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2016 Fall Conference Review

Medium Voltage On-Site Generation
Overview

Meet EGSA's David I. Coren
2016-2017 Scholarship Recipients

On-Site Generation -
More Important Now Than Ever

Phoenix Products Member Profile



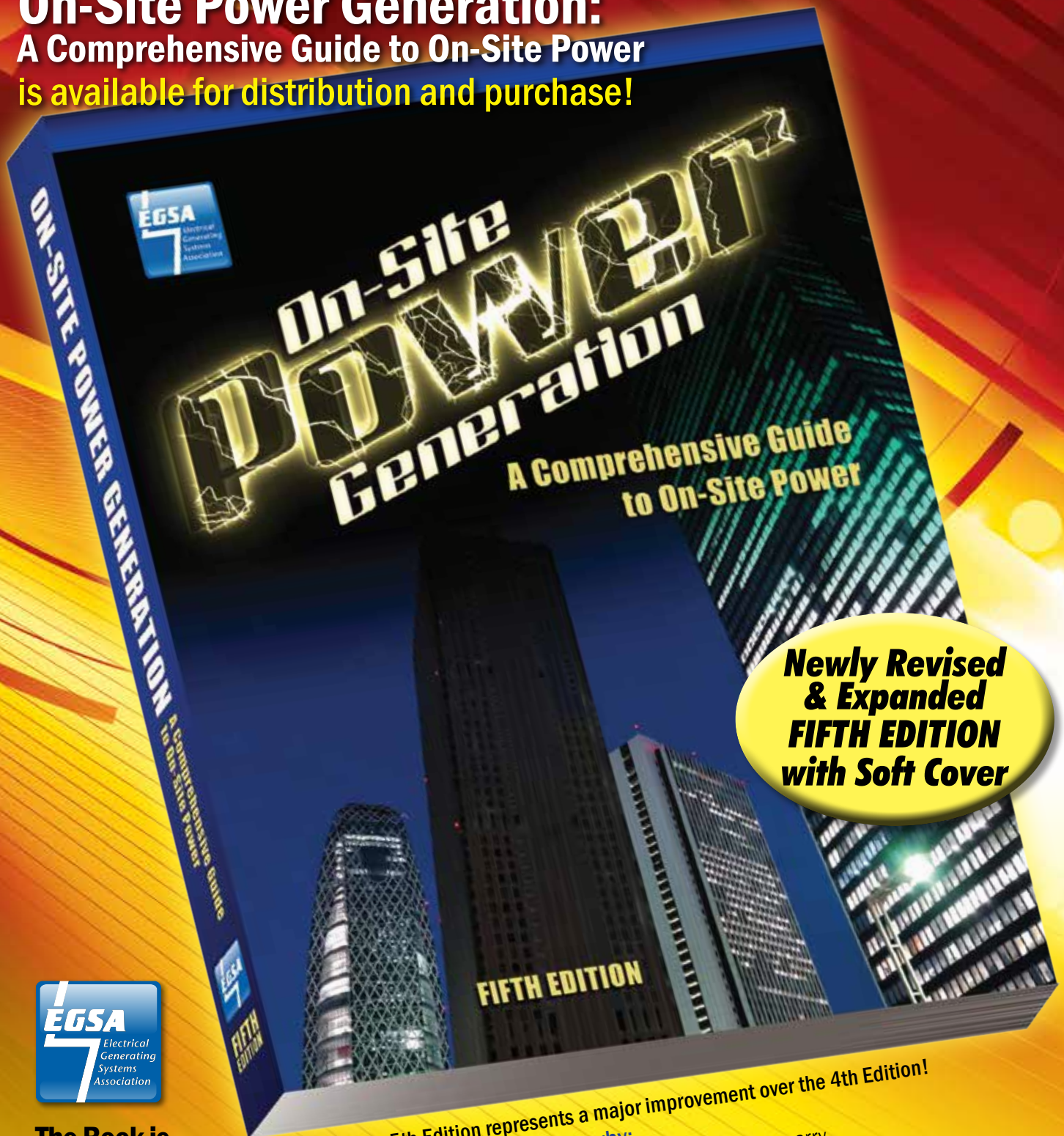
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CONTENTS

Volume 51, No. 5 • September/October 2016

Columns

From the Top	7
Creating the Wow Factor!	
Education	8
Update	
Codes & Standards	10
Update	

Features

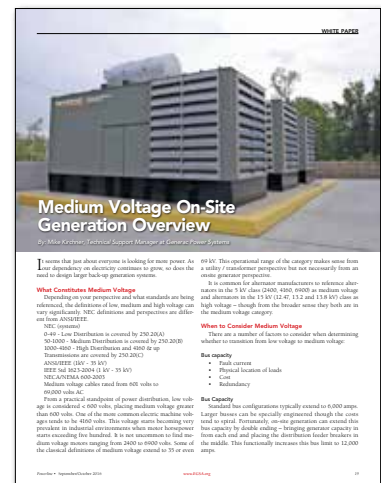
EGSA 2016 Fall Conference Review....	12
California Dreamin’	
Medium Voltage On-Site Generation Overview	19
Meet EGSA’s David I. Coren 2016-2017 Scholarship Recipients...	26
On-Site Generation - More Important Now Than Ever	30
Phoenix Products Member Profile	42
Another in our series of EGSA Member company profiles.	

Departments

Events Calendar	5
Association and Industry events.	
Index of Advertisers	6
Who’s Who in this issue of <i>Powerline</i> .	
Association News	36
Updates from EGSA.	
EGSA Membership Application	39
It pays to be a Member of EGSA. Join now!	
EGSA New Members	41
Who has joined EGSA in the past few months?	
Job Bank	45
Looking for a new job?	
Industry News.	46
The latest reports.	



On the Cover: 2016 EGSA Fall Conference Review: “California Dreamin’”; Page 12.



Medium Voltage On-Site Generation Overview; Page 19.



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EGSA 2017 Spring Conference

March 19-21, 2017; Kissimmee (Orlando), FL

EGSA's Annual Spring Conference features educational sessions on a broad range of issues impacting the On-Site Power Industry. More information will be available at www.EGSA.org or by calling (561) 750-5575.

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September 17-19, 2017; Minneapolis, MN

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December 12-14..... Orlando, FL*

*To be held concurrently with POWER-GEN International 2016

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Charlotte is the Rowley Schools' Homebase for 2017!

Basic School Dates

February 7-9

June 6-8

August 15-17

Advanced School Dates

April 3-6

July 10-13

October 16-19

Las Vegas Basic School*

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ADVERTISERS INDEX

Altronic, LLC (GTI Bi-Fuel)	20	Thomson Power Systems.	29
ANNA, Inc.	28	United Alloy, Inc.	11
ASCO Power Technologies	48	VDO	37
Basler	36		
Burlington Safety Lab	25		
Columbia Southern University	38		
Diesel Gas & Turbine Publications	38		
DynaGen	44		
ESL Power Systems	38		
EGSA.	2		
Generac.	18		
Generator Solutions, Inc.	32		
Hennig	5		
International Supply Co (Fibrebond).	4		
Penn Power Systems	32		
Phoenix Products	35		
Power & Compression Sales	24		
Power-Tronics.	41		
Pritchard Brown	24		
Robinson Enclosures.	24		
Russelectric, Inc.	9		
Sage Oil Vac	25		
Sure Power	34		

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Creating the Wow Factor! How EGSA Consistently Strives to Create Member Value

As we enter the fourth quarter of 2016, I find myself reflecting on the progress made so far this year and the expectations set for the remainder of it. While our industry has faced a challenging year in power generation, I wish to thank our member companies for their loyalty to the Association by paying their annual dues on time, participating in sponsorship opportunities, and for sponsoring new members in the Association. All of this in spite of our soft market. You have allowed our organization to shine, even in these lean times... and to create the WOW factor.

We are focusing our efforts on several projects that create the kind of member value that our members have come to expect! Providing value to our members is definitely at the forefront of our Strategic Long Range Planning efforts.

Some of the more recent examples of creating member value that have occurred this year include:

- The rollout of our 2016-2017 EGSA Membership Drive which took place at our 2016 Fall Conference – I have a great feeling that when we unveil the final number of memberships brought in from this new drive, that we will achieve the 50 New Member goal that our Membership Committee has set for the challenge. Make sure you visit the EGSA homepage for the details and ultimate drive prize! You are going to want to get in on this one;
- The creation of two new EGSA Committees. The Loadbank Certification Committee chaired by Paul Feld (Penn Power Systems), and the Technical Oversight Committee (TOC) co-chaired by Brian Ponstein (MTU Onsite Energy) and Dan Bigelow (Reverso Pumps);
- EGSA also worked with one of our oldest EGSA Members, Fairbanks Morse Engine, and rolled out a special grant for veterans to be

known as the EGSA Fairbanks Morse Grant for Veterans. The grant is intended to encourage personnel leaving a US or Canadian military service to pursue a civilian career in the on-site power industry by paying for the costs associated with becoming EGSA Certified Technicians.

Since 2014, our Raymond G. Russell Education Grant has been awarded in conjunction with the EGSA Rowley schools. In our third year, we awarded the following 6 veterans with our education grant. Congratulations to Vincent Berry (US Army), Phillip DeBrosse (US Air Force), Richard Gary (US Army), Jason Glore (US Marine Corps.), Brittany Hartman (US Army Reserve) and Scott Tuggle (US Army);

Jim Wright (retired EGSA Member) was honored at our 2016 Spring Conference and was the recipient of the EGSA Lifetime Emeritus Award.

David Yuro of Modern Power Systems was awarded the 2016 EGSA TOYA. On behalf of the EGSA Board of Directors, we commend David and thank our volunteer panel along with the Chair of the TOYA Working Group, Al Powers (Powers Generator Service, LLC), as well as our 2016 TOYA sponsors for a terrific job working together to make sure the TOYA was everything it could be.

The new Fifth Edition of the EGSA On-Site Power Generation Reference Book, introduced 18 months ago, has seen considerable demand from all segments of the power generation industry. The initial printing of 3,000 copies will carry us through to part of 2017, so we are preparing for the second printing. Fortunately, current technology allows us to make edits to the text on the second run so if you have edits, please contact Michael Pope at m.pope@egsa.org.

So how are we doing? We'd love to hear from you! Let us know what we are doing to help your business grow in the on-site power generation market, or how we can do better. Drop us a line at e-mail@egsa.org. ■



Michael Pope
EGSA Director
of Education
m.pope@EGSA.org

The on-site power generation industry, and many other industries involved in engineering, are finding that there are a large number of skilled and knowledgeable people who are approaching retirement age – and not enough qualified young people to take their places. A typical example: according to Kathleen Ronayne of the Associated Press in an August 1st article, the two Concord, NH jet engine plants of GE Aviation employ about 800 people. They are the largest employer in Concord. But in the next 5 to ten years, one third of them are expected to retire. “The company is scrambling to not only fill those jobs but to find workers with the needed skills to take on jobs that are becoming ever more technologically advanced.”

Sound familiar? It should; a high percentage of the key positions in our industry, including technicians, sales and applications engineers and the executive groups, are dominated by Baby Boomers and we are retiring with a huge amount of experience and knowledge! The problem is that there are not enough young people on the STEM path (Science, Technology, Engineering and Math); the government has set a priority of increasing the number of students and teachers who are proficient in these vital fields.

On-Site Power Generation is, unfortunately, almost hidden from the lists of career paths for young people and most of us in this industry found it by a combination of accident and good fortune. And we love it! I have never encountered anyone that didn't enjoy the technical challenges and variety of applications that we run across on a daily basis. It's not that young people don't want to join the on-site power generation industry; it's that few young people know it exists. It is up to us to promote this industry and I don't think there is a better place to start than at high schools, technical and community colleges and universities. It would be a real service to the industry if you were able to make contact at a local school or college and let the faculty and students know what great opportunities there are for them in on-site power. And for any college considering starting a power generation course, our reference book provides a great curriculum guide. A number of our distributor and manufacturer members are already doing this and participating in Career Days – and lining up future employees!

Certified Technician Program

Some GOOD News for our industry is that there are now over 1,600 EGSA Certified Techni-

cians across the USA, Canada and several other parts of the world. I expect there to be a record number of Apprentice and Journeymen technicians certified during 2016. According to the new member application forms we receive, this program is one of the top reasons for joining EGSA. This initiative came directly from our Distributor/Dealer Committee and the Board of Director's subsequent decision to make the heavy investment required to create a totally professional certification program that would have value to all stakeholders, especially facility managers and other generator set owners.

Again, I caution technicians that are planning to take the test: Study! Only 45% of those that take the Journeyman test pass it so please use the new study guide and the 5th Edition of *On-Site Power Generation: A Comprehensive Guide to On-Site Power* to improve your knowledge and increase your chance of success.

Just about everything you need to know about the Certified Technician Program, including costs, is on egsa.org. Techs are usually able to take the test within driving distance of their home base, as we now have over 300 proctor sites.

George W. Rowley School of On-Site Power Generation

For 2017 we will be conducting schools at a single location – Charlotte, NC for both our Basic and Advanced Rowley Schools. We chose a Hyatt Place near the airport because it offers a free airport shuttle service, competitive room rates, they will store our “show and tell” parts for us between schools and they provided excellent service while we were there for a Basic School this past June. CLT is a major airline hub - and we can find no relationship between the distance travelled and the air fare. Nor can we find a relationship between the school location and where attendees travel from. Sometimes our schools have few or none from close-by states and many from the opposite side of the country.

The seventh Rowley School (Basic) next year will be held December 4 - 6 in conjunction with POWER-GEN International in Las Vegas.

Here is the 2017 schedule for the Charlotte schools:

Basic Schools
February 7-9
June 6-8
August 15-17

Advanced Schools
April 3-6
July 10-13
October 16-19

Charlotte is the Rowley Schools' Homebase for 2017!

Continued on page 29

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Codes & Standards Update



Herb Whittall
EGSA Technical Advisor
HWhittall@comcast.net

In the June issue of *Power* magazine there were several articles on the subject of the aging work force in the power generation industry. I have been working with the local Indian River State College trying to get them to develop a curriculum for our industry similar to one they have in place for Florida Power and Light for their nuclear power plant nearby. The EGSA Rowley School courses are good for those who may have some experience, but we need a curriculum geared at those getting out of high school to offer training for the needs of our industry.

In the May issue of *Design News* there is an article titled “The Harmonizing of Machinery Safety Standards”. It concerns the work going on to harmonize two international standards. IEC 62061 and EN ISO 13849. The two groups were working toward making it IEC/ISO 17305. However, they had a time limit and ran out of time. This coordinated effort is exactly what is needed. Presently, there are too many individual country standards that need to be combined with those of other countries’ standards so that products meeting one standard can be utilized anywhere. I recall that some years ago at a standards meeting the manager of the Mercedes plant in Alabama where the M model was made for worldwide sale, indicated that if he could build all the automobiles to one standard he could save \$1,000 per vehicle.

Herb Daugherty attended the June 14-16 meeting of IEEE 1547 working group and Conformity Assessment Steering Committee (CASC). This group is addressing the revision to the Interconnect Standard originally adopted in 2003. Also being worked on is P1547.1 “Test Procedures for Interconnect Equipment”. As usual, the meeting was heavily attended by members of the inverter industry and utilities. The meeting covered progress of the various writing groups regarding Voltage Regulation, Anti-Islanding, Communications, Interoperability Microgrids, Voltage and frequency ride-through and Power Quality. While a majority of the discussion entails inverter-based Photovoltaic and wind system, it is imperative that interconnected reciprocating synchronous generating systems continue to be included. Therefore, we need EGSA Members to continue to be represented at these meetings. The pre-ballot draft is scheduled to be ready for review at the October meeting in Chicago with the final draft balloting scheduled for the end of 2016.

The CASC meeting discussed the makeup of the committee, the meeting at NC State in Raleigh, and a future meeting at Florida State University. These two sites are set up to procedures for Interconnect equipment. The CASC is charged with developing certification requirements for interconnecting Distributed Energy resources with Utility Emergency Power Systems. The NC site was set up with Duke Energy and AB&B.

At the NFPA Convention, the members approved the 2017 version of the National Electric Code (NEC). The 2017 code includes new articles providing requirements for large-scale photovoltaic systems, direct current micro-grids, energy storage systems and stand-alone energy systems.

On September 7, the committee for NFPA 110 Standard for Emergency and Standby Power Systems and NFPA 111 Standard on Stored Electrical Energy Emergency and Standby Power Systems will had their first meeting via a teleconference. This is the first time, to my knowledge, that no actual meeting was held. Apparently there are few public comments for change to the new editions.

ISO Standard IS2710-1 Reciprocating Internal Combustion Engines- Vocabulary – Part 1: terms for engine design and operation is in the ballot stage until September 8. One comment was posted “3.3 RIC engines classified by fuel type is missing three formal statements based on fuel applications that are in use at this time”. The proposed change is to add the following fuel: Natural Gas, Bio-gas and well-head gas.

On September 8, NFPA held a webinar for the first look at public comments for the 2019 Edition of NFPA 110 and NFPA 111. There was very little substance except the request to include fuel cells in Section 5.3.5 was rejected because of the long time for startup, and in Section 5.6.5.1 the word “mechanical” was added before “switch” by a close vote. All the changes will have to be approved at the ballot stage.

At the Fall Conference in Sacramento the Codes and Standards Committee had a presentation by OSHPD concerning meeting the OSHPD Seismic requirement for generator sets. Essentially, they need to be shake table tested to be accepted. For complete minutes of the meeting see the EGSA web site.

On September 20 and 21, NFPA held the Second draft meeting for NFPA 37. ■

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California Dreamin'

Sacramento was a Great Backdrop for Our "Golden State of Power"!

Last month, 297 EGSA Members and their guests descended on the Great State of California and were welcomed with open arms by EGSA and the Hyatt Regency Sacramento. What a perfect backdrop for an on-site power conference!

From September 11-13th, EGSA rolled out a relevant speaker line up, offered premium networking opportunities with industry colleagues and showcased our superior workloads for the EGSA Committees.

First, our 2016 EGSA President Bob Hafich delighted in pushing our membership numbers into overdrive with a subject near (and dear) to his heart, our 2016-2017 EGSA Membership Drive. The last time Bob had a hand in making EGSA membership everything it could be was when he served as Chair of the Membership Committee in 2012 and came up with the Hafich Challenge. EGSA reported 24 new members as a result and of course, one of our most active recruiters for the Association, Charlie Habic (Gillette Generators Inc.), was the winner of the challenge that year, signing up 8 EGSA members.

Above Right: Our emcee Charlie Habic (Gillette Generators, Inc.) had fun with the opening entertainment quartet, Artistic License, who learned a special version of California Dreamin' (by the Mamas and the Papas) just for us.

Right: 2016 EGSA President Bob Hafich opened the General Session with a great snapshot of our goals and accomplishments throughout the year, as well as a few new challenges that will carry over into 2017!



While signing 8 EGSA New Members may sound like a tough challenge, rumor has it that the Membership Committee is in talks of extending the Drive to include a 2nd place and runner up category. More information will be available on our website as these new features are added to the program!

2016-'17 EGSA MEMBERSHIP DRIVE

We're asking all EGSA Members to put the pedal to the metal and actively recruit quality members for the next 6 months. The prize offering is something everyone could use and is flexible enough for any of our members to become winners. We also know that more than a few of you are race fans, so whether you like Indy cars or NASCAR, EGSA has you covered for the drive of a lifetime.

Please make sure that any New Members that you recruit credit you as their SPONSOR on the EGSA Membership Application. That is the ONLY way we have to effectively gauge who brought the New Member to the Association. See our website for additional details at egsa.org.

Another important announcement made by 2016 President Bob Hafich was the roll-out of the inaugural **Fairbanks Morse Engine – EGSA Education Grant for Veterans!** Staff is on the fast track to get the word out to our veterans. The first grants will be provided in 2016. With a deadline of **December 1, 2016**, please consider telling your veteran colleagues (both US and Canadian Armed Forces) that as technicians, this is the perfect way to earn certification as an Apprentice or Journeyman EGSA Certified Technician. Is there a better way to showcase expertise in this arena? We don't think so!

With so much uncertainty in an election year, the Conference Planning Committee brought back the political angle for our keynote speaker in Sacramento. As our Nation inches closer to election day, EGSA turned to a political insider with his finger on the pulse.

Our keynote speaker on Monday, Mike Murphy, is one of the Republican Party's most successful political media consultants, having handled strategy and advertising for more than 26 successful gubernatorial and Senatorial campaigns. Mike frequently writes a column for TIME Magazine, as well as providing regular commentary on the Meet the Press roundtable.



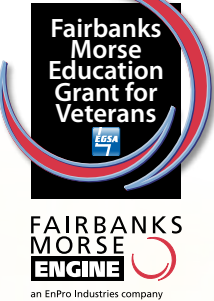
He gave an informative presentation on our political future and made his own predictions on several angles of this year's election. Murphy shared the current news out of Washington, the horse race for the White House.



The 2016 -'17 Membership Drive Prize Package includes:

- **One complimentary EGSA Registration** for Fall 2017 (estimated value \$580)
- **A \$250.00 hotel credit in the Fall** (to be redeemed during our Fall Conference next year from Sept 17th-19th, 2017 at the Hyatt Regency Minneapolis, MN)
- **A \$500 Richard Petty Driving Experience Gift Card** – This part of the gift provides the winner great flexibility to customize the Richard Petty Driving Experience. Go to link provided below for a list of tracks all over North America where you can redeem this fabulous prize purse for signing the most EGSA New Members:

www.drivepetty.com/race-tracks



Next, Edmund Campion (APR Energy), no stranger to EGSA, but this was his first conference, discussed several very large scale projects that he has worked on in his tenure with APR, including examining the technology; what occurs during a scheduled outage with insufficient reserve margins and what happens when a transmission line fails and the importance of the generator as an integral component to a microgrid.



To round out our Monday General Session, Joe Zirnhelt (Power Systems Research) provided our EGSA audience with an industry-specific presentation called **Investor Mindset – Why Invest in Power Generation Related Companies.**

During this presentation, Joe took us through putting on an investor's cap and examined what aspects of the reciprocating engine-based power generation industry would be compelling to an outside investor. From the size and scope of the market (in terms of total megawatts and revenue per year) to examining the market today and predicting 5 years out, Joe's presentation slides are available in the Member's only section of the EGSA website for review.





Tuesday's General Session provided the lighter side of the speaker program, leading off with Bill Clement, an original Broad Street Bully who brought the message that attitude really is everything and how your perception can shape your day today, as well as your days to come. His message was personal and inspiring.



Next, Sally Jacquemin (Siemens, Inc.) joined us as an EGSA "First Timer." Sally fit right in with her informative presentation regarding microgrids. Her presentation was videotaped and is available on our EGSA YouTube Channel, along with each of our EGSA Member presentations (Joe, Edmund and Sally's presentations are all available on our YouTube Channel).



Our final speaker, Chuck Gallagher, gave a lively presentation on ethics. Choosing to show up in an orange prison suit was definitely a memorable moment for props at an EGSA Conference. His message was based on choices and consequences.



Recognition for a Job Well done!

Whether it was winning a wireless Bose speaker, being presented with EGSA bucks for recruiting a New Member or winning cold hard cash for coming up with the theme of the next conference, it really pays to show up and be active in this association! Here a few pictures to prove it!



Our 2016 EGSA Technician of the Year Award was presented to David Yuro of Modern Power Systems on Monday night. It was so great to host Dave and his wife Dawn during the Fall Conference. We have asked our members for interview questions this month and you can expect full coverage and an interview with our winner in the final *Powerline* Magazine issue of the season, our November/December issue. Don't miss our special TOYA coverage up next!



A. Patrick Hoban gives Dean Weigand (Briggs & Stratton) a new Bose wireless speaker compliments of ComRent Intl. **B.** (L to R): Charlie Habic (Gillette Generators, Inc.), David Henning (DC Henning), Dennis Pearson (Woodward), Walter Petty (Atlantic Power Solutions, Inc.), Bob Piske (Arizona Generator Technology, Inc.), Michael Pope (EGSA) and Al Powers (Powers Generator Service, LLC) were all presented with one hundred EGSA Bucks by President Hafich (Emergency Systems Service Co.). **C.** Herb Daugherty (EGSA) is presented with a new Bose speaker too. This one was sponsored by Dan Bigelow, on behalf of Reverso Pumps. **D.** Bob Hafich presents Alex Georgopoulos (Aristo Intelligent Catalyst Technology) with \$100.00 cash for coming up with our theme, "The Golden State of Power."

1. Charlie Habic, Kim Giles, John Dutcher, James Namgoong, Joe Romano
2. John Stark, Eddie Roland
3. Deb Laurents, Bob Hafich
4. Bob Hafich, Tom Wein
5. Patrick Hoban, Damien Raspe
6. Robert Taylor, Armand Visioli, John Scarborough, Craft Tyler
7. Dave Stringer, Alan Fletcher, Edmund Campion
8. Jason Kapelina, David Vennie and Travis Coffey
9. Ralph Dupslaff, John Hu
10. (front row L to R) Kim & Bob Hafich, Deb Laurents, Ed Murphy, Kim Giles, Tom Wein, Nancy & Herb Whittall, Jalane Kellough, Liz Bustamante, Vaughn Beasley (second row L to R) Bill Kaewert, Herb Daugherty, Steve Stoyanac, Michael Pope, Steve Sappington, Joanne Dantzler, Dave Brown
11. Brian Cahill, Dave Oshefsky
12. John Dutch, Lanny Slater, Erik Lensing
13. Beth Kultgen, Brian VenHorst
14. Cal Dufault, Chuck & Sarah Gould



Our networking excursions were on a definite upswing in Sacramento. Even without holding the beloved fishing tournament in the Fall, our golfers, gearheads and third activity participants all had a great time networking on Tuesday afternoon.



Left: Tom Wein, EGSA Board Member (Generac Power Systems) gave a lively and energized summary to the crowd on our experience on the Sac Bike Brew Tour. His intensity was contagious!

Formalized Networking - Memorable and Engaging!

Our networking opportunities really came together in Sacramento, even with the absence of a fishing tournament! That being said, the fall networking excursions received great feedback from our members. From golfing at Teal Bend to our “Third Activity,” which during this conference was a 100% pedal powered 15-passenger cycle tour called the Sac Bike Brew Tour, our members really maximized their networking time on Tuesday afternoon. Our EGSA Gearhead Tour was also entertaining and educational, as the Golden State Gearhead Tour went to the Folsom Powerhouse, the first powerhouse in the country to transmit 3 phase, 60 cycle AC, 22 miles to the City of Sacramento. In operation from 1895 until 1952, the Folsom Powerhouse did close down due to the construction of the current Folsom Dam.

We also tried a new educational offering in the Spring and since it was successful, we carried it over to the Fall with even better success. Sunday, during the conference, we offered our Rowley School “Sizing to Service” class with Brian Ponstein (MTU Onsite Energy) teaching the course as he did in the Spring. On Tuesday afternoon, during the same timing as our formalized networking opportunities, Jim McDonald (PowerSecure Intl.) taught the Rowley School Emissions course. The feedback from the members who participated was great too.

Looking forward to the Spring of 2017

So what does EGSA have planned for 2017 in Kissimmee Florida? The Conference Planning Committee is taking “Power Your Imagination” seriously! They have already signed Jon Dorenbos for our keynote speaker. **You may have heard of him?** Jon Dorenbos absolutely “wowed” America with his mind-blowing and inspirational performances on NBC’s hit television show - America’s Got Talent this year. He made it to the finals and placed third overall in the competition amongst tens of thousands of competitors.

He inspires others by sharing his life experiences and NFL stories, relating them to corporate culture. He discusses the importance of discipline, teamwork, perseverance and the acceptance of failure in achieving a common goal. In his words, “Live in vision not circumstance.” The feedback received at our conference in Sacramento (by our members) also hit upon an idea for a role playing presentation between an EGSA Manufacturer and Distributor/Dealer Member on the steps it takes to customize a system for a client. Brian Ponstein (MTU Onsite Energy) raised his hand and also volunteered Tyson Robinett (Central Power Systems & Services) to cover a member presentation called, “Designing a Reliable & Sustainable System.”

You won’t be disappointed in this upcoming speaker slate to be sure. Stay tuned for additional details and as always, let us know if you have an idea to make a Conference shine! ■

1. Robert Desnoyers, Alex Georgopoulos, Brenda Desnoyers, Steve Sappington and Joanne Dantzler
2. Alex Lotz, George Tonis
3. Jil Holmstrom, Sara Rodriguez
4. Marty Morrill, John Hoeft
5. Steve Evans, Katie Bivens, Joe Hafich
6. Brian Berg, Deb Laurents, Kim Hafich
7. Joni & Greg Walters
8. Dave & Joni Philips, Jeannie & Andy Briggs
9. Mark Dornoff, David Jesberger
10. Joe Hafich, Rob Fennell, Ole Haaland
11. Tom Skaleski, Debbie Schilling
12. Dave & Joni Philips, Cal Dufault
13. Tim & Marci Geary
14. Hans Melberg, Ben Pierson
15. Steve Sappington, Steve Evans, Steve Stoyanac, Steve Oxtoby



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Medium Voltage On-Site Generation Overview

By: Mike Kirchner, Technical Support Manager at Generac Power Systems

It seems that just about everyone is looking for more power. As our dependency on electricity continues to grow, so does the need to design larger back-up generation systems.

What Constitutes Medium Voltage

Depending on your perspective and what standards are being referenced, the definitions of low, medium and high voltage can vary significantly. NEC definitions and perspectives are different from ANSI/IEEE.

- **NEC (systems)**
 - 0-49 - Low Distribution is covered by 250.20(A)
 - 50-1000 - Medium Distribution is covered by 250.20(B)
 - 1000-4160 - High Distribution and 4160 & up
 - Transmissions are covered by 250.20(C)
- **ANSI/IEEE (1kV - 35 kV)**
- **IEEE Std 1623-2004 (1 kV - 35 kV)**
- **NECA/NEMA 600-2003**
 - Medium voltage cables rated from 601 volts to 69,000 volts AC

From a practical standpoint of power distribution, low voltage is considered < 600 volts, placing medium voltage greater than 600 volts. One of the more common electric machine voltages tends to be 4160 volts. This voltage starts becoming very prevalent in industrial environments when motor horsepower starts exceeding five hundred. It is not uncommon to find medium voltage motors ranging from 2400 to 6900 volts. Some of the classical definitions of medium voltage extend to 35 or even

69 kV. This operational range of the category makes sense from a utility / transformer perspective but not necessarily from an onsite generator perspective.

It is common for alternator manufacturers to reference alternators in the 5 kV class (2400, 4160, 6900) as medium voltage and alternators in the 15 kV (12.47, 13.2 and 13.8 kV) class as high voltage – though from the broader sense they both are in the medium voltage category.

When to Consider Medium Voltage

There are a number of factors to consider when determining whether to transition from low voltage to medium voltage:

- **Bus Capacity**
- **Fault current**
- **Physical location of loads**
- **Cost**
- **Redundancy**

Bus Capacity

Standard bus configurations typically extend to 6,000 amps. Larger busses can be specially engineered though the costs tend to spiral. Fortunately, on-site generation can extend this bus capacity by double ending – bringing generator capacity in from each end and placing the distribution feeder breakers in the middle. This functionally increases this bus limit to 12,000 amps.

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applications such as drilling rigs, where the gas substitution rate must be mapped across the genset load range.

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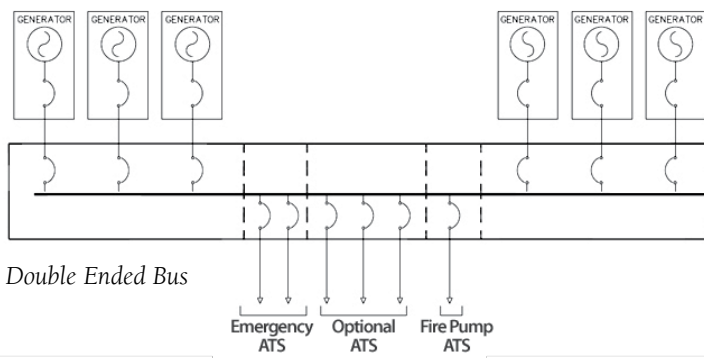


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Double Ended Bus

Costs

Costs are another key factor in the decision to transition to medium voltage. Within the market, transitioning a 480 V, 2 MW generator into a 15 kV unit will likely add \$100,000 to the overall costs, while making the same transition to 4160 V will only add \$40,000.

These added genset costs need to be compared to the cost of installing a pad mounted transformer at each generator. At 4160 V, the medium voltage alternator configuration is fairly common because the costs are similar. At 15 kV, many system designers will look at implementing a step up transformer configuration to achieve some cost savings.

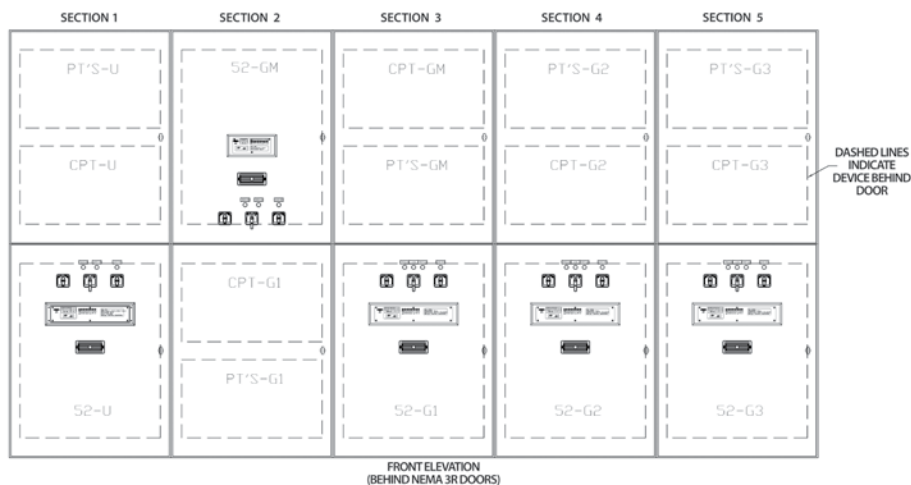
Also when implementing medium voltage solutions, it is not uncommon for utility services to be 23 kV. This voltage will require on-site generators to be transformed -- the highest nominal

Fault Current

The other limit that tends to appear around the same point is the fault current rating of the paralleling and distribution gear. Once the system fault current exceeds 100 kA, the costs to move to 150 or 200 kA breakers and gear may be economically limiting. Assuming an alternator subtransient reactance of 12%, the 100 kA limit occurs at the same 12,000 amps as the bus limit.

- 65 kA, 100 kA
- Rated Amps / x"d = Isc
- 12,000 / .12 = 100,000 amps

For 480 volt equipment, these limits are converging at 8,000 kW. This tends to be the strong transition point to move to medium voltage or split the low voltage generator bus into two separate systems.



Medium Voltage Switchgear with PT & CPT Compartments
(Diagram Complements of Pioneer Power Solutions)

Physical Location

When an application has loads that are physically located far apart, the cost of the low voltage cabling becomes a significant constraint. For campus environment projects with an incoming medium voltage utility service, it is often desirable to consider moving to a medium voltage "power plant" configuration. In this configuration, the entire campus can be backed up with a single medium voltage transfer pair. With this approach, a medium voltage power plant can provide redundant parallel generation capacity to all the step down transformers on the campus. This approach needs to be compared and contrasted with tying in multiple generators around the campus on the low voltage sides of the transformers. Historically, this approach was more common when the low voltage loads didn't require the reliability of redundant generation.

This approach also provides more choice in which loads would receive back-up power and which would be excluded. With various manufacturers offering integrated paralleling generator options, the low voltage tie-in approach is being considered on more mission critical applications. Pods of low voltage, paralleled generators also offer the advantage of providing protection from a failure of the utility step down transformers.

alternator voltage typically is 13.8 kV. When looking at transformer based solutions, considering 600 V generators may offer some cost savings by reducing ampacity on the low voltage side.

Another area of significant cost is the medium voltage metal clad switchgear (ANSI/IEEE C37.20.2) necessary for paralleling medium voltage generators or creating transfer pairs with the serving utility. This equipment with its associated vacuum breakers, protective relays and instrument transformers typically costs \$50,000 to \$60,000 per section, while a typical section only contains a single breaker. When comparing to low voltage solutions, transfer and paralleling equipment is generally twice the cost.

Redundancy

The options mentioned above do provide cost-effective alternatives to medium voltage applications; however, they do not provide redundancy for a failed transformer. As a result, these approaches may not provide the best solution, since many organizations and companies consider the generator system to be mission critical and that factor tends to override the potential cost savings.

Medium Voltage Alternators

While medium voltage alternators are conceptually the same as low voltage alternators, they differ in the construction relative to the alternator's armature (main stator). In low voltage alternators, the main stator is typically a random wound machine. This construction uses standard electric machine, insulated copper windings. The construction is called random wound because the wires within the stators slots and on the end turns can randomly lay next to another wire that is many turns further down in the phase coil. This isn't an issue because the insulation is easily rated for the maximum voltage potential.

In medium voltage alternators, many more coil turns are used in the main stator which keeps increasing the voltage with each turn. The resulting voltage potential would be greater than an individual wire's insulation could withstand if randomly wound. For this reason, the construction is converted to form coil.

The round wire is now replaced with square wire and the wire is precision wrapped to allow the wire to only touch the coil turn above and below it. This controls the voltage potential between turns. The coil is then wrapped with special varnish compatible insulating tape to insulate the high potential coil winding from the ground potential of the stator core.

As a rule of thumb, one wrap of tape is needed for each 1000 volts. That is part of the reason why the 15 kV class alternators cost so much more than 5 kV models. The entire stator assembly is varnished using a vacuum pressure impregnation (VPI) process. This process removes the air entrained in the insulating tape and then pressurizes the varnish into the tape. This varnish process is a must for form coil construction but offers few advantages when applied to low voltage random wound alternators that don't utilize insulating tape.

Medium voltage (5 kV and 15 kV class) alternators are typically only available in certain kW ranges. Alternators in the 5 kV class are available as small as 500 kW but are typically implemented ≥ 1000 kW. Alternators in the 15 kV class aren't typically available below 1000 kW with the standard implementation ≥ 2000 kW.

Both classes usually come standard with winding resistive thermal devices (RTDs). RTDs provide a method of monitoring the alternator and protecting it against heating effects due to restricted air flow, phase imbalance or harmonics. However, RTDs operate too slowly to be used to provide short circuit protection.

Bearing RTDs are also typically implemented on 15 kV class machines to allow pre-emptive shut-down. Due to the target market and physical size of the insulation, 15 kV alternators are typically implemented in large frames (1000 mm stator laminations). This larger frame causes the alternator's rotor weight to become too heavy for the engine's rear bearing. As a result, many 15 kV alternators are implemented in a two bearing closed coupled configuration. The second bearing carries the rotor weight and the closed coupling creates easy alignment to the engine flywheel housing.



Switchgear

Medium voltage alternators are configured for bus bar cabling with the switching and protection located within the metal clad switchgear. The genset will include potential transformers (PTs) that step down the main output voltage to typically 120 volts for instrumentation and control. The genset needs this PT input for the voltage regulator control of the alternator voltage and over/under voltage protection within the genset controller.

Protection Systems

The generator will also include current transformers (CTs) for monitoring and for overcurrent protection. The CTs are also used to calculate kW, KVAR, and kVA. This information is used for monitoring, protection, and control in the case of on-generator synchronizing and load share functionality.

Current transformers are also often utilized on the neutral side of the alternator phase coils to provide a zone of protection – differential (87) protection – which is implemented by a protective relay located in the switchgear.

This function monitors the current flow between two CTs located at different points within a current path. If the current isn't the same, the path has faulted. This is typically implemented from the high side of the vacuum breaker in the gear to the low side of the alternator resulting in an extremely high level of protection for all equipment between the two CTs.

Medium voltage systems are configured for 3 wire operation (no line to neutral loads). As a result, it is common to use low resistance grounding and then monitor for ground faults with a CT at the resistive bond. This grounding method is typical for 15 kV systems and also used on some 5 kV systems. The grounding resistor is typically sized to limit ground fault current in the 100 to 400 amp range. The resistor is sized by dividing the line to neutral voltage by the desired maximum ground fault current. The protective relaying is commonly set at 10% of the maximum ground fault current. This is done to protect the grounding resistor against the maximum continuous non-tripped ground fault. It is common to set the protective relaying to trip in 10 to 30 seconds.

For 5 kV systems, it is possible to use high resistance grounding when the ground fault current is limited to 8 amps. Above this level it is likely that the fault will escalate into a line to line fault. Systems operating in the 15 kV class typically have considerably higher capacitive charging currents which cause the ground fault currents to easily exceed the 8 amps. For this reason, high resistance grounding is not recommended.

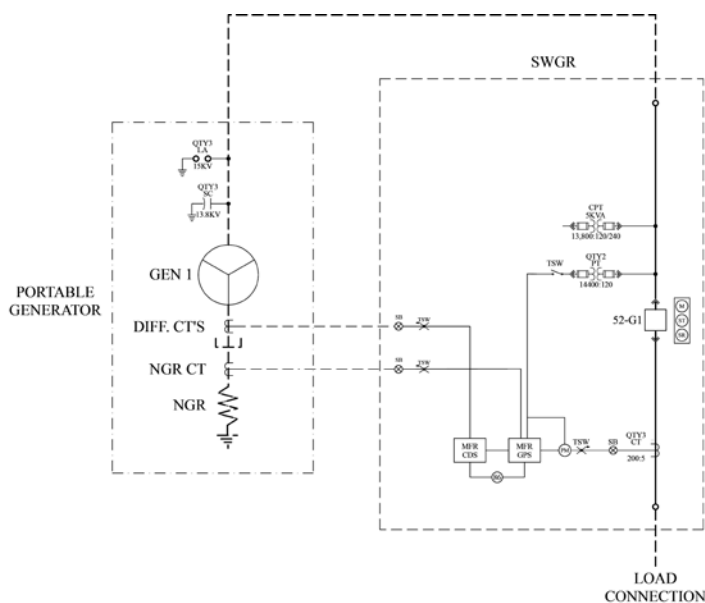
Protective relaying is a significant part of medium voltage systems. Since the vacuum breakers don't utilize integrated over-current trip units, over-current protection is implemented via multi-function protective relay. Given the capabilities of today's multi-function protective relays, it only makes sense to



Medium Voltage Form Coil Alternator
(Picture compliments of Marathon Electric)



Medium Voltage Form Coil Alternator
(Picture compliments of Marathon Electric)



Medium Voltage Protection and Neutral Grounding Resistor
(Diagram compliments of Pioneer Power Solutions)

incorporate various functions: differential (87), synch check (25), overcurrent (50/51), over/under voltage (27/47), over/under frequency 81OU, and ground fault (51N). For applications that utilize a low voltage generator coupled to a step-up transformer, it may be desirable to incorporate transformer differential protection (87T) to protect the entire zone between the high side of the vacuum breaker to the low side of the low voltage generator. This function tends to be fairly specialized and may require an additional protective relay.

For detailed design information on grounding and protection, consult the IEEE color book series.

All medium voltage systems require medium voltage metal clad switchgear (ANSI/IEEE C37.20.2) to tie everything together. A typical medium voltage metal clad switchgear lineup will utilize medium voltage vacuum breakers along with the associated protective relaying. It will contain potential transformers (PTs) for stepping down the medium voltage to typically 120 VAC for monitoring and protection. It will also typically contain

control power transforms (CPTs) for powering the recharging motor within the vacuum breakers. Together the PTs and CPTs consume the entire upper section above the vacuum breaker.

One strategy to compress the switchgear line-up and reduce cost is to switch the generators breakers to DC close and re-charge functionality and use the PTs located on the generators for sensing. This will free up the upper section for another generator breaker. This approach functionally combines two side by side sections into a single dual breaker stacked configuration.

Finally, it is fairly common for metal clad switchgear line-ups to incorporate lightning arrestors and surge capacitors for large generator systems, especially when incorporating 15 kV alternators. The use of these items on the utility source depends on the system topology.

Lightning/Surge Arrestors and Surge Capacitors

Lightning/surge arrestors limit the severity of a voltage surge to prevent damage of insulation of MV motors, generators and transformers. In its simplest form, it could be a spark gap. A typical surge arrestor features silicon carbide (SiC) discs in series with a small spark gap. When the voltage becomes too high, the spark gap will flash over and the SiC discs will conduct.

The best protection solution is to use surge arrestors together with the surge capacitors. Surge capacitors pick-up where lightning arrestors leave off and manage daily surges and transients. They are always connected to the system and limit the rate the voltage and rise to a few amps. They are typically paired with surge arrestors.

Cabling

Medium voltage cable is specialized as the insulation system must maintain its dielectric strength and provide multiple layers of protection. This cabling also uses stress cones which:

- Transitions voltage potential from wire to insulation
- Keeps the insulation from breaking down

Low Voltage / Medium Voltage Combo Applications

To help reduce costs, some designs might benefit from a combination low voltage / high voltage strategy. Instead of using medium voltage alternators and paralleling with medium voltage gear, it may be possible to configure a system in which the paralleling occurs on the low voltage side of step-up transformers. This configuration could be implemented with single or multiple transformer configurations.

An effective alternative choice for a medium voltage application below 2 MW is to implement on-generator low voltage paralleling functionality terminating at the low voltage side of a step-up transformer.

For medium voltage applications below 6-8 MW, using multiple step-up transformers with the medium voltage sides terminated together at the gear also creates an effective alternative. In this second configuration, the generators see gen-bus voltage on the low voltage side of the transformer allowing for on-generator low voltage paralleling.

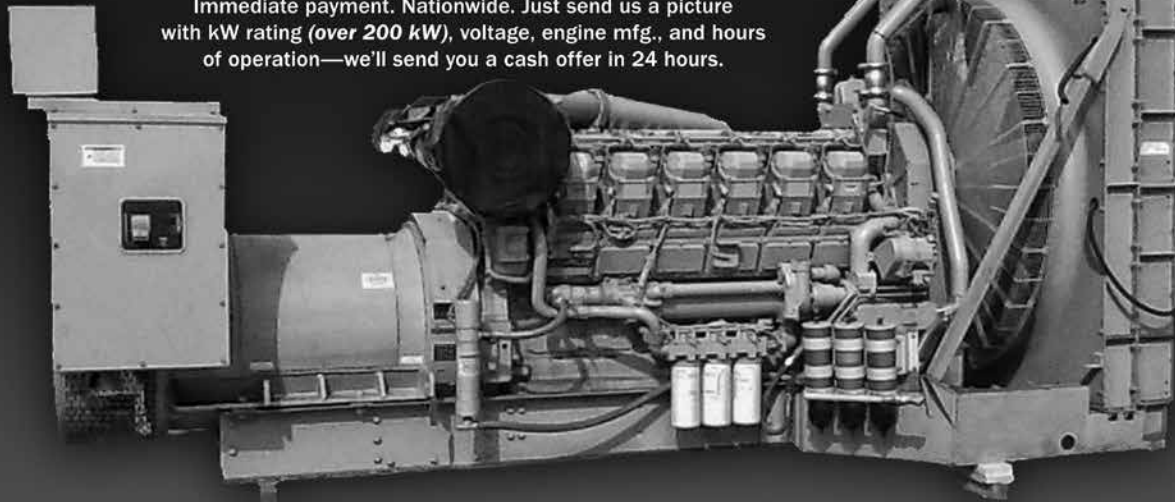
Safety Reminder

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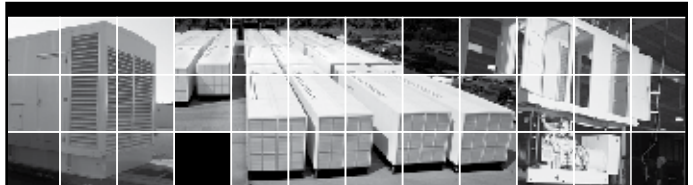


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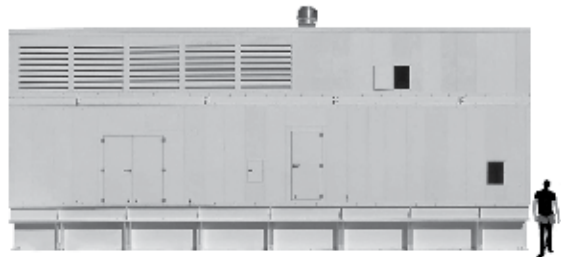
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be dangerous and thus requires very specialized equipment and knowledge. While there is always tremendous pressure to complete projects within tight timeframes, it's far more important to be sure everyone is safe.

Summary

Medium voltage applications can be found in data centers, pulp and paper, plastics and petrochemical industries, heavy manufacturing, and campus environments where loads are physically located far apart. Medium voltage often provides an excellent alternative to overcome low voltage constraints such as cabling costs, fault current and bus ampacity limitations. ■

Disclaimer

This information is provided as a service and does not constitute recommendations regarding products for specific applications and should not be relied on as such.

About the Author

Michael Kirchner: After graduating from the University of Wisconsin with an Electrical Engineering degree, Michael did a short stint as a field engineer in the oil fields of Saudi Arabia. He began his career in the electric power industry as a system engineer and project manager for Woodward. There, Michael designed hydro-turbine and plant control systems for the electric power industry. After leaving Woodward, Michael earned his Master's degree in Business Administration from the University of Wisconsin prior to joining Marathon Electric, an independent manufacturer of electrical power generators. At Marathon Electric, Michael performed marketing and application engineering duties. In 1999, Michael joined Generac Power Systems as an applications engineer. Michael is the author of Generac's Professional Development Seminar Series™ and Power Design Pro™ sizing software. His current role is Technical Support Manager, with responsibility for product support and sales training.

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Meet EGSA's David I. Coren 2016-2017 Scholarship Recipients

As EGSA leaps over the 1/4 million dollar mark this year with our David I. Coren Scholarship Program, we are so proud to announce the 2016-2017 David I. Coren Scholarship recipients.

EGSA is grateful to the Arthur and Judy Coren for the scholarship in their son David's name that was established in 2002 to provide financial assistance to students in our industry. Since the program launch in 2002, your Association has granted a total of 111 scholarships.

We approved 8 scholarships this year, each for \$2500.00 for the 2016-2017 calendar year. Congratulations go to these fine young people as they embark on a career in on-site power!

Kristina Alonzo

State Technical College
of Missouri

"Life is 10% what happens to me and 90% of how I react to it." -Charles Swindoll

My name is Kristina Alonzo and this quote describes how I approach life. I am married and the mother of two wonderful boys. I was born and raised in Portland, OR where I was a competitive swimmer and learned how dedication and focus pays off.

I left Oregon at 18 and moved to Hawaii for four years to attend college and make some life plans. After that, I decided to join the US Army as a combat medic. I spent a year in South Korea and deployed to Iraq with the 1st Cavalry Division from Fort Hood, TX. When I was medically retired from the Army, I moved to Holts Summit, MO where I am currently attending State Technical College of Missouri for Electrical Power Generation and Automotive - Light Duty Diesel. Currently, I hold a 4.0 GPA. I am looking forward to using my knowledge in this industry when I graduate in May.



Garritt Aucker

Penn College of Technology

My name is Garrett Aucker and I am a second year student at Pennsylvania College of Technology in Williamsport, PA in the on-site power generation program.

I thoroughly enjoy my program and genuinely want to go to my classes. I was fortunate enough to be picked by my advisor to go to the Power Generation International tradeshow in Las Vegas, NV last year, along with another student. Once I complete all of my power gen courses. I will begin business classes to work toward a Bachelor's degree in Business Management.

Currently, I work part-time at Auto Zone and also at Mack's Garage as a mechanic. I enjoy working on vehicles and also racing ATVs in my spare time. When I graduate from Penn College, I would like to have a career as a technician at a dealership that has power generation and work my way up to a management position.

I would like to thank EGSA for awarding me the David I. Coren Memorial Scholarship.



Adam Christopher Gehrke

Penn College of Technology

My name is Adam Christopher Gehrke. I currently live in Pennsylvania in a small town called Shermans Dale in Perry County, PA. It is a very rural setting and I am proud to have grown up here. I am attending college at Pennsylvania College of Technology. It is a Penn State affiliate and it is located in Williamsport, PA. My major is an Associates of Ap-



About David I. Coren

After working in the financial sector for nearly a decade, David I. Coren began his career in On-Site Power at Zenith Controls, headed by his father (and 1978-79 EGSA President) Arthur Coren. David became active in Zenith's business development group. He worked closely with Executive Vice-President and 1998 EGSA President, Ron Seftick and was eventually named President of Zenith Controls. David actively served EGSA as a conference presenter; along with serving on and chairing the Convention Planning Committee in 1998. Sadly, in April of 1999, he was diagnosed with a brain tumor and in September of 2000, we lost him.

David is remembered for his desire to succeed, his leadership potential and his ability to motivate his fellow association members.



plied Sciences in On-Site Power Generation and I plan to go on and get my Bachelors of Science degree in Applied Management. My current GPA is 3.88.

Last year, I was inducted into the Phi Theta Kappa honor society. Although I spent a lot of my free time at school applying for scholarships, I only received this one and I am really appreciative.

I enjoy working on vehicles, riding anything with two wheels and learning new things. Over the summer, I worked for a residential home builder because I wanted to learn more about building technology. My ultimate career goal would be to work for a well-rounded company selling generator contracts.

Bennett Hoeft

University of Wisconsin - Milwaukee

As a child, the internal drive and aspiration to be an engineer has always been high. I have been fortunate to always be involved in some type of mechanically oriented project with my dad. Whether ripping apart our dirt bike engines, or replacing the suspension, these interactions seem to have increased my fascination with the machines that drive our country.

While there are an endless amount of fields in which to specialize, on-site power generation is one that has always interested me. Although I have not directly worked on generators yet, my exposure to the field has come through many conversations with my father and doing some basic clerical tasks for his consulting business over the years. Also an EGSA Member, he worked with Waukesha Engine, Generac Power Systems and GE Jenbacher on their larger kW units and all of this has inspired me. My draw to engineering has been focused on the opportunity to solve problems. It would be rewarding to design engines or alternators to make them achieve better efficiency, a greater power output or lower emissions.

At Franklin High School in Franklin, WI, I learned many skills in my Transportation Technology and Project Lead the Way classes, all of which are applicable to the on-site power generation field. One of the strongest skills I have developed over the past couple years is my problem solving through working on more complicated projects. I have improved my engine troubleshooting skills, hand tool selection and organization, basic welding, CNC operation and auto suspension repairs. I believe these hands-on skills will help as a mechanical engineer. A couple other fun facts about me include I achieved my Eagle Scout when I was 14, balanced the extreme time pressures of school, varsity sports, scouts, work, and coaching, and have extensively traveled throughout Europe as an exchange student and with my family.

My official mechanical engineering education starts this Fall at the University of Wisconsin – Milwaukee. The scholarship will help pay for my tuition and I will do everything I can to make you proud of this selection. Please extend my sincere ap-



preciation to the Coren family and the members of EGSA for the honor. I hope to intern at an EGSA member engine/generator OEM and further pursue my interest in the on-site power generation business.

Bradley Hollister

Ohio Technical College

My name is Brad Hollister and I live in southern Vermont. I most recently graduated in June of 2016 from the Power Generation Program at Ohio Technical College in Cleveland, OH with a GPA of 96.8. I also graduated from Ohio Tech in March of 2016 with an Associates in Auto/Diesel Technology with a GPA of 95.3. I am also pleased to report that I have also passed the EGSA Apprentice Technician Certification.

In addition to the EGSA David I. Coren Scholarship that I received, I am also the recipient of an OTC Penske Scholarship, Ford/AAA Competition Scholarship, Imagine America Scholarship and the Vermont Business Roundtable Nordic Educational Scholarship. My awards while at OTC include Perfect Attendance and Academic Excellence throughout both programs. Other awards include the Vermont Auto Enthusiasts Golden Wrench Award and the Outstanding Student Award in Auto Tech.

In addition to family being the most important thing to me, I enjoy the outdoors and am an avid fisherman and hunter in my spare time. I recently accepted a full-time position with Advanced Power LLC in Round Lake, NY as a Generator Technician. I am very excited to immerse myself in the industry and expand on my career goals of becoming as good as the lead technicians out there today working on this equipment and to further my education and knowledge. I am always willing to learn more and adapt to new equipment and technology. I have a high standard for work ethic and I will provide professional and reliable work for my employer's reputation with their customers.



Christian Hugar

Penn College of Technology

My name is Christian Hugar and I am a third-year student at Pennsylvania College of Technology (PennTech), majoring in both On-site Power Generation (PW) and Diesel Technology (DD), two fields I truly enjoy. During my time at PennTech, I have been on the Dean's List all 4 semesters with a 3.9 GPA. Along with this academic success, I have also received a number of work place awards for excellent attendance and the ability to work through problem-solving efficiently.

After graduating school, I will seek out a professional job with a major power generation company that best utilizes my



previous work experience and newly acquired skills from at PennTech. With this new profession, I want to further my knowledge and understanding of the power generation field. Overall, I am a focused “go-getter” that is ready to graduate and put in the hours to be successful in the Power Generation industry. Thanks EGSA and to the Coren family!

Brendan Mulligan

Penn College of Technology

My name is Brendan Mulligan. I am a Pennsylvania native and currently reside in Williamsport, PA. I attend The Pennsylvania College of Technology also located in Williamsport. All of my classes are a bus or bike ride away. I major in On-Site Power Generation and expect to graduate with an Associate’s degree in December 2017. I have one semester under my belt and maintain a 4.0 GPA. My career goal is to be a field technician. I enjoy working alone or part of a small team. I spend my free time on the bicycle trails in the area around my school.



Dakota Schwartz

Penn College of Technology

My name is Dakota Schwartz and I am currently a junior at Pennsylvania College of Technology located in Pennsylvania. I recently finished my associates degree in On- Site Power Generation and now I’m continuing my education for a bachelor of science degree in Applied Management.



This summer I was very grateful to intern with IMG Midstream, a power company building small-scale natural gas fed power plants around the Northeast Marcellus region. My plans are to go forth and finish my bachelor’s degree by 2018 and implement that knowledge for further success in my career.

My career aspirations are to make a tremendous contribution to the Natural Gas and Power industry by aiding companies like IMG Midstream in their growth and development of environmental friendly, distributed power generation projects in targeted U.S markets. ■

Do You Qualify?

You must be a high school graduate (or GED equivalent), a full-time student at an accredited school, show academic achievement and demonstrate admirable characteristics. You must also have a declared major in On-Site Power industry-related subjects and plan to seek employment in the On-Site Power industry once you have earned your degree.

If you have previously applied for and/or received an EGSA Scholarship, you remain eligible for scholarships in subsequent years. As a scholarship recipient, you are not prohibited from accepting scholarship or financial aid or assistance from other sources.

To qualify, you must:

- Be enrolled (or accepted) as a full-time student at a Vocational-Technical School, Community College or a two-year or four-year educational institution.
- If you are entering your first year of studies, you must include an acceptance letter from the school.
- Have a declared major that is related to the On-Site Power Generation industry.
- Have and maintain a cumulative GPA of 2.8 (A = 4.0) or above.

Your academic and personal achievements (merit) will be used as the primary basis for the award of a scholarship. Financial need may be evaluated as a secondary consideration.

In awarding scholarships, the EGSA David I. Coren Scholarship Committee will examine your application and its supporting documents to determine whether you are taking the necessary steps to reach your goal of employment in the On-Site Power Generation industry.

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EDUCATION

Continued from page 8

Continuous Improvement

Our Rowley School instructors are constantly giving their modules a “tune-up” based on their intuition of what can be improved, evaluations that come back from the attendees and, significantly, lessons learned from Bill Heacock’s Presentation Skills webinars. We reviewed and modified the curriculum last year, adding some new topics (as announced in the January/February 2015 issue of *Powerline*). The result is that our school presentations are receiving increasingly higher scores from those that attend.

A special thanks is due to all the member companies that “loan” some of their key employees to EGSA as instructors for the Rowley Schools, including Alban Cat, ANNA, ASCO Power Technologies, Basler Electric, Chillicothe Metal Co., Eaton Corp., GE Critical Power, Generac Power Systems, MTU On-site Energy, OK Generators, Omnimetrix, Onsite Power, Inc., PowerSecure Intl., Pritchard Brown, SENS and Woodward. The generosity of these companies in allowing their topic experts to leave their regular assignments for a few days is greatly appreciated. They are truly “giving back” to the industry and benefitting the careers of those that attend our schools.

Veteran’s Grants

We now have two grants to help veterans of the US and Canadian armed forces. For full details go to the Site Map on egsa.org. Under the Education & Certification column you will find the Grants information.

The Raymond G. Russell Education Grant for Veterans

(Described in detail in the March/April edition of *Powerline*.) This grant pays the costs for grant winners to attend a Rowley School of their choice.

Fairbanks Morse Education Grant for Veterans.

This new grant is for veterans with power generation experience that would like to become EGSA Certified. It will pay for the veteran’s study guide, the 5th edition reference book and the test. Applications must be received by December 1st, 2016. Go to the egsa.org site directory for the program outline and application form. Applicants will be notified if they will be awarded a grant via email in early January. Each recipient will receive a copy of the appropriate study guide and the On-Site Power Generation reference book within four weeks of notification. The Certification test must be taken before December 31, 2017.

Comments or questions? Send me an email: m.pope@egsa.org. ■



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On-Site Generation - More Important Now Than Ever

By: William Kaewert, SENS - Stored Energy Systems, LLC®

The demand for on-site generation has historically been driven by the risk of local or regional power outage typically caused by bad weather, such as hurricane or ice storm. The bulk power grid is also susceptible to cyber attacks, physical assaults on critical facilities and severe damage from both deliberate and natural electromagnetic pulses. The purpose of this article is to highlight why traditional fossil-fueled on-site generating systems are likely to proliferate and become substantially more valuable to their owners as renewable generation increases its share of the bulk US electric power supply.

Even without the impact of renewable power generation, the US power grid has in recent years become increasingly fragile. Grid power interruptions have been increasing in both frequency and duration.

According to US Department of Energy data, "An aging infrastructure, combined with a growing population and more frequent extreme weather, are straining the electric grid. The annual average of outages has doubled every five years, which means the current five-year annual average is four times what it was fifteen years ago."¹ Comparing 2000 to 2013, monthly average grid outages increased six-fold. The Brock article referenced in footnote 1 cites the US Department of Energy for the source data. Researchers at Lawrence Berkeley National Laboratory and Stanford University found that the total number of minutes customers go without power each year has been increasing over time.²

The increasing frequency and duration of outages indicate that today's bulk electric power system is highly stressed. More stress and more outages mean that on-site power will become vital to new groups of users that were able to safely forego in the past. Today's power grid stress, however, appears to be trivial compared to what is coming.

Renewable generation targets are frequently set by politicians without regard for bulk reliability concerns. Unfortunately, the benefits of more renewable energy are widely touted, but rarely presented with countervailing discussion of the unintended consequences to either the reliability or cost of electric power.

There are three significant power system issues related to renewables, all of which suggest that the on-site power generation (diesel or natural gas-powered generators) will become increasingly important in the future:

- The rush to renewable energy production will reduce grid reliability;

- Variable renewable energy production will lead to increasingly volatile electricity prices; and
- Stubbornly high prices for energy storage mean that on-site generation will remain a viable customer-premises solution to electric reliability for a long time.

The Rush to Renewable Energy Production Will Reduce Grid Reliability

Essential Reliability Services (ERSs) including voltage support, frequency response and other services shown nearby in Exhibit 1

are vital to stable and reliable operation of the power grid.³ Voltage support, for example, prevents voltage collapse or system instability. Frequency response is necessary to maintain continuous load and resource balance by automatically responding to deviations from normal operating frequency. These services typically require that the bulk power system increase or decrease generation or shed load when necessary to maintain stable power grid operation.

The need for ERSs has historically been met with conventional generating systems such as steam turbines, hydroelectric turbines and combustion turbines. These conventional generating systems all share the property of having large rotating masses, the inertia of which enables them to ride through short-duration deviations in electric demand. In contrast, the rotating mass of wind turbines is relatively small, and solar systems offer zero rotating inertia. It is thus more difficult and costly to provide essential ERSs with renewables than it is with conventional generation.⁴

Conventional generating systems also share the property that their output is governed by man-made controls. When more output is needed in response to voltage or frequency sags, for example, these controls can typically increase the rate of energy input (opening valves to inject more combustion fuel, or admitting more water to boost hydroelectric turbine output). In contrast, the output from wind and solar generating systems is always outside of human control because the inputs are out of our control.

We obviously can't make the sun shine more brightly, force passing clouds to part or keep the wind blowing for another few hours. In fact, unpredictable and variable output from renewable generation can therefore cause voltage and frequency variation rather than solving it, compounding the difficulty and expense of delivering ERSs.

In other words, because conventional resources produce abun-



dant ERSs, modest penetration of renewables poses negligible reliability risk. But because renewables do not readily provide ERSs, high penetration levels represent significant risks to power grid reliability.⁵

Exhibit 1 from a North American Electric Reliability Corporation (NERC) report shows that increasing renewables penetration in the US bulk power system will reduce provision of Essential Reliability Services. The “Today” scenario below shows that there are fewer gaps (white blocks) in ERSs with largely conventional generation than there will be in the “Potential Future” when there are higher levels of variable generation.⁶

So, unpredictable variability in renewables output will very likely lead to gaps in ERSs. This is another issue. As the share of renewable power sources increase, so will the volatility of electricity flows on transmission and distribution (T&D) lines, as operators attempt to move power from where it’s produced to where it’s needed. It is important to understand that a key assumption behind renewable energy is that there exists a reliable and cost-effective means to move electric current from regions of abundance to areas of scarcity. Transmission bottlenecks will occur as the penetration rate of renewables continues to increase. The consequence of such bottlenecks will be lower reliability and higher costs of electricity.

Designers of our existing transmission and distribution systems never designed the grid to move large quantities of electricity in response to the vagaries of changing weather. The new demands imposed by the siting of renewable energy sources long distances away from consumers could well cause more frequent and longer duration outages. A California Energy Commission fact sheet concedes that, “moving to 50 percent renewable energy (the State’s goal by 2030) could make balancing electricity demand and generation increasingly challenging at some times during the day and year.”⁷

As renewable energy production increases its share of the US market, what will the change in bulk power system reliability look like? While we can’t know for sure, there are indications that, as with most systemic changes, the change will be a tipping point rather a linear decay. Forecasts for Germany, which leads the US in renewable energy adoption, suggest that this tipping point might occur at the point where renewable energy production begins to regularly replace base load generation.⁸

Exhibit 2 nearby includes two scenarios. The left graphic illustrates a week of actual 2012 German power generation showing both renewable and non-renewable sources. The right graphic shows estimated power generation in 2020. The 2012 graphic show that solar output is very effective at satisfying much of the normal daily peak load. The 2012 scenario is nearly ideal because base load systems continue running at relatively constant output, rather than facing large ramps, and renewable energy systems de-

liver output coincident with peak demand.

The relationship in 2012 between conventional and renewable energy generation is symbiotic. Just as important, power flows over the T&D network are likely little different from the “conventional” generation world for which they were designed. The system appears to work very well when renewables only supply power at the margin, as they did in 2012.

In contrast, the forecast for 2020 is no longer symbiotic. Solar output has largely replaced base load fossil and nuclear generation

- but for only a fraction of the average day. Unless this energy is both generated and consumed at each user’s site, which is highly unlikely, wild swings in power output and transmission system loading will occur. As this happens, suppliers and consumers will attempt to trade and move electric power over transmission pathways never designed for this task, which in turn will significantly challenge the German electric grid. As US renewable energy production reaches this same tipping point the reliability of North American power grids could well fall of the same proverbial cliff.

According to the German study referenced in Footnote 8, “baseload power is incompatible with intermittent renewables... To complement renewables, we will need dispatchable power plants that can ramp up and down relatively quickly.” On-site power meets this requirement perfectly, and will certainly

be part of the solution to the problem of managing tomorrow’s power grid. Historically, on-site power has been an “insurance” product that mitigates risk of power outages. It is not difficult to envision a new future role for on-site generation, which is delivering value to its owner each day by curtailing grid power consumption and/or avoiding exorbitant time-of-day pricing by utilities.

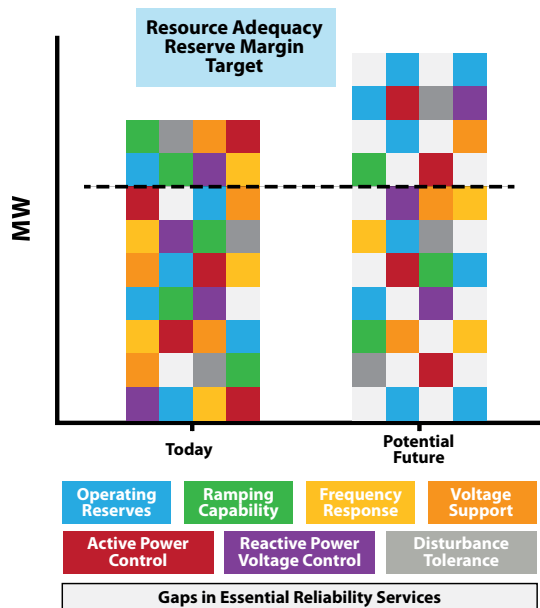
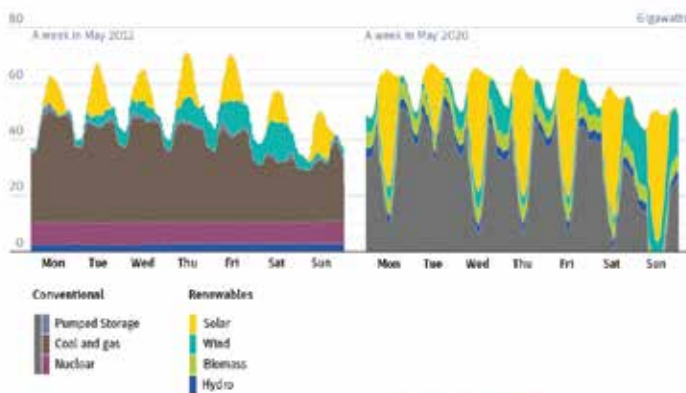


Exhibit 1: Potential Future Gaps in ERSs With Increased Renewables Penetration

Renewables need flexible backup, not baseload

Estimated power demand over a week in 2012 and 2020, Germany
Source: Voller Generation, ICF Berlin





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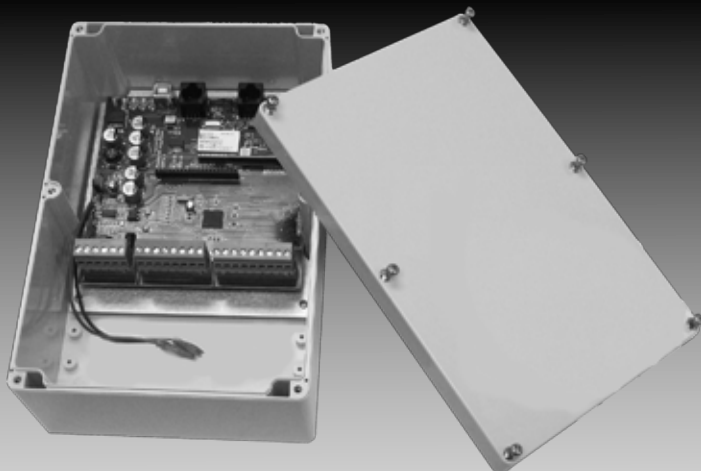
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Variable Production Will Lead to Volatile Pricing

We intuitively understand that power, like any good, will be cheap when there is too much of it,⁹ and very expensive when it is in short supply. As with any economic good, the more abundant or scarce electricity is, the more its price will vary. Time of day pricing is already a reality in some parts of the US. In Germany, variable renewable energy output has already resulted in such massive swings in the supply and price of energy that customers are sometimes paid to consume power.¹⁰ The reverse is certainly true: when power is truly scarce the price will become exorbitant. We therefore reach the very logical conclusion that it would be wise to store power when it is abundant and cheap, and draw stored reserves down when grid power is scarce and costly.

One obvious solution would be to consume as much power as possible when it is cheap and then curtail usage when it is costly. While nearly all of us either are, or soon will be, modifying our power consumption in response to market signals, all of us will reach a point where the prices demanded during peak times may become unaffordable. One solution to this problem will be to generate one's own power during peak demand times.

Another obvious solution to the problem of large swings in supply and prices is energy storage. Unfortunately, energy storage is costly and may remain so for some time.

Stubbornly high prices for energy storage mean that on-site generation will remain a viable customer-premises solution to electric reliability for the foreseeable future.

In a world where electricity is sometimes dirt cheap, and other times very costly, the logical solution would be "energy storage". Plentiful storage would enable users to buy cheaply and either use their excess when power is expensive, or resell it to others. Unfortunately, although the cost of battery technology¹¹ continues to drop, the price of truly useful amounts of storage remains high, as shown in the following forecast for 2020 California.

The red line in **Exhibit 3** shows 2020 California's so-called "duck" curve¹³ of daily electrical production. Bulk power from solar generating systems peaks during mid-day, replacing a large portion of output from traditional generating sources. With regard to energy storage, the pink shaded area depicts the magnitude of energy storage California would need if it were to meet 100% of the evening peak demand with energy storage instead of generating in excess of the 24,000 MW (megawatts) value shown on the chart at about 4:30 p.m. Starting at about 4:30 p.m. when solar output wanes, evening peak demand of 35,000 MWH (megawatt-hours), represented by the light red hump, lasts from 4:30 p.m. until nearly midnight.

At today's energy storage cost of between \$750,000 and \$900,000 per MWH, the cost to California of this storage would range from \$25 billion to \$31 billion. To put this number in perspective, 35,000 MWH is double the entire 2015 global lithium-ion battery manufacturing capacity of 14,600 MWH.¹⁴ The cost of this storage would represent more than half of California's entire annual agricultural output of \$54 billion¹⁵ Exacerbating the high capital cost is the fact that, because the lifetime of grid-

scale batteries is only estimated at eight to ten years, the huge expense would recur.

Given this stubbornly high cost of storage, it seems likely that most of the evening peak demand in 2020 California will be met either with either variable generation or by compelling users to reduce demand through punitive pricing schemes. As this future of highly variable pricing unfolds, the return-on-investment of on-site generation resources likely only gets better with time.

Summary

A 2004 paper by Albert, Albert and Nakarado¹⁶ concludes that "... vulnerability of the electric power grid is inherent to its organization and therefore cannot be easily addressed without significant investment." The authors are clear that truly reliable operation is possible only by adopting distributed generation, where users or local communities generate their own power.

In recent years reliability of the US power grid has declined. We are actively accelerating this decline by replacing conventional generators that provide plentiful ERSs with renewables that do not by themselves provide ERSs. We are also accelerating this decline by tasking the grid with moving electricity from new and different sources of generation over pathways that were never meant to move large quantities of power. Even if we get really lucky and don't suffer significant reliability problems or a big, long-duration blackout, the way we pay for electric power is sure to change. Time of day pricing is already a reality in parts of the US. The law of supply and demand says that as the percentage of total US power delivered by renewables increases the variation in time-of-day electricity pricing will only increase.

When considering electric grid reliability and almost certain increases in the volatility of electricity prices three conclusions are clear about on-site power generation:

- The only way to guarantee power to critical systems will be to make it locally, and
- As time-of-day pricing volatility increases the economics of on-site generation will improve
- On-site generation, today regarded as only an "insurance" product, will in the future provide new value by enabling its owner to avoid exorbitant time-of-day electricity prices. ■

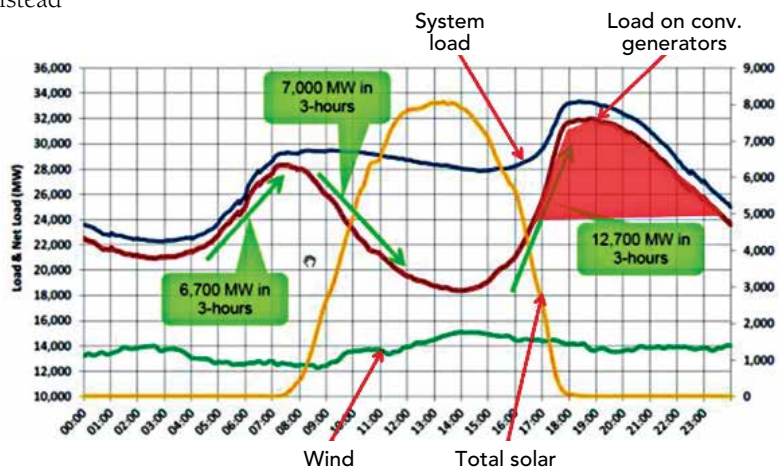


Exhibit 3: Forecast California¹²

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About the Author

William Kaewert is President and CTO of Colorado-based Stored Energy Systems, LLC (SENS), an industry leading supplier of non-stop DC power systems essential to electric power generation and transmission, energy production and other critical infrastructures.



Bill received his AB in history from Dartmouth College and MBA from Boston University. He serves on the Board of Directors of the Electrical Generation Systems Association (EGSA) and is a member of the FBI InfraGard Electromagnetic Pulse Special Interest Group.

Footnotes

[1] Power Outages On The Rise Across The US.; Jordan Wirfs-Brock; August 18, 2014; <http://insideenergy.org/2014/08/18/power-outages-on-the-rise-across-the-u-s/>

[2] Assessing Changes in the Reliability of the US Electric Power System; Lawrence Berkeley National Laboratory; August 2015

[3] North American Reliability Corporation (NERC); Essential Reliability Services Task Force, A Concept Paper on Essential Reliability Services that Characterizes Bulk Power System Reliability, October 2014

[4] Ibid.

[5] <https://judithcurry.com/2016/01/06/renewables-and-grid-reliability/>

[6] North American Reliability Corporation (NERC); Essential Reliability Services Task Force, A Concept Paper on Essential Reliability Services that Characterizes Bulk Power System Reliability, October 2014

[7] http://www.arb.ca.gov/html/fact_sheets/2030_renewables.pdf

[8] Illustration from German Energy Transition Book by Craig Morris, Martin Peht, An initiative of the Heinrich Boll Foundation; Released on 28 November 2012, Revised January 2014

[9] Four times (in the spring of 2014), California's grid operator had to shut off wind and solar power when it exceeded demand. The largest such curtailment was 1,100 megawatts during the morning of April 27, 2014. Source: <http://breakingenergy.com/2015/01/23/energy-quote-d-the-day-grid-operators-are-now-seeing-overgeneration/>;

[10] <http://qz.com/680661/germany-had-so-much-renewable-energy-on-sunday-that-it-had-to-pay-people-to-use-electricity/>

[11] There are alternatives to battery technology, some of which are very mature and well-proven. Pumped hydro, for example, has been used for decades to meet daily peaks of demand. Others include compressed air, chemical storage and thermal storage. All, however, are costly.

[12] North American Reliability Corporation (NERC); Essential Reliability Services Task Force, A Concept Paper on Essential Reliability Services that Characterizes Bulk Power System Reliability, October 2014

[13] https://www.aiso.com/Documents/FlexibleResourcesHelpRenewables_FastFacts.pdf

[14] <http://www.navigantresearch.com/research/advanced-battery-tracker-2q16>

[15] <https://www.cdja.ca.gov/statistics/>

[16] Structural Vulnerability of the North American Power Grid; Reka Albert, István Albert and Gary L. Nakarado, Pennsylvania State University, Huck Institute for Life Sciences and National Renewable Energy Laboratory, January 2004

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EGSA Announces 2017 Board Election Results

The Electrical Generating Systems Association proudly announces the election of officers and 3 new Board Members for 2017. These new Board Members will assume their offices on January 1, 2017.

The 2017 EGSA Executive Board Members are:

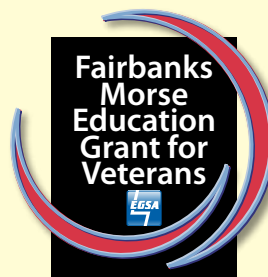
- President – Charlie Habic, *Gillette Generators Inc.*
- President-Elect – Dave Brown
- Vice President – Todd Lathrop, *Eaton Corporation*
- Secretary-Treasurer – Kurtiss E. Summers, *Austin Generator Service*
- Immediate Past President – Bob Hafich, *Emergency Systems Service Co.*

Also elected to the Board of Directors at large, please welcome our incoming (2017-2019) Board Members:

- Thomas Black, *ASCO Power Technologies*
- Justin McMahon, *Leroy Somer*
- Hal Walls, *Clariant Corp.*

These 3 incoming Members of the EGSA Board of Directors will join the following Directors, who remain on the Board of Directors through the coming year:

- Paul Feld, *Penn Power Systems*
- Ole E. Haaland, *Anna Inc.*
- Bob Piske, *Arizona Generator Technology, Inc.*
- Steve Sappington, *Caterpillar, Inc.*
- David Stringer, *DEIF, Inc.*
- Tom Wein, *Generac Power Systems*



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The objective of the EGSA Fairbanks Morse Education Grant for Veterans program is to support our Nation's armed services veterans as they return from service, offer a technician certification test and at the same time the opportunity to become engaged with our organization.

This annual grant is designed to provide qualified individuals with a full ride on costs associated with the EGSA Certified Technician test (Apprentice or Journeyman level).

The Grant will provide, at no charge, the test study guide, a copy of On-Site Power Generation: A Comprehensive Guide to On-Site Power and pay the certification testing fee. A small charge to cover the proctor's fee will be payable on site by the technician.

Applications are Due by December 1, 2016.

Learn more at:

<http://egsa.org/EducationbrCertification/ScholarshipsGrants/FairbanksMorseGrant.aspx> ■

David Yuro of Modern Power Systems Named 2016 EGSA Technician of the Year

EGSA and Modern Power Systems are proud to announce that Dave Yuro has been named the 2016 Technician of the Year Award (TOYA) winner. Dave, his wife and VP/GM of Modern Power Systems, John McClure, were in attendance at the EGSA Fall Conference in Sacramento, CA to celebrate this industry accolade in its third year of being awarded.



Recognizing that generator technicians had no formal achievement recognition program until 2014, the EGSA Technician of the Year Award is our association's way of honoring and showcasing the on-site power industry's first responders and unsung heroes, who determinedly give their time and attention to the power generation systems and packaged engineered solutions around the globe.



Generator technicians are responsible for servicing, maintaining, selling parts and providing customer assurance. In our industry, technical knowledge is respected and expected, but the ability to think and act under pressure is what separates elite technicians from the shade tree mechanic. These pieces of equipment are sensitive and complex systems that require expertise to keep the power on! The systems a technician works on can sometimes be the difference between a life or death situation.

EGSA is a trade organization for the on-site power industry whose membership encompasses generator manufacturers, distributors and EGSA Certified technicians from coast to coast. To be nominated for the industry TOYA is a great honor, and to win it represents one of the highest achievements in the industry. Dave's dedication to his career, customers, and his fellow employee-owners was expounded upon by John McClure for all EGSA members at the fall conference. Generac Industrial Power joined in the recognition and presented Dave with a gift of a portable generator.

"This is a proud day not just for Dave, or the Power Systems Service Team but all of us at Modern Group," reported John McClure, on hand for the presentation made by 2016 EGSA President Bob Hafich (Emergency Systems Service Company).

For more than 50 years, the EGSA has been on the cutting edge of generated power solutions. Providing codes and standards updates, emerging technologies, education, best practices, technician certification, and industry enrichment, EGSA is the leading authority in the on-site power industry.

For more information about Modern Power Services, please visit www.moderngroup.com. For more information about the Electrical Generating Systems Association, visit www.egsa.org.



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Application for Membership

ELECTRICAL GENERATING SYSTEMS ASSOCIATION

1650 South Dixie Highway, Suite 400, Boca Raton, FL 33432 • 561-750-5575 • FAX 561-395-8557
E-Mail: e-mail@EGSA.org • Website: www.EGSA.org

Under the leadership of its Board of Directors and operating through its various committees and staff, EGSA strives to educate, provide networking opportunities and share relevant knowledge and trends with industry professionals including manufacturers, distributor/dealers, engineers, manufacturer representatives, contractor/integrators and others serving On-Site Power consumers.

EGSA MEMBER CLASSIFICATION & DUES SCHEDULE (Choose appropriate membership below and enter amount in box #3 on reverse)						
FULL MEMBERSHIP			Annual Dues	Initiation Fee	TOTAL DUE	
<input type="checkbox"/>	MF Manufacturer Membership Any individual, sole proprietor, partnership or corporation seeking membership must apply for a Full Membership as a manufacturer if they meet one or more of the following criteria: 1. They manufacture prime movers for power generation. 2. They manufacture generators or other power conversion devices producing electricity. 3. They manufacture switchgear or electrical control devices. 4. They manufacture or assemble generator sets, UPS systems, solar power, hydropower, geothermal, or any other power production or conversion system including related components or accessories for national or regional distribution. 5. They are a wholly owned subsidiary of a firm that qualifies under rules one through four.		\$870	\$200	\$1,070	
<input type="checkbox"/>	DD Distributor/Dealer Membership Any individual, sole proprietor, partnership or corporation actively engaged as a distributor or dealer for products listed under Manufacturer Membership may apply for Full Membership as a Distributor/Dealer. If an organization qualifies under Manufacturer Membership, it is not qualified under this section.					
<input type="checkbox"/>	CI Contractor/Integrator Membership Any individual, sole proprietor, partnership or corporation actively engaged as a Contractor or Equipment Integrator of products listed under Manufacturer Membership, not bound by brand, geographic territory or contractually obligated as a Distributor/Dealer of a specific product. These firms typically purchase products from a Distributor/Dealer, Manufacturer or Retailer, adding value through installation, product knowledge, relationships, unique services, etc., and then re-sell the resulting product to an end-user.		\$310	\$100	\$410	
<input type="checkbox"/>	MR Manufacturer's Representative Membership Any individual, sole proprietor, partnership or corporation actively engaged in the representation of products listed under Manufacturer Membership may apply for Full Membership as a Manufacturer's Representative. If an organization qualifies under Manufacturer Membership, it is not qualified under this section.					
<input type="checkbox"/>	EM Energy Management Company Membership Any individual, sole proprietor, partnership or corporation engaged in energy management, including Energy Service Companies (ESCOs), Independent Power Producers (IPPs), Integrators, Aggregators, and other similar enterprises may apply for Full Membership as an Energy Management Company.		\$210	\$100	\$310	
ASSOCIATE MEMBERSHIP			Annual Dues	Initiation Fee	TOTAL DUE	
<input type="checkbox"/>	Associate Regular Membership (Select Appropriate Category Below)		\$210	\$100	\$310	
<input type="checkbox"/>	Associate Full Membership Any individual, sole proprietor, academic institution, student, partnership or corporation meeting the requirements of Associate Regular Membership may apply for Full Membership at their option to enjoy the privileges of Full Membership, including the rights to vote and to serve on EGSA's Board of Directors. Initiation fees and annual dues will be assessed at the existing non-manufacturer Full Member rates. (Select Appropriate Category Below)		\$310	\$100	\$410	
PLEASE SELECT ASSOCIATE MEMBERSHIP CATEGORY	Associate Membership Categories - Select One					
	<input type="checkbox"/>	AA Trade Publication Membership Any trade publication dealing with the electrical generating systems industry or its suppliers may apply for Associate Membership—Trade Publications.				
	<input type="checkbox"/>	AB Trade Association Membership Any trade association made up of individual or company members sharing a common interest in the electrical generating systems industry may apply for Associate Membership.				
	<input type="checkbox"/>	AC Engineer Membership Any consulting or specifying engineer may apply for Associate Membership—Engineer. Membership may either be held in the employer's name or individual's name under this classification. Individuals whose employer qualify as a Full Member, as described in the Full Membership section, do not qualify for this category.				
	<input type="checkbox"/>	AD End-User Membership Any individual employee of a company who owns or operates electrical generating equipment and/or related switchgear or components, whose responsibility to his employer includes planning, design, installation, supervision, or service of such equipment may apply for Associate Membership—User. Membership may either be held in the employer's name or individual's name under this classification. Individuals whose employer qualify as a Full Member, as described in the Full Membership section, do not qualify for this category.				
	<input type="checkbox"/>	AE Service Membership Any individual, organization or academic institution that offers services such as research, testing or repair to the electrical generating systems industry may apply for Associate Membership—Services. Membership may either be held in the individual's name or the organization's name under this classification. Individual companies whose employer or parent organization qualifies as a Full Member, as described in the Full Membership section, do not qualify for this category.				
	<input type="checkbox"/>	AG Educational Institution Membership Any postsecondary vocational-technical school or college offering on-site power generation-related instruction may apply for Associate Membership—Education Institution.				
	<input type="checkbox"/>	AM Military Membership Any individual who is currently enlisted, or who has been discharged, or has retired from the US or Canadian Military may apply for membership within this category. Proof of military engagement is required by either current Military ID card or honorable discharge documents.		\$50	N/A	\$50
	<input type="checkbox"/>	AR Retiree Membership Any individual who retires from a member company may apply for Associate Membership—Retired. This classification does not apply to any individual who is employed more than 20 hours per week.		Complimentary		\$0
	<input type="checkbox"/>	AF Student Membership Any individual currently enrolled at an academic institution may apply for Associate Membership—Student.		Complimentary		\$0

1. Contact Information

Company _____
 Address _____
 City _____ State/Province _____
 Zip/Postal Code _____ Country _____
 Phone _____ FAX _____
 Official Representative _____ Title _____
 Representative's E-Mail _____ Company's Web Address _____
 How did you hear about EGSA? Web site Powerline magazine Colleague POWER-GEN Other _____
 Why are you joining EGSA? Certification Program CEU Program Power Schools Buying Guide Listing Other _____

2. Member Classification

Please use the worksheet on page one of this application to determine your membership type.

Full Memberships

- Manufacturer (MF)
- Distributor/Dealer (DD)
- Contractor/Integrator (CI)
- Manufacturer's Representative (MR)
- Energy Management Company (EM)

Associate Memberships

- Regular Associate Membership →
- Full Associate Membership →

(Select Appropriate Category)

- Trade Publication (AA)
- Trade Association (AB)
- Engineer (AC)
- End User (AD)
- Service (AE)
- Educational Institution (AG)
- Military (AM)
- Retiree (AR)
- Student (AF)

3. Membership Dues

(Please fill in the appropriate TOTAL amount from the dues schedule on page one.)

Membership Dues	\$ _____
Membership Plaque (optional)**	\$ 55.00**
On-Site Power Reference Book (optional)**	\$ 140.00**

Florida Residents: Add 6% Sales Tax to ** items \$ _____

** Shipping and handling is included for Continental US Residents.
 Non-Continental US Residents should call EGSA \$ _____
 Headquarters for shipping charges for **items. **TOTAL** \$ _____

4. Payment Method

(Payable in US\$ drawn on U.S. bank, U.S. Money Order, or American Express)

- Check # _____ Amount Due \$ _____
- Mastercard Visa American Express

Card # _____ Exp. Date _____

Signature: _____

Print Name: _____

5. Products/Services

Please describe the nature of your business (50 words or less, NOT ALL CAPS). If you are a Manufacturer's Representative or Distributor/Dealer, please indicate which manufacturers you represent and/or distribute for; if you are a student, please provide the name and location of your school, your major and your anticipated graduation date:

Do you buy AND sell equipment? Yes No Do you manufacture packaged equipment? Yes No

Available Codes:

- | | | | | |
|------------------------------------|--|--|--|---------------------------------------|
| 01 --- Batteries/Battery Chargers | 07 --- Engine Starters/Starting Aids | 12 --- Governors | 18 --- Relays, Protective or Synchronizing | 22 --- Trailers, Generator Set |
| 02 --- Control/Annunciator Systems | 08 --- Filters, Lube Oil, Fuel or Air | 13 --- Heat Recovery Systems | 19 --- Silencers/Exhaust Systems/Noise Abatement | 23 --- Transformers |
| 29 --- Education | 28 --- Fuel Cells | 14 --- Instruments and controls, including meters, gauges, relays, contactors, or switches | 20 --- Solenoids | 24 --- Uninterruptible Power Supplies |
| 30 --- Emission Control Equipment | 03 --- Fuel Tanks and Fuel Storage Systems | 15 --- Load Banks | 21 --- Switchgear and Transfer Switches (Automatic or Manual), Bypass Isolation Switches, and/or Switchgear Panels | 25 --- Vibration Isolators |
| 04 --- Enclosures, Generator Set | 09 --- Generator Laminations Systems | 16 --- Motor Generator Sets | | 26 --- Voltage Regulators |
| 05 --- Engines, Diesel or Gas | 10 --- Generator Sets | 17 --- Radiator/Heat Exchangers | | 27 --- Wiring Devices or Receptacles |
| 06 --- Engines, Gas Turbine | 11 --- Generators/Alternators | | | |

Enter codes here: (Limit 10 codes per category)

Products sold: _____

Products rented: _____

Products serviced: _____

6. Sponsor(s):

A "Sponsor" is an EGSA Member who interested you in filling out this application. It is not mandatory that you have a sponsor for the Board to act favorably on this application; however, if a Member recommended that you consider membership, we request that individual's name and company name for our records.

Sponsor Name _____ Company Name _____

7. Official Representative's Authorization

Signature _____ Date _____

NEW EGSA MEMBERS

MF=Manufacturer DD=Distributor/Dealer CI=Contractor/Integrator MR=Manufacturers Rep
 EM=Energy Management Co. AA=Trade Publication AB=Trade Association AC=Engineer
 AD=End-User AE=Service AG=Educational Institution AM=Military AR=Retiree AF=Student

Applied Catalysts MF
 Doraville, GA

Martin Morrill, VP Sales & Marketing
 Lee Mitchell, President
 Bob Gulotty, Technical Manager
 Scott Plageman, Business Development MGR
 Applied Catalysts manufactures ABATE VOC™ catalysts for engine emission control. ACC also manufactures an ACM monolith (activated carbon monolith) for cleaning up siloxanes and other contaminants in landfill gas.

Athlon Generator LLC MF
 Manassas, VA

Margaret Barkley, Customer Service
 Together with our joint partner in China, we manufacture alternators for resale in the North American market.

Marcos Camacho AM
 Chula Vista, CA

E.I. Williams Industries MF
 Ajax, ON Canada

Jim Williams, President
 Manufacturer and designer of silencers and complete exhaust systems. Manufacturing since 1992. Quality products, warranties, quick delivery dates.

Sean Fauss AM
 St Louis, MO

GE Power MF
 Waukesha, WI

John Hoefl, Sr. Plant Marketing Leader

IAP Worldwide Services AE
 Cape Canaveral, FL

Bill Solanes, Director, Power Operations
 IAP Worldwide Services is a service provider in the power business as a U.S. Government contractor worldwide.

Isuzu Motors America Inc. MF
 Plymouth, MI

John Dutcher, Director of Sales & Marketing
 Isuzu Motors America, LLC (ISZA) is the wholly owned distribution entity for the Americas. Isuzu Motors Ltd. is the parent company and the manufacturer of record.

Keystone Pump and Power, LLC DD
 Dillsburg, PA

Scott Web, President
 Rental of portable generators, distribution and pumps. We service Central Pennsylvania and Northern Maryland.

Newmans Power Systems, Inc. DD
 Ft Pierce, FL

Gene Seissiger, President
 Generator sales & service. We represent and provide certified service/sales for Cummins, Kohler, and Briggs & Stratton products.

Carl Nix AM
 Huntsville, AL

Peter Noschese AR
 Charlotte, NC

Recently retired from Nixon Power Systems

Edwin Rivera AF
 Carolina, PR

Titan Laboratories AE
 Denver, CO

Michelle Hilger, Director of New Business Development
 Titan Laboratories provides customized fluid analysis programs and testing to include oil, coolant, diesel fuel and DEF sampling as well as all accessories needed to extract samples. We work with all 50 states and internationally.



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As part of their commitment to being the most comprehensive supplier of fuel storage systems and generator packaging to the emergency power market, Phoenix Products offers a complete range of fuel, tank and enclosure maintenance and repair services to help ensure that emergency power will be ready to operate when needed.



Phoenix Products manufactures a line of generator enclosure packages that meet the High Velocity Hurricane Zone requirement of Florida.

From humble beginnings, born of the entrepreneurial spirit of Pete and Kris Slater in the late '80s, Phoenix Products has grown to become a leading manufacturer of custom generator enclosures, fuel tanks and fueling systems for power generation installations. The Slaters' original vision was in providing innovative fuel tank solutions to the Federal Aviation Administration (FAA), Bellsouth and other various customers. The Envirovault UL2085 above ground storage tank, (which is still manufactured by Phoenix Products today), was the basis of their customer solutions.

From inception, Phoenix Products has taken a direction of differentiation and ingenuity. One solid example is the invention of a simple solution for contractors to connect directly their containment piping and test the integrity of the system from an integral component of the tank. This methodology is still in use today by the FAA for their AST installations and it is also a method imitated by several competitors.

Phoenix Products continued putting its creative designs to market, inventing the first sub-base tank to be investigated to the rigors of UL2085. The FireSteel was born out of the model of the Envirovault, mimicking the corrosion resistant design and heavy duty construction. To this day, the FireSteel is considered by many to be the tank by which all protected secondary sub base tanks are measured. Phoenix Products still holds the patent on the very concept of supporting a generator on the top of a UL2085 tank. Phoenix Products is also very flattered by the imitation that followed this innovation.

In 2005, Phoenix Products was purchased by Ring Power Corp. and has continued on the creative path it started on. The ISO 9001-certified company specializes in custom fabrications for difficult conditions and unique situations. This includes a line of day tanks and controls tested to meet the stringent California OSHPD requirements and generator enclosure packages that meet the High Velocity Hurricane Zone (HVHZ) requirements of Florida. This EGSA member firm has even designed and built containers to meet Det Norske Veritas (DNV) standards.

Diversity in Product Line

The diversity of Phoenix Products can be evidenced by a product they make for another industry. The ROOK is an armored, tactical vehicle used by law enforcement for varied situations. Phoenix Products design and builds the armor and attachments that protect our first responders.

This vehicle draws expertise from several manufacturing experiences throughout the firm's history. Because of their ability to provide fuel tanks and enclosures that meet high-level codes and specifications, Phoenix Products supports customers in industries



Phoenix Products manufactures a product to protect the ones that protect us all, say hello to the ROOK!



This red enclosure is a 2500KW drive unit for a crane. This enclosure also has an extremely specialized interior.

where performance, protection and reliability are critical: health-care, government, banking, data processing, communications and transportation sectors to name a few.

Commitment to Design and Engineering, as well as Serviceability and Performance, the Phoenix Products Promise

Phoenix Products' commitment to quality starts with design and engineering, where the company continues to pioneer new methods and materials. From above ground fuel tanks integrated with sophisticated fuel control systems to generator packages that protect the equipment they house, Phoenix Products designs with serviceability and performance in mind. Phoenix Products fabricates their products with tight quality controls at every step of the manufacturing process and no piece of the project escapes scrutiny. This ensures top quality craftsmanship and products that will provide decades of reliable service. This unwavering commitment is what allows some of the products Phoenix Products produces to carry warranties up to 30 years long.

Phoenix Products' home is a 100,000 square foot Jacksonville, FL manufacturing plant on 7 acres convenient to I-95, I-10 and the Jacksonville port on the St. Johns River. It is a fully equipped facility with capabilities to handle any packaging project from single generator packages to large, multiple unit ventures with project requirements that would be considered daunting, if not insurmountable, to other packagers. When testing units is part of the scope of work, Phoenix Products is prepared with diesel and natural gas on hand, as well as load banks and other associated equipment required for performing to specification requirements.

Products are Great, but People Are Everything...

While having all of the right equipment on hand is a great advantage, testing or otherwise, the most valuable asset that Phoenix Products cares about is the people that make up the brand. With a customer-centric mindset and a 'can-do' attitude, the employees stand ready and willing to go above and beyond to make their customer experience a positive one. From the sales department to the shipping crew and all points between, this group has a

common goal, **customer satisfaction**. Throughout the processes of estimate, design and execution, the Phoenix Products team is always looking for ways to provide a product that meets specification and ups their game.

The latest addition to the Phoenix Products family is their new General Manager, Bob Delp. Bob is no stranger to on-site power, coming from the training and safety division of Ring Power Corp. Bob has also had a successful career with Caterpillar in their engineering and manufacturing groups. He is a six-sigma black belt and brings a safety and efficiency concentration that will continue to improve operations and advance an already great safety record. "Bob is a great fit for the team and has been very well received into the Phoenix Products family," adds Vaughn Beasley, 2014 EGSA President (Ring Power Corp.).



Bob Delp

The EGSA Connection

Phoenix Products has come a long way since the American dream of a man and his wife to where they are today, a division of Ring Power Corporation, united in the vision of being an innovative leader in the generator packaging industry. The team's plan is to provide the best equipment and customer experience possible and to lead the continuous improvement charge forward. With the team that they have in place, nothing is going to stand in the way of their progress.

The firm has also been an active EGSA Member. Just in the last 5 years, Phoenix Products has not only participated in a leadership role with officers in one of our EGSA Committees, they have sponsored conferences, exhibited during each of our bi-annual exhibitor showcases, been a faithful advertiser and even carried the EGSA flag on important initiatives like the EGSA Technician of the Year Award (panel judge for 2 of our 3 years of the TOYA).

EGSA appreciates the fine work that Phoenix Products has contributed as an EGSA Member and look forward to a long history with this active member of our Association! ■

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USA Central

Generator Technician

Central Power Systems and Services

Location: Springfield, MO 65803

The ideal candidate will have: Flexibility and & willingness to be On-Call, and able to work Overtime on occasion; Willingness and Ability to Travel Overnight; Electrical and mechanical knowledge of diesel powered generators; AAS Electrical Power Generator Tech

EGSA Certified Technicians Preferred.

To apply: <http://jobs.ourcareerpages.com/job/142793?source=ccp&jobFeedCode=CentralPowerSystemsServices&returnURL=http://cpower.com>

Application Deadline: 2016-12-01

Generator Technician

Central Power Systems and Services

Location: Liberty, MO 64068

The ideal candidate will have: Flexibility and & willingness to be On-Call, and able to work Overtime on occasion; Willingness to be trained with various makes and models; Electrical and mechanical knowledge of diesel powered generators; AAS Electrical Power Generator Tech

EGSA Certified Technicians Preferred.

To apply: <http://jobs.ourcareerpages.com/job/142776?source=ccp&jobFeedCode=CentralPowerSystemsServices&returnURL=http://cpower.com>

Application Deadline: 2016-12-01

Generator Technician

Central Power Systems and Services

Location: Liberal, KS 67901

The ideal candidate will have: Flexibility and & willingness to be On-Call, and able to work Overtime on occasion; Willingness to be trained with various makes and models; Electrical and mechanical knowledge of diesel powered generators; AAS Electrical Power Generator Tech

EGSA Certified Technicians Preferred.

To apply: <http://jobs.ourcareerpages.com/job/142794?source=ccp&jobFeedCode=CentralPowerSystemsServices&returnURL=http://cpower.com>

Application Deadline: 2016-12-01

Field Generator Tech

Taylor Power Systems

Location: Houston, TX

GENERATOR TECHNICIANS NEEDED!! Taylor Power Systems is a name synonymous with dependability. We are a premier, made in USA generator manufacturer. We design, engineer, manufacture, and service generators for the oil and gas, industrial, commercial, business, health care, telecommunications, municipalities, agricultural and any standby or prime power needs. EXCELLENT BENEFITS.

EGSA Certified Technicians Preferred.

To apply: www.thetaylorgroupofcompanies.com

Field Generator Tech

Taylor Power Systems, Inc.

Location: Theodore, AL

GENERATOR TECHNICIANS NEEDED!! Taylor Power Systems is a name synonymous with dependability. We are a premier, made in USA generator manufacturer. We design, engineer, manufacture, and service generators for the oil and gas, industrial, commercial, business, health care, telecommunications, municipalities, agricultural and any standby or prime power needs. EXCELLENT BENEFITS.

EGSA Certified Technicians Preferred.

To apply: www.thetaylorgroupofcompanies.com

EGSA Job Bank Guidelines

EGSA will advertise (free of charge) EGSA Member company job openings in the Job Bank. Free use of the Job Bank is strictly limited to companies advertising for positions available within their own firms. Companies who are not members of EGSA and third-party employment service firms who service our industry may utilize the Job Bank for a \$300 fee. Blind box ads using the EGSA Job Bank address are available upon request; company logos may be included for an additional fee. EGSA reserves the right to refuse any advertisement it deems inappropriate to the publication. To post an EGSA Job Bank ad (limited to approximately 50 words) please visit www.EGSA.org/Careers.aspx.

Field Generator Tech

Taylor Power Systems, Inc.

Location: Jackson, MS

GENERATOR TECHNICIANS NEEDED!! Taylor Power Systems is a name synonymous with dependability. We are a premier, made in USA generator manufacturer. We design, engineer, manufacture, and service generators for the oil and gas, industrial, commercial, business, health care, telecommunications, municipalities, agricultural and any standby or prime power needs. EXCELLENT BENEFITS.

EGSA Certified Technicians Preferred.

To apply: www.thetaylorgroupofcompanies.com

Field Generator Tech

Taylor Power Systems, Inc.

Location: Bessemer, AL

GENERATOR TECHNICIANS NEEDED!! Taylor Power Systems is a name synonymous with dependability. We are a premier, made in USA generator manufacturer. We design, engineer, manufacture, and service generators for the oil and gas, industrial, commercial, business, health care, telecommunications, municipalities, agricultural and any standby or prime power needs. EXCELLENT BENEFITS.

EGSA Certified Technicians Preferred.

To apply: www.thetaylorgroupofcompanies.com

USA Mid-Atlantic

EPG Field Technician I

Alban CAT

Location: Elkridge, MD

The EPG Technician I is responsible for diagnosing, troubleshooting and repairing basic electrical generator systems.

To apply: <https://careers-albancaat.icims.com/jobs/1393/epg-field-technician-i/job>

EPG Technician (5 year)

Alban CAT

Location: Manassas, VA

The EPG Technician I is responsible for diagnosing, troubleshooting and repairing electrical generator systems.

To apply: <https://careers-albancaat.icims.com/jobs/1030/epg-field-technician-%285-year%29/job>

EPG Technician (3 year)

Alban CAT

Location: Manassas, VA

The EPG Technician is responsible for diagnosing, troubleshooting and repairing electrical generator systems.

To apply: <https://careers-albancaat.icims.com/jobs/1031/epg-field-technician-%283-year%29/job>

EPG Field Service Supervisor

Alban CAT

Location: Elkridge, MD

The EPG Field Service Supervisor directs and supervises activities of field operations and repairs, including coordinating and monitoring work schedule, managing service logistics, reviewing quotes, and troubleshooting as required. Travels from site to site and provides guidance and support for the Technician.

To apply: <https://careers-albancaat.icims.com/jobs/1352/epg-field-service-supervisor/job>

Sales Account Executive

Athlon Generator LLC

Location: Manassas, VA

Athlon Generator LLC seeks a seasoned sales account executive for the Mid and South Atlantic territory, to promote the Company's alternator (generator-end) product line to large and small engine-generator manufacturers. Experience dealing with the gen-set rental outlets is a plus, to promote after-market sales.

USA Northeast

Generator Technician

Emergency Systems Service Company

Location: Quakertown, PA

This is your chance to join a family focused company. Seeking a talented, independent, company minded individual with excellent electrical skills. Minimum 5 years experience servicing transfer switches and troubleshooting electrical systems. Trouble-shoot problems with transfer switches. Perform repairs to transfer switches. Benefits: health and dental, paid holidays, vacations, 401K.

EGSA Certified Technicians Preferred.

To apply: jobs@emergencysystems-inc.com

Field Service Technicians (Diesel & Gas)

Kinsley Power Systems

Location: East Granby

Kinsley Power Systems is seeking experienced generator technicians throughout the Northeast. This position is responsible for completing preventive maintenance, repairs and service on standby power generation equipment. Due to the nature of the service business Field Service Technicians must reside within 25 miles of the available territory and have a clean driving record.

To apply: lbarnes@kinsley-group.com

USA Northwest

Generator Field Technician

EC Company

Location: Portland, OR

The Generator Field Technician is located at our EC Power Systems headquarters in NW Portland, OR., but will be responsible for performing service work throughout the state of Oregon. Hours: Mon-Fri 8 a.m. – 5 p.m. Compensation: \$20-\$30/Hour depending on experience.

To apply: employment@e-c-co.com

EGSA JOB BANK

Generator Field Technician

EC Power Systems

Location: Fife, WA

The position of Generator Field Technician is located at our EC Power Systems in Fife, WA. This position will be responsible for performing service work throughout the state of Oregon. State of Washington 07 specialty electrical license or similar training and experience necessary to test for and obtain the license quickly, preferred. Hours: Monday-Friday 8 a.m. - 5 p.m. Compensation: \$20-\$30/Hour depending on experience.

To apply: employment@e-c-co.com

USA Southeast

Generator Service Technician

CJ's Sales and Service

Location: Ocala, FL

Maintain, repair and install mechanical and electrical components of commercial generator sets and/or related equipment. Required applicant skills: Working knowledge of electrical systems/circuitry as well as some knowledge of diesel engines; Perform accurate failure analysis and troubleshooting using diagnostic tools; This position requires travel and some after hour call outs.

EGSA Certified Technicians Preferred.

To apply: email resume to service@cjspower.com

Advanced Electrical Service Technician

Cummins

Location: Georgia, Florida, Tennessee, North Carolina or South Carolina

This position can be located in Georgia, Florida, Tennessee, North Carolina, or South Carolina. This technician will work with our customers, sales, service, factory, and vendors to oversee complex systems start-ups, generator controls upgrades, networks and switchgear modifications. Call/email our recruiter at (402)541-0911 or elizabeth.harders@cummins.com. Cummins is an EEO/AA employer.

EGSA Certified Technicians Preferred.

To apply: <http://cummins-us.jobs/jobs/?location=North+Carolina&+q=Advanced+Electrical+Service+Technician>

Manufacturer's Rep Seeking Principals

Leading Mid-South manufacturer's rep is seeking additional product lines. We have decades of experience in all aspects of the onsite power generation industry. We are interested in adding quality complementary manufacturers to our line of superior products serving the industry. Our record of outstanding success can help you achieve your sales and market share goals. Please respond if you have an area where you desire additional sales and market share.

Please respond to: J.Kellough@EGSA.org
(Reference PLMJ13JB-1)

Service Technician A

Nixon Power Services

Location: Lawrenceville, GA

Service Technician A is an advanced-level technician position. The position has the technical understanding of generator repair and operation to perform major repairs and installations of generators and associated equipment. The position reports to the Assistant Service Manager and/or Service Manager in the Service department and routinely interacts with customers and various employees within the company.

To apply: Go to www.nixonpower.com

Service Technician B

Nixon Power Services

Location: Lawrenceville, GA

Service Technician B is an intermediate-level technician position. The position has the technical understanding of generator repair and operation to perform simple repairs and preventative maintenance. The position reports to the Service Manager in the Service department and routinely interacts with customers both external and internal.

To apply: Go to www.nixonpower.com to apply

Field Generator Tech

Taylor Power Systems

Location: Little Rock, AR

GENERATOR TECHNICIANS NEEDED!! Taylor Power Systems is a name synonymous with dependability. We are a premier, made in USA generator manufacturer. We design, engineer, manufacture, and service generators for the oil and gas, industrial, commercial, business, health care, telecommunications, municipalities, agricultural and any standby or prime power needs. EXCELLENT BENEFITS.

EGSA Certified Technicians Preferred.

To apply: www.thetaylorgroupofcompanies.com

USA West

Generator Field Technician

EC Company

Location: Salt Lake City, UT

The position of Generator Field Technician is located at our EC Power Systems branch office located in Salt Lake City. This position will be responsible for performing service work throughout the region. Hours: Monday-Friday 8 a.m. - 5 p.m. Compensation: \$20-\$30/Hour depending on experience.

To apply: employment@e-c-co.com

Generator Field Technician

EC Company

Location: Aurora, CO

The position of Generator Field Technician is located at our EC Power Systems branch office located in Aurora, CO. This position will be responsible for performing service work throughout the Utah region. Hours: Monday-Friday 8 a.m. - 5 p.m. Compensation: \$20-\$30/Hour depending on experience.

To apply: employment@e-c-co.com

INDUSTRY NEWS

EGSA Industry News Guidelines

We welcome you to submit press releases for consideration for inclusion in the Industry News section of *Powerline* Magazine. However, due to the fact that *Powerline* is the voice of an organization consisting of more than 800 Member companies, we maintain a strict editorial policy that prohibits any endorsement of a particular company or product. As a result, **we do not accept product-specific or service-specific releases for publication.**

Please email your press releases to PR@EGSA.org.

Taylor Power Systems Appoints Thomas Culpepper as Intermodal Product Manager

Taylor Power Systems (TPS) announced Thomas Culpepper as the Intermodal Product Manager for TPS. Culpepper will be responsible for Transportation Unit, Power Pack and Rail Pack products. He will manage the design, marketing and selling of these products. Culpepper will assure that TPS designs lead the intermodal industry and follow up with field visits to ensure complete customer satisfaction.



Prior to accepting this position, Culpepper previously was Product Support Representative for Taylor Power Systems and was responsible for training on and off site, along with product support to TPS dealers, technicians and customers. Not only does he bring great knowledge and expertise from his TPS experience, but also a wealth of experience from his eight year tenure with Cummins Mid-South where he was a High Horsepower Field Technician.

Visit www.taylorpower.com for more information. ■

B3C Fuel Solutions Announces Robert Crane new Director of Sales

B3C Fuel Solutions, LLC, is proud to announce the appointment of Robert (Bob) Crane as Director of Sales. Bob will be responsible for sales planning and implementation for all B3C markets, with an emphasis on Automotive, Heavy Duty, Marine and Industrial, including Aftermarket, OEM and OES opportunities.



"We are extremely excited that Bob is joining our team," said Brian Boezi, CEO, B3C Fuel Solutions. "Bob's extensive experience and success in the sales arena will advance our growth efforts, particularly in the industrial sector," said Boezi.

Bob is a senior sales executive with broad management experience and extensive knowledge of sales, marketing, and team building. He is known for creating brand awareness in already established markets and has extensive experience in building sales team networks. He has also had extensive experience working with companies in manufacturing and distribution channels.

Please visit B3CFuel.com for more information. ■

Staff Changes, New Hire are Part of Planned KG&E Growth

Kelly Generator & Equipment Inc. (KG&E) has announced three upper level management changes designed to take advantage of major growth opportunities in the full service generator company's Mid-Atlantic market area.

Shirley Ashton, KG&E's former Director of Sales, has been promoted to Director of Operations. Working with her in that capacity will be Dru Tyson, who will serve in the newly created position of Director of Sales for the company's rental and service division, and Johnny Greenwell, a KG&E Industrial Sales Representative who succeeds Ashton as Director of Sales.

"The changes are part of a goal that John Kelly, Jr. has set in order to double the privately-held Generac Power Systems distributor's revenues in the next five years," Ashton said. Hitting that goal "is doable," Ashton said.

Ashton is a 30-year veteran of what are known as complex sales – providing highly

specialized products and services to many different industries.

Dru Tyson joined KG&E in May, after previously working as a Director, Sales Executive, Consultant and Business Owner in a variety of entrepreneurial and Fortune 500 company settings throughout his professional career. He began his career in power generation while serving in the United States Navy and that continued with his service as a Commissioned Officer in the Maryland Army National Guard.

His most immediate priority at KG&E will be recruiting assistant territory sales people and support staff to handle the company's projected expansion – "and, specifically, finding people with the right kind of critical power experience we need," he said.

Johnne Greenwell worked as an industry technician for a government contractor for seven years before he joined KG&E. He was a member of that contractor's emergency response team, flying to emergencies throughout the U.S. and nearby territories. "We spent the day after the 9/11 attacks (on New York's World Trade Center in 2001) bringing a radar installation back online in Corpus Christi, TX to help strengthen national security," Greenwell said. Now at KG&E, "I want to draw on experiences such as those to help improve service to our customers," he said.

Please visit kge.com for more information. ■

Russelectric VP of Sales and Marketing, John Meuleman, Retires

Russelectric Inc. announces the retirement of John Meuleman, Vice President of Sales and Marketing, effective September 2, 2016.

John started his career with Russelectric in September 1975 as an application engineer and has served as leader of the company's sales and marketing organization for the past 21 years. A key member of Russelectric's leadership team, he has played a major role in making Russelectric the US-market leader in paralleling switchgear and automatic transfer switch solutions for critical mission applications. With a tremendous work ethic and dedication, John has worked tirelessly throughout his career with Russelec-



tric's external sales representatives around the country; internal sales, quotations, and marketing organizations; as well as with external trade organizations and groups.

"I know I speak for all who have known and worked with John in thanking him for his efforts on behalf of the company and the industry as a whole," said Dorian Alexandrescu, Russelectric President and CEO. Alexandrescu added, "The Russell family and Russelectric Board of Directors also recognize John's efforts and wish to thank him for his exemplary professionalism and dedication to the company. And finally, I and the entire Russelectric organization and family would like to extend our best wishes."

Please visit russelectric.com for more information. ■

Russelectric Appoints Randall Adleman as VP of Commercial Operations

Russelectric Inc. is pleased to announce the appointment of Randall J. Adleman as Vice President of Commercial Operations reporting to Dorian Alexandrescu, President and CEO. In this role, Randy will be responsible for commercial operations for Russelectric, as well as all selling activities including sales, marketing, application engineering, and quotations. In addition, he will be part of the Russelectric Senior Leadership Team.

An experienced, creative, growth-driven leader with a unique mix of sales and marketing skills, Randy combines a deep knowledge of the power quality, distribution, and controls market with an impressive results-oriented, winning approach. Randy will take over for John Meuleman, who will be retiring after 41 years with Russelectric.

Prior to joining Russelectric, Randy was Vice President of Global Sales and Marketing for Active Power, in Austin, TX.

He holds a Bachelor's degree from Colgate University and an MBA in Marketing from Fairleigh Dickinson University.

Please visit russelectric.com for more information. ■





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