How Much is Zero?

Agile Solar Power Design with Insight360

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Class summary

Whether building for net zero or reducing building utility bills through net-metering with on-site energy production, distributed solar has become a common component of the modern design process.

This class will show how to use built-in tools in Revit software and FormIt software to understand the potential of solar power and its contribution to overall building-energy performance from the very beginning of conceptual design, and to generate and analyze a complete solar design from concept phase through to detailed panel layouts and specifications. We will also show advanced processes using Dynamo solar analysis graphs to parameterize, automate, and optimize your solar power installation at all design phases.

Key learning objectives

At the end of this class, you will:

- Learn how to visualize, optimize and integrate solar power systems during the design workflow starting at the pre-design through design development using Insight360 with FormIt, Revit and Dynamo.
- Learn how to identify the best locations, sizes and orientations for solar PV systems to meet energy targets.
- Learn how to use detailed design tools like Solar Analysis for Revit and Solar Analysis for Dynamo to define the specific solar PV system geometry and specifications.
- Gain confidence in the underlying Energy and Solar Analysis processes and use it to make better decisions faster.

What we will cover

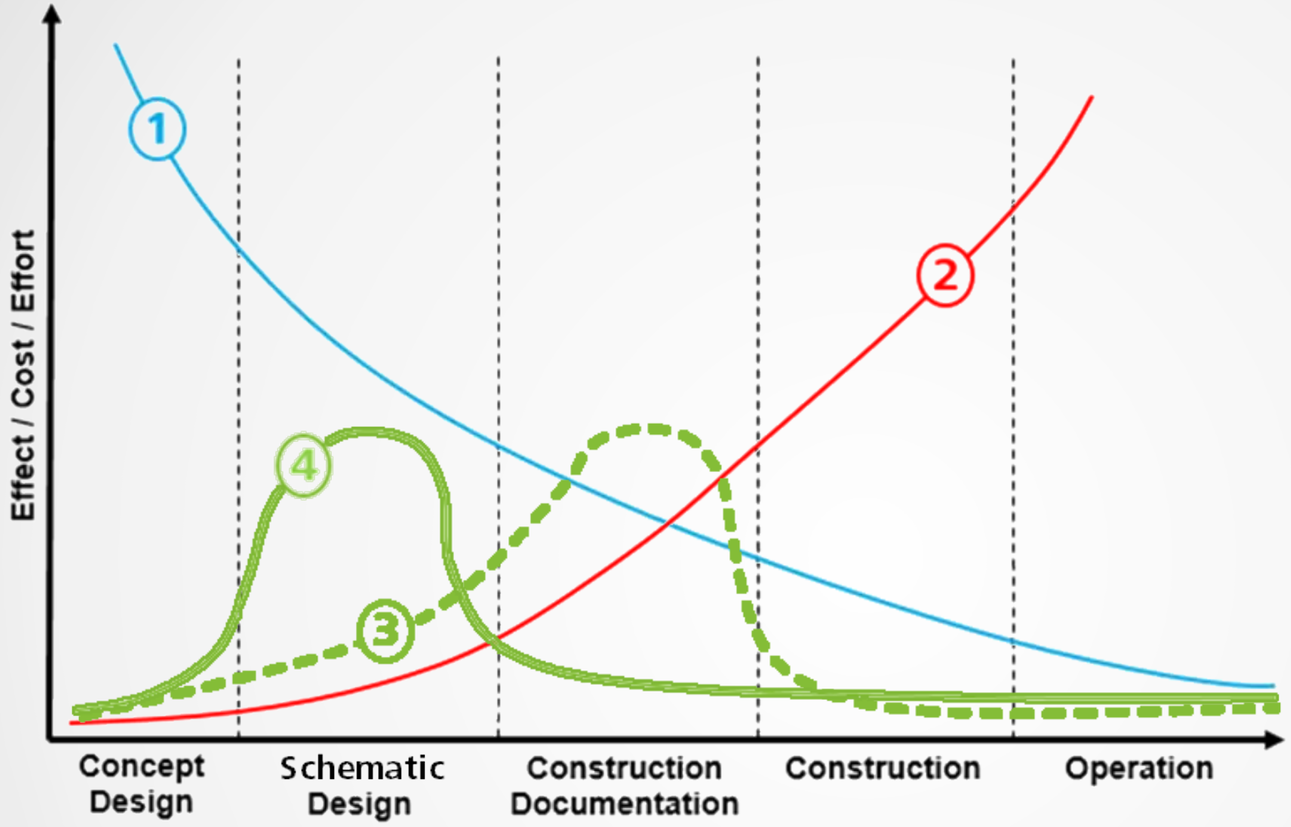
- Section 1.0 – **Agile Design and the Living Model**
- Section 2.0 – **Insight360 as an Agile agent for FormIt and Revit**
  - 2.1 – Insight360 Energy and Solar Energy PV
  - 2.2 – Solar Analysis for PV in FormIt and Revit
- Section 3.0 – **Solar Energy PV Design Iteration**
  - 3.1 – Site Analysis and Conceptual Design
  - 3.2 – FormIt and Revit
  - 3.3 – Detailed panel design and layout control
  - 3.4 – Dynamo automation for PV design
  - 3.5 – Working with Raw data export
- Section 4.0 – **Engine and Validation**

Section 1

Agile Solar Power Design

Section 1.1 – Agile Design and the Living Model

Traditional vs. Integrated…



1. Ability to impact cost & performance
2. Cost of design changes
3. Traditional design testing/analysis phase
4. Integrated design testing/analysis phase

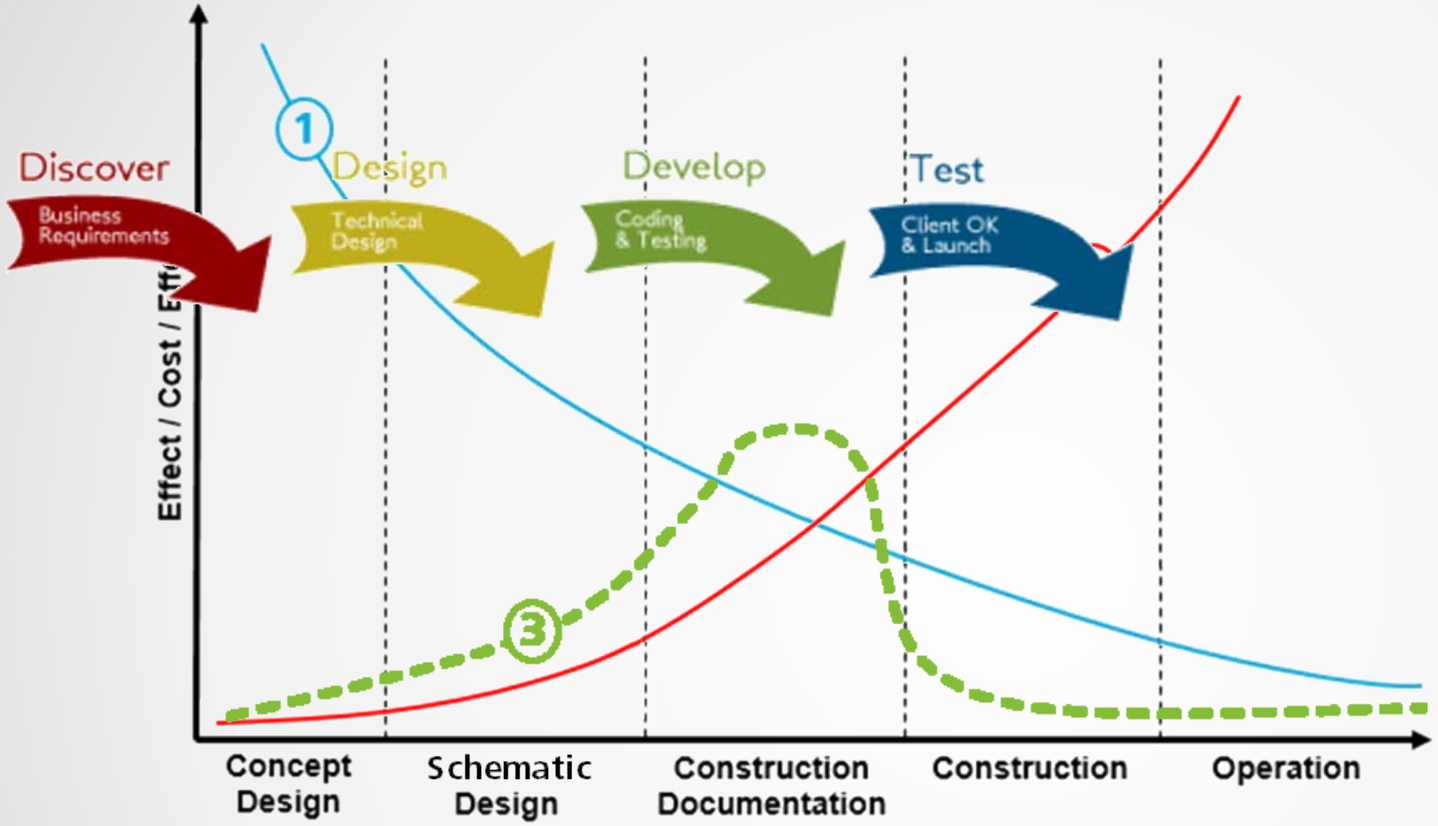
Making Better Buildings has a lot in common with Making Better Software.

Traditional → Integrated

Plan Driven
Serialized Process
Team Handoffs
Test at End

Value Driven
Iterative Process
Team Integration
Test Early

Waterfall vs. Agile…



1 Ability to impact cost & performance

2 Cost of design changes

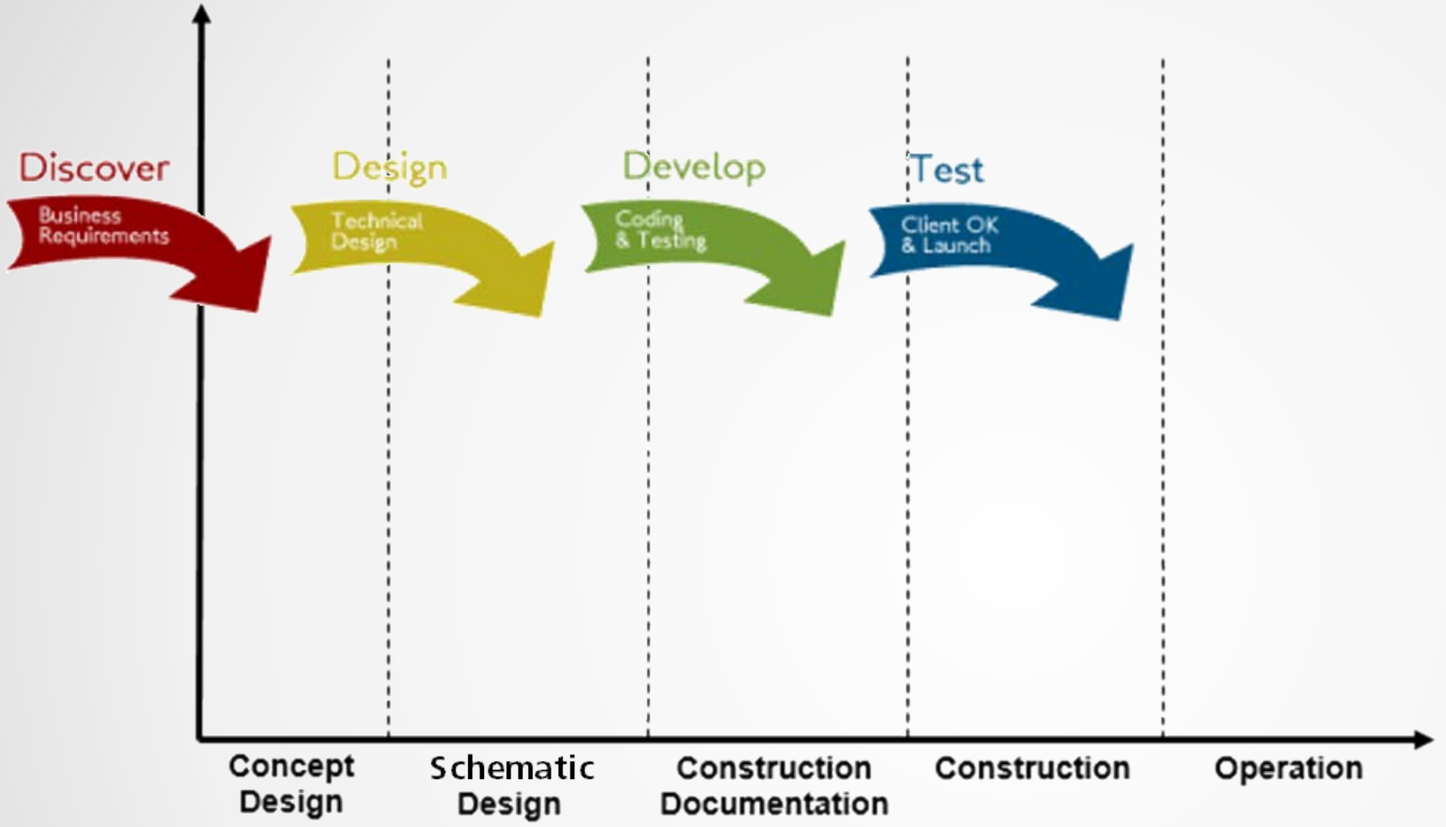
3 Waterfall design testing/analysis - phased

Waterfall

Plan Driven
Serialized Process
Team Handoffs
Test at End

Making Better Buildings has a lot in common with Making Better Software.

Waterfall vs. Agile…



Waterfall

Plan Driven
Serialized Process
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Test at End

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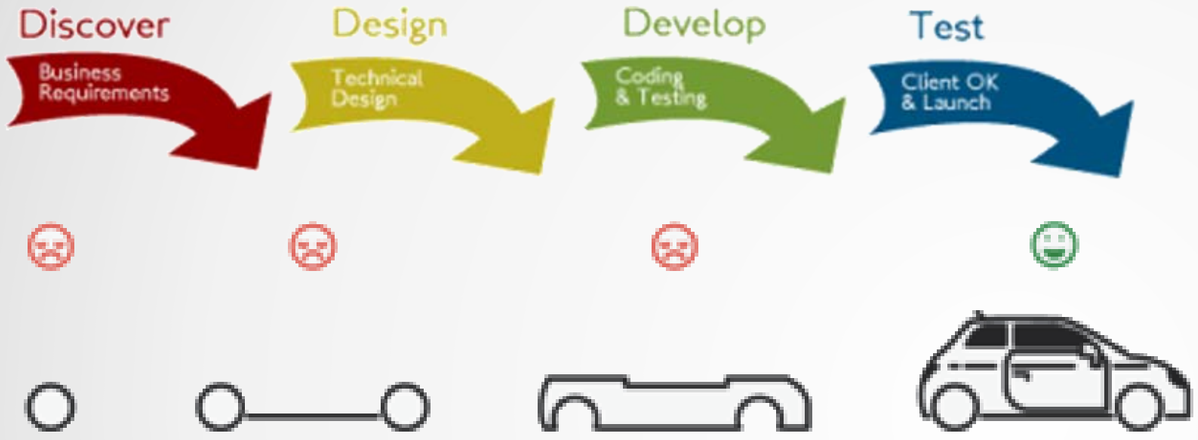

Making Better Buildings has a lot in common with Making Better Software.

Waterfall

Plan Driven
Serialized Process
Team Handoffs
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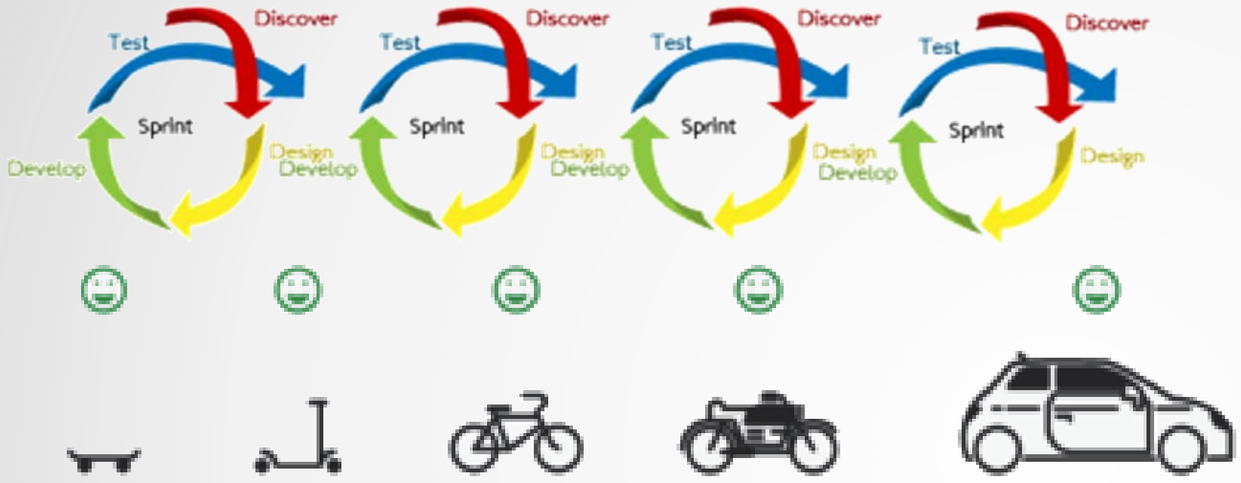
Waterfall vs. Agile…



Making Better Buildings has a lot in common with Making Better Software.

Waterfall → **Agile**

Plan Driven
Serialized Process
Team Handoffs
Test at End

Value Driven
Iterative Process
Team Integration
Test Continuously

Waterfall vs. Agile…

Set targets

Optimize passive design (ie reduce loads)

Optimize active system (ie HVAC design)

Design PV system to meet energy reduction targets

Waterfall

Plan Driven
Serialized Process
Team Handoffs
Test at End

Waterfall vs. Agile…

Site shading, siting & PV energy potential

Concept assessment, energy targets & PV siting

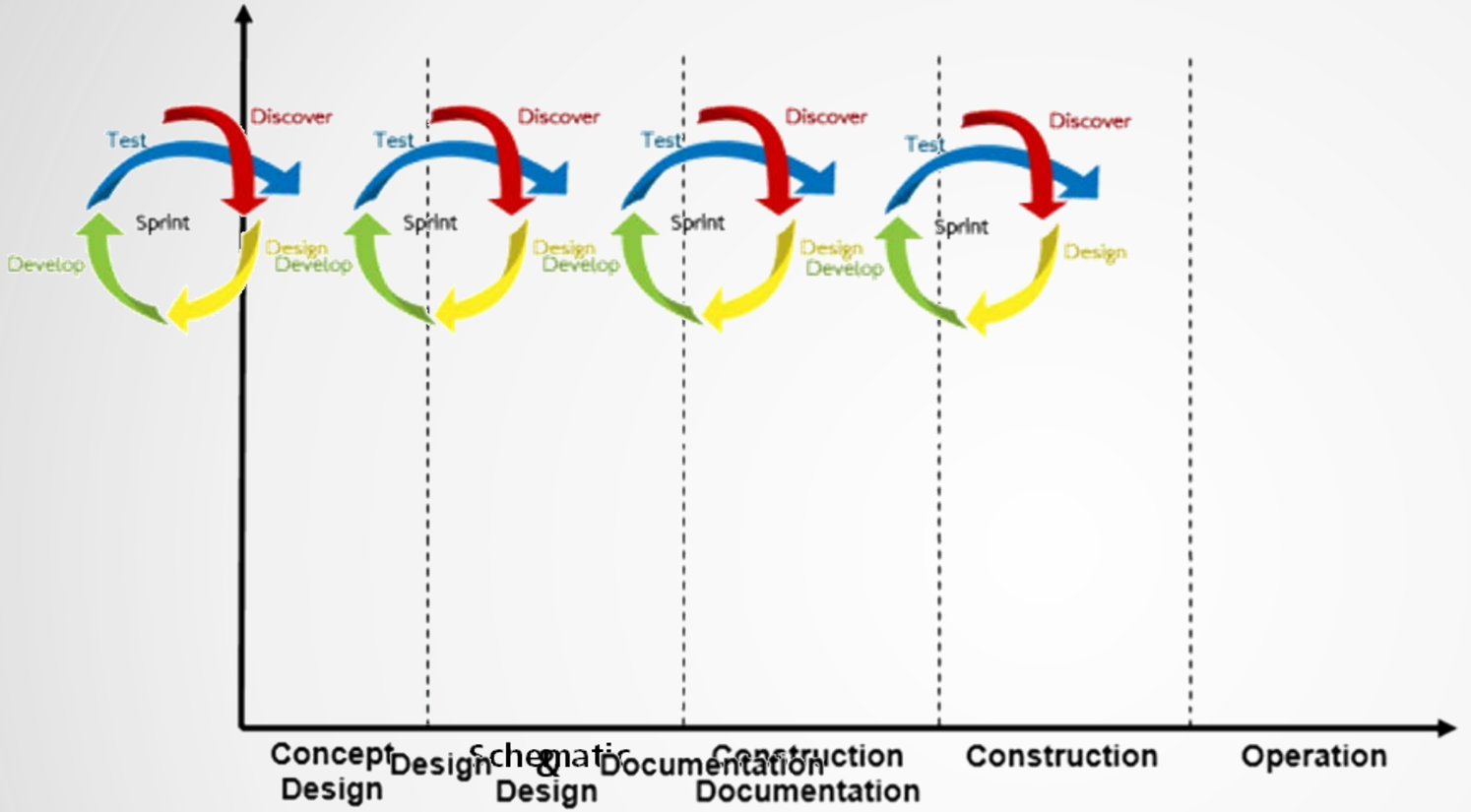
Building integration, sizing & panel siting

System specifications, panel layout & constr

Agile

Value Driven
Iterative Process
Team Integration
Test Continuously

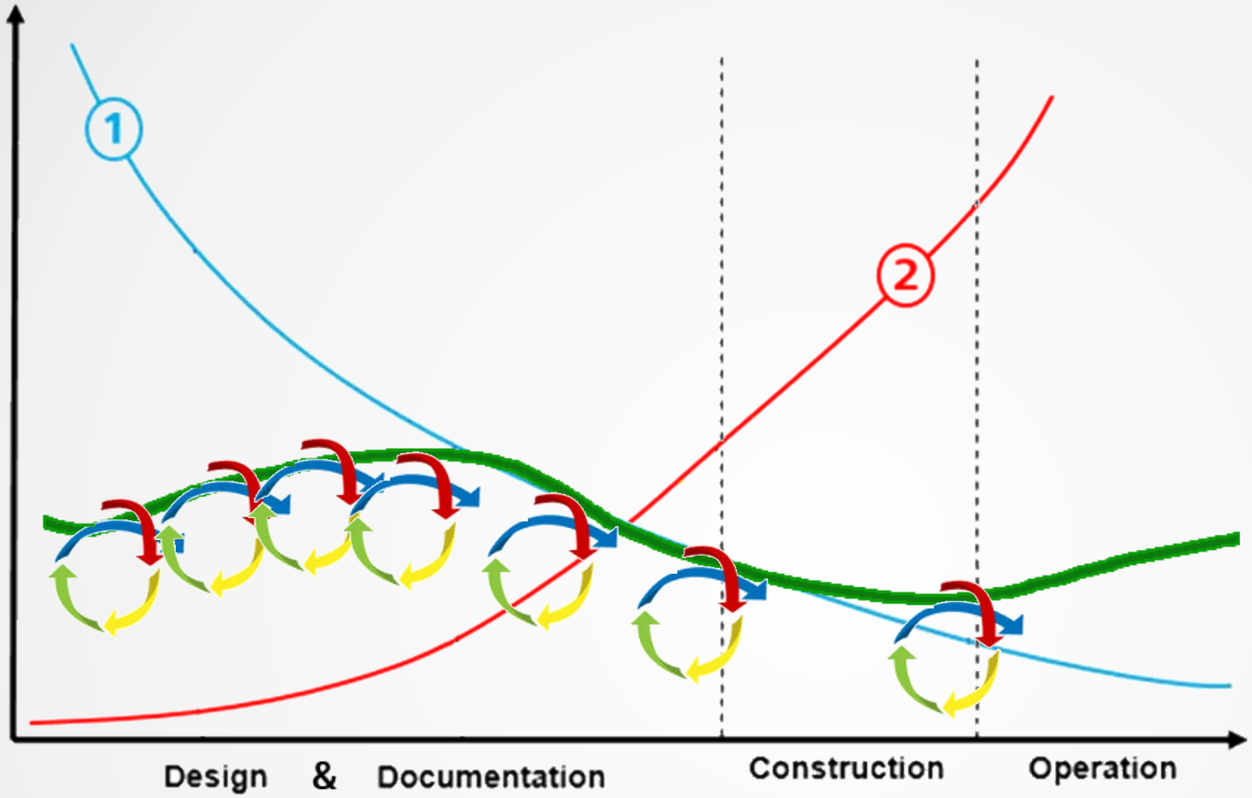
Waterfall vs. Agile…



Agile

Value Driven
Iterative Process
Team Integration
Test Continuously

Waterfall vs. Agile…



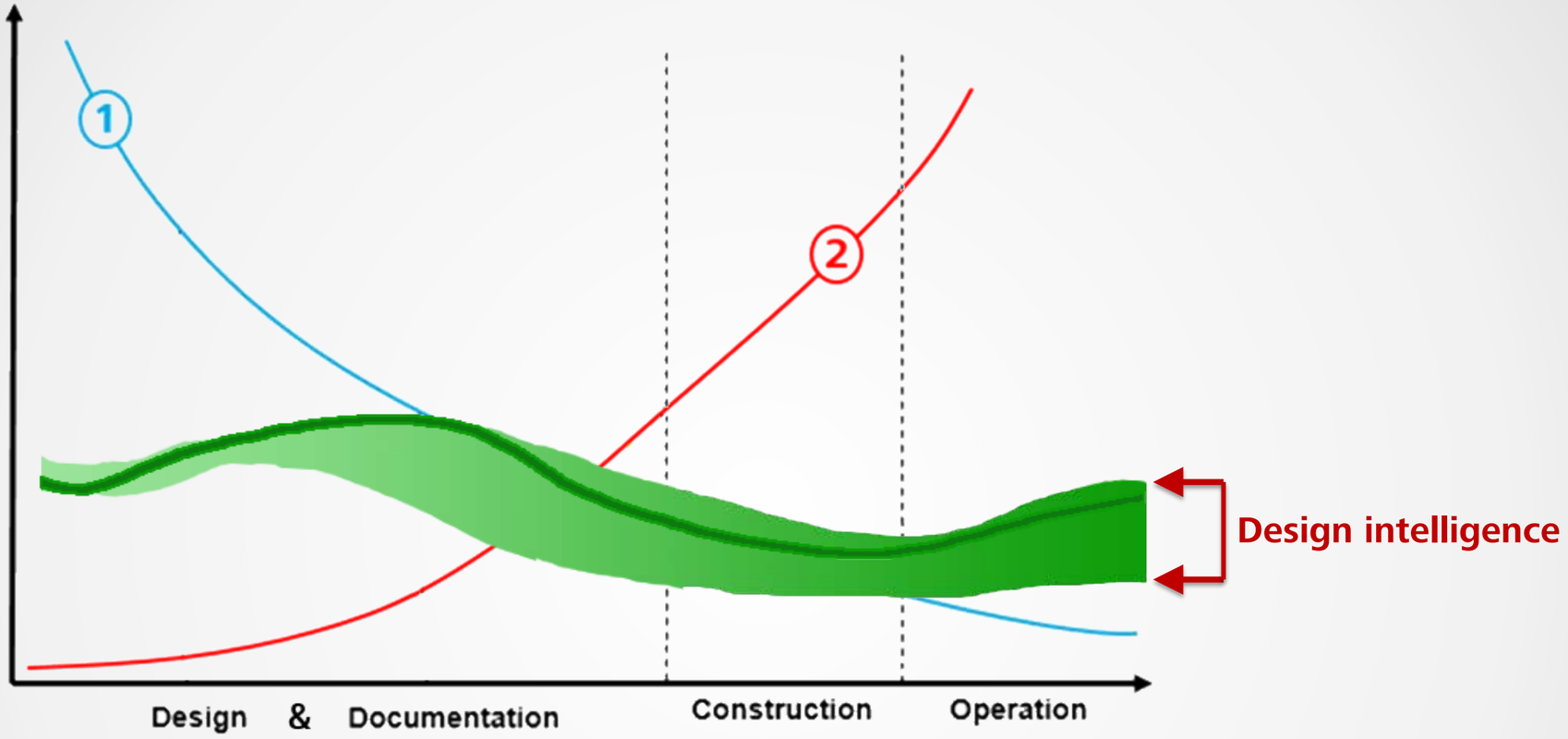
1 Ability to impact cost & performance

2 Cost of design changes

Agile

Value Driven
Iterative Process
Team Integration
Test Continuously

Waterfall vs. Agile…



Agile

Value Driven
Iterative Process
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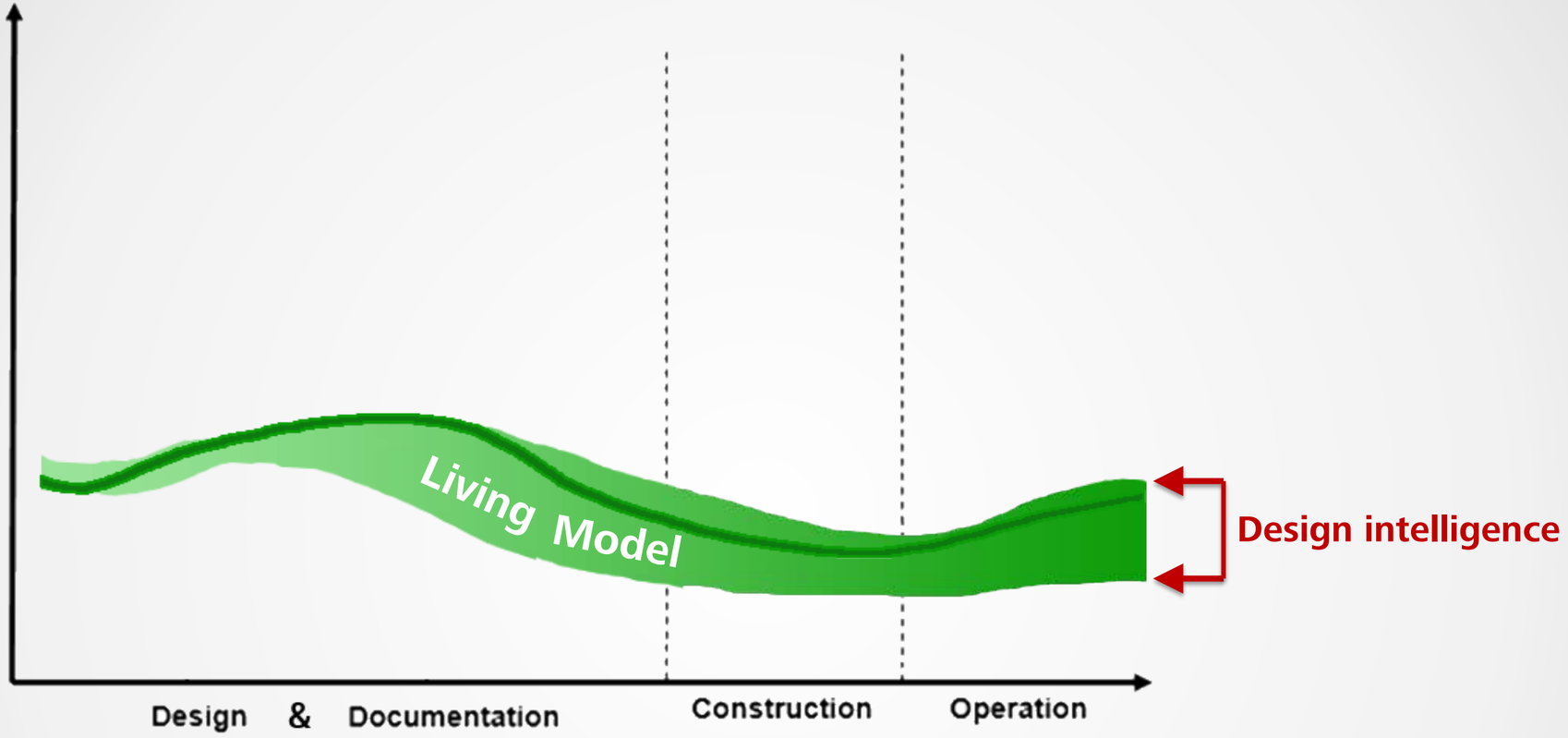
Test Continuously

Waterfall vs. Agile…



Agile

Value Driven
Iterative Process
Team Integration
Test Continuously

Section 1

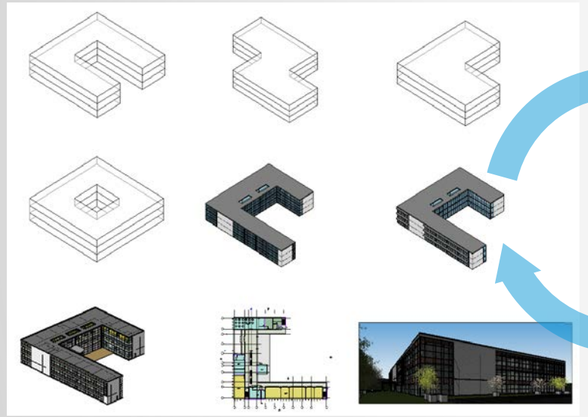
Agile Solar Power Design

Section 1.2 - Insight360 Tool Set

Autodesk Insight 360…

A Fast, Intuitive Outcome Driven Guide to Better Building Energy & Environmental Performance.

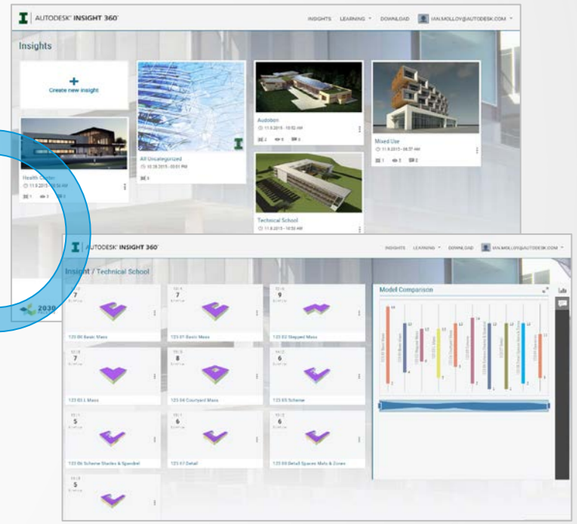
Revit and FormIt 360



Factors & Ranges, Heating, Cooling, Lighting & Solar

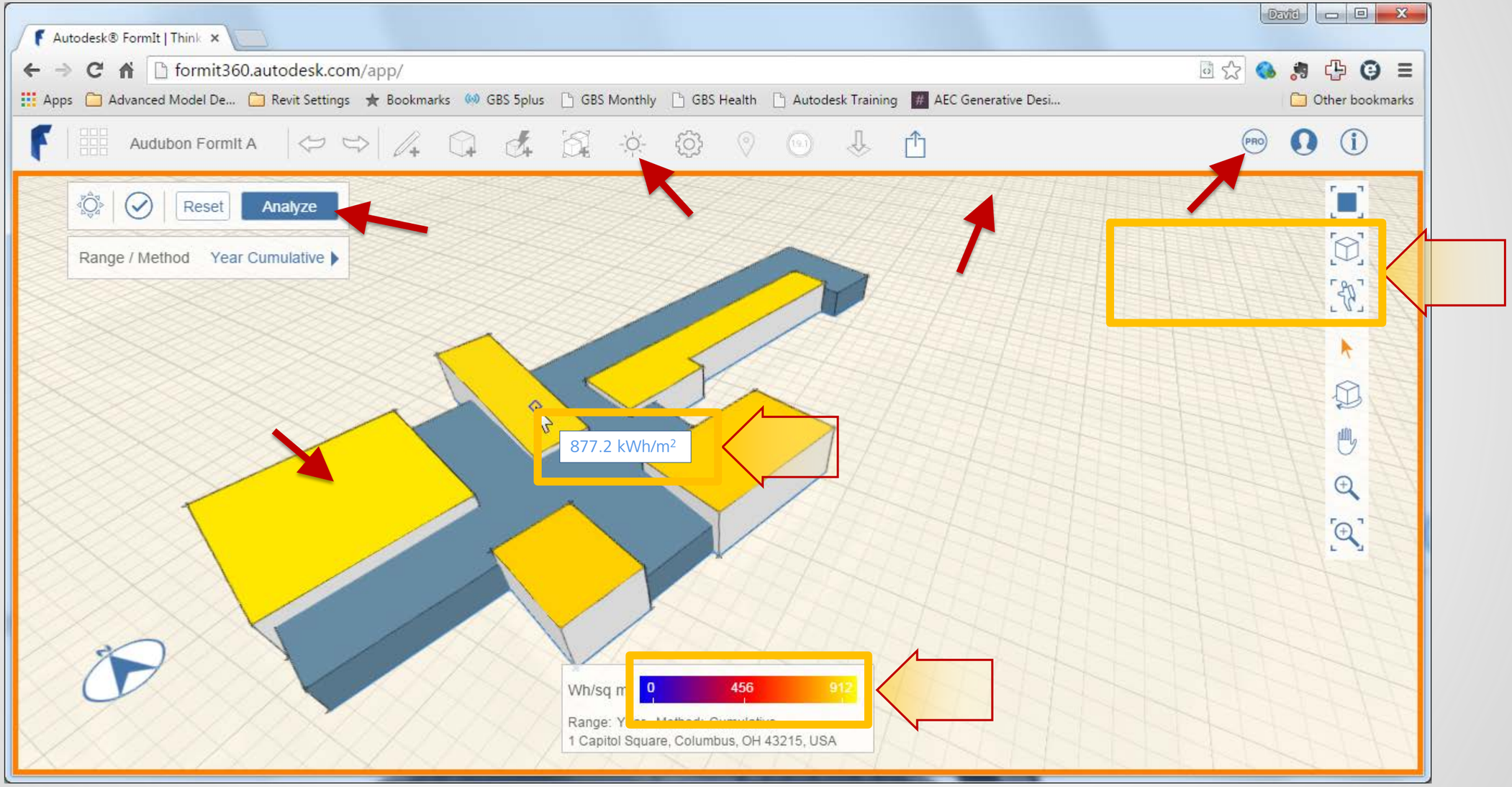
Energy Cost Range & Benchmarks

Insights & Models



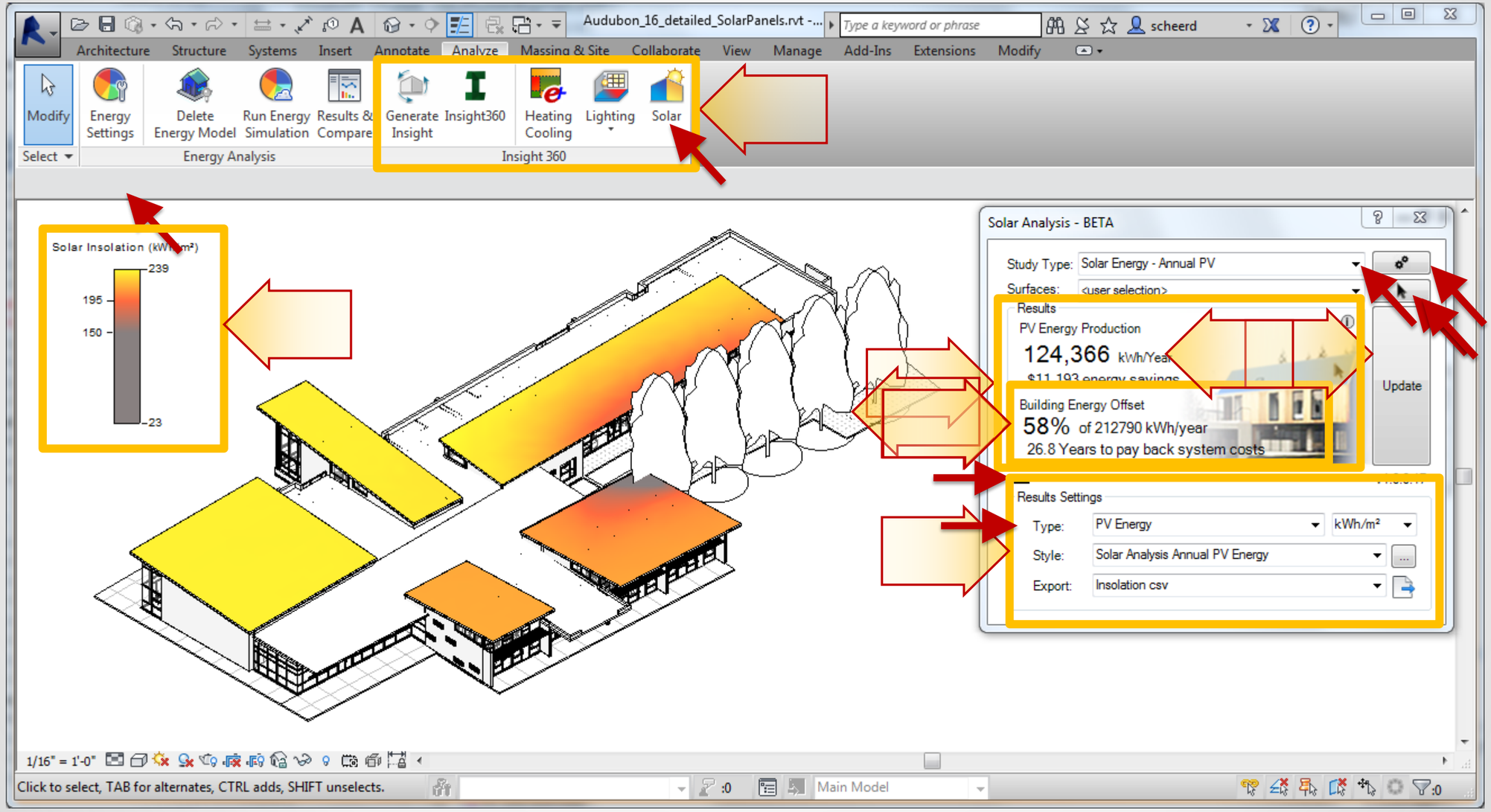
Solar Analysis in FormIt Pro…

In canvas results on model surfaces for cumulative annual and peak monthly insolation.



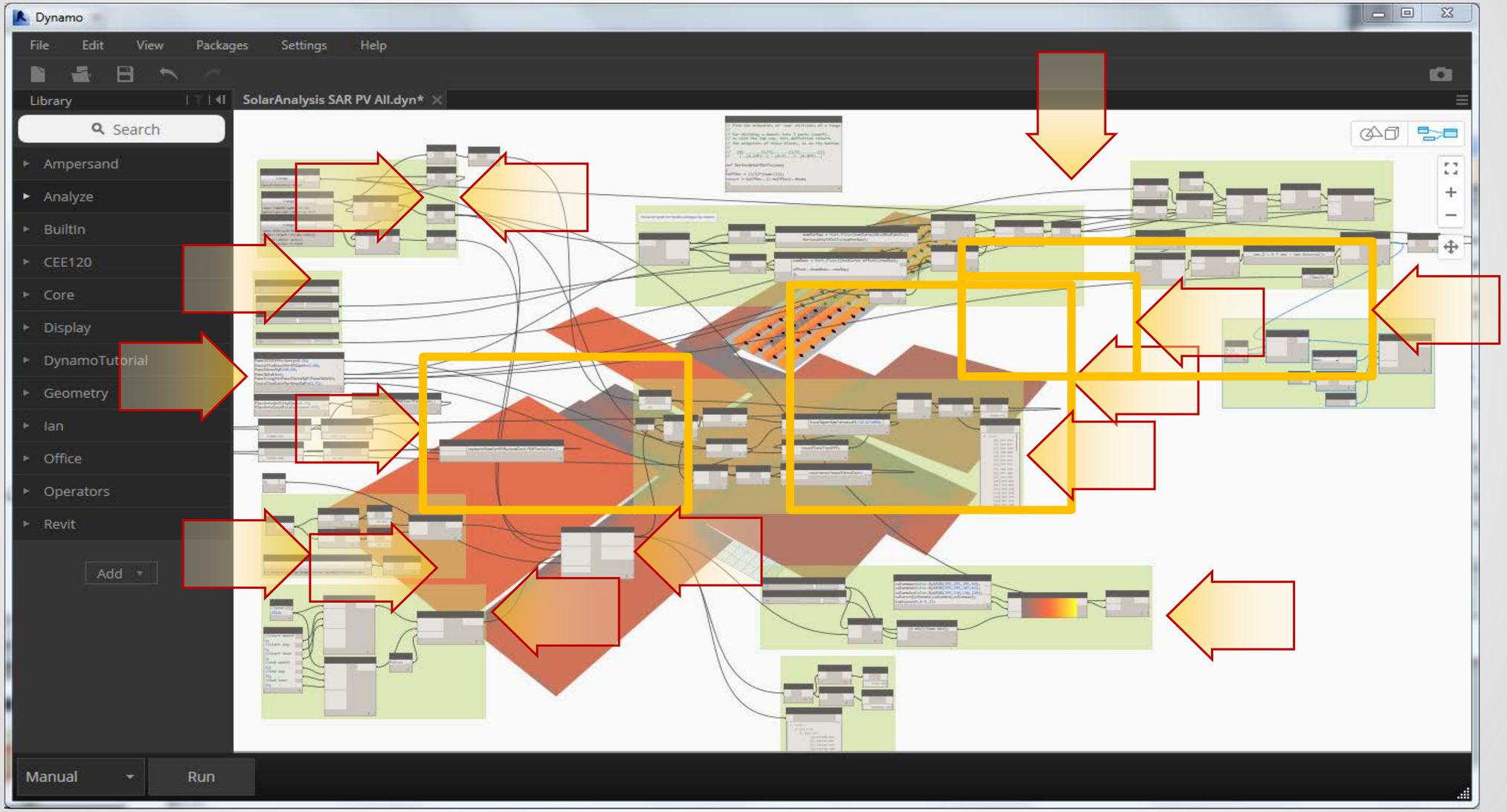
Solar Analysis in Revit Insight360…

In canvas results on model surfaces and summary calculations for custom and PV energy analysis studies



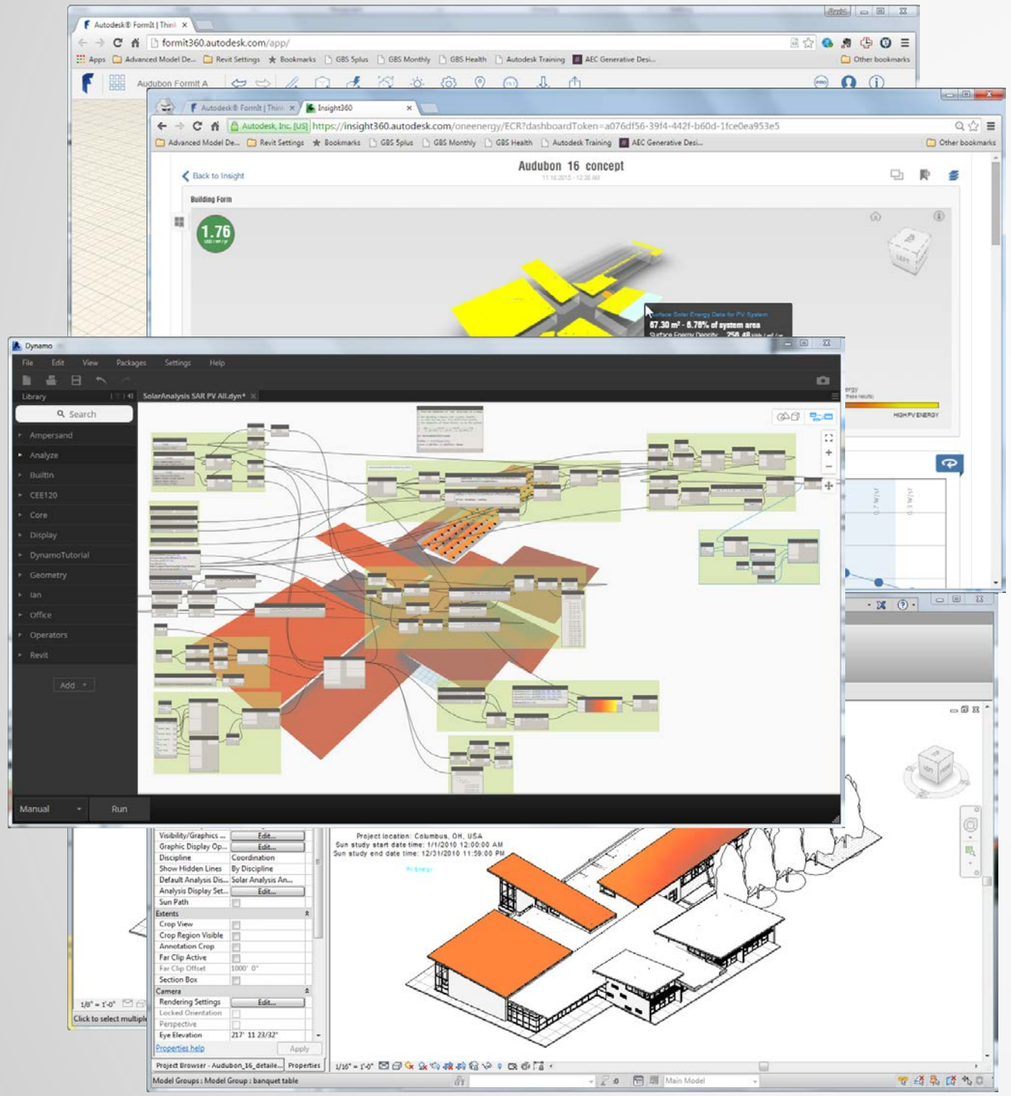
Solar Analysis using Dynamo…

Solar Analysis node supporting surface insolation calculations and visualization for Revit and standalone.



Agile Solar Power Workflow…

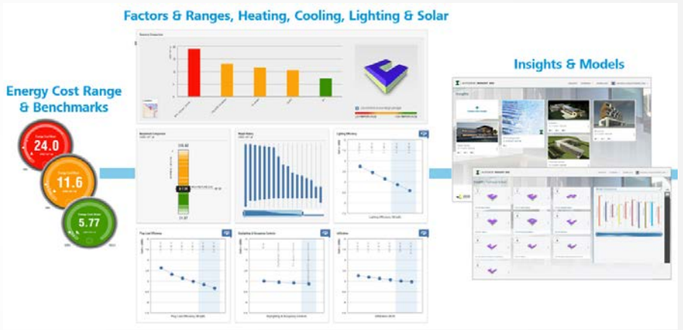
FormIt 360 Pro and/or Revit Subscription



1. Set Location

2. Generate Insight
   - Automatic Energy Analytical Model creation
   - Millions of whole building energy simulations
   - Automatic PV Energy factors for any model

3. Open Insight 360 to explore Energy & PV design Factors



4. Work in FormIt and/or Revit for focused design and Solar performance feedback

5. Automate and customize the process using Dynamo

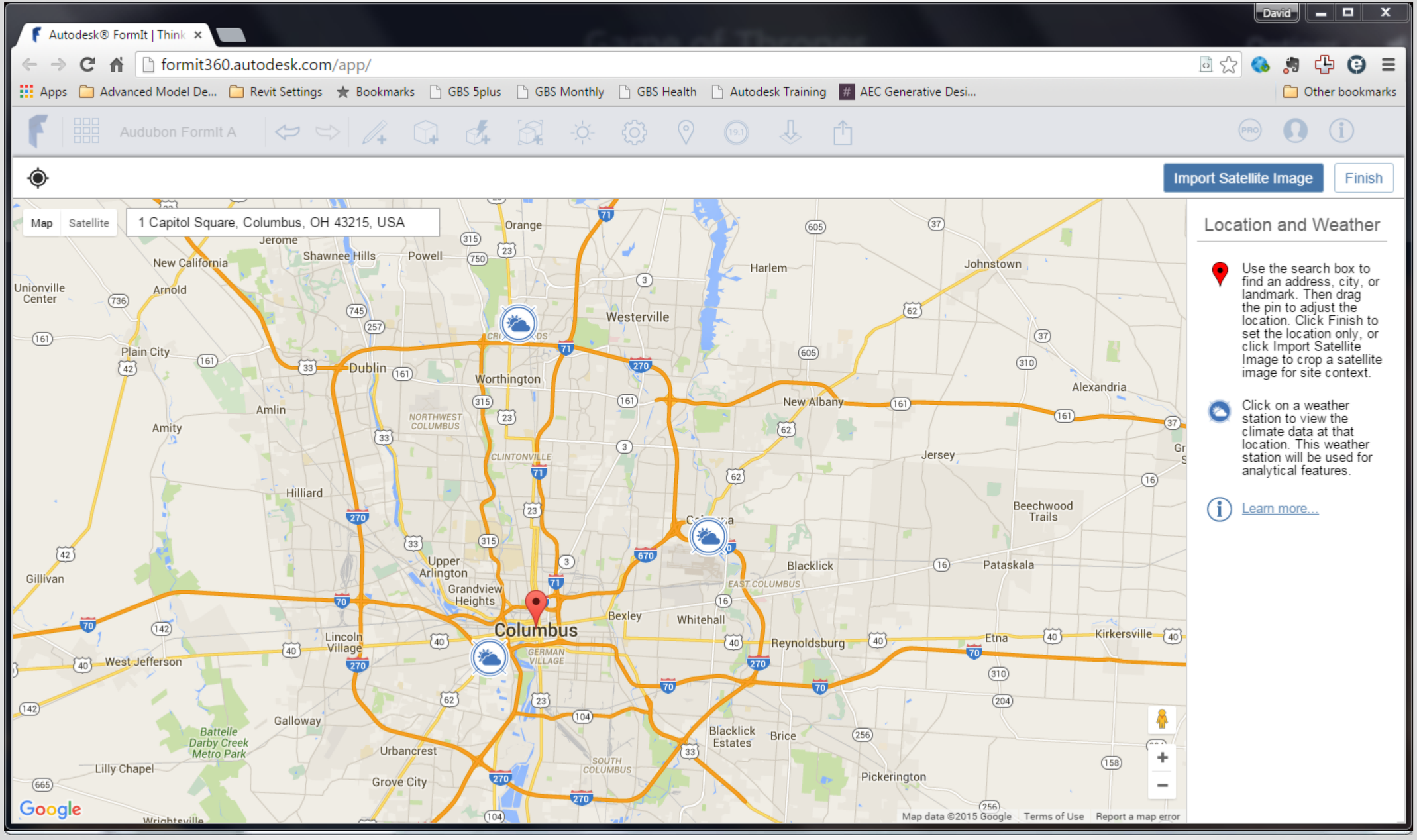
6. Repeat 2-5 as needed on any model, any time

* Innovative computational techniques provide the equivalent of millions of simulation results in a fraction of the time

Section 2

Agile Design for Solar Power

Exercise 2.1 - Site Potential


Autodesk® FormIt | Think
David
formit360.autodesk.com/app/
Apps
Advanced Model De...
Revit Settings
Bookmarks
GBS 5plus
GBS Monthly
GBS Health
Autodesk Training
AEC Generative Desi...
Other bookmarks
Audubon FormIt A
Import Satellite Image
Finish
Map
Satellite
1 Capitol Square, Columbus, OH 43215, USA
Location and Weather
Use the search box to find an address, city, or landmark. Then drag the pin to adjust the location. Click Finish to set the location only, or click Import Satellite Image to crop a satellite image for site context.
Click on a weather station to view the climate data at that location. This weather station will be used for analytical features.
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Upper Arlington
Bexley
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Blacklick
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Gahanna
Jersey
Alexandria
Johnstown
Harlem
Orange
Powell
Shawnee Hills
New California
Unionville Center
Arnold
Plain City
Amlin
Amity
Gillivan
West Jefferson
Lincoln Village
Galloway
Urbancrest
Grove City
Lilly Chapel
Battelle Darby Creek Metro Park
Blacklick Estates
Brice
Pickerington
Etna
Kirkersville
Beechwood Trails
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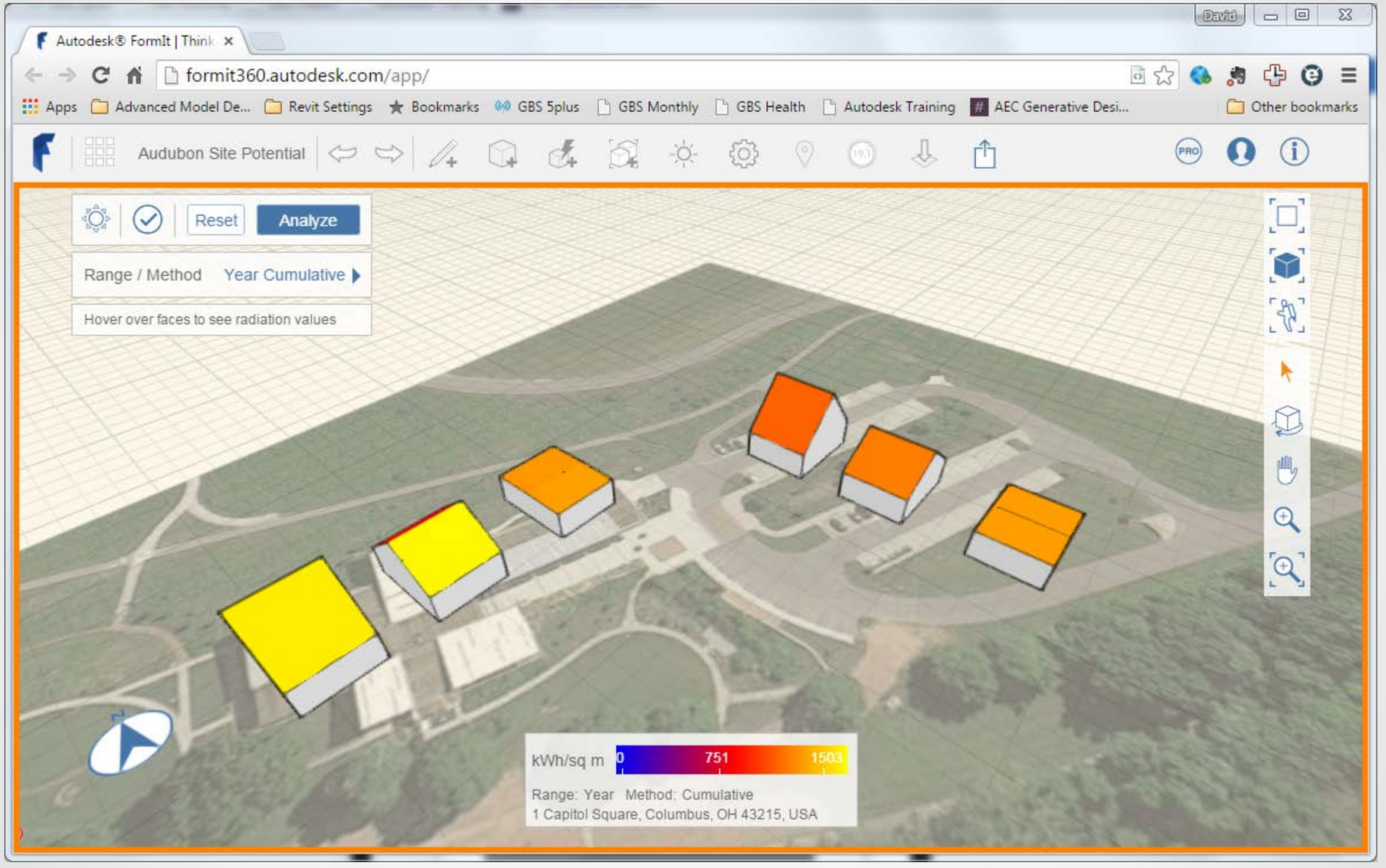
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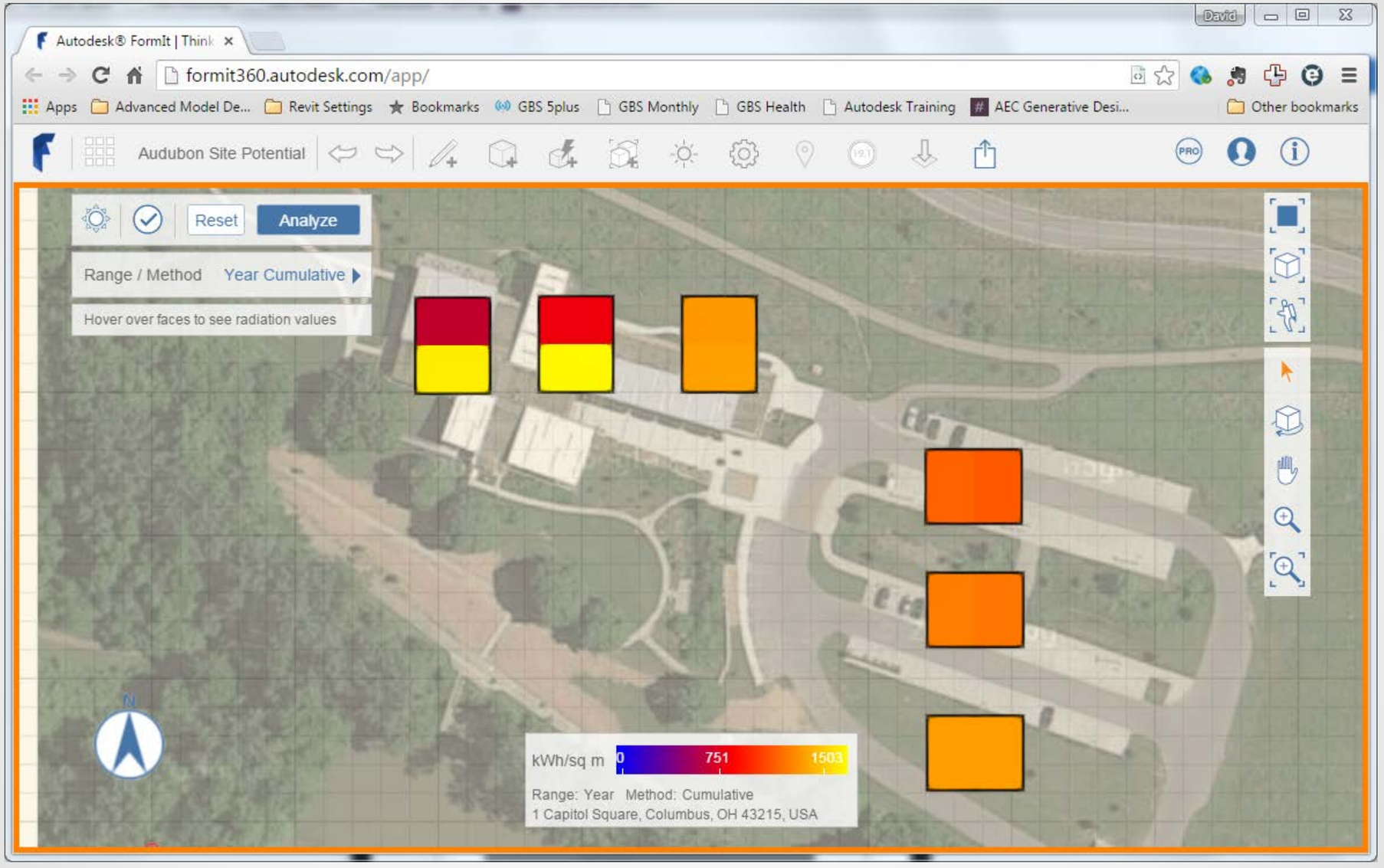
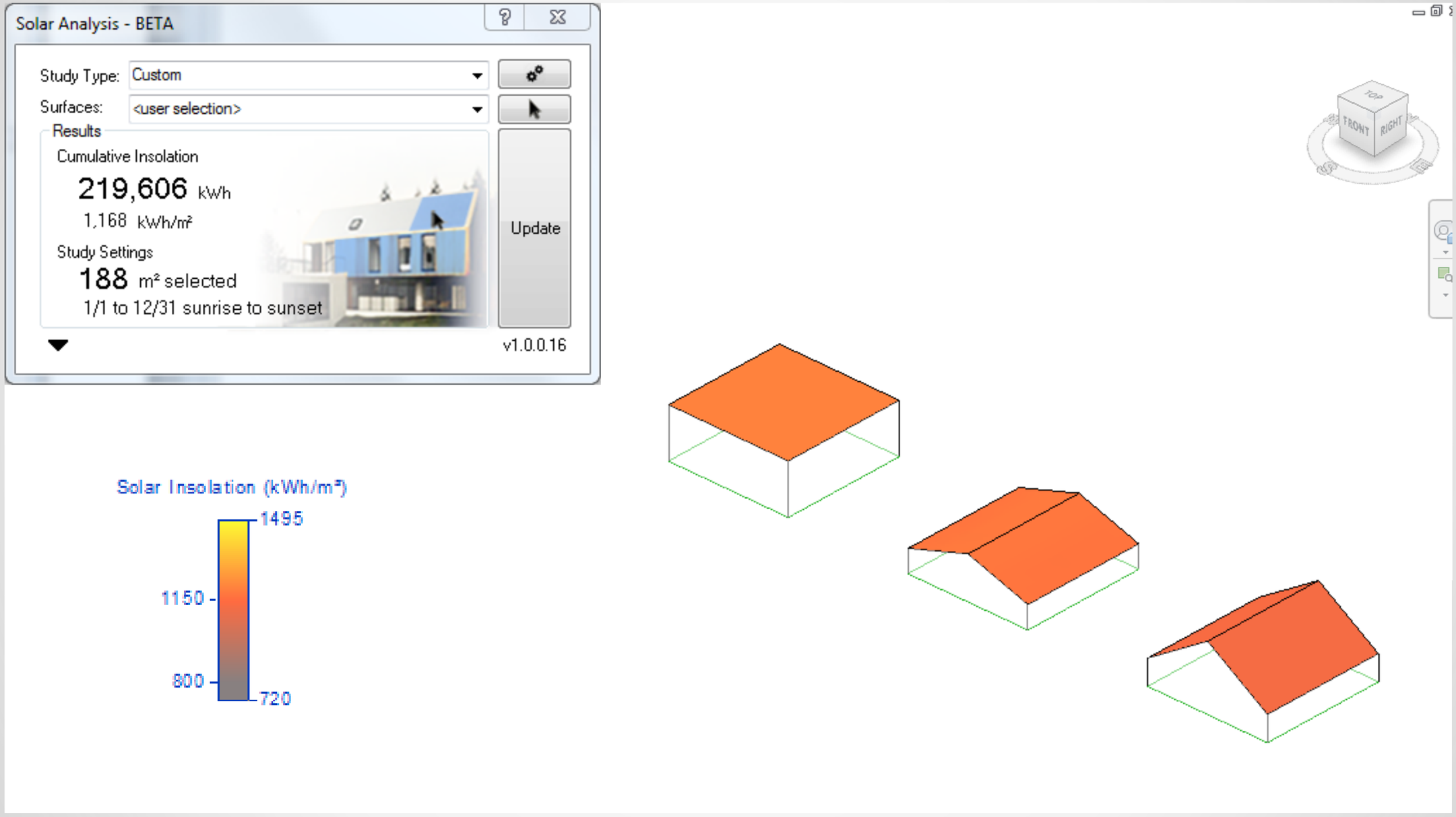
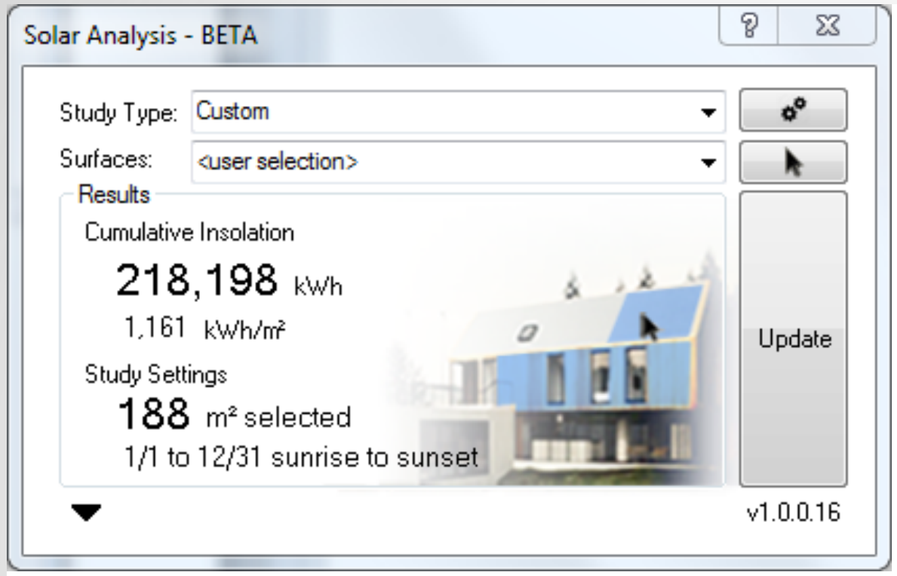
GBS 5plus
GBS Monthly
GBS Health
Autodesk Training
AEC Generative Desi...
Other bookmarks
Audubon Site Potential
Reset
Analyze
Range / Method
Year Cumulative
Hover over faces to see radiation values
kWh/sq m
0
751
1503
Range: Year Method: Cumulative
1 Capitol Square, Columbus, OH 43215, USA


Autodesk® FormIt | Think
formit360.autodesk.com/app/
Apps
Advanced Model De...
Revit Settings
Bookmarks
GBS 5plus
GBS Monthly
GBS Health
Autodesk Training
AEC Generative Desi...
Other bookmarks
Audubon Site Potential
Reset
Analyze
Range / Method
Year Cumulative
Hover over faces to see radiation values
N
kWh/sq m
0
751
1503
Range: Year Method: Cumulative
1 Capitol Square, Columbus, OH 43215, USA


Solar Analysis - BETA
Study Type: Custom
Surfaces: <user selection>
Results
Cumulative Insolation
219,606 kWh
1,168 kWh/m²
Study Settings
188 m² selected
1/1 to 12/31 sunrise to sunset
Update
v1.0.0.16
Solar Insolation (kWh/m²)
1495
1150
800
720
TOP
FRONT
RIGHT


Solar Analysis - BETA
Study Type:
Custom
Surfaces:
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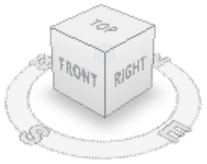
Results
Cumulative Insolation
218,198 kWh
1,161 kWh/m²
Study Settings
188 m² selected
1/1 to 12/31 sunrise to sunset
Update
v1.0.0.16


TOP
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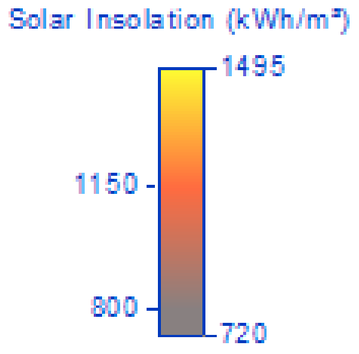
Solar Insolation (kWh/m²)
1495
1150
800
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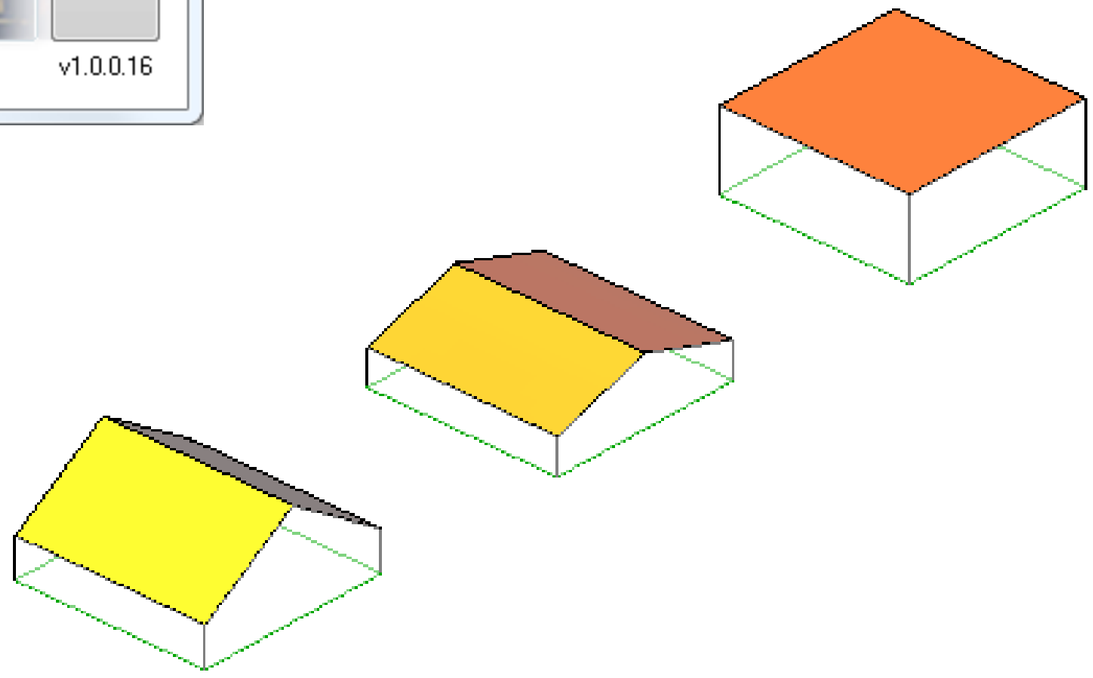
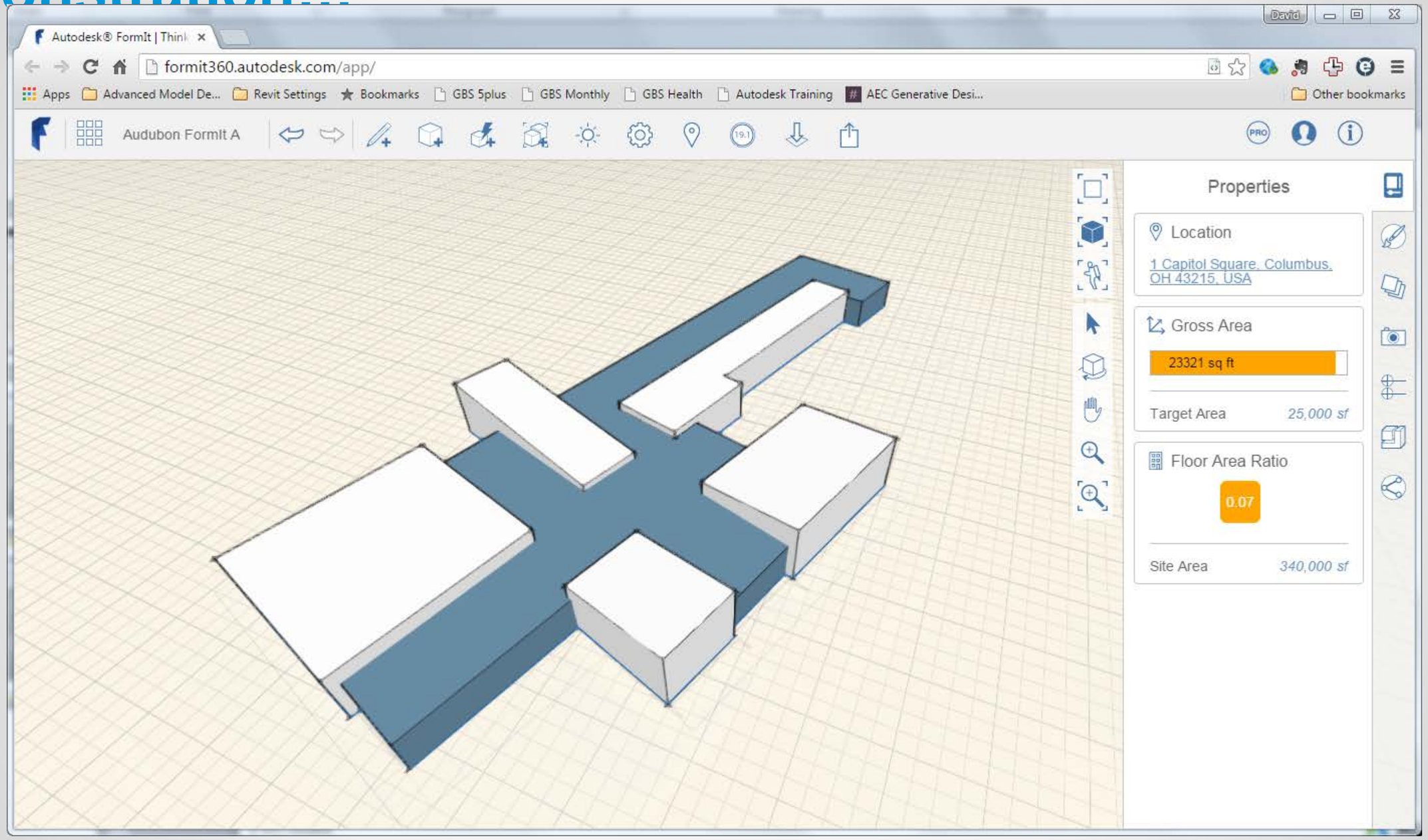


Section 2

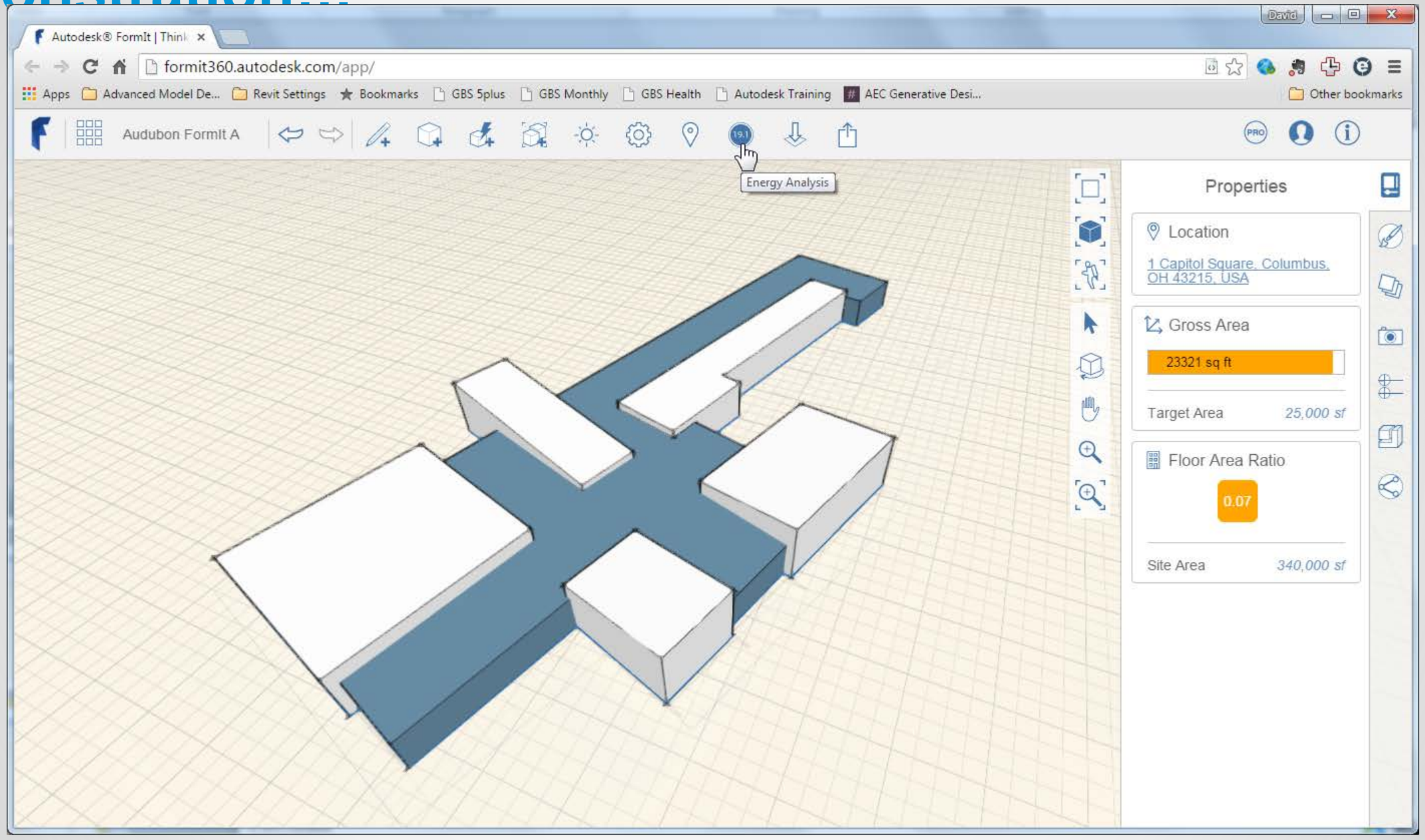
Agile Design for Solar Power

Exercise 2.2 – Concept Assessment,Targeting

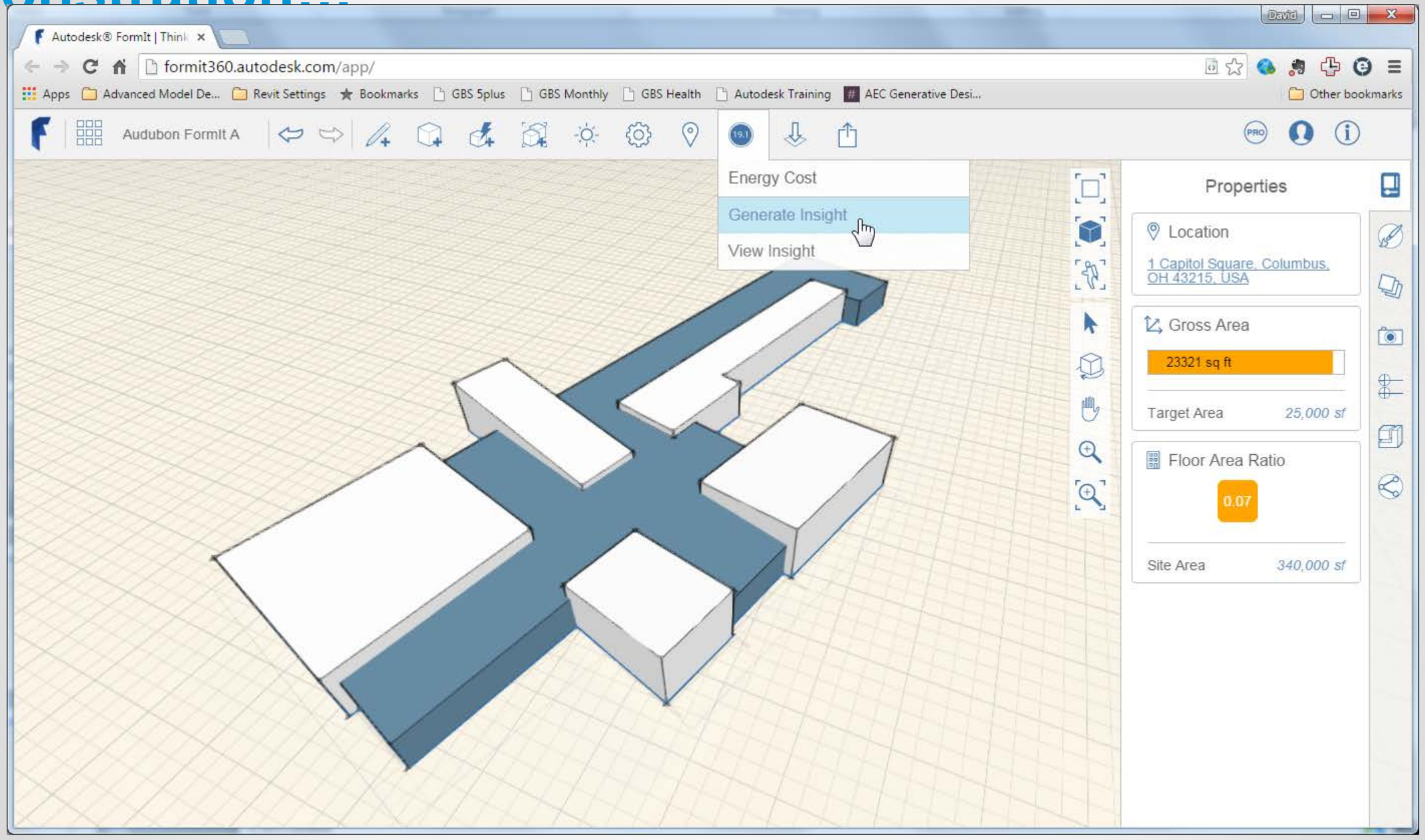
Demonstration…



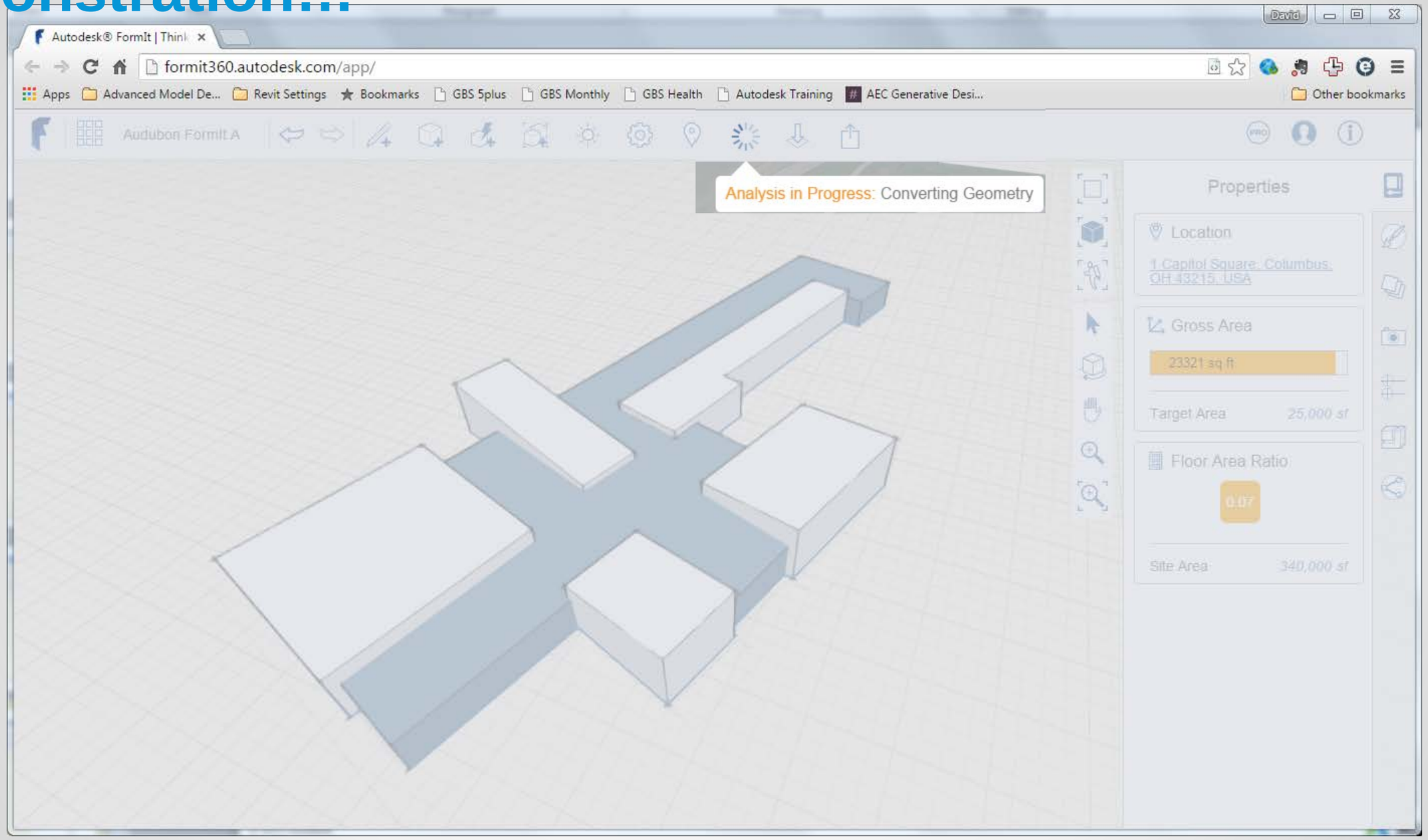
Demonstration…



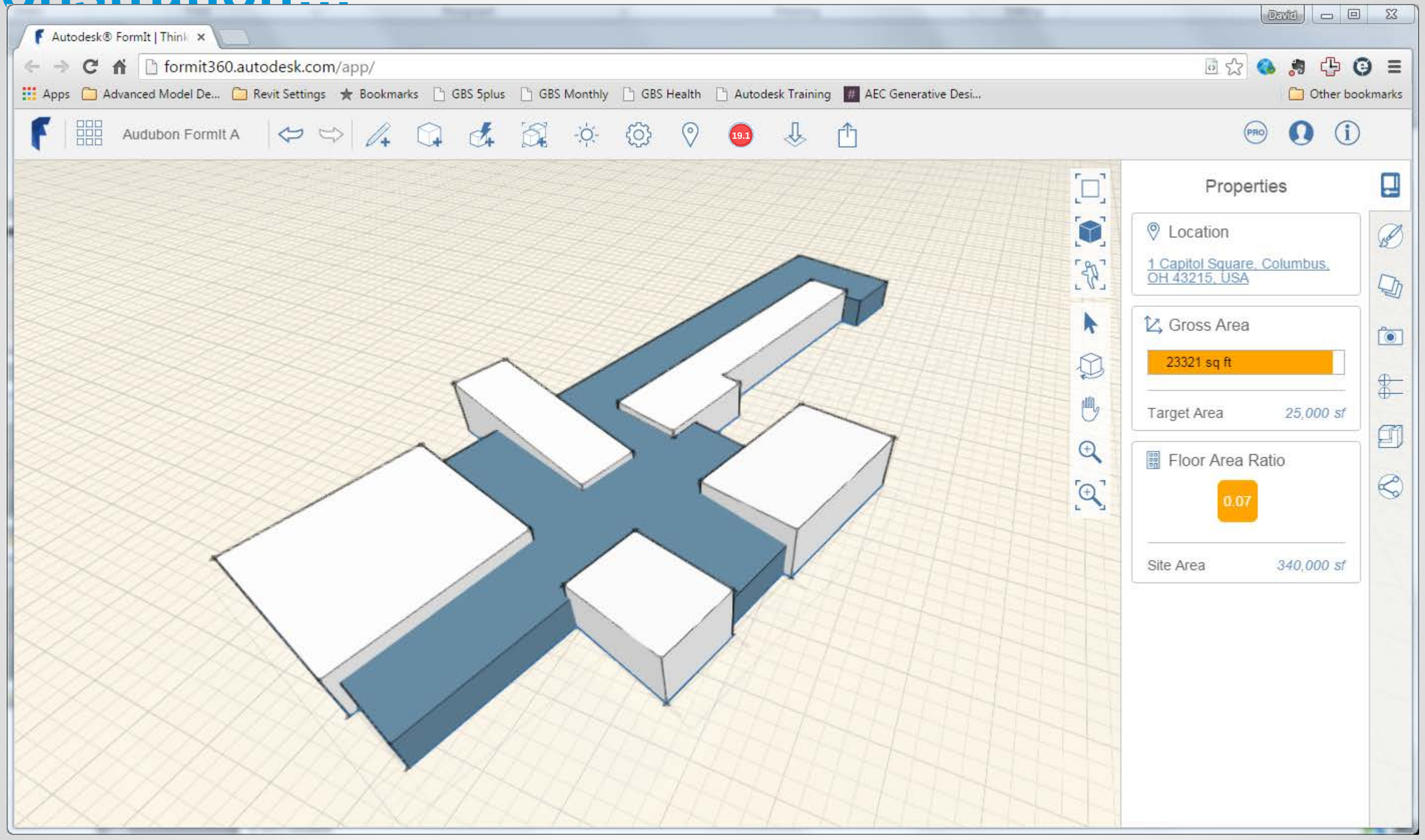
Demonstration…



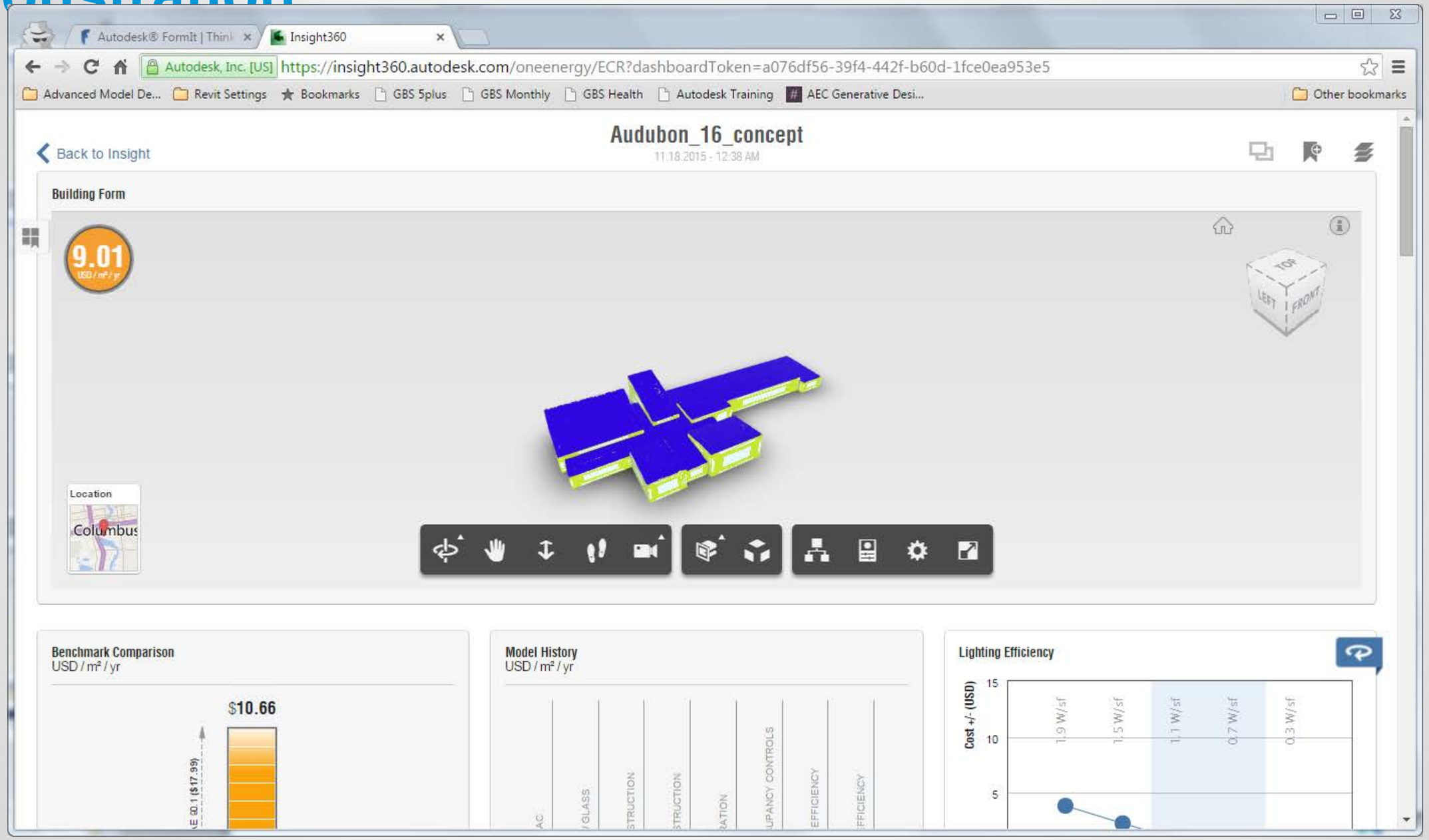
Demonstration…



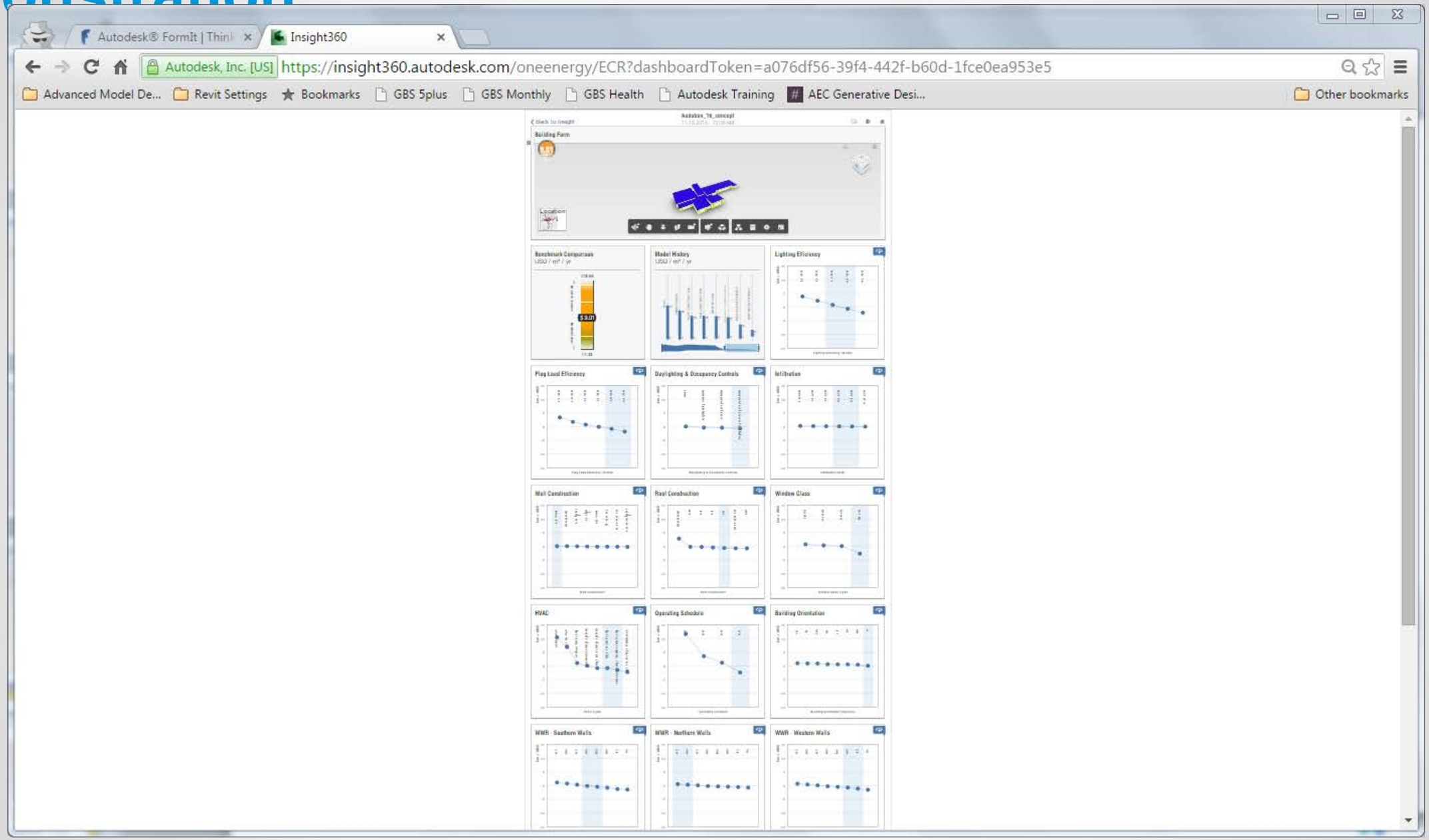
Demonstration…



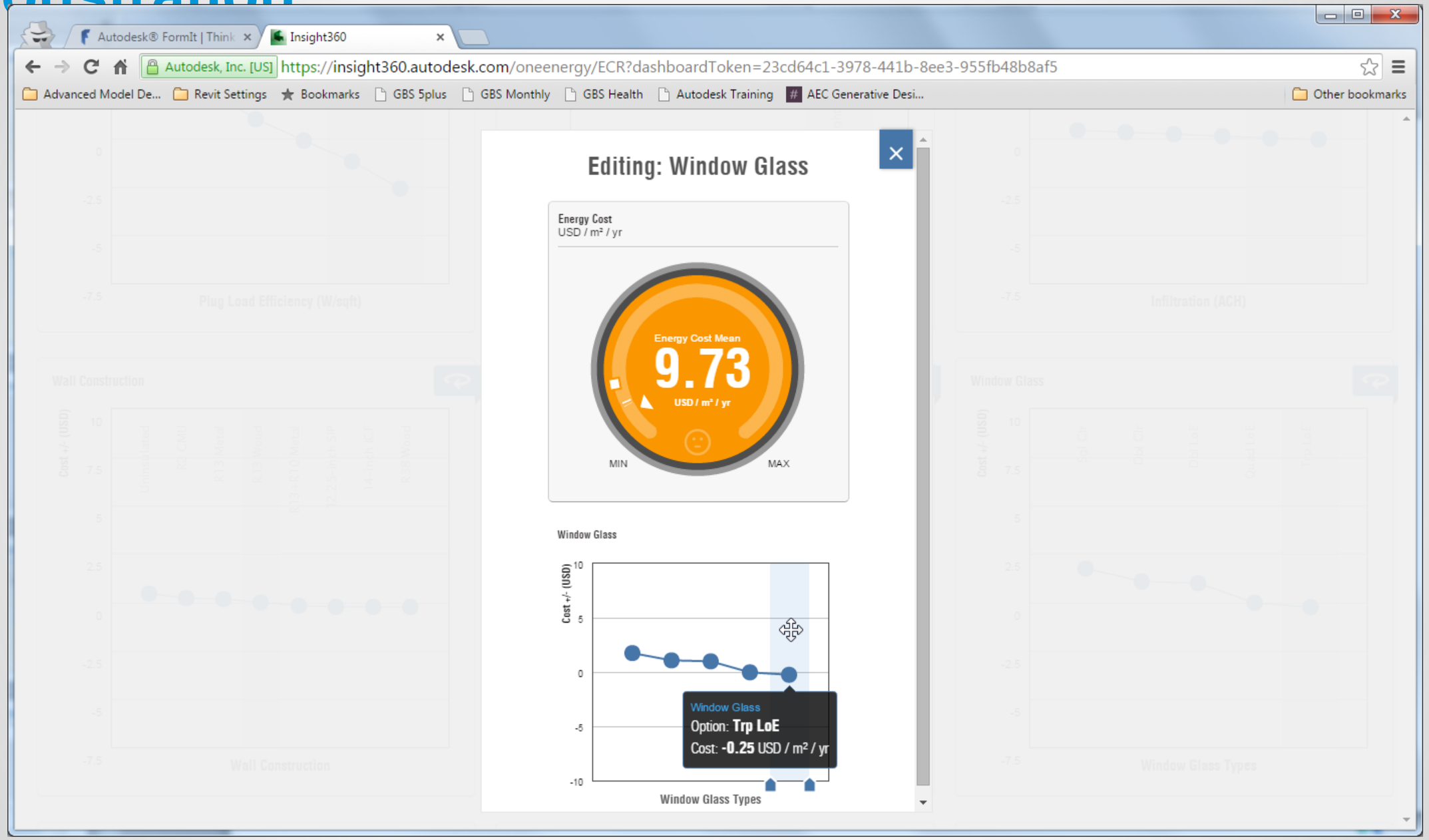
Demonstration



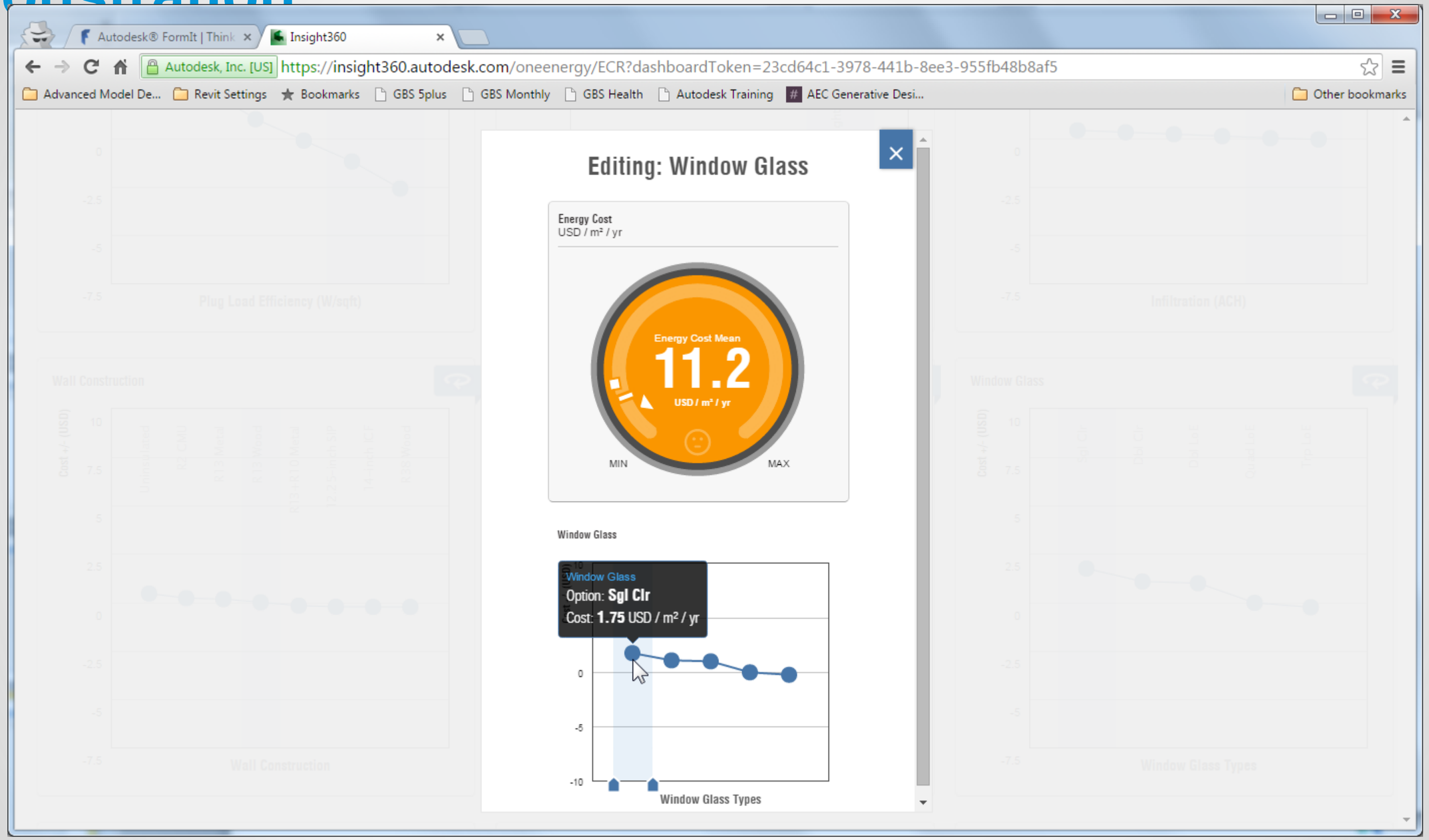
Demonstration



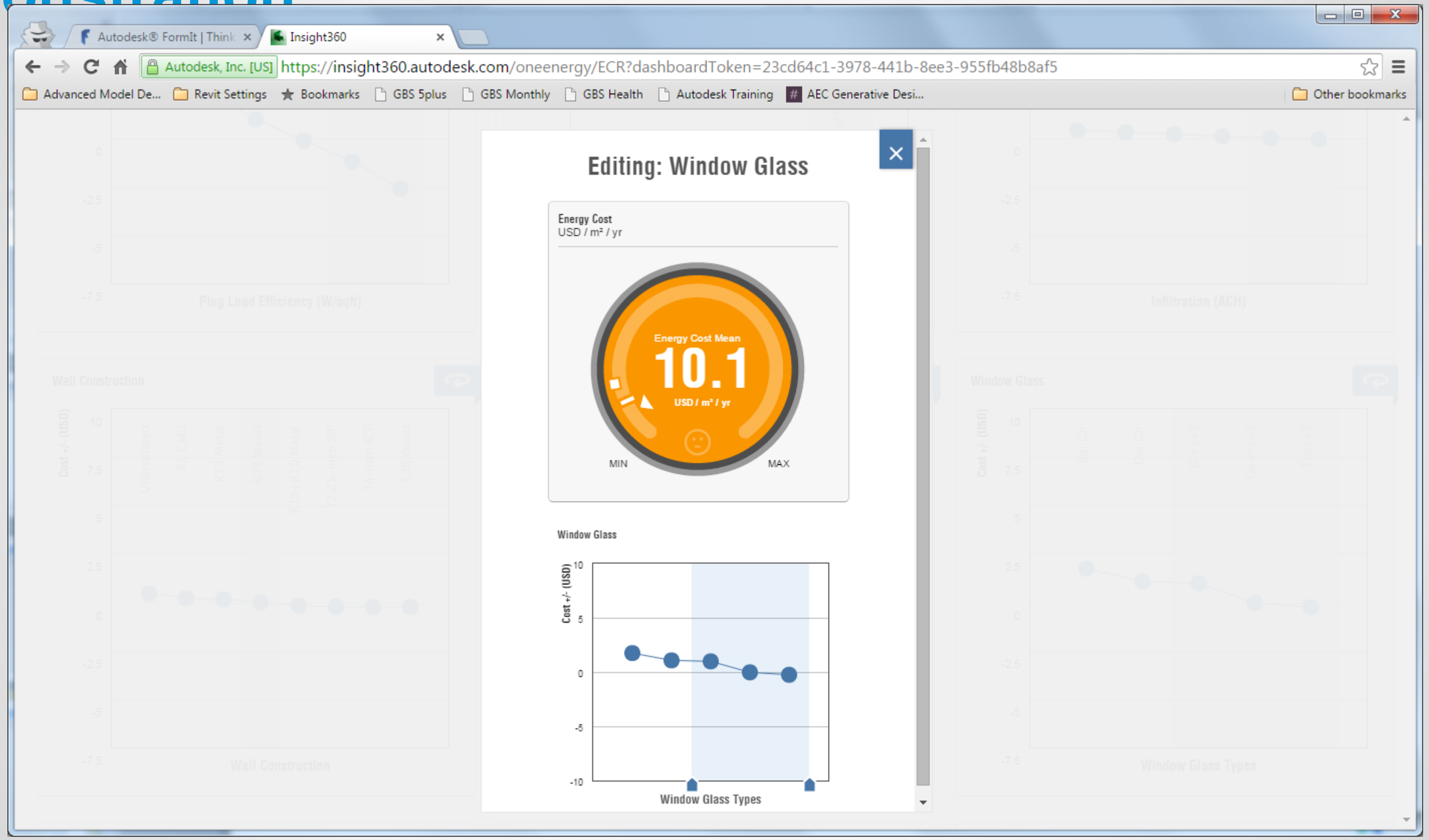
Demonstration



Demonstration



Demonstration



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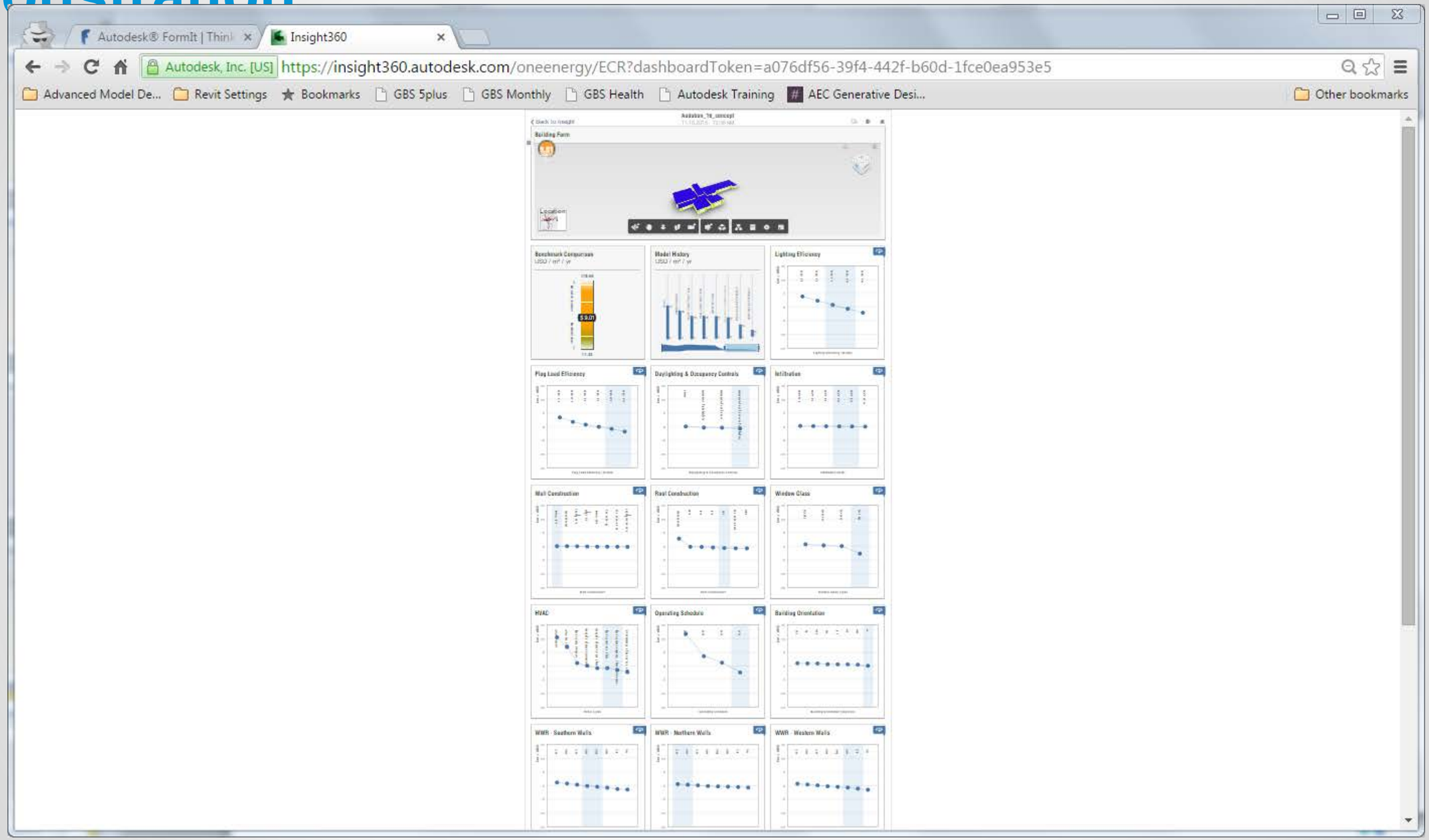

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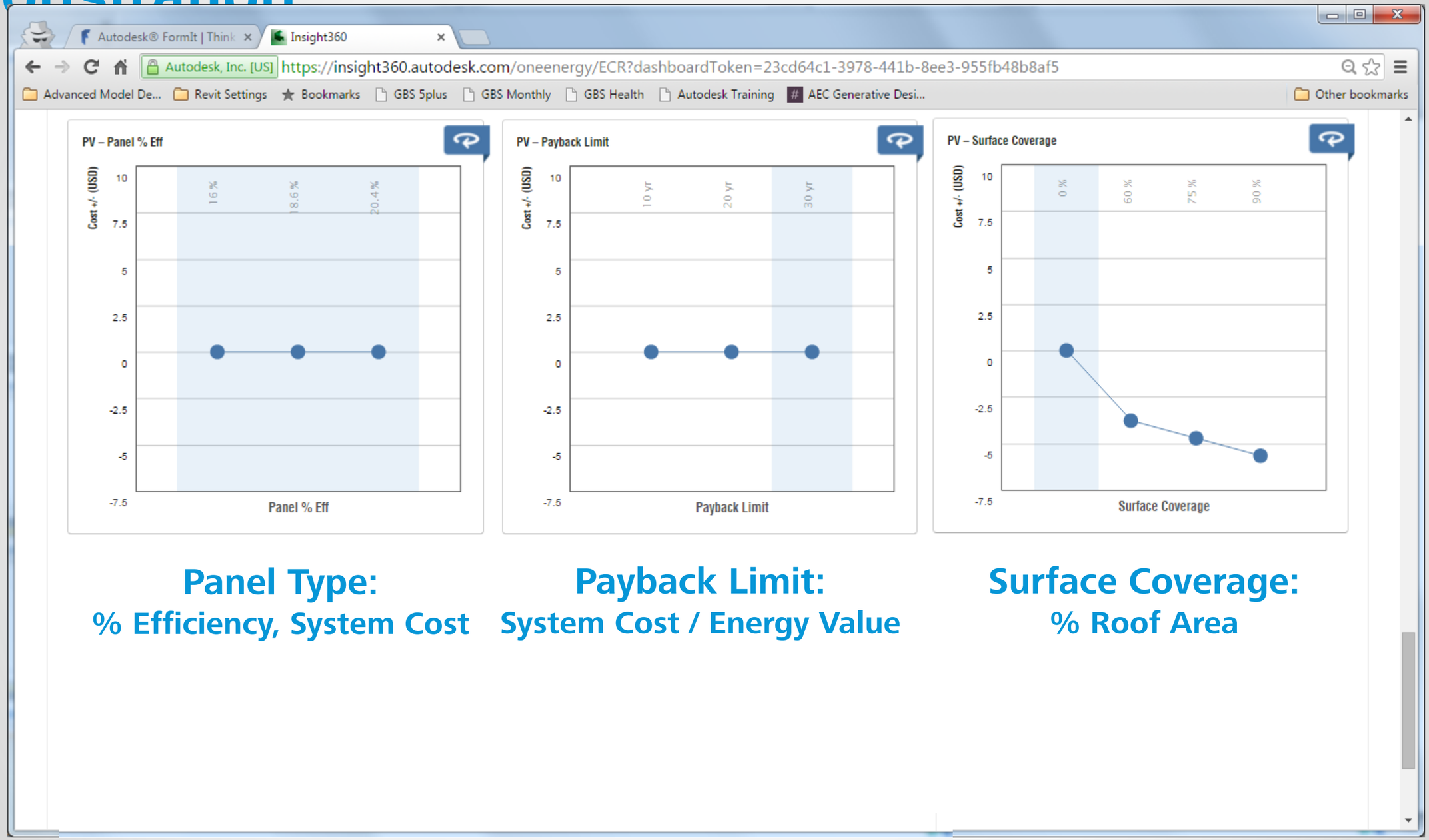
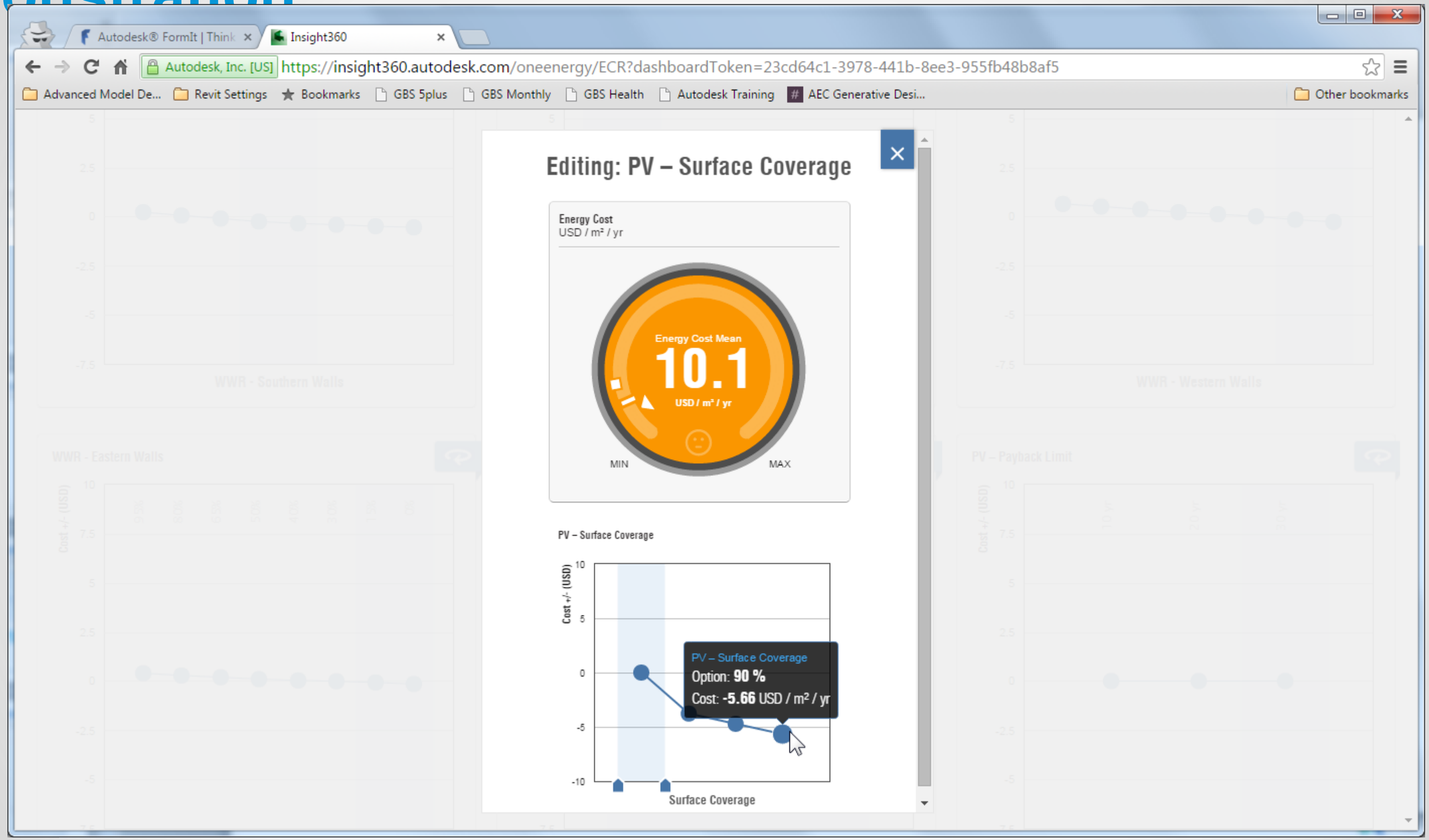


Panel Type:
% Efficiency, System Cost

Payback Limit:
System Cost / Energy Value

Surface Coverage:
% Roof Area

Demonstration



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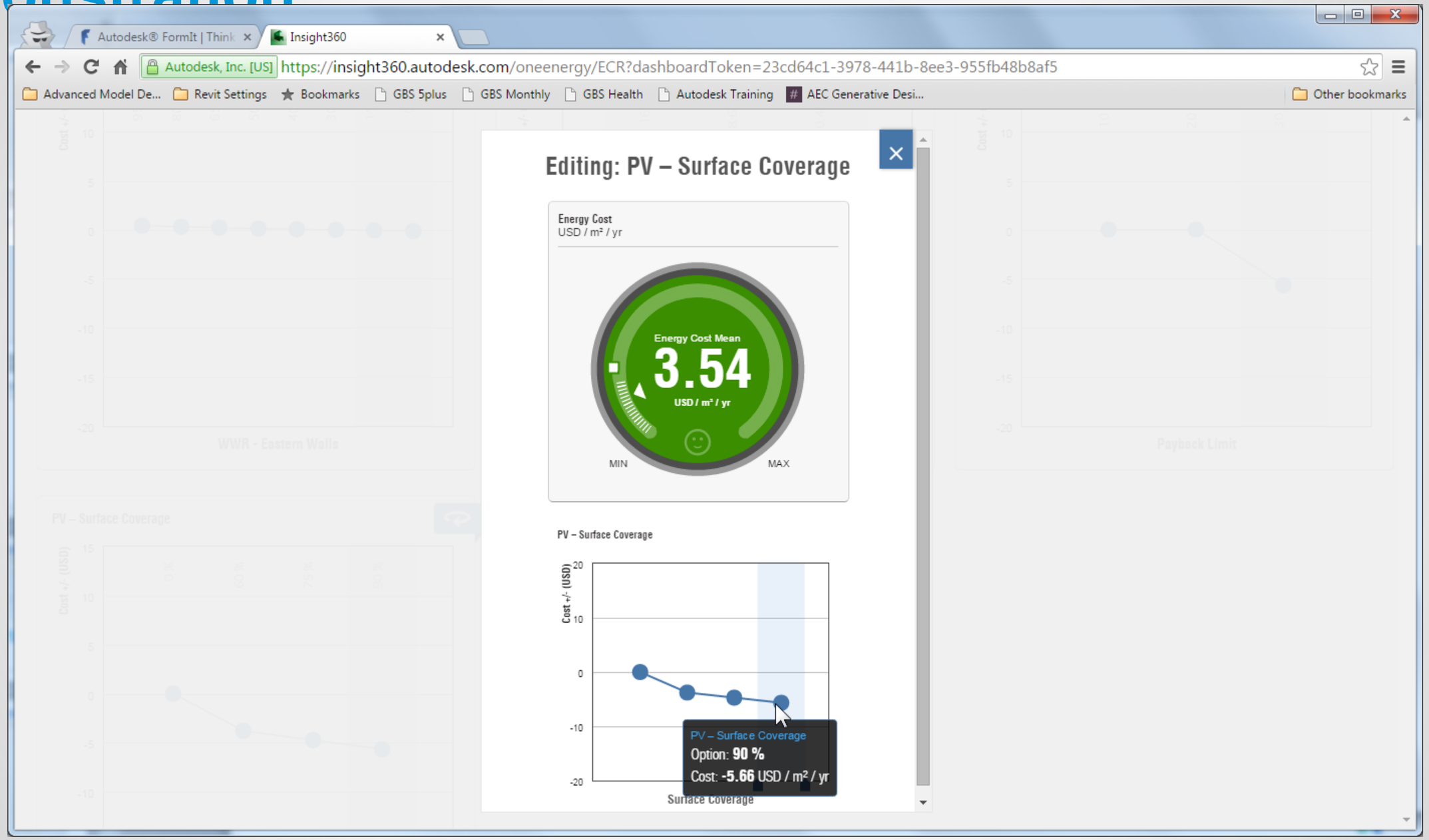
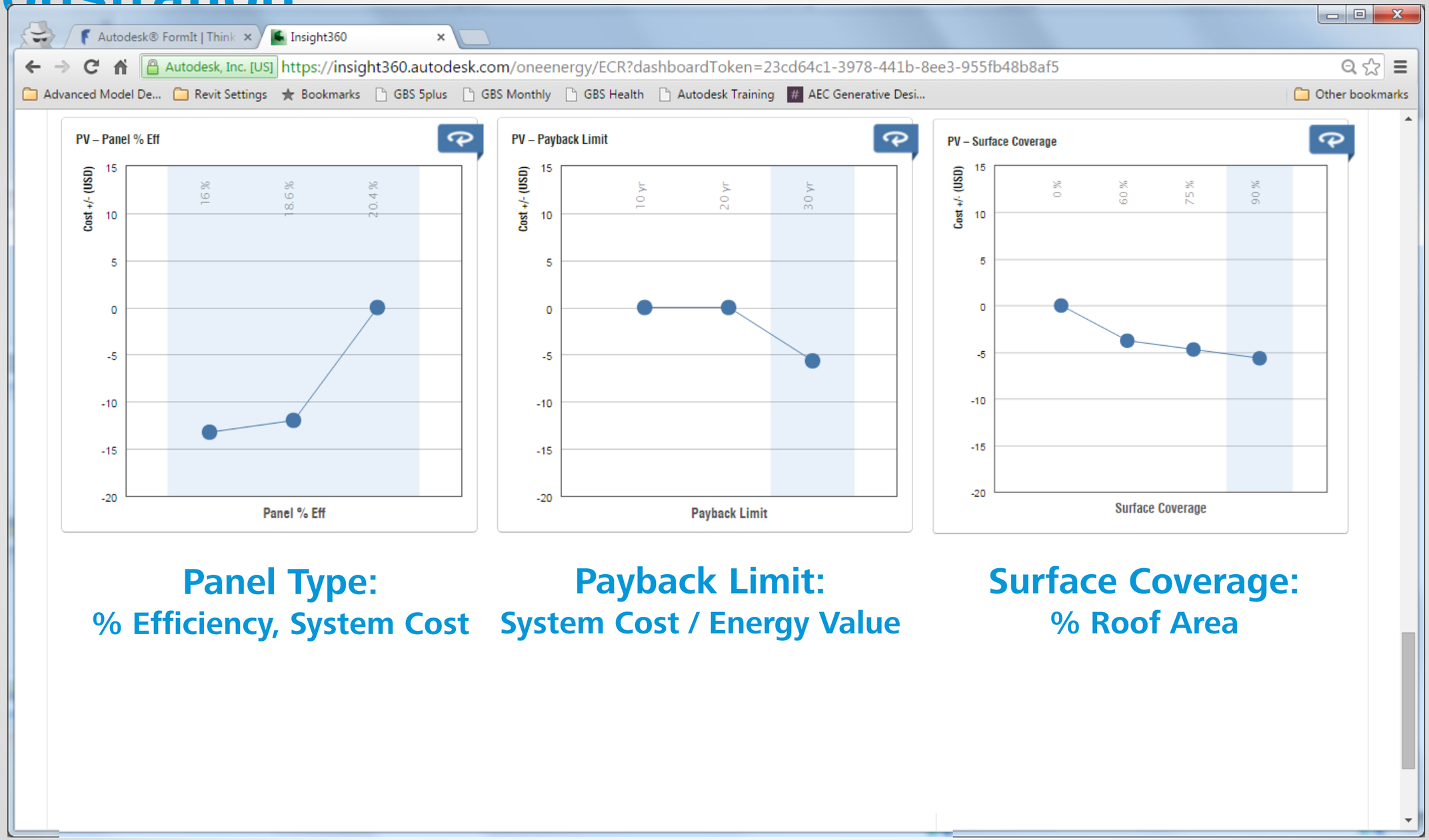


Demonstration



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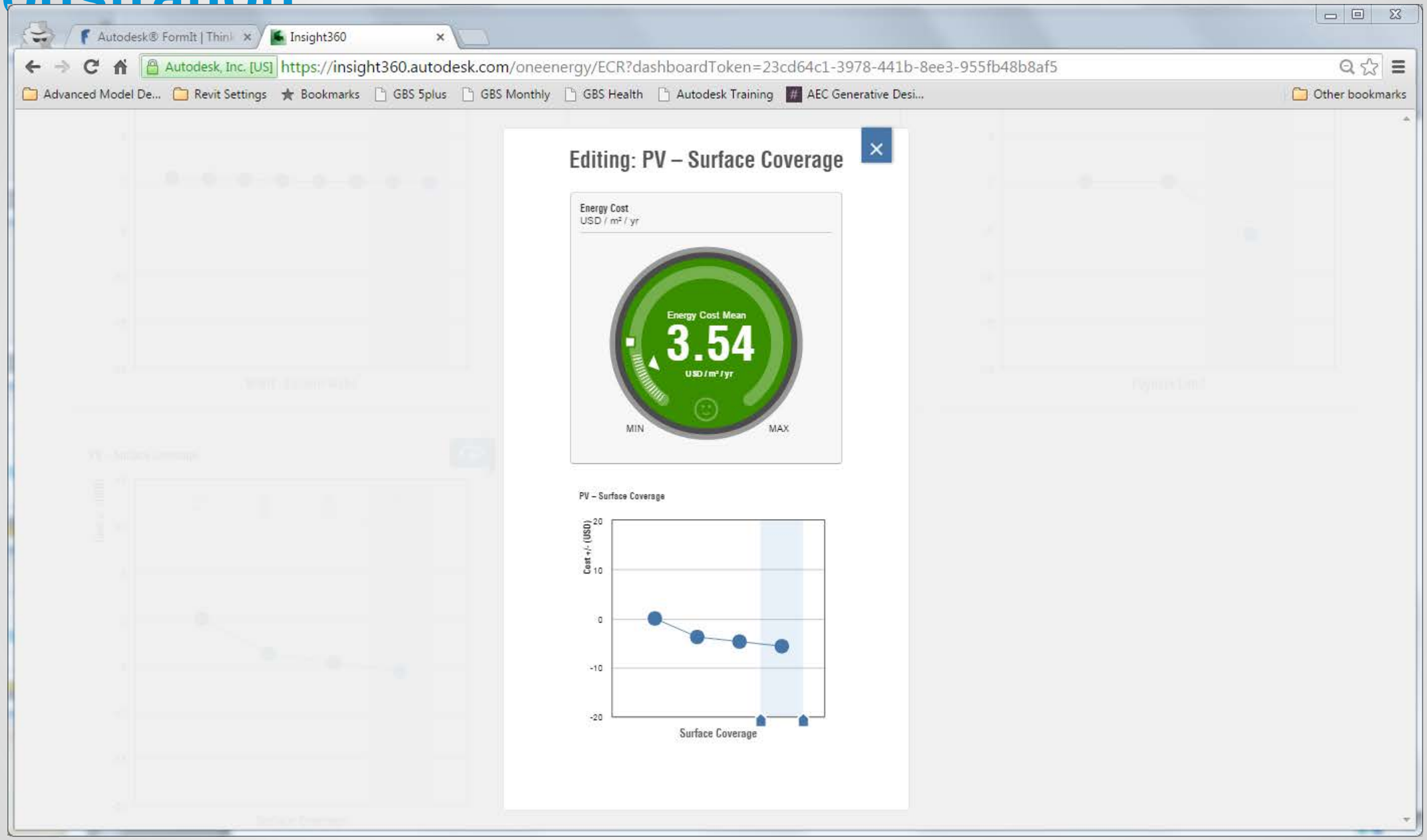
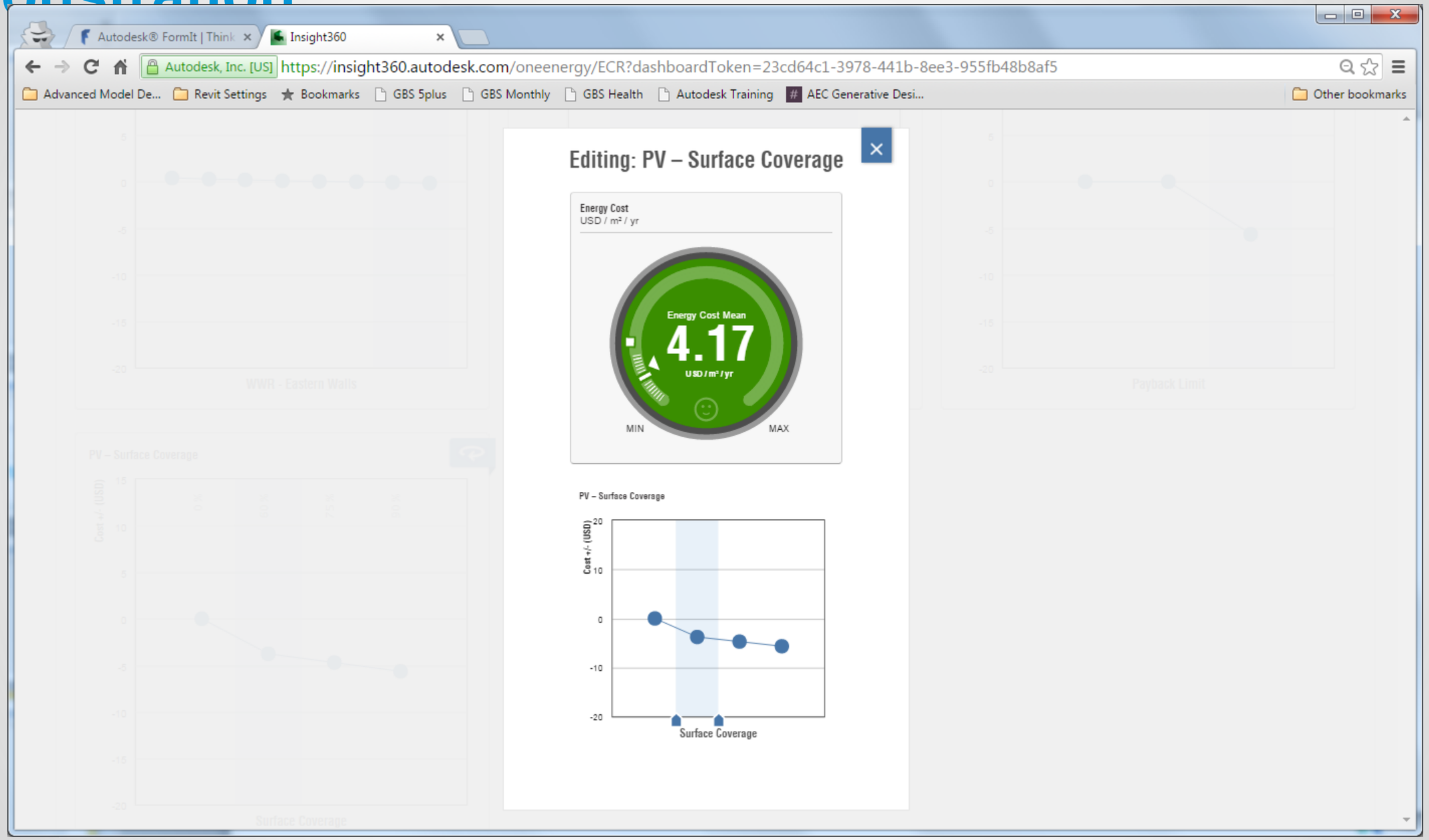
% Roof Area

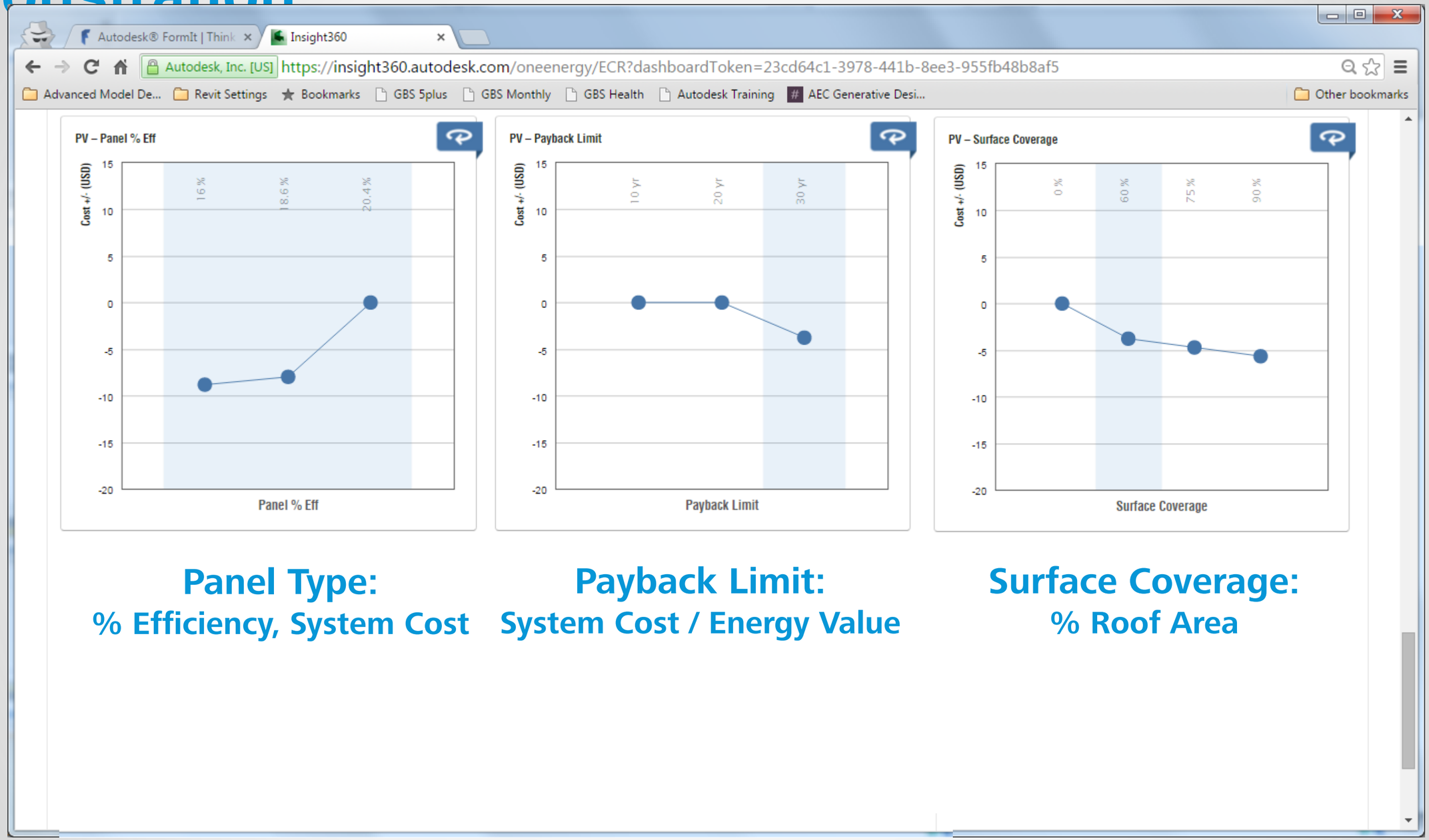
Demonstration



Demonstration



Demonstration

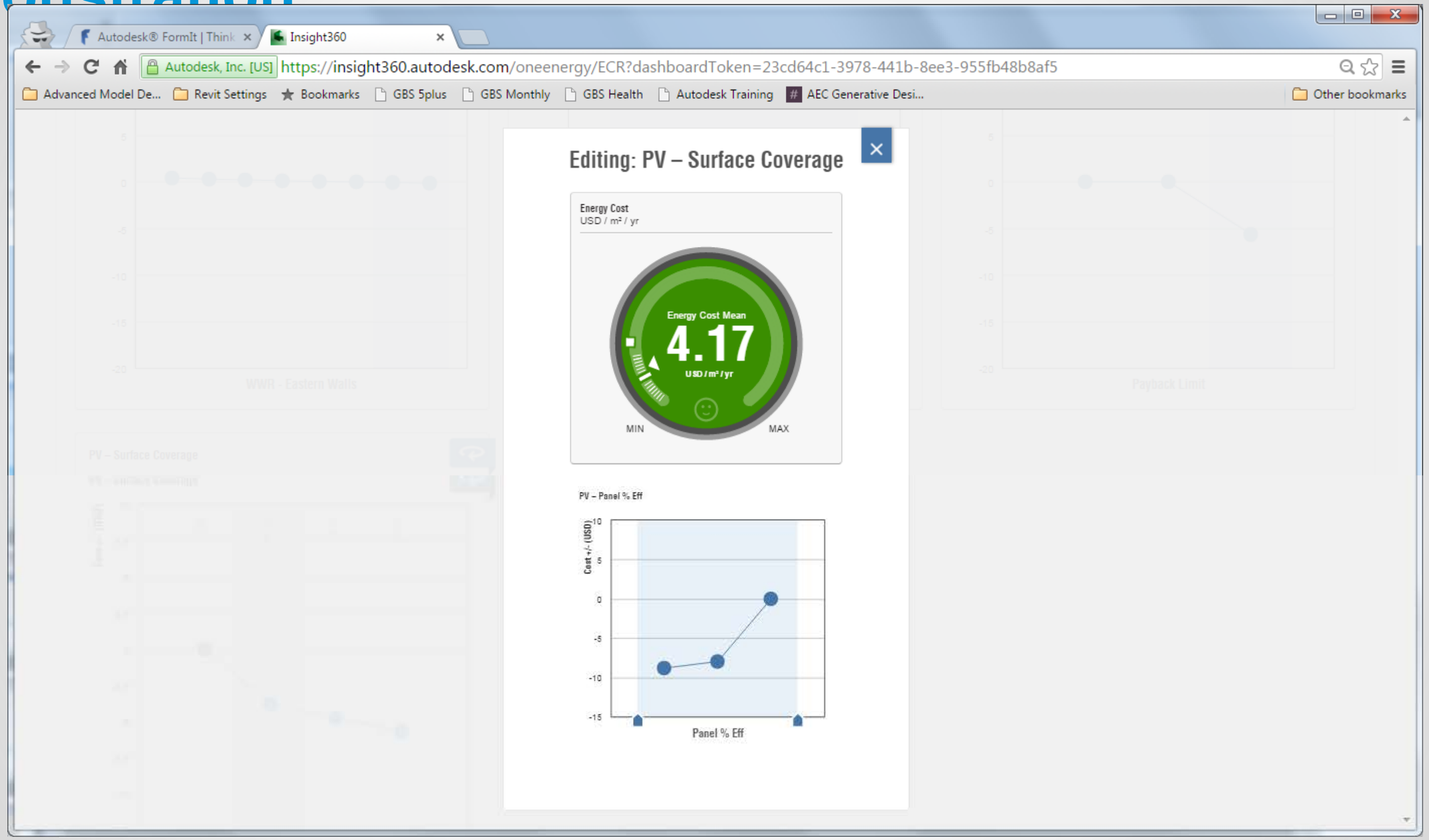


Panel Type:
% Efficiency, System Cost

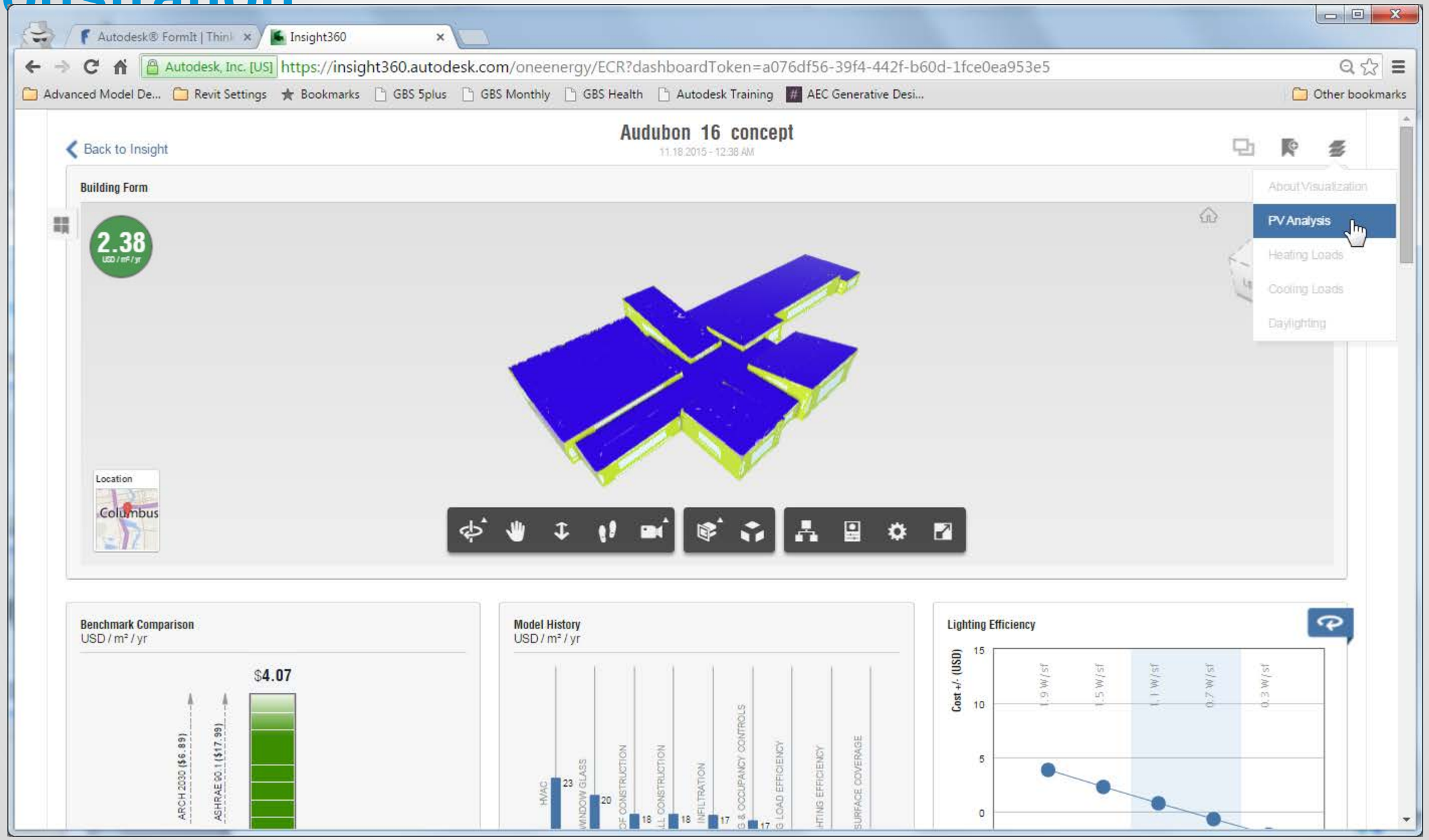
Payback Limit:
System Cost / Energy Value

Surface Coverage:
% Roof Area

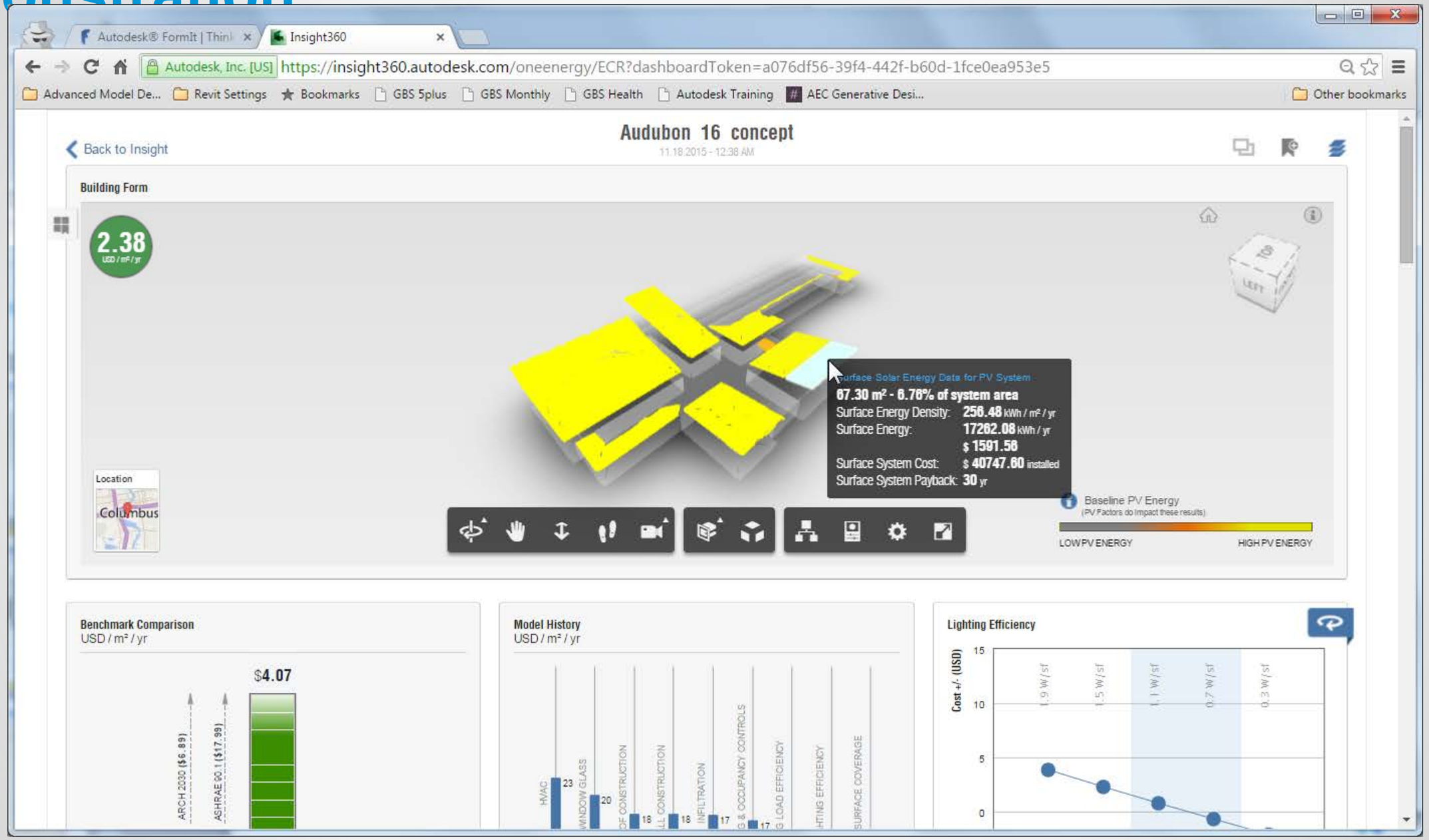
Demonstration



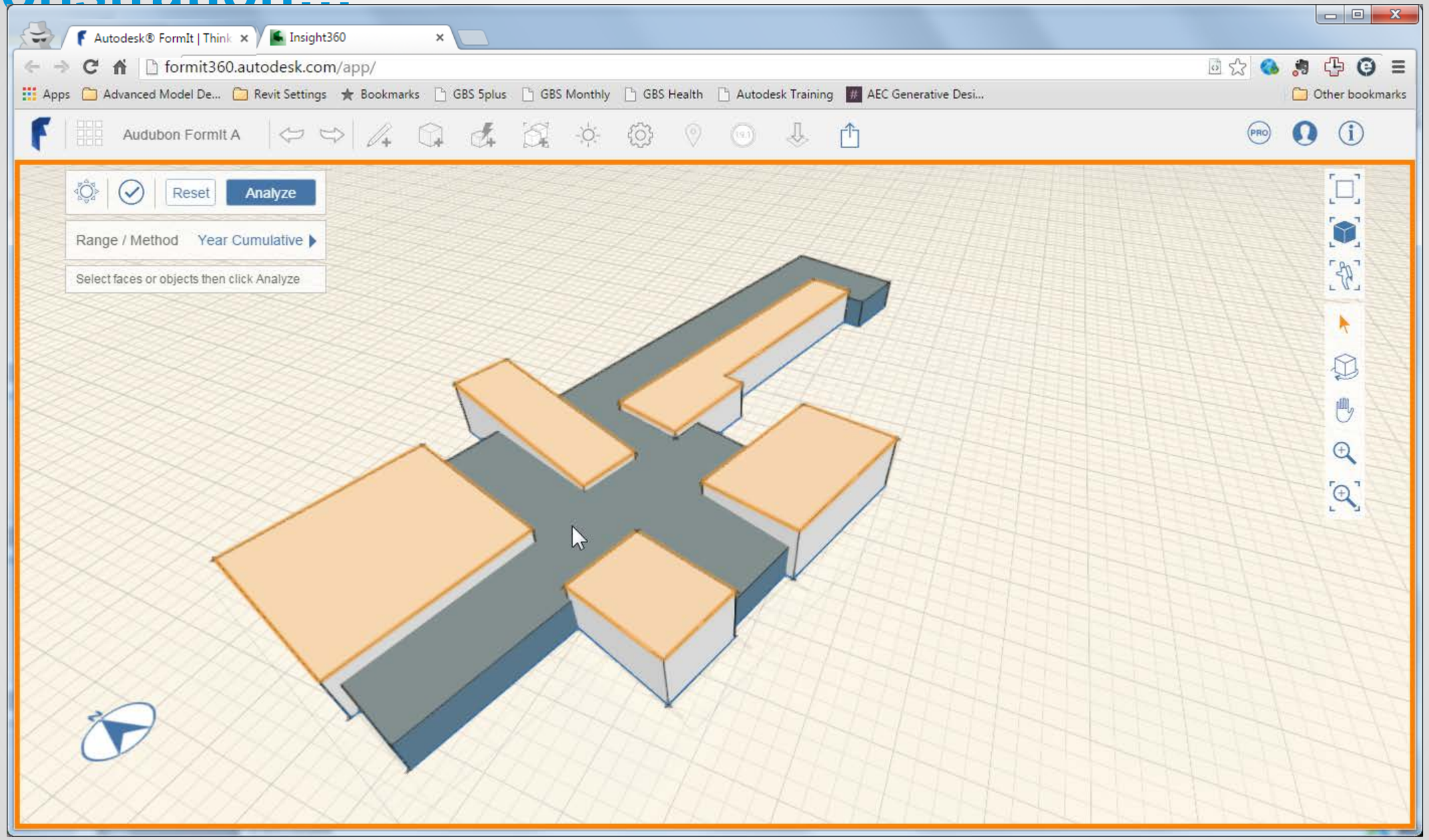
Demonstration



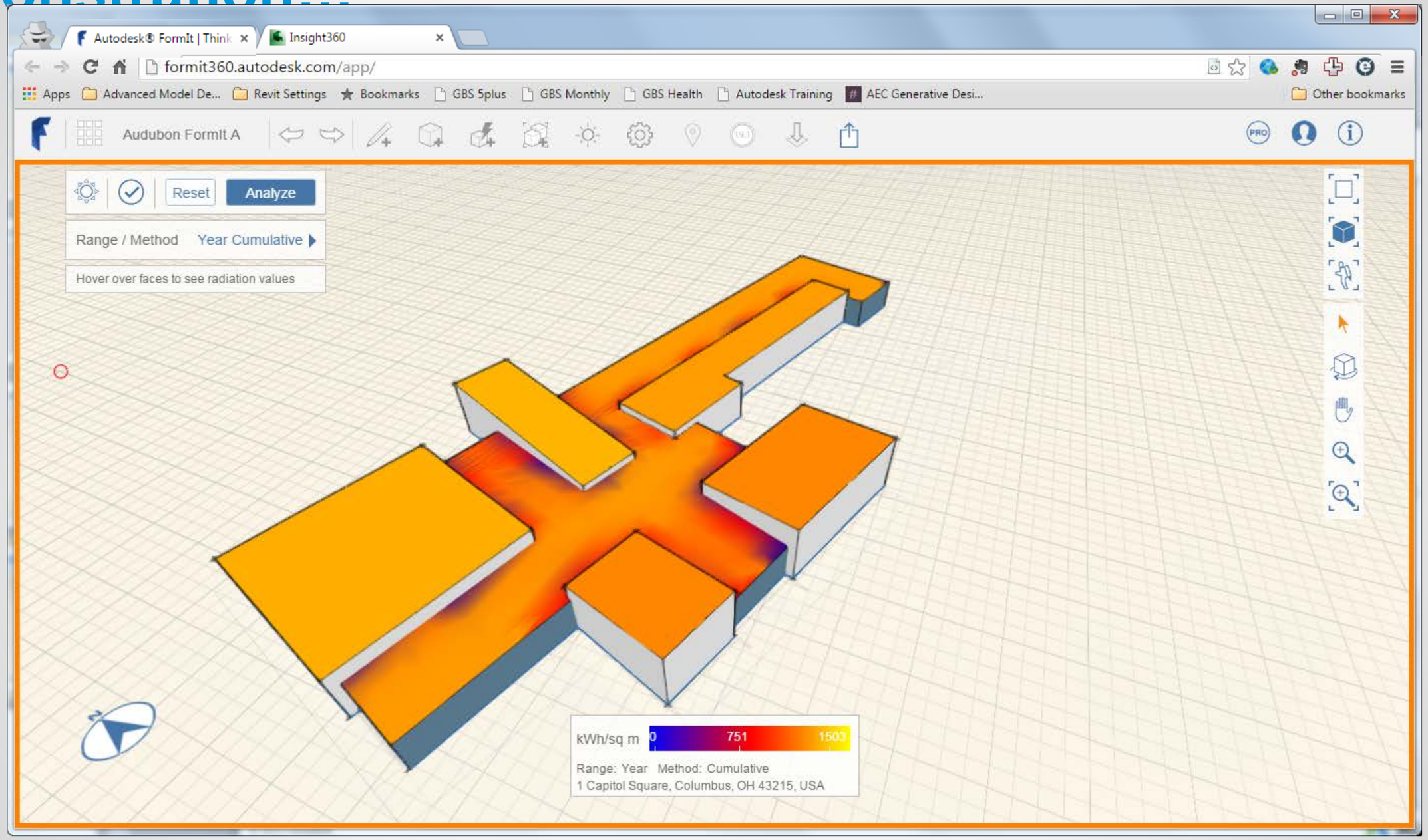
Demonstration



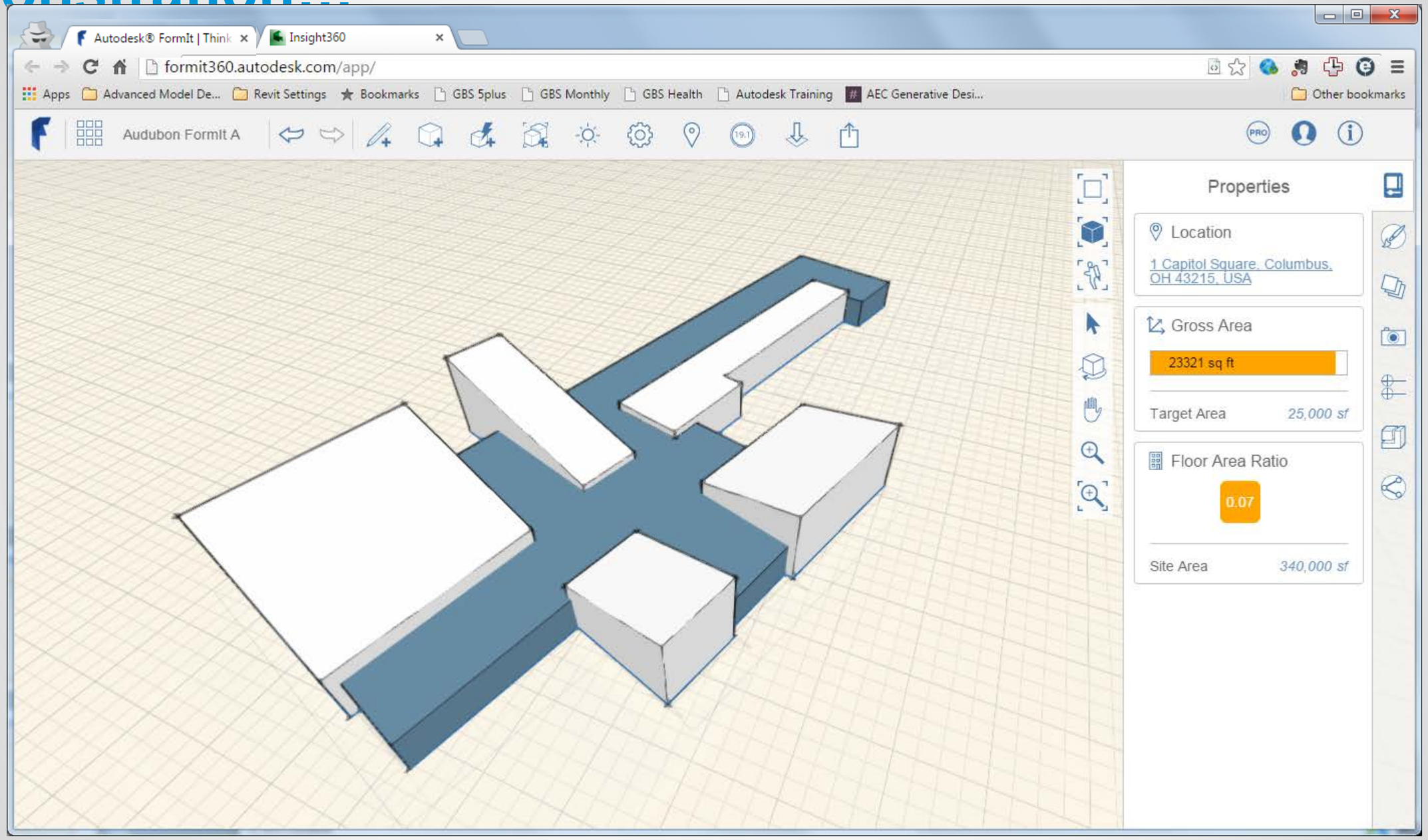
Demonstration…



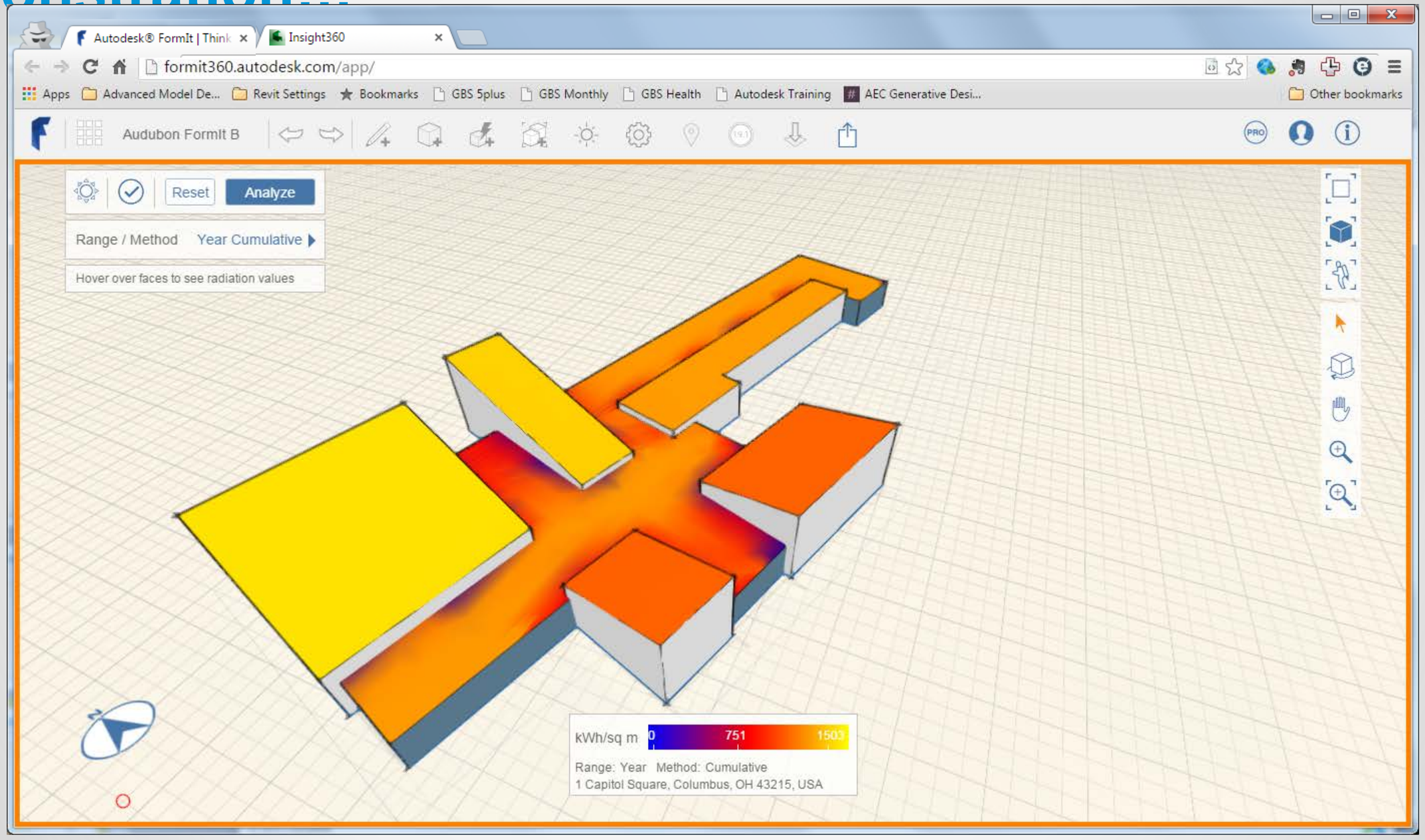
Demonstration…



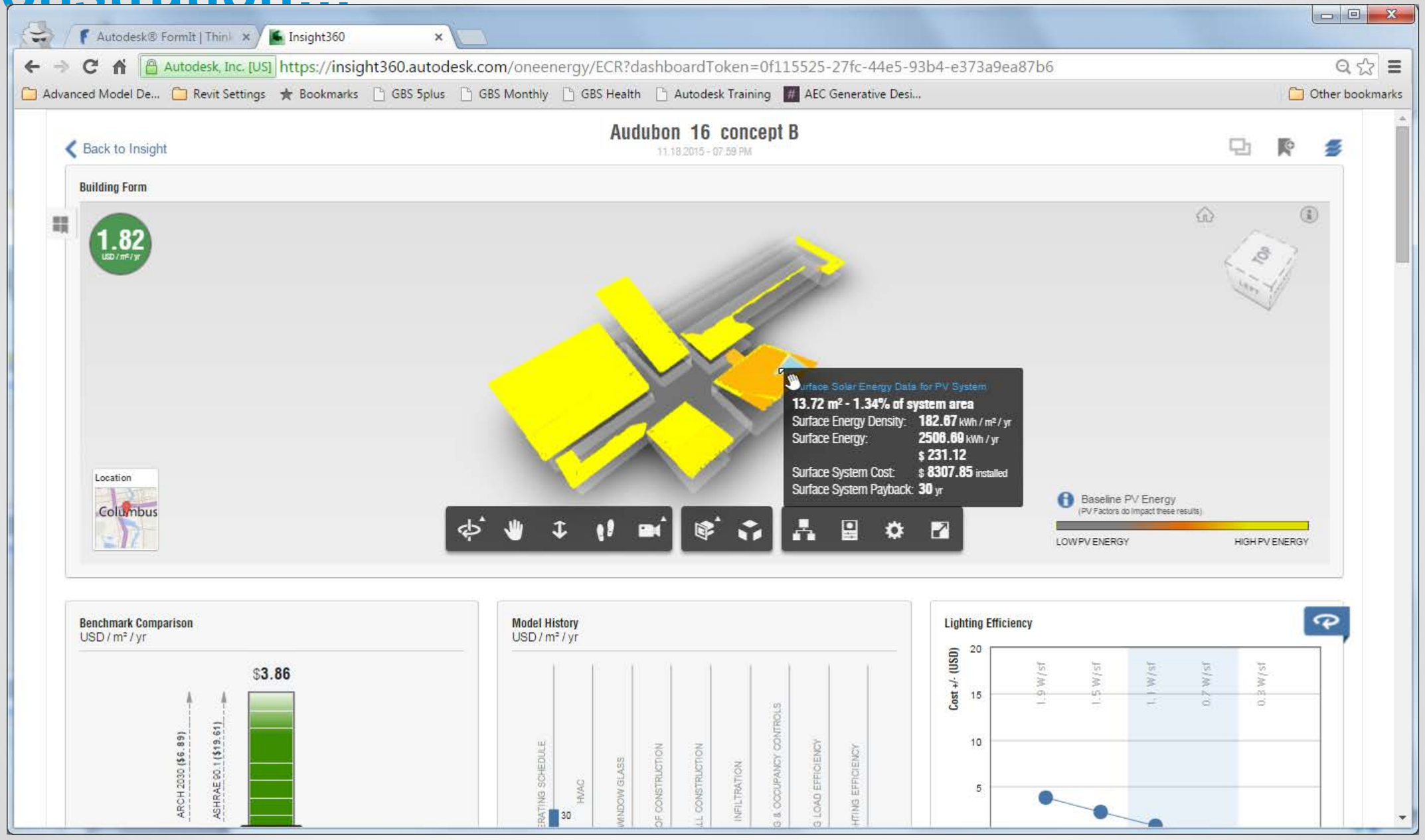
Demonstration…



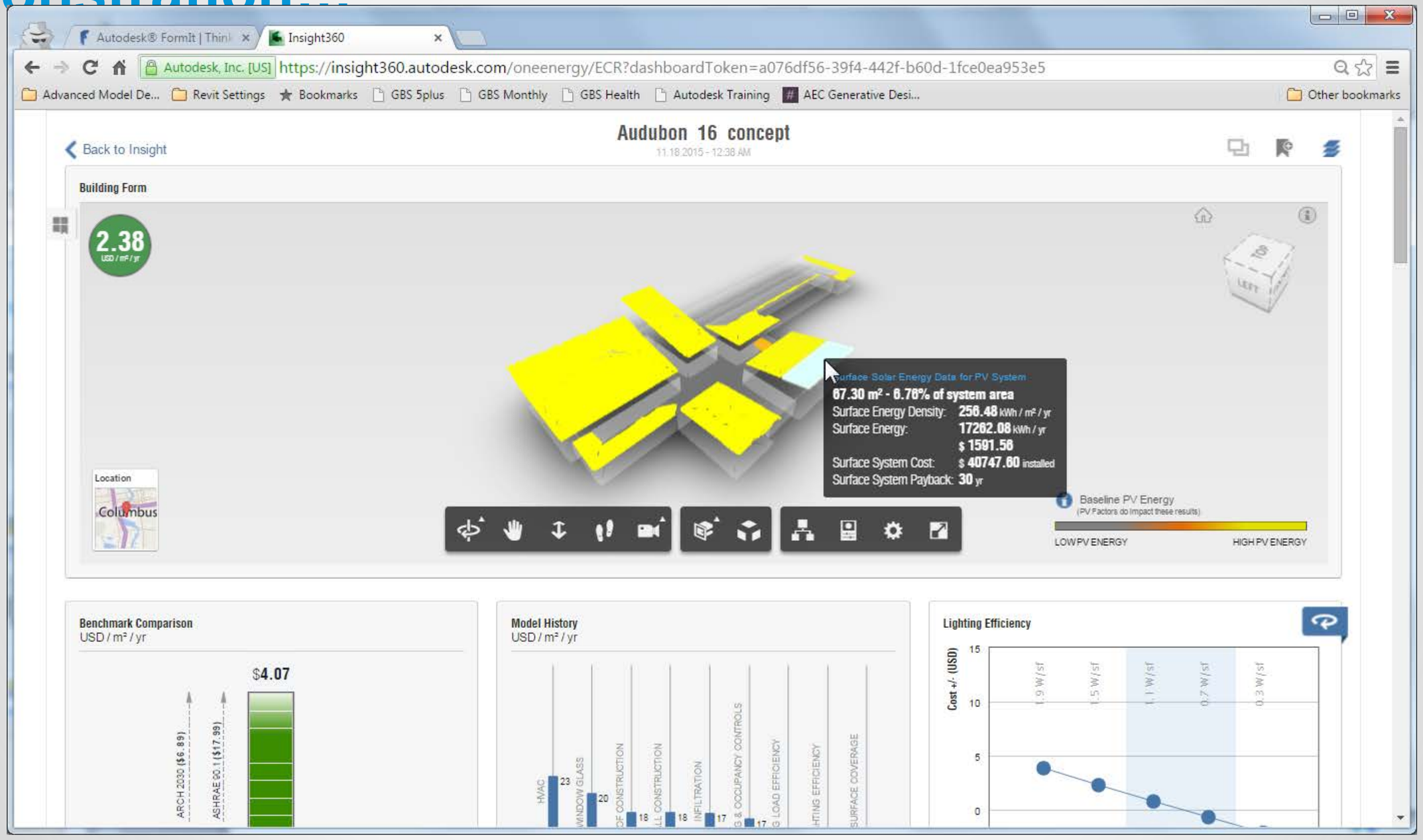
Demonstration…



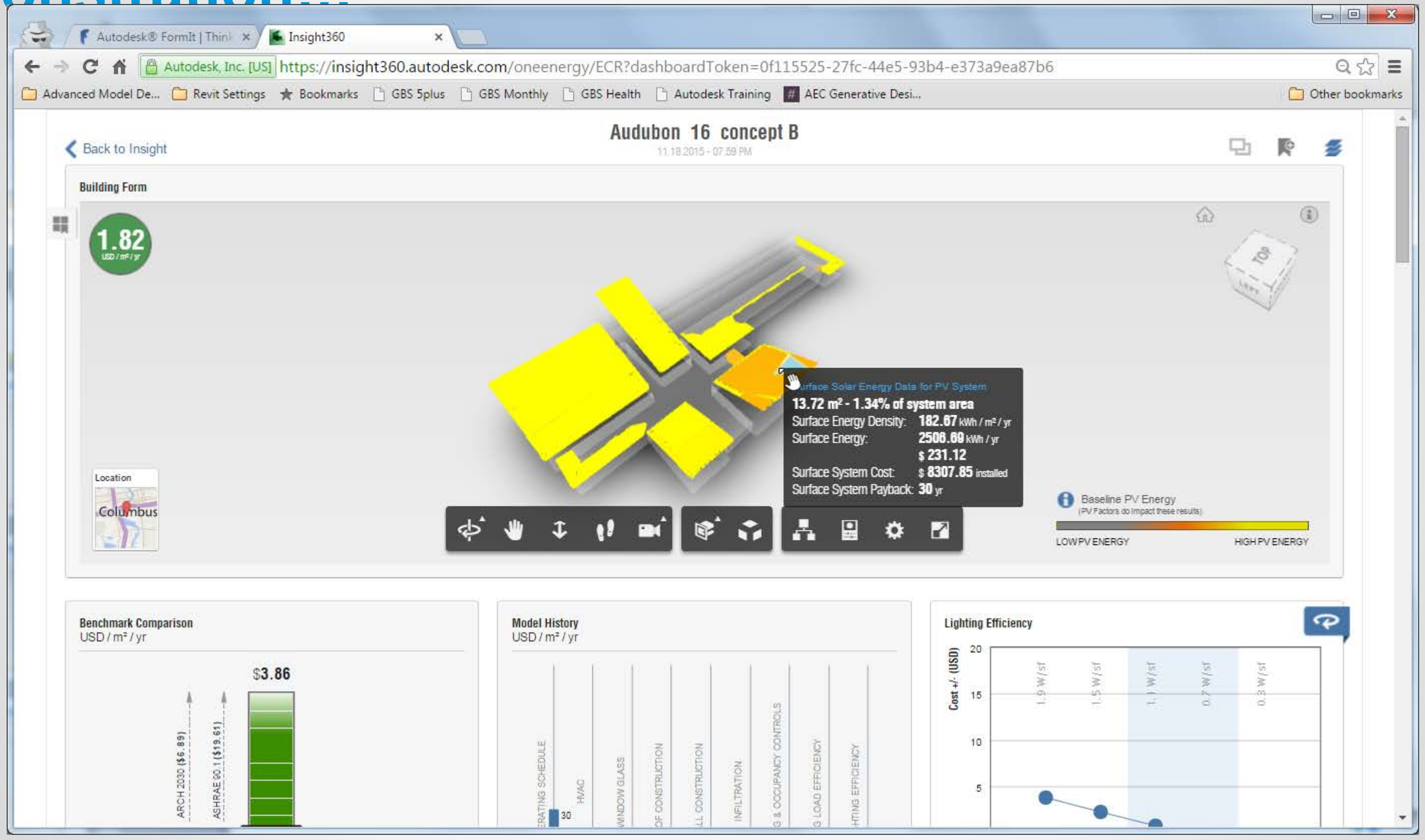
Demonstration…



Demonstration…



Demonstration…

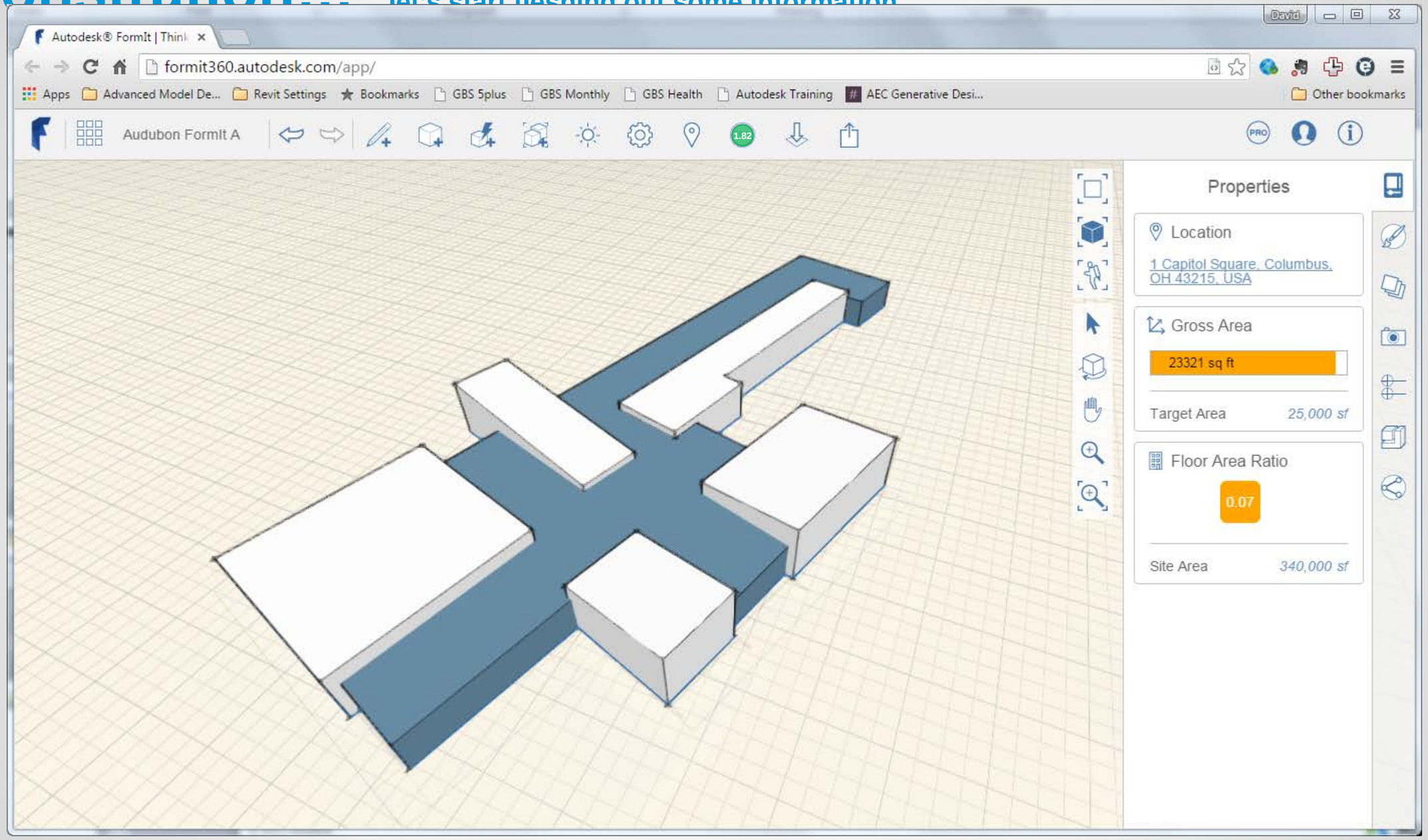


Section 2

Agile Design for Solar Power

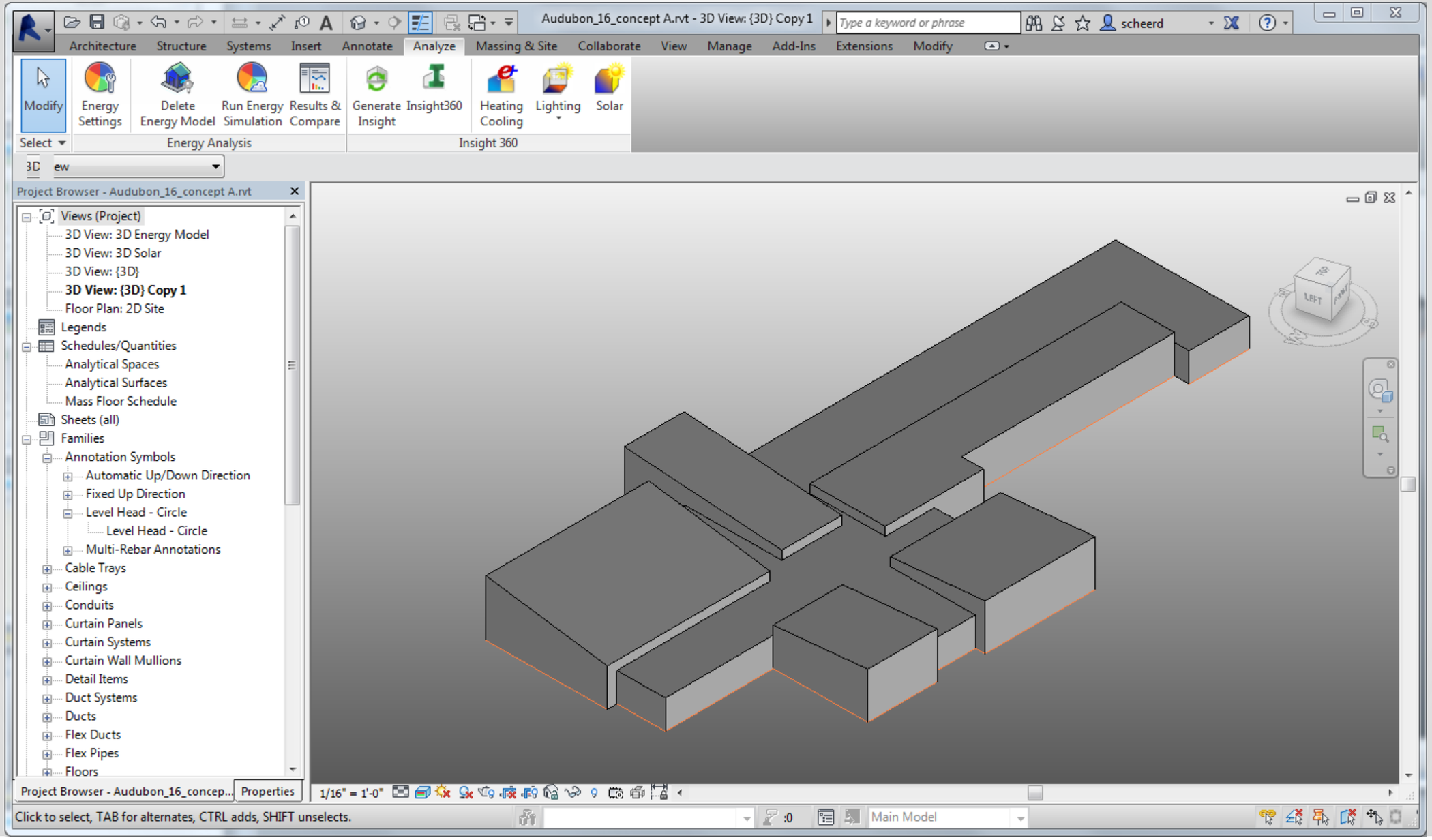
Exercise 2.3 – Building Design Integration

Demonstration . . . let's start fleshing out some information

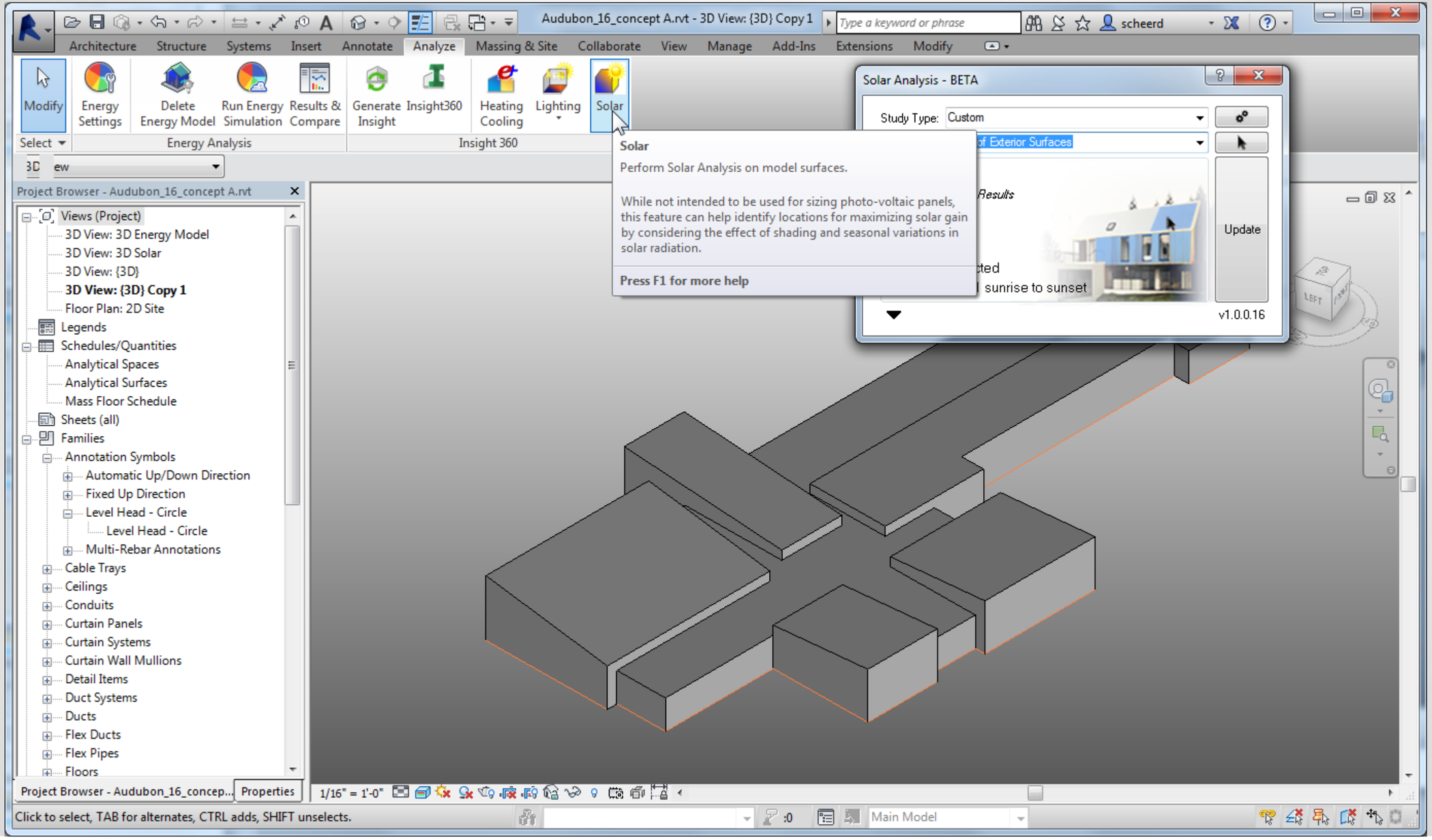


Demonstration…

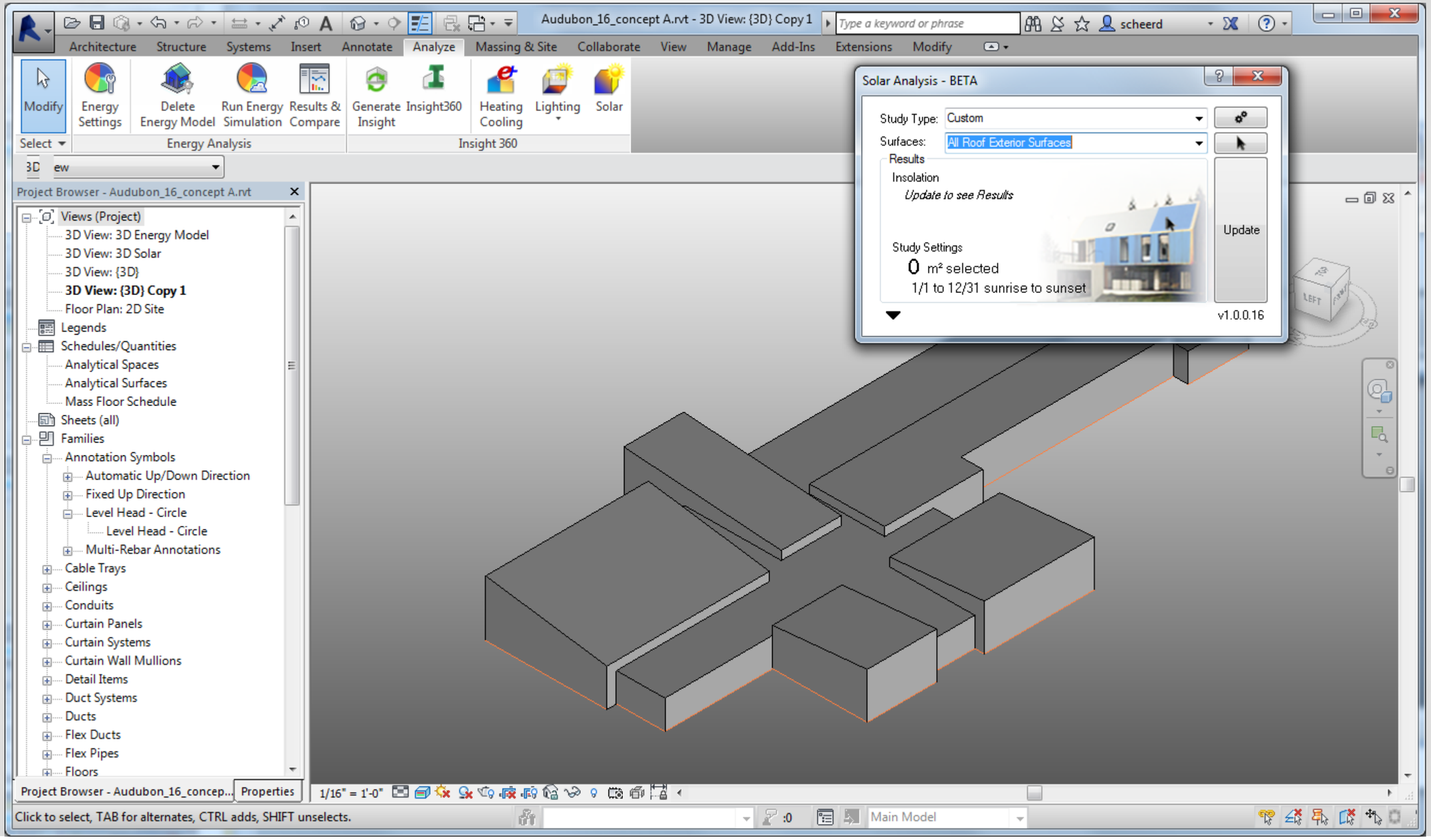
let's start fleshing out some information



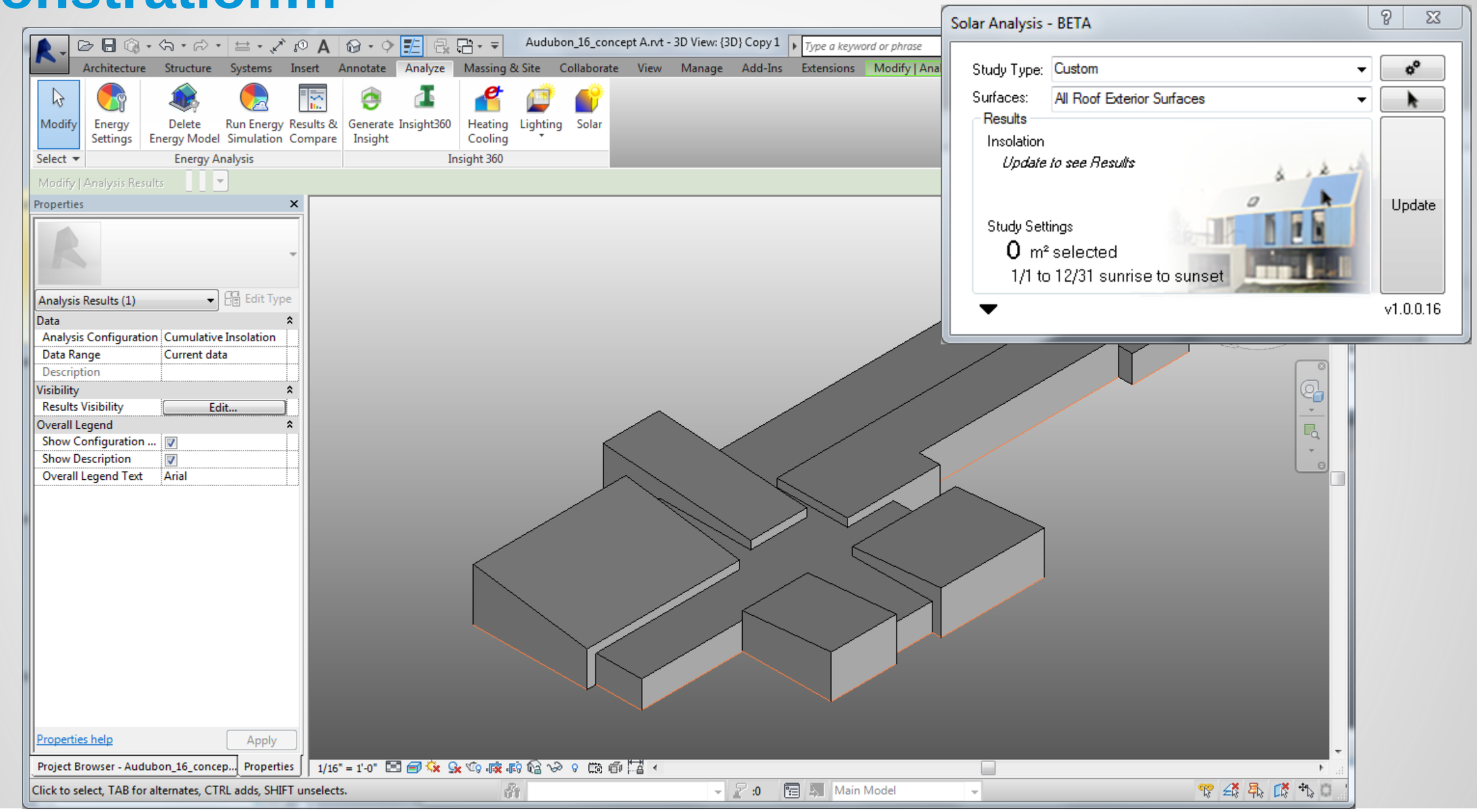
Demonstration…



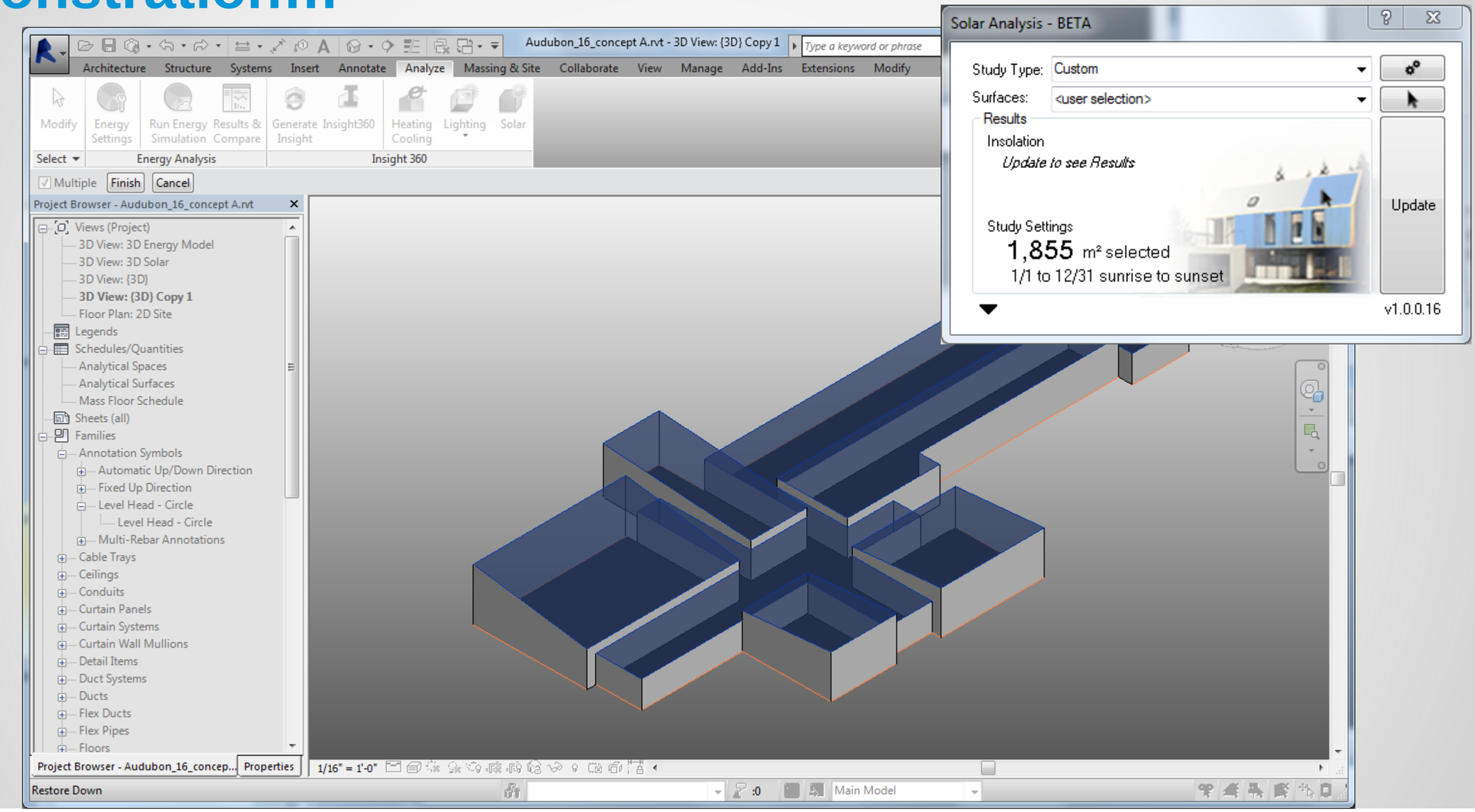
Demonstration…



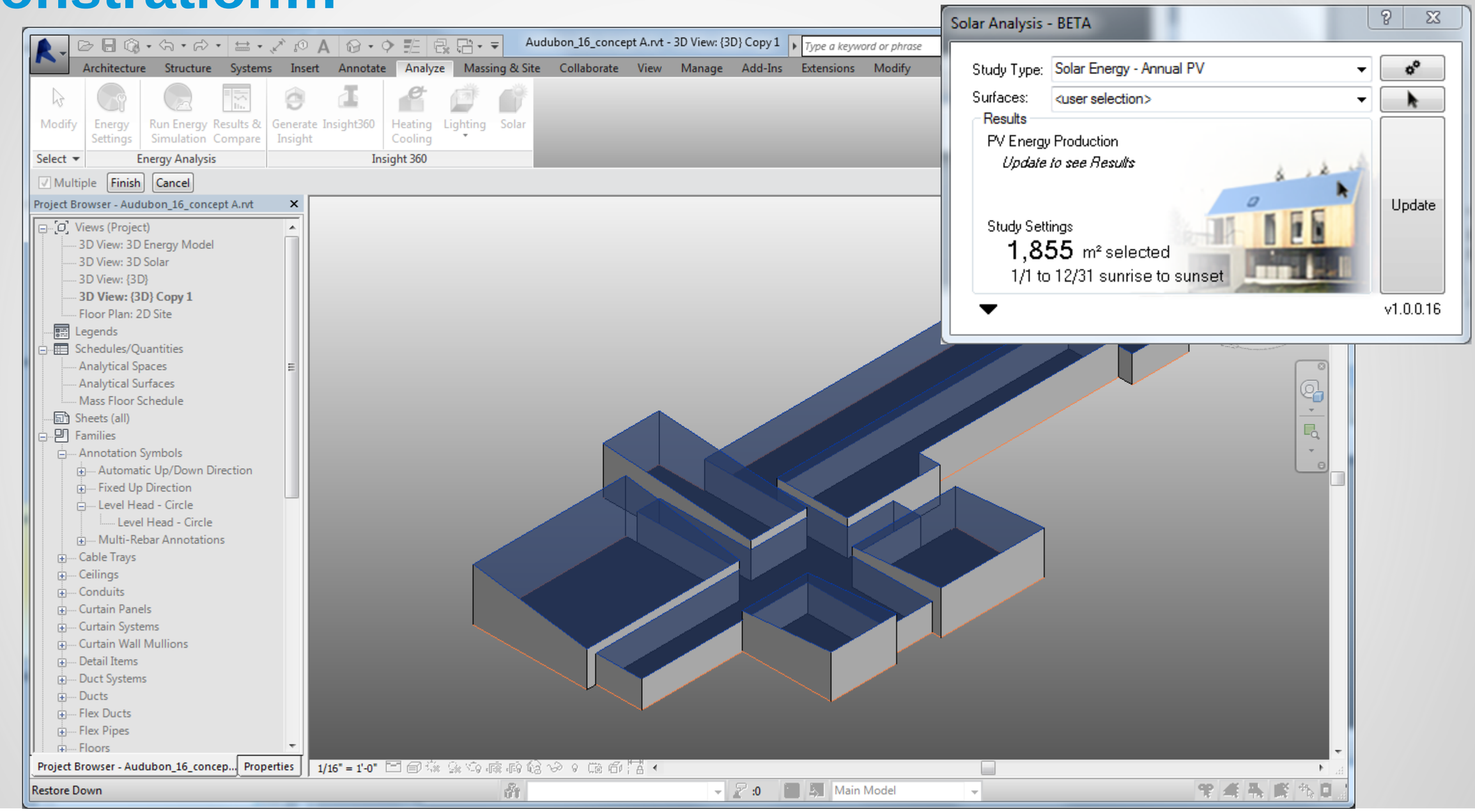
Demonstration…



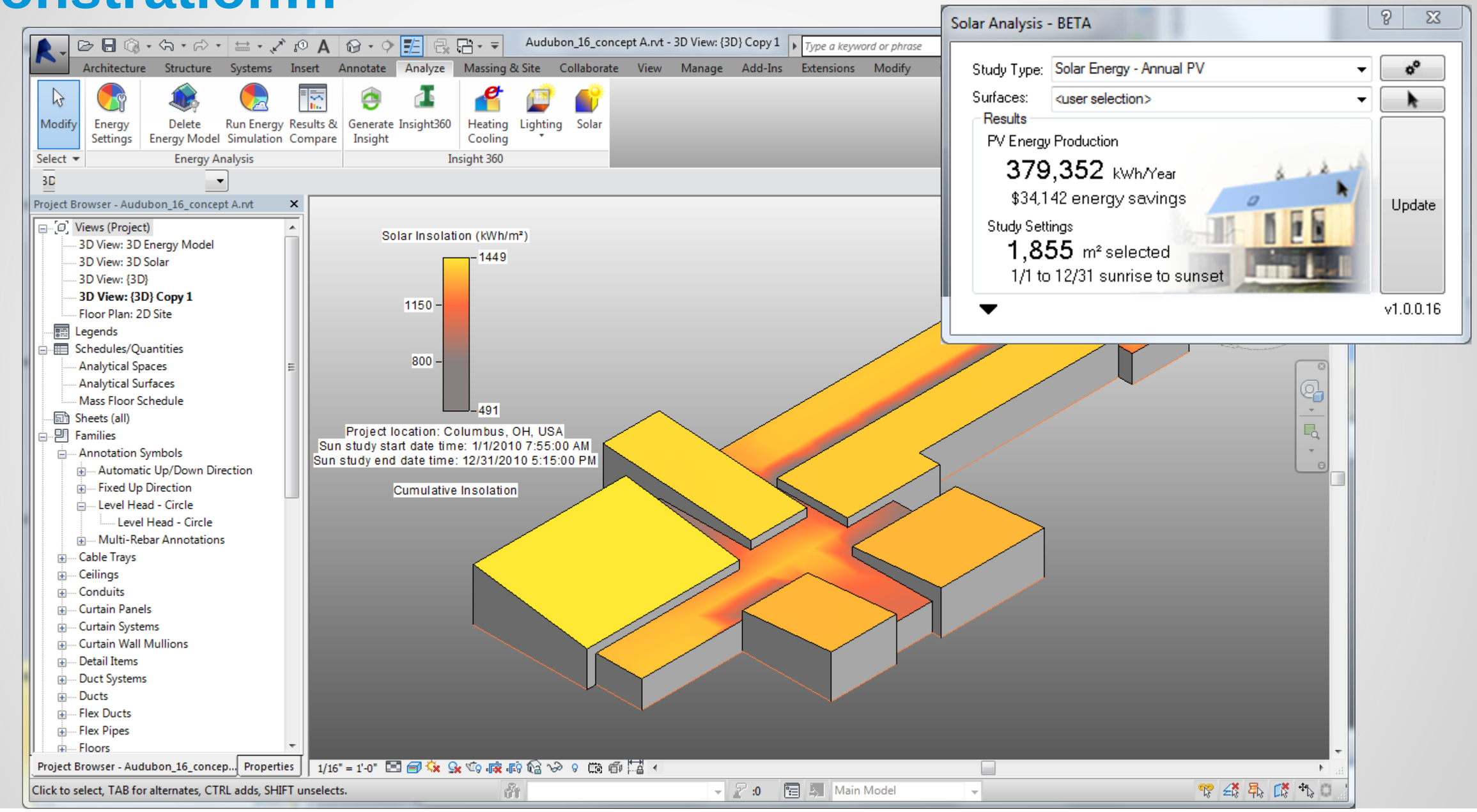
Demonstration…



Demonstration…

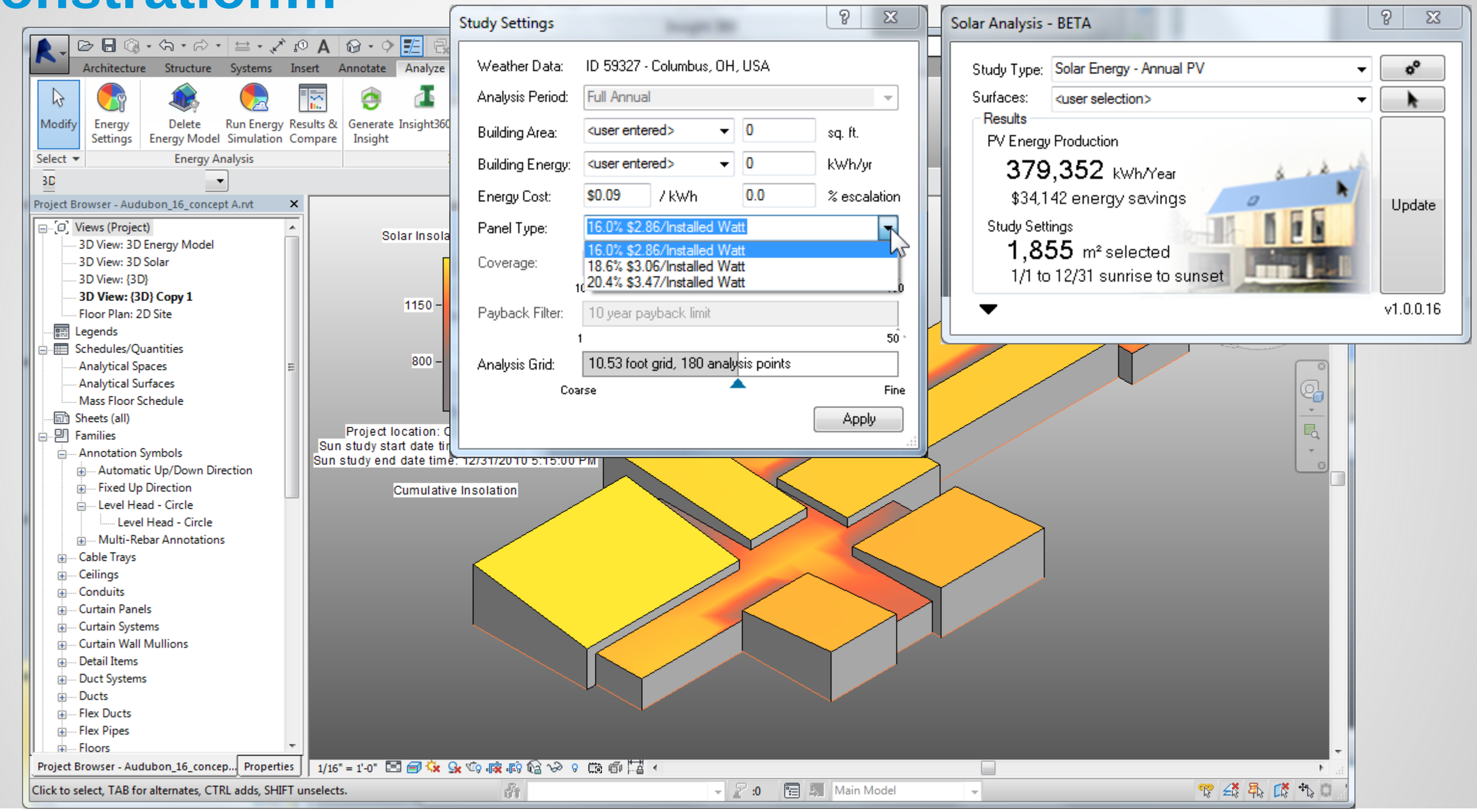


Demonstration…



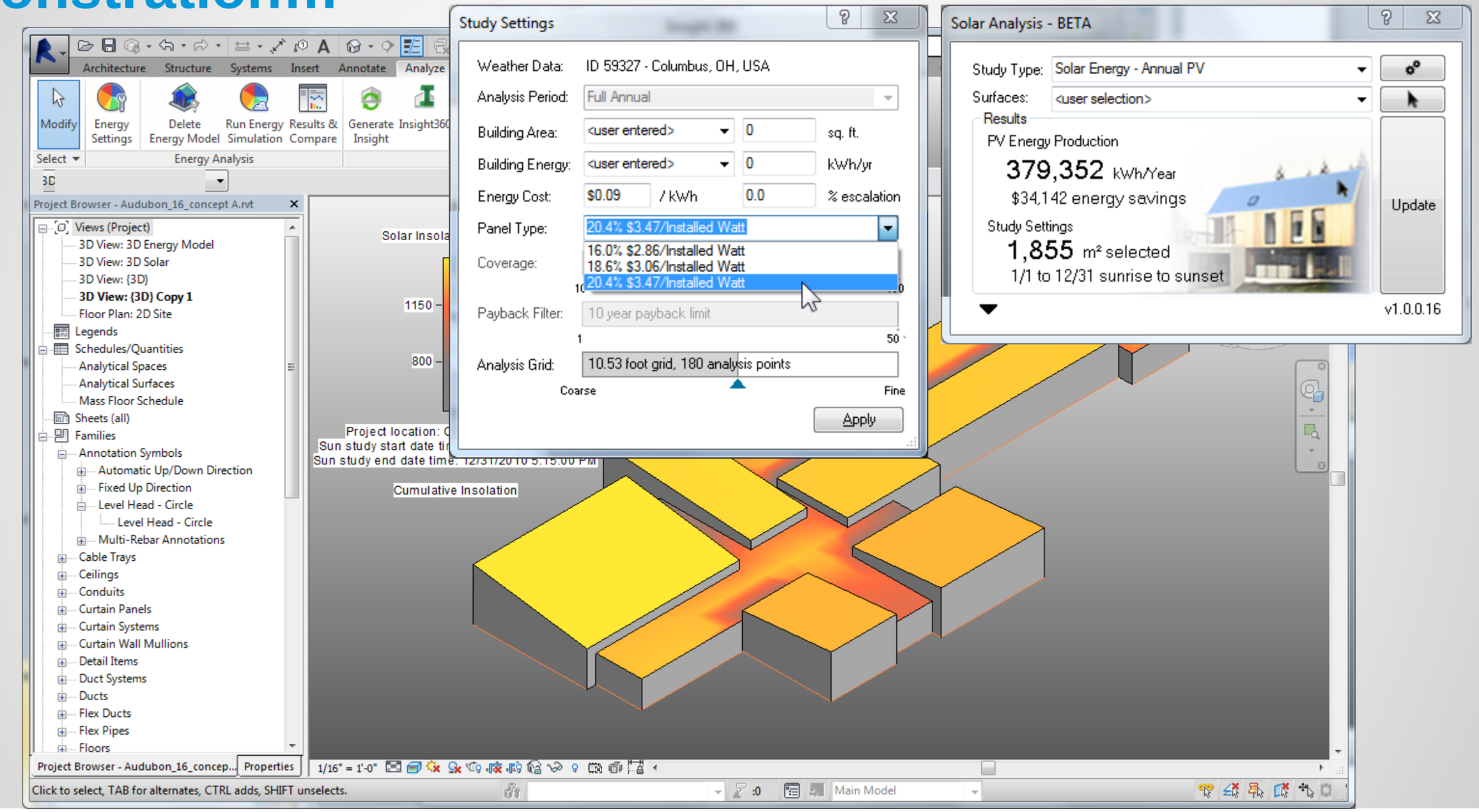
Demonstration…

16.0% eff



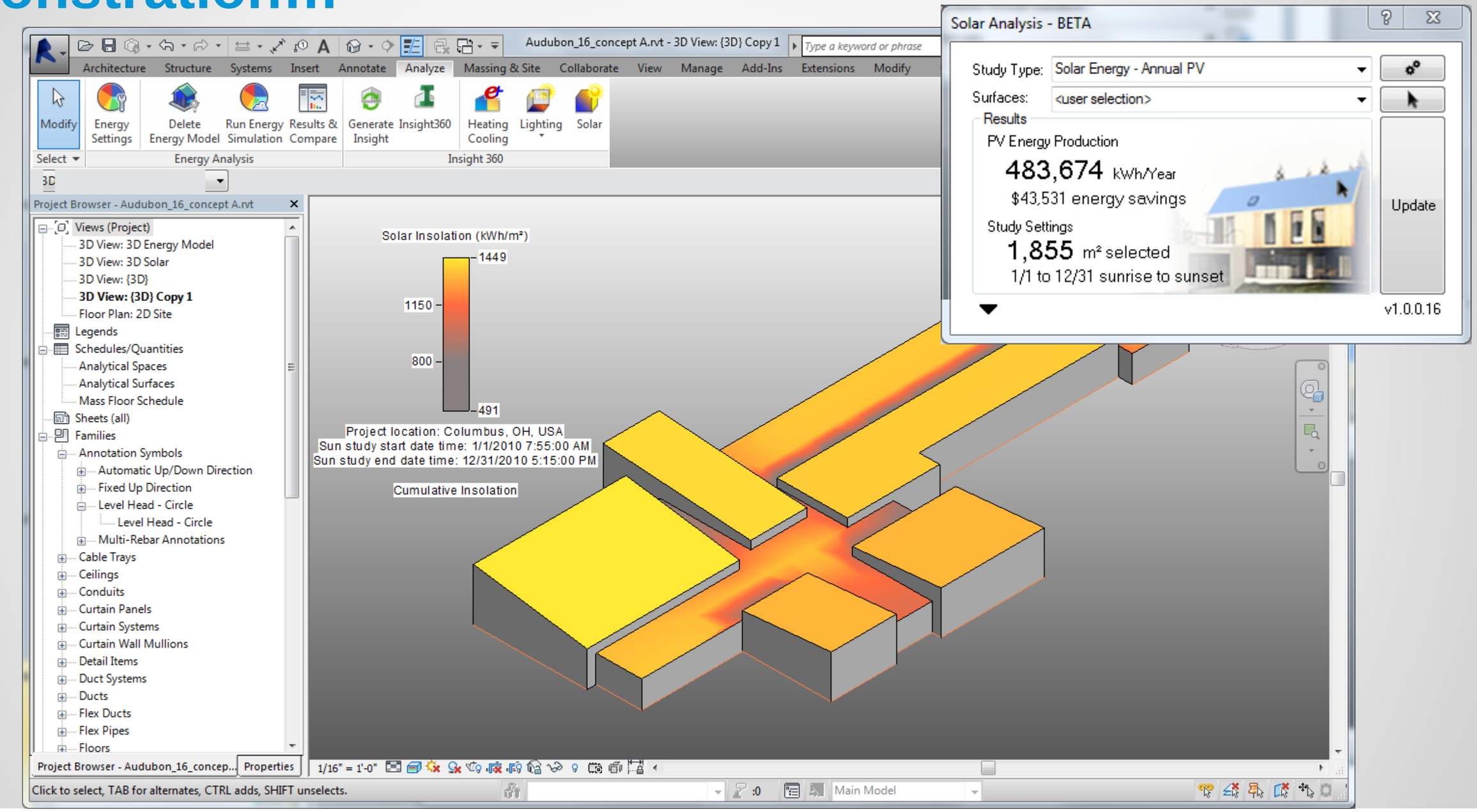
Demonstration…

20.4% eff



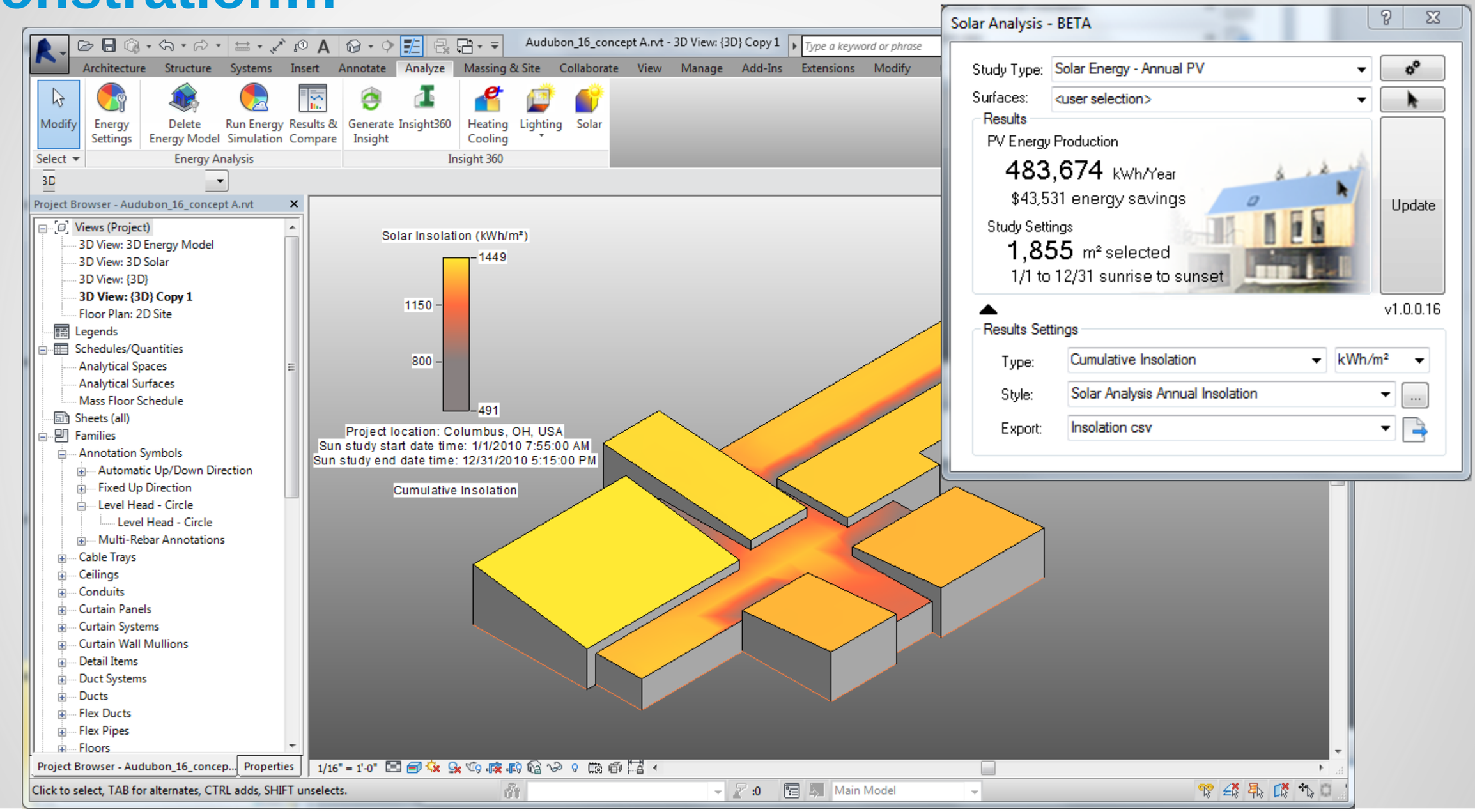
Demonstration…

20.4% eff



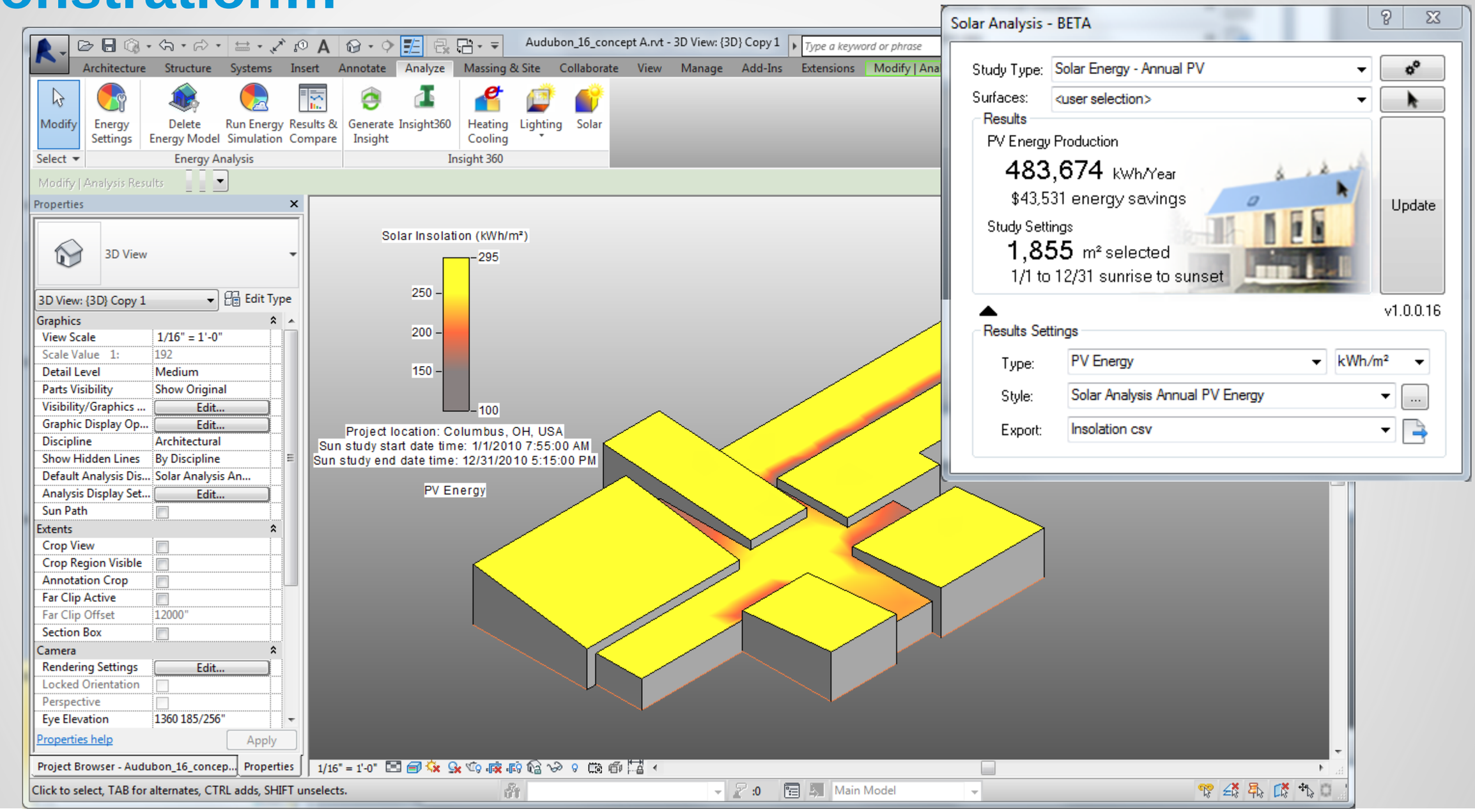
Demonstration…

20.4% eff



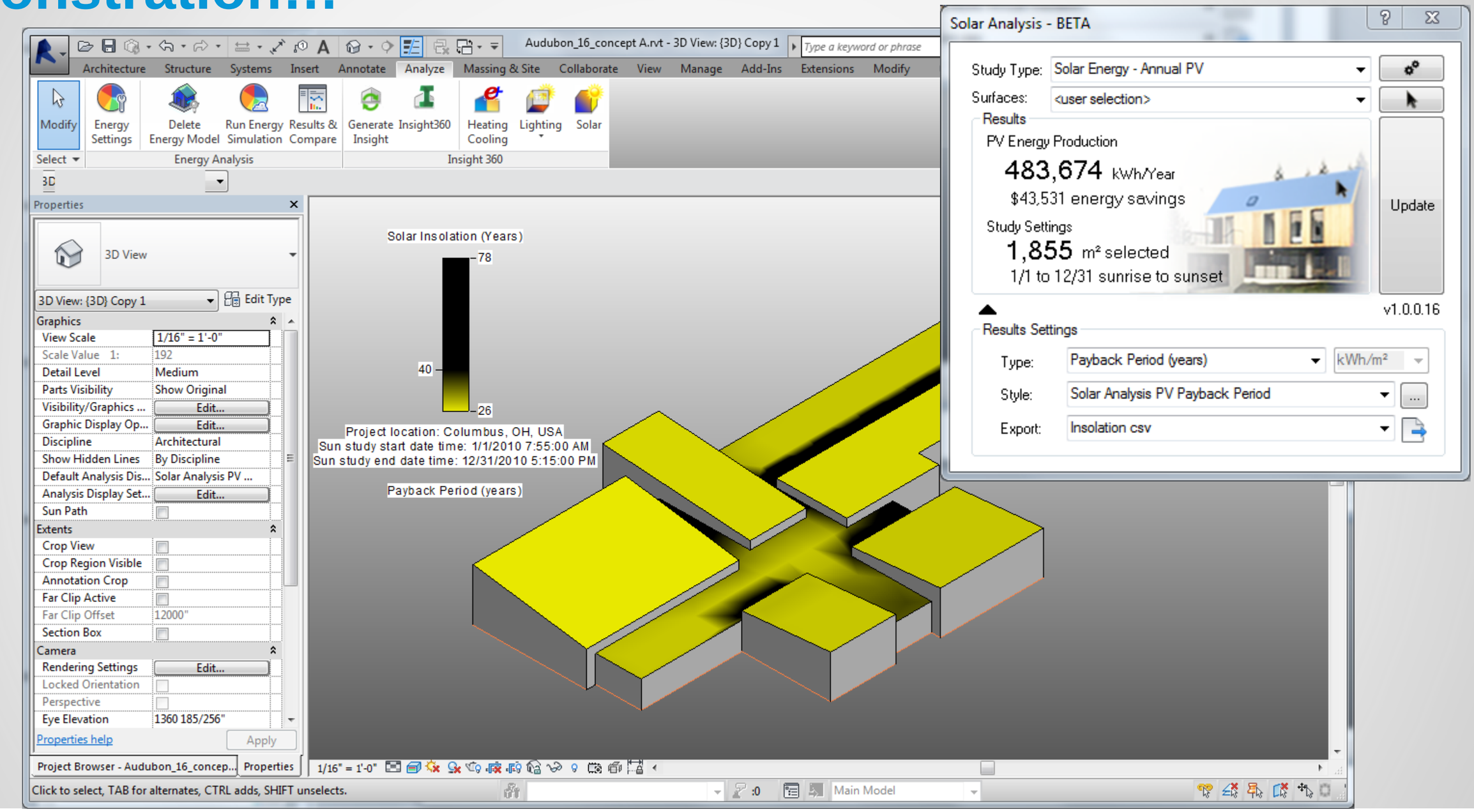
Demonstration…

20.4% eff



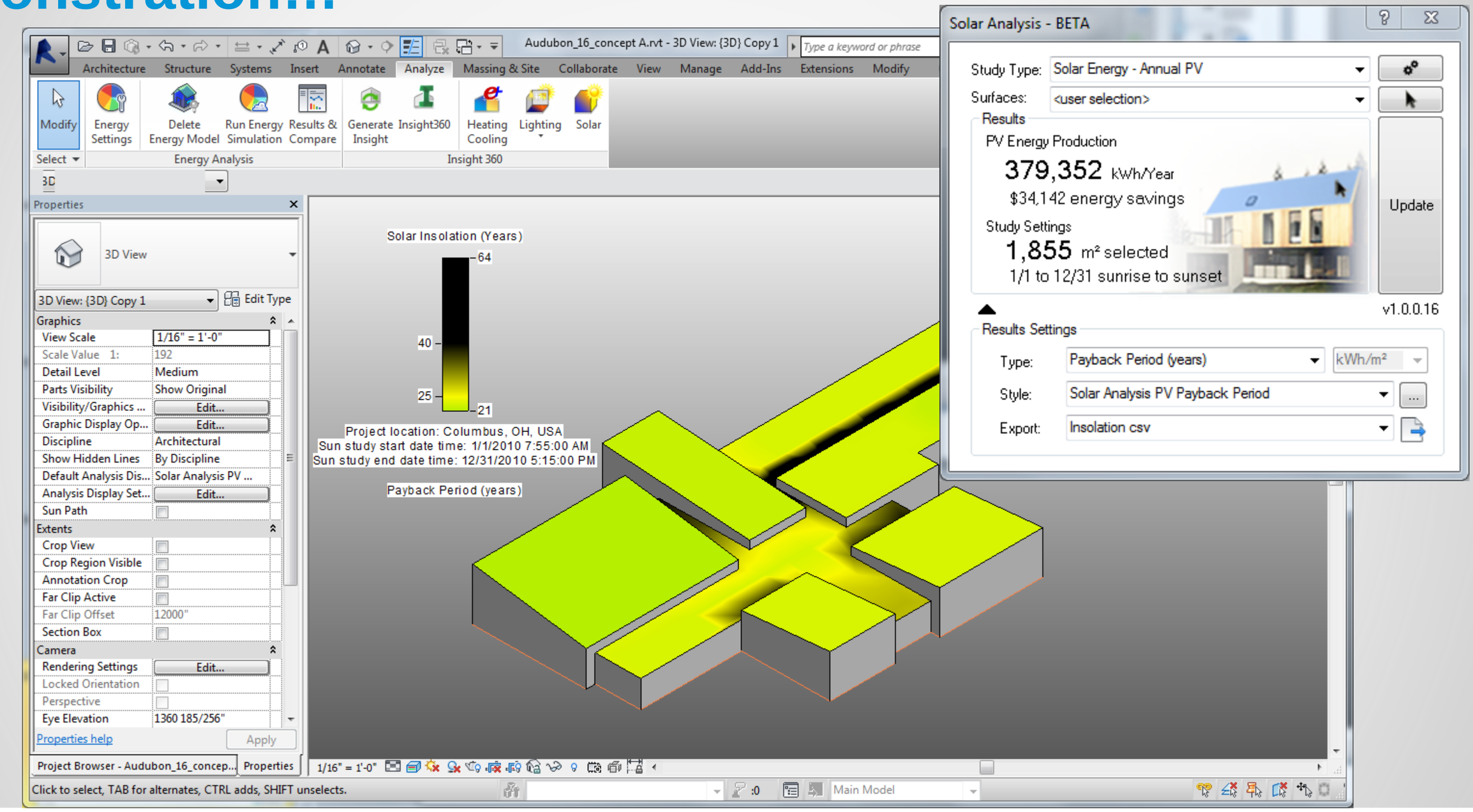
Demonstration…

20.4% eff



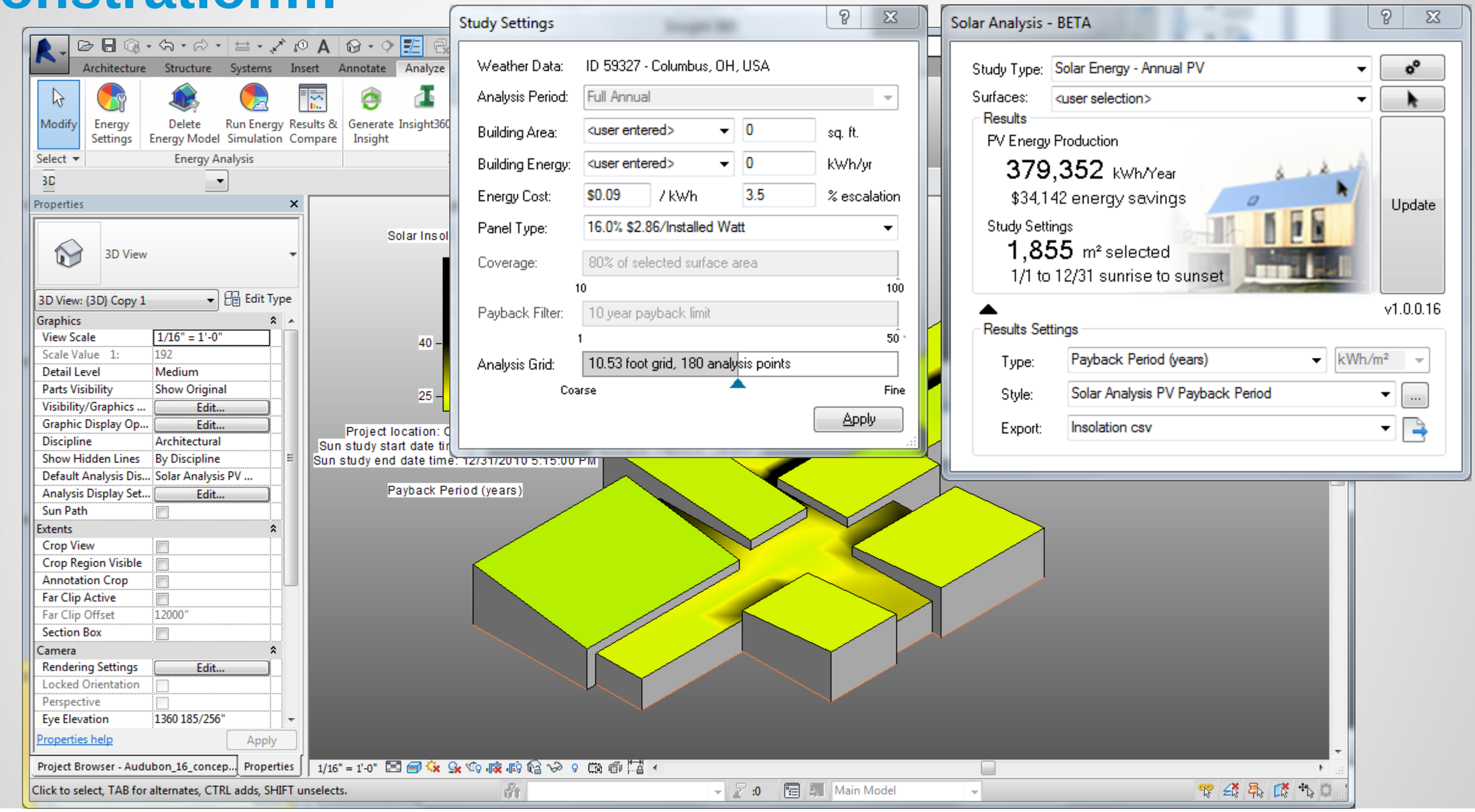
Demonstration…

16.0% eff



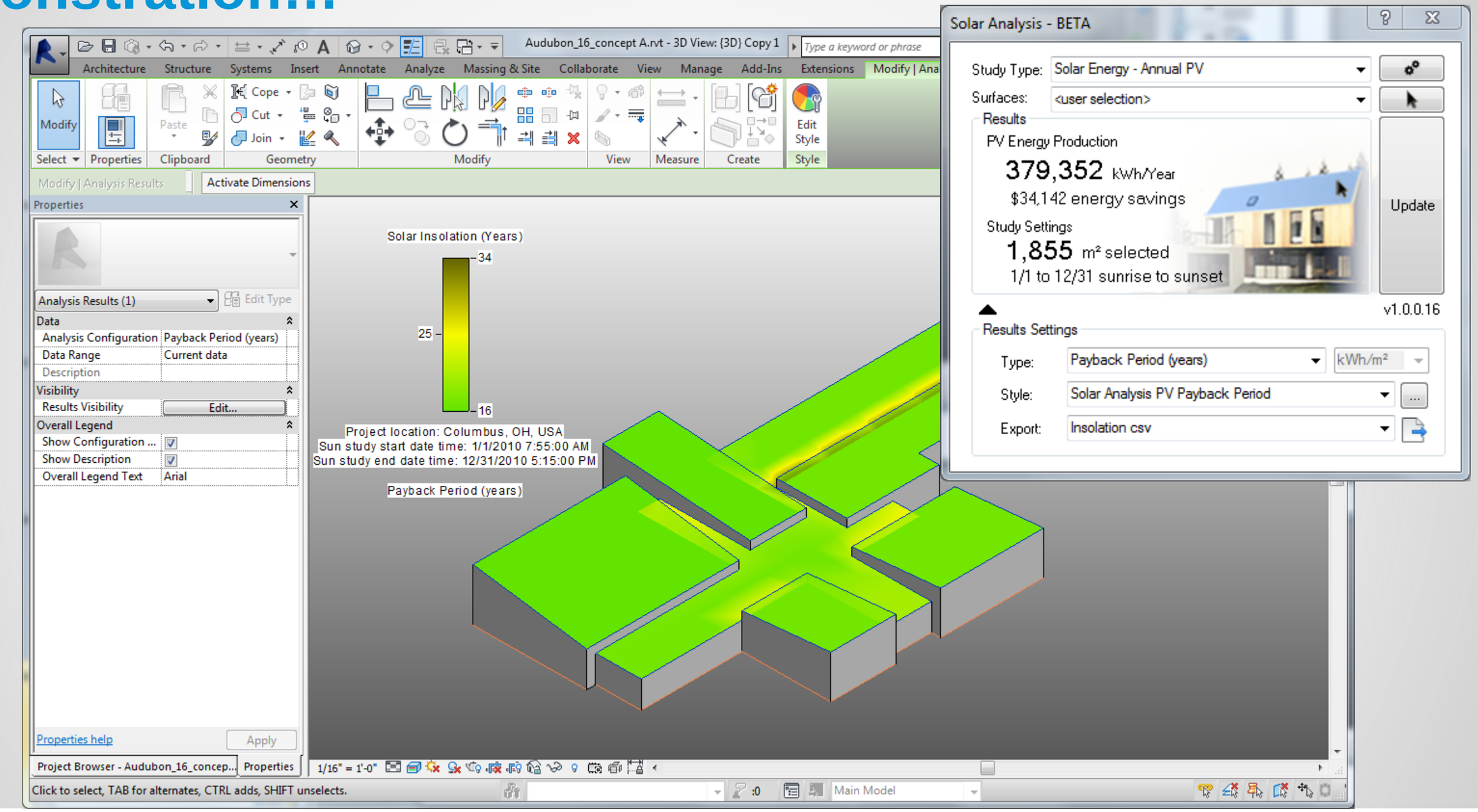
Demonstration…

16.0% eff, 3.5% escalation



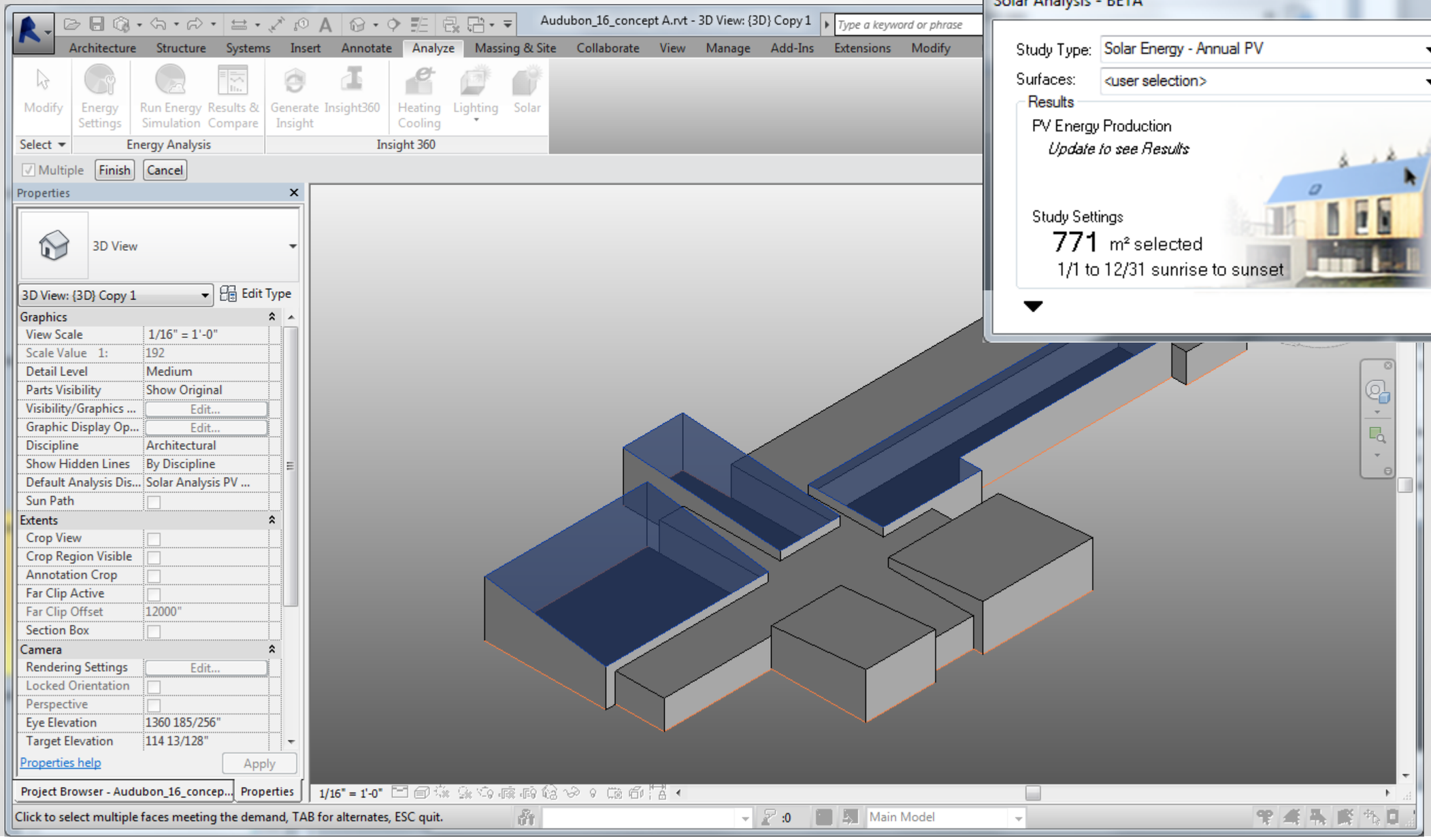
Demonstration…

16.0% eff, 3.5% escalation



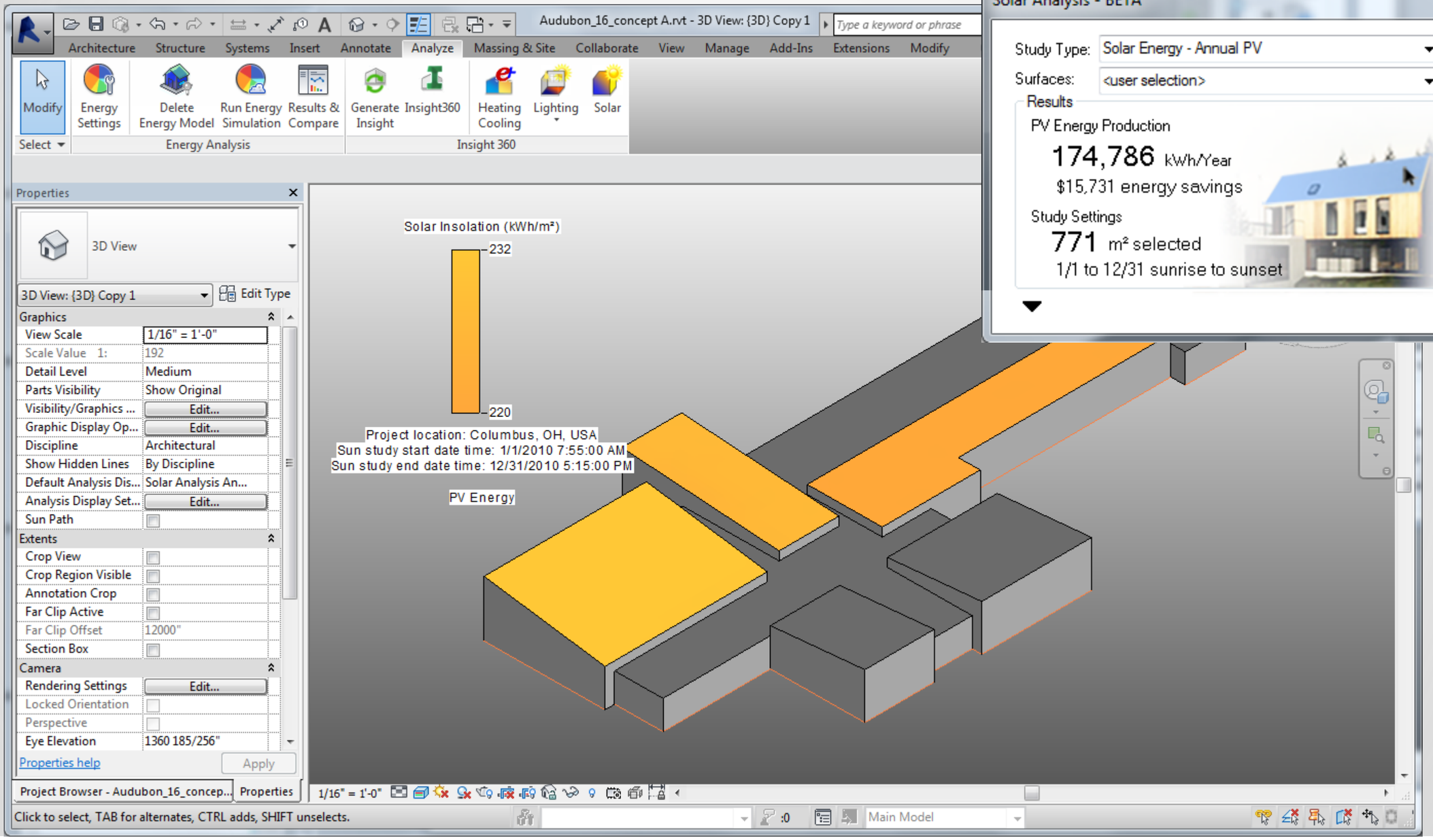
Demonstration…

16.0% eff, 3.5% escalation

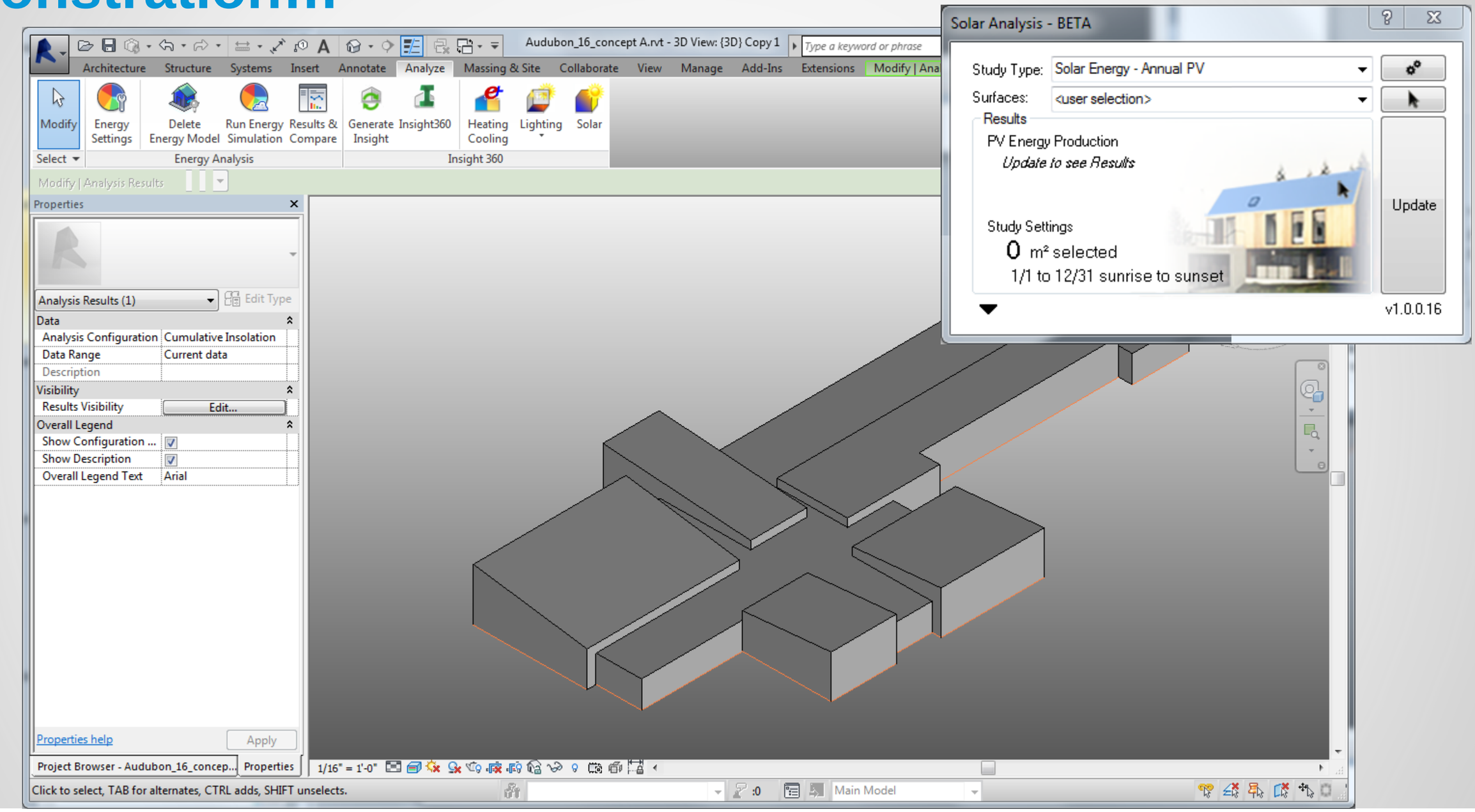


Demonstration…

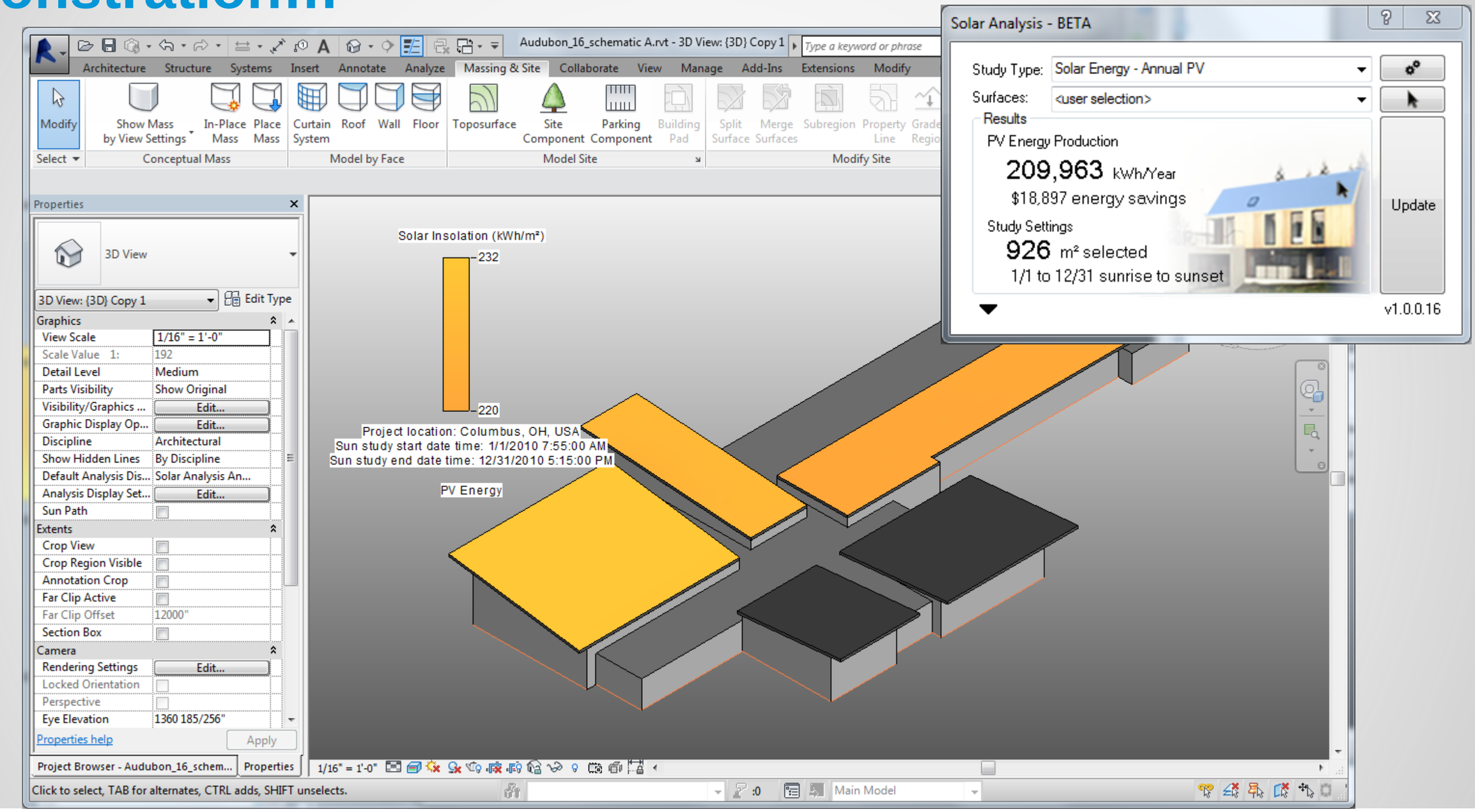
16.0% eff, 3.5% escalation



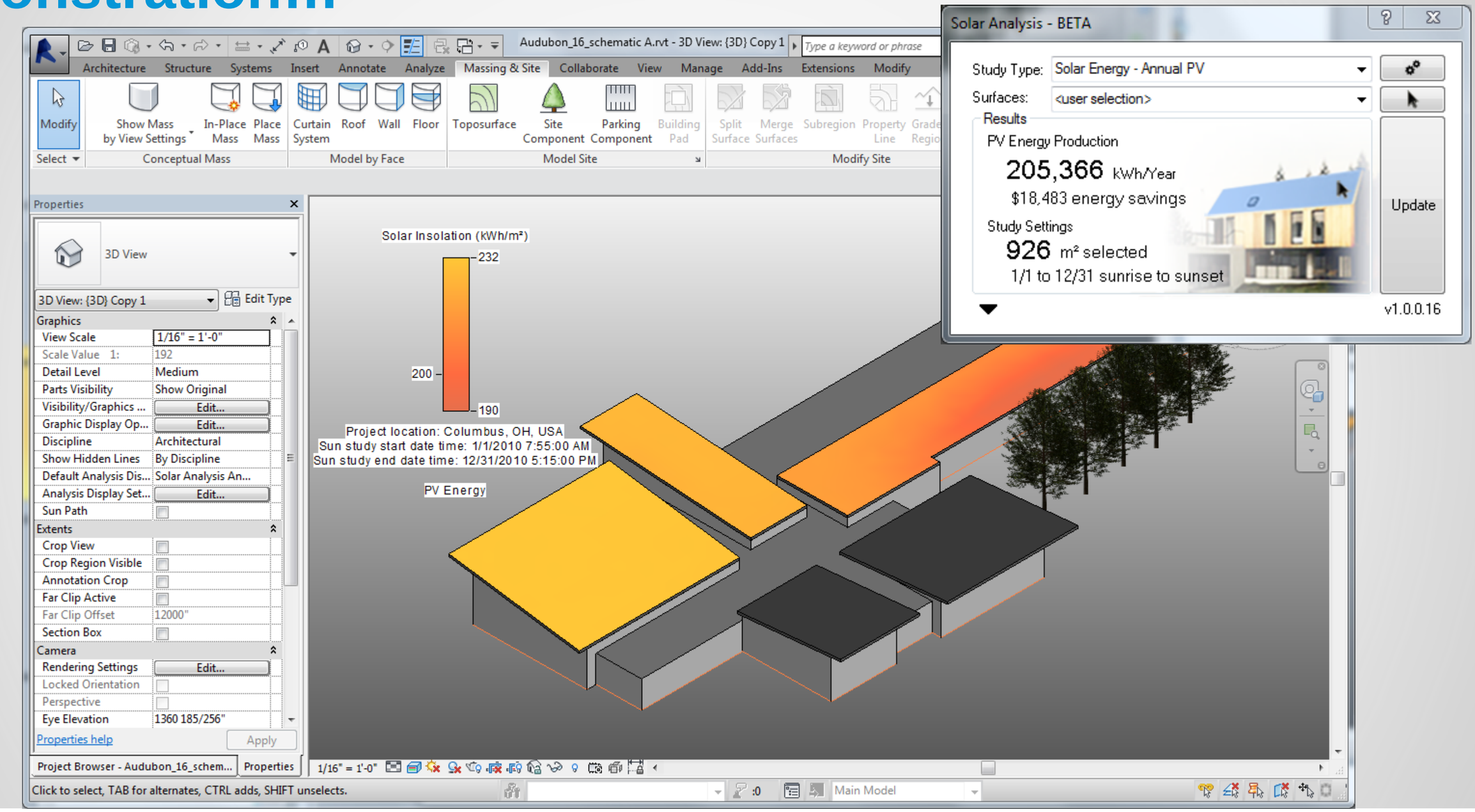
Demonstration…



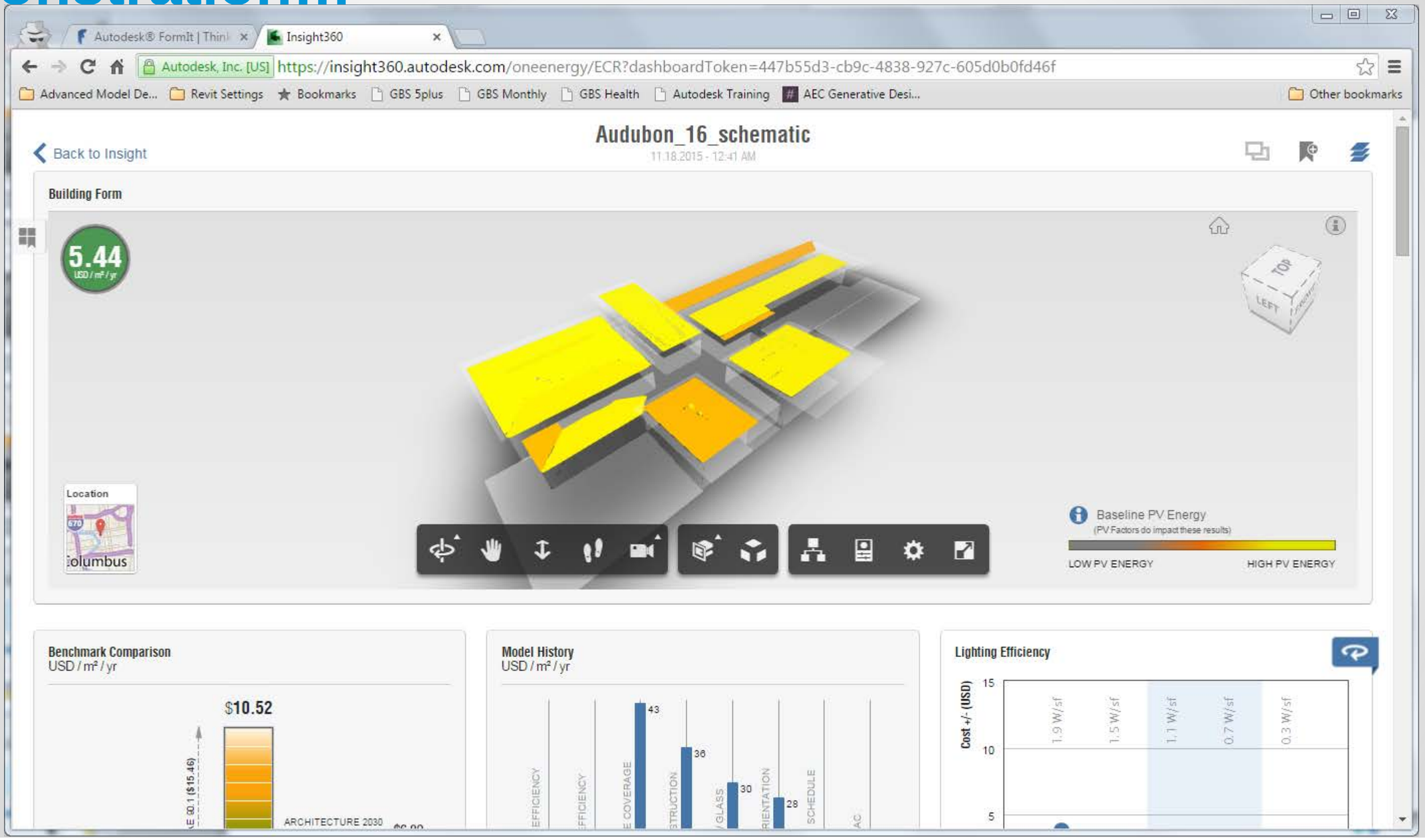
Demonstration…



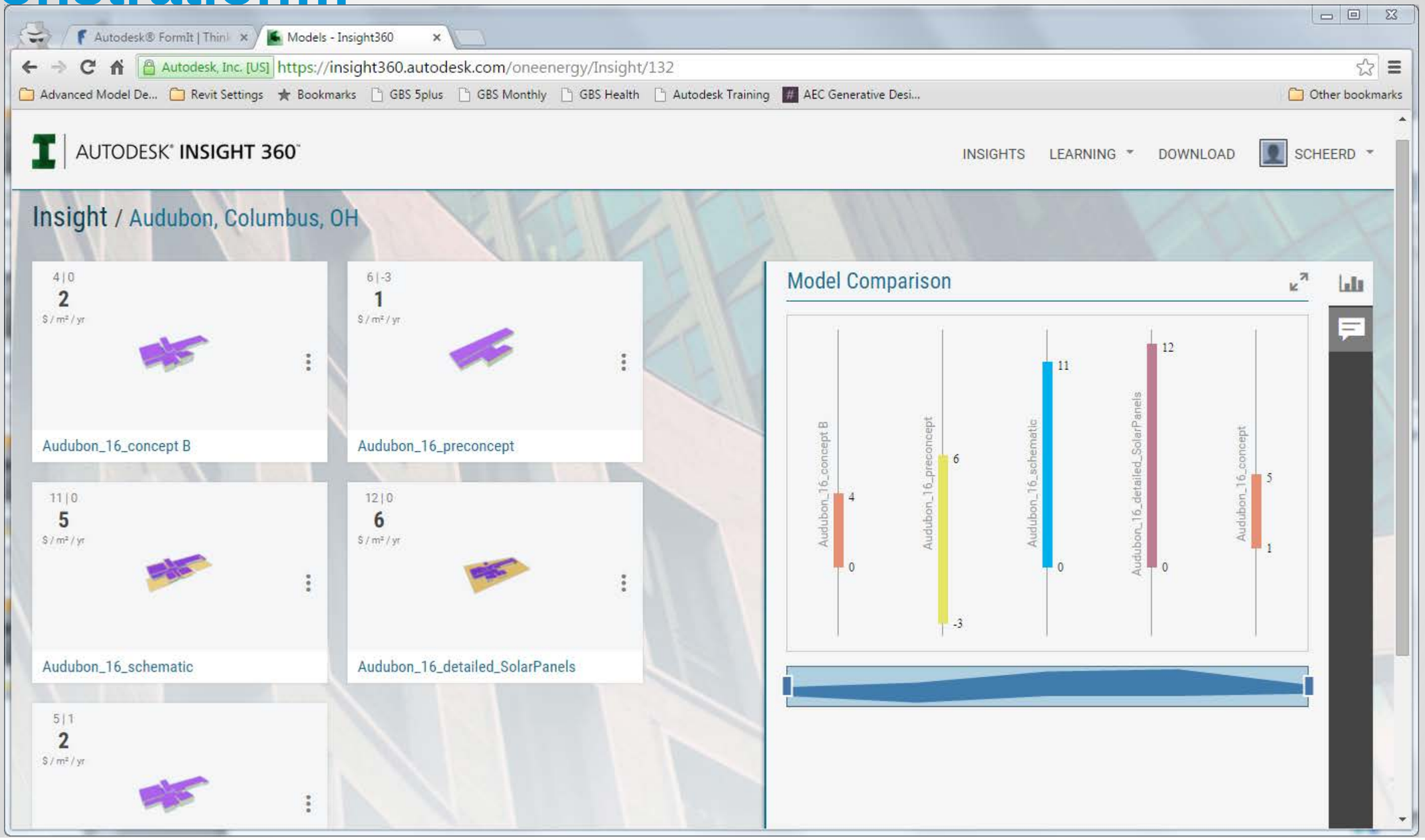
Demonstration…



Demonstration…



Demonstration…

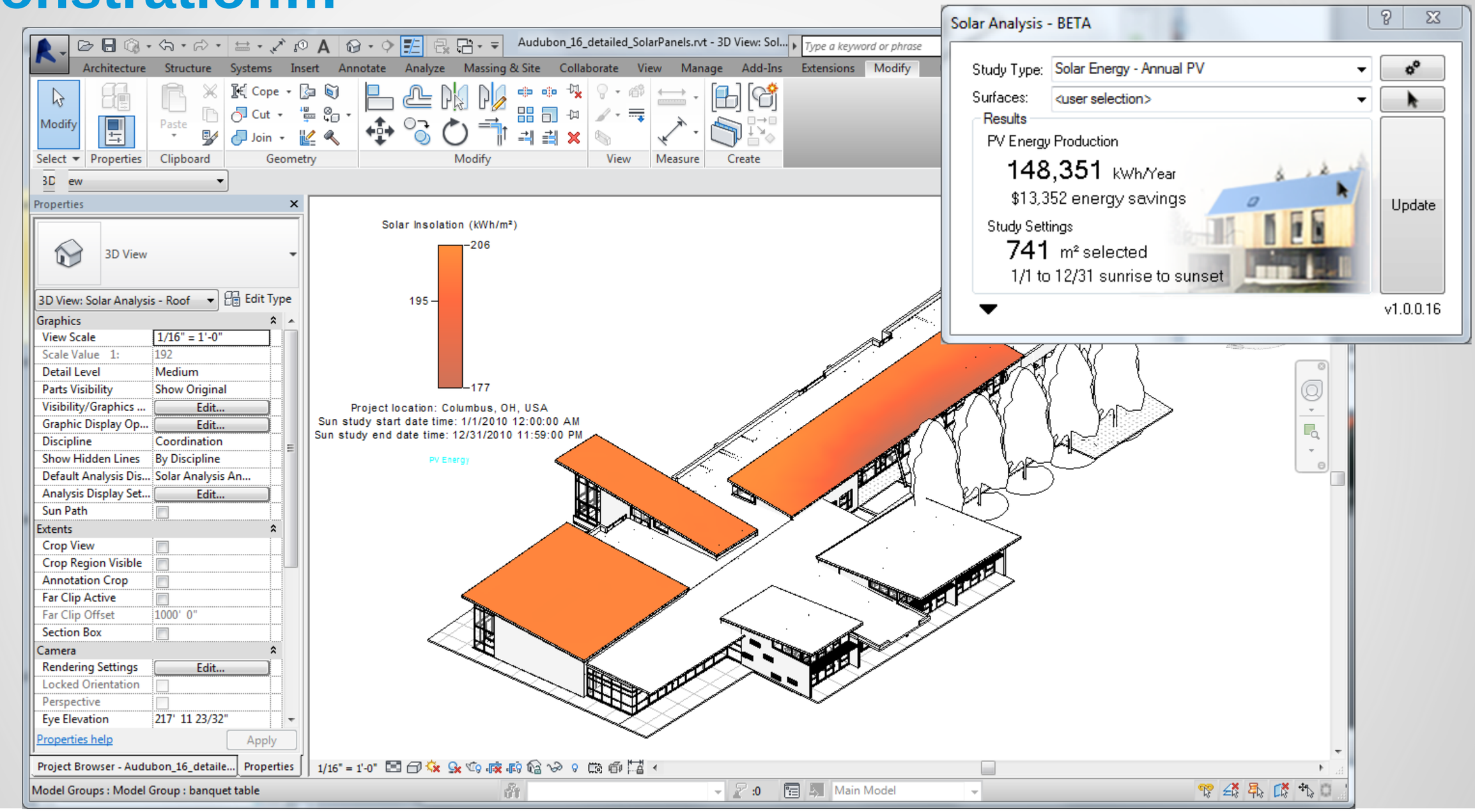


Section 2

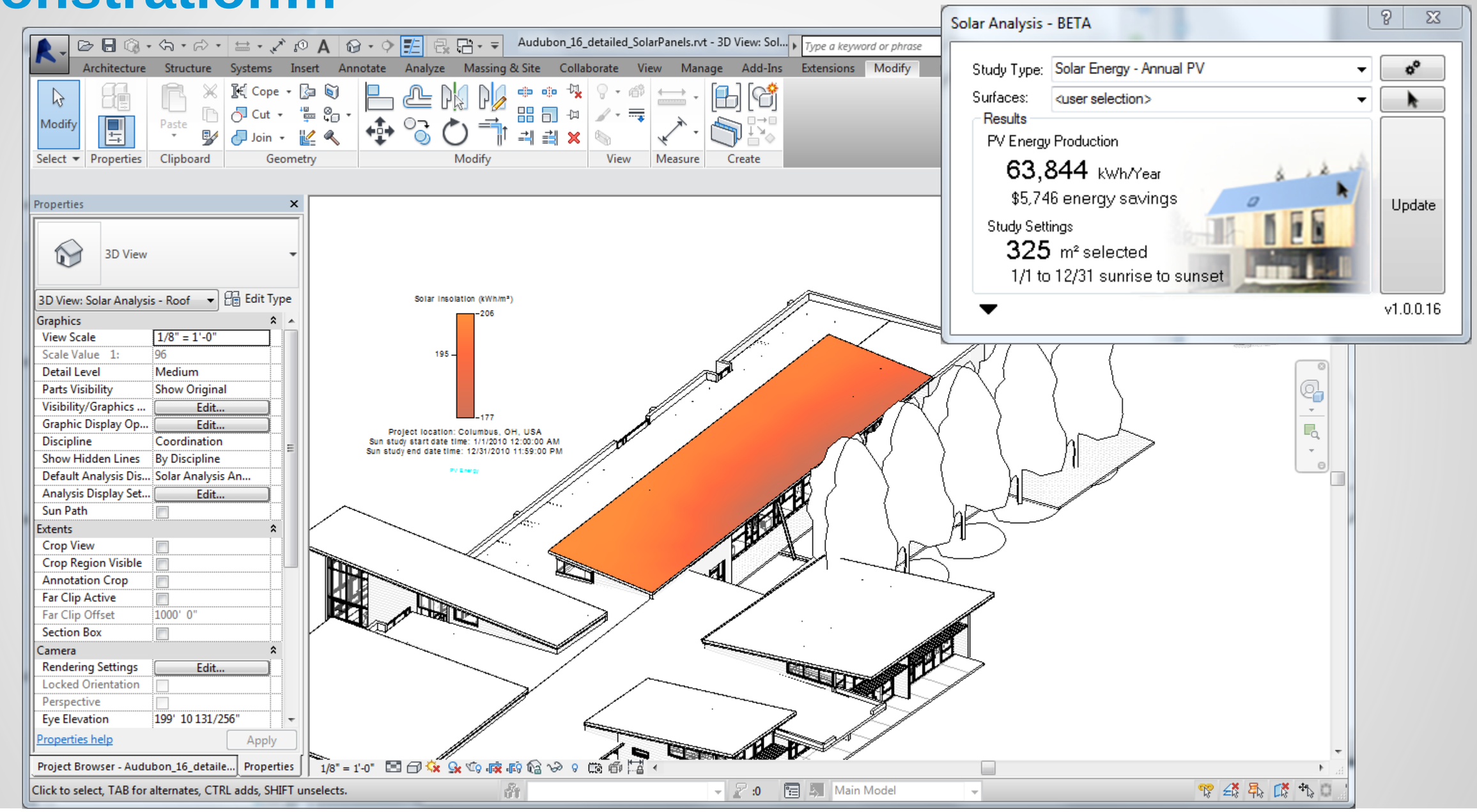
Agile Design for Solar Power

Exercise 2.4 – Panel Layout and Specifications

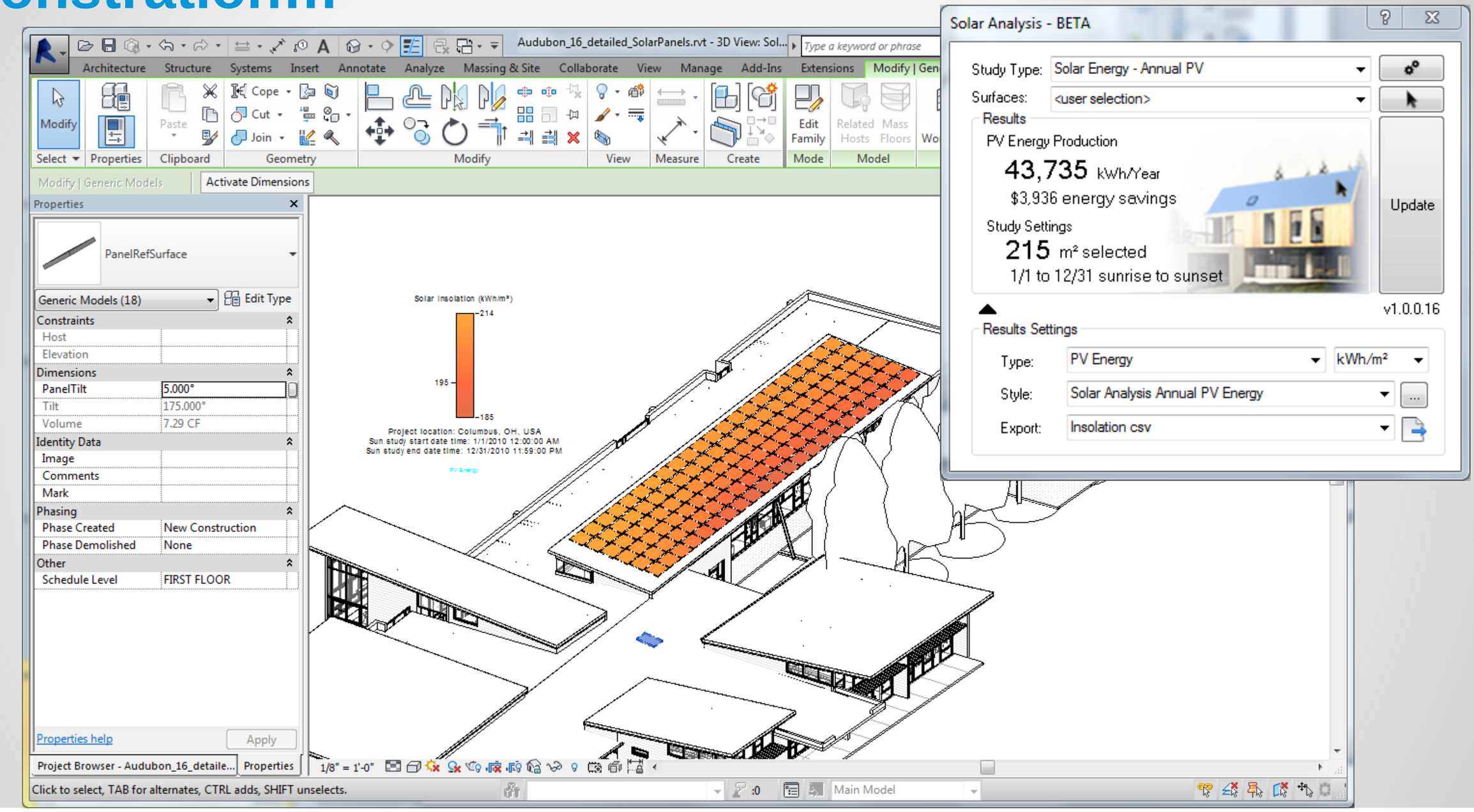
Demonstration…



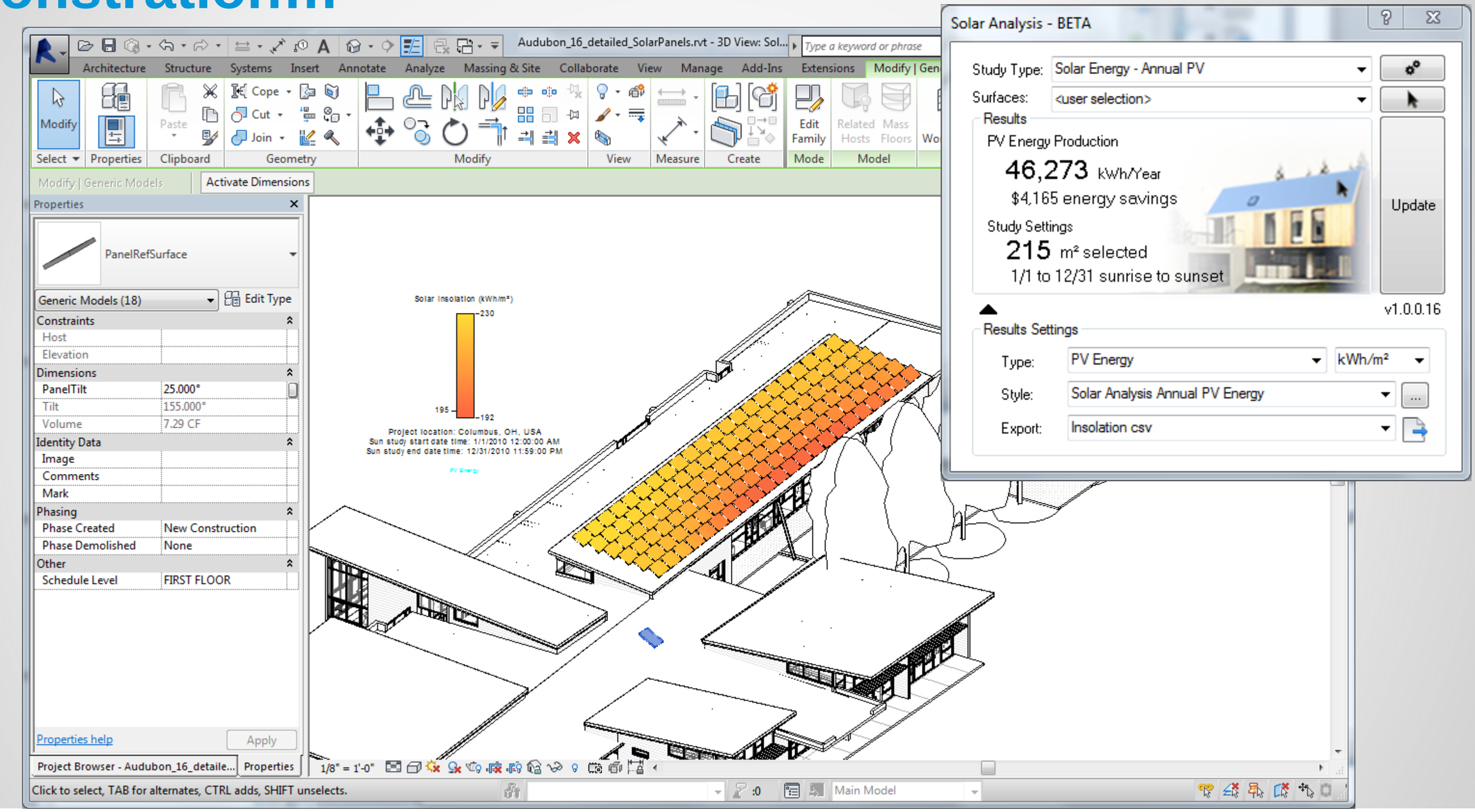
Demonstration…



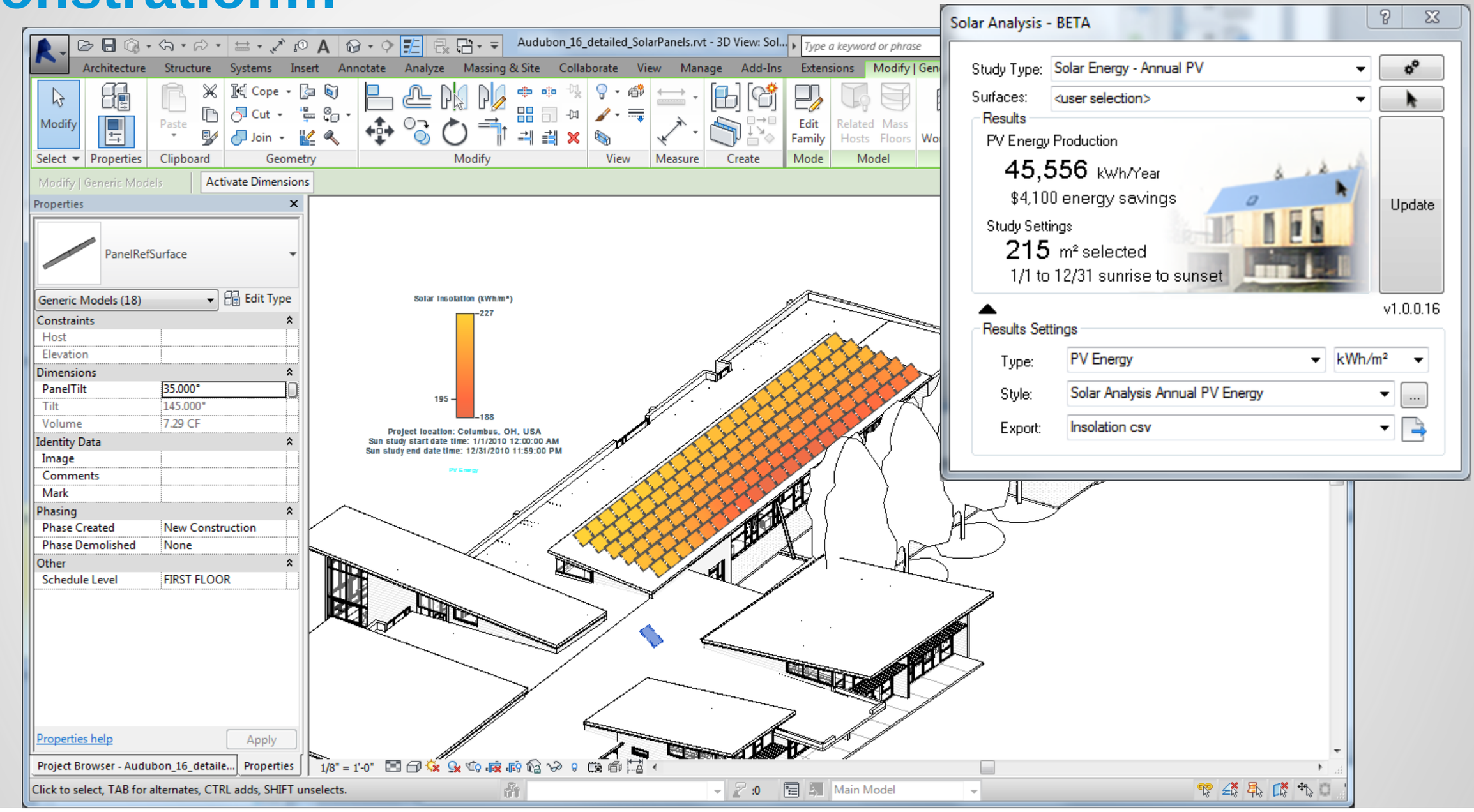
Demonstration…



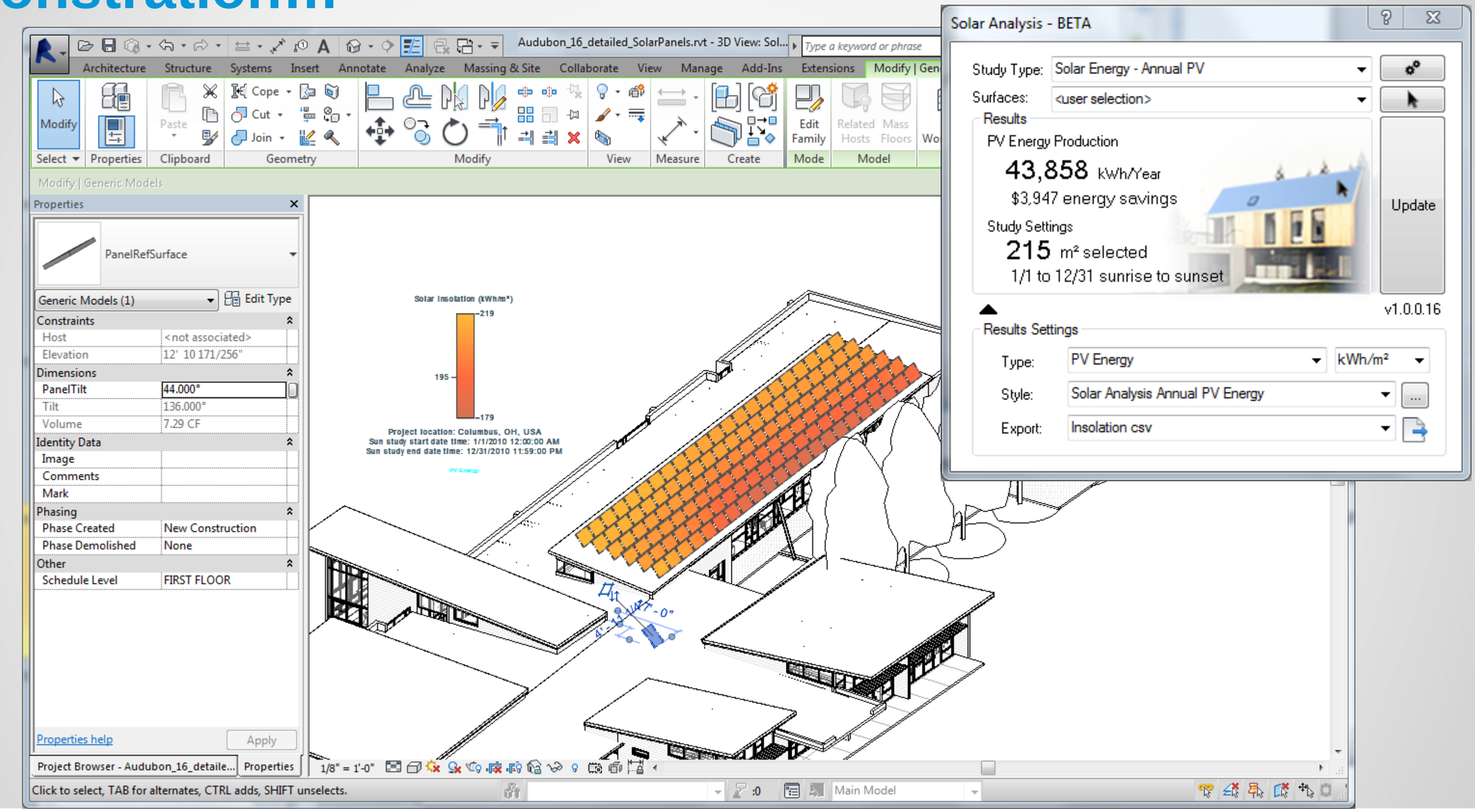
Demonstration…



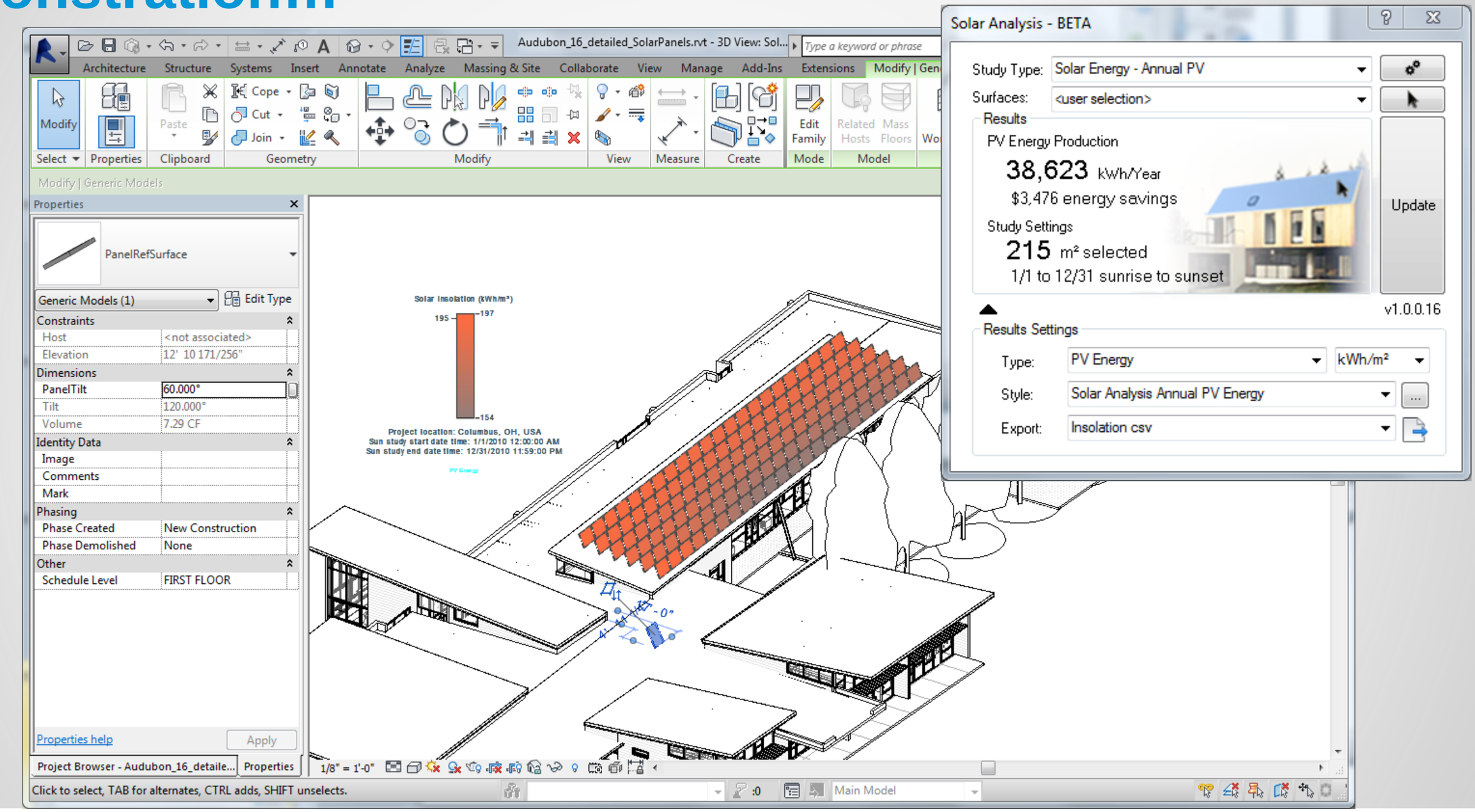
Demonstration…



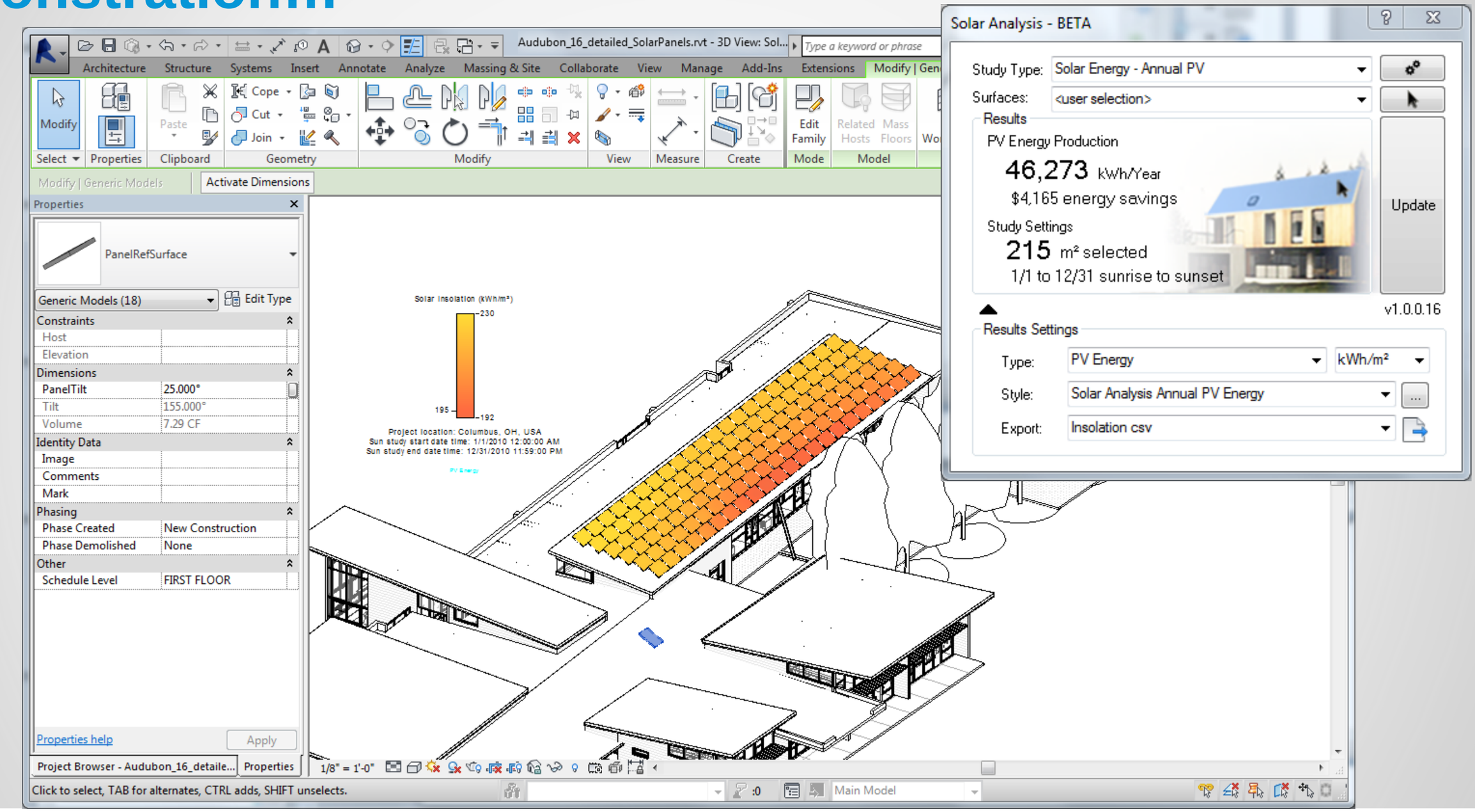
Demonstration…



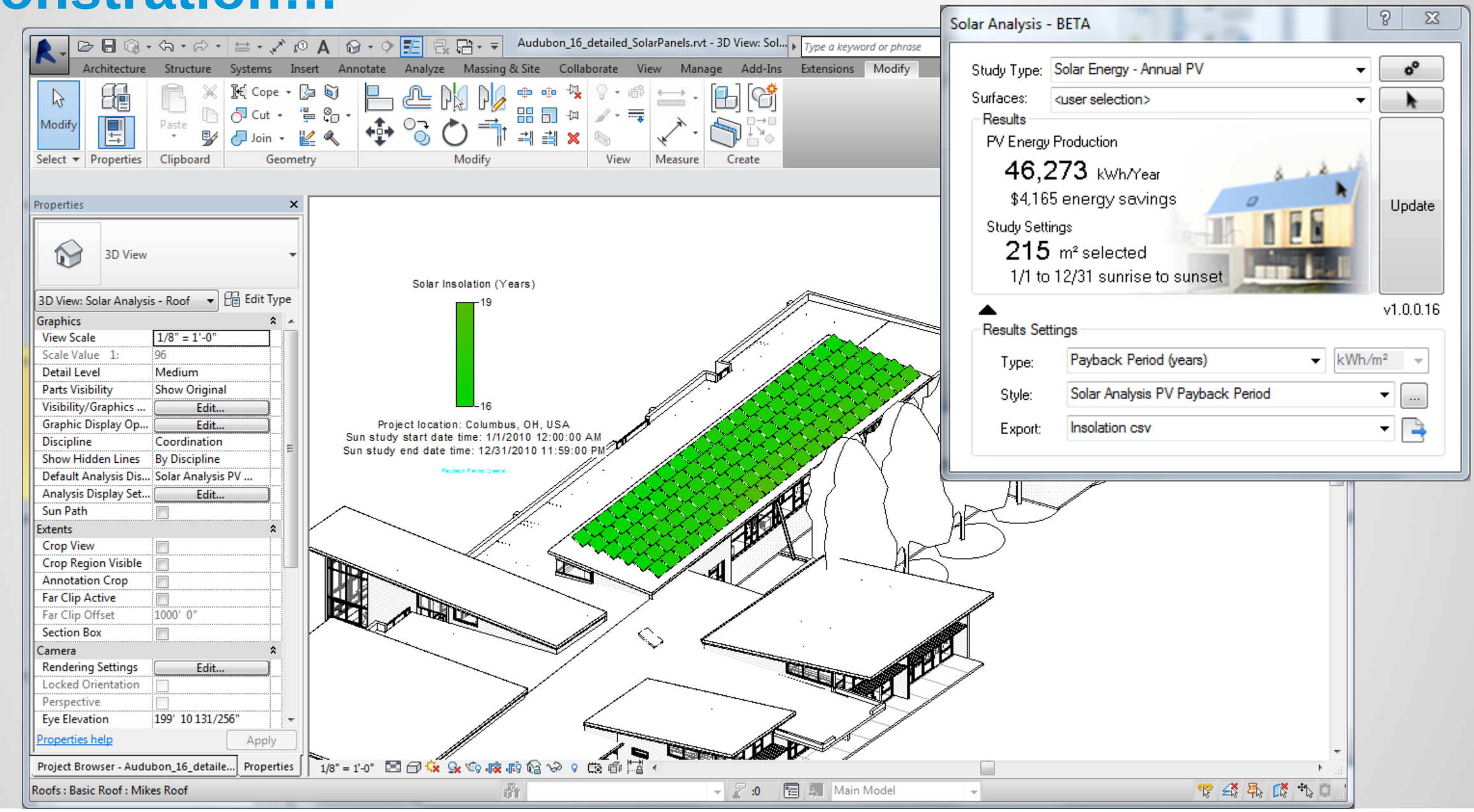
Demonstration…



Demonstration…



Demonstration…

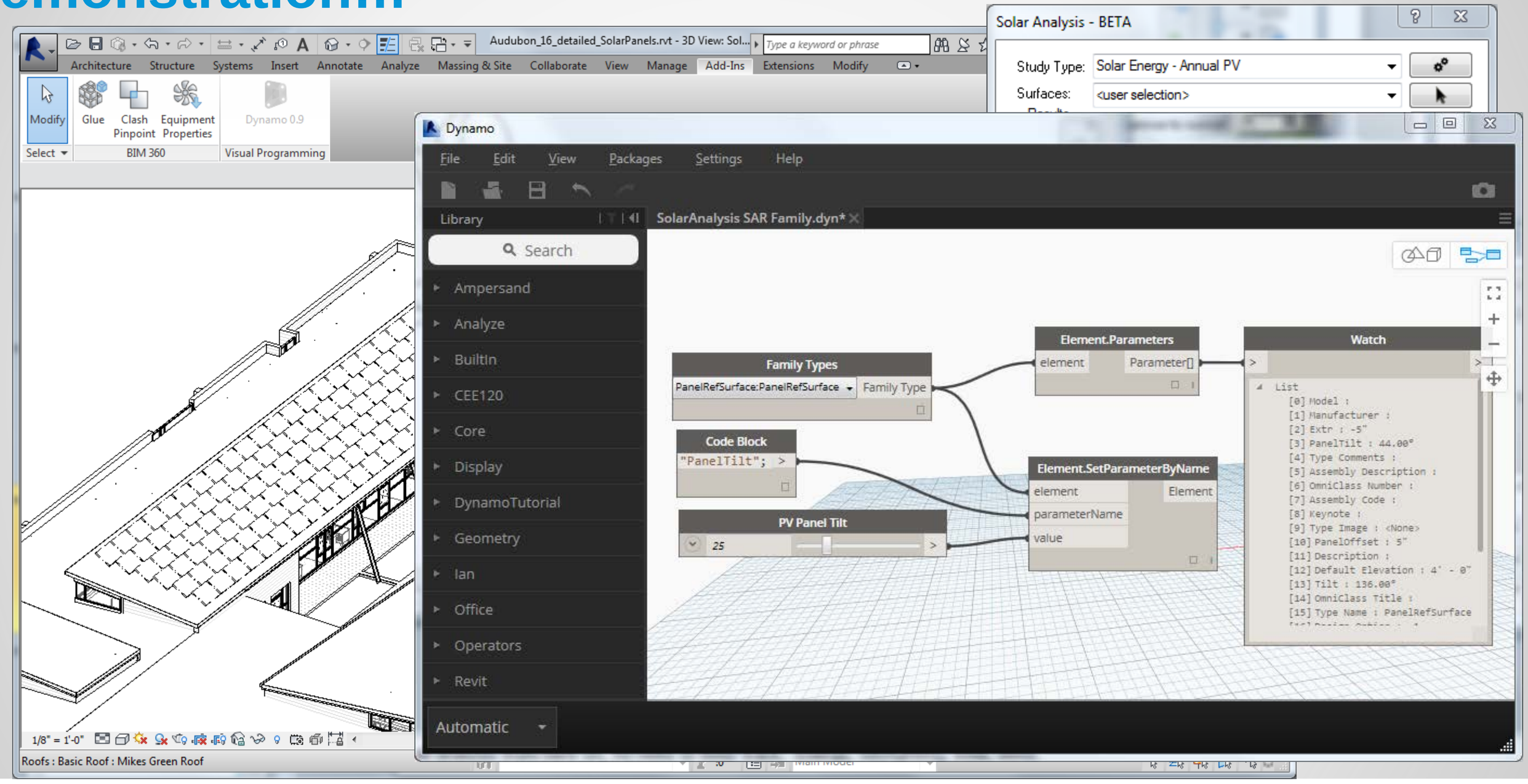


Section 2

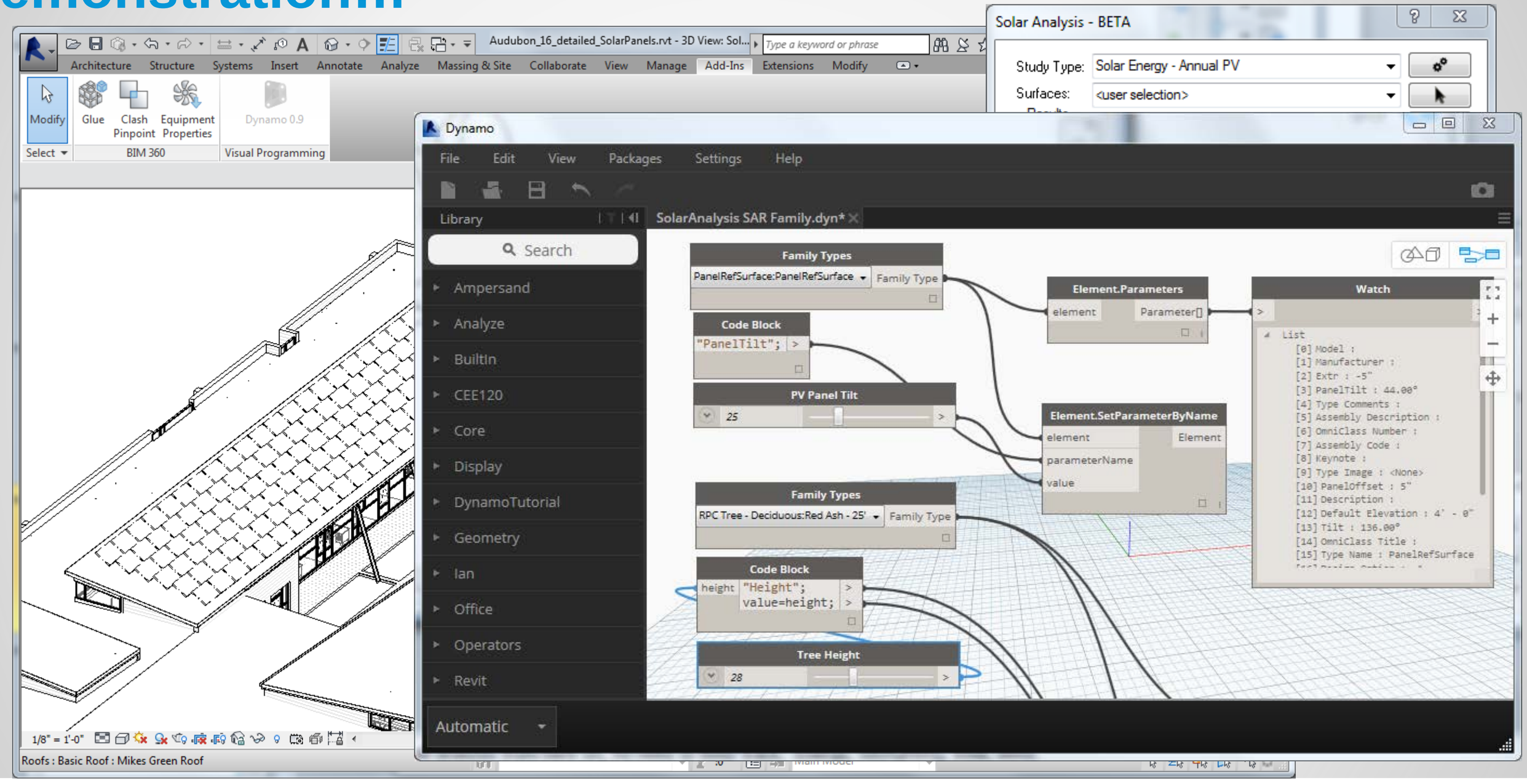
Agile Design for Solar Power

Exercise 2.5 – Dynamo Automation

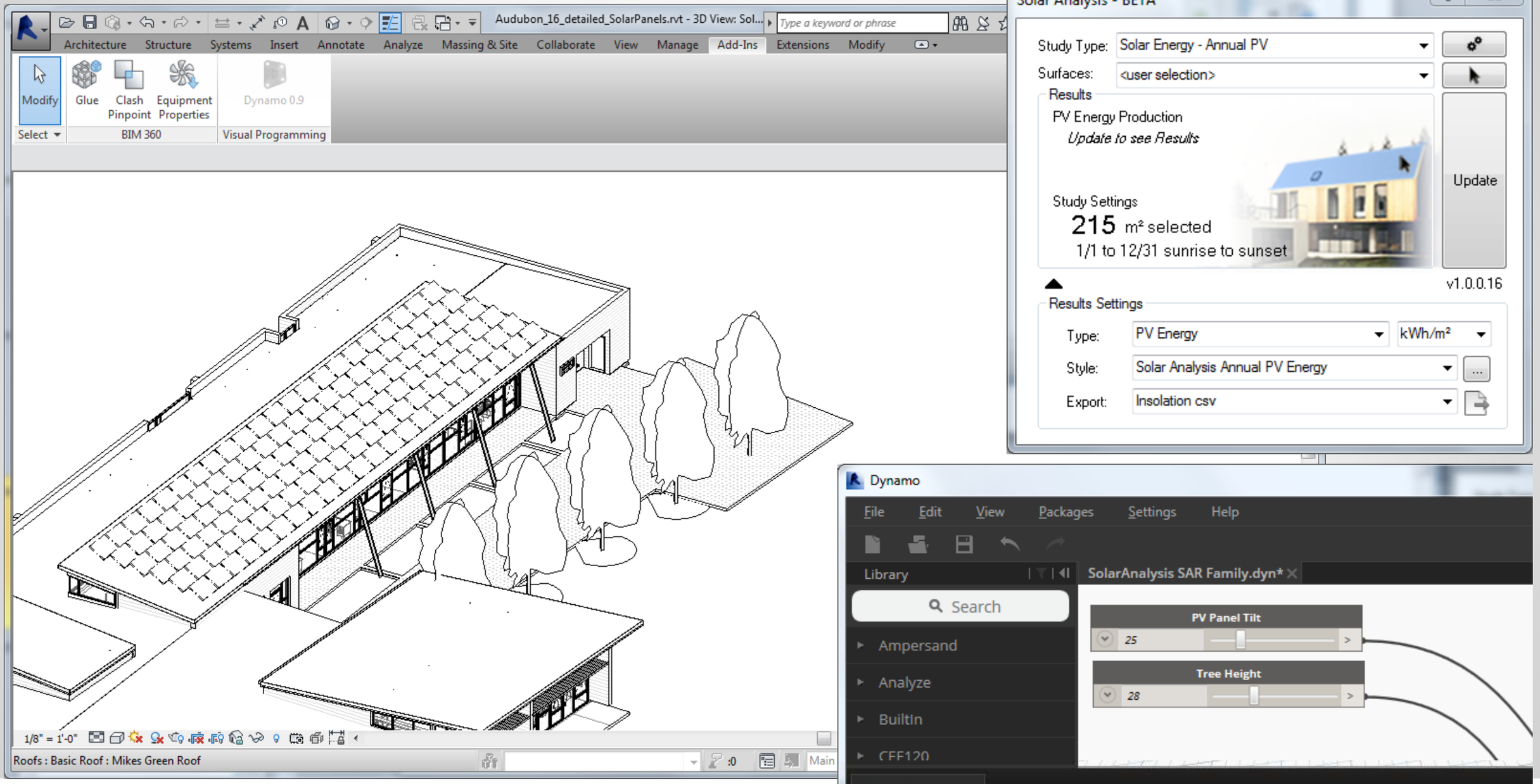
Demonstration…



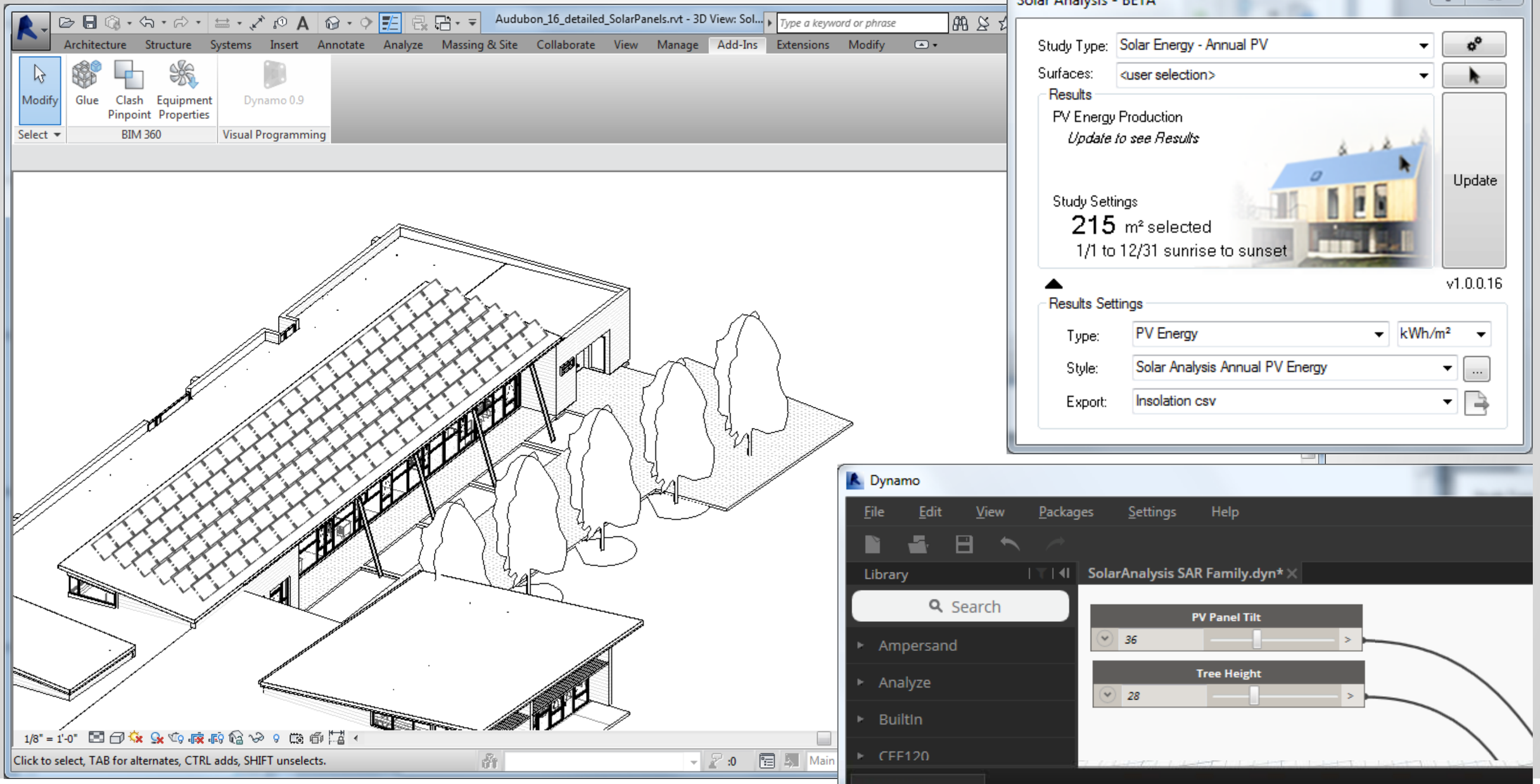
Demonstration…



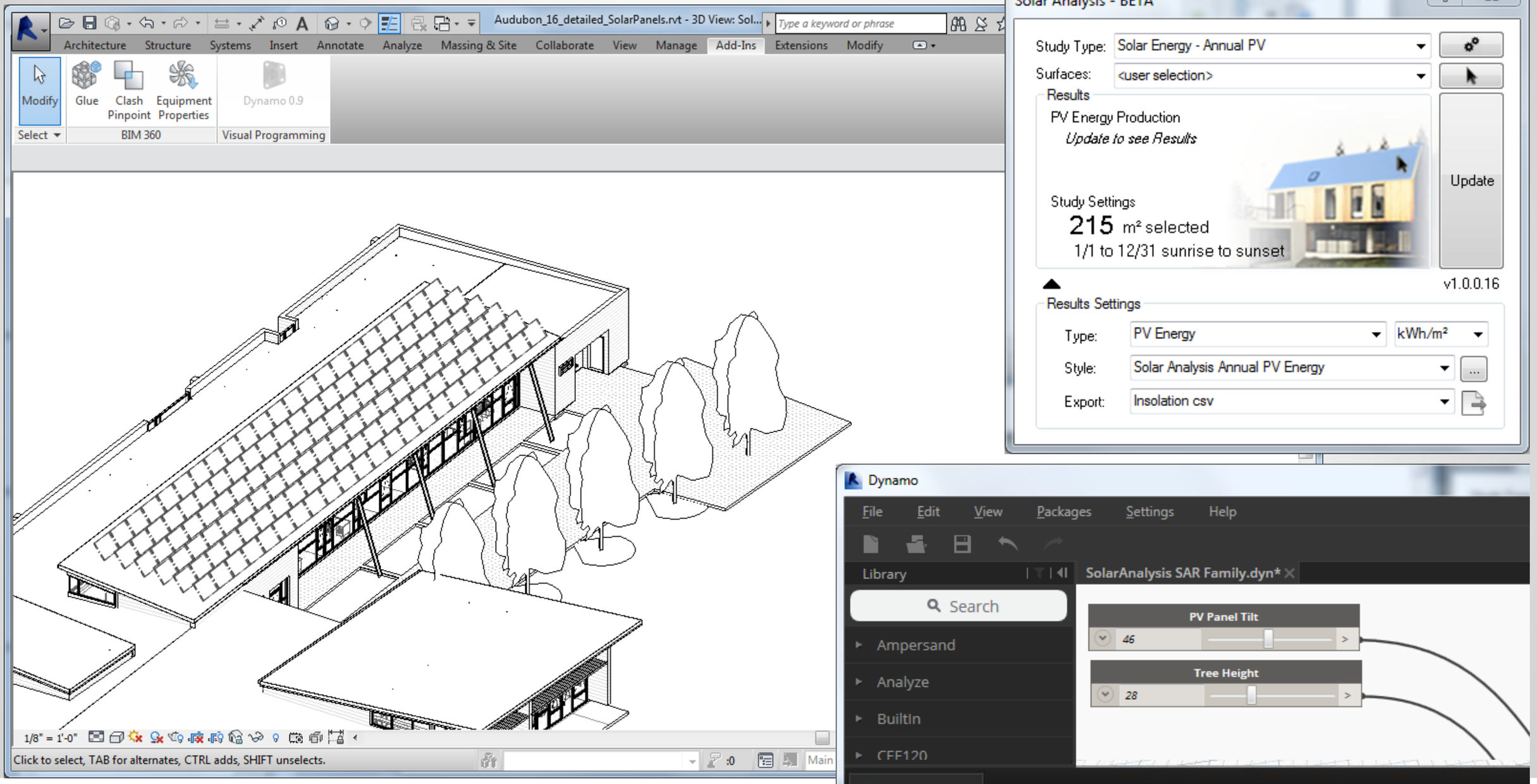
Demonstration…



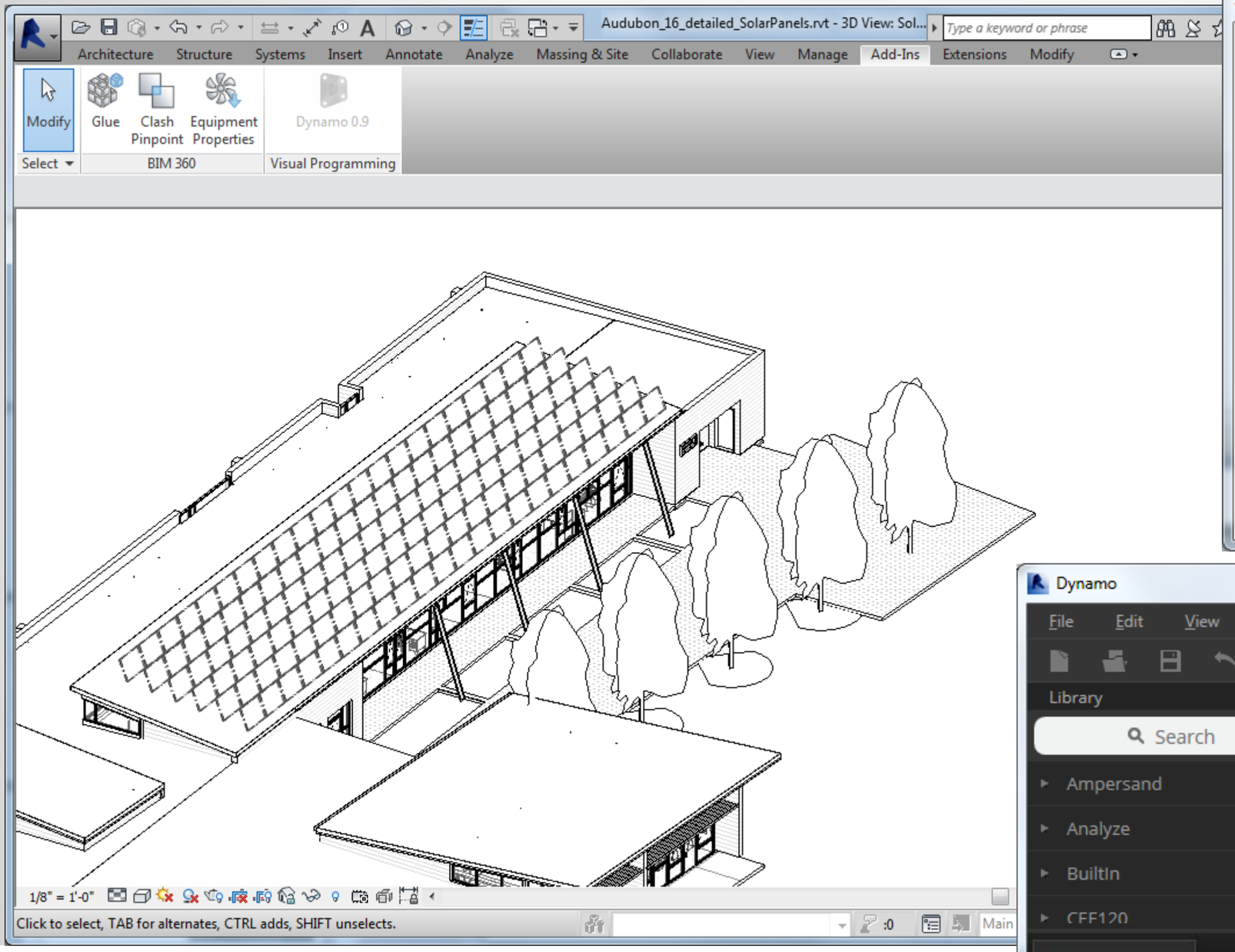
Demonstration…

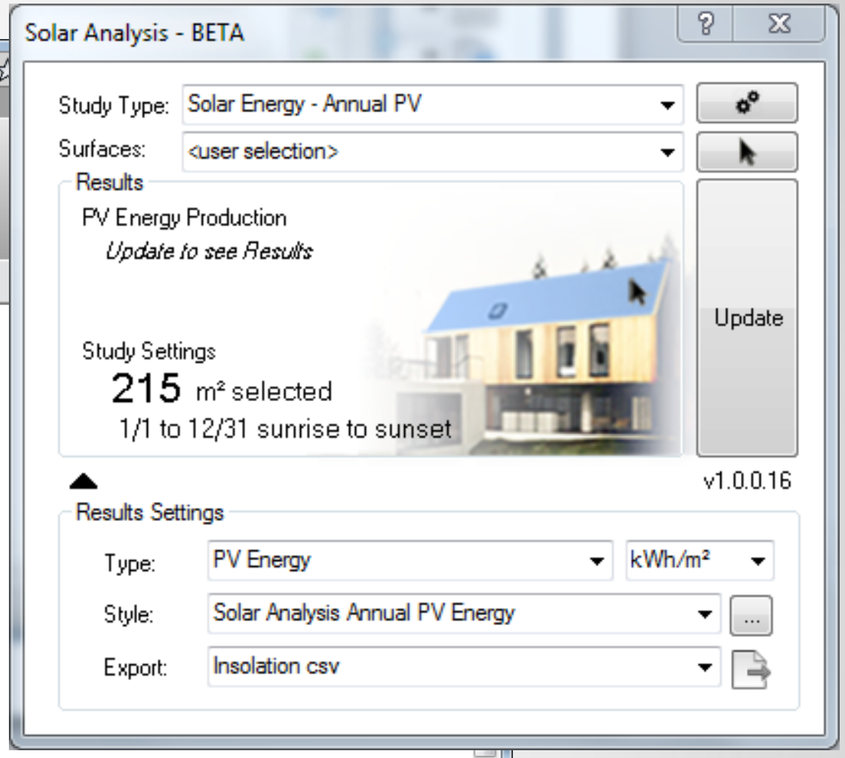


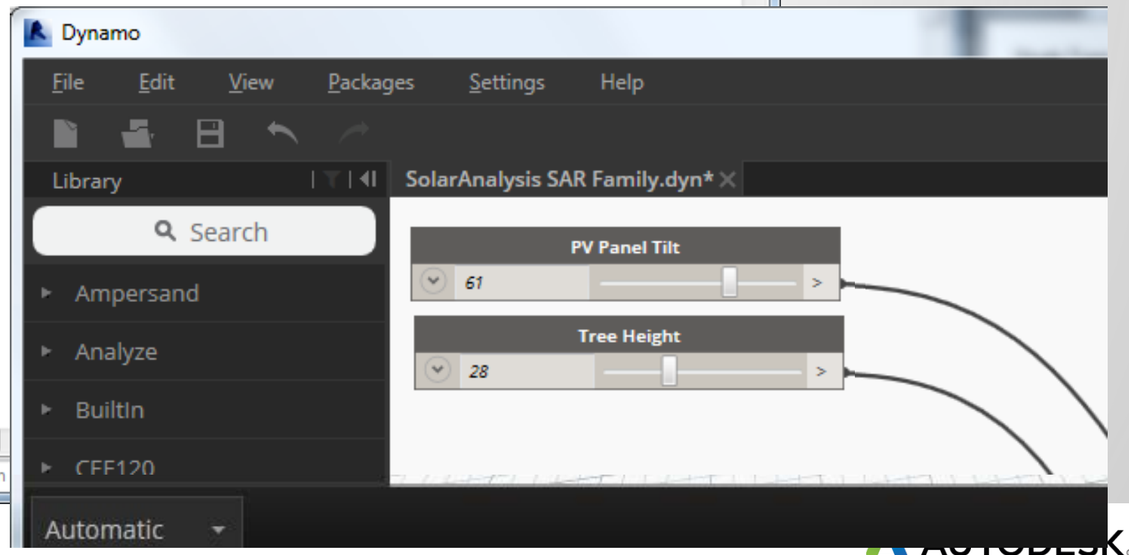
Demonstration…



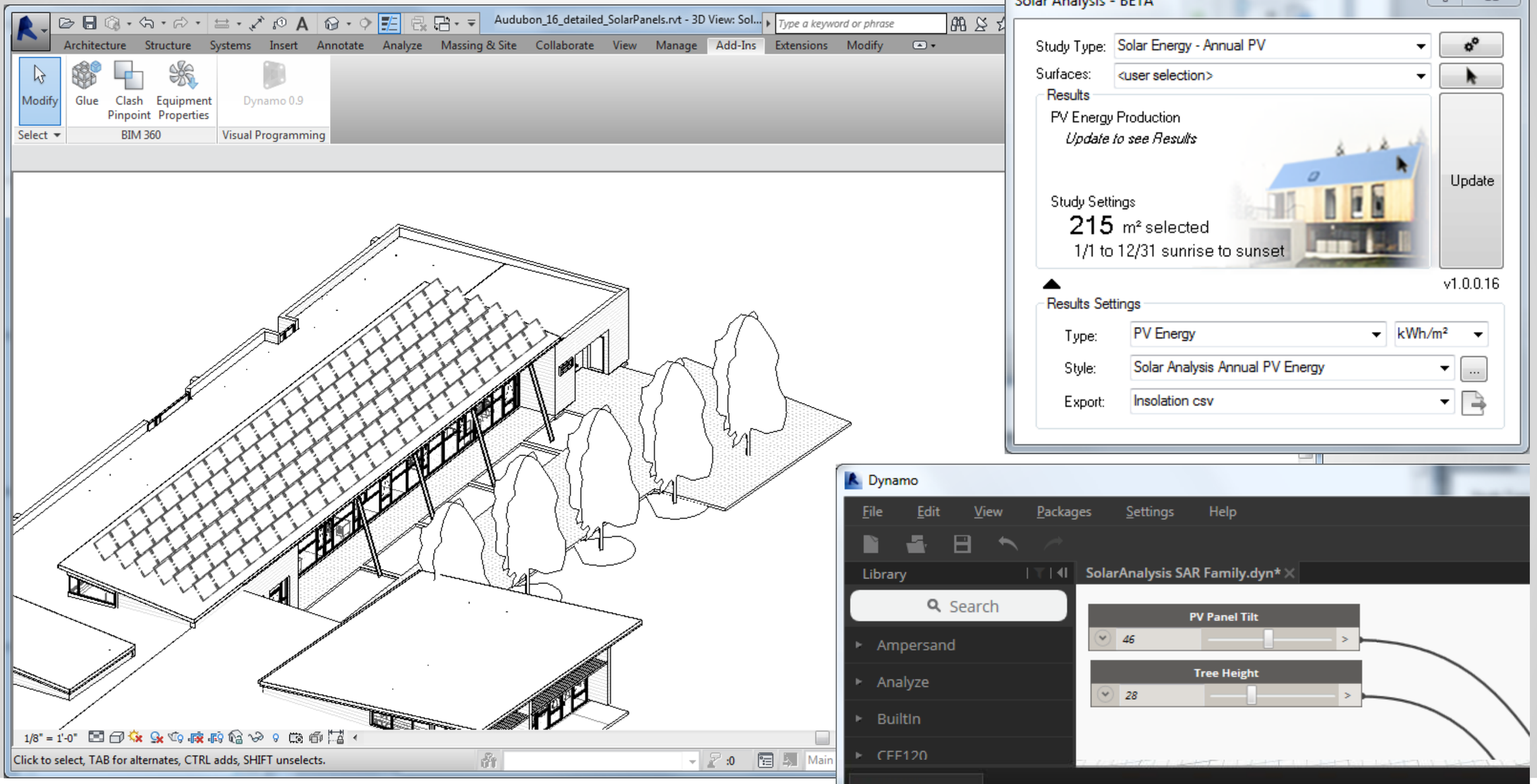
Demonstration…



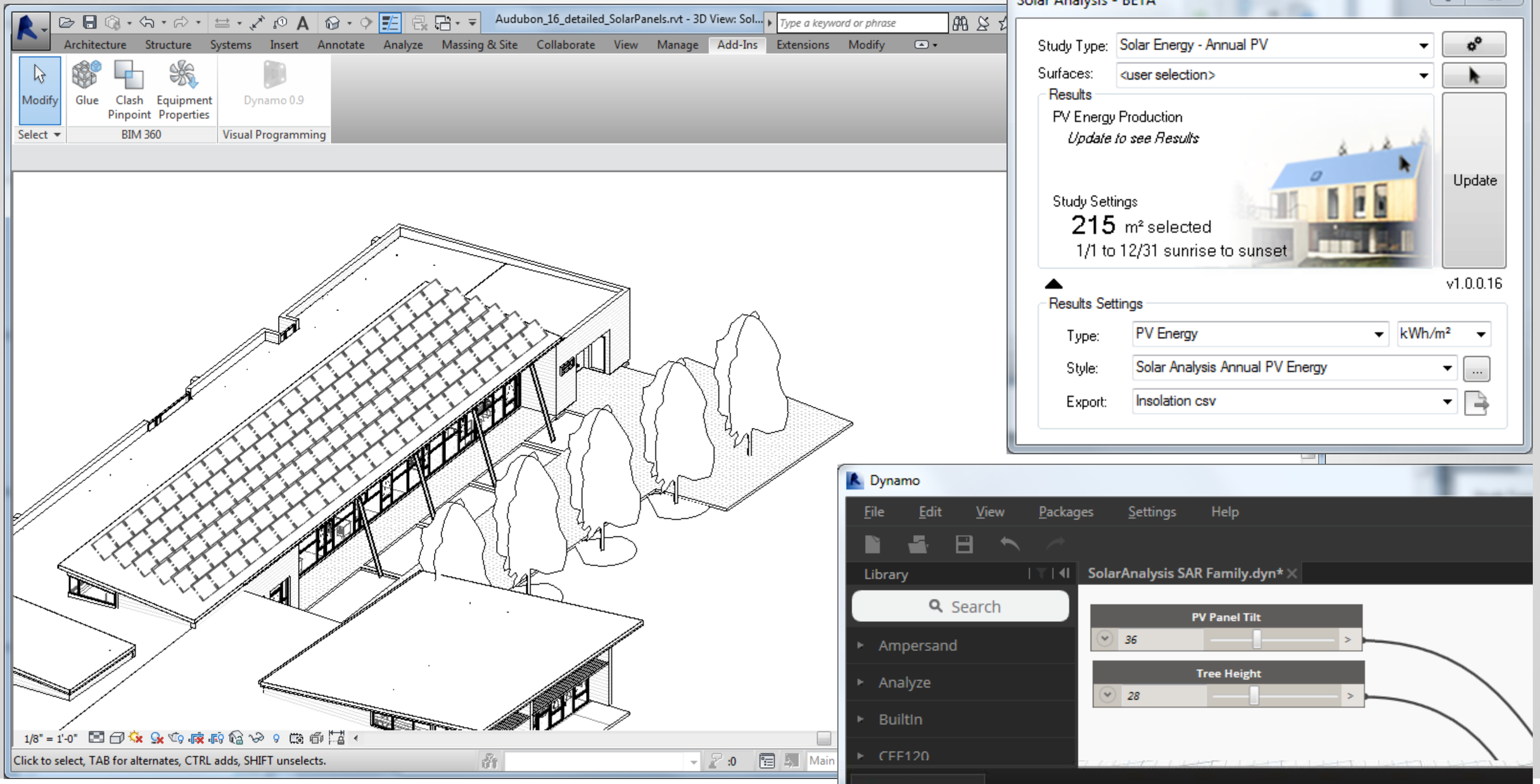




Demonstration…



Demonstration…



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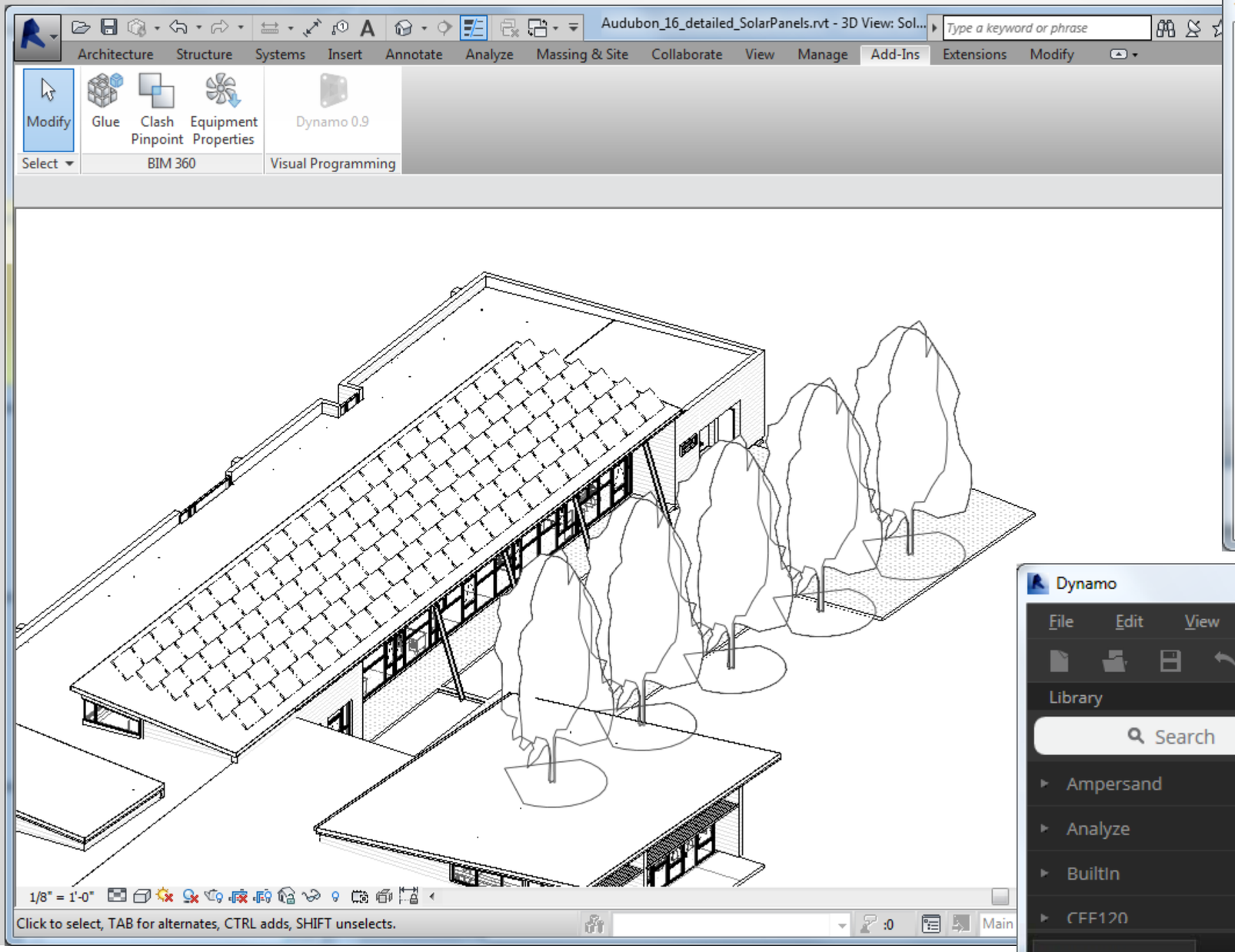

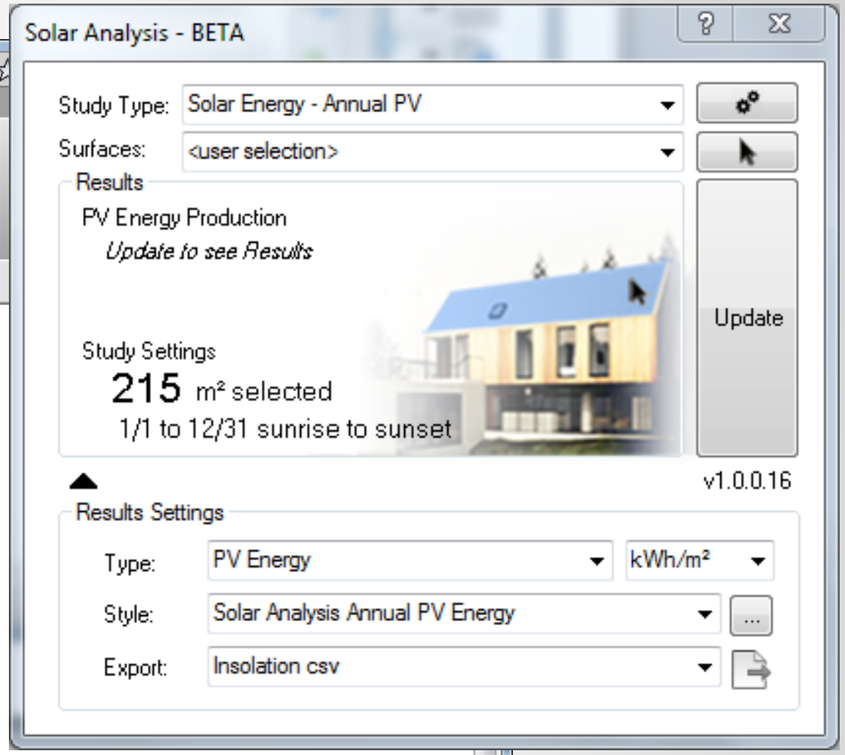

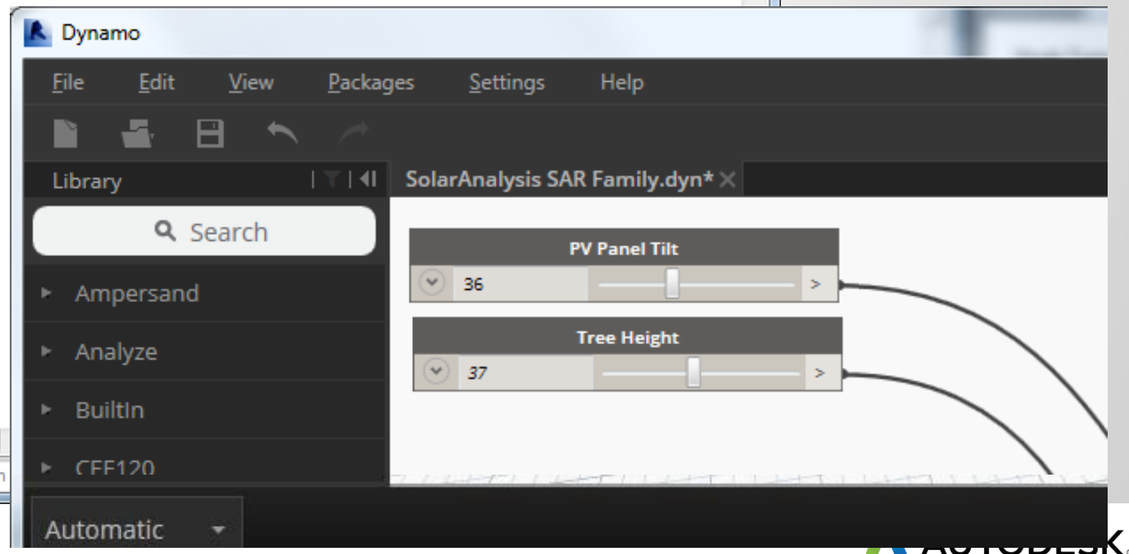

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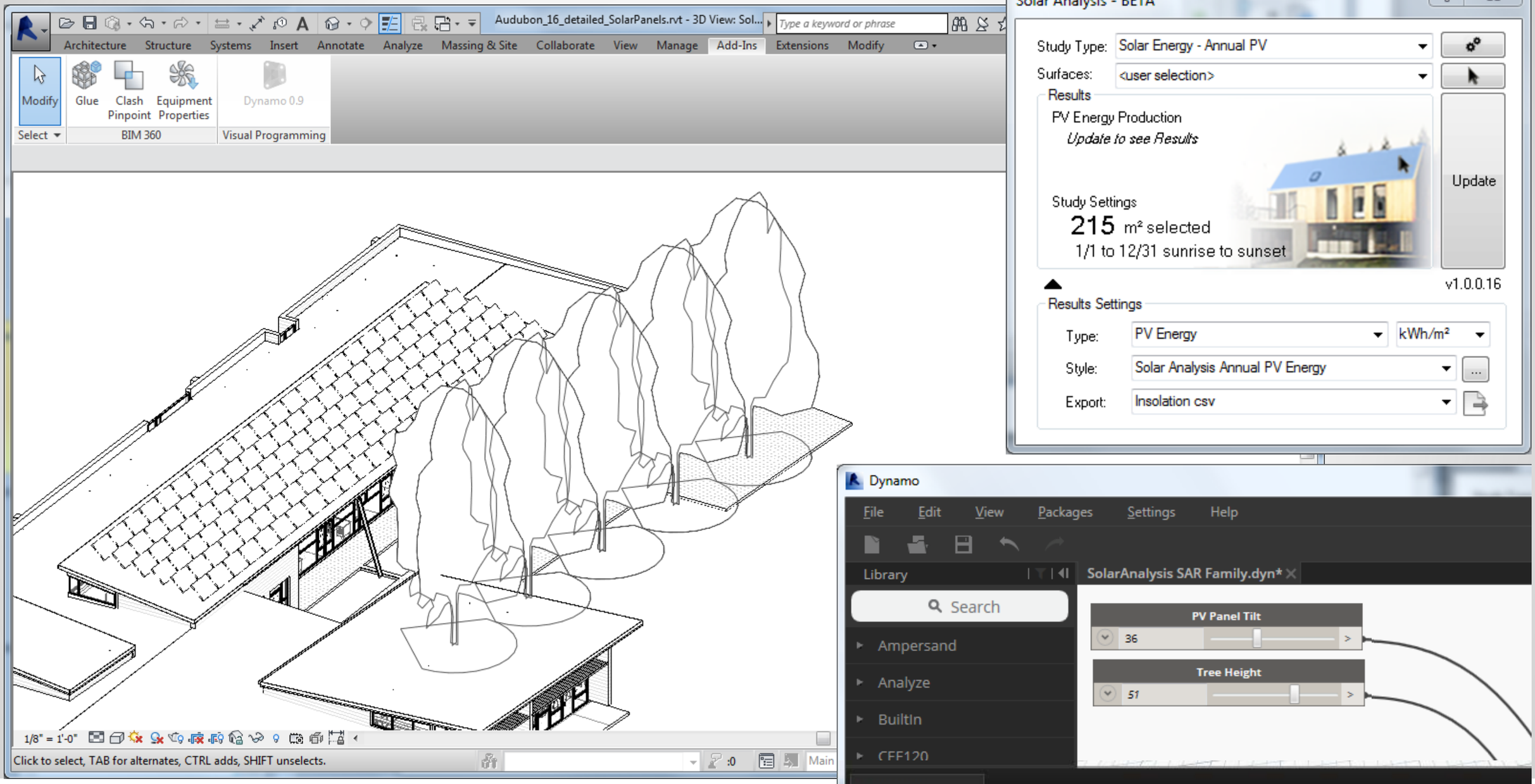

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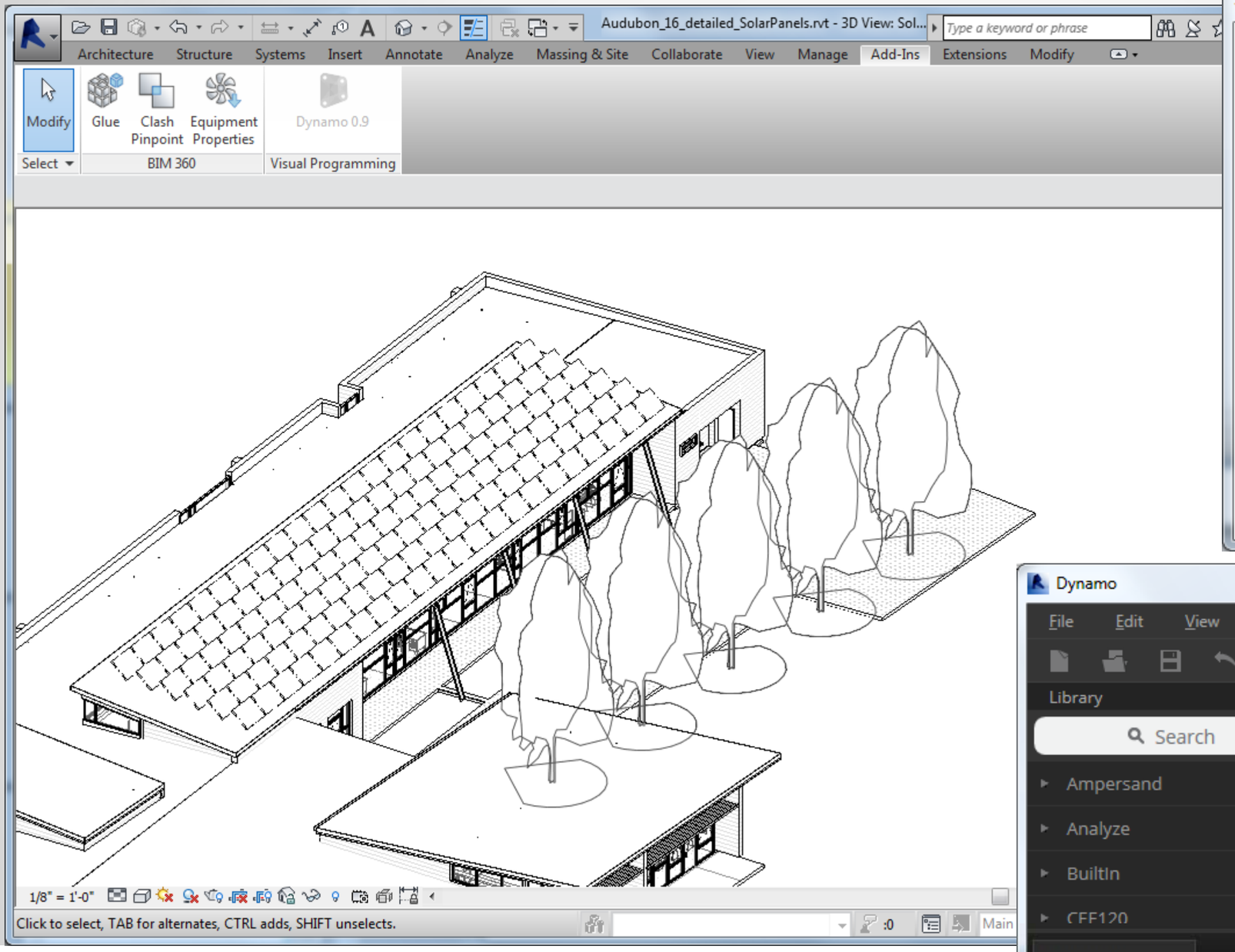

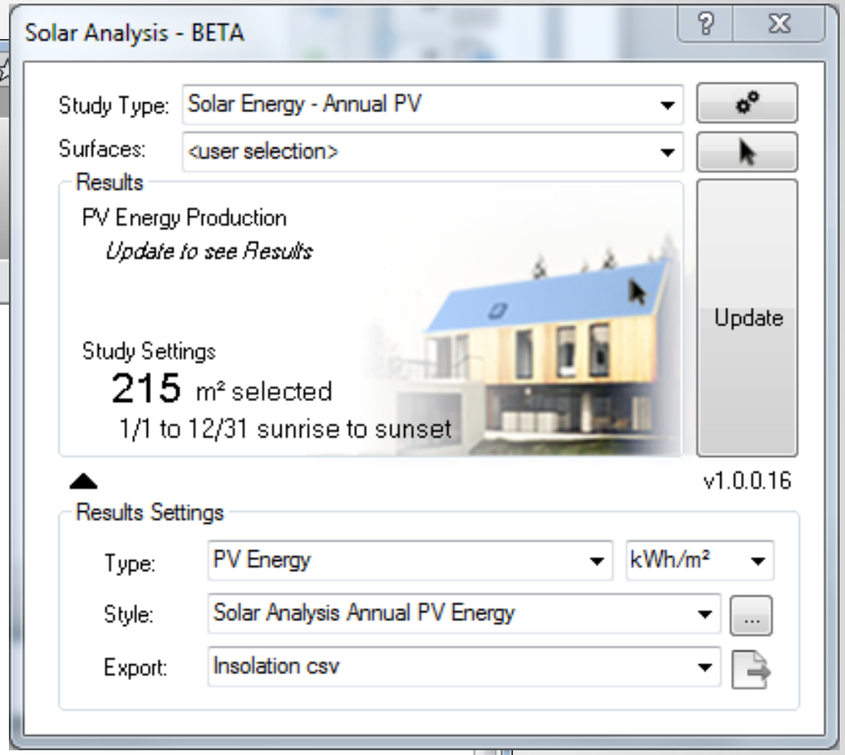

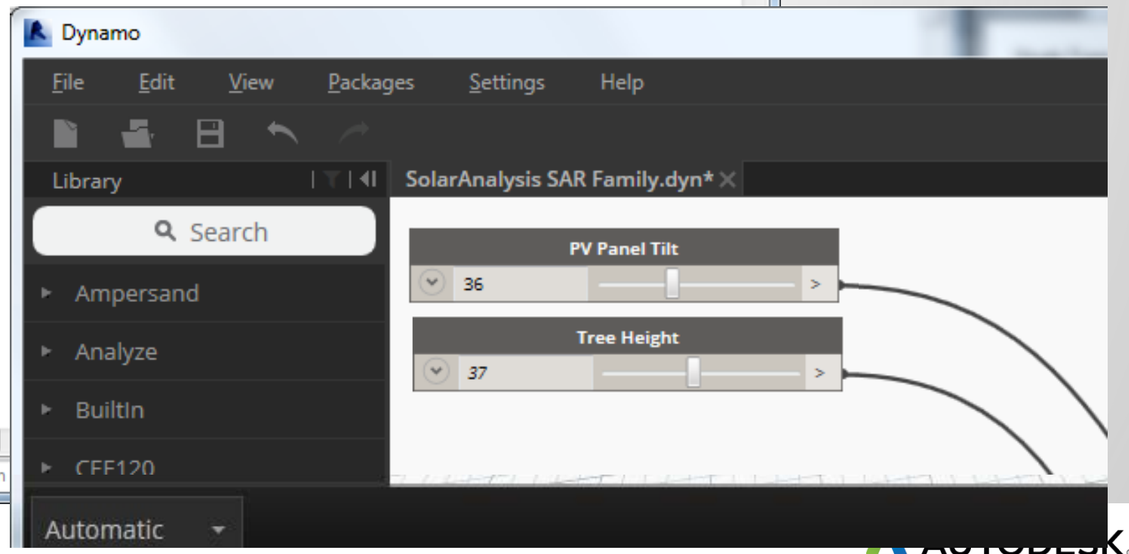

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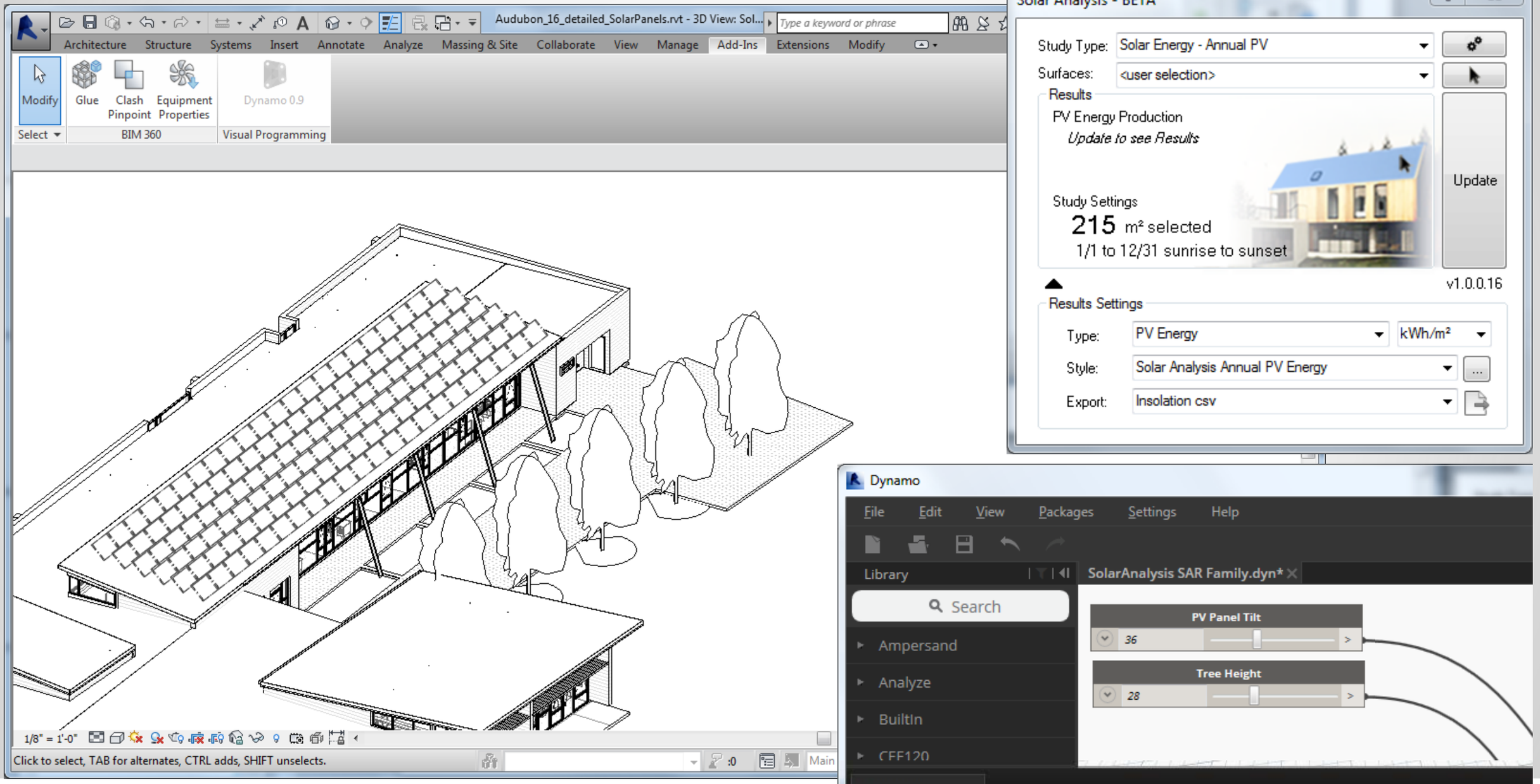

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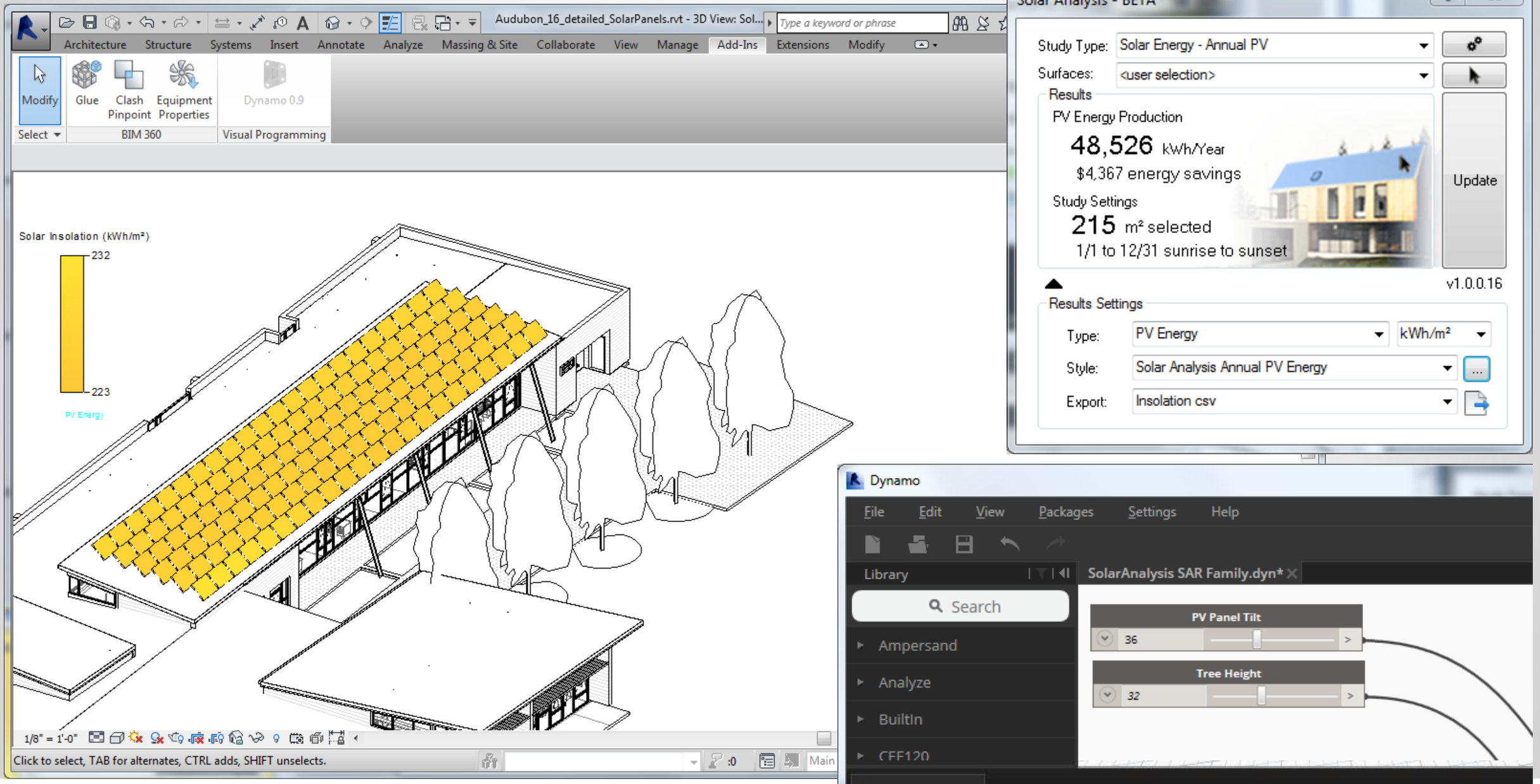

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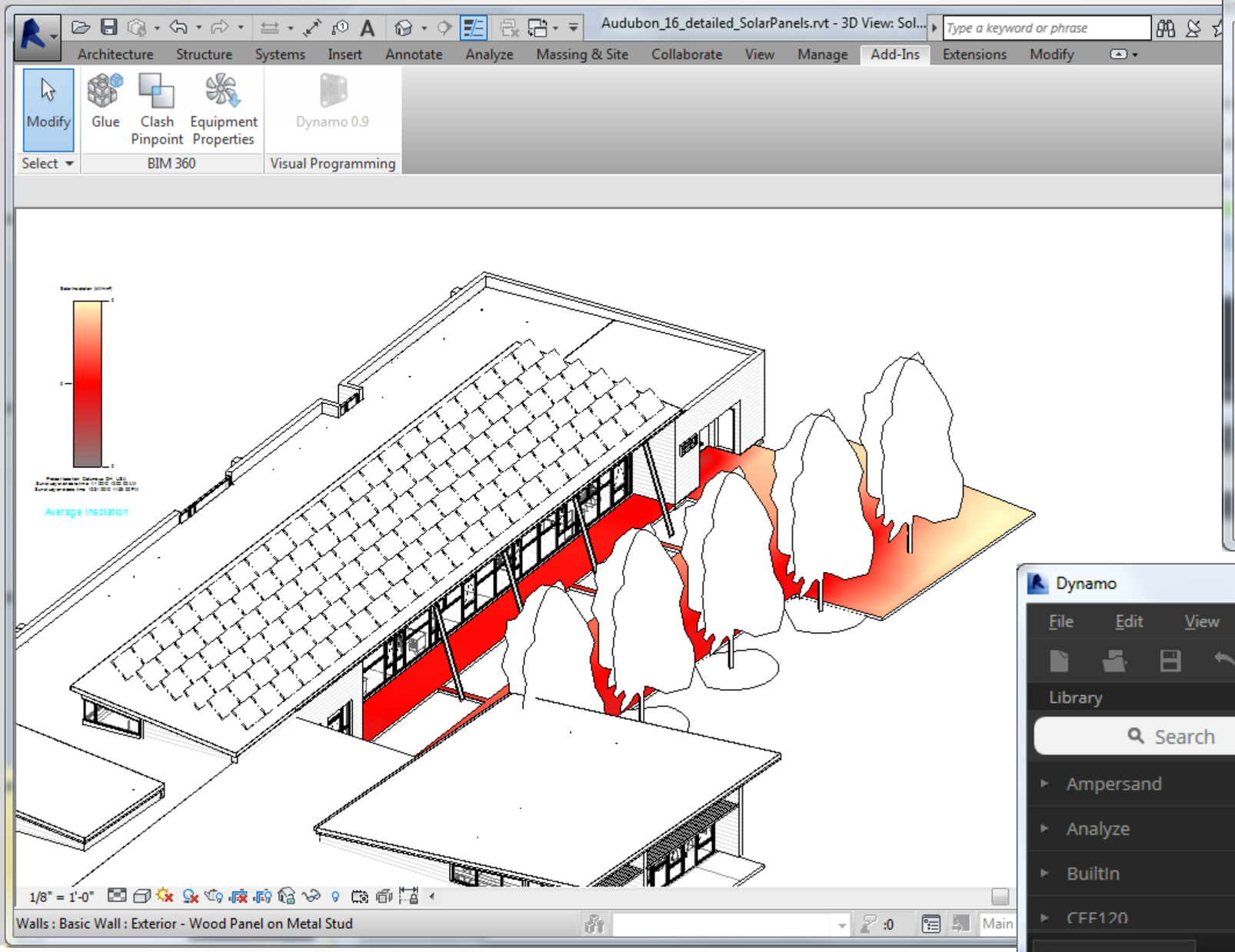

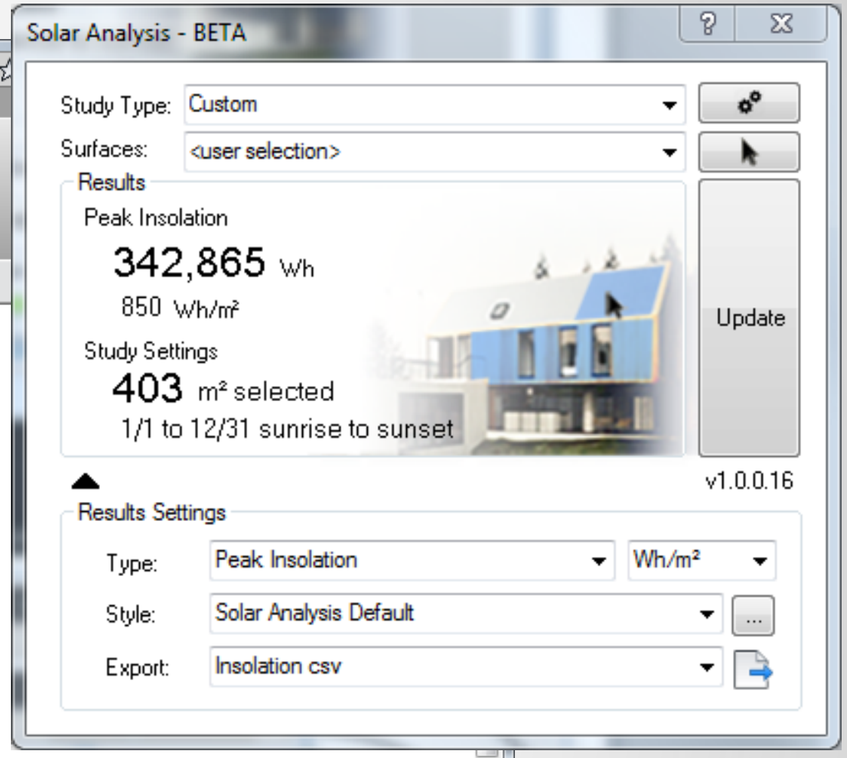

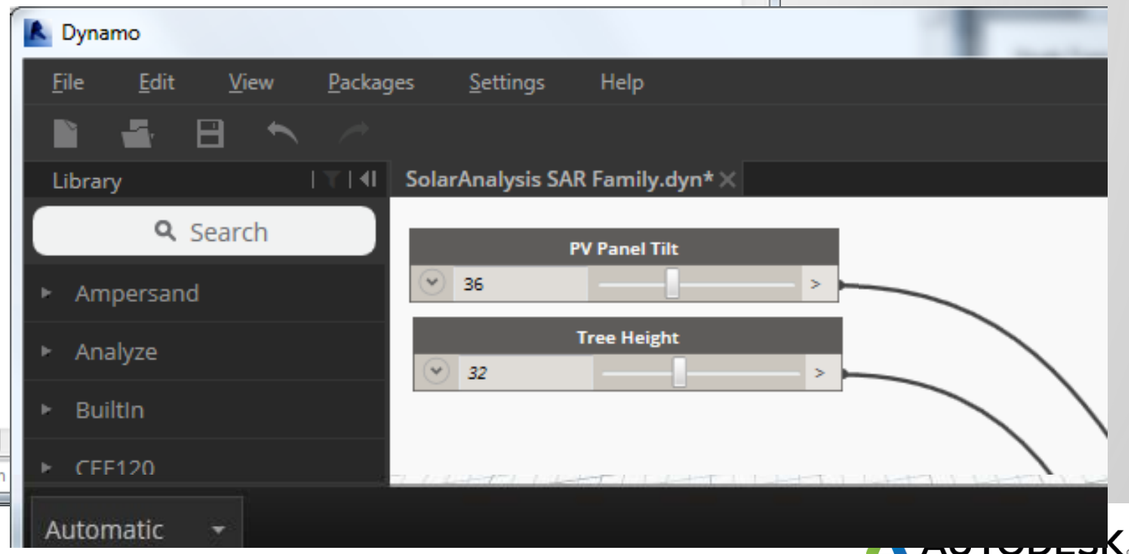

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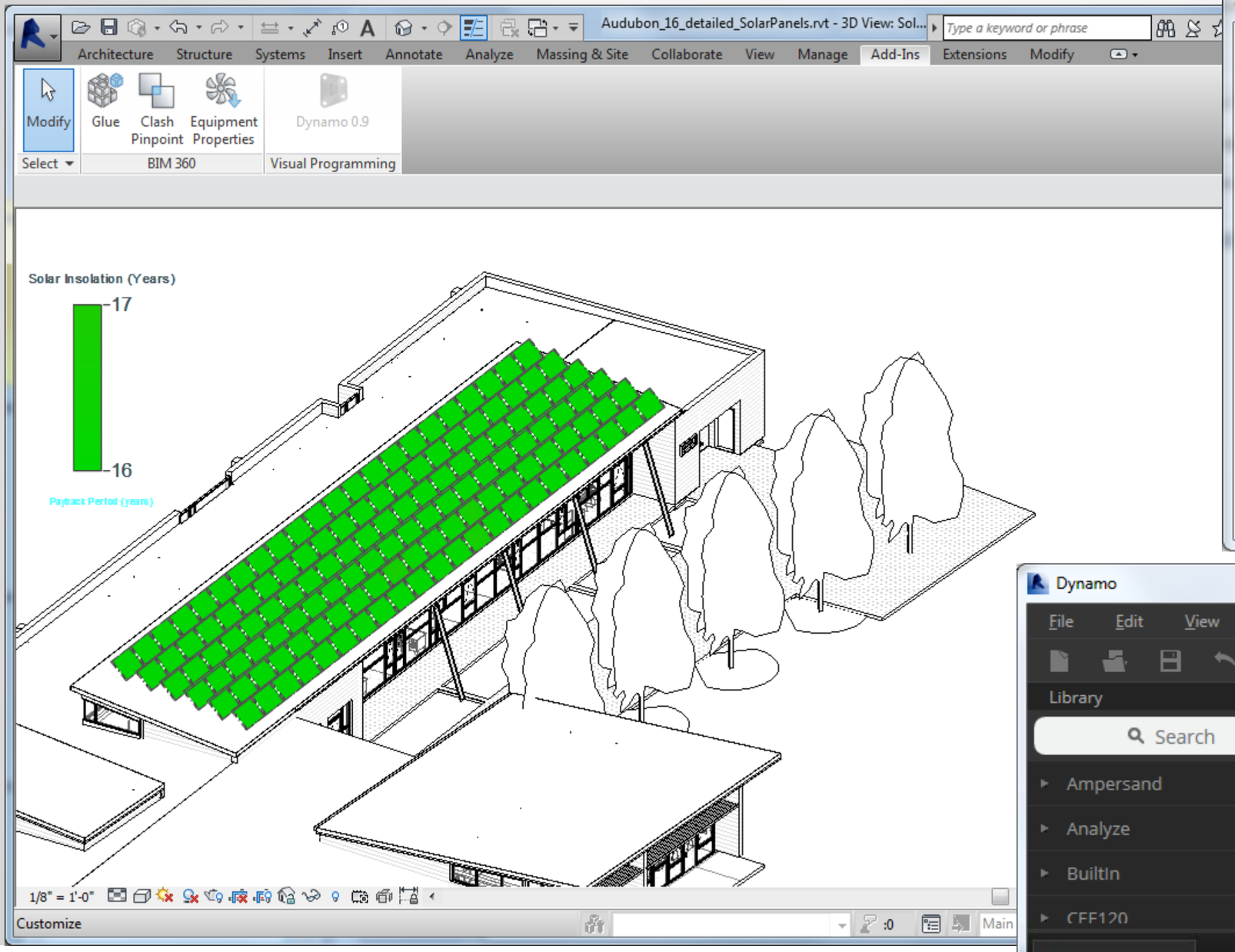

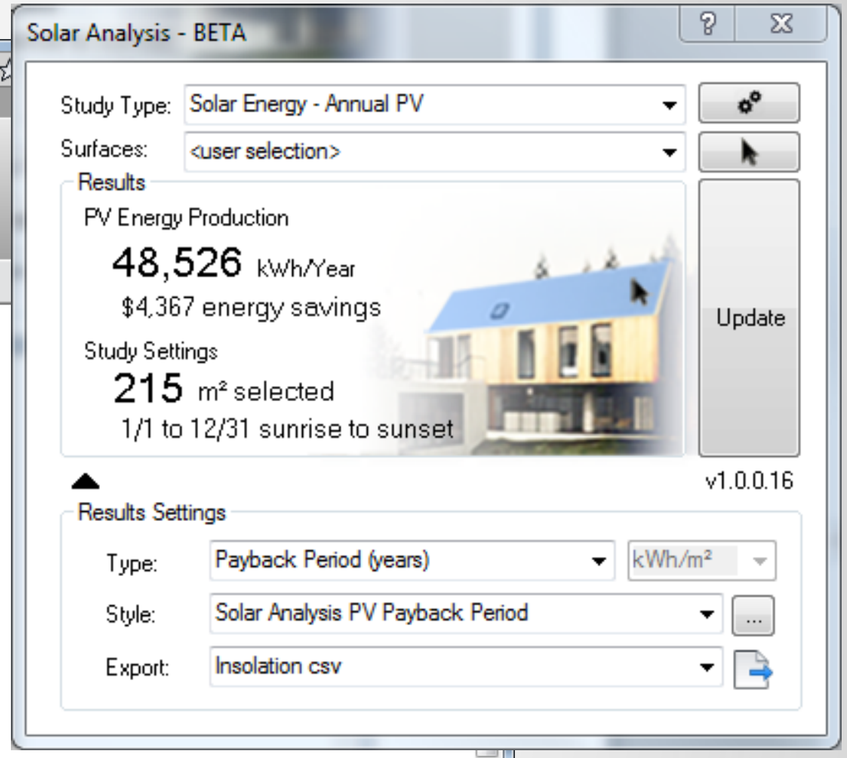

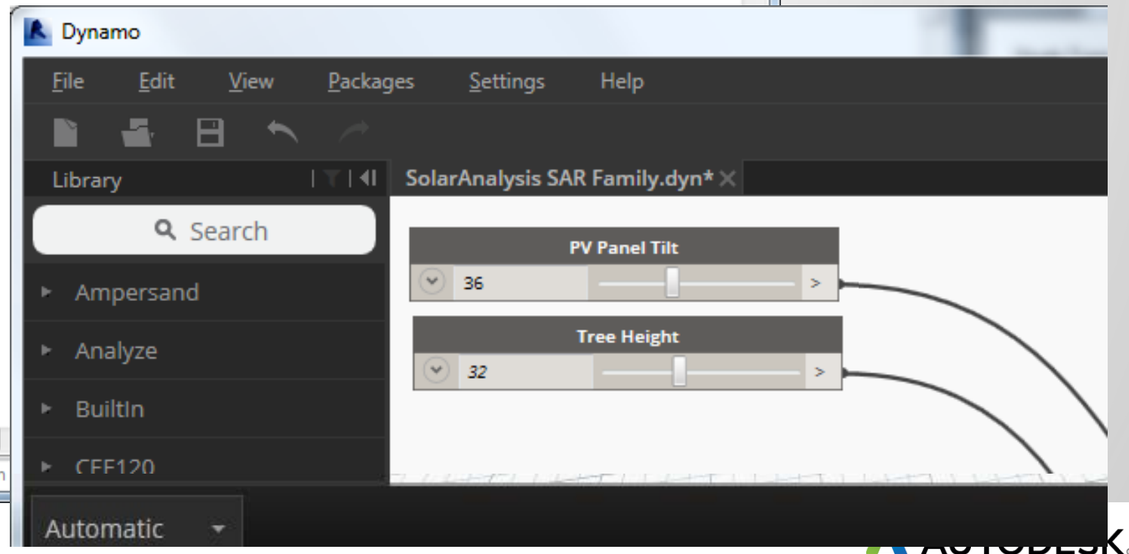

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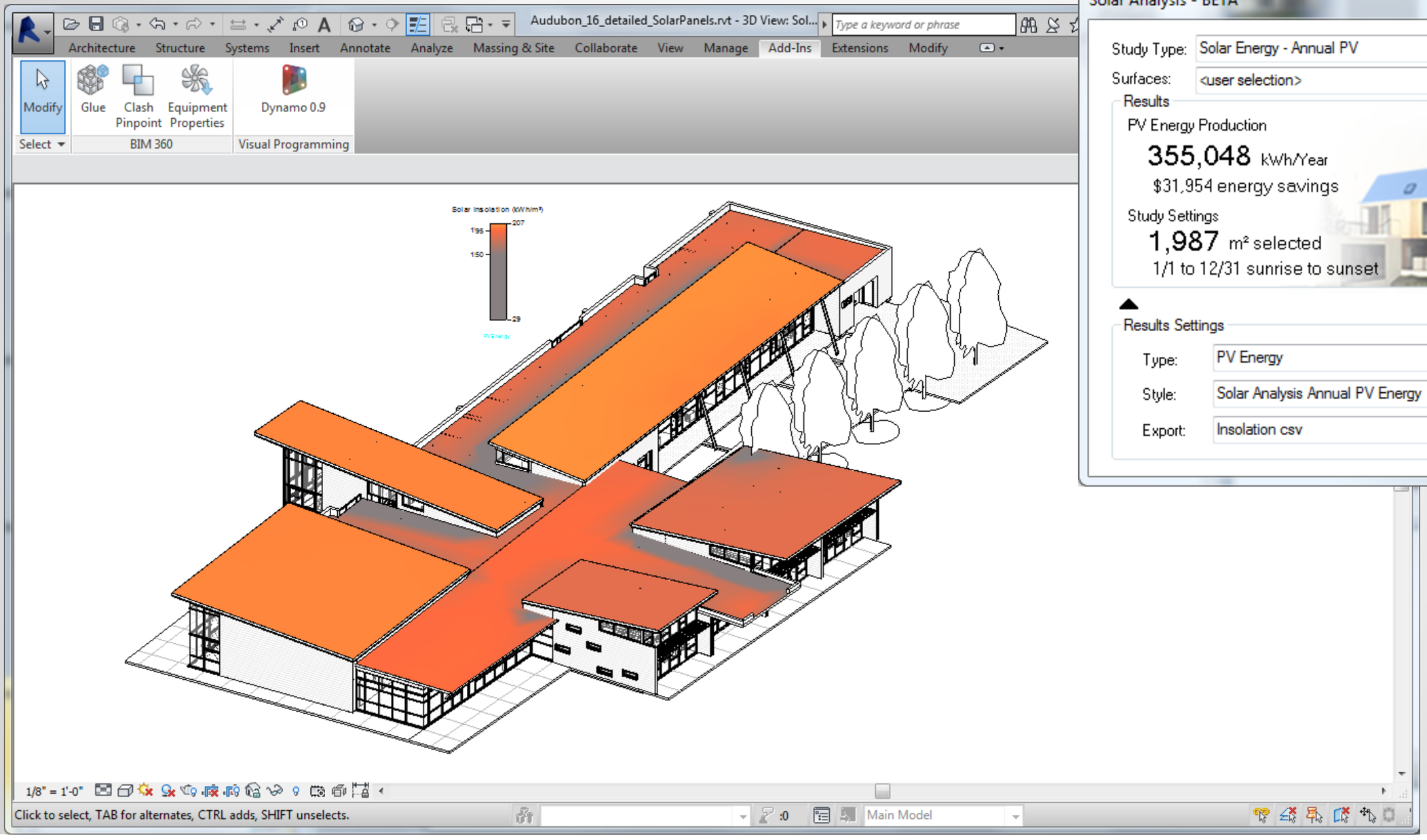

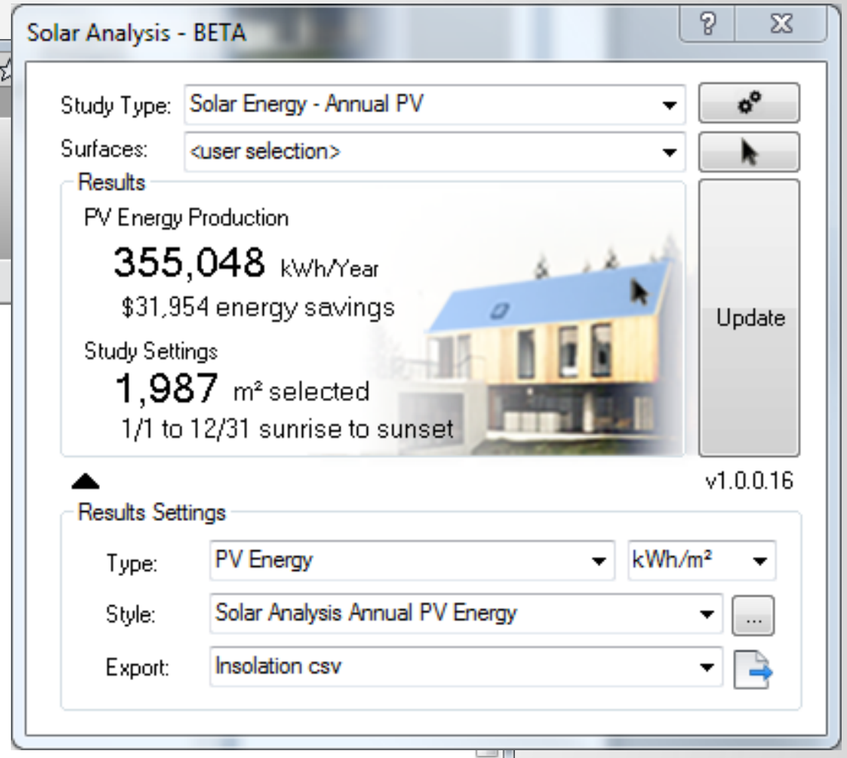

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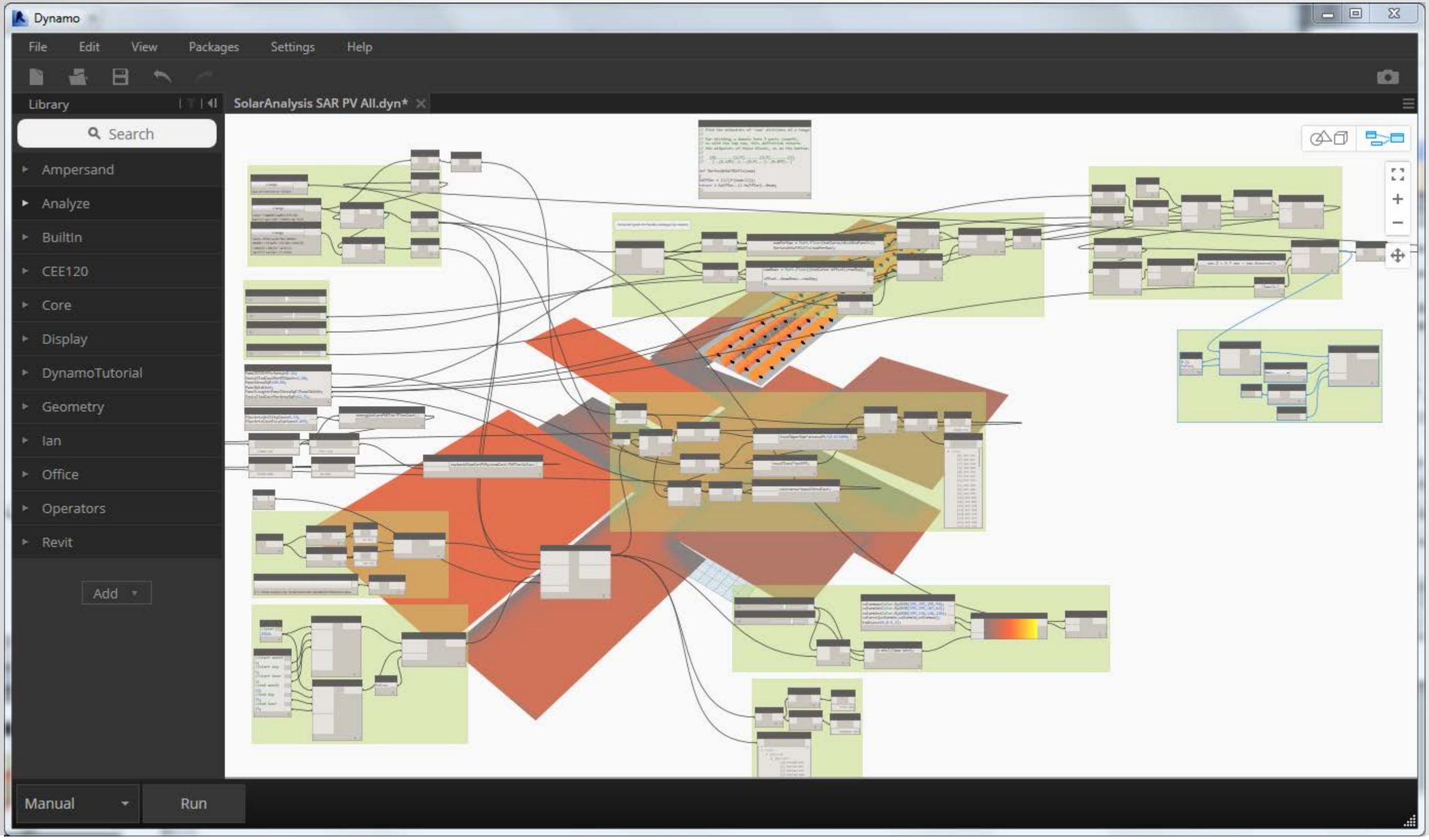

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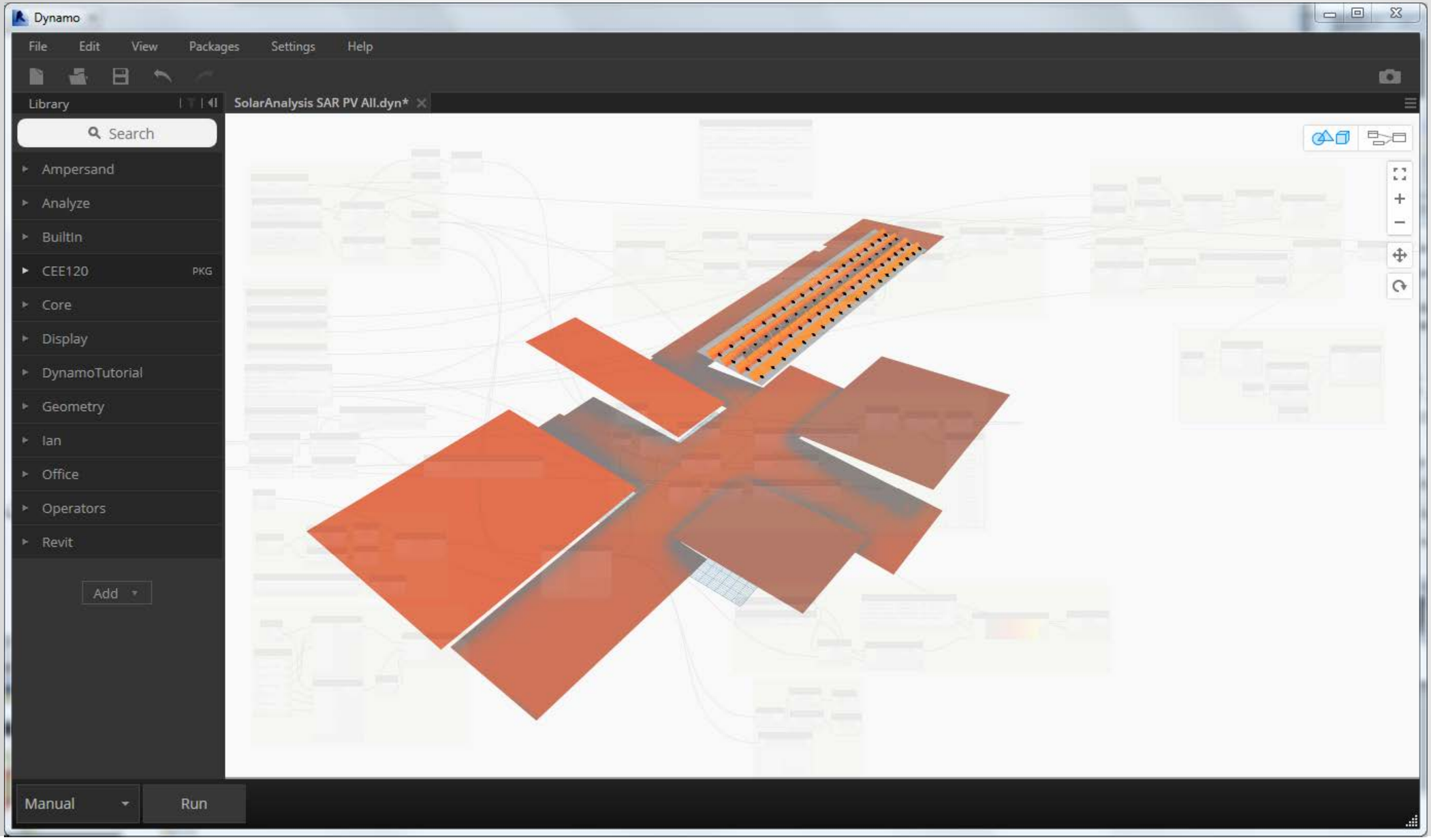

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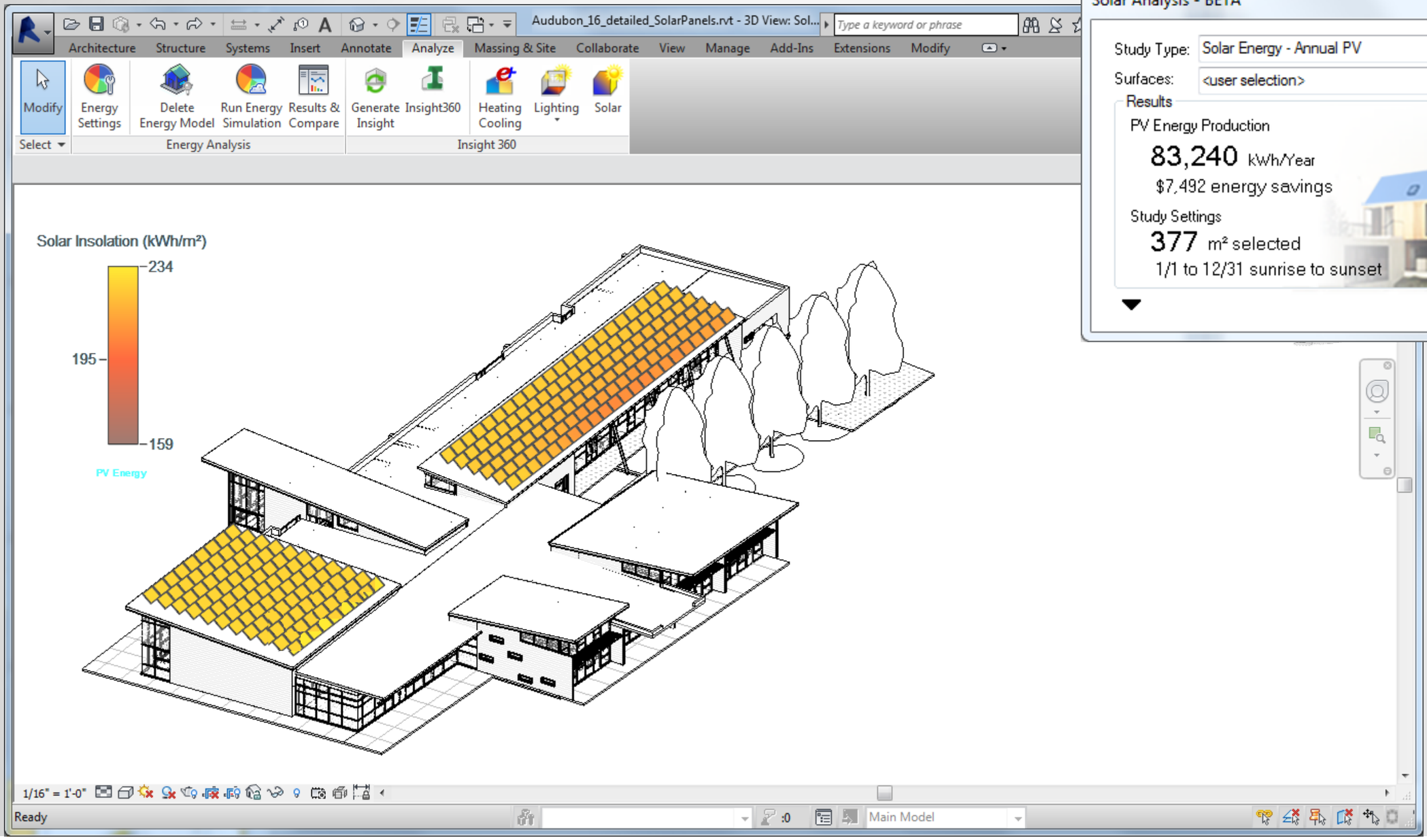

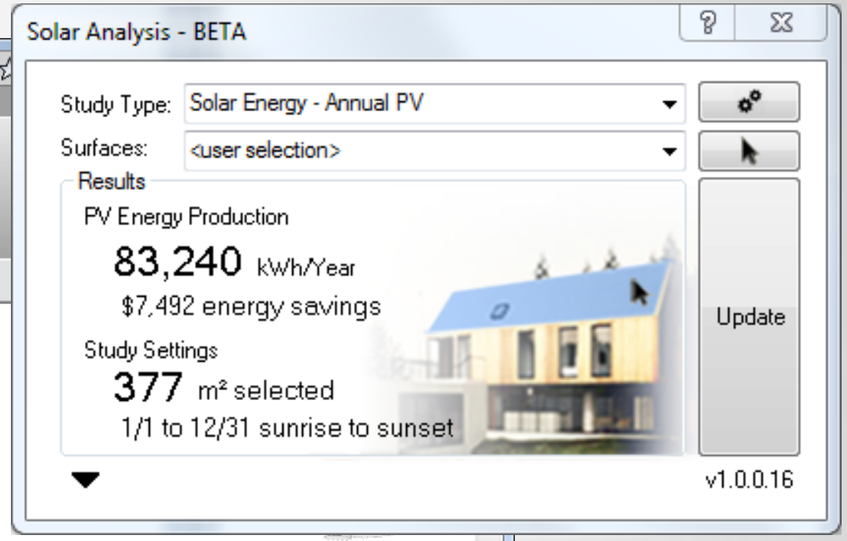

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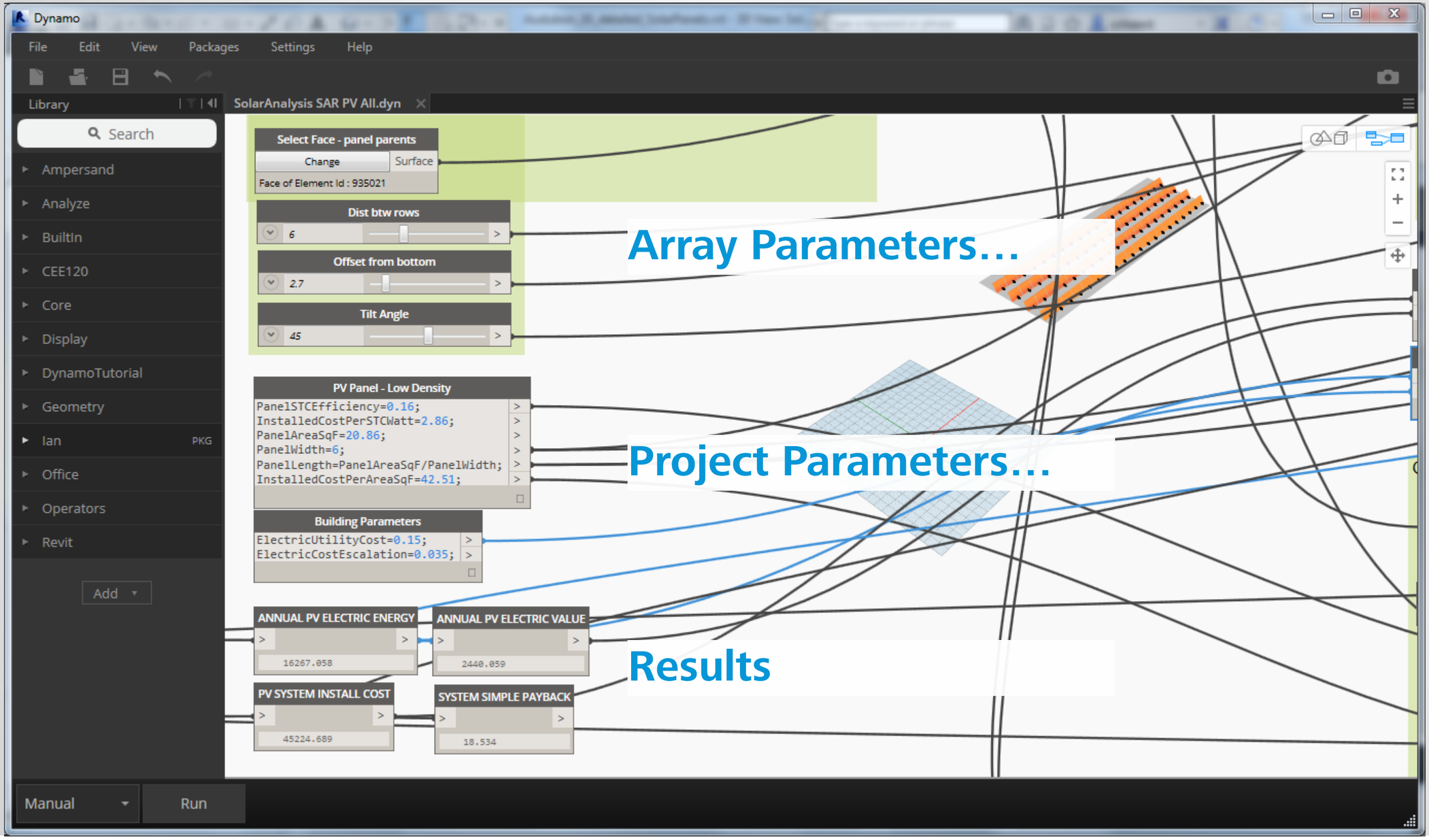

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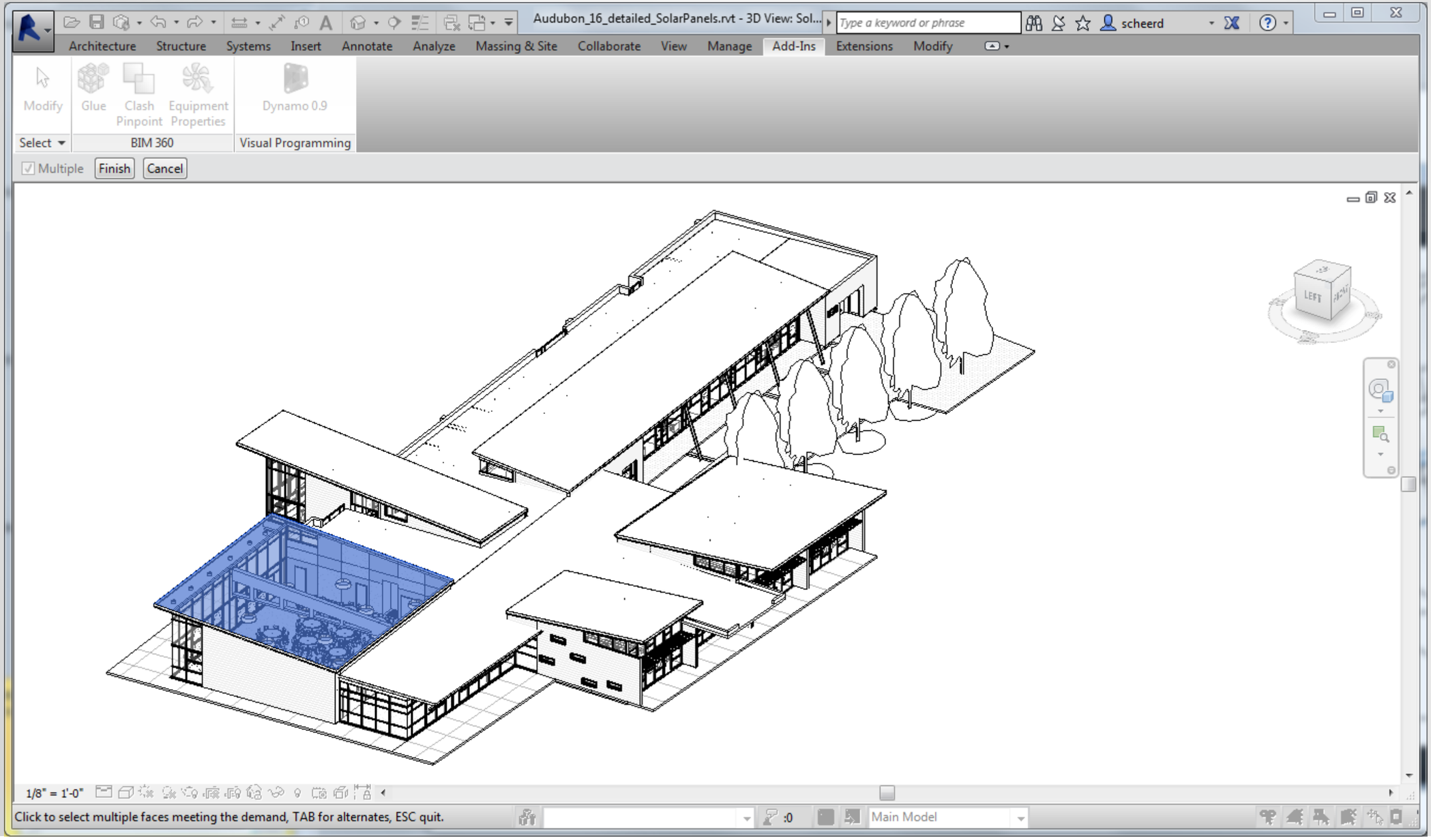

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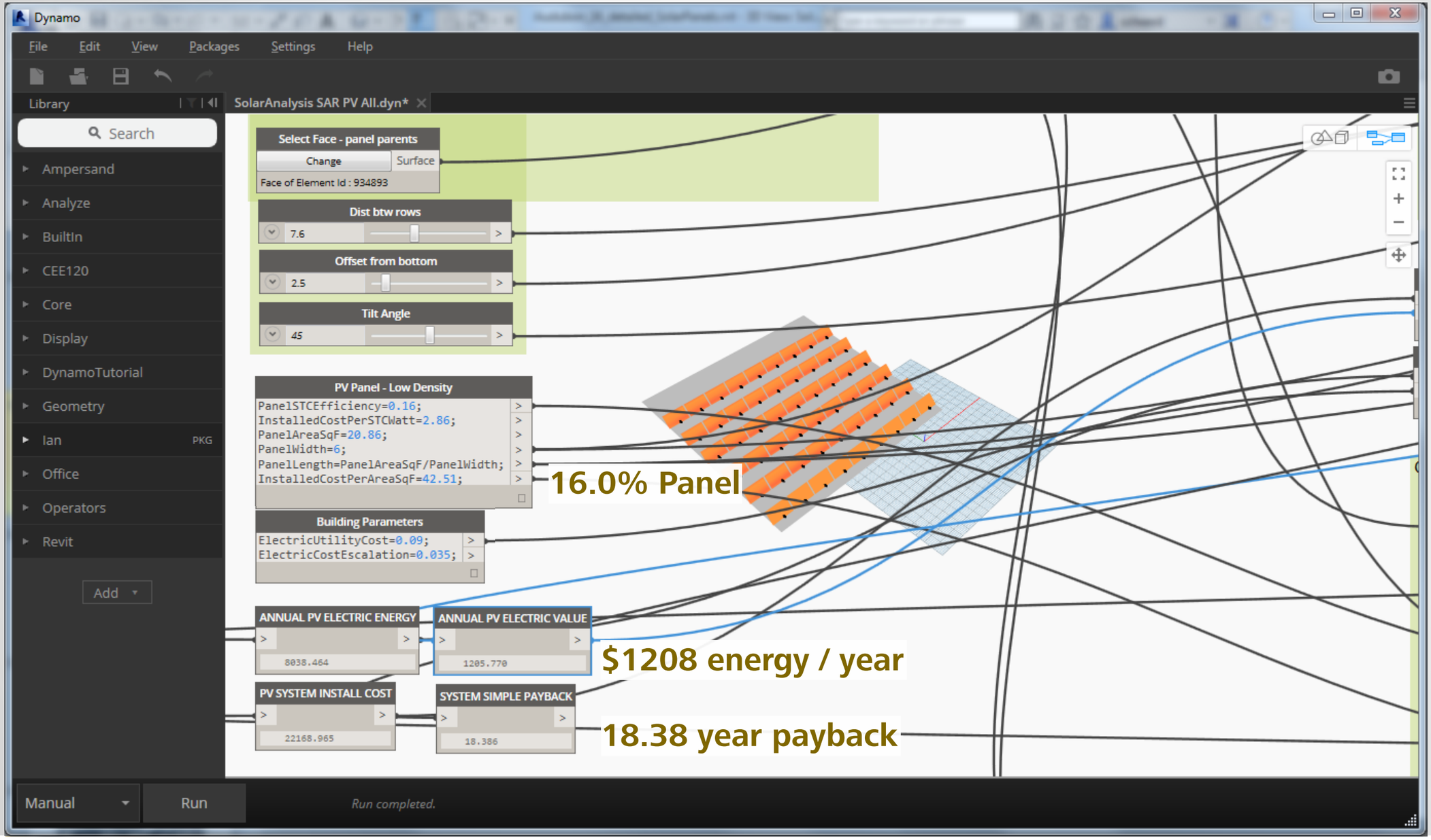

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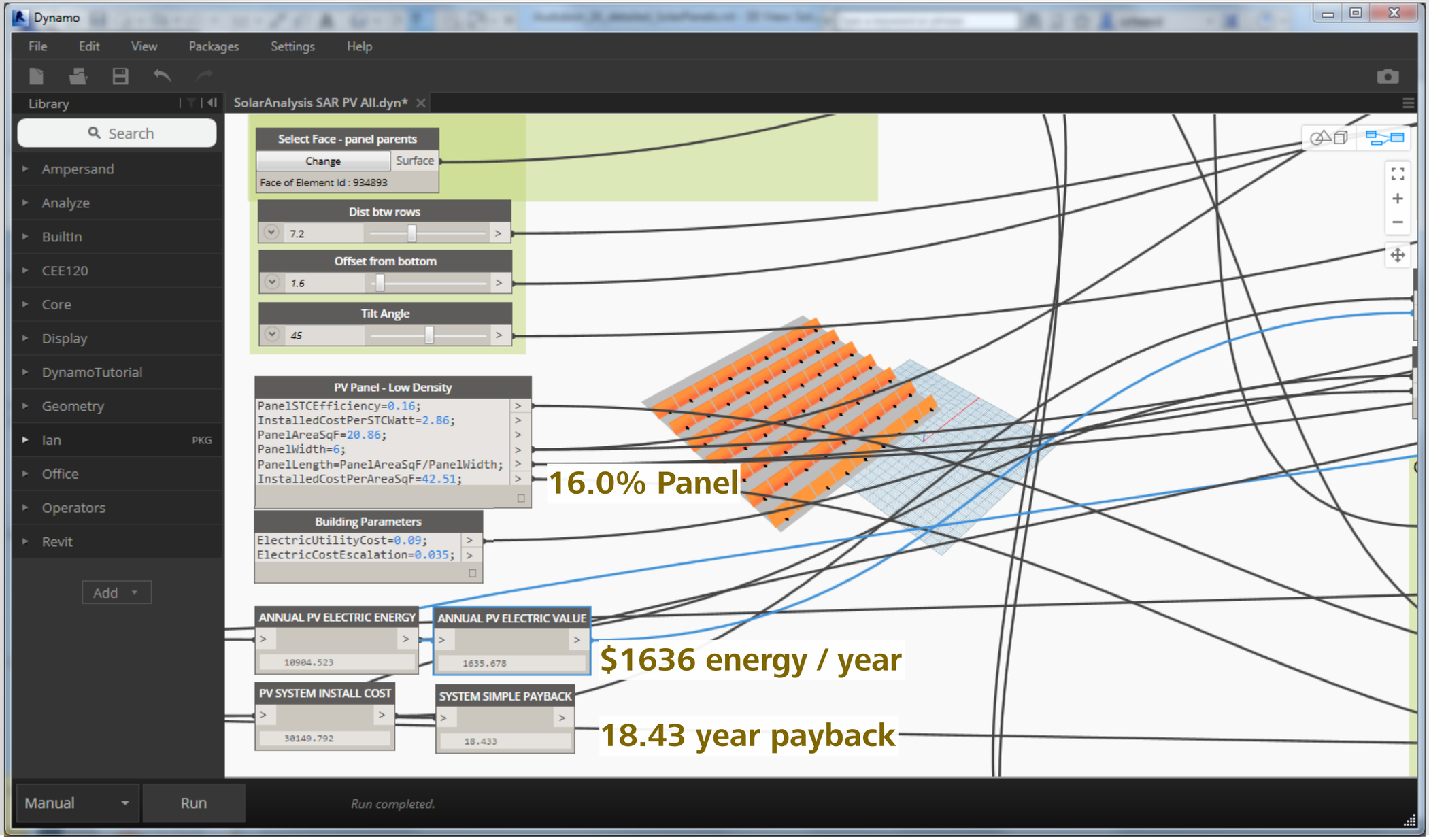

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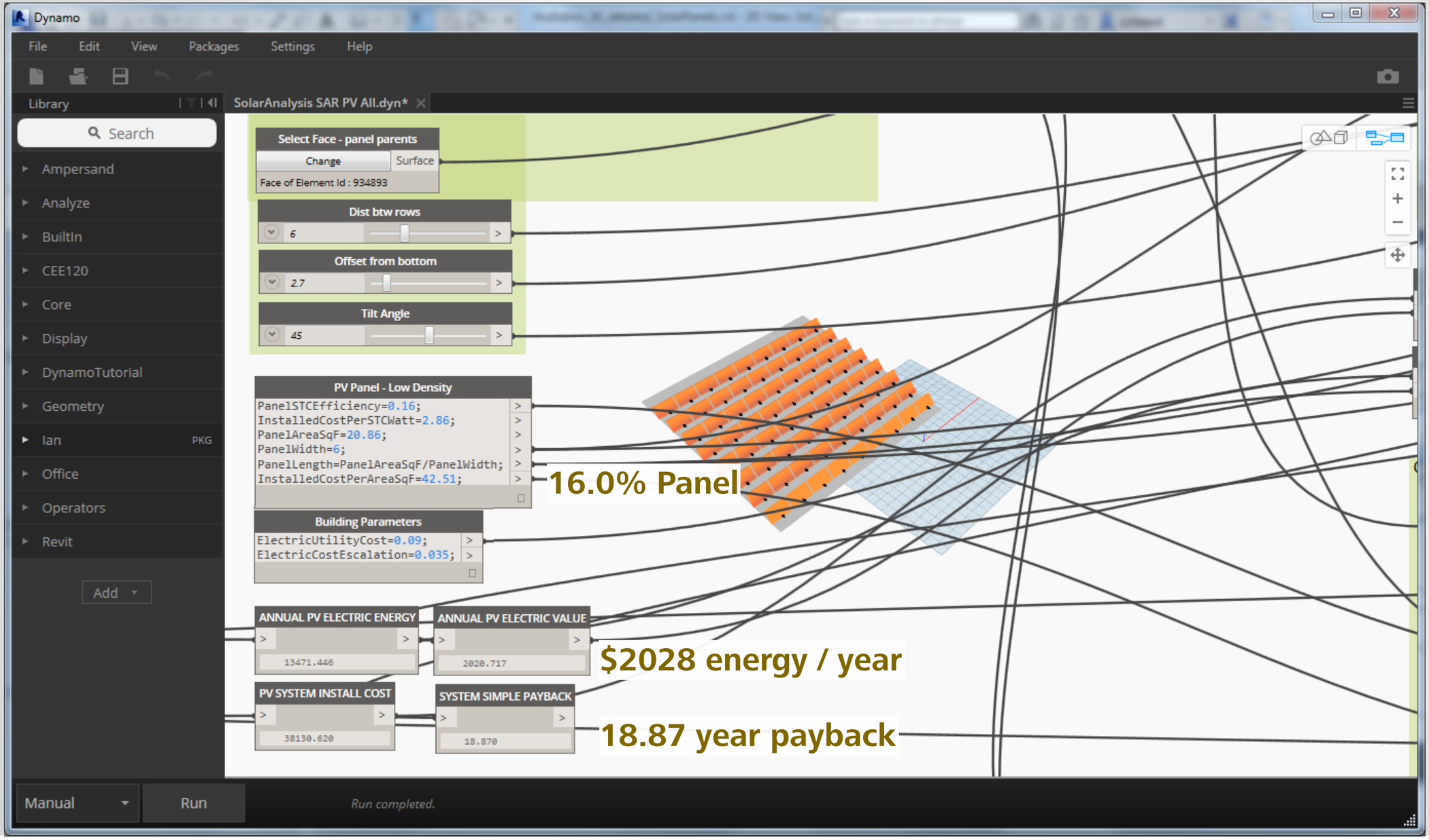

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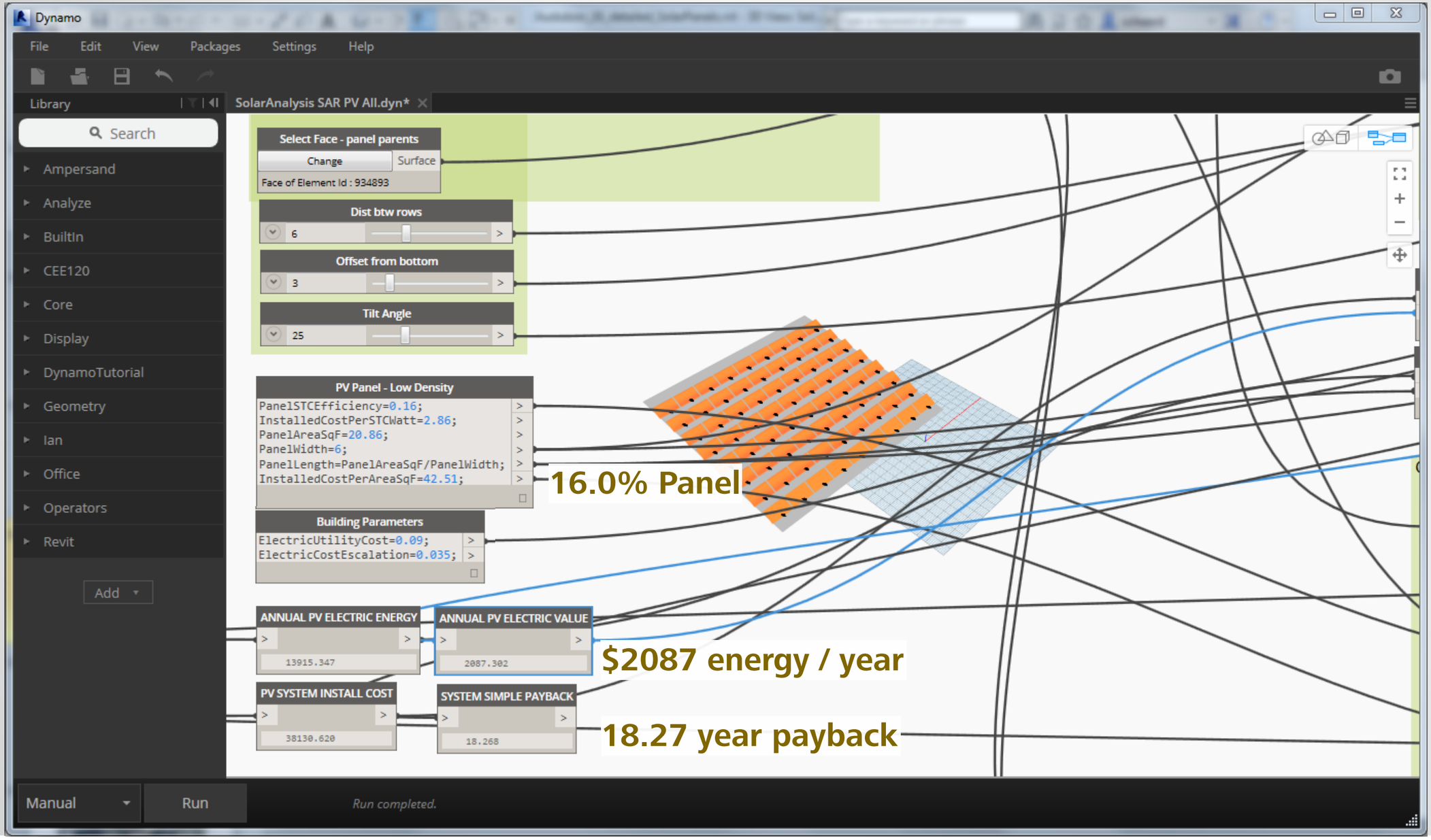

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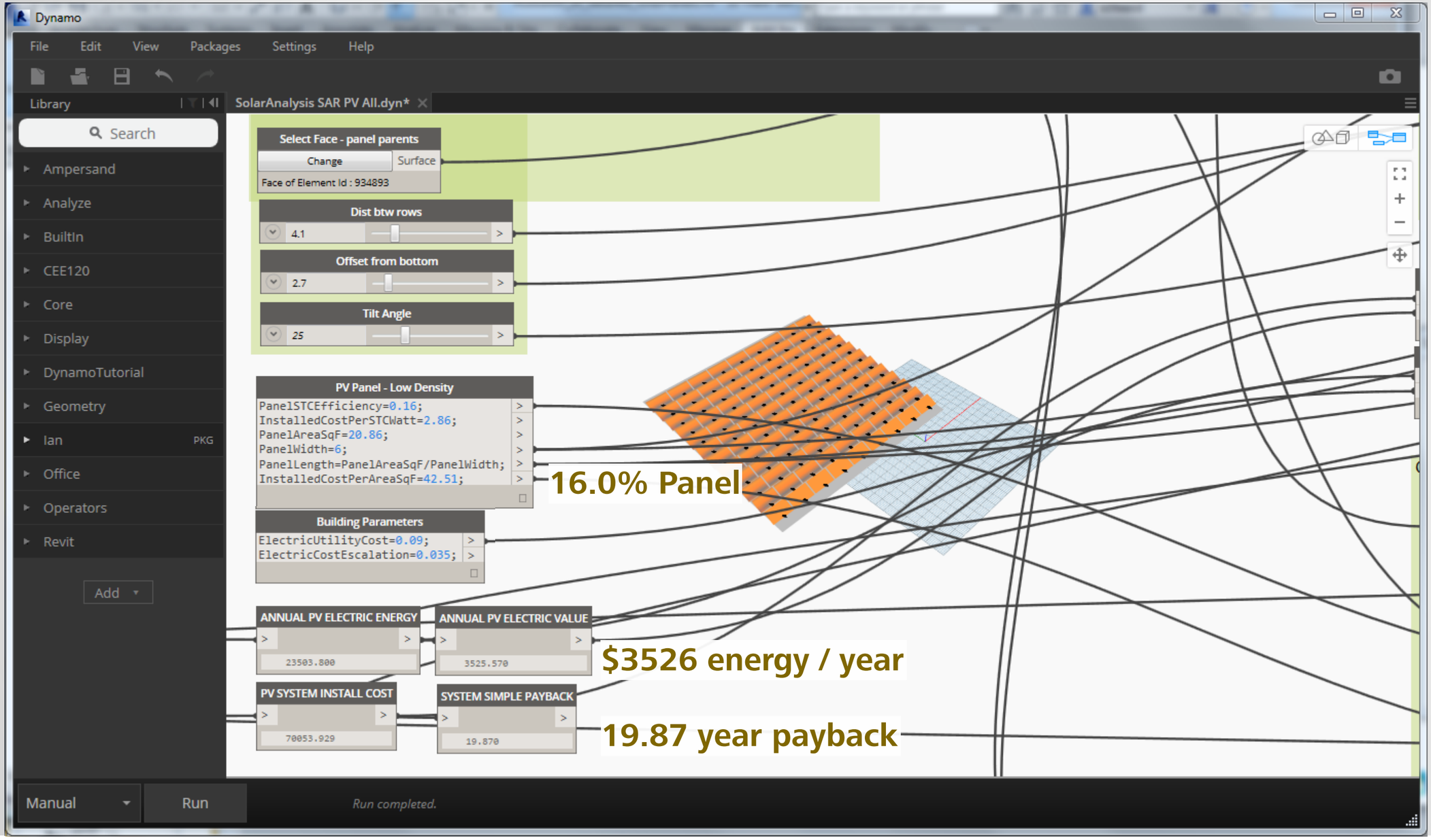

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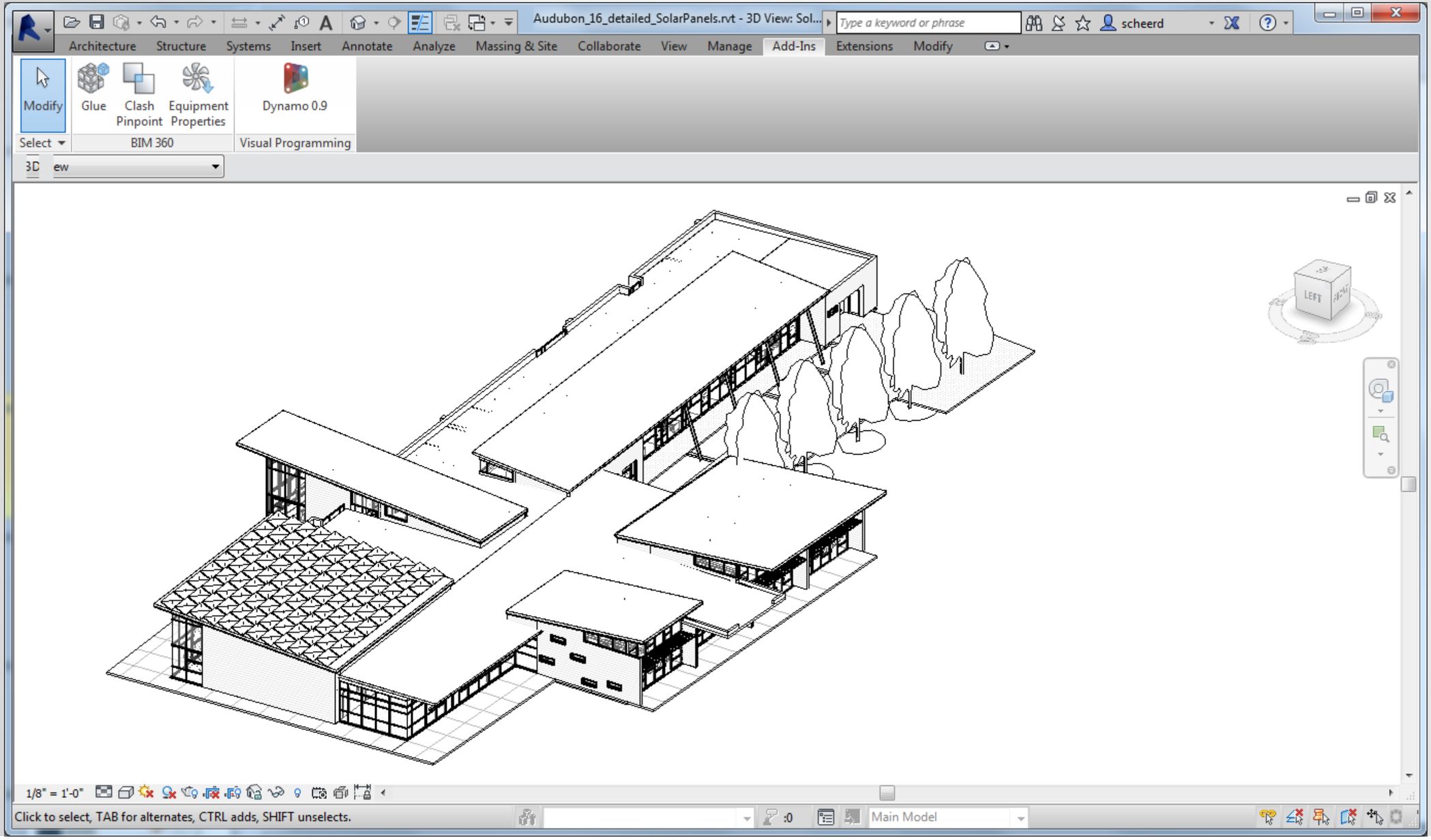

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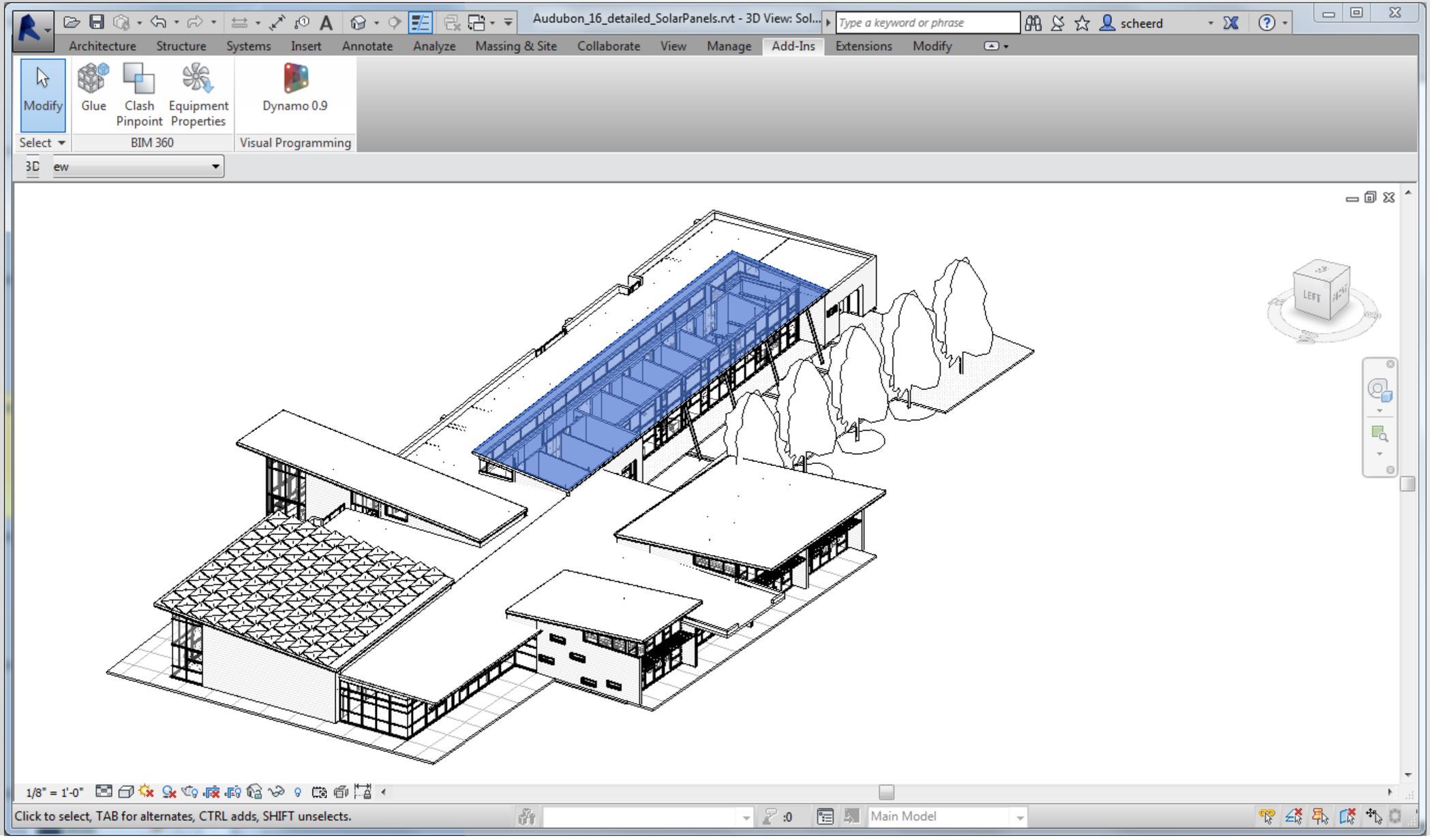

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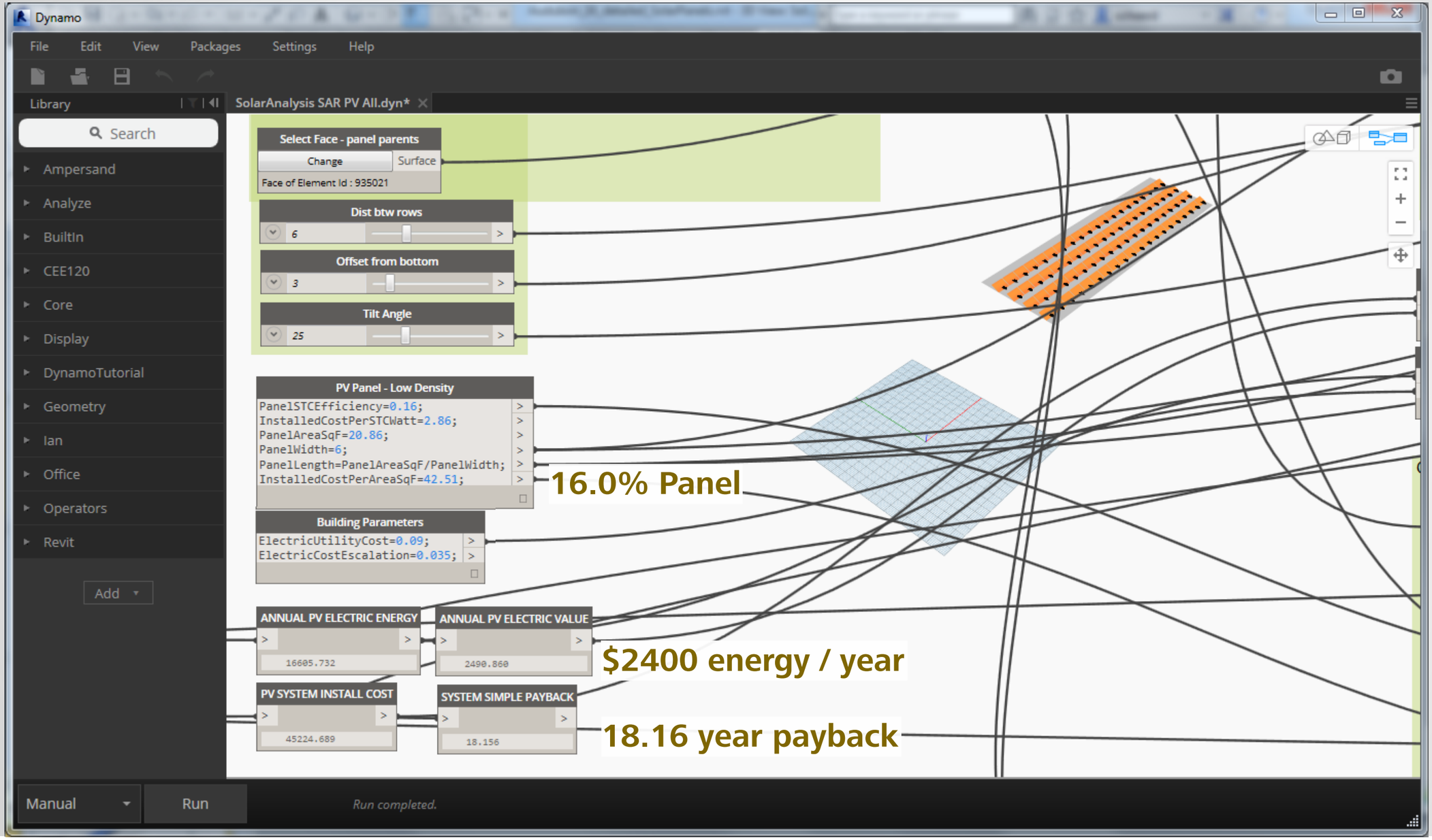

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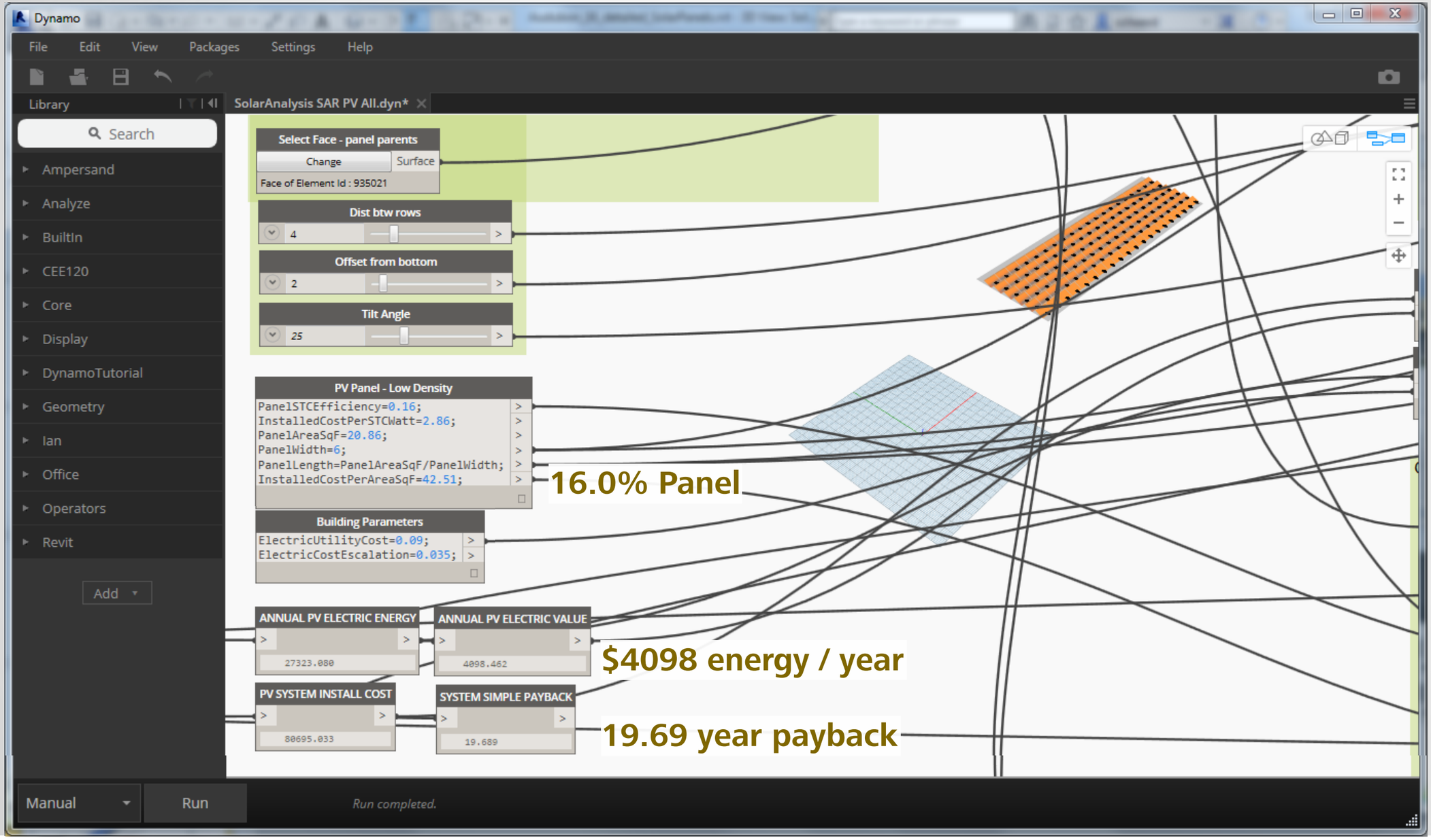

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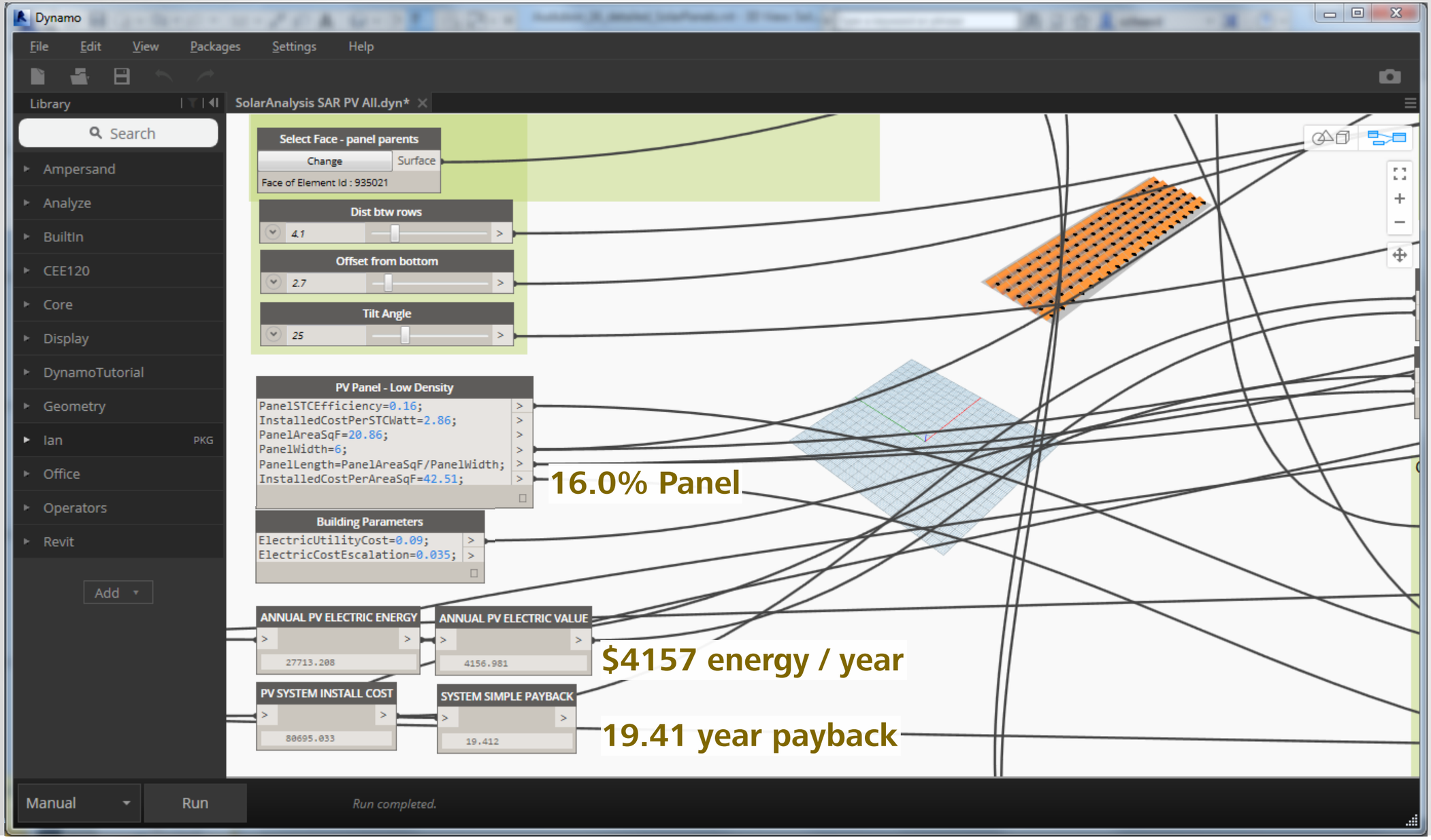
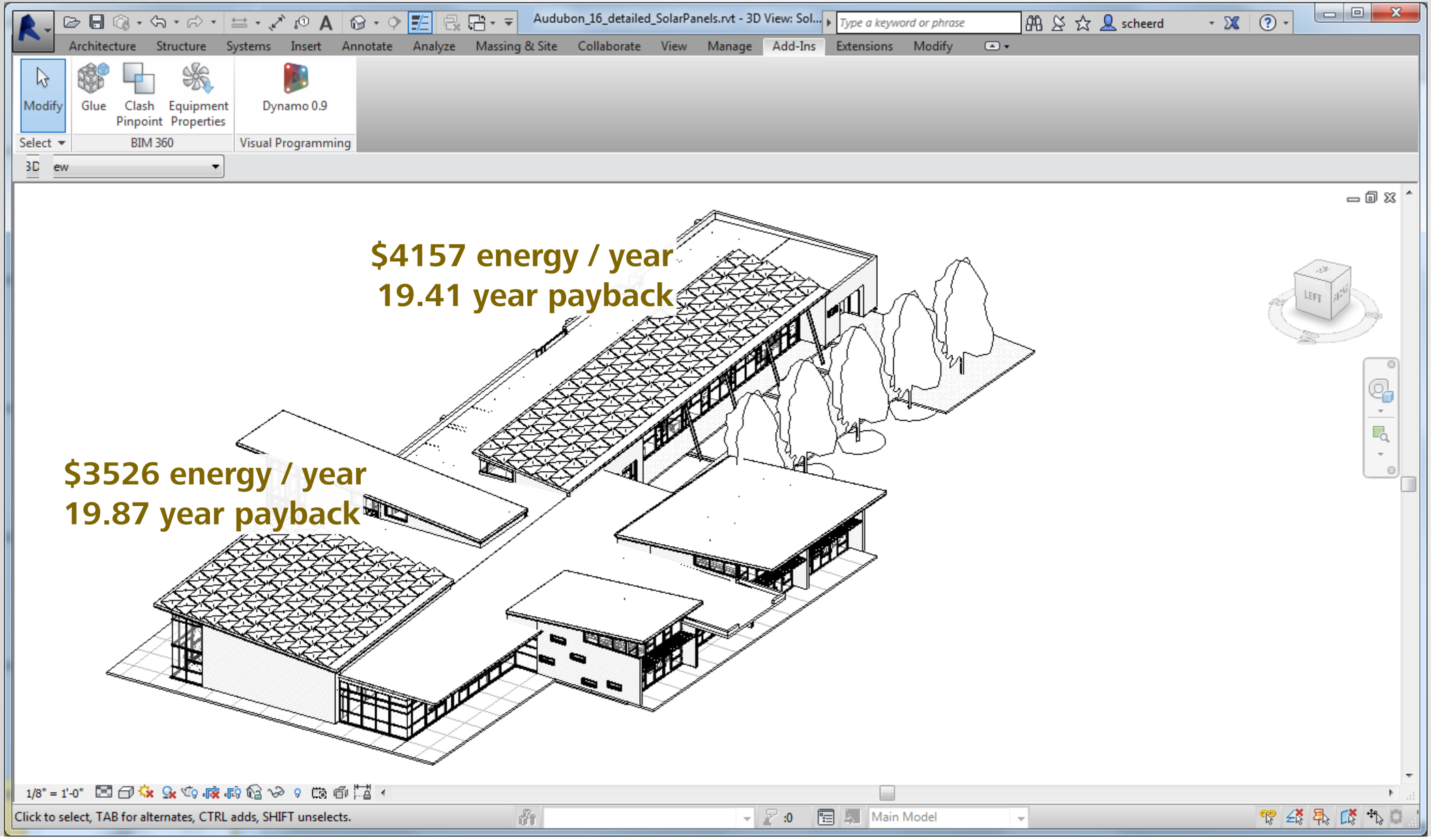
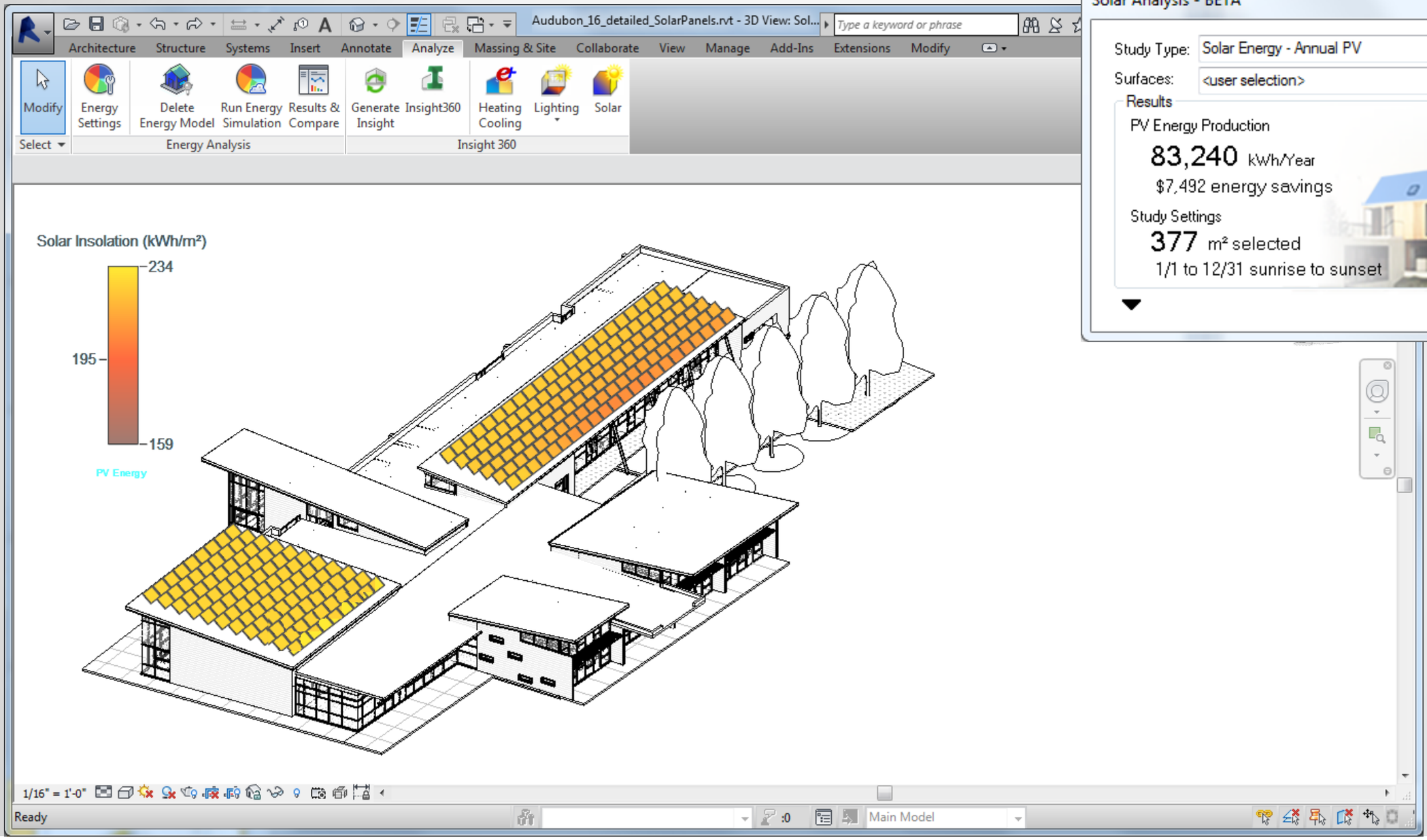


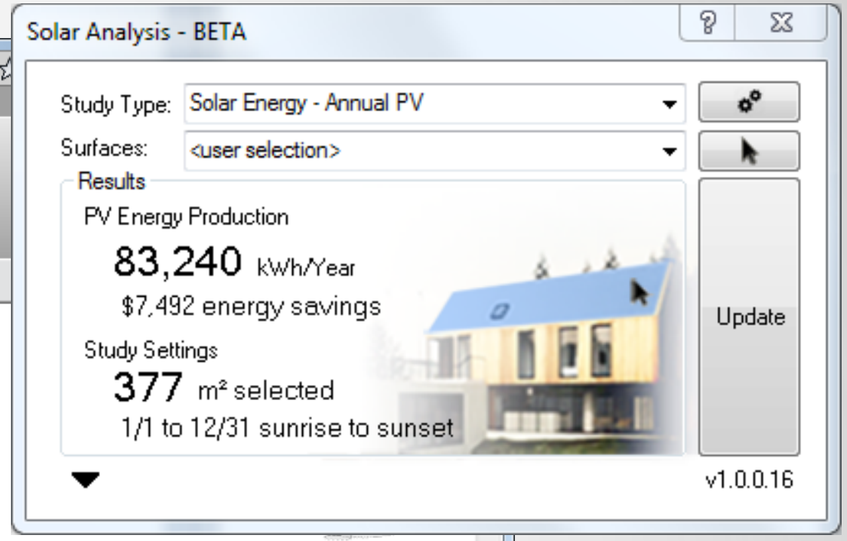
Review…

Demonstration…



Demonstration…





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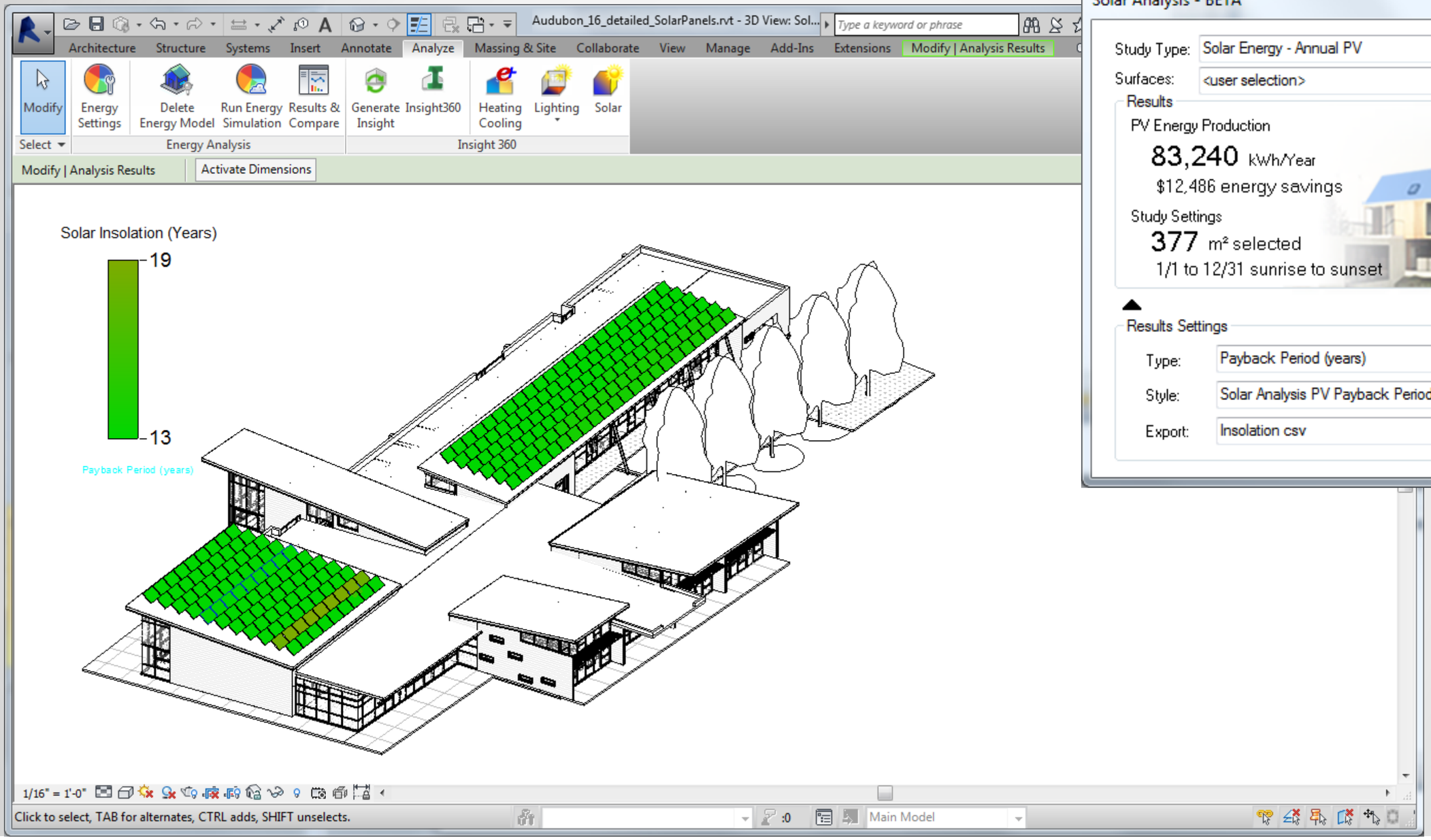

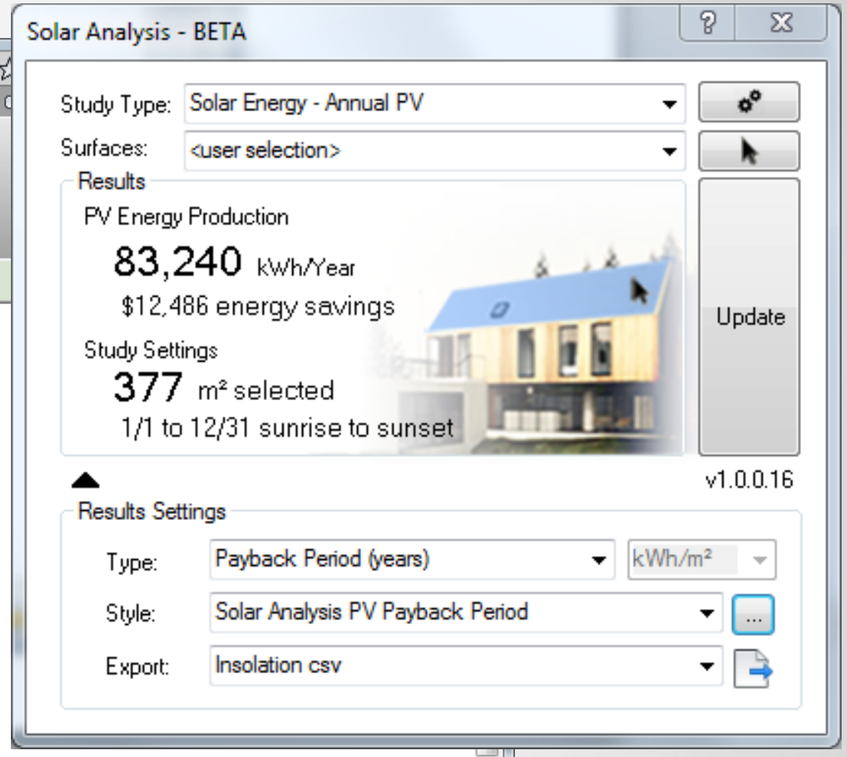

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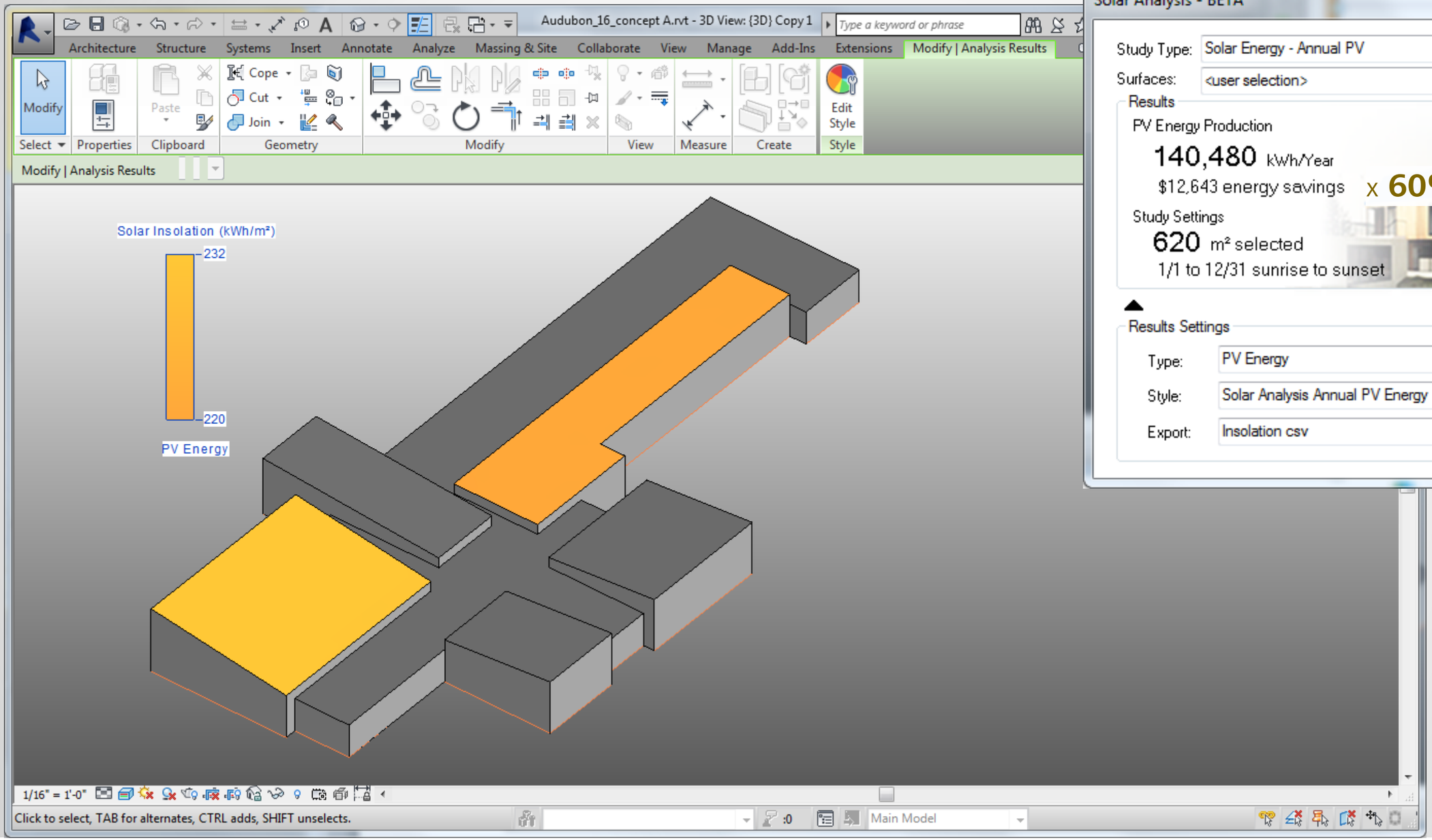

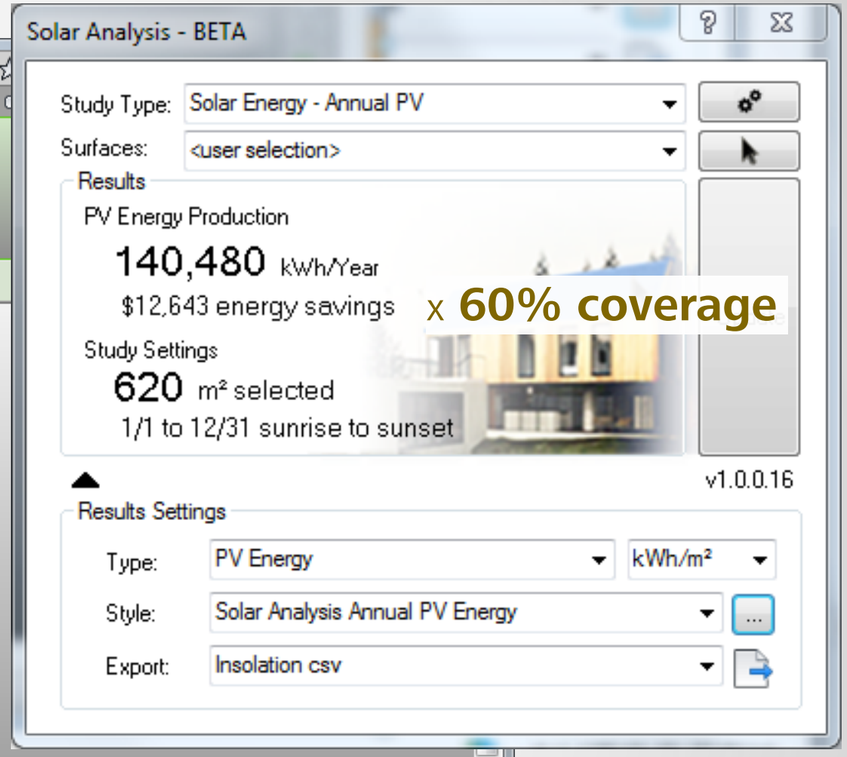

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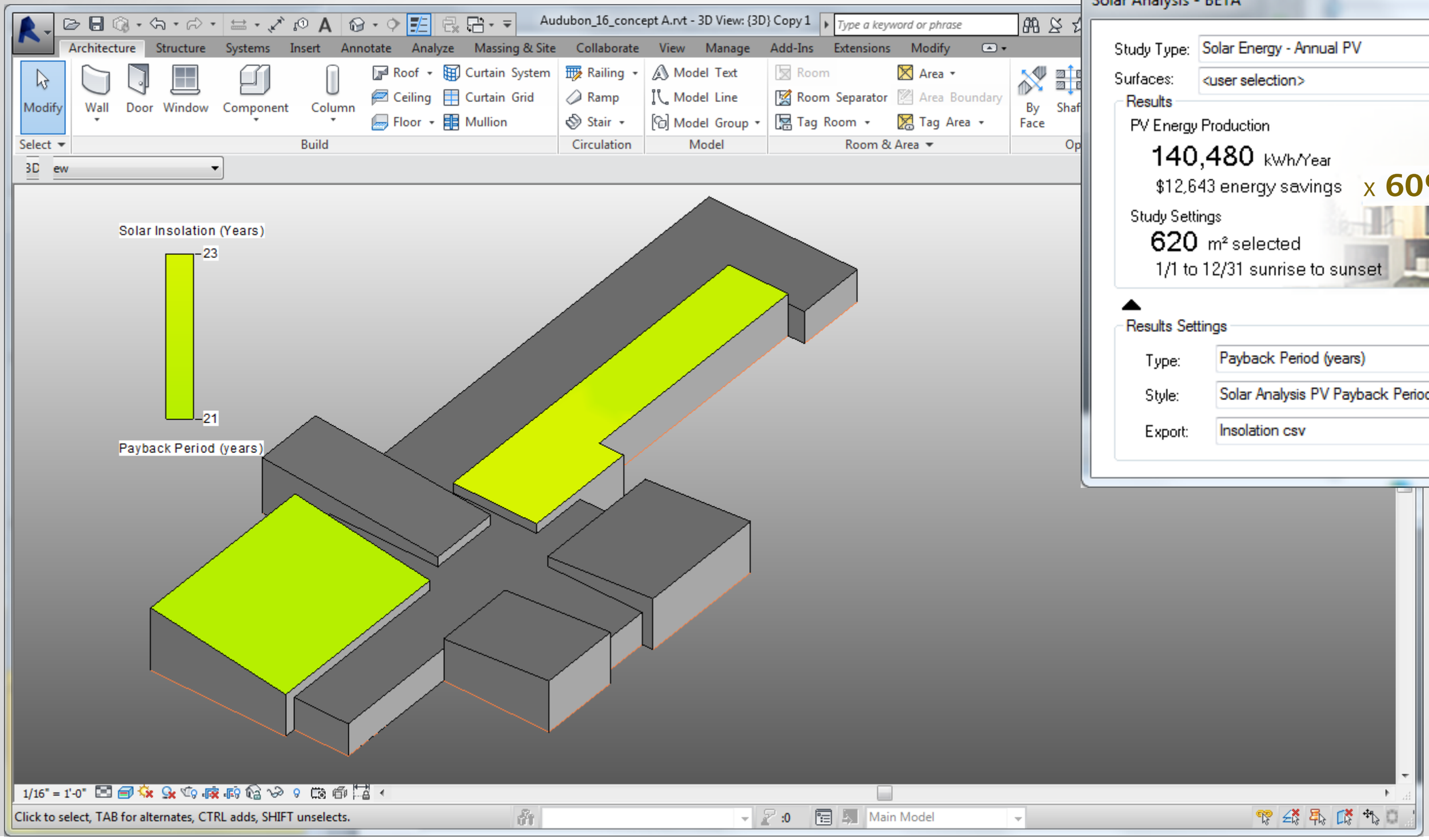
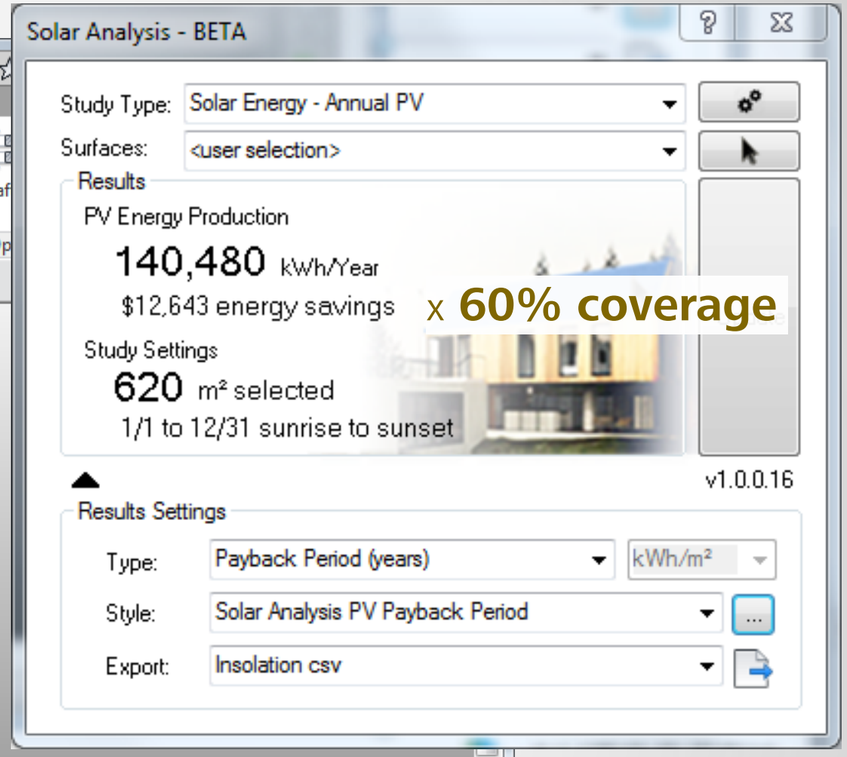
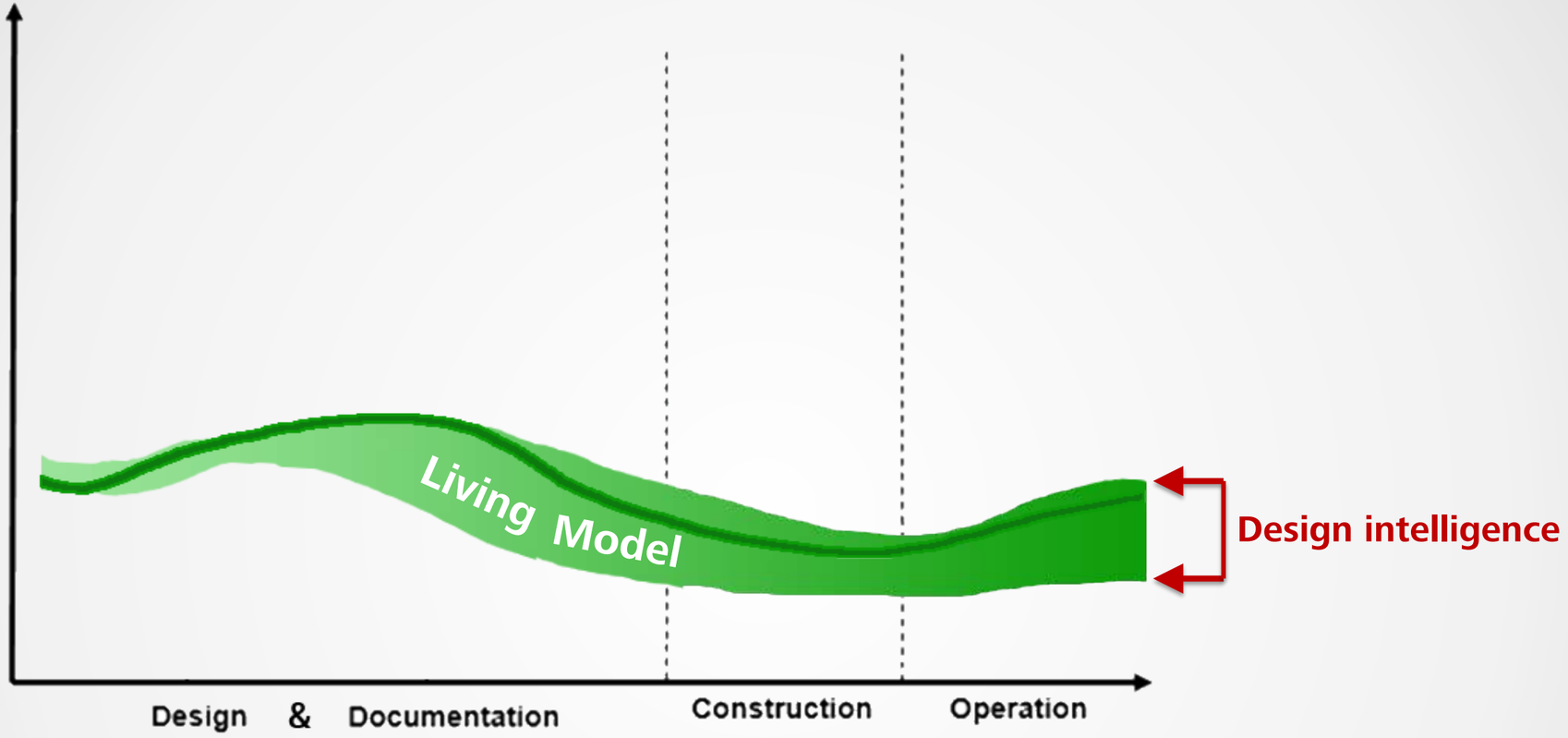




Summary…

Waterfall vs. Agile…

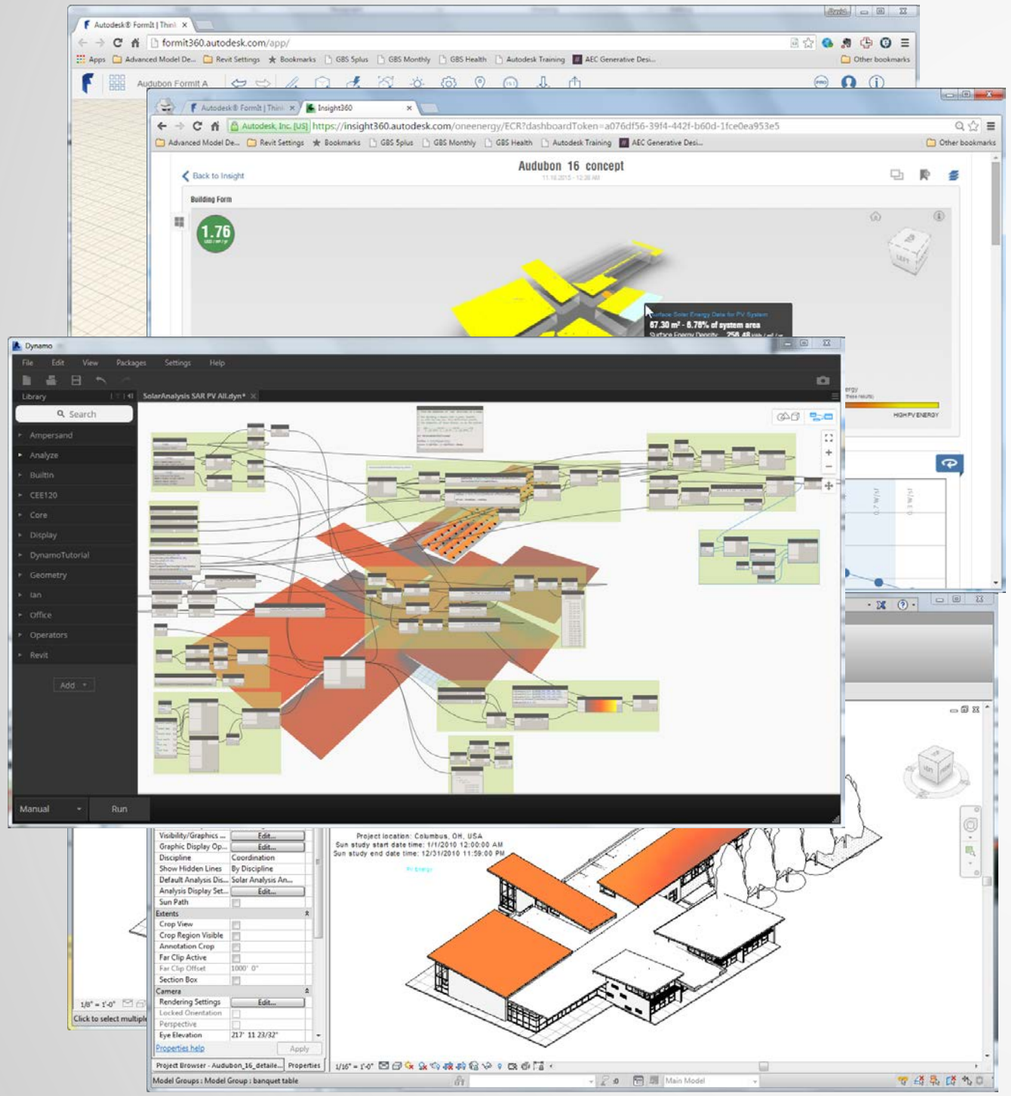


Agile

Value Driven
Iterative Process
Team Integration
Test Continuously

Agile Solar Power Workflow…

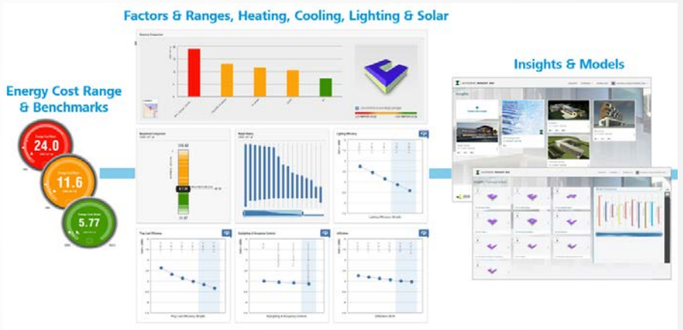
FormIt 360 Pro and/or Revit Subscription



1. Set Location

2. Generate Insight
   - Automatic Energy Analytical Model creation
   - Millions of whole building energy simulations
   - Automatic PV Energy factors for any model

3. Open Insight 360 to explore Energy & PV design Factors



4. Work in FormIt and/or Revit for focused design and Solar performance feedback

5. Automate and customize the process using Dynamo

6. Repeat 2-5 as needed on any model, any time

* Innovative computational techniques provide the equivalent of millions of simulation results in a fraction of the time

Conclusion…

How to get the tools…

- Revit
  - Subscription
  - Download and Install Insight 360 Plugin

    https://insight360.autodesk.com
    https://blogs.autodesk.com/insight360/
- FormIt 360
  - Pro Subscription
- Dynamo
  - Free, Open source at http://dynamobim.com/download/

Be heard! Provide AU session feedback.

- Via the Survey Stations, email or mobile device.
- AU 2016 passes awarded daily!
- Give your feedback after each session.
- Give instructors feedback in real-time.

Thank you – Q&A…

For more information:

http://blogs.autodesk.com/insight360/

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