

Evolving the worldwide electrical grid

The technology and business
practices that will get us there



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Climate change impacts every aspect of life on earth. Uncommon temperatures, rising ocean levels, extreme weather events, and devastating droughts are commonplace.

As the world frantically scrambles to offset carbon intensity and replace infrastructure, utilities carry a great responsibility: redefining how we generate, distribute, and consume the energy we need to power the planet.

Of particular concern is the global power grid, an ageing infrastructure that already stutters and fails when tested too hard. Shoring it up isn't an option. The old model must be reconfigured to support the new model: renewable energy generated by industry and consumers, collected, and delivered via a decentralized grid.

This is an epic project. While it's essential to identify and overcome the challenges that stand in our way, it's also worthwhile to remind ourselves of the goals we must collectively achieve to get there.



Goal #01 : Re-balance supply and demand

Utilities face the same pressure as most businesses in balancing supply with demand, delivering electricity to offset the load. If the supply is inadequate or the demand is too high, the system fails, and a black- or brown-out occurs.

As renewable energy gains momentum and the planet's reliance on fossil fuels lessens, the balance between supply and demand must be re-engineered.

Rather than viewing load as an immutable target, the future state for utilities is one where load and supply are both variables. Instead of scrambling to satisfy an ever-increasing demand, organizations must implement new strategies to influence how and when energy is consumed.

Challenges

The electrical grid is already incapable of supporting the contracted global load. Fortunately (and for now), demand is variable so there is no need to satisfy 100% of the world's energy entitlement.

However, energy consumption is becoming more unpredictable due to heightened demand. For example, the electrification of e-vehicles, transport, heat pumps, and the insatiable appetite of technology such as AI and the large data centers that power it.

As consumption increases, so does the frequency of blackouts.

Electricity grid failures are trending up and at a faster cadence year over year, with five of the [top 10 electricity blackouts](#) having occurred since 2019:

- Venezuela, (March 2019)
- South America (parts of Argentina, Paraguay, Uruguay) (June 2019)
- Indonesia, 2019
- Texas, USA, (February 2021)
- Pakistan, (January 23, 2023)

While the expansion of renewables will offset some of the demand, solar and wind energy supplies are intermittent and must be consumed immediately unless additional infrastructure to store the energy is available. Creating a new, more flexible balance between load and supply is critical to stabilizing the grid.

What's working: technology and business practices



Cloud-based, AI-powered solutions

Most utilities recognize the importance of technology in engineering the sea change that is underway. For example, in a recent survey of utilities, [over 82% of respondents](#) consider AI essential to their digital transformation strategy.

IFS customers benefit from [cloud-based capabilities](#) powered by artificial intelligence that reduce complexity, costs, and risks while providing unparalleled flexibility.

IFS combines deep industry experience with intelligent and autonomous capabilities within a single product, helping utilities plan, manage, and optimize critical asset availability, service delivery, and workforce productivity—all critical factors as the industry reinvents itself.



IFS has strength in the breadth of service capabilities that incorporate AI, machine learning, and IoT.”

Aly Pinder, Research Vice President,
Aftermarket Services Strategies





Communication

Streamlined customer communication is imperative in managing demand. A good example is the 2023 heat dome in California. Even though the state set records for the percentage of renewables serving the electrical load, usage increased dramatically during the warm temperatures, and the grid was pushed to the edge of collapse.

Using automated customer communication technology and the emergency broadcast system, grid operators explained why and how residents must conserve energy during peak periods or face a blackout. The community came together, avoiding a grid failure event.



Managed energy consumption

Another practice on the rise is the implementation of Flexible Energy or Demand Response programs that distribute demand over a longer time horizon.

In this model, utilities communicate and work directly with consumers, incentivizing them to use energy (charge EVs and devices, do laundry, etc.) during off hours to help balance the load. Many IFS utility customers support these programs in the evolution of their business model.

For residents that are low income or without the means to install their own solar arrays, community microgrids enable them to share in a flexible energy model. Entire communities generate their own power, actively participating in the energy market by selling back excess supply to the grid and taking some of the load off the primary grid during peak demand periods.



Additional options

Supplementary programs and solutions that support the shift to a new grid include distributed energy resources management systems (DERMS), the implementation of energy-efficient equipment, rate tariffs, energy audits, and customer education campaigns to share tips and tricks.

IFS customers with flexible energy and demand response programs



IFS Cloud...will give us full control of all of our data, and the ability to share real time data with all our stakeholders. This will further enable active management of power distribution, to ensure that peak consumption doesn't hit at the exact same time."

Jon Andreas Pretorius, CIO, Elvia



[Read the full story](#)



Exelon is a Fortune 200 company serving more than 10.5 million customers in the United States. Exelon's [stewardship commitment](#) is to help customers save energy and reduce monthly bills through energy efficiency, real-time pricing, and demand response programs. The company began working with IFS in 2024.

[Read the full story](#)



Stockholm Exergi is Stockholm's energy provider. The company's Annual Report commits to meeting Stockholm's electricity, heating, and cooling needs through efficient and flexible energy production, ensuring greater Stockholm is supplied with cost-effective and sustainable energy regardless of weather and temperature. Stockholm Exergi began working with IFS in 2021.

[Read the full story](#)

Goal#02 : Strategic asset investments

The world's power grid is massive. Europe operates [the world's largest interconnected grid](#), with over 400 interconnections linking nearly 600 million citizens. In North America, the infrastructure serves almost 400 million consumers across the continent.

Regardless of scale, the grid is showing its age, requiring constant care, vigilance, and innovation to maintain minimal standards.



Serves
400M+
consumers

5 interconnections
(2 major, 3 minor)



Serves
600M+
consumers

400
interconnections

The grid reached such an abject state due to many factors, including a chronic lack of investment, climate change, and ever-increasing energy loads that have outpaced the system's capabilities. Today, power for the planet depends upon antiquated infrastructure and assets that are too old to perform at scale.

Rebuilding the grid is the only option. But it's a lofty goal that requires utilities to invest in and replace critical assets and infrastructure, all while keeping the lights on. Literally. The question is where to start and how.

Challenges



Sustaining what's already there

Along with new infrastructure, asset investments must also support acquiring the necessary parts and components to sustain the existing operation, which isn't easy given its age.

Finding replacement parts is difficult. It's not unusual to see maintenance teams cannibalizing decommissioned assets or scouring the internet, looking for used parts no longer available within the existing supply chain. While some parts manufacturers offer certified, remanufactured parts, the global inventory is finite and diminishing daily.



Insufficient funding

Without appropriate funding, assets and equipment degrade over time due to inconsistent service and maintenance,

Public utilities limp along, squeezing painfully limited budgets to barely power the operation, while investor-owned utilities focus on profits versus investing in assets and infrastructure. Such systemic neglect complicates efforts to rebuild and repurpose the grid.

While technology has helped to increase efficiencies in certain areas, the industry could serve as a master class in doing as much as possible with very little.



Increased risk

With insufficient funding and neglected infrastructure, the grid has become a risky business, jeopardizing safety and the environment.

Catastrophic weather events spurred on by climate change trigger ever-escalating grid failures. For example, [in 2024, in the Balkan region](#), high temperatures created a sudden spike in consumption, causing an overload. Businesses and traffic systems were disrupted, and people were left without air conditioning amid an extreme heat wave.

In North America, weather events highlight the precarious state of the grid, fuelling disasters such as [the 2021 winter blackout in Texas](#), where hundreds died, and [wildfires sparked by downed power lines in California](#), Texas, and Hawaii.

As we've seen in California, utilities are being held to task for these failures with significant fines, criminal charges, and other penalties.

Utilities want and need to do better, investing millions of dollars to incorporate wildfire mitigation plans with new infrastructure investments and increased inspections.



Inadequate investment

The investment curve needed to upgrade the grid and move to a distributed model is massive. It certainly won't be funded by the ratepayer alone. Getting the grid to where it needs to be will require a significant investment of tax funds.

In the US, massive federal funding programs are available but require complex applications and often come with strings attached. For example, a requirement to buy locally when most of the components for the new infrastructure are only available overseas.

While support for solar and wind energy projects has increased in the past few years, investing in the existing grid remains a distant third.



What's working: technology and business practices



Future grid needs can only be met cost-effectively if utilities are able to model and assess key drivers including climate risks, asset health, and customer adoption of distributed energy resources.

Grid planning under uncertainty:
Investing for the energy transition

McKinsey & Company



Asset management and performance

Optimizing efficiencies within the existing operation extends the timeline to replace aged infrastructure. This means monitoring asset performance in real-time and carrying out predictive maintenance before asset failures occur.

With real-time data generated from assets across the operation, IFS utility customers leverage scheduled, reactive, and predictive [enterprise asset management](#) capabilities that minimize downtime while maximizing productivity, lowering the cost to manage and extend asset lifecycles.



Data-based insights

Some utilities have become proactive in their asset strategies, applying decision-making models to help manage critical infrastructure. Coupled with asset performance management, artificial intelligence, and other advances, utilities make data-based decisions to understand which assets are most vital to the operation and which are most likely to fail.

These insights help develop the roadmap to a contemporary power grid, informing where and when the utility must invest in new equipment versus maintaining the status quo.



Asset investment planning

The [acquisition of Copperleaf Technologies Inc. by IFS](#) reflects the value of pairing leading cloud and industrial AI software with advanced asset investment planning and management (AIPM) technology.

IFS customers that use the Copperleaf Suite in concert with existing [IFS Cloud technology](#) benefit from capital investment plans that align with EAM maintenance strategies. This combined perspective incorporates a new financial facet within asset management to further guide decision-making, one that looks at asset investment, balancing cost, risk, and resources to optimize investments.

These insights help the utility determine which components and parts should be immediately repaired, replaced, or built anew and which can be maintained (and even run to end of life) until the operation is ready to cut over.

AIPM analytics are rich, providing details down to the parts within a given asset, including where and how they could be used. For example, with AIPM data, the utility can quickly identify where a part could be harvested to support a business-critical asset that is failing.



Industry collaboration

As we enter a new frontier of energy production and consumption, utilities must work collaboratively. By sharing goals and constraints, new KPIs will be established to serve as benchmarks that guide the enterprise software technologies required for a modern power grid.

87% of utilities

Emphasize the importance of [setting and measuring critical KPIs embedded in enterprise software](#).

[Read the utility industry survey](#)

Goal #3 : Strong and dynamic workforce

Along with inadequate budgets, climate change, and ever-increasing energy demands, utilities face the same global talent shortage as most other industries. Over [70% of utilities](#) worldwide report chronic shortfalls in hiring new people.

Unfortunately, working at a utility is rarely at the top of the list for the most desirable job candidates who instead focus on higher-profile employers known for their technology-forward philosophies.

With little to attract the next generation of workers, utilities must reinvent how they present themselves to potential employees. Future-proofing the global energy grid will require the brightest and the bravest minds.

Challenges



An exodus of workers

Whether retiring early, seeking a better balance between life and work, or simply shifting one's career path to more meaningful employment, people are leaving the workforce in droves.

This trend came to the fore in 2022 when businesses worldwide experienced the great resignation. At the time, the US reached a high of [4.5 million workers quitting their jobs each month](#), with [hundreds of thousands of European workers](#) doing the same.

With little appeal to work in the industry, job seekers go elsewhere, forcing utilities to maintain existing operations with an ever-shrinking workforce.





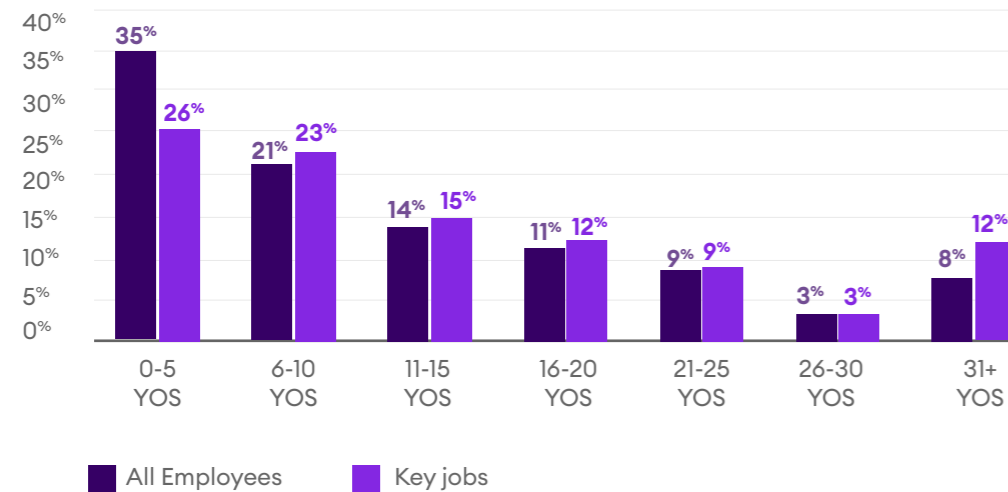
Loss of experience

Over 50% of the utility workforce is within 10 to 15 years of retiring. When they depart, these employees take all the experience and knowledge accrued over the years. The void they leave behind is impossible to fill, with new workers ill-equipped to learn and ramp quickly.

While the industry has worked hard to hire younger, the result is a workforce with [56% of overall workers](#) having less than 10 years of experience.

Utilities must implement training, mentorships, and other programs to expedite the development of this employee group.

Percent of Employees by years of Service



[Center for Energy Workforce Development \(CEWD\)](#)



Lack of interest in the industry

Young workers are not incentivized to join an industry they consider a technology laggard with a poor track record of environmental stewardship.

While a new global energy grid depends upon people educated in technical disciplines such as science, technology, engineering, and math (STEM), most of these workers are drawn to more glamorous (and better-paying) opportunities. Today, [about half of STEM jobs](#) are in computers and technology.



What's working: technology and business practices



Increased workforce productivity

IFS Cloud customers utilize [maintenance planning and scheduling optimization](#) as well as [mobile workforce management](#) to maximize productivity and safety within the existing employee base.

With such asset-intensive, complex operations, how a utility plans and schedules maintenance and service activities easily means the difference between operational profit and loss. As the industry pivots to a new energy model, every minute and dollar saved allows the lights to stay on longer, keeping costs down not only for the end consumer, but also freeing up capital for investments.

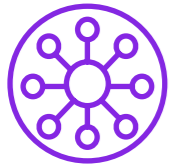
Additional benefits extend to the workforce itself. Onboarding is expedited by ensuring new employees have a constant connection to the back office and senior management via a mobile device.

Workers in the field easily access current and historical asset data and repair instructions to ensure a consistent first-time fix rate. All actions, parts used, and other details of the event transfer seamlessly to the back office, eliminating time-consuming paperwork so employees can focus on the highest-value activities.

**IFS is recognized as the
only Customers' Choice for
Field Service Management
in Gartner Peer Insights.**

[Learn more >>>](#)





Collaboration with educational institutions

Utilities must build partnerships with universities and other educational institutions to engage early with the best graduates.

By showcasing the challenges inherent in rebuilding the grid, the rapid adoption of technology within the industry, and the urgent work underway to turn things around, utilities will position themselves as employers of choice.

These relationships also help to influence curricula, ensuring learning tracks incorporate the scientific and technical requirements to help solve climate change. Such meaningful work resonates with these graduates.



Utilities look to emerging technologies to help them better engage with the workforce. By making use of the latest up and coming technologies, utilities position themselves to prospective employees as part of the future.

[IFS Global Utility Survey 2024: A new era of utilities](#)





Next steps

Clearly, today's utility is changing forever and for the better. Utility companies are no longer just energy suppliers; they must lead the way, expanding services to provide energy and non-core energy offerings. For example, EV, solar, asset rentals, demand response, energy audits, and other energy adjacent options.

Along with whole-scale changes to global infrastructure, utilities must reinvent every aspect of their business, going against the grain of how the industry has worked for decades. To remain viable today and into the future, utilities must:

- Encourage customers to use less of what the utility is selling, negatively impacting revenue
- Invest in new services and infrastructure to help customers do it themselves, instead serving as a broker enabling consumers to buy and sell energy
- Reinvent their public image from that of an obsolete and out-of-touch industry to a future-forward innovator

There is no overstating the urgency of evolving to a new and capable electrical grid. Incremental improvements are insufficient. Utilities must dramatically update their business models and infrastructure to serve their communities and the planet effectively.

IFS has worked with utilities worldwide for decades, developing a deep understanding of the business while collaborating with our customers to design and implement purpose-built technological advances for the industry.

Rebuilding the global power grid won't happen overnight and will probably not be complete within the next ten years. However, as the work is underway to get there, IFS continues to support the industry, improving the reliability and operational efficiency of existing infrastructure and assets while forging a unified and productive operation as we move into the future.

About IFS

IFS develops and delivers cloud enterprise software for companies around the world who manufacture and distribute goods, build and maintain assets, and manage service-focused operations. Within our single platform, our industry specific products are innately connected to a single data model and use embedded digital innovation so that our customers can be their best when it really matters to their customers – at the Moment of Service™. The industry expertise of our people and of our growing ecosystem, together with a commitment to deliver value at every single step, has made IFS a recognized leader and the most recommended supplier in our sector.

Our global team of over 6,000 employees every day live our values of agility, trustworthiness, and collaboration in how we support thousands of customers. Learn more about how our enterprise software solutions can help your business today.

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