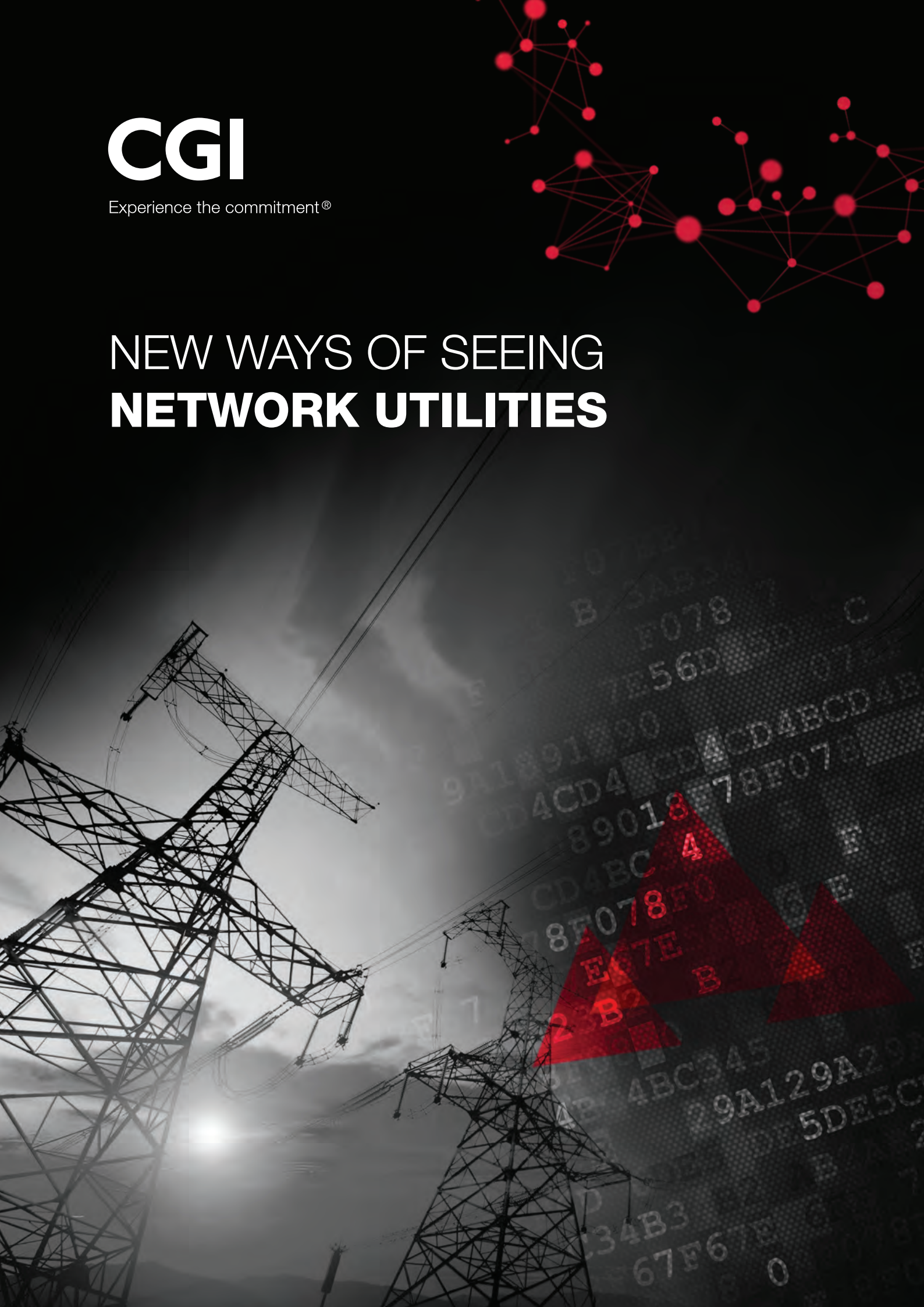


# CGI

Experience the commitment®

## NEW WAYS OF SEEING **NETWORK UTILITIES**





In 1972, art critic John Berger wrote a book called *Ways of Seeing*. It has never been out of print and has been translated from the original English into languages as diverse as German, Russian, Italian and Japanese.

This groundbreaking work, written at a time of transition in the art world, unveiled new and completely different ways of looking at paintings, photographs and other images. Berger's views, although controversial at the time, have seeped into every area of society, and you are likely to have been influenced by them, even if you have never heard of the book.

Today, the utility industries—providers of the basic commodities of energy and water—are also facing a transition in which almost everything is changing. And, new, far-ranging opportunities are emerging for those who can see them.

At the heart of these industries are the transmission and distribution networks that link producers to consumers. To manage successfully the transition that is taking place, utility networks need to evolve their ways of seeing, just as the art world did in the 1970s.

Those who do so will understand and respond positively to the far-reaching changes that are taking place across the entire physical and financial supply chains in their industry.

Taking a holistic view will allow them to exploit market opportunities at a time of uncertainty. It will enable them to balance many different stakeholder expectations while having the flexibility to alter tactics as opportunities and circumstances change. And, it will enable them to achieve all of this while maintaining a clear strategy that will help them to achieve their long-term objectives.

We are calling organizations that embrace, exhibit and act on these attitudes Optimized Network Utilities, or ONUs.

# Opportunity at a time of change

The way in which utilities operate has changed considerably over the last 30 years, and the pace is set to accelerate. The form and structure of utilities will alter enormously—perhaps beyond current imagination.

Utility networks are at the heart of enabling change. They have a responsibility to ensure that the future supply of energy and water is sustainable, reliable and affordable. They also have an opportunity to drive new collaborative business models while maintaining their relevancy in a market prone to change.

Utility networks will have a central role in improving society's quality of life without jeopardizing their own profitability, but only if they put themselves in the driver's seat of the coming market changes and seize opportunities as they present themselves.

All utility markets are facing a range of interrelated paradigm shifts—changes and trends that will tip over to become irrevocable and gradually, but completely, alter the circumstances within which the markets, suppliers, grids and retail operations work.

The timescale for these shifts differs among market models—some are happening now in specific countries while some are a far reality in others. But they are taking place, around the world, albeit at different paces. Nobody knows the exact tipping points for them, but we do know that they will eventually happen, everywhere.

To deal with these shifts, network utilities need to change the way they think and evolve into ONUs. We highlight each shift below, albeit in no particular order.

## From centralized to distributed networks

Grids are moving from **centralized to distributed networks**. The rise of renewable energy and the emergence of the “prosumer”—the consumer who is also a micro-generator of energy—are having a major impact. As a result, network utilities will have to bring together disparate and often intermittent supplies of energy from a range of large and small sources and distribute them efficiently.

This will involve increased use of decentralized intelligent assets—advanced sensors and communications capabilities—working automatically to provide measurement and control at a much more local level.

## From one-way to two-way flows of energy and information

These digitally connected and distributed intelligent assets will enable **the two-way flow of energy and information**, allowing utilities to efficiently manage increasing complexity. This move into an “Internet of Things” environment will enable data from intelligent assets to be managed increasingly in real or near real time across end-to-end business processes. Utilities will move from a “siloed” business model where responsibilities and access to data are restricted to specific areas to a collaborative ecosystem of digital enterprises.



## From matching supply to demand to balancing both

With increased distributed generation and changing consumption patterns, there will be a need to move **from matching supply to demand to balancing both**. Demand will continue to grow, particularly with the more widespread use of energy-intensive devices such as electric vehicles, and utilities will need to move from providing supply whenever it is wanted to actively managing demand as well.

## From the grid to a more consumer-centric model, and from valuing only energy to valuing flexibility as well

The above shifts will require changing the focus from the grid to more consumer-centric models and moving from valuing only energy to valuing flexibility as well. Consumers will be able—and will want—to

take control of their energy use. They will want, for example, options for limiting their intensive use to predefined hours, and of offering their energy consumption flexibility to the provider giving the best deal.

An ONU addresses all of this in a way that does not cost the earth—literally or metaphorically—by adapting its approach to suit individual market circumstances.

The process will be a journey, with the route set by an ONU's broader vision of where it wants to be in the long term within its interconnected ecosystem. The ONU will continually adjust its tactics to make the most of new efficiencies, technologies and ways of working, as well as sometimes having to balance what might seem to be opposite expectations from different stakeholders.

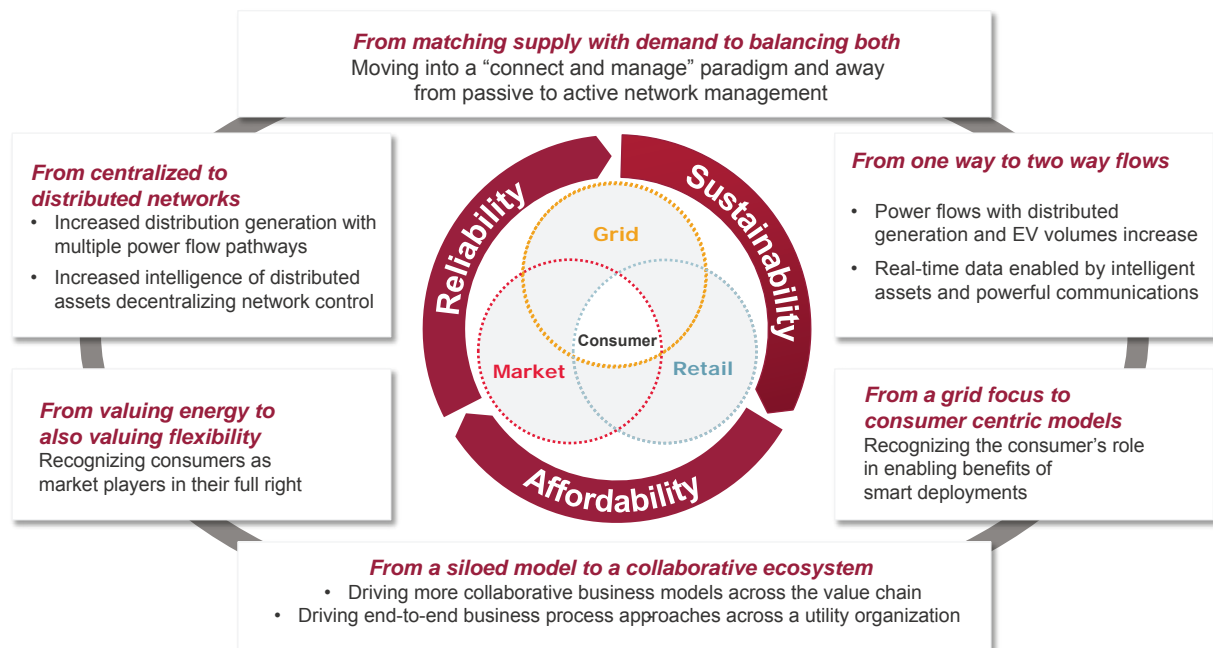
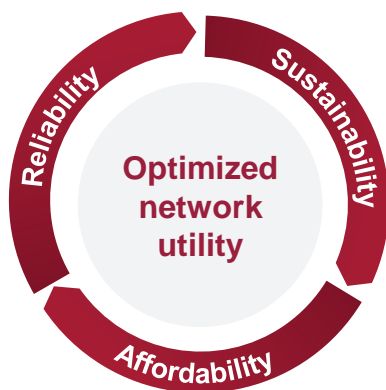


Figure 01: Trends driving fundamental paradigm shifts

# Becoming an ONU

How a network utility responds to these paradigm shifts will be driven by whether it has a holistic view of its role across the supply chain or not. ONUs have such a view and are proactively working towards long-term goals.

Three related ways of seeing will shape the attitudes that will enable ONUs to thrive in a utilities world buffeted by paradigm shifts. These ways of seeing will show how a network utility can take advantage of change to bring greater value to all stakeholders, whether shareholders, suppliers, consumers or regulators.



- 1 Embraces the bidirectional flow of energy and information, assuming a leading role in an interconnected ecosystem**
- 2 Defines a journey of progressively rolling out technologies with clear ROI while building knowledge and flexibility**
- 3 Exploits 360° control and visibility by driving end-to-end business processes enabled by automation and integration of OT/IT**

Figure 02: In CGI's vision, the ONU follows three fundamental mindsets

## ONUs within our vision of smart utilities

ONUs are part of a wider CGI vision of smart utilities that we have been developing with clients over many years. In this vision, we see "smart" as the creation of physical and commercial infrastructures that enable consumers to benefit from affordable, reliable and sustainable energy.

To make that happen, the conventional grid infrastructure needs to evolve towards a multi-directional digital network to manage intermittent supply and demand in real time. Market processes need to be reliable and secure, reducing barriers and costs of entry to the market and allowing retail markets to operate seamlessly across the physical grid.

At the center of this is the consumer. A consumer-centric retail market will bring end users the ultimate benefits of smart utilities, putting consumer needs first while balancing supply and demand.

## Helping ONUs get smarter

CGI has been a major partner to the utilities sector worldwide for more than a quarter of a century, and we are recognized as one of only three leaders in the *IDC MarketScape: Worldwide IT Professional Services for Utility Smart Grid 2014 Vendor Assessment*<sup>1</sup>.

We have been working on smart grids and end-to-end processes for years, developing a portfolio of offerings supported by more than 6,000 professionals who work with more than 250 utility clients worldwide in long-term relationships based on mutual trust, expertise and shared aims.

We help to build the business case for a smart strategy that fits individual needs and market circumstances. We support identifying new markets and models and re-engineering organization processes. We have a proven track record in delivering systems that cover a wide range of operational areas—from managing customer interactions to managing the assets required to deliver energy to controlling and operating the grid. We design and deliver solutions that integrate smart distribution network technologies with existing business systems. Our services allow our clients to scale and align their investments with future strategies and financial returns.

As a result, 11 of the world's 17 energy markets run on our systems. We are supporting smart grid projects such as Portugal's InovGrid and the UK's Low Carbon London, and we are the data services provider for the rollout of 53 million smart meters in the UK. Our Renewables Management System controls more than 5,550 turbines on nearly 300 wind farms in nine countries across three continents. And, 60 percent of the top 100 utilities in North America rely on us for asset, workforce and outage management systems.

In short, we not only have a future vision for utilities, we are already delivering on it.

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<sup>1</sup>*IDC MarketScape: Worldwide IT Professional Services for Utility Smart Grid 2014 Vendor Assessment, Document # EI246402, January 2014.*

# Way of seeing 1: The market

An ONU embraces the bidirectional flow of energy and information, assuming a leading role in an interconnected ecosystem

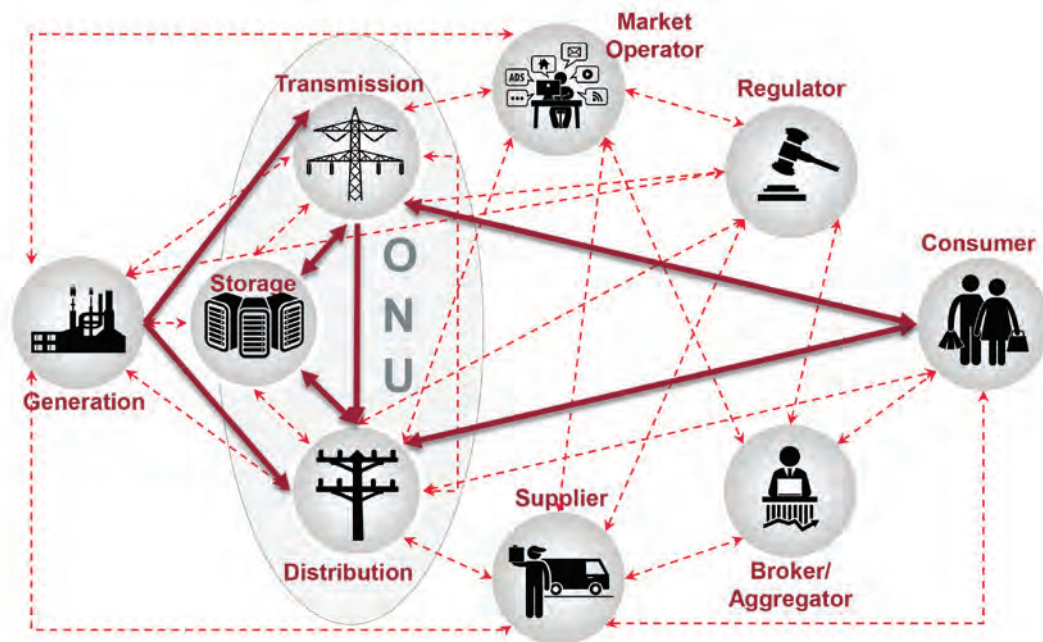


Figure 03: Actively managed systems and complex energy flows supported by extensive data exchange and collaboration with multiple players





An ONU drives change—anticipating events rather than following them. Paradigm shifts can quickly reach a tipping point, and an ONU recognizes that responses need to be planned early, with long-term objectives.

Understanding that new energy generation capabilities will come from multiple sources and will need to be balanced dynamically with demand, an ONU develops new, sustainable collaborative business models across the supply chain.

An ONU will actively bring grid operations closer to consumers and actively manage demand to make it much more flexible. The ONU will become an enabler of higher volumes of distributed generation and of energy-intensive devices, such as electric vehicles, with minimized grid reinforcements and guaranteed supply reliability.

Such changes are a major opportunity for an ONU to improve the efficiency of the network, with digital transformation enabling a two-way flow of information as well as energy.

As interconnections extend, an ONU introduces more collaborative business models throughout the value chain, across market stakeholders and even between the ONU's own departments.

The form these new business models take will depend on local conditions and vary from country to country, but they will shape an ONU's strategy, planning, organization and operations. ONUs welcome becoming part of a wider ecosystem of stakeholders involved in a smarter grid that more closely aligns generation and consumption by viewing the operation across the supply chain.

An ONU understands the critical need to forecast how consumers manage their demand and how and when “prosumers” produce energy. A real-time, end-to-end, 360° view of the grid and everything connected to it will gradually be developed to predict and shape demand as energy flows vary.

This means that an ONU will align value streams in the grid, while building sustainable, collaborative business models to maximize capacity at minimal cost.

Bidirectionality gives ONUs the opportunity to shape and control both demand and generation, putting them at the heart of the energy system and in charge of their own destiny.

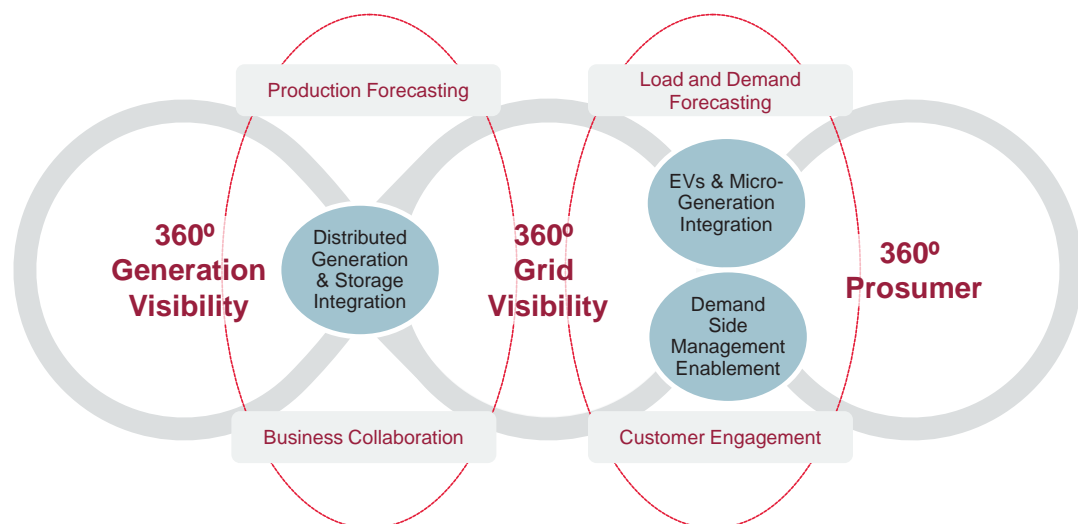


Figure 04: Making demand flexible as generation becomes inflexible through increased visibility and control

## Helping network utilities to think and act bidirectional

CGI utility consultants are known for their insight. We understand our clients' end-to-end processes and their need for 100 percent reliability in terms of changes and integrations. Many of our 6,000 professionals joined us from utility companies.

We build and deliver central market systems. In fact, we built 11 of the world's 17 central market systems and run many of them. Developing these required an in-depth understanding of market regulation, information management and security. We have been at the heart of successfully deregulating energy markets worldwide for many years.

Our Smart Data Services platform is a core system for many of the UK's energy market players, enabling interconnections across the value chain in probably the most complex market in the world.

Our home energy management solution, CeMS, enables effective demand response by supporting the development of new models of collaboration between the grid operator, the supplier, and the central market operator while involving consumers as market players in their own right. For example, it supports dynamic tariffs and provides tools to consumers, such as apps to monitor and control energy usage, allowing for the development of new energy services to enhance customer value while enabling better grid management.

CGI's electric vehicle charging station system, known as CiMS, extends this open approach for building additional energy and non-energy services, thereby allowing market players to develop new business models.

We are also experts in the other areas that impact an ONU — from regulation, information management, cybersecurity and consumer engagement to telecommunications and financial services.



# Way of seeing 2: The journey

An ONU is on a journey, progressively rolling out technologies with a clear return on investment (ROI), while building knowledge and flexibility

The journey towards the ONU vision will not be a big bang transformation. Instead, it will be considered progressive and thoughtful, with each step building on the last and defined by the benefits that smart technologies can deliver.

Utilities are in a state of continual change, so an ONU will seek to build in flexibility as it evolves legacy systems by innovatively exploiting new technologies and developing agile information systems.

The challenge lies in identifying the optimum sequence for such smart-related projects so as to balance risk, the pace of technological change and ROI.

Each ONU's journey is unique, taking into account factors such as its current organization, local market conditions and technological maturity, as well as the cost of installing new layers of technology, consumer attitudes, industry policies and the views of regulators.

A functioning ONU makes extensive use of trials and pilots to prove technology concepts and new, collaborative business models, along with new energy services that help address the increasing complexities of local grid management.

The process will be incremental and involve accumulating new knowledge to overcome uncertainties as the marketplace changes, allowing an ONU to exploit every opportunity offered in the new world of utilities.

There is no single recipe to becoming an ONU

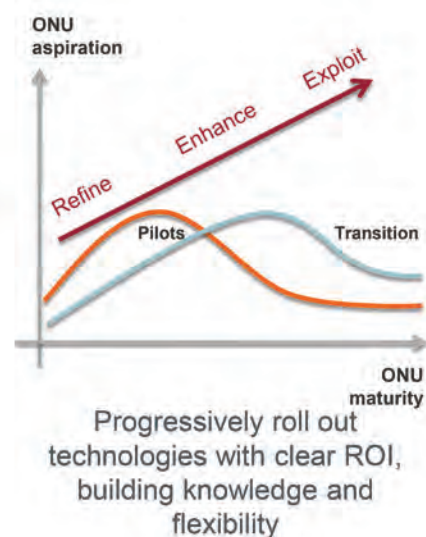
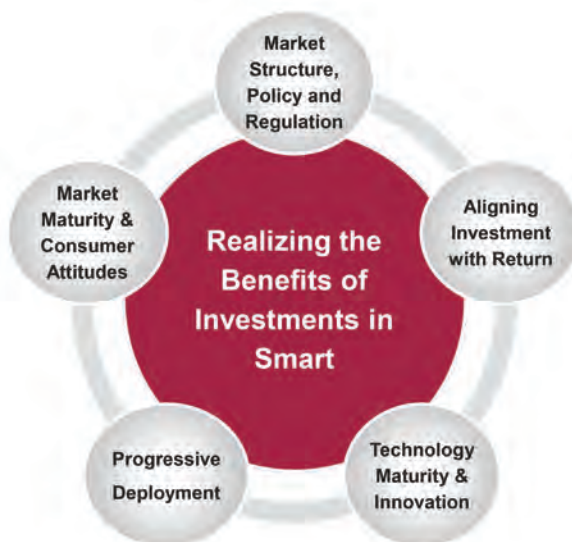


Figure 05: A unique ONU journey and a multidimensional challenge





## Helping network utilities to roll out new technologies

At CGI, system flexibility is a key consideration when developing and integrating applications. In our solutions development work, we use service-oriented architectures and web services to simplify integration with legacy systems, as well as application program interfaces (APIs) that align with the world's leading software. This is the case with our more mature solutions such as ARM for asset and work management and PragmaLine, a leading outage management system.

This approach also supports our broader portfolio of innovative intellectual property (IP). We have our own IP solutions to support the evolution of smart grids with core functionality that is easily configurable and can be integrated into legacy systems. We also have a network of partners, including leading third-party software vendors and innovative niche providers.

Our ONU solutions and commercial models are specifically designed to allow clients to test and scale their investments, aligning them to their strategy and the financial returns they expect. Integration with existing business systems is considered essential to optimizing the investment made in enhancing grids.

For example, we are working with UK Power Networks and other partners to deliver the Low Carbon London program. This is a series of interlocking trials looking at the interactions between commercial innovation, low carbon technologies and customer behavior. The program is designed to establish the best ways to build and manage power networks for Britain's low carbon future.

And, our Instant Energy platform has given network utilities a simple and low cost way to pilot smart metering investments, allowing them to see how smart technologies affect their businesses while earning a good return on investment.



# Way of seeing 3: Taking action

An ONU aspires to 360° visibility and control by driving end-to-end business processes enabled by automation and the integration of OT and IT

Data in isolation is meaningless. It needs to be interpreted, so decisions can be made and acted on. An ONU needs to be able to see supply and demand data from every link in the two-way chain and then act on it. An ONU will actively and incrementally introduce long-term automated routing of supply and control of demand.

That means marrying operational technologies (OT), information technologies (IT) and other enterprise data sources to create an organization that is truly agile and responsive. It also means ensuring departments, processes, people, systems and data are integrated in line with long-term strategic objectives and market conditions.

Removing silos will allow a smooth flow of information that will increasingly enable automatic control of the distributed network. Supply can be automatically routed to demand, and demand managed to fit the available supply. The result: greater efficiency, less waste, and cheaper, sustainable supplies for end users.

An ONU's aim is to turn data into information, information into knowledge and knowledge into action. Action is where the value of smart automation lies.

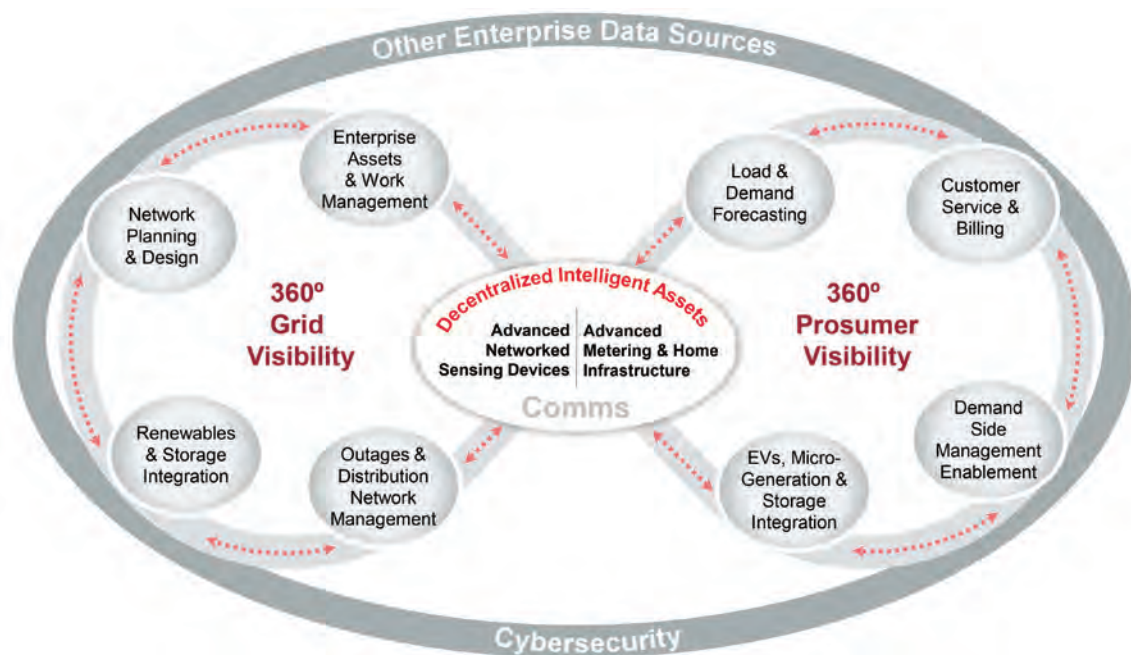


Figure 06: Visibility and control across end-to-end processes enabled by decentralized assets automated by integrated OT/IT

## Helping network utilities gain end-to-end visibility and control

We develop solutions and services that ONUs need. Many of our solutions were developed because clients needed to link disparate legacy systems. In each case, we worked collaboratively with clients to achieve business outcomes, defining end-to-end processes and then developing the solutions to make it all happen.

CGI is recognized as a systems integrator with extensive experience in OT software and back-end systems, and we work to develop hybrid IT/OT solutions, with a business process view that delivers a measurable return on investment.

With skills covering OT, IT, systems integration and IP (our own as well as that of our partners) and a reputation for innovation, we are the partner of choice for utility networks around the world as they develop their own approaches for becoming ONUs.

CGI is the lead integrator for designing and implementing SMECO's enterprise smart grid infrastructure, which covers areas from grid operations to customer service and connects more than 12 different enterprise applications. We support SMECO in leveraging new technologies to improve operational efficiency and save money for its customer-members. We are helping it to meet stakeholder expectations of a 15 percent reduction in total electric usage on a per capita basis by 2015.

## The three ways of seeing together

An ONU continually seeks to balance its responsibilities of providing society with an affordable and reliable supply of sustainable energy, exploiting automatically gathered information made available through the integration of IT and OT in end-to-end processes. This approach allows an ONU to balance supply and demand based on its intelligent assets, its grid connectivity, and the people who work together to make it happen.

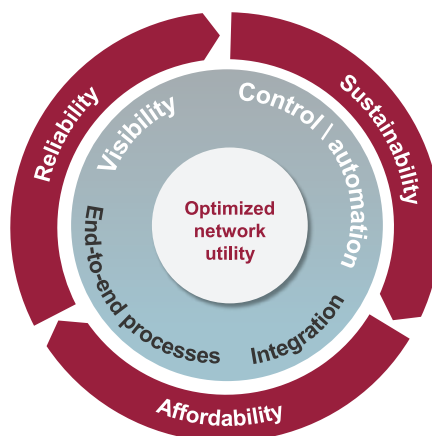


Figure 07: The circle represents what the three ways of seeing the future of utilities bring to an ONU

# ONU aspirations

The graphic below illustrates what an ONU will aim for in the long term or, in other words, its key aspirations. ONUs will concentrate on areas most relevant to their circumstances and the returns needed to justify their investments, always balancing business opportunities, market stakeholder expectations, regulatory obligations and risks.

## The business opportunities

In turning aspirations into reality, an ONU will realize strong business benefits covering all areas of the supply chain.

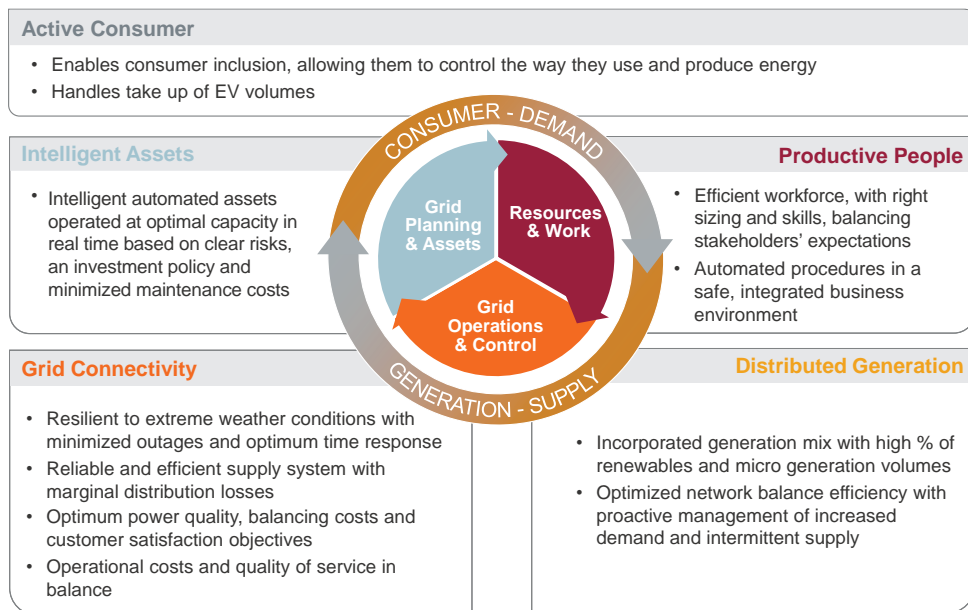


Figure 08: An ONU's aspirations in terms of intelligent assets, grid connectivity, people and distributed generation

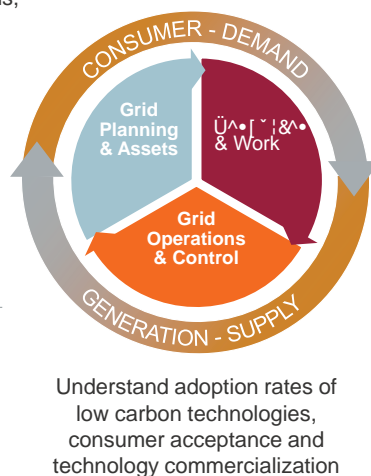
Define a roadmap of incremental initiatives with justified ROI, including evolving legacy systems, managing risk, and balancing investments needs with the expectations of stakeholders

Manage and exploit data, infusing integrated information into business processes

Operationalize analytics to improve network supervision

Improve network visibility and control for better and faster storm management and for providing up to date information to consumers

Reduce operational costs while improving quality of service



Pursue grid-driven energy services and the consumers to support smart meters rollouts

Optimize the workforce, eliminate organizational siloes and develop combined skills of OT and IT

Exploit the benefits of new technology and OT and IT convergence

Prepare for increased threats to physical and cyber infrastructures

Increase control of complex energy flows, minimizing grid reinforcements

Figure 9: The journey towards an aspirational ONU translates into some key business challenges and priorities

Utilities are being asked by their stakeholders to do more with less and, at the same time, move towards low carbon economies—and still meet the need for reliable, quality supplies.

In balancing the expectations of all interested parties, ONUs will seek out ways of reducing their operational costs while at the same time guaranteeing service quality to meet ever-increasing consumer expectations. They will also make investments to bring aging infrastructures into the digital future, so that they can shape both supply and demand efficiently and effectively.

ONUs understand that a roadmap for their journey will help them to do the following:

- Prioritize initiatives with a justifiable return on investment
- Manage risk and ensure security
- Balance investment and stakeholder expectations

One fundamental priority will be projects that merge OT and IT, making it possible to manage data in real time through re-engineered business processes. This will lead to increased network visibility and the ability to control events much more closely.

For example, the capacity to manage the impact of extreme weather events can be greatly improved. As a result, damage to mission-critical infrastructures can be reduced and consumers can maintain access to energy supplies under circumstances that would previously have led to outages.

There can be no single way of making the ONU journey. Investments will be made as relevant business opportunities, technologies and regulations present themselves. In each case, trials and pilots will help to define and prove business cases and to develop new business models based on cooperation and integration among all parties throughout the supply and demand chains.

Our clients are already taking their first steps on the journey, and some are beginning to change how they operate. In each case, CGI innovations and market insights are helping them to build business cases and develop new business models. As a consequence, they are building new organizational capabilities, integrating operational domains, managing risks, and controlling information flows through our software and services.

In fact, we are involved in every part of the ONU journey. We share the new ways of seeing.





# Helping network utilities on their ONU journey

As we have said, being an ONU involves a state of mind where the three ways of seeing inform decisions about where to deploy converged digital technologies to develop new capabilities and unite historically “siloes” operations. This will involve exploiting very large volumes of data—in real time and over time—and exploiting expertise from other sectors, such as telecommunications and financial services.

As one of the world's top five independent IT and business process services companies, and a specialist in both systems integration and the utility industries, we are helping clients around the world to realize their network business vision.

We use a wide range of applications—both our own and those of our partners—which have been tried and tested in real-world networks. We are experts in

converging and integrating technologies so that they are not only functionally effective but also meet future needs for cybersecurity, another area in which we specialize.

The emerging paradigm shifts will transform network utilities over time, not in a single step but through a series of organizational changes. This transformation will be guided by a carefully thought-out development plan, which CGI has extensive experience in delivering.

We can advise on the technologies to be deployed and the expected benefits from building a business case and ensuring a proper return on investment. We also build in flexibility, so our ONU clients can accommodate uncertainties and adapt to change in their specific circumstances by adopting new and innovative technologies as they become available.

## Realizing the vision

Our smart grid client base is highly diversified. We are geographically present on four continents, serve utilities from large to small, and have a diverse portfolio of projects. These range from generation to the customer, as well as adjacent energy providers such as electric vehicles and independent renewable generators. CGI is a services firm with a truly global strategy and delivery capability.

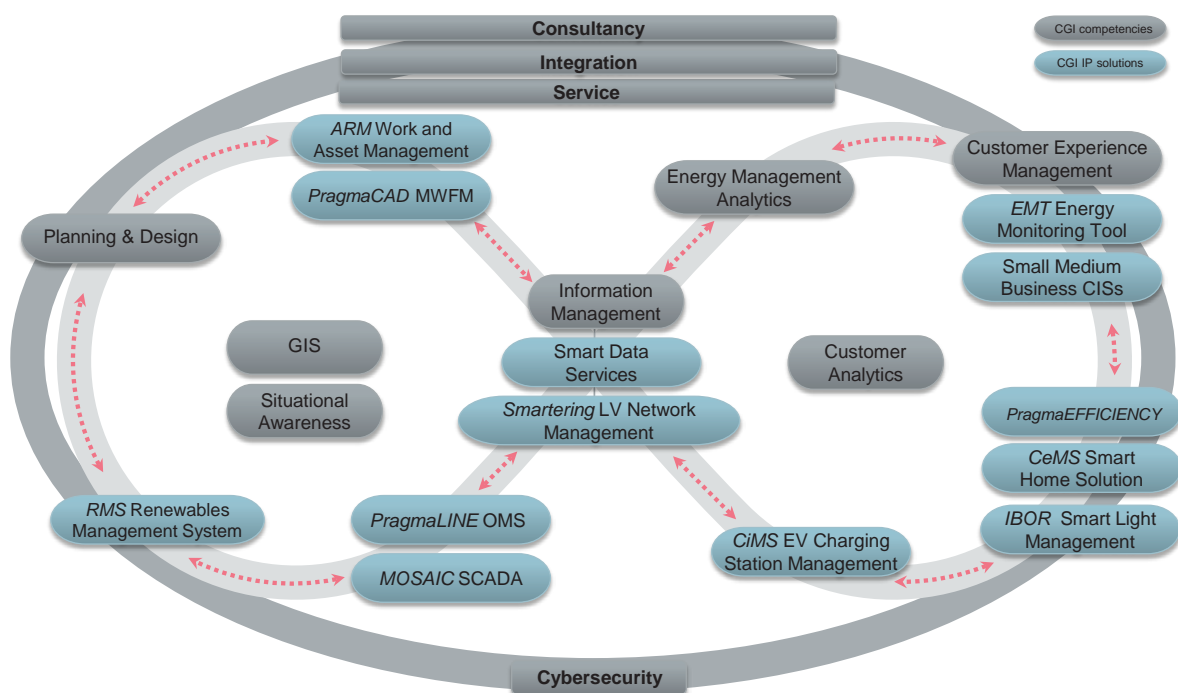
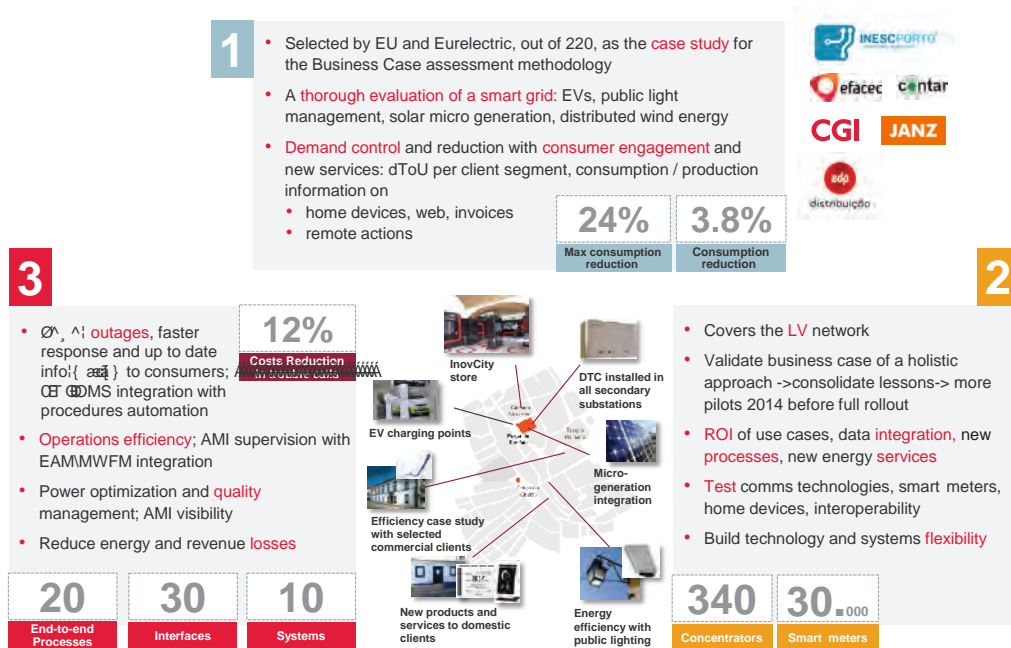


Figure 10: CGI provides a uniquely broad portfolio of IP solutions and other competencies across OT and IT domains

We are already helping many ONU clients define and realize their vision, as the two examples below show. The results so far—and we are still in the early stages—speak for themselves. Thinking—and acting—like an ONU really works.

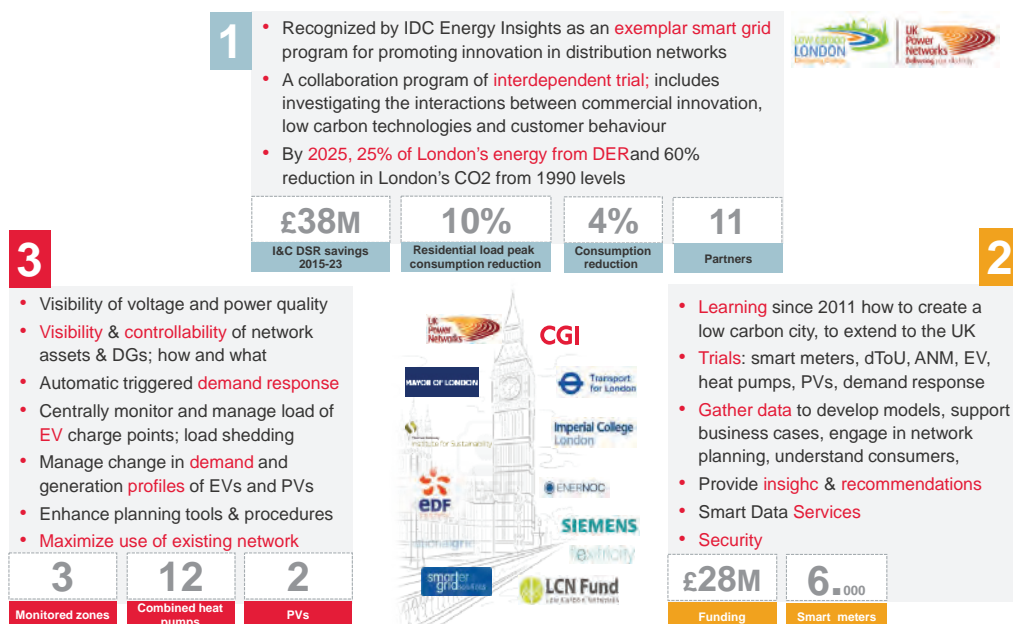
## Inovgrid: Towards an active network management

A smarter distribution grid, developed gradually and consistently



## Low Carbon London: A learning journey

Collaboration to define how to get into a future smart grid







[www.cgi.com/en/utilities](http://www.cgi.com/en/utilities)



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With 68,000 professionals operating in 400 offices in 40 countries, CGI fosters local accountability for client success while bringing global delivery capabilities to clients' front doors. Founded in 1976, CGI applies a disciplined delivery approach that has achieved an industry-leading track record of on-time, on-budget projects. Our high-quality business consulting, systems integration and outsourcing services help clients leverage current investments while adopting new technology and business strategies that achieve top and bottom line results.

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