ASIA CLEAN ENERGY FORUM 2025

2–6 June | ADB Headquarters, Manila

ADB

Deep Dive Workshop

Doubling Down to Triple Up: HTLS Conductors for Improved Grid Efficiency and Grid Security

(ADB)

4 June 2025 (Wednesday) • 2:00–3:30 p.m.

ASIA CLEAN ENERGY FORUM 2025

Empowering the Future: Clean Energy Innovations, Regional Cooperation and Integration, and Financing Solutions

2–6 June | ADB Headquarters, Manila

ADB

Vincent Bu

Head of Epsilon Cable - APAC

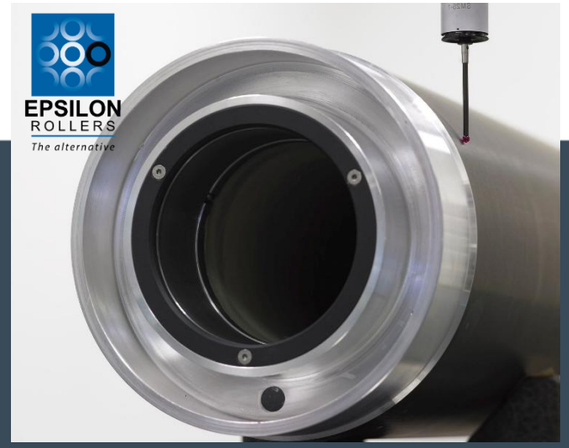
Featured Speaker

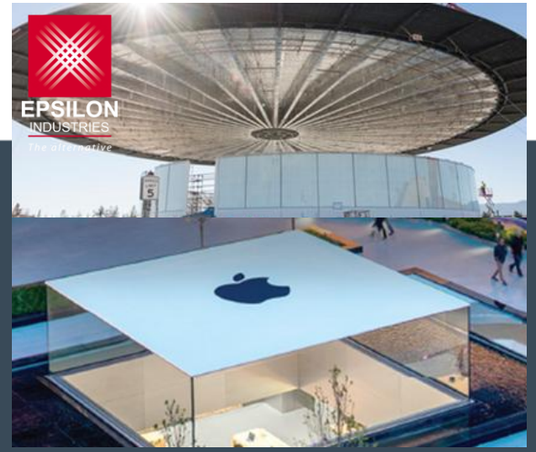
EPSILON COMPOSITE

The alternative

ADB

38 YEARS IN CARBON COMPOSITE





- Based in Gaillan Médoc (France), **since 1987**
- Pioneer in carbon fiber pultrusion | **80% export**
- **10%** of turnover dedicated to R&D | **>100 patents**
- Dedicated branch for OHL : **Epsilon Cable**

EPSILON CABLE

THE CONDUCTOR TECHNOLOGY

COMPOSITION OF THE COMPOSITE CORE :

CARBON FIBERS

- No thermal expansion
- Very high tensile strength
- Stiff
- Lightweight
- Corrosion free

GLASS FIBERS

- Galvanic corrosion protection
- High tensile strength
- Flexible
- Corrosion free

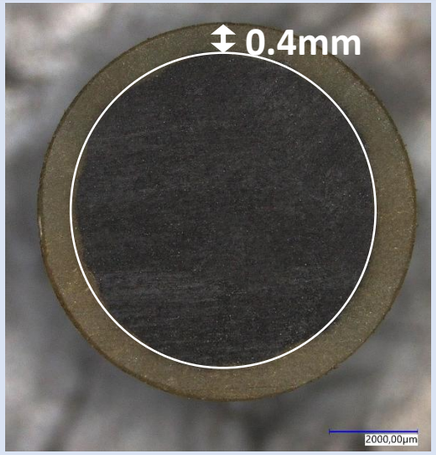
EPOXY MATRIX

- High temperature resistance
- Lightweight
- Corrosion free

COMPOSITE CORE

- Higher ampacity
- Low sag
- Easy installation
- No corrosion

INTRODUCTION OF HVCRC®

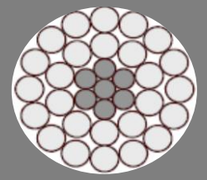
	HVCRC®
Volume fiber ratio	65% Carbon Fiber 35% Glass Fiber
Coefficient of thermal expansion	**1.3 µm/°C**
Stiffness – E Modulus	**123 GPa**
Resistance	**>2 250 MPa**
	

B987/B987M – 20

High Strength Grade
310 ksi (2137 MPa)
355°F [180°C] to 482°F [250°C]
0.015 in. [0.38 mm]
95 % retention of rated tensile strength after 52 weeks of heat exposure
50 times diameter of CFC
16.2 Msi (111.7 GPa)

INTRODUCTION OF HVCRC®

BASIC SPECIFICATIONS :

		ACSR 240/40 (Hawk) 	**HVCRC® 320/40 (Hawk)** 	
Conductor		21.77 mm	21.79 mm	
Aluminum section		242 mm²	**317 mm²**	
Linear mass		978 kg/km	950 kg/km	
DC resistance @ 20°C		0.1199 ohm/km	**0.0884 ohm/km**	✓ **Low losses**
Ampacity		700 amps	**1300 amps**	✓ **High ampacity**
Maximum operating temp		90°C	**180°C**	
Coefficient of thermal expansion	Below thermal knee point	18.4 x 10^{-6}/°C	18.11 x 10^{-6}/°C	
	Above thermal knee point	12 x 10^{-6}/°C	**1.3 x 10^{-6}/°C**	✓ **Low sag**
Tensile strength		87 kN	**108 kN**	✓ **High Tensile**

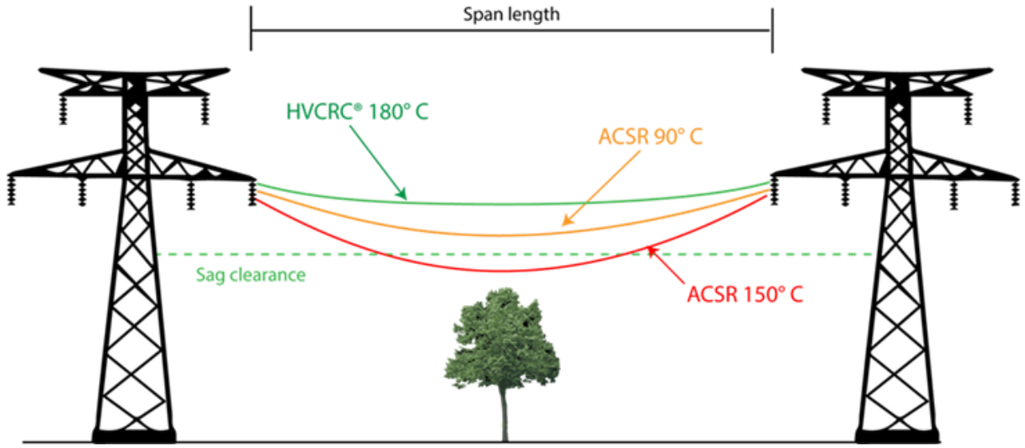
EPSILON CABLE

INTRODUCTION OF HVCRC®

BENEFITS OF HVCRC® :

Low Sag

Line status	Temp	ACSR 240/40	VS	HVCRC® 320/40
ACSR max operating temp	90°C	8.16m (725 Amps*)		**6.82m (830 Amps*)**
HVCRC max operating temp	180°C	/		**7.92m (1280 Amps*)**



High ROI

	ACSR 240/40	VS	HVCRC® 320/40
Ampacity	**50 % load => 350 Amps**		
Losses per year	143,366 kWh/km		**108,598 kWh/km**
Savings per year *(generation cost 0.07$/kWh)*			**2,430 $/km**
Price difference with ACSR			**13,500 $/km**
ROI (Return of Investment)			**6 years**

Low CO2

	ACSR 240/40	VS	HVCRC® 320/40
Savings per year			34,800kWh/km
Savings by year (emission @ 475 gCO2/kWh)			16,500kgCO2/km /year
Savings for 100km long line			**10,000tonsCO2 /year**

4,900 round-trip tickets NY-London!!!

PARTICIPATION TO STANDARDIZATION COMMITTEE

	Committees' Name	Standards' Name	Description of the standard	Status
Fittings	ANSI American National Standards Institute	NEMA/ANSI C119.7	Accessories and fittings for HTLS technologies	**Member of group**
Installation	IEEE	IEEE TF524	Installation of Overhead Transmission Line Conductors	
Conductors Fittings		IEEE TF1283	Guide for Determining the Effects of High-Temperature Operation on Conductors, Connectors, and Accessories	
Composite core	ASTM INTERNATIONAL	ASTM B987M-20	Standard Specification for Carbon Fiber Thermoset Polymer Matrix Composite Core (CFC) for use in Overhead Electrical Conductors	
Conductors		ASTM B01 ASTM B01.07	Shaped Wire, Compact Concentric-Lay-Stranded Aluminum Conductors, Carbon Fiber Composite Core Supported (ACCFCS/TW)	
Installation	cigré	CIGRE WG B2.66	Handling HTLS conductors	
Design		CIGRE WG B2.78	Use of high temperature conductors in new overhead lines	
Conductors Fittings		CIGRE WG B2.94	Inspection post installation, maintenance and end of life of HTLS solutions	**Leader of the group**
Composite core	IEC	TS IEC 62818	Conductors for overhead lines – Fiber reinforced composite core used as supporting member material	

CASE STUDY #1

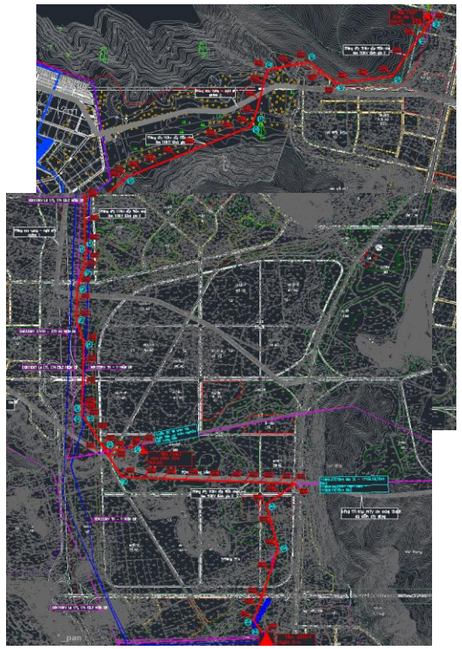
- Uprating of lines for fast developing industrial area.

- Relocation of Chinese manufacturing – geopolitical reason, lower labor cost and diversification
- Rapid industrial development in Thanh Hoa province – Index of Industrial Production (IIP) +15% annually
- Industrial parks like the Nghi Son economic zone and the planned Nghi Son LNG power plant resulted in the requirement of increased capacity on the power lines.
- CFC could help to future proof grids.

PROJECT DETAILS

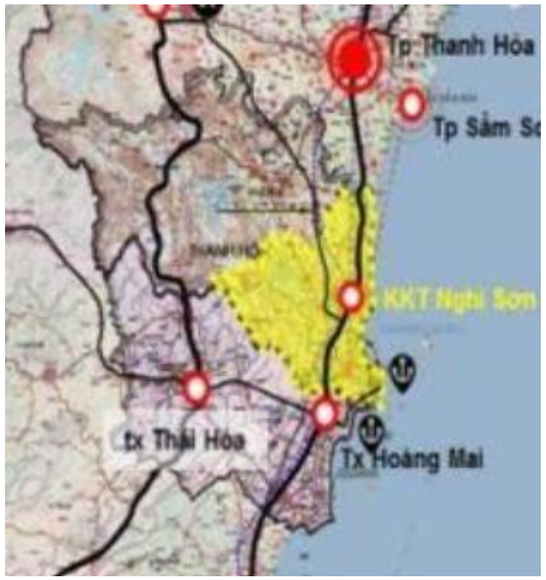
Project Name: Improving transmission capacity of 110kV line from 220kV Nghi Son - Tinh Gia 2 substation, Thanh Hoa province

Country: Vietnam
Utility Name: EVN
Conductor Size: HVCRC Lisbon
Conductor quantity delivered: 104 km
Line length: 17.3 km
Number of circuits: 2
Number of conductors per phase: 1
Voltage: 110kV



HVCRC® Project
110kV – VIETNAM
104 km of conductor with 7,11mm core

Line



Line Info

Conductor : HVCRC® 320-40 (Lisbon
Voltage : 110 kV
Design : 2 circuits 1 conductor/phase
Line length: 17.3 km
Max capacity: 1 300 A (248 MVA)

Involved Parties

EXTRANA® CABLE
Cable Manufacturer

Dervaux Sicame Group
Hardware and fittings

EPC
SÔNG ĐÀ 11

EVNNPC
Utility

EPSILON CABLE

TECHNICAL DATA SHEET	HVCRC® 320 - 40 Epsilon Advanced Conductors			EPSILON CABLE
International size	LISBON			
ASTM Size	HAWK			
Technical designation	ECRC® 320-AL0/40-S1			
				Governing Units: Metric
STRANDING CONFIGURATION				
	No. & Diameter of HVCRC core		1 x 7.11	mm
	Aluminium Layers Construction / height	16 TW x	3.67	mm
	1st layer composition and Øeq	6 x	5.03	mm
	2nd layer composition and Øeq	10 x	5.02	mm
	Lay Direction of outer layer		Right Hand (Z)	

CASE STUDY #2

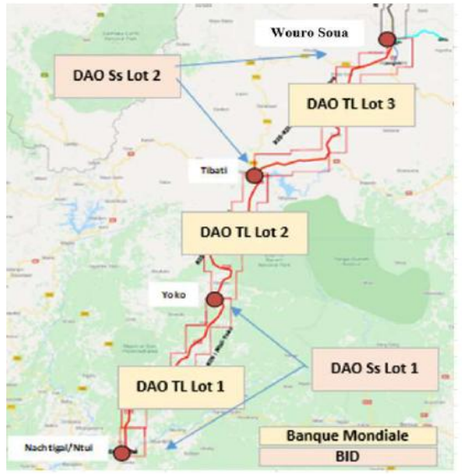
- Grid interconnection

PRECT
PROJET D'INTERCONNEXION DES RÉSEAUX ELECTRIQUES DU CAMEROUN ET DU TCHAD

THE WORLD BANK

- Interconnection line : Cameroon – Chad, later Nigeria funded by the World Bank.
- First phase : Linking RIS (southern grid) to RIN (northern grid)

- Linking Nachtigal Hydroplant (420MW) to the rest of Cameroon and beyond.
- Originally AAAC 570 (300M$) -> 400kv (600M$) -> 225kv (350M$) HVCRC Arlington 750 MW capacity



	Unit	HVCRC Arlington	AAAC 570
Conductor Ø	mm	29.87	31.05
Cross section	mm^2	666.6	570
Weight	kg/km	1647	1615
Breaking load	kN	195.8	185
Modulus of elasticity	GPa	62	54
DC resistance @ 20°C	ohm/km	0.0471	0.0585
CTE		18.41	23
Maximum operating T°	°C	180	75
Maximum current	Amps	1924	1188

EPSILON CABLE

PROJECT DETAILS

Project Name: **PIRECT RIS - RIN**

Location: Cameroon

Utility Name: SONATREL

Conductor Size: HVCRC Arlington

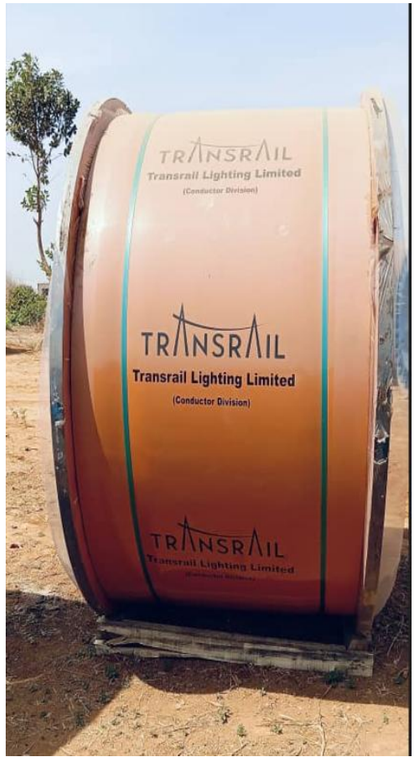
Conductor quantity delivered: 6000km (2300 km)

Line length: 515 km (195km HVCRC)

Number of circuits: 2

Number of conductors per phase: 2

Voltage: 225kV



Involved Parties

TRANSRAIL

EPC and Cable Manufacturer

Dervaux
Sicame Group

Hardware and fittings

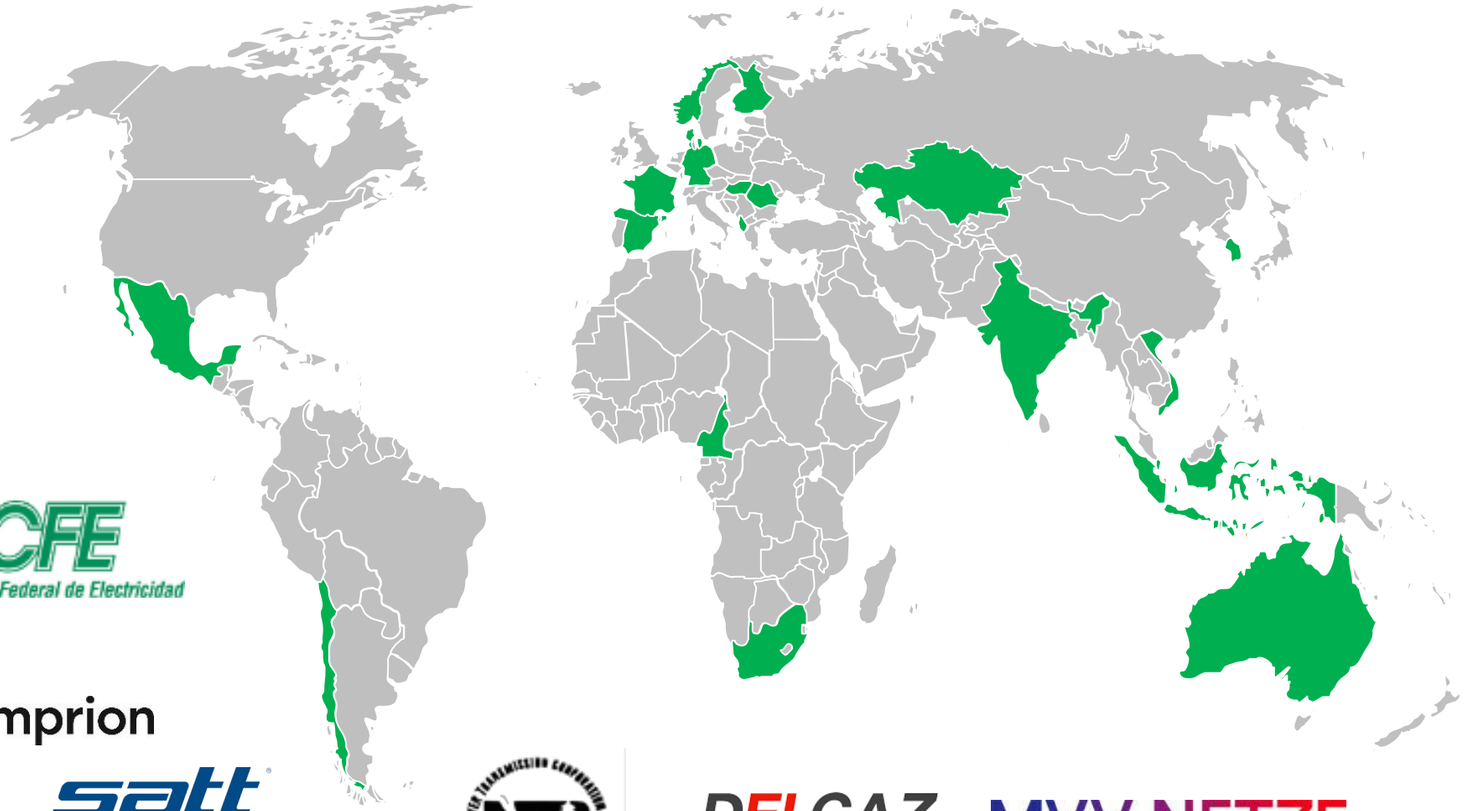
SONATREL

Utility

EPSILON CABLE

EPSILON CABLE PROJECTS : TRACK RECORD

CASE STUDIES



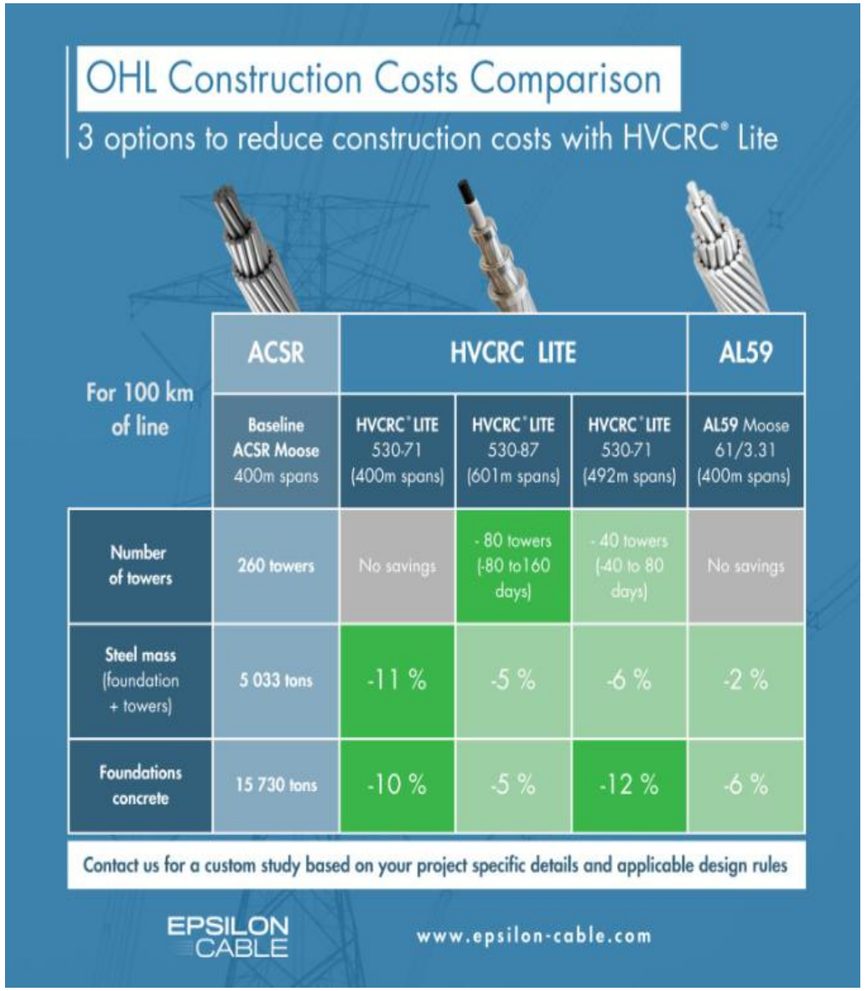
RECENT INNOVATIONS

- **R&D, new products and service :**

- Corecheck® : inspection of glass layer after installation

- HVCRC® Lite : cost efficient conductor for new lines

- Ageing model : to predict core end of life depending on operating conditions and utility design rules



THANK YOU!

For more information & news about HTLS solutions,

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