R1606 Behavior Program Persistence

Lisa Wilson-Wright and Chris Russell

September 2017

NMR Group, Inc.

- Definitions & Descriptions
- Objectives
- Key Findings
- Questions

What Do We Mean by ...

- Persistence: Two uses in the literature
  - Constancy: Savings remain high with repeated treatment
  - Retention: Households continue to exhibit savings post-treatment
- Degradation: % reduction in savings post-treatment
- Ramp-up: % increase in savings with repeated treatment
- Measure life: Years of statistically significant savings (treatment and post-treatment)

Program History - Yes, It is Confusing

	Treatment Group	2011	2012	2013	2014	2015	2016
Pilot Program	High-use Discontinued	Treatment	Persistence				
	High-use Continued	Treatment					
	Average-use Continued		Treatment				
Full Program	Mixed high-use average-use				Treatment		
	HES and HES-IE participants				Treatment		

Even More Confusing - Pilot Design

			2011				2012			...	2016
	Use Level	Frequency	Q1	Q2	Q3	Q4	Q1	Q2	Q3		Q4
Discontinued	High	Quarterly	Treatment				Persistence				
Discontinued	High	Monthly	Treatment				Persistence				
Discontinued	High	Monthly***	Treatment				Persistence				
Continued	High	Monthly	Treatment						Treatment		
Continued	Average	Monthly							Treatment		

*** Known as the persistence group (because goal was to study persistence with curtailed treatment)

Three Prior Studies of HERs Documented

- Treatment savings for all pilot groups
- Persistence savings for at least two years after treatment
- Highest cost effectiveness for high-users, persistence
- Cycling cohorts can maximize savings and cost effectiveness

Objectives

- Persistence: Determine how long / much savings persisted among former treatment groups
- Cost-effectiveness: Examine how persistence savings impact the cost-effectiveness ratio
- Program Delivery: Utilize estimated savings and cost-effectiveness to explore savings potential of multiple program delivery scenarios

Persistence Remains Unknown For

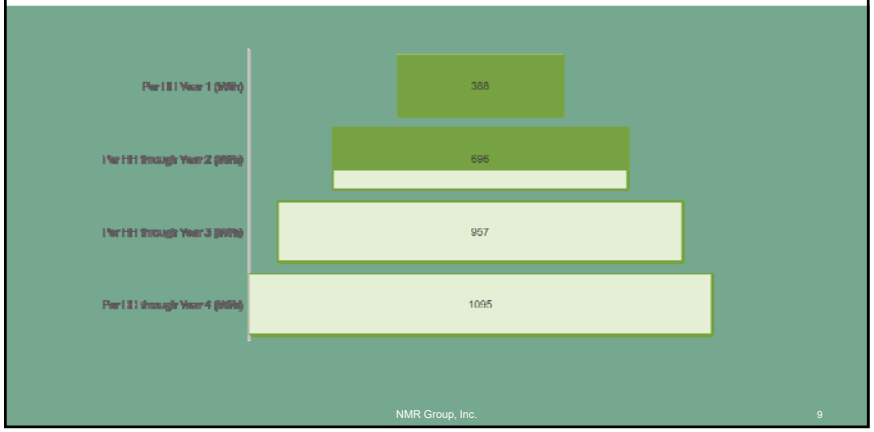
Average-use Households

Long-term Treatment Households
(average- and high-use)

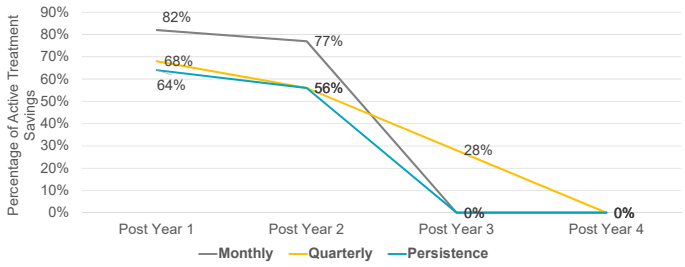
Persistence

- Treatment households saved energy for up to four years
  - Treatment plus post-treatment
  - Persistence varied by treatment sub-group
- Average lifetime measure of 3.3 years

Program Savings for All Discontinued Households in kWh



Percentage of active treatment savings retained post treatment



- Higher frequency treatment retained a greater percentage of savings post-treatment
- Longer treatment period resulted in longer persistence

Average Yearly Degradation

Degradation

- Degradation occurs between one year and the next
- Based on how long they actually saved
- Households who received reports monthly showed the lowest degradation

Degradation by Discontinued Group	Average Yearly
Monthly	12%
Quarterly	28%
Persistence	25%
Overall	16%

What About Continual Treatment?

Ramp Up

- Both high- and average-users ramped up
- Ramp-up tapers off after Year 3
- Decrease in Year 2 for high-use reflects hiatus in report delivery

Continued Group Ramp-up (relative to first-year savings)		
Yrs of Treatment	High-use	Average-use
1	First Year	First Year
2	-16%	26%
3	13%	73%
4	8%	22%
5	2%	N/A
Average	2%	40%
w/o Hiatus	8%	N/A

Program Effective Useful Life

Post-treatment Persistence for Discontinued Groups

Group (Sample Size)	Report frequency	Treatment Months	EUL based on modeled statistically significant savings	Implied lifetime multiplier
Monthly (1,507)	Monthly 1/11-4/12	16 reports, 16 months	2	2.28
Quarterly (9,374)	Quarterly 1/11-4/12	~5 reports, 16 months	2.5	3.8
Persistence (3,796)	Monthly 1/11-8/11	8 reports, 8 months	2.1	2.7
Overall Discontinued (14,733)	varies	varies	2.7	3.3

Cost-effectiveness Improved By

- Sending reports to high users
- Accounting for savings persistence
- Ramping up with continual treatment

Cost-effectiveness: $ per kWh

Expenditure-to-savings ratio

- Program budget by kWh saved
- Lower ratio = higher CE
- Three sub groups
  - High-use discontinued
  - High-use continued
  - Average-use continued
- CE best for high-use discontinued: persistence

Cumulative Expenditure-to-savings ratio by year			
	High Use Discontinued	High Use Continued	Average Use Continued
Year 1	$0.02	$0.02	$0.15
Year 2	$0.01	$0.03	$0.14
Year 3	$0.01	$0.03	$0.12
Year 4	$0.01	$0.03	$0.12
Year 5	No savings	$0.03	Treated 4 years to date

Program Delivery: Cycling Cohorts

- Cycling (aka crop rotation) involves sending reports to alternating groups of households
- Cycling can maximize savings and cost effectiveness
- One year with reports, three years off showed best balance of savings and cost-effectiveness

Example

Group 1	Group 2	Group 3
Treatment	Not in study	Not in study
Persistence	Treatment	Not in study
Persistence	Persistence	Treatment
Treatment	Persistence	Persistence
Persistence	Treatment	Persistence

Cycling Benefits vs Cycling Drawbacks

- Reach more households
- Improve cost effectiveness
- Maintain / increase savings

- Works best for high-users
- Increases implementer cost
- Interrupts treatment

Program Delivery Scenario Across Five Years		Accumulated Five-Year Savings (kWh)	Accumulated Five-Year Costs	Cost Effective-ness	Percent Greater Savings from Cycling	Percent Improvement in Cost-effectiveness
High-Use Households, Single Year with Reports, Three Years No Reports	Cycling	3,981	$50.00	$0.013	80%	115%
	Continual	2,214	$62.50	$0.028		
High-Use Households, Two Years with Reports, Three Years No Reports	Cycling	3,521	$62.50	$0.018	55%	50%
	Continual	2,274	$62.50	$0.027		
Average-Use Households, Single Year with Reports, Three Years No Reports	Cycling	738	$50.00	$0.068	38%	72%
	Continual	535	$62.50	$0.117		
Average-Use Households, Two Years with Reports, Three Years No Reports	Cycling	805	$62.50	$0.078	-9%	-10%
	Continual	887	$62.50	$0.070		

Delivery Scenarios

Cycling high-use households is always more cost-effective than continually treating them.

Recommendations

1. Conduct a more detailed cost-effectiveness analysis of cycling
2. Track savings persistence and degradation for any pilot group households that received reports for multiple years
3. Experiment with cycling among the large current treatment group
4. Integrate cycling into revised program design (pending results of deeper cost-effectiveness test)