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# Two half-day seminars on the remaining work packages to complete the MEDICIS Facility

## POWER CONVERTERS FOR MEDICIS

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on behalf of TE/EPC

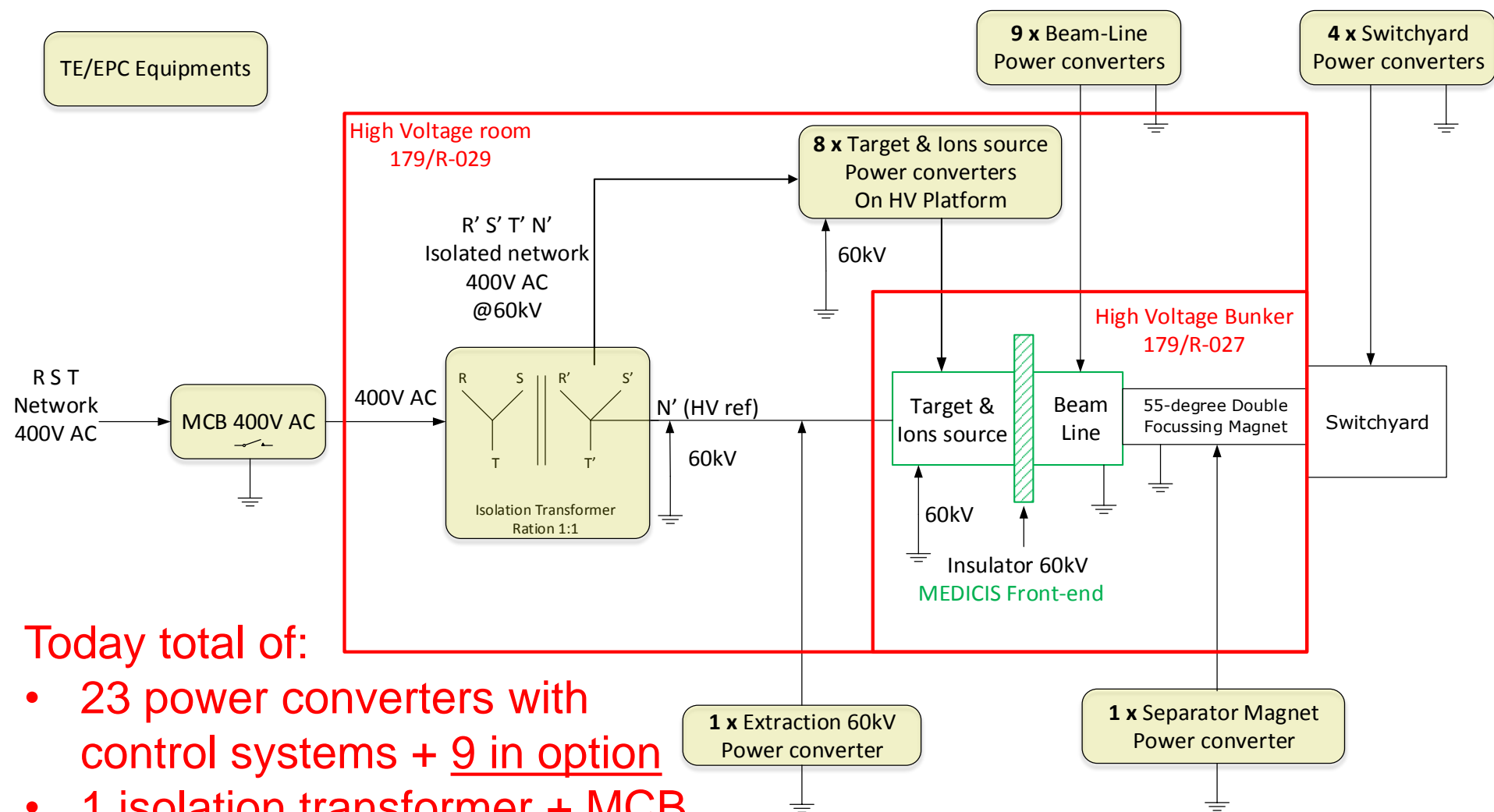
<https://te-epc-fpc.web.cern.ch/content/medicis>

2 March 2016

# Outline

- Equipment overview
- Items not included within TE/EPC
- Cost estimate
- Resources
- Schedule
- Conclusion

# Equipment overview



Today total of:

- 23 power converters with control systems + 9 in option
- 1 isolation transformer + MCB

# Equipment overview

- Example of similar/smaller installation in ISOLDE OFFLINE



Insulated  
cable tray

60kV platform for power converters  
Powered by Isolated 400VAC transformer

60kV Isolation  
400VAC transformer

# Equipment overview

- Items to be delivered by TE/EPC – Target & ion source

Item	I [A]	V [V]	Reg. in:	Stability	Reference/setting resolution
Target Heating	1200	15	Current	$1 \times 10^{-3} - 0.1\%$	$3.1 \times 10^{-3} - 0.31\%$ Proposed by EPC High end for EPC necessary?
Line Heating	600	10	Current	$1 \times 10^{-3} - 0.1\%$	
Ion Source 1	5	300	Voltage	$1 \times 10^{-4} - 0.01\%$	
Ion Source 2	5	300	Voltage	$1 \times 10^{-4} - 0.01\%$	
Mass Marker 1	100	15	Current	$1 \times 10^{-3} - 0.1\%$	
Mass Marker 2	100	15	Current	$1 \times 10^{-3} - 0.1\%$	
Magnet Target	10	24	Current	$1 \times 10^{-3} - 0.1\%$	
Pre-extraction	0.04	+/-3500	Voltage	$1 \times 10^{-4} - 0.01\%$	
Extraction	0.002	+/-60000	Voltage	$1 \times 10^{-4} - 0.01\%$	

**All power converters are DC!**

# Equipment overview

- Items to be delivered by TE/EPC – Beam line

Item	I [A]	V [V]	Reg. in:	Stability	Reference/setting resolution
H deflector 1	0.001	3500	Voltage	$1 \times 10^{-4} - 0.01\%$	$3.1 \times 10^{-3} - 0.31\%$ Proposed by EPC High end for EPC necessary?
H deflector 2	0.001	-3500			
H deflector 3	0.001	3500			
H deflector 4	0.001	-3500			
V deflector 1	0.001	3500			
V deflector 2	0.001	-3500			
V deflector 3	0.001	3500			
V deflector 4	0.001	-3500			
Einzel lens	0.002	30000			

All power converters are DC!

# Equipment overview

Items to be delivered by TE/EPC – Options added 2 days ago!

Item	I [A]	V [V]	Reg. in:	Stability	Reference/setting resolution
H deflector 1	0.001	3500	Voltage	$1 \times 10^{-4} - 0.01\%$	$3.1 \times 10^{-3} - 0.31\%$ Proposed by EPC High end for EPC necessary?
H deflector 2	0.001	-3500			
H deflector 3	0.001	3500			
H deflector 4	0.001	-3500			
V deflector 1	0.001	3500			
V deflector 2	0.001	-3500			
V deflector 3	0.001	3500			
V deflector 4	0.001	-3500			
Einzel lens	0.002	30000			

All power converters are DC!



# Equipment overview

- Items to be delivered by TE/EPC – Other grounded items

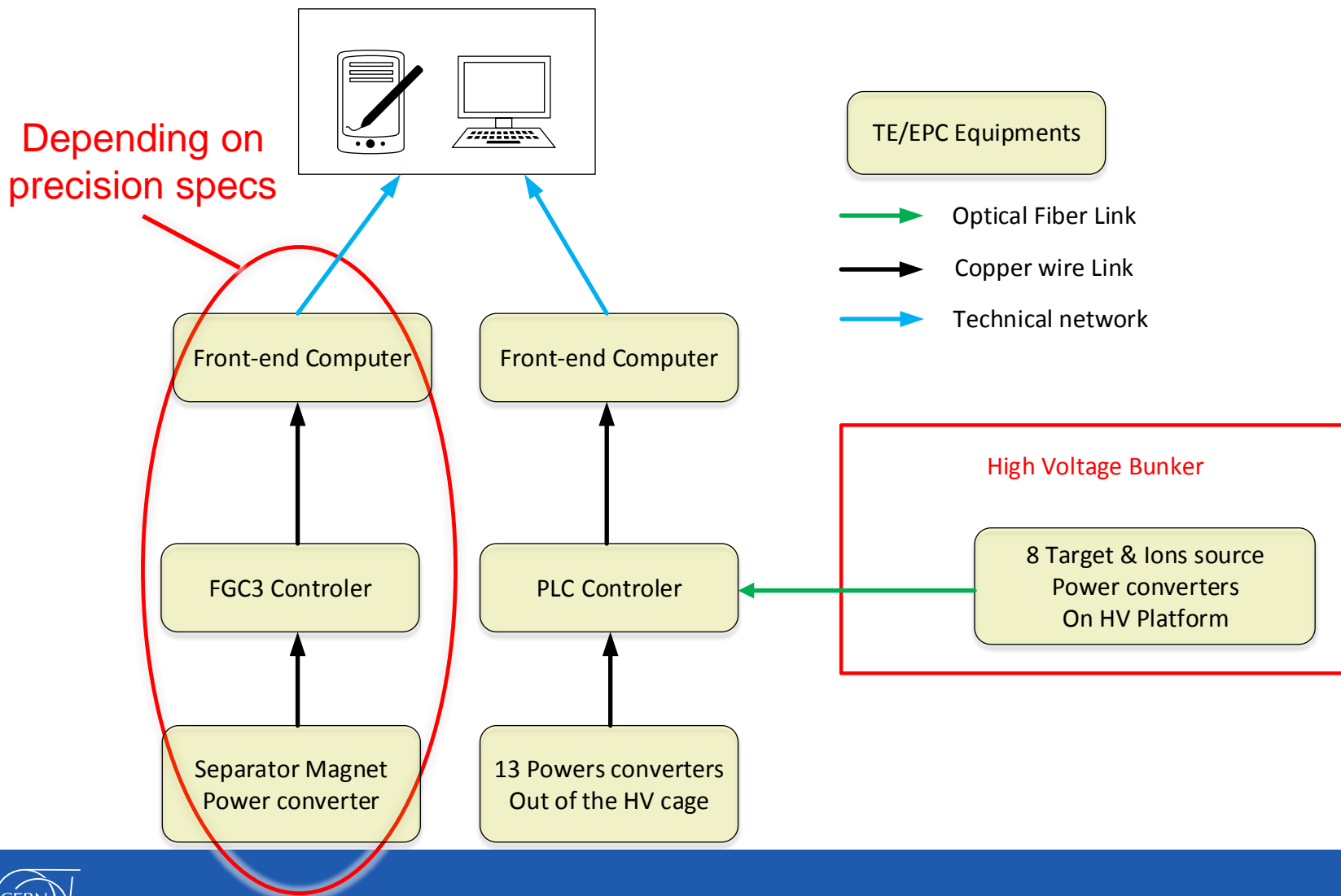
Item	I [A]	V [V]	Reg. in:	Stability	Reference/setting resolution
Double focusing	<b>140?</b>	<b>40?</b>	Current	100ppm? (FGC3)	TBD
Switchyard left 1	0.001	-3500	Voltage	$1 \times 10^{-4} - 0.01\%$	$3.1 \times 10^{-3} - 0.31\%$ Proposed by EPC High end for EPC necessary?
Switchyard left 2	0.001	+3500	Voltage	$1 \times 10^{-4} - 0.01\%$	
Switchyard right 1	0.001	-3500	Voltage	$1 \times 10^{-4} - 0.01\%$	
Switchyard right 2	0.001	+3500	Voltage	$1 \times 10^{-4} - 0.01\%$	
Insulating transformer	75/75	400/400	-	-	-
MCB	32	400 AC	-	-	-

**All power converters are DC!**

- Other Deliverables
  - Complete control system from converters to FEC (included)
  - Tests, installation, commissioning, operation & maintenance

# Equipment overview

- Remote control concept



# Items not included within TE/EPC



- Power network 400VAC distribution → EN/EL
- DC cabling on earth side → EN/EL
- Vacuum and cooling Interlocks distribution → EN/STI
- Mechanical design & manufacturing of HV Platform → EN/STI

# Cost Estimate

Designation	Quantity	Price (kCHF)	Remark
Target Heating	1	20	
Line Heating	1	14	
Ions source	2	5	
Mass marker	2	10	
Magnet target	1	5	
Pre-extraction	1	12	
Extraction	1	18	Depending on precision specs
Deflectors	8	16	
Einzel lens	1	15	
Magnet separator	1	30	Included FGC3
Switchyard	4	15	
Insulated transformer	1	30	Included MCB
PLC control	1	50	Interfaces and controller
Front-end computer	2	20	

# Cost Estimate

Designation	Quantity	Price (kCHF)
Power converter summary	23	~190
Control devices & infrastructure	23	~70
Installation (included Manpower)	-	~60
If options included	9	~50
TOTAL (with FGC3 for magnet)		~370
TOTAL (without FGC3 for magnet)		~350

This is a preliminary estimation, request to EPC still not final

Once power converters functional specification approved (prepared by TE/EPC), the final cost estimation can be released

# Resources (FTEs)

unit	Item	FTE E	FTE C
TE/EPC/FPC	Design, purchasing, tests, etc.	0.1	0.5
TE/EPC/LPC	Magnet converter (separator)	0.1	0.2
TE/EPC/HPM	Calibration/performances	-	0.1
TE/EPC/CCS	Control PLC+FGC3	0.3	-
Total		0.5	0.8

**~1.3 FTEs. FTEs not foreseen in 2016!**

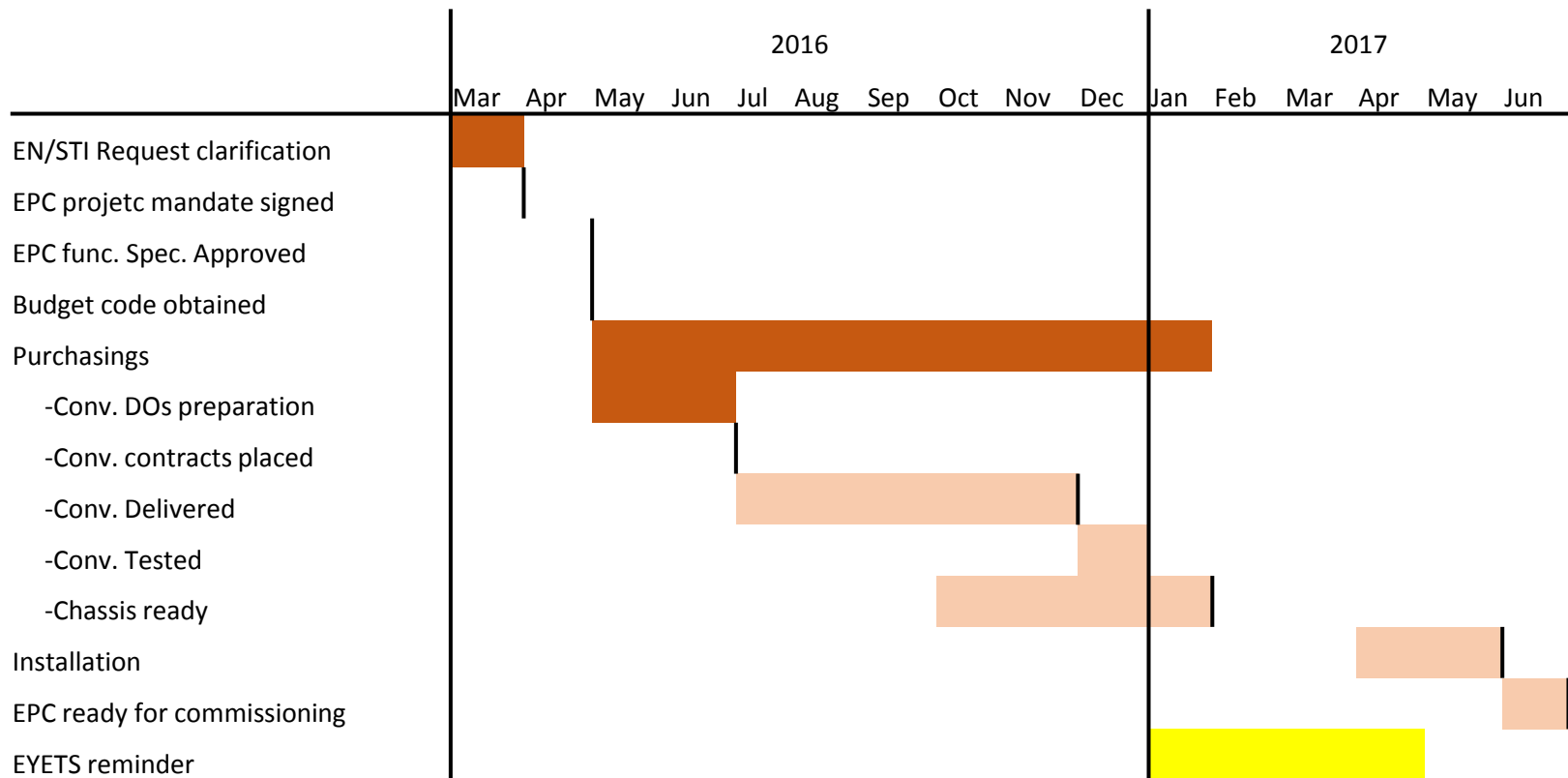
# Schedule

- **Ideal schedule if all FTEs were available**

Activity or milestone	Date
Request from EN/STI clarified	Mar. 2016 (end)
EPC project mandate signed (EDMS approval)	Mar. 2016 (end)
EPC functional spec. (EDMS approval)	Apr. 2016
Budget code obtained	Apr. 2016
Purchasing's + production + qualification	Feb. 2017
-2 x DOs>50kCHF prep. + contract placed	Jun. 2016
-Converters delivered to CERN: >4 months	Nov. 2016
-PLC, rack assembly, Distrib. Chassis	Dec. 2016
Installation: 6 weeks	Feb. 2017 (end)
<b>EPC ready for commissioning</b>	<b>Mar. 2017</b>

# Schedule

- Considering projects priorities within EPC (LIU *in primis* with EYETS works)
- Making an effort and providing FTEs in 2016 to launch orders
- Here is a realistic and still tight schedule for EPC:





# Conclusion

- Complete draft request received Feb. 2016
- Detailed request still to be finalised
- Since then EPC:
  - Is preparing a detailed functional spec.
  - Discussed (group level) priorities for 2016
    - Proposed schedule already impacts 2016 EPC objectives
  - Earliest date for project completion is June 2017

Reminder: delivery date  $\equiv$  EPC Func. Spec. signed + 13 months!

Thank you very much!