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Transmission in India

Alok Roy
CEO

Reliance Power Transmission Ltd.

Sudhakar Chimla

Senior Vice President

Reliance Power Transmission Ltd.

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Transmission in India

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India – Power Scenario (Conservative Estimates)



Installed Capacity

Present	164,000 MW
By 2027	575,000MW

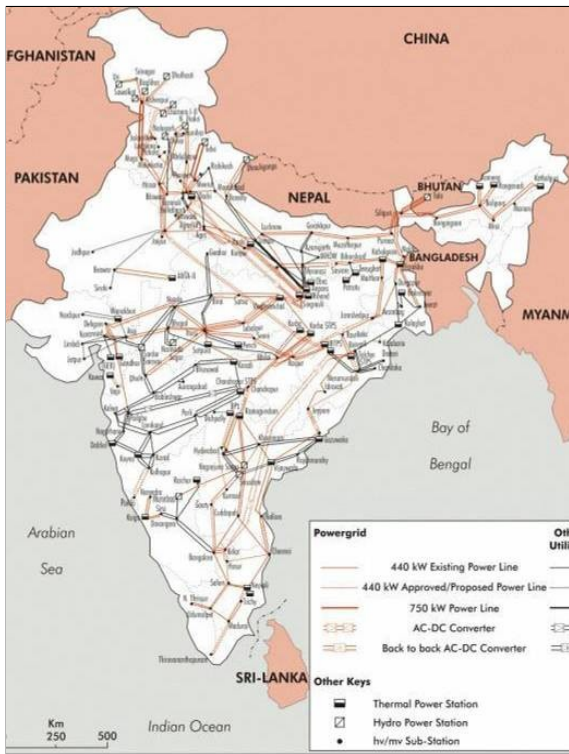
Peak Demand

Present	111,000MW
By 2027	437,000MW

Growth rate 8-9% p.a.

Data Source: CEA website

Transmission Opportunity



11th Plan outlay (2007-12)

Central Sector	\$ 16 bn
State Sector	\$ 14 bn
Total	\$ 30 bn

12th Plan estimates (2012-17)

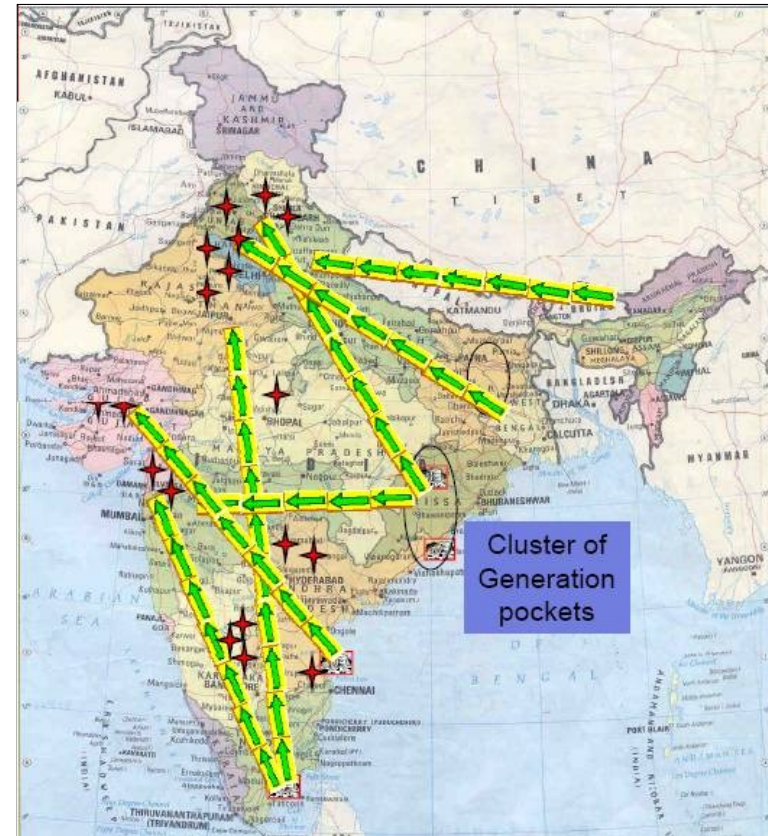
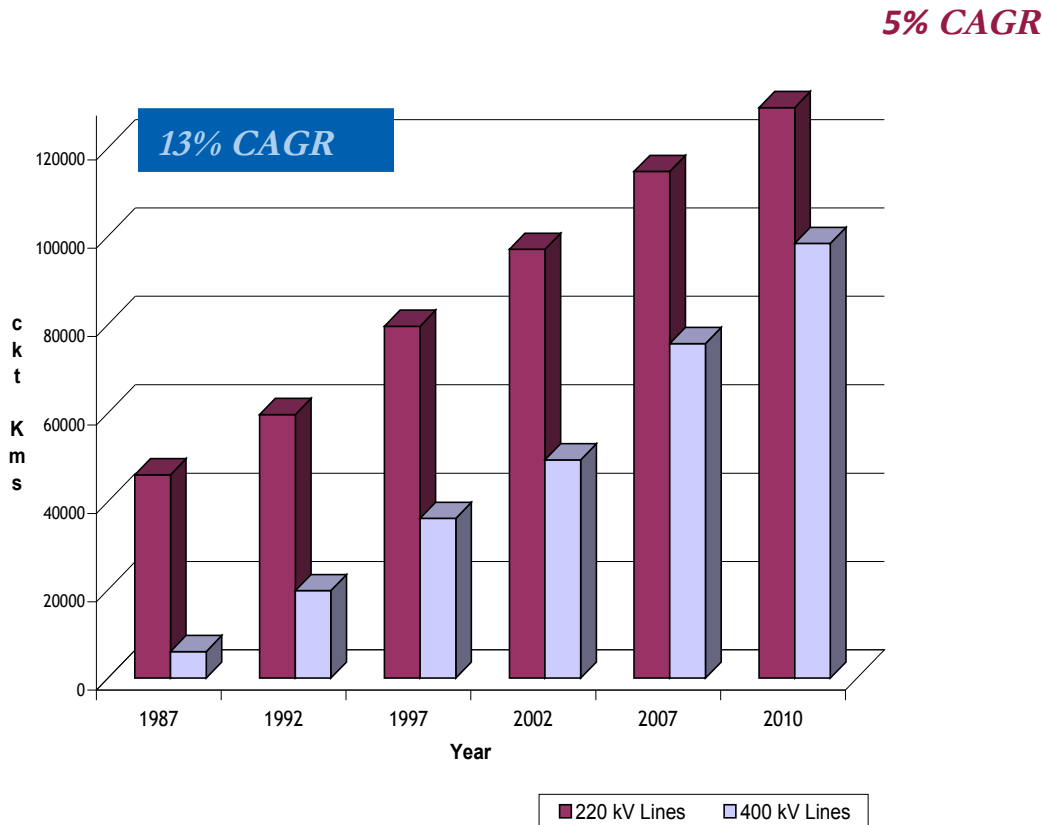
Central Sector	\$ 30 bn
State Sector	\$ 20 bn
Total	\$ 50 bn

Expected bids for Pvt Sector (Next 5 years)

Central Sector Projects	\$ 7 bn
State Sector Projects	\$ 6 bn
Total Opportunity	\$ 13 bn

Post 2011 projects to be awarded on competitive basis

Growth in Transmission Lines / Requirement



Layered Concept for National Grid

- Network in 'Two Layer System'
- Layer#1 (underlying network)
 - Whole of existing 400kV,765kV,220kV System+ Expansions in Regional Network to meet region's own demand
- Layer#2 (Super Grid)
 - Mainly 765kV,1200kV(in future) and HVDC systems
 - To transmit bulk power from one region to other region/regions
- Advantages
 - Contain short circuit level
 - Reduce transmission losses

Existing Transmission Lines and expansion during 2012-17 (in ckm)

Transmission lines	Existing (ckm)	Under construction	Total by March 2012	Addition / planned during 2012-2017
765 kV	2,184	5,428	7,612	25,000 to 30,000
HVDC 500 kV	5,872	1,606	7,478	
HVDC 800/600 kV	0	3,600	3,600	5,000
400 kV	75,722	49,278	125,000	50,000
220 kV	114,629	35,371	150,000	40,000
Total ckm	198,569	95,283	293,852	155,000 to 180,000

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**About
Reliance Power Transmission Ltd.
- A part of Reliance Group**

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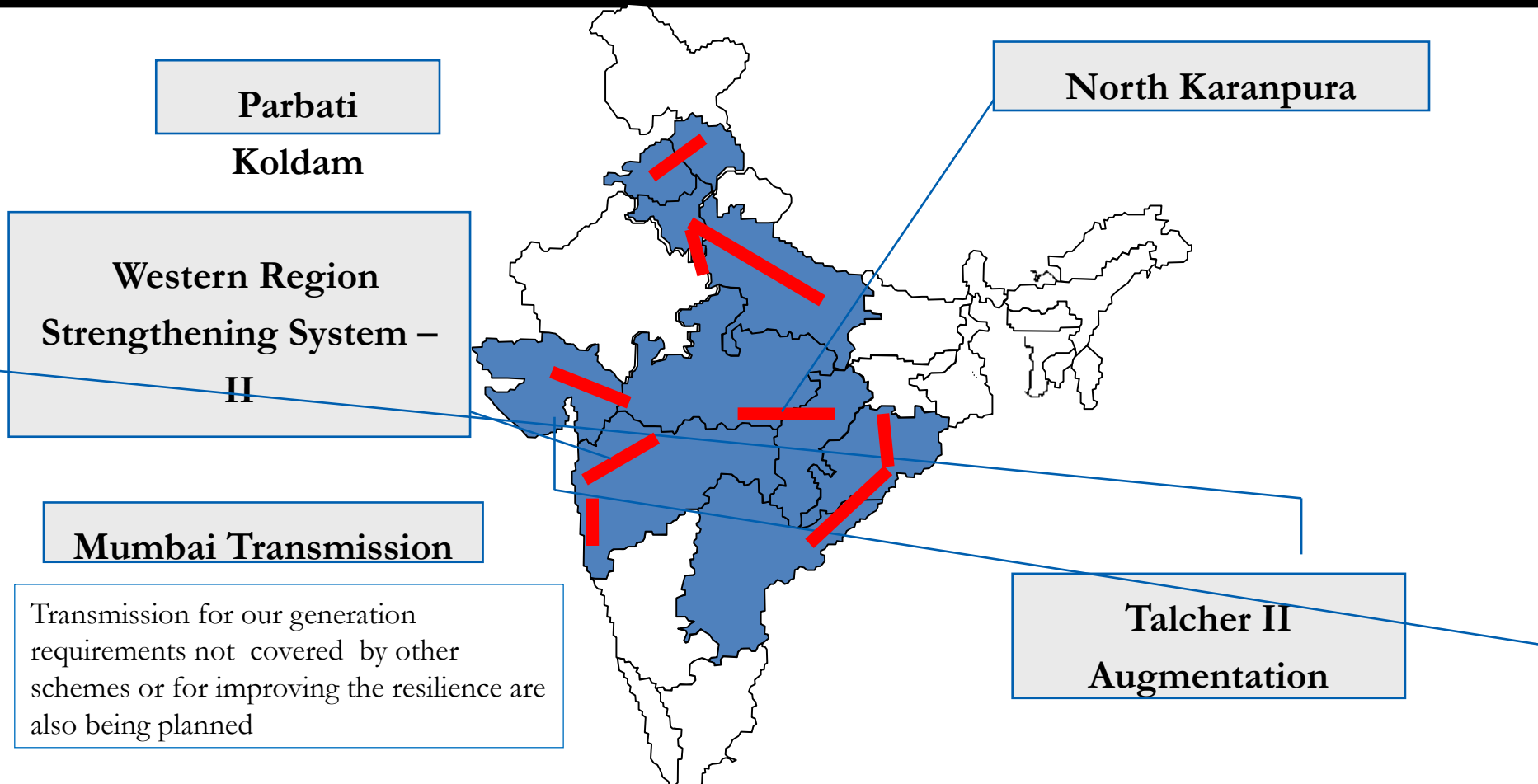
- The Reliance Group is among India's top three private sector business houses, with a market capitalisation US\$ 81 billion
- Net assets in excess of US\$ 29 billion, Net worth US\$ 14 billion
- Group has a customer base of over 100 million, the largest in India,
- Shareholder base of over 12 million, among the largest in the world.
- Reliance Group touches the life of 1 in 10 Indians every single day.

The interests of the Group range from communications (Reliance Communications) and financial services (Reliance Capital Ltd), to generation, transmission and distribution of power (Reliance Energy), infrastructure and entertainment.

Reliance Power Transmission Ltd.

- Established in 2004
- 100% subsidiary of Reliance Infrastructure Ltd
 - India's leading integrated Power Utility
 - \$4.1 bn Assets and \$3.2 bn revenues
- Current Size
 - 6000 ckt kms in Construction [765kV AC ,400kV AC and Substations]
 - \$ 1.5 bn capex
- Vision 2015
 - 20000 ckt kms
 - \$ 5 bn capex

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5 Projects

10 States

\$ 1.5 Bn



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Choice of RODURFLEX composite insulators for Reliance WRSSS-II project

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Project Background - Western Region System Strengthening Scheme II

1600 kms of 400 kV double circuit lines (> 3200 Ckt Km)

- lines in Maharashtra and Gujarat states, project enables
- power flow of 4000 MW from power rich East to West
- first 100% privately owned transmission project in India
- using Composite Insulators for the entire project
- 2 lines of more than 200 km commissioned in January and April 2011 in record time of 15 months
- insulator supplies completed in various lots over a period of 12 months

Project Background - Western Region System Strengthening Scheme II

Western Region Transmission (Maharashtra) Limited

Six lines with a line length of 2,137 ckt kms is to be executed by Western Region Transmission (Maharashtra) Limited.

Elements of the Project:

1. Parli (New) – Pune 400kV D/C line
2. Pune -Aurangabad 400kV D/C line
3. Parli (New) -Solapur (new) 400kV D/C line
4. Solapur (new) -Kolhapur 400kV D/C line
5. LILO of Lonikhand- Kalwa 400kV D/C line at Pune
6. LILO of Sholapur(MSETCL)-Karad-400 kV D/C line at Solapur(new)

Project Background - Western Region System Strengthening Scheme II

Western Region Transmission (Gujarat) Limited

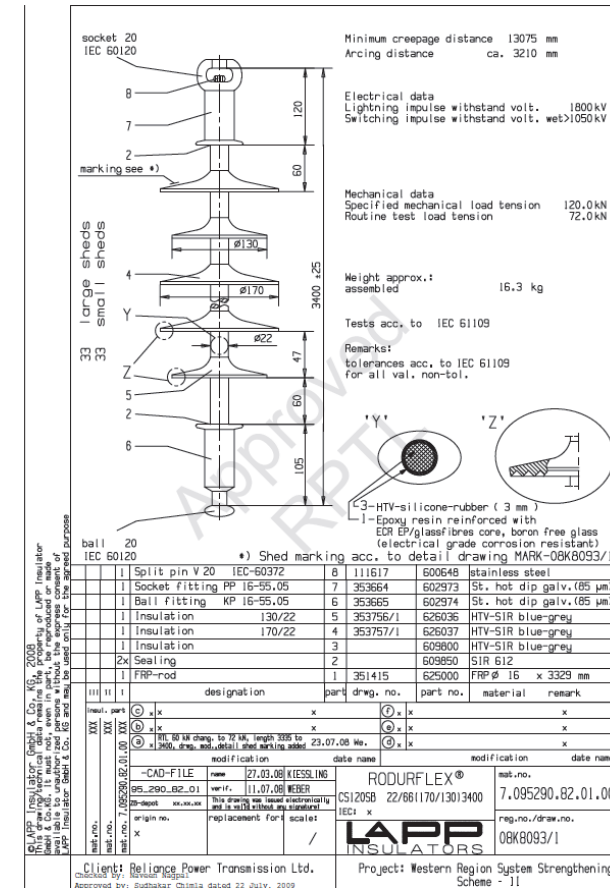
The remaining 3 lines of line length of 967 ckt kms will be taken care of by Western Region Transmission (Gujarat) Limited . This transmission-strengthening scheme will benefit 9 states and Union Territories in the Western Region.

Elements of the Project:

- i. Rajgarh-Karamsad 400kV D/C line
- ii. Limbdi (Chorania) - Vadavi (Ranchodpura) 400kV D/C line
- iii. Vadavi (Ranchodpura) - Zerda (Kansari) 400kV D/C line

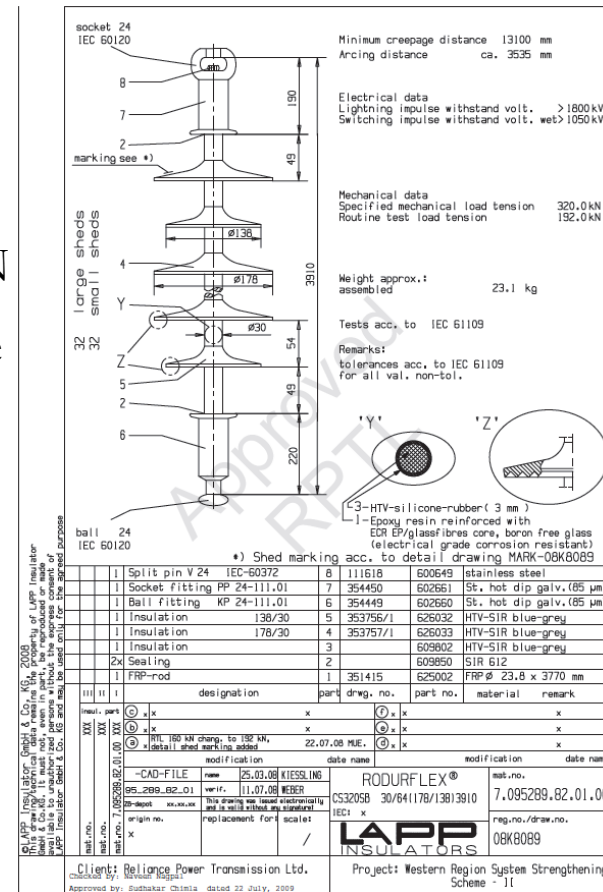
RODURFLEX Composite Insulators for WRSSS-II – design features

- supply of 20.171 pcs. 120 kN 400 kV suspension insulators
- connecting length: 3400 mm
- SML: 120 kN
- min. creepage distance: 13075 mm (31 mm / kV)
- shallow underrib shed profile acc. to IEC 60815-3
- ball and socket connection IEC 60120/20 (acc. to IS)



RODURFLEX Composite Insulators for WRSSS-II – design features

- supply of 14.147 pcs. 320 kN 400 kV suspension insulators
- connecting length: 3910 mm
- SML: 320 kN * optimized design to replace 2x160 kN
- This strength rating was used in India for the first time
- min. creepage distance: 13100 mm (31 mm / kV)
- shallow underrib shed profile acc. to IEC 60815-3
- ball and socket connection IEC 60120/24



RODURFLEX Composite Insulators for W R SSS-II – design features

timeline of insulator approval and type testing:

issued purchase order on Lapp on 09.06.2009

- approved manufacturing drawings 22.07.2009

- confirmed final insulator string designs 24.07.2009

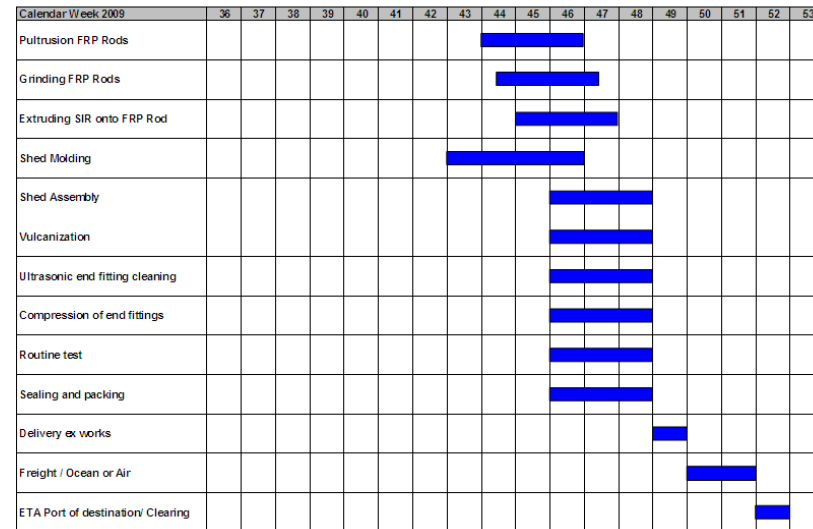
- type tests on insulators and strings carried out from 19.10 - 22.10.2009

- first insulator lot supplied end of November 2009

Preliminary (subject to internal changes, updated weekly)

Production and delivery bar chart
acc. to DIN EN ISO 9001

Lapp Order: SAP 584520XXXX
Customer Order: XXXX
Customer: Reliance Energy, India
Insulator(1): 7.05259.52.01.00 (120 kN)
Insulator(2): 7.05259.52.01.00 (520 kN)
Quantity(1): 20.038 pcs.
Quantity(2): 13.352 pcs.



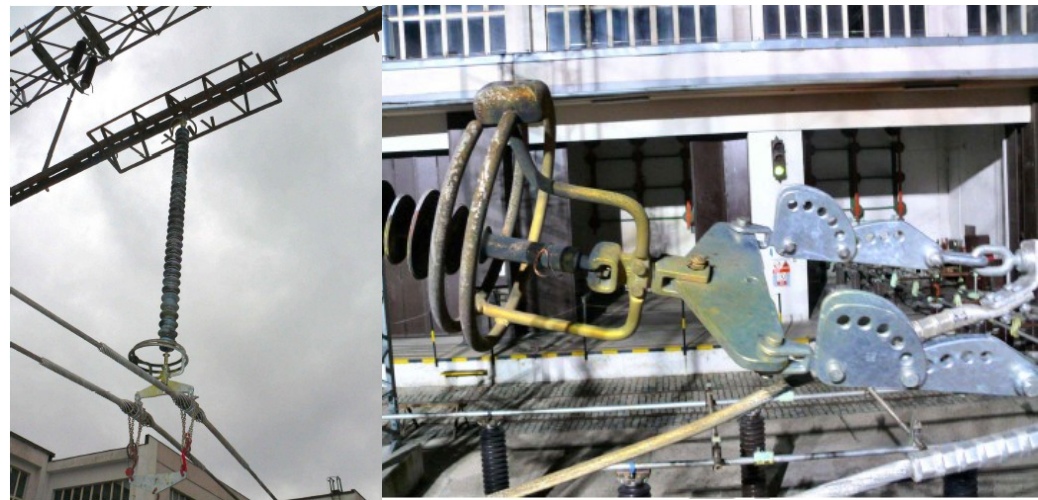
RODURFLEX Composite Insulators for WRSSS-II – design features

Tests carried out on full suspension and tension strings in high voltage laboratory of Lapp:

- dry lightning impulse withstand voltage
- wet power frequency withstand voltage
- wet switching impulse withstand voltage
- RIV / corona tests

Tests carried out in ZKU (KEMA) Prague:

- power arc tests 40 kA
- circuit type B acc. to IEC 61467



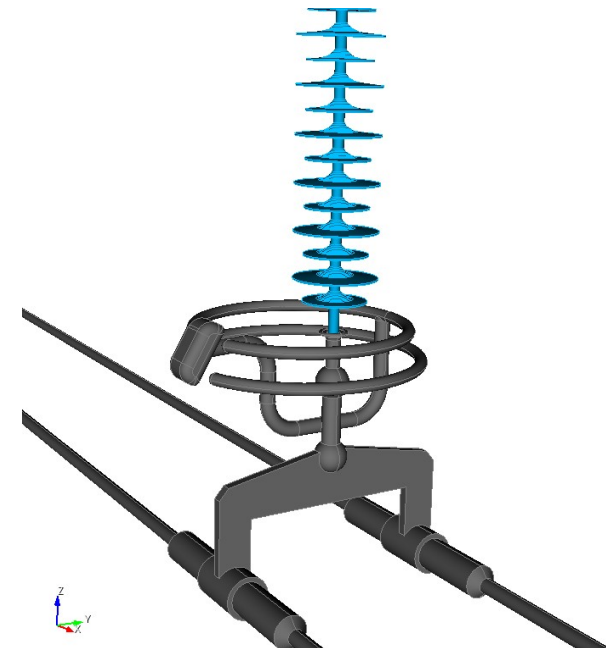
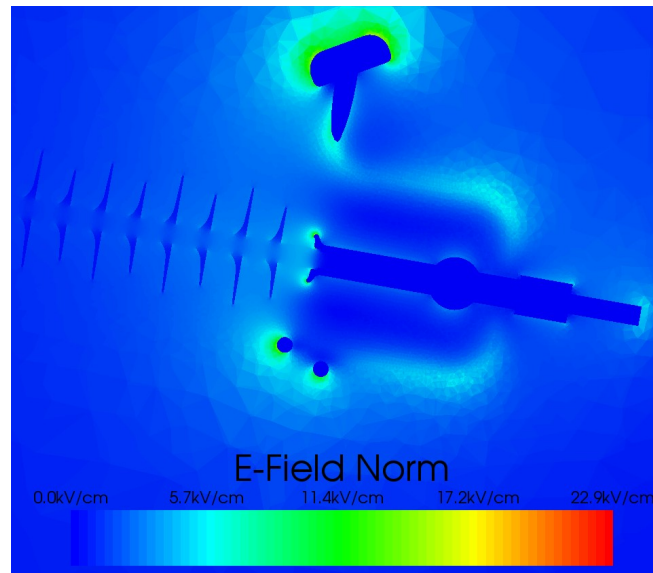
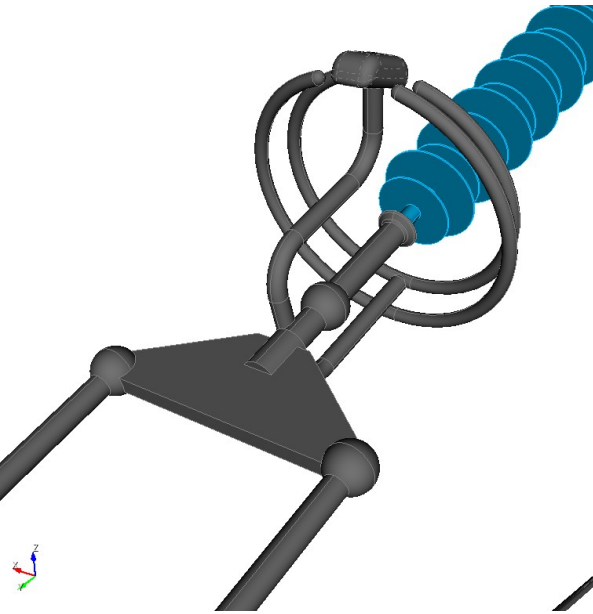
Tests carried out in EGU high voltage laboratory, Prague (suspension + tension insulator):

- artificial pollution test (salt fog method) acc. to IEC 60507 242 kV test voltage 160kg / m³ salinity

RODURFLEX Composite Insulators for WRSSS-II – design features

Additional services provided by Lapp Insulators:

Optimization of corona grading rings by means of 3D E-field study – assistance to hardware manufacturer to design proper combined arcing/corona protection rings



RODURFLEX Composite Insulators for WRSSS-II – design features

Additional services provided by Lapp Insulators:

Material Fingerprinting of first batch

- TGA/DSC analysis
- leakage current measurement on one complete insulator
- EDX/XRF
- FTIR (ATR/FTIR)
- HTM test



320kN / 1 (3180) after 2 days

Results are recorded and in a future periodic assessment (approx. every 5 years) used insulators taken out of WRSSS-II lines will be compared to initial values along with a repeat of mechanical and electrical type-test

RODURFLEX Composite Insulators for WRSSS-II – design features

Additional services provided by Lapp Insulators:

Introduction of composite insulators handling instructions based on CIGRE recommendations attached to each wooden crate for increased alertness of site people using composite insulators for the first time in India

Handling Instructions

Composite insulators are very durable but not indestructible. For best performance pay close attention to the following rules.



Avoid vehicle related damage



Secure insulators during transport to job site



Avoid bucket damage



Do not twist insulators



Avoid nails and screws



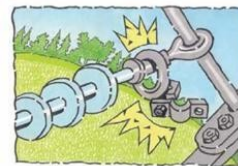
Avoid exposure to pests or contaminants



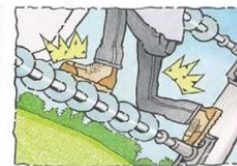
Do not use insulators for lift lines



Do not bend insulators



Attach corona rings properly



Do not stand on insulators

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RODURFLEX Composite Insulators for WRSSS-II – design features

Main reasons of choice of Lapp Insulators RODURFLEX:

- technical expertise
- supply record in marine / desert / arid regions

in total more than 1.000.000 insulator years of positive service performance under extreme conditions are available

- commercial and performance advantages compared to conventional disc insulators
- reduced life cycle cost
- modular design of composite insulators allow customized technical and commercial solutions
- higher Creepage and thereby better pollution performance for the same insulator and string lengths



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QUESTIONS?

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