

Connecticut Department of Energy and Environment
Technical Presentation

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Introduction to NORA

- Authorized under federal law
- Research and education support to the liquid fuels heating industry.
- Some 5 million buildings, residential and commercial
- Research and Training Center in Plainview, New York
- Key focus areas:
 - Energy Efficiency
 - Conversion of this Market to Renewable Fuels

Energy Efficiency - Examples

- In-Lab Studies of Annual Performance of Integrated Hydronic Heating Systems Using Imposed Load Profiles
- In-Lab Studies of the Annual Performance of Common Tankless Coil Boilers and Some Variants (cosponsored by NYSERDA)
- NORA Rebate Program – Actual Fuel Use Reduction Based on Analysis of Before and After Consumption Normalized for Degree Days.

Reports are posted on the NORA website <https://noraweb.org/technical-publications>
Peer-reviewed publications on NORA studies are generally published through ASHRAE

Highlights of Recent NORA Rebate Study

Detailed analysis of deliveries before and after boiler system upgrades was done for 330 cases, with 4 different participating fuel marketers;

Used a common degree day correlation approach which includes consideration of summer domestic hot water load;

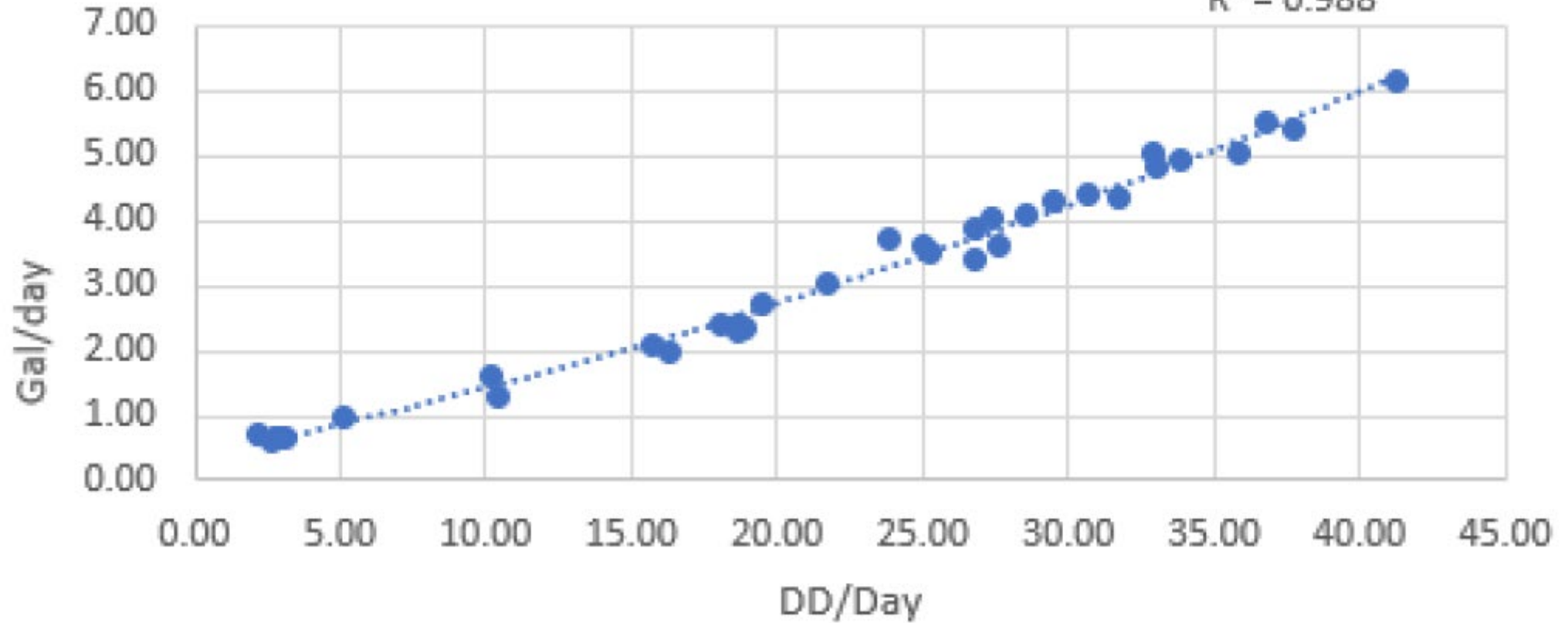
At nearly all sites, the boiler met both heat and domestic hot water demand (integrated);

Results were extrapolated to the full set of rebate sites available at the time, leading to an average savings of 20%;

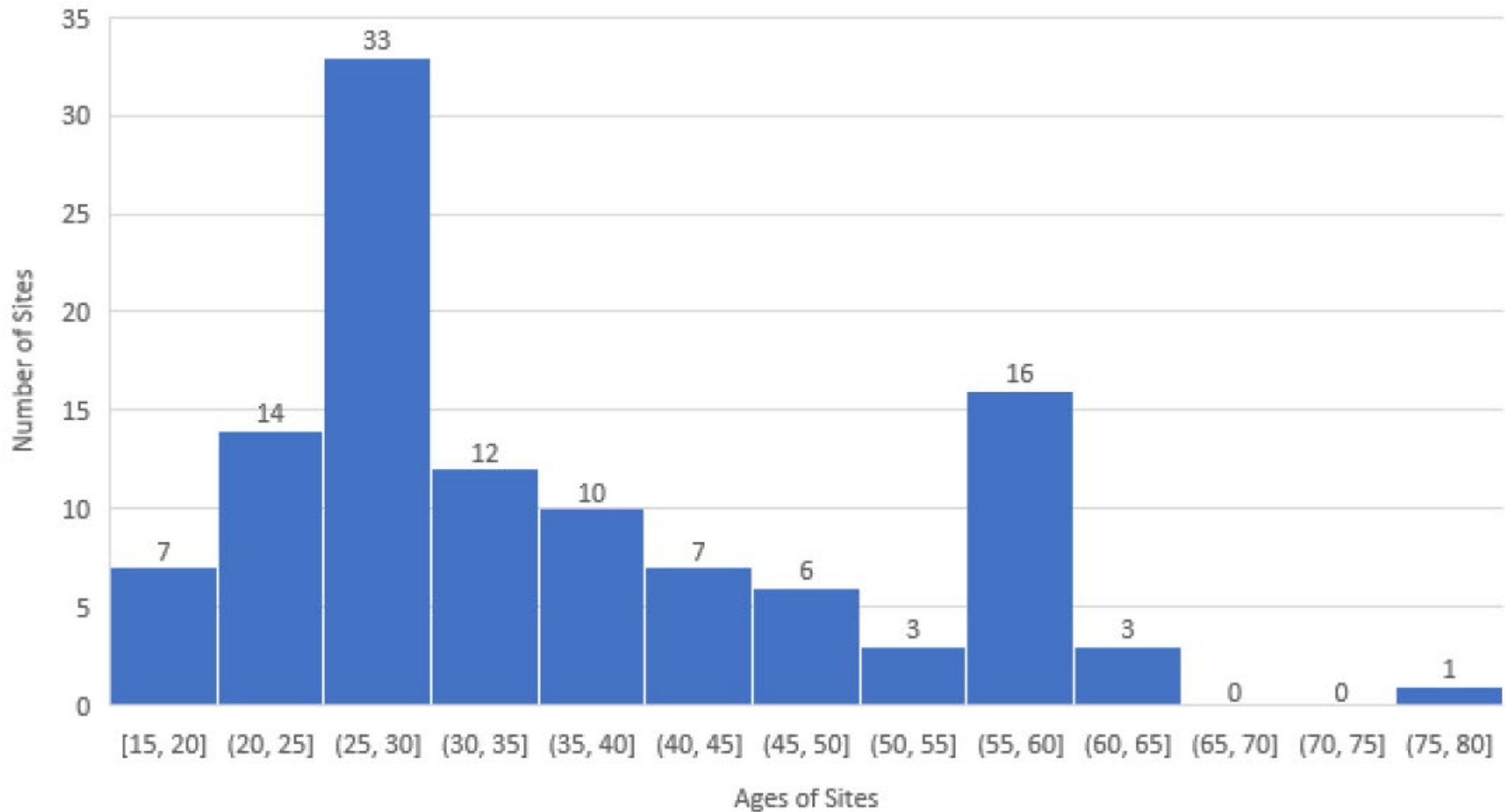
Pre

$$y = 0.0011x^2 + 0.0948x + 0.3715$$

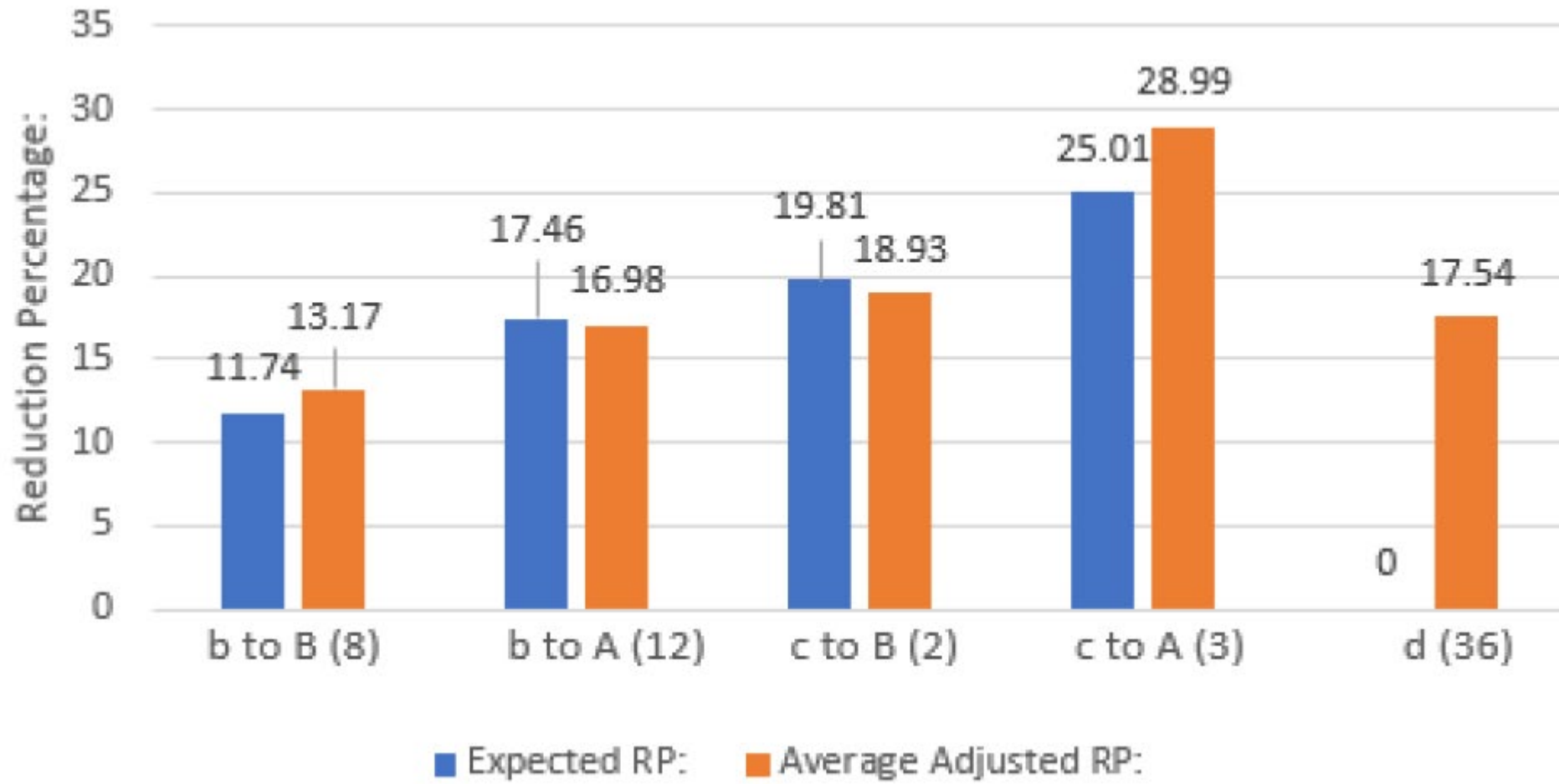
$$R^2 = 0.988$$



Frequency of Old Boiler Ages Across 112 Sites



Expected vs. Actual Reduction Percentages



Comments on Results

- Periods with low heating loads and domestic hot water only loads have the worst efficiency;
- Realized savings were found to be greater than AFUE would predict (modeled approach) and a major reason for this is that AFUE is a metric for heating only. Domestic hot water is not considered in AFUE.

How to reduce low load (idle) losses

- Improved boiler insulation;
- Improved controls that enable the boiler to remain at a lower temperature state when there is no demand
- Many control options available for this:
 - Outdoor reset;
 - Controls using inferred load;
 - Thermal postpurge;
 - Detect hot water draws and adjust firing and water temperature in response.

Our Request

- Allow the use of actual measured fuel consumption reduction in evaluating efficiency impact of heating system upgrades;
- Consider both individual sites and aggregated approaches in evaluating efficiency changes;
- Use of DOE-approved approaches and software.

Biofuel Conversion Status

Currently all major burner manufacturers and system component manufacturers offer products that are UL listed for fuels up to 100% biodiesel;

We estimate:

- over 200,000 sites are using B20;

- over 9,000 sites are using B50

- over 200 sites are using B100

There is an increase in interest in the use of Renewable Diesel in blends with biodiesel. Field testing is planned for the coming heating season.

A motivating factor for building owners is a far lower investment cost for decarbonization.

Thank you!

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