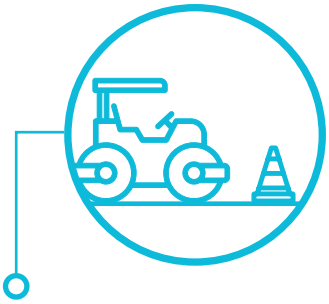
A Smarter Grid Costs Less

How advanced transmission technologies and high voltage transmission support energy affordability

Macro Grid Initiative
An ACORE Program

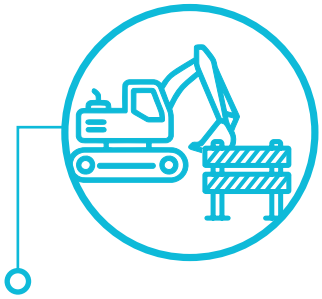
Smart transmission investments are essential for energy affordability

Utilities spend on transmission in three distinct ways, but they often get lumped together in your bill. **Understanding the difference helps you see where the real value lies.**



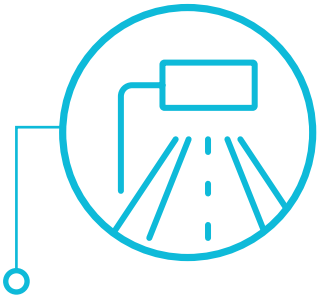
Local projects
Road maintenance

Replacing equipment that supplies homes and businesses, because it has reached the end of its useful life or for preventative resilience measures. Local projects can include upgrades to the distribution and transmission system.



Network upgrades
Access roads and system reinforcements

Like building an exit ramp to a new sports stadium, plus strengthening bridges and widening merge lanes to handle the additional traffic. These lines are built or upgraded to safely integrate new infrastructure onto the grid, typically paid for by the requesting customer.



Long-range transmission
Major highways

Like the highway system that transformed American commerce, these lines reduce congestion for everyone by opening access to areas with lower costs, can avoid the need to build new costly forms of generation, and keep the lights on during periods of extreme weather.

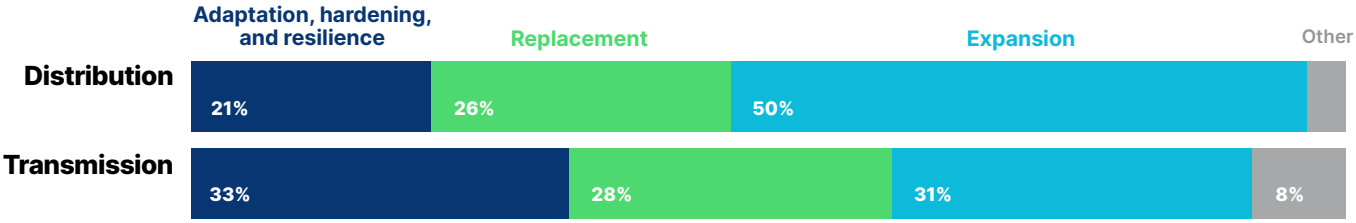
We need all three types of transmission investment. But right now, **we're spending heavily on patching up (local projects and network upgrades)** what we already have and **under-investing in what's transformational (regional and especially interregional transmission)**.

Spending on wires is on the rise

Most of our electricity grid infrastructure was built in the 1960s and 1970s and is now approaching the end of its lifespan. According to the U.S. Energy Information Administration, **rising electricity costs over the last two decades have been driven by several factors, including spending on the transmission and distribution systems and other capital improvements.**

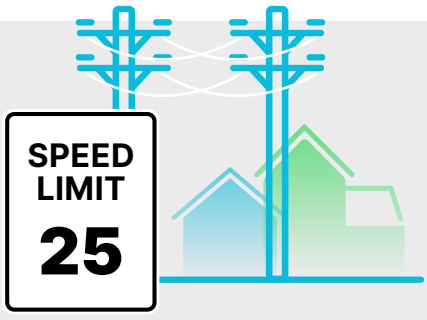
Source: US EIA

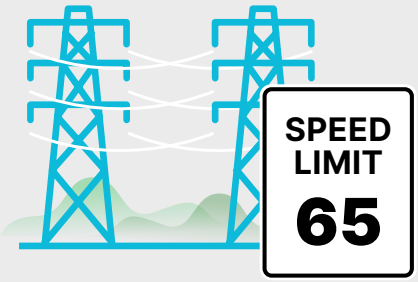
Drivers of Distribution and Transmission Investment



Source: EEI Data presented by LBNL

Imagine the electricity grid like a network of roads and highways. The **low-voltage distribution network delivers electricity to homes and businesses**, much like neighborhood streets with a 25 mph speed limit.





The **higher-voltage transmission network moves electricity in bulk** from where it is generated to where it is needed, like our network of highways with multiple lanes and faster speed limits.

How high-voltage transmission supports energy affordability

High-voltage power lines can carry more electricity and save consumers money, especially when they are built to connect different regions. **Improving transmission connections between regions could have saved consumers upwards of $5 billion per year in recent years just by accessing cheaper sources of generation.**

Source: PNAS

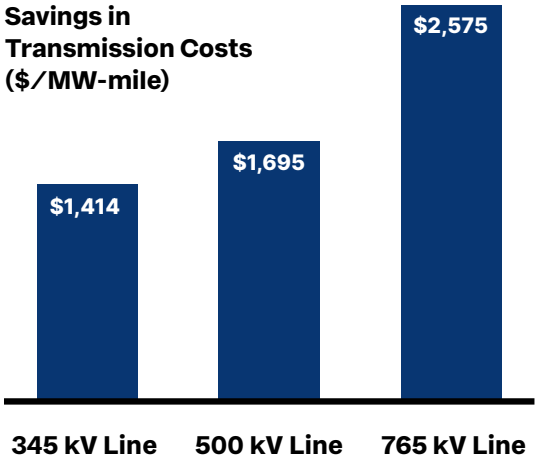
During Winter Storm Elliott,

a 1-gigawatt transmission line between Texas and the Tennessee Valley Authority (TVA) could have delivered nearly **$95 million in value**, primarily to TVA customers. That same line flowing towards Texas two years earlier during Winter Storm Uri would have provided Texans with **close to $1 billion in benefits**.

Source: ACORE and Grid Strategies

One recent analysis found that **expanded investment in well-planned, high-capacity transmission (regional and interregional) would save residential customers $6.3-10.4 billion per year**, when taking into account a wide spectrum of benefits.

Source: Grid Strategies and ACEG



Each element of the system serves a necessary purpose, but **how we invest matters. Planned regional infrastructure often costs less and delivers more** than building piecemeal local connections as needs arise.

Advanced transmission technologies are energy affordability technologies

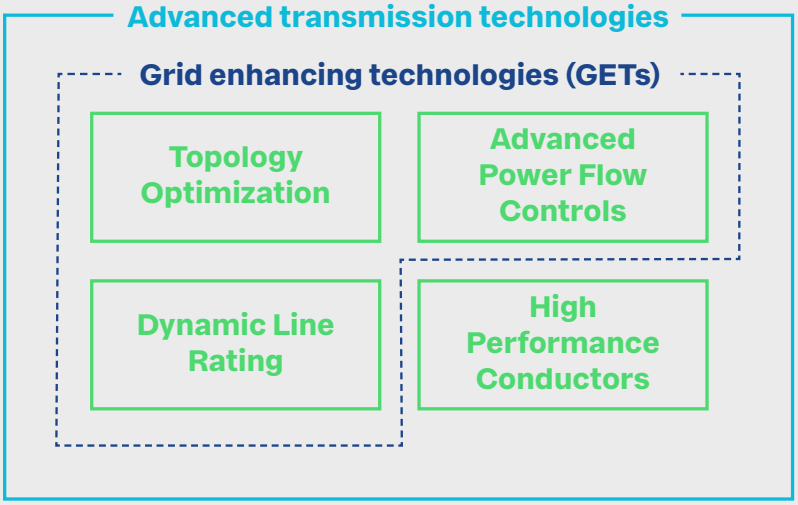
With an aging electricity grid and growing demand, investment in new electricity infrastructure is unavoidable. Evaluating advanced transmission technologies (ATTs) as part of the solution **brings modern technology to an antiquated power grid, helping to rein in energy bills.**

ATTs support affordability in four ways

1. **Upfront costs are lower**
2. **New sources of energy can come online faster**
3. **Less energy is lost as it travels from Point A to Point B**
4. **Electricity can be routed around bottlenecks in the grid**

Bottlenecks in the power grid create **congestion**, which drives up prices by creating shortages in places that are hard to reach. Grid enhancing technologies (GETs) can reduce grid congestion by 40%+, which **would have saved ratepayers $4-8 billion per year in recent years.**

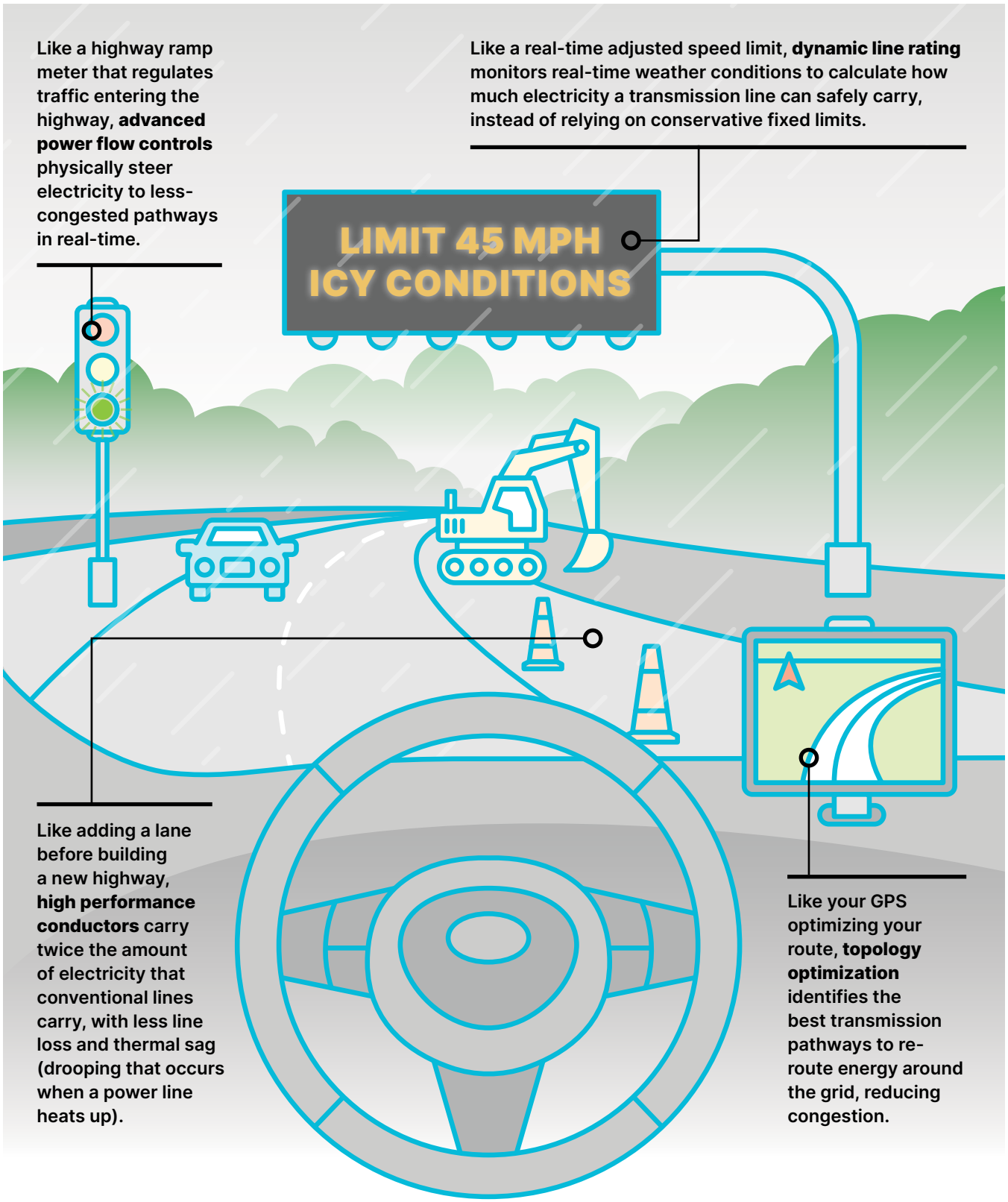
Source: Brattle, WATT Coalition



ATTs are infrastructure, hardware, and software options that cost-effectively increase the capacity and resilience of the transmission grid. They include grid enhancing technologies as well as high performance conductors.

How do ATTs work?

A traffic analogy is useful for understanding ATTs



Like a highway ramp meter that regulates traffic entering the highway, **advanced power flow controls** physically steer electricity to less-congested pathways in real-time.

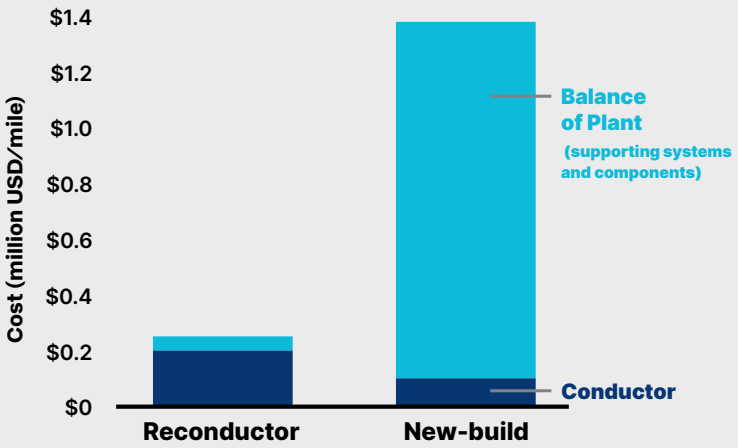
Like a real-time adjusted speed limit, **dynamic line rating** monitors real-time weather conditions to calculate how much electricity a transmission line can safely carry, instead of relying on conservative fixed limits.

Like adding a lane before building a new highway, **high performance conductors** carry twice the amount of electricity that conventional lines carry, with less line loss and thermal sag (drooping that occurs when a power line heats up).

Like your GPS optimizing your route, **topology optimization** identifies the best transmission pathways to re-route energy around the grid, reducing congestion.

ATTs deliver huge savings

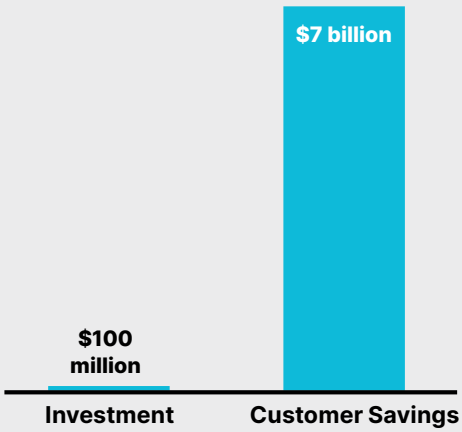
Reconductor vs New-Build Cost 200-300 kV



Upgrading the wires on existing power lines with high performance conductors (HPCs) reduces costs, timelines, and impacts compared to building new lines. Reconductoring with HPCs costs roughly 78% less than building a new 200-300 kV line.

Source: GridLab

Potential PJM Customer Savings (in USD) from deploying GETs 2027-2033



A $100 million investment in GETs could bring enough new, cheaper generation online faster to save PJM customers $7 billion over a six-year period.

Source: RMI

$15 million

in customer savings per year

One major U.S. utility company upgraded existing lines to HPCs and is now **saving its customers $15 million per year** just through avoided energy losses.

Source: CTC Global

These solutions help bring new resources online faster and cheaper than building new power lines, making the most of our grid while we build out a larger system to meet growing needs. **Regulators and transmission planners should require ATTs to be evaluated for any future investments in the power grid.**

Additional Resources

Advanced Transmission Technologies

- Incorporating GETs and HPCs into Transmission Planning Under FERC Order 1920
- Unlocking the Grid: A Playbook on High Performance Conductors for State and Regional Regulators and Policymakers
- Unlocking Power: A Playbook on Grid Enhancing Technologies for State and Regional Regulators and Policymakers

High Voltage Transmission

- Large-Scale Transmission Deployment Saves Consumers Money
- The Value of Transmission During Winter Storm Elliott
- Billions in Benefits: A Path for Expanding Transmission Between MISO and PJM