

Rural Digital Substation (RDS)

Speaker: Ganesh M. Mane

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TP Western Odisha Distribution Ltd.



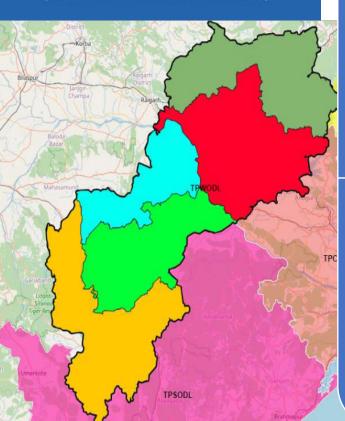
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•88 lakh **Population Served** 48373 Sq. Kms of **Distribution Area**

TPWODL - PPP

between Tata Power & Govt. of Odisha

•21.42 lakh **Customer Base**

Reliability improvement: One of the key KPI 28 Feb - 04 March 2023 | New Delhi

Context



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Reliability improvement requires modernization of substations for better monitoring & control

Current condition of Primary Substation (PSS)



Cable Trench



Old CRP's



Control Room



Cables Condition

Challenges in PSS modernization

- Substation Infrastructure is old
 - **Control Cables**
 - Protection System(Electro-mechanical Relays, etc.)
 - Civil Work (Trench, Control Room, etc.)
 - Space crunch in control room
- High turn around time to execute modification through regular RTU and Indoor Control Relay Panel (CRP) based automation
- Multiple outages of long durations & no data available for analysis at central location









SMART UTILITY Conventional CRP based SAS

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ISGF

India Smart Grid Forum

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33kV & 11kV Outdoor Breaker with Indoor CRP Panels

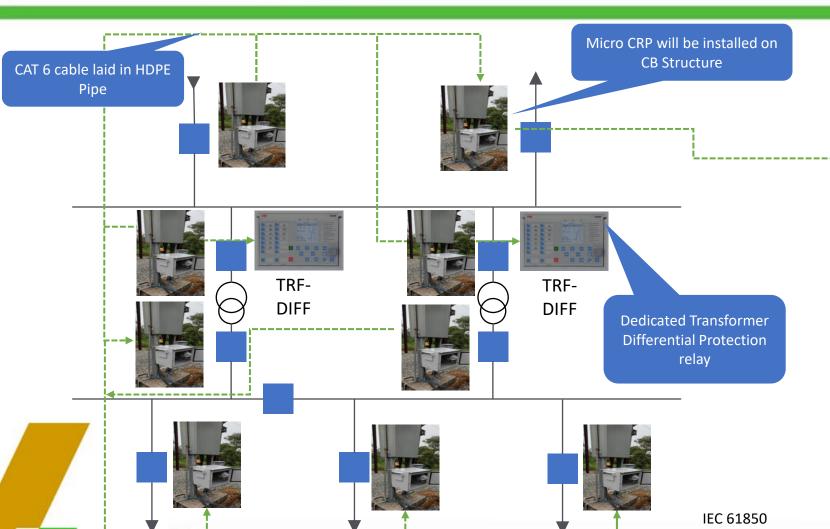
Control Room 33kV Bus 11kV Bus @ISUW_India in India Smart Utility Week (ISUW) isuw@isuw.in www.isuw.in Page: 4 of 10



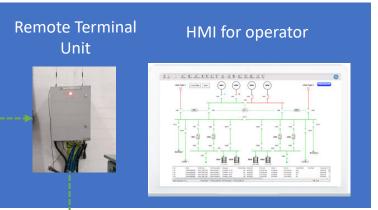
Concept Rural Digital SS







Control Room





Outdoor panel with BCPU to Manage Feeder Monitoring, Control, Protection & Metering by directly installing at **FEEDER in SS**

A micro CRP









Comparison Conventional Vs RDS

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For calculation purpose, below parameter considered,

- 33kV/11kV PSS
- 2 Nos. 33kV line
- 2 Nos. 33kV HT breakers, 2 Nos. 11kV Incomer breakers
- 4 Nos. Outgoing feeders
- 2 Nos. Power Transformer (PTR)
- Total Time reduction in modernization: 1/10 of conventional approach
- Total cost reduction in modernization: 62.8 % of conventional approach

Attributes	Conventional Approach			Rurl Digital Substation (RDS)			
	Time in days	Approx. Cost (Lakhs)	Remarks	Time in days	Approx. Cost (Lakhs)	Remarks	
Transportation of Panels from Store	3	1.5	Cost of transportation, services loading & unloading	2	1	Cost of transportation, services loading & unloading	
ITC for 10 Panels	30	2.5	3 days per feeder and availability of outages	3	1	3 hours per feeder and availability of outages	
Total Outages	3.3	4	4 hours per feeder	0.83	1	2 hours per feeder	
CRP Feeder		21	CRP for 7 feeder protn.		10.5	CRP for 7 feeder protn.	
CRP TRAFO.		10	CRP for 2 Trafo. protn.		6	CRP for 2 Trafo. protn.	
Copper cables	5	14.4	60 meter distance from bay to CRP for CT, PT, Control, AC, DC cables	1	5.1	60 meter distance from bay to Control room for AC, DC, CAT6 cables 10 meter for control cable from CB, CT, PT to CRP	
Size: Control room	90	30	3000 Sqft construction	30	10	1000 Sqft construction	
Cable Trench	45	15	600 mt. per PSS	2	2	170 mt. HDPE Pipe/PSS	
Vermin Proofing	2	0.05	For complete PSS	0	0	For complete PSS	
Total (if control room is ready)	Max 30 days	98.45		Max 3 days	36.6		

^{*} This data is caluculated based on current conditions and skills of TPWODL, this may vary utility to utility









Execution at 33/11kV Attabira PSS

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Following activities have been carried out while working on Feeder SITC









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2093	13-39-32 14:57-43.038 N	SCEL DYTOCL St. general	Earth fault correction instance 1 start	Normal .	9×000000000 500
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Installation of micro CRP panel below outdoor Circuit Breaker



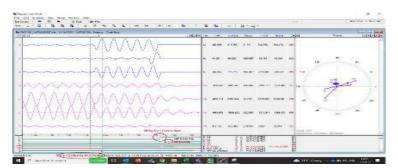












Termination of control signals, Aux Supply, CT and PT cables

Point to Point testing with SCADA

Disturbance Record







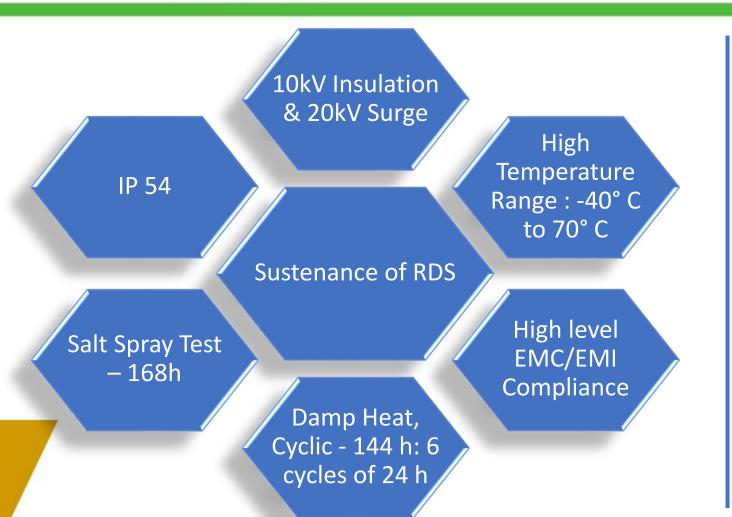


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Sustenance & Way ahead







Way Ahead

Idea 1: Digital Breaker Fixing micro CRP adjacent to CB mechanism



Idea 2: Micro CRP using Fiber reinforced polymers (FRP) material

Use of Fiber reinforced polymers (FRP) box to avoid all environmental challenges



Benefits & Recommendations



28 Feb - 04 March 202

Appreciation mail from OEM on Idea

Synopsis got accepted in CIGRE-23

Forum

To consumers

To utility:

To nation

environment

From: Sachin Subhash PATIL <sachin.patil@se.com>

Sent: Friday, February 10, 2023 3:50:04 PM

To: Ganesh Mane <ganesh.mane@tpwesternodisha.com>

Cc: Ruchir Somani < ruchir somani@se.com> Subject: Rural Distribution Substation Support

Dear Ganeshji,

We thank you for your whole hearted support to make this project in reality.

We have received valuable inputs from you which helped us to fulfil requirement & optimise the solution.

These products are with us from three to four years, but the ideas which you poured helped us to use these solution for overall benefits of both the organisation.

These ideas are benefited in large extend to reduce cables, faster execution etc...

Looking forward for your guidance always to create a new solutions and reduce the pain points at site.

Regards,

Sachin

Scalability:

From: cigre2023@jtb.com <cigre2023@jtb.com>

Sent: 13 January 2023 13:35

To: Ganesh Mane <ganesh.mane@tpwesternodisha.com>

Subject: (Sendai Colloquium 2023) Notification of peer review

results

rox

ms:

Thank you for your contribution. We accept your synopsis.

Please prepare the full paper referring to the full paper template and instructions, which will be published on the Sendai Colloquium Web site around January 20th, and upload it to AMARYS by May 26th.

The reviewers' comments on your synopsis can be viewed on the My Page of your account.

CIGRE2023 desk

JTB Corp.

Sendai Branch

zip code: 980-0804

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E-mail address:cigre2023@itb.com

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Thank You

For discussions/suggestions/queries email: isuw@isuw.in www.isuw.in Links/References (If any)







