

Reducing Energy Consumption in Buildings

Energy Services Association of
Canada & CTR Inc.

Meeting with Korean Delegation
September 6, 2016



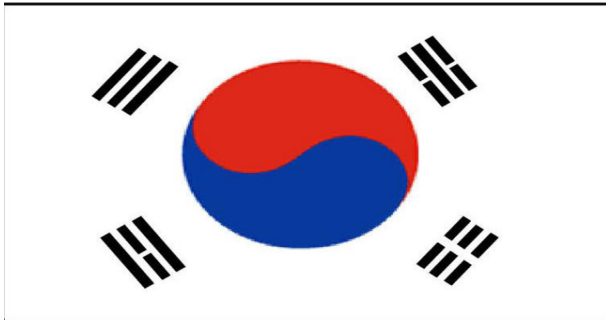
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캐나다 에 오신 것을 환영합니다

	Population (million)	GDP (\$US bil)	Electricity (GW)
S. Korea	50	1,460	100
Canada	35	1,837	130
Ontario	14	597	36



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S. KOREAN CITIES & TORONTO

	Population (Millions)	Hi Rise (number)	Rank
Seoul	10.3	4,448	6 th
Incheon	2.8	2,115	12 th
Toronto	2.6	2,102	13 th
Busan	3.4	2,006	14 th



AGENDA

- 10:30 Welcome by Peter Love
- 10:32 Introductions & Meeting Expectations
- 11:50 Presentation: “Energy, Buildings & Energy Performance Contracts” by Peter Love
- 11:45 Questions & Answers
- 12:30 Lunch with further Discussions
- 1:20 Concluding Comments
- 1:30 Depart of Tour



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PETER LOVE – BUILDING RELATED EXPERIENCE

- Founder/CEO of company that managed R-2000 & Energy Star for New Homes Programs
- CEO of organization advocating ee in Ontario Building Code
- Chief Energy Conservation Officer of provincial electricity planning authority
- Founder/CEO of Energy Services Association of Canada
- Adjunct Professor at York University Faculty of Environmental Studies
- Chair Toronto 2030 District Advisory Group
- Chair Toronto Race to Reduce Legacy Sub Committee
- Co-Founder Rethink Sustainability

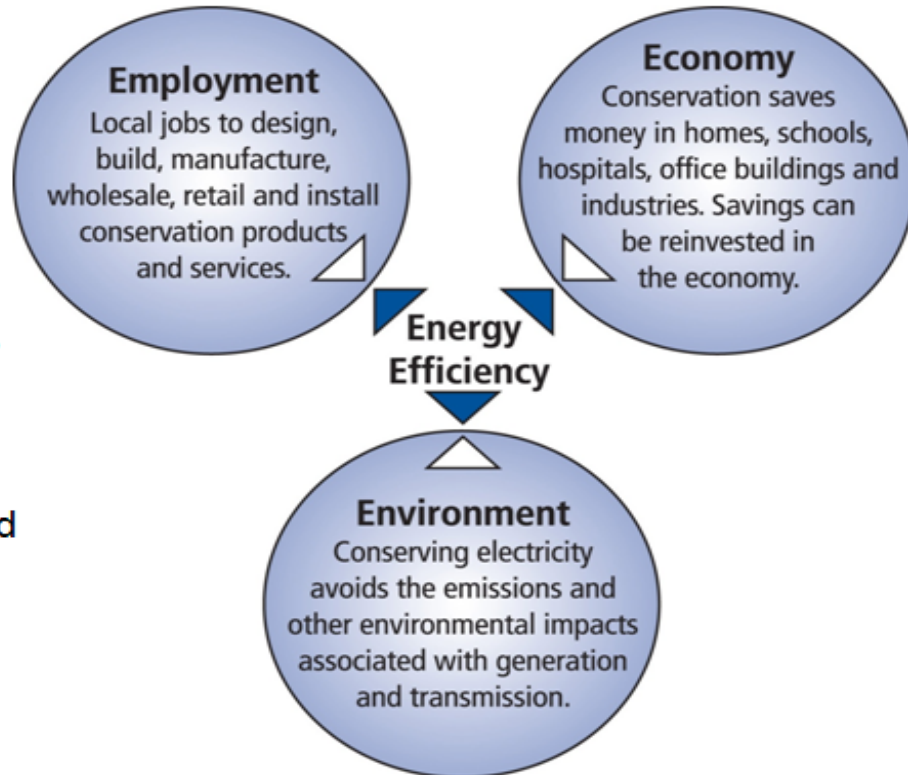


ENERGY CONSERVATION BENEFITS IN CANADA

Benefits of Conservation

The Three “Es”:

- **Employment** benefits: labour-intensive, local jobs
- **Economic** benefits: cost-effective for households and makes private sector more competitive
- **Environmental/health** benefits: reduced GHGs, acid rain, smog



4TH BENEFIT FOR ENERGY IMPORTERS

Increased Energy Security

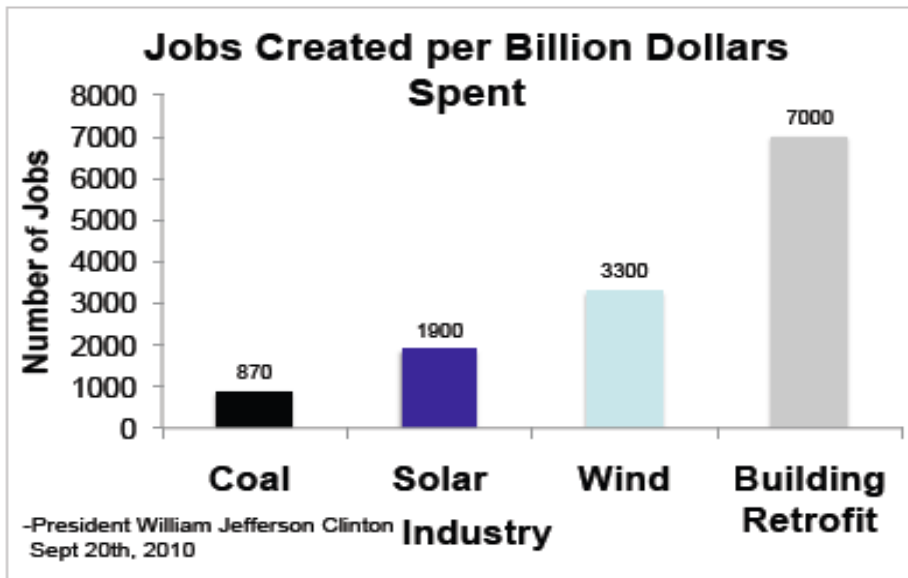


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EMPLOYMENT BENEFITS



Empire State Building Retrofit:

- 8 month design phase, 60 ideas considered, 8 projects (financial and environmental ROI).
- 3.1 year payback
- Initial \$20 million, 38% energy reduction, \$4.4 million savings annually.
- Creation of hundreds of jobs

- www.esbnyc.com

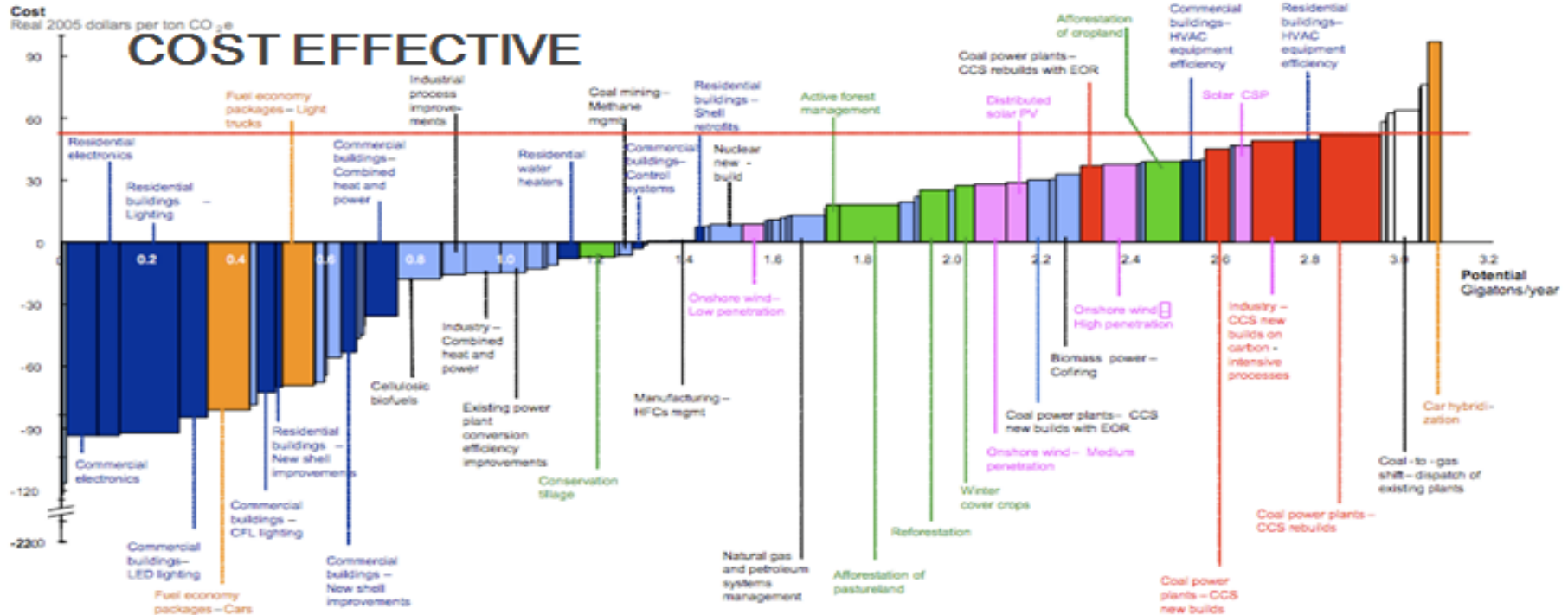


ENERGY EFFICIENCY IS COST EFFECTIVE

Example of GHG Abatement Cost Curve



U.S. curve indicates opportunity set in the U.S. is widely distributed (U.S. mid-range abatement curve – 2030)



SOURCE: McKinsey & Co. analysis

ENVIRONMENTAL BENEFITS

- **82%** of Canada's man-made green house gas emissions from the production and use of energy
- **2/3** of primary energy consumed in Canada is wasted (Univ. of Calgary)



BACKGROUND ON BUILDINGS

- **40%** world energy consumption
 - 50% if include embedded energy
- Importance of Existing Buildings
 - New 1– 1.5%/yr so >70% existing in 20 years



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BACKGROUND ON BUILDINGS (2)

Five Types of Buildings

- Low Rise Residential (single/multi)
- Low Rise Commercial
- Hi Rise (Residential/office)
- Institutional (Gov't, University/College, Schools, Hospitals)
- Industrial



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ENERGY EFFICIENCY IN BUILDINGS

ACEEE ranking

Germany	1
US	2
China	3
Canada	5
S. Korea	13
Japan	14
Taiwan	15

Criteria

Appliance Standards
Appliance Labelling
Res Building Code
Comm Building code
Res Energy Intensity
Com Energy Int



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ACEEE DETAILED TABLE

Country	Total score	Appliance and equipment standards	Appliance and equipment labeling	Residential building codes	Commercial building codes	Building retrofit policies	Building labeling	Energy intensity in residential buildings	Energy intensity in commercial buildings
Max. score	25	5	2	4	4	4	2	2	2
Germany	19.5	2	2	4	4	4	2	0.5	1
US	18.5	5	1	3.5	3.5	3	0.5	1	1
China	18	5	2	3.5	3	1	1	1	1.5
France	18	2	2	3	3	4	2	0.5	1.5
Canada	17.5	5	1	3.5	3.5	3	0.5	0.5	0.5
Spain	17.5	2	2	3	3	3	1	1.5	2
Italy	17	2	2	3	3	3	2	0.5	1.5
UK	16	2	2	3	3	2	2	0.5	1.5
Australia	15.5	1	1.5	4	4	2	1	0.5	1.5
Netherlands	15	2	2	3	2.5	3	1	0.5	1
Poland	15	2	2	2.5	2.5	3	2	0.5	0.5
Turkey	15	2	2	2.5	2.5	3	2	0.5	0.5
South Korea	14.5	3	2	3.5	3.5	2	0	0.5	0
Japan	13	2	1.5	3.5	2	2	0	1	1
Taiwan	13	1	1.5	2.5	2.5	3	0	1	1.5
Mexico	11	3	1	0	3	0	0	2	2
South Africa	11	0	1	4	4	0	0	0.5	1.5
India	7.5	0	1	1	2.5	0	1	1	1
Brazil	6.5	1	1.5	0	0	0	0	2	2
Russia	6	0	1.5	1.5	1.5	0	1	0	0.5
Indonesia	5.5	0	1	0	2	0	0	1	1.5
Saudi Arabia	5	0	1.5	1.5	1.5	0	0	0.5	0
Thailand	5	0	0.5	0	2.5	1	0	1	0



VOLUNTARY PROGRAMS IN CANADA

- Low Rise Residential
 - R-2000, EnergyStar for New Homes, EnerGuide)
- Hi Rise/Institutional
 - LEED
 - Portfolio Manager
 - Toronto Race to Reduce
 - Target to reduce energy use by 10% over 4 years
 - Achieved 12.1%
 - Used Portfolio Manager



MANDATORY LABELLING PROGRAMS IN ONTARIO

- **All Large Commercial Buildings in 2017**
 - Likely using Portfolio Manager
 - To be expanded in future
- **All Low Rise Homes Sold**
 - Being considered for 2019
 - Likely some version of EnerGuide



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EE IN BUILDING CODES

- Canada
 - Developed Model EE Codes for use by provinces
- Provinces
 - Most include EE in Code
 - Ontario EnerGuide 80
- Cities
 - Vancouver has own code
 - Toronto Green Building Standard



COMPLIMENTARY ROLE VOLUNTARY & MANDATORY PROGRAMS

Voluntary Programs

- Encourage new products/procedures

Mandatory Codes

- Require adoption of successful new products/procedures



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GUARANTEED ENERGY SERVICE PERFORMANCE CONTRACTS

- Introduced in 1980's in Canada
- \$300 mil/yr business in Canada (\$5 bil in US)
- Mainly institutional buildings
 - Canadian gov't program since 1991
- Carbon neutral gov't to require \$ bil



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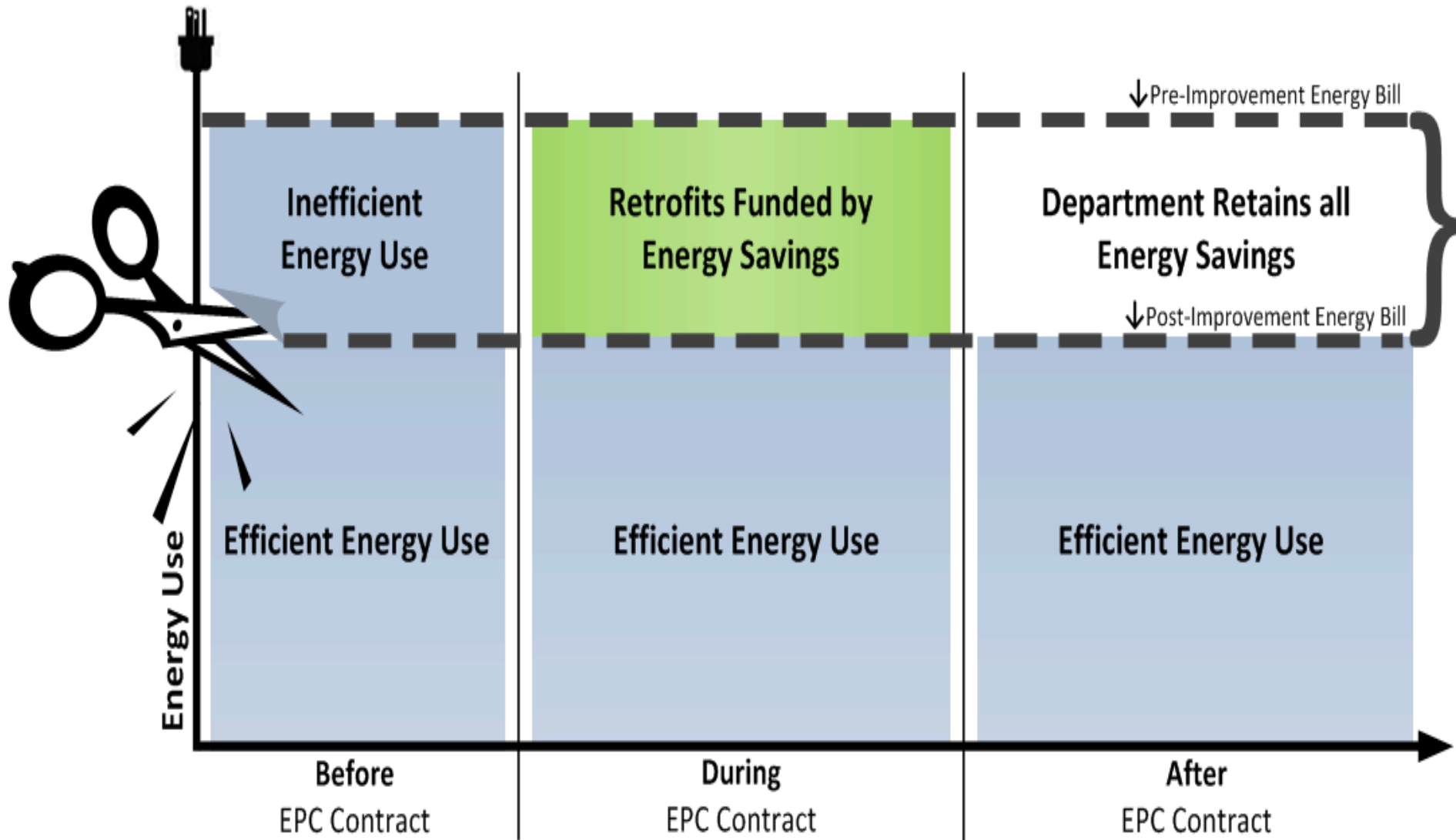
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WHAT IS AN ENERGY PERFORMANCE CONTRACT

- Involves: a building owner and energy service company (ESCO)
- Savings financing: comprehensive measures with guarantees that the energy savings will be sufficient to finance the cost of the project
- Performance guarantee: Transfers technical and financial risk to ESCO
- Used since mid 80's; Canadian government created Federal Building Initiative in 1992



ILLUSTRATION OF HOW AN ESPC WORKS



BENEFITS OF ENERGY PERFORMANCE CONTRACTS

- Turnkey – one contract managing many activities
- Releases pressure on capital funding allocations
- Tried and true approach – used by organizations across Canada since 1983
- **Financed by energy waste funded debt, NOT tax payer funded debt**









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EPC NOT MORE EXPENSIVE THAN TRADITIONAL PROCESS

EPC Procurement	Traditional "Piecemeal" Procurement
<p> Performance Guarantee Fee</p> <p> Financing Charges</p>	<p> Additional Procurement Processes</p> <p> Additional Human Resources</p> <p> Opportunity costs for differed projects</p> <p> Less Energy Savings resulting from:</p> <ul style="list-style-type: none">• Lost time• Fragmented Approach• No Monitoring and Verification• No Savings Guarantee



QUESTIONS?



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1. Direction / Goal of Certification of Buildings

- CaBGC certified/registered 5,000 buildings
- EnerQuality certified 60,000 new homes since 2005, 25-30 of all built
- CaGBC had targets few years ago but none now



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2. Policies/Conditions Of Zero Energy Buildings

- Architecture 2030 in US calls for zero carbon buildings by 2030
- 13 2030 Districts created to achieve Architecture 2030 target; one in Toronto
- Ontario target is zero carbon in small buildings by 2030
- Zero Energy Housing Council supports innovation



2. Policies/Conditions Of Zero Energy Buildings (2)

- NSERC Smart Net-Zero Energy Buildings Strategic Research network
- Mosaic Centre in Edmonton 1st zero carbon commercial building
- Manitoba Hydro office in Winnipeg one of most energy efficient buildings in world



3. How Assess Existing Buildings & Progress Made

- New mandatory labelling for large buildings will use US EPA's Portfolio Manager
- Proposed mandatory labelling for low rise homes likely to use EnerGuide



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4. Policies/Future Plans For Energy Efficient Buildings

- Canadian gov't has called for zero carbon federal buildings – no date set
- BC gov't set zero carbon target few years ago
- Ontario currently discussing



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5. Introduction To Energy Services Association Of Canada

- Incorporated August 2010
- 6 founding independent energy service companies



SIEMENS



Honeywell

- Represent >90% \$300 mil/year market for guaranteed Energy Service Performance Contracts (ESPC)



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6. Efforts to Enforce Performance Based Solution Cases

- Alberta requires school boards who are borrowing funds for ee upgrades to have a performance guarantee
- Ontario recently committed to enabling use of ESPCs
- Federal gov't actively promotes through Office of Energy Efficiency's "Federal Building Initiative" program



7. Standards for Devices Re Energy Efficiency Performance & Cases

- No standards, just product warranties from component manufacturers



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CONCLUSIONS/NEXT STEPS

- Research and write referenced Briefing Note on topics discussed today and/or others
- Participate in follow up meetings in S. Korea



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DISCUSSION

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