Welcome to the 8th edition of Generating Insight.

Standby power is a large part of the power generation industry, so this issue’s focus will discuss different aspects and considerations for this kind of application.

As suggested in the last edition of Generating Insight, price is a major factor when selecting an alternator. When the application is standby, and the alternator is only expected to run under emergency situations, rather than continuously, one may start to consider the value and benefit of sizing for this intermittent duty application, with a compromise between hours of service, and years in service.

Here you will find articles explaining the critical and emergency market segments, as well as an industry standard certification for data centre applications. We will also provide some exploration on the trade off when considering low cost alternatives, such as counterfeit machines, as part of selecting equipment and addressing important considerations when sizing an alternator for a standby application. Sometimes future expansion of the site comes into play, and sizing appropriately from the beginning to account for increased demand may save significant expense in the long run.

Since the standby application spends the majority of time being idle, limited use of the equipment raises questions about the best practices for maintenance as well as base specifications to assure that the equipment will be operated reliably when needed. Periodic exercising of the generator set is a common practice to prove that the equipment is functional, and will increase the useful life of the equipment. From distributing the grease in the alternator bearings, to warming the oil and the coolant in the prime mover, as well as circulating some air to help dry things out (in case of high humidity), and making sure the electrical controls are functioning as intended. This is all good practice to be ready for the emergency demand.

We look forward to any comments you may have about this issue, and our Application Engineering teams are available to answer any questions you may have around your particular application.

Tim Courant
Application Engineering Manager - Americas

An emergency standby alternator is an independent source of electric power that supports critical systems in the event that a normal source of power, often the electric grid, ceases to provide electric power.

An alternator used to supply standby power is utilized only when the normal source of power has failed. Depending on how reliable the normal source of power is, in some geographical areas, this could mean that a standby alternator is used only a couple of times a year. These alternators are also expected to provide higher electric output ratings above what they would produce if they were to be operated on a continuous mode. As such, when in operation, they run at higher heat levels than what the insulating materials used in their design and construction can tolerate, which reduces their useful life by two to six times. When considering these factors, some may question the worth of investing in a source of power which may not be used as often, or even last as long as it would if it were to be operated on a continuous mode. With this in mind, it’s easy to see why settling for a cheap standby alternator would seem appealing. But, as is the case with every commodity, a higher price typically translates to better quality, even for alternators. In the quest to purchase a cheaper alternator, what ends up happening in some cases is that customers fall into the trap of investing in counterfeit machines. However, sacrificing quality over cost sometimes has much greater consequences than some would think, and the benefits realised by having a quality source of standby power go well beyond the monetary investment made at purchase.

The consequences of losing electric power are mostly not apparent until it happens. The impact felt by the loss of electricity could mean the loss of substantial amounts of revenue for some industries, or even the loss of life for others depending upon the nature of the devices, machinery, and processes for which critical electric power is needed. Consider a manufacturing facility for instance, unreliable standby power could result in costly downtimes due to the shutdown of production lines during a power outage. In an age where global connectivity is vital, some industries rely heavily on standby power to ensure that the management and exchange of information remains seamless at all times. In the case of a data centre for example, the lack of quality/standby power could result in problems as unassuming as not being able to perform simple internet searches, to problems as complex as the loss of critical records of information for an organisation, or even the damaging of hardware used to store these records. In the instance of a telecommunications company, imagine not being able to place an emergency call because the company supporting your cell phone network lacks reliable standby power in the event of a power outage. In the healthcare industry, having a constant source of electric power is of paramount importance. Procedures such as surgeries which rely on multiple electronic devices cannot be jeopardized due to unreliable standby power. From ensuring that a manufacturing facility continues to operate at peak performance to helping keep patients alive, it is difficult to understand why one would sacrifice on quality over cost.

Benjamin Franklin, one of the Founding Fathers of the United States of America, once said that “The bitterness of poor quality remains long after the sweetness of low price is forgotten.” Considering the examples explored here, why risk serious consequences in the name of saving money by purchasing counterfeit alternators? Often these alternators are made of low grade materials, and are typically not tested thoroughly. Consequently, they are unlikely to perform to the levels expected of genuine alternators and are generally not covered under warranty. In addition, they could pose serious safety concerns because of their poor workmanship. Cummins Generator Technologies is committed to the fight against counterfeiting. In order to guarantee that a STAMFORD machine is genuine, each STAMFORD alternator is now labeled with a 3D hologram containing seven identification numbers unique to each unit. To learn more about the dangers of alternator counterfeiting, please visit genuine-stamford.com.
Overview of Rating Definitions for Alternators and Generator Sets

The rating on an alternator defines its capability to deliver electrical power to a connected load. This is recognised in terms of kVA and is the starting point for sizing an alternator in a generator set application.

Whilst there are other factors that must be considered during the sizing & selection process, this article addresses the subject of rating and duty cycle definitions, the terminology used in the industry and how this informs the process of assisting the GOEM to select the right alternator for their generator set.

Alternator rating

The kVA rating placed on an alternator is governed primarily by the thermal capabilities of the winding insulation system and the required operational life expectancy. For a given operational life the higher the class of insulation, the hotter the alternator can run.

The table below lists the letters used and the corresponding nominal operating temperatures for classifying the performance of an insulation system.

<table>
<thead>
<tr>
<th>Thermal class °C</th>
<th>Letter designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>130</td>
<td>B</td>
</tr>
<tr>
<td>155</td>
<td>F</td>
</tr>
<tr>
<td>180</td>
<td>H</td>
</tr>
</tbody>
</table>

The industry standard for modern winding insulation is class H for low voltage systems, (<1kV), and class F for medium and high voltage, (>1kV).

It should be noted however, that the letter assigned to the class of insulation system is not necessarily the same as the temperature rise class an alternator could be rated for. If the kVA rating placed on an alternator leads to a lower operating temperature than the insulation system’s nominal capability then operational life is extended. Conversely, if the kVA rating leads to a higher operating temperature than the insulation systems nominal capability then the operational life is reduced.

Either case is an acceptable operating condition, however the life expectancy of the alternator windings must be taken into account when selecting an alternator for a certain application.

Example: Standby versus prime power applications

In a typical standby application such as a hospital, the operating hours will most likely be less than 200 hours per year. Over the life time of the installation, e.g. 15 years, that equates to a total of up to 3000 operational hours. Given this is relatively low, one can afford to run the alternator at a higher temperature and therefore a relatively higher rating.

For this reason customers will be offered a peak-kVA rating on the alternator for standby applications.

However, in a continuously operating application such as an embedded generation scheme, the operating hours could be upwards of 8000 hours per year. This equates to upwards of 120000 hours over the same 15 year period. In this case the temperature of the windings must be reduced using a relatively lower kVA rating.

For this reason, customers will be offered a class F or even B kVA rating on the alternator.

The thermal damage curve illustrates the variation of insulation life with operating temperature and is used in conjunction with other tools to enable sizing and selection decisions to be made when assigning a rating to an alternator for a particular power generation application.

Generator set rating

The generator set rating philosophy introduces the concept of standby and prime power applications. Guided by ISO8528-1 the definition of a generator set rating is categorised by application in four ways:

- Emergency Standby Power, (ESP rating)
- Limited Time Prime, (LTP rating)
- Prime Rated Power, (PRP rating)
- Continuously Operating Power, (COP rating)

Each definition states the following criteria:

- Load type
- Number of operating hours per year
- Average load level
- Annual operating hours
- Maximum temperature rise

Example:

This needs to be taken in to account when matching the alternator to the generator set rating and application.

<table>
<thead>
<tr>
<th>APPLICATION</th>
<th>Generator set</th>
<th>Emergency Standby Power (ESP)</th>
<th>Limited Time Prime (LTP)</th>
<th>Prime Rated Power (PRP)</th>
<th>Continuous Operating Power (COP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load type</td>
<td>Variable</td>
<td>Constant</td>
<td>Variable</td>
<td>Constant</td>
<td>Variable</td>
</tr>
<tr>
<td>Annual operating hours</td>
<td>200</td>
<td>500</td>
<td>Unlimited</td>
<td>Unlimited</td>
<td></td>
</tr>
<tr>
<td>Average load</td>
<td>70%</td>
<td>100%</td>
<td>70%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Maximum temperature rise</td>
<td>No</td>
<td>No</td>
<td>+10% (1 hour in 12)</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

The table below summarises the definitions according to ISO 8528-1 for the generator set and a combination of ISO 8528-3 and IEC 60034-1 for the alternator. Despite the differences the table shows how to align the rating and operating duty of the alternator with the generator set.

It is important to note that the GOEM may decide to offer higher levels of performance compared to the standards e.g. higher average loads or longer durations of operation.

This needs to be taken into account when matching the alternator to the generator set rating and application.

<table>
<thead>
<tr>
<th>Alternator rating Definitions</th>
<th>APPLICATION</th>
<th>Standby</th>
<th>Prime / Continuous</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEMA MG1-32</td>
<td>Standby</td>
<td>Continuous</td>
<td></td>
</tr>
<tr>
<td>ISO 8528-3</td>
<td>Peak Continuous</td>
<td>Base Continuous</td>
<td></td>
</tr>
<tr>
<td>Allowable Temperature rise</td>
<td>150 / 40</td>
<td>125 / 40</td>
<td></td>
</tr>
<tr>
<td>Duty cycle (IEC 60034-1)</td>
<td>S10 or S1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load type</td>
<td>Variable or constant</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. Open-transition transfer devices: when the source fails, the open-transition transfer device opens the connected source before engaging the new source. This causes an interruption of power for a small period of time.

2. Fast closed-transition transfer devices: operates similar to the Open-transition transfer devices but uses a “make-before-break” switching action on return of original source by paralleling both sources for approximately 100 milliseconds. This device limits power interruption upon returning to mains utility.

3. Soft closed-transition devices: operates like an open-transition transfer switch but when transferring power from one generator to utility, the control system will synchronise the sources and gradually transfer the load.

The type of ATS is selected based on the application requirements. Most ATS systems include a bypass switch which can be used for maintenance purposes.

Mission Critical Standby Generators

From the different types of ATS, we understand that there is momentary interruption of power from a few milliseconds to several minutes affecting the reliability of power supply. In certain applications standby alternators play a vital role in providing power to critical power applications known as ‘mission critical’. Every effort is made to reduce the interruption of power to the loads as certain energy consumers cannot accept loss of power even for a few milliseconds due to the criticality of the application. Mission critical is separated into two classes Private and Public Safety. The Private sector are business related such as data centres, whereas the Public Safety sector includes applications such as hospitals and emergency services.

To address this problem an Uninterruptible Power Supply (UPS) is connected between the load and the ATS. When the mains fail the UPS will continue to power the critical loads until the ATS transfers the load to the Standby alternator.

There are two main types of UPS systems – Static and Rotatory.

Static UPS System

The static UPS uses power electronics and utilises batteries to deliver power for short periods. The UPS has a rectifier at the input stage to rectify the ac to dc where the batteries are connected and then through an inverter to provide an ac output. Under normal operating conditions the batteries are charged by the dc. During loss of power the batteries take over and supply the inverter. A bypass switch is included for maintenance purposes. A typical arrangement of the static UPS system is shown in Figure 3.

Rotary UPS Systems

A typical rotary UPS systems consists of a diesel engine, electromagnetic clutch, synchronous machine and a flywheel all coupled in line. The flywheel is used to provide short term power during utility failures as shown in Figure 4.

During normal mode of operation, the utility drives the synchronous machine as a motor which spins the flywheel. When the Utility fails the kinetic energy stored within the flywheel is used to drive the synchronous machine until the diesel engine is started and the electromagnetic clutch is engaged to drive the synchronous machine.

Conclusion:

Network design engineers must conduct a feasibility study on performance vs cost when making the choices to select the right standby alternator, ATS and maybe UPS to suit the application. As an alternator manufacturer, Cummins Generator Technologies have a proven track record for supplying alternators for these demanding and challenging applications in the standby market. The technical knowledge and expertise of Cummins Generator Technologies enable us to provide reliable machines, work in partnership with network designers and select the correct machine to meet all load demands by providing reliable power around the clock.
Important considerations when sizing for a standby application

Standby generating sets supply power to critical systems during periods when the power from a reliable public utility source is interrupted. Power interruptions can either be unplanned or an agreement between customer and the utility to disconnect the power during periods of high demand.

Standby generating sets provide power to prevent losses associated with power outages and keep businesses operating, allowing critical systems to continue to operate. However, it is still important to understand the factors that affect the nomination of a standby generating set. When sizing for a standby application, the following factors should be taken into consideration.

1. Project parameters
2. Load characteristics
3. Load sequence
4. Environmental conditions

Standby generating sets supply power to a mixture of linear and non-linear loads.

Motor loads

Motor loads cause difficulty due to the high current surge when starting. Starting current is typically six times a motor's rated full-load current, and high current will result in a high transient voltage dip. The alternator needs to be sized to limit the voltage dip to acceptable limits when starting.

Non-linear loads

The advancement in power electronics has seen non-linear loads become common in standby applications. These non-linear loads, e.g. uninterruptible power supply (UPS), cause harmonic currents resulting in high voltage distortion levels and additional heating in the alternator windings. The high level of voltage distortion can affect the operation of the load and the automatic voltage regulator (AVR). Alternators need to be sized correctly to reduce the voltage distortion levels and to accommodate any additional heat produced by the harmonic currents.

Transformer

The alternator should be sized to accommodate the high inrush current when magnetising transformers. The impact on the alternator is minimised by disconnecting all loads from the secondary of the transformer during magnetisation.

Lighting

There are many different types of lighting now widely used such as fluorescent, LED, HID, incandescent, all with different electrical characteristics.

Environmental conditions

Ambient temperature

When determining the ambient for alternator sizing, it is important to remember the ambient is actually the temperature of the cooling air into the alternator. Nominal design is based on an ambient of 40°C; if operated above this, the output rating must be reduced.

Altitude

Above 1000m the effectiveness of the air is reduced, therefore to avoid over-heating due to this reduction in coolant effectiveness, low voltage machines operating at altitude must be derated. Due to this for high voltage applications the alternator manufacturer should be consulted for suitability.

Humidity

Humidity is a measure of the moisture content of the air in which a machine is situated. When the moist air changes to liquid, condensation occurs, which could be catastrophic. For conditions above 70% relative humidity anti-condensation heaters must be fitted and energised when the set is stationary.

Load characteristics

Standby generating sets supply power to a mixture of linear and non-linear loads.

Motor loads

Motor loads cause difficulty due to the high current surge when starting. Starting current is typically six times a motor's rated full-load current, and high current will result in a high transient voltage dip. The alternator needs to be sized to limit the voltage dip to acceptable limits when starting.

Non-linear loads

The advancement in power electronics has seen non-linear loads become common in standby applications. These non-linear loads, e.g. uninterruptible power supply (UPS), cause harmonic currents resulting in high voltage distortion levels and additional heating in the alternator windings. The high level of voltage distortion can affect the operation of the load and the automatic voltage regulator (AVR). Alternators need to be sized correctly to reduce the voltage distortion levels and to accommodate any additional heat produced by the harmonic currents.

Transformer

The alternator should be sized to accommodate the high inrush current when magnetising transformers. The impact on the alternator is minimised by disconnecting all loads from the secondary of the transformer during magnetisation.

Lighting

There are many different types of lighting now widely used such as fluorescent, LED, HID, incandescent, all with different electrical characteristics.

Load Sequence

Next, consider the sequence of loading. Applying the full load in one step will increase the stress on the alternator considerably. The critical loads will also define the maximum allowable transient voltage dip. Applying the load in one step will contribute to a higher transient voltage dip. Applying the loads in multiple steps will reduce the alternator size significantly. Also employing an alternator with a permanent magnet generator (PMG) excitation system, a lower transient voltage dip can be achieved.

Sizing

Once all the four factors are established, the final step will be sizing the best fit alternator whilst checking the steady state and transient conditions. The steady state is mainly concerned with normal operation of the machine within temperature rise limits; and the transient condition, examines voltage deviations when suddenly applying high current loads (e.g. during motor starting or a block load).
Stanby
Uptime Institute
Tier Classification

As a means to quantify the integrity of data centres, and thereby the reliability of access to the cloud, the Uptime Institute was founded in 1993. An unbiased advisory organisation focused on business critical infrastructure, it is best known for its Tier Certifications of data centres.

The Tier Levels identify increased infrastructure cost and operational complexity with each increase in Tier Level. It is ultimately up to the data centre management to decide which level is appropriate for their particular business application. It has been recognized that many data centres incorporate complex design elements and technology choices dictated by local infrastructure, so it falls to the data centre owner to define the method in which to achieve a Tier Level that fits their infrastructure goals.

The Tier Levels are progressive; each Tier incorporates the requirements of all lower tiers that precede.

**Tier I:**
Basic Capacity – A Tier I data centre provides dedicated site infrastructure to support IT (Information Technology) beyond a simple office setting, including dedicated space for IT systems; some kind of UPS (Uninterruptable Power Supply) to filter power dips, spikes, and momentary outages; dedicated cooling equipment that remains running outside of office hours; and a dedicated generator set to provide power during extended outage periods. This level would qualify with a standby generator set as the power source for a utility outage event.

**Tier II:**
Redundant Capacity Components – Tier II facilities include redundant system components such as power and cooling systems in order to provide an additional level of protection against IT systems interruption in case of infrastructure equipment failure. Redundant components would include cooling system components, UPS modules, and generator sets among others. At this Tier level, standby generator sets would still be acceptable to qualify for facility certification.

**Tier III:**
Concurrently Maintainable – Tier III data centres require that service work for replacement of supporting infrastructure, or downtime due to maintenance routines require no shutdown of the IT systems. Redundant delivery paths for cooling and power are required for each and every component such that maintenance or repair can be conducted without any impact on the IT operations.

**Tier IV:**
Fault Tolerance – In addition to a Tier III design, Tier IV adds Fault Tolerance to the system, meaning equipment failures or distribution path interruptions are circumvented short of the IT systems, thereby assuring no interruption in the IT operations.

Earlier in the Tier classifications, Uptime Institute had conducted without any impact on the IT operations. While one might expect that the data centre primary power source be defined by the standard, the fact is the Tier Standard does not specify anything around utility feed for the facility power. Instead, the Uptime Institute recommends a robust on-site power generation system (typically generator sets), as this is considered the only reliable source of power for the data centre. In the case of Tier III and Tier IV, diesel generator sets are defined as the primary source of power, and so a standby rating would not be applicable due to the operational requirements.

While power is a major factor in the data centre operation, management of the site is also critical. If the power source becomes local, isolated from the utility feed, that management task becomes even greater.

**Sources**
https://journal.uptimeinstitute.com/explaining-uptime-institutes-tier-classification-system/
Best practices for re-lubricating alternator bearings

Grease is a form of lubrication that is fundamental to the operation and longevity of rolling element bearings. This form of lubrication reduces direct metallic contact between the bearing’s raceways, rolling elements and cage. It also helps to prevent foreign material from entering the bearing while guarding against corrosion or rusting and helps to discharge frictional heat. In turn, this helps to extend the bearing life significantly. Therefore it is critical that an appropriate re-greasing regime is controlled, monitored and checked on a regular basis.

There are various methods and many types of re-greasing equipment currently used today. However, the accuracy and method of application varies drastically. In too many cases, lubrication methods are inadequate and result in either too little grease or too much grease. In either case resulting in reduced bearing life.

The best method to re-lubricate bearings is to use a calibrated battery powered grease gun such as the example shown below. This system provides mobility, accuracy of grease dispensed with digital meter reading and ease of operation.

For more complex and remote systems, there are various auto re-grease system available on the market today. However, it is vital that consideration of the type of grease used, the method of pumping, the condition/environment the grease is stored and the distance the system is from the bearings is reviewed and engineered correctly.

**Bearing maintenance**

All STAMFORD and A&K products that have re-greaseable bearings will have a label fixed to the end plates above the bearings giving information about the bearing grease type, re-lubrication frequency and quantities.

It is recommended to have a dedicated grease gun for alternator bearing re-lubrication only.

Never mix lubricant types.

As per the Installation, Service & Maintenance manuals, it is vital that the grease, grease gun, grease nozzle and re-lubrication nipple are free from abrasive materials and other contaminants.

If the generating set is running, apply the specified quantity of grease via the grease nipple (All grease quantities can be found in the alternator manuals). It is recommended to keep the generator running for at least 60 minutes after applying the grease.

If the generating set is not running, apply the grease then start the generator and run for at least 60 minutes to allow excess grease to exhaust from the bearing assembly.

Clean the grease exhaust systems if required and inspect the telltale of the grease expelled. Replace the bearing if the expelled grease is severely discoloured.

Avoid high humid atmospheric or wet conditions as this can cause the grease to emulsify causing corrosion and deterioration of the grease, leading to premature failure of the bearings.

The best way to understand the condition of the bearings is to use a health monitoring regime. Measuring and monitoring the vibration characteristics of bearings is a very good way to identify the condition of the bearings and predict more accurately when the bearings need to be changed. Best practice is to take initial readings as a baseline level and periodically monitor the bearing signature to detect a change in trend. Examples of a typical condition monitoring system can be seen above in Figure 2.

**Maintaining bearing life during periods of storage**

If the alternator will not be used immediately and is stored for significant periods of time, the alternator must be stored in a clean, dry vibration-free environment.

If the alternator can be rotated, turn the rotor a minimum of 6 revolutions every month during the storage period.

This is to help move the grease around the bearing raceways and rolling elements to help line the contact surface with a film of oil to prevent metallic contact. This helps to reduce the possibility of false brinnelling that can significantly reduce the life of the bearing after the unit has been commissioned.

As per the alternator manual, before commissioning the alternator, refer to the following table below.

<table>
<thead>
<tr>
<th>Not rotated during storage</th>
<th>Rotated during storage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sealed Bearing(s)</strong></td>
<td></td>
</tr>
<tr>
<td>If stored more than 12 months, replace the bearing(s) before commissioning.</td>
<td>If stored more than 24 months, replace the bearing(s) before commissioning.</td>
</tr>
<tr>
<td><strong>Re-greaseable Bearing(s)</strong></td>
<td></td>
</tr>
<tr>
<td>If stored more than 12 months, replace the bearing(s) before commissioning.</td>
<td>If stored between 6 and 24 months, re-grease the bearing(s) before commissioning.</td>
</tr>
</tbody>
</table>

If stored more than 24 months, replace the bearing(s) before commissioning.

If stored between 6 and 24 months, re-grease the bearing(s) before commissioning.

If stored more than 24 months, replace the bearing(s) before commissioning.

**NEVER MIX LUBRICANT TYPES**

If standard hand pump grease guns are to be used, it is vital to make sure the correct amount of grease has been dispensed. This can be done by weighing the complete grease gun before and after the re-grease.
We have a saying here at Cummins Generator Technologies; ‘where there’s infrastructure, there’s a need for standby power’. From the everyday residential standby power that we rely on – all the way up to critical hospital power that we depend on – there are premium AvK or STAMFORD alternators that will guarantee the power stays running through the inevitable adverse weather conditions and grid blackouts that we’re subjected to.

Our experience in supplying a diverse range of backup power across every region of the globe means we’re equipped with the proven technologies and expertise to secure reliable standby power in critical circumstances.

Cummins Generator Technologies were approached by a key account customer, A J Power of Craigavon, to supply alternators for diesel generating sets that would provide critical standby power for two large ICT telecommunications centres in Scandinavia. Our Application Engineers worked closely with the generating set manufacturer during their design phase to determine the need for 12 x 2.25MW generating sets - six units per ICT centre.

6 x STAMFORD P80 - HV580DT2 Winding 81 alternators, rated at 2500kVA 10kV 50Hz, were supplied for each ICT centre for critical standby to reverse energise a 63MVA 22kV /10kV transformer network. The size of alternators required was determined by the magnetisation current profile of the transformer network. On any loss of power, the 6 generating sets would run up to speed and synchronise on a ‘dead bus’ parallel configuration to a common generator system output.

These STAMFORD P80 alternators were a preferred option for a number of reasons, not only for their dependability, but also for excellent transient performance and high efficiency.

Installation was completed by A J Power, including connecting all control cabling, fuel lines and mechanical items. Once fully installed, each site was subject to a site acceptance test, where each generating set was fully witness tested by the customer. Finally an Integrated Systems test was performed which ensured all critical systems for the building were fully operational and communicating properly.

Cummins Generator Technologies are proud to be associated with this project, which was the largest in scope and value for our customer. It demonstrates Application Engineering expertise and the professional competence of a highly trained team.