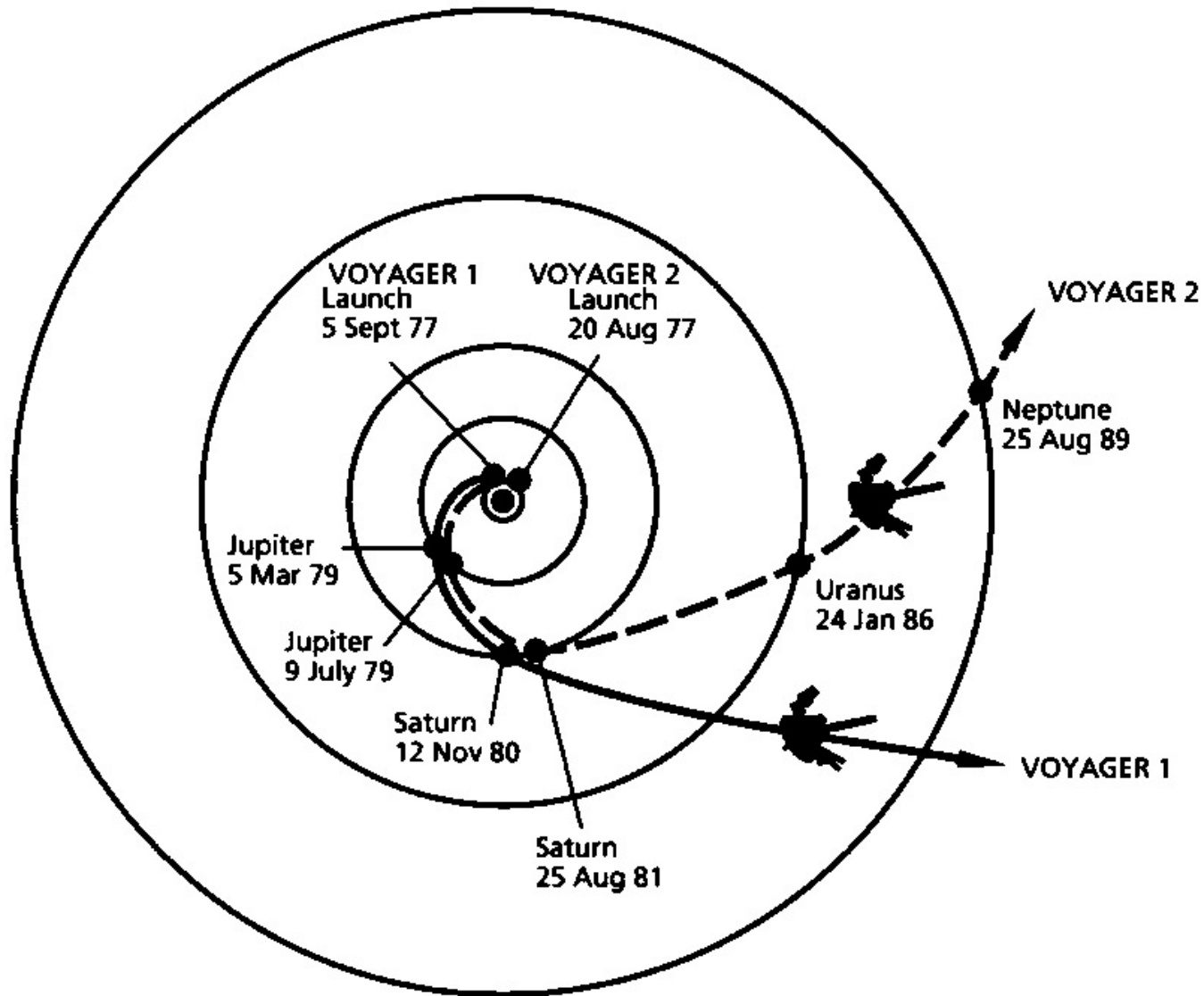




## Highlights from Recent SEM Research: What Have We Learned About **Persistence**?

# The Research Journey





# The Research Journey

## 2014 Workshops

How to evaluate SEM?

### SEM Evaluation

Let's test out our idea!

## 2017-2018 Process Evaluation

We've got some assumptions we want to test using data about SEM's impact on capital projects, and the relationship of SEM and FR

### O&M Persistence Study, Part I

We're seeing O&M and SEM measures persist – are we using the right measure life?

**O&M  
Persistence  
Study, Part II**  
... so we'll have to do primary research

Not a lot of primary research exists . . .

### Impact Evaluations

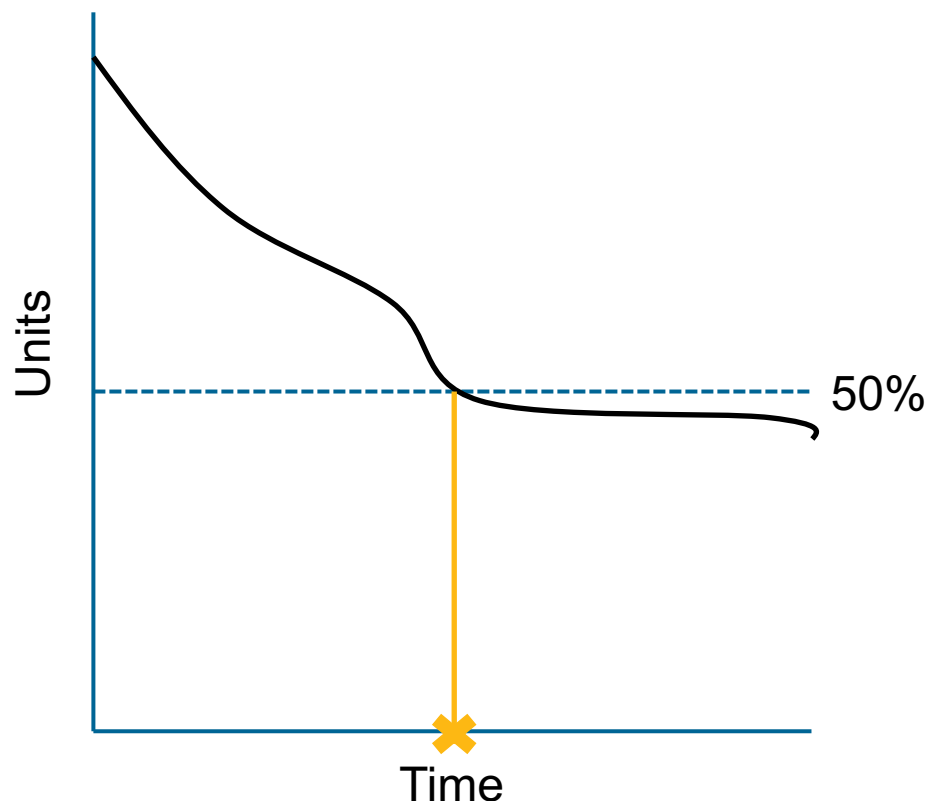
That didn't work like we thought it would; let's adapt

# Drivers for this study

- Three-year measure life used for standalone O&M and first-year SEM was our best guess
- A PSE ISOP evaluation, Energy Trust's SEM evaluation, and a literature review of O&M measure life all lent support to a measure life of not less than three years
- Literature review revealed very little published research; decided to undertake primary research in the form of a persistence study

# What do we mean by persistence study?

- **Measure life** = time at which half the units of the measures installed are **not** retained



# Study goals

- Estimate the long-term persistence of industrial O&M measures
  - Reasons why O&M measures are no longer in place
- Assess the appropriateness of the three-year measure life that is currently used for standalone O&M and SEM
- Assess if measure persistence differs for standalone O&M measures versus SEM
- Provide recommendations for improving the persistence of industrial O&M measures

# Study focus: standalone O&M and SEM

## Standalone O&M

- Focused; system-based
- Bottom-up calcs

## SEM

- Holistic; facility-based
- Top-down calcs
- Includes O&M measures as well as other activities

- Sampled standalone O&M and SEM projects installed between 2010 and 2017, i.e., between two and eight years ago (as of 2019)
  - Some customers completed multiple projects, and/or completed both standalone O&M and SEM projects
- Assessing persistence through interviews and site visits, rather than using energy models

# Methods I

Created sample and reviewed project documentation to identify projects, measures, and activities

Developed interview guides

Classified all activities as one of the following categories, and determined which activities to ask about during the interviews – max of 5

Controls

Operations – setpoint adjustments

Repairs – leak detection

Operations - schedules

Repairs – new equipment

Maintenance

Behavior



# Methods II

Conducted interviews and/or site visits

Determined if activities (and associated savings) persisted, and if not, when they stopped persisting

- Completed interview
  - Continuing
  - End date
  - No end date
- Incomplete – facility closed
- Incomplete – change in ownership
- Incomplete – no response

Conducted survival analysis to estimate measure life



# Sampled projects

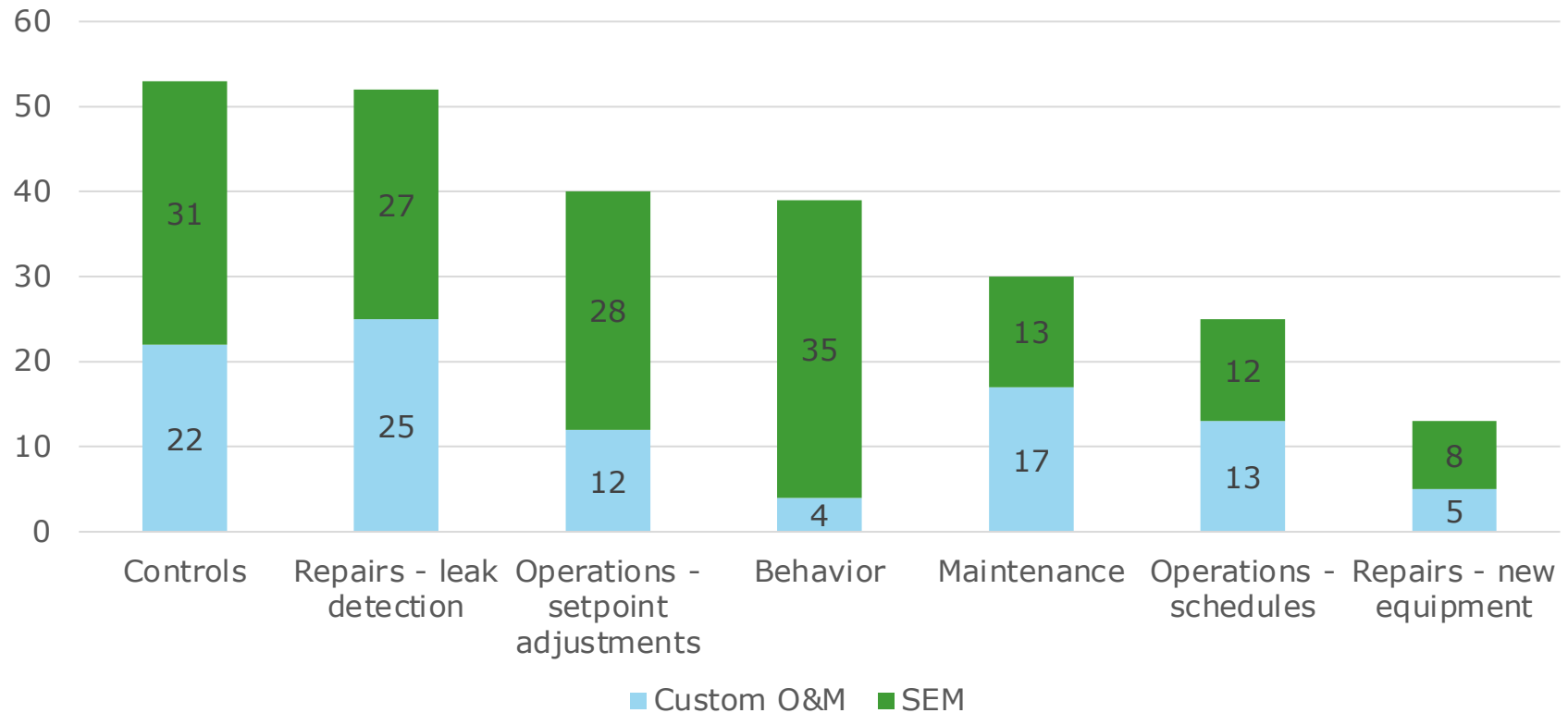
	Standalone O&M	SEM	Total
Population	326	202	528
Sample	63	57	120

	Standalone O&M	SEM	Total
Completed interview	52	49	101
Incomplete – facility closed	5	2	7
Incomplete – change in ownership	2	1	3
Incomplete – no response	4	5	9
Total	63	57	120

↓  
**98** activities

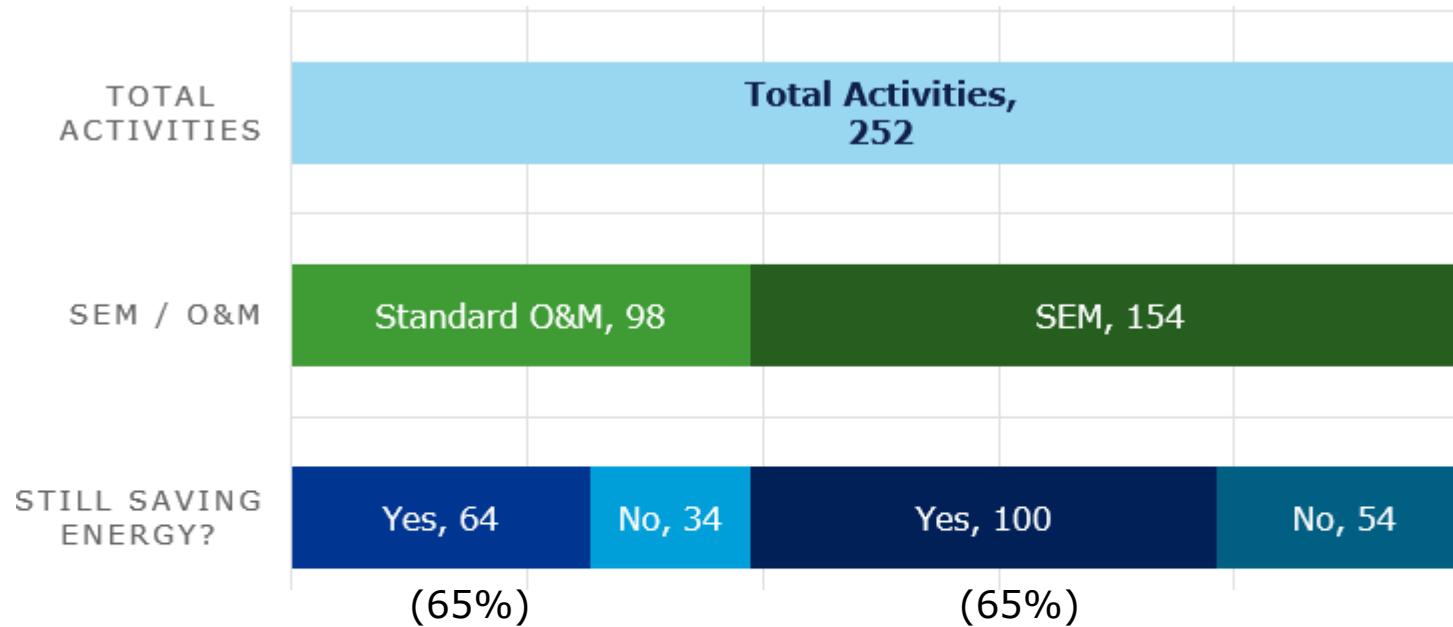
↓  
**154** activities

# Activities I



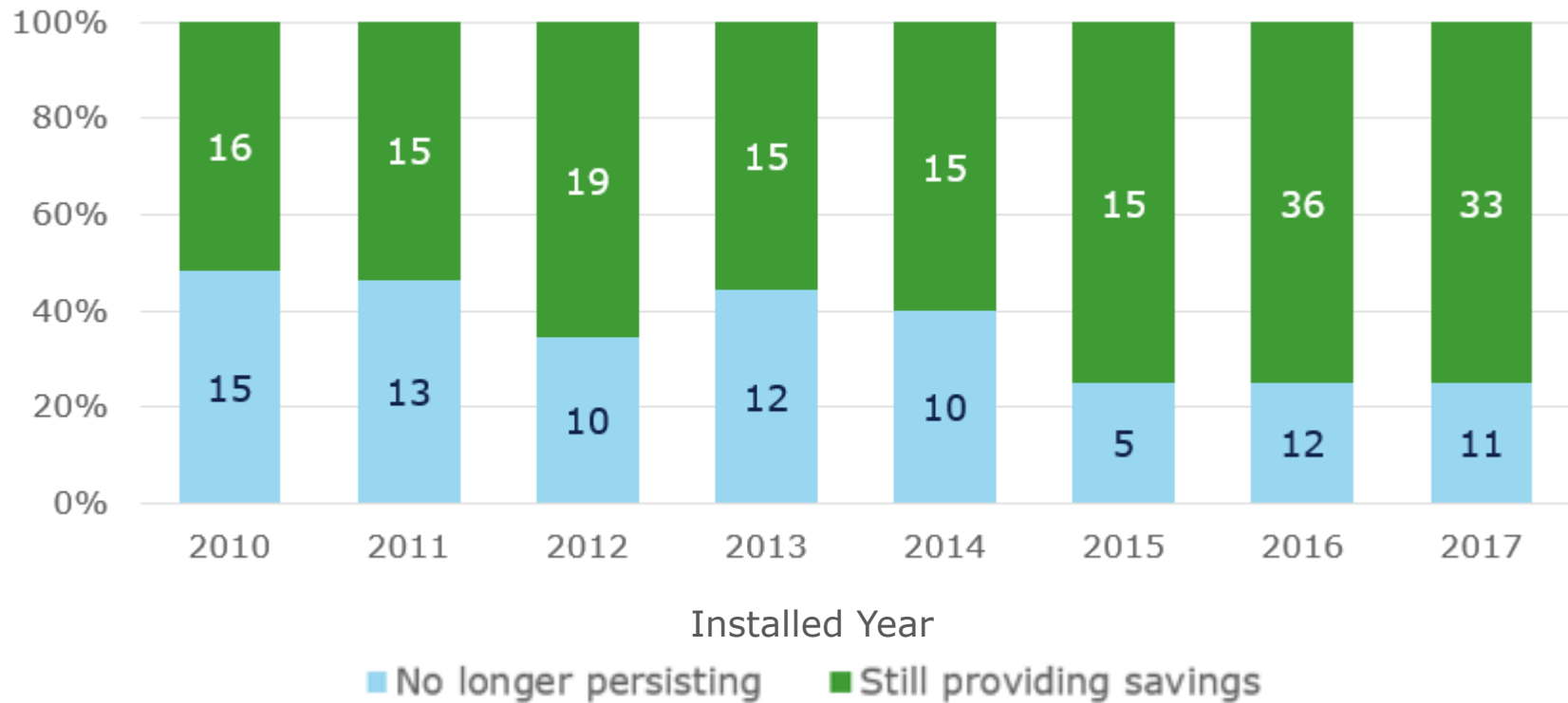


# Activities II



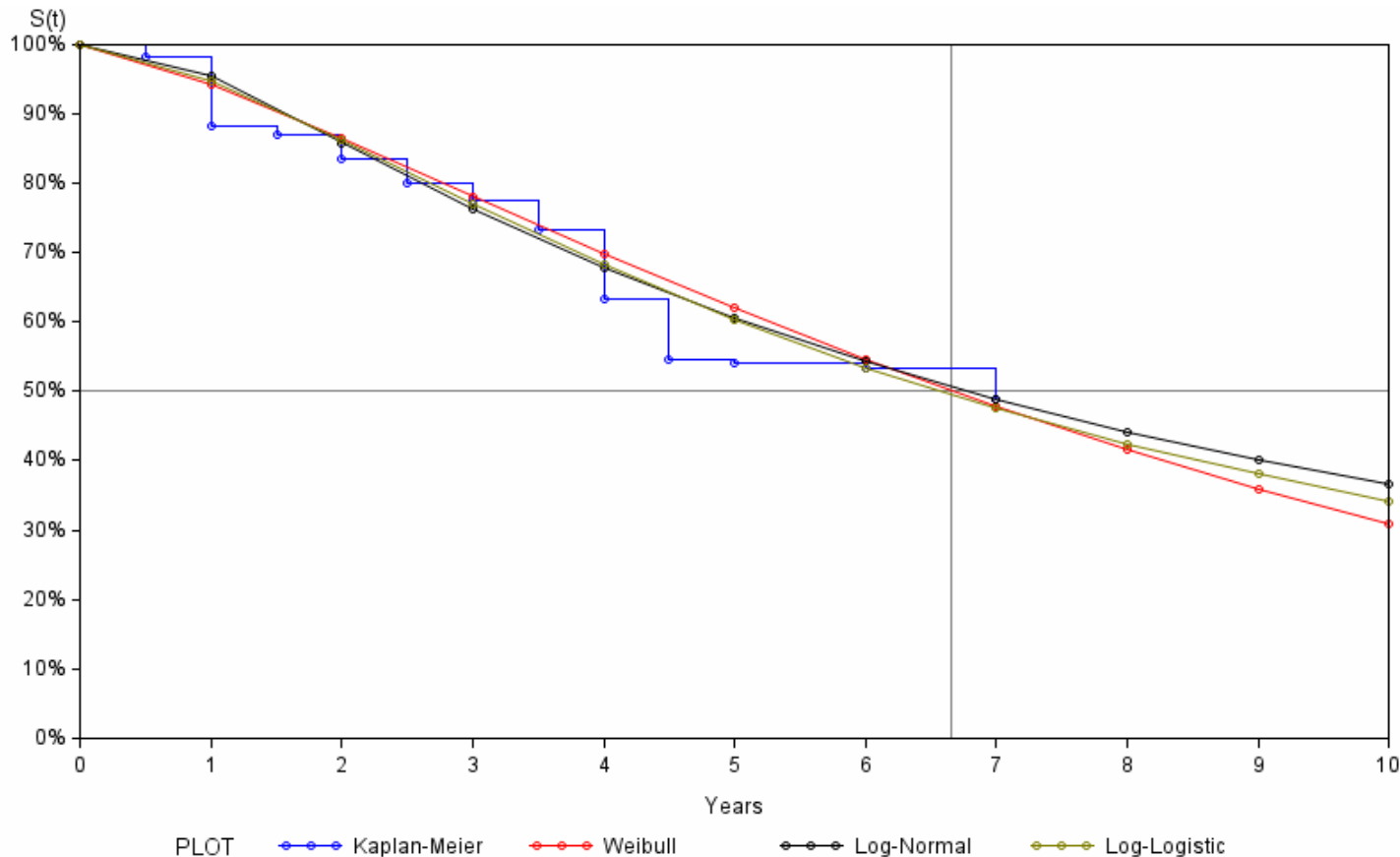


# Activities III



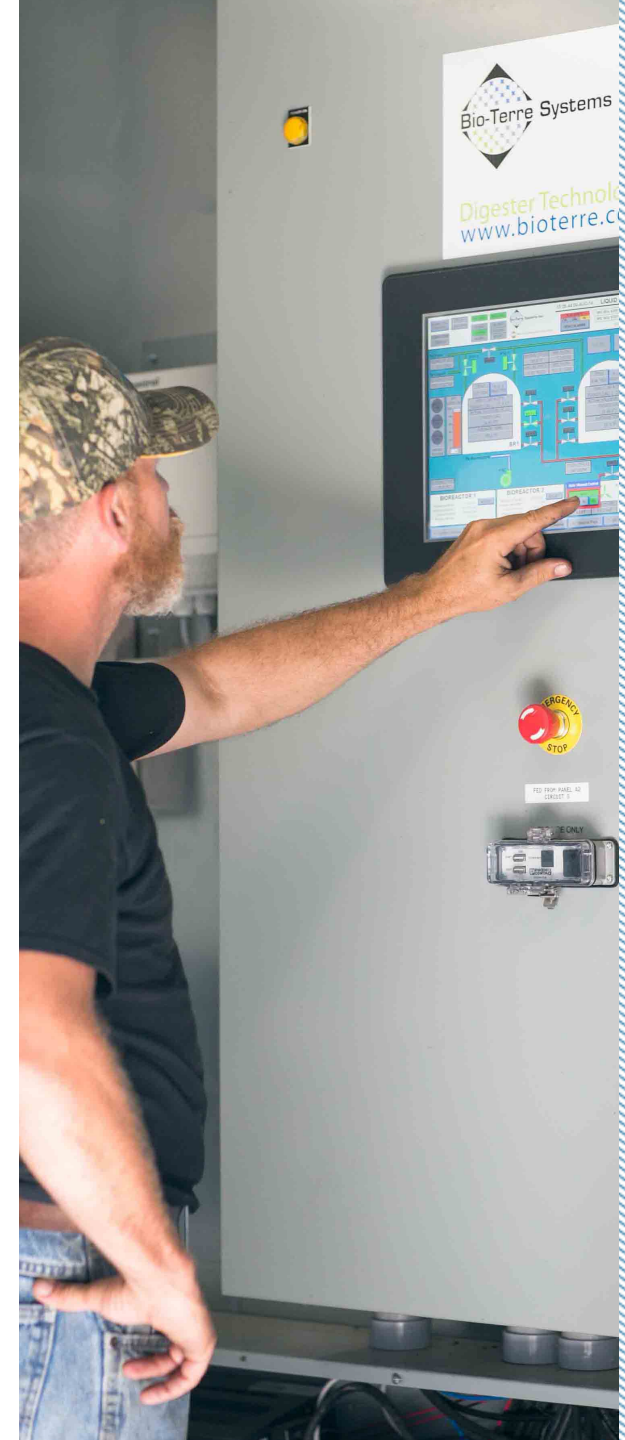
# Survival analysis

- Preferred approach of Kaplan-Meier + sample-weighted yields a measure life of **7 years**
- There is **no statistically significant difference in the survival curves for standalone O&M and SEM**

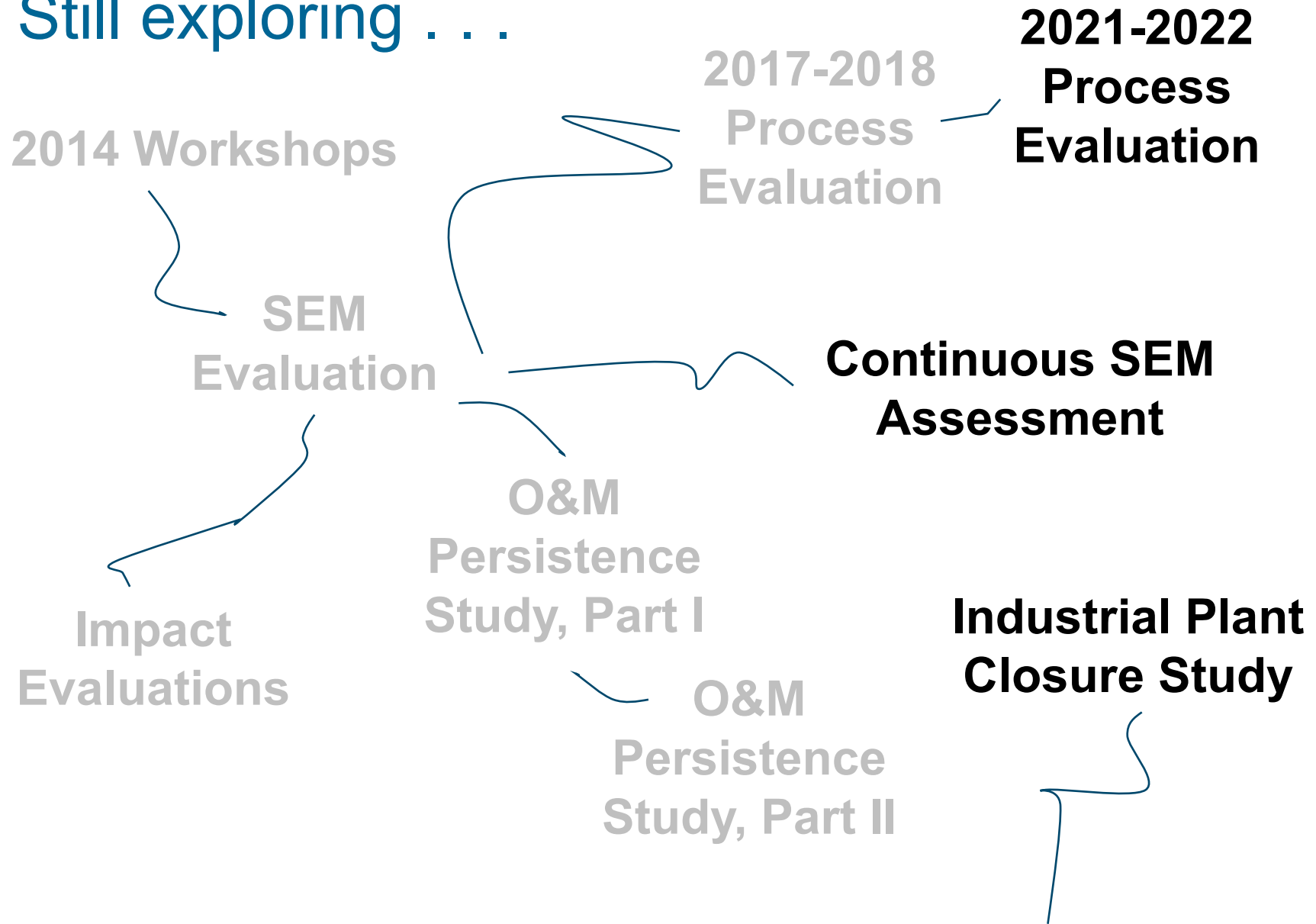


# What have we learned?

- This study, as well as other recent studies, provide support for using a seven-year measure life for standalone O&M and SEM
- Program's emphasis on strategies for long-term savings persistence is extremely valuable, and should continue



# Still exploring . . .





# Still exploring . . .



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# Thank You!

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