IEPEC International Energy Program Evaluation Conference

Disaggregation of End-Use Load from Whole House Interval Meter Data

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Introduction

- **Maximizing the potential of AMI data**
  - **Current hot-topic in the world of energy research**
  - **Going beyond DR and econometric analysis**

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Background

- **Gross impact evaluation for Sacramento Municipal Utility District (SMUD)**
- **2013-2015 Residential Pool/Spa Program**
  - **Rebate program for purchase and installation of VSD pool/spa pumps**
  - **Nameplate and operating schedules not reported for original equipment**

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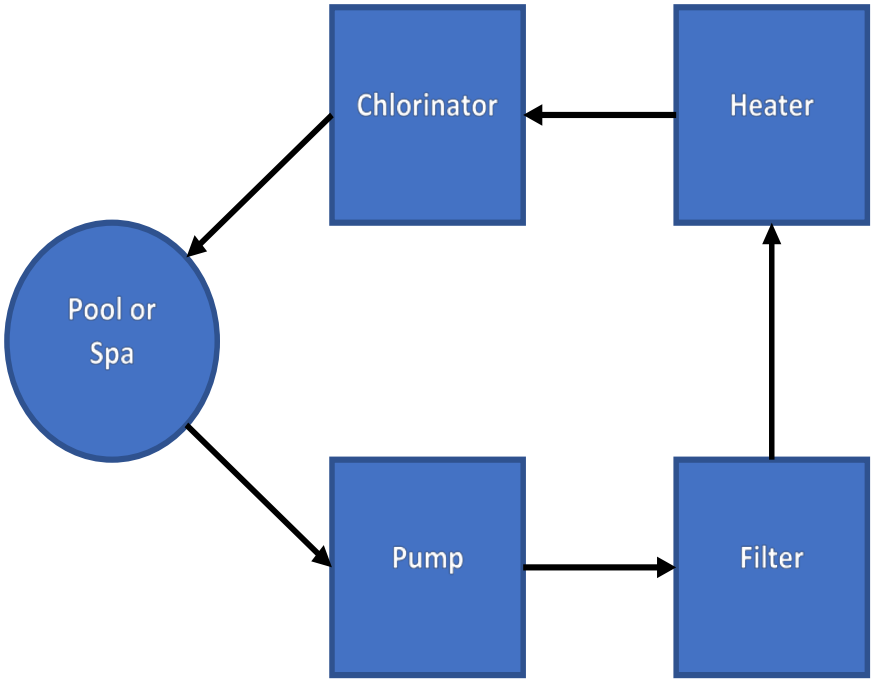
A Quick Background on Pool Pumps

- **The Pool Filtration Cycle**



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A Quick Background on Pool Pumps

- **Single-speed, two-speed, and VSD pumps**
  - **“Speed” refers to the RPM settings available on the pump**
  - **In a 2008 baseline study, more than 91% of participants in SMUD service territory had single-speed pool pumps**
  - **Single-speed load profiles are a function of geometry**

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Methodology

- **How would we typically evaluate a program like this?**
  - **Engineering approach**
  - **Econometric approach**

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Methodology: Engineering Approach

- **Pre-installation (Single-Speed)**
  - **Operating schedule and hourly kW extracted from AMI data**
- **Post-installation (VSD)**
  - **Operating schedule and hourly kW developed using on-site measurements**

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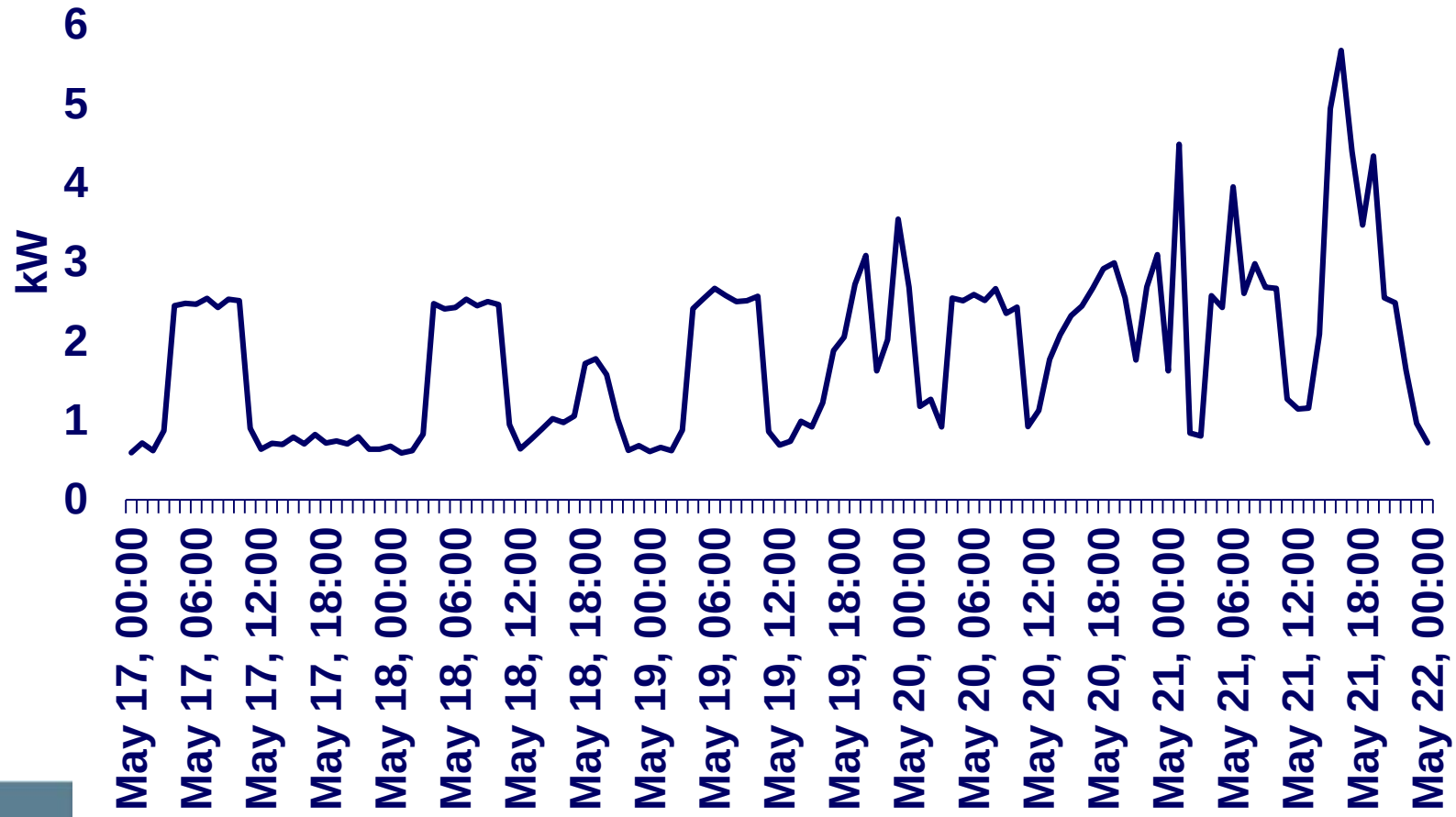
Methodology: Engineering Approach



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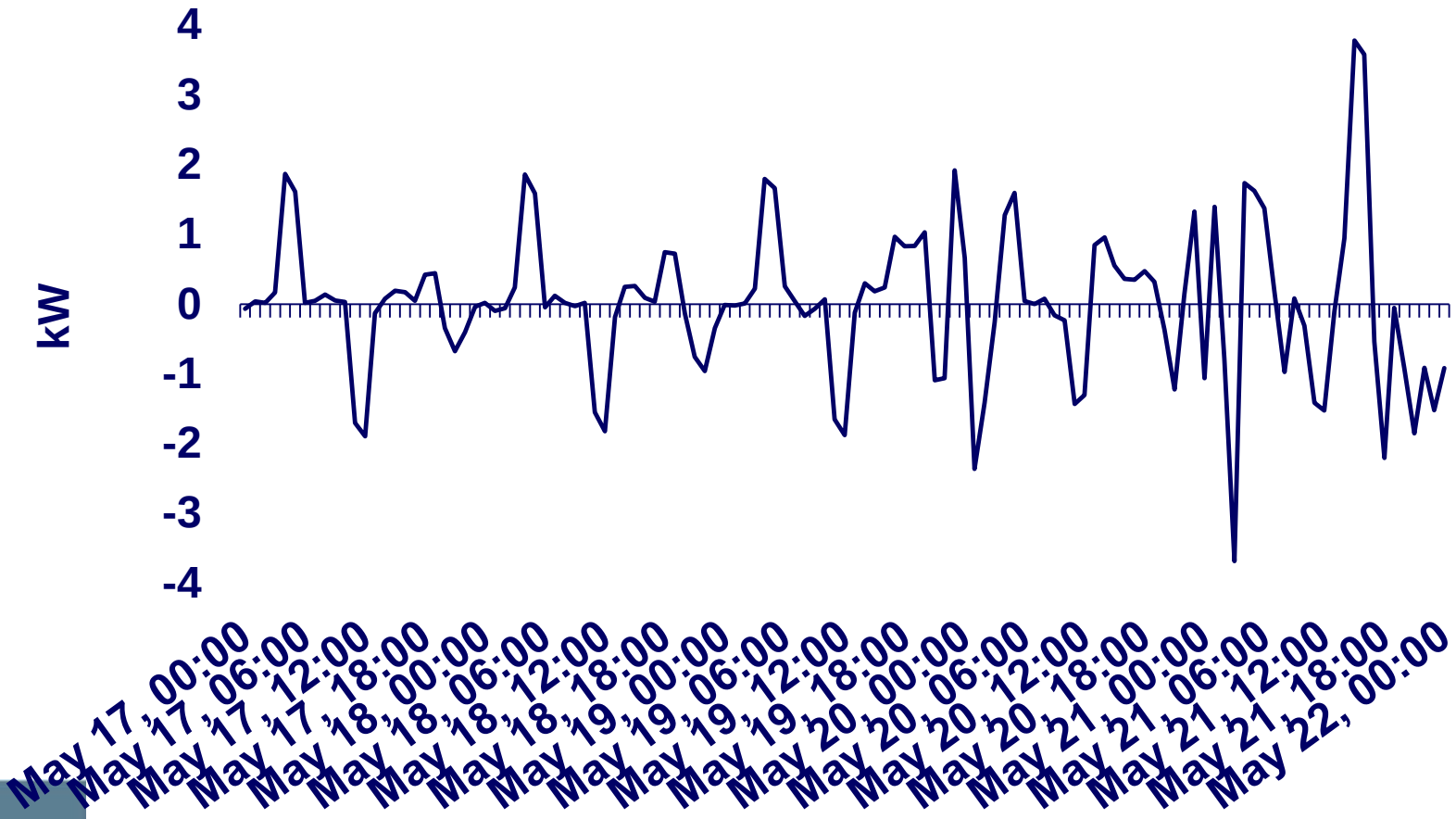
Methodology: Engineering Approach



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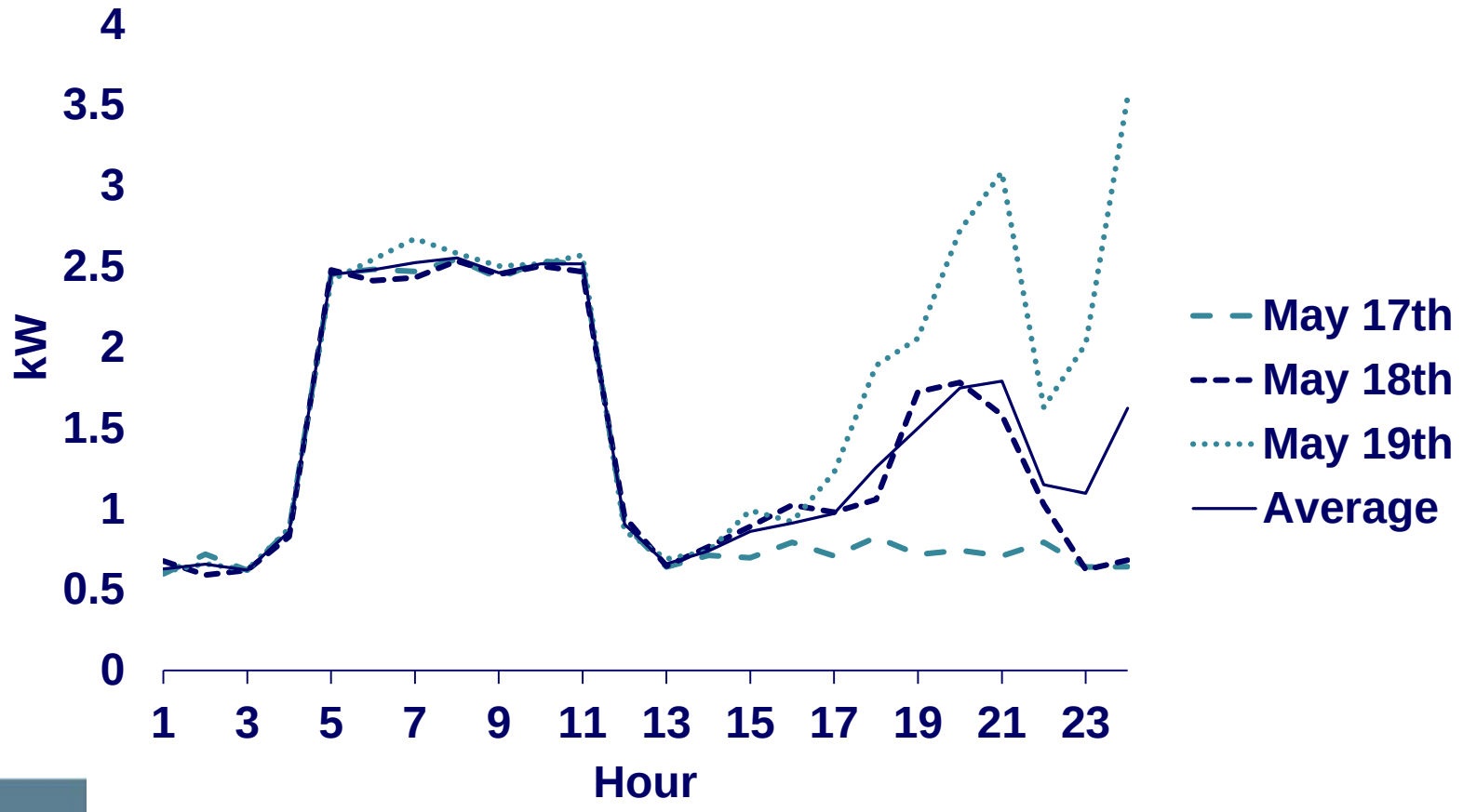
Methodology: Engineering Approach



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Methodology: Engineering Approach

- **Utilized the preceding logic to develop an automated process in R**
- **Designed to extract the profiles for the full population of homes (2,430)**
  - **Final comparison restricted to a sample of participants who received a site-visit for VSD verification (80 homes)**

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Methodology: Econometric Approach

- $AECit = \alpha_{ki} + \alpha_{02}POSTit + \alpha_{11}CDDit + \alpha_{12}CDDit * POSTit + \alpha_{21}HDDit + \alpha_{22}POST * HDDit + Eit$

- **Where:**
  - α_{ki} is the intercept.
  - α_{11}, α_{12}, α_{21} and α_{22} are coefficients that adjust for weather-sensitive usage,
  - And α_{02} represents hourly kW savings.

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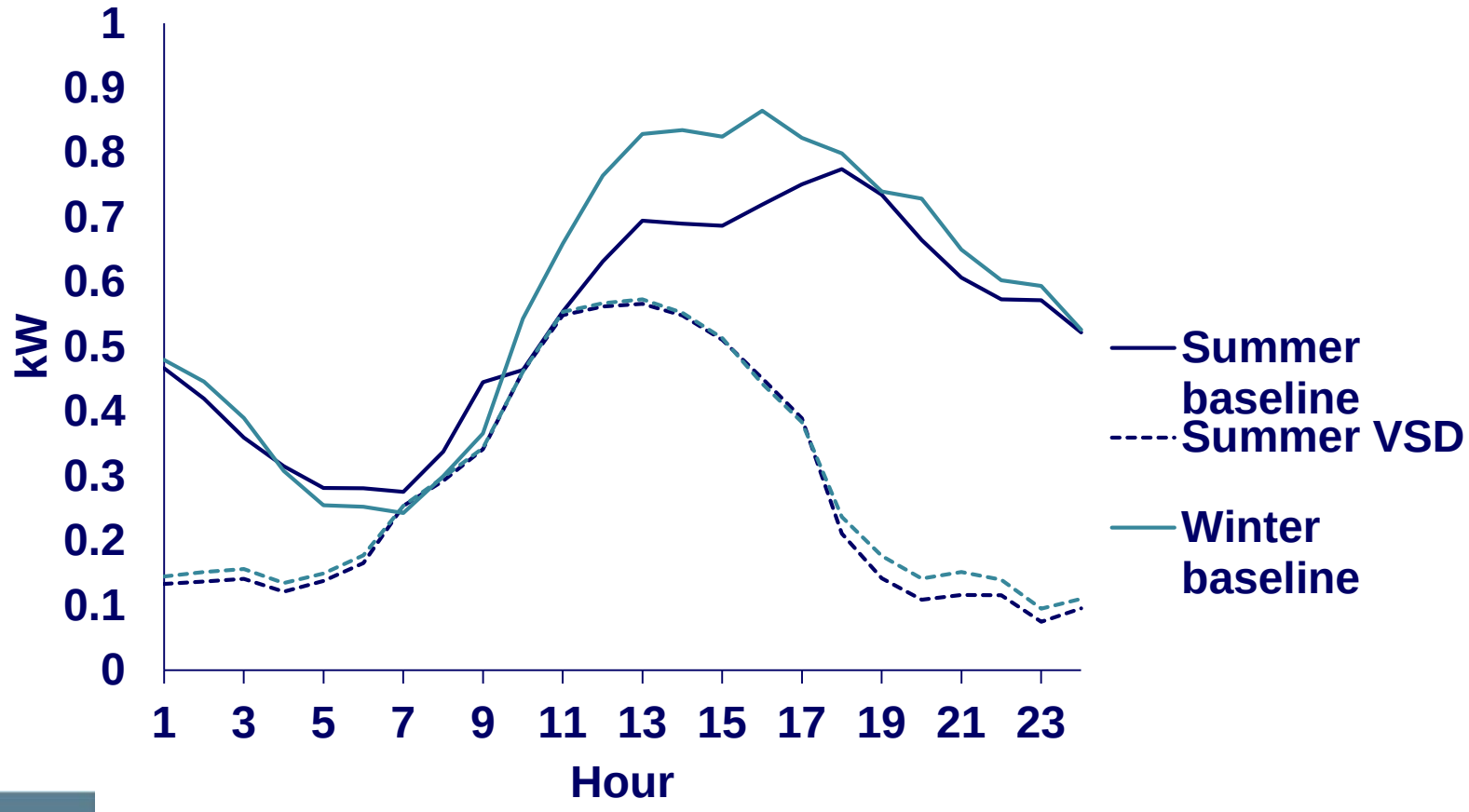
Results: Engineering Approach



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Results: Gross Impact Savings

Approach	kWh Savings	kW Savings
Engineering Approach	2,463	0.51
Econometric Approach	1,345	0.102

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Key Findings

- **Engineering approach with AMI-extracted baseline showed external validity compared to other sources**
- **Econometric approach showed savings suppression**

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What Does This Mean?

- **An approach for detecting fixed schedules in AMI data**
- **May be appropriate for projects with limited budget or timelines**
- **May provide greater accuracy than traditional methods**

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Important Caveats

- **Not appropriate for load profiles which change intensity over the course of the profile**
- **Relies on using the difference in kW between two intervals to identify the intensity of the load**

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Thank You

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