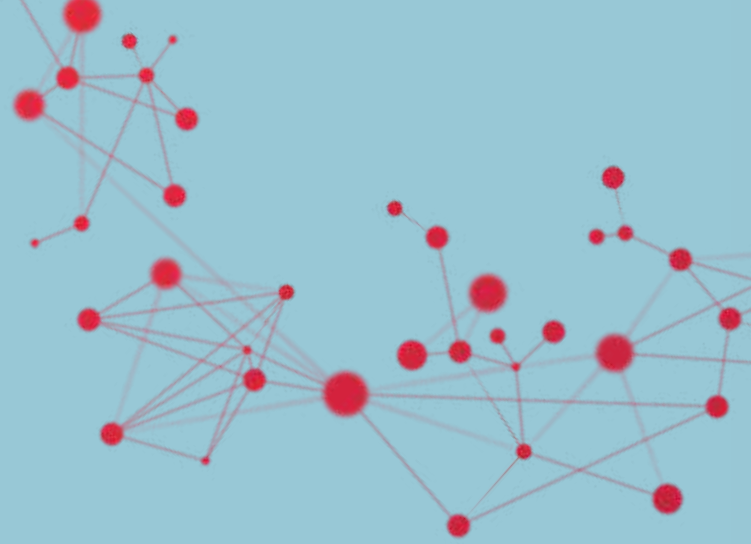
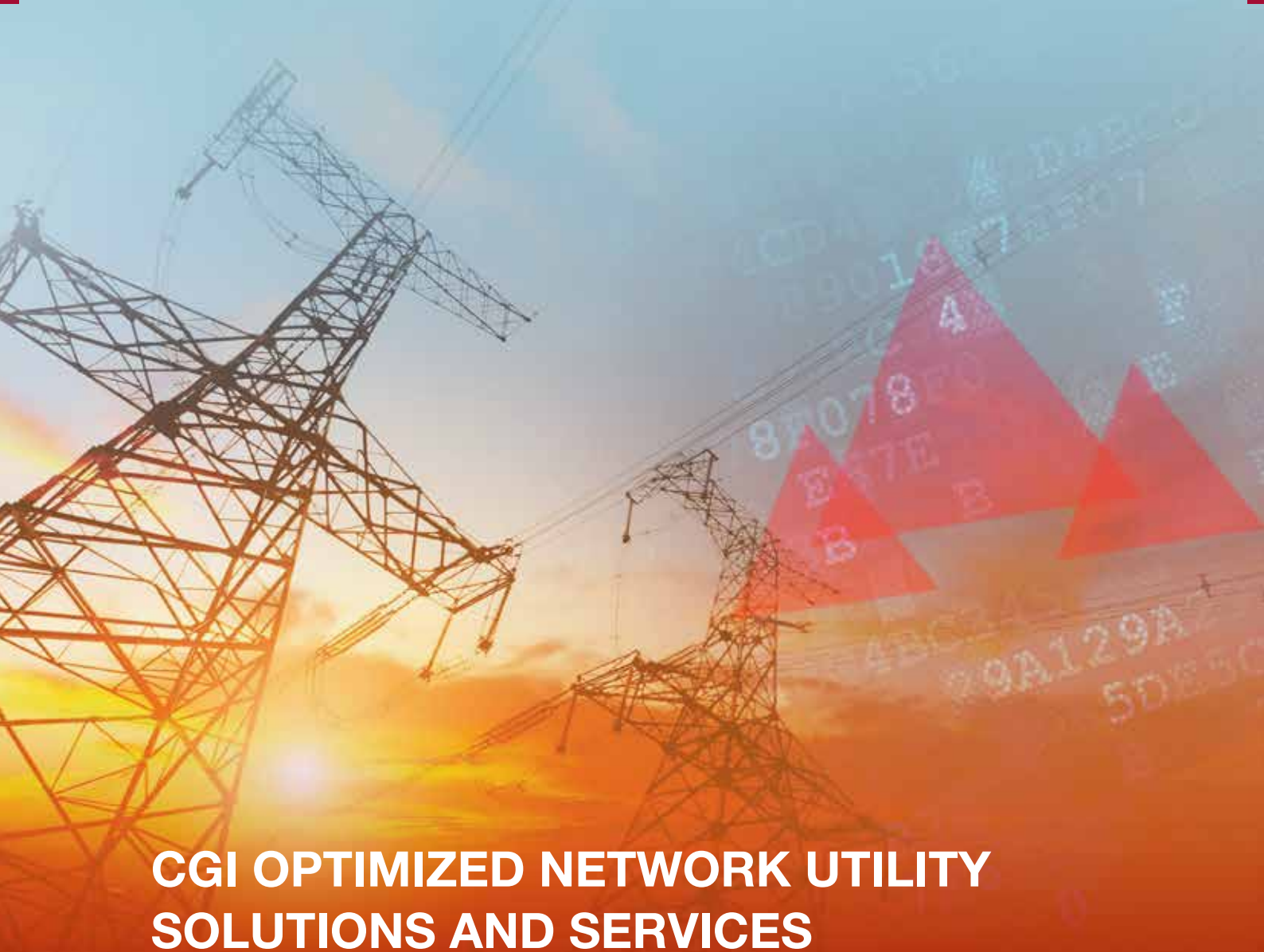




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**CGI OPTIMIZED NETWORK UTILITY
SOLUTIONS AND SERVICES**

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Introduction

The change

Energy related utilities are experiencing a major business transformation as the world changes its approach to the use of carbon-based energy. Transmission and distribution networks in particular are facing a significant transition as they adapt to the need of matching demand with intermittent supply. They must now deploy new technologies, drive more collaborative business models and engage the customer to actively participate in managing their new energy systems.

The opportunity

Many utilities have already woken up to the need for a better understanding of how the coming paradigm shifts will impact their businesses. In particular, there is an increased interest in evaluating short-term opportunities and long-term planning.

Value creation is also moving towards downstream segments of the value chain such as distribution energy management and flexibility services. This opens the opportunity to accelerate the pace at which innovation is integrated to build a smarter, digitally integrated ecosystem. It also drives opportunities to influence the industry's regulatory models to adapt to new ways of doing business, ensuring that the wider benefits of interacting with consumers are fully captured.

How CGI's solutions address utilities' challenges

We believe utilities need to take a holistic approach to smart grid related investments, looking at all the benefits that this technology can provide through an interconnected and integrated approach.

The solutions and software incorporated will need to be developed through a deep understanding of utilities' end-to-end market requirements. These need to support evolving legacy systems, add innovation, improve system flexibility and facilitate the integration of systems, processes and people.

CGI's solutions incorporate our unique combination of knowledge and experience of operational technology (OT) and information technology (IT)—resulting in mature products and the co-creation of smart grid solutions for the future. This is demonstrated in our own intellectual property (IP) based solutions, spanning OT and IT, and also by our long track record on business consultancy and systems integration services.

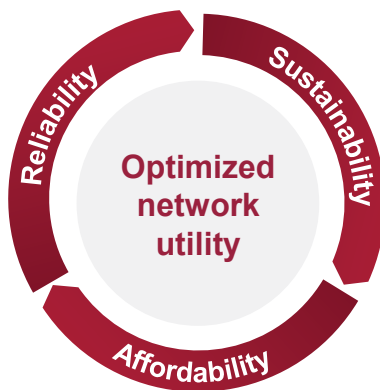
Our vision

There is really no single answer on how to best achieve this evolution as it depends on multiple dimensions. However, from our vast experience of a diversified smart grid customer base, we have identified fundamental common approaches that lead to a successful transition. We call organizations that follow this approach Optimized Network Utilities.

CGI's ONU vision

An Optimized Network Utility, ONU in short, is CGI's vision for network utilities that defines how smart technologies can be deployed holistically. It was developed in close conjunction with clients and business partners with whom we worked on several projects.

In CGI's vision, the ONU is driven by three fundamental mindsets that follow a holistic approach to the deployment and exploitation of all smart technologies. Through these mindsets, an ONU understands the need to take on an end-to-end business approach as a way of achieving relevant business outcomes; essential to this would be to understand the value of integrating applications and the correct data across the enterprise and the ecosystem in an increasingly collaborative way. The three fundamental mindsets are stated below:



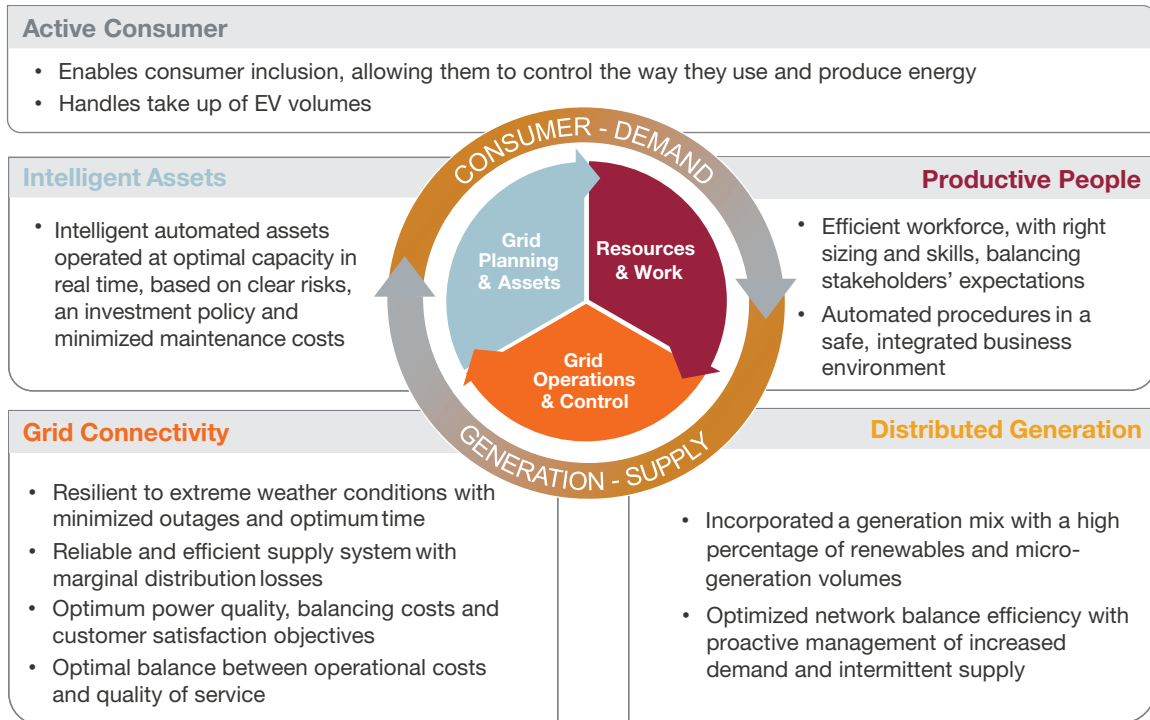
- 1 Embraces the bidirectional flow of energy and information, assuming a leading role in an interconnected ecosystem**
- 2 Defines a journey of progressively rolling out technologies with a clear ROI while building knowledge and flexibility**
- 3 Exploits 360° control and visibility by driving end-to-end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

Ultimately, a network utility does not seek to be a smart grid as its end objective. At CGI, we prefer to talk of ONUs that aim to optimize their grid operations, asset maintenance strategies, investment in assets and new technologies, and work and resources, while balancing disparate stakeholders' expectations, investments, risks, business opportunities and responsibilities.

Any network utility is expected to support the move into a low carbon economy, guaranteeing that lights are "always on" at affordable prices. To achieve these objectives, they are given control and responsibility over assets, people and grid connectivity. However, the increased volumes of devices at the edge of the grid out of utilities' control—impacting demand and supply—will have an increasing impact on their strategy, planning and operations.



These expectations drive ONUs' aspirations defining what an ONU will look like in the future and the business opportunities along the journey.



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

- Define a roadmap of incremental initiatives with a justified return on investment (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.
- Understand adoption rates of low carbon technologies, consumer acceptance and technology commercialization.
- Pursue grid-driven energy services and consumer support for smart meter roll-outs.
- Reduce operational costs while improving quality of service.
- Optimize the workforce, eliminate organizational siloes, and develop combined OT and IT skills.
- 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.



How CGI is enabling transformation within utilities

In this landscape, network utilities will need a combination of information and operational technology planning, innovation and flexibility, and an end-to-end business approach. CGI helps our utility clients make this transformation with a track record of innovation and successful partnerships.

IT & OT capabilities

More and more technology projects have to combine information technology (IT) and operational technology (OT) planning. Therefore, IT and OT convergence will play a key role in the success of an ONU. Subsequently, utilities will need technology partners with a unique combination of OT and IT knowledge and experience, who can co-create future smart grid solutions that bring innovation that truly adds value.

In 2015, CGI was recognized for “best of breed utilities IT and OT integration services” by Ovum.

* Ovum Decision Matrix: Selecting an IT-OT Integration Partner, 2014-15

CGI applies our unique combined knowledge of OT and IT worlds across our groundbreaking IP solutions, supporting the evolution of smart grids. We do this through our end-to-end business processes approach, integrating OT and IT applications to deliver demonstrable business benefits. Several of these engagements have received awards and are leading smart energy projects such as our work with EDP for the InovGridsmart city pilot or the UK Power Networks' Low Carbon London project.

Systems integration

An ONU will need to adopt an end-to-end business process approach to achieve relevant business outcomes, integrating the right data from different resources and relevant applications. Utilities will also need integration partners, such as CGI, who are established integrators with deep knowledge of the industry's end-to-end market requirements and business processes.

CGI is a highly-skilled partner with a long track record as an IT systems integrator within the utilities industry, having demonstrated expertise in smart grids and long lasting relationships with many utilities. We have real-world utilities knowledge and a complete understanding of industry processes. This is evident in our integrated approach, IP solutions and vision for the future of the utilities industry.

CGI's OMS is a key component of EDP's smart grid strategy and operational intelligence platform. CGI's OMS solution integrates 14 systems, covers six million customers, and adds value through reliable and timely information for operations and customers during extreme weather and disaster scenarios.

IP and flexibility

Exploiting market opportunities at a time of uncertainty requires network utilities to have the flexibility to alter tactics as opportunities and circumstances change. This flexibility is important for evolving legacy systems through new technologies and developing agile information systems. At CGI, system flexibility is a key consideration when developing and integrating applications. In our solutions development, we use service-oriented architectures and web services to simplify integration with legacy systems, as well as application program interfaces (APIs) for the world's leading software.

In this way, this market need is addressed by our extensive portfolio of IP-based solutions supporting ONUs and their evolution towards smart grids—from supervisory control and data acquisition (SCADA) and outage management systems (OMS) to asset and mobile workforce management. A number of our solutions have also been brought to market through innovative collaborations with our clients to overcome the lack of integration between the conventional applications necessary to support new market requirements.

Con Edison deploys CGI's Asset Resource Management solution to save millions annually.

Innovation

In this landscape, network utilities will need to exploit innovative technologies that meet their current and future requirements to ensure their long-term growth and success. CGI brings thought leadership to the market through our subject matter experts partnering with our clients to produce cutting-edge, innovative solutions that support this evolving industry.

As a direct contributor to the policies and frameworks governing the energy markets, CGI has participated in several energy programs and research projects. For example, our work with EDP on the InovGrid program was chosen by Eurelectric and the European Union as a prime European case study, and the Low Carbon London program in the UK, in which CGI was a partner, is recognised by IDC Energy Insights as an exemplar smart grid program. Through our global presence, we leverage our knowledge and experience from local markets for the benefit of our clients.

As a founding member of the Institute of Asset Management, CGI actively contributed to the development of the PAS-55 standard, which now forms the basis of the new ISO 55000 series of international standards for enterprise asset management.

Partners

We have a large network of partners, including leading third-party software vendors and innovative, niche providers. Working closely together, we combine our expertise to help grow and build our clients' businesses. Our wide range of applications have been tried and tested in real-world networks. We are experts in converging and integrating technologies that meet our clients' specific needs.

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

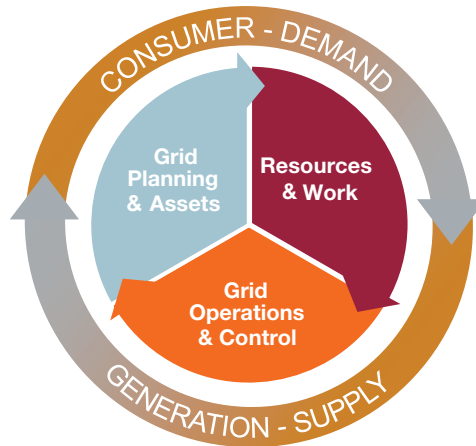
CGI's award winning Renewable Energy Management System (RMS) connects, monitors, manages and integrates wind energy. These functions are based on industry leading platforms from Alstom and OSIsoft.



Building the ONU portfolio

Our smart grid customer base is highly diversified. We are geographically present on four continents, serve both large and small utilities, and have a diverse portfolio of solutions.

Our portfolio segmentation aligns with the three core elements for an ONU: its assets, people and resources, and grid operations. It also covers the impact of supply and demand, though this is not within an ONU's direct control. The increasing volumes of devices on the edge of the grid, driven by prosumerization and proliferation of distributed energy resources, creates both challenges and opportunities for network utilities in their mission of delivering energy reliably and affordably.



Our portfolio segmentation aligns with the three core elements of an ONU and covers the impact of supply and demand in the following way:

Reduce Capital Needs and Maintenance Budgets	Increase Workforce Efficiency and Worker Safety	Improve Operational Efficiency and Network Performance	Enable Low Carbon Technologies and Consumer Involvement
Improve investment decisions in new assets to maximize ROI while optimizing the life cycle costs of the existing asset base in line with regulatory requirements and reliability targets.	Optimize work and resources to become more efficient while improving customer service and meeting compliance and safety requirements.	Drive operational and service excellence while reducing operational costs, with improved network reliability, safety, operational performance and customer satisfaction.	Improve engagement, integration and knowledge of the consumer, delivering enhanced customer and energy services for improved grid management and customer satisfaction.

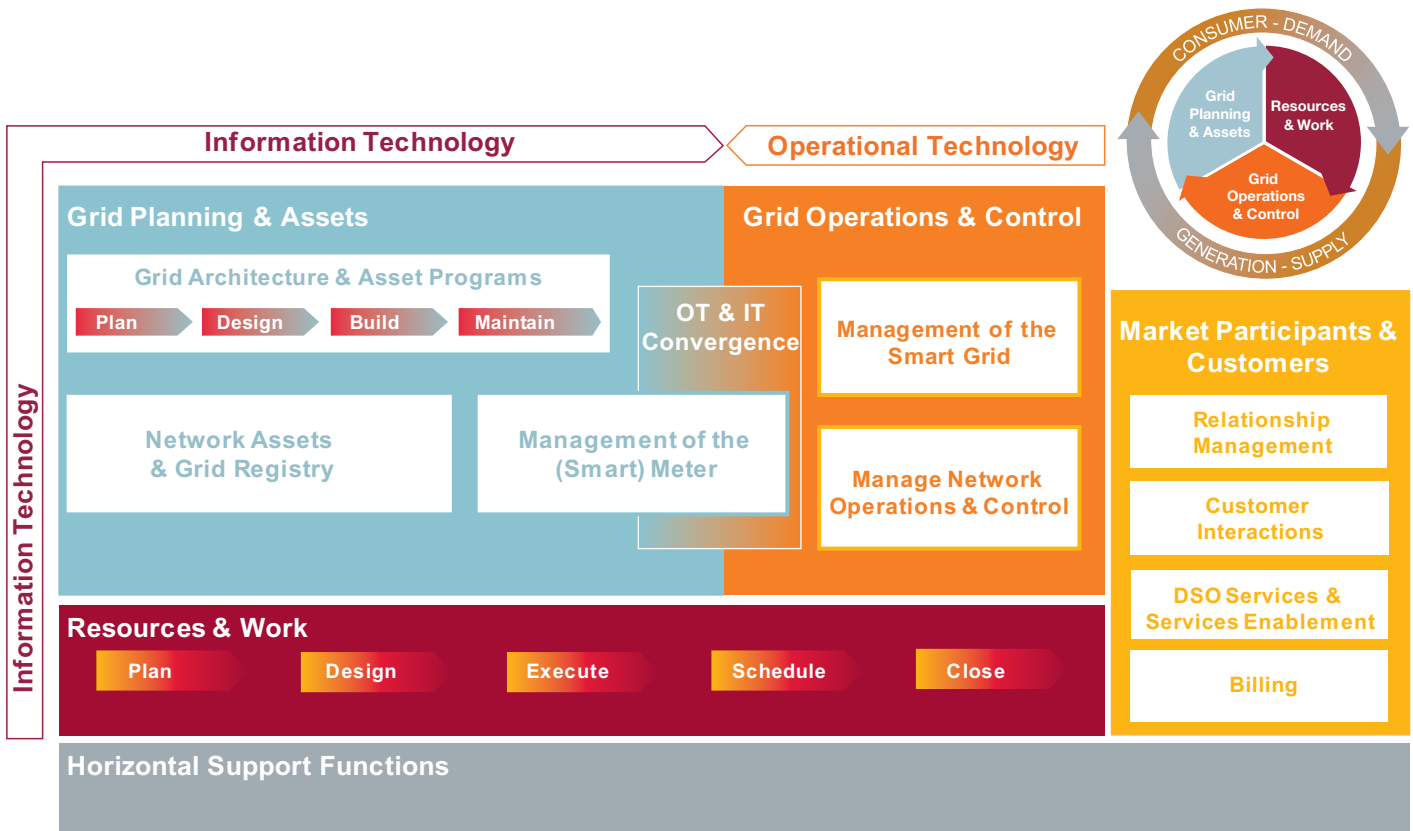
Our ONU portfolio of offerings based on CGI IP, partner IP and our competencies aligns with the ONU business priorities in the following way:

Reduce Capital Needs and Maintenance Budgets	Increase Workforce Efficiency and Worker Safety	Improve Operational Efficiency and Network Performance	Enable Low Carbon Technologies and Consumer Involvement
<ul style="list-style-type: none"> Network asset plan and management Advanced investment and maintenance Meter asset and roll-out management 	<ul style="list-style-type: none"> Work and resource management Aging workforce transformation Advanced metering infrastructure (AMI) intelligence and automation 	<ul style="list-style-type: none"> Network supervision and control Advanced outage and storm management Fully leverage the AMI 	<ul style="list-style-type: none"> Billing and collection Market participants management Services enablement

Data & BI	Business Consulting	Systems Integration
<ul style="list-style-type: none"> CGI provides the full range of business intelligence services, with 4,200 members, based on CGI's comprehensive business intelligence (BI) framework "Data to Diamonds". We deliver analytics projects and have incorporated modules into our IP, from energy management to grid performance and monitoring. 	<ul style="list-style-type: none"> Amongst our 3000 business consultants, 400 are dedicated to the utilities. With a large number of industry and subject matter experts, we apply our real-world industry knowledge of more than 25 years, having been at the heart of various market changes. 	<ul style="list-style-type: none"> We design, build, finance and operate critical systems around the globe. Our IP solutions are key examples of complex OT and IT integration. Today, 11 of the world's 17 energy markets run on our systems and we are providing data services to Britain's DCC to support 53 million smart meters.
Cybersecurity	Cloud	Services
<ul style="list-style-type: none"> Our 10 Security Operations Centers, within our cybersecurity global practice, identify and deploy solutions to maintain a state-of-the-art infrastructure, handling 70 million cyber events a day. 	<ul style="list-style-type: none"> Our global cloud practice offers consulting and technical services, including Platform as a Service (PaaS), Infrastructure as a Service (IaaS) and Software as a Service (SaaS) through IP, covering private, public and community cloud options. 	<ul style="list-style-type: none"> Our unique onshore, nearshore and offshore global delivery network supports long-term outsourcing relationships with clients such as EDP, Elexon and EDF.



Our ONU vision translates into a new framework of business functions as shown below:



ONU solutions and services

Asset optimization

Grid operations optimization

Resources and work optimization

Balanced demand and supply optimization

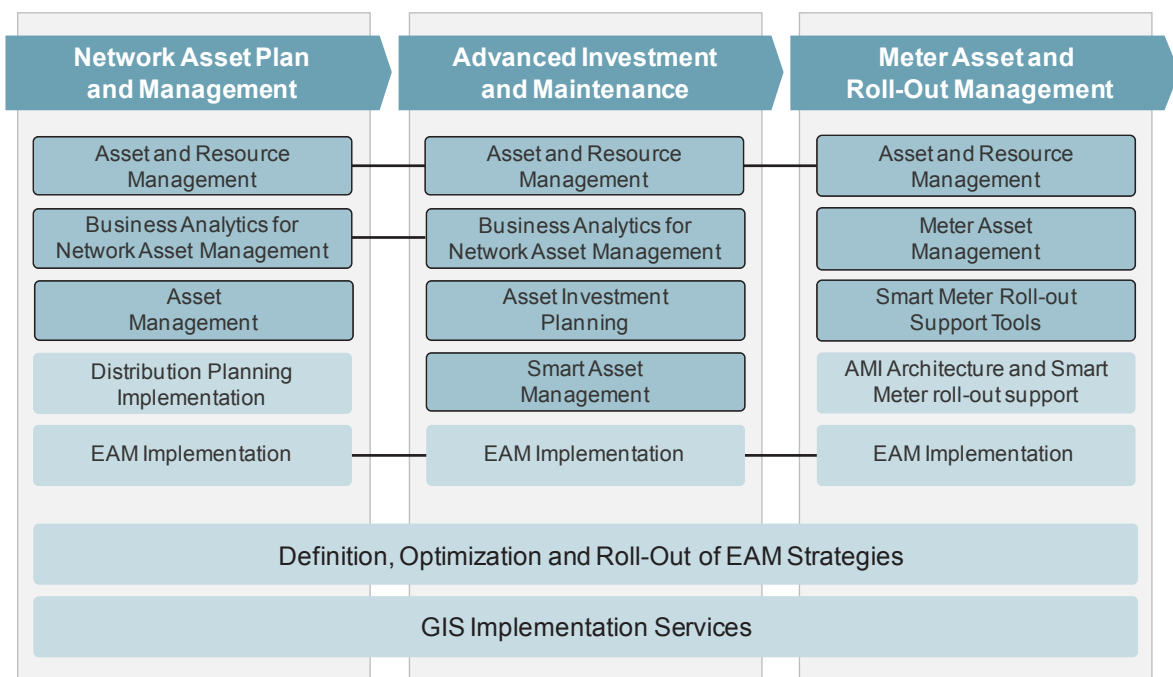


ONU offerings and competences

The ONU journey towards intelligent assets optimization

What we offer:

Network Asset Plan and Management	Advanced Investment and Maintenance	Meter Asset and Roll-Out Management
<p>Improve asset performance at a reduced cost, minimizing capital expenditures and improving investment decisions, while ensuring regulatory compliance and meeting service expectations.</p> <ul style="list-style-type: none"> • Single view of assets and continuous quality of data updates • Monitoring of asset health with generated and evaluated maintenance programs • Efficient design and modelling of network infrastructure • Streamlined, standardized end-to-end processes with integrated systems • Defined roadmap of incremental prioritized initiatives 	<p>Optimize the investment performance, prioritizing capital and maintenance spending based on risk management and more advanced asset management strategies, generating insight from more asset data.</p> <ul style="list-style-type: none"> • Automatically generated asset investment plans and support for project/work, based on asset performance data • Asset investment planning based on assessing assets risk and health • Adoption of risk, predictive and condition based maintenance strategies • Integrated OT and IT/enterprise asset management (EAM) data to improve asset failure predictions and reduce 	<p>Optimize smart meter deployments and improve low voltage (LV) return on assets at a reduced risk and decreased maintenance costs leveraging on increased visibility, control and automation down to the meter.</p> <ul style="list-style-type: none"> • Integration with enterprise and operational systems based on end-to-end business processes • Single asset management system for an optimized asset life cycle for all meter assets • Increased LV visibility and process automation for optimized smart meter deployments



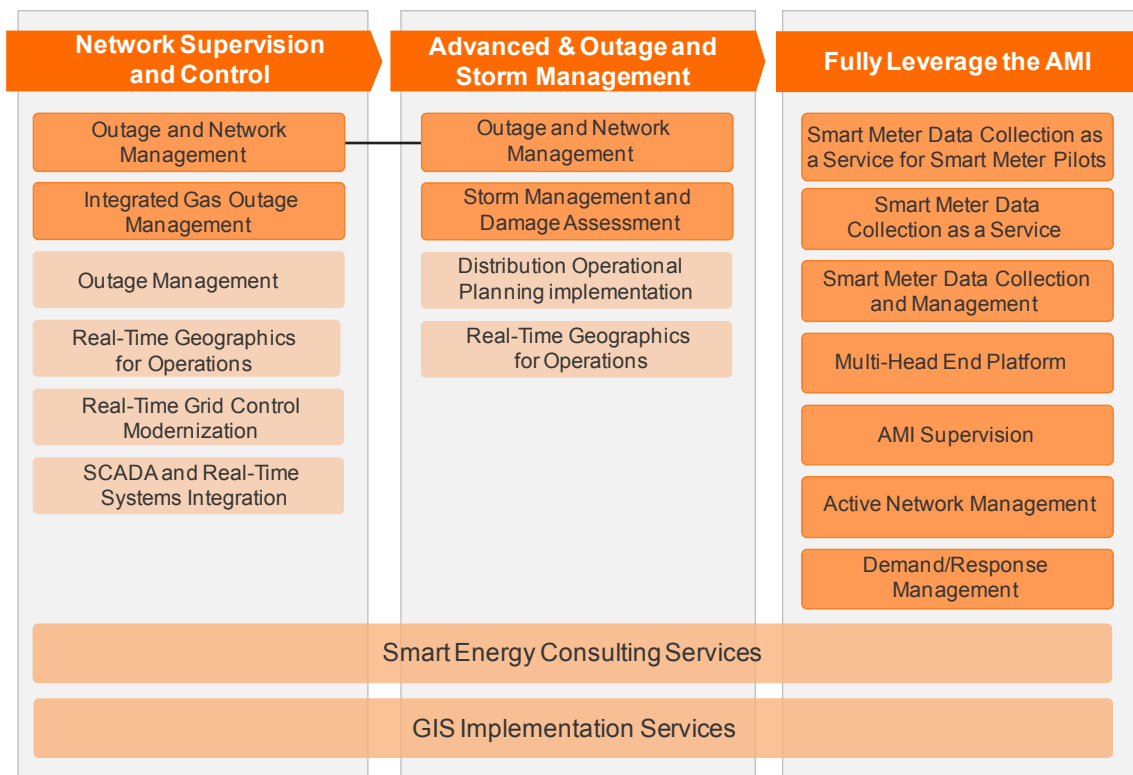
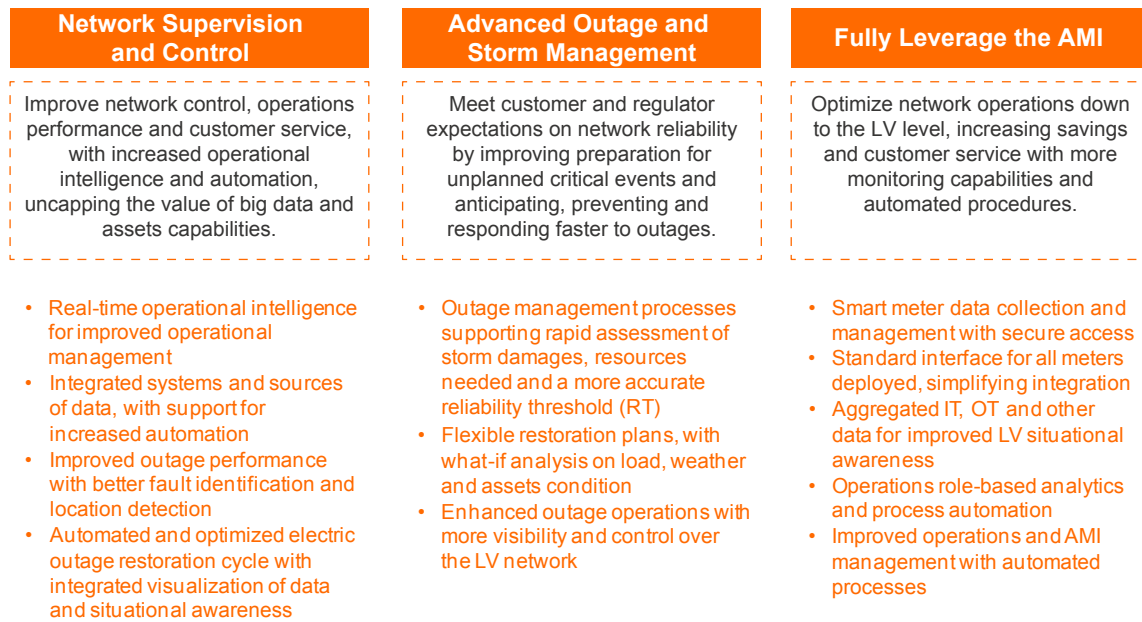
 The outlined boxes feature CGI IP

CGI Asset & Resource Management Platform	The Asset & Resource Management (ARM) suite is a solution designed to streamline the business processes that support utility operations with a specific focus on enterprise asset management for transmission and distribution.
CGI Asset Management Solution	Asset Manager unifies all asset data within a single asset repository to facilitate compliance tracking, maintenance management, asset risk management and asset investment planning.
CGI Business Analytics Solution for Network Asset Management	Performance Manager is a business analytics solution developed as part of CGI's ARM suite to provide and display key metrics for network operators. It includes an out-of-the-box extract transform load (ETL) for ARM and ETLs for other source systems.
CGI Asset Investment Planning Solution	Asset Investment Planning (AIP) is part of the ARM suite. It integrates with ARM and alternate source solutions to provide sophisticated decision optimization capability. It includes access to a large library of asset models, rapid setup, scalable deployment and performance of unlimited investment scenarios.
CGI Smart Asset Management Solution	Smart Asset Management (SAM) provides a packaged middleware function to integrate intelligent electronic devices within an overall asset management system. SAM supports the smart grid expansion towards active network management. It manages communications with advanced metering infrastructure (AMI) networks and intelligent electronic devices (IED), and all energy and sensory data collected from networks. SAM optimizes grid operations, supporting analysis and treatment of electric network data.
CGI Meter Asset Management Solution	Our solution uses an integrated suite to manage the "cradle to grave" asset life cycle for meters. It incorporates a meter asset register fully integrated with the client's store's solution, and supports the management of programs from the initial installation of meters to repair and replacement.
Distribution Planning Implementation Services	DPlan helps optimize distribution networks for maximum efficiency, reliability and quality of service, with minimum investment. With DPlan, operational constraints can be defined for switching possibilities, client voltage bounds, and line and transformer ratings.
Definition, Optimization and Roll-Out of EAM Strategies and EAM Implementation services	Our enterprise asset management offering leads to an optimized management of the distributed assets of transmission system operators (TSOs) and distribution system operators (DSOs). We offer audit, benchmark, requirements definition and systems roll-out to help you improve your asset management.
GIS Implementation Services	Geographical information systems (GIS) provided by CGI cover systems development and integration and applications maintenance, including field and web solutions, network field data capture, land base and remote sensing data production and integration, data conversion/migration, and quality assurance/quality control.



The ONU journey towards real-time grid operations optimization

What we offer



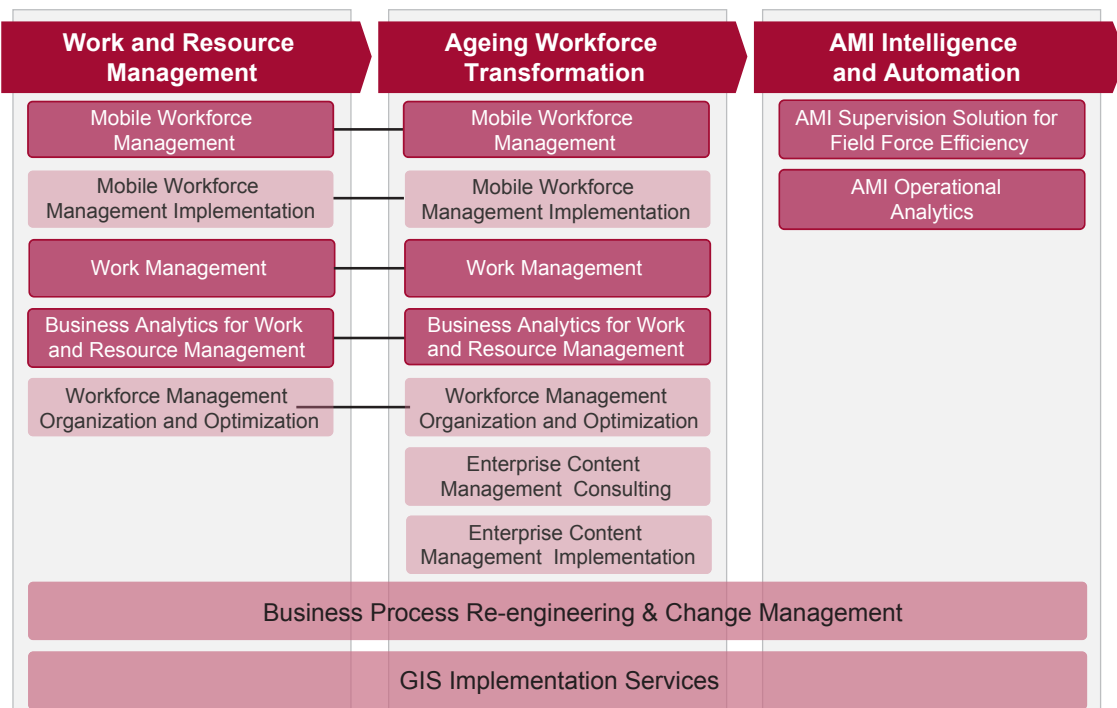
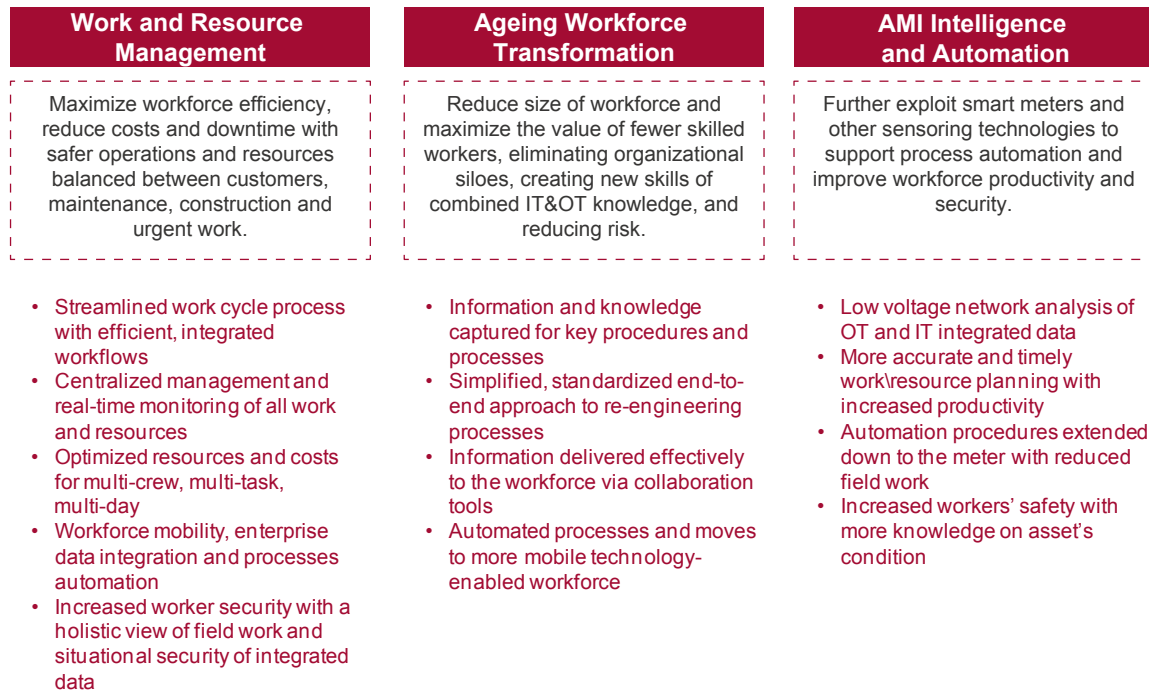
 The outlined boxes feature CGI IP

CGI Outage & Network Management Solution	Offering flexible and high-performance functionality essential to optimizing power distribution operations, PragmaLINE guarantees improvements in reliability, restoration efforts and overall operational performance by reducing the impact of planned and unplanned outages, and incidents during routine and crisis situations.
CGI Integrated Gas Outage Management Solution	An integrated outage management system helps gas companies manage the complete outage process, from the identification of the extent of the outage to the management of a quick and safe restoration process, providing the relevant information for decision-making to engineers and crews involved, and ensuring efficient communication between all stakeholders.
CGI Storm Management and Damage Assessment Solution	PragmaSCOUT empowers utilities by driving real-time damage assessment, allowing control room operations to have a timely, accurate picture of the actual state of affairs on the distribution network.
Outage Management Implementation Services	Services provided by CGI cover the entire OMS delivery project. Implementing and maintaining an OMS system has many challenges, including scalable integration with the major systems—from supervisory control and data acquisition (SCADA), geographic information systems (GIS), advanced meter infrastructure (AMI) and call taking platforms to workforce management (WFM), enterprise resource planning (ERP), enterprise asset management (EAM), customer information systems (CIS) and business intelligence (BI)—as well as data conversion, integration and permanent data quality assurance.
CGI Smart Meter Data Collection as a Service (for Smart Meter Pilots)	The smart data service delivers a smart data collection and management solution that addresses multiple utilities' challenges of providing secure access to AMI. It provides a standard interface to smart meters that have different functionalities, use different communication protocols and make use of various communication technologies.
CGI Active Network Management Solution and Smart Data Collection	Sm@rtering is a new generation advanced metering infrastructure developed by CGI, with a modular structure that includes MDM, data collection/head end, AMI supervision and smart grid functionalities. Sm@rtering addresses the new paradigms imposed to an MDM/EDM solution (including service-oriented architecture) already supporting smart grid projects. Water and gas data can also be managed as well as residential or commercial and industrial (C&I) customers.
Real-Time Geographics for Operations Implementation Services	Real-time geographics contribute to reducing costs, delivering faster and better decisions concerning the operation of the network. It provides an operational view on all that goes on in the network, with real-time dashboards and views on key performance indicators.
Smart Energy Consulting Services	Smart energy consulting delivers tailored solutions and services for senior management and experts within and around the energy and utilities sector facing game changing challenges across the entire value chain. Using a structured ramp-up, expand, strategize and valorize approach, CGI delivers guidance and control for organizations to evolve their business towards the new energy landscape.
Real-Time Grid Control Modernization Consulting Services	The grid control modernization offering leads to a safer and more reliable energy supply. Utilization of a real-time control-command system and a load forecasting engine or anticipating simulation tool brings in a new method of grid operation. We support the definition, optimization and roll-out of your grid control modernization strategy as well as the business processes impacted.
SCADA and Real-Time Systems Integration Services	SCADA and real-time systems integration services provide remote metering management, technical building management, and IoT integration—using sensors and big data analytics through the cloud. Now, utilities can benefit from flexibility and a faster time to market.



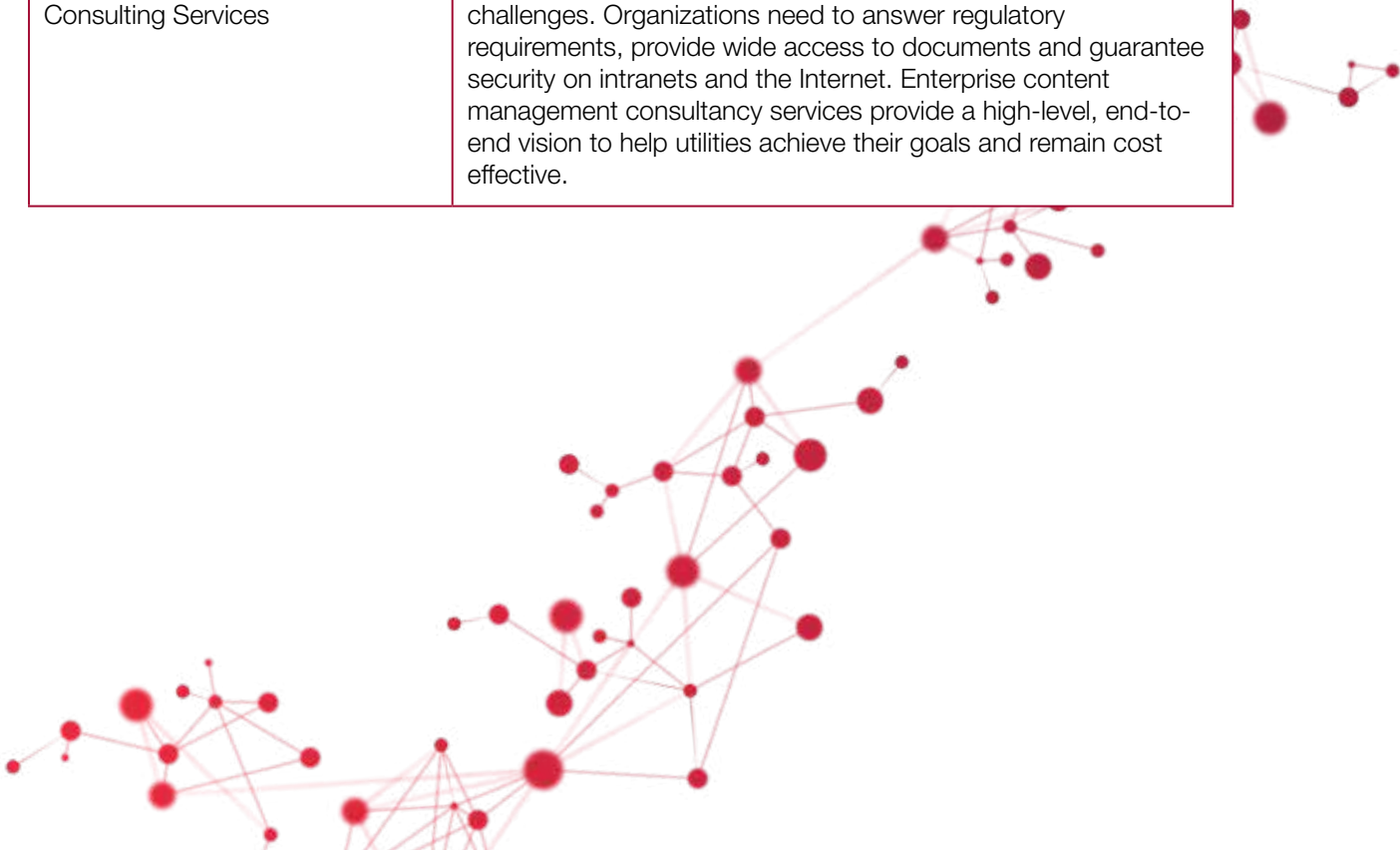
The ONU journey towards increased resources and work optimization

What we offer



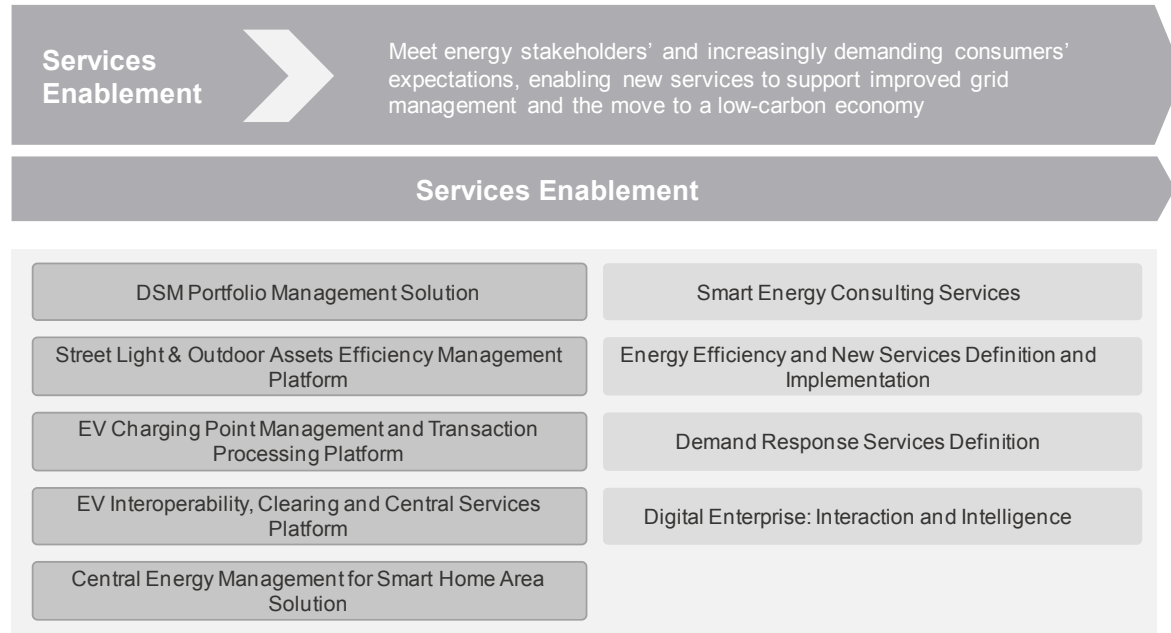
 The outlined boxes feature CGI IP

CGI Mobile Workforce Management Solution	PragmaCAD delivers real-time visibility and responsiveness of workload and resources for guaranteed improvements in service availability, field productivity and cost savings. Integrated tactical resource planning, job scheduling and workflow management provides intelligent scheduling recommendations based on key organizational metrics. From customer contact to fieldwork completion, PragmaCAD can accurately analyze business volumes and resource requirements critical to the growing demands of a virtual connected workforce.
CGI Work Management Solution	ARM Work Manager is a solution designed to streamline the business processes that support the unique utility transmission and distribution (T&D) operations in a single out-of-the-box solution used across many utility companies. It is designed to be used by many different users across an organization. It is readily integrated with corporate HR, finance and customer information systems (CIS) solutions, and includes optional “plug and play” modules for asset management, mobile workforce management and resource optimization.
CGI Business Analytics Solution for Work and Resource Management	Performance Manager is a business analytics solution developed as part of CGI's ARM suite to provide and display key metrics for network operators. It includes an out-of-the-box ETL for ARM and ETLs for other source systems are available. Built on Oracle's GoldenGate technology, it features the best low intrusion database replication capabilities and incorporates the Oracle Business Intelligence Enterprise Edition (OBIEE) reporting framework should a client choose to use this, though any standard reporting framework can be used.
Enterprise Content Management Implementation Services	Enterprise content management implementation services provide a full view to utilities—from the construction of a new plant/building to maintenance, from customer onboarding to cancellation. The benefits delivered include a reduction in cost by maintaining digital archives.
Enterprise Content Management Consulting Services	Content management in utilities is one of our main client challenges. Organizations need to answer regulatory requirements, provide wide access to documents and guarantee security on intranets and the Internet. Enterprise content management consultancy services provide a high-level, end-to-end vision to help utilities achieve their goals and remain cost effective.



The ONU journey towards balanced demand and supply optimization

What we offer in addition to our CGI utilities retail related offerings:



 The outlined boxes feature CGI IP

CGI DSM Portfolio Management Solution	Pragma Efficiency delivers a tailored solution for enhanced tracking, management and reporting of utility clients' electrical and gas energy efficiency programs.
CGI Street Light and Outdoor Assets Efficiency Management Platform	IBOR is a solution for all entities dealing with the management of assets in large public and private spaces. Examples of these assets are street lights, traffic lights, bridges, (sewer) pumps and sluices. The solution offers an intelligent system for controlling these various assets from a single user interface.
CGI EV Charging Point Management and Transaction Processing Platform	CiMS is a proven and future-proof solution to manage broad charge point networks based on open protocols. CiMS is interoperable with other charge point networks and provides open interfaces to enable the development of value-added services. CiMS is delivered as SaaS with a number of charge point based pricing models.
CGI EV Interoperability, Clearing and Central Services Platform	CIS stands for CiMS Integration Services and is a proven and future-proof solution to assure interoperability and transaction clearing. CIS is delivered as SaaS, but can also run on dedicated hardware.

Energy Efficiency and New Services Definition and Implementation	As clients face increasing pressure to reduce energy bills and generate new revenue streams, it is vital to be able to anticipate new trends in the market. This solution helps anticipate technological trends and new offers from competitors, allowing utilities to launch projects and exploit market opportunities in a timely fashion.
Digital Enterprise Interaction and Intelligence	Digital Enterprise Interaction and Intelligence leverages digital technologies to enhance self-service operations and increase sales leads through an optimized transformation funnel. This solution addresses the demand for digital customer interaction.
CGI Demand/Response Management Solution	CEMS core is a demand/response engine supplemented with several interfaces. CEMS enables demand/response on the home level within a certain area. In future, interaction between areas will also appear. CEMS is interoperable with different in-home systems to avoid lock-ins and to give consumers freedom of choice.

Conclusion

It is common knowledge in our industry that the energy system is undergoing a major transformation as we move to a low-carbon economy. This is especially true for network utilities that transmit and distribute energy and must find new ways of matching increasing peaks of demand with intermittent renewables energy supply. There is really no single answer on how to best achieve this evolution, as it depends on multiple dimensions. However, from our vast experience of a diversified smart grid customer base, both from large and small organizations, and across the value chain, we identify fundamental common approaches that lead to a successful transition.

Utilities may be taking their first steps on their ONU journey or they may already be changing the way they operate. But in every case, CGI's innovation and market leadership in smart energy ranges from helping utilities shape the business case for developing a strategy to identifying new models, and from building organizational capabilities to managing risk and systems security through software and services.

Our real-world utilities industry knowledge, unique combined knowledge of OT and IT worlds, and extensive portfolio of both software and systems integration capabilities across the value chain is offering our clients an important mix of competences and supporting them in realizing their ONU vision.

Anybody can pontificate about what will happen in the future, but the real value to clients lies in working with partners who can help them realize this vision, and that is one of CGI's strengths.





www.cgi.com/en/utilities

cgi.com

Founded in 1976, CGI is one of the largest IT and business process services providers in the world, delivering high-quality business consulting, systems integration and managed services. With a deep commitment to providing innovative services and solutions, CGI has an industry-leading track record of delivering 95% of projects on time and within budget, aligning our teams with clients' business strategies to achieve top-to-bottom line results.

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