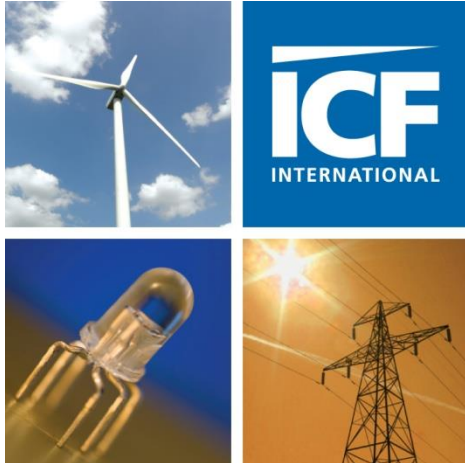


***DRAFT***



**Workshop Session 4, Benefits to Occupants  
and Owners: *Valuing Multiple Benefits for  
Utility and Government Planning Purposes***

**International Energy Agency:  
Multiple Benefits Evaluations Workshop**

April 20, 2015

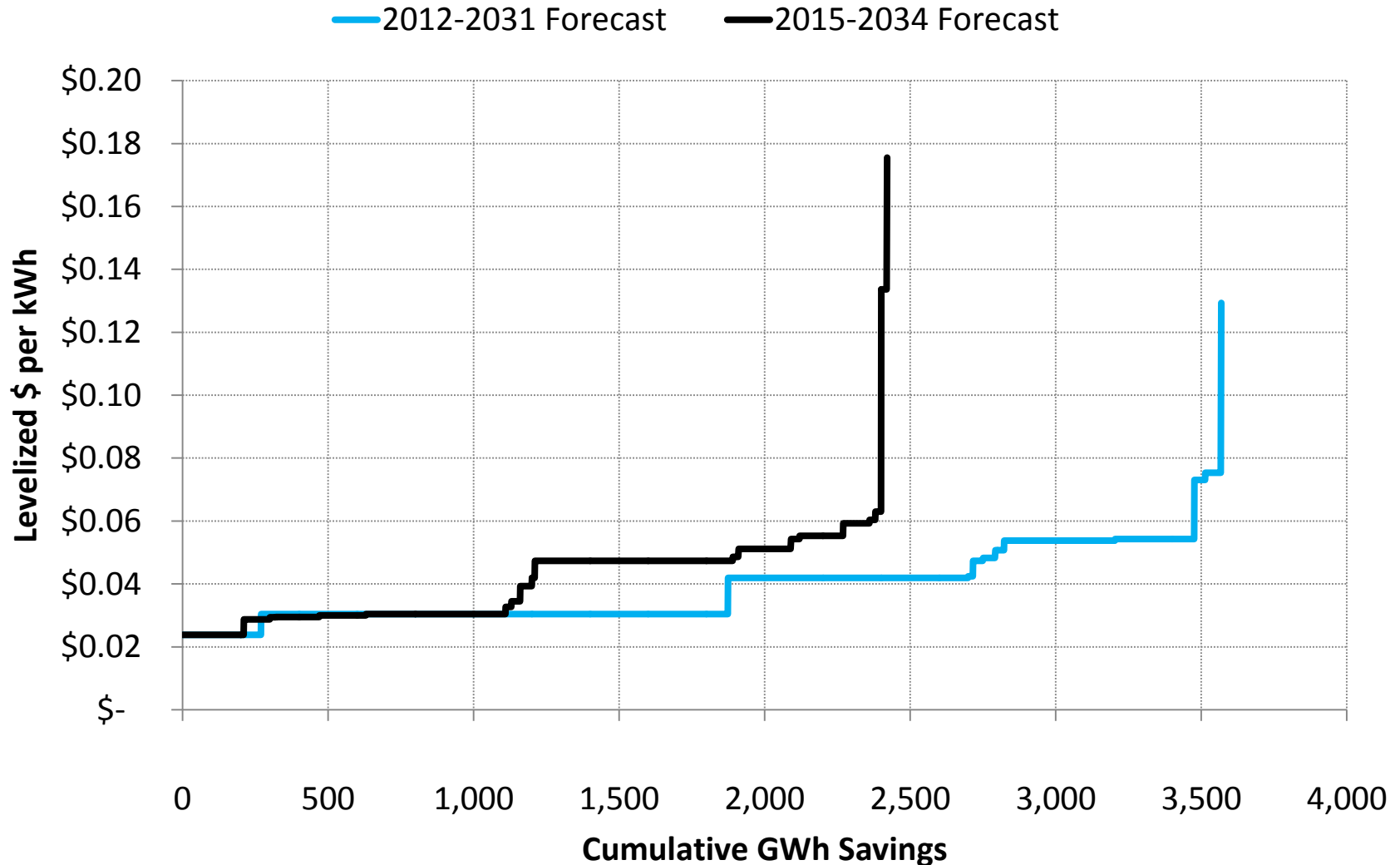
*Note: The content of this presentation and the opinions expressed by the presenter are solely that of the presenter and not necessarily that of ICF International.*

1. Setting the stage: Increasing attention to and importance of multiple benefits of EE in U.S.
2. Study of multiple benefits of EE in small residential buildings in New York
  - Secondary & Primary Research Conducted
  - Non-Energy Impact (NEI) Categories Studied
  - Monetisation of NEIs





- ~1/3 of U.S. states include non-energy benefits (NEBs) in EE B/C testing
  - Process for NEBs inclusion under review in many more states
- Most states use benefit adder of 10% to 15% to account for NEBs instead of individual NEB quantification
- Most common NEBs quantified are water, other fuel savings, reduced O&M costs, job creation
- Massachusetts most comprehensive. Many NEBs types monetised, including health, comfort, and safety.

Source: Adapted from, Katherine Johnson, Johnson Consulting Group, Independent Evaluation Monitor. Summary of the Discussion Non-Energy Benefits Among the Parties Working Collaboratively. Prepared for: Parties Working Collaboratively on Behalf of the Arkansas Public Service Commission. 26, February 2015.

# Long-term EE Supply Curves for Illustrative Electric Service Area, 2012 v. 2015



# The Big Squeeze

- Many EE programs administrators (PAs) in jurisdictions with mature EE markets are feeling squeezed between high performance targets, more efficient baselines, and restrictive cost-effectiveness tests.
- This is forcing PAs and regulators to rethink EE program regulation, design, B/C testing, and evaluation.
  - Less Planning & Implementation Flexibility            More Planning & Implementation Flexibility
  - Deemed Savings            Metered Savings
  - Average Pricing            Marginal Pricing
  - Minimal NEBs Accounting            Maximum (Reasonable) NEBs Accounting

- Study of the non-energy impacts (NEIs) of small residential EE
- **The major goal of this project** is to assist NYSERDA in collecting NEI data to monetise the value of NEIs for use in future decision making and cost-effectiveness testing
- **Secondary Research Task.** Monetise NEIs for important measures
  - 84 published papers on NEIs reviewed
  - Tool developed to adjust 303 measure-level NEI values to New York
- **Primary Research Task.** Prioritize measures for primary research; specify research methods for most important measures.

# NEI Types Studied

## A. Durability and Maintenance

1. Properly Installed Equipment
2. HVAC Equipment and Distribution
3. Water and Humidity Management
4. Appliances
5. Lighting
6. General

## B. Health and Comfort

7. Building Thermal/Pressure Envelope
8. Air Quality
9. Lighting
10. Increased Habitable Space
11. Reduced Risk of Shutting off Services
12. Lower Monthly Bills
13. General

## C. Improved Safety (Imminent Dangers)

14. Ambient Air Carbon Monoxide Levels
15. Gas Leaks/Fires
16. Radon
17. Detectors, Ventilation, Air Sealing
18. Lighting
19. General

## D. Environmental, Societal, and Government Impacts

20. Recycling and Proper Disposal
21. Infill over Greenfield Building
22. Appliance Recycling
23. Reduced Mobility
24. General

# Descriptions of Individual NEIs Studied – Durability & Maintenance Category



- **Appliance NEIs**
  - Low Income Window AC Retrofit
  - Non-Energy O&M savings for Estar clothes washer
  - Non-Energy O&M savings for Dishwasher Electric DHW and Gas DHW
  - Increased Value of Property
  - Reduced Drying time
  - Reduced wear and tear of clothes
  - Room AC early retirement; NPV of deferred replacement costs



# Descriptions of Individual NEIs Studied – Durability & Maintenance Category, cont.



- **HVAC Equipment and Distribution**
  - Equipment Maintenance - Residential Cooling and Heating
  - Equipment Maintenance - Residential Heating and Hot Water
  - Existing Home: Provide Quality Installation of new AC in existing home - 3 Ton unit
  - Distribution improvements
  - Home Durability - Residential Cooling and Heating Equipment
  - Home Durability and Equipment Maintenance
  - Increased Value of Property and Ease of Selling Home
  - Increased Value of Property - Residential Cooling and Heating Equipment
- **Properly Installed Equipment**
  - Non-Energy O&M savings of Quality Installation of new AC in existing home - 3 Ton unit
  - Home built following best practices in installation such that the heating and cooling and structural materials are less prone to failure and may exceed their expected lifetimes.

# Descriptions of Individual NEIs Studied – Durability & Maintenance Category, cont.



- **Lighting**

- Exterior Hardwired Compact Fluorescent Lamp (CFL) Fixture; Lumens  $\geq$  310 and  $\leq$  2600 (EISA compliant)
- Lighting lifetime and maintenance reduction
- Lighting Quality and Lifetime - Per bulb
- Lighting Quality and Lifetime - Per Fixture
- NPV of replacing an incandescent downlight lamp with a Solid State Lighting (LED) Recessed Downlight lamp (i.e. time of sale).
- NPV of replacing CFL bulb
- NPV of replacing CFL fixture
- NPV of replacing LED
- One time O&M Benefit Indoor and Outdoor hardwired fixture
- One time O&M benefit per bulb: General Service CFL bulb
- One time O&M benefit per bulb: LED Directional/Downlight
- One time O&M benefit per bulb: LED Non-General & General Service bulb
- One time O&M benefit per bulb: Non-General Service CFL bulb

# Descriptions of Individual NEIs Studied – Durability & Maintenance Category, cont.



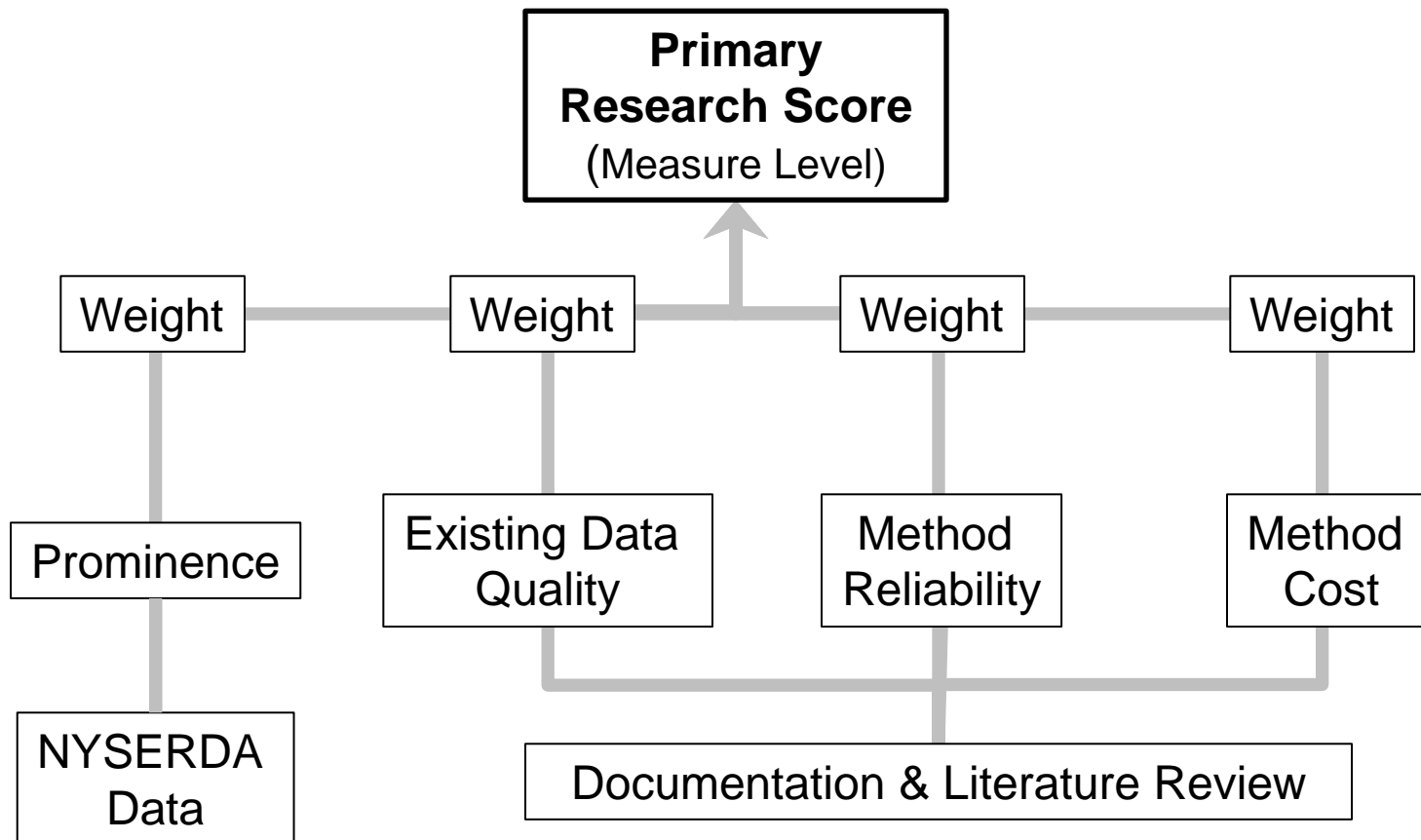
- **General**
  - Overall Improvements in Durability and Maintenance
  - Property value benefits
  - Increased ease of selling
- **Water and Humidity Management**
  - Reduced healthcare costs associated with asthma

# Secondary Research, Illustrative Results for Highest Prominence Measures in Home EE Retrofit Program



Measure Name	NEI (1-Year)	Measure Useful Life	Projected 2014 Measure Count	NYSERDA Program NEI (1-Year)	NYSERDA Program NEI (Lifetime)	Lifetime Prominence	
						Ratio	Score
Insulation	\$14.39	30	11,333	\$163,058	\$4,891,747	50.2%	5
Boiler	\$109.01	25	799	\$87,128	\$2,178,207	22.4%	5
Furnace	\$130.62	20	461	\$60,279	\$1,205,586	12.4%	5
Air Sealing	\$16.99	15	3,302	\$56,102	\$841,529	8.6%	4
CFLs	\$2.62	6	10,561	\$27,658	\$165,946	1.7%	4
Hot Water System	\$42.56	10	422	\$17,961	\$179,607	1.8%	4
Central AC	\$21.87	15	323	\$7,070	\$106,057	1.1%	4

# NEI Measure Database (Primary Research)



# Primary Research Methods Evaluated

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- 1. Direct Calculation and Analysis.** Examples methods include building simulation and pre/post testing (performance data)
- 2. Collected Data Analysis.** Examples include existing government, industry, and historical data
- 3. Created Records.** Examples include case studies and reporting
- 4. Observations.** Examples include direct observation and participant observation
- 5. Interviews.** Examples include structured interviews, open-ended interviews, in-depth interviews, key information interviews, and focus group/panel of experts interviews
- 6. Surveys.** Examples include contingent valuation (Willingness To Pay) and conjoint analyses

# Primary Research Method Papers for Most Prominent Measures

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- Measure description and identified NEIs
- Specification of most cost-effective and reliable primary research methods, including:
  - Approach
  - Benefits
  - Analyses
  - Concerns
  - Cost range (measure total)

