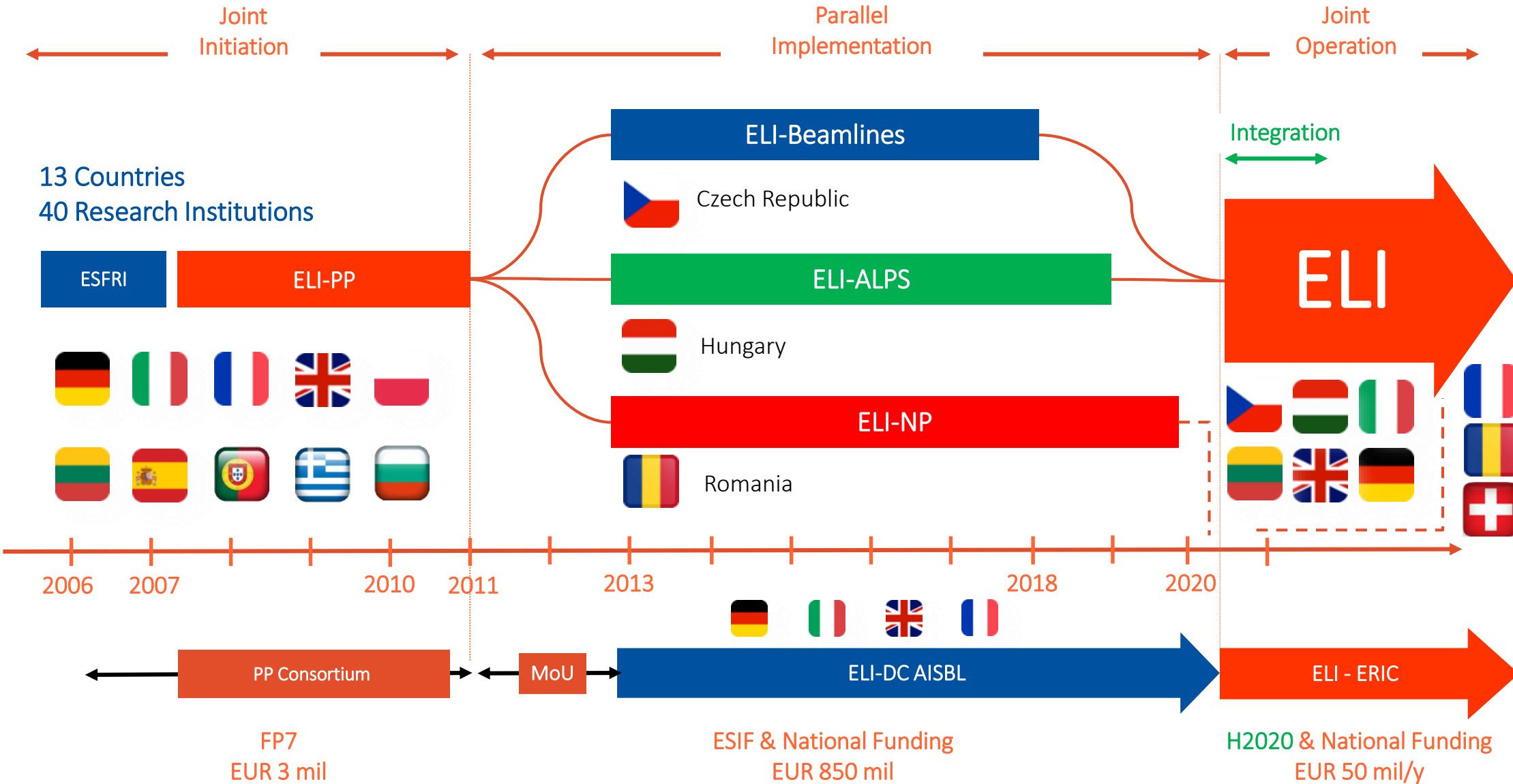
60 YEARS
OF LASER

ELI Beamlines

Control System Status 2020
Birgit Ploetzener, Dr Jack Naylor

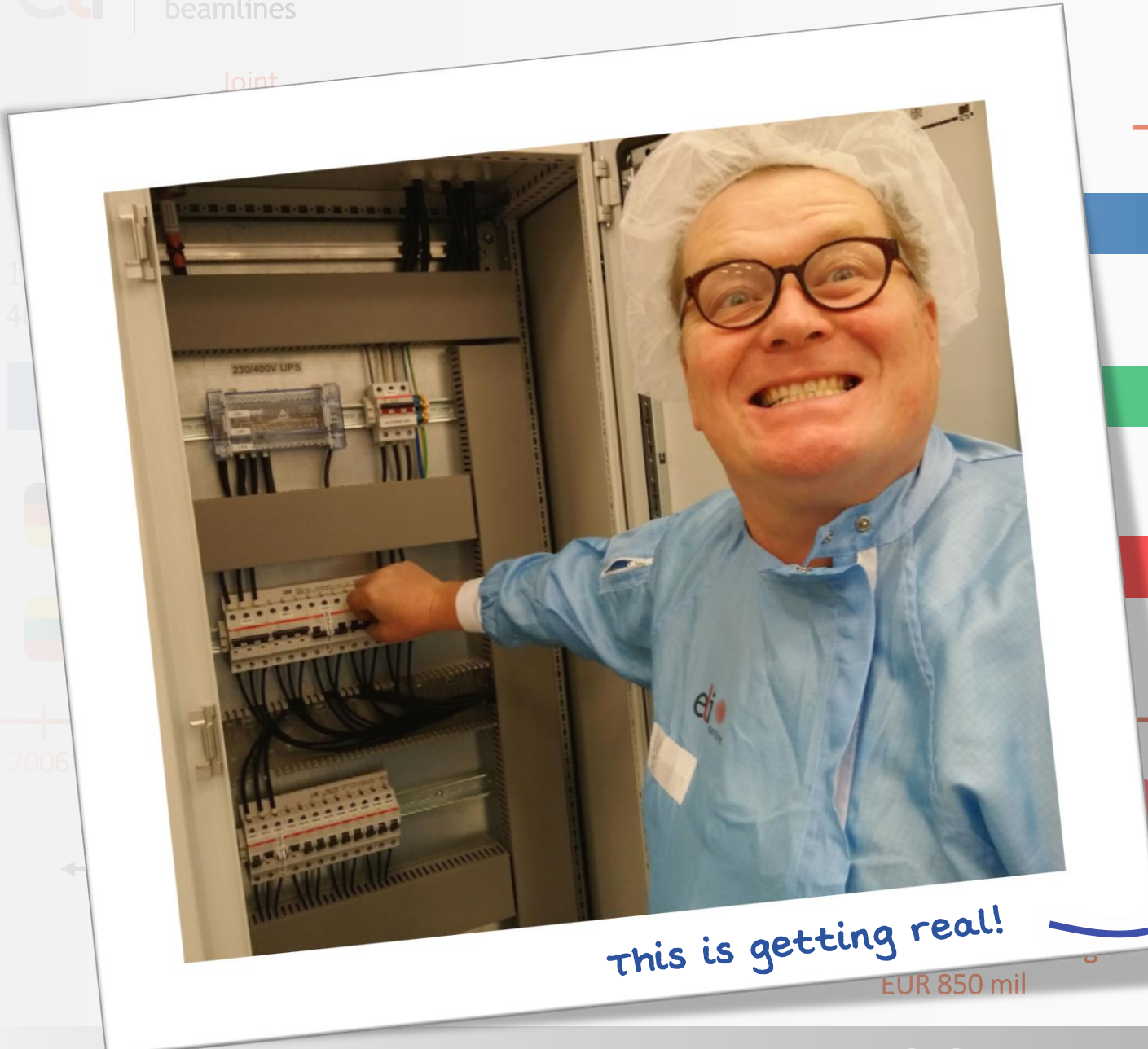


Organizational transition and integration



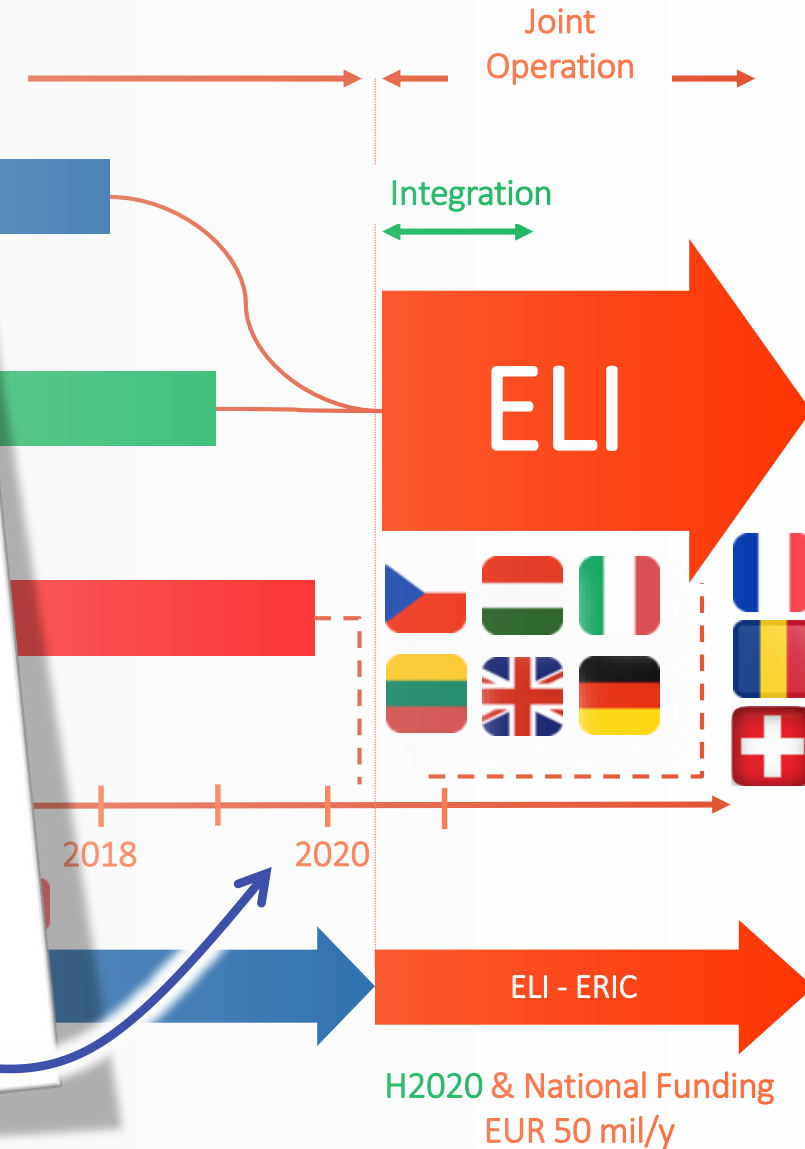
Organizational transition and integration

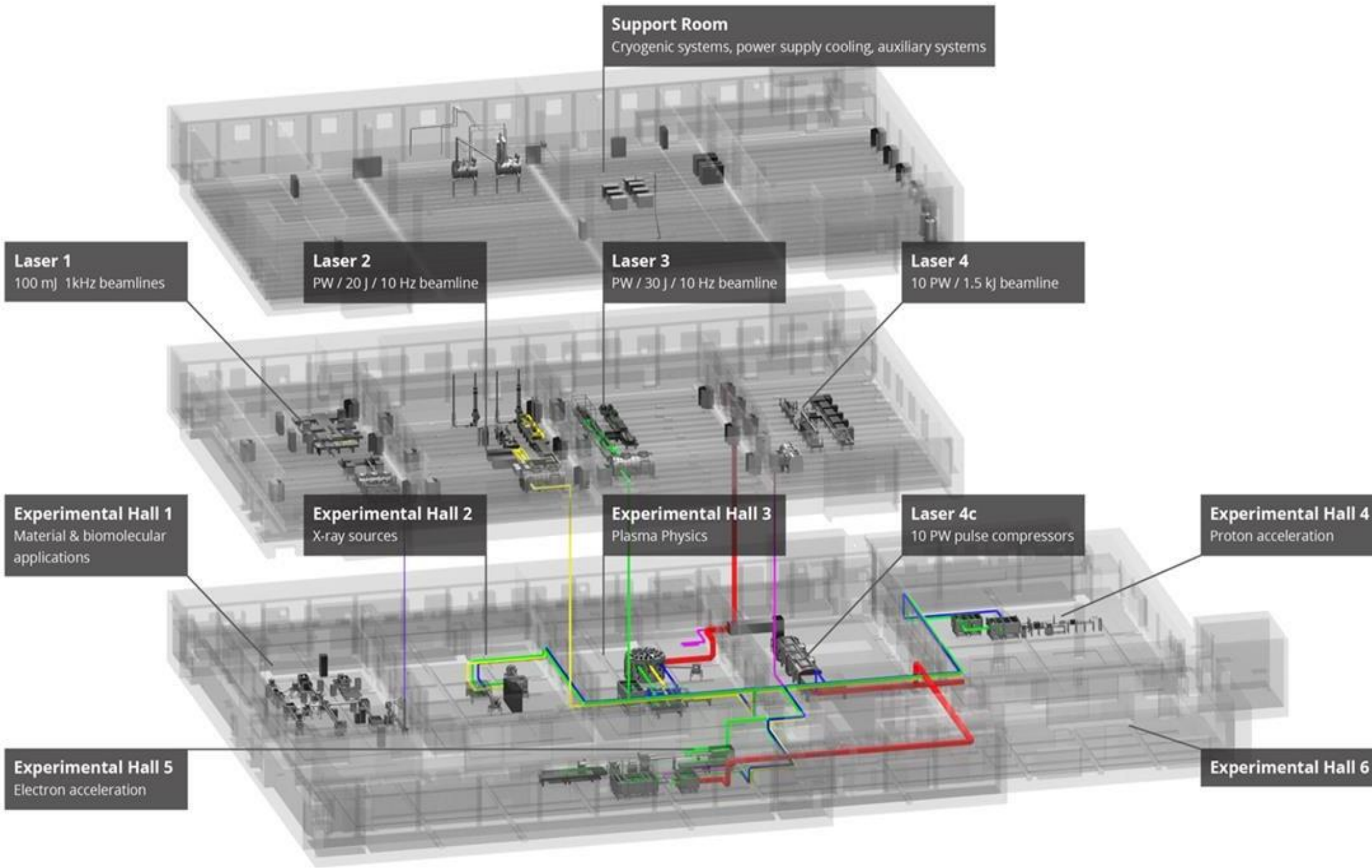
Joint



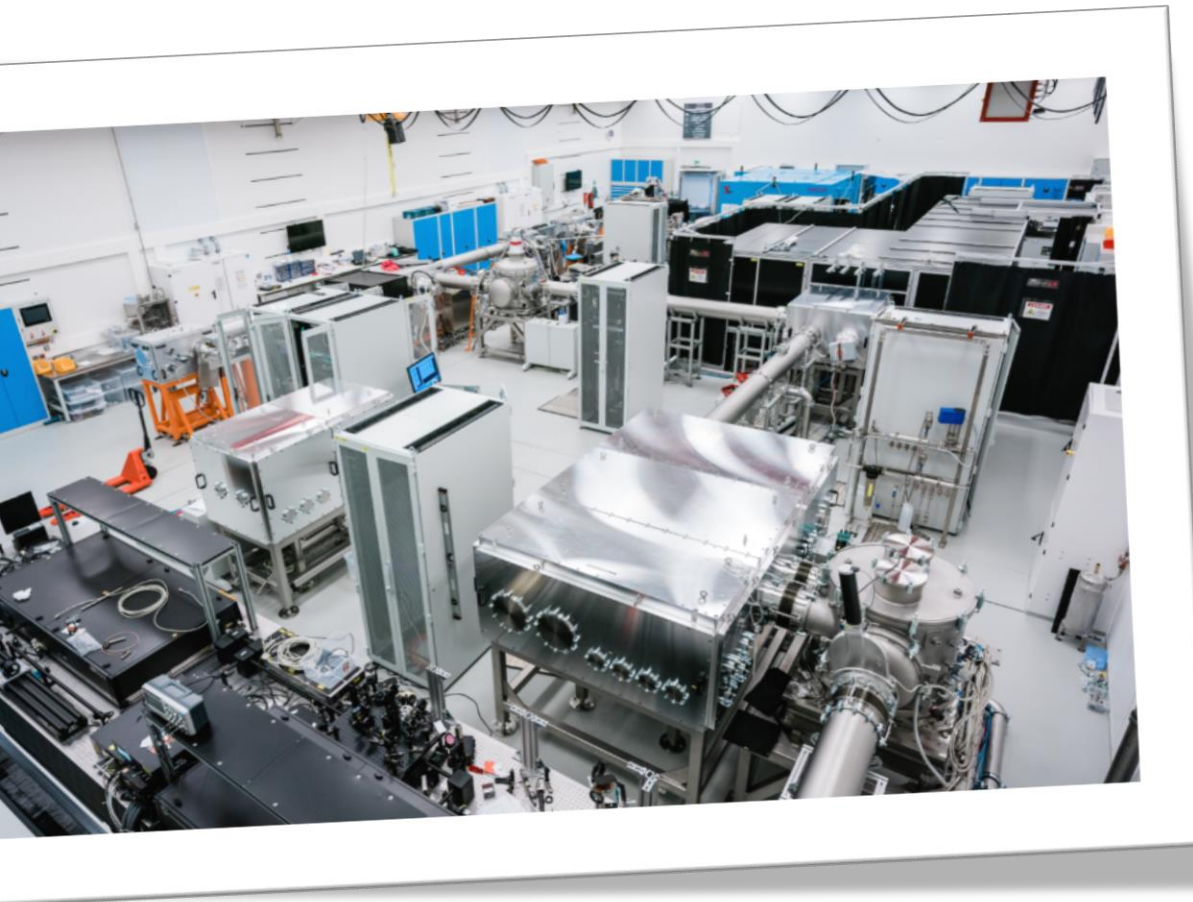
This is getting real!

EUR 850 mil





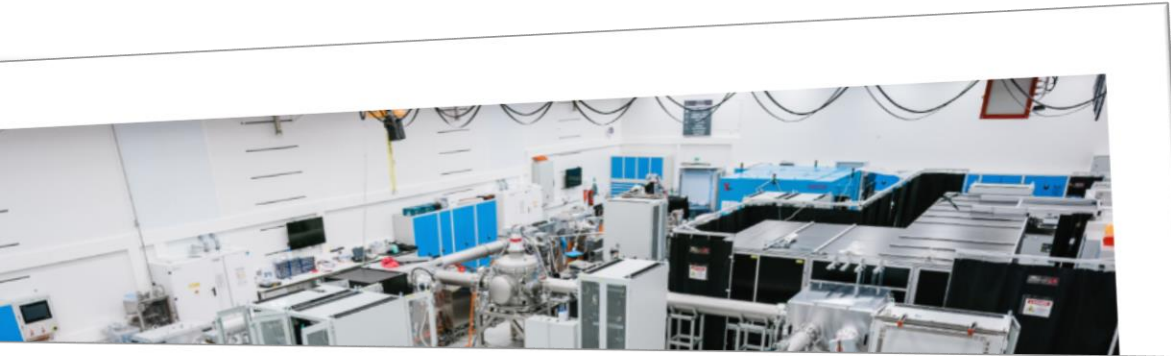
2020: Peak workload between maturing operations and intensive commissioning



Some stations/halls have users.

- Ramp-up of parameters
- Producing TBs/day
- Increased focus on operational availability
- Maturing / changing processes

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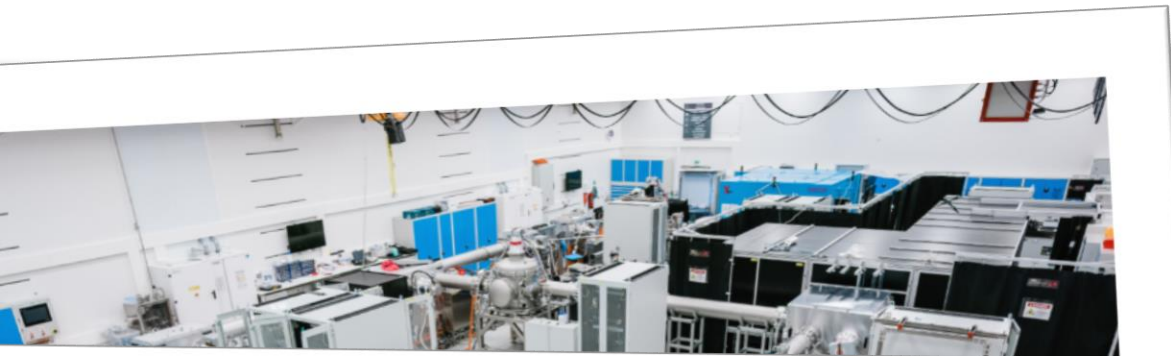
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- Every 6-8 weeks, we commission a large vacuum / machine safety / personal safety or motion CS.

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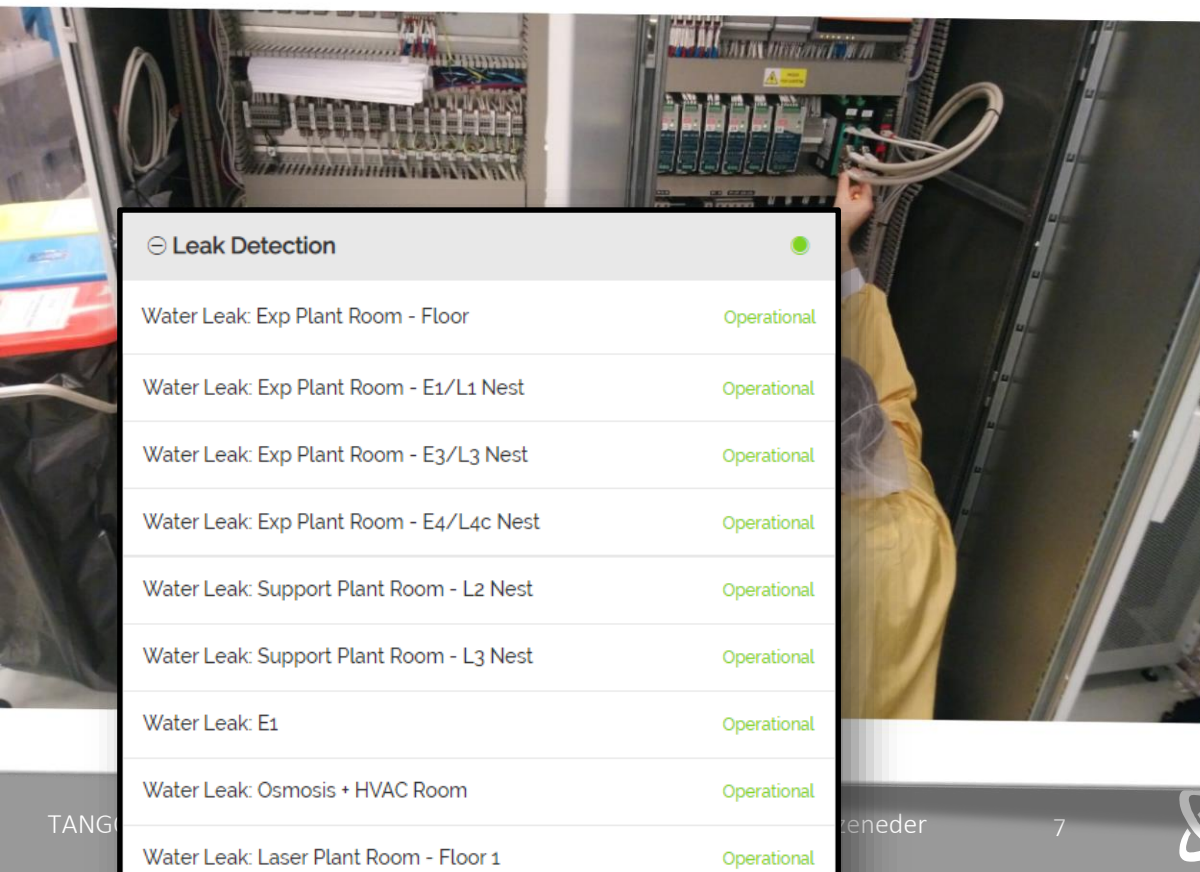


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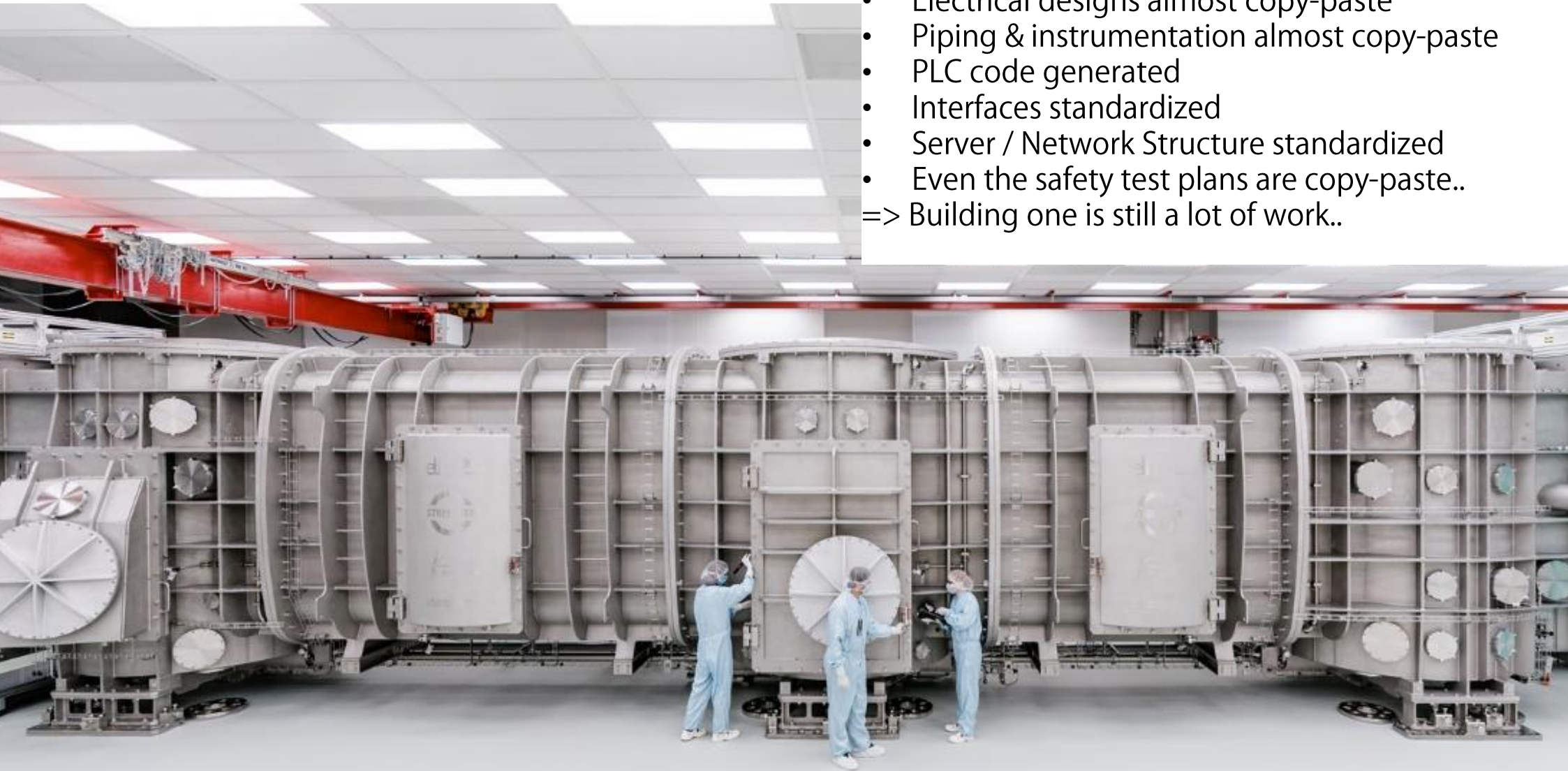


Leak Detection	
Water Leak: Exp Plant Room - Floor	Operational
Water Leak: Exp Plant Room - E1/L1 Nest	Operational
Water Leak: Exp Plant Room - E3/L3 Nest	Operational
Water Leak: Exp Plant Room - E4/L4c Nest	Operational
Water Leak: Support Plant Room - L2 Nest	Operational
Water Leak: Support Plant Room - L3 Nest	Operational
Water Leak: E1	Operational
Water Leak: Osmosis + HVAC Room	Operational
Water Leak: Laser Plant Room - Floor 1	Operational

And then there are those surprise systems 😊

8 Vacuum Sections in 2020

- Vacuum hardware almost fully standardized
 - Electrical designs almost copy-paste
 - Piping & instrumentation almost copy-paste
 - PLC code generated
 - Interfaces standardized
 - Server / Network Structure standardized
 - Even the safety test plans are copy-paste..
- => Building one is still a lot of work..



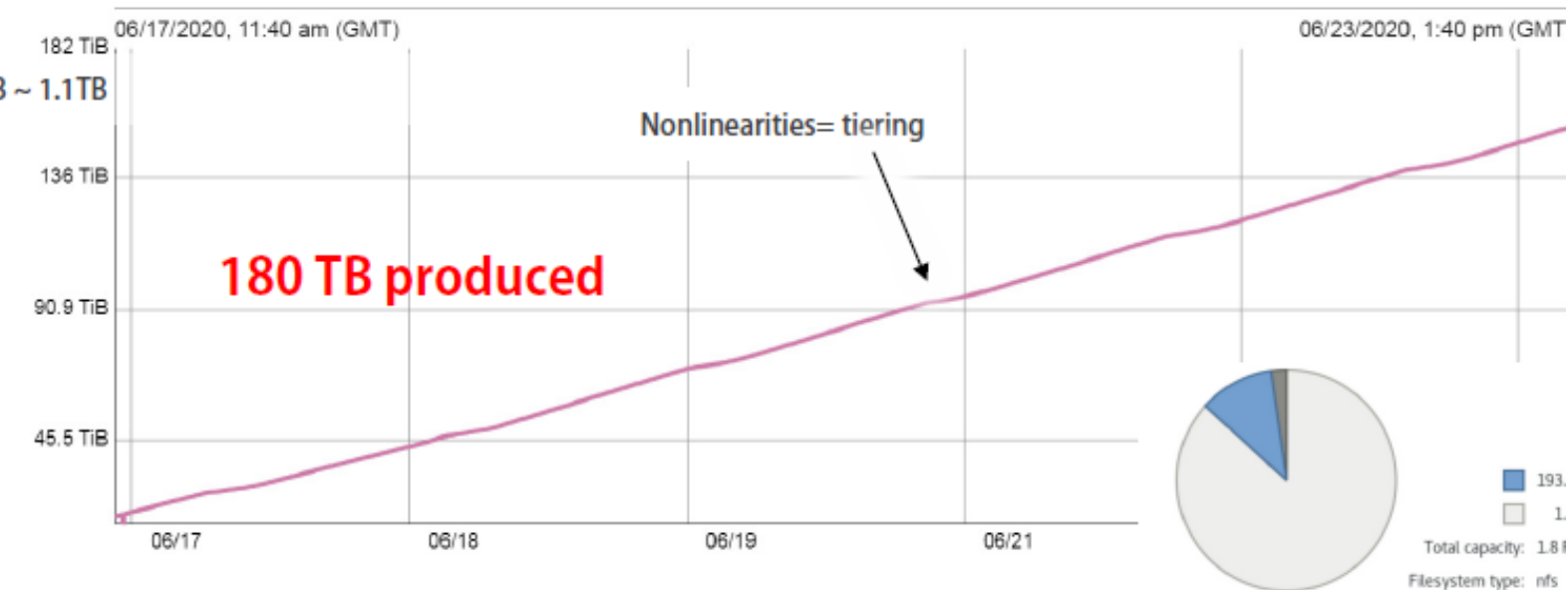
First generation DAQ System

- Initial storage (1.6PB) commissioned; will fill up quickly
- 1 beamline: Teledyne digitizer + 1kHz camera storing data at a sustained rate of ca 30Gb/s (limiting factor: MTCA backplane..)
- HDF5; option to do limited reprocess online processing, scientists use mostly via Matlab interface..



A lot above requested minimal spec. This is more platform prototype than local DAQ solution, and needs to scale.

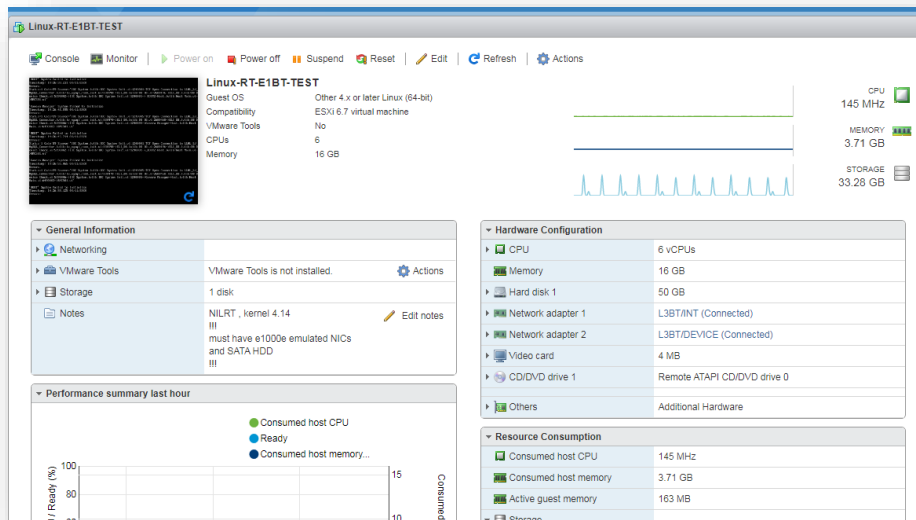
week sustained test run with typical settings for ions (12 μ s recording time, 1kHz, 10GS/s, 14bit)



Lessons learned:

Network cards can overheat. USB cable length can matter. Image decompression can be very resource-intensive. Our IT bought a firewall that can't handle high throughputs. **Don't forget to turn off a system that can produce 0.3PB/day...**

NI Linux RT: Opening up possibilities for LabVIEW-based systems



- NI Linux RT is a distribution that is used by National Instruments for their newer hardware (cRIO, RMCs etc).
- It is absolutely unsupported, but possible to deploy on third-party hardware. We've successfully tried that
 - Barebones / RT on various Supermicro Xeon systems
 - Virtualized on Lenovo x3650 m4 platform

- Virtualization with VMWare ESXi is unproblematic.
- You can compile TANGO-bindings for it.

If you want to try it yourself, here's what you need to know:

- Licences (NI RT Deployment) are required.
- NI MAX recognizes a cRIO and you can manage the system normally from there.
- The Linux package manager and NI MAX are in conflict. (In practical reality: Every time we install packages via NI MAX, it kills our network configuration and enumeration. We can live with that.)
- We have reason to assume embedded UI isn't supported, but we don't use it (-> TANGO/EPICS..)
- The only performance problems we've seen are with asynchronous UDP calls in larger systems. We also see that with official hardware, so we're hoping for a fix; and able to work around otherwise.

50 YEARS
OF LASER

We're hiring.

Electrical Designer

Frontend-Developer (REACT)

Systems Administrator / DevOps

Just drop me an email.

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