



# Update on ESS Construction Project

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European Spallation Source ERIC

2021.04.14

# Agenda



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1 NSS Project Status

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2 Managing ESS scope for instruments

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3 Managing ESS budget & schedule

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# NSS project status

# NSS Highlights



Jan – Mar 2021

instrument distribution boards for E01 delivered



Bunker West wall blocks installation ongoing



TBL bunker wall insert delivered



Electrical infrastructure (cable trays / raceways) in D-building galleries



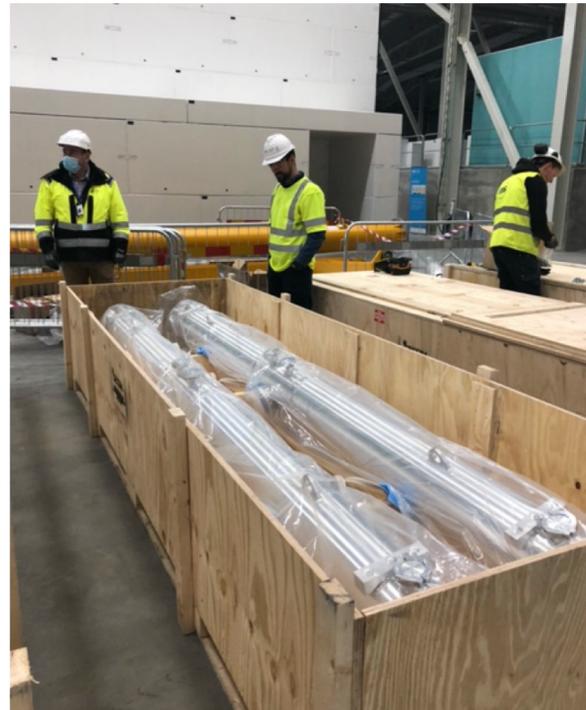
# NSS Highlights

Feb 2021

First Guide shielding blocks for CSPEC ready to be shipped (arrived at ESS early March)



CSPEC vacuum housings Delivered. Currently being tested



Baseplates & Bunker frame installation D03/D02



# NSS Highlights

March 2021



*Bunker south Wall installation started mid March*

# NSS Highlights

BIFROST Detector tank delivered to site



# Common Choppers

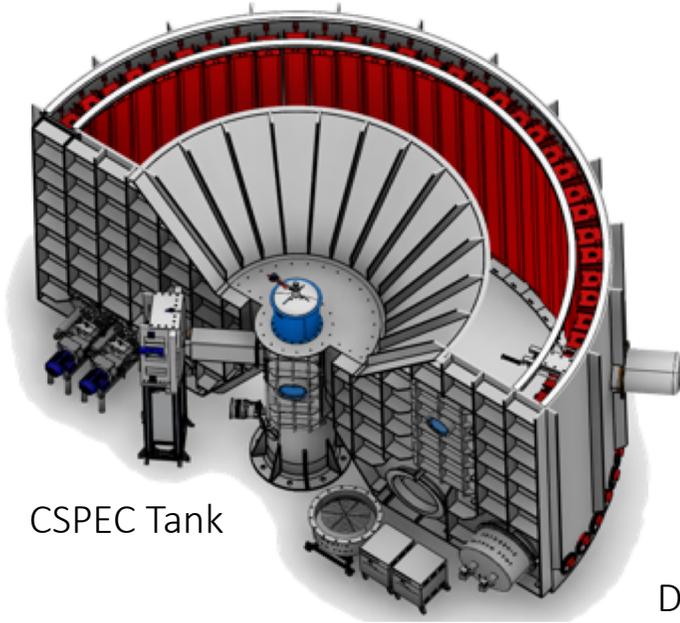


Prototype T0 chopper  
design speed of 31Hz  
reached



New NCG coated disc. Balanced and  
ready for high speed tests

# The Multi-Grid detector for CSPEC (& T-REX)

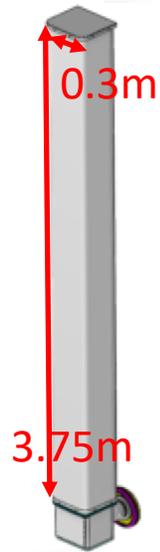


CSPEC Tank

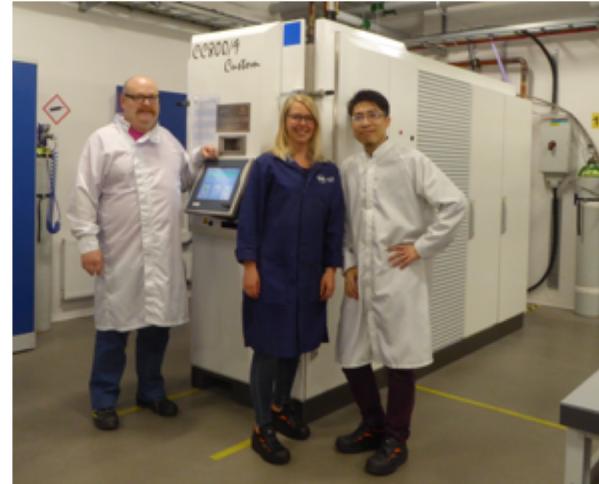
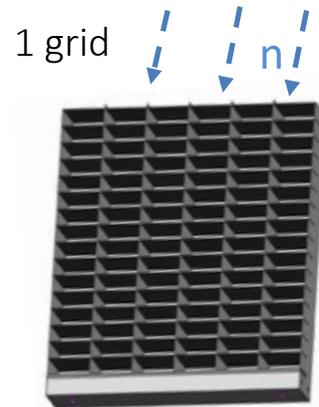
140 grids x  
2 columns/vessel



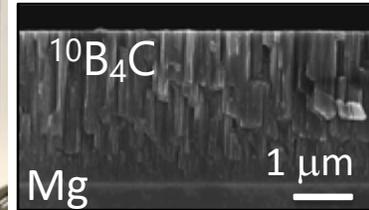
- Cost: 4.3 M€ (including installation)
- Delivery agreement b/n TUM & NSS signed in June 2020



Detector Module  
18 x vessels in total

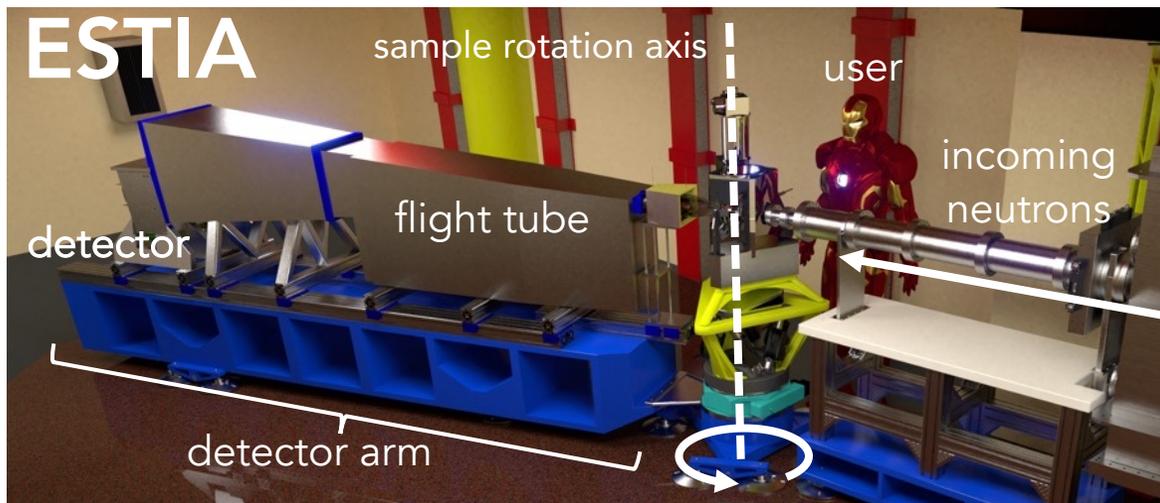


ESS Coating  
facility  
(Linköping)

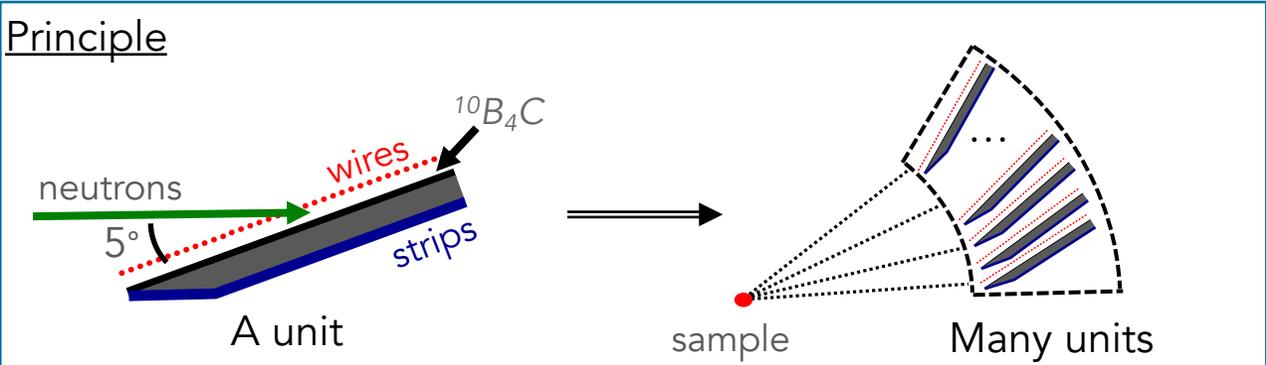


ESS Assembly workshop (Utgård, Lund)

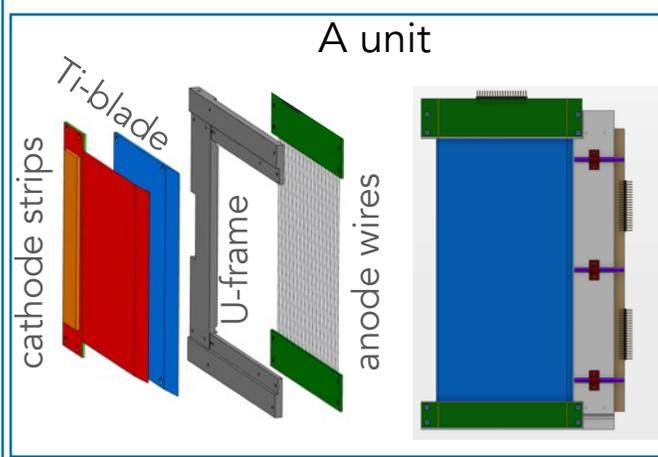




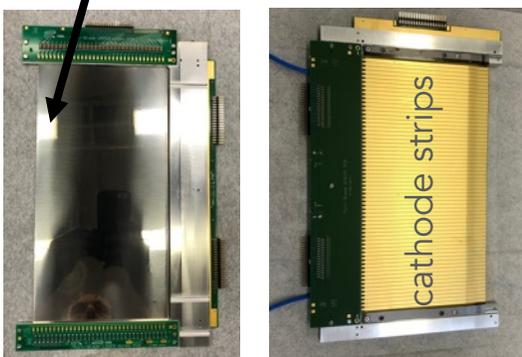
Cost: 790 kEUR (incl. installation and cold commissioning)  
 Delivery agreement soon to be signed b/n PSI and NSS



## ESTIA Detector

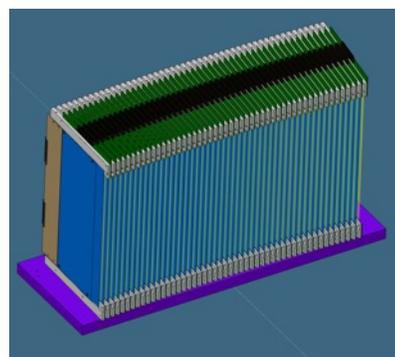


$^{10}\text{B}_4\text{C}$  coated Ti-blade by the ESS Coating facility (Linköping)



Assembly at the ESS workshop (Utgård, Lund)

48-unit ESTIA detector  
 (active area 480x260mm<sup>2</sup>,  
 Spat. Res. 0.5mm,  
 High Rate Capability)



The AMOR reflectometer (PSI) uses the same principle of neutron focusing guides as ESTIA.



A MB prototype permanently installed at AMOR since Sept 2020 for the commissioning of the beam line and for friendly user operations.

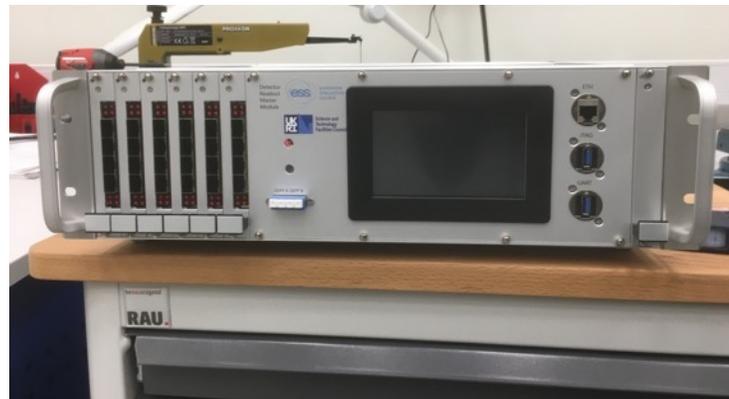
# NSS Highlights – detector group



Shelves and fume extraction points installed in E04 Detector area



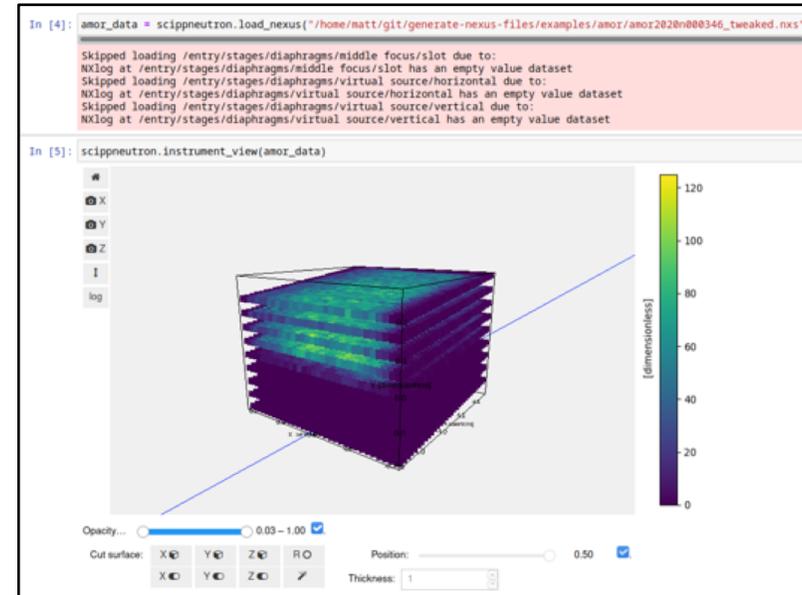
Detector workshop being established in B02



Back End Electronics - 5 Master Module readout crates in assembly as prototypes



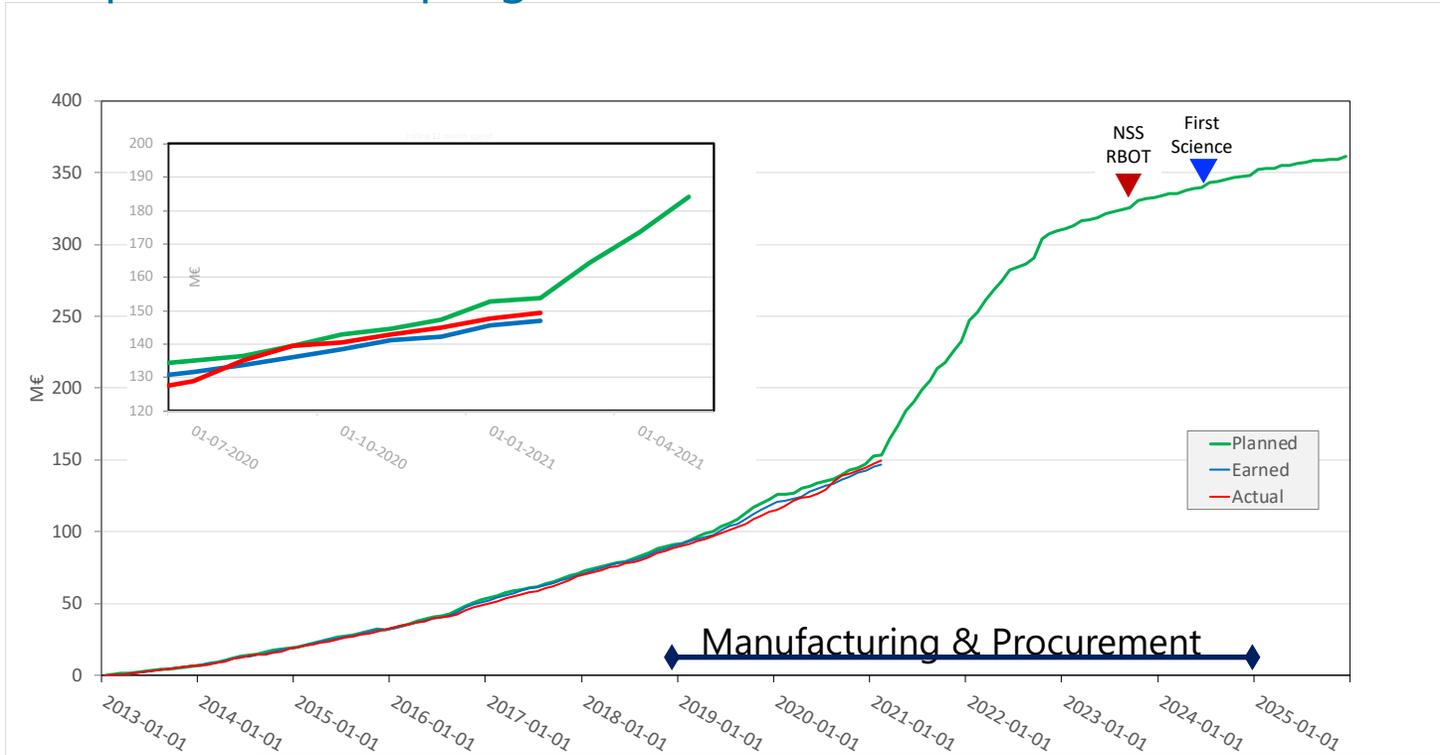
Demo at YMIR (instrument test-bed in Utgård Labs)



AMOR (PSI) files loadable in scipp

# EV graph - Construction project :

## NSS performance progress (Feb 2021)



Planned	Earned	Actual	SV	CV	SPI	CPI*
153,625,833	146,967,995	149,401,123	-6,657,838	-2,433,128	0.96	0.98

SV -6,6 M€ & **SPI = 0,96**

CV -2,4 M€ & **CPI = 0,98**

NSS budget = 361 M€

**NSS Project is 41,9 % complete**

(+0,3 since Jan 2021)

~ 209 M€ by IK partners  
- In part treated as cash-IK

\* In kind estimated from EV

RBOT & FS dates above correspond to ESS rolling wave plan (BOT = Oct '23)

# Instrument critical components check list

## First 8 neutron instruments – manufacturing and delivery to ESS site



subject for monthly review	TGS		Choppers				Detectors		Vacuum vessel // or other instrument spe		Guides							
	Current forecast		Current forecast				Current forecast		Current forecast		Current Forecast							
	TGS		in-bunker		out of bunker		contract signed	Delivery to site	contract signed	Delivery to site	NBOA		BWI		in-bunker		out of bunker	
			contract signed	Delivery to site	contract signed	Delivery to site					contract signed	Delivery to site	contract signed	Delivery to site	contract signed	Delivery to site	contract signed	Delivery to site
LOKI (Tom)	Green		Grey	Green	Grey	Green		Grey	Green		Grey	Green	Grey	Green	Grey	Green	Grey	Green
ESTIA (Tom)	Green		Grey	Green				Diagonal	Orange			Green		Green	Grey	Green	Grey	Green
DREAM (Wemer)	Green		Grey	Green								Green	Grey	Green	Grey	Green	Grey	Green
ODIN (Robin)	Green		Diagonal	Green	Diagonal	Green		Orange	Orange			Green	Grey	Green	Grey	Green	Grey	Green
BEER (Robin) no TA	Red		Red	Red	Red	Red		Orange	Orange			Green	Red	Red	Red	Red	Grey	Green
BIFROST (Rasmus)	Green		Diagonal	Green	Diagonal	Green		Green	Green			Green	Grey	Green	Grey	Green	Grey	Green
CSPEC (Pascale)	Green		Grey	Orange		Green		Diagonal	Orange		Green	Green	Grey	Green		Green		Green
MAGIC (Wemer)	Red		Diagonal	Green	Diagonal	Green		Grey	Green			Green	Orange	Red	Orange	Red	Orange	Red
NMX (Esko)	Green				Diagonal	Green		Orange	Orange			Red	Grey	Green	Grey	Green	Grey	Orange

### Components tracked:

- Choppers
- Detectors
- Large vacuum vessels
- Neutron guides

### Milestones tracked:

- Mfg contract signed
- Delivery to site

### Traffic lights:

Indicate status for BOT in Sept. 2023

Grey	done
Green	on track / delays 1-2 month
Orange	attention / delays 2-6 months
Red	critical / delays 6-> months or pushing TGS
Diagonal	NSS self delivery

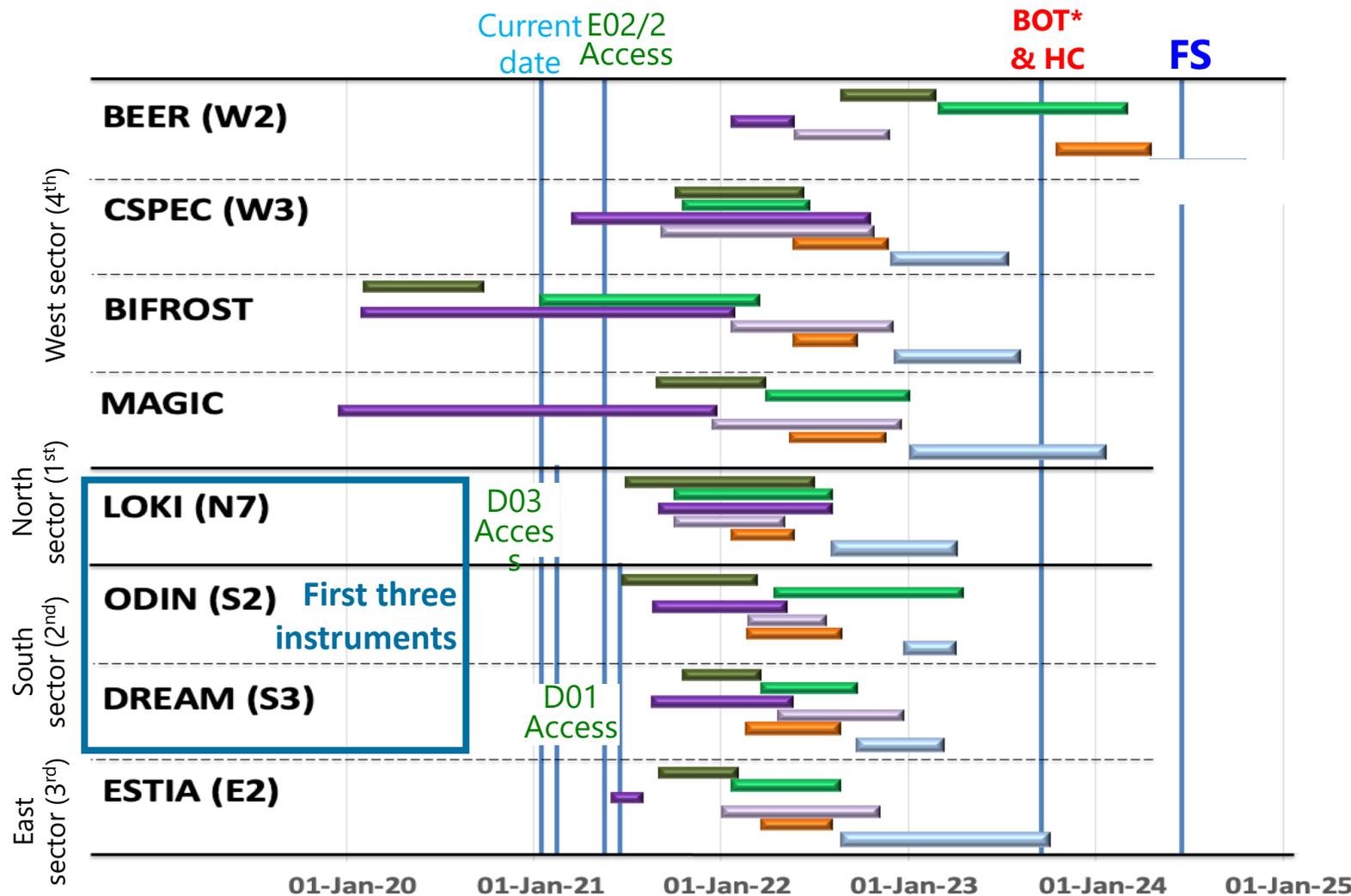
# High level installation chart for first 8 instruments:

*based on ESS Rolling Wave Plan with BOT\* in Sept 2023*

March 2021



- Instrument TG5 dates adjusted according to December Critical path map
- BT and FS dates aligned with Project Office's Rolling Wave plan
- **Assume BEER in-bunker components miss West sector open-bunker slot**
- **MAIN message:**
  - **NSS RBOT is July 2023 (2 months longer open bunker in West & 2 months float to BOT)**
  - **6/8 instruments (excl. BEER, MAGIC) should make BOT milestone**
  - **MAGIC should be complete by FS milestone**
  - **If BEER agreements signed in Feb, they may still make west sector open-bunker slot**



\* BOT in Rolling Wave plan has now moved to October 2023





# Managing ESS scope for instruments

# Neutron Instrument Construction Matrix (NSS + IKP)



Instrument delivery is the joint responsibility of NSS Staff and IK Partners → non-separable

Neutron Instrument	Budget (M€)	Contributing Partners (%)		NSS common projects; charged to Instrument budgets								
		In-Kind	NSS	NSS Project Division				Detector		Sci. Dir.		
				Shielding	Chopper	Electrical	Utilities	Electronics	Monitors	SEE <sup>a</sup>	MCA <sup>b</sup>	
LOKI	12.85	ISIS(81%)	19%		●	●	●	●	●		●	●
SKADI	11.50	FZJ(50%), LLB (50%)			●	●	●	●	●	●		
ESTIA	11.80	PSI <sup>1</sup> (100%)			●	●	●	●	●	●	●	●
FREIA	13.20	ISIS (78%)	22% <sup>2</sup>		●	●	●	●	●	●		●
DREAM	13.66	FZJ(76%), LLB(20%)	4%	●	●	●	●	●	●		●	
HEIMDAL	13.55	Århus U. (30%), PSI(35%), IFE(25%)	10%	●	●	●	●	●	●	●		
MAGIC	13.10	LLB(52%), FZJ(24%), PSI(16%)	8%	●	●	●	●	●	●		●	
NMX	11.67	WI/IER(53%), Bergen(22%), LLB(7%)	24%	●	●	●	●	●	●	●		●
BEER	14.99	NPI(50%), HZG(50%)		●	●	●	●	●	●	●	●	
ODIN	11.76	TUM <sup>5</sup> (60%), PSI(36%)	4%	●		●	●			●	●	●
BIFROST	13.45	DTU/KU(23%),PSI(27%),IFE(14%),LLB(~12%)	~24%	●	●	●	●	●	●	●	●	●
C-SPEC	16.50	TUM <sup>3</sup> (50%), LLB(~ 33%)	~17%	●		●	●	●	●	●	●	●
T-REX	16.85	FZJ <sup>4</sup> (75%), Perugia U. (25%)		●	●	●	●	●	●	●		
VESPA	12.00	CNR (100%)		●	●	●	●	●	●			
MIRACLES	13.40	ESS-Bilbao(89%), KU(2%)	9%	●	●	●	●	●	●	●		

NSS/SD scope outside Instrument budgets;  
 • Expt. Ctrl. (ECDC),  
 • Data Mgmt. (DMSC),  
 • pooled SEE (SAD)

**Total value 200.28**

**Detector Production Section**  
 1. minus NSS MB detector ~7%  
 2. incl. NSS MB detector ~6%  
 3. minus NSS MG detector ~20%  
 4. minus NSS MG detector ~7%  
 5. All purchasing by ESS

● Confirmed (costed & committed)  
 ● Planned (incl. agreed & in costing)

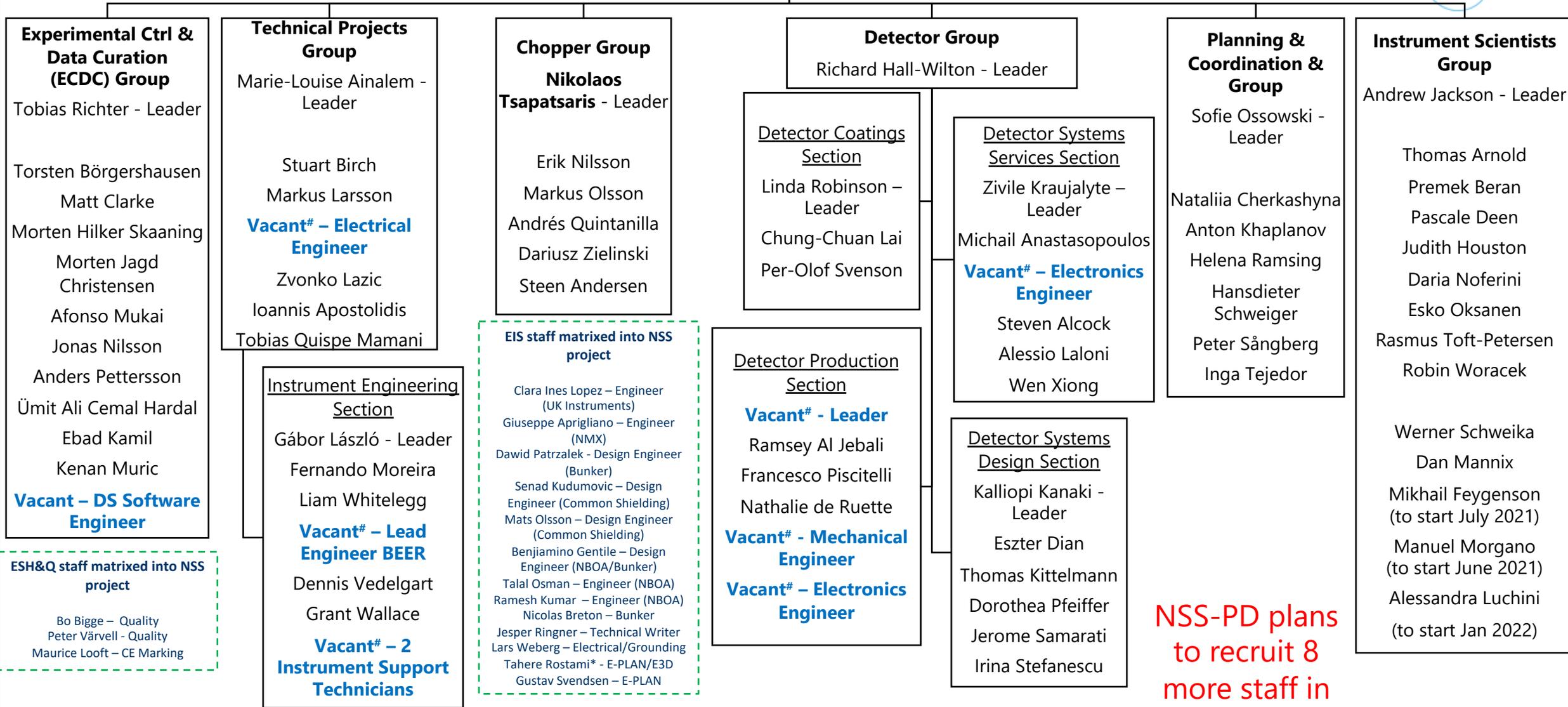
a. SEE = Sample environment equipment  
 b. MCA = Motion control & automation

# NSS-PD Org chart

March 2021



**Shane Kennedy**  
**Head of NSS Division**  
 Iain Sutton, Zsuzsa Helyes



**NSS-PD plans to recruit 8 more staff in 2021**

# recruitments approved on 24th Feb '21

# NSS – Top 5 Risk Mitigation Status



Event	Potential Impact	Probability	Mitigation measures	Due date
<b>Lack of key personnel</b> (ID 11) <i>NSS needs to grow with 15 positions in 2021 in order to meet our schedule.</i>	<del>3.36 M€</del> 2.81 M€	4	Secure approval from PMT for critical recruitments in 2021 Guaranteed delays to instrument delivery	2021-12
<b>Delayed delivery of T0 choppers for DREAM, ODIN &amp; HEIMDAL</b> (ID 58)	0,1 M€	4	Initiate new procurement for ODIN Installing temp guide piece for ODIN Using prototype to DREAM	2021-05 2021-05 2021-05
<b>Resourcing of MCA engineering to Instrument projects below agreed level or delayed</b> (ID 40)	0,1M€	4	Pursue hiring process for 2 temporary MCA engineers Reach agreements with those instruments concerned Replace engineer on permanent position	ASAP ASAP Q2 2021
<b>NSS will not meet construction project scope within assigned budget (15 instruments, 361M€).</b> (ID 1)	2,1 M€	3	Negotiate with IK partners on scope or methods of delivery to limit the costs, including scope transfer from IK to NSS where appropriate	Q2 2021  201221
<b>Failure to receive NSS installation license before installation of active radiation safety related systems</b> (ID 20)	0,33M€	3	Ensure submission quality Increase NSS effort on licensing	2021-09 2022-07

Expected Value of NSS cost risk = ~~12.8 M€~~ **8.9 M€** to end of project  
 Workshop held March 16<sup>th</sup>, updates in Exonaut done (captured above)  
 Next workshop in June 2021



# Managing ESS budget and schedule



# NSS tipping-point plan: (basis for Scenario 1 at ERIC Council March meeting)

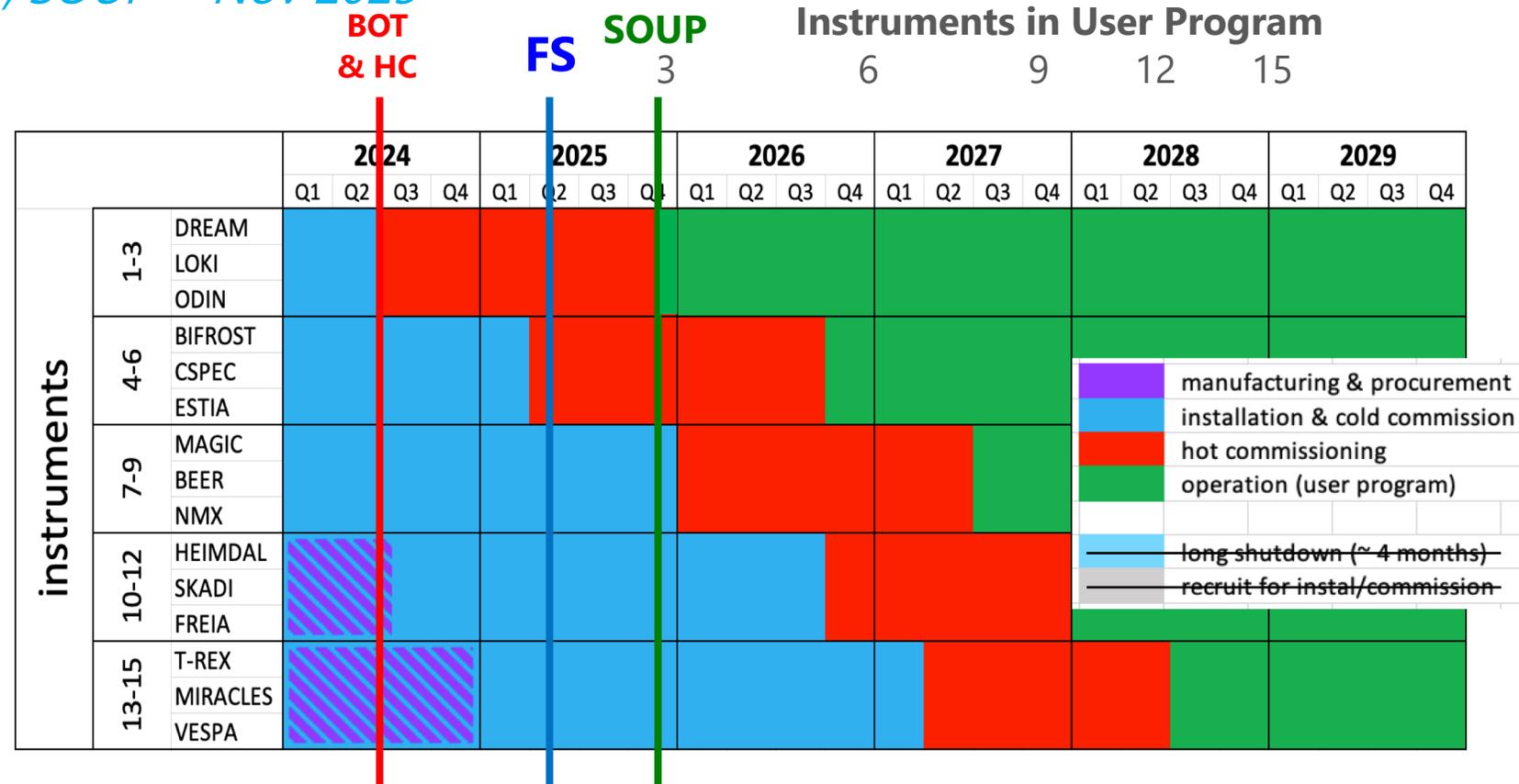


Balance science (FS+SOUP), instrument completion and schedule risk

*BOT = July 2024, FS = May 2025, SOUP = Nov 2025*

## Outcome/impact

- 3 instruments to operations before EOC
- + 3 in 2026
- + 3 in 2027
- + remaining instruments in 2028
- 80% installation complete; *more than current plan (MS V4.4)*
- 9 months float from rolling wave plan
- 6 last instruments rescheduled to allow construction to continue into 2027
- incentive for late instruments (8-15) to complete manufacturing early
- No long shutdown needed



# NSS Scenario 2C-A: (basis for Scenario 3 at ERIC Council March meeting)



BOT with 3 instruments, EOC in 2027, continuous ramp to 15 in user program

*BOT = Dec 2024, FS = Oct 2025, SOUP = July 2026*

## Outcome/impact

- **SOUP delayed beyond EOC**
- First 3 instruments to operations in 2026
- + 6 more in 2027
- + remaining instruments in 2028
- 85 % installation complete; *more than current plan (MS V4.4)*
- 15 months float from rolling wave plan
- 6 last instruments rescheduled to allow construction to continue through 2026
- incentive for late instruments (8-15) to accelerate manufacturing early
- No long shutdown needed

