exogrid™

BY AMPJACK

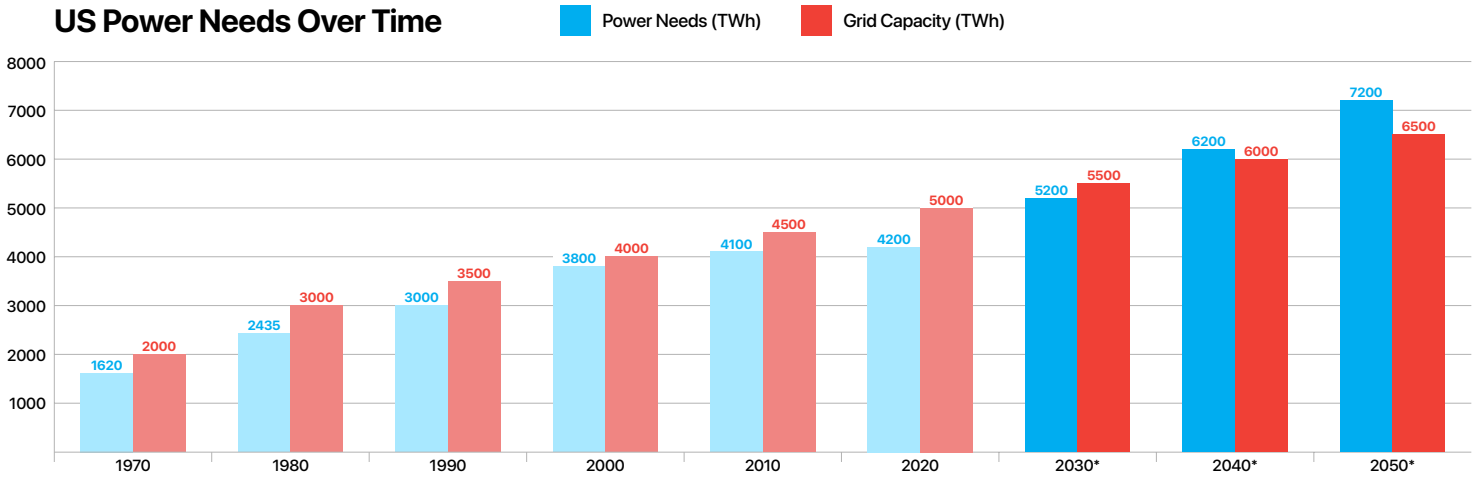
The eco-friendly way to increase grid capacity using existing right-of-ways.

www.ampjack.ca/exogrid

We need more power.

The Department of Energy calls for a 57% increase in transmission capacity and a 120% boost in interregional transfer by 2035. This demand is fueled by renewables, AI, data centers, and shifting industries. But our current grid can't keep up. Upgrades face major challenges: right-of-way acquisition, rapid tech shifts, renewable siting, and NIMBY resistance. Innovation and urgency are critical!

US Power Needs Over Time



*Data for 1970-2020 taken from U.S. Energy Information Administration (EIA). (2023). Annual Energy Review and Monthly Energy Review. Data estimates for 2030-2050 based on future needs and upgrade plans.

We face challenges.

New right-of-way acquisition

New right-of-way acquisition is a significant challenge for the power industry. It involves navigating complex regulatory approvals, land use conflicts, and public opposition, all of which can delay critical infrastructure upgrades.

Addition of new technologies

Rapid growth in AI data centers and renewables like wind and solar is reshaping energy demand and supply. Many sites are far from population centers, and today's grid can't yet move that power where it's needed most.

Not in my back yard mentality

NIMBY-ism poses a significant challenge to grid upgrades, as local opposition to new power lines and infrastructure can lead to prolonged delays, increased costs, and complex regulatory hurdles.

We have the solution.

Upgrade existing towers for enhanced capacity and grid hardening.

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Uses existing right-of-way

exogrid™ builds new towers over existing ones, maximizing efficiency while minimizing land use and environmental impact. This preserves land resources and avoids expanding the right-of-way.

Potential for reduced timelines

By reusing existing structures, **exogrid™** can shorten project timelines—reducing the need for new towers, foundations, and right-of-way acquisition, speeding up capacity expansion.

Lower cost for you and the environment

exogrid™ offers a cost-effective, eco-friendly solution by using existing infrastructure. It avoids new land development, helping preserve habitats and reduce emissions.

Significantly reduced permitting

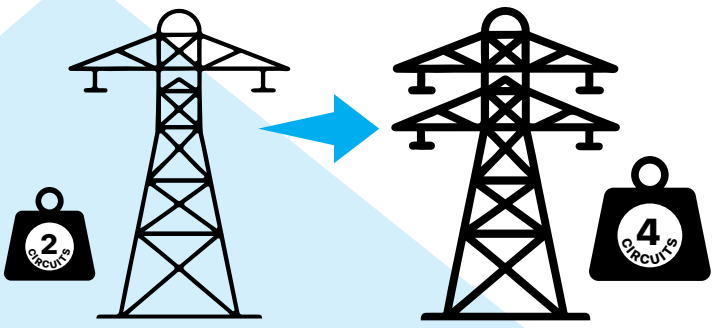
Using current tower sites, **exogrid™** reduces the number of new structures needed, easing permitting challenges and enabling faster project approvals.

Less downtime, more power

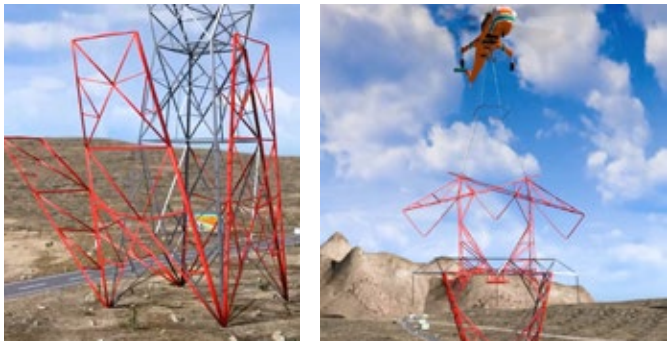
exogrid™ allows upgrades with minimal disruption. Building over active lines lets many improvements occur while systems stay energized, ensuring reliable service.

Enhanced grid hardening

exogrid™ strengthens towers to meet future demands—converting tangents to dead ends, rerating for wind loads, and supporting larger, higher-tension conductors.



Once a tower's structure has been strengthened by adding an **exogrid™** exoskeleton, the tower can hold additional weight, and allows for upgrades such as bundled or additional circuits.



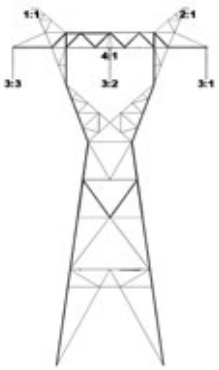
exogrid™ structures (pictured in red for demonstration purposes) are assembled off site and then assembled in place using common construction equipment.

Innovative applications.

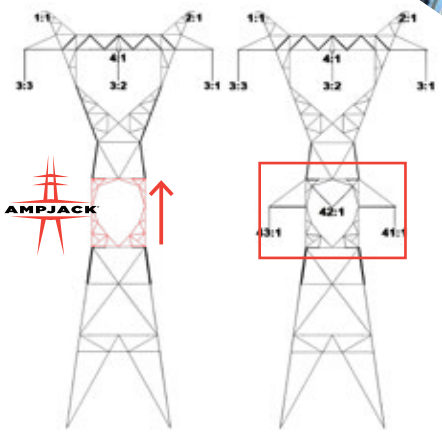
APPLICATION: ADD CIRCUITS BELOW EXISTING CIRCUITS

Raise towers, add *under-build* circuits.

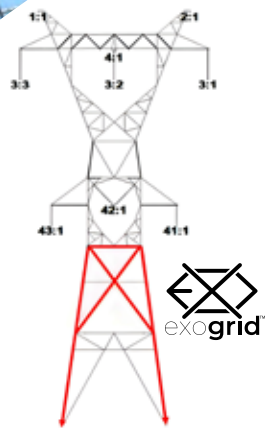
By combining Ampjack® Tower Raising with exogrid™ technology, we offer a unique, innovative approach to upgrading transmission lines, adding circuits, and hardening the grid—all without the need for new towers or costly right-of-way acquisitions.



Existing 345kV or 500kV single circuit tower.



Tower raised using the **Ampjack® tower raise system**. Modified mid-body extension for clearance window for lower 115kV or 230kV circuit.

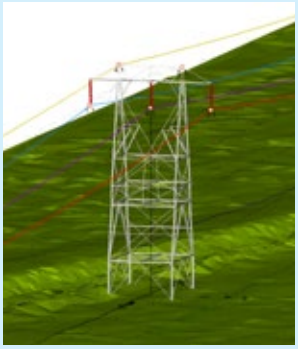


Modified to 230kV double circuit transmission tower with **exogrid™** exoskeleton for stability.

APPLICATION: CONDUCTOR BUNDLING

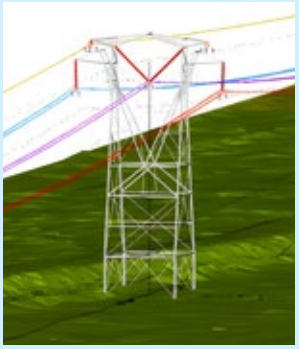
Increase capacity with *conductor bundling.*

exogrid™ reinforces towers with a structural exoskeleton, enabling conductor bundling that can double the number of conductors per tower, significantly enhancing transmission capacity and grid reliability.



Existing tower: **Single conductor.**

Modifying upper window and tower top.

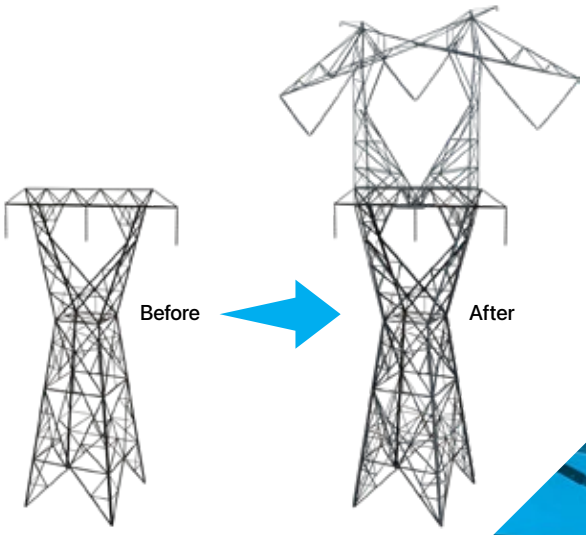


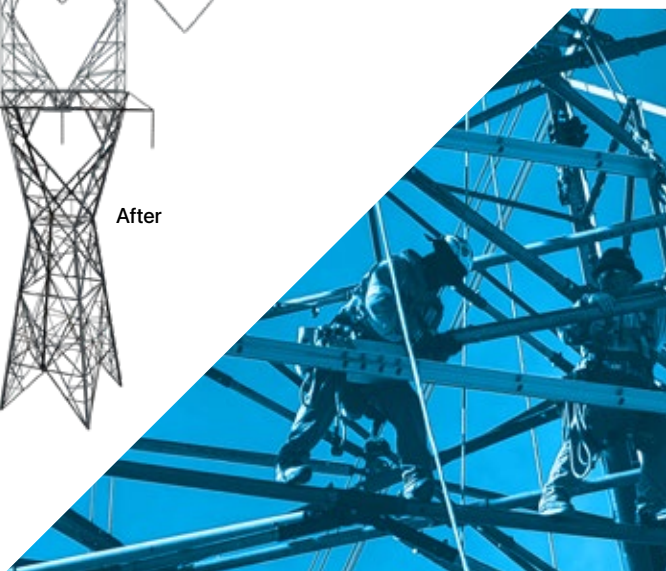
Upgraded tower with complete exogrid™ modifications and **double bundle conductor.**

APPLICATION: ADD CIRCUITS ABOVE EXISTING CIRCUITS

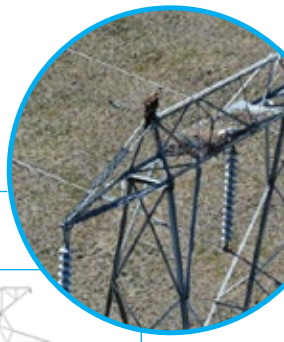
Strengthen towers, add *above-build* circuits.

By combining Ampjack® Tower Raising with exogrid™ technology, we offer a unique, innovative approach to upgrading transmission lines, adding circuits, and hardening the grid—all without the need for new towers or costly right-of-way acquisitions.





Solving real challenges.



CASE STUDY 1:
UPGRADE RATHER THAN REBUILD

Primary objectives

- Retrofit existing transmission lines to accommodate 2x bundled HTLS (ACCC) circuit configuration
- Increase window and phase wire clearances to modern standards
- Resolve bird fouling issues

Secondary objectives

- Increase ground line clearance and remove floating dead-end configurations
- Minimize scheduled outage time
- Implement climbing and fall-arresting standards
- Develop a consistent design for structures of the same type
- Develop a constructible sequencing plan

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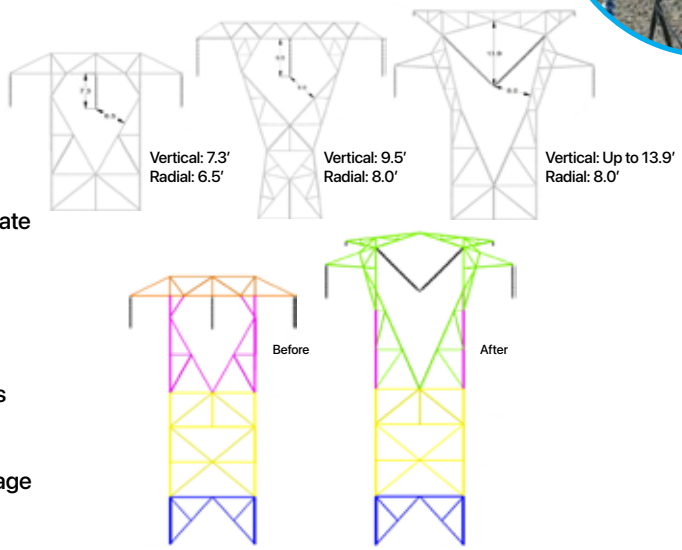
SOLUTION

- Bridge & K-Frame modified to accommodate V-String center phase
- Outside phase height increased by 5′
- Able to eliminate standard configuration once re-conductoring is completed
- Vertical clearance to bridge increase to average of 10′, up to 13.9′



COST SAVINGS

As per California ISO Generator Interconnection Procedures (ISO Tariff DD Appendix 5)

Tear-down	**$1.19M/mile**
Rebuild	**$4.7M/mile**
Distance	**30 miles**
Total cost~	**$177M**

Towers: ***single circuit*** **ASCR conductor**

exogrid™	**$2.1M/mile**
Distance	**30 miles**
Total cost~	**$63M**

Towers: ***twin bundle*** **ACCC conductor**

CASE STUDY 2:
NO NEW RIGHT-OF-WAYS REQUIRED

TRADITIONAL OPTION 1:

Full tear-down and rebuild for higher capacity

- Full tear-down of an existing 345kV line and rebuild with a 500kV triple bundle t-line.

- **Cost estimate:** ~ $1.1B
- **Time estimate:** ~ 10 years

TRADITIONAL OPTION 2:

Keep existing line, purchase new right-of-ways

- Purchase additional right-of-ways to build a second line to raise the network capacity.

- **Cost estimate:** ~ $990M
- **Time estimate:** ~ 9-10 years

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SOLUTION

Use exogrid™ to upgrade all existing towers to 500kV and bundled conductors

Using ***exogrid™'s*** exoskeleton system, upgrade your towers where they stand, no need for tear-downs or purchasing of new right-of-ways, and expedite any permitting or construction delays.

- **exogrid™ cost estimate:** **~ $500M** (approx. ½ the cost)
- **exogrid™ time estimate:** **~ 2-3 years** (approx. ¼ the time)

Additional grid hardening benefits.

Severe weather events are becoming more frequent and intense, making the resilience of utility infrastructure crucial. exogrid™ offers an advanced solution to harden transmission towers, ensuring your grid can withstand extreme conditions while maintaining reliability and safety.

With the increasing energy demands, exogrid™ provides utilities with a reliable and cost-effective way to strengthen the grid for current and future needs.

Improving Structural Integrity for Aging Infrastructure

Increase Grid Reliability
Fortify transmission towers to ensure consistent power delivery and reducing the risk of service interruptions.

Minimize Outages
Strengthens existing infrastructure to meet modern safety and performance standards.

Cost Savings
Avoid expensive full replacements by retrofitting existing towers with advanced reinforcement technology.

Hardening Towers for Extreme Weather Events

Resilient Structures
Reinforces transmission towers to endure high winds, ice loads, and heavy storms.

Minimize Downtime
Reduce the risk of service interruptions during severe weather conditions.

Future-Proofing
Prepares your infrastructure for the increasing unpredictability of weather patterns.

Licensed to upgrade.

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With flexible licensing options, exogrid™ allows you to seamlessly integrate this innovative system into your infrastructure, optimizing performance and future-proofing your grid.

How do I license exogrid™?

We work closely with utilities and contractors to ensure the optimal application of exogrid™ technology for each project.

- exogrid™ can be licensed on a per-project basis or for system-wide implementation, providing maximum flexibility.
- We also offer partnership arrangements. Contact us to explore how exogrid™ can help modernize your grid.

Who can license exogrid™?

- Electric utilities
- Engineering firms
- Construction and EPC firms
- Other qualified organizations involved in grid modernization.
- Regulatory agencies

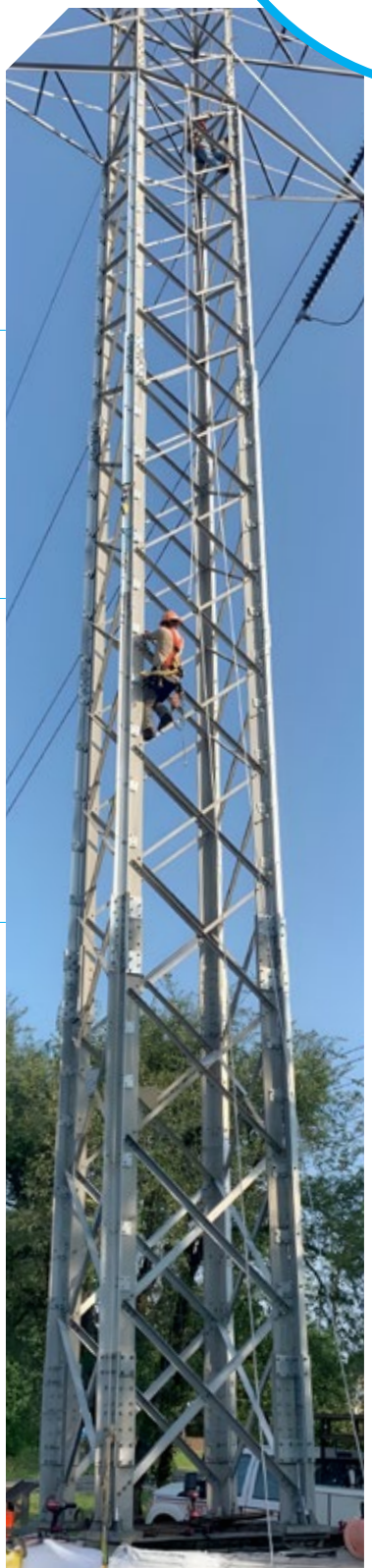
What does a license include?

- Access to the full exogrid™ IP portfolio, including current and future innovations.
- Project feasibility studies tailored to your infrastructure.
- Engineering support and testing data to ensure seamless implementation.
- Comprehensive exogrid™ training and installation guidance.

What are qualified exogrid™ consultants?

Qualified exogrid™ consultants are licensed to design, engineer, and oversee exogrid projects for clients. These professionals are industry leaders, including:

- Top-tier engineering firms
- Expert consulting engineers
- Experienced EPC firms



Upgrade existing towers for enhanced capacity and grid hardening

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- **Uses existing right-of-way**
- **Potential for reduced timelines**
- **Lower cost for you and the environment**
- **Significantly reduced permitting**
- **Less downtime, more power**
- **Enhanced grid hardening**

Contact us today to learn more

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Ampjack Industries Ltd. is an engineering venture dedicated to developing and utilizing advanced transmission line procedures, tools, and technologies, providing comprehensive solution systems to utility and transmission line owners worldwide. Our sustainable solutions cater to clients seeking innovative, cost-effective, and safe transmission line upgrade options that we continuously strive to improve. With a team of highly experienced engineers specializing in new and upgrade design, structure raising, mid-span structure placement, reconductoring, and more, Ampjack delivers practical and reliable solutions for challenging projects. Our operations team offers specialized turnkey transmission line upgrade and maintenance services, from initial inspection to final repair or upgrade. Ampjack's commitment to excellence ensures the most economical and efficient solutions for our clients, making us a sought-after partner in the industry.

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