Canada’s Association for GeoExchange™
2018 RH&C Meeting

Saratoga Springs NY

Ted Kantrowitz, CEO
2018 Cumulative / Historical Canadian Market Context

19,305 CGC-certified residential geoexchange systems
4,354 trained individuals
687 accredited installers
482 accredited residential designers
442 qualified companies
300+ members
22 college partners
15 board positions
10 provincial caucuses
7 fully developed training courses
1 strong and representative national association!
Geothermal Heat Pump Installations Per Capita
(Units per 100,000 inhabitants)

Canada: X 11 the 1996 level

United States: X 3 the 1996 level
How did CGC and partners do it?

- A decade of consultations from NRCan, utilities, CGC
- Open RFP Process for training development – Sept 2005
- Study to assess whether & which stakeholders would benefit from a quality programme – early 2006
  - Long term health of the industry – reputation issues
  - Avoid the boom-bust subsidy effect and ‘little mushrooms’
  - Protect consumers, boost competition, grow the pie
  - Possibly help unite the industry
- Report and staff recommendation, CGC Board Resolution
- National Public Consultation – June 2006
  - Copy to multiple ministries in each government
  - Private comments from CGC members and major stakeholders
- Three draft program releases, comment, revisions, then final release
Industry Infrastructure partly means: CGC Market Transformation Initiative

- Market transformation infrastructure to support anticipated industry growth
- Create a strong and **even more** professional geothermal industry through training programs and partnerships – building a labour force
- Keep financial resources (training revenue) in Canada and reinvest those financial resources to support services (QA, other) to the industry
- QA programs and **partnerships** – building a labour force
- “The same thinking that got us here won’t get us where we’re going”
- Create the necessary mechanisms for this industry to play a major role as a renewable and reliable energy source across regions and country
Technology Adoption Lifecycle

Phase 1 - Pilot
Goal: Raise Awareness
Market: Innovator

Phase 2 - Program
Goal: Demonstration
Market: Early Adopter

Phase 3 - Commercialise
Goal: Remove Barriers
Market: Early Majority

Phase 4 - Propagate
Goal: Transform Market
Market: Late Majority

Phase 5 - Maintain
Goal: Sustain Market
Market: Laggards

Educate customers

Technical training - industry
Develop tools and resources
Utility / government programs
In-school training
Standards development
Regulations

R&D Funding intensity
“Valley of death”
Market interventions
Theoretical market share
“Natural” market share?
Quality Program Flow

CGC TRAINING COURSES

LOOP INSTALLATION
3-day stand-alone training
Horizontal and Vertical Installation - Technicians

INSTALLATION
3-day stand-alone training
GX (Water-based)
DX (Refrigerant-based)

RESIDENTIAL DESIGN
3-day stand-alone training
CGC Installation Course (or equivalent) is pre requisite

COMMERCIAL DESIGN
4 day stand-alone training
CGC Installation Course (or equivalent) is pre requisite

OTHER COURSES
1-3 day trainings
Municipal Inspector, Technical Introduction, Geology Workshop

CGC ACCREDITATION FOR INDIVIDUALS

CGC ACCREDITED
LOOP INSTALLER
- Training(s)
- Verified Experience (5 jobs)
- Province-required work permits or licences
- Signed Agreement to CGC Code of Conduct

CGC ACCREDITED
DX INSTALLER
- Multiple Trainings
- Verified Experience (5 jobs)
- Refrigeration-tech & other licence(s)
- Signed Agreement to CGC Code of Conduct

CGC ACCREDITED
GX INSTALLER
- Multiple Trainings
- Verified Experience (5 jobs)
- Province-required work permits or licences
- Signed Agreement to CGC Code of Conduct

CGC ACCREDITED
RESIDENTIAL DESIGNER
- Multiple Trainings
- Verified Experience (5 jobs)
- Province-required work permits or licences
- Signed Agreement to CGC Code of Conduct

CGC ACCREDITED
COMMERCIAL DESIGNER
- Multiple Trainings
- Verified Experience (5 jobs)
- Engineering Licence
- Signed Agreement to CGC Code of Conduct
Quality Program Flow

- CGC QUALIFICATION FOR FIRMS
- FIRMS ARE REVIEWED + QUALIFIED, WORK WITH CGC ACCREDITED PROFESSIONALS
- CERTIFICATION OF SYSTEMS
- SYSTEM IS REVIEWED FOR TECHNICAL AND ADMINISTRATIVE COMPLIANCE, MEETS OR EXCEEDS ALL REGULATIONS AND CGC BEST PRACTISE REQUIREMENTS, AND IS CERTIFIED BY THE CGC
- GRANTS, FINANCING, INSURANCE, OTHER PROGRAMS
- THE CGC CERTIFIED GEOEXCHANGE SYSTEM IS ELIGIBLE FOR GRANTS AND OTHER PROGRAMS
Training and Industry Tools

Municipal Toolkit

1. Inspector’s routine & templates
2. Sample Bylaw
3. Policy Roadmap for Municipal Policymakers
4. Original GeoAnalyser.com software
Comparative – Training Programs – Canada vs the Past

- INSTALLATION / FUNDAMENTALS STREAM
  - DIRECT EXPANSION (DX) INSTALLATION
  - RESIDENTIAL DESIGNER STREAM
  - COMMERCIAL DESIGN STREAM

- INSTALLATION / FUNDAMENTALS STREAM:
  - 3 DAYS
  - PREREQ.

- RESIDENTIAL DESIGN STREAM:
  - 3 DAYS
  - PREREQ.
  - 3 DAYS

- DX INSTALL. STREAM:
  - 3 DAYS

- COMMERCIAL DESIGN STREAM:
  - 4 DAYS
  - PREREQ.

- COMPLEMENTARY COURSES (REQUIRED FOR CGC ACCREDITATION):
  - PIPE FUSION CERTIFICATE
  - RESIDENTIAL HEAT LOSS CALCULATION COURSE
  - Refrigeration Technician Licence
  - COMMERCIAL HEAT LOSS CALCULATION COURSE

- Past Model: NO REQUIREMENTS
### Comparison – Additional Training Options – Canada vs Past

<table>
<thead>
<tr>
<th>Training Type</th>
<th>Canada Courses</th>
<th>Past Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loop Installer</td>
<td>2 Days</td>
<td></td>
</tr>
<tr>
<td>Municipal Inspector</td>
<td>3 Days</td>
<td></td>
</tr>
<tr>
<td>Introductory-Generalists</td>
<td>4 Hours</td>
<td></td>
</tr>
<tr>
<td>Introductory-Technical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commercial Installer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Past Model:**
- No Courses

**Date and Any Prerequisites:**
- To be announced; tied to accreditation renewal
Comparison – Accreditation – Canada vs the Past

<table>
<thead>
<tr>
<th>Installation</th>
<th>3 Days</th>
<th>+ Accreditation Requirement</th>
<th>+ Accreditation Requirement</th>
<th>+ Accreditation Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDPE Pipe Fusion Certificate</td>
<td>FIVE JOBS VERIFIED EXPERIENCE + Refs</td>
<td>SIGNED AFFIDAVIT</td>
<td>SIGNED AFFIDAVIT</td>
<td>SIGNED AFFIDAVIT</td>
</tr>
<tr>
<td>Refrigeration Technician Licence</td>
<td>FIVE JOBS VERIFIED EXPERIENCE + Refs</td>
<td>SIGNED AFFIDAVIT</td>
<td>SIGNED AFFIDAVIT</td>
<td>SIGNED AFFIDAVIT</td>
</tr>
<tr>
<td>Residential Heat Loss Calculation Course</td>
<td>FIVE JOBS VERIFIED EXPERIENCE + Refs</td>
<td>SIGNED AFFIDAVIT</td>
<td>SIGNED AFFIDAVIT</td>
<td>SIGNED AFFIDAVIT</td>
</tr>
<tr>
<td>Commercial Heat Loss Calculation Course</td>
<td>ENGINEERING LICENSE ISSUED BY STATE BODY</td>
<td>SIGNED AFFIDAVIT</td>
<td>SIGNED AFFIDAVIT</td>
<td>SIGNED AFFIDAVIT</td>
</tr>
<tr>
<td>Commercial Design</td>
<td>7 Days</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commercial Installer</td>
<td>2 Days</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HDPE Pipe Fusion Certificate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loop Installer</td>
<td>5 Days</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential Design</td>
<td>6 Days</td>
<td>+ Accreditation Requirement</td>
<td>+ Accreditation Requirement</td>
<td>+ Accreditation Requirement</td>
</tr>
<tr>
<td>Commercial Design</td>
<td>7 Days</td>
<td>+ Accreditation Requirement</td>
<td>+ Accreditation Requirement</td>
<td>+ Accreditation Requirement</td>
</tr>
<tr>
<td>Commercial Installer</td>
<td>2 Days</td>
<td>+ Accreditation Requirement</td>
<td>+ Accreditation Requirement</td>
<td>+ Accreditation Requirement</td>
</tr>
<tr>
<td>Safety</td>
<td>1 Day</td>
<td>+ Accreditation Requirement</td>
<td>+ Accreditation Requirement</td>
<td>+ Accreditation Requirement</td>
</tr>
</tbody>
</table>

Past Model

NO REQUIREMENTS, SUPERVISION, OR POST-ACCREDITATION FOLLOW UP; BOOM AND BUST INDUSTRY CYCLE

Affidavit to follow Association’s Code of Conduct, all applicable laws, and best practise, carry adequate insurance, act in industry’s best long term interest, etc
### Comparison – System Certification – Value Delivery

#### Some typical scenarios under Canada / CGC Model

1. **Complete Certification Application**
   - File with Association
   - ~ 5% chance of audit
   - Customer Receives Certificate

2. **Customer Complaint**
   - Association mediates / plays ombudsman role
   - Problem less likely to proceed to court

3. **Insurer Query for Industry Data**
   - Association issues statistical report / delivers presentation(s)
   - Insurer treats geoexchange contractor as normal-premium technology

4. **Regulator Query for Industry Info**
   - Association delivers actuals based on Certification database
   - Regulators and Governments discover a new partner and ask more about industry needs

#### Past Model

- NO REQUIREMENTS, SUPERVISION, OR POST-ACCREDITATION FOLLOW UP; BOOM AND BUST INDUSTRY CYCLE; NO QUALITY PROGRAM BENEFITS, ALL IN PURSUIT OF CHEAPEST SHORT TERM
Quality Program Delivers Data

System Retrofits - Fuel Replaced (Canada)

- Oil: 42.3%
- Electricity: 35.6%
- Propane: 10.1%
- Wood: 2.0%
- Oil + Wood: 2.2%
- Natural Gas: 7.4%
- Oil + Electricity: 0.4%
- Other: 7.4%

Geoexchange Systems By Loop Type - Canada

- Closed Horizontal: 56.0%
- Open Loop: 12.5%
- Closed Vertical: 26.8%
- Pond/Lake Loop: 4.7%

Average Residential System Price per Ton (Retrofits)

- Canada: $7,837, $8,085
- Ontario: $6,803, $5,817
- Other: $5,861, $5,878

Source: Canadian GeoExchange Coalition
## Comparative Analysis – Training and Installers Accreditation

<table>
<thead>
<tr>
<th>CGC Model</th>
<th>Past Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Specialized separate training for drillers, installers and designers</td>
<td>yes</td>
</tr>
<tr>
<td>✓ In-class training harmonized for all trainers / quality controlled</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Training material fully adapted to region’s regulations</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Trainers selected based on their professional credentials</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Trainers and training linked to Canada’s trade-education system</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Training materials aligned with National Occupational Standards</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Trainers participate in ongoing discussion on training improvement</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Automatic accreditation with training</td>
<td>no</td>
</tr>
<tr>
<td>✓ Accreditation requires professional references</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Accreditation requires verified field experience and performance</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Accreditation requires supervision for first installations</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Accreditation requires appropriate work permits and licenses</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Accreditation renewal linked to compulsory membership</td>
<td>no</td>
</tr>
<tr>
<td>✓ Accreditation renewal linked to conference attendance</td>
<td>no</td>
</tr>
<tr>
<td>✓ Accreditation renewal linked to quality work and performance</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Accreditation renewal linked to positive customer feedback</td>
<td>yes</td>
</tr>
</tbody>
</table>

✓ [Etc]
## Comparative Analysis – Industry Association Perspective

<table>
<thead>
<tr>
<th>CGC Model</th>
<th>Past Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Individual trainer can keep class ‘profit’ after expenses</td>
<td>no</td>
</tr>
<tr>
<td>✓ Industry training revenues stay in country / state</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Training revenues go to build national industry association services</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Quality program revenues build national industry association services</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Training courses reflect Canadian geology &amp; climate</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Training courses reflect Canadian regulation and standards</td>
<td>yes</td>
</tr>
<tr>
<td>✓ National industry controls national standards and training</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Quality program materials reflect industry needs</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Training is improved annually / on demand</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Improved image for industry &amp; lower insurance rates</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Lowered transaction costs for overall industry</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Honest contractors / designers better protected from the dishonest</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Accreditation linked to a complaint management mechanism</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Association serves as ombudsman and helps industry long-term</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Accreditation linked to a Code of Conduct enforcement</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Industry association adds value for governments</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Industry association adds value for industry</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Industry association adds value for end-use customers</td>
<td>yes</td>
</tr>
<tr>
<td>✓ Etc...</td>
<td></td>
</tr>
</tbody>
</table>
Market Structure Experiences

**Laissez-faire**
Assoc Functions Left to Individual Companies

- Inertia
  - Transaction costs high for each player
  - Conflicting or confusing messages to government and consumers
  - Industry driven by individual growth and fight for market share in a flat market
  - Attempts to control the market

**Market Transformation**
Programme as base for a National Assoc. and Effort

- Industry Leadership
  - Fair & national leadership asserted, change constant
  - Raising the bar in a continuous process
  - Organised, forward-looking leadership
  - Collective industry growth and relative positioning in growing market
  - Markets **will** change; industry creates its own momentum

**Fully Regulated**
~90% Handled by State

- Dependence
  - Usually centralised, standards and regs first
  - Much depends on regulator competence and involvement
  - Limited: Much depends on extant stakeholders / infrastructure
  - Consultation and decisions often directly affected by political winds / whims.
Our ultimate goals

- Work with industry professionals and partners to grow the industry in a financially sustainable manner, in Canada and abroad.
- Build and disseminate as many tools to the smaller / medium-sized contractor as possible – enable the small guy to offer big services.
- CGC College partners train, rather than private trainers, and build a workforce rather than simple training.
- Maintain control over Canada’s quality program and develop it / bolster it
- Bring in more conventional HVAC / R companies via education channels
- Raise international cooperation, fair and cooperative exchange, and bring in more stakeholders to build competition for heat pump tech.
Merci / धन्यवाद / 감사합니다 / شكرا لك / תודה / Thank you!

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