



EUROPEAN  
SPALLATION  
SOURCE

# IKON 18

## NSS Electrical Engineering Infrastructure

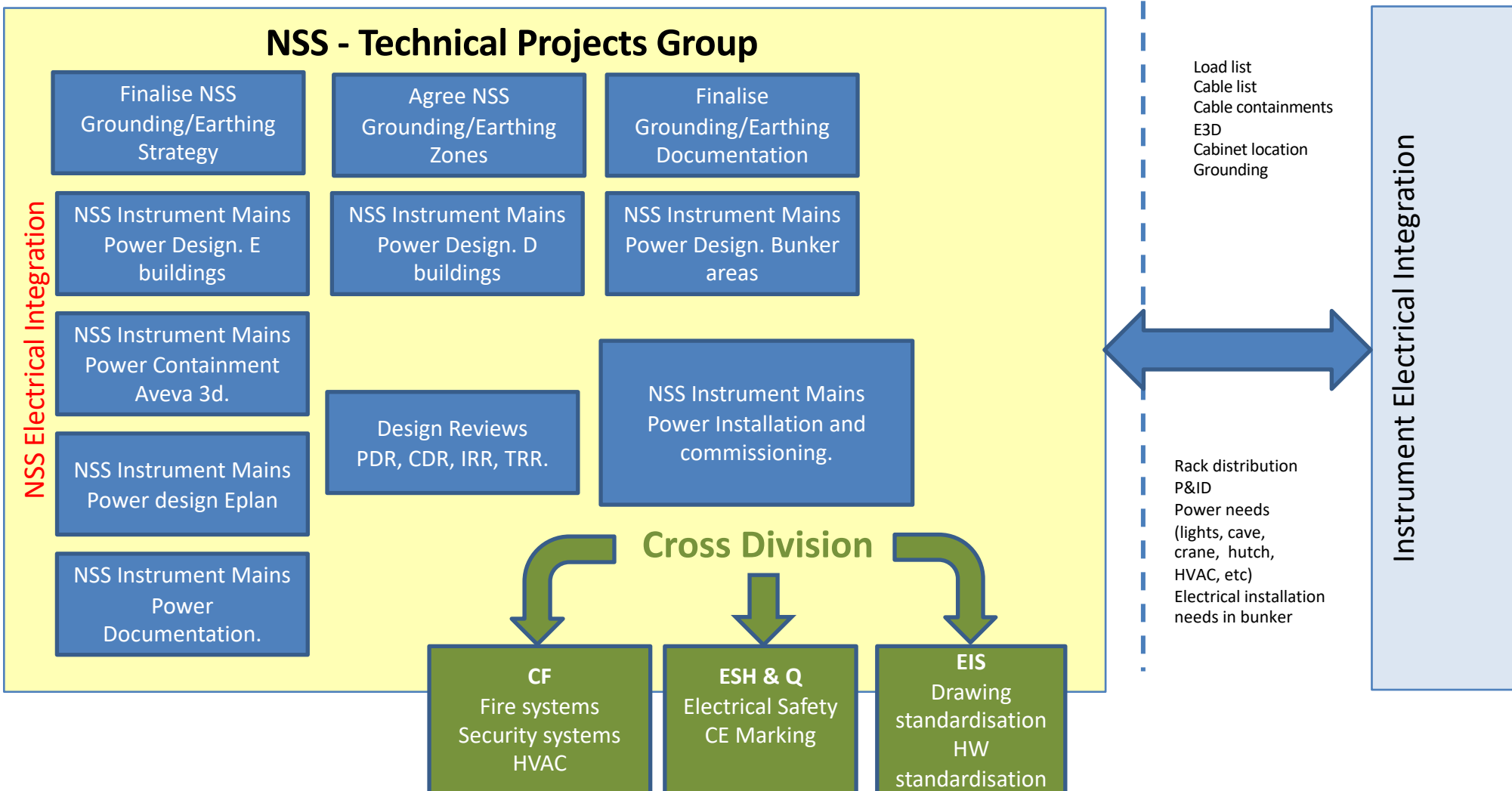
### Scope of work

Stuart Birch MIET  
Senior Engineer-NSS-Technical Projects Group  
2020-02-26

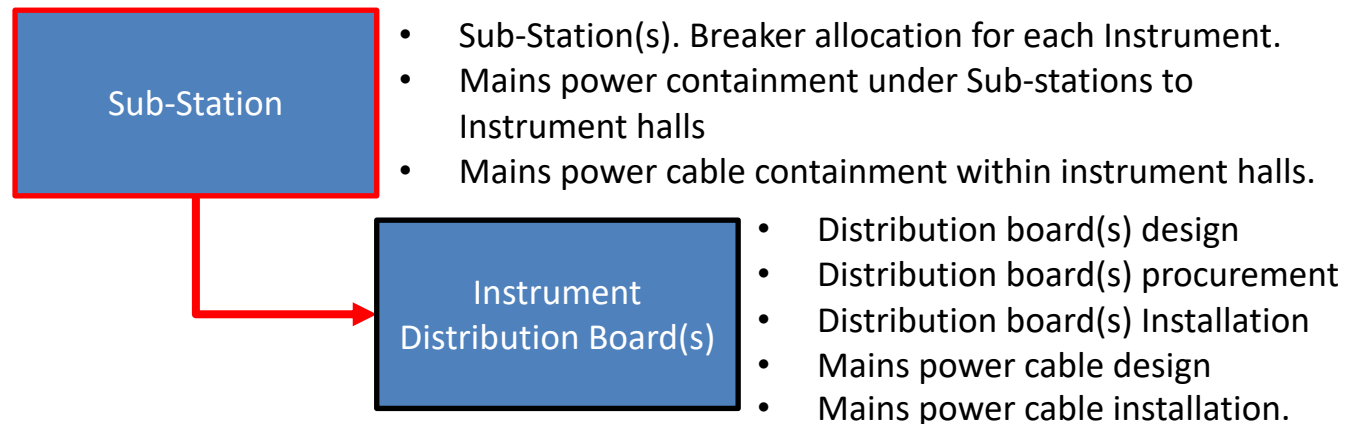
- High Level Scope of work
- Current Scope
- Ideal Scope (Maybe!)
- Electrical Engineering Management and standards.
- Current status and Timeline E buildings

# NSS Technical Projects Group Scope of work

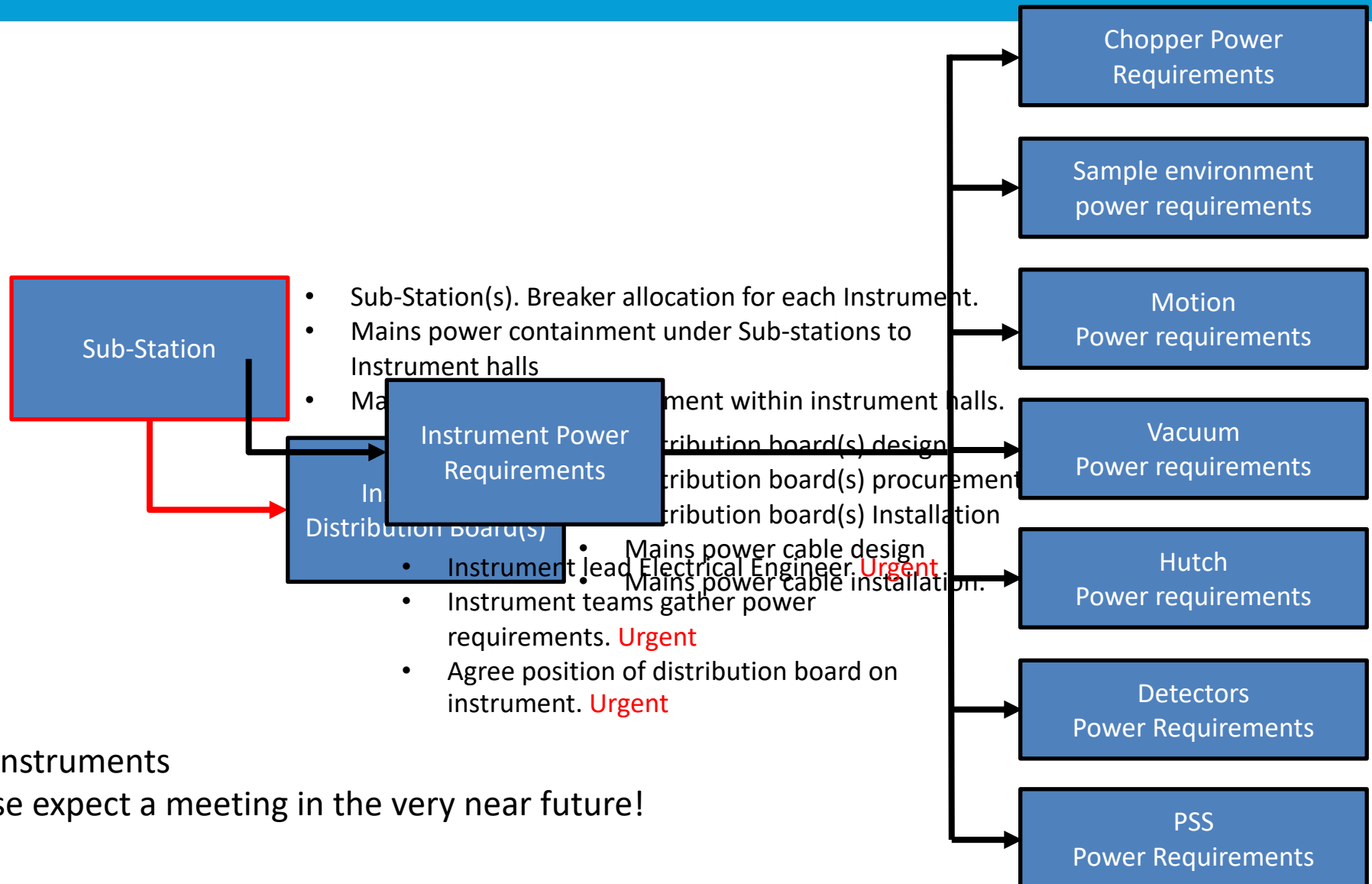
## NSS - Technical Projects Group



# NSS Technical Projects Group Scope of work



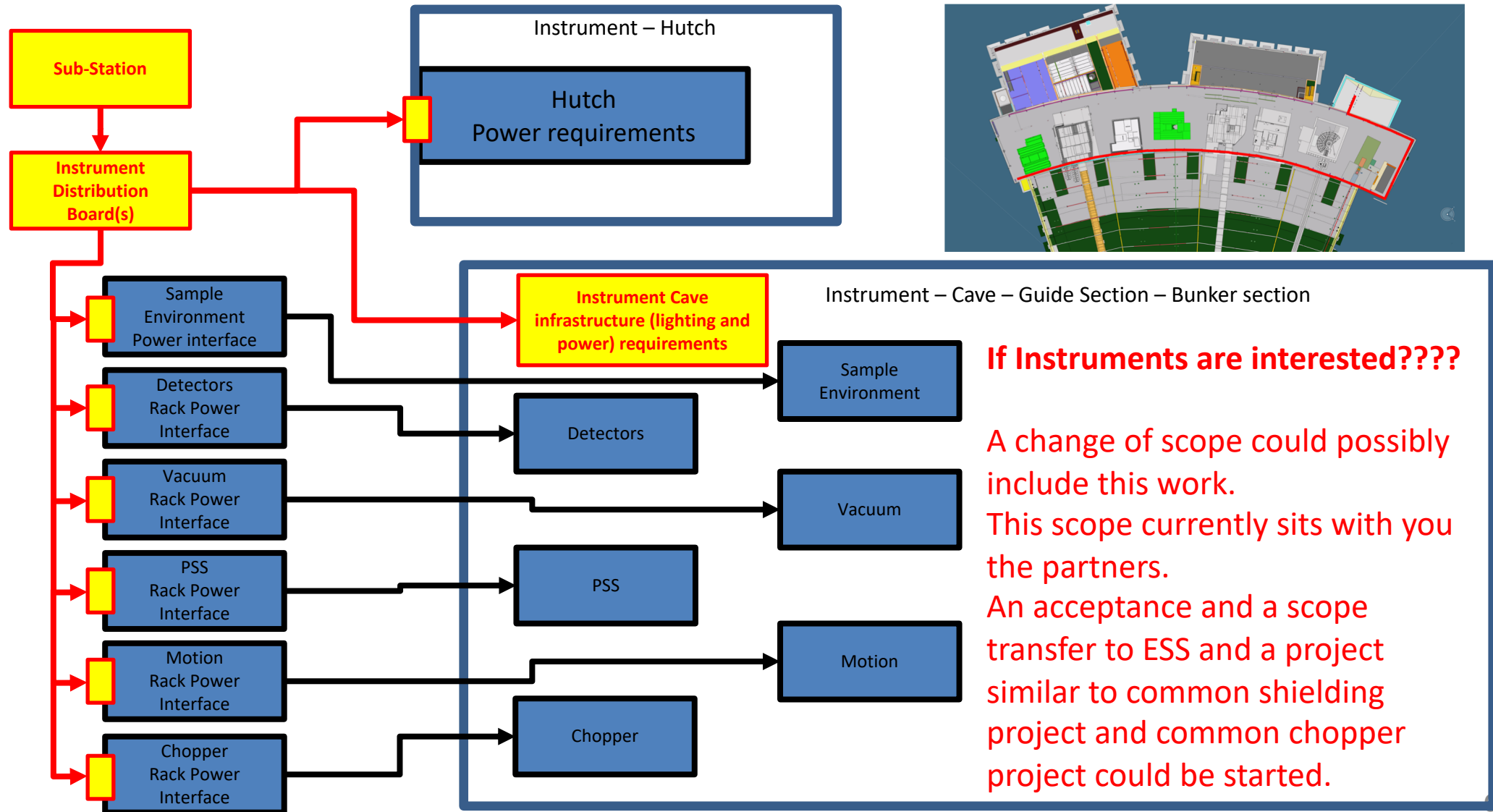
# NSS Technical Projects Group Scope of work



E01 instruments

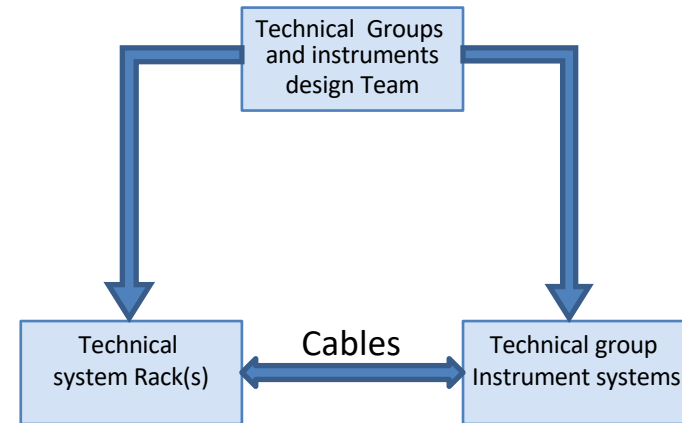
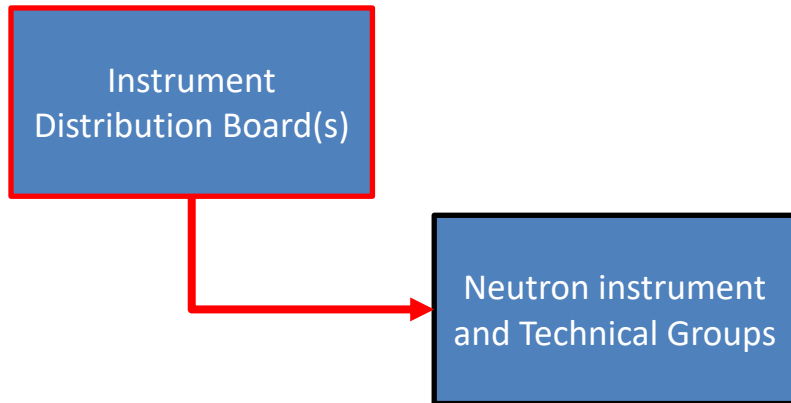
Please expect a meeting in the very near future!

# Increased Electrical Scope Maybe!



# Electrical Engineering management on Instrument projects Eplan and Aveva 3D

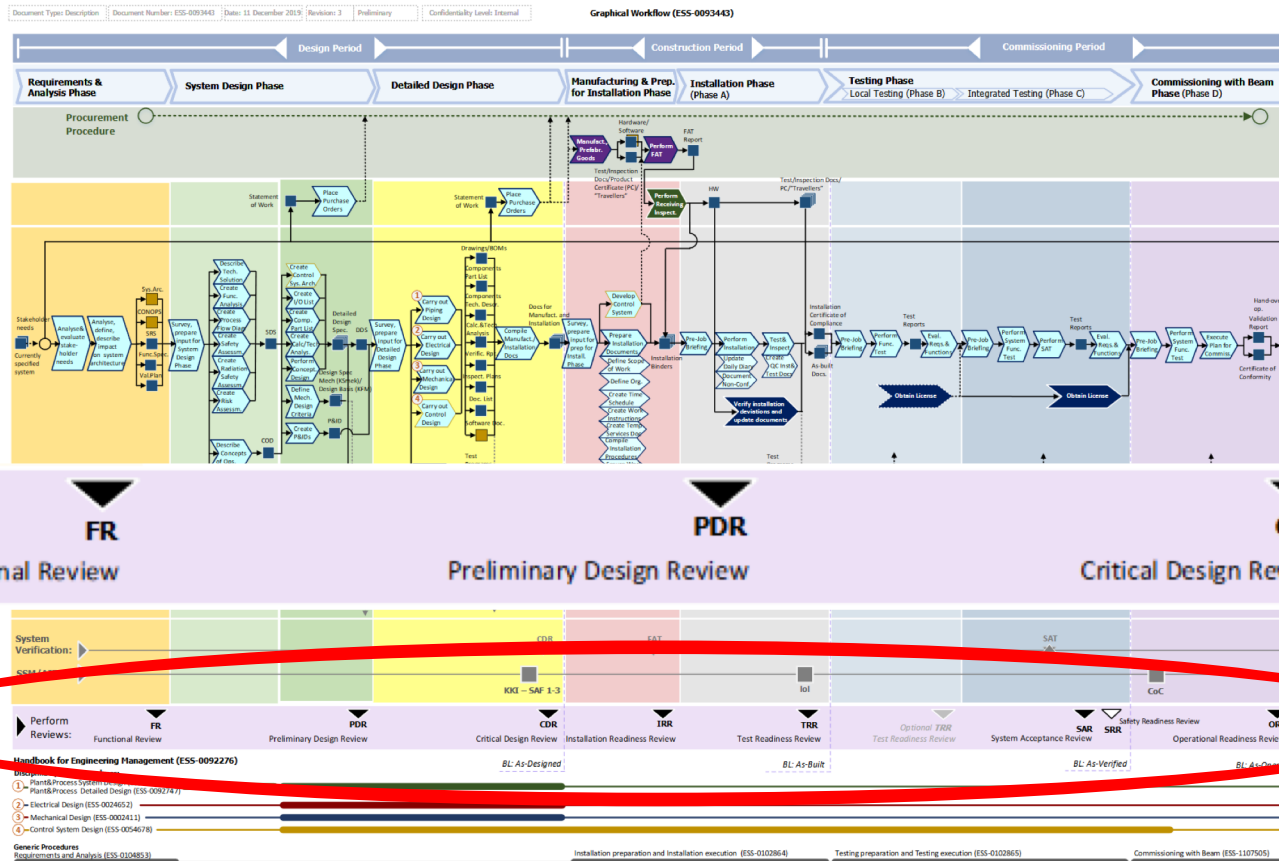
Example Eplan drawings for a system. ESS-0508473



- ESS Handbook for Engineering Management ESS-0092276
- Breakdown Structures for NSS (ESS-xxxxxxx)
- ESS Guideline for ESS Breakdown Structures (ESS-0048668)
- ESS Generic requirements for marking and labelling (ESS-0094091)
- ESS Generic Requirements for Naming and Tagging (ESS-0094090)
- ESS Rules for electrical design (ESS-0015433)
- ESS Strategy for CE Marking (ESS-0103087) Electrical LV-installations shall as a minimum be tested and inspected in accordance to part 6 in the SS436 40 00 standard. See also ESS Rules for Inspection, test and verification of electrical installations (ESS-01455259).

# ESS Engineering Management

- ESS Handbook for Engineering Management ESS-0092276
- It comes with a graphical 'workflow' pdf: <https://chess.esss.lu.se/enovia/link/ESS-0093443/21308.51166.54528.23778/valid>





# ESS Guidelines, Rules and Procedures!

Procedure Docs:		
ESS-0104853		ESS Procedure for Requirements and Analysis Phase
ESS-0039063		ESS Procedure for Plant & Process System Design
ESS-0092747		ESS Procedure for Plant & Process Detailed Design
ESS-0002411		ESS Procedure for Mechanical Engineering Design
ESS-0024652		ESS Procedure for Electrical Design
ESS-0102864		ESS Procedure for Installation preparation and Installation execution
ESS-0102865		ESS Procedure for Testing preparation and Testing execution
ESS-1107505		ESS Procedure for Commissioning with Beam Phase
ESS-0055717		ESS Procedure for Submitting and Handling Procurement Requests
ESS-0011452		ESS Procedure for sustainable selection of materials
Guidelines, Requirements and Rules Docs:		
ESS-0094092		ESS Generic Requirements for Documentation of Technical Systems
ESS-0094091		ESS Generic Requirements for Marking and Labelling
ESS-0094090		ESS Generic Requirements for Naming and Tagging
ESS-0094204		ESS Guideline for Validation Factory Acceptance Test (FAT) and Site Acceptance Test (SAT)
ESS-0105257		ESS Guideline for Engineering Data Change Management
ESS-0050017		ESS Rules for Project Information Management
ESS-0033258		ESS rules for radiation safety classification of mechanical equipment
ESS-0047989		ESS rules for quality requirements for mechanical equipment
ESS-0054158		ESS rules for radiation safety classification of Electrical and I&C Equipment including technical and quality requirements
ESS-0016468		ESS rule for identification and classification of safety important components
ESS-0039311		ESS Rules for Technical requirements for mechanical equipment
ESS-0135373		ESS Rules for Design of Electrical Power Systems
ESS-0189461		ESS Rules for Spatial Integration validation
ESS-0177539		ESS rule for release and change of technical documentation, drawings and models
Misc Docs:		
ESS-1106469		ESS Facility Development Methodology Handbook
ESS-0093443		ESS Engineering Graphical Workflow
ESS-0091757		Required submittals for mechanical safety systems
ESS-0008910		Standard Operating Procedure for conducting design reviews
ESS-0001515		Standards & Norms applicable for ESS
ESS-0018828		New English translation 2017-01-09 of the official permit 2015 from the Swedish Radiation Safety Authority, SSM
ESS-0091812		ESS Project Management Handbook
ESS-0489907		ESS Facility Configuration Management Plan

# Swedish/International Standards



## Electrical installations

- SS 436 40 00 - General regulations for low voltage electrical installations.
- SSG 4100E – Erection instructions for electrical equipment (informative).
- ELSÄK-FS 2016:1 - The Swedish version based on the EU regulation 2014/95/EG Low voltage directive.
- ELSÄK-FS 2008:1 – The Swedish Electrical Safety Authority regulations and general guidelines how electrical installations must to be performed.
- SS-EN 61936-1:2010 - Power installations exceeding 1 kV a.c. -  
Part 1: Common rules
- SS-EN 50522 - Earthing of power installations exceeding 1 kV a.c
- 94/9/EC - Equipment and protective system in potentially explosive atmospheres.
- SS-EN 60079 – Explosive atmospheres, Part 14: Electrical installations design, selection and erection.

## Electromagnetic compatibility

- SS-EN 62305 - Protection against lightning.
- IEC 61000 - Electromagnetic compatibility.
- SSG 5150E – Earthing and screening of electronic equipment (informative).
- ELSÄK-FS 2016:3 - The Swedish version based on the EU regulation EMC- Directive 2014/30/EU.
- SS-EN 50310 - Application of equipotential bonding and earthing in buildings with information technology equipment  
NOTE: The requirement for conformance stated in “clause e” will not be fulfilled by all systems at ESS
- SS-EN 61000-2-4 - Electromagnetic compatibility (EMC) – Part 2-4: Environment – Compatibility levels in industrial plants for low-frequency conducted disturbances.
- SS-EN 61000-6-4 - Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments.

# Swedish/International Standards



## Technical documentation

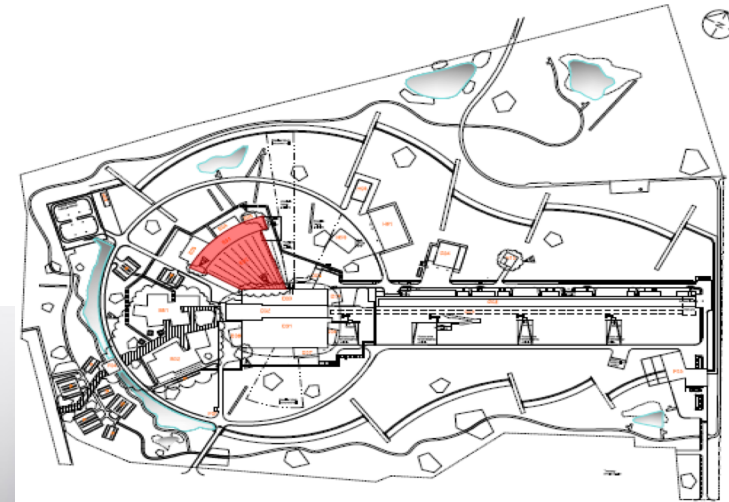
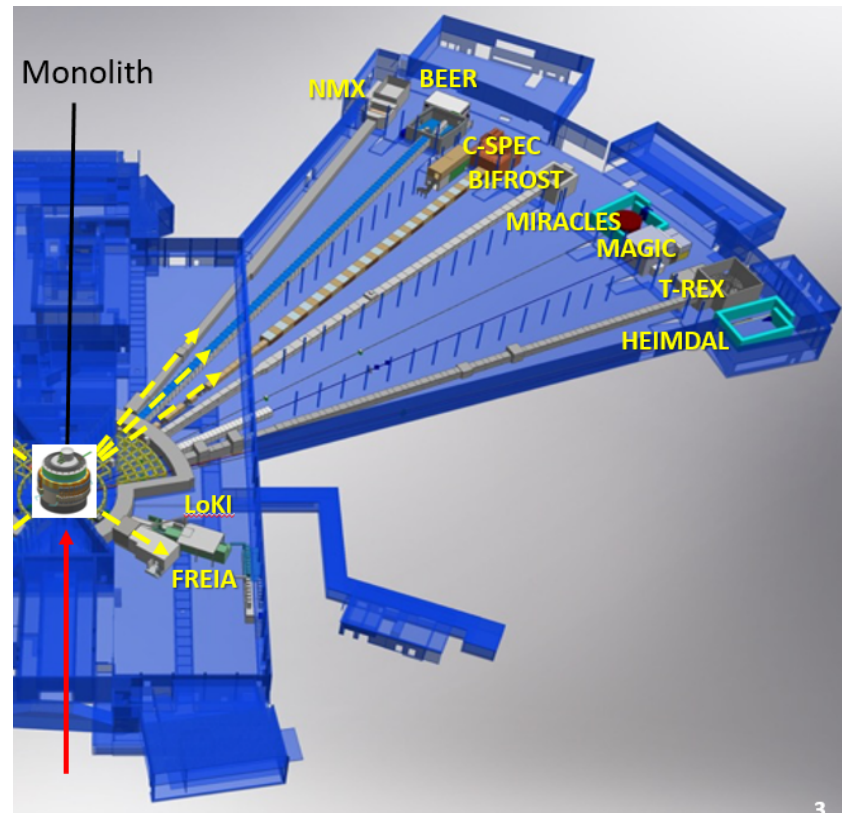
- SS-EN 61355 - Structuring of technical information and documentation.
- SS-EN 61082 - Preparation of document used in electro technology.
- IEC 60027 - Letter symbols to be used in electrical technology.
- IEC 60050 - International Electrotechnical Vocabulary.
- IEC 60617 - Graphical symbols for diagrams.

## Other applicable standards

- SS-EN 61439 - Low-voltage switchgear and controlgear assemblies.
- SS-EN 60715 - Dimensions of low-voltage switchgear and controlgear - Standardized mounting on rails for mechanical support of electrical devices in switchgear and controlgear installations.
- SS-EN 60947 - Low-voltage switchgear and controlgear.
- SS-EN 61850 - Communication networks and systems for power utility automation.
- SS-EN 60529 - Degrees of protection provided by enclosures.
- SS-EN 60309 - Plugs, socket-outlets and couplers for industrial purposes.
- SS-EN 62381 - Automation systems in the process industry - Factory acceptance test (FAT), site acceptance test (SAT), and site integration test (SIT)
- ISO 27000 - Information technology - Security techniques

# Current Status E buildings?

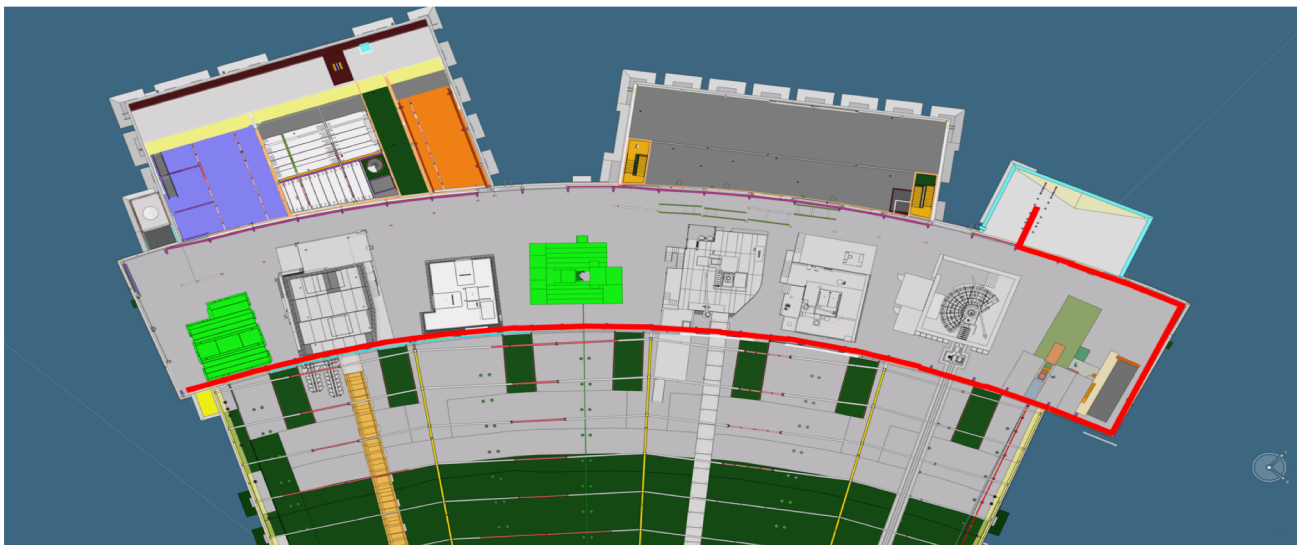
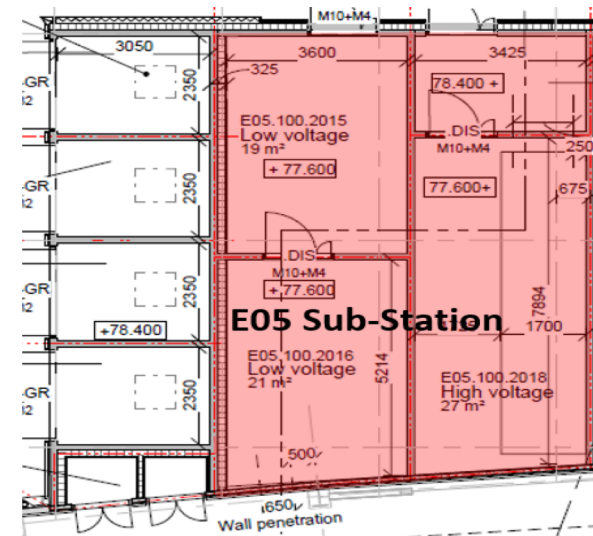
- Mains power Infrastructure to Distribution Board
- E01, E02 & E05 Buildings (8 instruments)
  - NMX
  - BEER
  - CSPEC
  - BIFROST
  - MIRACLES
  - MAGIC
  - T-REX
  - HEIMDAL



# Current Status E buildings?

## Mains power Infrastructure

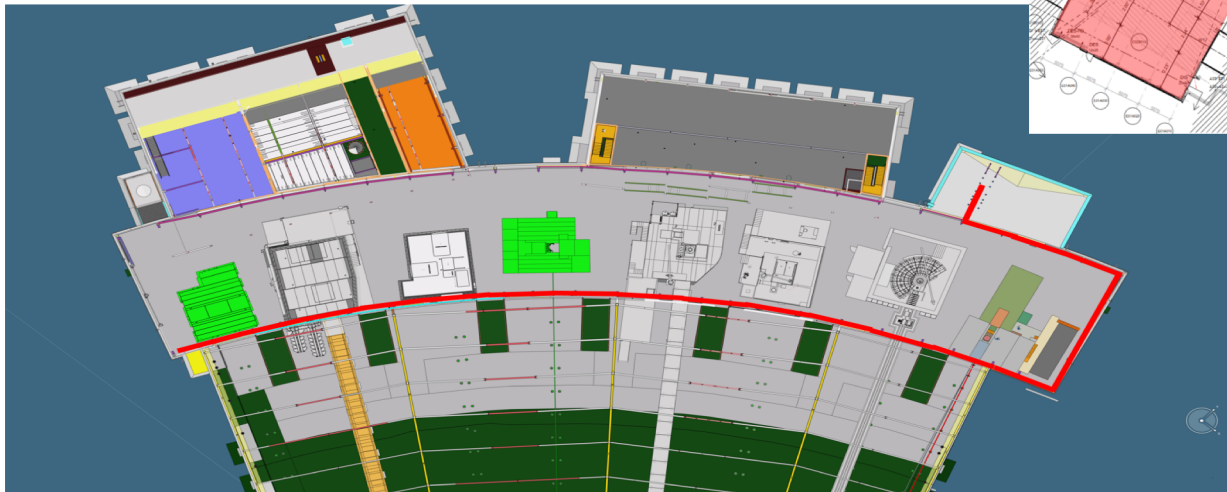
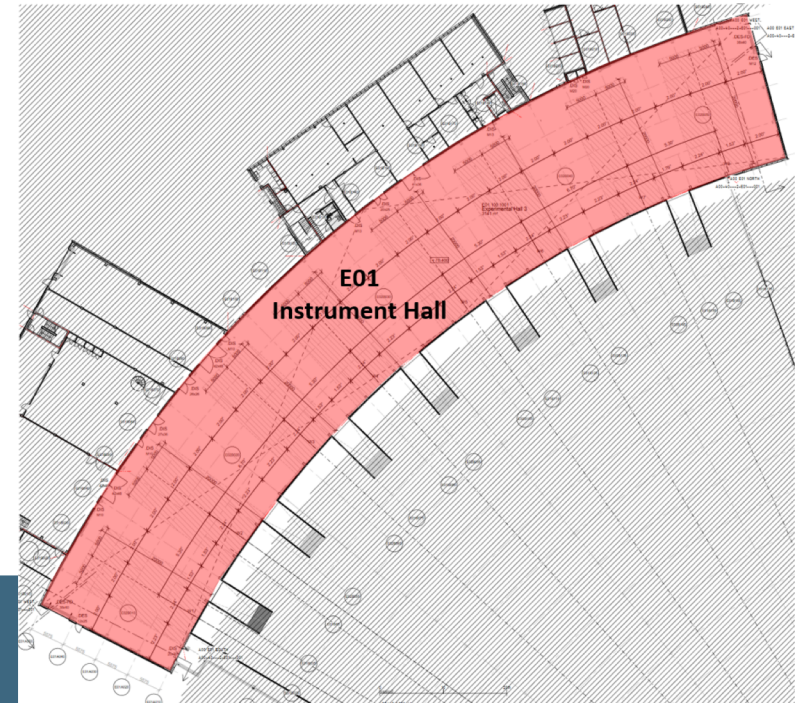
- E05 Substation
  - Select Main breakers for 8 Instruments
  - Design E05 substation cable containment
  - Procurement
    - Materials
    - Installation teams
- Installation and Commissioning



# Current Status E buildings?

## Mains power Infrastructure

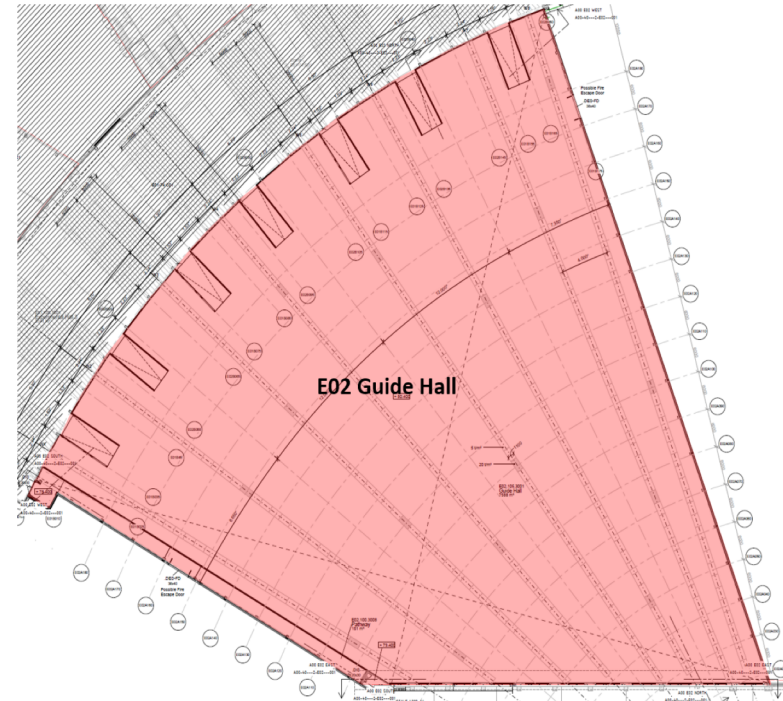
- E01 Instrument hall
  - Mains power infrastructure design
  - Cable design
  - Distribution board design
  - Procurement
    - Materials
    - Installation teams
- Installation and Commissioning



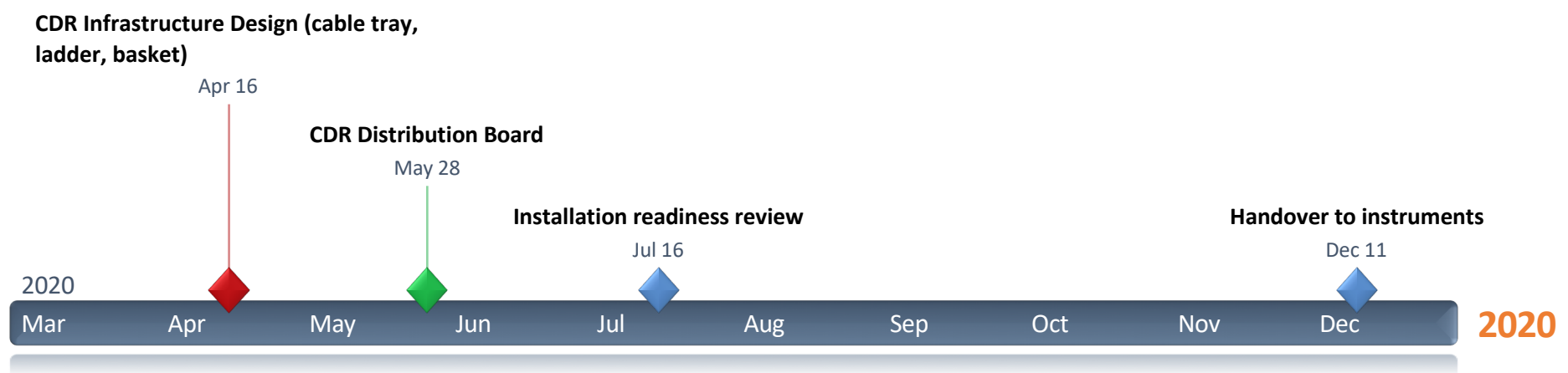
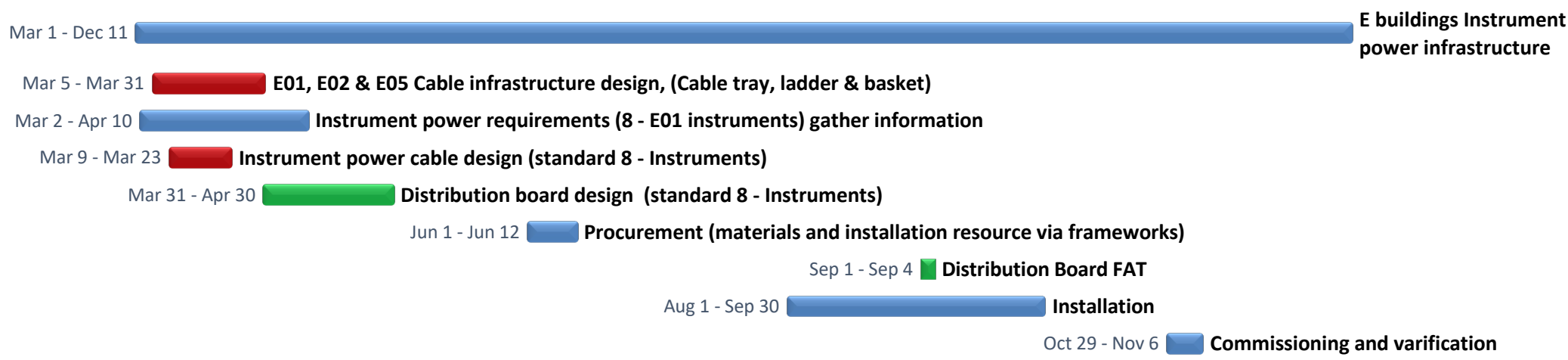
# Current Status E buildings?

## Mains power Infrastructure

- E02 Guide hall
  - Mains power infrastructure design
  - Cable design
  - Distribution board design
  - Procurement
    - Materials
    - Installation teams
- Installation and Commissioning



# E Building Electrical Infrastructure Timeline





# Thank you



# Thank You

# Questions?

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**PSS** [annika.nordt@ess.eu](mailto:annika.nordt@ess.eu)

FBS									
TAG						Description			
Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Class name	RDS code	Type	Description
ESS						Site			European Spallation Source
└─	NSS					Neutron Scattering System			Neutron Scattering Systems
	└─	H01				Instrument System	H01	System	Instrument Systems
		└─	A01			Infrastructure System	A01	Sub-system	Instrument Infrastructure
		└─	H01			Research Support System	H01	Sub-system	Enabling Systems
		└─	H02			Research system	H02	Sub-system	LoKI
		└─	H03			Research system	H03	Sub-system	NMX
		└─	H04			Research system	H04	Sub-system	ODIN
		└─	H05			Research system	H05	Sub-system	BEER
		└─	H06			Research system	H06	Sub-system	SKADI
		└─	H07			Research system	H07	Sub-system	DREAM
		└─	H08			Research system	H08	Sub-system	ESTIA
		└─	H09			Research system	H09	Sub-system	CSPEC
		└─	H10			Research system	H10	Sub-system	FREIA
		└─	H11			Research system	H11	Sub-system	VOR
		└─	H12			Research system	H12	Sub-system	HEIMDAL
		└─	H13			Research system	H13	Sub-system	BIFROST
		└─	H14			Research system	H14	Sub-system	T-REX
		└─	H15			Research system	H15	Sub-system	VESPA
		└─	H16			Research system	H16	Sub-system	MIRACLES
		└─	H17			Research system	H17	Sub-system	MAGIC
		└─	H18			Research system	H18	Sub-system	ESS Test Beam Line (TBL)

TAG								FBS		Description	
Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Class name	RDS code	Type	Description
ESS								Site			European Spallation Source
	NS							Neutron Scattering System			Neutron Scattering Systems
		HO1						Instrument System	HO1	System	Instrument Systems
			AO1					Infrastructure System	AO1	Sub-system	Instrument Infrastructure
				HOB				Research system	HOB	Sub-system	ESTIA
					AO1			Infrastructure System	AO1	Sub-system	Beam Transport and Conditioning
						B01		Beam Validation System	B01	Sub-system	Beam Validation
							B01	Beam Monitoring System	B01	Sub-system	Beam Monitor 1 (F)
							B02	Beam Monitoring System	B02	Sub-system	Beam Monitor 2 (F)
							F01	Shielding System	F01	Sub-system	Shielding
							F01	Shielding System	F01	Sub-system	Beamline Shielding
							F02	Shielding System	F02	Sub-system	In-line Bunker Shielding
							F03	Shielding System	F03	Sub-system	Neutron Guide Shielding (Heavy Collimation)
							R01	Chopper System	R01	Sub-system	Chopper System
							R02	Beam Geometry Conditioning System	R02	Sub-system	Beam Geometry Conditioning
							R01	Beam Collimation System	R01	Sub-system	Slit Collimation
							R02	Beam Collimation System	R02	Sub-system	Aperture Collimation
							R03	Beam Cut Off System	R03	Sub-system	Beam Cut off
							R01	Beam Dump	R01	Sub-system	Beam Stop
							W01	Beam Transport System	W01	Sub-system	Beam delivery system
							??	??	??	Sub-system	Beam Filtering System
							AO2	Infrastructure System	AO2	Sub-system	Sample Expose System
							W01	Sample Positioning	W01	Sub-system	Positioning System
							AO3	Infrastructure System	AO3	Sub-system	Scattering Characterisation system
							AD1	Sampling System	AD1	Sub-system	Neutron Detector System
							B01	Sensor System	B01	Sub-system	Neutron Detector
							B02	Analysing Instrument	B02	Sub-system	Analyser
							CO1	Tank	CO1	Sub-system	Vacuum Tank
							W01	Positioning System	W01	Sub-system	Tank Positioning System
							AO4	Infrastructure System	AO4	Sub-system	Support Systems
							AD1	Control Hut	AD1	Sub-system	Control Hut
							AD2	Sampling System	AD2	Sub-system	Sample preparation facility
							AO3	Infrastructure System	AO3	Sub-system	Support Infrastructure
							B01	Detector	B01	Sub-system	H2 Leakage Detection
							B02	Detector	B02	Sub-system	H2O monitoring
							B03	Detector	B03	Sub-system	O2 Monitoring
							F01	Fire Fighting System	F01	Sub-system	Fire protection
							CO1	Ventilation System	CO1	Sub-system	Ventilation (HVAC)
							GM01	Crane	GM01	Component	Local Crane
							PO1	Video Surveillance System	PO1	Sub-system	Remote Area Surveillance
							F01	Shielding System	F01	Sub-system	Experiment Space & Shielding
							F01	Shielding System	F01	Sub-system	Cave building
							F02	Shielding System	F02	Sub-system	Shielding Door
							F03	Shielding System	F03	Sub-system	Shielding Hatch
							U01	Mechanical Support	U01	Sub-system	Cable Management
							??	??	??	Sub-system	Optical Cave
							AO5	Infrastructure System	AO5	Sub-system	Supply System
							AO1	Infrastructure System	AO1	Sub-system	Utilities
							AO1	Infrastructure System	AO1	Sub-system	Utilities Distribution Common zone
							E01	Cooling System	E01	Sub-system	Chilled water
							R01	Air Pressure System	R01	Sub-system	Compressed air
							W01	Gas Distribution System	W01	Sub-system	Gas Distribution
							AO2	Infrastructure System	AO2	Sub-system	Utilities Distribution Intern zone
							E01	Cooling System	E01	Sub-system	Chilled water
							R01	Air Pressure System	R01	Sub-system	Compressed air
							W01	Gas Distribution System	W01	Sub-system	Gas Distribution
							AO3	Infrastructure System	AO3	Sub-system	Utilities Distribution Cave zone
							E01	Cooling System	E01	Sub-system	Chilled water
							R01	Air Pressure System	R01	Sub-system	Compressed air
							W01	Gas Distribution System	W01	Sub-system	Gas distribution
							WC01	Low Voltage Power Distribution	WC01	Sub-system	SE utilities Panel
							K01	Timing System	K01	Sub-system	Timing System
							W01	Electrical Power Distribution System	W01	Sub-system	Electrical Power & Grounding
							W01	Electrical Power Distribution System	W01	Sub-system	UC03 Power & Grounding distribution+ Monitoring Intern Zone
							W02	Electrical Power Distribution System	W02	Sub-system	UC03 Power & Grounding distribution+ Monitoring Cave Zone
							W03	Electrical Power Distribution System	W03	Sub-system	UC03 Power & Grounding distribution+ Monitoring Common Zone
							AO6	Remote Handling System	AO6	Sub-system	Instrument Control & DAQ Systems
							K01	Motion Control System	K01	Sub-system	Shutter Motion Control
							K02	Motion Control System	K02	Sub-system	General Purpose Motion Control
							K03	Motion Control System	K03	Sub-system	Robotics Control
							K04	Motion Control System	K04	Sub-system	DAQ Neutron Detectors
							K05	Motion Control System	K05	Sub-system	DAQ Beam Monitors
							K06	Motion Control System	K06	Sub-system	Controls Network
							AO7	Infrastructure System	AO7	Sub-system	EMCS (Should be named differently)
							K01	Data Management And Analysis System	K01	Sub-system	Data Acquisition
							K02	Data Management And Analysis System	K02	Sub-system	Data Management
							K03	Data Management And Analysis System	K03	Sub-system	Beamline Control
							K04	Data Management And Analysis System	K04	Sub-system	Server Infrastructure
							F01	Safety System	F01	Sub-system	Personal safety System PSS (ESTIA)
							G01	Vacuum System	G01	Sub-system	Vacuum system (ESTIA)