August 1, 2018

Karlene Fine, Executive Director
North Dakota Industrial Commission
State Capitol – 14th Floor
600 East Boulevard Ave Dept 405
Bismarck, ND 58505-0840

RE: Transmittal and Commitment Letter for "Fargo's Smart Energy Ramp" – An Application to the Renewable Energy Program (REP), North Dakota Industrial Commission

Dear Ms. Fine,

The attached proposal is a public-private partnership intended to stimulate an untapped renewable energy market in North Dakota – solar energy. Our partners include the City of Fargo, Microsoft Corp, Xcel Energy, Kilbourne Group, Border States Electric, and MBN Engineering. By combining solar energy with Artificial Intelligence (AI) along with Electric Vehicles and battery storage, we see a cost-effective Smart Clean Energy Package that can take root in North Dakota without subsidies.

Thank you for the opportunity to submit this Application. This is the eSmart Team's commitment to a 50% cost share and to deliver this project as proposed. Please let us know if you have any questions.

Sincerely,

John E. Flory
Senior Vice President, North America

cc: Terry Sando, eSmart Systems US, Inc.
Sandi Piatz, Microsoft
Bruce Grubb, Mike Williams, City of Fargo
Mark Nisbet, Xcel Energy
Mike Allmendinger, Kilbourne Group
Tim Conmy, Border States Electric
Mike Berger, MBN Engineering

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412 5th Ave, SE
Hillsboro, ND 58045
(701) 430-1786

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405 114th Ave SE, #100,
Bellevue, WA 98004 USA
www.esmartsystems.com

Renewable Energy Program
North Dakota Industrial Commission

Application

Project Title: Fargo's Smart Energy Ramp

Applicant: eSmart Systems US, Inc.

Principal Investigator: Terry Sando

Date of Application: August 1, 2018

Amount of Request: $305,000

Total Amount of Proposed Project: $610,000

Duration of Project: 18 months

Point of Contact (POC): Terry Sando

POC Telephone: 701-430-1786

POC Email: terry.sando@esmartsystems.com

POC Address: 412 5th Ave, SE
Hillsboro, ND 58045

TABLE OF CONTENTS

Attachments C-E are provided in separate documents.

ABSTRACT

Objective:

Fargo's Smart Energy Ramp project objective is to demonstrate, and provide a guide to developers and cities, on how a Smart Clean Energy Package ("Package") including renewable energy (e.g., solar) and artificial intelligence (AI) can add value and cost-effectively attract tenants and enhance economic development while making efficient use of the utility grid in a public-private partnership.

More specifically, the City of Fargo wants to use the Package in a demonstration at the Roberts Common (RoCo) mixed use facility (City Parking ramp with a private residential and commercial wrap) as a step toward lowering costs, making a more efficient use of land, enhancing the attractiveness of downtown, and reducing carbon footprint.

The Package will include: on-site solar, battery storage, Electric Vehicle (EV) charging, and intelligent (AI) control to optimize the use of renewable energy while minimizing the impact on the utility grid.

A Smart Clean Energy Package provides

AI intelligent control of:

- photovoltaic roof-top solar,
- battery storage,
- EV charging
- major facility loads (e.g. lighting, cooling)

so as to optimize:

- renewable energy use,
- utility bill reduction,
- peak electricity demand reduction on the grid,
- efficient, and security-minded, use of lighting.

Renewable energy will be used, and will reduce carbon footprint, in two ways:

a) directly, to meet building electricity needs (e.g., lighting) and
b) indirectly, through charging Electric Vehicles to reduce transportation costs and auto emissions.

Solar energy is an underutilized resource in North Dakota, since North Dakota is about the same latitude as Germany, the greatest user of solar energy in the world. This project should provide a guide on how to integrate solar energy cost-effectively (without subsidies) as part of a smart clean energy package to enhance economic development and promote the growth of North Dakota's renewable energy industries.

Expected Results:

There are two major results from the project, as elaborated below – a demonstration of a Smart Clean Energy Package and production of a Guide to developers and cities for cost-effectively putting such packages in future commercial projects. In particular:

1) The Demonstration will show:

A. AI intelligent control of photovoltaic roof-top solar, battery storage, EV charging and major facility loads (e.g. lighting, cooling) so as to optimize several factors -- renewable energy use on-site, utility bill reduction, peak electricity demand reduction on the grid, and carbon reduction.
B. the willingness of EV users to flexibly schedule EV charging to minimize peak electricity demand – or pay surge pricing if they want faster charging.
C. the willingness of residents and businesses near RoCo to pay for solar credits to reduce their carbon footprint and enhance the growth of solar energy.

2) The "Guide to a Smart Clean Energy Commercial Package" ("Guide"), which, building on the results of the demo, will show developers (and cities) how to cost-effectively include such a Package in the design of future new construction or remodels to further enhance economic development. The ability to use high tech (e.g., AI) and sustainability should make cities more attractive to new high-tech industries and the workers they want to attract.

Duration:
The study portion of this project is expected to last 18 months – 3 months for project ramp-up, 12 months of monitored operation and 3 months for project analysis and preparation of the Guide and a final report. Standard operation of the project is expected to continue beyond the study period.

Total Project Cost:
The total project cost is $610,000, with half of the funding coming from the Participants listed below.

Participants:

- City of Fargo: owner of public parking ramp portion of the mixed-use development.
- eSmart Systems https://www.esmartsystems.com, which has experience in using Artificial Intelligence to bring intelligent control to a clean energy package in similar projects, such as the European Union's EMPOWER project.
- Microsoft Corp, which has its second largest campus in Fargo, provides cloud-based solutions for using renewable energy, reducing utility costs and lowering carbon footprint.
- Kilbourne Group https://kilbournegroup.com, owner of private residences and commercial space wrapping the ramp.
- Xcel Energy, the local utility serving this area of Fargo, has interest both in renewable energy and in understanding and managing its impact on grid reliability.
- Border States Electric (BSE) https://www.borderstates.com , one of the largest providers of electrical equipment supply chain solutions, who will support eSmart in project delivery.
- MBN Engineering, https://www.mbnengr.com/index.html, has significant experience in North Dakota in the design and implementation of electrical and mechanical systems.

PROJECT DESCRIPTION

Objectives:

Fargo's Smart Energy Ramp project objective is to demonstrate, and provide a guide to developers and cities, on how a Smart Clean Energy Package ("Package") including renewable energy (e.g., solar) and artificial intelligence (AI) can add value and cost-effectively attract tenants and enhance economic development while making efficient use of the utility grid in a public-private partnership.

More specifically, the City of Fargo wants to use the Package in a demonstration at the Roberts Common (RoCo) mixed use facility (City Parking ramp with a private residential and commercial wrap) as a step toward lowering costs, making a more efficient use of land, enhancing the attractiveness of downtown, and reducing carbon footprint.
The Package will include: on-site solar[1], battery storage, Electric Vehicle (EV) charging, and intelligent (AI) control[2] to optimize the use of renewable energy while minimizing the impact on the utility grid.

Renewable energy will be used, and will reduce carbon footprint, in two ways:

a) directly, to meet building electricity needs (e.g., lighting) and
b) indirectly, through charging Electric Vehicles to reduce transportation costs and auto emissions.

Solar energy is an underutilized resource in North Dakota, since North Dakota is about the same latitude as Germany, the greatest user of solar energy in the world. With the cost of solar dropping nearly 70% and the cost of batteries dropping about 80% over the last decade, there is significant opportunity to re-examine solar energy. This project should provide a guide on how to integrate solar energy cost-effectively (without subsidies) as part of a smart clean energy package so as to promote the growth of North Dakota's renewable energy industries.

Methodology:

The methodology in this project is shaped by the interests and goals of the various participants. There are three major sets of interests:

a) The City of Fargo and the developer, Kilbourne Group, are interested in enhancing the attractiveness/vibrancy of downtown while lowering costs.
b) The utility, Xcel Energy, is interested in managing the impact of renewables and EV charging on an efficient and reliable use of the grid,
c) The others (eSmart, Microsoft, BSE, MBN) are interested in demonstrating a cost-effective intelligent, clean energy solution that meet the needs of the first two groups.

There are three major components of the methodology include:

A. Smart Clean Energy Package,
B. EV Scheduling App,
C. Sale of Solar Credits

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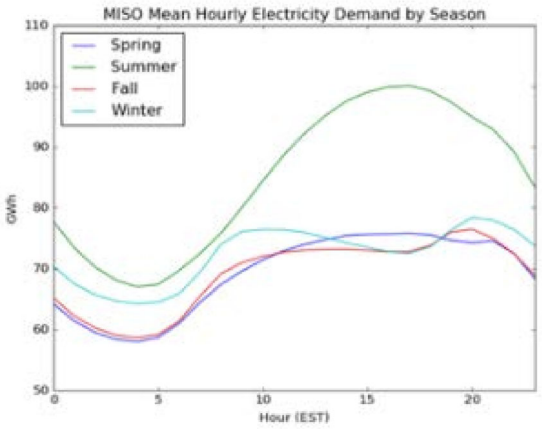
[1] It is anticipated that future project stages may include off-site solar and wind.
[2] Intelligent control will be applied to the battery storage, EV charging, and major building loads (e.g., lighting, cooling).

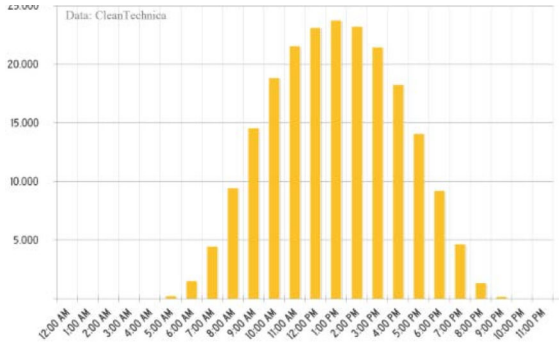
Each of these components are described below after discussion of one underlying thread in the methodology.

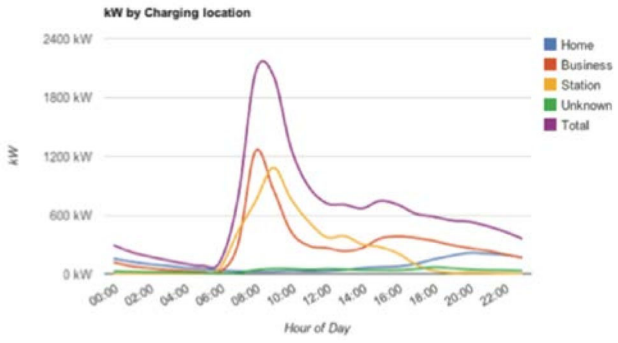


A. Smart Clean Energy Package

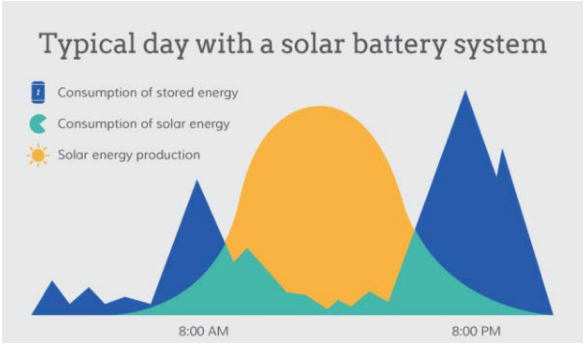
One common underlying thread across the methodology is "time".

- Electricity grids must be designed to insure supply and demand are in balance at all times. Therefore, the electricity utility includes a peak demand charge component (highest electricity use during any 15 minute period of the month) that often is about 20-25% of the total bill for a medium-size commercial account, such as RoCo.
- The times of solar output, EV use, and electric system need are typically not synchronized. To illustrate this, the figures below show that solar output typically peaks between noon and 2pm[3] whereas the MISO[4] summer electricity system demand typically peaks between 4 and 5 pm (16.00 – 17.00) and we do not know when EV Charging will peak – some results below show morning peak in business and evening peak for residences.





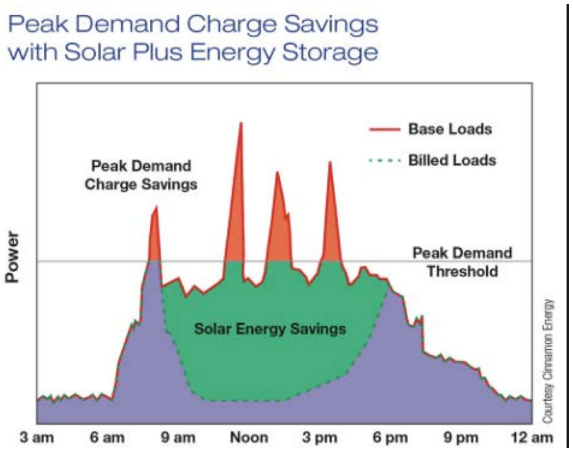
Since much of the hard benefit to a developer or city come from a reduction in the electric utility bill, the ability to intelligently control or shape the timing of electricity use can drive a significant portion of the cost-effectiveness. That is, "synchronization" of electricity use and on-site supply can influence the timing of the net purchases and hence costs from the utility. Such "synchronization" can also influence the efficient and reliable use of the grid as well as maximizing the use of solar. The intelligent charging of battery storage, the intelligent scheduling and control of EV charging and the intelligent control of other loads (e.g., cooling and lighting) can influence such synchronization and timing of net purchases from the utility, which also influences the utility bill, which in turn influences the cost-effectiveness of the Package. The AI based systems will help provide such intelligent control and enhancing the cost effectiveness.



As the figure "Typical day with a solar battery system" illustrates, there are times when the sun is shining when a facility will normally be using electricity (green). There may be times when the sun is shining and there is no net usage and

[3] Germany has a comparable latitude to North Dakota and hence comparable solar output.
[4] MISO is the Midcontinent Independent System Operator, which controls the electric power grid for North Dakota and other states.

the power would normally flow back into the grid (yellow). With battery storage we want to shift solar electricity production to other hours (blue). Typically, the cost-effectiveness of a project is enhanced by sizing the solar system and managing the facility energy production/usage so that the green area is the largest and the yellow area is the smallest of the three areas. AI intelligent control helps achieve that.

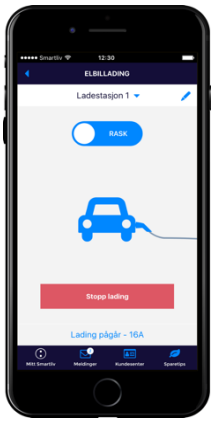


As noted above, another key driver of the net utility bill is the peak demand charge cost which is driven by spikes in normal demand (see "red" in the figure), which could be caused by EV charging, high demand for facility cooling or other usage. The AI intelligent control can help control the timing of the EV charging and the operation of battery storage and other loads so as to minimize those peak demand spikes.

Because the "timing" of electricity use and production is so critical, one key part of both the operation of the intelligent control and the "evaluation" of the project will be the collection of electricity use data from the total facility as well as key loads (EV charging, battery operation, solar production, other loads). Xcel Energy will help provide the special metering systems necessary to collect such data.

B. EV App for "reserving" charging

EV users will be asked to download an EV Reservations App to purchase and schedule the EV charging. Several factors influence the pricing of charging at any one time.[5] The exact surge pricing will be prepared with the Advisory Team to balance cost accuracy with simplicity for customer understanding.



C. Sale of Solar Credits

A number of consumers are willing to pay a little to help support the use of renewable energy.[6] In this project Kilbourne Group is willing to confirm that experience for Fargo. Kilbourne Group intends to find residents and commercial businesses at or near the RoCo project who are willing to pay $5-20 per month for the purchase of solar credits to help reduce their carbon footprint. These dollars will be used to help off-set the cost of the Package.[7]

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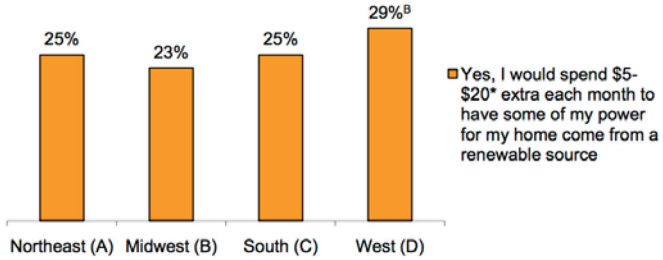
[5] The longer in advance that a "reservation" is made to do the EV Charging, the more flexibility the Intelligent Controller has in managing electricity use and keeping down the peak demand. Therefore, the "EV Charging price" for a longer lead time Level 2 reservation (e.g., one day) will be lower than the price for a shorter lead time Level 2 reservation (e.g., one hour). In addition, the EV Charging price for a longer charge time (e.g., 4 hours) and lower amount of charging (e.g., 10 kWhs) will be lower than the EV Charging price for a shorter charge time (e.g., 2.5 hours) and more charging (e.g., 15 kWhs). We may also provide a lower EV Charging price during times of high solar output (e.g., cloudless July day at 1 pm) than times of low solar output (e.g., 6 pm in mid-January).

[6] https://www.nrel.gov/docs/fy11osti/50988.pdf

[7] There is an active Solar Renewable Energy Credit (SREC) market in some states (e.g., New Jersey). These SRECs can be sold to companies or consumers even if they are not physically close to the solar generator – they still "own" the ability to claim credit for that portion of the solar output to feel good about supporting solar and/or to reduce their carbon footprint. Following a similar logic, consumers at or near the RoCo project do not need to be physically connected to the RoCo solar panels to claim credit for the solar output.

To implement the above methodology, the following task structure is used:



1) *Project Management –*
   This will start with the assembly of an Advisory Committee with a representative from all the key Participants. The Committee will meet at some regular time (semi-monthly or monthly) to guide the project. At least quarterly they will have a Status report and review meeting with the ND REC designee(s).
2) *Final Design and Specification of the Package and all of its components*.
   The Smart Clean Energy Package must be specified so as to meet the project objectives, including the "timing" issues identified above. A high level specification of the Package is reflected in the Preliminary Design/Engineering Report prepared by MBN Engineering and contained as Attachment E. This Report includes the major hardware components of the Package-- photovoltaics, EV Charging, battery storage, lighting and cooling controls. The AI software for intelligent control and software app for scheduling EV use will be adapted from existing eSmart/Microsoft systems, which are described further below. The metering systems to collect 15 or 60 minute electricity usage data will also be specified. The selling of the Solar Credits by Kilbourne Group will be part of this task.
3) *Acquisition/Configuration and Installation of the Package*.
   The equipment will be acquired based on the specs above. In parallel, the AI software systems will be modified and configured to communicate and control the major hardware component. equipment will be installed by a local contractor to be selected, who will work with eSmart/Microsoft in commissioning the integrated Package.
4) *Operation of the Package for 12 months.*
   After commissioning, the system will be operated for 12 months. In will operate in two modes: a) Current electricity rates b) Potential Real-Time Pricing rates that reflect the MISO prices and other considerations identified by Xcel Energy as could potentially benefit the grid. Furthermore, other adjustments may be made in the selling of the solar credits or the EV Pricing or Scheduling App based on the response by Fargo citizens.
5) *Evaluation of the Demonstration experience.*
   Some evaluation will be made in the project, shortly after project start so as to make refinements and improve lessons learned from the Demo (e.g., changes in control algorithms, solar credit sales or EV App) as alluded to above. Towards the completion of the 12 months of Demo operation a complete evaluation will be made. Such evaluation will consider items such as:
   - Workability of the approach,
   - Performance of each component of the Package,
   - Electricity use impacts (both peak kW demand, total kWh use and hourly kWh use) of the control strategies under:
     - Actual Demo conditions for
       - current electricity rates,
       - potential RTP or other Xcel Energy suggested options,

    - Potential conditions under refined control strategies based on the Demo experience,
  - Utility cost savings under existing and potential Xcel Energy options
  - Carbon impact, both direct from solar generation and indirect from using EVs rather than conventional cars,
  - Potential cost-effectiveness if this Package were included in the Preliminary design phase of any new building remodel or new construction,

6) *Development of the "Guide for Smart Clean Energy Solutions in Commercial Facilities"*
   Based on the evaluation of the Demo, a Guide will be developed for Smart Clean Energy Solutions in Commercial Facilities. This will draw upon other European and US experience as well as the Demo. This Guide will be tested on 1-2 other developers.
7) *Preparation of the Final Report.*
   A draft Final Report will be prepared that documents all of the project experience in the six tasks above. The draft will be reviewed with the REC designees and then finalized.

Anticipated Results:

1) A Demonstration that shows:
   a. the actual and potential impacts of a Smart Clean Energy Package per the Evaluation criteria in identified in Task 5 above.
   b. the willingness of residents or businesses near RoCo to purchase solar credits, which will help fund the Demo Package.
2) The "Guide to a Smart Clean Energy Commercial Package" ("Guide"), which, building on the results of the demo, will show developers (and cities) how to cost-effectively include such a Package in the design of future new construction or remodels to further enhance economic development. The ability to use high tech (e.g., AI) and sustainability should make cities more attractive to new high-tech industries and the workers they want to attract.

Facilities:

This project will be hosted at the mixed-use Roberts Common complex in which the City owns the Parking Ramp and Kilbourne Group owns the residential and commercial space wrapping the Parking Garage.[8]

Resources:

As observed above, there will be three types of resources in this project:

- Hardware
- Software
- Human

The Hardware components to be purchased and installed include:

a) On-site photovoltaic (PV) solar (15 kW) on the roof, which will also shade cars on the top floor of the parking structure;
b) Five dual charge EV chargers[9] with the ability to remotely control the chargers,

[8] https://www.kvrr.com/2017/06/13/roberts-commons-roco-parking-ramp-opens-in-downtown-fargo/ ; https://kilbournegroup.com/properties/robertscommons/

[9] This includes the ability to charge at a slower electricity pace (Level 1, typically 3.6 kW) or a faster pace (Level 2, typically 7.2 kW)

c) On-site battery storage to better balance electricity demand with solar output;
d) Lighting Control System – that will include the ability to:
    - Reduce lighting levels when there is:
        - increased daylight,
        - a need to control peak demand,
        - little parking activity,
    - Increase lighting levels when there is movement – this also alerts users of the space of other people's presence.
e) Controls on the cooling system in the common area

The preliminary Concept Design for these hardware systems is contained in Attachment A.

The Software components include an adaptation of the software systems that eSmart Systems and Microsoft have successfully used in Europe for AI based intelligent load control to reduce the peak electricity demand, maximize solar energy use, manage the EV charging and optimize the charging and discharging of the battery storage. (see below) In addition, eSmart will be adapting its EV App to this Fargo application so that EV charging can be purchased and scheduled.

Significant Human Resources will be provided by the Participants and subcontractors to accomplish the tasks identified above.

The Project Team has experience in performing and managing all these areas.

Techniques to Be Used, Their Availability and Capability:

The main technique is the application of AI control of the Package to achieve the desired benefits. eSmart Systems has done similar projects in Europe such as projects for the European Union -- the EMPOWER project https://www.esmartsystems.com/newsroom/empower-project-reaches-important-milestone/ and the INVADE project https://h2020invade.eu/partners/. The core algorithms of such AI have been published.[10] Microsoft has demonstrated the application of such a technique in Europe.[11]

[10] https://smartgrids.no/wp-content/uploads/sites/4/2017/02/PhD-thesis-Ottesen-2017-Techno-economic-models-in-Smart-Grids.pdf ; https://ideas.repec.org/a/eee/energy/v149y2018icp120-134.html; http://isiarticles.com/bundles/Article/pre/pdf/94480.pdf ; https://www.researchgate.net/publication/272484356_Modeling_Consumer_Flexibility_of_an_Aggregator_Participating_in_the_Wholesale_Power_Market_and_the_Regulation_Capacity_Market

[11] https://www.youtube.com/watch?v=Z1NO4BiIfl0; https://www.youtube.com/watch?v=cxKphN8iVHE

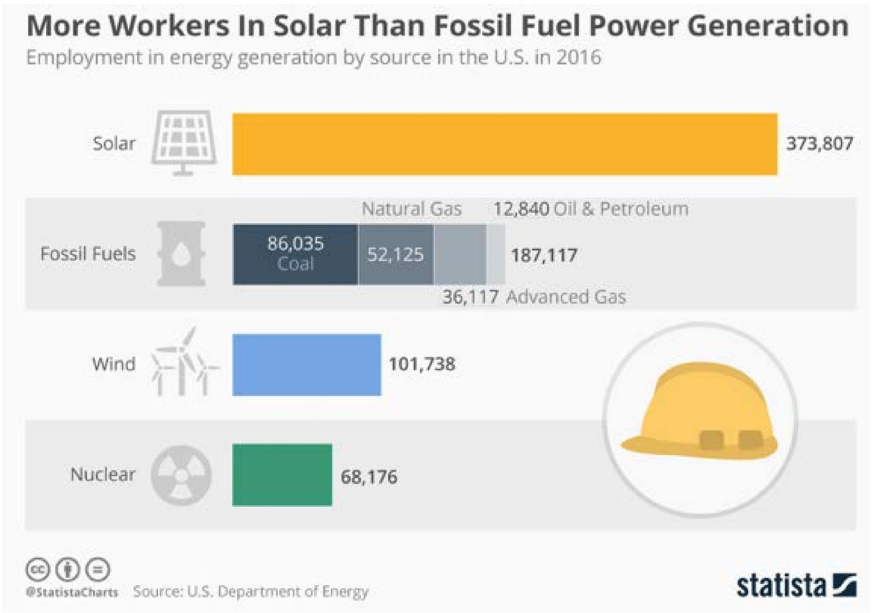
One aspect of this technique is that it has the capability to respond to sub-hourly or real-time prices (RTP) from grid operators like the MISO. In addition to the Demo results with RTP, we will work with Xcel Energy to analyze the impact of such operation in this project to help utilities understand the potential next generation of grid benefits of such AI control.

The eSmart/Microsoft techniques will be adapted to North Dakota and applied in this project. eSmart and Microsoft have a long successful history of working together. Indeed the eSmart platform is built upon the Microsoft Azure cloud. Further eSmart was recently named a finalist as a Microsoft global AI Partner of the Year.[12]

Environmental and Economic Impacts while Project is Underway:
There are no negative environmental and economic impacts of this project. Indeed, this project should start achieving the Ultimate Technological and Carbon Impacts described below.

Ultimate Technological and Economic Impacts:
This project should help the City of Fargo and developers to achieve their goals – vibrant downtown using sustainable, renewable energy. The Guide developed from these demo results should make it easier for other developers and cities to cost-effectively implement a smart clean energy package, which should appropriately grow the market and associated jobs for solar energy in North Dakota. Finally, the development of such smart clean energy packages should make it easier to attract high tech companies and a labor force to North Dakota.

Why the Project is Needed:
There is significant untapped potential for solar energy in North Dakota. Many believe ND to be too far north and not appropriate for solar. But the country with the greatest use of solar energy is Germany, which has a similar latitude and has similar solar radiation patterns to North Dakota. This project will allow the development of solar as it is cost-effectively included as part of a smart clean energy package.



North Dakota is interested in job growth. According to the US Department of Energy (US DOE), solar energy creates 40-80x more jobs per kWh supplied

[12] https://enterprise.microsoft.com/nb-no/customer-story/uncategorized/power-and-utilities/esmart-systems/ ; https://www.esmartsystems.com/newsroom/esmart-systems-recognized-as-global-microsoft-ai-partner/

than conventional resources. If solar energy became 10-20% of North Dakota's electricity generation over the next decade, that could mean an extra 5000-10,000 jobs, based on US DOE numbers.

Electric Vehicles (EVs), with their potential to bring renewable energy to the transportation sector, are also underdeveloped in ND. Norway has the highest penetration of EVs in the world (nearly half of all new car sales over the last 12 months). Further, cities in Norway have used both EVs and solar to shape the vibrancy of communities and enhance economic development.

STANDARDS OF SUCCESS

There are two major measurable deliverables:

- Demo showing potential changes in electricity usage patterns of a smart clean energy package,
- Development of a "Guide to a Smart Clean Energy Commercial Package" for commercial developers and cities which will show how to cost-effectively implement solar energy in commercial facilities as part of a smart clean energy package – preferably as part of a private-public partnership.

Based on past experience, getting the developers and cities "on board" is the fastest way to introduce new technologies into commercial space. Developers and the local Architect-Engineering community like a strong example, easy to use Guide and a compelling business case, including the ability to attract new tenants/buyers at higher value properties. The support of the local cities will typically further incents commercial developers.

Thus, we believe this Demo and Guide are the foundation for stimulating a solar market in North Dakota.

BACKGROUND/QUALIFICIATIONS

Below the relevant experience of the key Participants and their lead people is summarized. More detailed information on these key people is provided in Attachment D.

eSmart Systems, https://www.esmartsystems.com, has significant experience in Europe in applying AI for the intelligent control of clean energy packages such as those proposed here. eSmart's AI capability is built upon the Microsoft Azure platform and eSmart has worked closely with Microsoft for the last 5 years. Terry Sando, the head of eSmart Systems North Dakota office, is the Principal Investigator. He is assisted by Senior VP John Flory, has 4 decades of relevant experience as a management consultant or system supplier in managing peak demands under various conditions, including real-time pricing by ISOs. Both will be assisted by eSmart's Business Manager, Energy Markets, Joakim Sveli, who manages many of the Connected Prosumer projects – the ones where AI is applied to PV, EV charging, storage, demand control and supporting customer apps.

Microsoft Corp has recently made significant contributions to advance smart energy solutions, such as Microsoft's own 88-acres project[13] and the Agder Energi project.[14] OP Ravi, the Smart Energy Program Manager with extensive AI/Big Data/IoT (Internet of Things) background, is leading the effort to expand the Agder project capability in the smart energy solutions area.

The City of Fargo is supporting a smart energy version of its RoCo parking ramp as a step toward a lower carbon, less car-centric footprint. Parking Commissioner Mike Williams has played a lead role in shaping this project and will represent the City of Fargo's interests along with a designated staff person on this project.

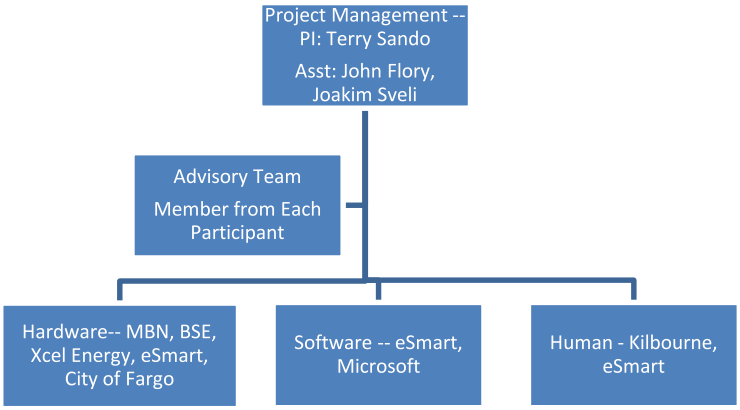
Kilbourne Group owns the mixed-use space around the RoCo parking garage. Mike Zimney is Kilbourne's project manager for the RoCo project and will facilitate the integration of the equipment for this project. He will be assisted by other project managers in selling solar credits to residents and businesses at or near RoCo.

Xcel Energy North Dakota manager, Mark Nisbet, will coordinate their involvement in this project. Such involvement includes providing appropriate special metering and reviewing the project evaluation, Guide and final report.

MBN Engineering assisted Kilbourne Group and the City on the design of the RoCo project. They also provided the Preliminary Concept design on this project. Mike Berger, the principal Electrical Engineer, will lead their efforts in preparing the Final Design and coordination on project implementation.

Border States Electric (BSE), from its Fargo headquarters, is a leading electrical equipment supplier in 22 states. As an extension of BSE's formal partnership with eSmart,[15] Tim Conmy, the head of Commercial Project Integration, will support the project system implementation.

MANAGEMENT



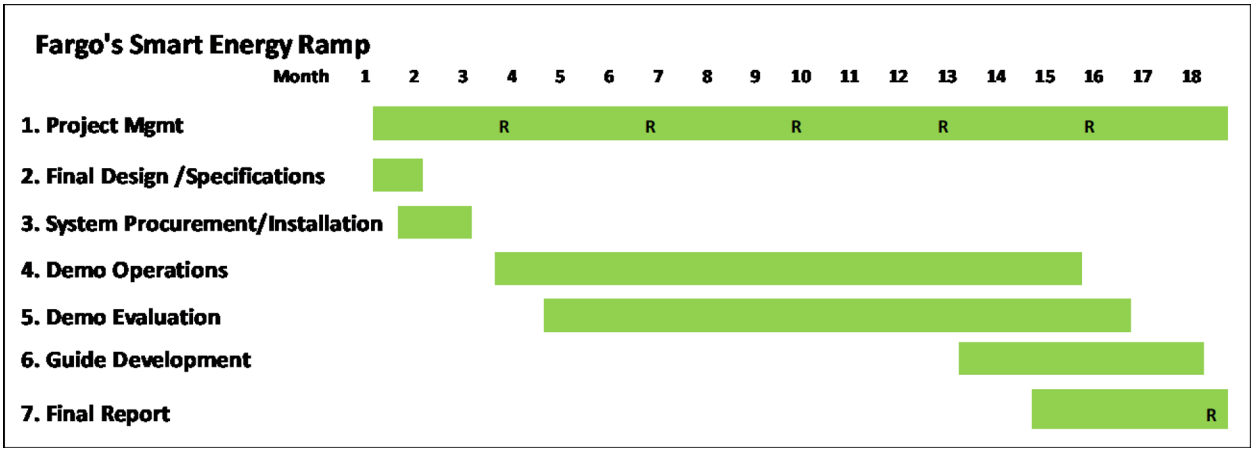
[13] https://www.microsoft.com/en-us/stories/88acres/
[14] https://www.youtube.com/watch?v=Z1NO4BiIfl0; https://www.youtube.com/watch?v=cxKphN8iVHE
[15] https://electricalnews.com/esmart-systems-border-states-electric-finalize-agency-agreement-bringing-drone-technology-high-end-analytics-u-s-utility-industry/

eSmart will provide the over-all Project Management, but will draw upon the strengths of each Participant in the relevant component. The Organizational Chart above shows Terry Sando, the head of eSmart's North Dakota office, will serve as Principal Investigator for easy access by the ND REC/NDIC. He will be assisted by John Flory, who has 4 decades of management consulting experience in delivering and evaluating similar projects. Joakim Sveli, who has delivered similar projects in Europe for eSmart, will also be part of the over-all project management.

The lead person for each of the Participants is identified in the Background/Qualifications section. Key evaluation points throughout the project, as shown on the Timeline below, will occur as each task is completed and also in a Quarterly Progress Report to the ND REC.

TIMETABLE

The project schedule is shown below. The Project Management includes the finalization of the Project Advisory Team and the development of interim quarterly progress reports to the ND REC. A Preliminary Design has been completed. (see Attachment E.) The Final Design and Specifications will be completed within the first two months. The System Procurement will start in the second month and be completed within the third month. Dem Operations for twelve months will start in the fourth month. Demo Evaluations will start in the fifth month so that System refinements can be made as appropriate. A full Evaluation will be completed near and after the end of Demo Operations so as to inform the Guide Development (ie, the Guide to a Smart Clean Energy Commercial Package) and the Final Report. Since many insights will have been obtained part way through the project, the Guide Development and Final Report can start before, but finish after, the Demo Operation is completed.



BUDGET

We are proposing a $610K budget of which half of the funding is sought from the ND REP. About half of the budget is for the systems (Hardware, Software, Cloud) to run the project. Attachment E shows the detail on the Hardware systems. The other half is the project design, system adaptation/configuration, operations, evaluation and preparation of the Guide and Final Report. The table below shows the expected labor by participant on each project.

Labor Budget by Task by Key Participant

	eSmart/MSFT		Fargo	Kilbourne	Xcel	BSE	MBN	Other	
	Senior	Developer							
Hourly Rate	250	150		150	200	150	150	150	
Dollars									
1. Project Management	20000	13500	0	750	2000	1500	3000	0	
2. Final Design/Specs	16250	15000	0	13500	8000	1500	12000	0	
3. System Acquisition	5000	6000	0	750	8000	1500	3000	18000	
4. Demo Operations	6000	12000	0	1500	4000	1200	3000	18000	
5. Demo Evaluation	10000	9000	0	1200	4000	1350	3000	12600	
6. Guide Development	6000	3150	0	1200	2000	1500	18000	6300	
7. Final Report	10000	8100	0	1200	2000	1500	3000	0	
Total	73250	66750	0	20100	30000	10050	45000	54900	300050

The Contributions to cover the expenses are shown below. The eSmart/Microsoft combo[16] is providing almost half of the Participant's share of contributions and the other Participants are providing the other half. The other Participants are mostly providing in-kind labor and related services– Kilbourne- $20,000; BSE - $10,000; MBN - $15,000; Xcel Energy - $40,000. The City of Fargo is providing $50,000 in cash and Kilbourne is also projecting $20,000 in cash from buyers of solar credits.

Project Associated Expense	Total	NDIC's Share	Applicant's Share (Cash)	Applicant's Share (In-Kind)	Other Project Sponsor's Share
Labor	$ 300,000	$ 105,000		$ 60,000	$ 135,000
Travel	$ 10,000		$ 10,000		
Software Licenses	$ 50,000			$ 50,000	
Cloud Platform	$ 30,000		$ 30,000	$ -	
Hardware	$ 220,000	$ 200,000	$ -		$ 20,000
TOTAL	$ 610,000	$ 305,000	$ 40,000	$ 110,000	$ 155,000

We believe the value is there for North Dakota to warrant funding the the whole project. However, if the NDIC funding must be reduced, then some of the actions to be taken to reduce

[16] As the Applicant, eSmart is ultimately responsible for the contributions from the combo. This is also consistent with Microsoft's policy that their ISV partner (i.e., eSmart) is the client-facing entity.

scope and budget include reducing the scope of – hardware systems (e.g., fewer EV chargers, smaller storage, less lighting controls), less detail on the evaluations or the Guide. If the OGRC has a target number, we can discuss what reduced scope offering will allow that budget to be met.

CONFIDENTIAL INFORMATION

Any information on specific control algorithms used in the AI software will be considered confidential information that needs protection under *North Dakota Century Code 54-17.6.*

PATENTS/RIGHTS TO TECHNICAL DATA

Since this project builds upon existing AI tools of eSmart and Microsoft, eSmart and Microsoft reserve the Intellectual Property Rights (IPR) to any AI tools and results of such tools developed in this project. Furthermore, they reserve the right to use any data from this project for commercial purposes.

Attachment A
Project Fit with Goals, Purposes and Priorities of the North Dakota Renewable Energy Council

Project Fit with Goals, Purposes and Priorities of the North Dakota Renewable Energy Council

This project is consistent with several goals and purposes of the ND REC, particularly

- *Promote efficient, economic and environmentally sound development and use of Dakota's vast renewable energy resources, particularly in the areas of wind energy, biofuels (ethanol & biodiesel), and biomass.*
    - This project should identify a path for growing the use of solar energy, another vast ND renewable energy resource – as evidenced by places of comparable latitude like Germany and Norway.
- *Encourage and promote the use of new technologies and ideas that will have a positive economic and environmental impact on renewable energy development and production in North Dakota.*
    - The new technologies are solar and AI as part of a clean energy package.
- *Create jobs related to the production and utilization of North Dakota's renewable energy resources.*
    - Renewable energy jobs will be created by providing a guide on how to integrate renewable energy plus AI into buildings as they are remodeled or under new construction.
- *Ensure economic stability, growth and opportunity in the renewable energy industry.*
    - This will be a by-product of the above.

This project is also consistent with the ND REC priorities such as:

- *Identify and develop renewable energy technologies presently not used in North Dakota*
    - This will develop solar and AI as part of a smart clean energy package,
- *Generate information and knowledge that will have the highest probability of bringing new renewable energy companies and industry investment to North Dakota.*
    - By showing how renewable energy plus AI can cost-effectively fit in new and remodeled commercial construction, this project provides the base for attracting more companies to be involved in promoting renewable energy. Indeed eSmart Systems is one such company.
- *Maximize the market potential for renewable energy resources and the associated byproducts produced therewith.*
    - Same answer as above.
    - Furthermore, by pursuing this in a way that is an efficient use of the grid, we should have the support of the utilities.
- *Have the highest potential for creating new renewable energy jobs, wealth, and tax revenues for North Dakota.*
    - As noted above, a proactive approach to solar energy could attract 5,000-10,000 new jobs.

Attachment B
Certificate of Good Standing

State of North Dakota

SECRETARY OF STATE

CERTIFICATE OF GOOD STANDING
OF

ESMART SYSTEMS US, INC.

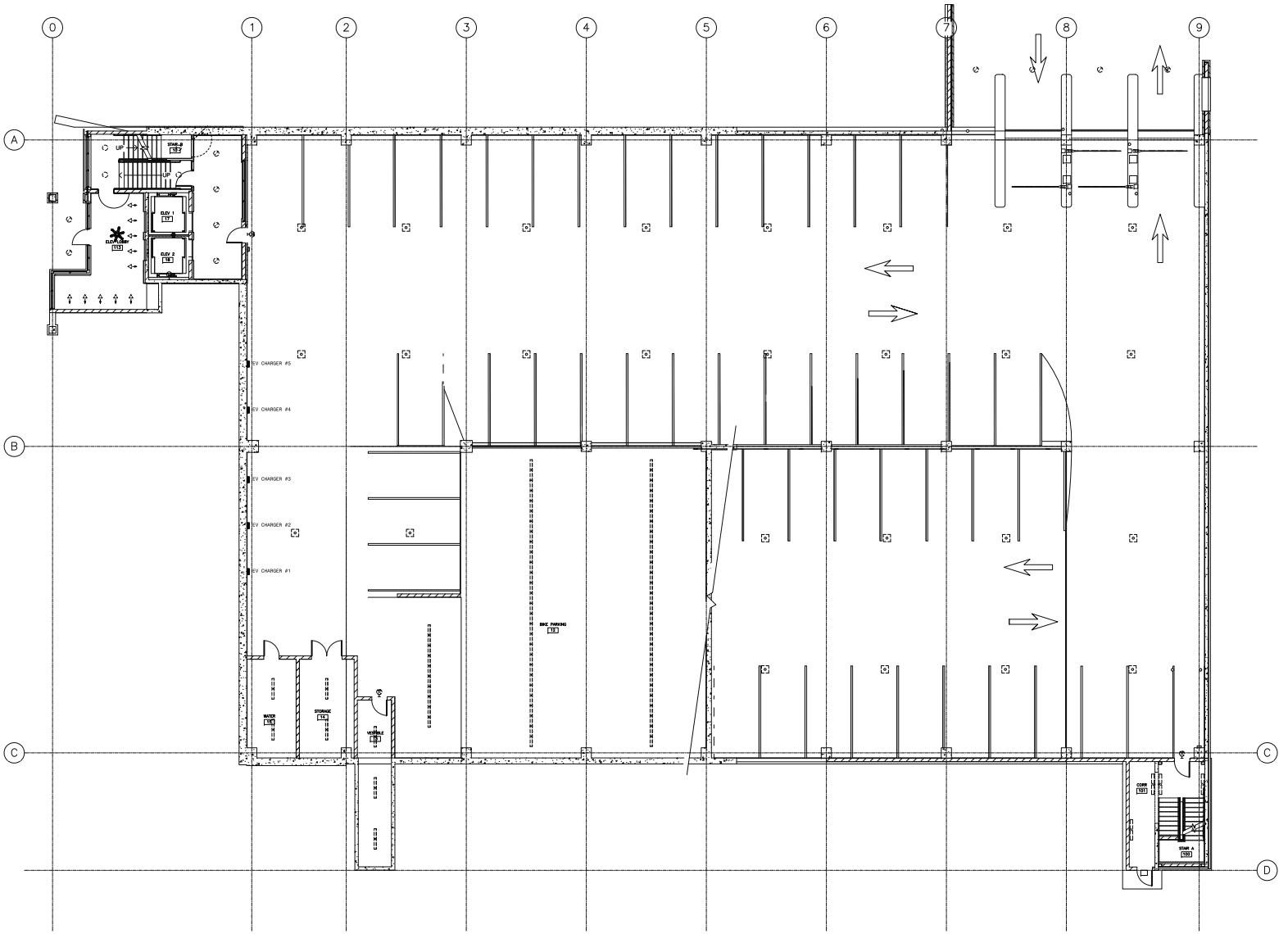
The undersigned, as Secretary of State of the State of North Dakota, hereby certifies that ESMART SYSTEMS US, INC. , a Delaware corporation, authorized to transact business in the State of North Dakota on March 2, 2018, and according to the records of this office as of this date, has paid all fees due this office as required by North Dakota statutes governing foreign corporations.

ACCORDINGLY the undersigned, as such Secretary of State, and by virtue of the authority vested in him by law, hereby issues this Certificate of Good Standing to

ESMART SYSTEMS US, INC.

Issued: June 1, 2018

Alvin A. Jaeger
Secretary of State



1 E100 1ST LEVEL - LIGHTING PLAN

N

0' 4' 8' 16'

MBN ENGINEERING
MECHANICAL * ELECTRICAL * CIVIL
503 7TH ST. N , SUITE 200
FARGO, ND 58102
PHONE: 701.478.6336
FAX: 701.478.6340

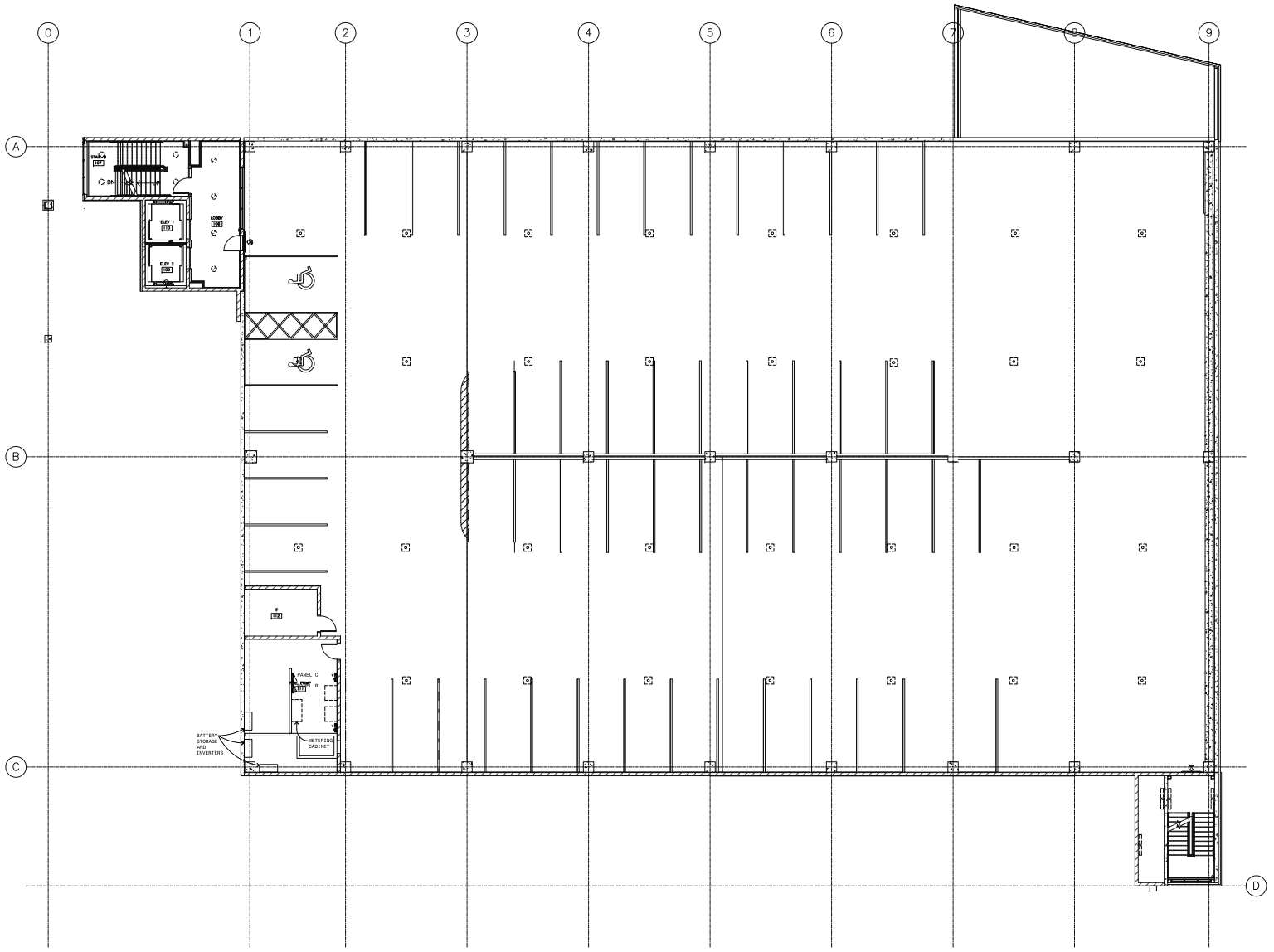
FARGO SMART ENERGY PARKING RAMP

FARGO, ND

NOT FOR CONSTRUCTION

MBN JOB #: 18-043 DATE: 06-29-18

E100



1 E101 2ND-6TH LEVEL - LIGHTING PLAN

N

0' 4' 8' 16'

MBN ENGINEERING
MECHANICAL * ELECTRICAL * CIVIL
503 7TH ST. N , SUITE 200
FARGO, ND 58102
PHONE: 701.478.6336
FAX: 701.478.6340

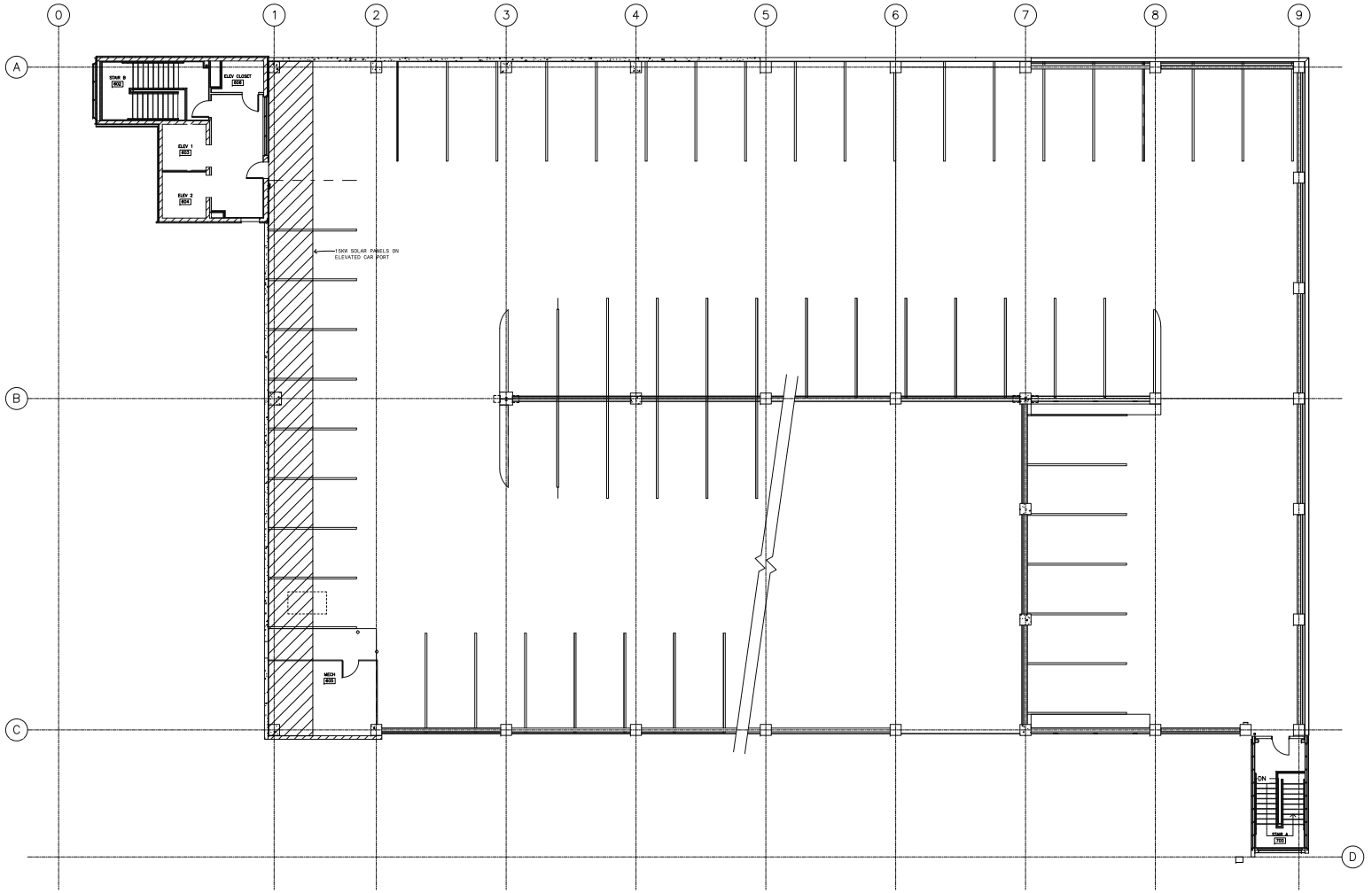
FARGO SMART ENERGY PARKING RAMP

FARGO, ND

NOT FOR CONSTRUCTION

MBN JOB #: 18-043 DATE: 06-29-18

E101



1 E102 7TH LEVEL - LIGHTING PLAN

0' 4' 8' 16'

N

MBN
ENGINEERING
MECHANICAL * ELECTRICAL * CIVIL
503 7TH ST. N , SUITE 200
FARGO, ND 58102
PHONE: 701.478.6336
FAX: 701.478.6340

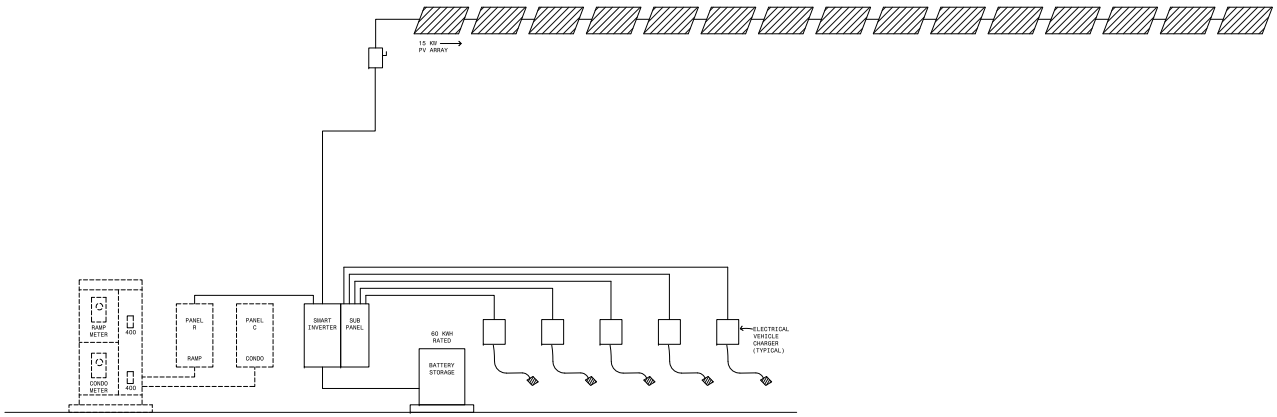
FARGO SMART ENERGY PARKING RAMP

FARGO, ND

NOT FOR CONSTRUCTION

MBN JOB #: 18-043 DATE: 06-29-18

E102



1 E200 ELECTRICAL INTERCONNECTION DIAGRAM
NOT TO SCALE

MBN
ENGINEERING
MECHANICAL * ELECTRICAL * CIVIL
503 7TH ST. N , SUITE 200
FARGO, ND 58102
PHONE: 701.478.6336
FAX: 701.478.6340

FARGO SMART ENERGY PARKING RAMP

FARGO, ND

NOT FOR CONSTRUCTION

MBN JOB #: 18-043 DATE: 06-29-18

E200

MBN
ENGINEERING

July 30, 2018

Mr. John Flory
eSmart Systems US, Inc.
405 114th Ave SE, #100
Bellevue, WA 98004

Subject: Fargo Smart Energy Parking Ramp
Preliminary Engineering Report
MBN Project No. 18-143

The following is a summary of the design features and preliminary costs associated with the Fargo Smart Energy Parking Ramp at Roberts Commons.

Photovoltaic Array

The project includes a 15 kilo-watt rated photovoltaic array on the top level of the parking ramps. The attached drawing E102 proposes this array be located along the south end of the parking ramp on an elevated structure. The elevated structure will be designed so that the photovoltaic panels are mounted on the top side of the structure to allow cars to park under the structure. There will be approximately fifty 300 watt rated photovoltaic modules that make up the 15 kilo-watt array. Each module is approximately 66 inches long by 40 inches wide, see the attached data sheet illustrating a typical module.

The photovoltaic array will be connected to the building power distribution system via a smart inverter and battery storage system. The smart inverter converts the DC power produced by the photovoltaic modules to AC power that is consumed by the Parking Ramp and the power grid. A battery storage system will allow for storage of the energy produced by the photovoltaic modules which in turn can be used to charge the electric vehicles being proposed for the ramp or to power the lighting system in the ramp if electric vehicle charging is not being used at certain times. The battery storage system will be utilized to keep the energy consumed by the Parking Ramp from the utility grid system constant so the car charging system is energy neutral. Essentially, the photovoltaic system will charge the batteries during the day so that the electric vehicles can be charged overnight or power the ramp lighting when vehicle charging is not required.

The attached drawing E200 illustrates the preliminary schematic diagram that interconnects the photovoltaic array to the inverter, battery storage system and building power distribution system. In addition to the components illustrated, the utility company will be implementing real time metering on the Parking Ramp so the eSmart control system can monitor and control how power is consumed, when batteries are charged, when batteries are discharged, etc to optimize the power consumed by the Parking Ramp from the utility grid. The battery storage system is preliminarily sized at 60 kilo-watt hours.

MBN ENGINEERING

Estimated Cost:

1.	PV Array and Structure (15 kW)	$ 65,000
2.	Smart Inverter System and Metering	$ 15,000
3.	Battery Storage System (60 kwh)	$ 60,000
4.	Wiring and Infrastructure	$ 25,000
5.	Total	$165,000

Electric Vehicle Charging Stations

It is proposed to implement five (5) level 2 electric vehicle (EV) charging stations within the parking ramp. The attached drawing E100 illustrates the proposed locations for the chargers. In addition to the (5) level 2 chargers, (1) level 3 fast charger is being considered. This charger would be located in the same area as the level 2 chargers. The chargers will be smart enabled so the charging schedule, power level, etc., can be controlled via the eSmart system. Attached is a data sheet on the proposed type of EV charger.

1.	(5) Smart EV Charging Stations	$ 8000
2.	Wiring and Infrastructure	$ 4000
3.	Total	$12,000

Lighting Controls

Presently, the parking ramp is lit by LED fixtures that operate 24 hours, 7 days a week. Part of this project is to consider changing the control of the parking ramp lighting so that the fixtures dim when areas of the ramp are not occupied. The control system being considered is an occupancy sensor that mounts within the light fixture that can be programmed to dim the light fixture to 10 -20% of its rated output when occupancy is not detected. Implementing the controls should save up to 50% of the energy consumed by the lights while still maintaining a baseline lighting level throughout the ramp to ensure the safety of the public. Attached is a data sheet on the proposed system that would be added to the existing light fixtures.

1.	Cost for One Level	$ 8000
2.	Energy Savings for One Level / Year	$ 800
3.	Simple Payback	10 years
4.	Cost for Entire Ramp	$ 41,000
5.	Energy Savings / Year	$ 4,300
6.	Simple Payback	9.5 years

Sincerely,

Michael A. Berger, P.E., LEEDAP BC+D
Electrical Engineer

Q.PEAK DUO BLK-G5 305-320

Q.ANTUM SOLAR MODULE

The new Q.PEAK DUO BLK-G5 solar module from Q CELLS impresses with its outstanding visual appearance and particularly high performance on a small surface thanks to the innovative Q.ANTUM DUO Technology. Q.ANTUM's world-record-holding cell concept has now been combined with state-of-the-art circuitry half cells and a six-busbar design, thus achieving outstanding performance under real conditions — both with low-intensity solar radiation as well as on hot, clear summer days.

Q.ANTUM TECHNOLOGY: LOW LEVELISED COST OF ELECTRICITY
Higher yield per surface area, lower BOS costs, higher power classes, and an efficiency rate of up to 19.3 %.

INNOVATIVE ALL-WEATHER TECHNOLOGY
Optimal yields, whatever the weather with excellent low-light and temperature behaviour.

ENDURING HIGH PERFORMANCE
Long-term yield security with Anti LID Technology, Anti PID Technology[1], Hot-Spot Protect and Traceable Quality Tra.Q™.

EXTREME WEATHER RATING
High-tech aluminium alloy frame, certified for high snow (5400 Pa) and wind loads (4000 Pa).

A RELIABLE INVESTMENT
Inclusive 12-year product warranty and 25-year linear performance warranty[2].

STATE OF THE ART MODULE TECHNOLOGY
Q.ANTUM DUO combines cutting edge cell separation and innovative wiring with Q.ANTUM Technology.

www.VDEinfo.com
ID. 40032587

[1] APT test conditions according to IEC/TS 62804-1:2015, method B (–1500 V, 168 h)
[2] See data sheet on rear for further information.

THE IDEAL SOLUTION FOR:

Rooftop arrays on residential buildings

Engineered in **Germany**

Q CELLS

SIEMENS

usa.siemens.com/versicharge

New Wi-Fi enabled VersiCharge™ SG electric vehicle charging stations

All VersiCharge Smart Grid (SG) devices feature:

- **Communication:** The Siemens VersiCharge SG with Wi-Fi is equipped with a CEA2045 module to enable communication through the Siemens cloud to provide user with actionable information on a smart phone or via web pages.
- **Remote control:** Charging an electric vehicle has never been easier than with the Siemens VersiCharge SG. Customers are able to monitor and control the charging status, charging schedule, and power level remotely through the VersiCharge SG SmartPhone App or via provided web pages.
- **Built in metering:** We make it easy to understand the power consumption of your EV. The usage information conveniently displayed via the VersiCharge SG SmartPhone App or via the web pages is captured in real time from the revenue accurate meter integrated into each VersiCharge SG unit.
- **Highest quality guarantee:** As with all of our products, Siemens ensures that VersiCharge SG is manufactured to the highest quality standards, is up to date on software revisions and complies with all relevant standards and certifications.
- **Easy installation:** The included mounting bracket is easily attached to many surfaces with the included screws. VersiCharge SG is rated for outdoor installations (NEMA 4) and is easily commissioned to work with smart devices employing iOS and Android platforms.
- **Flexible demand response profile:** To support advanced demand response programs, all VersiCharge models feature variable amperage demand response and allow consumers to take advantage of utility rate programs. This feature ensures the energy demand from the EVSE can be curtailed with a reduced impact to the end user. For the VersiCharge SG, this feature can be controlled via the SmartPhone App or via provided web pages.

Application information

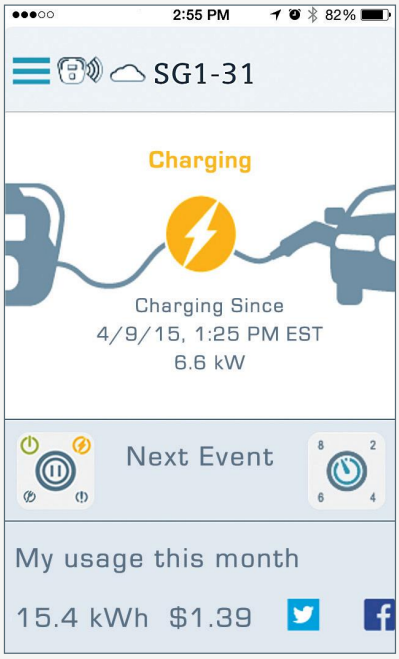
The Siemens VersiCharge SG App has been developed for use with smart devices employing iOS and Android platforms. It is also available to use via a web browser.

Compatible with: iPhone 4, 5, 6, on iOS 8 or newer, all Android phones and tablets

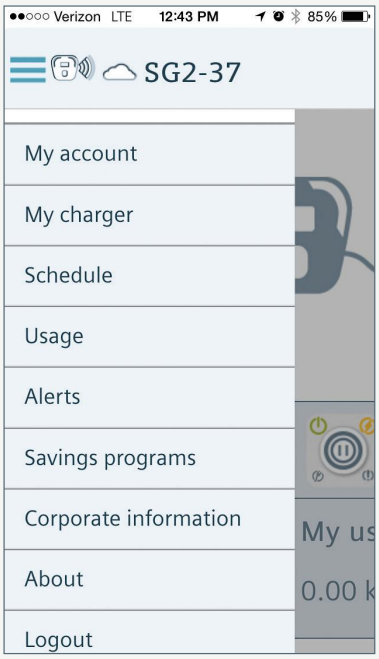
Available on: Available on the iPhone App Store Google play

Accessories

Part number	Description	Color
VCMNTGBRK	Spare parts mounting bracket	Black
VCPOSTGRY	Outdoor mounting post	Grey



Customers are able to monitor and control the charging status, charging schedule, and power level remotely through the VersiCharge SG SmartPhone App or via provided web pages.



Feature rich and cost effective smart EV charging allows the user to actively engage to shape and shift their EV power consumption.

Kilowatt usage is displayed in a daily, weekly, monthly, and yearly format to view in real time from anywhere.

Technical information

Essentials	
Part number	VCSG30GRYUW
Amperage	30 Amps
Input voltage	208 - 240 VAC
Cord length	20 ft
Wall weight	14.5 lbs
Dimensions	14.5”W x 16.0”H x 6.5”D
Output power	1.8 kW to 7.2 kW
Enclosure	NEMA 4
Plug in installation	Yes (below or behind unit)
Permanent installation	Yes
Communication hardware	CEA2045 compliant module (included)
Network connection	Wi-Fi
Radio	High Performing 2.4 GHz IEEE 802.11 b/g/n
Connectivity	Communicates through local wireless network to VersiCharge SG Cloud
Metering accuracy	+/- 0.5% standard (custom precision variant available)
Reporting parameters	Power consumption, energy, events
Demand response compatible	Yes with Opt-in

Electrical	
Circuit requirement	40 Amperes
Input power connections	Line 1, Line 2, Earth Ground
Recommended branch breaker	40 Ampere double pole (Siemens: Q240 plug in type, B240 bolt on type)

Mechanical	
Coupler	SAE J1772

Safety and Operational	
Standards compliance	UL, SAE J1772, NEC® 625
EMC	FCC Part 15 Class B
Operating temperature	-30°C to +50° C
Storage temperature	-40°C to +60°C
Operating humidity	Maximum 95% non-condensing
Ground fault detection	5 mA CCID with auto retry

Electric Vehicles Tested	
BMW i3	Nissan Leaf
Ford Focus Electric	

Siemens Industry, Inc.
5400 Triangle Parkway
Norcross, GA 30092

1-800-241-4453
info.us@siemens.com

Subject to change without prior notice.
Order No.: RPFL-VCSGD-0915

Printed in USA

usa.siemens.com/versicharge

PRT55/D10/WS

This ultra high efficiency LED garage light delivers up to 118 lumens per Watt. An integrated motion/photo sensor option provides multi-level lighting control. Available in 30, 42 and 55 Watt versions that replace 70 to 175 Watt metal halide fixtures. Fixture measures 14" L x 14" W.

Color: Bronze

Weight: 10.6 lbs

Project:	Type:
Prepared By:	Date:

Driver Info

Type:	Constant Current
120V:	0.5A
208V:	0.33A
240V:	0.32A
277V:	0.31A
Input Watts:	57W
Efficiency:	96%

LED Info

Watts:	55W
Color Temp:	5000K
Color Accuracy:	78 CRI
L70 Lifespan:	100000
Lumens:	6352
Efficacy:	111 LPW

Technical Specifications

Listings

UL Listing:

Suitable for wet locations

IESNA LM-79 & LM-80 Testing:

RAB LED luminaires and LED components have been tested by an independent laboratory in accordance with IESNA LM-79 and LM-80.

DLC Listed:

This product is on the Design Lights Consortium (DLC) Qualified Products List and is eligible for rebates from DLC Member Utilities.
DLC Product Code: PTXBTKZ9

Electrical

Drivers:

Constant Current, Class 2 100V - 277V, 50/60 Hz. THD <20%.

THD:

7.9% at 120V, 7.7% at 277V

Power Factor:

99.2% at 120V, 97.1% at 277V

Dimming Driver:

Driver includes dimming control wiring for 0-10V dimming systems. Requires separate 0-10V DC dimming circuit. Dims as low as 10%.

Construction

Lens:

Frosted polycarbonate

Gaskets:

High temperature silicone

IP Rating:

Ingress Protection rating of IP66 for dust and water

Ambient Temperature:

SuitableFor use in 40°C (104°F) ambient temperatures

Finish:

Formulated for high-durability and long lasting color

Cold Weather Starting:

Minimum starting temperature is -40°C (-40°F)

Thermal Management:

Superior thermal management with external "Air-Flow" fins

Housing:

Die-cast aluminum and sheetmetal housing. Polycarbonate is affected by cleaning agents or other liquids containing partial solvents such as low molecular weight aldehydes and ethers, ketones, esters, aromatic hydrocarbons and perchlorinated hydrocarbons.

Mounting:

Die-cast aluminum backbox with (4) 1/2" conduit openings with plugs. Hinged tether for easy installation and wiring. Also accomodates 1/2" or 3/4" NPS pendants (provided by others).

Lens:

High-transmission and vandal-resistant polycarbonate frosted lens

Reflector:

Specular polycarbonate

Green Technology:

Mercury and UV-free. RoHS compliant components. Polyester powder coat finish formulated without the use of VOCs or toxic heavy metals.

LED Characteristics

LEDs:

Long-life, high-efficacy surface mount LEDs

Lifespan:

100,000-hour LED lifespan based on IES LM-80 results and TM-21 calculations

Color Consistency:

7-step MacAdam Ellipse binning to achieve consistent fixture-to-fixture color

Color Stability:

LED color temperature is warrantied to shift no more than 200K in CCT over a 5 year period

Color Uniformity:

RAB's range of CCT (Correlated Color Temperature) follows the guidelines of the American National Standard for Specifications for the Chromaticity of Solid State Lighting (SSL) Products, ANSI C78.377-2017.

Other

Warranty:

RAB warrants that our LED products will be free from defects in materials and workmanship for a period of five (5) years from the date of delivery to the end user, including coverage of light output, color stability, driver performance and fixture finish. RAB's warranty is subject to all terms and conditions found at

Buy American Act Compliance:

RAB values USA manufacturing! Upon request, RAB may be able to manufacture this product to be compliant with the Buy American Act (BAA). Please contact customer service to request a quote for the product to be made BAA compliant.

Technical Specifications (continued)

Sensor Specifications

Operating Voltage:

120-277V

Power Consumption:

1W

0-10V Sinking Current:

50mA

Adjustable High and Low Modes:

High: 0-10V; Low: off, 0-9.8V

Adjustable Time Delay:

Amount of time in high mode with no motion before switching to low mode: 5 min., 1 -30 min.

Adjustable Cut Off Delay:

Time in which the fixture will remain on low mode with no motion before turning off and waiting for new motion to turn on: None, 1 -60 min., 1 -5 hrs.

Adjustable Sensitivy:

None, low, medium, maximum

Adjustable Setpoint:

None, 1 to 250 fc, auto

Operating Temperature:

-40°F to 167°F (-40°C to +75°C)

Operating Humidity:

20% to 90% noncondensing

Relay Life Rating:

200,000 cycles (120/277VAC), 50,000 cycles (230VAC)

IP Rating:

Ingress Protection rating of IP66 for dust and water

UL Listing:

Suitable for Wet Locations as factory installed

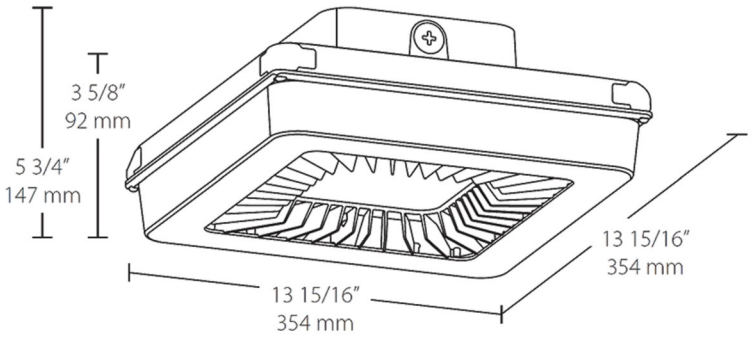
Handheld Wireless Configuration Tool:

Adjust settings using handheld wireless configuration tool. Only available with 0-10V dimming driver options.

PRT55/D10/WS

RAB

Dimensions



Features

- Ultra-high efficiency
- Pendant or surface mount
- IP 66 rated, keeps water and dust out
- Low glare, vandal-resistant polycarbonate lens
- 20% uplight eliminates "cave effect"
- 100,000-Hour LED lifespan
- 5-Year, No-Compromise Warranty

Ordering Matrix

Family	Wattage	Color Temp	Finish	Driver Options	Sensor Options
PRT	55				/D10
	55 = 55W **42** = 42W **30** = 30W	**Blank** = 5000K (Cool) **N** = 4000K (Neutral) **Y** = 3000K (Warm)	**Blank** = Bronze **W** = White	**Blank** = 120-277V On/Off **/480** = 480V On/Off **/D10** = 120-277V w/ 0-10V Dimming **/480/D10** = 480V w/ 0-10V Dimming **/E2** = Emergency Battery Backup	**Blank** = No Sensor **/WS** = Multi-Level Motion Sensor for 14" **/WS2** = Multi-Level Motion Sensor for 18" **/PCS** = 120V Swivel Photocell **/PCS2** = 277V Swivel Photocell **/PCS4** = 480V Swivel Photocell **/LC** = Lightcloud® **/LCS** = Lightcloud® Sensor

LINE VOLTAGE HIGH/LOW/OFF PIR FIXTURE INTEGRATED OUTDOOR PHOTO/MOTION SENSOR

FSP-211

Fully adjustable high and low dimmed light levels; optional dusk to dawn control

Designed for LED fixtures; rated for extreme temperatures and up to 200,000 on/off cycles

Hold off setpoint with automatic calibration option for convenience and added energy savings

2011 PROGRESS Report SELECTION

Adjustable via handheld wireless configuration tool

IP66 rated with choice of lenses for wet and outdoor locations, and mounting heights from 8' to 40'

Adjustable time delay and cut off delay

PEP ecoPASSPORT® RoHS

Description

The FSP-211 mounts in an outdoor lighting fixture and provides multi-level control based on motion and/or daylight contribution. It controls 0-10 VDC LED drivers or dimming ballasts, as well as non-dimming ballasts and, with an FSP-Lx Lens, is rated for wet and cold locations. All control parameters are adjustable via a wireless configuration tool capable of storing and transmitting sensor profiles.

Operation

Typically, the sensor ramps lighting On to the selected High mode level when motion is detected and the ambient light level is below the hold off setpoint. After the sensor stops detecting movement and the time delay elapses, lights fade to the Low mode level. If there is no motion during the subsequent cut off time delay, the lights will turn Off. For dusk to dawn control, the integral photocell can switch the lights On and Off based on the ambient light level so that lighting remains on overnight even without motion detection.

Wireless Handheld Configuration Tool

Initial setup and subsequent sensor adjustments are made using a handheld configuration tool (FSIR-100). This tool enables adjustment of parameters including high and low modes, sensitivity, time delay, cut off and more. The FSIR-100 is also used to initiate automatic calibration of the FSP-211 ambient light level setpoint. The setpoint is used to hold the controlled lighting off or at low level when there is sufficient daylight. The wireless tool stores up to six sensor parameter profiles to speed configuration of multiple sensors.

Applications

The slim, low-profile FSP-211 is designed for installation inside the bottom of a light fixture body. When fully assembled and installed in an IP66-rated fixture, the sensor and FSP-Lx lenses are IP66 outdoor rated. The sensor is ideal for areas such as parking facilities, gas stations, pedestrian pathways and warehouses. A choice of four lenses ensures complete coverage for mounting heights up to 40'.

Features

- Provides line voltage On/Off switching and 0-10 VDC dimming control
- Works with ballasts or LED drivers
- High and low modes fully adjustable from 0 to 10V
- Time delay from 5 to 30 minutes
- Optional cut off delay
- Adjustable ramp up and fade down times
- Optional daylighting setpoints feature automatic calibration, or permit manual adjustment
- Configuration tool stores six sensor profiles for quick setup and adjustment of multiple sensors
- Polycarbonate construction; flame retardant, UV resistant, impact resistant, recyclable
- UL244A and UL508; IP66 rated (when fully assembled and installed) for use in wet locations
- This product meets the materials restrictions of RoHS
- BAA/TAA-compliant models available

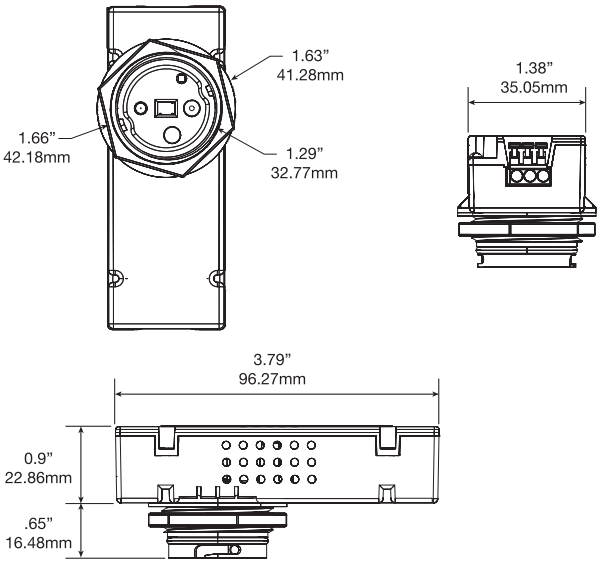
PROJECT		LOCATION/ TYPE	

Specifications

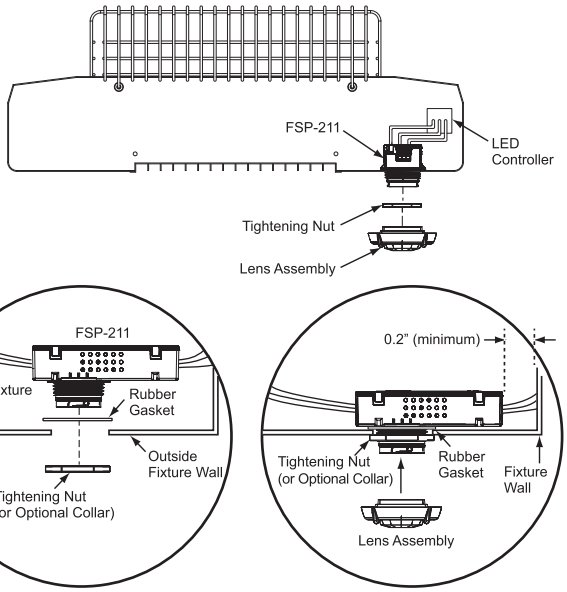
- 120/277 VAC, 50/60Hz
  - Load @120 VAC 0-800W ballast or incandescent
  - Load @277 VAC 0-1200W ballast
- 230 VAC, 50Hz; Load 0-300W ballast
- Relay life rating: 200,000 cycles (120/277 VAC); 50,000 cycles (230 VAC)
- High mode: 0-10 V; default 10 V
- Low mode: Off, 0-9.8 V; default 1 V
- Time delay: 30 sec., 5-30 min.; default 5 min.
- Cut off delay: none, 1–60 min. 1-5 hrs.; default 1 hr.
- Sensitivity/service mode: low, med, max; on-fix, off-fix; default max
- Hold off setpoint: disable, 1–250 fc, auto; default disabled
- Photocell On/Off: 1–250 fc; default disabled
- Ramp up time: none, disable, 1–60 sec.; default disabled
- Fade down time: none, disable, 1–60 sec.; default disabled
- Operating temperature: -40 to 167°F (-40 to 75°C)
- Operating Humidity: 20–90%
- Weight: 2.8 oz (80 grams)
- IP66, CE compliant
- TUV, UL and cUL listed (E101196)
- Five year warranty

Dimensions, Mounting & Wiring

Sensor Dimensions

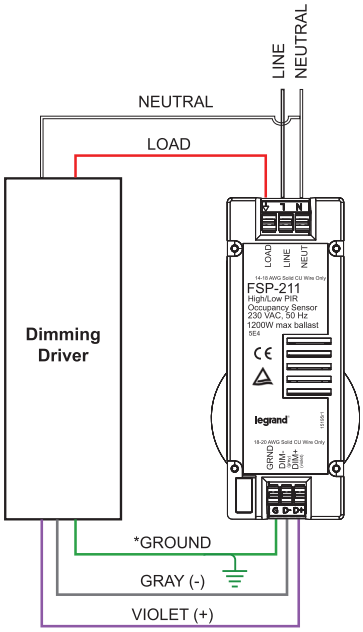


Sensor Mounting

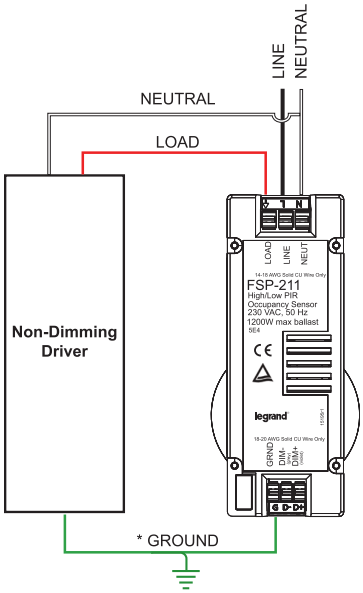


The FSP-211 accommodates fixture wall thickness up to 0.125" (3.18mm)

Dimming Wiring Diagram



Non-Dimming Wiring Diagram



* The FSP-211 must be properly grounded.

Ordering Information

Catalog #	Color	Description	Input Voltage
☐ FSP-211	White	Fixture mount PIR motion sensor	120/277VAC, 50/60Hz or 230VAC, 50Hz
☐ FSP-211-U	White	Fixture mount PIR motion sensor, BAA/TAA compliant*	
☐ FSP-L2	White	360° lens, maximum coverage 48' diameter from 8' height	
☐ FSP-L2-B	Black		
☐ FSP-L2-BR	Brown		
☐ FSP-L2-G	Gray		
☐ FSP-L3	White	360° lens, maximum coverage 40' diameter from 20' height	
☐ FSP-L3-B	Black		
☐ FSP-L3-BR	Brown		
☐ FSP-L3-G	Gray		
☐ FSP-L7	White	360° lens, maximum coverage 100' diameter from 40' height	
☐ FSP-L7-B	Black		
☐ FSP-L7-BR	Brown		
☐ FSP-L7-G	Gray		
☐ FSP-C1-W	White	Small collar, for use with FSP-L2 and FSP-L3 lenses (Optional for models above. Included with -D and -S models ordered below)	
☐ FSP-C1-B	Black		
☐ FSP-C1-BR	Brown		
☐ FSP-C1-G	Gray		
☐ FSP-C2-W	White	Large collar, for use with FSP-L7 lens (Optional for models above. Included with -D and -S models ordered below)	
☐ FSP-C2-B	Black		
☐ FSP-C2-BR	Brown		
☐ FSP-C2-G	Gray		

Note: FSP-Lx series lens required for operation; order lens separately.
*Product is compliant with Buy American Act and Trade Agreement Act

Pub. No. 27375r1 Rev. 11/2017

Attachment D – Bios of Key People

John E. Flory
Senior Vice President
& Regional Manager, North America

Current – Manage Business Development and Client Relations for eSmart Systems in using Big Data Analytics and Machine Learning with energy companies in North America for Intelligent Asset Management. Indicative projects include:

- Co-managed projects applying eSmart Systems tools to improve energy companies' processes for detecting defective assets and prioritizing the maintainance or replacement of such defective assets.
- Managed the project, "The TransAtlantic Collaboration of Transmission System Operators on defining the TSO-DSO interface in an increasingly DER world."
- Worked with MIT "Utility of the Future" project co-lead on pilot projects integration Distributed Energy Resources (DER) into utility practices.

2010's – With the Alliance Risk Group, consulted with energy companies on risk management practices including:

- Implications of Big Data Analytics for reducing operational risk and enhancing reliability,
- Risk management practices around oil, power and gas trading and long term contracts,
- Risk Management practices for Distributed Energy Resources(DER),
- Designed a Clearinghouse for Mexico's long-term clean energy auction.
- Co-managed several projects with Deloitte on energy risk.

Mid-late 2000s—Created a clearinghouse for physical power and natural gas, North American Energy Credit and Clearing, which was later sold to NASDAQ OMX.

Late 1990s -- Assisted S. David Freeman, Restructuring Trustee, in setting up the independent power market operators, CAISO and CalPX.

Mid 1990s -- As Head of the West Coast office for Tabors, Caramanis and Associates, assisted energy companies in market research and test design for service offerings.

Mid 1980s-early 1990s –
Co-founded a consulting firm to energy companies in the test design and evaluation of potential new products.

Early 1980's. Worked for a manufacturer of small energy management systems targeted for the residential and commercial customers.

Late 1970s. At the California Energy Commission (CEC), evaluated the impact of utility load management programs on the performance and reliability of major electrical equipment and developed the US's first utility residential load management standards.

BS in Mathematics. Manchester College, Indiana.
MS in Ecology, at University of California, Davis, with emphasis on ecosystem resiliency and modeling, including application of ecosystem concepts to economic and energy systems.

eSmart Systems US Inc,
405 114th Ave SE, Suite 100, Bellevue, WA 98004 USA
www.esmartsystems.com,
john.flory@esmartsystems.com

Joakim Sveli, Business Manager, Energy Markets, eSmart Systems, AS

As the Business Manager, Energy Markets, Mr. Sveli is responsible for business development and product concepts in Connected Prosumer products. Connected Prosumer systems allow customers who are both producers and consumers to optimize their Distributed Energy Resources (on-site generation, storage, Demand Response) for both minimizing their bill and reducing the costs of the local utility. Mr. Sveli has been a leader in eSmart projects with the EU in the Connected Prosumer area. He specializes in the digitalization of energy infrastructure and energy management systems.

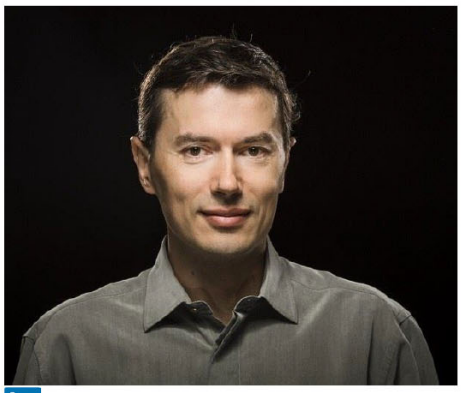
Master of Science in Business at Bodø Graduate School of Business.

Background

Mr. Sveli came from position as business development manager at Fortum Charge&Drive (2014-2017). Responsible for the development for the charging infrastructure network in Fortum- Norway's largest fast charger network. Building it up from 4 fast chargers to 1000.

Before that he holds a position as Climate and Energy Adviser with Østfold County Council (public sector) (2010-2014). Regional planning and development concerning climate and energy, with focus on procurement and sustainable mobility. Developed planning tools for charging infrastructure.

He came to this position from a role as Senior Consultant at Ernst & Young Consultancy, Norway (2007-2010). Main tasks involving Internal audit, cash flow management, fraud investigation and environmental management.



Curriculum Vitae

Name	:	**Davide Roverso, PhD**
Current positions	:	**CAO – Chief Analytics Officer**
Date of birth	:	**08.Dec.1966**
Email	:	**davide.roverso@esmartsystems.com**
Mobile	:	**+47 92615003**
Employer	:	**eSmart Systems** Håkon Melbergs vei 16, 1783 Halden, Norway

LinkedIn: no.linkedin.com/in/davideroverso

Research Gate: https://www.researchgate.net/profile/Davide_Roverso

Summary

Davide holds a PhD degree in Computing Science. He has over 25 years' experience in the field of Machine Learning and Big Data Analytics, with applications in diagnostics, prognostics, condition monitoring, and early fault detection in complex processes, in sectors ranging from energy to medicine and environmental monitoring. He has authored over 90 publications in international journals, conference proceedings and edited books. He is currently CAO (Chief Analytics Officer) at eSmart Systems where he leads the analytics and data science group.

Professional experience

Applied Research, Basic Research, Department Management, Project Management.

Areas of expertise:

- Data Analytics, Big Data, Condition Monitoring and Diagnosis (e.g. gas turbines, pumps, valves, complex processes), Predictive Modelling (e.g. Remaining Useful Life modelling) and Virtual Sensing (e.g. emission monitoring, fuel consumption, etc.), Artificial Intelligence, Machine Learning, Neural Networks, Data Mining, Knowledge Based Systems

Industry Fields Experience:

- Nuclear, Upstream Oil & Gas, Maritime, Medical, Finance, IT, Environment, Energy

Special skills:

- Computer programming (e.g. Python (scikit-learn, pandas, theano, numpy, etc.), Matlab, C, Lisp, etc.)

Figure 8 Davide Roverso CV Page 1

Selected Recent Projects

- 2016-present: Big data analytics and deep learning applied to drone based inspections.
- 2015-present: Big data analytics applied to the Smart Grid and Smart Cities.
- 2013-2014: Big data analytics applied to condition monitoring and condition based maintenance of gas-fuelled turbo-generators for offshore oil & gas production.
- 2013: Big data analytics applied to condition monitoring of hydraulic actuators of subsea oil & gas production valves.
- 2012-2014: Data analytics applied to optimisation of ship energy efficiency and emissions
- 2012-2013: Big data analytics applied to condition monitoring of the instrumentation of subsea gas booster compressors.
- 2012: Big data analytics applied to finance market direction of change forecasting.
- 2011: Data analytics applied to city air quality monitoring and estimation of particulate concentrations
- 2011: Data analytics applied to chemical dosage optimisation in waste water and drinking water treatment

Education

- 1997: **PhD** in Computing Science, University of Aberdeen (Scotland, UK)
- 1990: **Laurea Degree** in Informatics with honourable mention at Universitá di Torino (Turin, Italy)

Languages

Italian	Native tongue
English	Fluent written and spoken ability
	Report writing, publications, conference presentations
Norwegian	Good spoken and written ability
	Conference presentations

Employment history

- **'15-present:** CAO, Chief Analytics Officer, eSmart Systems.
- **'15-'15:** Principal Research Scientist, IFE.
- **'11-'14**: CTO, First Sensing AS.
- **'08-'11**: Department Head and Principal Research Scientist (*forskningsleder*), Computerized Operator Support Systems, IFE.
- **'07-'08**: Deputy Department Head and Principal Research Scientist (*forskningsleder*), Computerized Operator Support Systems, IFE.
- **'98-'07**: Senior Research Scientist (*senior forsker*) in the Process Monitoring and Diagnosis Section, Computerized Operator Support Systems Division, MTO Sector, IFE.

Figure 9 Davide Roverso CV Page 2

- **'96-'97**: Principal Research Scientist in Neural Networks and Data Mining at the Insitute for Information Technology of STØ (Østfold Research Foundation, Norway).
- **'95-'96**: Research Scientist in Machine Learning, Neural Networks, and Data Mining at CSELT (Center for Studies and Laboratories for Telecommunications, Telecom Italia, STET group, Italy).
- **'91-'95**: Research Assistant for the EU project Science Stimulation (No. SC1*CT890048) and later Assistant Administrator of MLnet, the European Network of Excellence in Machine Learning (EU Esprit project No. 7115), coordinating over 40 academic and industrial research labs in Europe.
- **'89**: Consultant for Optrotek, Brussels, Belgium.

Patents

ZA 2011/06080, "System and Method for Empirical Ensemble-based Virtual Sensing of particulates".

NO 329798, "System og fremgangsmåte for empirisk ensemblebasert virtuell sensing av svevestøvpartikler".

PCT/NO2010/00058, "System and Method for Empirical Ensemble-based Virtual Sensing of particulates".

PCT/NO2008/00292, "System and Method for Empirical Ensemble-based Virtual Sensing of gas emission".

PCT/NO2008/00293, "System and Method for Empirical Ensemble-based Virtual Sensing".

Publications

Author of over 90 publications in international journals, conference proceedings and edited books.

For a full list see Research Gate: https://www.researchgate.net/profile/Davide_Roverso

Figure 10 Davide Roverso CV Page 3

Terrance (Terry) W. Sando
412 5th Ave SE
Hillsboro, ND 58045
TDTSando@aol.com
701-430-1786

eSMART SYSTEMS, September 2017-Present

Currently, I am the Head of the North Dakota Office of eSmart Systems US, Inc.

GRAND FORKS REGION EDC, September 2013-September 2017

I was the first EDC lead for advancing the establishment of Unmanned Autonomous Systems (UAS). My portfolio included aviation, training, and military operations at Grand Forks AFB. I traveled internationally to promote the Grand Forks Region as the gateway into the United States market. Coordinated Research North Dakota opportunities to companies that wanted to leverage matching dollars from the North Dakota Department of Commerce for establishing business in North Dakota. Promoted the first large UAS, a Hermes 450 to simulate Beyond Visual Line of Sight (BVLOS) operations for Precision Ag and Storm Damage Assessment flights from the Hillsboro Airport.

UNIVERSITY OF NORTH DAKOTA, August 2012-September 2013

I was a Graduate Student in Aviation concentrating in Unmanned Aircraft Systems and Helicopter Flight Operations.

UNIVERSITY OF NORTH DAKOTA, October 2010-August 2012

I was the Director of Emergency Management and Public Safety for the University of North Dakota (UND). Duties included directing the day-to-day activities of the Operations Center, the University Police, Risk Management, Safety, and Emergency Management functions. I reported to and advised the Vice President of Finance and Operations. I was hired as the subject matter expert in emergency management and business continuity. During the 18 months I completely revamped the Emergency Management Framework, Business Continuity Planning, Continuity of Operations Planning, and the University's Exercise Program. My team fostered linkages between UND and the City of Grand Forks, County of Grand Forks, the State of North Dakota, and federal agencies.

UNITED STATES AIR FORCE, June 1998-November 2009

AFNORTH A5/8 Director Plans & Requirements: As the Director of Plans and Requirements (A5/8) at AFNORTH, I lead the development of policies and procedures for strategic planning and resource requirements. This included directing a multi-disciplined, bi-national staff of military, civilian, and contractor personnel which supported programs of national scope. These plans covered the spectrum of sovereign air, maritime, space, and

cyberspace operations for North American Aerospace Defense Command (NORAD) and U.S. Northern Command (NorthCom). Key responsibilities were the integration of execution planning with Joint Forces, Multi-national forces, interagency staffs, states, and local governments that leveraged AFNORTH capabilities for Homeland Defense and Defense Support of Civil Authorities (DSCA). My Battle Staff duties included the seamless transition of Title 10 and Title 32 forces in support of states responding to natural disasters. I was the Deputy A5/8 from 1 June 2007 to 1 March 2008.

NGB-J8 Director of Force Structure & Resources: Bridging Plans to Joint Programs, NGB-J8 is responsible to the Chief, National Guard Bureau (NGB) for Joint Strategic Resource planning; capabilities based planning and analysis; and overall program requirements analysis and validation. I provided resource oversight, guidance, policy, procedures, and performance metrics for the entire spectrum of National Guard appropriations totaling over $17 billion dollars annually across six individual appropriations.

NGB-J7 Division Chief, Op Plans & Joint Force Development: Responsible to the Director and Deputy Director, NGB-J7 for current resource oversight, guidance, policy, and procedures that pertain to operational plans and joint force development. I functioned as the NGB staff proponent for training transformation, joint force readiness reporting, and operational plans using the Joint Capabilities Integration and Development System (JCIDS). I represented NGB on the Functional Capabilities Boards at the Department of Defense.

Current Operations Training and Standardization Chief: Established the Training and Standardization Branch for NorthComs Current Operations, J33. I was responsible for the training and certification of over 30 crew members in Current Operations in Homeland Defense and DSCA operations.

NORTHCOM Domestic Events Officer – Cheyenne Mountain Operation Center (CMOC): Selected to be the first senior NORTHCOM representative in the CMOC Consolidated Command Center. My main responsibilities were the overall defense of NORTHCOM AOR from all threats. I maintained operational control and integrity of all command resources. Conducted time critical actions and provided recommendations to CDRNORTHCOM, Department of Defense, and Battle Staffs in the execution of Homeland Defense operational plans and Defense Support of Civil Authorities for natural disasters.

Air Force Space Command (AFSPC) – DO Guard Advisor: AFSPC/DO's primary advisor for Air National Guard (ANG) affairs and mission migration issues. I provided operational expertise on major Air Force Space Systems. As a member of the integrated staff, I expedited coordination, streamlined processes, reduced redundancies and facilitated access to the ANG. This enhanced AFSPC's ability to meet the Commander's force requirements through a well-trained, modernized Total Force.

Deputy Commander – Air Force Space Battlelab: Commander's primary advisor as well as acting commander in his absence. I led a 24 person unit and managed a $5 million dollar budget. An important aspect was overseeing the collaboration with six other Battlelabs to solve the warfighters most difficult problems. I was responsible for effectively communicating with the Air Force Requirements Oversight Council and the General Officer Steering Group on program initiatives and reports.

Air Guard Advisor to 21st Space Wing: Assisted the 21st Space Wing Commander in the integration of Guard and Reserve forces into the Wing. I helped create a Total Force solution for more effective peacetime, contingency, and combat forces within the 21st Space Wing. Coordinated mission transition issues between the National Guard Bureau, the States and 21st

Space Wing. As the senior ANG representative at the Wing, I scoped future ANG involvement in space missions.

ND AIR NATIONAL GUARD, 119th FW, Fargo, ND, November 1984- June1998

Wing Plans: After returning from Air Command and Staff College in-residence, I was assigned to the LGX/XP (Wing Plans) position. This position provided functional support for Wing operations. I was the focal point at the 119th Fighter Wing for plans, programs, and deployments. I directed planning and implementation of force bed down at home station and at deployed operating locations.
Quality Advisor: Charged with developing and institutionalizing Total Quality in the Wing. I advised the commander and key staff on the implementation of Quality. Presentations and training of Wing personnel were important aspects of this job.
Supply Management & Systems Officer: Planned and assigned work done in Supply, mainly in the Management and Systems areas. I was responsible for inventory and analysis functions, which involved the development of plans, programs, and policies for the operations of Supply. I acted as Chief of Supply during a management transition.
Intelligence Officer: Developed and administered intelligence and aircrew training plans, presented staff briefings, assembled and distributed mission data. I conducted intelligence operations for the Commander and his Battle Staff. I was Chief of Intelligence during counterdrug operations while deployed to Central America.
Security Police Officer: I was responsible for security of all resources assigned to the 119th Fighter Wing. I directly supervised 29 full time employees. An integral part of the job was communications with members of the unit, other units, and local law enforcement personnel.

UNITED STATES AIR FORCE, April 1979-October 1984

Defensive Aerial Gunner: Operated defensive aerial gunnery and satellite communications equipment. I performed flying functions as a B-52 aircrew member, doing training, combat procedures, and instructing others in gunnery systems. I participated in nuclear alert operations.
Avionics Inertial and Radar Navigation Systems Specialist:
Maintained analog and digital inertial navigation and avionics systems on the following aircraft: F-4s, A-10s, F-15s, and F-16s. Worked flight line operations and back shop functions as well as augmenting other maintenance operations.

CIVILIAN EDUCATION:

University of North Dakota: Currently a Graduate Student in Aviation, thirty one hours completed with a GPA 4.00/4:00
Embry Riddle Aeronautical University: Masters of Aeronautical Science with a concentration in Aviation Operations. Thirty three semester hours completed with a 3.66/4.00 GPA.
Embry Riddle Aeronautical University: 1987 Bachelor of Professional Aeronautical degree, with a concentration in Business and Avionics Technology. GPA 3.33/4.00

Figure 15 Terry Sando CV Page 3

FEMA TRAINING

IS-100.b Introduction to Incident Command System
IS-120.a An Introduction to Exercises
IS-139 Exercise Design
IS-200.b ICS for Single Resources and Initial Action
IS-300 Intermediate ICS for Expanding Incidents
IS-400 Advanced ICS Command and General Staff-Complex Incidents
IS-700.a National Incident Management System
IS-800.a National Response Plan
IS-800.b National Response Framework
DOD Defense Support of Civil Authorities Course

KEY MILITARY EDUCATION:

Nuclear Surety Executive Course: March 2008, Kirtland AFB
Air War College: July 2006 – June 2007, Maxwell AFB, Masters of Strategic Studies
Cheyenne Mountain Operations Center Orientation Course: August 2002, Schriever AFB
Space Applications Advanced Course: March 1999, Schriever AFB
Undergraduate Space and Missile Training Staff Course: September 1998, Vandenberg AFB
Air Command and Staff College: August 1996 – June 1997, Maxwell AFB
Supply Officers School: March 1994 – June 1994, Lackland AFB
Security Police Officers Course: February 1991 – March 1991, Lackland AFB
Intelligence Applications Officers Course: May 1985 – Nov 1985, **Distinguished Graduate**
Academy of Military Science: February 1985 – April 1985, Commissioned as Second Lieutenant
Combat Crew Training Course, B-52G: Sept 1982 – June 1983, **Distinguished Graduate**
Avionics Inertial and Radar Navigation Course: June 1979 – January 1980, Keesler AFB
Basic Military Training School: April 1979 – June 1979, **Honor Graduate**, Lackland AFB

OTHER:

Top Secret/SCI/TK and Program Clearances (held in the military)
Private Pilot: over 200 hours flying time
Facilitator Training Course
Quality Awareness Training
Teams, Tools, and Techniques
Leadership Training Course
Graduate of the Grand Forks Chamber Leadership Training Program

Figure 16 Terry Sando CV Page 4

OP Ravi

Azure IoT, Smart Grid & Energy Solutions PM Microsoft

OP Ravi serves as a Principal Program Manager in the Azure IoT team. He has led multiple initiatives from incubation to production. After the successfully launched a new Azure service – Time Series Insights and he is now focused on smart energy initiatives. Recently the Smart Grid pilot with Agder Energi has been awarded with the Innovative Star of Energy Efficiency Award
In his 15 years at Microsoft, he has worked on multiple product teams, including Azure IoT, Time Series Insights, Streaming/Near Real-Time Analytics, Log Analytics, Azure Data Lake, Cloud (Autopilot, Azure), and Bing. He helps customers with their digital transformation journeys by developing intelligent capabilities for the power and utilities sector.
LinkedIn - https://www.linkedin.com/in/opravi/

Mike Williams

1529 5th St S

Fargo, ND 58103

Risk Manager/adjuster/drone pilot for Family Mutual Insurance, a progressive, home grown North Dakota company.

I am an engaged citizen that enjoys meeting and collaborating with people to achieve common goals. I am grateful for the opportunity to continue to serve the citizens of Fargo as chair of the Fargo Parking Commission and on the BID Advisory Board and continue to work with the great city employees.
Prior: Fargo City Commissioner Jun 2004 to June 27, 2016 · Deputy Mayor Fargo, North Dakota. Reached 3 term limit in June 2016.

2003 – 2010 Served on the Board of Directors and past president for the 150 member North Dakota Alliance for Renewable Energy advocating and developing legislation and use, for clean, home grown, renewable energy and conservation.

Mark Nisbet, ND Principal Manager

Mark Nisbet is the North Dakota Principal Manager for Xcel Energy, the fourth-largest combination natural gas and electricity company in the nation; serving 3.3 million electricity customers and 1.8 million natural gas customers in eight Western and Midwestern states. In 2018, Xcel Energy is breaking ground on the Foxtail Wind Farm in Dickey County which will bring Xcel Energy to 500 MW of owned wind plus 112 MW of purchased wind power in North Dakota. Mark has shown a personal commitment to renewable energy by installing 40 KW of solar panels on his farm and purchasing the all-electric Chevy Bolt.

Mark serves on the board for the North Dakota EmPower Commission, North Dakota Renewable Energy Council, the West Fargo Economic Development Authority and incoming Chair for the Fargo Moorhead Chamber of Commerce. He also has served as chairman of the governor's Centers of Excellence Commission, and was the 2016 United Way of Cass Clay Campaign and United Way Board member.

Mark received a bachelor's degree in business administration from Minnesota State University, Moorhead. He is a graduate of the Minnesota Management Institute at the Carlson School of Business, University of Minnesota.

Mark lives in Fargo with his wife, Sandy and they have three sons.

In 2006, Mike Allmendinger joined Kilbourne Group, which strives to be a catalyst of inspiration and action for vibrant downtown communities by redeveloping and creating infill projects in Downtown Fargo. With more than 10 years of experience developing mixed-use redevelopment and infill projects in downtown Fargo, Mike believes in the vibrancy of an 18-hour city that offers unique experiences and places designed for people.

Mike founded Land Elements in 2003, with a goal to create a landscape architecture firm that focuses on conceptual design to create a unique sense of place. The Land Elements team offers full landscape architecture services, including schematic design, construction documents and construction administration.

Michael A. Berger, P.E., LEED AP BD+C

ELECTRICAL ENGINEER

GENERAL BACKGROUND

Manager of electrical engineering department. Project electrical manager and engineer responsible for all aspects of electrical engineering projects including programming, estimating, design, construction, and administration. Project design work includes schools, healthcare facilities, government facilities, industrial facilities, generator installations, housing facilities, office building, and recreational facilities.

EXPERIENCE

- **West Fargo Police Department, West Fargo, ND 2013**
  This project was an addition to the existing West Fargo City Hall facility that was designed to house the West Fargo Police Department. The new addition included underground parking, a large open office space, private offices, and a large A-V meeting room. The project also involved remodeling of the existing City Commission chambers, the IT department and other remodeling in the existing City Hall. Electrical design included lighting and controls, power distribution including a full building backup generator, fire alarm design, telecommunications design, A-V design, access control and camera surveillance system design.
- **Bobcat Acceleration Center, Bismarck, ND 2013 (LEED Silver)**
  This project was a large 2 story office expansion to an existing shop facility in order to create an engineering acceleration center. Electrical design included interior and exterior lighting and controls, power distribution including an emergency generator, fire alarm design, telecommunications design, A-V design, access control and camera surveillance system design.
- **ND Air National Guard Building 375, Fargo, ND 2017 (LEED Silver)**
  This is a new 7,000 square foot analytics facility on the air base in Fargo. Electrical design included lighting and controls, power distribution including 25 kV distribution system revisions, roof mounted photovoltaic system design, fire alarm design, telecommunications design including the on base outside plant design, A-V design, access control and camera surveillance system design.
- **Fergus Falls Public Safety, Fergus Falls, MN, 2012 (LEED Silver)**
  This was a new facility to house the city police department. The building included underground parking and main floor office, interview and conference rooms. Electrical design included lighting and controls, power distribution including a full building backup generator, fire alarm design, telecommunications design, A-V design, access control and camera surveillance system design.

EDUCATION

- B.S. Electrical Engineering
  North Dakota State University, Fargo, ND, 1995

CERTIFICATIONS

- LEED accredited professional

PROFESSIONAL REGISTRATION

- ND #4438
- MN #40294
- SD #7028
- NE #E-16037
- MT #15814
- IA #18919
- OK #27787
- PA #PE087332
- IN #11700808
- MO #2017037879
- WI #46099-6
- CO #0052783
- DE #21894
- NY #099156
- FL #84863
- TX #130068
- CT #33109
- IL #062.070498

ASSOCIATIONS

- American Society of Healthcare Engineering
- Fargo Moorhead Electrical Industry Association
- Construction Specifications Institute FM Chapter
- Syn-Aud-Con
- International Association of Electrical Inspectors
- Illuminating Engineering Society

Tim Conmy

Area Director, Northern Plains, Border States Industries, Fargo, North Dakota.

Experience

Professional Experience

Border States Electric, March 22, 2002 – Present

- Integration Manager – Fargo, ND (April 2016-Current)
- Branch Manager – Fargo, ND (2006-2016)
- Branch Operations Manager – Fargo, ND (2006 8 months)
- Marketing Manager for the Industrial Supply Division/Plumbing – Fargo, ND (2004-2006)
- Customer Service Supervisor for the Industrial Supply Division – Fargo, ND (2002-2004)

Integra ips/West Central Region, 1999 – 2002

- Operations Manager – Fargo, ND
    - Managed sixteen Customer Service and Inside Sales employees' in three states.
    - Oversite of warehouse and shipping functions in three states.
    - Maintained onsite computer hardware and network functions.
    - Trained new employees on all software applications used by Integra, including Microsoft Office and Eclipse Business Operating system.
    - Responsible for regional productivity tracking and reporting.
    - Responsible for regional operational budgeting and reporting.
    - Monitored and coordinated maintenance for three facilities.

KSC Supplying Industry, 1991 – 1999

- Branch Manager – Bismarck, ND / Fargo, ND
    - Performed Customer Service/Inside Sales duties
    - Purchased and monitored all inventory stocked at the Bismarck branch.
    - Responsible for monthly profitability and budget reporting for the branch.
    - Oversaw all branch activities as well as managed one Warehouse employee.

FM Automart, 1990 – 1991

- Parts Department Manager – Fargo, ND

Stan Marthaller Motors, 1983-1990

- Parts Department Manager-Bismarck, ND

Beartooth Drilling, 1980-1982

- Drillers Helper – Dickinson, ND

2302 Great Northern Drive
P O Box 2747
Fargo, North Dakota 58108

July 23, 2018

Mr. Terry Sando
eSmart Systems US, Inc.
412 5th Ave, SE,
Hillsboro, ND 58045

RE: "Fargo's Smart Energy Parking Ramp: Optimizing the Use of a Renewable Energy Package (PV, Storage, EV, and Load Control) to lower energy costs and provide value-added services in a Public-Private Partnership" -- A Proposal to the North Dakota Renewable Energy Program

Dear Mr. Sando,

This is to inform you that Xcel Energy is interested in participating as a partner in the Proposal to the North Dakota Renewable Energy Program (REP) called "Fargo's Smart Energy Parking Ramp". Xcel Energy likes the way this project uses Artificial Intelligence to optimize the use of a unique Renewable Energy Package – Photovoltaics, Battery Storage, Electrical Vehicle Charging and load control to lower energy costs and reduce carbon footprint.

In particular Xcel Energy sees benefits from this project in terms of providing insights on how:

- To integrate this renewable energy package into the grid so as minimize the impact on the local T&D grid as well as to increase the use of renewable energy,
- such a package might be operated in a manner that would be consistent with operating under real-time pricing of electricity,
- Future designs of MISO pricing could affect the operations of renewable energy packages,
- Other new build or re-model projects might consider similar renewable energy packages in their design.

For these reasons Xcel Energy is willing to participate in this project in:

- Metering of electricity use,
- An Advisory capacity in reviewing the project analysis and report recommendations.

Our expected non-cash resources commitment is $40,000.

Let me know if you have any questions.

Regards,

Mark Nisbet
Xcel Energy Principal Manager

BORDER STATES
Supply Chain Solutions™

605 25th Street S
Fargo, ND 58103
701.239.7480 phone
701.232.7673 fax

Mr. Terry Sando
eSmart Systems US, Inc
412 5th Ave, SE,
Hillsboro, ND 58045

July 24, 2018

RE: "Fargo's Smart Energy Parking Ramp: Optimizing the Use of a Renewable Energy Package (PV, Storage, EV, and Load Control) to lower energy costs and provide value-added services in a Public-Private Partnership" -- A Proposal to the North Dakota Renewable Energy Program

Dear Mr. Sando,

This is to inform you that Border States is interested in participating as a partner in the Proposal to the North Dakota Renewable Energy Program (REP) called "Fargo's Smart Energy Parking Ramp". Border States is excited to support the proposed effort to make the Roberts Commons parking facility "carbon neutral". Border States has been involved in promoting and supporting the use of solar in our region for many years. Solar has been viewed as "not economical" or "inefficient" in our geography, this project would showcase today's advances in solar and power storage as well as "smart" energy management. Solar power has become a very viable energy solution in our climate area and BSE appreciates the opportunity to be a part of facilitating it.

Border States is committed to the success of this endeavor and support all the entities involved to make this a showcase for the City of Fargo and State of North Dakota. We feel that having a highly visible, fully functional smart grid capable installation is essential to proving the "smart" technologies that will advance the view of solar and "smart grid" opportunities available today. This installation can become the first step toward the North Dakota community utilizing renewable energy resources.

Border States is committed to use its experience in serving as a Project Advisor for both the pilot design and the development of the Smart Clean Energy Guide for developers and cities on future projects.

Border States would appreciate a favorable decision by the Renewable Energy Commission to allow this project to move forward.

Sincerely,

Tim Conmy
Border States- Area Director

Cc: John Flory

KILBOURNEGROUP

July 31, 2018

Mr. Terry Sando
eSmart Systems US, Inc
412 5th Ave, SE,
Hillsboro, ND 58045

RE: "Fargo's Smart Energy Parking Ramp: Optimizing the Use of a Renewable Energy Package (PV, Storage, EV, and Load Control) to lower energy costs and provide value-added services in a Public-Private Partnership" -- A Proposal to the North Dakota Renewable Energy Program

Dear Mr. Sando,

Kilbourne Group supports the effort of the City of Fargo, Xcel Energy, and eSmart Systems "Fargo's Smart Energy Parking Ramp" proposal to the North Dakota Renewable Energy Program. We believe this pilot project would provide valuable insight into best practices to integrate renewable energy into future construction projects. The use of battery storage to power smart electric vehicle charging stations would be a great addition to downtown for electric vehicle owners working, living, or visiting downtown. This is an excellent opportunity to use Artificial Intelligence with renewable energy in mixed use development to help create a vibrant downtown.

Kilbourne Group is therefore willing to support this project by:

- Co-hosting the project with the City of Fargo at a mixed-use facility (the RoCo project),
- Finding residents and businesses who are willing to purchase solar credits to reduce their carbon footprint
- Serving on an advisory committee to review:
    - the Demo direction and results, plus
    - The Guide for Developers and Cities on incorporating Smart Clean Energy Packages into the design of future re-builds and new construction.

Let me know if you have any questions.

Regards,

Mike Allmendinger

Cc: Mike Williams, John Flory

MBN
ENGINEERING

July 30, 2018

Mr. Terry Sando
eSmart Systems US, Inc
412 5th Ave, SE,
Hillsboro, ND 58045

RE: "Fargo's Smart Energy Parking Ramp: Optimizing the Use of a Renewable Energy Package (PV, Storage, EV, and Load Control) to lower energy costs and provide value-added services in a Public-Private Partnership" -- A Proposal to the North Dakota Renewable Energy Program

Dear Mr. Sando,

MBN Engineering, Inc is pleased to assist the City of Fargo and eSmart Systems in developing the Fargo Smart Energy Parking Ramp project. MBN Engineering has been assisting the project partners in planning and developing the infrastructure to support a photovoltaic energy system with battery storage on the roof of the ramp, electric vehicle charging systems, and smart controls to allow users to interact with the systems. We are also willing to support the development of the "Guide for Smart Clean Energy Commercial Packages" for developers and cities. Finally, we are offering to provide in-kind support as part of the Advisory Committee to insure this project provides its full value.

We encourage the North Dakota Renewable Energy Commission to support this project. The project will be an example of how solar energy systems and electric vehicles can be used to reduce energy usage and be a resource for not only downtown Fargo, but for all communities throughout North Dakota.

Let me know if you have any questions.

Regards,

Michael A. Berger, P.E.
Electrical Engineer

Cc: John Flory

Microsoft Corporation
One Microsoft Way
Redmond, WA 98052-6399

Tel 425 882 8080
Fax 425 706 7329
www.microsoft.com

Microsoft

RE: Microsoft Support for this Fargo Smart Parking Ramp project

Microsoft looks forward to participating in this project. This statement and key Microsoft references are provided below as its Letter of Support.

As noted in the proposal, Microsoft has provided cloud-based software systems to support similar projects, such as the Agder Energi project in Norway:

https://www.youtube.com/watch?v=Z1NO4BiIfl0

https://www.youtube.com/watch?v=cxKphN8iVHE

Microsoft and Agder Energi were awarded with the Innovative Star of Energy Efficiency Award: Power Generation and Supply for their work on the Smart Grid Pilot Program, an Azure solution, which has been implemented at Agder's substations.

https://www.ase.org/news/alliance-announces-2018-stars-energy-efficiency-award-winners

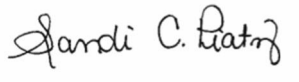
In addition, eSmart Systems has long been a trusted partner of Microsoft for delivering comparable software systems. https://enterprise.microsoft.com/nb-no/customer-story/uncategorized/power-and-utilities/esmart-systems/.

Therefore, Microsoft desires to adapt and enhance the Agder capability with eSmart Systems in this Fargo project, where one of its largest field sites is located.

Any questions about Microsoft's interest and support should be directed to:

- OP Ravi, Program Manager, OP.Ravi@microsoft.com, 425-785-5227
- Sandi Piatz, Site Lead, US-Fargo, sapiatz@microsoft.com , 701-281-3122

Sincerely,



Sandi C. Piatz
Director – Site Leader - Microsoft Fargo