

POTLNS *and* **LNS Technical Department**



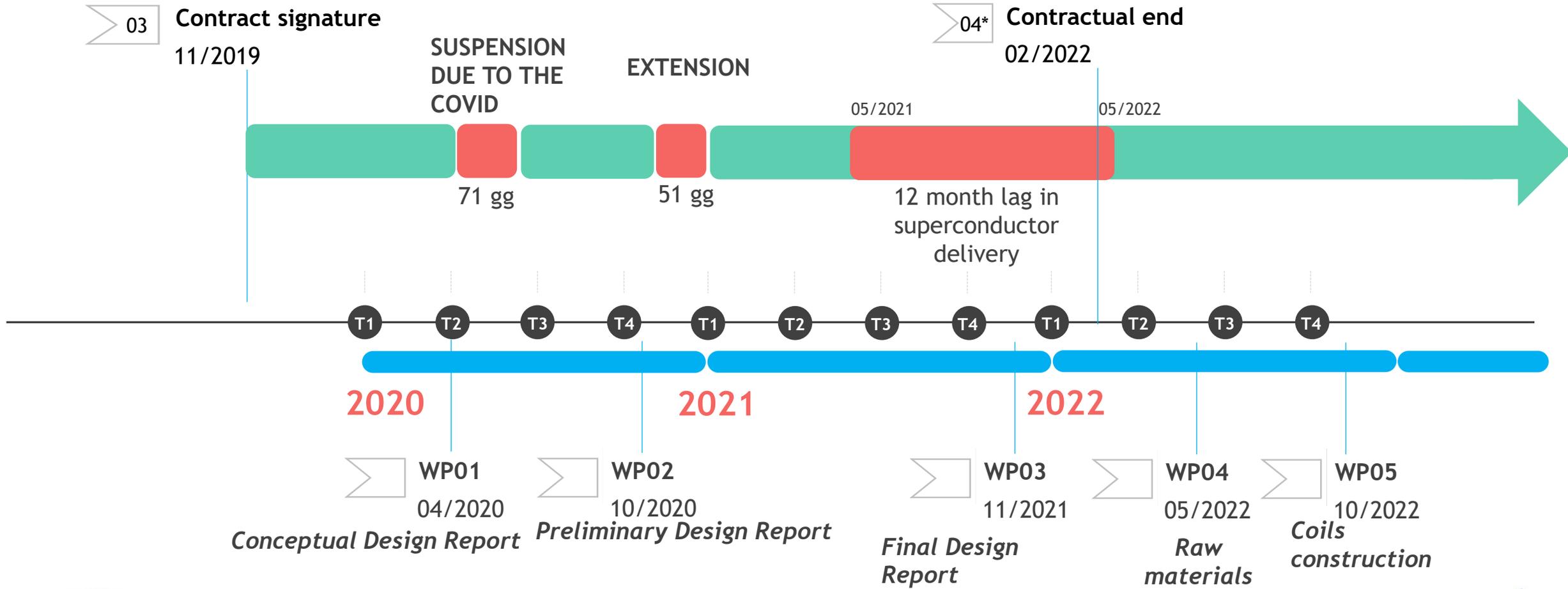
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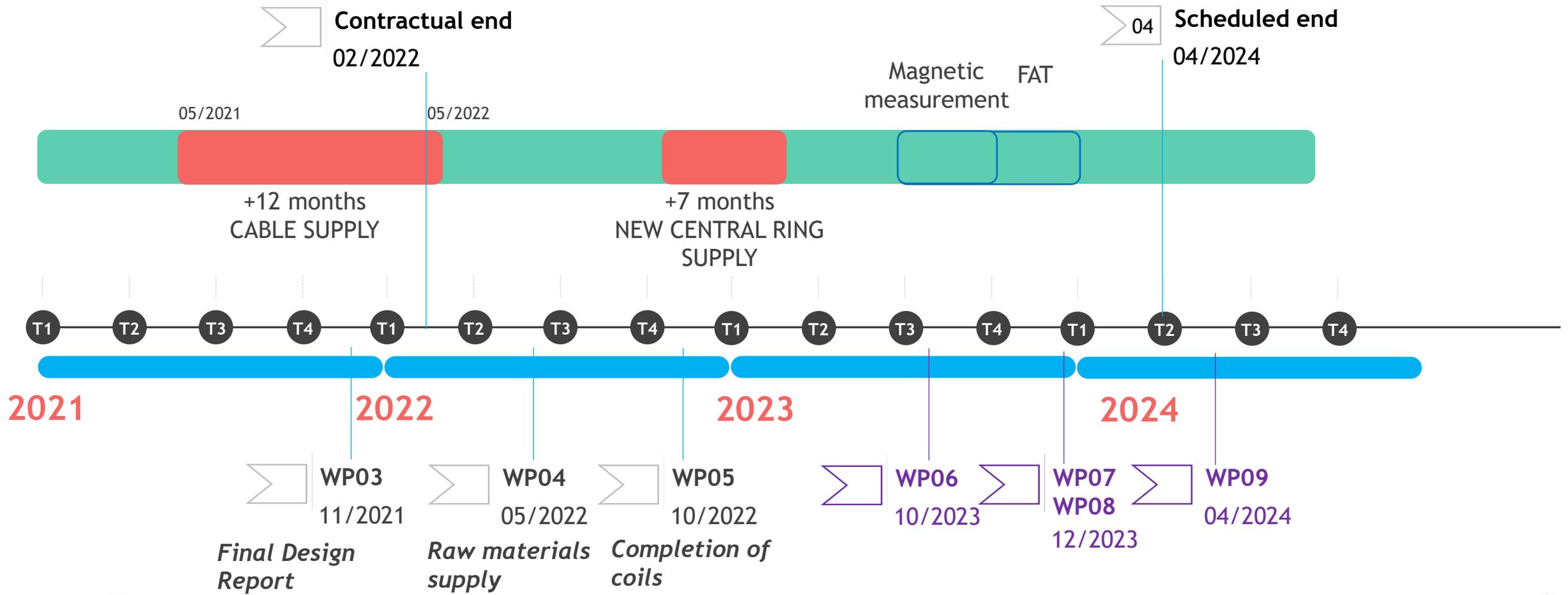
CS Magnet production

Supply - current schedule

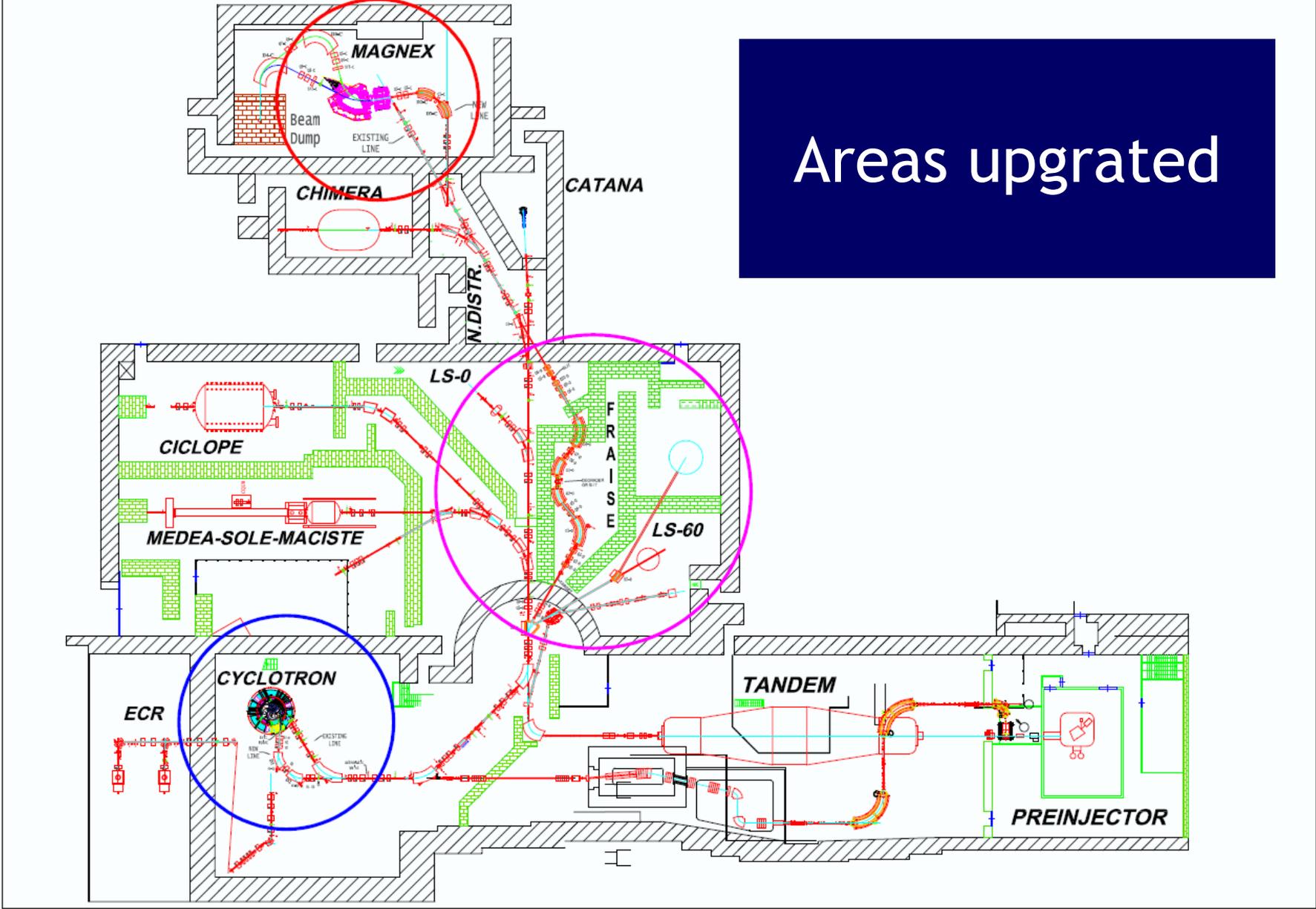


CS Magnet production

Supply - current schedule



Areas upgrated



Project overall progress

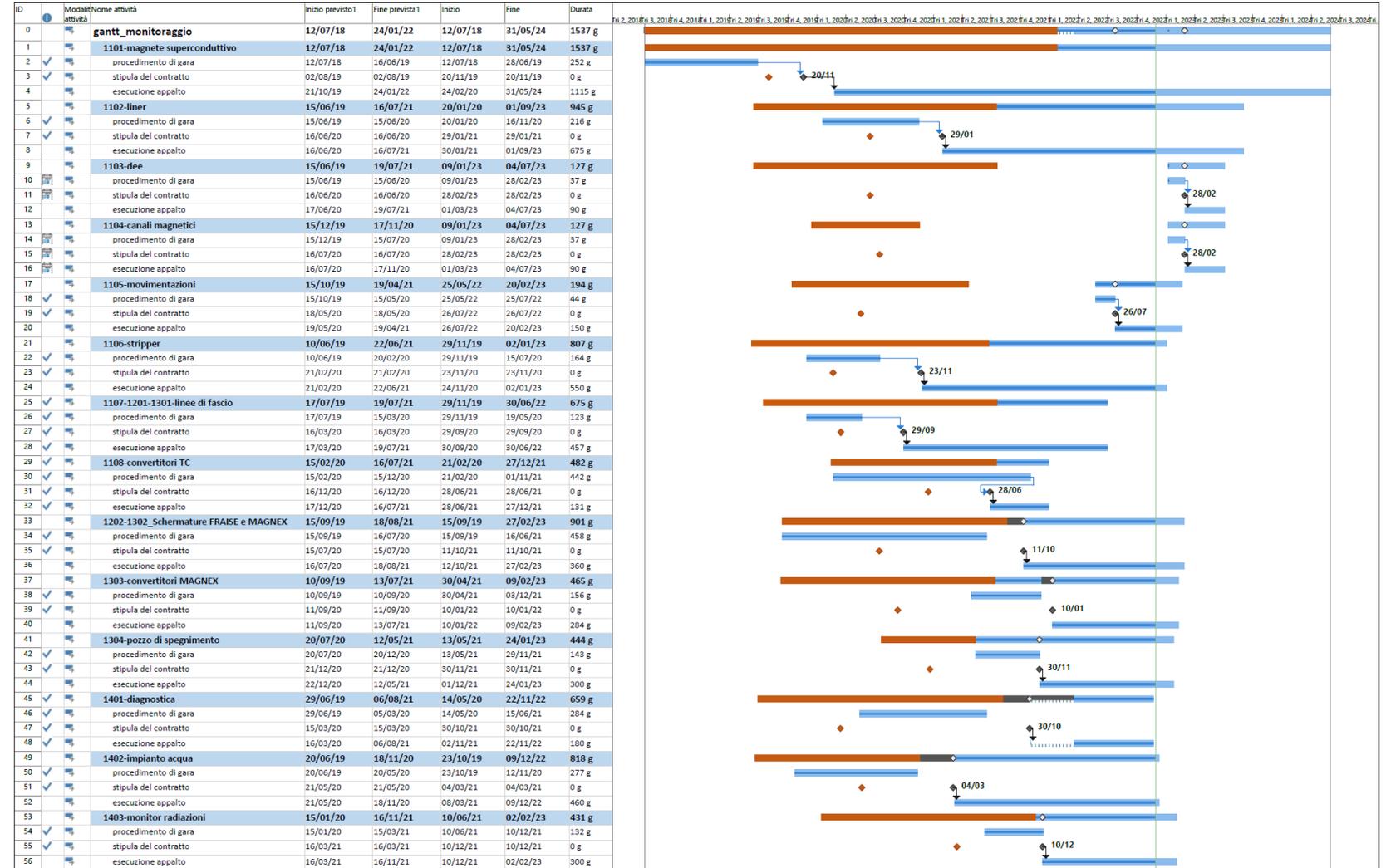
STATUS

15/17 assets: supply in execution phase

- Movimentazioni → contract signed in July

2/17 assets: tender procedure in execution

- Canali magnetici;
- Dee.



Project progress: schermature FRAISE e MAGNEX (PBS 1202 - 1302)

Supply status:

- **FRAISE experimental room**

- ✓ Pouring for covering slab
- ✓ Vertical mobile shield (80%)



FRAISE experimental room

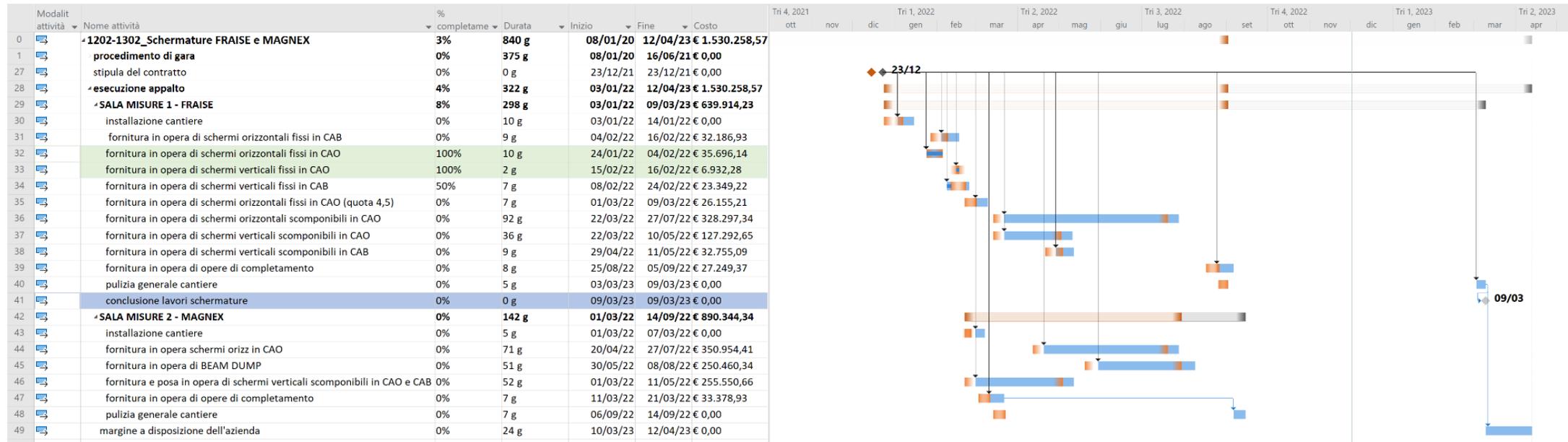
- **MAGNEX experimental room**

- ✓ Core of extinguishing well
- ✓ Vertical mobile shield (in progress)



MAGNEX experimental room

Project progress: schermature FRAISE e MAGNEX (PBS 1202 - 1302)



Overall supply lag 4 months due to
Expected end of work: 03/2023

Accounting

- 30% anticipation
- SALO1

Project progress: linee di fascio (PBS 1107- 1201-1301)

% complete	Modalità attività	Nome attività	Durata	Inizio	Fine	Predecessore	Timeline (Semestre 1, 201; Semestre 2, 201; Semestre 1, 202; Semestre 2, 202)																											
							M	L	S	N	G	M	M	L	S	N	G	M	M	L	S	N	G	M	M	L	S	N	G	M	M	L	S	N
0	86%	1107-1201-1301_linee di fascio	1089 g	17/06/19	17/08/23		[Gantt chart showing progress bars and milestones for the main project line]																											
1	100%	procedimento di gara	250 g	17/06/19	29/05/20		[Gantt chart bar]																											
27	100%	stipula del contratto	0 g	29/09/20	29/09/20		[Gantt chart bar]																											
28	79%	esecuzione appalto	639 g	08/03/21	17/08/23		[Gantt chart bar with milestone 29/09]																											
29	100%	20% sal conclusione fase di accettazione della documentazione before manufacturing	0 g	08/03/21	08/03/21		[Gantt chart bar with milestone 08/03]																											
30	100%	30% sal conclusione fase di accettazione della documentazione before shipment	150 g	20/01/22	17/08/22		[Gantt chart bar]																											
31	100%	consegna supporti dei magneti	0 g	12/04/22	12/04/22		[Gantt chart bar with milestone 12/04]																											
32	0%	consegna 21 magneti (UE)	0 g	31/03/23	31/03/23		[Gantt chart bar with milestone 31/03]																											
33	0%	installazione supporti e magneti linea di estrazione	30 g	31/03/23	11/05/23	32	[Gantt chart bar]																											
34	0%	esecuzione appalto soppalco CS	150 g	18/01/22	15/08/22		[Gantt chart bar]																											
35	0%	installazione supporti e magneti linea di estrazione	20 g	31/03/23	27/04/23	C:\Users\	[Gantt chart bar]																											
36	0%	consegna 15 magneti (USA e Oceania)	0 g	22/06/23	22/06/23	32FI+60 g	[Gantt chart bar with milestone 22/06]																											
37	0%	apertura tetto MAGNEX e FRAISE	10 g	09/06/23	22/06/23	36FI-10 g	[Gantt chart bar]																											
38	0%	installazione supporti e magneti linee FRAISE e MAGNEX	60 g	23/06/23	14/09/23	36	[Gantt chart bar]																											
39	0%	installazione supporti e magneti FRAISE e MAGNEX	20 g	23/06/23	20/07/23	36	[Gantt chart bar]																											
40	0%	30% sal conclusione fase di accettazione della documentazione at the delivery	0 g	20/07/23	20/07/23	39	[Gantt chart bar with milestone 20/07]																											
41	0%	20% saldo conclusione fase di accettazione della documentazione after the installation	0 g	17/08/23	17/08/23	40FI+20 g	[Gantt chart bar with milestone 17/08]																											

Overall supply lag 24 months

Accounting

- Paid and accounted: SALO1 (€ 1.273.759,84)

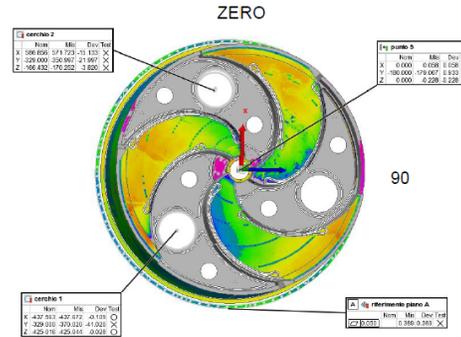
Project progress: liner (PBS 1102)

Supply status

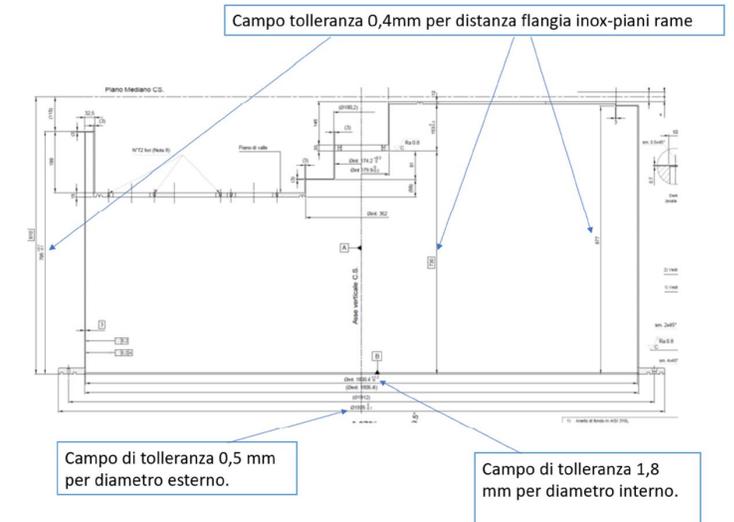
- ✓ Liner in manufacturing

3D scanning – coupling liner-pole

- ✓ Areas of possible interference and backlash between the coupling surfaces have been identified.
- ✓ Some changes to the liner design have been implemented in order to delete/reduce the joint interferences and optimize the o-ring clamping (07/2022 final release)
- ✓ Reduction of liner thickness at the contact surface liner and pole ridges
- ✓ Increase in construction costs



POTLNS-FAB-RP-1102 REPORT DI STATO AVANZAMENTO DEI LAVORI – Allegato 2



Project progress: liner (PBS 1102)

Modalità attività	% comp.	Nome attività	Durata	Inizio	Fine	Predecessori	
0	65%	1102_liner	904 g	20/01/20	06/07/23		
1	100%	procedimento di gara	216 g	20/01/20	16/11/20		
27	100%	stipula del contratto	0 g	29/01/21	29/01/21		
28	60%	esecuzione appalto	635 g	29/01/21	06/07/23		
29	100%	sal anticipazione - caso 20%	0 g	23/03/21	23/03/21		
30	100%	sviluppo dei disegni di produzione dei liner ed acquisto dei materiali	78 g	29/01/21	18/05/21	27	
31	100%	verifiche preliminari: prove saldature, lavaggio, ecc...	45 g	12/03/21	13/05/21	27FI+30 g	
32	100%	acquisto vasca ad ultrasuoni	46 g	12/03/21	14/05/21	27FI+30 g	
33	100%	10% sal conclusione fase di accettazione documentazione ribaltatore	0 g	28/05/21	28/05/21	30FI+5 g	
34	0%	smontaggio liner da polo superiore	2 g	21/02/22	22/02/22		
35	100%	Scansione 3D interfaccia Liner inferiore e superiore	5 g	07/03/22	11/03/22	C:\Users\Vincenza\Istitu	
36	100%	comunicazione modifiche al modello a seguito del report Hexagon	30 g	14/03/22	22/04/22	35	
37	100%	20% sal conclusione fase di accettazione doc post rilievi liner LNS	0 g	22/09/22	22/09/22	36	
38	28%	realizzazione dei liner	120 g	14/10/22	30/03/23	37	
39	0%	FAT	30 g	31/03/23	11/05/23	38	
40	0%	imballo, spedizione e consegna	30 g	12/05/23	22/06/23	39	
41	0%	30% sal conclusione fase di accettazione documentazione FAT	0 g	22/06/23	22/06/23	40	
42	0%	SAT	10 g	23/06/23	06/07/23	41	
43	0%	40% saldo conclusione fase di accettazione documentazione SAT	0 g	06/07/23	06/07/23	42	
44	0%	montaggio liner inferiore su polo inferiore	10 g	07/07/23	20/07/23	43	



Currently 65 % work progress

Overall supply lag 18 months due to

- Internal Activities
- Changes in 3D scanning

Accounting

- Paid and accounted: anticipation; SALO1, SALO2
- Total amount accounted: 370.734,21 € (845.460,00 €)



Project progress (extra-PON)

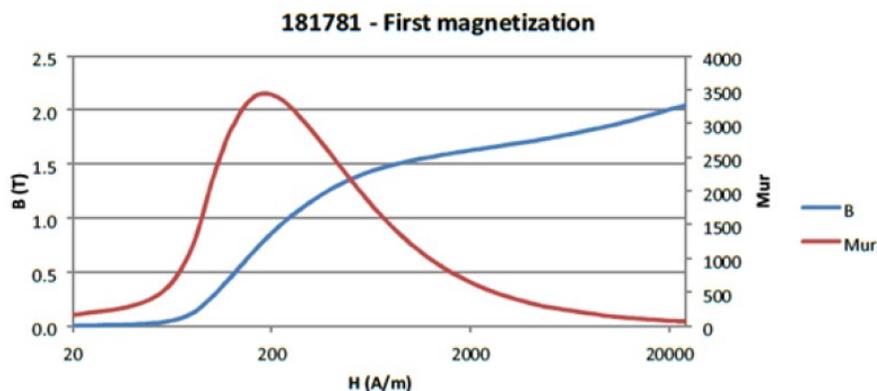
05/2022

PURCHASING OF ARMCO IRON

Supply status: **100% completed**

FAT: **accepted**

- ✓ Chemical analysis
- ✓ Dimensional test on slabs (#6)
- ✓ Mechanical tests
- ✓ B/H curve (desumed from chemical)
- ✓ Ultrasonic tests



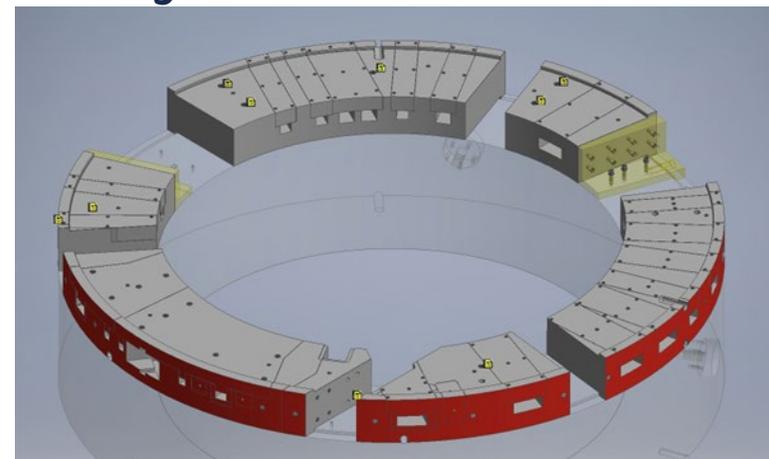
Supply in execution

MECHANICAL MACHINING

Awarded amount: **€ 190.000 (IVA not included)**

Tender procedure: **negoziata MePA (Nebiolo)**

Contract signed in **11/2022**



26	→	stipula del contratto	0 g	30/11/22	30/11/22	
27	→	lavorazione meccanica	150 g	30/11/22	27/06/23	26
28	→	consegna anello	0 g	27/06/23	27/06/23	27
29	→	montaggio anello centrale	10 g	28/06/23	11/07/23	28
30	→	montaggio anello centrale	4 g	28/06/23	03/07/23	28

CS magnet production

supply status

Since May:

- Some new issues about some nonconformities on coils shape and size and deformation on cryostat subcomponents popped up (see Pasquale report for technical details);
- The supplier suspended the activities, causing further lag in the supply, since may till now day, during the renegotiation with INFN for agreeing how to go ahead on the magnet construction using the currently available coils. A solution has just been set and is going to be implemented. The further lag in magnet delivery is currently estimated in 12 months (see following slides to have an overview)

CS Magnet production

Effects on the project

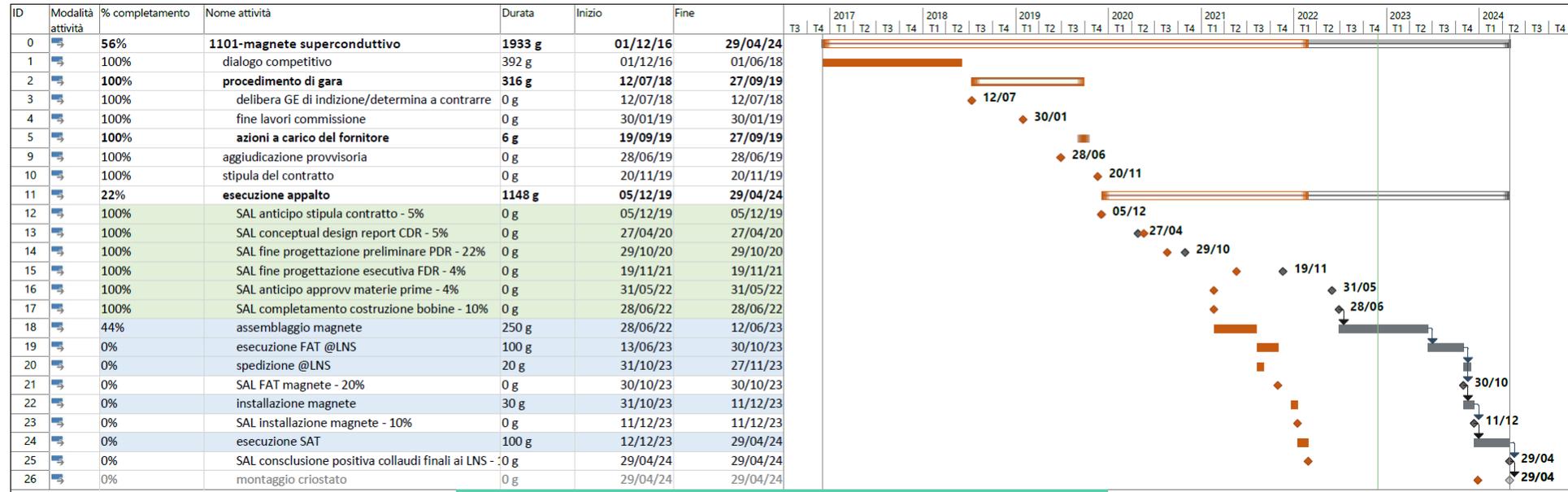
- ✓ Further lag for magnet delivering to LNS with respect to previous scheduling (currently, 2nd quarter 2024);
- ✓ Some extra cost to perform some magnetic field measurement during the magnet construction not included in the current contract (see Pasquale report for technical details);

Follow up of the CS Magnet production

Mitigation actions

- ✓ Pasquale Fabbricatore has been asked to assist the Project in the issues analysis and he is giving a strong support into fixing them;
- ✓ The LNS group engaged into the CS simulation has been strengthened, both in term of FTE and of experience, in order to simulate as quick and precisely as possible the deviations from the ideal design of the magnet subcomponents and evaluate the effects on the beam acceleration. This action is crucial to guarantee prompt decisions making after receiving the actual values of the magnetic field measured by the supplier step by step during the magnet construction.

CS Magnet production



Currently 56 % work progress

Overall supply lag 26 months

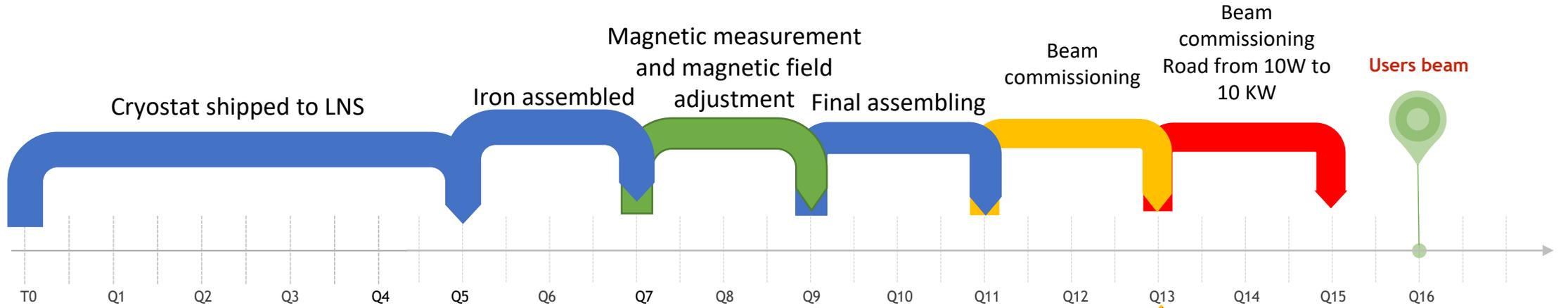
- 29/06/2020 – contract suspended due to COVID for 71 days
- 16/10/2020 – contract extended for 51 days
- 12 months delay in superconductors delivery from Luwata to ASG
- 7 months delay for supplying new central rings

Accounting

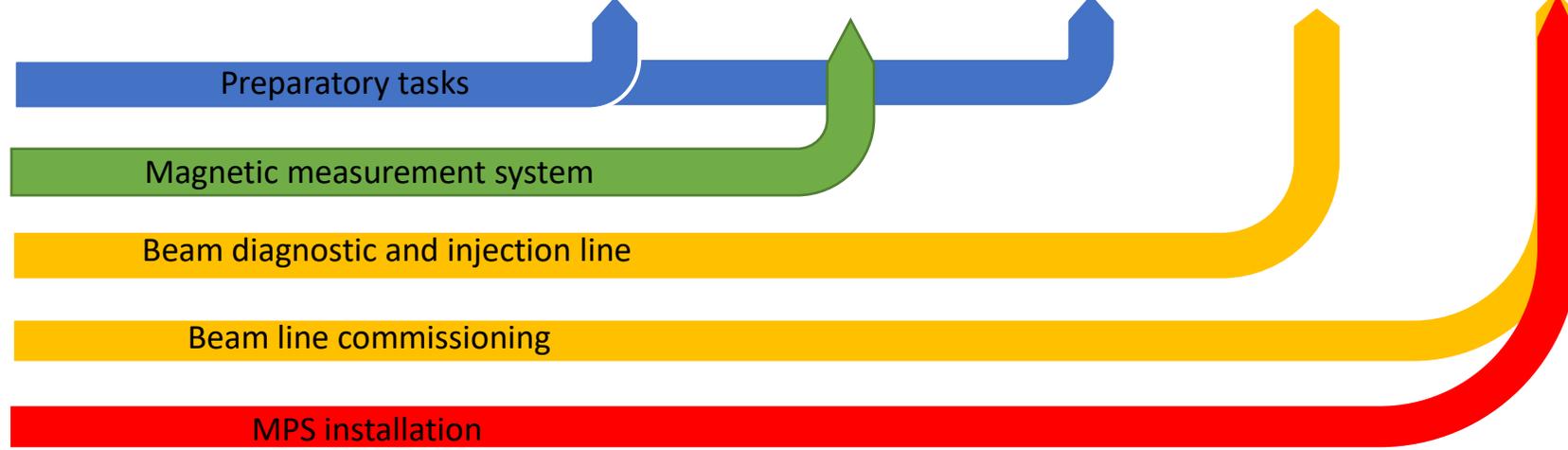
- Paid and accounted: anticipation; SALO1, SALO2, SALO3, SALO4, SALO5
- Total amount accounted: 2.598.684,97 € (5.025.180,00 €)

CS masterplan

Serialized



Parallelized



CS Magnete: risks vs. counteractions

Risks

- 1. Financial:** *the shifting in the magnet schedule is critical from the Sponsor point of view. At the moment, the latest invoice needs to be paid within 14th of June. The risk for INFN is not be reimbursed by MUR*
- 2. Technical:** *a possible mismatch between the specifications and the actual magnetic field of the magnet could imply some restriction in the operative diagram of the Cyclotron*

Counteractions

- 1. Financial:** *is currently on going a tight interaction with MUR with several options under evaluation:*
 - *to renegotiate the Project end date;*
 - *to accept, from MUR side, a temporary (till the fixing of the technical issues on the magnet) downgrade of the facility performance;*
 - *Etc...*
- 2. Technical:** *a great effort is being focused on simulating the various possible scenarios of the magnet performance and the effects on the Cyclotron operative diagram. This effort aims getting the best ratio between shortening the magnet delivery time and the overall Cyclotron performances.*

Conclusions for POTLNS

- *The project overall progress in line with the technical goal, the schedule and with the sponsor constraints;*
- *Next six months shall be crucial for close the pending apparatus deliveries and deployments;*
- *The major risk is currently represented by the superconductive magnet production and delivery, both from the scheduling and financing point of view;*
- *A big pressure is currently put on all the aspects related to the magnet (technical, relationship with supplier, relationship and renegotiation with MUR)*

Direct support of Technical Division to research

LNS Technical Department beside the standard management and maintenance of the LNS infrastructures (please remember that, among the latest twenty years, the LNS areas have been tripled, both in size and in number, is currently committed in leading several large projects (below are listed only those above 300k€):

LNS main:

- New UPS, 1.5M€, project ready, waiting for funding
- Fire detection and protection system, 2.2M€, partially (0.3M€) done, preliminary project done, project ready for construction under finalization
- Experimental and accelerators areas air treatment system renewal, 0,4M€, undergoing

POTLNS:

- Shielding, 3.6M€, 2 years (going to be finalized)
- Chilling for accelerators and beam lines, 1.5M€, 1.5years (finalized)
- Powering for MAGNEX, 1M€ project ready for construction, waiting for funding
- Chilling for MAGNEX/NUMEN 2M€, project ready for construction done, waiting for funding

EuAPS:

- Clean room for laser, 1M€, preliminary project done, project ready for construction undergoing
- Control room for laser, 0.4M€, project ready for construction done, going to star tendering

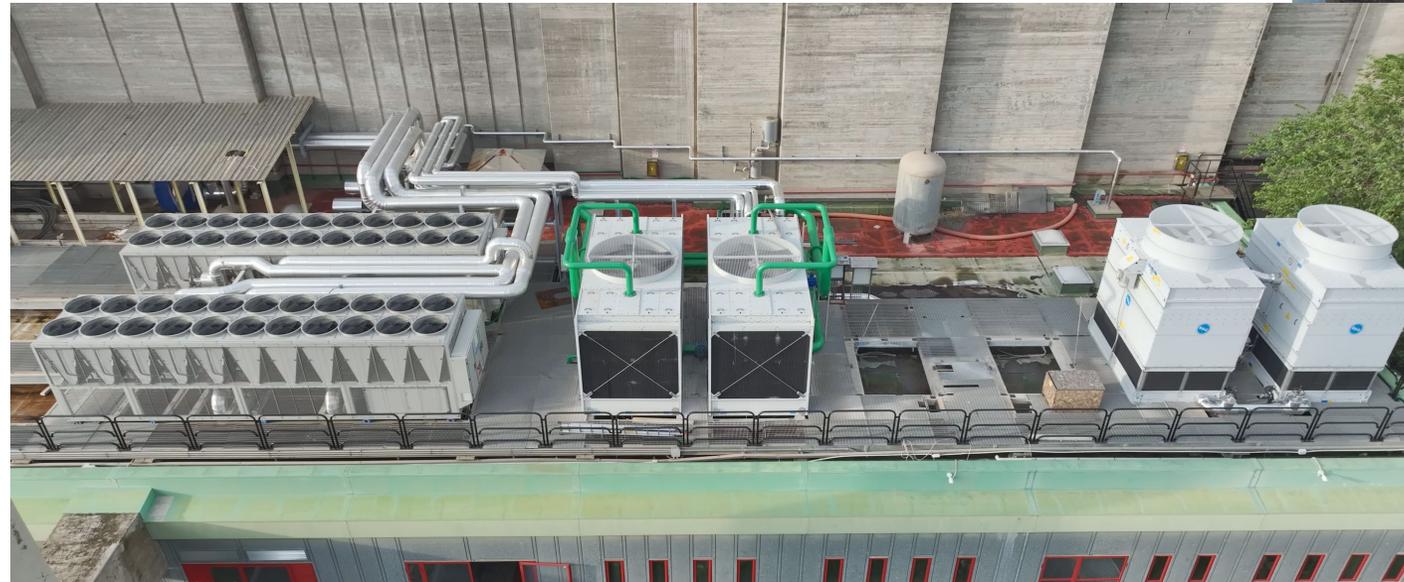
LNS chilling plant



LNS chilling plant



LNS chilling plant



Air compressor plant renewed



Air treatment system under renewal



Civil works for new shielding



LNS Technical Department synoptic

ID	project	Cost	Status	Funded	Start	Duration (including tender)
1	UPS	1,5 M€	Ready for tendering	No	ASAP	15 months
2	Power for MAGNEX	1,5 M€	Ready for tendering	No	ASAP	15 months
3	Cooling water distribution system	2M€	Ready for tendering	No		
4	Renawable energy system	3M€				
5	Cooling plant power system	600k€	On going	Partially	Done	12 months
6	Fire detection system	200k€	Ready for tendering	No	ASAP	4 months
7	Fire control system (civil works)	2,3M€	Preliminary project	No	1 year	24 months
8	Accesses control system	180k€	Preliminary project	No	1,5 year	6 months
9	Laser clean room	1M€	Specifications check	Yes	2023	15 months
10	Laser control area	300k€	Ready for tendering	Yes	End 2022	6 months
11	power supply at Catania port	300k€	Specifications check	Partially	2023	12 months
12	manteinance Catania port (civil work);	500k€	Ready for tendering	No	ASAP	15 months
13	LNS accelerators rooms roofs	600k€	Ready for tendering	Yes	ASAP	20 months

Great effort on power use mitigation

Anno	Mese	kwh (se macchine spente)	kwh (se macchine accese)
2020	Novembre	552.754	1.158.193,83
2020	Dicembre	531.268	1.158.193,83
2021	Gennaio	476.208	1.158.193,83
2021	Febbraio	438.474	1.158.193,83
2021	Marzo	426.440	1.158.193,83
2021	Aprile	342.568	1.158.193,83
2021	Maggio	324.590	1.158.193,83
2021	Giugno	352.540	1.158.193,83
2021	Luglio	423.090	1.158.193,83
2021	Agosto	411.164	1.158.193,83
2021	Settembre	451.551	1.158.193,83
2021	Ottobre	318.224	1.158.193,83
2021	Novembre	236.070	1.158.193,83
2021	Dicembre	244.476	1.158.193,83
2022	Gennaio	241.616	1.158.193,83
2022	Febbraio	213.366	1.158.193,83
2022	Marzo	214.068	1.158.193,83
2022	Aprile	189.000	1.158.193,83
2022	Maggio	205.000	1.158.193,83
2022	Giugno	293.000	1.158.193,83
2022	Luglio	347.498	1.158.193,83
2022	Agosto	310.006	1.158.193,83
2022	Settembre	286.272	1.158.193,83
2022	Ottobre	256.246	1.158.193,83
2022	Novembre	236.070	1.158.193,83
2022	Dicembre	244.476	1.158.193,83

An huge attention is being put on power use mitigation

The chillers renewal has, for sure, given a first stage of improvement

Further improvement is being given by some audits that are highlighting further points to work about for further energy saving actions

LNS Technical Division conclusions

LNS Technical Department despite being committed in the ordinary management of the LNS infrastructures and services, has produced an huge amount of project ready for tendering.

Despite, among latest 20 years, LNS ha tripled the infrastructures, the Technical Department has been decreased in terms of Human Resources.

We are working for powering up the Division in terms of HR availability as well