The following case studies are compiled from top performing projects as identified through data shared by participating Chicago offices. These are projects which were in design during 2012 and meet or come close to meeting the 2030 target of 60% reduction from average as determined by either preliminary energy target or advanced energy modeling.
The Tower at PNC Plaza

Location: Pittsburgh, PA
Project Scope: Whole Building
Completion Date: 2015
Size: 32 Stories, 800,000 GSF
Space Types: Retail space, business center, data center, auditorium and cafeteria
pEUI: 33 kBtu/sf/yr
Regional Site EUI (baseline): 89 kBtu/sf/yr
Energy Modelling: Yes, IES <VE>
Will Actual Energy Use Data be Collected: Yes

Notable Features:
- The use of natural ventilation and day lighting in conjunction with high efficiency mechanical systems
- Internally and externally ventilated double skin facade
- Solar chimney
- Lower U-value assembles of the building envelope
- Active blinds and permanent shading in the DSF cavity
- Daylight dimming control for the office zones
- Reduced LPD
- Five story tall sky garden

Lessons Learned:
- Importance of a dynamically linked Air Flow Network when simulating natural ventilation
- Impact of an automated double skin façade
- Interaction between radiant systems and façade components

Contact:
For more info about this project email:
Matthew Herman at Buro Happold
Matthew.Herman@burohappold.com

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Grace Farms

Location: New Canaan, CT
Project Scope: Whole Building
Completion Date: Ongoing
Size: 1 Story, 65,000 GSF
Space Types: Classrooms, a library, dining room, offices, gymnasium and worship space
pEUI: 49 kBtu/sf/yr
Regional Site EUI (baseline): 121 kBtu/sf/yr
Energy Modelling: Yes, IES <VE>
Will Actual Energy Use Data be Collected: Yes

Notable Features:
- Geothermal and VRV system for heating and cooling
- Under-floor air distribution (select areas)
- High-performance thermal envelope
- High-performance interior LED lighting fixtures
- High-performance exterior LED lighting fixtures
- Energy Recovery Ventilation (ERV)
- Demand Controlled Ventilation (DCV)
- Extensive Overhangs/Shading

Lessons Learned:
- Benefit of geothermal systems on energy consumption
- Importance of the roof insulation and assembly
- Benefit of shaded glass when using radiant systems

Contact:
For more info about this project email: Matthew Herman at Buro Happold
Matthew.Herman@BuroHappold.com

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Tozzer Library

Location: Cambridge, MA
Project Scope: Whole Building
Completion Date: 2014
Size: 4 Stories, 34,459 GSF
Space Types: Offices, Library, Storages
pEUI: 38 kBtu/sf/yr
Regional Site EUI (baseline): 109 kBtu/sf/yr
Energy Modelling: Yes, IES <VE>
Will Actual Energy Use Data be Collected: Yes

Notable Features:
- High-performance external glazing (U-Value and SHGC)
- Daylight dimming control system
- Energy recovery ventilation (ERV)
- Active chilled beam
- High performance lighting fixtures
- Combined heat and power (CHP)
- Extremely efficient central heating and cooling plant

Lessons Learned:
- Role of the campus central plant in achieving CO2 reductions.

Contact:
For more info about this project email:
Matthew Herman at Buro Happold
Matthew.Herman@BuroHappold.com
Click here for more about the AIA 2030 Commitment
Chiaravalle Montessori School

Location: Evanston, Illinois
Project Scope: Addition
Completion Date: 2015
Size: 4 Stories, 19,000 GSF
Space Types: 100% Education K-12
Design Energy Code: ASHRAE 90.1-2010
Target pEUI: 19 kBtu/ sf/yr
Regional Site EUI (baseline): 72 kBtu/ sf/yr
Energy Modeling: eQuest
Will Actual Energy Use Data be Collected: Yes

Notable Features:
- Mechanical efficiency via ground-source heat pump with dedicated outside air
- On-site photovoltaic system to offset 5+% of the building's energy consumption
- LEED Platinum Target

Lessons Learned:
- Chiaravalle administration, teachers and parents have a deep commitment to sustainability, which we documented in a workshop early in the project
- Incentives for energy efficiency and on-site renewable energy helped the school plan to offset upfront capital premiums in favor of long-term operating benefits.
- From the earliest parts of the project, the team agreed that the high-performance building and its design and construction process will offer important learning opportunities for Chiaravalle students.

Contact:
For more info about this project email: Teri Wright, AIA at Cannon Design
twright@cannondesign.com

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Slotnick Residence

Location: Glencoe, Illinois
Project Scope: Whole Building
Completion Date: 2011
Size: 2 Stories, 5550 GSF
Space Types: 100% Single Family Residential
Design Energy Code: IRC 2009
pEUI: 23 kBtu/sf/yr
Regional Site EUI (baseline): 50 kBtu/sf/yr
Energy Modelling: Yes, HEED
Will Actual Energy Use Data be Collected: No

Notable Features:
- Designing the home into two south facing masses which allowed for a green roof in the space between.
- Integrated roof design for passive solar gain in the winter, self shading in the summer, optimized angles for solar thermal (winter) and PV's (summer), and water collection.
- Classic vernacular design updated for high performance.

Lessons Learned:
- Simple and free energy modeling program was able to accurately model design at early stages.
- Many local zoning/building ordiances need to be updated for sustainable design.
- High performance home can be built at 'market rate' levels by reviewing the cost/benefit's of the major systems early in the process.

Contact:
For more info about this project email:
Nathan Kipnis at Kipnis Architecture + Planning
nkipnis@kipnisarch.com
Click here for more about the AIA 2030 Commitment
College of Lake County
Science & Engineering Building

Location: Grayslake, IL
Project Scope: Whole Building
Completion Date: 2015
Size: 3 Stories, 42,400 GSF
Space Types: 100% Higher Education/Science Building
Design Energy Code: California Title 24-2008
pEUI: 88 kBtu/sf/yr
Regional Site EUI (baseline): 262 kBtu/sf/yr
Energy Modelling: Yes, Trace 700
Will Actual Energy Use Data be Collected: Yes

Notable Features:
- LEED-NC 2009 Platinum certification (pending)
- 50% more energy-efficient over conventional science building
- 47 geothermal wells, 500 feet deep, tied to campus-wide geothermal field
- 187 roof-mounted photovoltaic panels providing 5% of building energy needs
- Highly energy-efficient fume hoods w/ seasonally adjusted air re-circulation
- All LED light fixtures
- Daylight harvesting system
- Gray water purification system integrated with the building plumbing system
- 20,000 gallon internal rain water harvesting tank
- "Live wall" indoor feature
- Green (vegetated) roof

Lessons Learned:
- Sustainable strategies defined at the very onset of the project help save time and money
- Holistic integration and coordination of highly energy-efficient building systems reduces construction costs, as well as the future cost of building operation and maintenance

Contact:
For more info about this project email:
Vuk Vujovic at Legat Architects
vvujovic@legat.com

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Kanfer Residence

Location: Chautauqua, NY
Project Scope: New Building
Completion Date: 2013
Size: 3 Stories, 14,855 GSF
Space Types: 100% Residential
pEUI: 19 kBu/sf/yr
Regional Site EUI (baseline): 50 kBu/sf/yr
Energy Modelling: Yes, Trace/HERS
Will Actual Energy Use Data be Collected: Yes

Notable Features:
- Solar responsive design priorities
- Passive cooling through natural ventilation
- Carefully designed for daylighting
- Smart building envelope: r-70 roof, r-60 walls, r-8 windows
- Smart mechanical system including radiant floor and HRV
- On-site renewable energy through PV

Lessons Learned:
- Client education results in effective collaboration
- Natural ventilation is a solid strategy but difficult to measure
- Energy and LEED reviews required at every stage of design
- The better the orientation and envelop, the simpler the HVAC

Contact:
For more info about this project email:
Marty Serena at Serena Sturm Architects, Ltd.
mserena@serenasturm.com
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**Notable Features:**
- Adaptive reuse of existing small house combined with a new high performance addition.
- Passive solar gain and control through south facing glazing, stack induced cross ventilation.
- On-site renewable energy through PV and SHW.
- The incorporation of the south facing, passive solar hallway contributed approximately 10% energy savings to the overall energy portfolio.
- A combination of r-6 windows on the south, and r-9 windows on the north, east and west, contributed to the low peui.

**Lessons Learned:**
- The incorporation of the south facing, passive solar hallway contributed approximately 10% energy savings to the overall energy portfolio.
- A combination of r-6 windows on the south, and r-9 windows on the north, east and west, contributed to the low peui.

**Contact:**
For more info about this project email: Marty Serena at Serena Sturm Architects, Ltd. mserena@serenasturm.com

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**Notable Features:**
- Major energy saver: No AC systems installed
- Thermal comfort is largely facilitated by passive ventilation (trickle vents integrated in the curtainwall)
- 50% vision glazing provides daylight, views and reduces artificial lighting

**Lessons Learned:**
- Critical that a Natural Ventilation Thermal Comfort study was conducted at project inception to validate the use of natural ventilation to cool the building in lieu of installing mechanical cooling systems
- With high percentage vision glazing and no mechanical cooling systems strategies to mitigate unwanted solar gain are critical: exterior shading, low SHGC and spectrally selective glazing were pursued
- Engaging owner early to get full buy-in crucial

**Contact:**
For more info about this project email: Mike Stopka at Solomon Cordwell Buenz
mike.stopka@scb.com
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