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

Sudave Kumar Subramaniam

Regional Vice President – Asia Pacific
CTC Global

Featured Speaker

WHAT IS HTLS CONDUCTOR?

- HTLS stands for High-Temperature Low Sag Conductors
- Can operate at high temperatures (150C-250C) compared to conventional ACSR Conductors (up to 100C)
- Low sag reduces line clearance even at high temperature
- Enables higher ampacity 2 to 2.5 times of same size conventional conductors without tower modifications
- Ideal for reconductor existing transmission line to meet growing energy demand
- Uses advanced core materials such as carbon fiber composite core (CFC), INVAR core, to limit thermal expansion
- Examples of HTLS Conductors: ACCC® (Aluminium Conductor Composite Core), GZTACSR (Gap Thermal Alloy Conductor Steel Reinfored), ZTACIR (Thermal Alloy Conductor Invar Reinforced), an ACSS (Aluminium Conductor Steel Supported)

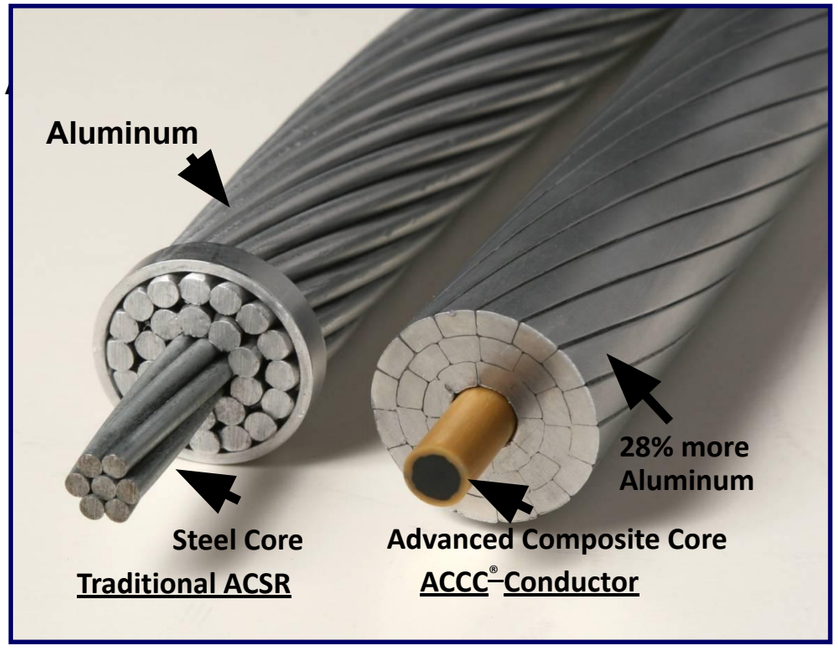
ACCC® Conductor

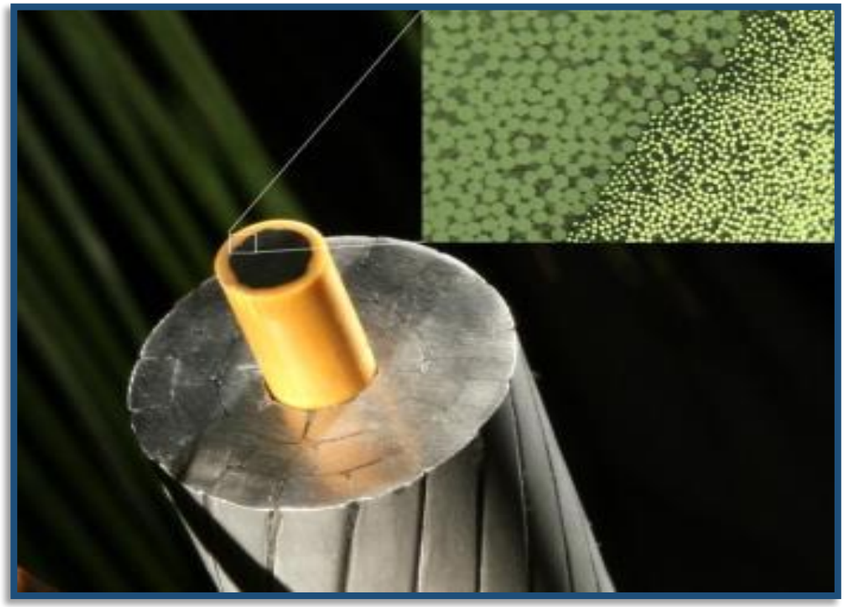
ACSS Conductor

GZTACSR Conductor

ZTACIR Conductor

WHAT IS ACCC® CONDUCTOR?





Definition

- ACCC® (Aluminum Conductor Composite Core) is a registered trademark for a type of HTLS overhead line conductor.
- Composition: Polymer Matrix Core

Property comparison to ACSR

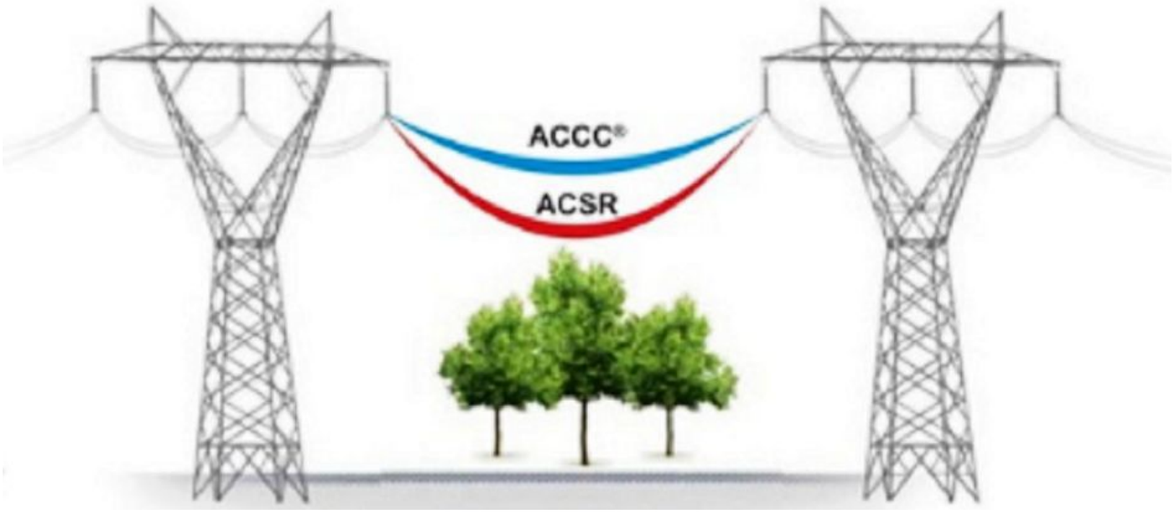
- ACCC hybrid carbon fiber core is 70% lighter and 50% stronger than steel
- Coefficient-of-thermal-expansion about 10 times less than steel reduces sag
- Able to operate at high temperature which offer up to 2x capacity of ACSR
- 25-30% more aluminum, which improves efficiency
- Provides better Capacity and Efficiency.

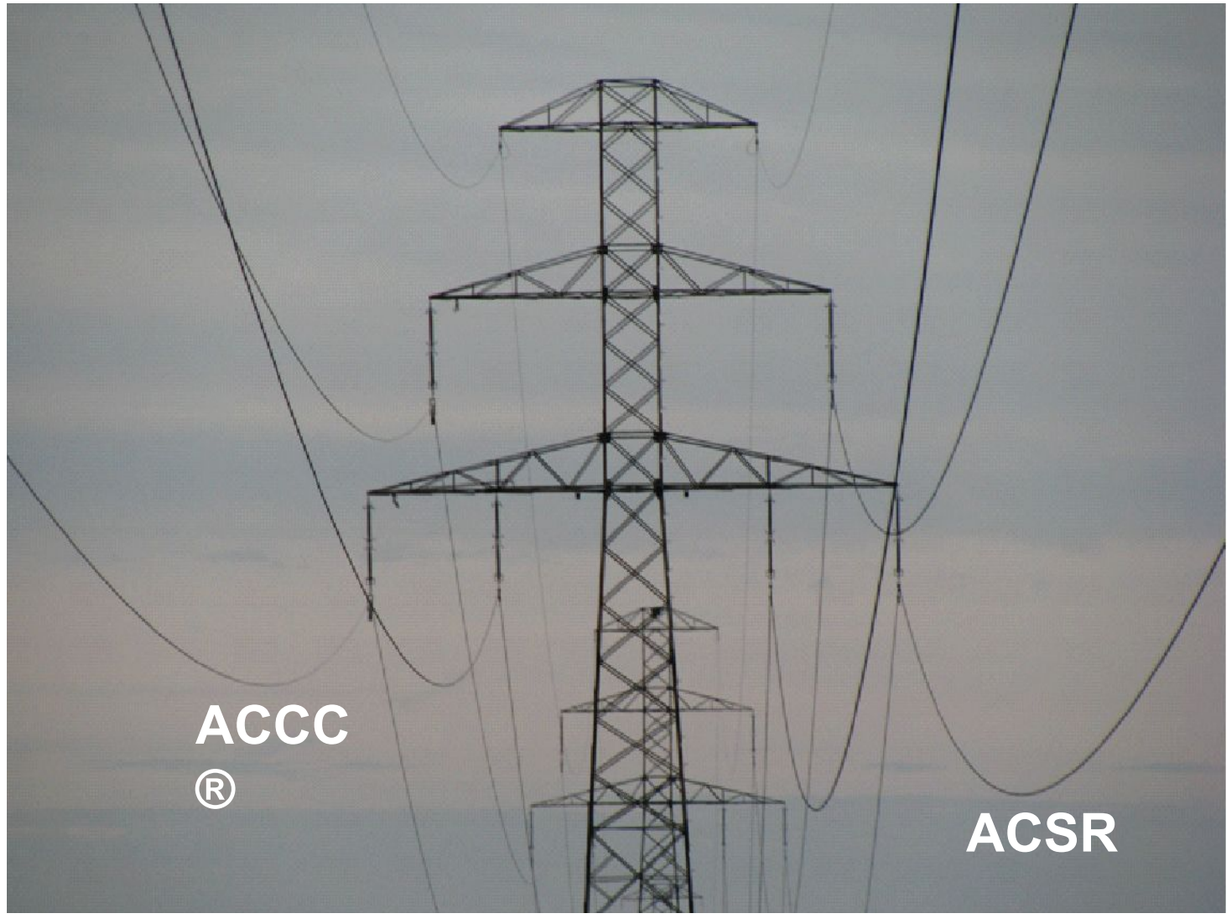
Application

- Reconductor Projects
- New Line Projects
- Long Span Applications

ACCC® CONDUCTOR IN RECONDUCTORING

- Increase capacity up to 2 times versus ACSR
- Reduce line losses by over 30% versus ACSR
- Minimize project cost and time by avoiding tower and foundation improvements
- Extend asset life of towers by maintaining tension on structure
- Reduce system congestion without tower





This installation on one half of a two circuit 220 kV line for the Polish National Grid shows side by side performance comparison of ACCC delivering increased capacity and efficiency at much lower sag compared ACSR.

ACCC® CONDUCTOR RECONDUCTOR PROJECT MALAYSIA

Project Background

Utility:	Tenaga Nasional Berhad
Line configuration:	230kV double circuit line
ACCC® install base:	120 km conductor length
Project objective:	The line is being upgraded to accommodate growing demand for electricity in Singapore.

Project Features	
Project type:	Reconductoring
Conductor type:	ACCC® Lisbon
Project status:	Completed in August 2020

ACCC® Solution

1 Increased line capacity

Increased the line rating from 600 MVA to 1000 MVA, adding 67%+ more capacity

2 No tower modification

Line capacity is upgraded without replacing or modifying any 35 existing steel lattice structures first installed over 25 years ago

3 Lower maximum sag

Reduced maximum sag at rated operating temperature by 12% compared to existing ACSR

> *In 2014, a comprehensive study on the ACCC/TW conductor was undertaken. It was found to be suitable for uprating existing lines. It is also suitable for new lines in urban areas and flat terrain.*

Source : TNB Initiatives Towards Energy Efficient Transmission Lines

ACCC® CONDUCTOR IN NEW LINES APPLICATION

- **Capacity:** Able to support high power loads without additional conductors and reconductoring. Flexibility for future demand growth
- **Efficiency**: Less line losses, reduced generation operation cost and total cost ownership
- **Environment**: Reduced CO2 emission from reduce line loss, & less ROW
- **Number transmission tower**: Reduced number of tower resulting increase distance between towers.
- **Reduction tower size:** Has option to use shorter transmission tower due to low sag properties
- **System Reliability:** Has lower sag and improved system security by reducing sag trip outages

Diagram 1

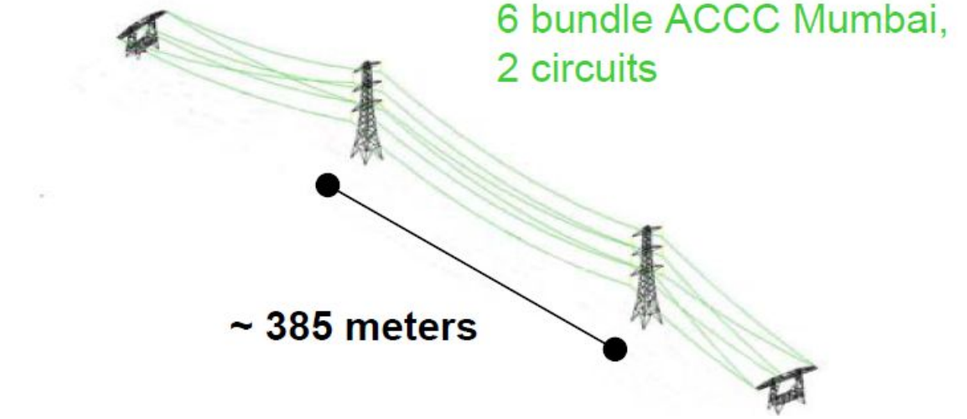
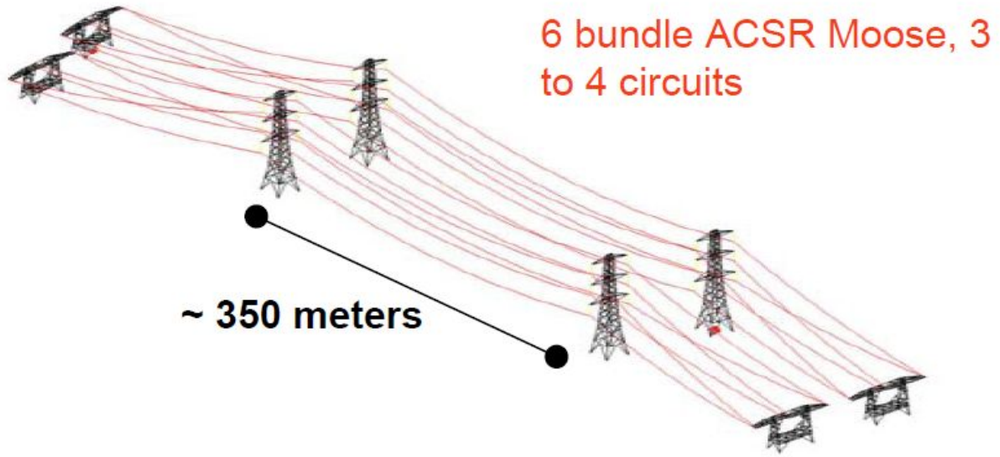


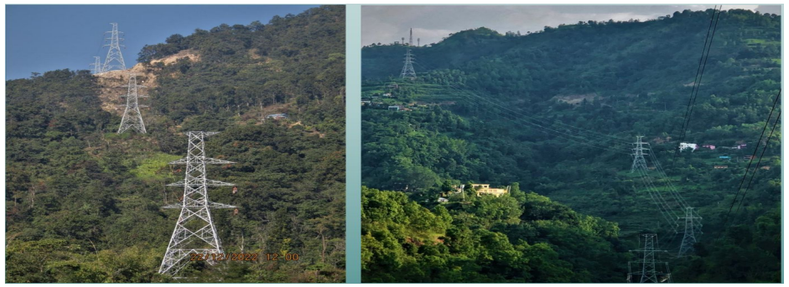
Diagram 2



ACCC® CONDUCTOR NEW LINE PROJECT NEPAL – ADB FUNDED PROJECT

Project Background

Utility:	Nepal Electric Authority (NEA)
Line configuration:	220 kV D/C transmission line (twin bundled)
ACCC® install base:	88 kms line length
Project objective:	Increased the capacity of the Western Nepal's power infrastructure with less



Project Features	
Project type:	New Line
Conductor type:	ACCC® Drake
Project status:	Completed in October 2024

ACCC® Solution

1 Capacity Enhancement

Capacity of line got enhanced from Twin ACSR Moose (2x835) to Twin ACCC Drake (2X 1786)

2 Reduction in RoW width

By adopting 220 kV twin bundled ACCC against 400 kV ACSR, leads to reduction in ROW from 52 meter to 35 meter. Project got implemented shorter period than 400kV line

3 Installation in one of the toughest Terrains

Hilly terrain, Major Valleys Elevation difference

> *"Nepal's hydropower can convert one-third of South Asia from non-renewable to renewable energy consumption, thus reducing approximately 3.5 percent of total greenhouse gas emissions worldwide by 2040"*

Source : The Kathmandu Post : Renewable Energy in Nepal Dt: 30 OCT 2022

ACCC® CONDUCTOR NEW LINE PROJECT BANGLADESH

ADB FUNDED PROJECT

Project Background

Utility:	Power Grid Company of Bangladesh “PGCB”
Line configuration:	400 kV, 230 kV, 132 kV transmission lines
ACCC® install base:	506 Circuit km
Project objective:	Ensure a stable & sufficient power supply to emerging Economic Zones in Barishal and Rajshahi, Bangladesh's primary agricultural production region, to meet increasing energy demand in the southwest and north. Reduce energy loss through efficient conductors.

Project Features	
Project type:	New Line
Conductor type:	ACCC® Hamberg, ACCC® Dhaka, ACCC® Grosbeak
Time to completion:	9 months

ACCC® Solution

1 Increased line capacity

Capacity of electricity supply in Bangladesh increased. Installed approximately 506 Circuit KM.

2 Expansion

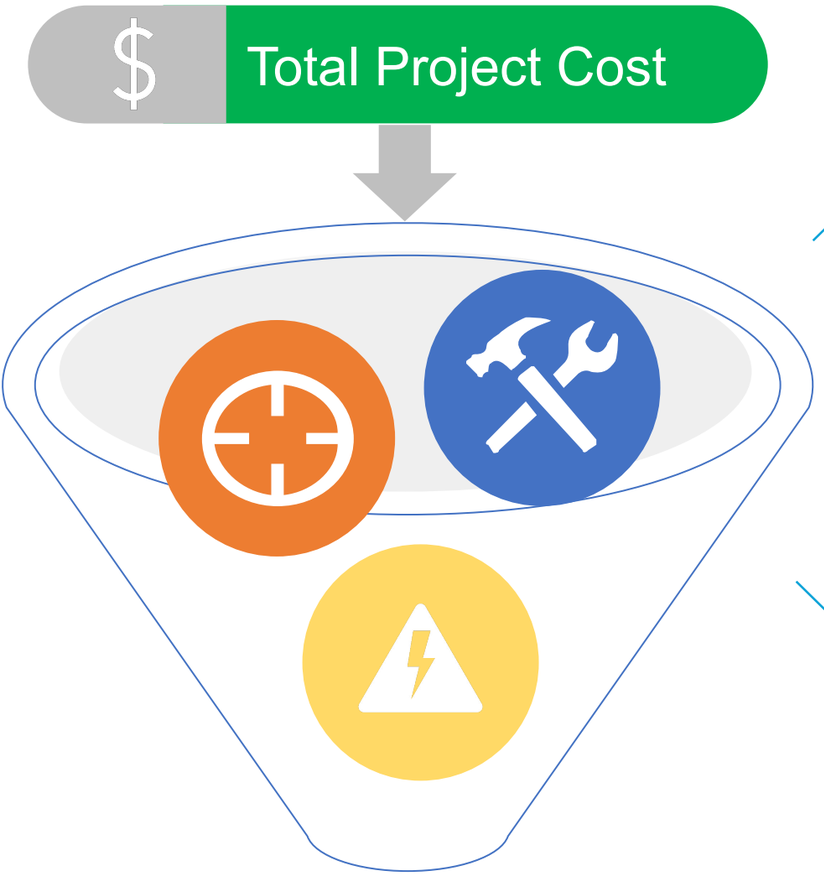
Future proof transmission network in western Bangladesh expanded

3 CO2 Emission Reduction

The use of ACCC® Conductor has led to a reduction of 174,595 tons of CO2 equivalent emissions annually.

> *“The project will improve the operational performance of the power sector and contribute to the Government of Bangladesh’s target to achieve electricity for all.*
>
> Asian Development Bank (ADB)

ACCC® CONDUCTOR LIFE CYCLE COST ANALYSIS



Total Project Cost

CAPEX

Transmission tower, installation cost, conductor cost, and reinvestment (if necessary)

Conductor Cost

Transmission Tower Cost

O & M Cost

The utility usually applies a specific % percentage of CAPEX

0.1 – 0.5% of CAPEX

Cost of Loss

Energy and capacity cost of loss

Energy loss (MWh)

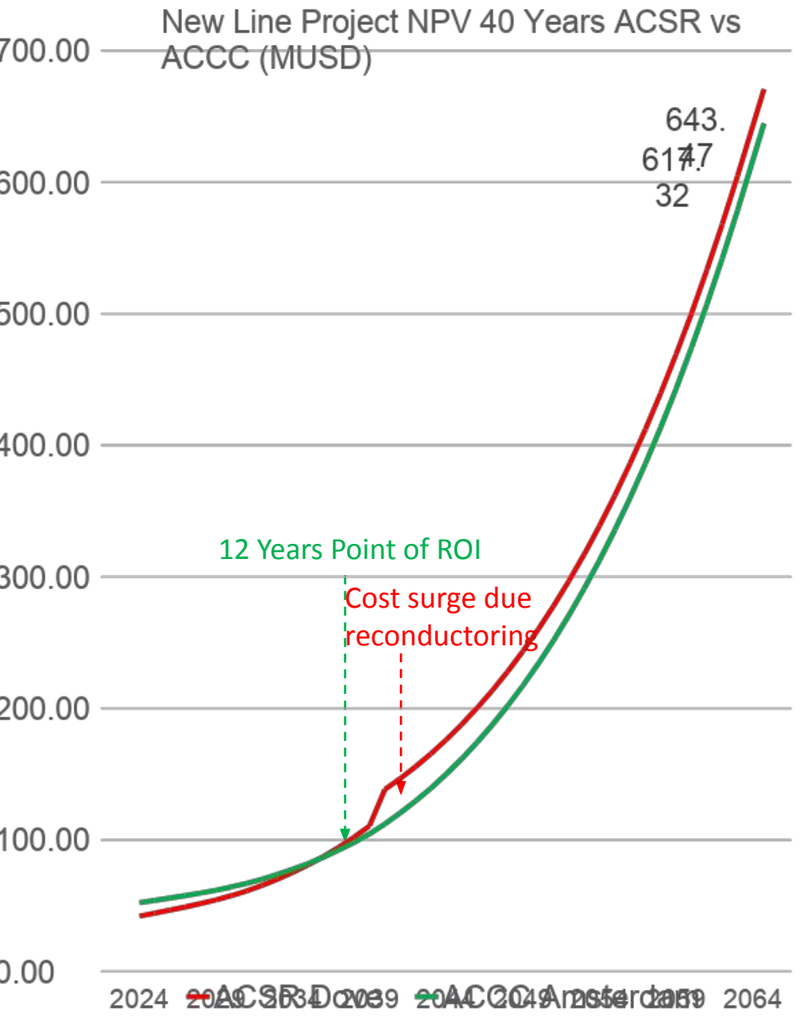
CO2 emission

$/meter vs $/Amps/meter or $/MW/meter

Total project cost

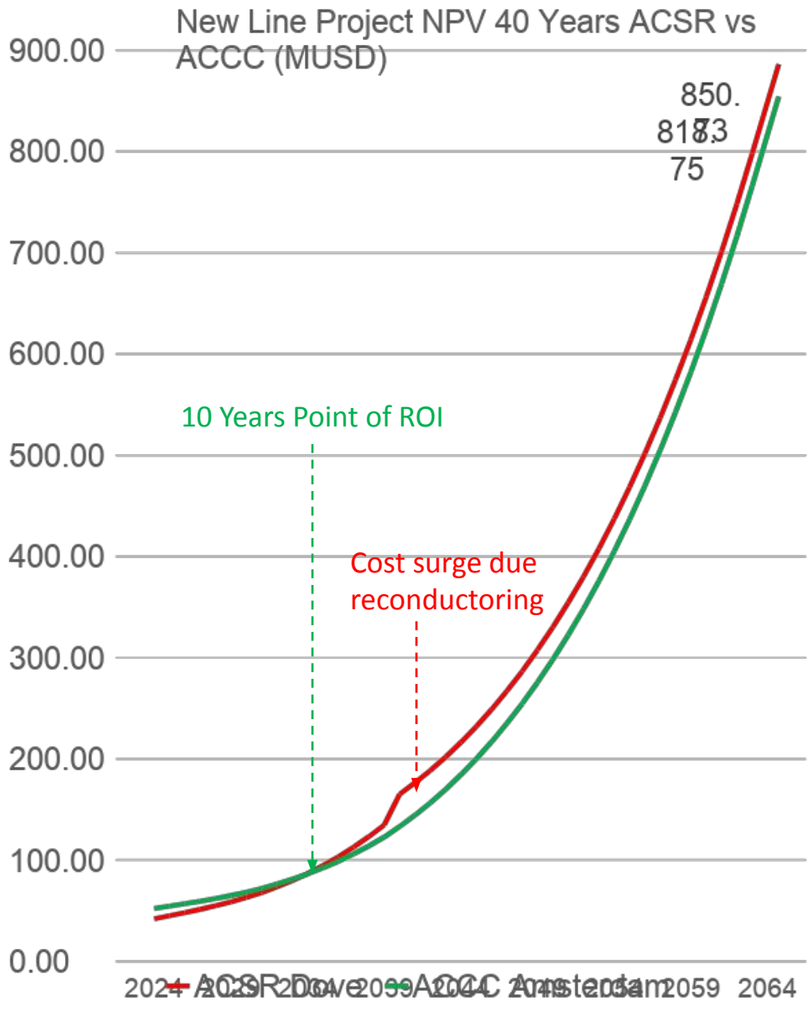
- Yearly expense cost
- 40 years operation
- NPV comparison

ACCC® CONDUCTOR LIFE CYCLE COST ANALYSIS



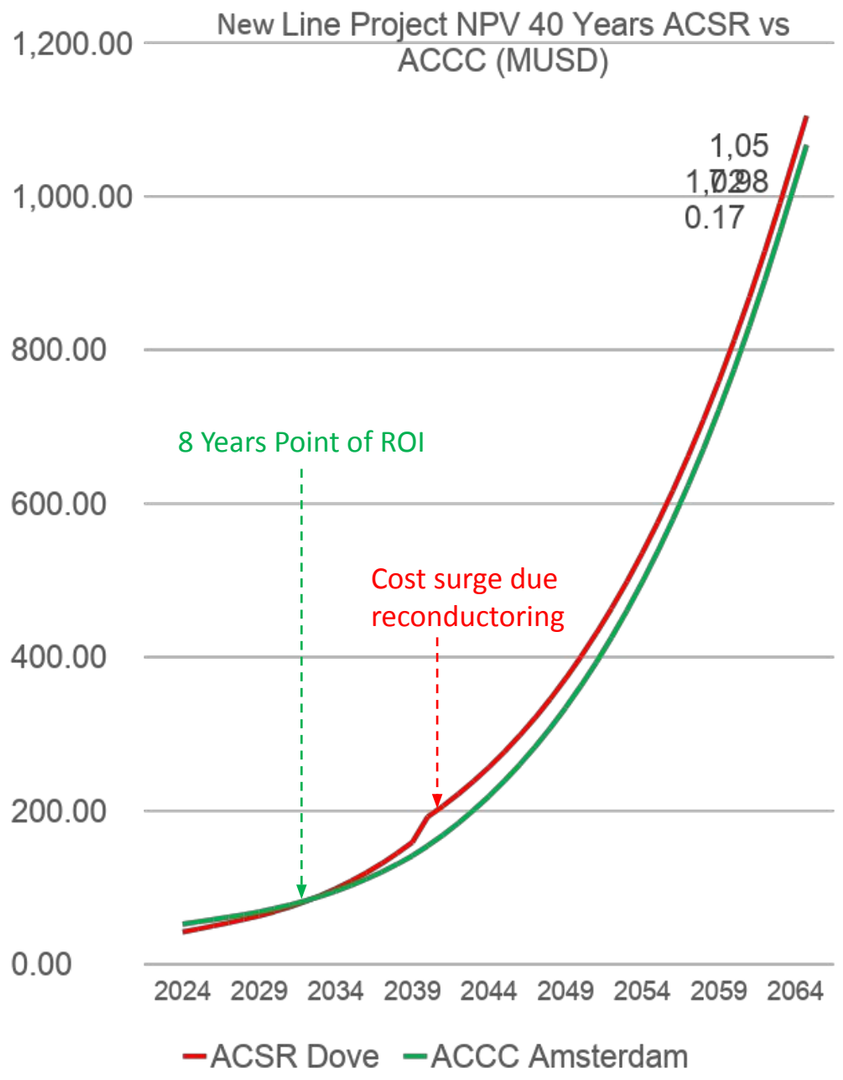
Carbon price @ 50 USD/Ton

Reference: "State and Trends of Carbon Pricing 2023" by World Bank Group



Carbon price @ 100 USD/Ton

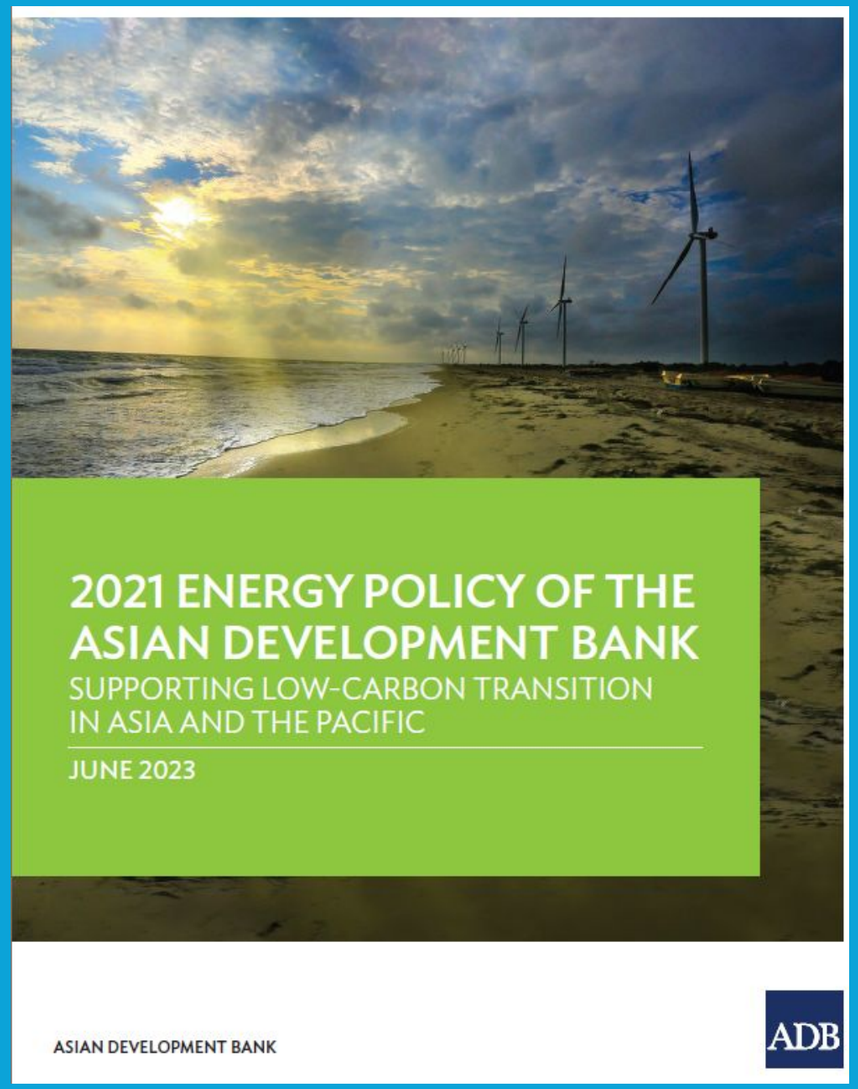
Reference: "State and Trends of Carbon Pricing 2023" by World Bank Group



Carbon price @ 150 USD/Ton

Reference: "State and Trends of Carbon Pricing 2023" by World Bank Group

ADB ENERGY POLICY – EFFICIENCY & RESILIENCE



Source : ***ADB Energy Policy 2021 version June 2023***

ADB 2021 Energy Policy

1. Securing Energy for a Prosperous and Inclusive Asia and the Pacific
   - Sub Pillar : Improving Energy Efficiency across Supply and Consumption Chains
     - **ADB will promote increased efficiency in transmission and distribution networks**

2. Building a Sustainable and Resilient Energy Future
   - Sub Pillar : Increasing the Resilience and Efficiency of Electricity Infrastructure
     - **ADB will support DMCs in building higher resilience in the transmission and distribution subsector**

3. Supporting Institutions, Private Sector Participation, and Good Governance

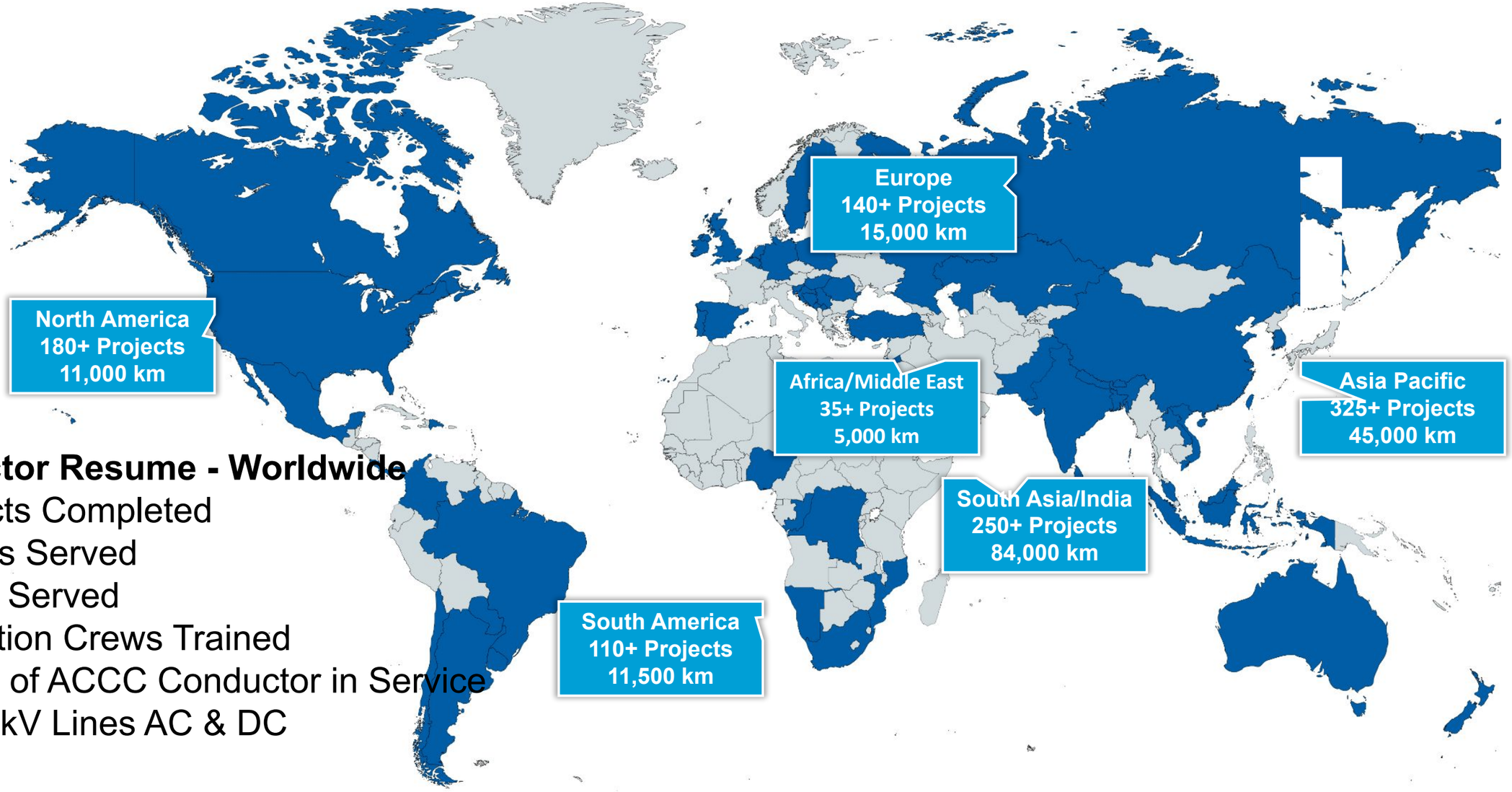
4. Promoting Regional Cooperation and Integration

5. Integrated Cross-Sector Operations to Maximize Development Impact

CTC GLOBAL CORPORATION - LEADERS IN MODERN POWER GRID SO

- Headquarters in Irvine, California
- 5 Core Prod. Facilities (USA, China, Indonesia, Paraguay, and India)
- R&D began in 2003
- Trial Lines Installed in 2004
- Commercially Deployed in 2005
- ISO Certified - Production and Test Labs
- 36 Conductor Manufacturing Partners
- 16 Hardware Manufacturing Partners

CTC GLOBAL ACCC CONDUCTOR INSTALLATION WORLD MAP



ACCC Conductor Resume - Worldwide

- >1350 Projects Completed
- >65 Countries Served
- >300 Utilities Served
- >400 Installation Crews Trained
- >180,000 km of ACCC Conductor in Service
- 11 kV to 800 kV Lines AC & DC

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Thank you