# Enhancing Energy Efficiency and Operational Excellence in K-12 Schools

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SC Tri Association of Facility Managers

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# Agenda

TYPES OF PROCUREMENT METHODS

FOCUSING ON ENERGY PERFORMANCE CONTRACT

MEASUREMENT AND VERIFICATION

BUILDING MANAGEMENT SYSTEM

ENERGY AND UTILITY MANAGEMENT

Q&A SESSIONS

WRAP UP

# Goals and Outcome

***Goal:***

- Understanding Energy Performance Contract as a Procurement Method
- Understanding of Measurement & Verification Concepts
- Key Considerations for Network Building Management System
- Energy and Utility Management as On-Going Strategies

***Outcome:***

Strategic Approaches to enhance energy efficiency and reduce Operational costs.

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# Types of Procurement Methods

**Table: Comparison of Capital Project Procurement Methods in K-12 Markets (Including EPCs)**

| Procurement Method | Pros | Cons |
|---|---|---|
| **Traditional (Design-Bid-Build)** | - **Cost**: Lower initial costs via competitive bidding.<br>- **Timeline**: Predictable.<br>- **Complexity**: Straightforward, familiar.<br>- **Energy Projects**: Good for simple projects (e.g., LEDs). | - **Cost**: Low-bid focus risks quality, higher long-term costs.<br>- **Timeline**: Slow due to sequential phases.<br>- **Complexity**: Multiple contracts add burden.<br>- **Energy Projects**: Not ideal for complex integration (e.g., BMS, solar). |
| **Design and Build (D&B)** | - **Cost**: Fewer cost overruns.<br>- **Timeline**: Faster via overlapping phases.<br>- **Complexity**: Simple, one contract.<br>- **Energy Projects**: Ideal for integrated projects (e.g., BMS, solar). | - **Cost**: Higher initial bids.<br>- **Timeline**: Limited stakeholder input.<br>- **Complexity**: Needs detailed specs upfront.<br>- **Energy Projects**: Risk of prioritizing cost over performance. |
| **Construction Management at Risk (CMAR)** | - **Cost**: Budget adherence via early estimates.<br>- **Timeline**: Faster via overlapping phases.<br>- **Complexity**: CM reduces district workload.<br>- **Energy Projects**: Good for collaborative projects (e.g., BMS). | - **Cost**: Higher costs due to contingencies, CM fees.<br>- **Timeline**: More upfront planning.<br>- **Complexity**: Requires oversight of CM.<br>- **Energy Projects**: Risk of cutting energy efficiency to meet budget. |

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# Types of Procurement Methods

| | | |
|---|---|---|
| **Public-Private Partnerships (PPP)** | - **Cost**: No upfront capital, ideal for tight budgets.<br>- **Timeline**: Fast delivery.<br>- **Complexity**: Private partner manages most aspects.<br>- **Energy Projects**: Ideal for performance projects (e.g., BMS, solar). | - **Cost**: Higher long-term costs due to financing, profits.<br>- **Timeline**: Delays from negotiations, approvals.<br>- **Complexity**: Requires legal/financial expertise.<br>- **Energy Projects**: Risk of short-term focus over long-term performance. |
| **Cooperative Purchasing** | - **Cost**: Savings via volume discounts.<br>- **Timeline**: Fast, pre-negotiated contracts.<br>- **Complexity**: Simple, low staff burden.<br>- **Energy Projects**: Good for standard equipment (e.g., LEDs). | - **Cost**: Limited flexibility for specialized solutions.<br>- **Timeline**: N/A (already fast).<br>- **Complexity**: Not suited for complex projects.<br>- **Energy Projects**: Less suitable for custom projects (e.g., solar, BMS). |
| **Energy Performance Contracts (EPCs)** | - **Cost**: No upfront cost; repaid via guaranteed energy savings.<br>- **Timeline**: Fast, as providers are incentivized to deliver quickly.<br>- **Complexity**: Provider manages design, construction, and performance, reducing district burden.<br>- **Energy Projects**: Ideal for comprehensive energy upgrades (e.g., BMS, solar, HVAC), with savings guaranteed. | - **Cost**: Long-term costs may exceed traditional methods if savings underperform.<br>- **Timeline**: Delays from contract negotiations, performance audits.<br>- **Complexity**: Requires expertise to negotiate performance guarantees.<br>- **Energy Projects**: Risk of overpromising savings, needing robust measurement and verification. |

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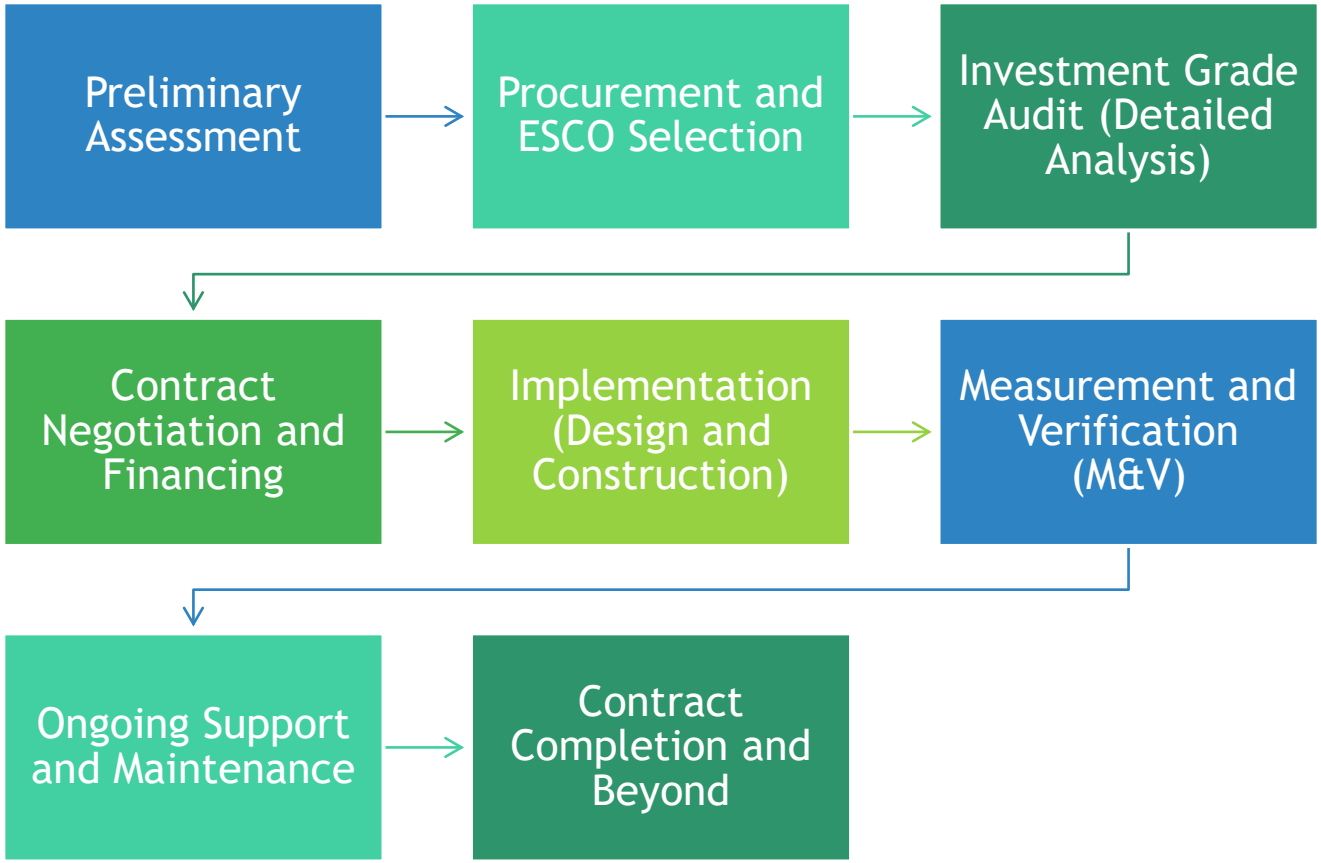
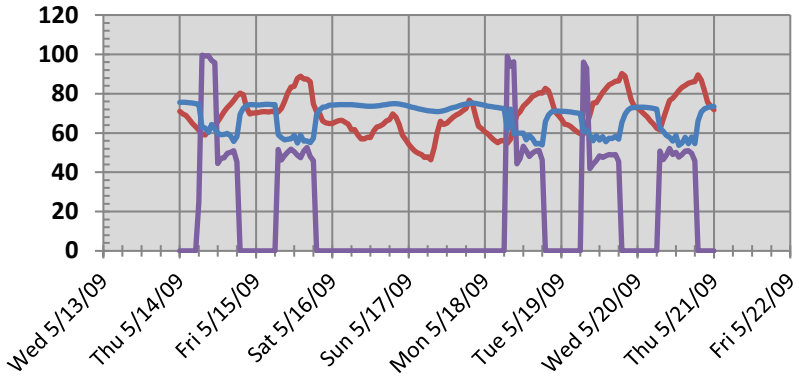
# Energy Performance Contract Process Flow



# What is Measurement and Verification?

Measurement and Verification (M&V) is the process of using measurements to reliably determine actual savings created within an individual facility as the result of an energy management program.

*International Performance Measurement and Verification Protocol*

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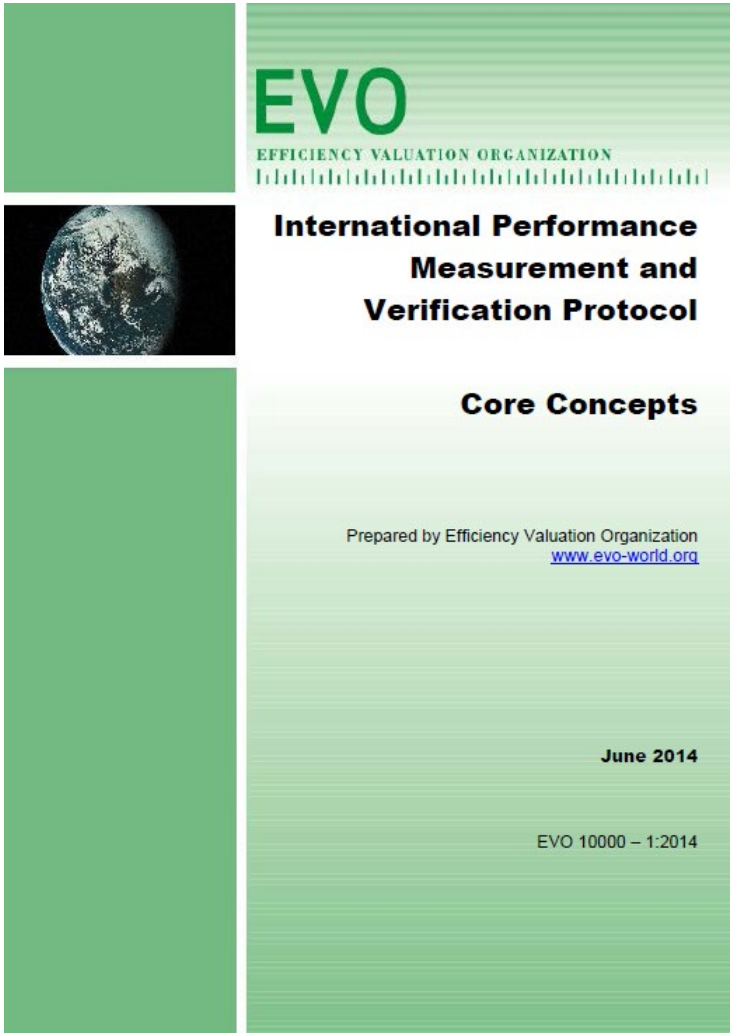
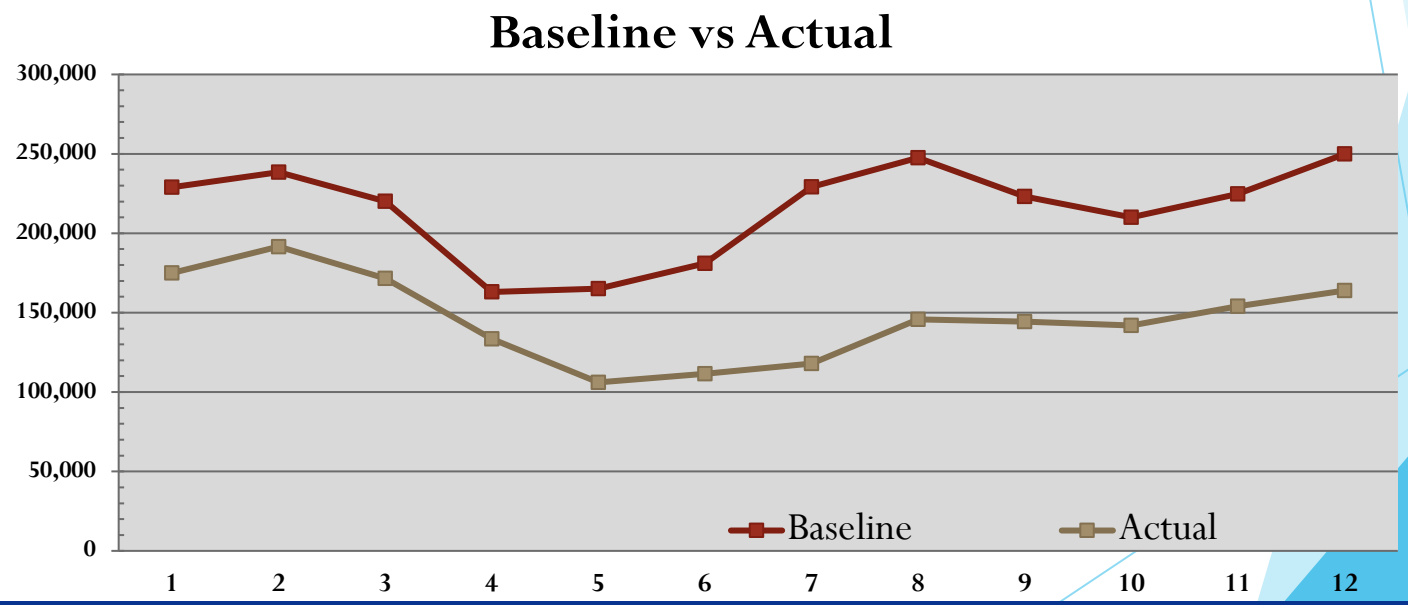
# M&V Guidelines

- International Performance Measurement and Verification Protocol (2014): (http://www.evo-world.org/index.php?option=com_rsform&formId=124&lang=en)
  - Documents common terms and methods to evaluate performance for buyers, sellers, and financiers.
  - Provides best practice methods, with different levels of cost and accuracy, for determining savings.
  - Adds international credibility to Performance Contracting as a vehicle for resource efficiency and sustainability.



# How to Determine *Savings* or *"Avoided Cost"*

- Energy savings represent the ***absence*** of energy use
  - Usually determined by comparing energy use *before* the project (Pre-Retrofit) to energy use *after* the project (Post-Retrofit)
  - Pre-Retrofit energy usage is called the "Baseline"

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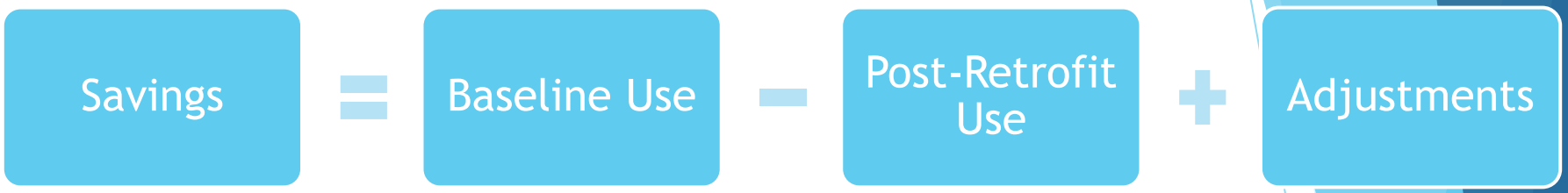
# M&V Plan Components




- Baseline Conditions
  - Pre-measurements, Utility Invoices, Rates, Informational Sources, Assumptions
- Post-measurement Procedures
  - Methods/Options chosen, Responsibilities, Calculations, Adjustments
- Report Delivery Requirements
  - Frequency, Format, Future Projections & Activities, Other Responsibilities
- Adjustments
  - Weather, Change of Usage, Additions, Deletions, Population
  - All Adjustments calculations are presented and agreed to with customer

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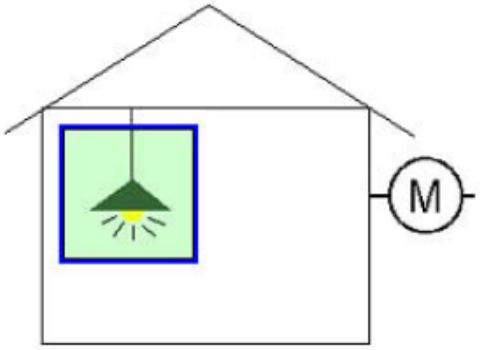
# Considerations for Choosing an M&V Option

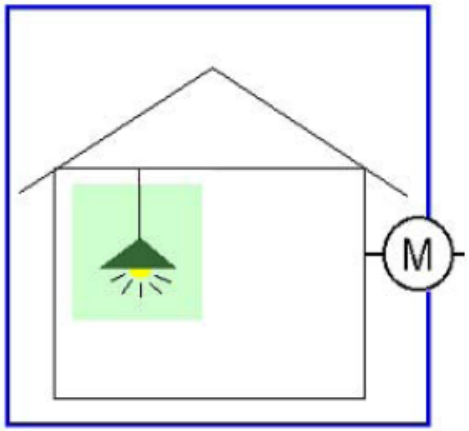
- Project cost & expected savings
- Certainty of savings being achieved
- Length of contract term
- Costs to manage the guarantee
- Future plans for facility
- Number and types of Facility Improvement Measures (FIM)
- Total energy impact of FIMs
- Availability of historical utility information
- Ability to establish baseline
- Legislative requirements

# The Options

- M&V Options
  - Retrofit Isolation (Options A & B)
  - Whole Facility (Option C)
  - Calibrated Simulation (Option D)




Options A, B




Options C, D

Source: M&V Guidelines: Measurement and Verification Guidelines for Federal Energy Management Projects

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# M&V Option A - Retrofit Isolation with Key Parameter Measurement

- Savings measured at improvement (FIM) level
- One-time, Short term or continuous field measurements of **KEY** variables impacting energy usage
- Parameters not measured are estimated
  - Manufacturer's specifications
  - Historical information
  - Engineering judgment
- Sampling is acceptable
- Uses engineering calculations, component or system models
- Generally least expensive option

# M&V Option A - Retrofit Isolation with Key Parameter Measurement


or


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# M&V Option B - Retrofit Isolation with All Parameter Measurement

- Savings measured at improvement (FIM) level
- One-time, Short term or continuous field measurements of **ALL** variables impacting energy usage
- Sampling is acceptable
- Uses engineering calculations, component or system models
- Typically more expensive than Option A

# M&V Option B - Retrofit Isolation with All Parameter Measurement


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# M&V Option C - Whole Facility

- Savings measured at the utility meter
- Regression of utility meter data utilizing weather, occupancy, etc.
- Only used if savings are greater than 10% of the metered utility usage
- Annual savings reporting normally includes adjustments
  - Weather
  - Changes in facility operation
- Often very expensive
  - Typically only applied to projects with interactive FIMs and complex systems
  - Doesn't show savings by measure
  - Requires a lot of interaction with JCI
  - Reporting all facility changes to JCI
  - Requires at least 12 months of baseline utility bills and analysis and documentation of baseline operations across all energy consuming equipment


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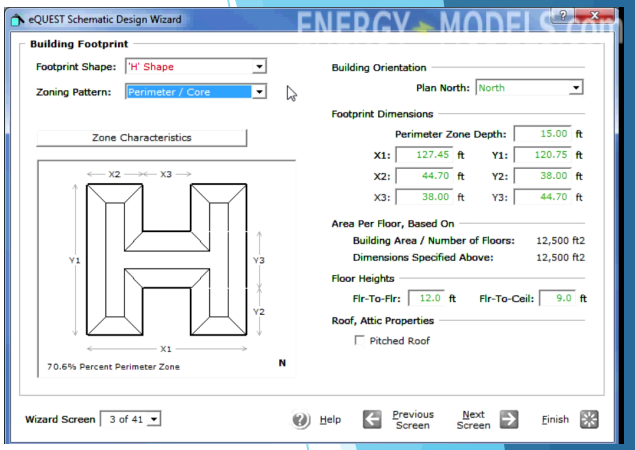
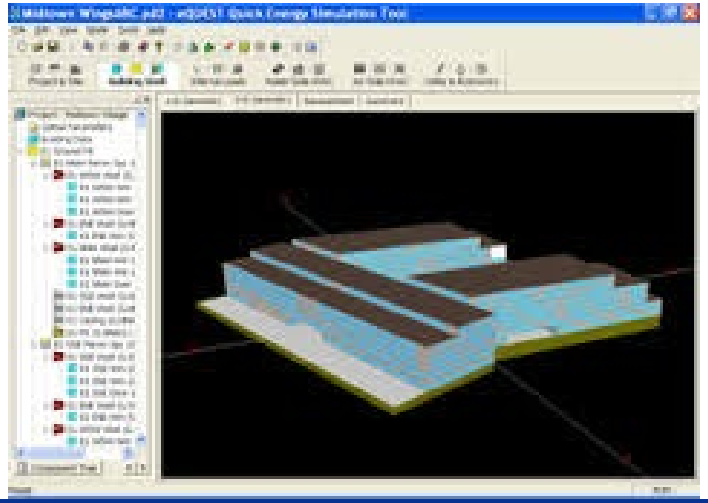
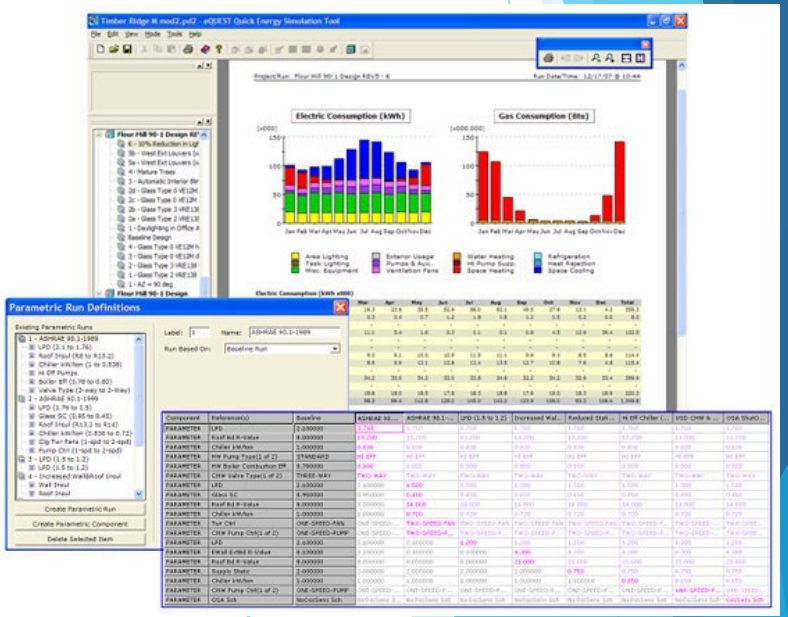
# M&V Option D - Calibrated Simulation

- Detailed computer simulation
- Utilizes short term data and trended data points
- Calibrated to whole-building metered utility data
- Annual savings reporting normally includes adjustments
- Utilized when improvements affects many systems
- Typically for new construction or in cases where baseline energy data no not exist
- Can be very expensive



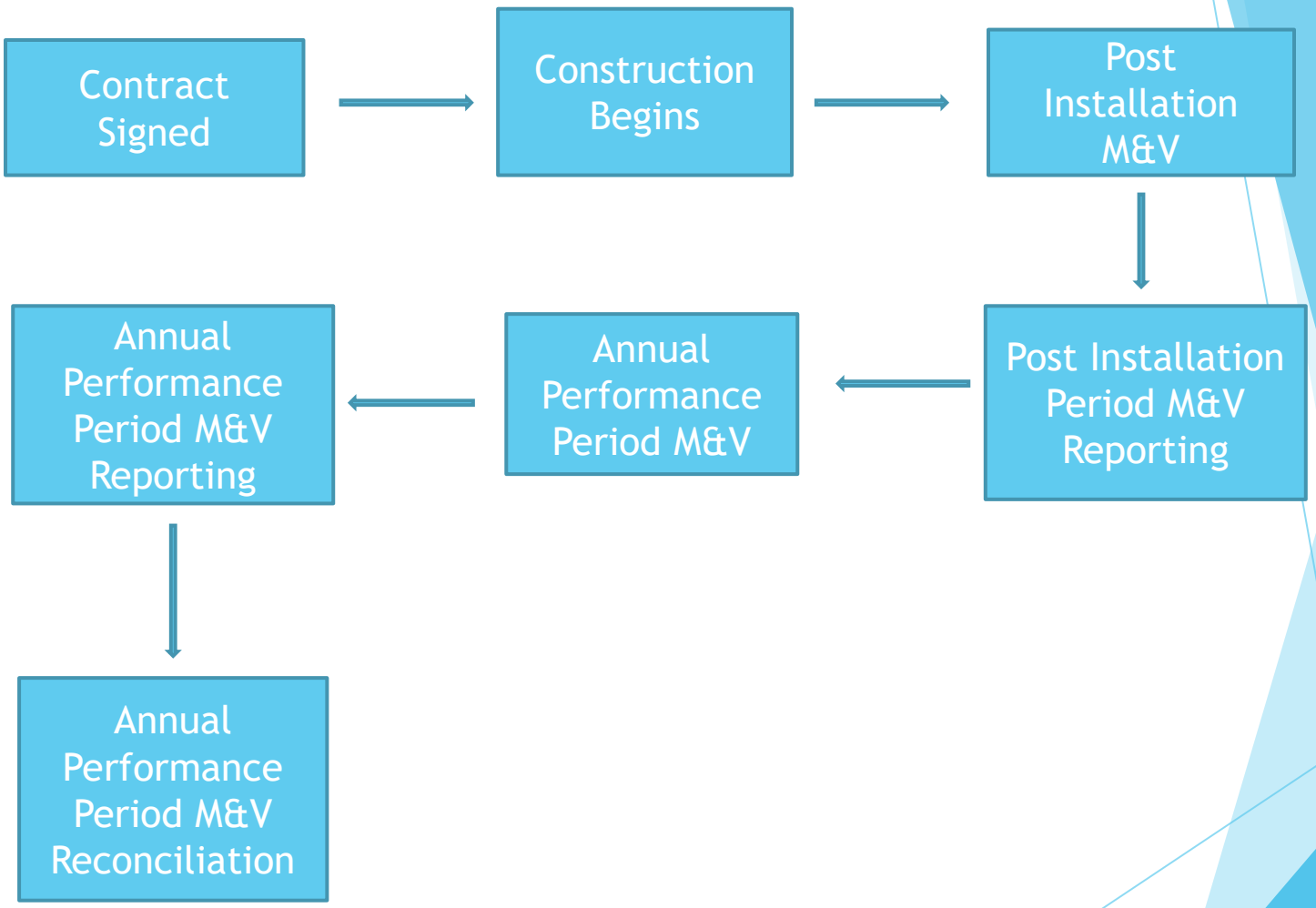





# Operations and Maintenance Savings

- Certain FIMs May Reduce Operations and Maintenance Costs
- These costs can be documented and captured as savings
  - Avoidance of Contract cost savings resulted from Technology Improvement
  - Material savings such as Lighting Material
  - Labor savings Or Better Use of Resources such as reduced Lighting Change Frequency

# Projected Time Line

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# Key Considerations for Implementing Network BMS in K-12 schools

- Upfront and Ongoing Costs
- Compatibility with Existing Infrastructure
- Cybersecurity Risks
- Staff Training and Expertise
- Maintenance and Reliability
- Scalability and Integration
- Regulatory and Compliance Requirements
- Vendor Selection and Support
- User Adoption and Over-Reliance
- Measurement and Verification of Savings

# Building Management Systems Services

## Cost Mitigation

- Using Energy Performance Contract as Financing Mechanism

## Cybersecurity

- Engage school IT team as soon as possible

## Integration

- Tied BMS implementation to school operation's broader strategy

# Utility and Energy Management

BENCHMARKING AND MONITORING

OPTIMIZED SCHEDULING

PROACTIVE MAINTENANCE

UTILITY BILL MANAGEMENT

BEHAVIORAL MODIFICATION

RETRO-COMMISSIONING AND UPGRADES

RENEWABLE ENERGY INTEGRATION