

F R O S T & S U L L I V A N

FROST & SULLIVAN BEST PRACTICES AWARD

DIGITAL GRID - EUROPEAN

New Product Innovation 2019



FROST & SULLIVAN

2019

BEST
PRACTICES
AWARD

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Background and Company Performance

Industry Challenges

Globally, the electricity grid structure is evolving from the traditional composition of centralized power stations to a grid that encompasses numerous decentralized or renewable energy sources. The traditional electrical grid was developed under a top-down, generation-to-consumption design, wherein energy is directly distributed to end customers. Yet this grid structure is ill fit to operate with smaller, variable, and decentralized production plants and does not best support active consumers (also called prosumers). Decentralized sources typically involve energy generation from solar photovoltaic (PV), wind, and biomass, and involve loads such as electric vehicles (EVs) or generic thermal loads like boilers and heat pumps. The increasing penetration of decentralized sources into the grid will likely result in grid instability; this is expected to lead to supply insecurity and outages.

Today's distribution system operators (DSOs) need to adapt their infrastructure for hosting these new dispersed generation sources and consumption patterns. For each new installation (e.g., PV, EV, storage systems), they must perform time-consuming grid analysis to ensure secure grid operation and efficient placement of their assets. Yet due to lack of adequate data and respective ability for fact-based analysis, today DSOs often rely on costly and unnecessary over-sizing of infrastructure. Moreover, the process of system planning studies is time consuming, requiring multiple simulation tools that do not base their analysis on real data, use conservative assumptions for grid simulations, and do not always rely on accurate grid conditions (mismatch between perceived and actual presence of lines, cables, and connectivity between transformers due to switching activities in the network). Consequently, they end up using more manpower than needed for field operations that could be digitalized and automated.

Frost & Sullivan recognizes that with increasing penetration of decentralized generation, it is becoming more and more complex for DSOs to manage grid operations and infrastructure. As such, DSOs need to develop grid infrastructure and integrate distributed energy resources (DERs) into the grid, keeping in mind the volume of energy generated, economic constraints, and regulatory limitations.

New Product Attributes and Customer Impact

Match to Needs and Design

DEPsys, a Swiss company focused on developing smart grid solutions for electricity distribution networks, has developed a grid optimization toolbox called GridEye that can improve grid health and performance. The GridEye solution is a combination of hardware and software components. The hardware includes sensors which enable measurement, control, and communication; they are placed on both the low voltage (LV) and medium voltage (MV) parts of the grid and allow for high sampling and accurate, time-synchronized measurements. A GridEye device can measure electrical values at electrical cabinets, control electrical elements, and serve as a communication gateway for server communication. The software part of the solution is embedded in the hardware to perform

edge computing in the field, apart from the backend software presence which allows a full integration and communication with the DSO's environment (e.g. SCADA or ADMS).

A significant amount of data is generated from decentralized GridEye Hardware. To effectively manage the grid, DSOs must make good use of this data. The GridEye system design revolves around minimizing expensive communication infrastructure and reducing big data issues. This objective is enabled by placing the hardware components at important and critical parts of the grid, such as secondary substations, cabinets, and influential nodes. With the wealth of information collected by GridEye for DSOs, DERs can be controlled to manage grid instability, and monitoring can be conducted effectively. In particular, GridEye solves issues such as network balancing, fault identification, and localization by collecting data in real time and analyzing it locally. At the same time, GridEye allows for more efficient network operation in the sense that it enables higher yet secure utilization of assets and optimal deployment of cables and transformers on the distribution grid, avoiding costly and non-optimal oversizing.

Frost & Sullivan recognizes that many different technologies claim to address network stability, distribution security, and energy efficiency that include traditional and unsophisticated grid reinforcement, voltage regulators, measurement devices, and other tools; however, these are all single-purpose solutions. In contrast, GridEye has the advantage of performing network monitoring and controlling DERs from within the same unit. This means DEPsys has competitors on both the hardware and software end. On the hardware side, some key competitors are power quality devices, MV/LV transformer monitoring devices, as well as some types of smart meters. These are point solutions and therefore require dedicated software to collect, manage, and analyze the data, and depending on the type, they are either quite expensive or non-functional in terms of delivering the proper set of information in real time.

Frost & Sullivan believes that in GridEye, DEPsys has developed a groundbreaking smart grid solution that combines hardware and software to deliver a simpler, more efficient, and cheaper grid optimization toolbox. By meeting the increasing need for digitalization of grids required by DSOs, GridEye exhibits the potential to make the energy transition to DERs, such as solar PV and wind energy, as well as distributed loads such as EVs, much easier.

Positioning

While competing software solutions use network models, GridEye uses its ModelLess® Technology to analyze and control low voltage networks. This model-less approach is based on accurate calculation of sensitivity coefficients, without the need to know any grid parameters. The absence of network parameters results in reduced operating costs for the utility. Moreover, as fewer hardware device are needed and installation is plug-and-play, the investment required is quite lower.

Frost & Sullivan finds the wealth of software tools provided by GridEye is unmatched by its competitors. GridEye offers a toolbox of different solutions all aiming to improve grid operation. Although other companies offer particular parts of the solution, no other

exhibits GridEye's broadness of application. Specifically, GridEye provides 15 different grid tools with applications that range from grid security and balancing to managing operations and field personnel.

DEPsys recently received funding of about USD 13 million as part of its series B investment round with investors including BNP Paribas and SET Ventures. The company will use this support to facilitate international expansion. DEPsys is also a portfolio company of Statkraft Ventures, a venture capital firm backed by Statkraft Group, Europe's largest renewable energy generator.

Frost & Sullivan acknowledges the impressive innovation of the model-less approach that readies GridEye technology to perform real-time grid analysis and sees it as unique in grid digitalization. This approach, combined with funding from industry majors, makes DEPsys well-positioned to expand its innovative technology to new markets the world over.

Quality and Reliability

GridEye takes time-synchronized measurement of voltages and currents with a high sampling rate (52 kHz). The superior quality of its measurements are certified as "IEC61000-4-30 Class-A" by the accredited conformity evaluation of measuring instruments evaluation body of Switzerland (and recognized by the EU): METAS (Federal Institute of Metrology). The high quality measurement data allows provision of detailed and accurate power quality analysis and reports.

Measurement and computing are integrated in the embedded software. The decentralized software solution ensures that all electrical quantities are calculated in the embedded intelligence (GridEye device), and the results are sent to the web server according to the required reporting rate (e.g., 10 min for monitoring and 1 week for power quality). These design features provide a huge advantage over other technologies by minimizing communication costs and required infrastructure.

GridEye's Power Quality application (certified "IEC 61000-4-30 Class-A" power quality analysis and report) delivers detailed, accurate, and continuous information on the quality of supply and real-time notification of breach to any power quality threshold. Thanks to the constant real-time monitoring, DSOs stay informed about the quality of service provided to end customers and can perform preventive actions before any damage occurs.

Price/Performance Value

DEPsys charges a one-off fee for each device as well as an annual fee for cloud-based (or on premise option) applications and software maintenance. An annual charge covers the data communication costs that are kept to a minimum as the decentralized intelligence allows performing necessary calculations for monitoring and controlling purposes locally. As edge computing is performed locally at the embedded units and not at a single centralized web server, GridEye prevents the risk associated with single point of failure.

Moreover, GridEye needs to be deployed only on the important nodes of the grid, such as MV/LV transformers and cabinets. When deployed on transformers, it offers readings on both the LV part as well as high-accuracy estimated readings on the MV part. The latter is

a significant cost saver since dedicated MV monitoring devices are expensive and difficult to install, and require deployment and connection to third-party tools (mainly voltage transformers). With the deployment of GridEye, large parts of an MV network that are expensive and difficult to monitor yet critical for solid grid operation where a single fault can affect larger parts of the population and contribute towards black-outs can be covered by equipping the LV side with the solution.

A competitive advantage of GridEye is that even a few devices allow the execution of most of its applications on that part of the grid without any connection to other systems of the DSO (avoiding expensive system integration and issues with legacy systems). The DSOs can purchase a scalable number of devices so they have the ability to spend only on parts of their grid that seem to face challenges. As deployment grows in size and more parts of the network become visible, more synergies are materialized, especially on the front of grid management and new connections planning, asset management, fault identification, and localization. At the same time, the data that is recorded on various parts of the grid and critical to be communicated in real time can also be distributed to other core systems of the DSO, such as SCADA (supervisory control and data acquisition) and DMS (distribution management system), increasing their efficiency and utilization rates.

Frost & Sullivan is impressed by the potential cost efficiencies offered by the comparatively negligible hardware requirement from GridEye's solution in addition to its ability to function independent of DSO system integration.

Customer Ownership Experience

Romande Energie (RE), one of the largest DSOs of Switzerland covering over 300,000 clients in the Canton de Vaud, is faced with an increased presence of DER due to which there is a need to maintain good power quality in its network and its established low customer minutes lost (CML) rates. To achieve these goals, GridEye was deployed for monitoring the LV and MV parts of RE's grid. With GridEye's real-time monitoring capabilities, RE now receives real-time information on network events, such as overvoltage and congestion, sent directly to its SCADA system to monitor situations faster and with more accuracy. The fact that RE has access to data over a larger part of its network allows it to significantly optimize its field operations and understand faster and with greater geographical accuracy where issues were identified on its grid. Moreover, DEPsys delivers its GridEye solution to 30 DSOs in 10 countries in Europe and Asia. To be closer to its customers DEPsys has opened two subsidiary in Germany (Essen) and recently in Singapore.

Conclusion

The proliferation of DERs into the energy grid has made grid operation a challenging ordeal for DSOs. As such, need has become critical to extract important data from different parts of the grid and perform real-time analysis to effectively manage the integration of DERs into grid infrastructure. The Switzerland-based technology company DEPsys has developed an intelligent solution, GridEye, that digitalizes grid operation by the integration of hardware and software components into various parts of the grid. A key technology aspect that stands out is GridEye's model-less approach towards LV grid analysis and control that enables decentralized intelligence. The superior quality of GridEye's power quality reports is validated by METAS. Also, the attractive price structure of GridEye with potential cost reduction possibilities for DSOs and the recent funding from prominent venture capital firms such as Statkraft Ventures make GridEye well-positioned to experience healthy market expansion.

For its strong overall performance, DEPsys is recognized with Frost & Sullivan's 2019 New Product Innovation Award.

Significance of New Product Innovation

Ultimately, growth in any organization depends on continually introducing new products to the market and successfully commercializing those products. For these dual goals to occur, a company must be best in class in three key areas: understanding demand, nurturing the brand, and differentiating from the competition.



Understanding New Product Innovation

Innovation is about finding a productive outlet for creativity—for consistently translating ideas into high-quality products that have a profound impact on the customer.

Key Benchmarking Criteria

For the New Product Innovation Award, Frost & Sullivan analysts independently evaluated two key factors—New Product Attributes and Customer Impact—according to the criteria identified below.

New Product Attributes

Criterion 1: Match to Needs

Requirement: Customer needs directly influence and inspire the product's design and positioning.

Criterion 2: Reliability

Requirement: The product consistently meets or exceeds customer expectations for consistent performance during its entire life cycle.

Criterion 3: Quality

Requirement: Product offers best-in-class quality, with a full complement of features and functionalities.

Criterion 4: Positioning

Requirement: The product serves a unique, unmet need that competitors cannot easily replicate.

Criterion 5: Design

Requirement: The product features an innovative design, enhancing both visual appeal and ease of use.

Customer Impact

Criterion 1: Price/Performance Value

Requirement: Products or services offer the best value for the price, compared to similar offerings in the market.

Criterion 2: Customer Purchase Experience

Requirement: Customers feel they are buying the optimal solution that addresses both their unique needs and their unique constraints.

Criterion 3: Customer Ownership Experience

Requirement: Customers are proud to own the company's product or service and have a positive experience throughout the life of the product or service.

Criterion 4: Customer Service Experience

Requirement: Customer service is accessible, fast, stress-free, and of high quality.

Criterion 5: Brand Equity

Requirement: Customers have a positive view of the brand and exhibit high brand loyalty.

Best Practices Recognition: 10 Steps to Researching, Identifying, and Recognizing Best Practices

Frost & Sullivan analysts follow a 10-step process to evaluate award candidates and assess their fit with select best practices criteria. The reputation and integrity of the awards are based on close adherence to this process.

STEP	OBJECTIVE	KEY ACTIVITIES	OUTPUT
1 Monitor, target, and screen	Identify award recipient candidates from around the world	<ul style="list-style-type: none"> • Conduct in-depth industry research • Identify emerging industries • Scan multiple regions 	Pipeline of candidates that potentially meet all best practices criteria
2 Perform 360-degree research	Perform comprehensive, 360-degree research on all candidates in the pipeline	<ul style="list-style-type: none"> • Interview thought leaders and industry practitioners • Assess candidates' fit with best practices criteria • Rank all candidates 	Matrix positioning of all candidates' performance relative to one another
3 Invite thought leadership in best practices	Perform in-depth examination of all candidates	<ul style="list-style-type: none"> • Confirm best practices criteria • Examine eligibility of all candidates • Identify any information gaps 	Detailed profiles of all ranked candidates
4 Initiate research director review	Conduct an unbiased evaluation of all candidate profiles	<ul style="list-style-type: none"> • Brainstorm ranking options • Invite multiple perspectives on candidates' performance • Update candidate profiles 	Final prioritization of all eligible candidates and companion best practices positioning paper
5 Assemble panel of industry experts	Present findings to an expert panel of industry thought leaders	<ul style="list-style-type: none"> • Share findings • Strengthen cases for candidate eligibility • Prioritize candidates 	Refined list of prioritized award candidates
6 Conduct global industry review	Build consensus on award candidates' eligibility	<ul style="list-style-type: none"> • Hold global team meeting to review all candidates • Pressure-test fit with criteria • Confirm inclusion of all eligible candidates 	Final list of eligible award candidates, representing success stories worldwide
7 Perform quality check	Develop official award consideration materials	<ul style="list-style-type: none"> • Perform final performance benchmarking activities • Write nominations • Perform quality review 	High-quality, accurate, and creative presentation of nominees' successes
8 Reconnect with panel of industry experts	Finalize the selection of the best practices award recipient	<ul style="list-style-type: none"> • Review analysis with panel • Build consensus • Select recipient 	Decision on which company performs best against all best practices criteria
9 Communicate recognition	Inform award recipient of recognition	<ul style="list-style-type: none"> • Present award to the CEO • Inspire the organization for continued success • Celebrate the recipient's performance 	Announcement of award and plan for how recipient can use the award to enhance the brand
10 Take strategic action	Upon licensing, company is able to share award news with stakeholders and customers	<ul style="list-style-type: none"> • Coordinate media outreach • Design a marketing plan • Assess award's role in strategic planning 	Widespread awareness of recipient's award status among investors, media personnel, and employees

The Intersection between 360-Degree Research and Best Practices Awards

Research Methodology

Frost & Sullivan's 360-degree research methodology represents the analytical rigor of the research process. It offers a 360-degree view of industry challenges, trends, and issues by integrating all 7 of Frost & Sullivan's research methodologies. Too often companies make important growth decisions based on a narrow understanding of their environment, resulting in errors of both omission and commission. Successful growth strategies are founded on a thorough understanding of market, technical, economic, financial, customer, best practices, and demographic analyses. The integration of these research disciplines into the 360-degree research methodology provides an evaluation platform for benchmarking industry participants and for identifying those performing at best-in-class levels.

360-DEGREE RESEARCH: SEEING ORDER IN THE CHAOS



About Frost & Sullivan

Frost & Sullivan, the Growth Partnership Company, helps clients accelerate growth and achieve best-in-class positions in growth, innovation, and leadership. The company's Growth Partnership Service provides the CEO and the CEO's growth team with disciplined research and best practices models to drive the generation, evaluation, and implementation of powerful growth strategies. Frost & Sullivan leverages nearly 60 years of experience in partnering with Global 1000 companies, emerging businesses, and the investment community from 45 offices on 6 continents. To join Frost & Sullivan's Growth Partnership, visit <http://www.frost.com>.