# Successful Implementation of vNode at Taiba N'Diaye Wind Power Station by Infinity Power

Overcoming Connectivity barriers: vNode rescues Infinity Power's real-time Data flow for enhanced analysis and precision monitoring.



SOLUTION PROVIDER: **SOLUTION PROVIDER:** 



### Introduction

This case study highlights the successful implementation of the vNode solution at the Taiba N'Diaye Wind Power Station, a flagship project by Infinity Power. This project not only demonstrates the effectiveness of vNode in connectivity and data transmission security but also marks the beginning of a larger data centralization project across all wind and solar parks operated by Infinity Power.

#### Context

Infinity Power, in collaboration with Vestas and Eiffage, undertook the construction of the Taiba N'Diaye Wind Power Station in Senegal. The wind farm comprises 46 Vestas V126 turbines, with a total capacity of 158.7 MW. The generated energy is integrated into the national electrical grid through Senegal's National Electricity Company (Senelec).

### **Previous Challenges**

Before the implementation of vNode, Infinity Power faced challenges in connectivity and real time data access from the substation of the wind farm to its Control Center in the United Kingdom allowing the implementation of new analysis technologies to find deviations and malfunctioning in real-time.











vNode is an Industrial IoT Gateway designed to effortlessly process automation system data and facilitate integration with SCADA systems, IoT solutions, Internet of Things Platforms, and, more broadly, any software solutions employed in industrial automation. With its robust data integration capabilities, in this project vNode has enabled the adoption of innovative and efficient solutions in renewable energy project management.

# Implementation of vNode

As the main contractor, Vestas collaborated with Eiffage for comprehensive construction, and the engineering company subcontracted Schneider Electric and Vester Business for the implementation of control and communication systems. Vester Business played a crucial role in implementing vNode for data centralization.

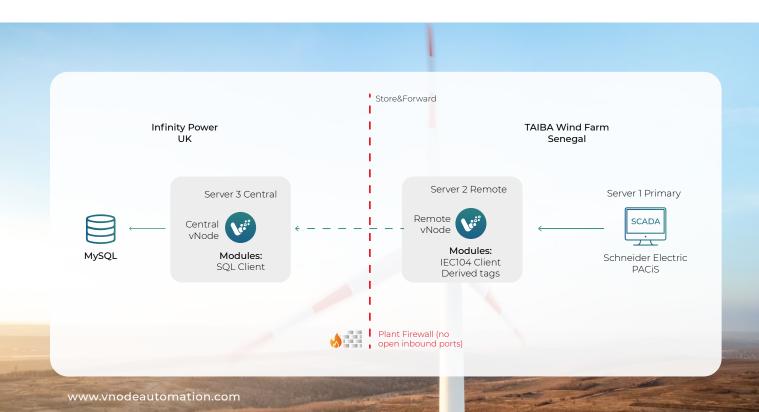
vNode incorporates diverse drivers for data collection from various sources, presenting a multitude of connection options, including the Modbus protocol, OPC DA connection, DLMS, and IEC 60870-5-104 protocol. Following several weeks of rigorous testing, the IEC 60870-5-104 protocol emerged as the chosen option. This decision was based on meticulous evaluation and analysis, considering factors such as:

a) PACiS was already sending data to other applications using IEC 104.

b) IEC 104 allows both pulling (General Interrogation) and spontaneous messages, allowing the communication to be lighter and faster.

c) The use of OPC DA wasn't convenient since a complex DCOM configuration was needed through Windows users from both computers.

# **Project Architecure**





# Operation of vNode

The remote vNode in the substation processes data from the PACIS system, normalizing and adding context before transmitting it to the Central vNode at Infinity Power's offices. The connection between vNode and PACIS is realized by the implementation of the protocol IEC 60870-5-104 where vNode acts as the Master and PACIS acts as the Slave.

3 different data types are being collected from PACis: double points, single points and floating points.

A total amount of 1600 tags are being sent to the Central vNode (on change). This means an average of 185 events per second under normal operation.

This distributed architecture between vNodes ensures secure and efficient communication, using TLS 1.3 for encryption, data compression and enabling bidirectional communication without opening inbound ports on the site firewall.

# Data Centralization

A Central vNode at Infinity Power's offices collects data from all distributed vNode nodes and inserts it into a central MySQL database. This central database serves as the primary repository for information generated by the wind farms, preparing it for subsequent analysis through Nispera's asset performance management software, which offers valuable insights that have a significant impact on multiple crucial departments. The data integration and the AI-powered analytics enable comprehensive reporting and analysis, encompassing asset performance data from all sites in a single view.

	Configuration							
	Property	Value						
O DPText	▲ 🗅 IEC104	< 🗀 Group>						
S FPTime	Description							
© IEC104	4 Tags							
SPSText	A C DP	< C Group>						
SPText	Description							
	▲ Tags							
	TAIBA_225KV_LINE 225KV_225-DJ-L1_CIRCUIT BREAKER POSITION	< S IEC104>						
	Custom properties							
	IOA	4000	4000					
	Type	dp	dp					
	Type	Number	number					
	Format	Default	<pre>&lt; cnull&gt;</pre>					
	Deadband	0.0u	0.0u					
	-Client access	Read Only						
≡ Model	-Persistency mode	None	· 0					
	▶ Details							
	⊳-Simulation							
4 C IEC104	Assigned views							
D DP	▷ Scaling							
DPText	4 Source							
▷ CD FP	Enabled	Yes	true					
FPTime	Module type	Iec104Client	· Iec104CLient					
D SP	Module name	IEC104	JEC104					
D SPText	4 Config							
	Device	C1/D1	C1/D1					
	10A	= {IOA}	4000					
	Data type	= {Type}	✓ dp					
	Variable	Value	· value					
	> History							
	Alarms & Events							
	TAIBA_225KV_LINE 225KV_225-SB-L1_SB1 POSITION	< IEC104>						
	TAIBA_225KV_LINE 225KV_225-SL-L1_SL POSITION	< > IEC104>						
	TAIBA 225KV LINE 225KV 225-ST-L1 ST POSITION	< 0 IEC104>						
	TAIBA_225KV_LINE 225KV_MODE CONTROL PANEL	< > IEC104>						
	TAIRA 225KV TR1 225-DI-TR1 CR POSITION	C IEC104>						



## **Results and Achievements**

The successful implementation of vNode at the Taiba N'Diaye Wind Power Station represents a significant milestone for Infinity Power.

This project has not only improved real-time data transmission connectivity and security but also serves as the first step in a larger data centralization project across all its wind and solar parks.

lavigation	🖈 Tag groups	Tag list							
🛇 Data	4 / A TAIBA	Q Reger filter Sublevels @ \$14 tags							
Real Time	4 IEC104	N	ame 1	Value	I Quality	Link	Timestamp	Туре	Access
Historical	DP	TAIBA_225KV_BUSBAR 225KV_225-T	T-B_225KV BUS VOLTAGE PHASE 0	0	Good	C Local	2024/02/14 11:30:18:167	number	R
-	DPText	TAIBA_225KV_BUSBAR 225KV_225-T	131.11001586914062	Good	C Local	2024/02/14 11:30:18:167	number	R	
Alarms	FP	TAIBA_225KV_BUSBAR 225KV_225-T	0	Good	O Local	2024/02/14 11:30:18:167	number	R	
A- Real Time	FPTime	TAIBA_225KV_LINE 225KV_ION7650	47.78532791137695	Good	O Local	2024/02/14 11:30:18:725	number	R	
	SP	TAIBA_225KV_LINE 225KV_ION7650	56.336181640625	Good	O Local	2024/02/14 11:30:18:725	number	R	
Historical SPText		TAIBA_225KV_LINE 225KV_ION7650_CURRENT PHASE 0		143.44110107421875	Good	O Local	2024/02/14 11:30:18:728	number	R
- 100 000 - 100 000		TAIBA_225KV_LINE 225KV_ION7650	143.6881866455078	Good	O Local	2024/02/14 11:30:18:730	number	R	
System		TAIBA_225KV_LINE 225KV_ION7650	142.4984130859375	Good	O Local	2024/02/14 11:30:18:732	number	R	
Diagnostics		TAIBA_225KV_LINE 225KV_ION7650	EXPORTED ACTIVE POWER	1393791	Good	O Local	2024/02/14 11:30:18:218	number	R
Config		TAIBA_225KV_LINE 225KV_ION7650	EXPORTED REACTIVE POWER	42586.20703125	Good	C Local	2024/02/14 11:30:18:218	number	R
@ Licensing		TAIBA_225KV_LINE 225KV_ION7650	FREQUENCY	50.14203643798828	Good	O Local	2024/02/14 11:30:18:218	number	R
Cocersing		TAIBA_225KV_LINE 225KV_ION7650	4429.21728515625	Good	O Local	2024/02/14 11:30:18:218	number	R	
& User		TAIBA_225KV_LINE 225KV_ION7650_IMPORTED I		1282097	Good	O Local	2024/02/14 11:30:18:218	number	R
		TAIBA_225KV_LINE 225KV_ION7650	84.77777862548828	Good	O Local	2024/02/14 11:30:18:221	number	R	
<b>≙</b> *Logaut		TAIBA_225KV_LINE 225KV_ION7650_REACTIVE POWER		-29.83836555480957	Good	O Local	2024/02/14 11:30:18:725	number	R
		TAIBA_225KV_LINE 225KV_ION7650	227.5844268798828	Good	O Local	2024/02/14 11:30:18:725	number	R	
		TAIBA_225KV_LINE 225KV_ION7650_VOLTAGE PHASE 4+8		227.5631866455078	Good	O Local	2024/02/14 11:30:18:727	number	R
		TAIBA_225KV_LINE 225KV_ION7650	227.3167266845703	Good	O Local	2024/02/14 11:30:18:728	number	R	
		TAIBA_225KV_LINE 225KV_SL7000-1	ACTIVE ENERGY EXPORT	4395	Good	O Local	2024/02/14 11:30:18:167	number	R
		TAIBA_225KV_LINE 225KV_SL7000-1_ACTIVE ENERGY IMPORT		1481499	Good	O Local	2024/02/14 11:30:18:167	number	R
		TAIBA_225KV_LINE 225KV_SL7000-1	45.224998474121094	Good	O Local	2024/02/14 11:30:18:167	number	R	
		TAIBA_225KV_LINE 225KV_SL7000-1	0	Good	O Local	2024/02/14 11:30:18:167	number	8	
		TAIBA_225KV_LINE 225KV_SL7000-1	_CURRENT PHASE A	138	Good	O Local	2024/02/14 11:30:18:167	number	R
		TAIBA_225KV_LINE 225KV_SL7000-1	CURRENT PHASE B	138.60000610351562	Good	O Local	2024/02/14 11:30:18:167	number	R
		TAIBA_225KV_LINE 225KV_SL7000-1	CURRENT PHASE C	137.39999389648438	Good	O Local	2024/02/14 11:30:18:167	number	R
		TAIBA_225KV_LINE 225KV_SL7000-1	FREQUENCY	50.02000045776367	Good	O Local	2024/02/14 11:30:18:167	number	R
		TAIBA_225KV_LINE 225KV_SL7000+1	POWER FACTOR	0.833299994468689	Good	O Local	2024/02/14 11:30:18:167	number	R
		TAIBA_225KV_LINE 225KV_SL7000-1	REACTIVE ENERGY EXPORT	1295933	Good	O Local	2024/02/14 11:30:18:167	number	R
		TAIBA_225KV_LINE 225KV_SL7000+1_REACTIVE ENERGY IMPORT		0	Good	O Local	2024/02/14 11:30:18:167	number	R
		TAIBA_225KV_LINE 225KV_SL7000+1_REACTIVE POWER +		0	Good	O Local	2024/02/14 11:30:18:167	number	R
		TAIBA_225KV_LINE 225KV_SL7000-1	TAIBA_225KV_LINE 225KV_SL7000-1_REACTIVE POWER -		Good	O Local	2024/02/14 11:30:18:167	number	R
		TAIBA_225KV_LINE 225KV_SL7000-1	VOLTAGE PHASE A	130.72500610351562	Good	O Local	2024/02/14 11:30:18:167	number	R
		TAIBA_225KV_LINE 225KV_SL7000-1	VOLTAGE PHASE B	130.9499969482422	Good	O Local	2024/02/14 11:30:18:167	number	R
		4	-		1.1.				
ered by vNode							Logged in as: admin	2024/02/14	11:30:28

"For our first time, we found the vNode solution very interesting in substation data's transmission. With this solution we can save data for more than two years and no data is lost even if the network is offline. It's flexible and quick to implement. With its functionalities, the data management and energy business become more reliable and more affordable."

-Mr. Ibrahima Diallo, Site Manager at Eiffage Senegal.



"By utilizing vNode, the Taiba N'Diaye Wind Power Station has been able to maximize its energy production, improve grid stability, and reduce operational costs. This successful implementation showcases the potential of innovative solutions in the renewable energy sector and sets a positive example for future wind power projects."

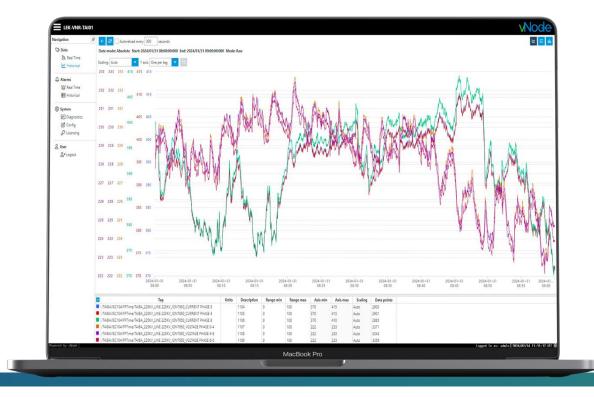
-Mr. Hany William, IT Sites Manager at Infinity Power.

#### **Future Benefits**

Data centralization with vNode will enable Infinity Power to have a comprehensive, real-time view of the operation of all its projects in Africa. This not only enhances operational efficiency but also lays the foundation for informed decision-making and sustainable development through clean energy generation.

### Conclusion

The successful implementation of vNode at the Taiba N'Diaye Wind Power Station highlights Infinity Power's ability to adopt innovative and efficient solutions in renewable energy project management. This case study serves as a testament to Infinity Power's ongoing commitment to excellence in clean energy generation in Africa, using cutting-edge technologies to ensure a sustainable future.





#### Sales Contact:

info@vnodeautomation.com sales@vnodeautomation.com saleseurope@vnodeautomation.com

Vester Business USA 1549 NE 123 St, North Miami, FL, 33161, United States +1 (754) 755-0009

Vester Business Spain Av Cerdanyola 92, 2da Planta Of 27, 08173, Sant Cugat del Valles, Spain (+34) 93 572 10 07

#### Vester Business France

672 Rue du Mas de Verchant, 34967, Montpellier CEDEX 2, France +33 (0)4 13 68 01 06

Vester Business Costa Rica Ofimall 3er Piso, Oficina #57, San Pedro de Montes de Oca, San José, Costa Rica (+506) 2225 2344

