HL-LHC/LARP International Review of Superconducting Cable for the HL-LHC Inner Triplets Quadrupoles (MQXF)

Hi-Lumi Conductor Procurement

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High Luminosity LHC

LARP

Outline

- Quantity of conductor procured
- Procurement of wire for series production
- Cable production plan

Conductor for MQXF quadrupole

- **Double sourcing**

  Procurement of **PIT and RRP®** Nb_3Sn wire

- **Needed:** (520 + 230) km of RRP®

  (520 + 230) km of PIT

  1500 km (8.4 tons) in total

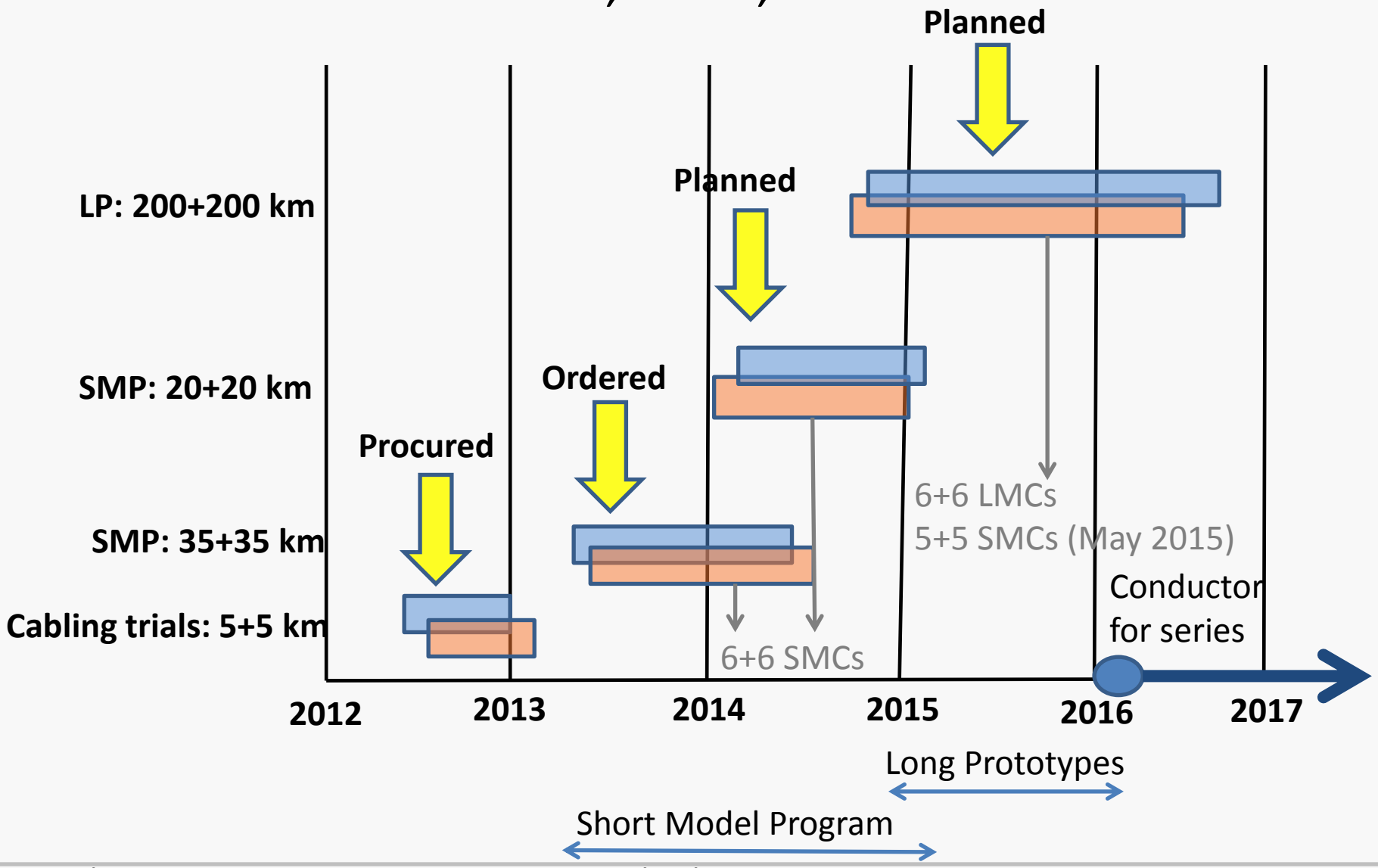
- **Procured**: **1000 km (4.54 tons)** of RRP (+ option for 500 km)

  1000 km (4.54 tons) of PIT (+ option for 500 km)

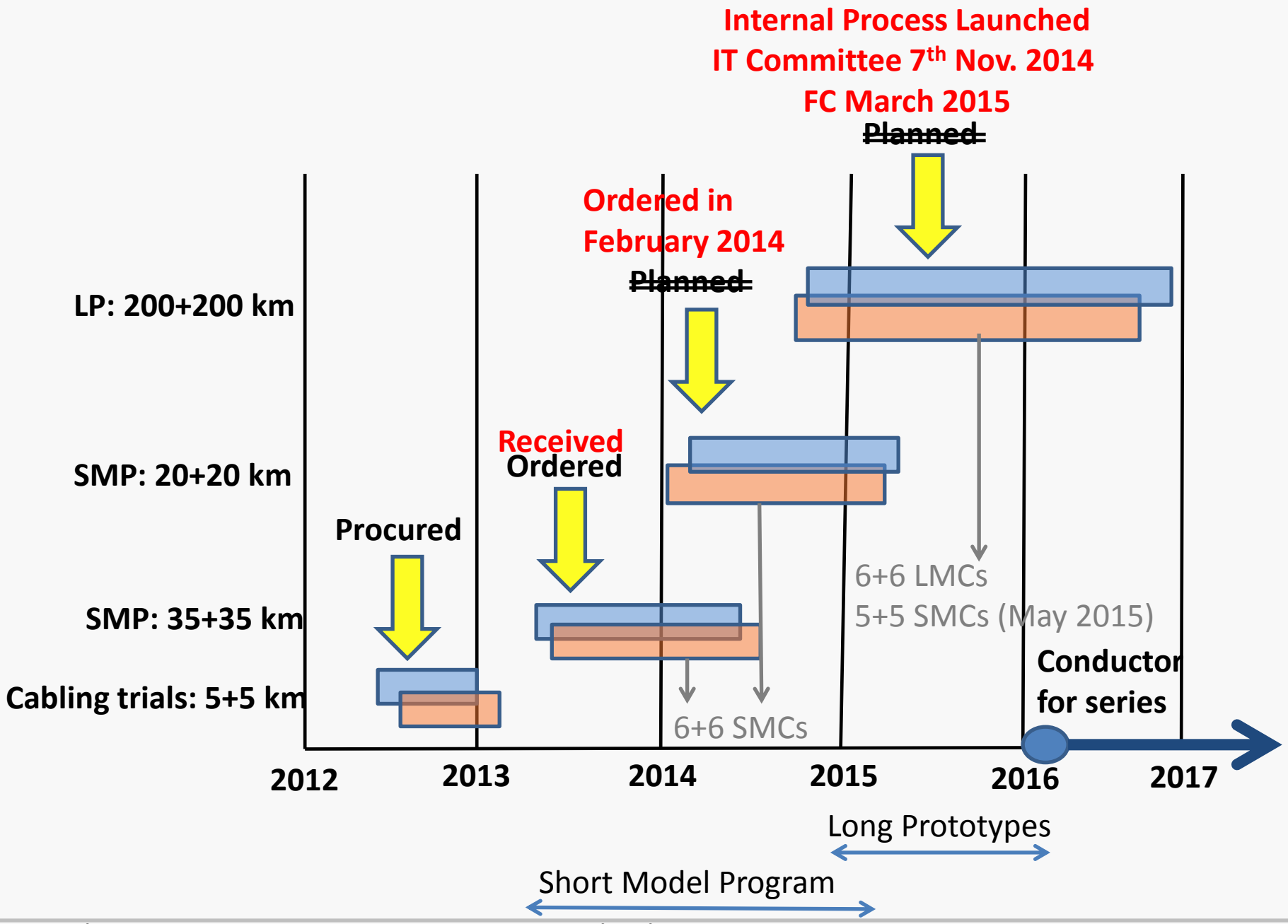
- The option enables to act in case of problems from one supplier

Procurement –Nb_3Sn Wire

Procurement strategy as presented at the Hi-Lumi/LARP Conductor Internal Review, CERN, October 2013



Procurement – Nb_3Sn Wire



Nb_3Sn Wire for MQXF Prototype Program

Short Models (UL = 400 m)

5 km (RRP 132/169) **+ 5 km** (PIT 192) – Cabling trials

45 kg delivered from December 2012 to March 2013

35 km (RRP 132/169) **+ 35 km** (PIT 192)

318 kg delivered from November 2013 to October 2014

20 km (RRP 132/169) **+ 20 km** (PIT 192)

182 kg to be delivered in the first trimester 2015

545 kg of Nb_3Sn for MQXF ordered

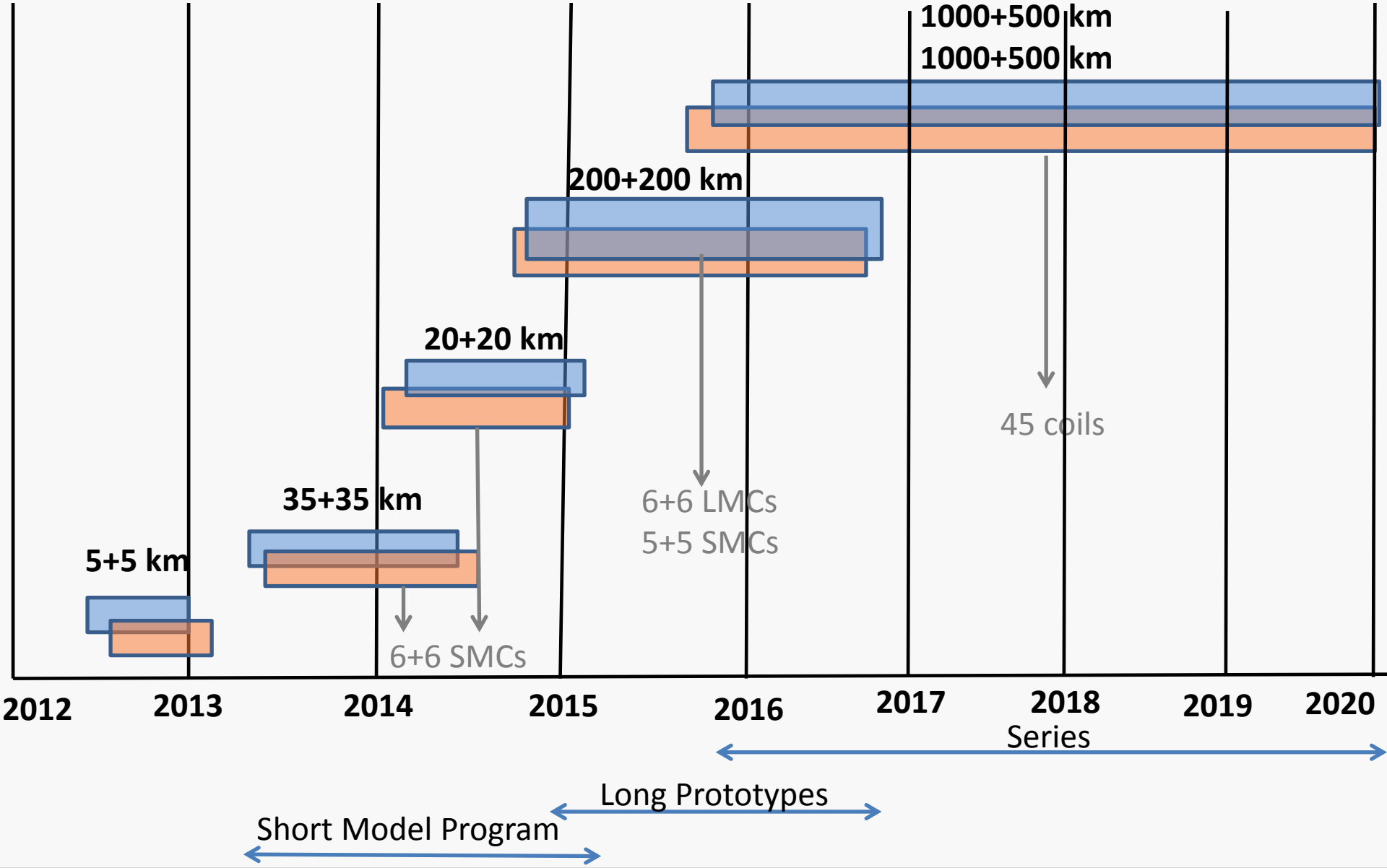
Long Models (UL = 800 m)

200 km (RRP) **+ 200 km** (PIT)

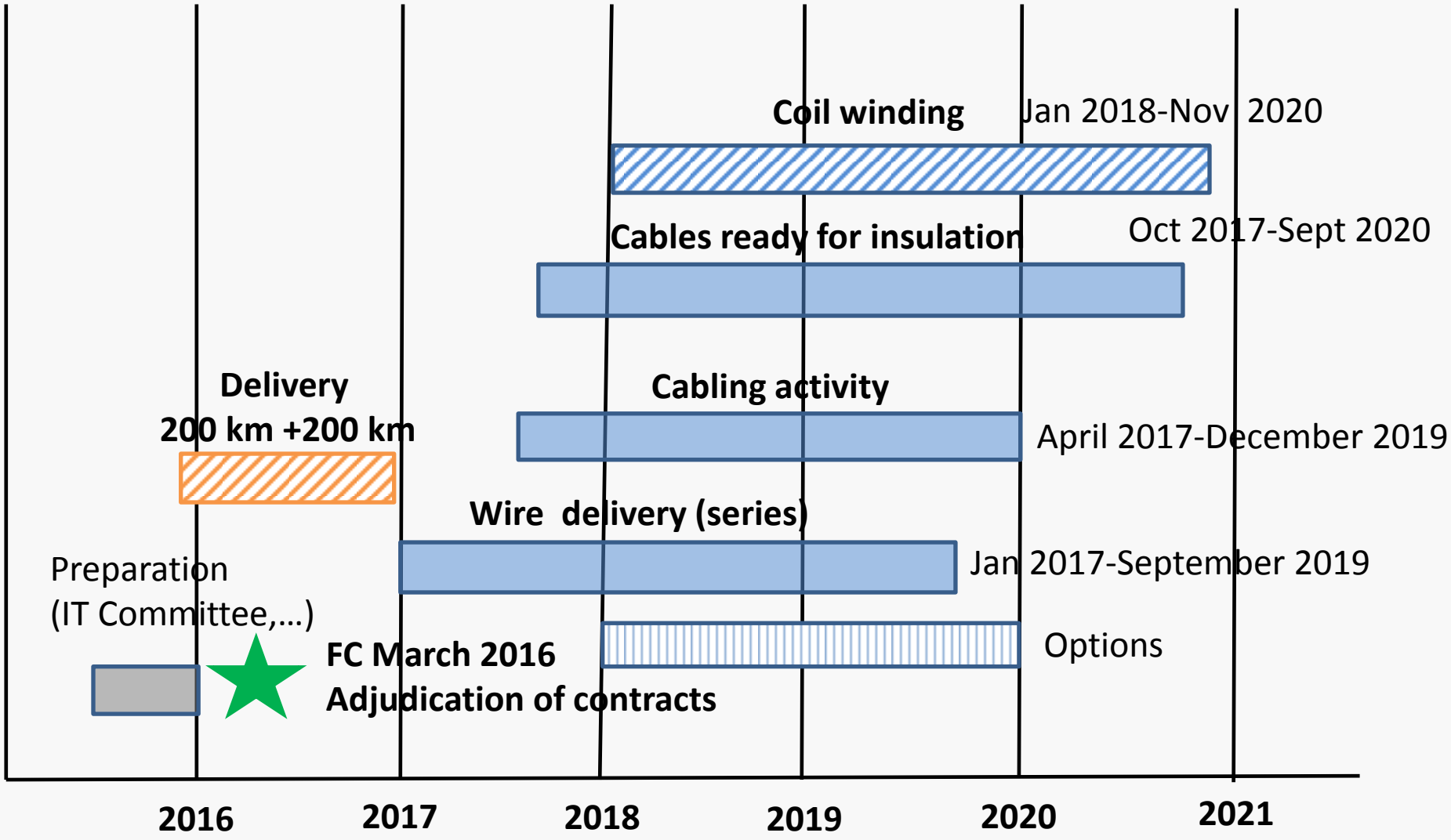
1.8 ton to be delivered in 2016 (18 months)

Tot = 2.35 tons of Nb_3Sn for MQXF Prototype Program

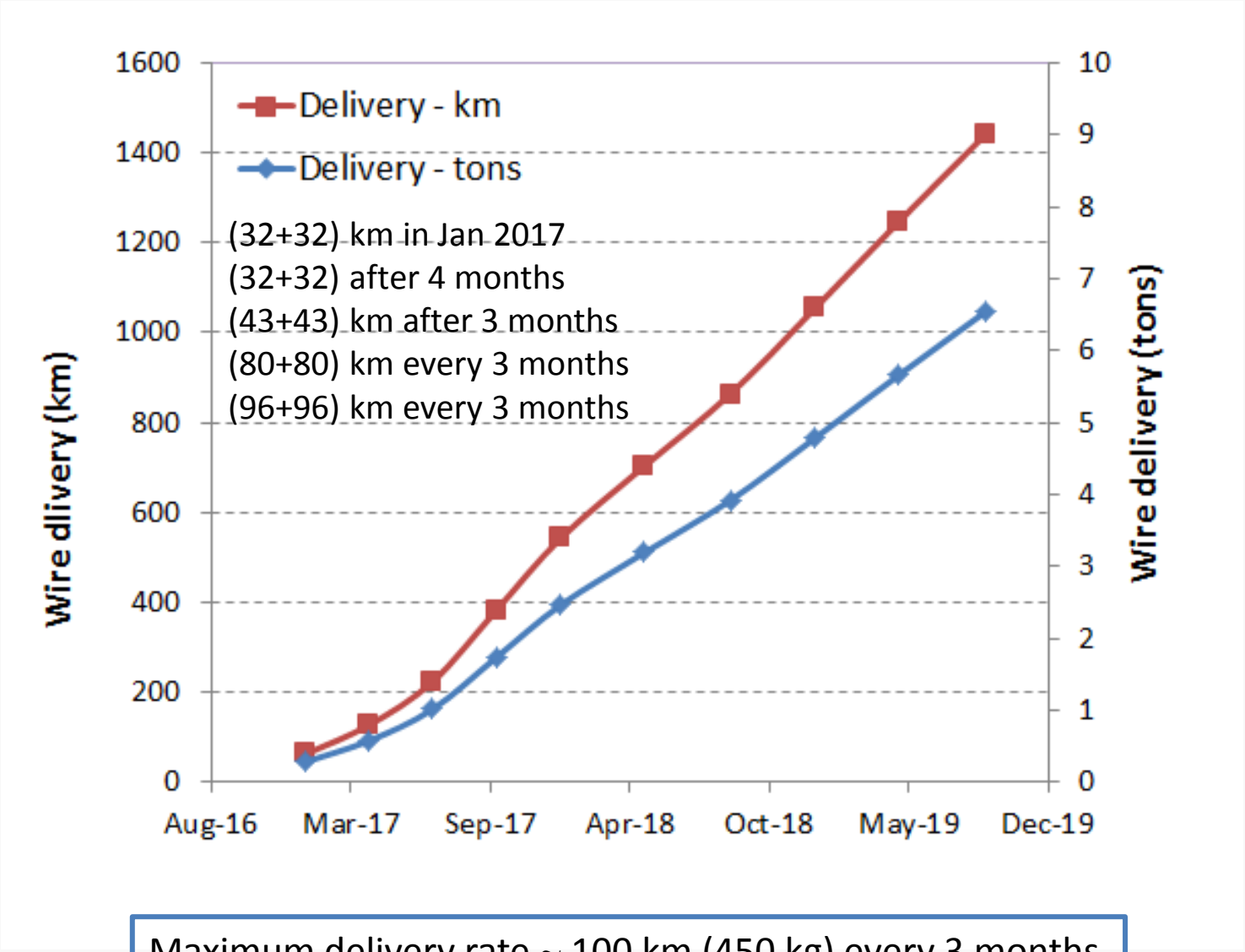
Procurement of Nb_3Sn



Strand delivery and cable production

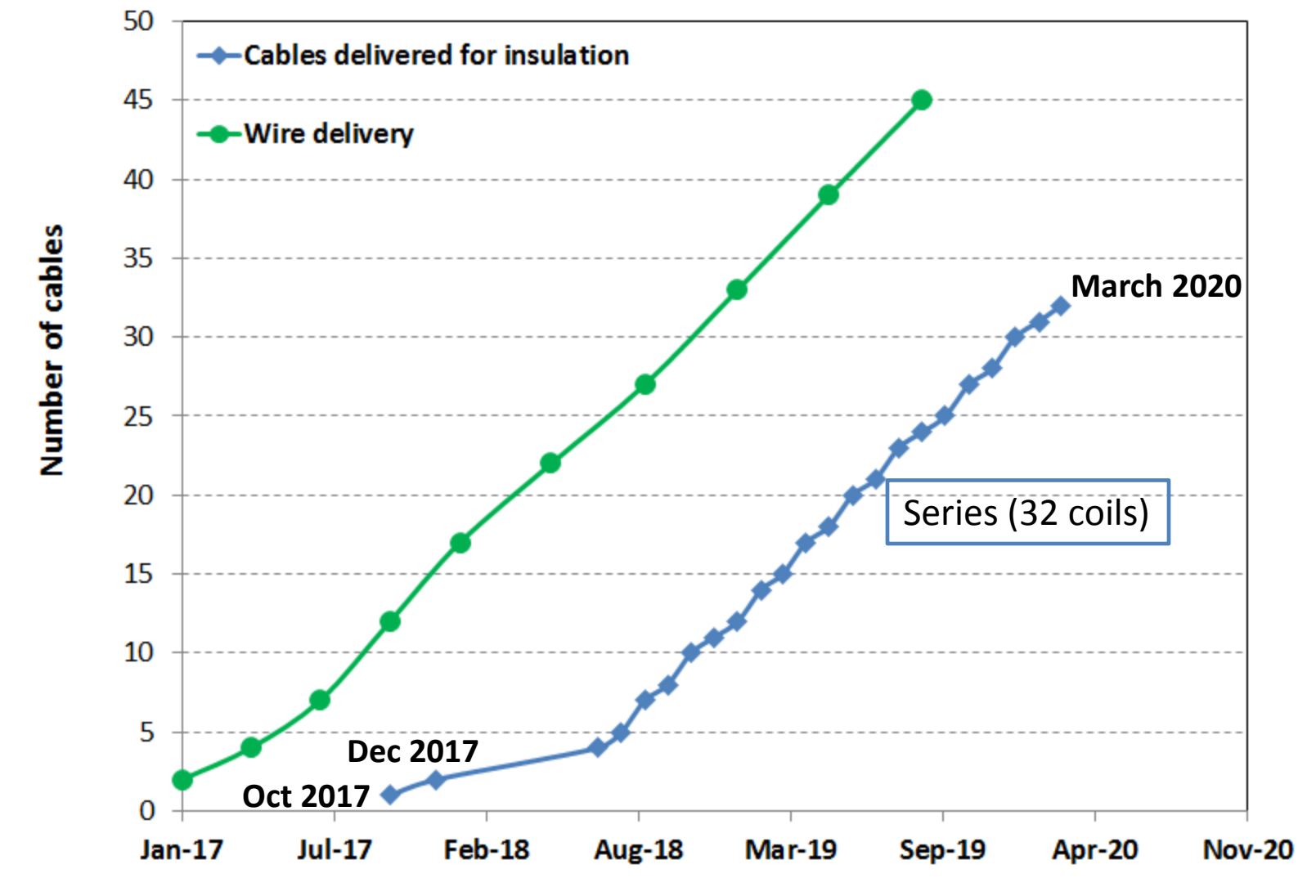


Wire delivery



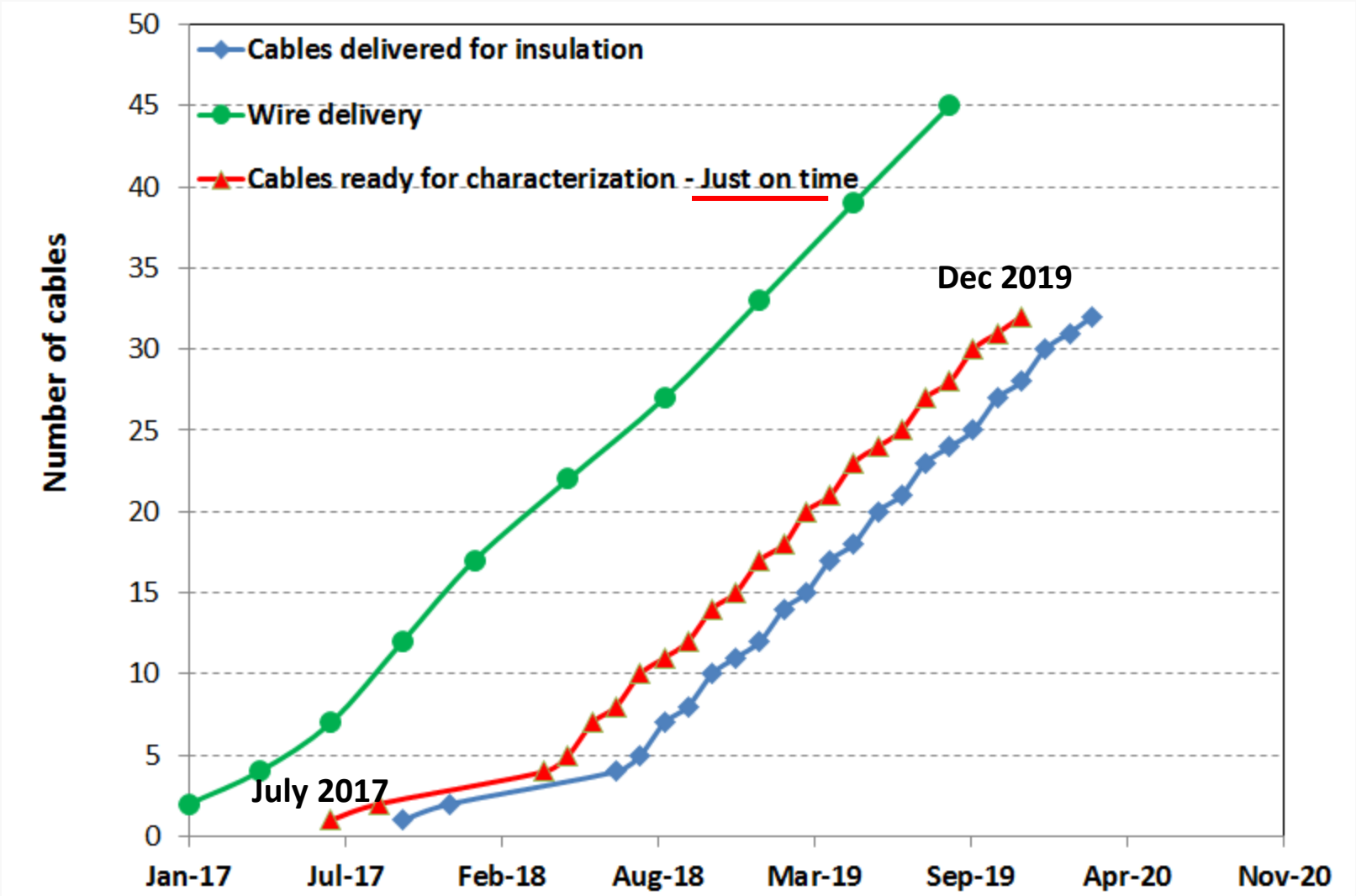
Maximum delivery rate ~ 100 km (450 kg) every 3 months

Wire delivery and cables production - Series



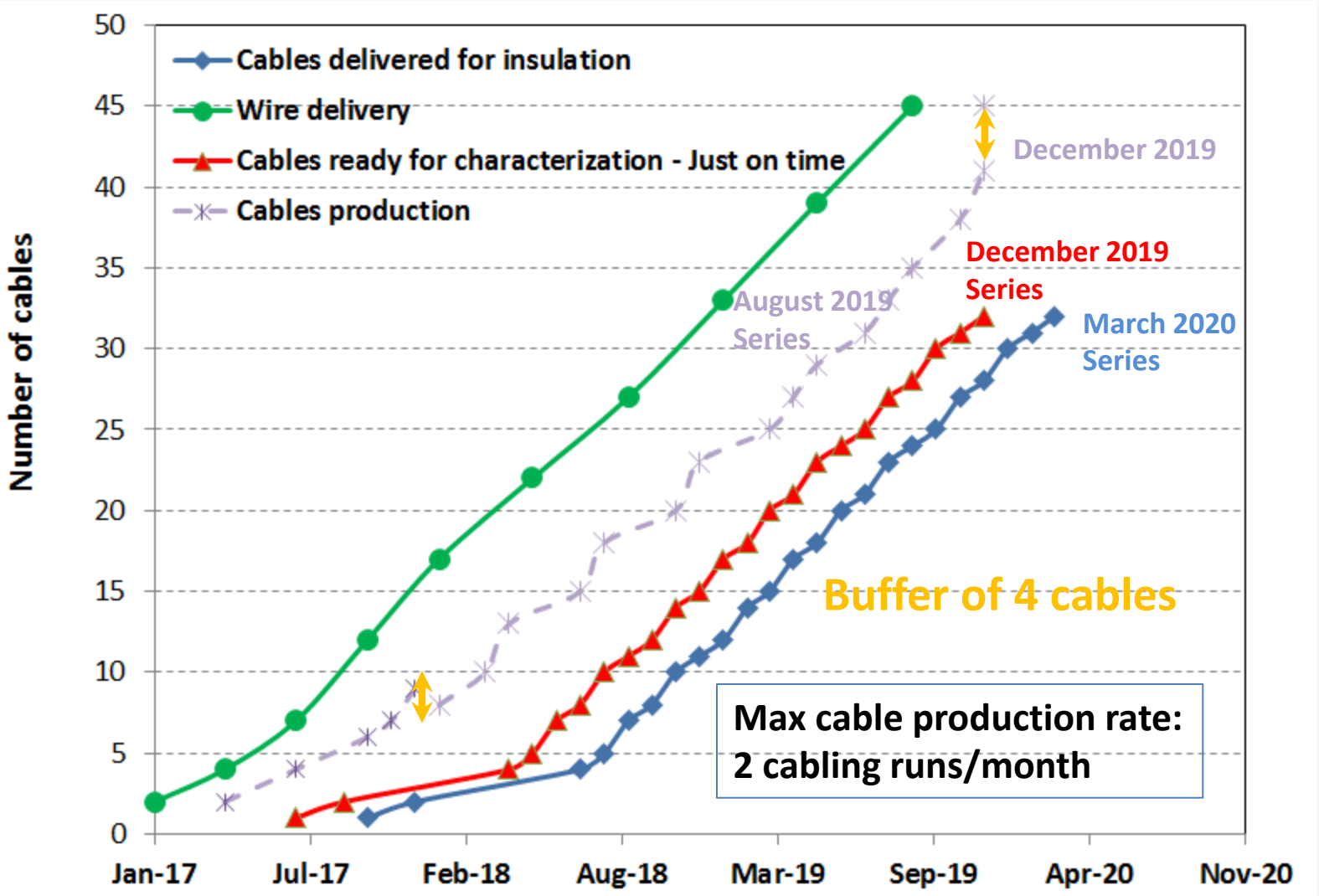
Delivered to magnet team: 2 months before coils assembly (for electrical insulation)
Available: availability of cables according to wire delivery schedule

Wire delivery and cables production - Series



Delivered to magnet team: 2 months before coils assembly (for electrical insulation)
Cables ready for characterization : 3 months before delivery to magnet team
Available: availability of cables according to wire delivery schedule

Cables production - Series



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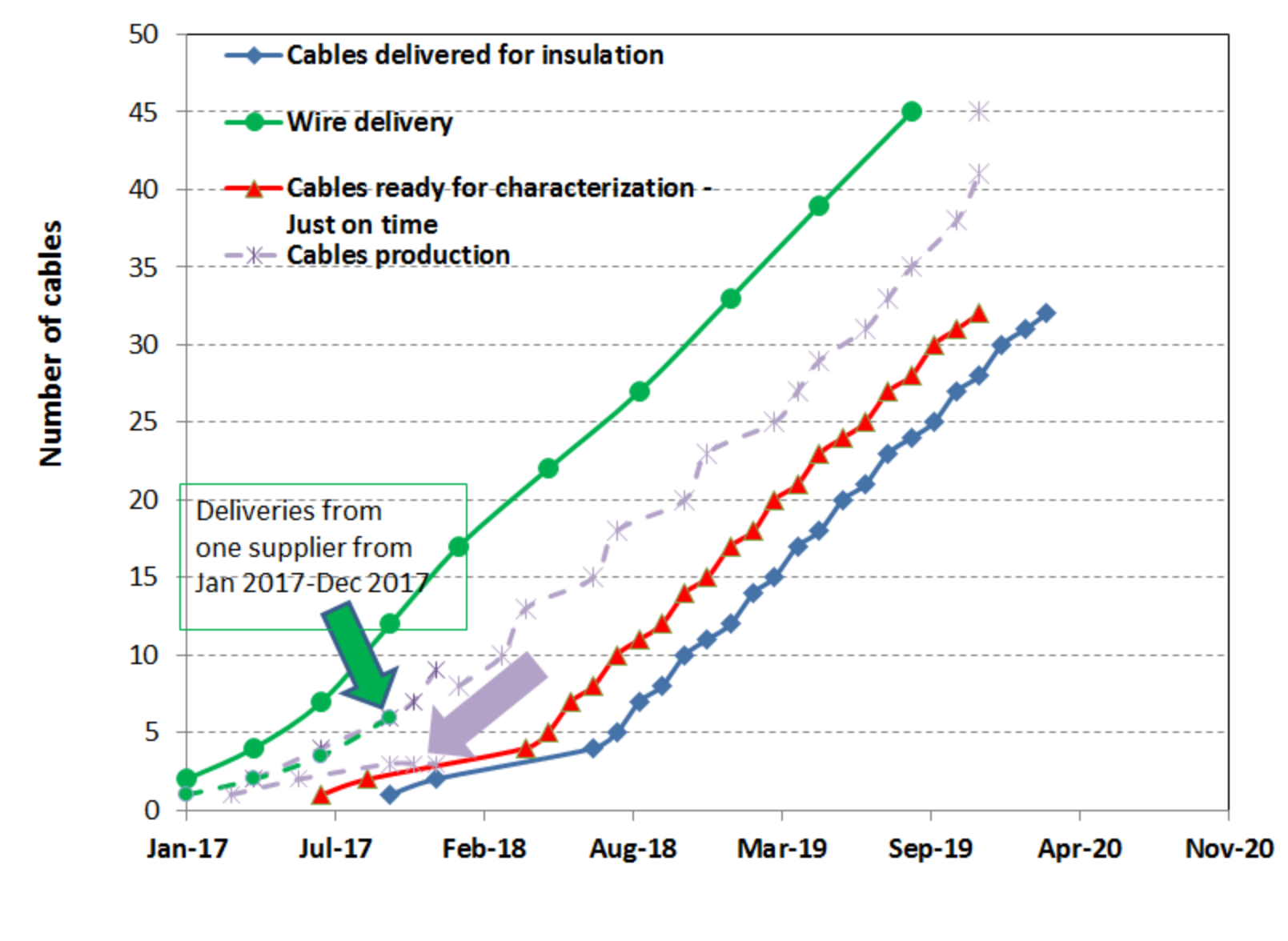
Cables production - Series



Cable production

- Total quantity: 45 cables to be produced during 3 years – 32 for series production

- From April 2017 till December 2017: production of cables for earlier deliveries plus buffer of 4 fully qualified cables – to compensate for unforeseen stop of production (cabling machine, QC equipment, delay in measurements…)

- Cable production rate: one cable every two weeks. Three months have been taken into account for measurements before delivery of cables for coils winding

Conclusions

- A **wire procurement strategy** has been **established** in accordance with requirements for cable production
- A **cable production plan has been established** in accordance with requirements for coils assembly
- **Cabling activity** will be performed **at CERN**. Production of unit lengths of cables will be launched sufficiently early to assure cables need for coils assembly – also in case of late delivery from one wire manufacturer - and availability of a **buffer of cables**