DEEPER GREENING
Investing in a Greener Future

Alberta Infrastructure

DESIGN & TECHNOLOGY SERIES **10**

What is Deeper Greening?

Alberta Infrastructure (AI) has set sustainability requirements for all Government of Alberta (GoA) projects through the Technical Services Branch's (TSB's) *Technical Design Requirements for Alberta Infrastructure Facilities (TDR)*, including *Appendix G - Green Building Standards (GBS)*[1]. New construction and major renovations (Tier 1 projects) must achieve *Leadership in Energy and Environmental Design (LEEDv4)* Silver certification, including certain mandatory credits (e.g. minimum 12 Optimize Energy Performance points for office buildings). As of September 2018, the GoA has 160 projects at various levels of certification, with 115 more in progress.

To further reduce the environmental impact of buildings, AI encourages *Deeper Greening* strategies. **Deeper Greening is the pursuit and implementation of sustainability initiatives that exceed Appendix G - Green Building Standards.** It describes the universal or project specific stretch goals that further reduce energy use, material consumption, and greenhouse gas (GHG) production. TSB provides guidelines for project teams seeking alternative technologies including solar photovoltaic (PV) in its online Technical Resources Centre[2].

Effective Deeper Greening initiatives use established rating systems and planning concepts to provide measurable, meaningful results while minimizing the risks of pursuing untried or emerging technologies. Deeper Greening encompasses all areas of sustainability, including energy, material selection, waste reduction, air and water quality, climate resilience, disaster/climate risk reduction, and occupant health.

Why Deeper Green?

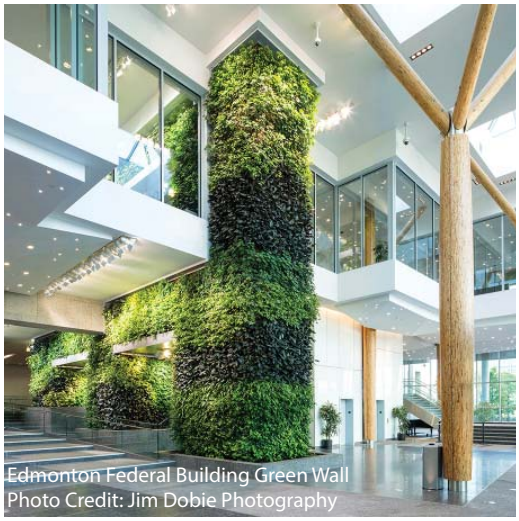
As building construction, demolition and operation generate significant carbon emissions, regulations governing the environmental impact of buildings are becoming increasingly stringent. The Pan-Canadian Framework on Clean Growth and Climate Change (PCF) is a federal plan that puts a price on carbon pollution and implements measures to reduce carbon emissions[3]. A key goal of the PCF is the 2030 adoption of a *Net Zero Energy Ready (NZER)* building code. **Net Zero Energy Ready is a performance target where building efficiency is maximized and heat loss is minimized to a point where renewables (e.g. solar, wind, etc.) can feasibly offset the building's total annual energy use.**

NZER by 2030 is a major upgrade from current building regulations. While GoA LEED Silver facilities typically exceed the National Energy Code for Buildings (NECB 2011), considerable progress is required to achieve NZER by 2030. Governments have a key leadership role in the advancement of green building policy and construction; Deeper Greening offers both immediate and long-term potential to help achieve the 2030 goal.

Net Zero Energy can be pursued through the International Living Future Institute's *Zero Energy Certification* or the Canada Green Building Council's *Zero Carbon Building Standard* (in pilot stage). TSB offers a Net Zero Energy Calculator for determining NZER viability.

How Can Deeper Greening be Implemented?

Integrate sustainability into the process at project inception. Deeper Greening provides best value when it is incorporated into a design that has been optimized for efficiency, functionality, and durability. To maximize the effectiveness of Deeper Greening strategies, project teams require a sound understanding of a site's climatic, geographic, and geologic conditions, and realistic expectations of how occupants will use a facility.



Edmonton Federal Building Green Wall
Photo Credit: Jim Dobie Photography

Deeper Greening and LEED

While a single initiative or technology (e.g. PV) can be appropriate, multi-faceted Deeper Greening approaches that cumulatively enhance or exceed minimum requirements are also encouraged. Established tools for modeling, measuring, tracking, and communicating how a project exceeds minimum thresholds should be utilized.

LEEDv4 ranks a building's sustainability into one of four levels: Certified, Silver, Gold, and Platinum. Using the GoA's LEED Silver certification as a starting point, examples of Deeper Greening may include Gold or Platinum certification based on increased points over several categories, or exceptional performance in a specific category (e.g. Energy & Atmosphere).

The use of existing certification systems such as LEEDv4 provides a familiar, accountable, and transparent method for determining the value of Deeper Greening. Other suitable third-party sustainability tools include the WELL Standard, Living Building Challenge, Zero Energy Certification and/or Zero Carbon Building Standard. Note that these systems are intended to enhance but not replace minimum LEED Silver requirements; early evaluation of options can optimize investments in higher LEED levels.

Eastgate Office Building, Edmonton, Alberta
Photo credit: Technical Services Branch

What Gets Measured, Gets Managed

AI's TDR sets energy efficiency targets that exceed minimum industry requirements and promote the delivery of greener buildings for Albertans (e.g. LEED v4).

While LEED projects typically consume less energy and water than uncertified facilities[5], a gap often exists between modeled and actual building energy use/GHG emissions. A primary reason for this discrepancy is that occupant behaviour is less predictable than equipment performance. Temperature preferences, operator skill, maintenance quality, and commitment to sustainability can vary over time, sometimes resulting in poor building performance and higher GHG emissions vs. the energy model.

A core value of Deeper Greening is the principle of *what gets measured, gets managed*. Planning for monitoring based commissioning (MBC) is a mandatory GBS LEEDv4 credit that accounts for occupant activities and supports building systems optimization. Monitoring, collection and analysis of operational data can significantly narrow the gap between design and actual energy use: the Government of Canada estimates that their MBC-based *Smart Buildings Initiative* has resulted in 17% energy savings vs. unmonitored facilities[6].

Examples:

Utilize a building's location and configuration to provide natural heating, cooling, lighting and ventilation. Consider rooftop or building integrated PV opportunities during design.

Where open spaces such as parking lots or fields are available, geoexchange systems can be used to supply heating and cooling without on-site combustion and resultant GHG emissions. Facilities close to lumber or agricultural operations may consider biomass waste as a local, renewable option for heating fuel. In the near-term, geoexchange systems should be paired with renewable energy to ensure that reduced heating emissions are not replaced by increased electricity from Alberta's coal-heavy grid.

Cogeneration (on-site heat and electricity production) is becoming an increasingly viable option for projects with year round heating needs (e.g. hospitals, care facilities, offices).

Adopt resilient and adaptive design strategies. Utilize projected climate data to anticipate and withstand the effects of changing weather patterns and the changing climate.

Human comfort is greatly affected by air temperature, movement, and humidity. Heating and cooling systems typically deliver conditioned air from above, resulting in uneven air movement, occupant discomfort and energy wastage. Optimize the distribution of conditioned air to occupied spaces. Raised floor ventilation, underfloor radiation, and radiant panels provide greater thermal comfort and energy efficiency in suitable climates. Consider the advantages of high performance windows and occupancy controlled sensors to maximize thermal comfort and reduce energy use and wastage.

For buildings with varying occupancy (e.g. schools), a central mechanical plant may not be the ideal solution. Modular systems allow building zones to be shut off when unused, thereby increasing the efficiency of equipment serving the occupied spaces.

The Bigger Picture

Alberta's Climate Leadership Plan[4] includes the phase-out of coal-fired power generation, the production of 30% renewable electricity by 2030, and the adoption of a carbon levy. Pricing GHG emissions will incentivize building owners to implement aggressive energy reduction strategies in order to lower operating costs. Decarbonization Pathways Canada predicts a $100-150/tonne price is needed by 2030 for Canada to meet its carbon goals; the Intergovernmental Panel on Climate Change states that emissions reductions of 45% of 2010 levels by 2030 are needed to avoid exceeding 1.5°C of global warming[7].

Meeting these targets as well as Net Zero Energy Ready by 2030 will require increasingly rigorous sustainability standards. The green building industry has already shown great leadership in responding and adapting to these higher standards and is well poised to meet future challenges. For facility owners, it is critical that they understand the value of investing in Deeper Greening techniques to reduce carbon emissions, material and water waste, and to improve the indoor and outdoor environment for all Albertans.

Information Sourced From:

1. http://www.infrastructure.alberta.ca/Content/docType486/Production/TechDesignRequirements.pdf
2. http://www.infrastructure.alberta.ca/500.htm
3. https://www.canada.ca/en/services/environment/weather/climatechange/pan-canadian-framework.html
4. https://www.alberta.ca/climate-leadership-plan.aspx
5. https://www.usgbc.org/articles/leed-buildings-outperform-market-peers-according-research
6. https://www.tpsgc-pwgsc.gc.ca/biens-property/intelligents-smart/index-eng.html
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TECHNICAL SERVICES BRANCH
3rd Floor, Infrastructure Building
6950 - 113 Street NW
Edmonton, AB
Canada
T6Y 5V7