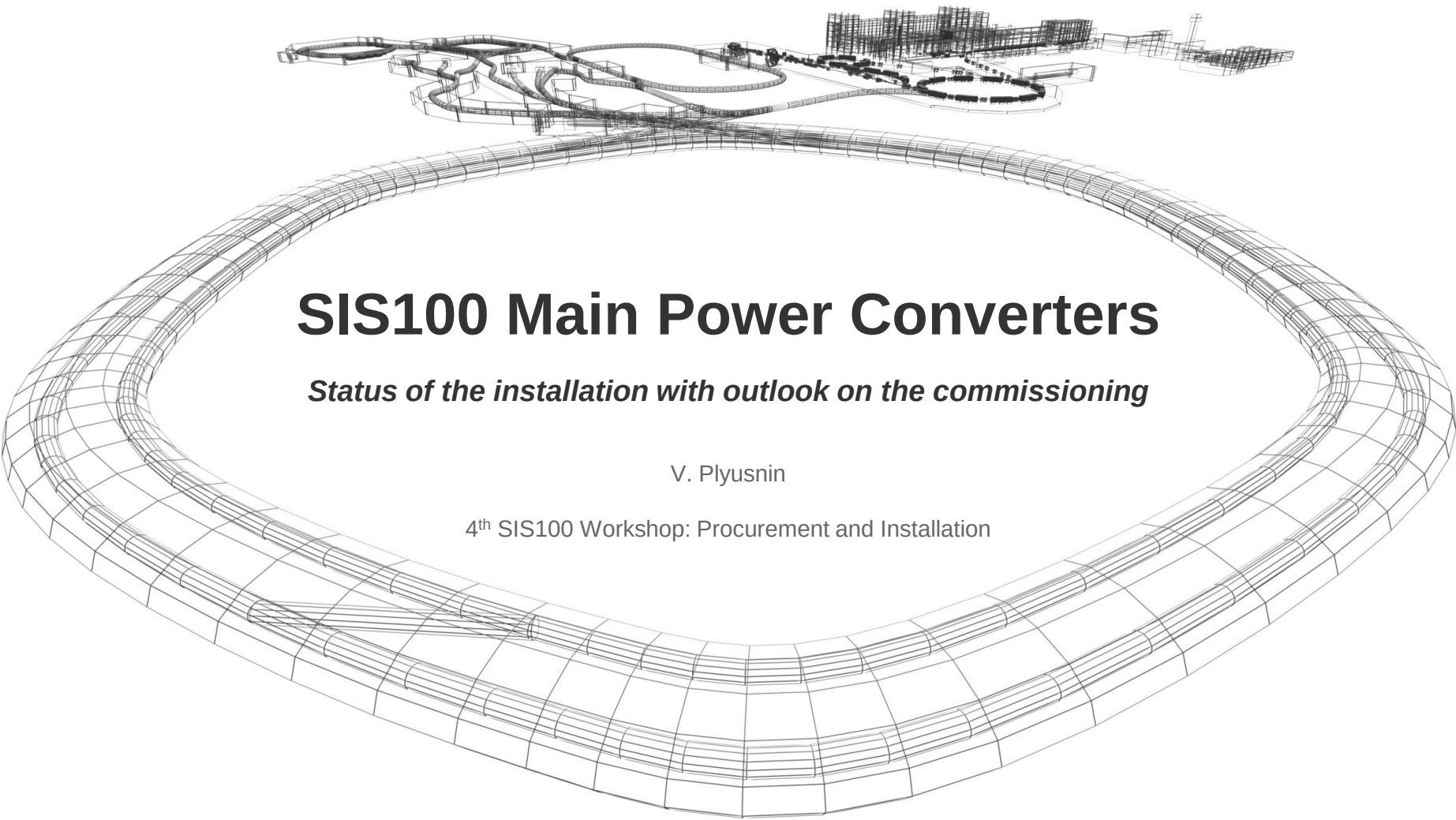


A large, detailed 3D wireframe model of the SIS100 particle accelerator. The model shows a long, curved ring structure with various internal components and a smaller, more complex structure at the top right. The entire model is rendered in a black wireframe style, highlighting the geometric complexity of the facility.

SIS100 Main Power Converters

Status of the installation with outlook on the commissioning

V. Plyusnin

4th SIS100 Workshop: Procurement and Installation

- **SIS100 Main Power Converters**
 - Overview and production status
 - Installation status
 - Outlook on the comissioning

SIS100 Main Power Converters

Overview and production status

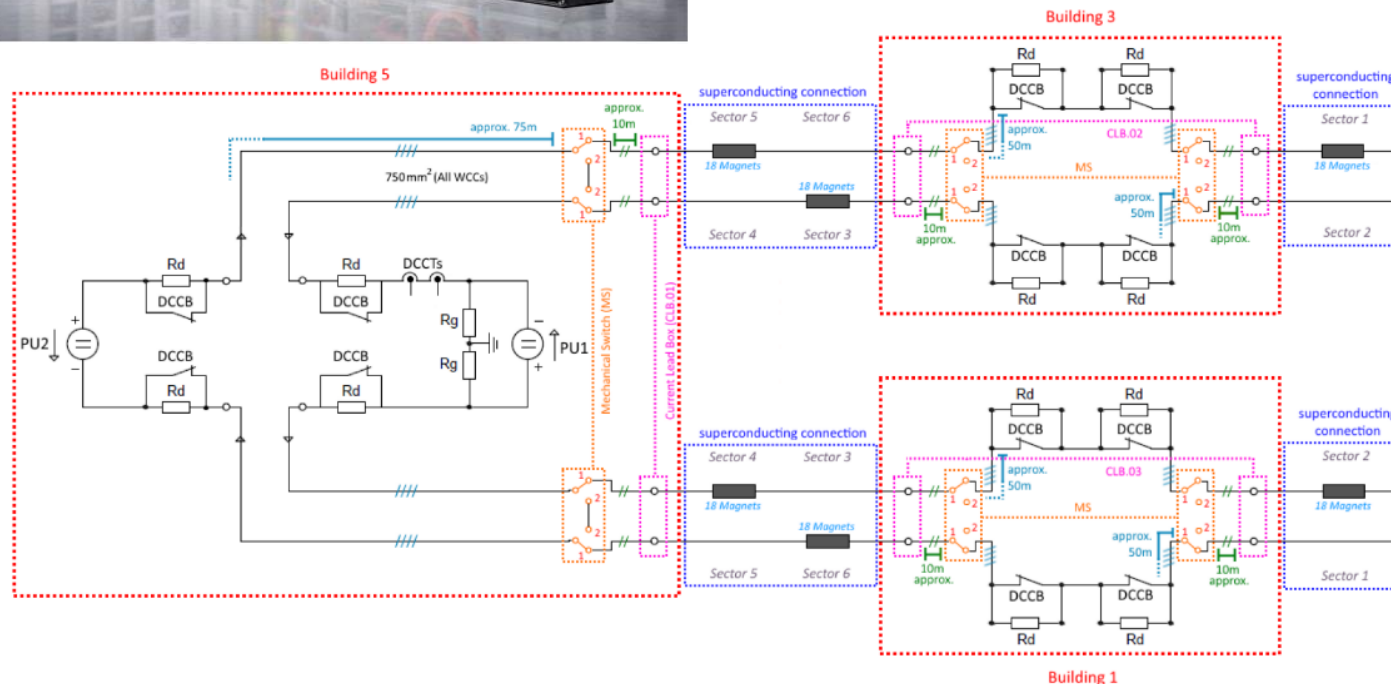


Main Dipole PC: 2 power units (PU) in series + quench protection (12 DCCBs + RdS)

$I_{out} = 13200 \text{ A}$
 $di/dt = 19 \text{ kA/s}$
 $V_{out} = \pm 1400 \text{ V}$
 $P_{max} = \pm 18,5 \text{ MW}$
 $S_n = 12 \text{ MVA}$

(2x) Main Quadrupole PCs: 1 power unit + quench protection (4 DCCBs + RdS)

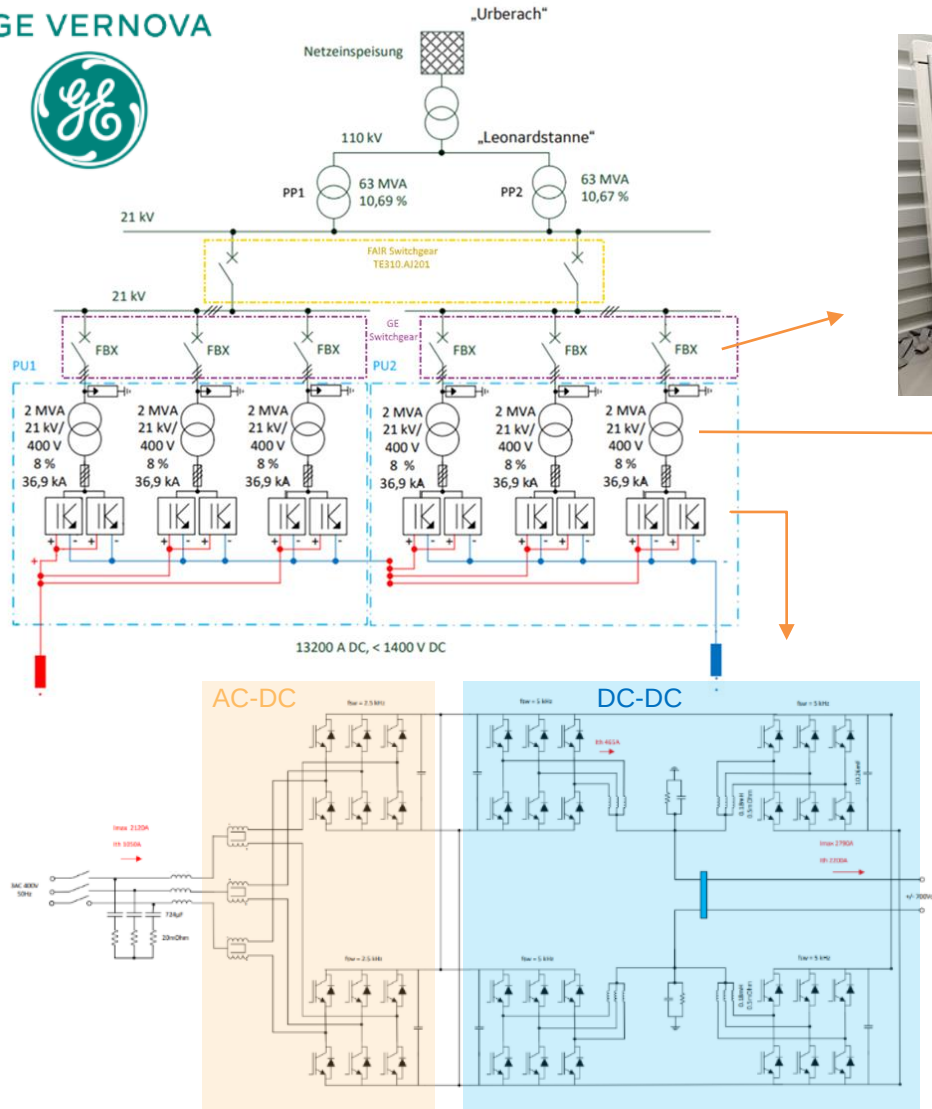
$I_{out} = 8500 \text{ A}$
 $di/dt = 15 \text{ kA/s}$
 $V_{out} = \pm 700 \text{ V}$
 $P_{max} = \pm 6 \text{ MW}$
 $S_n = 4 \text{ MVA}$



SIS100 Main Power Converters

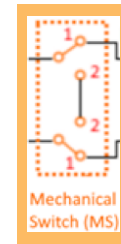
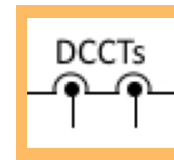
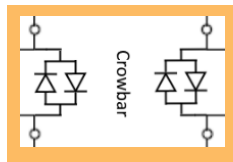
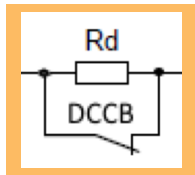
Overview and production status

GE VERNOVA

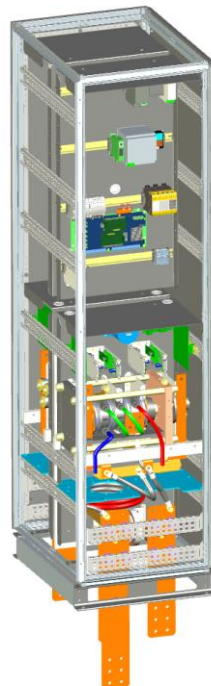


SIS100 Main Power Converters

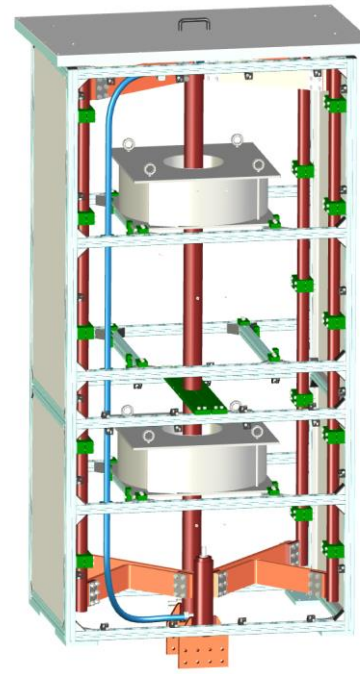
Overview and production status



4 T/s operation – 14.5/11.5 kA



Water-cooled



DCCT heads ready

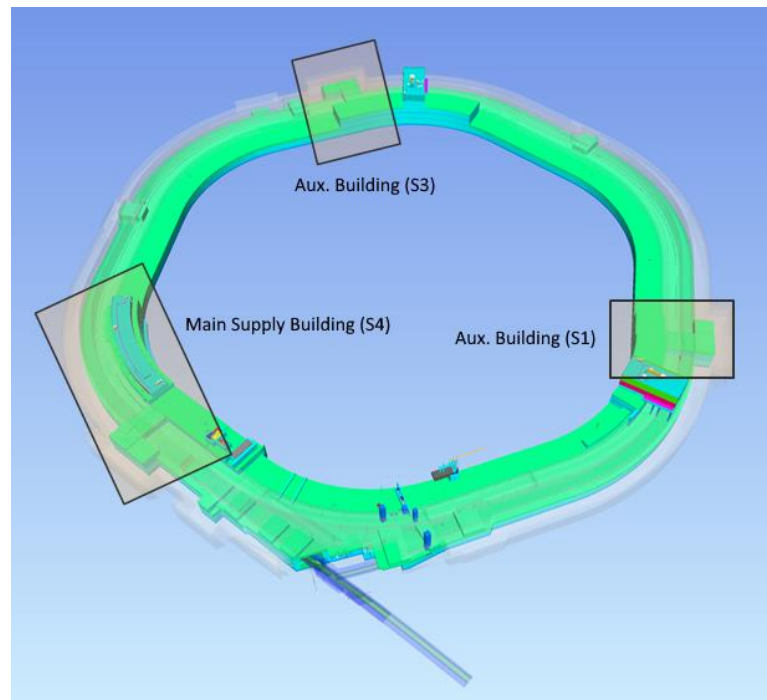


- In total components to be installed:

- **U10:**

- 8 x 20kV Switchgear Cabinets
- 10 x 20kV/400V Transformers

Installed



- **U20:**

- Main Supply Building (S4):

- 20 x AC/DC Converters
- 12 x DCCBs
- 3 x Crowbar Cabinets
- 3 x DCCT Cabinets
- WC-Bus-bars
- 8 x Mechanical Switches (Nische 5)
- WC-Bus-bars (Nische 5)

- Auxiliary Building (S3):

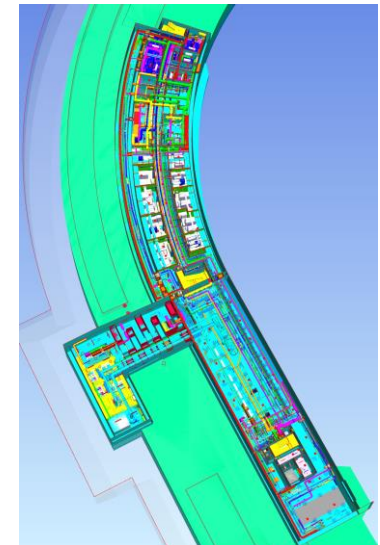
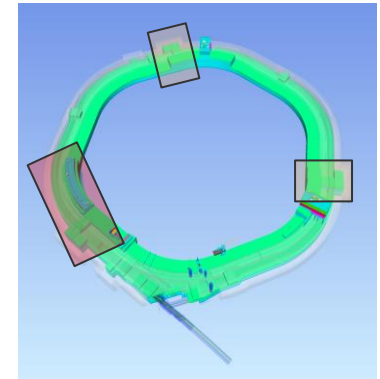
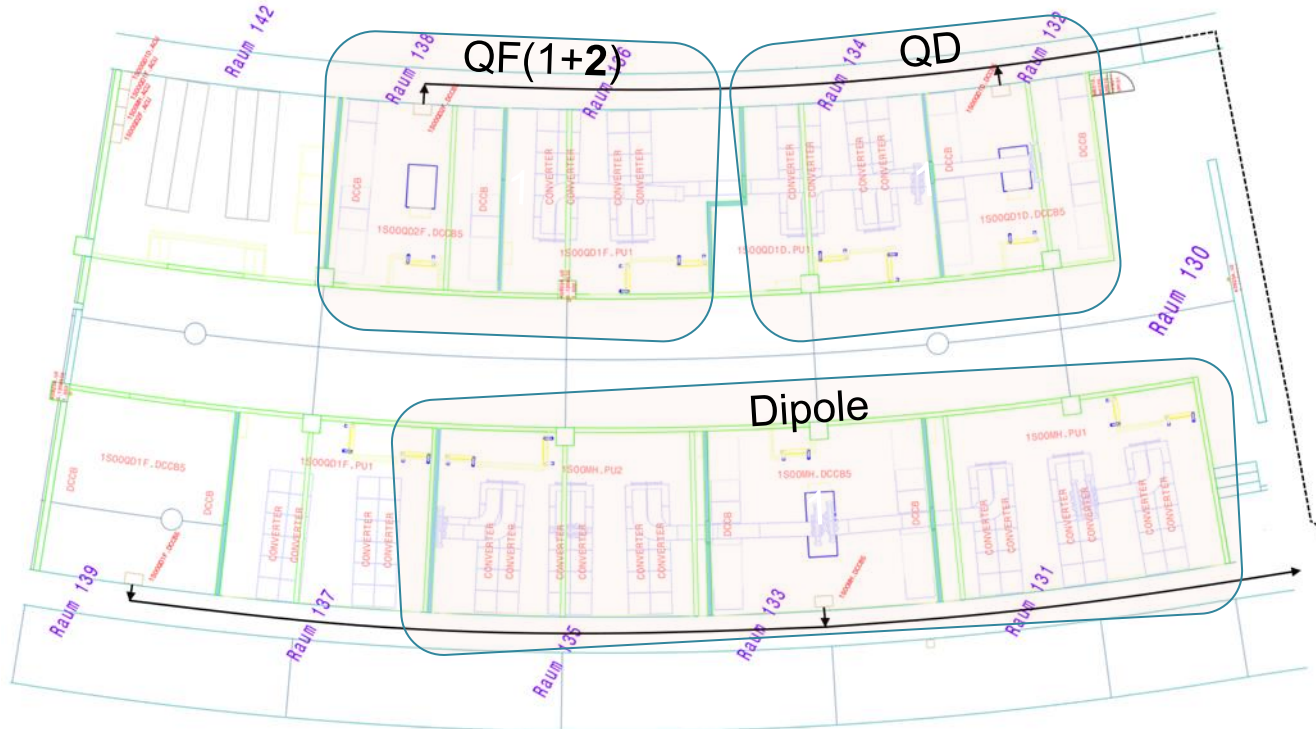
- 4 x DCCBs
- WC-Bus-bars
- 2 x Mechanical Switches (Nische 3)
- WC-Bus-bars (Nische 3)

- Auxiliary Building (S1):

- 4 x DCCBs
- WC-Bus-bars (Nische 1)
- 2 x Mechanical Switches
- WC-Bus-bars (Nische 1)

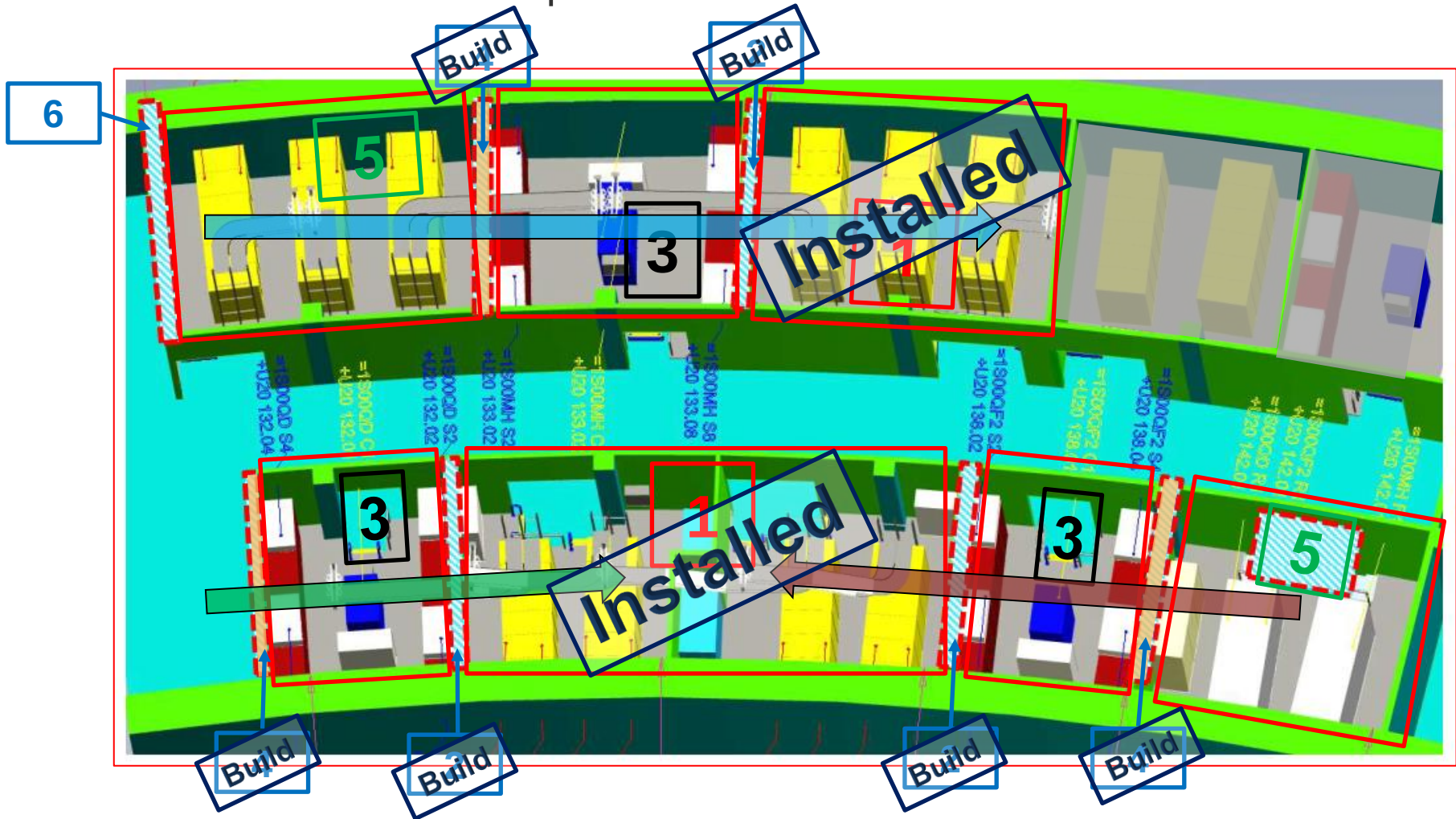
SIS100 Main Power Converters

■ U20: Main Supply Building (S4)

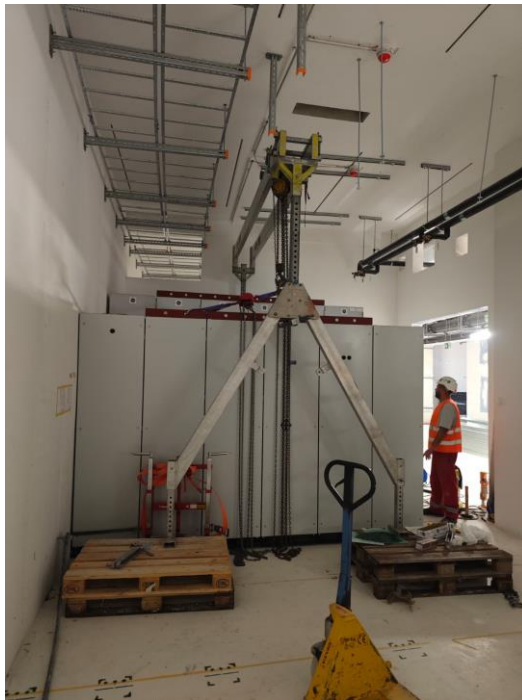


- Most of the main components are already stored in U20 using main crane and cabinet transport trolley
- Installation is ongoing using portal crane and forklifters
- Some components still at Testbench in Berlin
- Electrical installation works are under preparation (U10+U20) as well as water cooling infrastructure

U20: Installation Concept

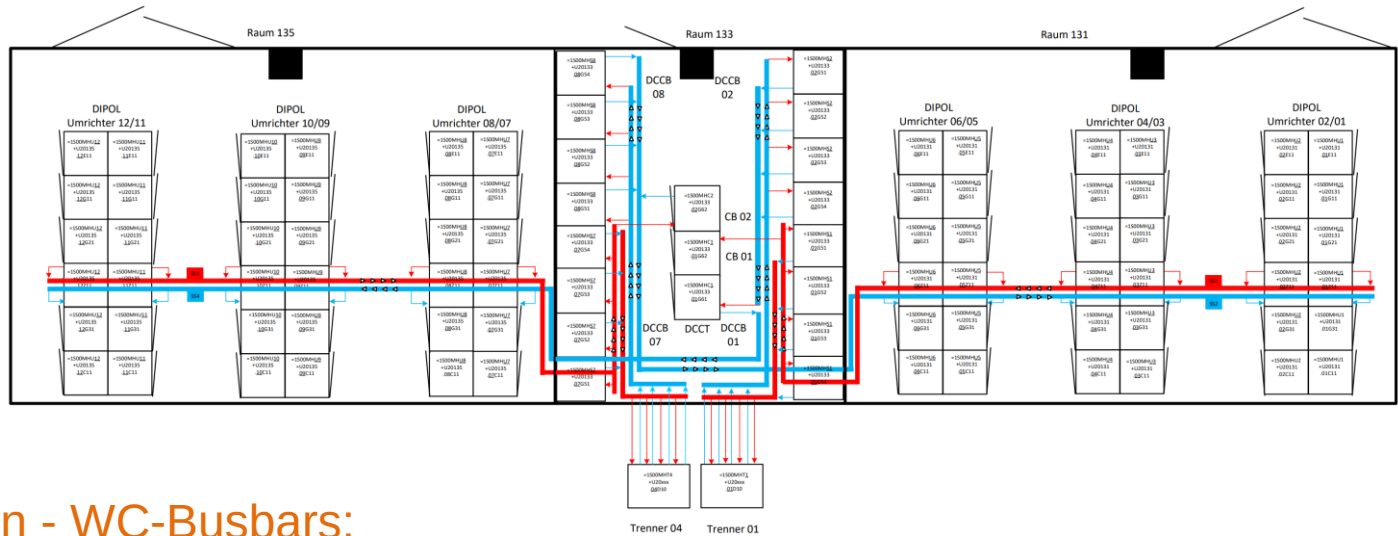


SIS100 Main Power Converters

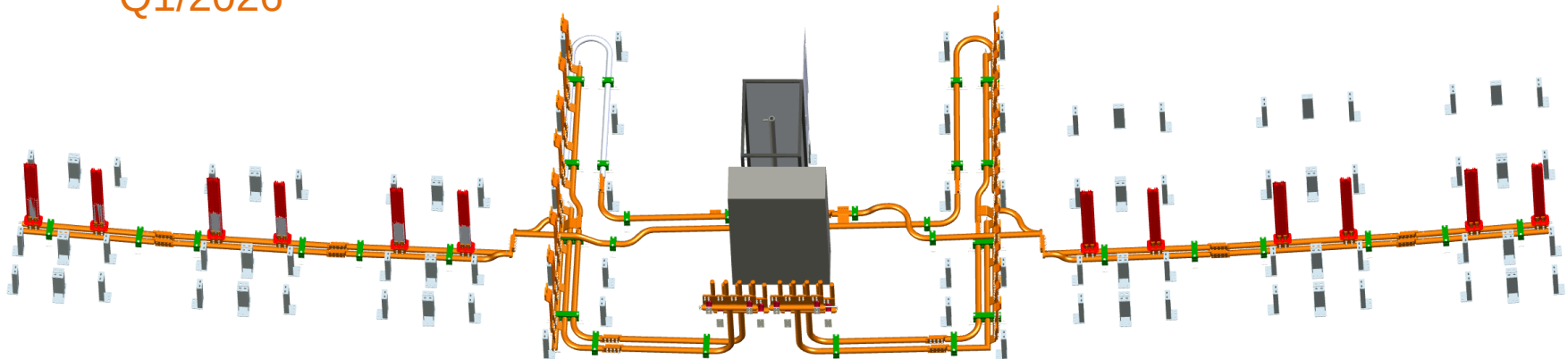


SIS100 Main Power Converters

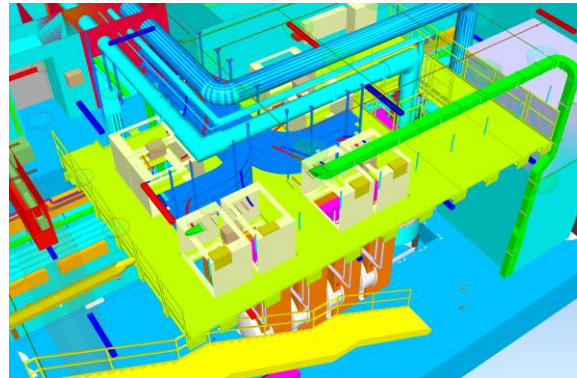
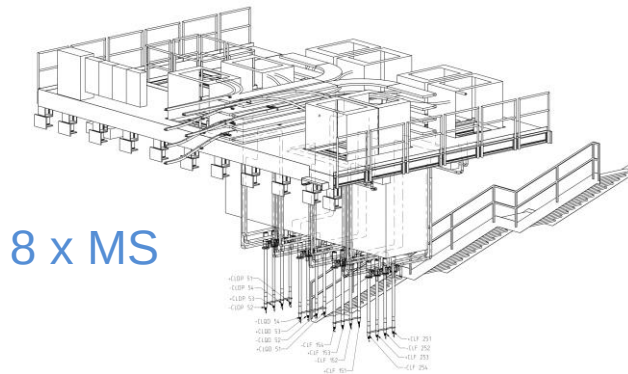
Dipole:



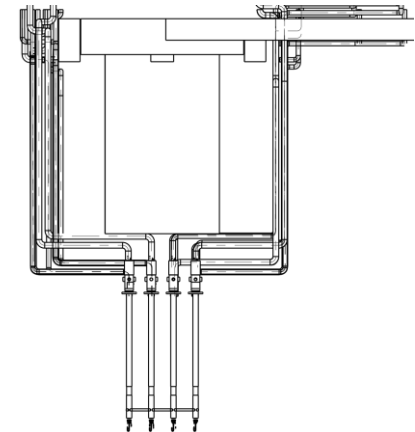
Production - WC-Busbars:
Q1/2026



■ Niches 5, 3, 1:



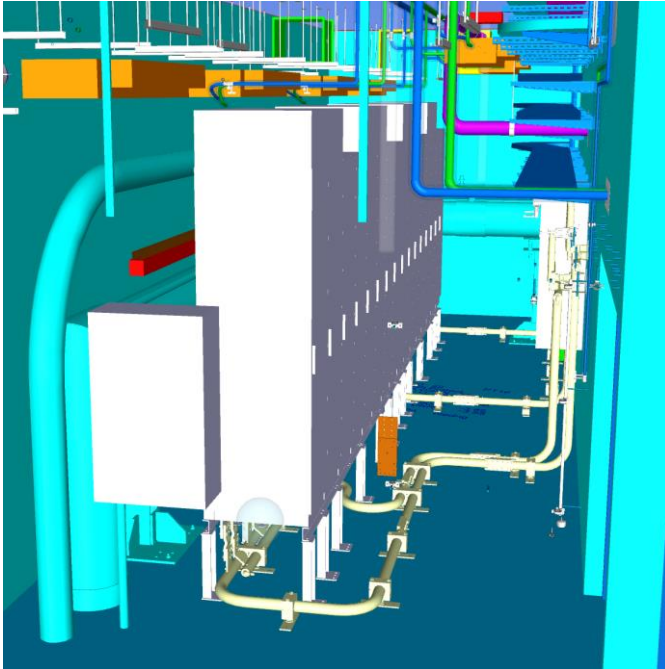
WC-busbars 2



- All Mechanical Switches were successfully installed using mini-crane and hand fork-lifters
- Next steps:
 - Bus-bars to connect the CLBs (still missing info. from GSI!)
 - Electrical installations and grounding of the components
 - Installation of the control and pulling of the control cabling
 - Installation and connection of the water distributions
 - Connections of F1 and F2 magnet systems ins series for the FQuads.



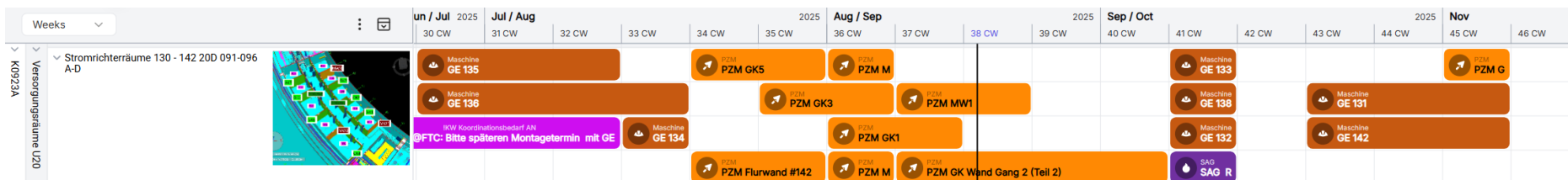
■ DCCB Rooms U20 – 322/222



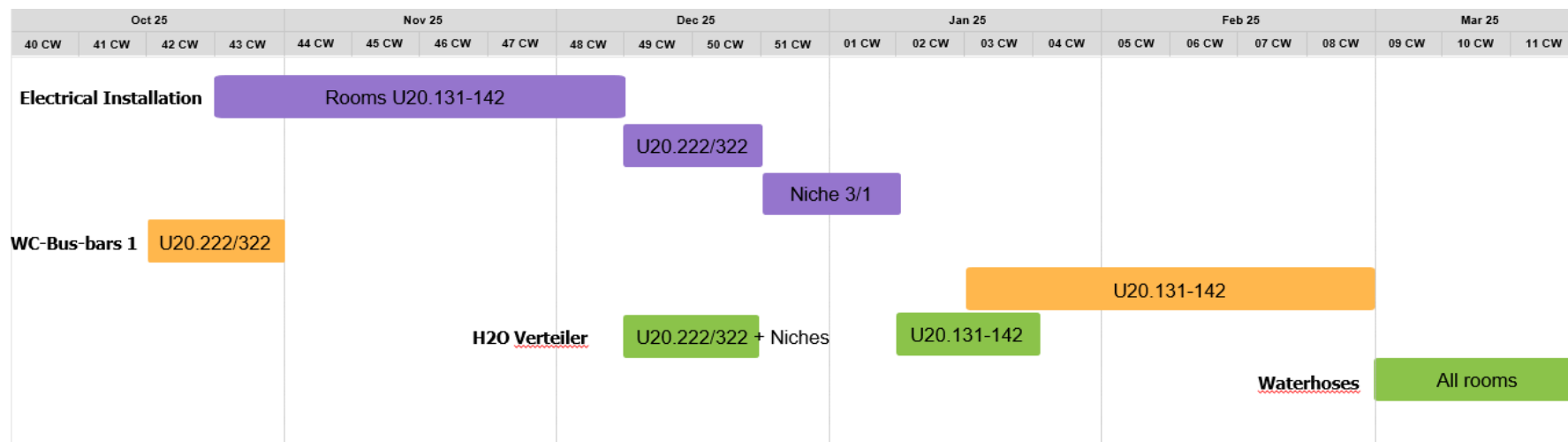
- All DCCBs were inserted using elevators and cabinet transport trolley
- All DCCBs installed using forklifters and appropriate supporting wood constructions
- Dump resistors were installed on the top of the cabinets with chain hoists
- Next steps:
 - Output Bus-bars transport and installation
 - Electrical installations and grounding of the components
 - Installation and pulling of the control cabling
 - Installation and connection of the water distributions

SIS100 Main Power Converters

Upcoming installation of the rest of main components:

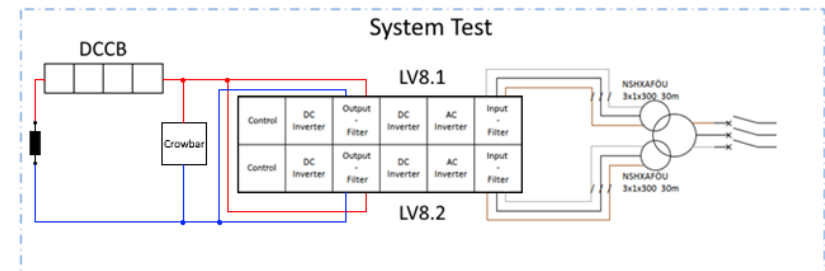
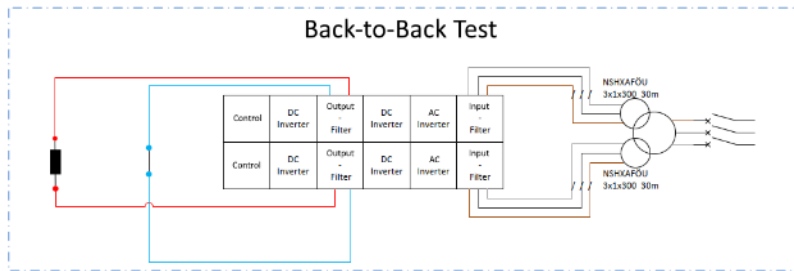


Further installation activities:

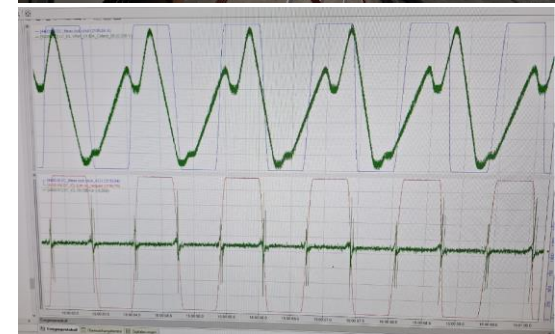


FAT of 2xFoS Inverters – Done Q4/2023

System Safety Test – Done Q4/2024

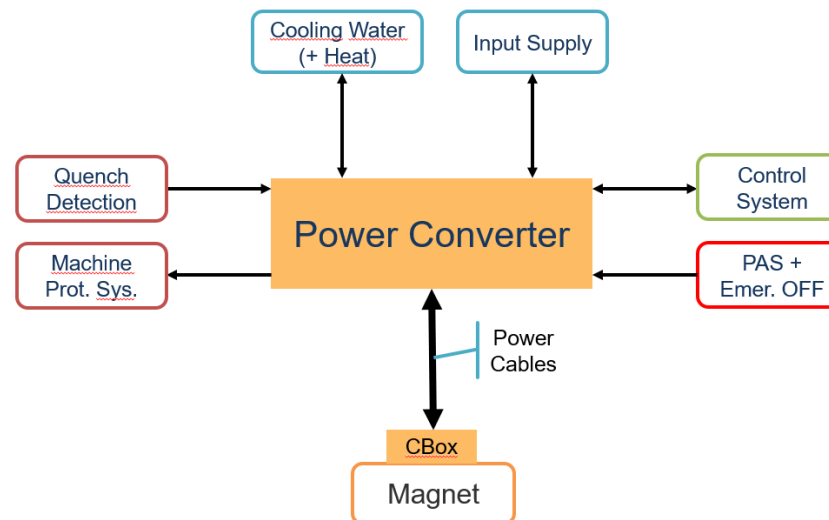


- Routine tests
 - Isolation tests
 - Pressure tests
 - Thermal test with full current of the inverters
- Operation of two converters in series (DC & ramped modes) completed
 - Current flow in both directions
 - Accuracy tests on a test load
- Operation mode of two converters in parallel (DC & ramped modes)
 - Operation and accuracy tests
 - With reactive power compensation of SIS18 current shape tested
- Safety concept being finalized based on test results
 - MPS Trigger
 - Performance of the system safety mechanisms



- **Commissioning of the main power converters:**

- **SAT Aa** - End of installation including VDE tests, pressure tests, etc.
 - **Pre-conditions:** 400V supply
- **SAT Ab:**
 - Dry commissioning without 20 kV [i.e. signal checks, functionality tests without power, etc.]
 - **Pre-conditions:** Cooling water available, output power cables connected and tested
 - Short circuit test with 20kV [i.e. operation of the complete power converters]
 - **Pre-conditions:** 20kV supply, doors with locks and working emergency-off system.
- **SAT B** – Supply of the final load
 - **Pre-conditions:**



SIS100 Main Power Converters

SAT Ab:

					Vorläufiger Starttermin: xx.2026																20 kV notwendig																			
System	Menge	IBN-Zeit je System [d]	Summe [d]	Personal	Januar				Februar				März				April				Mai				Juni				Juli				August				Sept.			
					W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	W17	W18	W19	W20	W21	W22	W23	W24	W25	W26	W27	W28	W29	W30	W31	W32	W33	W34	W35	W36
Kalt-IBN	Controller	3	10	30	①④⑤																																			
	MSR	18	0,5	9	②③																																			
	HV-Schalter	10	0,5	10	①②③																																			
	Trafo	10			①②③																																			
	LV8 Umrichter	20	2	40	①②③																																			
	Wasserverteiler	12	1	12	②③																																			
	Crowbar	3	2	6	②③																																			
	DCCB	20	2	40	①②③																																			
	DCCO	12	1	12	①③																																			
	DCCT	3	0,5	1,5	①③																																			
Heiß-IBN	Test Sequenzen	3	1,5	4,5	①②③④⑤																																			
	DP-System	1	20	10	①②③④⑤																																			
	QD-System	1	10	10	①②③④⑤																																			
	QF-System	1	5	10	①②③④⑤																																			
	Schutzmatrix	3	10	30	①②③																																			
	Abnahme	1	5	5	①																																			

SAT B:

				Vorläufiger Starttermin: xx.2028																																
System	Menge	IBN-Zeit je System	Summe [d]	Personal	Januar				Februar				März																							
					W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14																		
DP-System	1	20	20	①④⑤																																
QD-System	1	10	10	①④⑤																																
QF-System	1	5	5	①④⑤																																
Schutzmatrix	3	5	15	①④																																
Lastprofile	3	5	5	①④																																
Statcom SiS 18	3	3	9	①④																																
Abnahme	1	5	5	①④⑤																																

Thank you for your attention