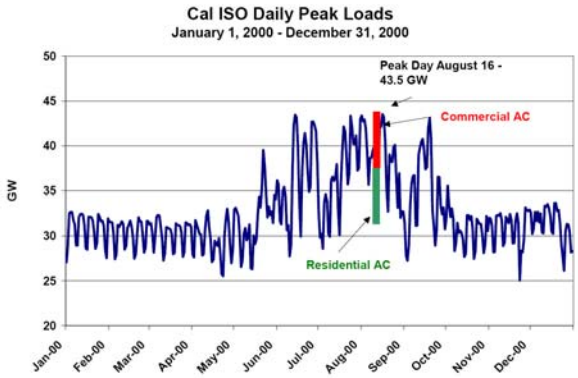
# Demand Response Integrated Feedback Technique (DRIFT™)

- **Large load reduction**
- **Easy to install**
- **Thermal comfort control**
- **Low-cost**

**Description:**

Federspiel Controls has developed the Federspiel Advanced Control System (FACS™), which is a web-based, wireless, supervisory control system for commercial building HVAC systems. FACS includes a suite of control applications for large HVAC systems.

DRIFT is the FACS application for automatically shedding HVAC system electric load in response to a signal from a demand response server. As the figure below shows, HVAC is a major contributor to summertime electrical grid congestion. DRIFT can be integrated with other FACS applications so that the system saves energy when a demand response event is not in effect, and sheds additional load when an event is in effect.




Federspiel Controls has a patent pending for DRIFT.

**Benefits:**

DRIFT has the following benefits:

1. same load shedding as a global zone temperature setpoint setup
2. minimal business interruption during install
3. closed-loop control of thermal comfort during a demand response event
4. low installed cost

A recent study with LBNL demonstrated that DRIFT can shed 1.5 Watts per design CFM of supply air on a design day in a hot climate such as Sacramento.

DRIFT installations are so non-intrusive that they can be performed while the building occupants work. The installation of each sensor takes just five to ten minutes.

Reducing the fan speed causes zone temperatures to drift or float upward. The amount that zone temperatures drift is controlled by the operator and by a feedback loop that uses readings from the wireless zone temperature sensors. In this way, savings from DRIFT are achieved without compromising thermal comfort.

The following table compares the benefits of DRIFT to conventional demand response actions for HVAC systems.

**Comparison of Benefits**

| | Global Setpoint Setup | Fan speed limit or duty cycling | DRIFT |
|---|---|---|---|
| Large load reduction | ✓ | | ✓ |
| Thermal comfort control | ✓ | | ✓ |
| Zone-level DDC not necessary | | ✓ | ✓ |
| Low cost | | ✓ | ✓ |

**Requirements:**

DRIFT is applicable to all large HVAC systems. It can be applied to variable air volume or constant volume HVAC systems. The systems can be single-duct reheat, dual-duct, or multi-zone systems. It is compatible with systems that have pneumatic controls, legacy digital controls, or modern direct digital controls (DDC). We can integrate a FACS system with your DDC system via BACnet, Modbus, or XML/SOAP.

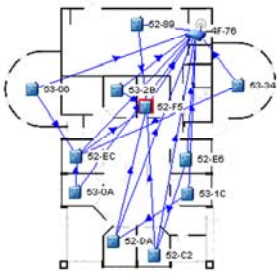
**How it works:**

DRIFT is integrated with other FACS energy efficiency applications. When there is no demand response event under way, the system executes its energy efficiency application. When a demand response event is initiated, FACS stops executing the energy efficiency application and starts executing DRIFT. DRIFT reduces HVAC system fan speeds until the highest zone temperature measured by a wireless temperature sensor is close to a high-temperature

setpoint. The setpoints can be different from zone to zone, and they can be determined by DRIFT automatically or specified by the operator using the web interface of FACS. Reducing fan speeds reduces the energy consumed by those fans, and reduces the amount of air cooled by the chiller. After the demand response event ends, FACS stops executing DRIFT and resumes executing its energy efficiency application.

The figure to the right shows an installation of a wireless sensor module used to measure zone temperature. The sensor module is attached to a standard wall plate.

Each wireless sensor has a transceiver that supports self-configuring, seal-healing mesh networking as shown in the figure to the right. The network has numerous features for security and reliability including 128-bit encryption, authentication, frequency hopping, and N+1 path redundancy.



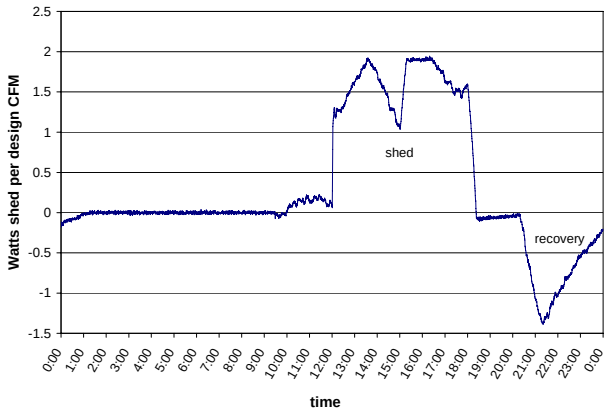

**Scoping study:**

Federspiel Controls worked with Lawrence Berkeley National Laboratory's Demand Response Research Center to study the load shedding capabilities of DRIFT. The study involved the following tasks:

1. Development of client software for the Demand Response Automation Server (DRAS) used for the AutoDR programs in California
2. Testing DRIFT using a real-time computer simulation of the thermal behavior of a whole building.

The following figure shows the load shed by DRIFT on the design day in Sacramento. DRIFT was configured to allow the highest zone temperature to drift up to 76 degF when the DRAS server switched into a medium-price mode, and 79 degF when the DRAS server switched into a high-price mode.

The scoping study also demonstrated that DRIFT can have a significant positive impact on utility costs. For a HVAC system that delivers 1.5 CFM/sf, DRIFT can reduce electric energy costs by as much as




**$0.095/sf/yr**. The savings from any particular installation will depend on the amount that temperatures are allowed to drift, the design of the HVAC system, and the number and duration of load shedding events.