



WHEN TRUST MATTERS

The Price Is Right

A Multi-Modal Approach to Researching Incremental Measure Costs

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Why care about incremental measure costs?

- Cost effectiveness testing
- Regulatory filings
- Integration with savings estimates (TRM)
- Establishing incentive levels
- Estimating economic potential and setting goals

The problem:

- Sources that appear to cite recent research are actually based on primary research 10+ years old!
- Potential studies
- Incremental measure cost databases
- Technical reference manuals
- Evaluation reports and IMC studies
- Benefit-cost ratio models
- Papers



1. Most recent source



2. Source cited by most recent source

3. Primary research that hasn't been updated in a decade

Use multiple methods to triangulate costs

Data source	Baseline		Efficient	
	Equipment cost	Labor cost	Equipment cost	Labor cost
Program tracking data			X	X
Market actor interviews	X	X	X	
Web scraping	X		X	
Distributor price lists	X		X	

Also used secondary research such as with RSMeans, TRMS or cost databases, and more recent cost research studies.

Challenges

- Equipment and labor costs not distinguishable
- Lack of additional variables to isolate costs by efficiency and capacity
- Program data uses deemed costs

Solutions

- Request equipment and labor costs separately
- Apply percent labor costs from market actor interviews
- Request variables relating to capacity, quantity, efficiency, date, model numbers
- Supplement with AI
- Check for cost correlation with capacity

Challenges

- Non-response
- Lack of comparable cost values across respondents
- Complicated pricing schemes for C&I equipment

Solutions

- Flexible scheduling, experienced interviewers, incentives, demonstrate legitimacy and value
- Get costs for specific scenarios and a range of capacities and efficiencies
- Hire contractors as subcontractors to deep dives into their distributor portals with you

Challenges

- Differences in names representing the same variable from the same source
- Does not include equipment markup
- AI tool falters if too broad a prompt is used

Solutions

- Carefully examine sources before setting up AI tool and clean initial batch of data
- Mark-up equipment based on results from market actor interviews
- Develop empty table with specified columns and specify source for data.

Challenges

- Distributors hesitant or prohibited from sharing pricing information.
- Unique systems throw off costs

Solutions

- Make the request using a trusted relationship from the distributor, ensure confidentiality and that prices will be aggregated
- Conduct outlier analysis
- Examine models to see if they have any differentiating features necessitating their exclusion.

Analysis methods

- Remove outliers
- Examine costs multiple ways:
 - Hedonic price modelling to isolate cost impacts attributable to changes in efficiency
 - Matched-pair analysis provides incremental costs across manufacturers or other sellers
 - Simple averages are useful for technologies with few non-efficiency attributes or data collection that resulted in limited additional attributes (e.g., IDIs)
- Adjust for inflation of equipment and labor separately using U.S. Bureau of Labor Statistics
- Apply a discount rate for use in the early replacement scenario

Triangulating costs

- Weight available sources based on the following logic:
 - Greater weight given to sources with credible data for both baseline and efficient scenarios
 - Greater weight given to sources with large sample counts
 - Greater weight given based on applicability to the New Jersey market

Key Findings

- **Equipment costs are highly dependent on capacity, with larger systems costing more.**
- **For most equipment types, labor costs do not vary by efficiency level.**
- **Program tracking data records often could not be used for incremental measure cost analysis.**
- **Small commercial HVAC systems have similar costs to residential HVAC systems.**
- **Pricing data for large commercial systems is not as freely available online or in program tracking data as it is for residential-duty systems.**

Example IMC Findings (Mini-split heat pump)

#	Fuel Switch Type	Baseline case	Efficient Case	Equipment IMC	Labor IMC
5	Full	Boiler and room air conditioners (80 AFUE & 8.6 EER2)	Mini Split Heat Pump Tier 1 (17.2 SEER2 11.7 EER2 8.5 HSPF2)	\$1,987.70/ton	\$1,291.13/ton
6	Full	Boiler and room air conditioners (80 AFUE & 8.6 EER2)	Mini Split Heat Pump Tier 2 (19.3 SEER2 11.7 EER2 10.8 HSPF2)	\$2,193.25/ton	\$1,291.13/ton
7	Partial	One third of labor costs for boiler + full boiler equipment and labor costs for future replacement + room air conditioner costs (80 AFUE & 8.6 EER)	Mini Split Heat Pump Tier 1 (17.2 SEER2 11.7 EER2 8.5 HSPF2)	\$2,095.21/ton	\$1,301.38/ton
8	Partial	One third of labor costs for boiler + full boiler equipment and labor costs for future replacement + room air conditioner costs (80 AFUE & 8.6 EER)	Mini Split Heat Pump Tier 2 (19.3 SEER2 11.7 EER2 10.8 HSPF2)	\$2,300.76/ton	\$1,301.38/ton

Example IMC Findings (Heat Pump Water Heaters)

#	Fuel Switch Type	Baseline case	Efficient Case	Equipment IMC	Labor IMC
1	Full	Gas storage water heater (UEF < 0.64, gallons <=55, atmospherically vented)	Heat pump water heater (gallons <=55, UEF>=3.3, 240V)	\$33.35/gal	\$596.25/unit
2	Full	Gas storage water heater (UEF < 0.78, gallons > 55, atmospherically vented)	Heat pump water heater (gallons > 55, UEF>=3.3, 240V)	\$23.48/gal	\$596.25/unit

Example IMC Findings (Ducted ASHPs)

#	Fuel Switch Type	Baseline case	Efficient Case	Equipment IMC	Labor IMC
3	Full	Central Air Conditioner (13.4 <= SEER2 < 15.3) + Furnace (AFUE < 95)	Air Source Heat Pump Tier 1 (15.3 SEER2 12.4 EER HSPF2 8.5)	\$1,226.22/ton	\$349.62/ton
4	Full	Central Air Conditioner (13.4 <= SEER2 < 15.3) + Furnace (AFUE < 95)	Air Source Heat Pump Tier 2 (17.2 SEER2 12.4 EER HSPF2 8.5)	\$1,807.75/ton	\$349.62/ton

Lessons Learned

- **Web scraping is the lowest-cost and most comprehensive method of data collection and works particularly well for residential measures.**
- **Program tracking data had limited usefulness.**
- **Distributors and manufacturers are reluctant to provide distributor price lists.**
- **Funneling a concentrated incentive to a small number of contractors is an effective way to gather data for commercial measures.**
- **Interviews with commercial installers should ask about specific prototype installations.**

Thank you

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