Introduction to Subdivision Energy Analysis Tool (SEAT)

Overview of Development Plans

Craig Christensen & Scott Horowitz
National Renewable Energy Laboratory , Golden, CO

Cheri Davis & Norm Bourassa
CEC - PIER Buildings Program

March 26, 2007

Agenda

Introductions and purpose of this meeting 10:00-10:10

Cheri Davis and Norm Bourassa, California Energy Commission (CEC)

Overview of the PIER Program 10:10-10:20

Cheri Davis and Norm Bourassa, California Energy Commission (CEC)

Preview of the SEAT 10:20-11:20

Craig Christensen and Scott Horowitz, National Renewable Energy Laboratory (NREL)

Discussion 11:20-12:00

Cheri Davis and Norm Bourassa, CEC

What is PIER?

Public Interest Energy Research Program

- Initiated in 1998 as a part of California electricity deregulation and funded at $62M/Yr
- Natural Gas funding added in 2004, $15M/Yr
- Research counterpart to the public goods energy efficiency program administered by the utilities and the Renewables Program administered by the CEC

The Mohave Power Plant currently dumps more than 40,000 tons of sulfur dioxide and 10,000 tons of soot and smoke into the region's air.

- Mission: to conduct public interest energy research that seeks to improve the quality of life...by providing environmentally sound, safe, reliable and affordable energy services and products

PIER Buildings Program Goals and Outcomes

- More affordable, comfortable, energy efficient buildings from improved designs, construction methods, and operational strategies
- More reliable electricity systems through lowered peak demand
- Healthier, energy efficient indoor environments
- Improved customer choices for affordable, energy efficient technologies

PIER Buildings Program Scope

- Shorter term, applied research in new and existing buildings
- Lighting, HVAC, building envelopes, water heating, appliances, office equipment
- Design information/ specifications, technologies (hardware), software, controls, and other tools
- Entire building life cycle - component development/design, construction, commissioning, and operation

Subdivision Energy Analysis Tool

- Contract with National Renewable Energy Laboratory (NREL)
- Contract period: April, 2007 – March, 2009
- Purpose: Develop a software tool that provides rapid feedback on the energy implications of street layout

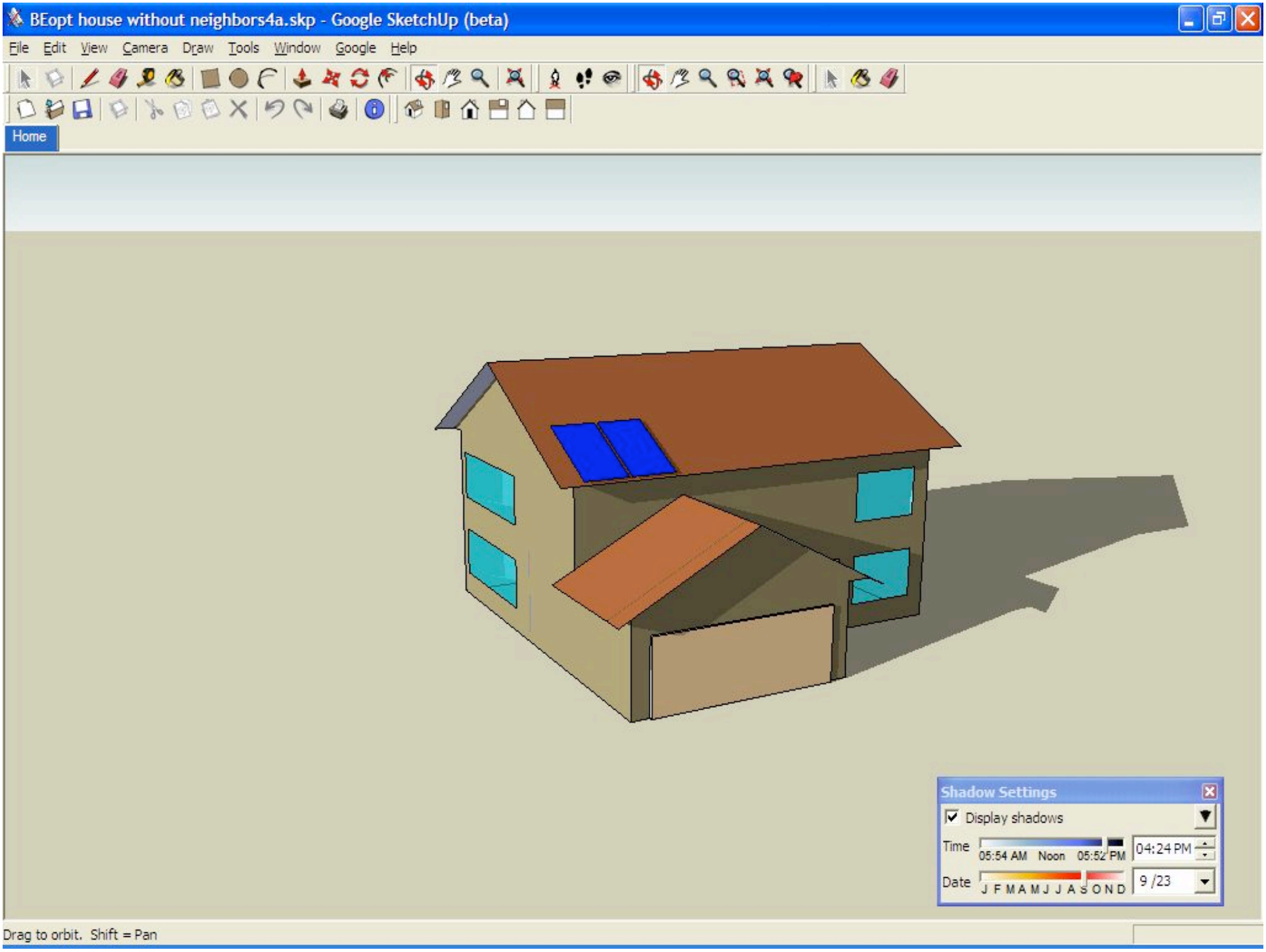
Background

- The problem:
  - House orientations follow the street layout, which in turn dictates each home's solar access
  - Street layout therefore factors into building space conditioning energy consumption, as well as the solar thermal and solar electric production potentials
  - Street layout is typically dictated by other factors. Energy is not a consideration.
  - There are no community scale design tools that can interactively provide energy impact feedback from the street design.

SEAT Preview

1) Description:
   - genesis of the concept
   - what SEAT will be (what it won't be)
   - how it may be used

2) Demo of mock-up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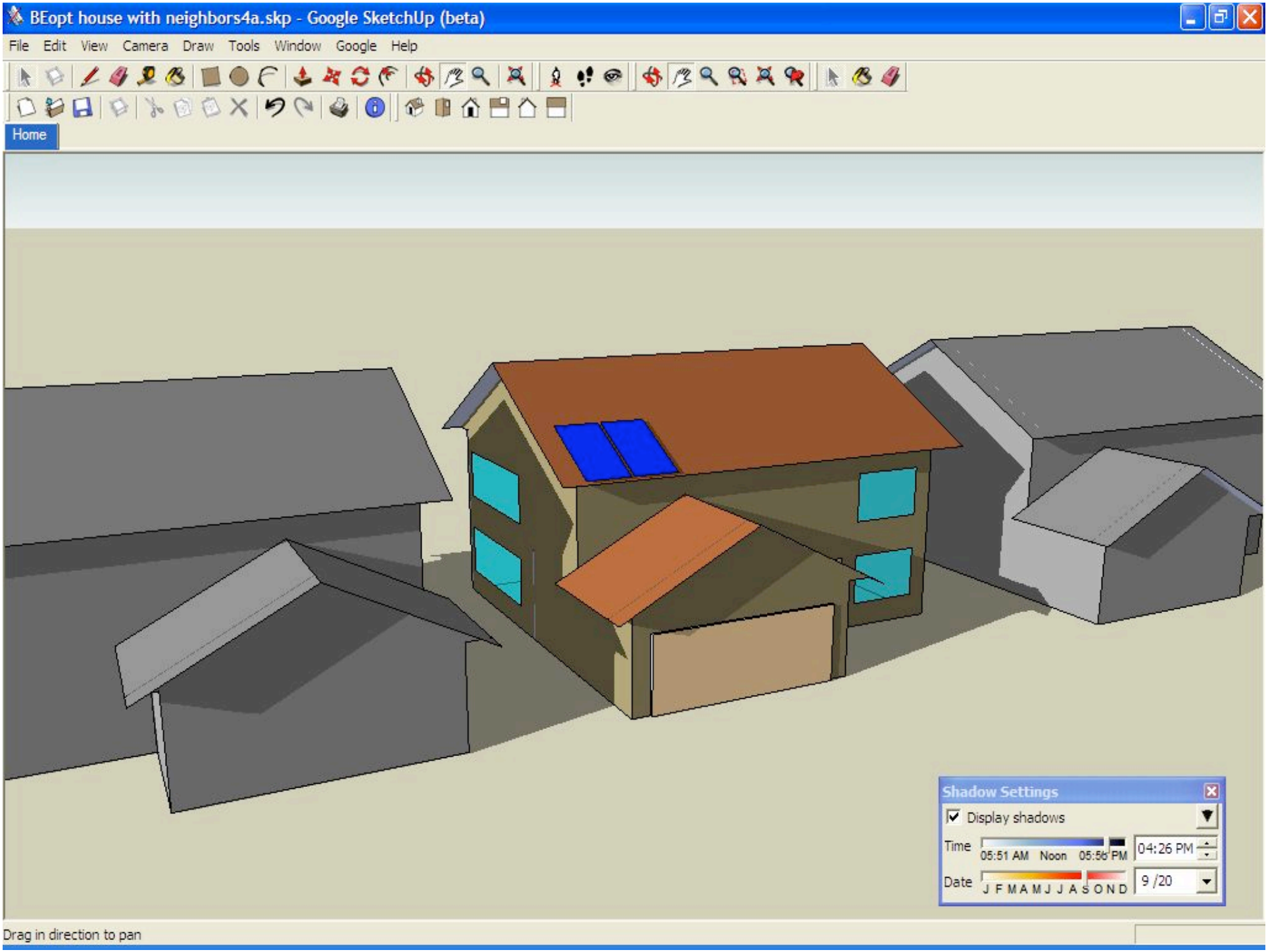
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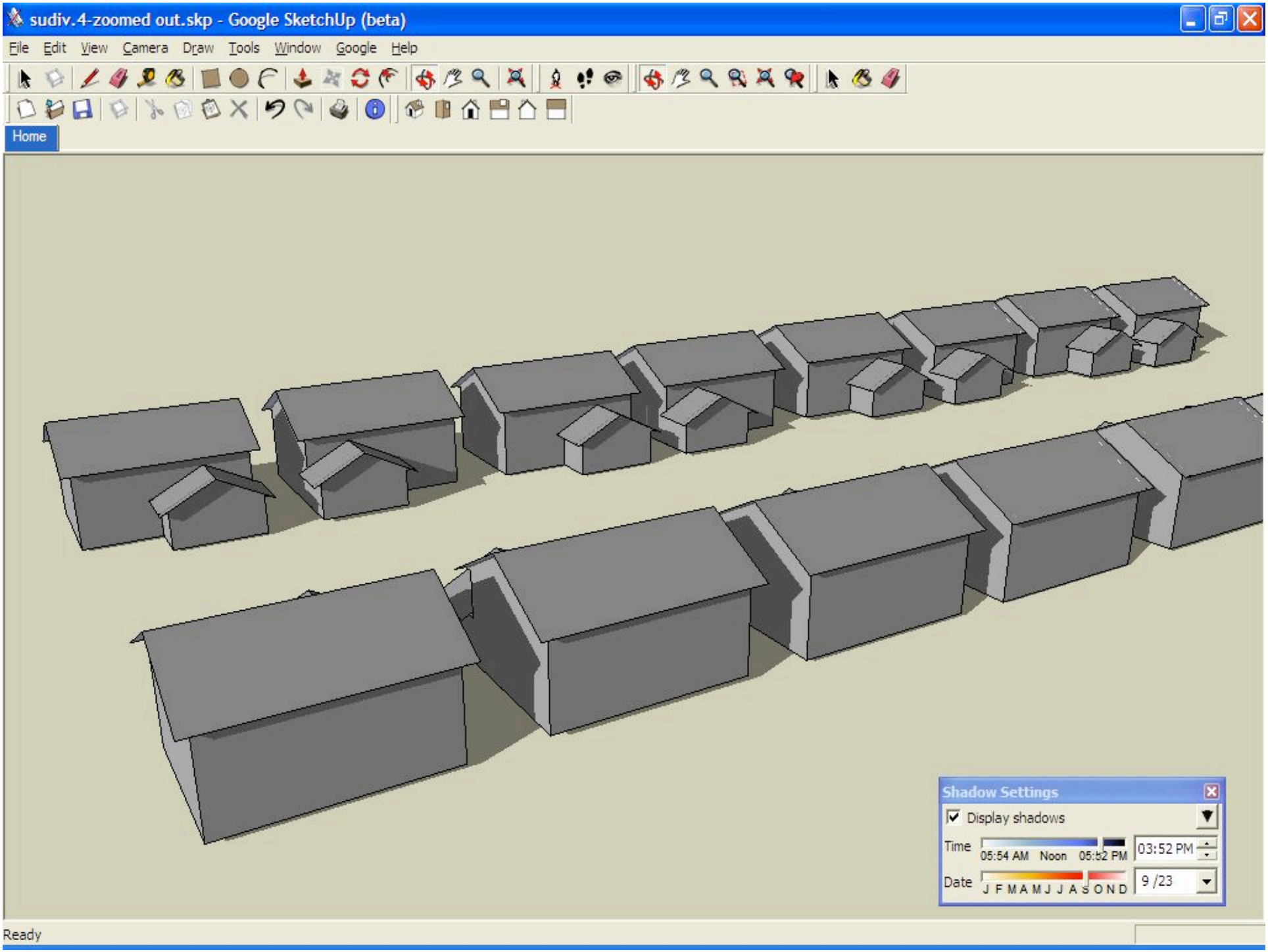
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THEODORA STREET
113th PLACE
114th TERRACE
114th PLACE
114th STREET
115th STREET
DEER RUN STREET
WALKING TRAIL
LONGVIEW COURT
REDBIRD LANE
114th ST.
LEGEND
BRIGHTON'S MEADOW
THE RESERVE
PHASE 1
THE VILLAS
PHASE 2
FUTURE PHASES

Orientation Impacts

Annual Energy

– Heating	consumption	gas (or electricity)
– Cooling	consumption	electricity
– PV	production	electricity
– SWH	production	gas (or electricity)

On-Peak Demand

– Cooling	consumption	electricity
– PV	production	electricity

Combined

– Time Dependent Valuation (TDV)

SEAT vs. CAD

SEAT is <u>not</u> intended to be a full-on subdivision design tool nor a substitute for Autocad Civil 3D, Autocad Land Desktop, or Bentley PowerCivil, etc.

SEAT <u>is</u> intended to be an energy analysis tool*:

- Evaluation Mode (tracing) to assess existing subdivision designs
- Sketch Mode (drawing to assess alternative subdivision designs

*Not accounting for topography (assumes a relatively flat site)

Potential Users / Uses

- Developers
- Builders
- Local Governments
- Utilities
- Education
- Research

User-Defined Constraints

- Minimum %'s of specific house plans
- Maximum %'s of specific house plans
- PV roofs? (left, right, front, back),
- PV Minimum output %
- SWH roofs? (left, right, front, back)
- SWH Minimum output %
- Building characteristics
- Lots: sizes, street frontage, setbacks
- Street: widths, layout
- Community space: parks, open space, paths

User-Defined Reference

- %'s specific house plans
- PV roofs? (left, right, front, back)
- PV Minimum output %
- SWH roofs? (left, right, front, back)
- SWH Minimum output %
- Distribution of house orientations

Design Interactions

	Developer		Builder		Buyer
Sequential	Street Layout	→	House Designs	→	House Assigns

	Builder / Developer				
Integrated	Street Layout	↔	House Designs	↔	House Assigns

Demo

What You Are About To See …

It’s only a mock-up!*

*Any resemblance to real-world results is purely coincidental.

SEAT Mock-up Demo

Thank You!

Questions, comments, suggestions?

Subdivision Energy Analysis Tool - Timeline

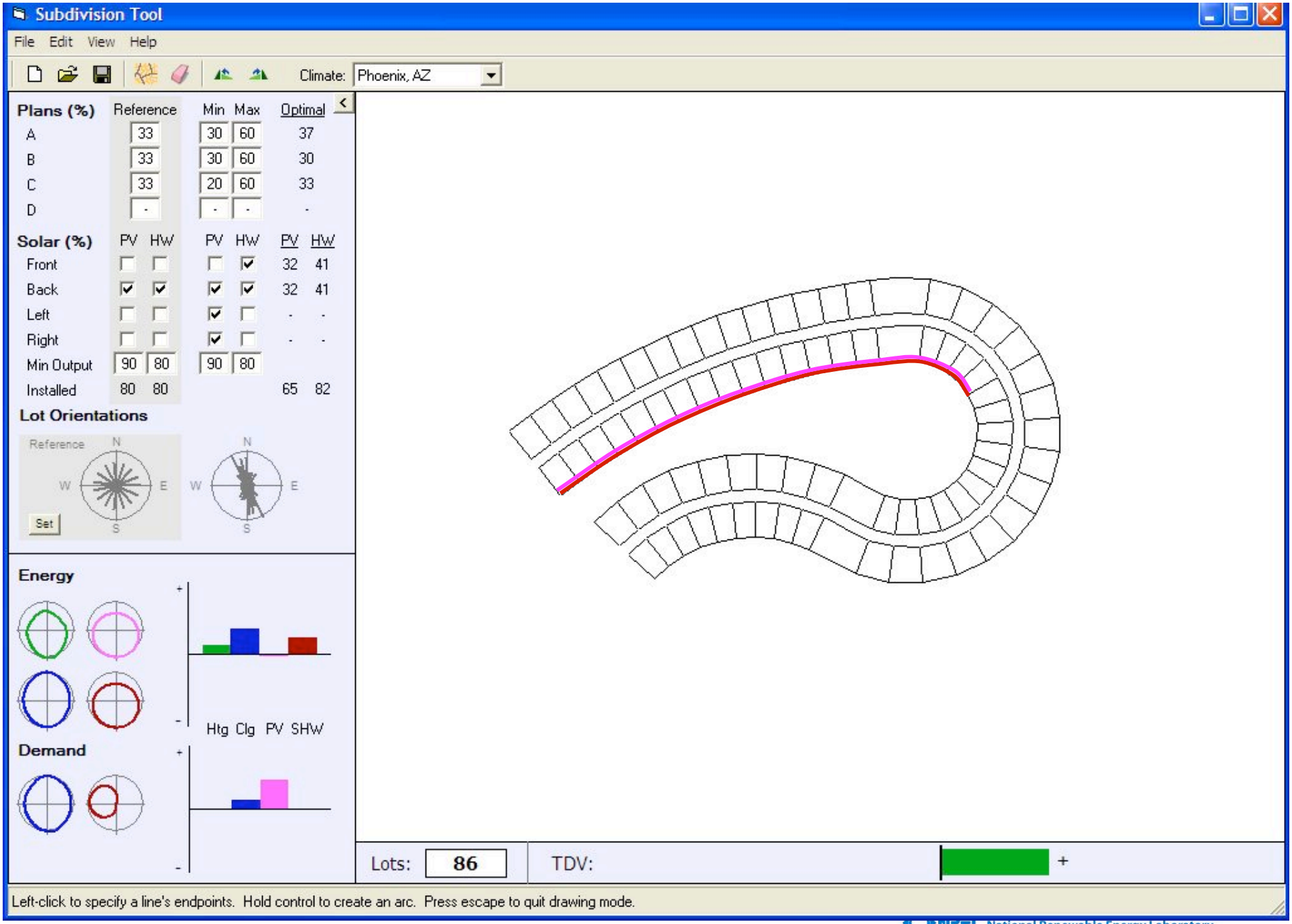
- SEAT Mockup Development 6/07 – 1/08
- SEAT Alpha Development 1/08 – 8/08
- SEAT Beta Development 8/08 – 2/09

Participation Opportunities

- Project Advisory Committee (PAC) - provide overall guidance on the project
- Domain Experts - assist with testing the SEAT mockup, alpha, and beta versions
  - Would like representation from land development consultants, city planners, homebuilders, academia, etc

Contact Information

- Norm Bourassa: nbourass@energy.state.ca.us
- Cheri Davis: cdavis@energy.state.ca.us
- Craig Christensen: Craig_Christensen@nrel.gov
- Scott Horowitz: Scott_Horowitz@nrel.gov


Subdivision Tool
File Edit View Help
Climate: Phoenix, AZ
Plans (%) Reference Min Max Optimal
A 33 30 60 37
B 33 30 60 30
C 33 20 60 33
D - - - -
Solar (%) PV HW PV HW PV HW
Front 32 41
Back 32 41
Left - -
Right - -
Min Output 90 80 90 80
Installed 80 80 65 82
Lot Orientations
Reference
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+
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