HTLS conductors in NEA Transmission System

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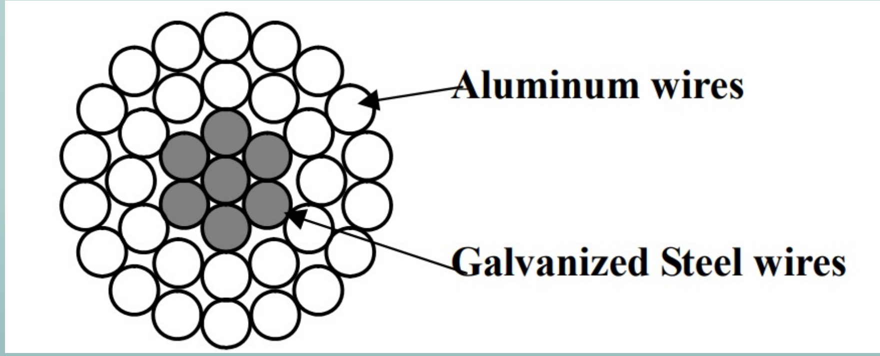
HTLS conductors in NEA Transmission System

Why High Temperature Low Sag Conductor (HTLS)?

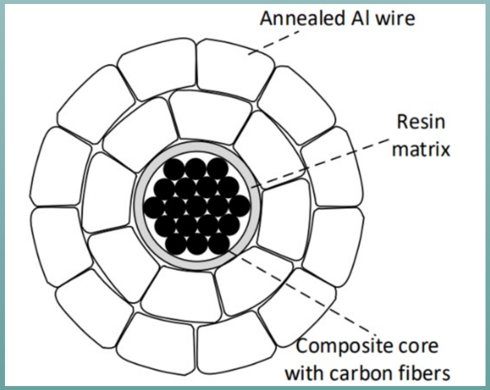
- Rapid Growth of Electricity Demand
- Increasing presence of Electric Vehicles and Electric Cooking is giving pressure to the transmission system
- Rate of construction of new transmission lines are below rate of increase of power generation
- Nowadays it is difficult to construct new transmission lines due public, social, economic and environmental constraint
- No new right of way available /Occupied by existing lines
- Time for construction of new line is far more than the tolerable limit of utility

HTLS conductors in NEA Transmission System

Normal ACSR Conductor

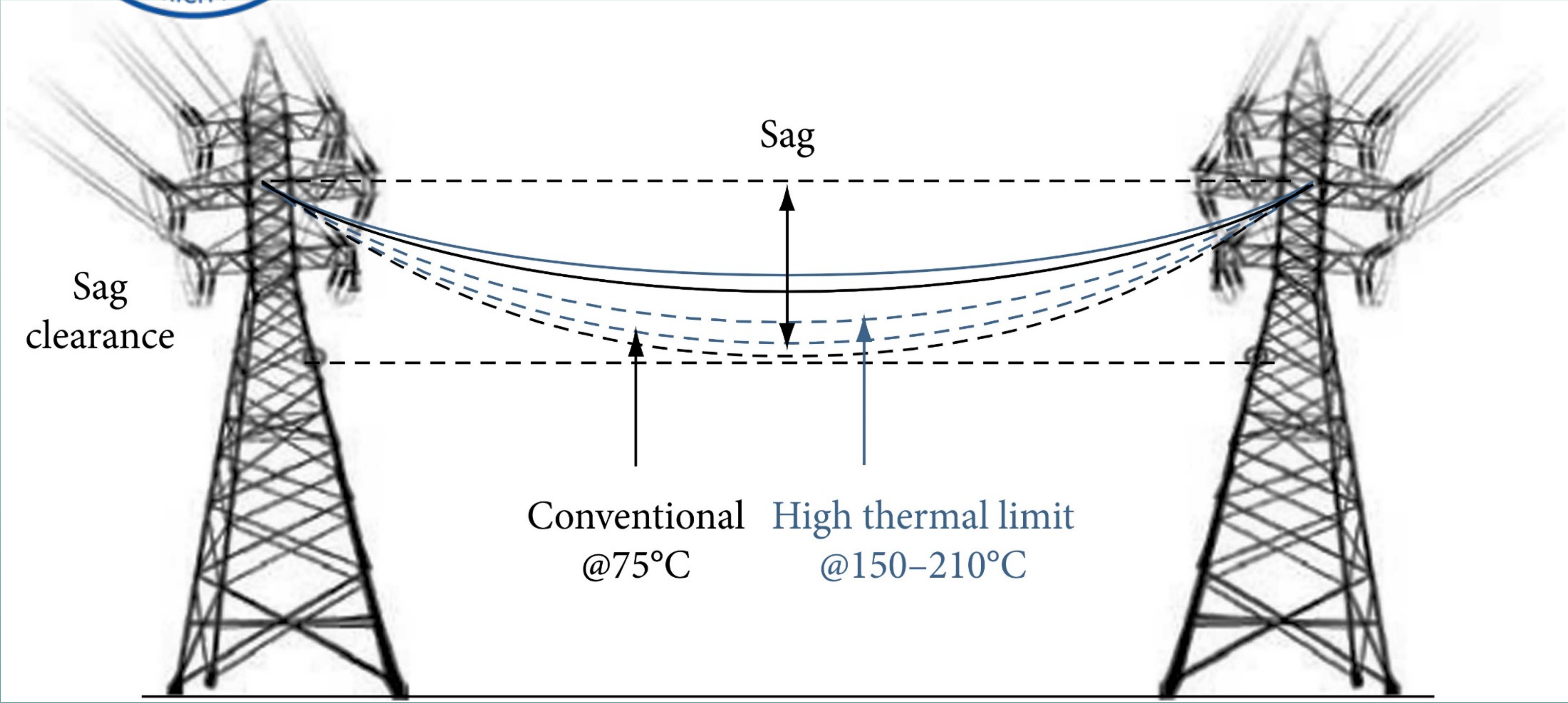


ACCR



ACCC

HTLS conductors in NEA Transmission System



HTLS conductors in NEA Transmission System

Use of HTLS conductors in NEA

- Old Transmission Lines – Existing Transmission lines are required to be upgraded to increase the current transmission capacity
- New Transmission Lines - Design the new transmission lines with HTLS conductor . However more design options and flexibility are available.

HTLS conductors in NEA Transmission System

Nepal Power Generation & Transmission Scenario

- Power Generation–
  - Installed Hydropower- 2750MW
  - Under Construction – 5000MW
  - Potential – 43000MW
  - Waiting for PPA – 10000MW

HTLS conductors in NEA Transmission System

Nepal Power Generation & Transmission Scenario

- Power Generation–
  - Installed Generation- 2750MW(including 70MW Solar)
  - Under Construction – 7000MW
  - Potential – 43000MW
  - Waiting for PPA – 10000MW

HTLS conductors in NEA Transmission System

Nepal Power Generation & Transmission Scenario

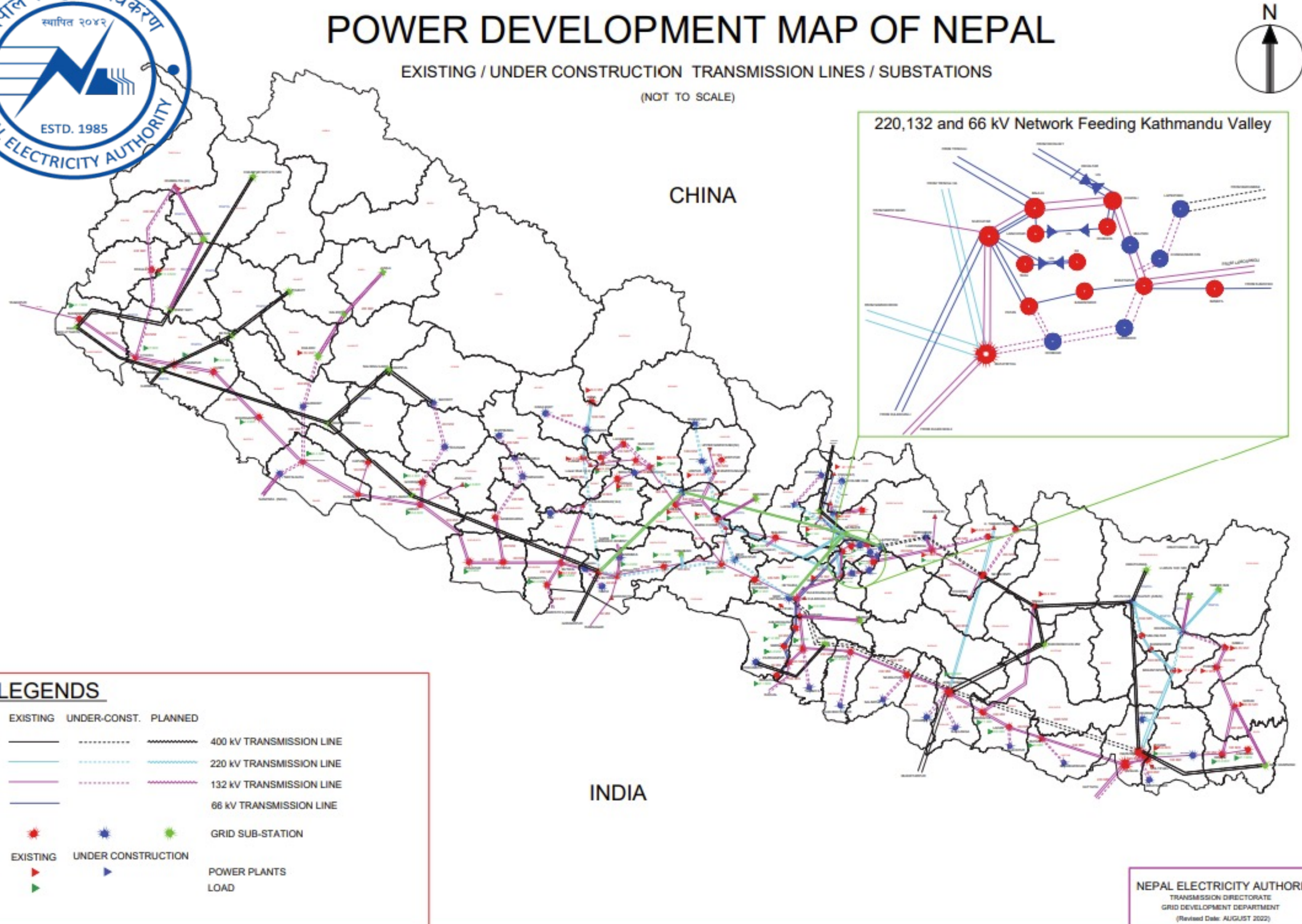
- Power Transmission Existing–
  - 400kV TL – 78km (circuit km)
  - 220kV TL – 741 km (circuit km)
  - 132kV TL – 3950 km (circuit km)
  - 66kV TL – 514 km (circuit km)
- New Transmission Lines -
  - Upgrading of older transmission lines and build new transmission lines to address the industrial residential consumer
  - New Lines for evacuation of under construction hydro-power plants (7000MW)
  - Future transmission lines for remaining power plants (10000MW)
  - Cross-Border transmission lines

नेपाल विद्युत प्राधिकरण
स्थापित २०४२
ESTD. 1985
NEPAL ELECTRICITY AUTHORITY

POWER DEVELOPMENT MAP OF NEPAL

EXISTING / UNDER CONSTRUCTION TRANSMISSION LINES / SUBSTATIONS

(NOT TO SCALE)



NEPAL ELECTRICITY AUTHORITY
TRANSMISSION DIRECTORATE
GRID DEVELOPMENT DEPARTMENT
(Revised Date: AUGUST 2022)

HTLS conductor in NEA Transmission System

Different types of HTLS conductors used in Nepal

- ACCC-Aluminum Conductor Composite Core
- ACCR-Aluminum Conductor Composite Reinforced (Aluminum matrix core)
- ACIR-Invar Core Conductors (Invar Alloy core 64% steel and 36% nickel)

HTLS conductors in NEA Transmission System

Upgradation of Existing ACSR Conductor using HTLS Conductor in Nepal

S.N.	Transmission Line Section	Length (km)	Voltage Level (kV)	Type of Circuit (SC/DC)	Old			New HTLS			Status
					Conductor	Ampacity	MW loading	Conductor	Ampacity	MW loading	
1	Bhaktapur Baneshwor	8.8	66	SC	LGJ 120 and WOLF	300	35	ACCC-Silvasa	600	70	Completed and Under Operation (NEA Internal Funding)
2	Baneshwor Patan	3.7	66	SC	WOLF and LGJ 120	300	35	ACCC-Silvasa	600	70	
3	Chapali Chabahil	5	66	DC	DOG	2x300	2x35	ACCC-Silvasa	600	2x70	
4	Patan Suichatar	6.4	66	DC	WOLF	2x400	2x46	ACCC-Copenhegan	2x780	2x89	
5	Birgunj Parwanipur Simara	20	66	DC	WOLF	2x400	2x46	INVAR	2x850	2x97	
6	Kushaha Kataiya	15	132	SC	BEAR/PANTHER	482	110	3M (ACCR)	900	205	
7	New Khimti Lamosanghu	45	132	SC	BEAR	600	125	ACCC-Cordoba	1200	250	Under Construction (50% Progress)
8	Hetauda Pathlaiya	36	132	DC	BEAR	600	2x125	ACCC-Cordoba	1200	2x250	Under Construction (ADB Funding)
9	Pathalaiya Dhalkebar	102	132	DC	BEAR	600	2x125	ACCC-Cordoba	1200	2x250	
10	Kushaha -Duhabi	28	132	DC	BEAR	600	2x125	ACCC-Cordoba	1200	2x250	
11	Suichatar Matatirtha	5	132	DC	BEAR	600	2x125	ACCC-Cordoba	1200	2x250	
12	Suichatar Teku	4.5	132	DC	BEAR	600	2x125	ACCC-Cordoba	1200	2x250	
13	Suichatar Balaju	4	132	SC	DUCK	650	125	ACCC-Amsterdam	1200	250	
17	Pathlaiya Parwanipur	17	132	DC	BEAR	600	2x125	BEAR Equivalent HTLS Conductor	1200	250	Bid Submission Phase (ADB Funding)

HTLS conductors in NEA Transmission System

Results and Achievements

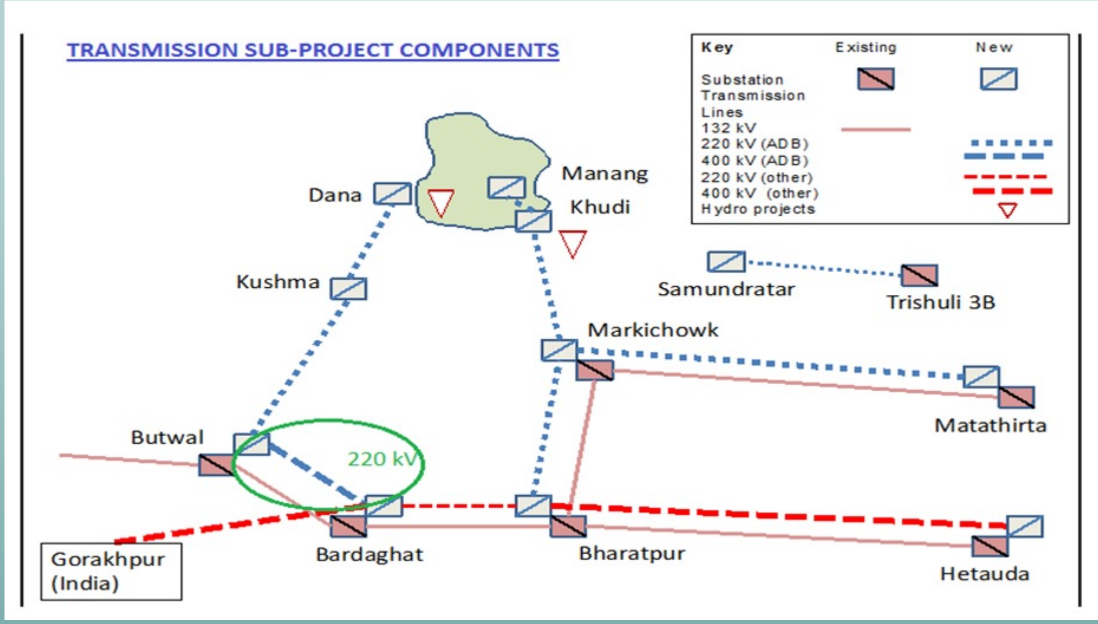
- Transmission capacity of the selected lines nearly doubled
- Implemented within 1.5 to 2 years
- No Right of Way (RoW) faced during implementation
- IEE and other project studies for new transmission line not required.
- No trees are required to cut
- No extra social and environmental safeguards required during implementation

HTLS conductors in NEA Transmission System

HTLS in new Transmission Lines

- Kushma-New Butwal 220kV TL Under Kaligandaki corridor TL Project funded by Asian Development Bank(ADB)

- Khudi-Udipur-Bharatpur 220kV TL Under Marsyangdi corridor TL Project funded by European Investment Bank(EIB)



HTLS conductors in NEA Transmission System

Use of HTLS conductors in new transmission lines in Nepal- selected lines

- Enhance current carrying capacity at lesser voltage level
- Reduction in overall capital expenditure
- Shorter project duration
- Reduction in overall operation expenditure

HTLS conductors in NEA Transmission System

220kV Vs. 400kV Transmission system

New Transmission lines Using HTLS Conductor in Nepal											
S.N.	Transmission Line Section	Length (km)	Voltage Level (kV)	Type of Circuit (SC/DC)	Design Standard for 400kV			New HTLS for 220kV			Status
					Conductor	Ampacity	MW loading	Conductor	Ampacity	MW loading	
1	Kushma New Butwal (Kaligandaki Corridor)	88	220	DC	Twin Moose	2x835	2x580	Twin ACCC Drake	2x1786	2x680	In the completion phase
2	Khudi-Udipur-Bharatpur (Marshyadi Corridor)	67	220	DC	Twin Moose	2x835	2x580	Twin ACCC Drake	2X1786	2x680	70% works completed

HTLS conductors in NEA Transmission System

220kV Vs. 400kV Transmission system

New Transmission lines Using HTLS Conductor in Nepal

S.N.	Transmission Line Section	Length (km)	Voltage Level (kV)	Type of Circuit (SC/DC)	Design Standard for 400kV				New HTLS for 220kV			
					Line cost (MUSD)	ROW cost (MUSD)	Total (MUSD)	Cost /km (USD)	Line cost (MUSD)	ROW cost (MUSD)	Total (MUSD)	Cost /km (USD)
1	Kushma New Butwal (Kaligandaki Corridor)	88	220	DC	44	8.76	52.76	600,000.00	33.78	5.84	39.62	450,000.00
2	Udipur-Bharatpur (Marshyadi Corridor)	67	220	DC	33.5	15.49	48.99	731,000.00	24.48	10.33	34.81	519,000.00

HTLS conductors in NEA Transmission System

400kV Transmission system

Khimti-Barhabise-Lapsiphedi 400kV Line (Quad Moose)

New Transmission lines Using HTLS Conductor in Nepal

S.N.	Transmission Line Section	Length (km)	Voltage Level (kV)	Type of Circuit (SC/DC)	400kV Quad Moose TL			
					Line cost (MUSD)	ROW cost (MUSD)	Total (MUSD)	Cost /km (USD)
1	Khimti-Barhabise-Kathmandu 400kV Line	88	400	DC	50	12.15	62.15	706,000.00

HTLS conductors in NEA Transmission System

Results and Achievements

- Right of Way costs are growing recently due to land cot, social and environmental safeguard. These are minimized by constructing 220kV lines instead of 400kV lines for transferring same amount of power
- Implemented short period than 400kV lines
- Higher the voltage level- higher right of way and increased social and environmental problems
- Less trees are cut than 400kV transmission line

HTLS conductors in NEA Transmission System

HTLS conductors in NEA Transmission System