
SUPER CONDUCTIVITY
International Energy Agency
IEA Technology Collaboration Program on
High-Temperature Superconductivity
(IEA HTS TCP)
HTS Workshop
Organized by NEDO
4 - 5 July 2017
Kawasaki - Japan
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Tuesday, 4 July 2017

ExCo Open Session: HTS Workshop

Welcome and Introduction Shigenobu Watanabe, Director General NEDO
Luciano Martini, IEA HTS TCP

Moderator: Hiroyuki Ohsaki, Vice Chair, IEA HTS TCP

13:40 – 13:55	**"*Present status of applied HTS in Italy*"**, L. Martini, RSE (IT)
13:55 – 14:10	**"*Status of applied HTS in the US*"**, Brian Marchionini, Operating Agent (USA)
14:10 – 14:25	**"*HTS activity in Switzerland*"**, Bertrand Dutoit, EPFL (CH)
14:25 – 14:40	***"HTS activity in China",*** *Yutaka* Yamada, Operating Agent (JP)
14:40 – 14:55	***"Current status of HTS power devices development at KEPRI"***, Yamada on behalf of Sang Chul Han, KEPRI (KR)
14:55 – 15:10	***"Status of HTS materials and applications development in Germany"***, Yamada on behalf of Mathias Noe, KIT (DE)
15:10 – 15:30	***"Recent Activities at Nexans in the Field of Superconducting Systems"***, Jean-Maxime Saugrain, Nexans (FR)

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Japanese Special Session

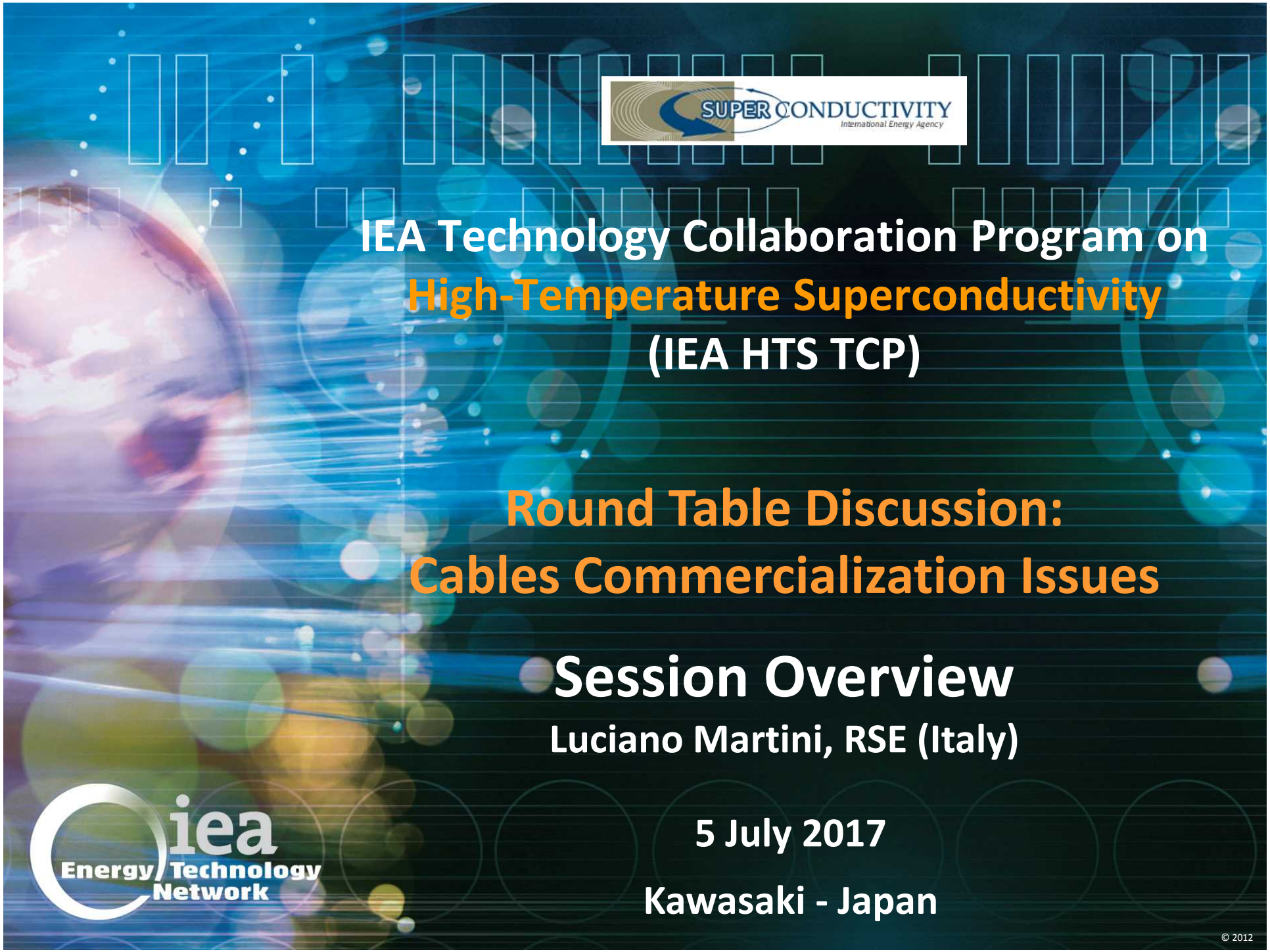
Moderator: Luciano Martini, Chair, IEA HTS TCP

16:00 – 16:20	***"Japanese HTS Projects – Now and Future***", Tetsushiro Iwatsubo, NEDO
16:20 – 16:40	***"Safety and Reliability verification tests for Superconducting Cables",*** Takato Masuda, SEI
16:40 – 17:00	***"HTS Railway Applications"***, Masaru Tomita, Railway Technical Research Institute
17:00 – 17:20	***"Development of High Stable Magnetic Field HTS Magnet System Technology"***, Shoichi Yokoyama, Mitsubishi Electric
17:20 – 17:40	***"Recent Progress of REBCO Coated Conductors at Fujikura"***, Masanori Daibo, Fujikura
17:40 – 18:00	***"Present Status of Taiyo Nippon Sanso Neon Turbo-Brayton Refrigerator"***, Shigeru Yoshida, Taiyo Nippon Sanso

Wednesday, 5 July 2017

Round Table Discussion - Cables Commercialization Issues

09:00 – 09:10	Session Overview	Luciano Martini, RSE
09:10 – 09:20	System view	Jean-Maxime Saugrain, Nexans
09:20 – 09:35	Wire, Cable, and System view	Takato Masuda, SEI
09:35 – 09:45	System view	Masaru Tomita, RTRI
09:45 – 09:55	Cooling system view	Naoko Nakamura, Mayekawa
09:55 – 10:30	Discussion with Presenters and ExCo Members Moderator: Brian Marchionini, OA IEA HTS TCP	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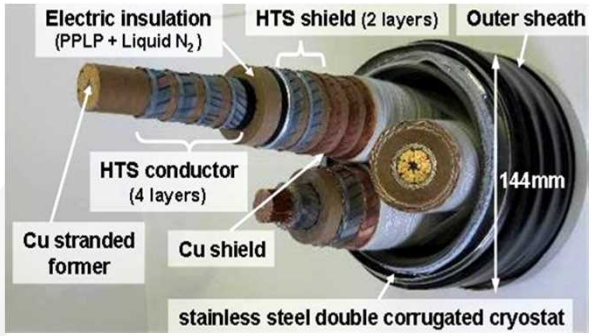
HTS Cable Main Advantages

- **Power enhancement (3-5x) for the same dimensions**
- **Power transmission at lower voltages** (e.g., 138 kV vs 345 kV)
  - Transformer removal at some locations
- **Low impedance cable, lower losses**
- **No thermal impact**
  - More cables per volume, …
- **No electromagnetic impact**
- **No environmental impact**
- **…**

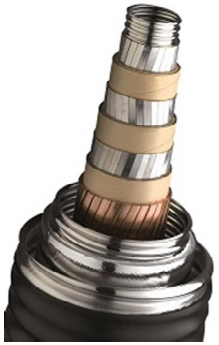


Several HTS cable projects are ongoing for demonstrations

HTS cables provide a lot of freedom & opportunities

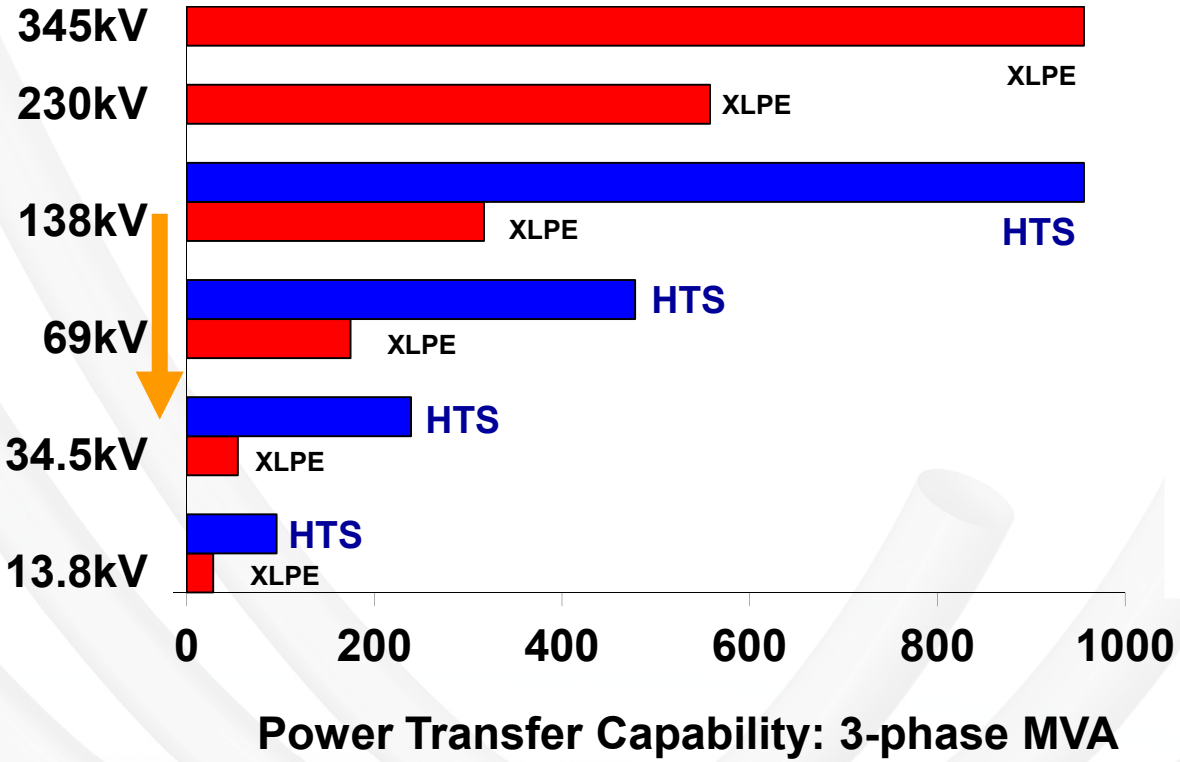
HTS Power Cables owns Unique Electrical Characteristics

- **Very high power transfer capability** compared to conventional cables solves many siting problems
- **Thermal isolation** eliminates de-rating, simplifies installation concerns, and minimizes right-of-way
- Optional fault current management capabilities eliminate need to upgrade existing equipment
- Minimal magnetic field



Superconductor cables offer unique capabilities

HTS Power Cables owns Unique Electrical Characteristics



Same Voltage, More Power

Greatly increased power transfer capacity at any voltage level

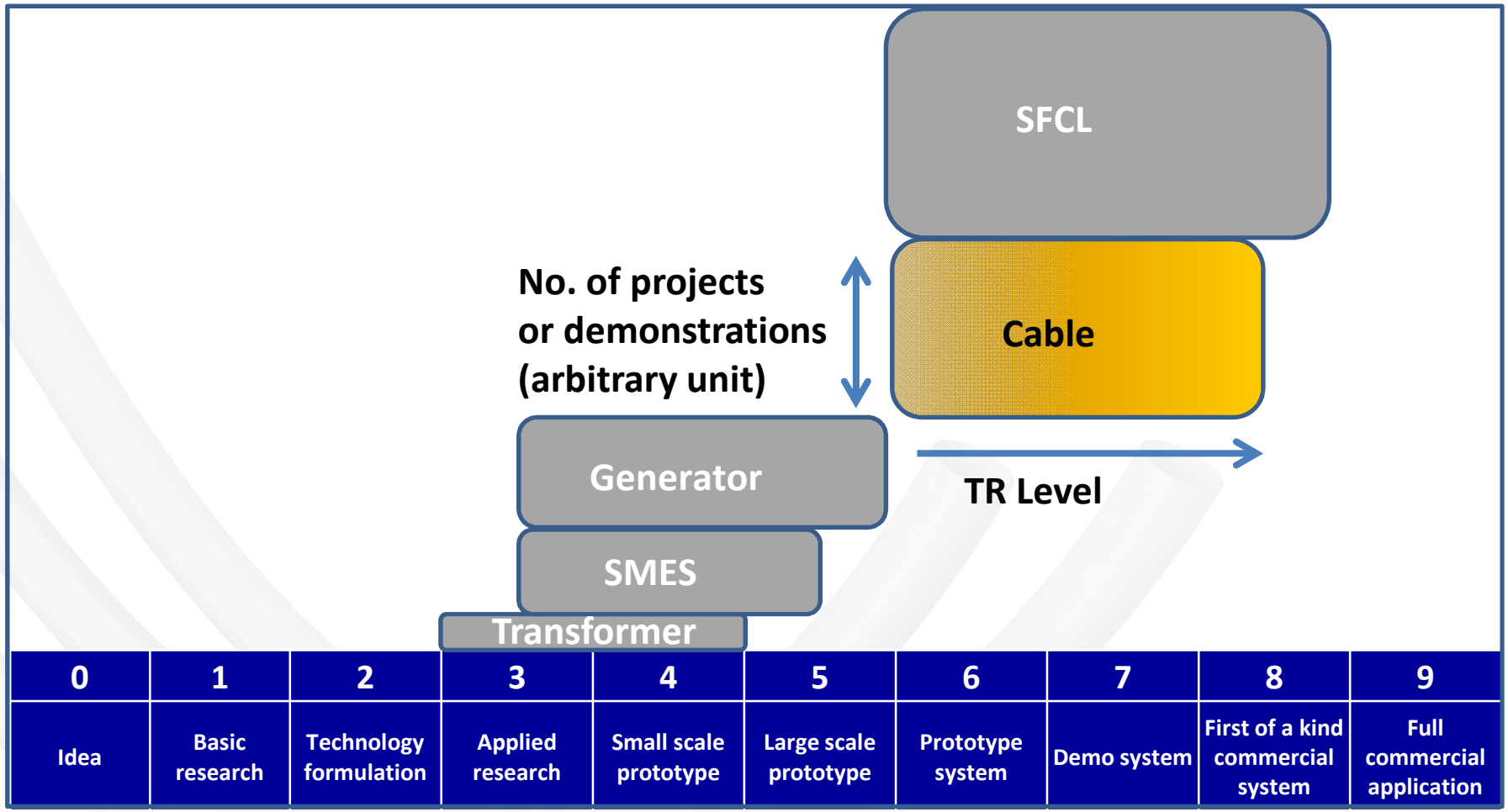
Same Power, Lower Voltage

New MV versus HV siting Opportunity

- "MV Transmission"

HTS Cables could provide transmission-level power at distribution voltages

Technology Readiness Level for HTS Applications
(as for the IEA HTS Roadmap)



State-of-the-Art of HTS AC Cables

HTS Layout	TRIAX	3 Phases in an Envelope	3 Separated Phases
			
	- No ext. magnetic field - Compact structure - Min. SC quantity - Min. Thermal losses	- No ext. magnetic field - (Less compact)	- No ext. magnetic field - Max. piece length - Usable for HV
	- Up to MV voltage only	- Up to MV only	- Less compact

Techno-Economical Study

VORWEG GEHEN

exans

AMPACITY
Smart grids for the city

KIT Karlsruhe Institute of Technology

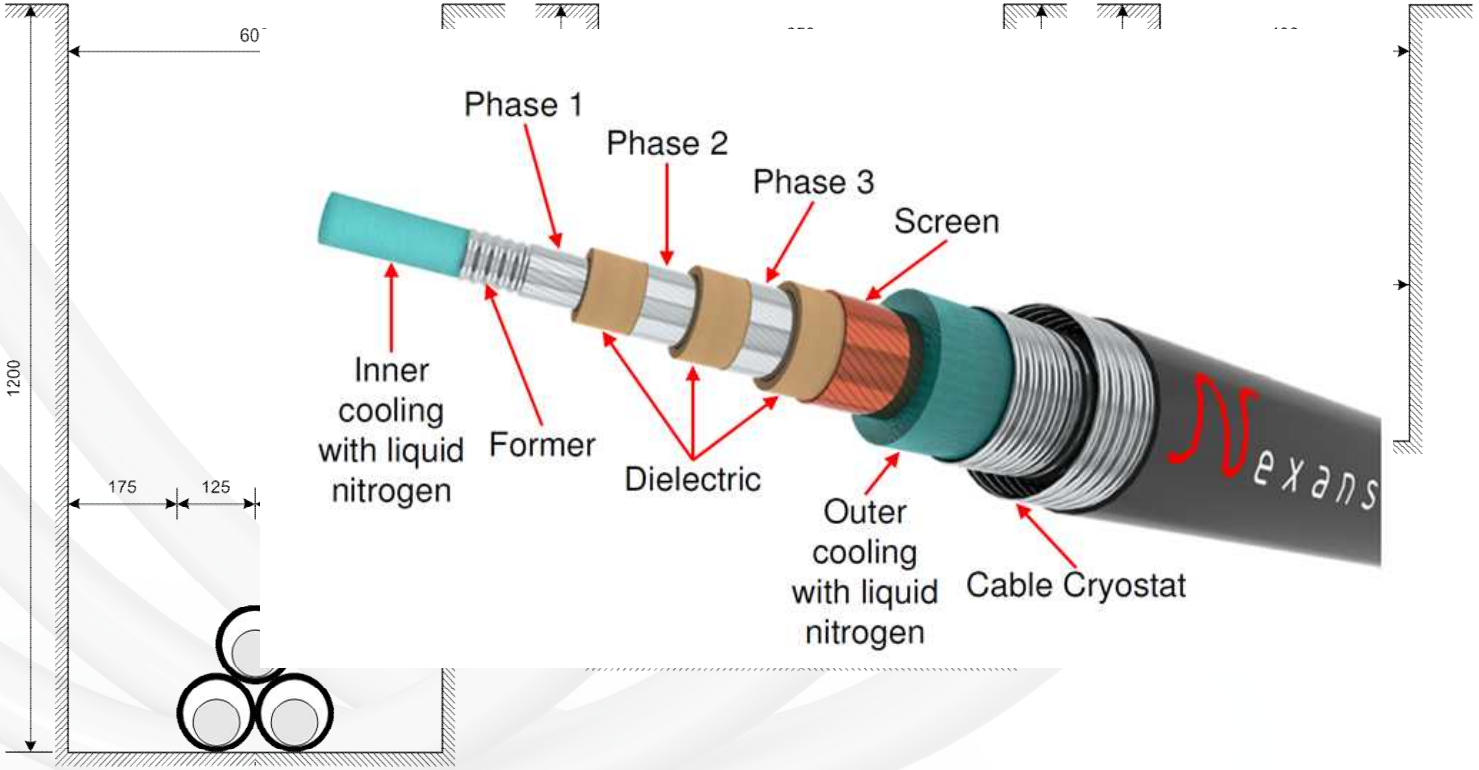
Federal Ministry of Economics and Technology

ptJ Projektträger Jülich Forschungszentrum Jülich

Conventional 110 kV cable

Conventional 10 kV cables

Superconducting 10 kV cable



The EU Project

HVDC Cable Ratings

Characteristics	*Values*
Power	3,2 GW
Voltage	320 kV
Current	10 kA
Length	~ 20 m
Cooling media	Liq N_2 for the voltage insulation
	He gas for MgB_2 conductor
Losses of the demonstrator	< 50 W He gas (~20K)
Fault current	35 kA during 100 ms
Change of polarity	100 MW/s up to 10,000 MW/s

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