**OMNETRIC**
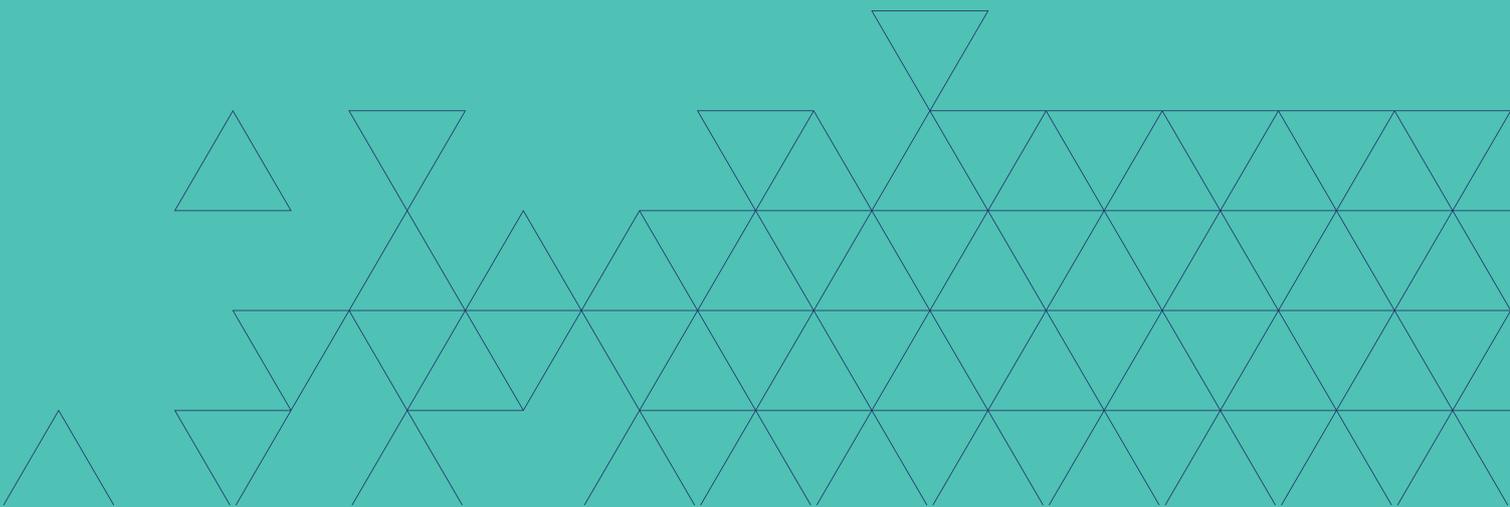
A Siemens Company

# Power to the people

Community Energy as a major driver of change in the global energy ecosystem

"Come gather 'round people where ever you roam

And admit that the waters around you have grown

And accept it that soon you'll be drenched to the bone

If your time to you is worth savin'

Then you better start swimmin' or you'll sink like a stone,

For the times they are a-changin'!"


Bob Dylan

# Introduction

Who better than a poet to describe what we are witnessing today? The global energy system is currently undergoing a multitude of change and disruptive developments: technological; economic; and not least; social. Established market models are under threat, resulting in diverse challenges for all players, especially the traditional energy companies. It's a safe bet to say that the industry will be turned upside down and nobody can currently predict who will emerge as the champions of the new energy era.

As foretold by Dylan back in the '60s, at another time of transformation, the only certainty is change. But all too often, the transformation to a new era, including a new energy era, is described as an ominous black cloud obscuring the future and bringing doom. For some energy actors that could be the case, but for others, the cloud could have a silver lining of opportunity.

At OMNETRIC, we are driven by the strong belief that successful change necessitates the open involvement of different stakeholders and an active collaboration to share ideas and conquer new routes in the energy industry.

In this context, there is a major market and social trend emerging. We call that trend Community Energy, and it is evolving into a significant driver for change. Over recent years, prosumers and communities have played an increasingly important and active role in shaping and re-inventing the energy world. According to Accenture's study, New Energy Consumer: Trends shaping the Energy Ecosystem (2016), consumers welcome new ways to share products and services. For example, 69% are interested in having an energy trading marketplace and, within the next five years, 47% plan to sign up for a community solar program, managed by a third party, that allows them to benefit from solar power even if they do not have solar panels on their property.

With the rise of renewables and the decreasing costs for decentralized energy generation, more and more stakeholders have entered the energy playing field. We see this positively: the carbon emission and sustainability goals of our global society can only be met if all stakeholders join forces and work together. Equally, we believe the provision of energy requires the involvement of stakeholders committed to safe and reliable generation and distribution.

At OMNETRIC, we constantly strive to better understand and address the needs of a new energy economy: one that is stronger, greener, smarter, and more diverse. We actively share and discuss our thoughts on the future of the energy market with all the players and stakeholders in the energy ecosystem as a core element of our business approach. Driven by this philosophy, we decided to talk to different stakeholders worldwide on the topic of Community Energy.

## Community Energy

Community energy, sometimes called "citizen utilities", encompasses the broad and growing scope of projects and initiatives worldwide that are driven by the ambition of communities to mobilize around the generation and distribution of energy. We define a community as a coalition of stakeholders – consumer groups, businesses, local governments etc. – with a joint agenda and action plan for its energy issues such as generation, distribution, management, and consumption. A community can take a multitude of forms and sizes, from large metropolitan areas and major cities all the way to small villages or city districts. Business parks, reservations, and university campuses can also be regarded as communities, as they can often have similar energy needs and challenges, and a desire to play an active role within the energy ecosystem.

# Methodology

Our approach was primarily to learn from those already building experience with Community Energy across various geographies – whether professionals working for communities or energy providers serving communities. We aimed to compile, compare, and consolidate perspectives on several major topics:

- Overall trends and challenges for communities – in general and energy-related.
- Prerequisites, requirements and obstacles to implementing the energy agenda.
- Energy expertise of communities.
- Expectations toward utilities and energy service providers.
- Potential solutions and services for Community Energy.
- How an ideal future for Community Energy might look.

We followed a two-phase approach, commencing with desk research on the topics of smart cities and Community Energy. Drawing on industry reports from analysts, case studies and thought leadership publications from different market experts, this phase helped clarify the status quo.

During the second phase of the research, between May and June 2016, we conducted 45-minute telephone interviews with 18 executives either representing communities, or representing utilities serving community needs. During the course of the survey, we had the chance to talk to market actors from Austria, Germany, the Netherlands, the United Kingdom, and the United States (see Table 1).

The interviews followed a semistructured format to ensure that all relevant questions were discussed, while it also provided an open platform for each interview partner to share their thoughts, ideas and comments. We took these insights, complemented them with the learnings from the desk research and then discussed the outcomes of the research inside OMNETRIC. This allowed us to reflect on the findings and enrich them further with our first-hand experience garnered on projects. This report is a combination of all of these different perspectives and opinions.

This report contains our findings, with the objective of:

- Sharing the insights and ideas that we gathered during our conversations regarding the importance of Community Energy, the success factors and major challenges, as well as the lasting impact this trend will have on the energy system.
- Stimulating different stakeholders to join the discussion and get involved in Community Energy. This ideally includes traditional market players like utilities or ESCOs, but also new participants such as public action groups and start-ups in the energy domain.
- Supporting broader adoption and success of Community Energy programs, projects and initiatives through the provision of the necessary technology solutions to enable community needs.

Table 1: Interviewees

| Austria | Germany | Netherlands | United Kingdom | United States |
|---|---|---|---|---|
| Smart city | Utility | Community Energy initiative | Community Energy initiative | Municipal utility - CA |
| Smart city | | Utility | Municipal utility | Community Energy initiative - CA |
| Smart innovation expert | | Smart city | Smart city | Community Energy expert - CA |
| Municipality | | | Government entity | Renewables research expert - CO |
| Government | | | | Utility - NY |

# Contents

# Key findings

As we followed an open approach to the conversations we held with Community Energy stakeholders, each exchange yielded a very unique set of insights and ideas. We have organized those insights and ideas into six key findings. However, the findings are not exhaustive and do not cover all potential topics relevant to the future evolution of Community Energy.

## The following six findings emerged strongly from the interviews:

### 1. A primary objective is economic benefit

There are multiple reasons why communities decide to take a more active role in the energy market. The drivers range from sustainability, to affordability of energy (including solving fuel poverty), and reliability of supply. In some instances, the communities were motivated by a rejection of traditional utility models. While oftentimes communities got involved in the energy market in response to sustainability measures and mandates, in all instances they pointed to economic benefit as the major driver of change. Affordable, clean energy for all was the basic economic value to be gained from managing the communities' generation and distribution. However, they also pointed to the opportunity to generate jobs for the community, as well as potentially keep any profits or advantages related to the success of an energy program for the community's benefit.

### 2. Ease, integration, and scale matter

A community is an organized coalition of stakeholders. By definition the needs of its members vary in size and scope, which represents complexity for any provider trying to service them as a market. While communities are generally small (in terms of demand requirement/supply capacity), they often take a broad perspective on all aspects of energy when they determine their goals. They aspire to a more holistic, integrated view that brings together multiple resources, such as electricity, gas and water, plus also heat and electric vehicles for the benefit of the citizen and community at large. Today, communities believe that such an integrated view of resource management is not available.

### 3. Communities have to engage all stakeholders

Communities usually consist of many different stakeholders: residents, business owners, state or municipal administrators etc. As communities start to work on specific energy-related projects, the stakeholder list broadens to include utilities, technology partners, financial institutions, and regulators, to name but a few. This diversity is a challenge, as communities need to ensure that they involve, inform and motivate all stakeholders if they are to build consensus that can be acted upon. Successful communities have identified the need to answer the "what's in it for me?" question in the minds of the different stakeholders, in order to turn them into active advocates of Community Energy.

## 4. Communities are becoming energy-savvy, but not experts

A lack of in-depth technology and business knowledge within communities has, to date, held them back from getting started with Community Energy programs. The absence of external help to bring the appropriate expertise has also been an issue. That said, competence in communities is growing, with some communities attracting experienced professionals from the energy sector, and even more nurturing their own in-house experts. Generally, these professionals do not aspire to become fully-fledged authorities in the energy domain, but are working to acquire the necessary breadth and depth of knowledge to define and realize an energy strategy that is tailored to their needs and goals. In addition, they understand the dynamics of community action and are open to collaborating with third parties able to enrich their expertise, and help them achieve their goals.
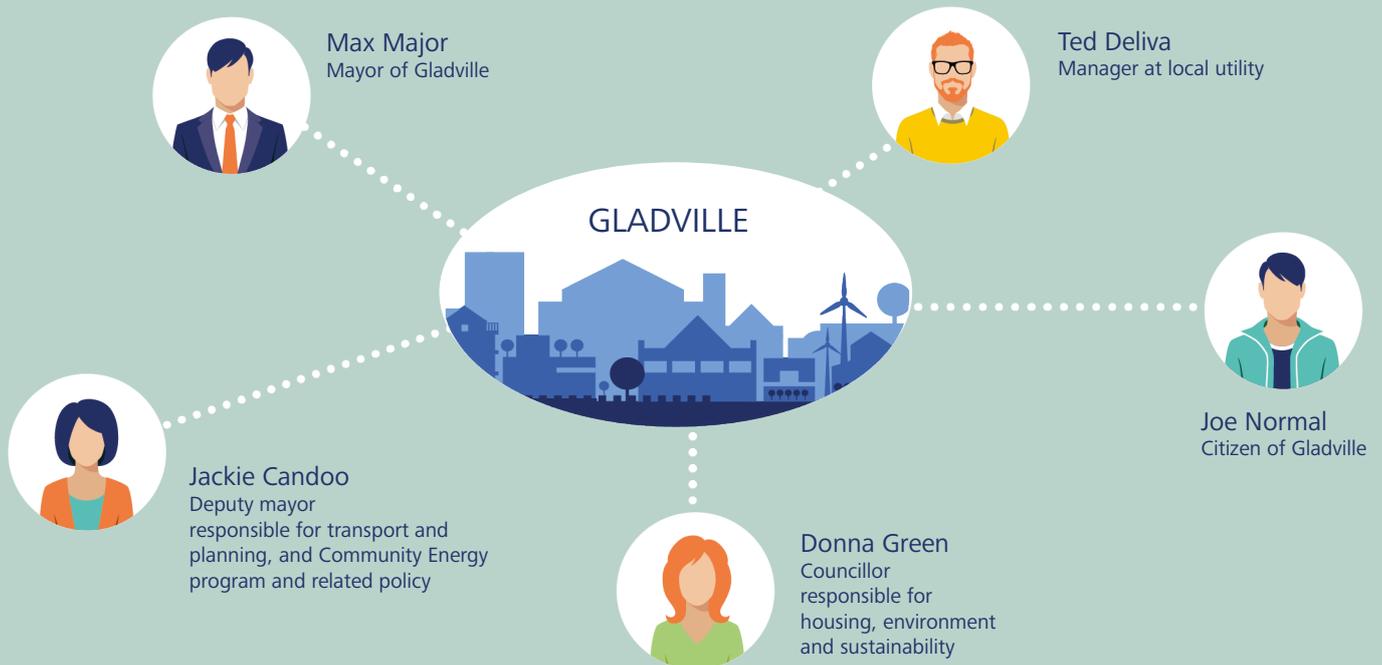
## 5. Communities are hampered by energy regulation

While regulatory mandates have been an impetus for developing an energy agenda at a community level, regulation is also a major impediment to adoption and progress for Community Energy programs. The impact of regulation for communities varies by geography, but one of the most disruptive factors for all communities is the volatility of regulatory decisions. This creates uncertainty for communities and stifles their investment. Regulatory change has made certain investments unviable in the long run, bringing complete programs to a sudden and painful halt. Also, the complexity of some energy market mechanisms, such as public subsidy programs, adds to the uncertainty: some are partly managed with tender-based, open-market mechanisms, while other aspects are still controlled by prescriptive, regulationbased concepts. Many communities feel overwhelmed by the abundance of choices and ill-equipped to navigate this unknown territory.

## 6. Information is essential to progress

Information is a critical success factor for Community Energy initiatives. Firstly, one of the major goals for communities is to better understand their local energy system, from generation through to consumption. Armed with this understanding, communities also seek to evaluate the economic value that is created and distributed within the system. This increases transparency as a basis for discussion between different stakeholders, or can be used to promote the Community Energy concept within the community, for example by showcasing the positive effects of green energy programs to consumers. In addition, communities say that continuous aggregation, consolidation, and analysis of data is essential to optimizing operational efficiency in the system and identifying areas for further improvement.

# A Community Energy Scenario

**Max Major**
Mayor of Gladville

**Ted Deliva**
Manager at local utility

### GLADVILLE

**Jackie Candoo**
Deputy mayor
responsible for transport and
planning, and Community Energy
program and related policy

**Donna Green**
Councillor
responsible for
housing, environment
and sustainability

**Joe Normal**
Citizen of Gladville

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## Max Mayor

### Mayor of Gladville

| | |
|---|---|
| Overall objectives: | Make Gladville a great place to live and a good place to do business. |
| Hidden objective: | Assure a positive legacy to enable re-election and ongoing pursuit of political agenda. |
| Other considerations: | Support the broader agenda for improving the quality of life in Gladville. Community Energy should not become a core competency for the council. |
| Expectation toward energy providers: | That they generate greater prosperity for Gladville, and assure the safety and reliability of energy supply. |
| Ideal Community Energy solution: | Would provide an intuitive and engaging presentation of information that convinces citizens of the value of the Community Energy program. Gladville could potentially use the insight in the future to assure energy transactions such as the sale of excess energy on the wholesale market, which might drive revenues and investment funds for other community needs. |

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## Jackie Candoo

### Deputy mayor responsible for transport and planning, and the Community Energy program

| | |
|---|---|
| Overall objectives: | Define a long-term energy vision for Gladville, developing a plan that identifies energy technology options, necessary investments, regulatory stimulus and barriers, and overall program management requirements. |
| Hidden objective: | Make Gladville a leading example, among smart cities and towns, of how communities can achieve sustainability and economic benefit from Community Energy. |
| Other considerations: | Move on from an opportunistic and ad-hoc attitude to community generation and distribution assets by defining a holistic view and ongoing management approach. |
| Expectation toward energy providers: | That they bring the energy management expertise and regulatory understanding to assure reliability and safety, as well as the economic benefits of the program. |
| Ideal Community Energy solution: | Would achieve a holistic view of community generation and distribution assets across electricity, gas, water etc. for ongoing optimization of the system. |

## Donna Green

### Councillor responsible for housing, environment and sustainability

| | |
|---|---|
| **Overall objectives:** | Cultivate more energy-awareness across the community, encouraging citizens to become prosumers and contribute to a more sustainable energy future. |
| **Hidden objective:** | Make Gladville a better place to live and work, today and tomorrow, through greater sustainability awareness and social balance. |
| **Other considerations:** | Change the mindset of residents and businesses through careful, tailored, ongoing communication. Neither lower costs for energy nor sustainability benefits alone are enough to make the majority become a prosumer. |
| **Expectation toward energy providers:** | That they bring the energy management expertise and regulatory understanding to assure reliability and safety, as well as the economic benefits of the program. |
| **Ideal Community Energy solution:** | Would equip citizens with real-time information so that they can play a proactive role (as prosumers) in the generation and consumption of energy. It would also contribute to the social objectives of the community's program, such as finding ways to share energy to support community facilities and programs. |

## Joe Normal

### Citizen of Gladville

| | |
|---|---|
| **Overall objectives:** | Get better visibility where energy comes from (source of generation, as well as location), reduce my energy costs and contribute to saving the environment. |
| **Hidden objective:** | None. I've got other things to think about. |
| **Other considerations:** | Make access to information and services instantaneous and accessible as well as personalized and automated. |
| **Expectation toward energy providers:** | That they proactively and clearly communicate what they can offer me in order to stand out from the many companies talking to me about the options. Then, they should deliver a solution that is easy to install, maintain and use. |
| **Ideal Community Energy solution:** | Would allow collaboration and sharing and provide easy-to-read information about potential benefits, whether saving the environment or money. |

## Ted Deliva

### Manager at local utility

| | |
|---|---|
| **Overall objectives:** | Continue to serve the community reliably and safely. |
| **Hidden objective:** | Work collaboratively with the community in order to serve the customer and safeguard the grid, while assessing the Community Energy business opportunity. |
| **Other considerations:** | Serve the needs of the community with a relevant and viable solution that can be re-purposed for other communities thereby generating economies of scale for the community and for the utility. |
| **Expectation toward energy providers:** | Not relevant |
| **Ideal Community Energy solution:** | Would be a software-based energy management platform designed to help communities measure, monitor, and manage power generation and consumption across all households and businesses connected to a specific part of the distribution system. It would be cloud-based for scale requirements and affordability and allow aggregation of information from a broad range of sources. |

This scenario represents a fictitious distillation of the diverse insights we heard during interviews.

# Success factors

Community Energy initiatives to date have largely been driven by inspired and passionate individuals, collaborating to realize a vision, and learning as they go along. On the basis of our interviews with communities and with utilities serving communities, we have formalized some of the key success factors for Community Energy initiatives.

### Gather and nurture a strong coalition of the willing
- Think broad, even unconventional, regarding stakeholders.
- Understand what motivates stakeholders. Ensure there is a clear value story in the targeted solution for each one, and tie this – at least partly – to the creation of clear benefits.
- Communicate to sustain engagement.
- Renew contributors to keep the initiative bright.

### Establish open exchange and joint ideation as a principle of the program
- The outcome is based on a sharing concept – the process to launch and maintain should be also.
- Don't try to become the expert; seek out subject matter experts, there are more and more who are ready to contribute.
- Connect with other Community Energy initiatives, particularly those in the same (regulatory) market.
- Push on all actors to encourage regulators to recognize and react to Community Energy as a trend. Guidelines on how to manage local markets (at a low voltage level) will not hurt the model and will enable pilots and trials that will lead the way forward.

### Leverage information as a core asset
- Ideally, consolidate, manage, and share information and the resulting insights on one platform.
- Pursue a software-first approach to avoid unnecessary hardware investments.
- Utilize information to showcase system performance and value creation for the community.
- Adopt a modular approach to software adoption, starting small and scaling the solution according to uptake and evolving needs.

### No compromise, but be realistic
- Aim for a realistic level of technological feasibility and economic viability.
- Think about practical, as well as mandatory ways to track progress.
- Do not compromise on goals unless it would mean the end of the initiative.
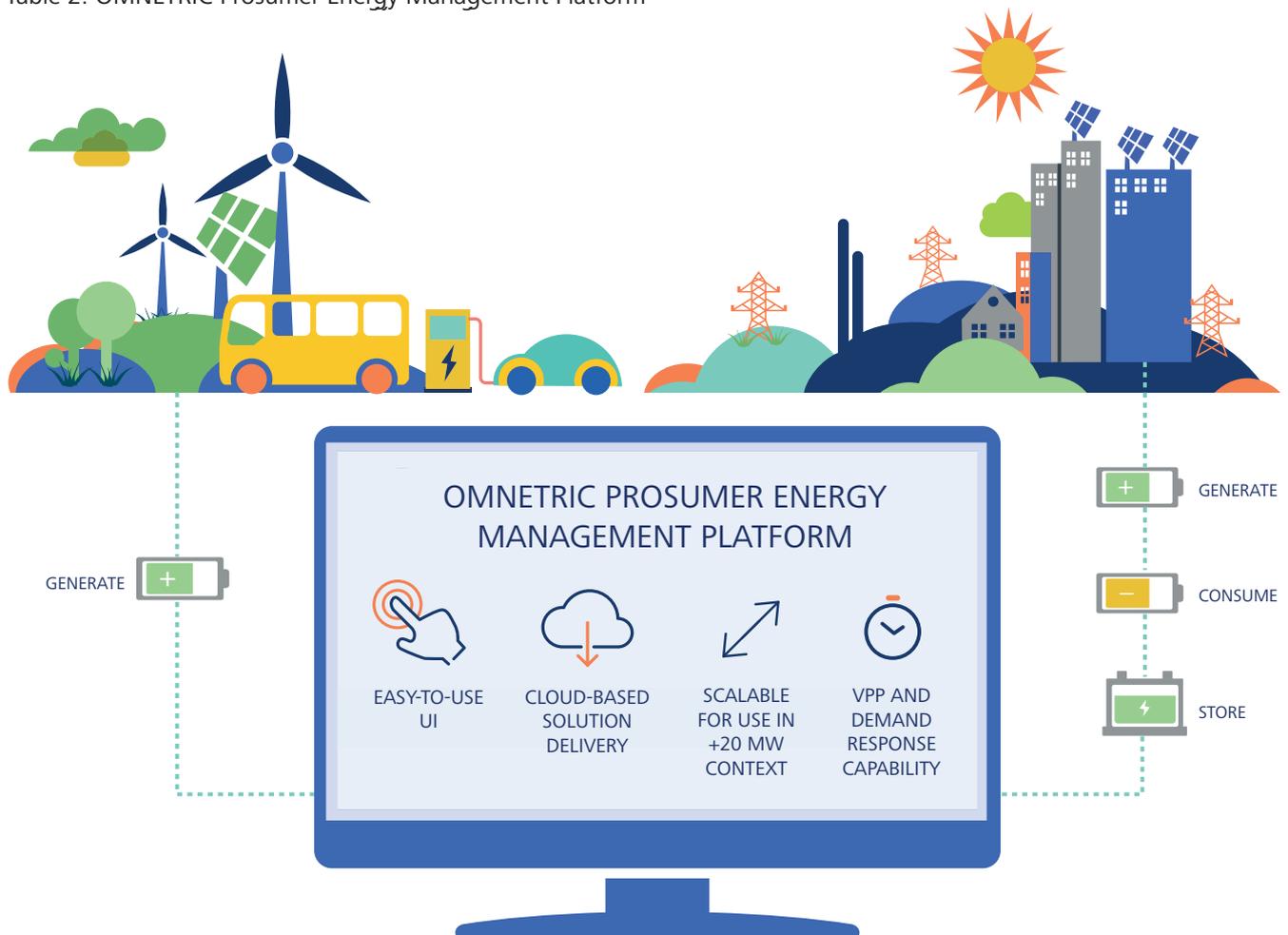
# Blueprint for success

Since OMNETRIC was founded, our ambition has been to establish ourselves as a partner in the energy market, collaborating on innovative solutions that generate value by capitalizing on an increasingly intelligent energy system.

Community Energy is potentially one of the most important forces to disrupt the energy system. It's our aspiration to contribute to the progress of Community Energy working with the various stakeholders, be they utilities working to serve communities and their evolving needs, or new players, such as municipal authorities, university campuses or co-housing initiatives.

We have been collaborating on a broad variety of energy management and smart grid solutions that deliver on the different expectations of communities for their ideal energy system. The following case studies represent actual solutions and future concepts that we are working on. Even though initially conceived and targeted at utilities, they demonstrate the types of solution already available for use in a community solution.

Having listened to communities, we are working on a solution to measure, monitor and manage power generation and consumption community-wide (see Table 2).

Table 2: OMNETRIC Prosumer Energy Management Platform



OMNETRIC PROSUMER ENERGY MANAGEMENT PLATFORM

EASY-TO-USE UI

CLOUD-BASED SOLUTION DELIVERY

SCALABLE FOR USE IN +20 MW CONTEXT

VPP AND DEMAND RESPONSE CAPABILITY

GENERATE

GENERATE

CONSUME

STORE

# Solution snapshots

## Changing consumer behavior with data

A solution designed to:
- Create awareness about energy consumption, generate transparency, and influence behavior.
- Drive increased customer interactions and improve customer satisfaction and retention.
- Establish a foundation for additional energy-related initiatives such as demand-response programs.
- Provide insight upon which new behavior-based pricing schemes can be modeled.

A Community Energy program, by definition, seeks to increase customer involvement in managing energy generation and consumption in that community. This requires providing easyaccess to relevant information, as well as the intelligent utilization of different drivers to change behaviors.

OMNETRIC is currently deploying Siemens Energy Engage, a consumer engagement software solution at an investor- and public-owned utility in North America. The data collected in the meter data management system is transformed into actionable insights that are regularly reported back to customers. The solution can potentially provide a statement about multiple resources such as electricity and gas, depending on the data available. The information generated can be sent out in written reports, by email for example, or accessed in real-time via a mobile application, showing current energy usage, consumption patterns, environmental impact, as well as a forecast of the month-end bill. This information can be linked to energy conservation tips, invitations to shift consumption to times with lower price points, or offers of different, cost-saving pricing plans adapted to the actual consumption pattern. The open design enables customers to configure their preferences, such as meter-level detail and bill periods, and consult historical data, for example on consumption, environmental impact and the relationship between daily weather and energy use.

## Optimizing control of distributed energy affordably with microgrid in the cloud

A solution designed to:
- Adapt to existing infrastructure or usage scenarios, thanks to open standards.
- Reduce the upfront investment of developing a microgrid through cloud delivery, thereby lowering the financial barrier to getting started.
- Enable a microgrid deployment with less know-how than a traditional solution, since it is hosted, managed and maintained by the provider.

A microgrid solution can enable communities to take control of their existing generation capacity or take advantage of the sinking costs of renewable energy sources and storage to become energy independent. The additional flexibility offered by a microgrid helps save money by automating certain decision processes, for example when to use one's own energy or buy it from the grid. However, the cost of purchasing, running and maintaining a microgrid can be a barrier to adoption.

Microgrid in the Cloud is a remotely-hosted, microgrid control solution, based on Siemens Microgrid Management System, developed and tested by OMNETRIC. It is designed to offer advanced monitoring, control and optimization of distributed energy with the flexibility and greater affordability of cloud-based delivery. The solution includes integration to existing on-site software systems such as building automation, advanced physical and cyber security measures, and regular software maintenance and upgrades. The user can log into a configurable dashboard offering relevant information about the status of the microgrid, and can also integrate weather and load forecasting for a more comprehensive view. The solution can be deployed in a private cloud or as-a-service in a one-to-many mode, decreasing the individual costs further.

## Balancing the grid for more efficient supply- and demand-side management

A solution designed to:
• Create consumer awareness – commercial and residential – for energy management.
• Provide the opportunity to participate in load-shifting programs, for example through controlling heating, ventilation, and air conditioning units, water heaters, smart thermostats, and irrigation switches to lower costs.
• Increase grid stability and reliability in both the transmission and distribution networks while providing cost savings through peak load shaving.
• Integrate and simplify the management of distributed energy resources like solar photovoltaic, wind farms, storage facilities or electric vehicles.
• Aggregate different programs and management tools into one, easy to use, software platform.

In order to achieve their sustainability and financial goals, forward-looking communities want to influence the energy consumption related behaviors of their members, while more accurately managing their generation. While regulation remains a hurdle in many markets, some would also like to either share or sell excess energy capacity. Installed smart meters can set the foundation for the creation of dedicated demand-response programs. At OMNETRIC we integrate demand-response management solutions based on Siemens EnergyIP. Our solutions allow communities to better understand what is going on across the grid so that they can pinpoint localized grid stress and isolate and target demand reductions via substation, feeder, zip code or geographical location. With the individual definition of disposable load units, commercial and industrial customers, as well as residential customers, can be easily integrated and managed.

However, with the rise of distributed energy resources, many additional opportunities are evolving that lie beyond demand-side management. Distributed energy management systems, such as Siemens DEMS, enable the integrated management of demand with the direct control of the distributed energy resource to optimize how the grid is balanced, assuring grid stability. For consumers, peak load shaving can generate significant savings, enabling them both to avoid expensive peaking power purchases, and discover new revenue streams by selling excess power on the wholesale market. OMNETRIC is currently integrating a distributed energy management solution at WVPA in North America, which enables the integration of all existing demand-response initiatives at a generation and ransmission utility under one common IT platform, thereby achieving transparency and control.

## Monitoring energy consumption real-time

A solution designed to:
• Enable an operator to optimize and reduce energy consumption in a defined area thanks to an intelligent platform with a highly visual and intuitive interface.
• Work with existing infrastructure and data.
• Adapt to diverse usage scenarios and levels of detail.
• Provide the flexibility to integrate control and management modules such as demand-response, workforce management and outage management.

OMNETRIC Active Energy Monitoring Solution is a software platform, based on Siemens EnergyIP, that enables real-time control of energy consumption in a specific area, such as a campus or a district. Based on energy usage data from multiple and diverse information sources such as SCADA, building management systems, asset management systems and pump controls, the solution integrates, categorizes, and analyzes the data, equipping the user to more efficiently manage consumption.

Based on the available data, the software will calculate average energy consumption for a given area, building or group of buildings and determine suitable benchmarks, perform cost analysis and inform the user if any of the buildings are behaving unusually. In addition, the user can define individual thresholds and will be informed when they are reached.

An open software architecture means the solution can be integrated with legacy systems and can work with diverse data formats, including those manually collected and fed into the system. The user interface can be configured to meet specific goals and usability needs. It displays all relevant information on energy consumption, energy usage forecasts, the impact of weather, and areas with issues, from a summary for the whole area, down to details about individual buildings. With all relevant insights on the energy consumption of each defined measurement point in the area, the platform allows to – manually or automatically – dispatch service teams if thresholds are broken or unusual consumption patterns are identified. The modular configuration of the solution allows for the integration of additional functions such as meter data management, demand-response management systems (for load-shedding and peak-shaving), advanced fault detection and diagnostics, or distributed energy management systems in the future.

# Opportunities for utilities

Over decades, traditional market players have worked to assure energy reliability and safety and provide widespread access to energy resources. Today, market dynamics are changing. With the rise of prosumers, the economic viability of rooftop solar and storage, and the adoption of Community Energy initiatives, the game is changing.

All community representatives we interviewed expressed a desire to collaborate with partners able to bring expertise and solutions that could help them execute on their energy agenda. Recognizing their experience, most were open to working with utilities. For their part, utilities vary in their response to Community Energy initiatives. Some may follow a more or less defensive route and try to limit their active involvement with communities, fearing the negative impact of such programs on their core business.

A growing number of utilities however, are actively addressing communities and initiating joint discussions. Top of the agenda for discussion are the opportunities afforded by current technologies for more active management of the energy grid at a community level. Among the different roles that utilities can adopt, there are three that stand out. These roles do not represent either/or decisions for a utility, and it may vary its role by community, depending on the community's size, character, and energy goals.

Each of these roles demands a certain set of capabilities and assets to successfully execute the respective business strategies. In addition, the market situation and regulatory environment affect the viability and attractiveness of each role, calling for a very thorough assessment and evaluation of the alternatives before a utility can take any final decisions regarding their strategic direction.

Table 3: Community Energy equation demonstrating the economic viability of the Community Energy concept

|  | | Scenario 1: Individual approach | Scenario 2: Community Energy approach |
|---|---|---|---|
|  | Average home(s) | 1 | 100 |
|  | Solar capacity | 5 kW | 500 kW |
|  | Storage capacity | 8 kW | 800 kW |
|  | Relationship to the grid | • 7,870 kWh of solar production annually<br>• Battery storage shaves over 100% of peak time of use charges with smart management<br>• House-by-house installation and interconnection | • 7,954,054 kWh of solar production annually<br>• Battery storage shaves over 100% of peak time of use charges with smart management<br>• Leverages project cost efficiencies and ability to aggregate solar production and battery storage |
|  | Benefits | • Net present value over 25 years including battery replacement: USD 7,296<br>• Average electricity bill savings of USD 2,700 per year over 25 years<br>• Hedges against future electricity price increases reaching upwards of 3% per year<br>• Enhanced self-sufficiency and reduced environmental impact | • Saves USD 3,900 in capital costs per household compared to scenario 1, a 17.5% discount, even factoring in land acquisition costs<br>• Net present value over 25 years including battery replacement and land leasing costs: USD 10,485 per home<br>• Average electricity bill savings of USD 2,700 per year over 25 years<br>• Hedges against future electricity price increases reaching upwards of 3% per year<br>• Provides those without ability to install solar an opportunity to take advantage of solar + storage benefits<br>• Enhanced community engagement, self-sufficiency, and reduced environmental impact<br>• Offers an aggregated resource that can be utilized for demand response and/or grid ancillary services |

Source: Based on research and modelling using National Renewable Energy Laboratory's System Advisor Model (NREL SAM): https://sam.nrel.gov and its U.S. Photovoltaic Prices and Cost Breakdowns: Q1 2015 report: http://www.nrel.gov/docs/fy15osti/64746.pdf for the San Diego, California region.

## Collaborative partner

Utilities can tap their broad scope of expertise and project experience to support a community as it evaluates different solutions for its specific circumstances and goals.

Requiring only a limited technical solution may prohibit utilities from commercial involvement in the solution chosen by the community. Nevertheless, by opting to remain part of the team, the utility can ensure that they still have a seat at the table in the event the needs of the community evolve to require more sophisticated support.

Additionally, given the speed at which the Community Energy trend is evolving, participation in the program as an observer and sounding board, can help to shape community-relevant offers going forward.

## Community Energy service provider

This is an extension of the consulting approach, where the utility would not only collaborate with communities to define a solution, but would also develop the solution and deliver it based on their own available technologies and add-on technologies from thirdparty providers. Depending on the degree of community involvement in the ongoing management of the energy solution, as defined in the community's energy ambitions, the utility could potentially work as a business partner, running, maintaining and optimizing the solution.

From a business perspective, the energy service provider role presents the most diverse array of economic growth opportunities for utilities. On the other hand, this route potentially requires an intensive form of continuous collaboration between the involved stakeholders, which could negatively affect the business case for this option. In addition, there is a threat of new entrants to energy distribution assuming the role of energy platform provider and offering a lower-cost solution.

Examples of utilities taking on the Community Energy service provider role already exist in all of the countries we evaluated – examples include Austin Energy (Pecan Street), Eneco and Wabash Valley Power. We have also seen and are collaborating with Community Energy projects in Brooklyn, New York, the Netherlands, and the United Kingdom where the utility is taking on the service provider role. Both the supply and the demand side of energy provision contribute to the growth of this kind of collaboration – for example government-led initiatives and investments such as smart cities, or progressive business models from utility shareholders.

## Community Energy platform provider

In the role of Community Energy platform provider, the utility assumes the role of optimizing the management of energy generated, stored and shared by the community. Today the meter is the control point that provides the data to inform decision making at the utility. Moving forward, storage will become the control point and the key asset to manage the distribution grid. Prevailing regulatory structures might prevent optimal decisions about storage on the part of utilities today. Key for them to determine is whether in the future, storage is owned by the distribution company, embedded but owned by a third party provider or beyond the meter as part of a consumer installation.

In this scenario, the utility develops a range of potential solutions, packaged and offered to communities to respond to different but "classic" usage scenarios, with little to no tailoring. The solutions are based on a broad assessment of the market situation and latest technologies, thereby providing communities with a market-proven standard that will be optimized over time. These solutions would likely be delivered as a service, providing economies of scale for the provider and community.

This role requires a clear business case, initial and ongoing funding, and a commitment to the Community Energy opportunity. In this scenario, larger utilities could offer their solutions as white label platforms to local/municipal utilities. These smaller utilities could then provide the service under their own names to the communities, acting in the role of an energy service provider.

# Conclusion

No single party can solve the multitude of current and future challenges on its own. Open dialogue and exchange are essential drivers of transformation and progress in the energy world. Greater openness of business models, architectures, and standards, as well as ecosystems is what will enable progress.

## It's time for Community Energy

At the beginning of the 21st century, a multitude of cities set about building sustainable communities. They developed plans, secured funding, and launched pilots aimed at accommodating expanding populations, all while reducing emissions and energy consumption. While these smart city initiatives did not die completely, many stalled at the end of the first decade. Now, more than another five years on, aspirations for greener cities are seeing a revival. This time around, it is not just dense, urban areas that are mobilizing to execute on an energy agenda, but also rural villages, campuses, and business parks.

## Why now? What's changed?

### Technolological advancement
Energy technologies have matured and proliferated. Technological advancements mean that energy generation is no longer the reserve of the traditional players. The significant fall in the price of solar photovoltaic for example makes this generation tool a no-brainer – at least for those in sunny climates. Likewise, storage capacity is growing, and while the cost of storing energy generated remains relatively high, options such as re-conditioned car batteries for household use, or virtual energy storage, are making storage more viable and accessible to more people. In addition to these advancements, technologies in the areas of energy efficiency, energy conservation, and energy substitution are also making the green agenda more mainstream.

Efficient buildings and appliances, demand response mechanisms, and the electrification of transport and heating for example, all represent great technology strides that are empowering not just traditional energy players, but also the population at large to reduce their carbon footprint. In parallel, IT solutions that can serve as a digital ledger, such as Blockchain, are bringing down the cost of transactions.

### Economic viability
Our research revealed however, that technology does not drive a community's interest in the energy topic. While communities are often motivated to consider community-led approaches to energy distribution in order to achieve their sustainability targets, a primary objective for undertaking a Community Energy initiative is economic benefit. Job creation for example is a motivating factor, as is deriving value that can be consumed directly by the community. The original smart city initiatives lost impetus when the early pilots were unable to demonstrate economic viability. Thanks to technology advancements, today's Community Energy initiatives are better equipped to realize their economic potential.

### Mindset shift
While economic benefits are paramount, a shift in consumer mindset is undoubtedly contributing to the spread of Community Energy initiatives. This shift is characterized by an increasing public awareness of the dangers of climate change, but also a growing distrust of large public institutions. Add to this the consumer trends of "buying local", and the sharing economy, and citizens are proactively pushing their local

governments and councils to define and execute on an energy agenda. Smart cities and towns are responding by redefining their original objective of sustainability to include values such as openness and social equity.

## Regulatory uncertainty slows progress

While progress in technology maturity, economic benefit and customer mindset is pushing the Community Energy agenda forward, it is regulation that is hampering broader and faster uptake. Communities and utilities interviewed cited regulatory uncertainty as a barrier to progress. The topic of regulation has not been explored in this research, but in the wake of other disrupted sectors, such as communications, hospitality and hotels, and transport and taxis, communities and utilities would do well to strongly encourage regulators to provide some degree of flexibility in the system. Not only would this provide the space for experimentation and innovation, it would potentially present the opportunity for communities and utilities to work more closely together to assure the durability of the grid – the critical backbone to the energy system.

## An invitation to collaborate

At OMNETRIC, open dialogue and exchange is at the core of how we do business. We'd like to issue an open invitation to those interested in contributing to the progress of Community Energy. If you have ideas or opinions to share, or simply want to challenge the insights in this report, please get in touch.

# Further Reading

There is a great deal of interesting material available that we came across during our research. This list of sources ranges from real-life projects and case studies to white papers related to Community Energy and the future of our energy system.

## Papers

Studies and white papers that highlight different aspects of Community Energy and the future of our energy system:

A glimpse into the future of Britain's energy economy
https://www.openutility.com

How Collective Energy Buying is helping Communities go 100% Renewable
https://www.fastcoexist.com/3058324/how-collective-energy-buying-is-helping-communities-go-100-renewable

New York's revolutionary plan to remake its power utilities
http://www.vox.com/2015/10/5/9453131/new-york-utilities-rev

Building Smart Energy Communities
http://www.questcanada.org/downloads/Building%20Smart%20Energy%20Communities%20-%20Implementing%20ICES.pdf

Beyond Utility 2.0 to Energy Democracy
https://ilsr.org/report-energy-democracy

The New Energy Consumer: Thriving in the Energy Ecosystem
https://www.accenture.com/us-en/insight-new-energy-consumer-thriving-new-retail-ecosystem#

Community and local energy: Challenges and opportunities
http://ippr.org/read/community-and-local-energy-challenges-and-opportunities#

Low Carbon – High Stakes: Do you have the power to transform
https://www.accenture.com/_acnmedia/Accenture/Conversion-Assets/DotCom/Documents/Global/PDF/Strategy_7/Accenture-Strategy-Low-Carbon-High-Stakes.pdf

Community Scale Solar
http://www.rmi.org/Content/Files/RMI-Shine-Report-CommunityScaleSolarMarketPotential-201603-Final.pdf

Reimagining electric utilities for the 21st century
http://www.vox.com/2015/9/11/9306247/utilities-21st-century

Beyond Sharing – How Communities can take ownership of Renewable Power
https://ilsr.org/report-beyond-sharing

Boston Community Energy Study
http://www.bostonredevelopmentauthority.org/planning/planning-initiatives/boston-community-energy-study

Community Power
http://www.foeeurope.org/sites/default/files/publications/community_power_briefing_nov2013.pdf

Cities, Towns & Renewable Energy
http://www.iea.org/publications/freepublications/publication/cities2009.pdf

Community Power: Model Legal Frameworks for Citizen-owned Renewable Energy
http://www.clientearth.org/reports/community-power-report-250614.pdf

Community energy in Germany: existing models, public-private funding and good practice examples
http://www.communitypower.eu/images/GemanyD32.pdf

Power to the people: Is community energy the way forward
http://www.irishtimes.com/news/environment/power-to-the-people-is-community-energy-the-way-forward-1.2515437

A Guide to Community Solar
http://www.nrel.gov/docs/fy11osti/49930.pdf

How MGM Prepared Itself to Leave Nevada's Biggest Utility
http://www.greentechmedia.com/articles/read/How-MGM-Prepared-Itself-to-Leave-Nevadas-Biggest-Utility

Back to the Future: What Role Will Electric Utilities Play in 2030?
http://www.greentechmedia.com/articles/read/back-to-the-future-what-role-will-electric-utilities-play-in-2030

Community Solar Programs Can Reach Millions of People—If Utilities Design and Market Them Right
http://www.greentechmedia.com/articles/read/community-solar-programs-can-reach-millions-of-people-if-utilities-design-a

Shared Solar: Current Landscape, Market Potential, and the Impact of Federal Securities Regulation
http://www.nrel.gov/docs/fy15osti/63892.pdf

# Projects

Projects and initiatives that are already bringing Community Energy to life:

**Aspern Smart City Research**
Testing a smart energy grid with integration of buildings and generation in Vienna
http://www.ascr.at/

**Lancaster Cohousing Project**
Supplying a private cohousing initiative with renewable energy
http://www.lancastercohousing.org.uk/Project

**TexelEnergie Cooperative**
Privately initiated, community-owned energy company form a Dutch island, now growing into a smart grid project
http://www.texelenergie.nl
http://www.rvo.nl/sites/default/files/2015/09/5339-IPIN-FS-Cloud%20Power%20Texel-ENG%20%5Bweb%5D.pdf

**The Brooklyn Microgrid**
Establishing a local microgird to buy and sell energy to direct neighbors via block chain
http://transactivegrid.net
http://brooklynmicrogrid.com

**Westchester Power**
Creating transparency and managing consumption with a local small business program
http://www.westchesterpower.org/business/

**Silicon Valley Clean Energy**
Providing a platform for renewable community choice energy in cooperation with the local utility
http://www.svcleanenergy.org

**Sonoma Clean Power**
Establishing a not-for-profit agency that provides clean energy and invests locally to support Sonoma County renewable power and local jobs
http://sonomacleanpower.org

**Marin Clean Energy**
California's first community choice aggregation program
https://www.mcecleanenergy.org

**The Triangulum Landmark Project**
Co-creating smart cities with citizens and developing viable business models
http://triangulum-project.eu

**The Isle of Eigg Microgrid**
Installing a community-owned microgrid
https://building-microgrid.lbl.gov/isle-eigg
http://microgridprojects.com/microgrid/ilse-of-eigg-microgrid
http://www.rmi.org/Content/Files/RMI-Islands-RenewableMicrogrids-FINAL-20151103.pdf

**Stedin**
Developing Lombok into a smart energy district with integration of citizens
http://www.slideshare.net/dutchpower/henk-fidder-smart-solar-charging-in-lombok
http://smartstorage.nl/_site/wp-content/uploads/2015/09/Steden_Poster-visie.pdf

**Brixton Energy**
Developing a community owned solar project to share the energy and benefits in the neighborhood
https://brixtonenergy.co.uk

**SolShare Energy**
Granting communities access to community-based renewable electricity generation via a co-operative controlled corporation
http://solshare.ca

**Open Utility**
Developing a peer-to-peer energy matching platform for renewables
https://www.openutility.com

**The city of Perth**
An interesting case study of distributed electricity generation
http://www.abc.net.au/radionational/programs/ockhamsrazor/citizen-utilities:-the-future-of-solar/7558174#transcript

# People

A selection of inspiring thought leaders, visionaries and institutions that push new ways of generating, distributing and managing energy:

### The Community Energy Coalition
Founded by some of the United Kingdom's most influential and trusted institutions and charities, the aim is to ignite an energy revolution which places communities at its heart and strives for a clean, affordable and secure energy system for all
http://www.ukcec.org

### Coalition for Community Energy
Guiding and supporting the development of the community energy sector
http://c4ce.net.au

### Community Energy Scotland
Providing practical help for communities on green energy development and energy conservation.
http://www.communityenergyscotland.org.uk

### Institute for Local Self-Reliance
Providing innovative strategies, working models and timely information to support environmentally sound and equitable community development
https://ilsr.org/initiatives/energy

### The Breakthrough Energy Coalition
Global group of 28 high net worth investors from 10 countries committed to funding clean energy companies
http://www.breakthroughenergycoalition.com/en/news.html

### CarbonCrowd
Platform to purchase carbon rights and track the impact in real-time
https://blog.heatspring.com/crowd-funding-meets-carbon-reduction

### Bill Gates
Personal thoughts and opinion about the future of the world and the importance of clean energy
https://www.gatesnotes.com/2016-Annual-Letter

### Galvin Power
Founded by former Motorola chief Bob Galvin, the Galvin Electricity Initiative is leading a campaign to transform the way communities generate, deliver, and use electricity in the United States.
http://galvinpower.org

### Jeremy Rifkin
Evangelist and thought leader of the third industrial revolution and the lateral power architecture
http://www.thethirdindustrialrevolution.com

### REV
New York's Initiative to reform the energy vision for the community
http://www3.dps.ny.gov/W/PSCWeb.nsf/All/CC4F2EFA3A23551585257DEA007DCFE2?OpenDocument

### Roadmap Next Economy Rotterdam
Creating a future-oriented roadmap from digitalization to smart energy and circular economy
http://mrdh.nl/system/files/projectbestanden/Summary%20Executive%20Seminar%2021%20%26%2022%20June.pdf
http://mrdh.nl/RNE

### Billions in Change
A movement to save the world by creating and implementing solutions to the most basic global problems – water, energy and health
http://billionsinchange.com/news

### Co-op Power
A consumer-owned sustainable energy cooperative that creates a multi-class, multi-racial movement for a sustainable and just energy future
http://www.cooppower.coop/community-owned-energy

### Mongoose Energy
Identify, develop, finance, build and manage community-owned, renewable energy installations in the United Kingdom
http://mongooseenergy.coop

### Community Power Network
A network of grassroots, local, state, and national organizations working to build and promote locally-based renewable energy projects and policies
http://communitypowernetwork.com

### Mission Innovation
Founded by the leaders of 20 countries to accelerate clean energy innovation
http://mission-innovation.net

# www.omnetric.com

## About OMNETRIC

OMNETRIC is dedicated to helping energy providers reap the benefits of the digital energy system by integrating their energy operations with IT to support their business goals.

Our global team of engineering, IT, security and data experts brings extensive industry experience to help customers discover and exploit data intelligence to capitalize on industry change, and realize new business models.

Helping customers since 2014, we are an inventive, technology services company.
For more, visit www.omnetric.com.

OMNETRIC is a Siemens company.

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