The Road to Savings
Residential New Construction in Massachusetts

Presented to
RESNET Conference 2007

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Outline

- **Overview of the MA Program**
- **Where We Have Been**
- **Where We Are Going**

Program Sponsors

- **Electric IOU's**
- **Gas IOU's**
- **Energy Services Providers**

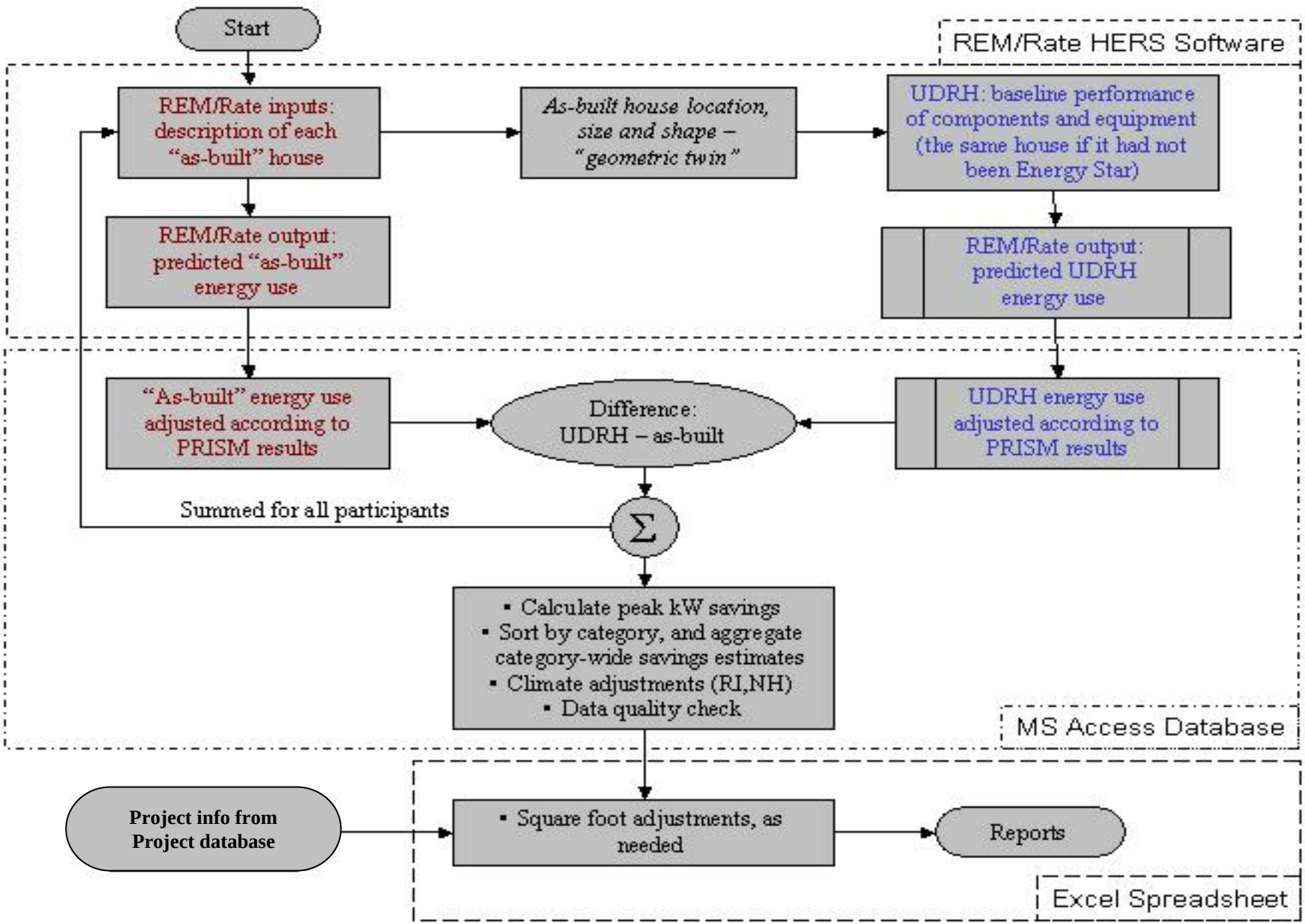
Paths for Improving the Energy Efficiency of New Homes

- **Performance/HERS Index**
- **Prescriptive/Builder Option Packages (BOP)**
- **CODE PLUS /Energy Savings Measures**
  - **Duct Sealing, Air Sealing, HVAC Equipment, High Performance Insulation & CFLs**

Performance Path

Original Program

- **Used RemRate to estimate kWh savings**
  - **Custom baseline – UDRH vs. As Built**
- **Model was calibrated using PRISM**
- **kW savings estimated with spreadsheet**


Start
REM/Rate HERS Software
REM/Rate inputs: description of each "as-built" house
As-built house location, size and shape – "geometric twin"
UDRH: baseline performance of components and equipment (the same house if it had not been Energy Star)
REM/Rate output: predicted "as-built" energy use
REM/Rate output: predicted UDRH energy use
"As-built" energy use adjusted according to PRISM results
Difference: UDRH – as-built
UDRH energy use adjusted according to PRISM results
Summed for all participants
Σ
▪ Calculate peak kW savings
▪ Sort by category, and aggregate category-wide savings estimates
▪ Climate adjustments (RI,NH)
▪ Data quality check
MS Access Database
Project info from Project database
▪ Square foot adjustments, as needed
Reports
Excel Spreadsheet

Adjustments to Energy Consumption Savings Estimates

Energy Star Adjustment					Baseline Adjustment				
REM/Rate predictions of "as-built" energy use	x	Overall Energy Star coefficient	=	Adjusted Energy Star prediction	REM/Rate predictions of UDRH energy use	x	Overall baseline coefficient	=	Adjusted UDRH prediction
As-built heating	x	1.01	=	Adj. heating	UDRH heating	x	0.997	=	Adj. Heating
As-built cooling	x	0.779	=	Adj. cooling	UDRH cooling	x	0.815	=	Adj. Cooling
As-built water heating					UDRH water heating				

Heating Savings:	Adj. UDRH heating – Adj. Heating = heating savings estimate
Cooling Savings:	Adj. UDRH cooling – Adj. cooling = cooling savings estimate
Water heating Savings:	UDRH water heating – As-built water heating = water heating savings estimate

Cooling peak kW

Eq (1):

$$\left(\frac{Designbtuh_{UDRH}}{EER_{UDRH}} - \frac{Designbtuh_{ASBUILT}}{EER_{ASBUILT}} \right) \times 0.7$$

where:

Designbtuh$_{UDRH}$: design load of the baseline home

Designbtuh$_{ASBUILT}$: design load of the participant home

EER$_{UDRH}$: estimated Energy Efficiency Ratio (EER) of the baseline AC system(s)

EER$_{ASBUILT}$: estimated EER of the participant AC system(s)

0.7: diversity factor

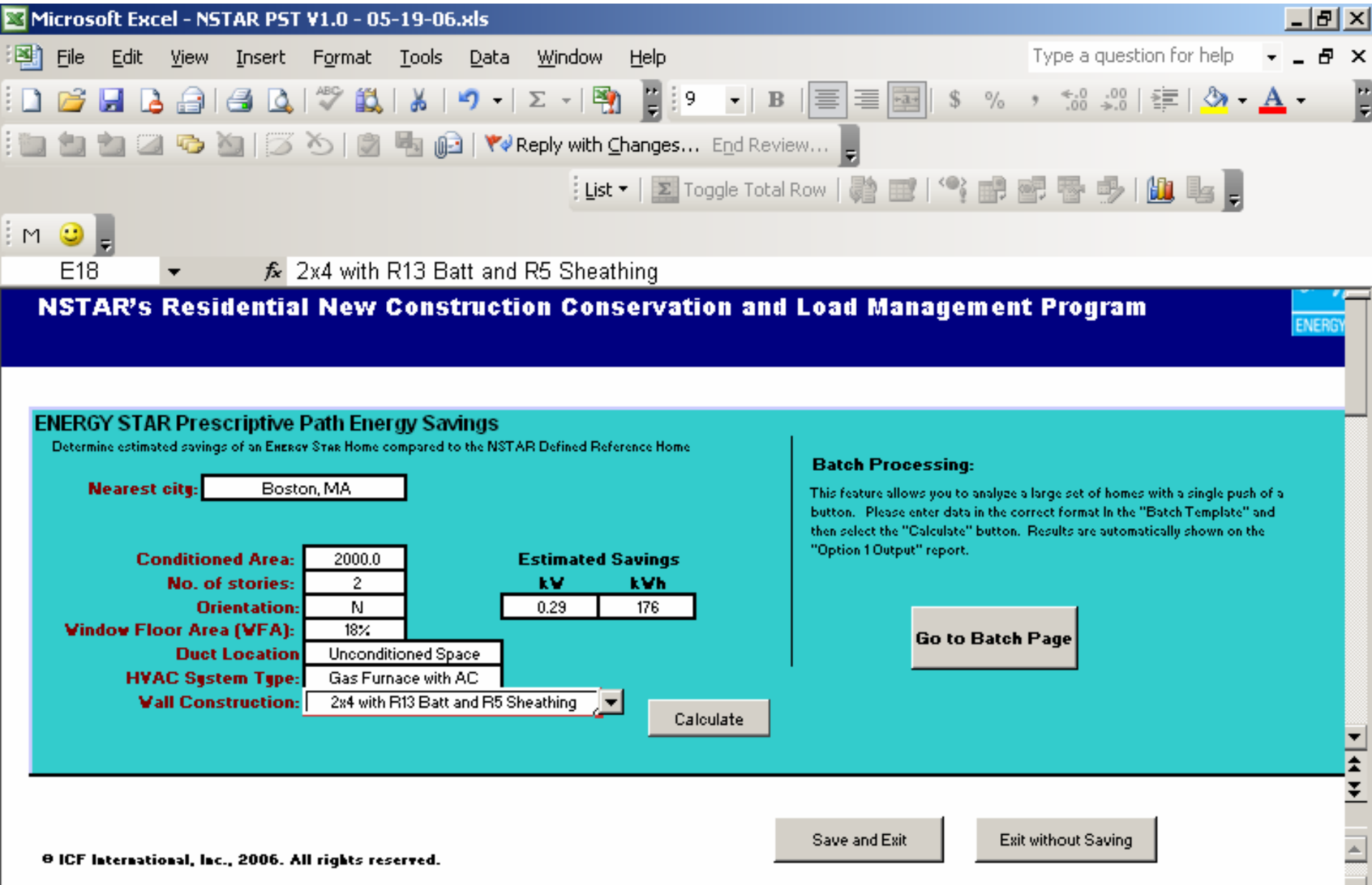
Eq (2):

$$EER = ((SEER - 10) \times 0.8) + 9.2$$

Prescriptive Path

Recent Program

- Introduced BOPs (2006)
- Concern – how to capture max savings?
- ICF International developed PST for BOPs
  - Energy improvements fixed
  - House characteristics variable


Microsoft Excel - NSTAR PST V1.0 - 05-19-06.xls
File Edit View Insert Format Tools Data Window Help
Type a question for help
Reply with Changes... End Review...
List Toggle Total Row
E18
2x4 with R13 Batt and R5 Sheathing
NSTAR's Residential New Construction Conservation and Load Management Program
ENERGY STAR Prescriptive Path Energy Savings
Determine estimated savings of an Energy Star Home compared to the NSTAR Defined Reference Home
Nearest city: Boston, MA
Conditioned Area: 2000.0
No. of stories: 2
Orientation: N
Window Floor Area (WFA): 18%
Duct Location Unconditioned Space
HVAC System Type: Gas Furnace with AC
Wall Construction: 2x4 with R13 Batt and R5 Sheathing
Calculate
Estimated Savings
kW kWh
0.29 176
Batch Processing:
This feature allows you to analyze a large set of homes with a single push of a button. Please enter data in the correct format in the "Batch Template" and then select the "Calculate" button. Results are automatically shown on the "Option 1 Output" report.
Go to Batch Page
Save and Exit
Exit without Saving
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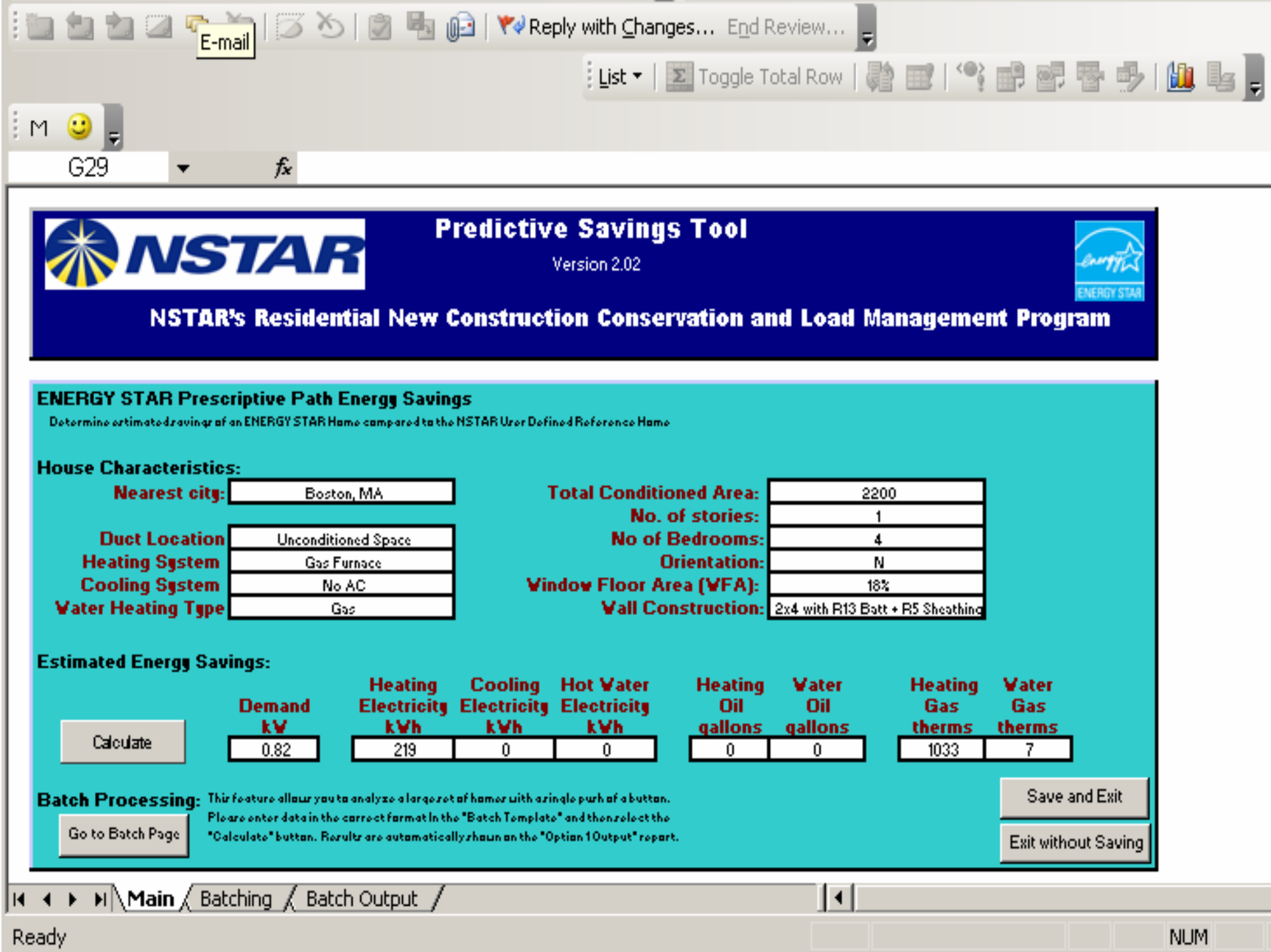
E-mail
Reply with Changes...
End Review...
List
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G29
NSTAR
Predictive Savings Tool
Version 2.02
ENERGY STAR
NSTAR's Residential New Construction Conservation and Load Management Program
ENERGY STAR Prescriptive Path Energy Savings
Determine estimated savings of an ENERGY STAR Home compared to the NSTAR User Defined Reference Home
House Characteristics:
Nearest city: Boston, MA
Duct Location: Unconditioned Space
Heating System: Gas Furnace
Cooling System: No AC
Water Heating Type: Gas
Total Conditioned Area: 2200
No. of stories: 1
No of Bedrooms: 4
Orientation: N
Window Floor Area (WFA): 18%
Wall Construction: 2x4 with R13 Batt + R5 Sheathing
Estimated Energy Savings:
Calculate
Demand kW: 0.82
Heating Electricity kWh: 219
Cooling Electricity kWh: 0
Hot Water Electricity kWh: 0
Heating Oil gallons: 0
Water Oil gallons: 0
Heating Gas therms: 1033
Water Gas therms: 7
Batch Processing:
This feature allows you to analyze a large set of homes with a single push of a button. Please enter data in the correct format in the "Batch Template" and then select the "Calculate" button. Results are automatically shown on the "Option 1 Output" report.
Go to Batch Page
Save and Exit
Exit without Saving
Main
Batching
Batch Output
Ready
NUM

The Future

- **DOE-2**
- **FCM in NE**
- **HERS, BOPs & Code+**

The New Program

- All DOE-2 based
- Performance path
  - Use detailed inputs for DOE-2, e.g., RemRate
  - Variable energy efficiency improvements
- Prescriptive path
  - Detailed inputs for house characteristics
  - Fixed energy efficiency improvements
- Code Plus path
  - Detailed inputs for house characteristics
  - Fixed energy efficiency improvements

DOE-2 Pros & Cons

- **Pros**
  - **Consistent methodology**
  - **Hourly simulation**
  - **Flexibility**
  - **Cost**

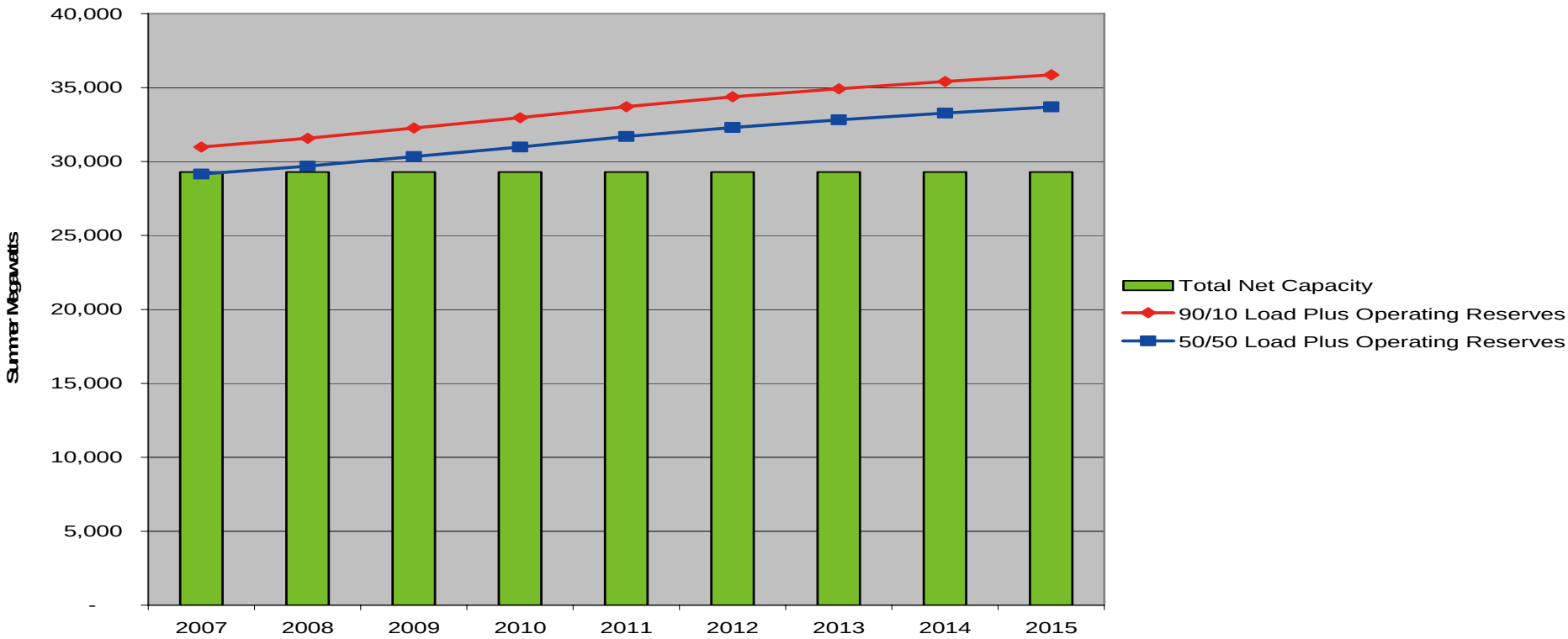
DOE-2 Pros & Cons

- **Cons**
  - **More Powerful**
  - **Limited # of Users**
  - **Cost**

FCM in New England

- **Forward Capacity Market**
- **The objective**
  - **sufficient capacity for reliable system**
  - **all resources participate equally**
- **Peak Period being defined**

Projected New England Operable Capacity Situation 2007-2015



Source ISO New England

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