The Weakest Hour
Meets the Weakest Link

ICF's 2026 demand report calls for getting more out of the grid we already have. Here is the component that plan rests on.

ICF released its 2026 demand growth report last week, *Electricity Demand Growth: How Will the Grid Keep Pace?*, and it deserves your attention precisely because it isn't advocacy. It's a self-funded analysis from a consultancy that models the grid for a living, and its numbers are sobering.

Total U.S. electricity demand will be up 21% by 2030 and 39% by 2035 from 2026 levels. Peak demand will be up 14% by 2030 and 25% by 2035. And against that growth, ICF counts roughly **26 GW of excess generating capacity nationwide above minimum reliability requirements: about 3% of the U.S. fleet**. In ERCOT and PJM, the number is zero. Not “tight.” Zero. SERC and NYISO are forecast to follow within a few years.

Yes, a historic generation buildout is underway; ICF projects 445 GW of additions from 2026 through 2030. But read the fine print: only 68 GW arrives in 2026, and on a peak-contribution basis, those 445 GW deliver only about 191 GW of dependable capacity. Meanwhile, the loads are asking for service *now*.

So what does ICF prescribe for the gap years? Better use of what's already built. Grid-enhancing technologies. Higher utilization of existing corridors. Conditional firm service that connects new loads today using the grid's spare capacity, in exchange for curtailment during constrained hours. FERC Orders 881 and 1920 already point in the same direction.

The report's transmission section puts it in language worth pinning to the wall of every planning department. Transmission investment is rising steadily (roughly $178 billion planned by investor-owned utilities for 2025 through 2028, per EEI figures cited in the report), and ICF calls transmission the primary enabler of future load growth. Then comes the qualifier: how quickly that growth can be served will depend as much on optimizing the grid we already have as on completing the major projects. I agree with every word of it. And I want to talk about the assumption buried inside that qualifier, the one nobody at ICF, or FERC, or most utilities ever examines.

Every better-utilized line hangs on its connectors

When we say a transmission line will run at higher utilization, here is what we mean physically: more current, more of the time, through every component in the circuit. The conductor. The suspension hardware. And the connectors (splices and dead-ends).

The conductor gets all the attention. It has a thermal rating, a sag model, and sometimes a dynamic rating system watching it in real time. The connectors get none. They are assumed to be at least as good as the conductor they join.

That assumption is roughly 100 years old, and it is wrong.

The compression connector, the industry's default connector technology since the 1920s, depends on residual mechanical stress from the crimping operation to maintain its electrical interface. Published research tells us how little of that stress survives: **after the compression die is removed, the connector retains only 5–18% of peak crimping stress.** Thermal cycling then relaxes 92–95% of what remains. The degradation is internal, invisible from the ground, and cannot be remedied by any surface treatment or coating.

This is not a fringe concern. Consider where the standards stand: the published ANSI standard for transmission connectors, C119.4, covers connectors designed for normal operation at or below 93°C. C119.7, the standard intended to qualify connectors for high-temperature conductors, remains unpublished after years of committee work. **The industry is deploying conductors rated to 250°C, governed by connector standards written for 93°C.** That gap is the story.

Independent testing puts numbers on the gap. In thermal cycling performed at Kinectrics (report K-657046), a conventional compression splice **failed at cycle 50**. A ClampStar® shunt on the same program **completed a total of 1,000 cycles, 500 at 335°C and 500 at 390°C** without degradation.

Thin margins make the contingency case real

Here's where ICF's reserve-margin math connects directly to hardware. A grid with a 3% national cushion and zero in its two largest markets is a grid where N-1 contingency events stop being planning abstractions and become operating reality.

Consider two parallel lines sharing a corridor, a configuration found across every RTO. When one trips, the survivor picks up the load, roughly doubling the current it carries. Because heating scales with the square of current, doubling the current quadruples the I^2R heating at every connector, driving the conductor toward its maximum rated temperature (250°C for ACSS). To be precise, utilities don't operate anywhere near that temperature continuously, and shouldn't. But the contingency case is exactly what qualifies the hardware. Connectors on both parallel lines must be rated for the full temperature the conductor can reach under N-1, because on the day one line is lost, the other line's splices are all that stand between a contingency and a cascading outage.

A compression connector that has quietly relaxed through twenty years of thermal cycles meets that emergency condition at the worst possible moment.

The weakest hour, the weakest component

One of the report's sharpest lines comes from its demand-response analysis: “reliability depends on the weakest hour, not the best hour.” ICF wrote it about customer programs, and it's exactly right. A resource that delivers early in an event but fades before it ends is not dependable capacity.

The same logic governs hardware. Reliability depends on the weakest *component*, and on a heavily utilized transmission line, the weakest component is seldom the conductor. It's the connector: unmonitored, unrated for the duty it's being asked to perform, and degrading in a way no inspection from the ground can see.

Some utilities have quietly reached this conclusion already. At least one major utility's publicly filed wildfire mitigation plan includes a dedicated, ongoing splice-shunting program as a named risk-reduction activity: a formal acknowledgment, in a regulatory document, that legacy splices are a fire and reliability risk worthy of systematic remediation.

What connector readiness looks like

If your system is on ICF's map of high-growth, low-headroom regions, the question to put to your standards and asset-management teams is simple: *when this line runs hotter, what is the rated temperature of every splice and dead-end on it, and how do we know?*

For circuits where the honest answer is "we don't," ClampStar® Engineered Electrical/Mechanical Shunts offer a path that doesn't require cutting the conductor or taking the extended outages of full splice replacement. A ClampStar unit installs over the existing connector, restoring full mechanical strength and providing a parallel electrical path independently verified through 1,000 thermal cycles at temperatures well beyond the 250°C rating of ACSS, qualifying the connection for the duty the next decade will actually demand of it.

ICF has told us where the demand is going and why the grid will be asked to do more with the lines it already has. The conductor community has spent a decade preparing for that future. The connector question is the one still sitting unexamined in the middle of every uprated span.

It's worth asking before the weakest hour finds the weakest link.

Chris Costanzo is the Director of Marketing & Communication at Classic Connectors USA, LLC. *The full ICF report is available at icf.com. Kinectrics test documentation and technical white papers are available on request.*