NARUC CPI
Innovation Webinar

BEYOND NEW BUILDS: ADVANCED TRANSMISSION TECHNOLOGIES AS ALTERNATIVES TO TRADITIONAL INFRASTRUCTURE

INNOVATION WEBINAR

September 10, 2026
3:00 to 4:00 p.m. ET

Free & open to the public!

***Moderator*: Chair Brian Rybarik** (Washington)

Jessica Harrison
AssetCool

Brian Berry
Heimdall Power

Justin Bell
EPRI

About NARUC

- Founded in 1889, the National Association of Regulatory Utility Commissioners (NARUC) is a non-profit organization dedicated to representing the state public service commissions who regulate the utilities that provide essential services such as energy, telecommunications, power, water, and transportation.

- NARUC's members include all 50 states, the District of Columbia, Puerto Rico, and the Virgin Islands.

- Our mission is to serve the public interest by improving the quality and effectiveness of public utility regulation.

- For more information, visit: www.naruc.org

About NARUC CPI

- The NARUC Center for Partnerships & Innovation (CPI) builds relationships, develops resources, and delivers training to assist state commissions contending with complex current and emerging issues.

- CPI is funded by cooperative agreements with the U.S. Department of Energy (DOE).

- CPI conducts work across five key energy areas and many topics within each: generation; transmission; distribution; customers; and critical infrastructure preparedness, response, and resilience.

- Among other events, CPI hosts a monthly innovation webinar series on a wide range of timely topics.

- For more information, visit: www.naruc.org/cpi

Upcoming Events

Virtual Events:

- **NARUC-NASEO Comprehensive Electricity Planning Roadmaps Webinar**: September 14, 2026 at 4:00 PM ET
- **Data Center Primer Webinar**: September 17, 2026 at 3:00 PM ET
- **Evaluating Long-Duration Energy Storage: Costs, Benefits, and Regulatory Pathways**: October 15, 2026 at 3:00 PM ET

Upcoming In-Person Events:

- **NARUC Annual Meeting:** November 8 – 11, 2026; San Juan, PR

See the full list of events and access registration links at: www.naruc.org/events/event-list/

Previous Webinar of Interest

Resources available: https://www.naruc.org/core-sectors/energy-resources-and-the-environment/valuation-and-ratemaking/

Today's Speakers

***Moderator*: Chair Brian Rybarik** (Washington)

Jessica Harrison
AssetCool

Brian Berry
Heimdall Power

Justin Bell
EPRI

Beyond New Builds Webinar

Justin Bell
Pr. Technical Lead
jbell@epri.com

September 2026 NARUC Webinar

Set Up A Meeting

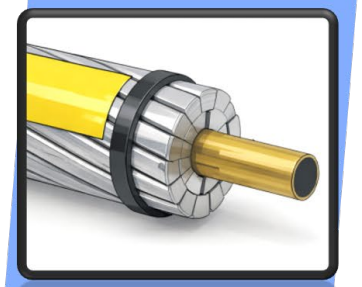
Free DLR Whitepaper

DLR Tech Database

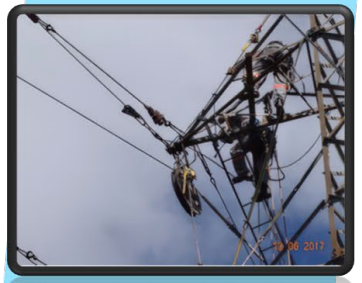
Project Information

Goal: Get more MW from A-to-B safely with the "right size" solution

Non-wires Alternatives (NWA)

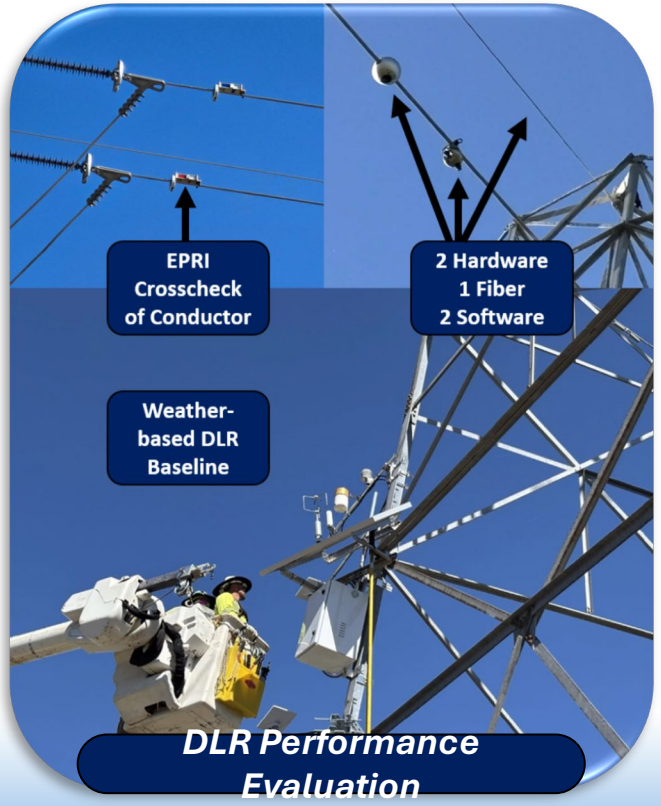


"Wires" Upgrades



Structural / Mechanical Upgrades

System-Level or Major Architecture Changes



Uprating Methods
71+ Methods Researched

Utility Experiences
81+ Projects Tracked

Clearance Constraints
18+ Methods Tracked

Conductor Coatings
9+ Providers Tracked
200+ Samples Tested

DLR
66+ Providers Tracked
84+ Projects Tracked

In Person Meetings

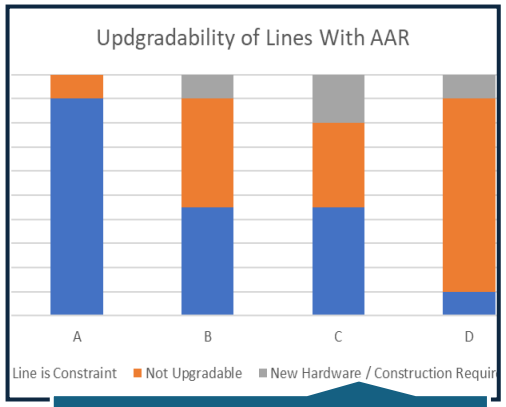
Tech User Groups

Guides & Training

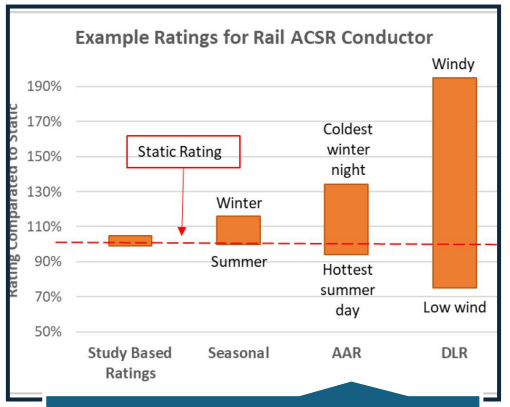
Software Tools

Deploying Technologies: Standalone, staged, & combined

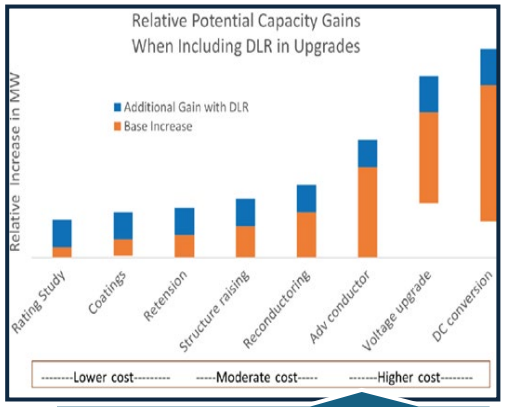
- Benefits can be additive, but so are the costs, risks, delays, design processes, etc.
  - There are positive and negative interactions so additional (more complex) modeling is needed to address combined designs



Substation and St. Clair curve can limit capacity uplift

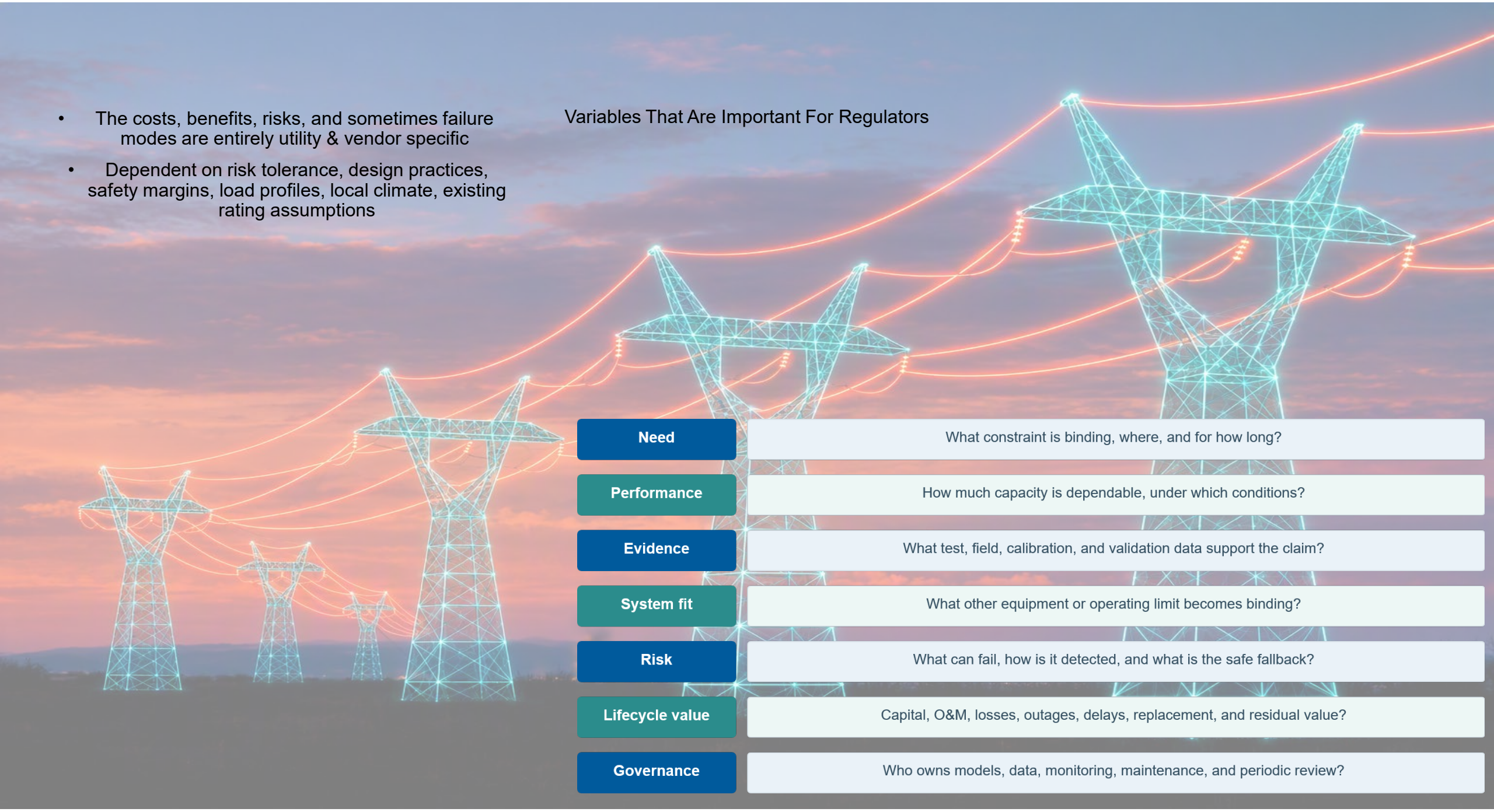


Capacity variability will add



Potential benefit adders from combined upgrades

Line Type	Uprating Alternative	New Rating	Cost per Mile (2016 @ Oncor)	Cost per 1% Gain per Mile
138 kV Lattice & Wood H-frame	Reconductor	193%	$321,851	$3,461
138 kV Lattice & Wood H-frame	DLR	110%	$56,200	$5,620
138 kV Wood H-frame, rerate	Rerate to 125°C & modify structures	130%	$10,561	$352
138 kV Wood H-frame, rebuild	Rebuild	209%	$750,000	$6,881
138 kV Wood H-frame, rerate	DLR	110%	$29,471	$2,947



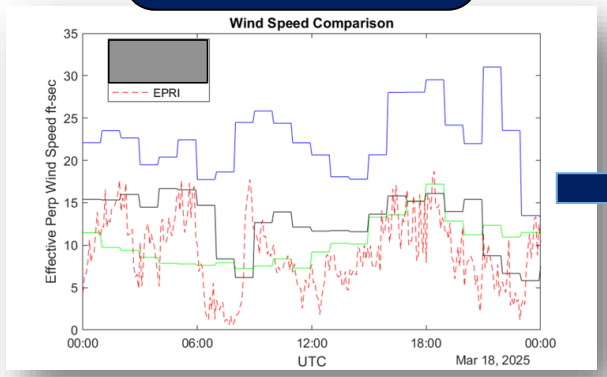
- The costs, benefits, risks, and sometimes failure modes are entirely utility & vendor specific
- Dependent on risk tolerance, design practices, safety margins, load profiles, local climate, existing rating assumptions

Variables That Are Important For Regulators

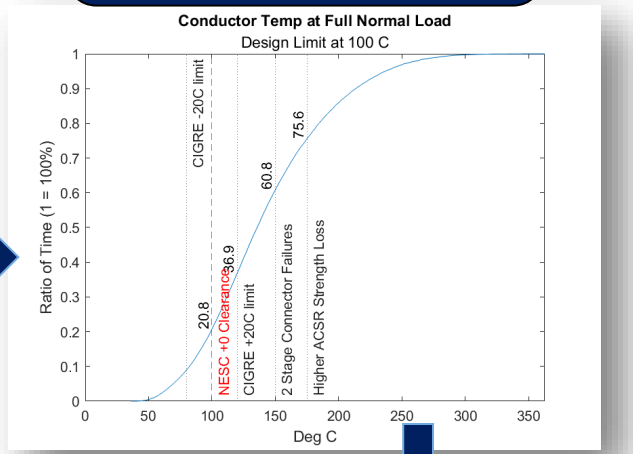
Need	What constraint is binding, where, and for how long?
Performance	How much capacity is dependable, under which conditions?
Evidence	What test, field, calibration, and validation data support the claim?
System fit	What other equipment or operating limit becomes binding?
Risk	What can fail, how is it detected, and what is the safe fallback?
Lifecycle value	Capital, O&M, losses, outages, delays, replacement, and residual value?
Governance	Who owns models, data, monitoring, maintenance, and periodic review?

Evaluation Considerations to Focus On | Robust Technical Basis

What can go wrong



What are the consequences



What is the risk exposure

% of Life/ Thermal Overload	Negligable	Minor	Moderate	Significant	Severe
Ongoing / Off-Scale		Potential for AAC annealing	Potential for ACSR annealing begins	Typical ACSR annealing	
Very Likely	Copper annealing	Long span sag limit	Connector Risk	Weakest ACSR anneal	
Likely		Copper annealing	Short span sag limit	Connector Risk	Typical ACSR anneal
Possible				buffer & terminal hardware risk	Weakest ACSR anneal & Connector Risk
Unlikely			Typical AAC anneal	Typical AAC anneal & NERC reliability limit	
Very Unlikely			Weakest AAC anneal	Weakest AAC anneal	Typical AAC anneal

These are not universal criteria, your limits will vary

Piloting Isn't The Problem

- 80% of pilots are not structured as to generate actionable data
- Shift who is at the helm to an asset SME in piloting may help
- Lack of a trustworthy technical basis is what can lead to slower adoption / pushback (rightly-so)
- The majority of technologies piloted with a technical basis did not pass go/no-go thresholds

Cost vs Ampacity Can Be A Poor Metric

- Often hides true lifecycle costs
- It's easy to promise capacity if you don't care about risk
- Most ATTs / GETs have variable capacity
- We struggle to quantify long term value of relative capacity gain

Speed Doesn't Mean Direct Adoption

- Leverage collaborative models to perform deeper research
- Innovate doesn't mean duplicate
- You may need multiple pass, but only one fail to
- Implement in a way there are extra "training wheels" and "safety factors" to leverage a trust but verify approach

Commit to Forward Looking Work vs Firefighting

- All of the GETs and ATTs concepts are decades old, we need mechanisms to better support long term forward looking projects, and pilots
- Existing mechanisms aren't flexible enough to be efficient; for example doing collaborative research across stakeholders

Having A “Technology Agnostic” Mindset

- A robust technology and vendor agnostic screening concept can be drilled down into technology specific tools
  - This requires SMEs to have incredible depth of knowledge on how all options perform relative to each other and interact with utility specific nuances

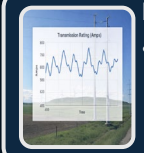
Agnostic Workflow	Technology Specific Application (example)
Identify challenges	What is DLR forecast accuracy? → Tolerance? Timeframe?
Solve w/ technical basis	Independent testing → Define test method? Site selection? Vendor selection?
Train and knowledge – share	Go / no-go
Broad screening tools	Non-biased workshops, papers, software tools
Documented risk analysis and controls	

Example of Flexible “Toolbox” Approach

ART (Alternatives Ranking Tool)
- Of all upgrade methods known – was coatings the right one? What are in the “top 5”

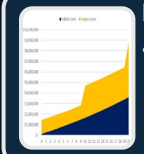
ART (Alternatives Ranking Tool)
- Of all upgrade methods known – was DLR the right one? What are in the “top 5”

DLR / AAR software
- How much capacity will coatings give? How hot do my wires get when they underperform or degrade?

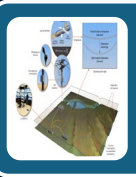


DLR / AAR software
- How much capacity will DLR give over AAR? How hot do my wires get when DLR are wrong?

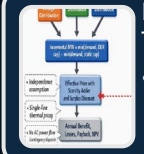
Conductor Selection Cost Benefit
- Capture CapEx, OpEx, and O&M costs over full life and consider the change in losses due to cooler operation for specific load cases



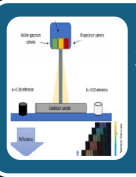
DLR LCC (Life Cycle Costing)
- Capture CapEx, OpEx, and O&M costs over full life



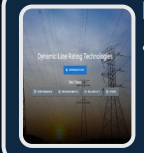
Benchmark Against Industry Peers
- Example report describes decision drivers for differing GETs/ATTs from >70 real world deployments



BEST (Basic Economic Screening Tool)
- Quick screen to flag clear winners and losers to determine if more costly production model analysis is worthwhile

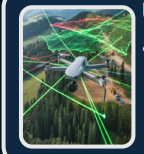


ETI / ATI Testing Database 2006-26
- Test results from new, aged, nonspec, and coated conductors



DLR Technology Database
- Screen 65+ DLR technologies based on capabilities, failure modes, and cybersecurity to "short list" the best fit solutions and map testing needs

Compare Robotic and Factory Applied Coatings
- Web tool to plan flight times and crew sizes, optimize flight for either CADD or Ai (different requirements)



UAS Activity Planner
- Web tool to optimize drone based activities for DLR projects

Closing Thoughts

We need to stay optimistic on GETs / ATTs

Ensuring the system operates safely and reliably means considering the capacity may go down (at least in the short term)

- Risk protections have been removed by new practices, old methods may be less safe, we get false sense of security from low load days or poor ability to link cause and effect
- We could consider speed to power similar to “public convenience and necessity”

To build trust and gain experience in GETs/ATTs, we may need a window of regulators allowing “Option A+B” for upgrades or “Evaluate A & B before selection” in project processes

- We need to consider the downside risk of deferrals, especially when inflation rates and COG are increasing consistently
- Adding DLR may defer the cost of reconductoring, but the reconductoring will cost more when you get there

If we “put more aluminum in the air” – for example ACSS/TW even if we only operate at 100C for now, would allow more headroom more cost effectively than coming back up upgrading later

- The number of times the load growth doesn’t appear over the 40-80-year wire life will be offset by large savings everywhere it eventually pays off
- The upside vs downside cost risks have changed significantly; we need to recalibrate the mindset around futureproofing

Safe adoption still takes time

- We need new ways to invest in long term development and experience building with technologies
- If we made continuous small investments in understanding and improving DLR since it came out, we’d be farther ahead now – this goes for all ATTs / GETs

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NARUC
National Association of
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INNOVATION WEBINAR SERIES: SEPT. 10, 2026

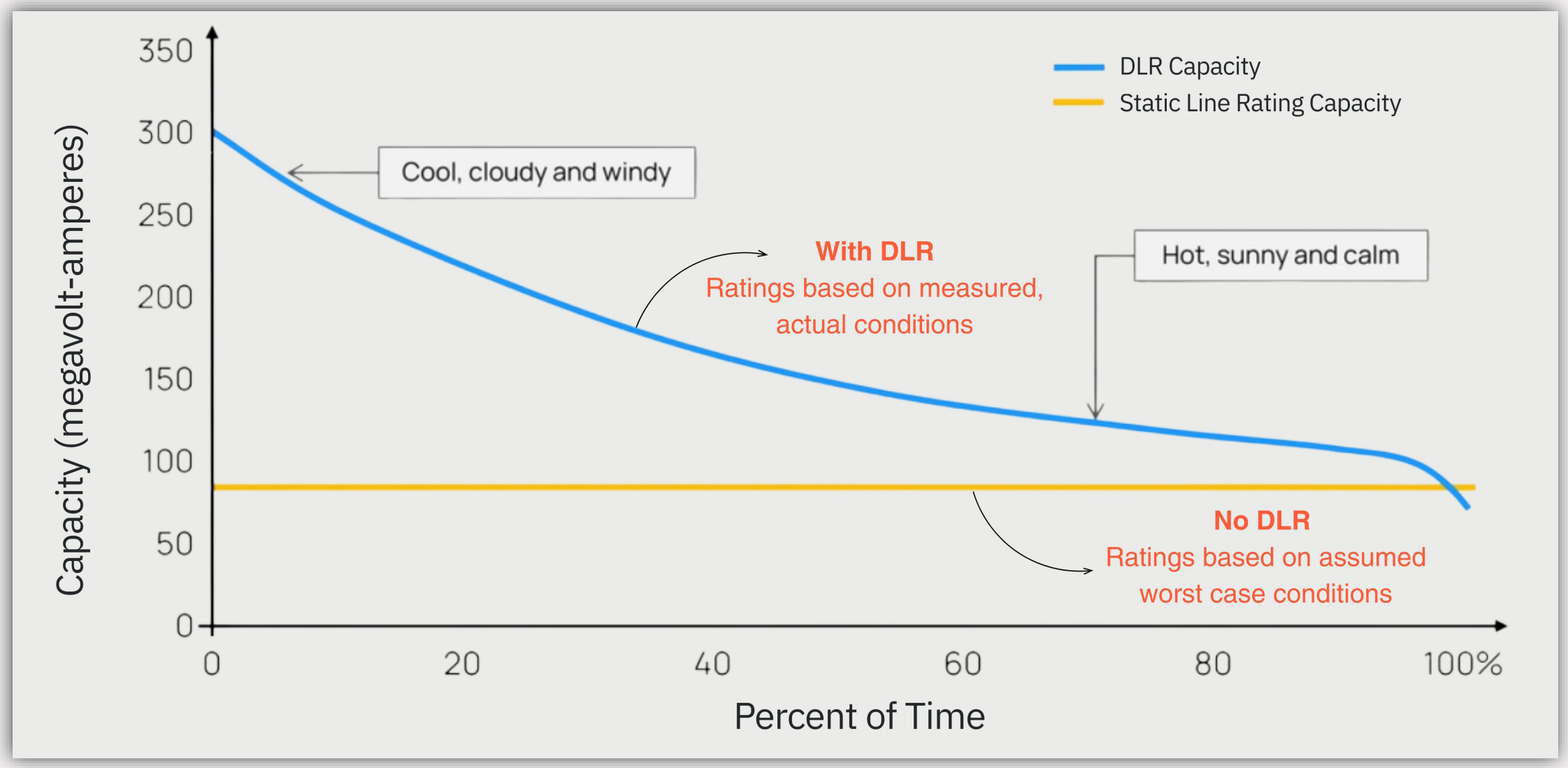
Beyond New Builds:
Advanced Transmission Technologies as Alternatives to Traditional Infrastructure

Brian Berry, Chief Product Officer
Heimdall Power

Heimdall Power


PSE
PUGET
SOUND
ENERGY

Dynamic Line Ratings (DLR) 101

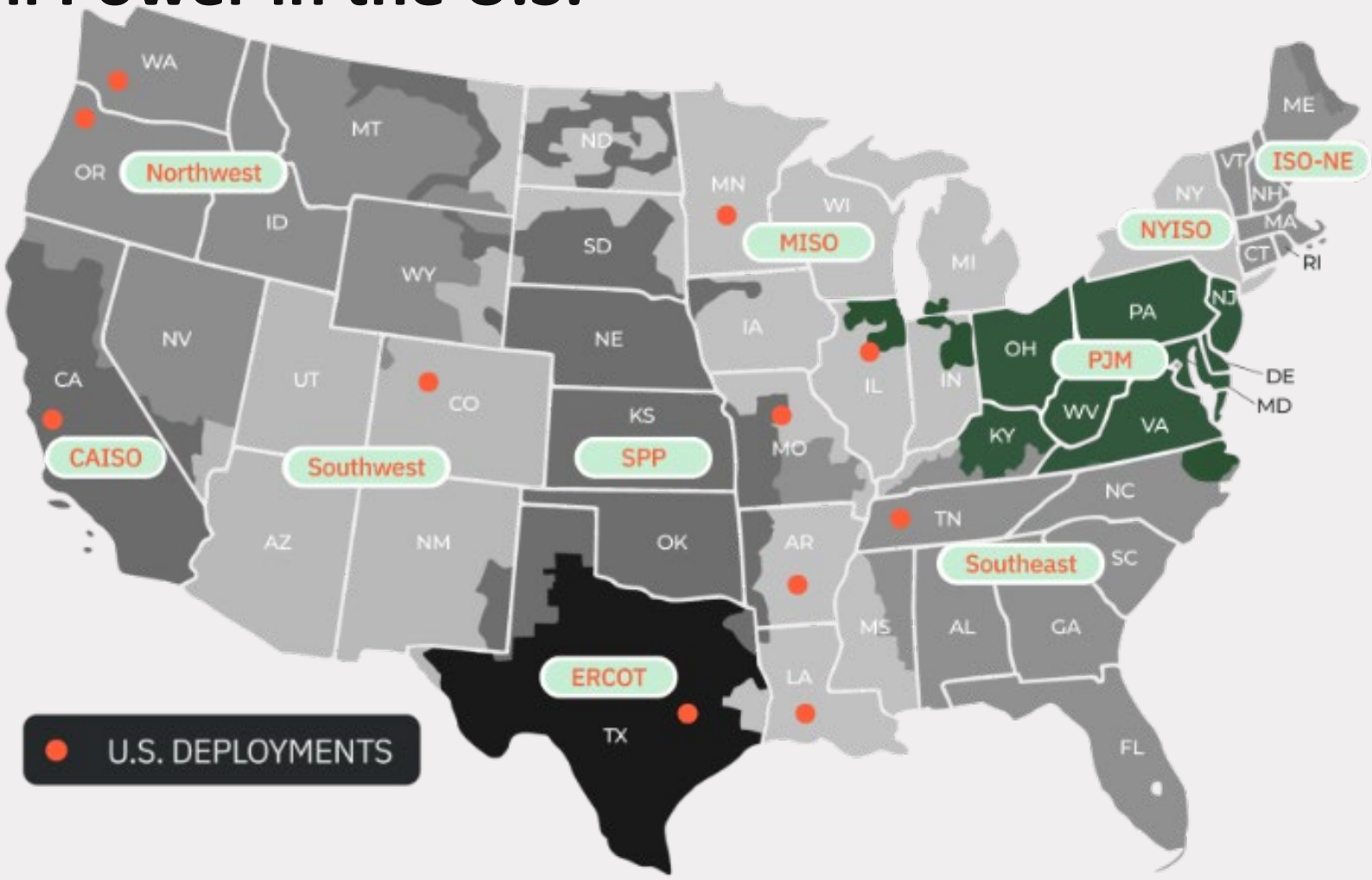


The Neuron: Technical Specifications

Delivering real-time data across voltages, line diameters, and use cases

Mechanical	Sensor weight	3.5 kg / 7.7 lbs
	Sensor housing dimensions	20 cm diameter (spherical)
	Sensor housing material	Aluminum
	Power line diameters	6 to 41 mm, #4 Swan to 1590 Falcon
	Ingress protection	IP66
Operating limits	Operating current	0 to 3000 A (50/60 Hz AC)
	Current survivability spike	125 kA peak, 50 kA rms for 1 second
	Operating voltage	7 to 420 kV (deployed), up to 540 kV (tested), up to 750 kV (possible)
	Operating line frequency	16 – 60 Hz
	Operating ambient temperature	-40 to + 60 °C
	Max line temperature	120 °C (continuous) / 200 °C (High-temp Neuron available Q3 2026)
Power supply	Power supply primary	Power harvester from, >6 A limited mode, ≥ 12 A fully operating mode
	30–60 minute backup	Super capacitor
	3 to 6 month backup	Li-ion battery
Communication	Primary communication	LTE Cat M1, NB-IoT and LTE
	Secondary communication	Satellite (to be released Q3 2026)
	Data package encryption	TLS
	Firmware updates	OTA (over-the-air)
	Auxiliary sensor enabled	Bluetooth
	EMC approvals	CE, FCC, ISED
Installation	Live line installation	Yes
	Installation methods	Hot stick, Drone, Hot glove, Cherry Picker, Helicopter

Heimdall Power in the U.S.



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PSE PUGET SOUND ENERGY

Portland General Electric

PG&E

GREAT RIVER ENERGY

minnesota power AN ALLETE COMPANY

Ameren

entergy

Heimdall Power's Solution at Work

Data enables faster, more flexible paths to affordability

Deferred spend
at
Portland General Electric

$244.5M anticipated in **deferred new construction costs** for five monitored lines at PGE

Capacity gains
at
GREAT RIVER ENERGY

63% more transmission capacity during periods of peak demand

$30,000 saved by avoiding a single, 48-hour congestion event

Rapid deployment
at
entergy

31 Neurons installed across three states in 5 days in January 2026;
14 Neurons installed across 30+ miles in **one day** (01/27/26)

Curtailment uplift
at
bayernwerk

29% more capacity unlocked on solar-dominated circuits during curtailment events, with peak feed-in reaching 12,000 MW

AssetCool

Beyond New Builds: Advanced Transmission Technologies as Alternatives to Traditional Infrastructure Description

Robotic Grid Updates for Static Line Uprating

www.assetcool.com

Conductor coatings provide:

Speed to power

- In-field coatings deploy on the order of weeks to months
- Limited to no integrations required (confirm can run at higher amps)

Affordability

- Coatings enhance performance at a fraction of the cost of rebuilds

A new tool to optimize, strengthen or enhance

- Get up to 30%+ capacity on existing system
- Enhance Dynamic Line Ratings
- Enhance reconductoring or new lines: standard or HTLS conductors
- Gain flexibility in system investments with more headroom and time

A unified coatings + robotics approach

Increased Emissivity

Decreased Absorptivity

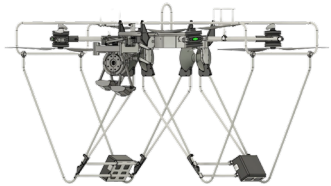
Permanently increases line capacity by up to 30%

AssetCool Coated

Coating Robotics

Retrofit application

Introducing new aerial deployment method, CapacityAir



Advanced Coatings

Factory application

Techno-Economics of HTLS/SE01 reconductoring.

Ideal Complement for HTLS: Improving uplift, Sag and economics of reconductoring projects.

15 km, 138KV, Single circuit, single conductor, ACCC Fort SE01

	Reconductoring HTLS	Reconductoring HTLS + SE01
Capacity uplift	146%	192%
Capacity Uplift MW	236	310
Marginal cost $/MW	23,979	21,328

Assumptions:

- Cost of reconductoring $480/mile as per MISO cost guide for 138kV
- SE01 Factory applied over ACCC Fort
- Conservative estimate, does not consider additional cost that may arise from real reconductoring projects

Coatings have been in existance for a decade

Available today

- Deploying commercially in the U.S. on full circuits this year
- Available for commercial retrofit with robotic application and for new lines via multiple conductor manufacturers

Trialed across the globe

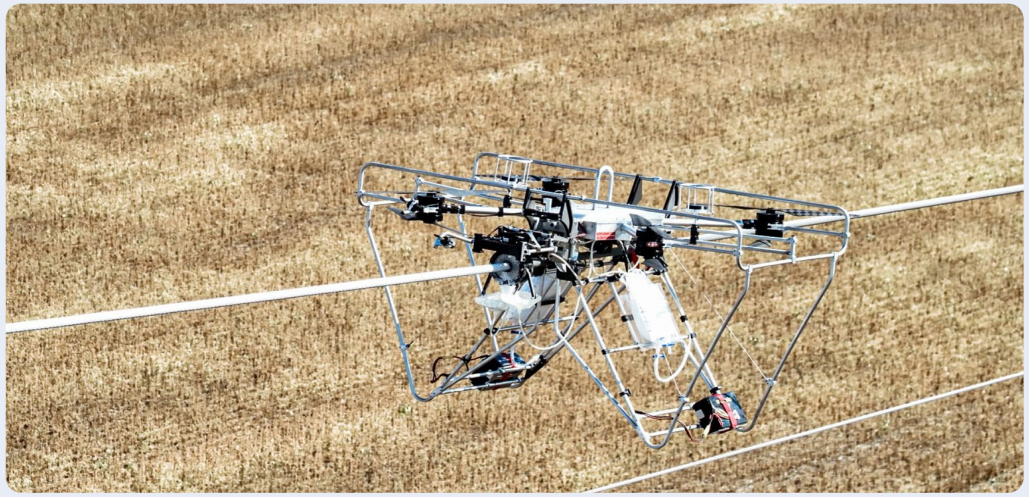
- Deployed on at least 3 continents across 20 countries and by over 20 utilities

Tested by industry experts

- Active and ongoing testing continues through in-field pilots and lab testing

Capability is still evolving

- Moving to live line capability to increase speed of deployment and safety for crews



Definitions matter, let's include innovative technologies.

- **Advanced Transmission Technology Definition (U.S. Code § 16422)**
  - *A technology that increases the capacity, efficiency, or reliability of an existing or new transmission facility…*
- **Advanced Conductors (FERC Order 1920)**
  - *… present and future transmission line technologies whose power flow capacities exceed the power flow capacities of conventional aluminum conductor steel reinforced conductors…*
- Conventional Categories
  - **GETs** have traditionally included DLR, power flow control, and topology optimization
  - **Advanced Conductors** have been defined as superconducting cables, advanced composite conductors, advanced steel cores, HTLS conductors, fiber optic temperature sensing conductors, and advanced overhead conductors.
- Conductor coatings can be applied in field and to new conductors to increase efficiency and enhance capacity.

Thank You.

www.assetcool.com

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