



NEXANS WEBINAR

Emerging Trends for Utility Cables

March 4, 2021

By: Randy Szilagyi, Applications Engineering Manager



Nexans
ELECTRIFY THE FUTURE

ATTENTION

AUDIENCE PARTICIPATION

- **Questions can be asked at any time using the chat function on the webinar screen**
- **Any unanswered questions will be followed up through email**
- **This presentation, a recording of the webinar and a brief survey will be emailed to all registrants**

PRESENTER

Randy Szilagyi



Applications Engineering Manager, Nexans Canada

- Completed 3 yr. term as Energy Division Vice President of the Insulated Cable Engineers Association (ICEA)
- Continue to serve as Chairman of ICEA standards for Cable Ampacities and Hot Creep test standard
- Past member of CSA standards committees on Bare Overhead, LV and MV Overhead and Underground products
- ISO 9001 Lead auditor

A worldwide leading expert in advanced cabling and connectivity solutions

Sales in 2019 of 6.5 billion Euros ⁽¹⁾
Listed on Euronext Paris, Compartment A

13%⁽²⁾
High Voltage

23%
North America

38%
Europe

12%
Asia, Pacific

7%
South America

7%
Middle East,
Russia, Africa

- Serving customers on all continents
- Industrial footprint in 34 countries and commercial activities worldwide
- 26,000 local experts

1. Sales at constant metal prices, 2019 data restated with change in copper standard price in force since January 2020
2. Global Business Group
3. % sales by Geography based on sales at constant metal prices new standard, excluding Harness

Nexans is a global leader with a long legacy in Canada



Weyburn, SK

Fergus, ON

Montreal, QC



1911

Started with Canada Wire in Toronto, ON

3 Plants

750+ Products

Residential, Commercial, Industrial & Utility





Industry Education

Our Previous Webinars

- **Key 2021 Electrical Code Changes Impacting Wire and Cable** – click [here](#) to watch it
- **15 kV Medium Voltage Armoured Cables** – click [here](#) to watch it
- **Connected Drums - Nexans Canada's Reel Tracking Solution** – click [here](#) to watch it
- **DriveRx® VFD Cable 2.0** – click [here](#) to watch it
- **CORFLEX®** – click [here](#) to watch it
- **2019 Nexans in Canada** – click [here](#) to watch it
- **2021 Canadian Electrical Code Changes** – click [here](#) to watch it
- **Prior VFD webinar** – click [here](#) to watch it

Nexans Canada – A team driven by service excellence

Engineering Support:

- **Full technical support for products manufactured**
- **Electrical and physical cable properties calculations (i.e. impedances, dimensions)**
- **Custom engineered solutions to optimize a project from conception to energization**
- **Conductor ampacity and temperature calculations**
- **Post installation product support**
- **Overhead line calculations, including conductor ampacity, temperature, impedance, as well as sag and tension**

Unique Service and Solutions:

- **Connected Reels Tracking Solution**
- **Customized Recycling and Scrap Management Solution**



AGENDA

- Nexans Utility Wire & Cable Products and Unique Service & Solutions
- Old vs. new Specifications: How to find the right specifications?
- Nexans Innovation
- Nexans Global Latest Technologies
- Summary
- Q&A




Old vs. new Specifications: How to find the right specifications?

EVOLUTION OF UTILITY SPECIFICATIONS

CEA Purchasing Specifications (1990's)	CSA (Today)
WCWG-01 - XLPE Primary Cable up to #4/0 AWG	CSA C68.5
WCWG-02 - XLPE Primary Feeder Cable	CSA C68.5
WCWG-03 - Bare Overhead Aluminum Conductors	CSA C49.8
WCWG-04 - Underground Aluminum Secondary Conductors	CSA C68.7
WCWG-05 - Overhead Secondary Conductor	CSA C68.8
WCWG-06 - Covered Overhead Line wire	CSA C68.9

Current CSA Overhead Standards



C 49.2	Compact Aluminum Conductors Steel Reinforced (ACSR)	2010
C 49.3	Aluminum Alloy 1350 Round Wire, All Tempers, for Electrical Purposes	2010
C 49.5	Compact Round Concentric Lay Aluminum Stranded Conductors (Compact ASC)	2010
C 49.8 	Bare Overhead Aluminum Conductors for Distribution Applications	2009
C 68.8 	Overhead Aluminum Secondary and Service-entrance cables and Conductors for Electrical Distribution Utilities	2011
C 68.9 	Covered Overhead Distribution Line Wire	2009
C 22.2 129	Neutral Supported Cables	2010

Current CSA Overhead Standards



Harmonized - IEC Standards

C 60888	Zinc-Coated Steel Wires for Stranded Conductors	2003
C 60889	Hard-Drawn Aluminum Wire for Overhead Line Conductors	2003
C 61089	Round Wire Concentric Lay, Overhead Electrical Conductors	2011
C 60104	Aluminum-Mg-Si wire (6101) for Overhead Line Conductors	2003

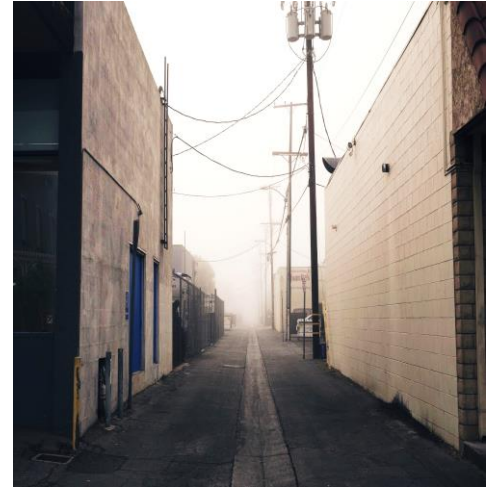
C49.8 (2009) – Bare Overhead Aluminum Conductors for Distribution Utilities

- Covers stranded constructions: ASC, AASC, ACSR and Compact ACSR Haddock
- Only includes size range #2-556
- All tables, dimensions and units converted from Imperial to Metric
- Added IEC terminology for conductor descriptions
- Added sections for suggested packaging, marking and ordering info



C68.8 (2011) – Overhead Aluminum Secondary and Service-entrance Cables and Conductors for Electrical Distribution Utilities

- Covers one, two, or three insulated conductors cabled around a bare neutral for up to 600 V overhead service entrance applications
- Modelled after C22.2 No. 129
- Added Utility requirements from CEA WCWG-05
- Restricted sizes to only those commonly used by Distribution Utilities #6 – 266.8 kcmil






C68.9 (2009) – Covered Overhead Line wire

- A covered conductor used in overhead distribution lines that carries no voltage rating
- Incorporated Utility requirements from CEA WCWG-06
- Includes conductor types ACSR, ASC, AASC, MHBC and compact ACSR



Current CSA Underground Standards



C 22.2 38	Thermoset-Insulated Wires and Cables	2010
C 22.2 52	Underground Service Entrance Cables	2009
C 22.2 75	Thermoplastic-Insulated Wires and Cables	2008
C 68.3	Shielded and Concentric Neutral Power Cables Rated 5-46 kV	1997
C 68.5 	Shielded and Concentric Neutral Power Cables Rated 15-46 kV	2013
C 68.7 	Underground Secondary and Service-entrance cables for Electrical Distribution Utilities	2011
C 68.10 	Shielded Power Cable for Commercial & Industrial Applications 5-46 kV	2014

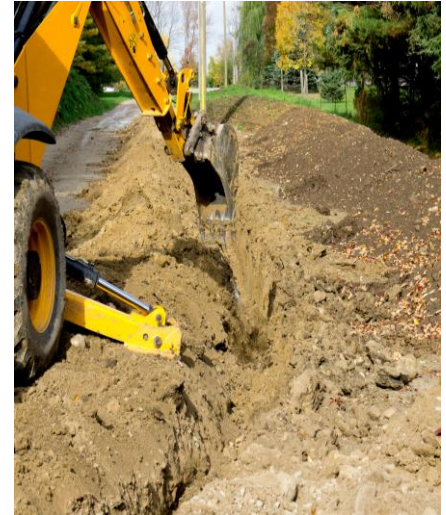
C68.5 (2013) – Primary Shielded and Concentric Neutral Cable for Distribution Utilities

- Replaces C68.3 (1997)
- 15-46 kV cables single or 3 conductors twisted; different metallic shielding types
- Harmonized Medium Voltage Standard:
 - **CSA C68.5 → ICEA S-94-649 → AEIC CS8**
- Other Standards of interest:
 - **AEIC CG5** – Underground Power Cable Pulling Guide
 - **ICEA S-113-684** – Performance Based Standard for Electric Utility Extruded Dielectric Power Cables Rated 5 thru 46 kV



C68.7 (2011) – Underground Secondary and Service-entrance Cable for Distribution Utilities

- 600 V cables either direct buried or in conduit systems
- Modelled after C22.2 No. 52 - Service Entrance Cables
- Added Utility requirements from CEA WCWG-04
- Restricted sizes to only those commonly used by Dist. Utilities



Nexans Innovation



Medium Voltage Cable with Patented Water Blocking System

- Has Dow ENDURANCE™ and Water Swellable Tapes and Yarns
- Water swellable yarns and tapes replace a viscous bitumen based material to fill the void spaces in the interstices of the conductor



Old Water Blocking
Technology – Bitumen











New Water Blocking System –
Water Swellable Yarns & Tapes



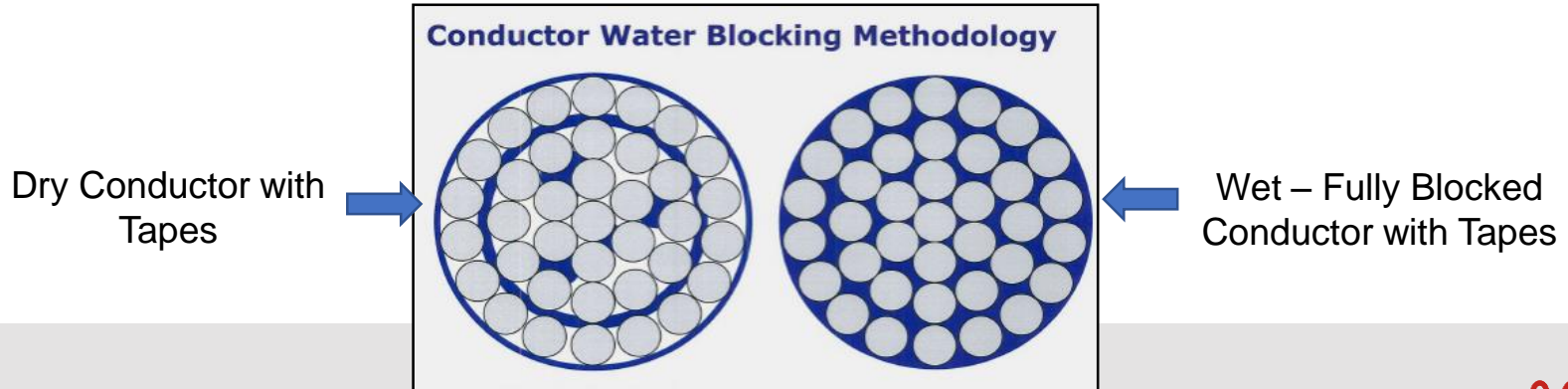
Medium Voltage Conductor Strand Sealant Comparison

Benefits to Nexans' method of water blocking:

Old Technology (Bitumen)	Nexans Technology (Water swellable Yarns & Tapes)
Messy to work with 	Simpler manufacturing process 
Process difficult to control 	Cleaner, faster installation and more reliable terminations 
Little to no salvage value for metal 	No penalty for metal recovery 
Environmentally unfriendly 	Environmentally friendly 

Medium Voltage Conductor Water Blocking System

- Yarns & tapes are inert and dry until activated by contact with water such as in a cable “dig-in”
- Upon contact with water, yarns & tapes swell to fill void space in the conductor and effectively block water from propagating further into the conductor equally as well as the viscous bitumen filler and well within the industry requirement of < 300 mm.



Medium Voltage With Blocking Yarn – Qualification Test Summary

1. Semi-conductive shield compatibility

CABLE CONSTRUCTION	No. of COND. LAYERS	WATERBLOCKING METHODOLOGY	LONGITUDINAL WATER PENTRATION TEST			ELECTRICAL VERIFICATION TEST	CABLE PRODUCED
			Production Test to : ICEA T-31-640			Production test to :	
			5 Psi	10 Psi *	15 Psi *	ICEA T-24-380	
#2 Cmpr (7w) Al 15kV	1 + core	Yarn only	PASS	PASS	PASS	PASS	760 m.
4/0 Cmpt (18w) Al 25kV	2 + core	Yarn only	PASS	PASS	PASS	PASS	8000 m.
750 Cmpt (58w) Al 25kV	4 + core	Yarn + Tape	PASS	PASS	PASS	PASS	500 m.
* - In excess of industry standard requirement.							
OTHER QUALIFICATION TESTS :	- Volume Resistivity Compatibility with Semi-conducting Shields to : ICEA T-32-645					PASS	

2. Passed ANSI C119.4 Connectability Test

- CSA test report can be provided on request

Nexans Global – Latest Technologies

A large portfolio of Aluminum Alloys and high performance designs:

High-Capacity CONDUCTOR	DENOMINATION	Max. Temperature	Customer Applications
ACSS/TW or ZW (EHS)	Aluminum Conductor Steel reinforced (Extra High tensile Strength)	250°C	High temperature Middle sag Middle weight
Lo-Sag™/TW	Aluminum Conductor Composite Core (Carbon fiber core)	Actually 180°C	Middle-High temperature Low sag Low weight
T-ACSR	Thermal Aluminum (TAL) conductor steel reinforced	150°C	Middle temperature High sag High weight
Need of Capacity Increase (in emergency)			
Lo-Sag™/TW or ZW	Aluminum Conductor Composite Core (Carbon fiber core)	90°C	Longer spans, less towers Low weight
AACSR-Z AAAC-Z	All Aluminum Alloy Conductor Steel Reinforced All Aluminum Alloy Conductor	90°C	Standard temperature / std sag Less corrosion / less maintenance Low drag

Overhead Transmission Lines - High-end Products

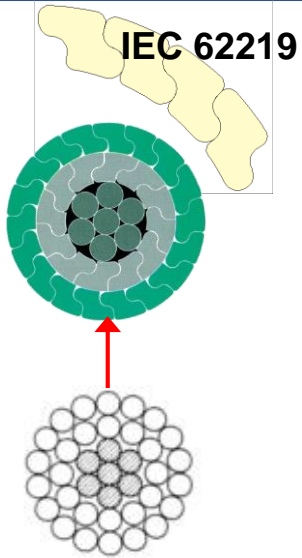
Nexans recommends (for refurbished or new lines):

- The improved capacity, low sag compact conductors:
AAAC, AACSR & Lo-Sag™ Aero-Z®
- The high capacity, low sag conductors:
ACSS and Lo-Sag™
- The improved Aero-Z® Compact, Low-Drag Design
- Solutions validated with Accessories Manufacturers and Installers


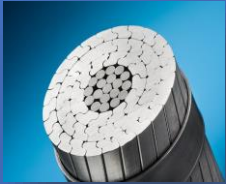


Modern Design Conductors

Compact Smooth Conductor Made of Z-shaped Wires



**Does improve
operating costs!**

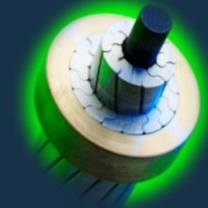
	AERO-Z® AAAC-Z 	AERO-Z® AACSR-Z 
Core	Aluminum alloy	Galvanized steel
Outer layers	Aluminum alloy	Aluminum alloy
Maximum allowed temperature	90 °C	90 °C
Conductivity	Very good	Good
Climatic zone	All	High snow/ice loads

Aluminum Conductors Steel Supported ACSS Major Features



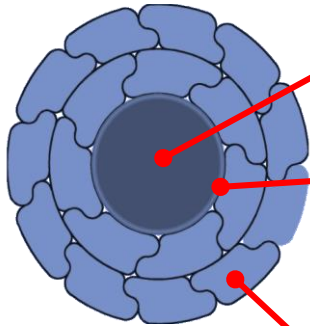
- Can double the line capacity (at up to 250°C)
- Steel core carries most or all of the mechanical load of the conductor due to the temper (fully annealed or soft) aluminum of outer layer
- Steel core wires are protected from corrosion by use of zinc-5% aluminum Mischmetal alloy coating
- Extra High Strength steel core, aluminized, and Aluminum-clad steel core is also possible

Aluminum Conductors Composite Core Lo-Sag™ Major Features



High tensile strength carbon fibers in an epoxy matrix to carry most or all of the mechanical load of the conductor:

- high glass transition temperature
- high breaking load
- high elastic modulus
- low coefficient of thermal expansion
- good creep properties



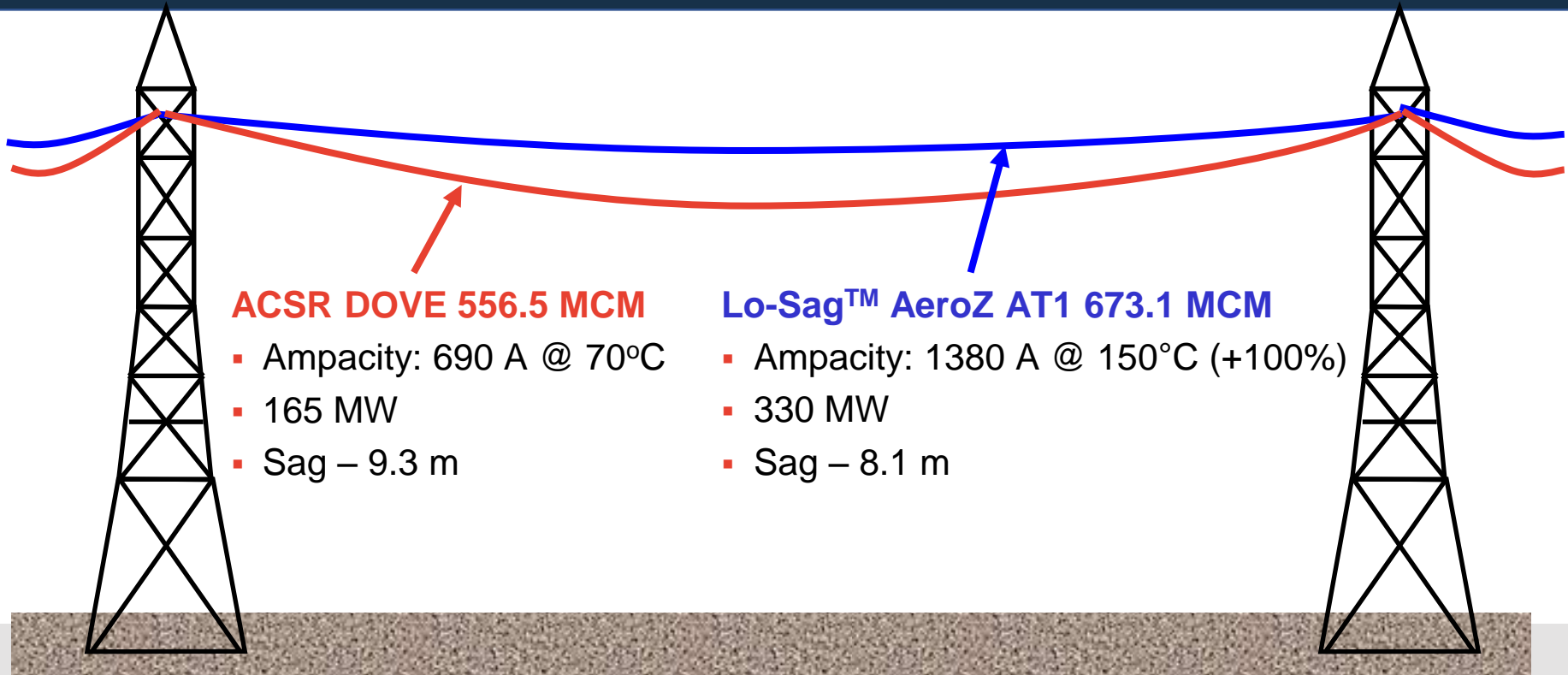
Appropriate protective cladding :

1. prevent thermal oxidation
2. mechanical protection
3. avoid galvanic current
4. avoid delaminating as a result of exposure to moisture and ultraviolet radiation
5. chemical protection (ozone, pollution...)

Aluminum Zirconium strands:

- 2 or 3 layers of shaped wires Aero-Z®
- No damage stress on wires = No failure / fall down of line

Lo-Sag™ - Sag Comparison



ACSR DOVE 556.5 MCM

- Ampacity: 690 A @ 70°C
- 165 MW
- Sag – 9.3 m

Lo-Sag™ AeroZ AT1 673.1 MCM



- Ampacity: 1380 A @ 150°C (+100%)
- 330 MW
- Sag – 8.1 m

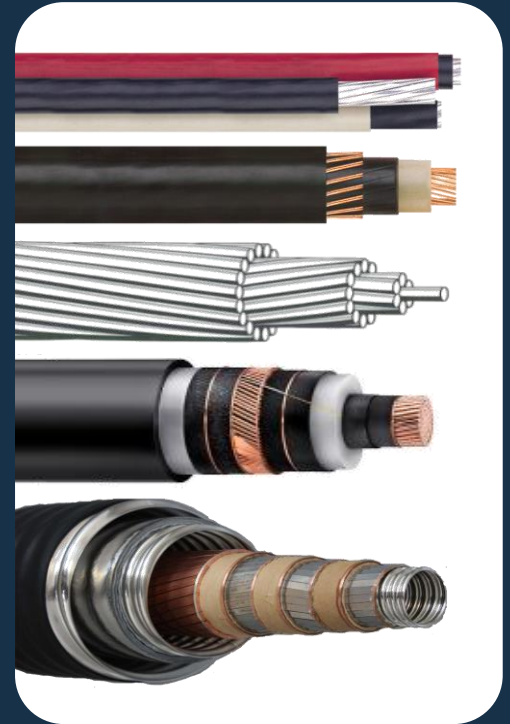
Lo-Sag™ Major Benefits



- **Globally cheaper:**
 - Longer spans, less towers (lighter for river crossings)
 - Lower towers (low sag)
 - Less efforts on towers (Aero-Z® low drag coefficient)
- **Better Return On investment on Life Cycle Costs**
 - Less Joule losses
 - No corrosion of the core
 - Improved behavior with Aero-Z®
- **High Temperature Lo-Sag™ for more ampacity & reliability**

Nexans Canada Utility Wire & Cable Products

- **Secondary Distribution (LV)** 
- **Primary Distribution (MV)** 
- **Overhead & Underground Transmission** 
- **Submarine**
- **Superconducting**



Secondary Distribution (Low Voltage 300-5000 V)

Overhead:

➤ Bare Overhead Conductors

- ASC & ACSR



➤ Neutral Support

- NS75 & NS90



➤ Covered Line Wire



Underground:

➤ Service Entrance

- USE175 & USE190
- USEB90

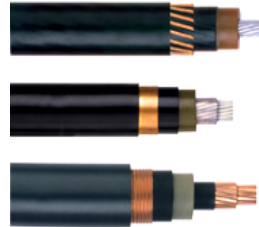


Primary Distribution (Medium Voltage 5-46 kV)









Underground:

- Concentric Neutral or Shielded Power Cables
 - ENERGEX[®] CN
 - ENERGEX[®] SP
 - CORU-SHIELD[®]



Medium Voltage Accessories

Connectors 	<ul style="list-style-type: none">• Premoulded EPDM• Separable
Ferrules and lugs 	<ul style="list-style-type: none">• Wide range of crimp and mechanical connectors and lugs• Pioneers of the bolted connector
Straight and transition joints 	<ul style="list-style-type: none">• Cold-shrinkable solutions• Reliable transition joints
Terminations 	<ul style="list-style-type: none">• Cold-shrinkable solutions• Moulded silicone rubber
Heat-shrink products 	<ul style="list-style-type: none">• Full range of joints and terminations
Bushings 	<ul style="list-style-type: none">• Large range of equipment bushings for in-oil, in-air and for plug-in or bolted versions• Moulded epoxy resin solutions

Overhead & Underground Transmission (69 - 500 kV or higher)



Overhead:

- Bare Overhead Conductors
 - ASC, ACSR, ACAR, ACSS, ACPR



Underground:

- XLPE



High Voltage Accessories

Outdoor Sealing Ends



- Composite insulator
- Porcelain insulator
- Dry-type
- GIS/Transformer

Joints



- Straight
- Straight joints with earth bonding
- Insulated/cross-bonding joints
- Step-up/step-down joints
- Transition joints (HPPF / HPPT / HPGF)

Various Accessories & Tools





- Cable disconnecting systems
- Surge arresters
- Cable clamps, etc.

Renewable Energy



Solar:

➤ INSTAGLIDE® RPVU90 Cu or Al

- Copper: #12 to 2/0 
- Aluminum: #6 to 1000 

➤ ENERGEX® Medium Voltage

- 15-35 kV CN from #1 to 1250

Wind:

➤ ENERGEX® Medium Voltage

- 15-35 kV CN from #1 to 1250



Submarine (MV & HV Systems)



- HVAC XLPE up to 420 kV
- HVDC XLPE up to 400 kV
- HVDC MI (mass impregnated) up to 600 kV
- Inter-array cabling solutions for windfarm
- Turnkey cable laying, burial & protection services



Superconducting

- High Temperature Superconductor (HTS) Cable
- Superconducting Fault Current Limiter (SFCL)

Did you know?

Nexans has received multiple world records in the US/LIPA project.

- Longest cable built → 600 meters long, 138 kV & 2400 A
- World's first high voltage cable
- Highest Power



Unique Services and Solutions Focused on Corporate Social Responsibility

1. Recycling & Scrap Recovery Services
2. Connected Reels Tracking System



Recycling & Scrap Recovery Services: Purpose

Your cable waste has never been more valuable



Scrap Management: How it works

Reduce your ecological footprint while maximizing the economic value of your scraps which accounts for approximately 3% of your cable purchases



Connected Reels Tracking Solution

The Augmented Reels

Get more from your cable reel data



Real-Time Location

Track your reel fleet

Stock Management

Follow your residual length and optimize your stocks

Project Management

Monitor your connected reels in a project mode

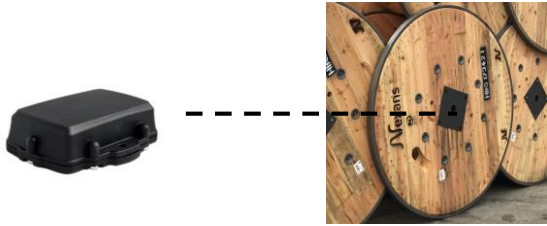
**15,000 Nexans Connected Reels successfully installed worldwide!
And already >100 in Canada**

How It Works

Hardware

Infrastructure

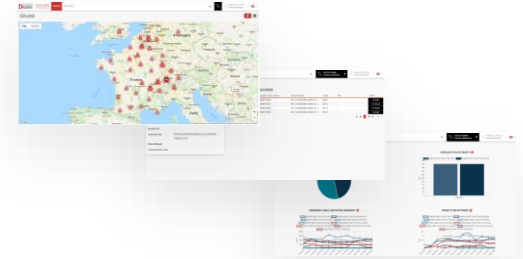
Software



**Devices embedded
in our reels**



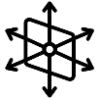
**CLOUD NATIVE
2G/3G/4G/LTE-M**



**SAAS platform connected
with your ERP**



Geolocation



Movement Sensors
For Remaining length



3 years
battery life



Real-Time



Real-Time Alerts





SUMMARY

- How utility specifications have evolved over time
- Nexans Innovation: Medium Voltage Cable with Patented Water Blocking System
- Latest Technologies: AERO-Z[®] & Lo-Sag[™]
- Overview of Utility Wire & Cable Products and Unique Service & Solutions:
 - Recycling & Scrap Recovery Services
 - Connected Reel Tracking System

Where to Get Power Cable Standards



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Questions




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