

# Monetizing Sustainability

## The Total Cost of Building Ownership

### NS Ecology Action Centre – Better Buildings Speakers Series

Jim Nostedt, P. Eng.



## **Objectives of a SEEFAR-Valuation ©**

- 1. Reduce GHG emissions and the Total Cost of Building Ownership**
- 2. Show that New High-Performance buildings have higher value than Code Built**
- 3. Show that a deep retrofit can achieve Net Zero Ready with higher value than the existing building over its remaining useful life**
- 4. Optimize the building renewal investment**

## **What is the Total Cost of Building Ownership (TCBO)?**

- **TCBO is the life cycle cost analysis of the building based on all major building operating, age-related renewal and maintenance costs:**
  - **Utilities and Carbon Tax**
  - **Component Maintenance & Renewal**
  - **Mortgage Interest**
  - **Insurance**
  - **Property Tax**

## **Why is TCBO so important?**

- **Because 90% of the cost of ownership occurs after construction is complete**
- **Your building that cost \$1 million to build will cost you \$9,000,000 to own and operate over its useful life**
- **Design costs were only \$100,000 or 1% of the TCBO, so don't short change on design costs**
- **Don't miss the opportunity to optimize the investment at the design stage**

# High Performance versus Low Energy

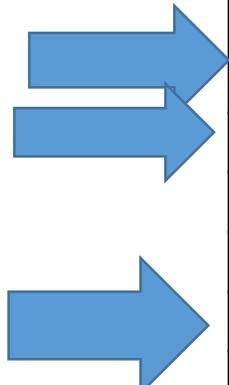
- **Sustainability is more than just energy**
- **Integrate and Optimize all building performance attributes:**
  - **Energy Efficiency**
  - **GHG reduction**
  - **Embodied carbon**
  - **Durability**
  - **Life-cycle performance**
  - **Occupant comfort and productivity**

## **SEEFAR Analysis of *New* Buildings has shown:**

- 1. High-Performance Buildings cost 3 to 10% more to build, but**
- 2. Have a 30 to 40% lower Total Cost of Building Ownership (TCBO)**

# SEEFAR Analysis of *New* Buildings

Table 3		Building A	Building B	Building C	Building D
Row		Code Built	Code Built with solar panels	Hi Perf Home	High Perf with solar panels
1	GHG emission (kg) (60 Years)	6,608,000	5,149,000	2,071,000	612,000
2	EUI (kWh/m2/yr.)	173	135	49	15
3	TCBO at 12 Years	\$315,000	\$309,000	\$251,000	\$245,000
4	TCBO at 27 Years	\$834,000	\$824,000	\$560,000	\$550,000
5	TCBO at 60 years	\$3,060,000	\$2,821,000	\$1,658,000	\$1,419,000
6	Home Equity at 60 years	\$1,294,000	\$1,358,000	\$1,496,000	\$1,561,000
7	Net Cost of Home Ownership	-\$1,766,000	-\$1,463,000	-\$162,000	\$142,000
8	Average Monthly Cost of Ownership over 60 Years	-\$2,500	-\$2,000	-\$200	\$200



Savings \$1.5 million



- **How long do plan on living in your current home?**
- **What if you do not plan to live in your home for 60 years, how do you get the added value out of your high performance home?**

## **Getting the Value out of your High Performance Building:**

- **Every building that is applying for a commercial mortgage must be appraised**
- **Most appraisals are based on comparative analysis**
- **What do appraisers know about high performance buildings?**
- **Our SEEFAR analysis provides an appraisal report to identify the higher value in real terms.**

## Existing Buildings

- **Are the elephant in the room**
- **How do we evaluate existing buildings?**

# Conventional Financial Analysis – Would you Invest in this Project?

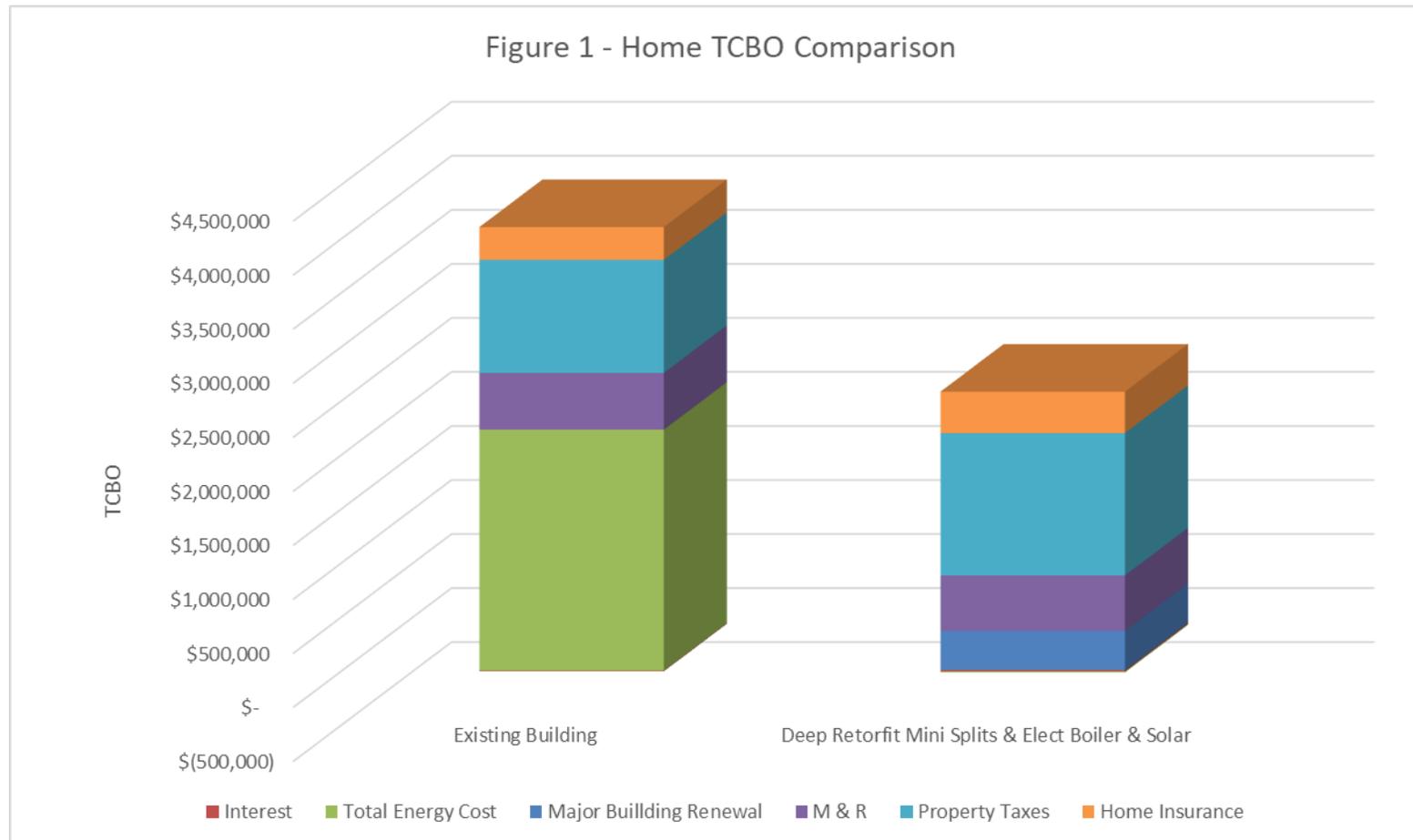
- **Simple payback** **6 Years**
- **Return on Investment (ROI)** **24% over 60 years**
- **Net Present Value (NPV)** **\$598,000 @ 2% DR over 60 years**
- **TCBO considers cost of capital, escalation of energy, materials etc. , carbon tax, property tax, insurance, M &R**

Table 4		Building A	Building C		
Total Cost of Building Ownership (TCBO)		Existing Building	Deep Retorfit Mini Splits & Elect Boiler & Solar	Total Savings A to C	Total Savings A to C
Row					
	TCBO at 60 years	\$ 4,111,000	\$ 2,579,000	\$ 1,532,000	37%

# Deep Retrofit - Total Cost of Building Ownership

Total Cost of Building Ownership (TCBO)		Existing Building	Deep Retrofit Mini Splits & Elect Boiler & Solar	Total Savings A to C	Total Savings A to C
Row					
1	GHG emission (kg) (60 Years)	28,000	(1,000)	29,000	104%
2	EUI (kWh/m2/year)	155	(2)	157	101%
3	TCBO at 12 Years	\$ 439,000	\$ 639,000	\$ -200,000	-46%
4	TCBO at 25 Years	\$ 1,052,000	\$ 1,055,000	\$ -3,000	0%
5	TCBO at 60 years	\$ 4,111,000	\$ 2,579,000	\$ 1,532,000	37%
6	Building Equity at 60 years	\$ 3,095,000	\$ 3,900,000	\$ -805,000	-26%
7	Net Cost of Home Ownership	\$ 1,016,000	\$ -1,321,000	\$ 2,337,000	230%
8	Savings/year			\$ 39,000	
9	Incremental Difference in Capital Cost		\$ 351,000	\$ 351,000	
11	Average Monthly Cost of Ownership over 60 years	\$ 5,710	\$ 3,580	\$ 2,130	37%

# Base Case vs Deep Retrofit



## Key Findings

- **Adding solar PV panels to the Deep Retrofit achieved Net Zero and reduced the 60-year TCBO by \$1.5 million**
- **Order of Optimizing investment value is important:**
  - **reducing load and improving durability,**
  - **electrifying to reduce GHG emissions,**
  - **adding solar to get to Net Zero**
- **Start SEEFAR-Valuation<sup>®</sup> at the beginning of the project to help optimize and generate high quality input data**
- **Go all the way to high performance the first time**

## **Data Used for the SEEFAR-Valuation©**

- **Energy Model for existing and for options**
- **Energy / GHG unit costs & annual escalation rate**
- **Establish existing building TCBO (like an FCA)**

### **For each major building component:**

- **Capital cost**
- **Energy consumption**
- **GHG emissions**
- **Useful life**
- **Current age**
- **Annual maintenance cost**
- **Replacement cost escalation**
- **Improvement in energy efficiency at replacement**
- **Cost of capital**

## **How Can a SEEFAR-Valuation© Help Investors & Owners**

- **To understand the ongoing costs for energy, maintenance, insurance, property taxes, and cost of capital for the building**
- **(When a new building is being designed has anyone every asked for what it will cost to own and operate?)**
- **To reduce the TCBO**
- **Provide appraisers with the monetized value of the high performance building**
- **Lower TCBO means higher profit and lower rent**

# **Who Wins or Benefits When a High Performance Building is constructed?**

## Who Wins With High Performance Buildings?

- **The Owner, the TCBO is lower and more resilient to climate change**
- **The design team because their design fees are higher**
- **The contractor who constructs it because the capital cost is higher, so profit is higher**
- **The bank because they loaned more money and the O & M costs are lower so there are less owner defaults**
- **The occupant or renter because their costs are lower and the building is more comfortable with better air quality**

**If you own more than one building (a portfolio)  
how would your approach to reducing energy  
and GHG emissions change?**

# Monetizing Sustainability

## The Total Cost of Portfolio Ownership

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**Don't be distracted by the myth that “every little (bit) helps.”**

**If everyone does a little, we'll only achieve only a little.**

**We must do a lot.**

**What's required are big changes in ~~demand and supply~~  
**Approach.****

“Sustainable Energy — without the hot air”  
- David JC MacKay

## Overview

- New Approach
- Goals & Challenges in meeting goals
- Effective approach to goals
- Challenges with current approach
- Total Cost of Portfolio Ownership (TCPO) is the key
- How do we move forward

## New Approach

- This is not a technical problem
- We have the technical knowledge to achieve net zero now, but
- It is a extremely large **financial investment** problem
- The solution requires integration of technical and financial aspects

## Goals

- Ultimate goal – no fossil fuel burning
- Reduce the Total Cost of Portfolio Ownership

## **Challenges in meeting goals**

- All levels of government have a large asset base
- No significant work done to date
- Maintenance backlog is huge (\$1000/m<sup>2</sup>)
- The problem is big, getting bigger and will require a huge level of effort
- Effort must be sustained over useful life of assets
- Survive change of personnel and government
- View that we cannot afford to make the changes
- Space utilization is big problem, GSA only 30%

## Current Approach to Goals

- Energy reduction approaches – short term measures, 20% reduction
  - Building Automation Systems
  - Variable Speed Drives
  - LED lighting
  - Heat Pumps
- These will not get us net zero and what is worse our TCPO will be higher

## Effective Approach to Goals

- Large goals broken into smaller ones is good
- But **not incremental goals** for infrastructure
  - 10%, 20%, 30%, Net Zero (ultimate goal)
  - Short payback first, then longer and longer
  - Visit the same building many times
  - Short payback measures needed to help finance long term
- Need to look at TCPO for useful life of the assets
- Tackle GHG reduction, maintenance backlog and space utilization at the same time
- Get rid of surplus space
- Tackle fewer buildings, but do them all the way to net zero the first time

## **“The Total Cost of Portfolio Ownership” the integration of space management, and life-cycle management, and sustainability**

- Know what you need
- Know what you have
- Know the condition of assets (FCA)
- Decide what’s surplus, what’s to be replaced, what’s to be maintained – prioritize
- Know “Total Cost of Building Ownership” – reduce through deep retrofits, energy audits and SEEFAR valuation ©

## **The Way Forward**

- A pilot project of at least 10 buildings
- A specialized team of financial and technical experts from a wide cross section of government and industry (direct award, not tendered)
- Dedicated, unrestricted funding for the pilot
- Develop the knowledge to transfer to government, provinces, municipalities, and industry

**Whatever you can do or dream you can, begin it.  
Boldness has genius, power and magic in it.  
Begin it now. Goethe**

## **Questions and Discussion**

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