What’s New in Residential Construction?

Presented by: Sandra K. Adomatis, SRA, LEED Green Associate
Adomatis Appraisal Service
Email: Adomatis@icloud.com
Saturday, June 10, 2017: 1:30 pm - 3:00 pm.

Learning Objectives

• Define the terms associated with the new building science
• List the benefits of high performance construction
• Identify ways to establish value
Cold Climate Home – North Dakota

5,800-square foot house - annual natural gas bill of $700
occupied by two adults and four children.

March 14, 2016 Home Buyer Survey

- 84% Heating & Cooling Costs
- 67% EE Lighting
- 67% EE Appl.
- 47% Energy Landscaping
- 44% Environmentally-Friendly Community
- 11% Solar Panels

http://narnewsline.blogs.realtor.org/2016/03/14/infographic-home-buyers-going-green/#sf22588999
1. 71% said energy efficiency promotion in listings was very or somewhat valuable.
2. 56% said clients are somewhat interested in sustainability.
3. 80% said solar panels are available in their market & 42% said solar panels increased perceived property value.


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**Emerging Home Design Trends**

Keynote: Energy efficient and smart home designs are nearly neck and neck as the most popular design trends of 2017. In fact, efficiency features and new technologies are practically a must for all new home styles from builders.

1. **Energy Efficient**: 78% of the influencers think it will be trendy
2. **Smart Home**: 77% of the influencers think it will be trendy
3. **Green**: 55% of the influencers think it will be trendy

https://www.fix.com/blog
New Building Science Lingo

• ACH50- Air Changes Per Hour at 50 Pascals
• HERS – Home Energy Rating System
• HES – Home Energy Score
• Blower Door
• Duct Blaster
• ERI – Energy Rating Index (Used in U.S. Building Codes)
• ERV and HRV - Ventilation Systems

Home Performance Defined

Home Performance Priorities

- Energy Efficiency
- Comfort
- Durability
- Health
- Safety
Good Building Science Considerations

- Site Orientation
- Water Efficiency
- Energy Efficiency
- Indoor Air Quality
- Materials that last and are environmentally friendly
- Operations and Maintenance – Financial benefits

Site Orientation

- Build to the orientation
- Take advantage of site assets
- Solar access for daylighting
- Minimize site weaknesses
- Keep water runoff on site
- Landscape minimizing water needs
Water Efficiency

- Low Flow Show Heads-
  Faucets-toilets
- Recycle greywater

Energy Efficiency

- High Efficiency Appliances
- Solar Thermal or PV
- Daylighting
- Tight –well-insulated envelope
- High Efficiency Mechanicals
- Low-E Windows Double/Triple Pane
Indoor Air Quality

- HRV or ERC– Air Ventilation System – tight envelope
- Low VOC Materials
  - Paints
  - Carpets
  - Dyes – Mastics
  - Furniture

Under slab radon barrier

https://basc.pnl.gov/images
Materials that last – Durable – Environmentally Friendly

Operations and Maintenance

• Durable
• Less Maintenance
• Longer Lives

Thomas Jefferson Home – Charlottesville, VA
Home Labels

- NZE – Net Zero Energy
- ZERH – Zero Energy Ready Home
- ENERGY STAR® - Meets ES Standards of Efficiency
- Green Certified - Meets a Specific Green Standard
- Energy Efficient – Energy Efficient Measures Implemented
- High Performance – May be green + but performs higher than code.
- Smart Home – Implements Smart Technology Controls

Canada House Label


- High insulation levels in envelope
- High-efficiency windows and doors
- High-efficiency heating
- Whole-house mechanical ventilation
- Envelope rating based on diagnostic testing
- Water-conserving fixtures
- Certified by the Government of Canada

https://www.nrcan.gc.ca/energy/efficiency/housing/new-homes/5085
Canada Labels Illustrated

Code is minimum requirement. This means your comparable selection should consider which label applies to the subject and comparables.

http://www.chba.ca/nze

+100% Net Zero
Up to +80% Zero Energy Ready
+50% R-2000
+20% Energy Star
Energy Performance compared to building code

U.S. Building Codes, Climate Zone, and Energy Modeling

U.S. Building Code Increases Energy Efficiency Requirements

<p>| International Energy Conservation Code (IECC) Changes from 2006 and forward |
|---------------------------------|----------------|</p>
<table>
<thead>
<tr>
<th>IECC Year</th>
<th>Percent of Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>Base Year</td>
</tr>
<tr>
<td>2009</td>
<td>+15%</td>
</tr>
<tr>
<td>2012</td>
<td>+30%</td>
</tr>
<tr>
<td>2015</td>
<td>+31%</td>
</tr>
</tbody>
</table>

Seems there is a trend here that cannot be ignored.

2012 IECC Code requires a blower door test and a visual inspection.

Source: [http://www.greenbuildingadvisory.com/climate-zone-map-including-canada](http://www.greenbuildingadvisory.com/climate-zone-map-including-canada)
CA Energy Step Code - Voluntary

   • This home is built for solar PV and constructed energy efficient.

4. R-2000 Home is 40% better than code
   • This home is energy efficient and exceeds code or the prior labels.

2-3. ENERGY STAR and GreenBuilt -10-20% better
   • This home is more energy efficient than code.

1. BCBC – Enhanced Compliance
   • Building codes are increasing energy expectations.

Do buyers ask about utility costs?
Energy Cost “Auto-Pop” in Chicago

Maybe It is the Messaging.

My power bill is $5. What’s yours?

Adomatis Appraisal Service

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HERS Rating Reported in MLS

**HERS Index:** 55

**Comments:** EcoSmart features and HERS 55 rating per builder ensure cost-efficient living.

Challenges in Estimating Value

Knowing what is behind the wall

*SIP* Structurally Insulated Panel
Energy reports must be accessible

<table>
<thead>
<tr>
<th>Energy Reports</th>
<th>U.S.</th>
<th>Canada</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home Energy Score (HES)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Home Energy Rating Score (HERS)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Building Performance Institute (BPI)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>EnerGuide System</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Energy Audits</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

What is a HERS Index and Score?

Scoring System based off the 2006 IECC
Home based on 2006 IECC scores a HERS Index of 100
A Score of 0 = Net Zero Home

http://www.resnet.us/hers-index
2015 IECC Target ERI Scores

The ERI score is defined as a numerical score where 100 is equivalent to the 2006 IECC and 0 is equivalent to a net-zero home. Each integer value on the scale represents a one percent change in the total energy use of the rated design relative to the total energy use of the ERI reference design.

<table>
<thead>
<tr>
<th>Climate Zone 1-2:</th>
<th>52</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate Zone 3:</td>
<td>51</td>
</tr>
<tr>
<td>Climate Zone 4:</td>
<td>54</td>
</tr>
<tr>
<td>Climate Zone 5:</td>
<td>55</td>
</tr>
<tr>
<td>Climate Zones 6:</td>
<td>54</td>
</tr>
<tr>
<td>Climate Zones 7-8:</td>
<td>53</td>
</tr>
</tbody>
</table>

States That Have Already Adopted ERI as Compliance Option

There are now a total of thirteen states that have adopted the Energy Rating Index as a compliance option to their state energy code. The states that have incorporated the Energy Rating Index into their energy code are:

- Alabama
- Florida
- Hawaii
- Illinois
- Maryland
- Massachusetts
- Michigan
- Nevada
- New Jersey
- New York
- Texas
- Utah
- Vermont
Public Access to RESNET National Registry


**RESNET Appraiser Dashboard**
RESNET Appraiser Dashboard

RESNET Appraisers Search

By State/City
- State
- City

By ZIP Code
- ZIP Code

By Address
- Address

Search

RESNET Appraiser Dashboard

FILTERS
- Use the filters below to further refine your search results from the Search screen above.

Search Criteria
- By Area Name
- By ZIP Code
- By Address

Search

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RESNET Appraiser Dashboard

1. Filters allow the user to refine their search results.
2. HERS Index score range slider (0-150).
3. Builder Name filter – drop down list.
4. HERS Rating Company Name filter – drop down list.
5. Estimated annual energy cost range slider.
6. Annual savings range slider.
7. Construction date range picker.
8. *Update* button to refine search results based on filters.
9. User can choose how many results to display on the page at a time (10, 20, 50, 100).
10. Results are displayed in a table.
11. Pagination for search results.

RESNET Appraisers Search


- By State/City
- By Zip Code
- By Address

Search

Filters

*Copyright 2017 – Sandra K. Adomatis, SRA*
1500 Howard Rd SE
Washington, DC 20020

HERS Index Score

Builder's Name: Ashton Woods Homes
HERS Rating Company: Balanced Building Performance
Year of Construction: 1996
Date submitted to Registry: 2007
Annual Energy Costs: $3500
Annual Energy Savings: $0

< Back to search results
Canada EnerGuide Scale

Identify your province and select which scale applies to your property.

http://www.nrcan.gc.ca/energy/eficiency/housing/new-homes/18701

Blower Door

A blower door is a machine used to measure the airtightness of buildings. It can also measure how many times the air in the building changes per hour (ACH).

This machine is used by energy raters to develop HERS Index Ratings.

Duct Blaster

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Air Changes Per Hour – 0.47 ACH

3% Cost Over Code Built
Air Changes Per Hour – 0.47 ACH

<table>
<thead>
<tr>
<th>Code</th>
<th>Climate Zone(S)</th>
<th>Max. ACH</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006 IECC*</td>
<td>1-8</td>
<td>No requirement</td>
</tr>
<tr>
<td>2009 IECC</td>
<td>1-8</td>
<td>7 ACH</td>
</tr>
<tr>
<td>2012 IECC</td>
<td>3-8</td>
<td>3 ACH</td>
</tr>
<tr>
<td>2015 IECC</td>
<td>3-8</td>
<td>3 ACH</td>
</tr>
<tr>
<td>ENERGY STAR V</td>
<td>3-8</td>
<td>3-4 ACH</td>
</tr>
</tbody>
</table>

*IECC – International Energy Conservation Code®

2015 IECC – Energy Rating Index


ERI - Energy Rating Index

*Copyright 2017 – Sandra K. Adomatis, SRA
### HERS Rating – States w/40% of new construction receiving HERS Rating

<table>
<thead>
<tr>
<th>State</th>
<th>AVG HERS 2013</th>
<th>AVG HERS 2014</th>
<th>AVG HERS 2015</th>
<th>AVG HERS 2016</th>
<th>% of Permits w/HERS 2013</th>
<th>% of Permits w/HERS 2014</th>
<th>% of Permits w/HERS 2015</th>
<th>% of Permits w/HERS 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC</td>
<td>66</td>
<td>65</td>
<td>67</td>
<td>59</td>
<td>38.7%</td>
<td>38.9%</td>
<td>65.1%</td>
<td>100.3%</td>
</tr>
<tr>
<td>MA</td>
<td>58</td>
<td>62</td>
<td>56</td>
<td>55</td>
<td>68.7%</td>
<td>72.8%</td>
<td>83.1%</td>
<td>90.4%</td>
</tr>
<tr>
<td>IN</td>
<td>68</td>
<td>67</td>
<td>66</td>
<td>65</td>
<td>72.8%</td>
<td>68.9%</td>
<td>74.6%</td>
<td>63.5%</td>
</tr>
<tr>
<td>IA</td>
<td>61</td>
<td>60</td>
<td>59</td>
<td>56</td>
<td>54.1%</td>
<td>58.3%</td>
<td>66.2%</td>
<td>61.1%</td>
</tr>
<tr>
<td>MD</td>
<td>60</td>
<td>59</td>
<td>57</td>
<td>55</td>
<td>59.1%</td>
<td>54.5%</td>
<td>53.8%</td>
<td>58.7%</td>
</tr>
<tr>
<td>CO</td>
<td>60</td>
<td>59</td>
<td>57</td>
<td>55</td>
<td>45.0%</td>
<td>49.0%</td>
<td>51.2%</td>
<td>57.5%</td>
</tr>
<tr>
<td>CT</td>
<td>56</td>
<td>53</td>
<td>55</td>
<td>53</td>
<td>31.5%</td>
<td>29.7%</td>
<td>49.1%</td>
<td>51.6%</td>
</tr>
<tr>
<td>AZ</td>
<td>61</td>
<td>62</td>
<td>63</td>
<td>63</td>
<td>16.6%</td>
<td>57.0%</td>
<td>49.7%</td>
<td>51.3%</td>
</tr>
<tr>
<td>MN</td>
<td>54</td>
<td>57</td>
<td>53</td>
<td>51</td>
<td>11.1%</td>
<td>56.8%</td>
<td>38.3%</td>
<td>47.7%</td>
</tr>
<tr>
<td>DE</td>
<td>59</td>
<td>57</td>
<td>55</td>
<td>53</td>
<td>46.9%</td>
<td>38.3%</td>
<td>55.2%</td>
<td>44.1%</td>
</tr>
<tr>
<td>Average</td>
<td>60</td>
<td>60</td>
<td>59</td>
<td>57</td>
<td>44.4%</td>
<td>52.4%</td>
<td>58.6%</td>
<td>63.5%</td>
</tr>
<tr>
<td>Median</td>
<td>60</td>
<td>60</td>
<td>57</td>
<td>55</td>
<td>45.9%</td>
<td>55.6%</td>
<td>54.5%</td>
<td>58.1%</td>
</tr>
</tbody>
</table>

### RemRate Report

#### ANNUAL ENERGY PROFILE

<table>
<thead>
<tr>
<th>Energy End-Use</th>
<th>Component</th>
<th>Consumption (MMBTU/yr)</th>
<th>Cost ($/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating</td>
<td>Windows/ Skylights</td>
<td>4.4</td>
<td>12.1</td>
</tr>
<tr>
<td></td>
<td>Ceiling/Roofs</td>
<td>5.2</td>
<td>165</td>
</tr>
<tr>
<td></td>
<td>Above Grade Walls</td>
<td>7.9</td>
<td>102</td>
</tr>
<tr>
<td></td>
<td>Slope Roof</td>
<td>7.4</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Insulation</td>
<td>6.5</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>Mechanical Ventilation</td>
<td>1.6</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>-12.7</td>
<td>-164</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>28.7</td>
<td>370</td>
</tr>
<tr>
<td>Cooling</td>
<td>Internal Gains</td>
<td>4.3</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Mechanical Ventilation</td>
<td>1.6</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Ceiling/Windows</td>
<td>4.3</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>Insulation</td>
<td>2.9</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Windows/Skylights</td>
<td>0.1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Above Grade Walls</td>
<td>0.1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>-1.8</td>
<td>-41</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>5.7</td>
<td>68</td>
</tr>
<tr>
<td>Water Heating</td>
<td>Water Heater</td>
<td>0.6</td>
<td>15</td>
</tr>
<tr>
<td>Lighting &amp; Appliances</td>
<td>Lights &amp; Appliances</td>
<td>31.4</td>
<td>727</td>
</tr>
<tr>
<td>Photovoltaics</td>
<td>Photovoltaics</td>
<td>-15.2</td>
<td>-363</td>
</tr>
</tbody>
</table>

*Copyright 2017 – Sandra K. Adomatis, SRA*
Home Energy Score for Existing Homes

*Copyright 2017 – Sandra K. Adomatis, SRA

Home Energy Score for Existing Homes - Methodology

*SBP: U.S. Census data. Method normalized for local weather conditions and standard operations assumptions.

*SRA: Sandra K. Adomatis, SRA

http://betterbuildingschallenge.energy.gov/home-energy-score/home-energy-score-about-score

http://betterbuildingschallengeenergy.gov/home-energy-score/home-energy-score-methodology
Valuation Methods that Require Data and Competency

- Cost – less all forms of loss
- Sales Comparison – Paired-Data Analysis
- Income Approach – Present Value of Energy Savings
- Income Approach – Gross Rent Multiplier
- Income Approach – Discounted Cash Flow – Solar PV
Sales Comparison – Paired-Data Analysis

Table 10: Paired Sale 2

<table>
<thead>
<tr>
<th>Paired Sale #</th>
<th>Contract Date</th>
<th>DOM</th>
<th>Sold Price</th>
<th>Adj. Sale Price</th>
<th>Gross Adj.</th>
<th>Leasing Area (SF)</th>
<th>SPP</th>
<th>PRE</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-2</td>
<td>8/12/14</td>
<td>67</td>
<td>$780,000</td>
<td>$701,500</td>
<td>1.215</td>
<td>$180,500</td>
<td>3.37</td>
<td>103</td>
<td></td>
</tr>
<tr>
<td>S-1</td>
<td>8/12/14</td>
<td>25</td>
<td>$700,000</td>
<td>$759,500</td>
<td>5.60%</td>
<td>$20,500</td>
<td>2.63</td>
<td>104</td>
<td></td>
</tr>
<tr>
<td>S-2</td>
<td>8/15/14</td>
<td>18</td>
<td>$725,000</td>
<td>$795,500</td>
<td>1.740</td>
<td>$25,500</td>
<td>3.01</td>
<td>107</td>
<td></td>
</tr>
</tbody>
</table>

Pair 2 - Premium Results

Subject - HPH Sale | 67 | $780,000 | 1.720 | 1.67 |
Mean               | 9  | $750,000 | 8.70% | 1.557 | $20,000 |


Income Approach – Discounted Cash Flow & Cost Approach

Solar photovoltaic system valued by a discounted cash flow analysis using PV Value®

www.pvvalue.com


*Copyright 2017 – Sandra K. Adomatis, SRA*
If only the appraiser could see this!

<table>
<thead>
<tr>
<th>Improvement Projects</th>
<th>Estimated Total Cost</th>
<th>Estimated Incentive</th>
<th>Estimated Annual Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air seal</td>
<td>$1,504</td>
<td>$750</td>
<td>$185</td>
</tr>
<tr>
<td>Water heaters - all</td>
<td>$1,295</td>
<td>-</td>
<td>$360</td>
</tr>
<tr>
<td>Insulate basement</td>
<td>$1,852</td>
<td>$281</td>
<td>$266</td>
</tr>
<tr>
<td>Insulate attic</td>
<td>$1,403</td>
<td>$96</td>
<td>$20</td>
</tr>
<tr>
<td>Insulate vault / flat</td>
<td>$747</td>
<td>$113</td>
<td>$29</td>
</tr>
<tr>
<td>Insulate walls</td>
<td>$3,039</td>
<td>$556</td>
<td>$112</td>
</tr>
<tr>
<td>PV</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Windows</td>
<td>$6,169</td>
<td>-</td>
<td>-5</td>
</tr>
<tr>
<td>Heating systems - all</td>
<td>$3,122</td>
<td>$500</td>
<td>-$212</td>
</tr>
<tr>
<td>Package Total</td>
<td>$18,192</td>
<td>$2,295</td>
<td>$754</td>
</tr>
<tr>
<td>Total Package Costs after Incentives:</td>
<td>$15,897</td>
<td>-</td>
<td>$754</td>
</tr>
</tbody>
</table>

PRESENT VALUE OF SAVINGS

Saving $754 a year for 18 years or a total savings ($13,572) is worth $9,545 in today’s dollars.
Resources – Grants-Incentives-Regulations

Canada

Grants and Financial Incentives

Select your province to see what grants, financial incentives or programs are available.

www.nrcan.gc.ca/energy/funding/4947

United States

http://www.dsireusa.org/

Data Challenges – Really?

*Copyright 2017 – Sandra K. Adomatis, SRA
Data Flow in a “Typical” MLS

Source: Rob Larson

Data flow possibilities

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Roadmap to Solar PV Data

First Steps to Auto Populating the MLSs with Solar PV Data


OPT Out Language for Contracts

Contract Consent Clauses

This strategy is designed to collect data from future system installations. These could either be new consent clauses or the amendment of existing confidentiality and third-party data-access clauses to gain the customer's consent to access their data.

Clauses could include opt-in or opt-out language. As such they should adhere to the best practices noted for Barrier Buster I (page 62). Most importantly, they must provide an explicit description of what the data will be used for and how their use will be restricted to protect customer privacy. Clauses should clarify that the goal is to share data with the MLS or additional data syndicators like real estate portals.
Steps forward to a more accurate valuation – Rate – Record

A two-page resource especially designed for new homebuilders

- Identifies resources regarding the appraisal of your energy efficient home
- Provides a sample letter for lender
- Identifies your “Bill of Rights” in the appraisal process

[Additional content as per the image]
Prepare Your Buyer

https://www.appraisalinstitute.org/assets/1/29/AI-BCAP_Flyer.pdf

Sample Letter to Lender

https://www.appraisalinstitute.org/assets/1/29/AI-BCAP_Flyer.pdf
Residential Green and Energy Efficient Addendum

- Alerts lender property is special
- Recognize special features
- Credible value opinion
- Brag sheet

Residential Green and Energy Efficient Addendum

- Standardize the communication of residential high performance features
- Enhance current appraisal forms
- Provide a basis for the comparable sales search

www.appraisalinstitute.org/assets/1/7/ai-residential-green-energy
Overcoming barriers

AI Residential Green & Energy Efficient Addendum

Residential Green Valuation Tools
www.appraisalinstitute.org/assets/1/7/ai-residential-green-energy

2-Page New Builder Resource

Appraisal Institute Green Registry

Valuation of Sustainable Buildings

<table>
<thead>
<tr>
<th>Title</th>
<th>Hours</th>
<th>State Approval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to Green Buildings</td>
<td>8</td>
<td>State Approval</td>
</tr>
<tr>
<td>Case Studies in Appraising Green Residential Buildings</td>
<td>8</td>
<td>State Approval</td>
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<td>Residential and Commercial Valuation of Solar</td>
<td>15</td>
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</tr>
<tr>
<td>Case Studies in Appraising Green Commercial Buildings</td>
<td>16</td>
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FAQs
Program Registry – Residential
Program Registry – Commercial

http://www.appraisalinstitute.org/education/your-career/professional-development-programs/

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Steps Forward

How will you apply what you learned today?

Speaker contacts

Sandy Adomatis, SRA,
LEED Green Associate
Adomatis Appraisal Service

Twitter: https://twitter.com/sadomatis
Website: http://www.adomatisappraisalservice.com

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Thank You for Attending!