SYMMETRY WHITE PAPER

Energy Conservation and Environmental Considerations for Using Symmetry

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Reducing carbon footprint is good for the environment, saves money, and may be required by law or regulation. The "carbon footprint" is a complex calculation of carbon emissions due to non-renewable energy use, consumption of materials, and contribution to landfill. There are obvious ways to reduce energy and consumables, reuse materials, and recycle waste in the commercial office environment. This white paper, however, focuses on some of the less obvious ways in which the Symmetry Security Management System can support your efforts to reduce carbon footprint.

Typical efforts to reduce carbon footprint include use of renewable energy (typically solar power generation or water heating), using energy efficient lighting (fluorescent or LED lighting), waste recycling programs, and efficient use of ventilation to limit air cooling requirements. It is perhaps not obvious that the security and access control system can support these efforts as well. For instance, we will show how there can be significant energy efficiencies achieved simply by the selection of the Symmetry product. In addition, part of the carbon footprint reduction plan may be to partner with vendors that have ISO 14001 or similar carbon footprint reduction plans. In all of these situations, AMAG Technology is happy to be a part of your efforts.

Leadership in Energy & Environmental Design (LEED)

LEED, or Leadership in Energy & Environmental Design, is a green building certification program in North America that recognizes best-in-class building strategies and practices. To receive LEED certification, building projects satisfy prerequisites and earn points to achieve different levels of certification. Prerequisites and credits differ for each rating system, and teams choose the best fit for their project. More information on LEED is provided in an appendix to this white paper. There are many areas where the energy reductions afforded by the Symmetry hardware and software as discussed throughout this document can earn points for LEED projects.

Areas where Symmetry can help reduce carbon emissions

Symmetry supports many features and capabilities that can be used to realize energy efficiencies resulting in cost savings and LEED credits. The items below are organized by Symmetry controllers, Symmetry readers, and Symmetry software features.

Symmetry Controllers

The Symmetry controllers (the field panel that supports microprocessor and memory) support up to 16 doors. Compared to some other access control products that only support four or eight doors on a panel, Symmetry requires fewer controllers to provide online electronic access control for the portals in your facility. Eight-door controllers also provide more efficient hardware control. **Fewer controllers mean less energy use**.
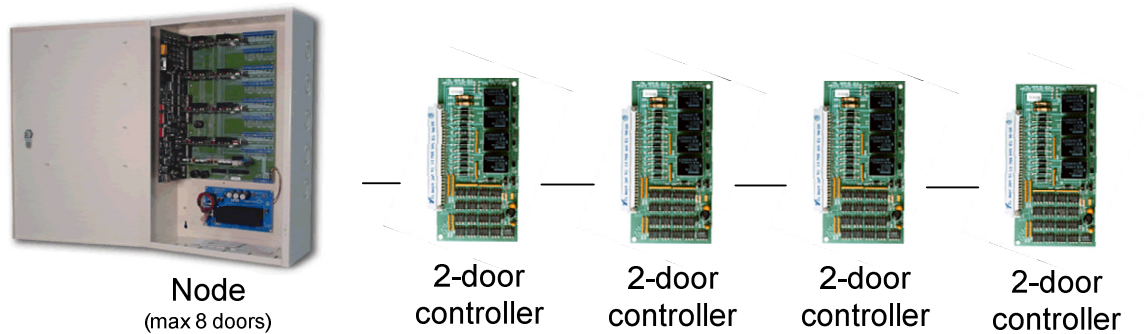

| Node (max 8 doors) | 2-door controller | 2-door controller | 2-door controller | 2-door controller |

Figure 1: Typical Access Control Hardware

Node + 8-door Controller (max 16 doors)   8-door Add-on Controller

Symmetry hardware provides support for more doors with fewer components and less electricity
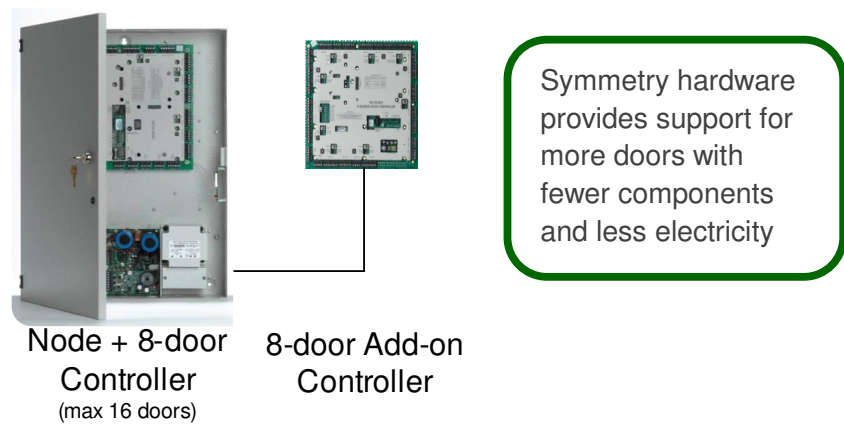
Figure 2: Symmetry Hardware

Reduction in hardware, thereby **generating savings on initial installation, maintenance, and energy/operational savings** can also be realized by using the Symmetry hardware for both access control and intrusion detection (IDS) functionality. This unified approach is not common in the security industry, but can generate significant savings from only having to power a single piece of hardware to perform two or more functions.

The Symmetry M2150 series hardware comes in a variety of door controllers. Whether you start with a two-door controller or jump to eight or 16, it is easy to expand the functionality of Symmetry with modular components. However, each component requires power to operate, and an eight-door controller requires more power than a two-door controller. Symmetry saves on budget and on energy use by allowing you to **purchase what is needed** with the ability to add on in the future.

The M2150 hardware is highly reliable as well. **With reliable operation comes fewer repair trips to the site, and therefore less fuel used by the maintenance vehicles**. The M2150 access control and IDS capable panels have a mean time before failure (MTBF) of approximately 100,000 hours[1].

There are two controllers in the Symmetry product line that support Power over Ethernet (POE) – EN-1DBC and EN-2DBC. There are several benefits of the POE controllers. For instance, POE controllers get power and communication over the same cable. Therefore, there is less copper and cabling installed. Also, since the POE controllers get DC power directly from the Ethernet cable, they don't require transformers and power supplies for each panel so power conversion is more efficient. **POE controllers reduce cabling and power infrastructure minimizing copper installation**.

Figure 3: Symmetry POE-enabled EN-2DBC

POE controllers are environmentally sound in another way as well. Since physical security is a critical application for most businesses, the access control system is backed up with reserve power – typically battery power. **Batteries require special handling for disposal at the end of their useful life**. The fewer batteries used in the system, the simpler the process of maintaining the system. POE devices also require power backup, but a UPS in an intermediate distribution frame (IDF) can be managed much more efficiently than individual batteries strewn throughout the enterprise.

Figure 4: Symmetry Javelin 884 Reader

Symmetry Readers
Another area of energy use in electronic access control systems is the card reader at the door. The card reader is

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[1] Detailed MTBF data may be requested from AMAG Technology. Different hardware components have different MTBF values. Data is determined from actual returns over time, not calculated based on theoretical models.

powered up all the time. **The Javelin reader range has been designed for low energy use.** One way this is accomplished is through design choices in the display on the reader. The display uses a low energy liquid crystal display, but this display requires a backlighting to make it readable. The Javelin reader is designed with a low-energy LED backlight, and the backlighting dims to a very low power state when the reader keypad is not in use. Small individual power savings like these have big impacts because they are multiplied by the number of readers in a facility and the amount of time the readers are operating – all the time.

Symmetry card readers with backlighting can be used in other ways as well. For instance, often corridor lights are left on just for night time security and maintenance staff, but this level of lighting is not necessary (security staff don't need bright hallway lights and the newest video surveillance cameras work very well in low light conditions). If the Symmetry readers are configured to keep the backlight active this may provide enough light to **avoid using overhead lighting**.

Symmetry card readers support a bi-directional communication protocol called MultiNode Current Loop Protocol (MCLP). This protocol is implemented over a physical interface that uses four conductors for communications and two conductors for power. Thus, the readers are able to get power, configuration and output information from the access control panel; and, in turn, communicate inputs back to the controller including alarm conditions all in six conductors – a single cable. In the case of a typical Wiegand interface reader, there may be two conductors for power, two conductors for card number communication, two conductors for LED interface, another conductor for a sounder and another conductor for the tamper indicator – totalling to at least eight conductors. Like in the case of POE controllers above, you **use less copper and there is less cabling installed**. Reducing the number of cables that need to be pulled over long distances not only **saves on installation cost** of materials, but **reduces waste** down the road when technology is upgraded or a building undergoes major renovation.

Finally, the Javelin reader is manufactured from 100% recyclable materials. Therefore there is less waste going to the landfill at the end of the useful life of the product.

Symmetry Software
The Symmetry software supports a number of integration points. Using software APIs (programming interfaces) **Symmetry data can be used to make energy efficiency decisions in external systems**. In one example, the purpose of the building automation system is to control heating, ventilation and air conditioning (HVAC). However, building automation may only be adjusting the heating and/or cooling of office space based on assumed occupancy and time of day. When Symmetry data is integrated with the building automation system, actual occupancy status can be used to determine if additional cooling or heating are required for workplace comfort.

In a similar manner, when whole areas of the building won't be needed, doors can be closed and access to these areas can be restricted to necessary personnel only, and HVAC services limited to **reduce the area that must be illuminated and temperature controlled**. As mentioned above, often corridor lights are left on just for night time security and maintenance staff – Symmetry reader backlighting may be sufficient to provide light for these services as opposed to overly bright overhead lighting.

One area in which buildings can garner LEED credits is in **promoting healthy lifestyles** such as walking to services in and around the building. By implementing video surveillance, the building operator creates a safer environment that will in turn enable residents and visitors to move comfortably through these public areas. Symmetry supports unification of the access control with video surveillance. This simplifies the operator interface and reduces how much hardware is required to implement a solution: fewer computer monitors, fewer servers, and fewer personnel to operate the system.
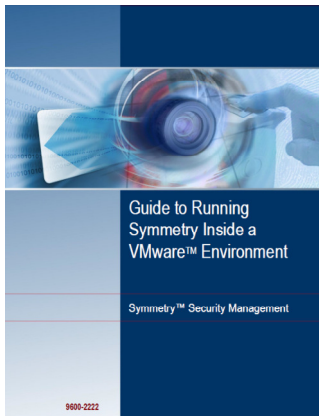
As computing hardware becomes more powerful, it is capable of running several applications simultaneously, however, best practices in the Information Technology field call for separation of applications. Therefore, to make the most efficient use of modern server hardware, virtualization is used to allow multiple applications to share the same hardware while still operationally separate. Symmetry supports virtualization. Furthermore, we offer a design guide for customers interested in taking advantage of virtualization. Additionally, Symmetry Version 8 allows the separation of the database from the application server, thereby allowing larger organizations to take advantage of existing Microsoft SQL Server infrastructure and licensing. **Save on capital expenditures and operational expenditures through virtualization and common database use**.

Figure 5: VMware Design Guide

Symmetry supports wireless locks through our integration with Aperio technology from ASSA ABLOY. The Aperio technology is built into a wide variety of products from integrated locks like the A100/E100/PR100 to cabinet locks like the K100/M100. Traditionally less than 10% of the doors in a facility are controlled by electronic means. Additional doors may be locked through off-line cipher locks, but virtually all other doors are simply controlled through mechanical key locks. Security personnel must visit each of these doors to verify that doors are not propped open or forced open. This is a massive undertaking for even smaller facilities. If these mechanical locks and cipher locks are replaced with on-line electronic access control, there is considerably less need for patrols to check on each door. Instead, the doors will report back to central monitoring when a door is propped open or forced open (as well as other events). In the case of mechanical key locks, there is an even greater return on investment that includes the cost savings of re-keying locks and redistributing keys (which may be done by policy on a

regular basis or in the event of a missing key). **One customer saved over $5 million per year by moving away from mechanical keys.** Wireless locks like Aperio make on-line access control even more cost effective when one considers the elimination of copper cabling – less installed cabling means less waste when systems are upgraded.

A large consumer of electric energy in commercial office buildings is the elevator system. A recent trend in elevator technology is to move to software control to define how passengers are transported through the building. By providing software based optimization algorithms, the system can group personnel and visitors into elevator cars based on their destination. Users have shorter wait times and building owners can get the same level of service with a reduced number of elevator cars – thereby significantly reducing the energy used in the building. Software elevator control also provides an opportunity for integration to external systems such as the Symmetry security management system. **Symmetry is integrated with all of the major elevator manufacturer's destination dispatch systems**.

Symmetry software provides significant opportunities to unify traditionally disparate applications. For instance, access control, intrusion detection, and video management have traditionally been separate applications running on different servers and requiring different client applications to connect to them. Symmetry unifies these applications together so that a single client displays as a single graphical user interface to the operator of the system. This allows security management to consolidate the number of computer workstations needed to operate the command center or the desk of the security officers. **Reduction in the number of computer workstations or monitors will reduce energy usage**.

Modernizing the Security Operations Center
The use of analytics and automation can also reduce the number of monitors needed to operate the security function. Big old-fashioned control rooms may have 50 to 100 screens and a similar number of computers. **Symmetry can support modernizing this to a much smaller room with typically 10 to 15 screens**. Typically, security staff members are monitoring many video cameras for inappropriate behavior or actions. Video analytics running at the edge (on the encoder or camera) or at the server level can provide automated notification of such an event. This can be used to call up actionable video thereby allowing the security staff to focus on tasks other than mundane monitoring until they need to attend to a situation and **reducing the number of staff members needed to complete the same work**.

Visualizer encoders and Symmetry HD cameras include on-board analytics that run at the edge of the network. Therefore, there is no resource allocation at the server or client computer required to implement analytics. The analytics create alarms in Symmetry when actionable events are detected. Symmetry trigger commands can be created to operate on these analytic alarms. Furthermore, the Symmetry Workflow Manager can be engaged to manage the process of responding to the alarm situation.

Mobile technology can also be used to allow security staff to be used more efficiently during their shift. If a security officer can be on patrol, but at the same time have access to security alarm annunciation and video data on demand, then that one person is doing the same work that would normally take two or more persons.

Areas where AMAG Technology and G4S Technology can help

AMAG Technology and parent company G4S Technology have been working to reduce carbon footprint. This is being done through internal and external efforts. Our external efforts can be used for LEED credits on projects that use our Symmetry security management system.

For example, all packaging materials used in our product distribution are made of non-bleached, 100% recycled cardboard. Additionally, the design of these packages does not require glues or fixings (staples, etc.). The filler material is recyclable as well.

All products manufactured by AMAG Technology and G4S Technology are designed to Restriction of Hazardous Substances (RoHS) standards. This regulation ensures that heavy metals and indicated toxic chemicals are not used in the final product.

Corporate commitment to sustainability

Internal efforts include our corporate commitment to sustainability, our ISO 14001 certifications and efforts to reduce waste and energy use and enhance our recycling programs.

G4S is a global company with over 618,000 employees, operating in over 120 countries, and annual revenue of £7.4bn (approximately US$12.4bn). From 2009 through 2012 the company reduced CO_2e emissions per £1M revenue from 88.3 tons to 74.2 tons (a 16% reduction). We have done this through a large number of programs. With the technology group, we have adopted new packaging and recycling programs, started using different materials in our manufacturing that lend themselves to recycling, and have made many of our manufacturing processes more environmentally friendly.

Challenge House is the worldwide headquarters for G4S Technology

Challenge House design

Challenge House is the worldwide headquarters for G4S Technology, the parent company of AMAG Technology. Challenge House was constructed from the ground up in 2004, and environmental conservation was part of the design considerations from the beginning. The following represent some of the areas in which we considered our own carbon footprint when constructing this showpiece facility.

- Building constructed from materials of highest insulation for the time (2004)
- Building also pressure-tested, to eliminate energy-wasting drafts
- Site machinery / equipment was the most energy efficient at the time of purchase
- All office lighting uses "T5" lamps, plus PIR motion control
- Secondary meters installed across site in 2009 (20 positions) for more accurate monitoring/auditing
- Ongoing projects to further reduce utility waste and costs
- Ongoing 'Energy Management Committee' to monitor site usage and identify areas of conservation
- Independent Carbon Trust efficiency assessment positioned facility "better than best practice", against other facilities of similar age and usage

ISO 14001

ISO 14001 is an international standard for Environmental Management Systems made up of a series of practices and procedures. Both the Challenge House and the AMAG Technology North American headquarters in Torrance, CA have achieved initial certification and completed several annual re-certifications. G4S Technology was the first security company in the world (December 2007) to achieve ISO 14001 certification. AMAG Technology quickly followed with initial certification completed in July 2008. One auditor commented,

"...the company has been extremely successful in creating improvements in recycling and waste segregation across the site, and can be considered to be in the forefront of best practice."

AMAG Technology's North American headquarters is in Torrance, CA

Torrance efforts to Reduce, Re-use, and Recycle

Torrance, CA is the North American headquarters for AMAG Technology. In the Torrance office, we achieved ISO 14001 certification in 2009, and have consistently passed each annual surveillance audit as well as our first Certificate of Registration renewal.
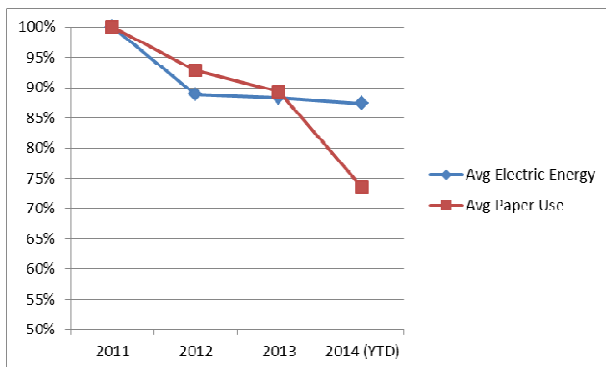
AMAG has been successful in continuing to reduce energy and paper use.

AMAG Technology has also implemented a "Green Team" to promote environmental conservation topics to employees through a monthly newsletter, annual drives to encourage proper paper and e-waste disposal, and regular competitions among employee groups.

Recognition of our efforts

The Torrance facility has received the State of California Waste Reductions Awards Program (WRAP) every year from 2009 until the program was ended in 2012 when these efforts became mandatory in California.

Other considerations

Beyond the capabilities of Symmetry and AMAG Technology, there are other areas in which the security system features can support energy reductions. For instance, some third party products can offer power reductions over and above what has been described below.

Card readers on the wall sit idly most of the time even during normal business hours. Yet, the operation of a reader is to transmit an electro-magnetic field looking for a card presentation. If the reader only woke up to generate this field for a short time (say 10 ms – enough time to generate the field and check for cards) and then went back to sleep (say for 90 ms), then the reader is checking for cards 10 times a second. A user would hardly notice a delay in operation, but the reader would **reduce power consumption by 90%.**

Use of light emitting diodes (LEDs) and liquid crystal displays (LCDs) are low power users compared to alternatives, however, what good does a message display do when no one is looking at it? Smart systems can turn off these interfaces (and LCD backlighting) when not being observed (such as inside a closed cabinet).

The door locking mechanism is also available in a variety of options – some using more power than others. For instance, servo mechanisms (sometimes referred to as actuators) use power when changing state from locked to unlocked and vice versa, but do not consume significant power to remain in a given state. The older solenoid based locks require power to remain unlocked, while magnetic hold locks require constant power to remain locked.

The building automation system (BAS) is responsible for controlling heating, ventilation, air conditioning and lighting services to the various work spaces. If a tenant is "hoteling" or "hot desking" (using temporary work spaces for transient or temporary employees), then the Symmetry access control system can interface with the BAS to provide occupancy information so that the BAS provides the appropriate level of service to the area. **Reducing services in unoccupied areas of the building will significantly reduce energy use.**

Summary

There are many ways your access control system can be configured or deployed to reduce energy use and save money. Furthermore, a comprehensive security management system like Symmetry brings many more opportunities for energy savings and cost reductions.

Symmetry provides unification of systems (access control, intrusion detection, video management, and more), and software API integration to external systems such as building automation to enable truly significant environmental impact improvements.

Whether working on a new project requiring LEED credits, upgrading an existing system, or replacing an unsupported end-of-life security system, contacting AMAG Technology is the first step to achieving your energy savings goals.

For more information about Symmetry and reducing the environmental impact of your organization through an effective access control system please visit www.amag.com or contact AMAG Technology.

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Appendix A: LEED Primer

Symmetry Access Control Systems can play a significant part in your building design to help achieve LEED compliance. Leadership in Energy & Environmental Design compliance demonstrates the implementation of *green* practices and energy efficient design within a building. The access control system is not usually one of the first considerations when LEED compliance is being considered for a project, but the Symmetry system, through its high level of integration with other systems such as HVAC, Building Management, ERP, Space Planning and others through XML Web Services can play a significant part in efficient use of energy.

LEED,is a certification program for buildings that recognizes best-in-class building strategies and practices leading to green and energy efficient environments .

Developed by the U.S. Green Building Council (USGBC), LEED is intended to help building owners and operators be environmentally responsible and use resources efficiently. Almost 20,000 organizations are members of the USGBC, and they are all able to review proposed changes to the LEED standard.

To receive LEED certification, building projects must satisfy prerequisites and earn points to achieve the varying levels of certification. Prerequisites and credits differ for each rating system, and teams choose the best fit for their project. Each rating system groups requirements that address the unique needs of building and project types on their path towards LEED certification. Once a project team chooses a rating system, they'll use this to make design choices, or find areas where existing or planned building systems can be applied to earn credits toward certification.

There are five rating systems that address multiple project types:

- Building Design and Construction
- Interior Design and Construction
- Building Operations and Maintenance
- Neighborhood Development
- Homes

Each rating system is made up of a combination of credit categories. Within each of the credit categories, there are specific prerequisites that projects must satisfy and a variety of credits that projects can pursue to earn points. The number of points the project earns determines its level of LEED certification.

- **Integrative Process** requirements, while not a credit category, promote reaching across disciplines to incorporate diverse team members during the pre-design period.
- **Location and transportation** credits reward projects within relatively dense areas, near diverse uses, with access to a variety of transportation options, or on sites with development constraints.
- **Materials and Resources** credits encourage using sustainable building materials and reducing waste. Indoor environmental quality credits promote better indoor air quality and access to daylight and views.
- **Water efficiency** credits promote smarter use of water, inside and out, to reduce potable water consumption.
- **Energy and atmosphere** credits promote better building energy performance through innovative strategies.
- **Sustainable sites** credits encourage strategies that minimize the impact on ecosystems and water resources.
- **Indoor environmental quality** credits promote better indoor air quality and access to daylight and views.
- **Innovation** credits address sustainable building expertise as well as design measures not covered under the five LEED credit categories.
- **Regional priority credits** address regional environmental priorities for buildings in different geographic regions.
- LEED for Neighborhood Development additional credit categories
  - **Smart location and linkage** credits promote walkable neighborhoods with efficient transportation options and open space.
  - **Neighborhood pattern and design** credits emphasize compact, walkable, vibrant, mixed-use neighborhoods with good connections to nearby communities.
  - **Green infrastructure and buildings** credits reduce the environmental consequences of the construction and operation of buildings and infrastructure.

The number of points a project earns determines the level of LEED certification. There are four levels of certification - the number of points a project earns determines the level of LEED certification that the project will receive. Typical certification thresholds are:
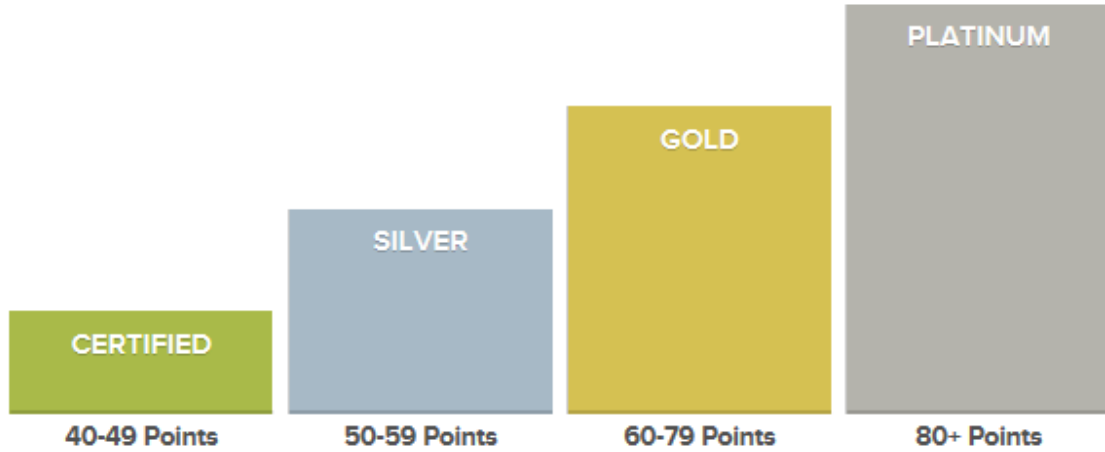
There are many aspects to new building construction or renovation that can earn LEED credits. Many of these are out of scope for Symmetry or the security system such as location of the project, community interaction, green power generation and use, waste management, water management, etc. Areas where Symmetry can support point totals:

1. Reduction in power usage (up to 20 points)

Table 1: Points for percentage improvement in energy performance

New Construction	Major Renovation	Core and Shell	Points (except Schools, Healthcare)	Points Healthcare	Points Schools
6%	4%	3%	1	3	1
8%	6%	5%	2	4	2
10%	8%	7%	3	5	3
12%	10%	9%	4	6	4
14%	12%	11%	5	7	5
16%	14%	13%	6	8	6
18%	16%	15%	7	9	7
20%	18%	17%	8	10	8
22%	20%	19%	9	11	9
24%	22%	21%	10	12	10
26%	24%	23%	11	13	11
29%	27%	26%	12	14	12
32%	30%	29%	13	15	13
35%	33%	32%	14	16	14
38%	36%	35%	15	17	15
42%	40%	39%	16	18	16
46%	44%	43%	17	19	-
50%	48%	47%	18	20	-

2. Building life-cycle impact reduction (up to 5 points)

3. Building product disclosure and optimization (up to 6 points)

4. Thermal comfort (1 point)

5. Acoustic performance (1 point)

6. Innovation (up to 5 points)

7. Integrative process (1 point)

Additionally, several categories such as LEED for Neighborhood Development location and Sensitive land protection call out for buildings to be in areas with existing infrastructure and to provide opportunities for walking and healthy activities. Symmetry offers unified video surveillance providing a safer environment for building workers and patrons. Using Symmetry Video, it is possible to match every event which takes place within the building environment with a relevant video clip.