



# Why Deep Energy Retrofits are Important

BY DEBORAH R. HUSO

**L**ooking to increase energy efficiency and boost your bottom line? Skip the low-hanging fruit and take a hard look at optimizing your building's full energy efficiency (and even generation) potential.

Traditional energy efficient design frequently follows the path of least resistance or considers projects piecemeal – one contractor installs a high-efficiency HVAC system and another

puts in some energy efficient lighting, for example. Yet neither considers the impacts of one energy efficiency upgrade on the other, creating silos that fail to maximize building efficiency.

If you want to have a deep impact on the environment, maximize your company's investment in efficiency upgrades and establish significant company savings (and perhaps even income generation), you need to look at the whole building and analyse the structure as a complete system.

This is what we call a *Deep Energy Retrofit* – where you not only optimize a structure's capacity for energy efficiency, but also consider ways to convert waste energy into capital for asset renewal. Established three decades ago, the Deep Energy Retrofit model eschews traditional engineering in favour of cost optimization when it comes to energy efficiency upgrades.

The Rocky Mountain Institute, a key promoter of Deep



Energy Retrofit models – as well as Integrated Project Delivery (IPD) – describes the value of this model as “a whole building analysis and construction process that achieves much larger energy cost savings than a simpler energy retrofit.” The institute, in fact, has a guide devoted to helping commercial building owners, operators and investors understand the net present value of Deep Energy Retrofits.

### Integrated Energy Performance Contracting

Before you launch head-long into a Deep Energy Retrofit, however, make sure you hire a consulting firm that can provide solid Integrated Energy Performance Contracting (IEPC). With IEPC, you can establish your building’s complete energy profile, and make sure any and all energy efficiency improvements work hand in glove. You can take into account the interrelationships of all systems, from the building envelope to the age and performance of existing equipment, while also considering the range of subsidies and incentives available for equipment upgrades. The result of such a deep analysis and subsequent retrofit is maximization of efficiency *and* your company’s investment.

The Quebec City-based firm Ecosystem coined the term “Integrated Energy Performance Contracting” services, and was the first firm in Canada to formalize this “whole building” approach to project design and delivery. Through IEPC, Ecosystem contractually guarantees clients the total project cost and energy savings. Additionally, IEPC allows for almost immediate energy savings, according to Joseph Clark, energy solutions executive at Ecosystem.

“You’ll see savings in an eight to 12-month period as op-

posed to six to 10 years,” he said.

Among the early adopters of IEPC in Quebec have been schools and hospitals. In fact, within the education sector alone, the concept has helped result in nearly \$1.5 billion in cumulative savings to taxpayers over the last two decades, according to 2013 / 2014 data from the Quebec Education System.

A Deep Energy Retrofit assumes a fully-integrated project involving both financial considerations (namely the cost savings to be gained) and mechanical engineering to best accommodate the client’s goals when it comes to lowering energy costs, reducing carbon footprint and establishing asset renewal.

### Biodôme – Space For Life

Among the Deep Energy Retrofit projects Ecosystem has led is that of Montreal’s Biodôme-Space for Life. Given the Biodôme is home to more than 600 species of flora and fauna, representing five different ecosystems in the Americas, it has unique and challenging climatic needs. Those needs include having a heated rainforest year-round as well as four other ecosystems – two polar regions among them – which also required year-round cooling.

Ecosystem came up with a retrofit plan that prevented the Biodôme from having to heat and cool simultaneously, and reduced the facility’s energy bills by 52 per cent. Today, the Biodôme has a heat recovery system that draws heat from areas of the building that need cooling and redirects it to the tropical rainforest. Ecosystem also installed a geothermal heating and cooling system that redirects excess heat from the building into the underlying water table in summer, and then

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Biodôme-Space for Life in Montreal, QC.

reuses that heat for warming the building in winter.

Meanwhile the Space for Life's Insectarium has been certified LEED Silver by the Canada Green Building Council while the Biodôme received the 2015 Association of Energy Engineers (AAE) International Energy Project of the Year award, as well as the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) 2013 Technology Award.

With a \$9.6 million investment and \$1.6 million in guaranteed incentives, the Space for Life, which includes the Biodôme, Insectarium and Jardin Botaniques actually exceeded its \$1.3 million goal of guaranteed annual savings by 139 per cent, and reduced greenhouse gas emissions by 80 per cent.

**Lakeridge Health**

In the healthcare sector, Ecosystem has assisted a number of hospitals in both Canada and the U.S. in performing Deep Energy Retrofits. Among them is Lakeridge Health who hired Ecosystem to increase energy efficiency, renew assets and improve the patient experience at all four of its Ontario hospitals through 29 different measures fully funded by incentives and energy savings.

One of Lakeridge's hospitals now produces electricity using a combined heat and power (CHP) plant fueled by natural gas, resulting in the provision not only of electricity, but thermal energy via heat recovery from the CHP's

generators. Three hospital structures also feature solar photovoltaic power, which Lakeridge sells back to the grid.

The retrofit required an investment of \$17.7 million for guaranteed annual savings of \$1.4 million and \$2.5 million in incentives. The result has been a 22 per cent reduction in Lakeridge's energy bills.

**Samares School Board**

Ecosystem also enabled Quebec's Samares School Board to reduce its energy bills by 44 per cent through a Deep Energy Retrofit across 80 buildings in four different phases. With a total \$17.9 million investment (\$3.1 million of it covered by incentives), the school board has achieved annual savings of \$1.7 million, cut its greenhouse gas emissions by 4,920 metric tons of carbon dioxide annually, completely eliminated oil consumption, and reduced natural gas consumption by 80 per cent.

Among the school board's innovative energy solutions were the installation of thermal storage units (which store heat in off-peak hours) and geothermal



fields, the use of aerothermal energy (drawing free energy from outside air), and use of a wind turbine to produce energy. The Samares School Board won

**Picking the Right Contractor - Using Net Present Value to Assess Competitive Bids**

Procurement based on Net Present Value (NPV) is still new in much of North America, but it has proven successful in the Province of Quebec over 15 years. Energy projects that use standard procurement generate on average 15-20% energy savings, but NPV-based models result in 30-40% savings.

Building owners must invest in infrastructure with a long-term mindset, sometimes spending more to generate more savings. Using NPV, a building owner can baseline the value of projects against one another, rather than gravitating to the lowest bidder.

**The benefits of using NPV are:**

- Achieving deeper energy savings
- Picking projects that deliver the highest value
- Incentivizing contractors to save, not spend
- Accurately comparing bids using consistent metrics
- Turning capex projects into projects with payback
- Aligning interests of stakeholders



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(Above) Lakeridge Health hired Ecosystem to increase energy efficiency, renew assets and improve the patient experience at all four of its Ontario hospitals through 29 different measures fully funded by incentives and energy savings.

(Left) Ecosystem enabled Quebec's Samares School Board to reduce its energy bills by 44 per cent through a Deep Energy Retrofit across 80 buildings in four different phases.

the Association of Energy Engineers' (AEE) 2015 Institutional Energy Management award.

### Why You Should Consider a Deep Energy Retrofit

If you're thinking about making some energy efficiency upgrades to your buildings, give some thought to a Deep Energy Retrofit as opposed to piecemeal upgrades. A Deep Energy Retrofit provides global and long-term value because costs are paid by energy savings. Those savings continue 15- to 20-years later once the project has not just provided savings but also profit. Consider the following:

- You can renew or replace old and inefficient assets in one shot.
- You can significantly lower energy and maintenance costs.
- You will likely simplify building operations.
- You can improve tenant retention through increased building comfort.
- You'll experience the satisfaction of reducing your structure's carbon footprint through a project that can be completely funded through grants and cost savings.

- A typical IEPC project can save between 25 and 50 per cent on a building's energy bill.

If you work with an IEPC firm, you'll also assume no financial risk because the retrofit will be an investment partnership where the Deep Energy Retrofit firm will provide a contractual commitment to attain a certain level of energy savings over the course of a certain period of time, or the IEPC firm pays the difference to the client. To date, Ecosystem has not failed to meet

its contractual commitments, and currently has a 102 per cent average savings rating across its completed projects.

In all three of the above case studies, Ecosystem was not only able to optimize potential energy savings, but was also able to discover innovations.

"With a Deep Energy Retrofit, you're not doing a low-hanging fruit project," explains Clark. "You leave no rock unturned. Through an iterative process, you can stumble upon innovative ways to completely change a building."

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