## A first-of-its-kind grid modernization law

In May 2025, the State of Montana took a historic step in grid modernization by enacting Senate Bill 301 (SB 301). This legislation marks a paradigm shift in how electric transmission lines are engineered, approved, and deployed. Initiated from a technical briefing by Epsilon Composite to the Montana Public Service Commission (PSC) in late 2024, SB 301 swiftly progressed from technical insight to bipartisan law, earning unanimous support in the State Senate (50–0) and the endorsement of Governor Greg Gianforte. This rapid timeline—less than six months—demonstrates how clear data, sound engineering, and a shared vision can result in meaningful, fast-tracked policy transformation.

Unlike traditional utility regulations that focus primarily on procedural compliance, SB 301 sets a performance-driven benchmark for infrastructure design. It is the first law in the United States to mandate a quantifiable thermal behavior standard for power lines, specifically targeting sag and expansion during operation.

### Defining a new performance standard

At the core of SB 301 is a simple but powerful requirement: all new transmission conductors must exhibit a coefficient of thermal expansion (CTE) equal to or better than that of advanced composite-core technology. This engineering standard is critical to preventing line sag during high-temperature conditions—one of the leading causes of utility-related wildfires. The law effectively removes “thermal sag” as an acceptable design flaw in new power lines.

By legally defining low-sag behavior based on advanced composite standards, Montana introduces a science-based metric into utility planning. This ensures that utilities can no longer rely on outdated materials or speculative safety claims. Instead, grid reliability, wildfire mitigation, and thermal performance are directly linked to proven, state-of-the-art materials.

### Wildfire mitigation through better engineering

Power lines that sag under heat pose a grave risk, especially in wildfire-prone regions. Traditional steel-core conductors, which expand significantly with temperature, have been responsible for numerous utility-ignited fires across the Western U.S. SB 301 directly addresses this issue by favoring the use of modern composite-core conductors, which maintain their tension and clearance—even under heavy load and extreme heat.

Commissioner Randy Pinocci emphasized that preventing line sag is not just about safety—it’s also about economics. The cost of a single wildfire can reach hundreds of millions of dollars, far outweighing the upfront cost of deploying advanced conductors. By aligning regulations with

wildfire science, Montana is prioritizing prevention, ultimately saving lives, protecting ecosystems, and preserving public funds.

## Boosting capacity without building new towers

One of SB 301's most transformative effects is its ability to unlock significant grid capacity without requiring new towers or rights-of-way. Modern composite-core conductors can carry up to twice the current of conventional aluminum-steel cables. They run cooler, exhibit lower resistance, and reduce energy losses by as much as 40%.

This means utilities can double the capacity of existing lines by simply retrofitting them—a process known as reconductoring. In many cases, this can be completed in months rather than the years or even decades needed for entirely new transmission corridors. SB 301 clears the bureaucratic path for such upgrades by simplifying approvals for projects over 69 kV and recognizing composite-core solutions as valid and encouraged.

This approach is particularly vital as electrification increases demand on the grid. From electric vehicles to heat pumps and data centers, electricity usage is soaring. Simultaneously, renewable energy sources like wind and solar are often located far from urban load centers. Without enhanced transmission capacity, these renewables risk curtailment. SB 301 provides a fast-track to integrate them without building from scratch.

## Engineering meets legislation

SB 301's legislative power lies in its precision and clarity. It doesn't just recommend technology : it requires it. And it supports utilities in making the switch:

- **Regulatory deadlines**: The Montana PSC must respond to transmission upgrade applications within 300 days.
- **Incentivized investment**: Optional cost recovery mechanisms allow utilities to invest in qualifying technologies without long-term financial uncertainty.
- **Public-interest alignment**: The law recognizes advanced conductors as public-good infrastructure, aligning shareholder interests with ratepayer and environmental benefits.

This is a model of modern governance: policy that is both visionary and executable.

## The technology behind the law: Composite-core conductors



What makes composite-core conductors so revolutionary? These cables replace traditional steel cores with fiber-reinforced materials—typically carbon fiber or hybrid composites. The result: conductors that are up to 70% lighter, more robust, and thermally stable.

Technically speaking, these conductors:

- Expand ten times less than steel when heated
- Retain mechanical strength at higher operating temperatures
- Resist weakening or annealing during wildfire exposure

This high-capacity, low-sag (HCLS) behavior means they remain intact even in disaster scenarios. Field tests and real-world deployments have shown them surviving wildfires and storms where steel-core lines fail. Their use translates to fewer emergency repairs, faster service restoration, and improved disaster resilience.

Moreover, these conductors typically use high-purity aluminum or next-generation alloys in larger cross-sections. This minimizes resistance, enhances conductivity, and reduces $CO_2$ emissions from generation. In essence, they offer a triple win: more capacity, better safety, and higher efficiency.

## A proven global solution

These aren’t experimental technologies. Composite-core conductors are commercially available from companies like Epsilon Composite and CTC Global and have been deployed across Europe, Asia, and the Middle East. For example, Bangladesh has installed more kilometers of advanced conductors than the entire U.S. grid, a testament to the maturity of the solution.

What has slowed adoption in North America isn’t technical viability, but institutional inertia. Montana’s SB 301 challenges that inertia, encouraging utilities to modernize without delay.

## From briefing to law: a case study in collaboration

The story behind SB 301 is one of teamwork and vision. In December 2024, Epsilon Composite presented detailed technical data to the Montana PSC, showcasing how advanced conductors could address the state’s most pressing grid issues: wildfire vulnerability, capacity constraints, and aging infrastructure.

What followed was a model public-private partnership. The PSC conducted public hearings with input from engineers, utilities, and regulators. Industry representatives voiced cautious optimism, while the PSC explored incentives and implementation strategies.

State Senator Daniel Zolnikov authored and championed the bill, backed by Commissioner Pinocci and other stakeholders. The legislative journey culminated in swift passage and

gubernatorial approval. SB 301’s bipartisan support reflects a shared understanding that modernizing the grid is not just feasible : it’s necessary.



## National and global implications

Montana’s law is a call to action for other jurisdictions. Its design, rooted in hard engineering data and wrapped in policy mechanisms, can be replicated anywhere. States like California are already exploring similar initiatives. As the federal government emphasizes infrastructure and decarbonization, SB 301 serves as a ready-to-deploy model.

The broader implications include:

- **Wildfire prevention as national policy**
- **Faster integration of renewables**
- **Reduced ratepayer costs over time**

- **A resilient, flexible grid ready for 21st-century demands**

## Efficiency as the first fuel

SB 301 also underscores a simple truth: the cleanest, cheapest kilowatt-hour is the one you don’t lose. By cutting transmission losses, advanced conductors function as virtual power plants, delivering more electricity without generating more.

Commissioner Pinocci summarized it best: «These high-efficiency conductors will bring lower costs to our electric consumers while providing substantial benefits to the environment and the grid.»

## Conclusion: a blueprint worth following

SB 301 isn’t just a law, it’s a template for change. It shows how science, policy, and industry can work hand-in-hand to solve some of our toughest infrastructure challenges. With clear standards, efficient processes, and targeted incentives, Montana has created a new gold standard for electric transmission modernization.

As the saying goes: as the grid evolves, so must the materials we use to build it. Montana has made that philosophy law. Now it’s time for others to follow.

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