SEDAC

THE DEMAND SIDE OF SMART AUTOMATION

Brian Deal | Associate Professor Urban and Regional Planning |

Director, Smart Energy Design Assistance Center

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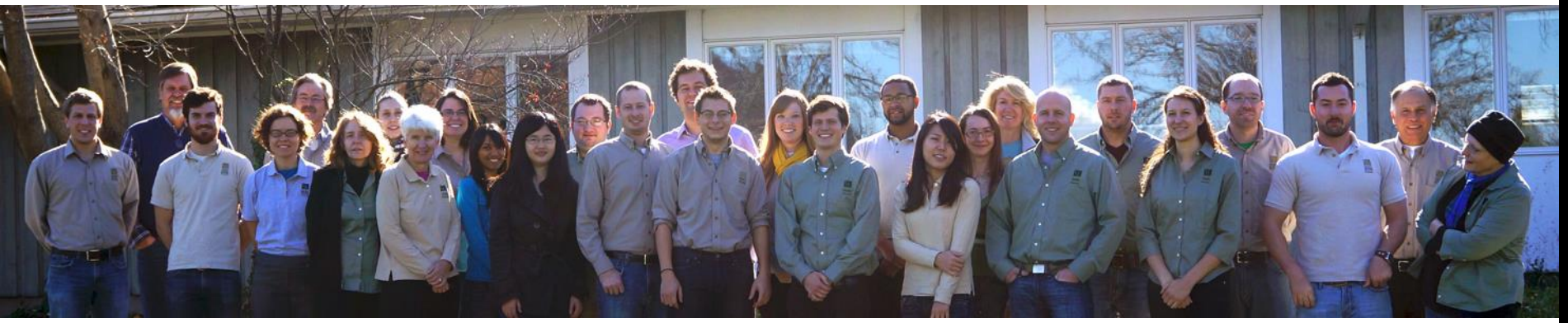


A Public/Private Partnership

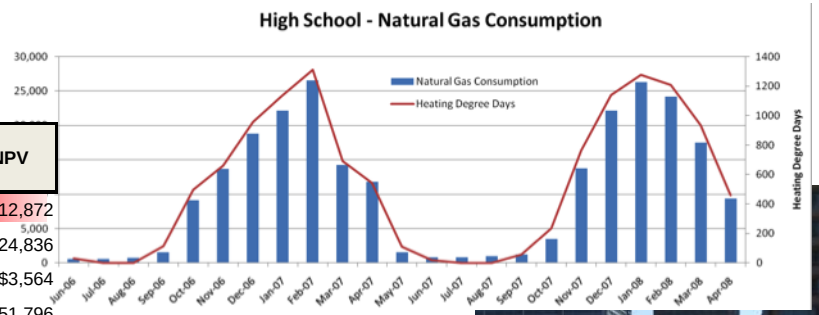
- University of Illinois
  students, staff, faculty
- IL DCEO

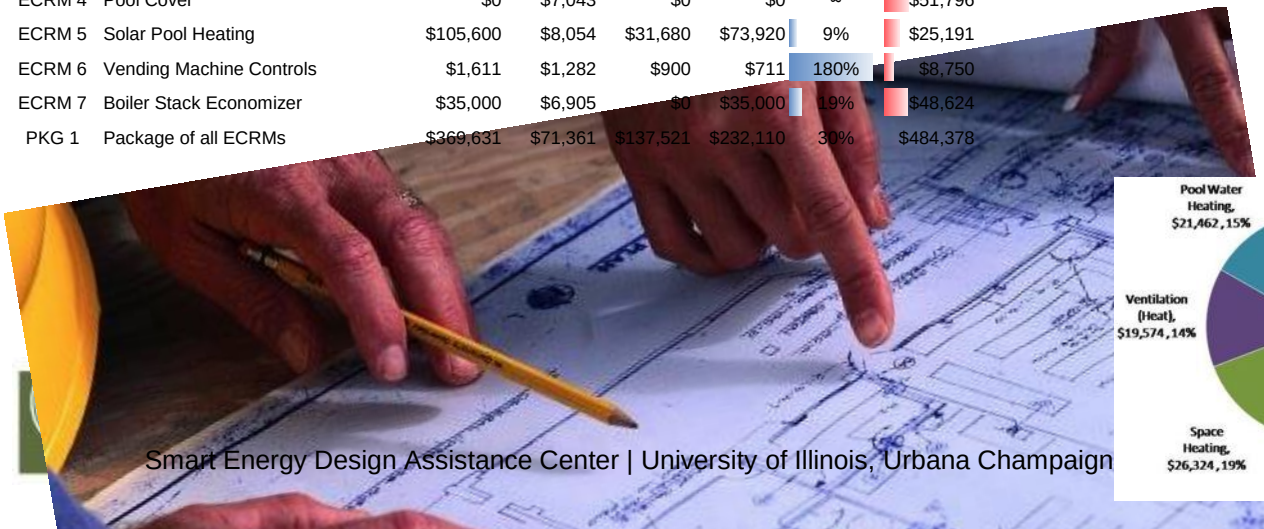
WHAT WE DO

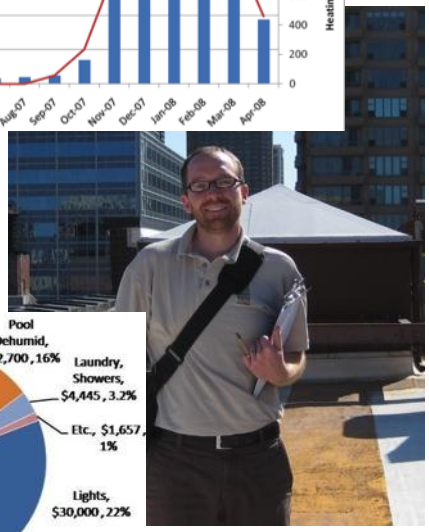
Our Mission:

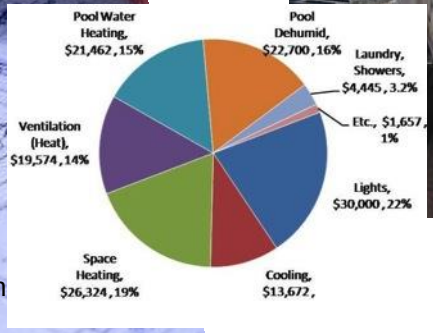
- To help reduce the energy footprint of the state of Illinois

Energy Cost Reduction Measures (ECRM)		Additional First Cost	Annual Savings	Rebates	Final Cost	IRR	NPV
ECRM 1	Super T8 and Reflector Retrofit	$190,000	$41,249	$95,000	$95,000	42%	$212,872
ECRM 2	Gym Metal Halide to T8 Retrofit	$25,420	$5,667	$7,741	$17,679	30%	$24,836
ECRM 3	LED Exit Signs	$12,000	$1,754	$2,200	$9,800	12%	$3,564
ECRM 4	Pool Cover	$0	$7,043	$0	$0	∞	$51,796
ECRM 5	Solar Pool Heating	$105,600	$8,054	$31,680	$73,920	9%	$25,191
ECRM 6	Vending Machine Controls	$1,611	$1,282	$900	$711	180%	$8,750
ECRM 7	Boiler Stack Economizer	$35,000	$6,905	$0	$35,000	19%	$48,624
PKG 1	Package of all ECRMs	$369,631	$71,361	$137,521	$232,110	30%	$484,378









WHAT WE DO

Outreach / Training

- Students, Internships

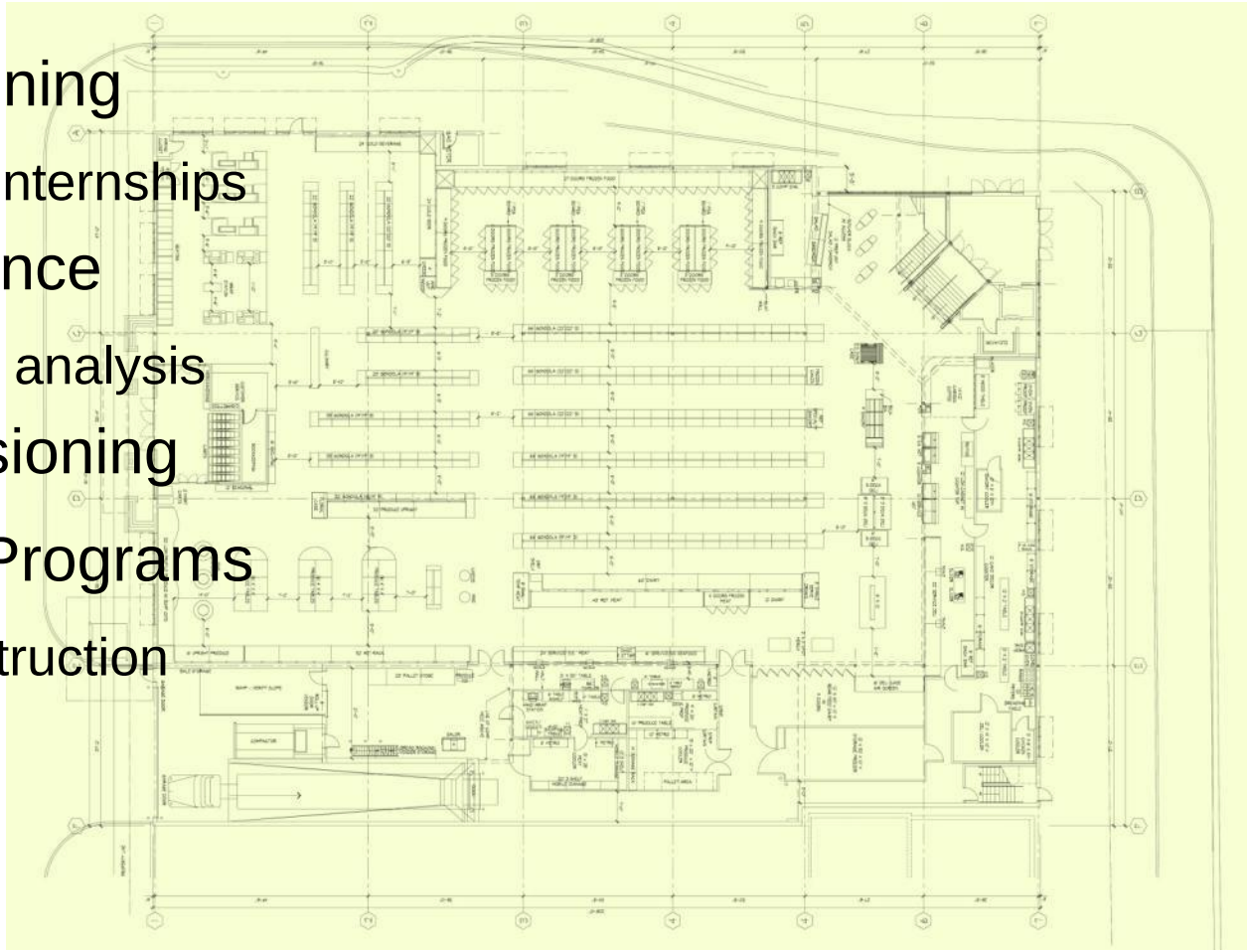
Design Assistance

- Audits and analysis

Retro-commissioning

Other Energy Programs

- New Construction



WHAT WE HAVE DONE

To date

- 1,287 anlysis reports
- Covering 128 million sf
- $50.9 M total potential annual savings identified
  - $10.2 M implemented annual cost savings
- 367,461,908 estimated annual potential kWh savings
  - 81,896,522 implemented annual kWh savings
- 18,690,251 estimated annual potential therms savings
  - 2,775,686 implemented annual therms savings

SMART BUILDING INFORMATION

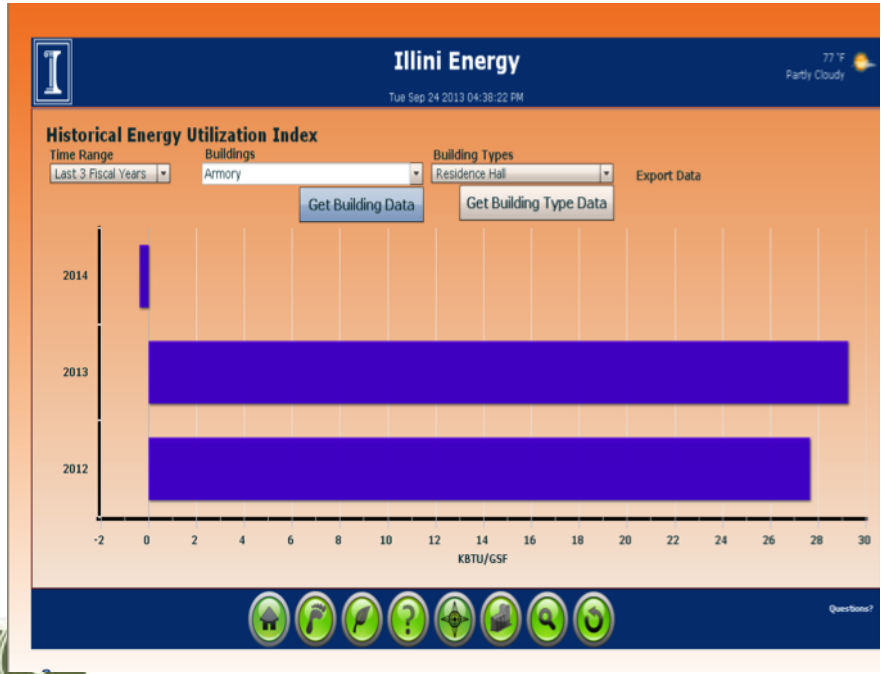
- Feedback is critical to smart grid systems
- Smart grids require equally smart buildings
- Smart buildings and smart building information systems
  - Building automation systems BAS

CURRENT BAS LIMITATIONS

- Inaccessible and costly
  - Complex - out of normal range of knowledge
  - Unreadable data in different forms and sources
  - Lacking user-friendly Interface
  - Existing systems are too large in scale—and too expensive
    - Inaccessible to small or moderately sized buildings
    - Predominant building type in US
  - Needs expert to maintain, repair and integrate new components
    - Adding to the cost problem

ENERGY DASHBOARD APPROACH

One way to synthesize complex BAS data sets to provide useful and useable information



ANOTHER APPROACH

Separate, highly efficient furnaces
Each zone has its own thermostat:

- Staff has control over their zone
- Some public zones have wireless remote sensors

SIMPLE CONTROL

With a smartphone the building maintenance person can:

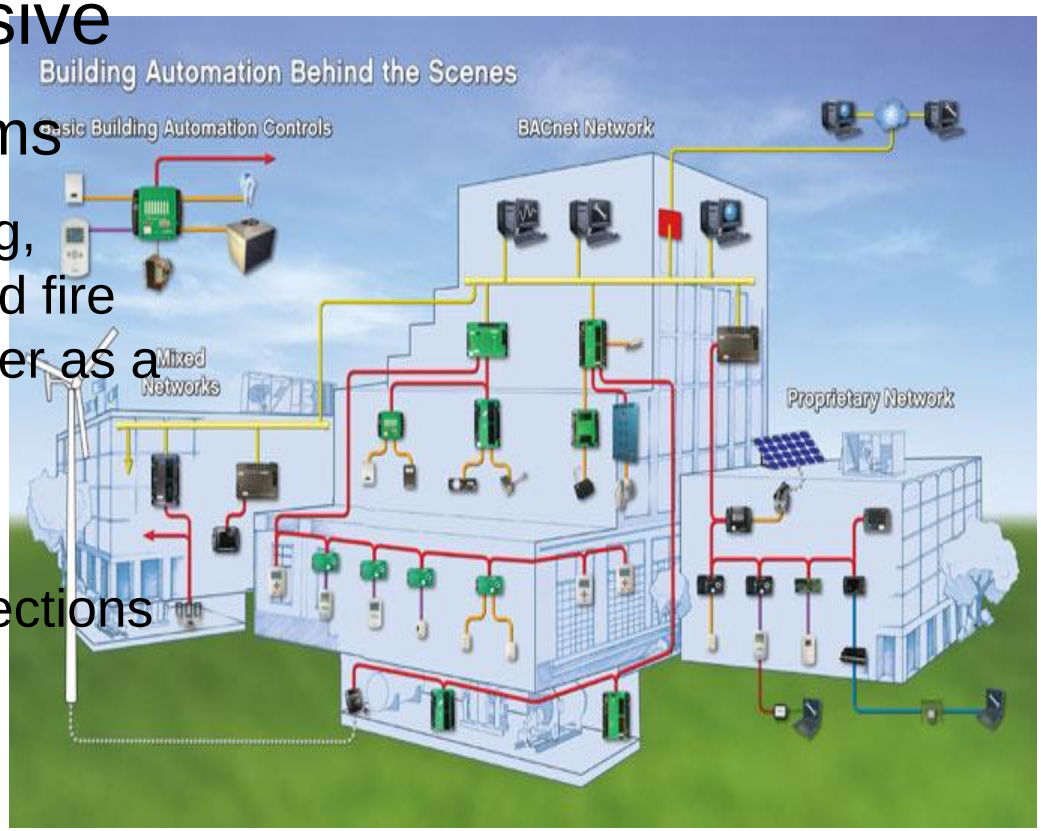
- see all 10 zones on one screen
- review temperature setpoints (user adjustable)
- change the setback schedules
- review the fan schedules (on, auto, scheduled)

DRAWBACKS

- No trend data
  - (future software improvement?)
- No detailed data
  - CFM, etc.
- Ventilation economizer and CO2 controls require separate control hardware
- Etc.

IDEAL BAS SYSTEMS

- Simple and Inexpensive
- Integrate building systems
  - HVAC equipment, lighting, security management and fire protection to work together as a cohesive unit.
- Accessible
  - control by wireless connections
- Display real-time data
  - Anomalies



NET ZERO REQUIRES IT

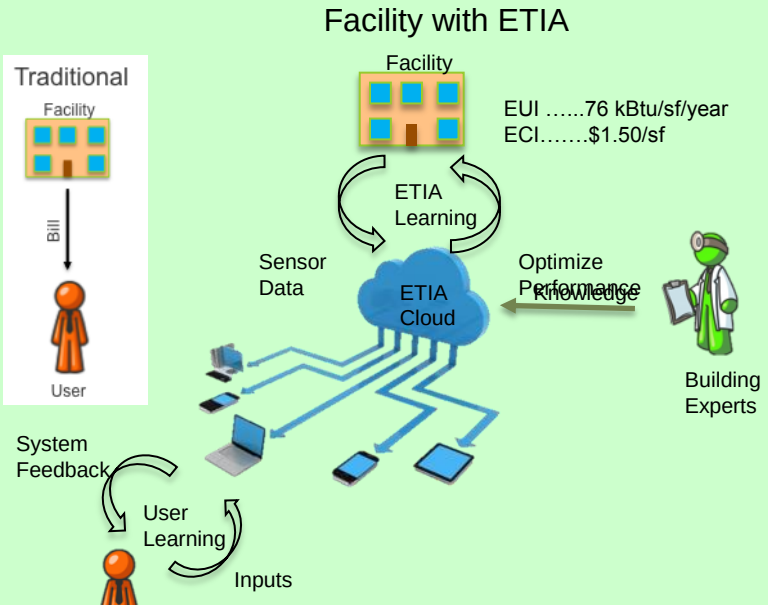
SMART DISTRIBUTION SYSTEMS REQUIRE A NEW APPROACH

Simple, noninvasive feedback for improved decision-making

- Continuous learning and dynamic optimization

Evolves across 3 stages

- 1. interactive system that recommends Energy Cost Reduction Measures (ECRMs) and guides their implementation;
  - empower building owners/operators to do energy self-assessment and take advantage of available local, state, or national incentives
- 2. A replication engine
  - guidance on the installation of sensors and controls, and recording and playback of daily manual optimization of controls across a full seasonal lifecycle.
- 3. Automatic (AI-based) optimization engine that learns and improves season-to-season.



Building Scenarios	EUI*
Traditional	100
Building w/ BAS	95
Building w/ BAS + Commissioned	87
Building w/ ETIA	76

*EUI = Energy Use Intensity (kBtu/sf/year)