# Energy Security Interface

Red Crater's Energy Security Interface (ESI) utilizes physical security to provide intelligent control of lighting and air-conditioning for optimal energy efficiency.

ESI is a software system which uses the Gallagher Command Centre security platform and attached security devices to monitor security status of rooms and intrusion zones, then intelligently instructs the building management system (BMS) to control air-conditioning and lighting. It uses motion sensors to detect actual room occupancy, security switches for contraindications (such as doors being left open) and intrusion zones to determine arming status as input parameters for its energy control algorithm. It also comes with a SQL Server database which allows lighting and air-conditioning to be controlled via booking schedules to support preparatory room heating and lighting.

ESI will interface to any building management system which supports the BACnet control protocol. However, if there is no building management system, or the building management system does not control all of the lighting and air conditioning appliances, the ESI Solution can control lighting and air conditioning directly through power control relays.

Significant savings on electricity costs can be achieved with the added benefit of improved awareness among personnel of practical initiatives to reduce their electricity consumption and impact on the environment. For example, this solution has saved St Peter's School 50% on their air-conditioning costs with return on investment in only 14 months whilst also raising environment awareness of staff and pupils.

## How it works

ESI automatically turns lighting and air conditioning on and off based on whether rooms are scheduled to be used, or whether the rooms are actually occupied. It uses a variety of control methods ranging from simple schedule-only control to a combination of scheduled, occupation detection, manual override and intrusion zone controlled.

| Control Method | How it works |
| --- | --- |
| Scheduled Control | The Scheduled Control method uses either the built-in SQL Server database or an external database to determine when rooms are to be used, and turns the air-conditioning and lighting on and off accordingly. |
| | This provides people who are using stand alone air-conditioners much more sophisticated control of when units operate, well beyond that which is possible through the air-conditioners' own built-in timers. It also offers people who are using ducted systems more schedule control than they currently have available. |
| | The Scheduled Control method easily accommodates non-contiguous use (which is common in teaching environments), unusual usage patterns, as well as one off changes (such as weekend use of a facility). |
| Manual Override | This provides users with the ability to manually override the lighting and air-conditioning in their particular room through a easy to use desktop application. For example, if the air-conditioning has automatically come on but a user wants it turned off, this application gives a user the ability to do this through a one click operation. |

| Control Method | How it works |
|---|---|
| **Occupancy Control** | When Scheduled Control is not currently active (e.g. after hours), then Occupancy Control will automatically control lighting and air-conditioning in rooms.<br><br>It uses door and motion detectors to determine when someone is present in a room and turns the air-conditioning and lighting on accordingly.  It will also determine when a room is empty and turn the air-conditioners and lighting off automatically. |
| **Deactivate on Arming** | When intrusion zones are armed it normally indicates that everyone is out of a room and that its use is no longer required.  The ESI system uses arming to trigger turning off the air conditioners and lighting so these are not left on unnecessarily. |

## Example situations where the ESI Solution is suitable

Red Crater's ESI Solution is a very flexible system that has wide applicability to control air-conditioning and lighting, therefore reducing electricity consumption.  The following is a list of just some example situations where the ESI is suitable.

**Education Facilities—Schools, Colleges, Universities**

Rooms in education facilities provide an ideal environment for the ESI to regulate air-conditioning and make electricity savings.  Rooms are often in use only some of the time, in which cases the system regulates the lighting, heating and cooling to only when it is needed.

Given students enter and exit rooms frequently there is an inherent risk that doors will be left open which will mitigate a room's heating/cooling.  ESI monitors for this situation and when it determines a door has been left open, it turns off the air-conditioning and lighting to conserve power.  Conversely, when air-conditioners are scheduled to be off ESI's Occupancy Control is smart enough to determine when people have only temporarily entered a room (e.g. to get something from a desk).  It turns the lights on but leaves the air-conditioners off both to conserve power but also to prevent the air-conditioner going through an unnecessary on/off cycle.

**Accommodation Blocks**

Many high intensity work sites (such as mines and construction) have onsite accommodation blocks to house staff and contractors.  Similarly educational facilities, military camps and homes for the elderly also house large numbers of people in accommodation blocks.

People in these environments want to keep the temperature at a pleasant level, in particular when the accommodation units are exposed to extremes of temperature outside.  However, to ensure a pleasant temperature is maintained residents often leave the air-conditioners on when they are not in the accommodation block so that they can enjoy the correct temperature once they return.

This is an extremely wasteful practice which can easily be mitigated through the ESI's Scheduling function.  This can be linked to a schedule so that heating/cooling automatically commences prior to the person occupying the room so at the time they return to their accommodation their room will be at the correct ambient temperature.

**Small Office Blocks and Retail**

It is common for office blocks and retail stores to be fitted with stand-alone air-conditioners rather than a ducted air-conditioning system. However, these systems generally only have simple time control and no form of occupancy detection.

The ESI Solution provides the inherent benefits of the time based control features previously only available with large ducted air conditioning systems, but does so more cost effectively. This means employees arrive at work to a pleasant ambient temperature but have assurance that the air-conditioning and lighting will turn off as scheduled at the end of the day, thereby avoiding the risk of inefficient after hour operation. Furthermore, if more sophisticated air-conditioning control is desired then alarm based, occupancy detection and manual override options can also be implemented.

**Corporate Buildings**

Most corporate buildings will have some form of building management system as part of their air-conditioning system. While these system are generally very good at maintaining temperature in an efficient way, very few of these will control whether air-conditioning should be on or off based on whether rooms are actually occupied. For rooms which are used infrequently such as board rooms and meeting rooms this constitutes a huge opportunity for energy saving through turning air-conditioning off when not needed. Furthermore, most building management systems either are not set up to control lighting, and if they do it is controlled poorly (e.g. the lighting comes on only well after a person has entered a space).

Red Crater's ESI Solution addresses both of this situations. Firstly, the security devices can be used to determine when rooms are actually in use and automatically turn the air-conditioning and lighting on or off accordingly. Conversely, any room booking system can be linked to the ESI's SQL database to automatically control air-conditioning and lighting in those rooms.

## System Components

The following components are required for the Energy Security Interface Solution.

| Red Crater Software Solutions | Description |
|---|---|
| **ESI Server** | This is a Windows Service which monitors room activity and scheduled occupancy, and controls air-conditioning devices accordingly. |
| **ESI Desktop Application** | This is a Windows application which allows computer users to override automatic control of air conditioners on a per room basis. |
|  |  |

| Gallagher Security Platform | Description |
|---|---|
| **Gallagher Command Centre** | The Windows based control software used for managing the Command Centre hardware. The ESI Server communicates with the Command Centre Server using the OPC Data Protocol. |
| **Controller 3000 and 6000** | The controllers provide the Digital Inputs and Outputs required to monitor motion detectors and interface to Relay Power Control (if required). |
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## System Components contd.

| Other Components | Description |
|---|---|
| **Relay Power Control**<br><br>**(Required if using power control rather than a Building Management System)** | A Solid State Relay is recommended.  This should have a control voltage of 40VDC, and a circuit voltage and amperage to meet the requirements of the air-conditioners in a room. |
| **Motion Detectors**<br><br>**(Optional)** | 'Standard' Security Passive Infrared Detectors (PIRs) are suitable for this purpose.  While security PIRs are normally intended to prevent false activation and are therefore not suitable for room control applications, the ESI Server occupancy detection algorithm is designed to work with these detectors. |
| **Door Reed Switch**<br><br>**(Optional)** | A standard Magnetic Reed Switch fitted to the door is suitable for the ESI application. |

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