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# Evaluation, Measurement, & Verification

## Principles and Vermont Examples

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## Topics

- EM&V Resources
- Evaluation Fundamentals
  - Definitions
  - Why Evaluate
  - Planning, Implementation, Evaluation process
  - How good is good enough?
- Vermont's Evaluation framework



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# EM&V RESOURCES



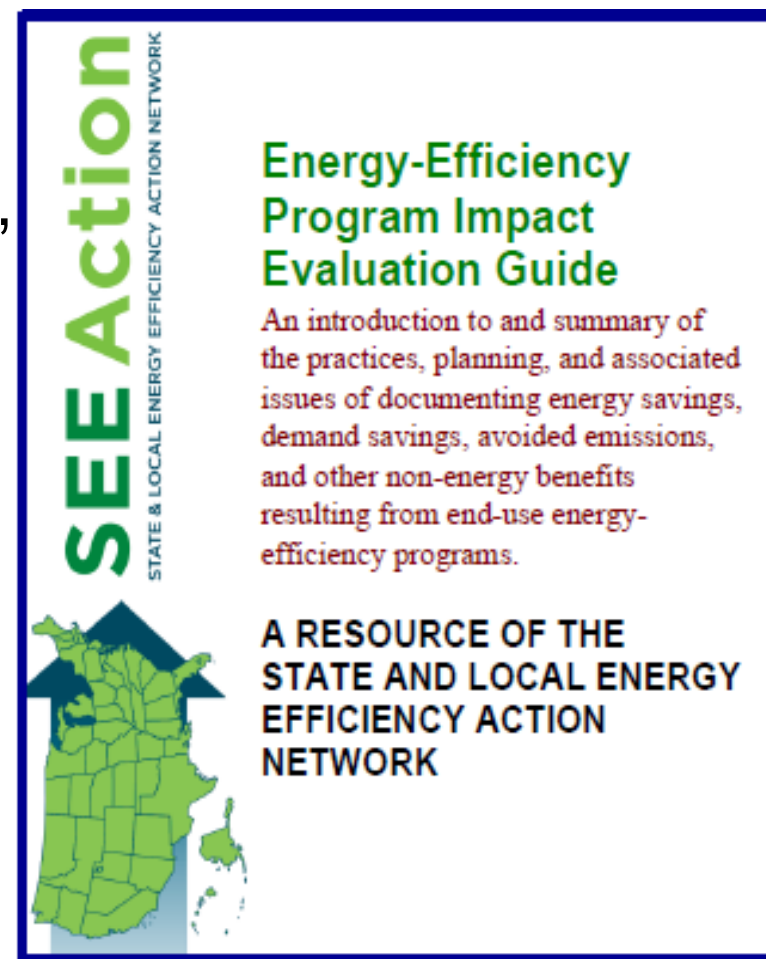
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## The Guide

- Describes common terminology, structures, and approaches
- Does not recommend specific approaches – it provides
  - Context
  - Planning Guidance
  - Discussion of Issues
- Audience:
  - Regulators, implementers, policymakers, etc.



\*Many slides in this presentation borrow from SEE Action; presentations of Steven Schiller, Schiller Consulting Inc.



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## Other Resources

- North American Energy Standards Board M&V Standards
- US DOE Uniform EM&V Methods and Protocols (under development)
- Northeast Energy Efficiency Partnerships Forum EM&V Methods Guidelines
- Regional ISO-NE and PJM M&V Manuals
- International Protocol for Measurement and Verification of Programs (IPMVP)
- EPA webinar series – [www.emvwebinar.org](http://www.emvwebinar.org)



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# EVALUATION FUNDAMENTALS



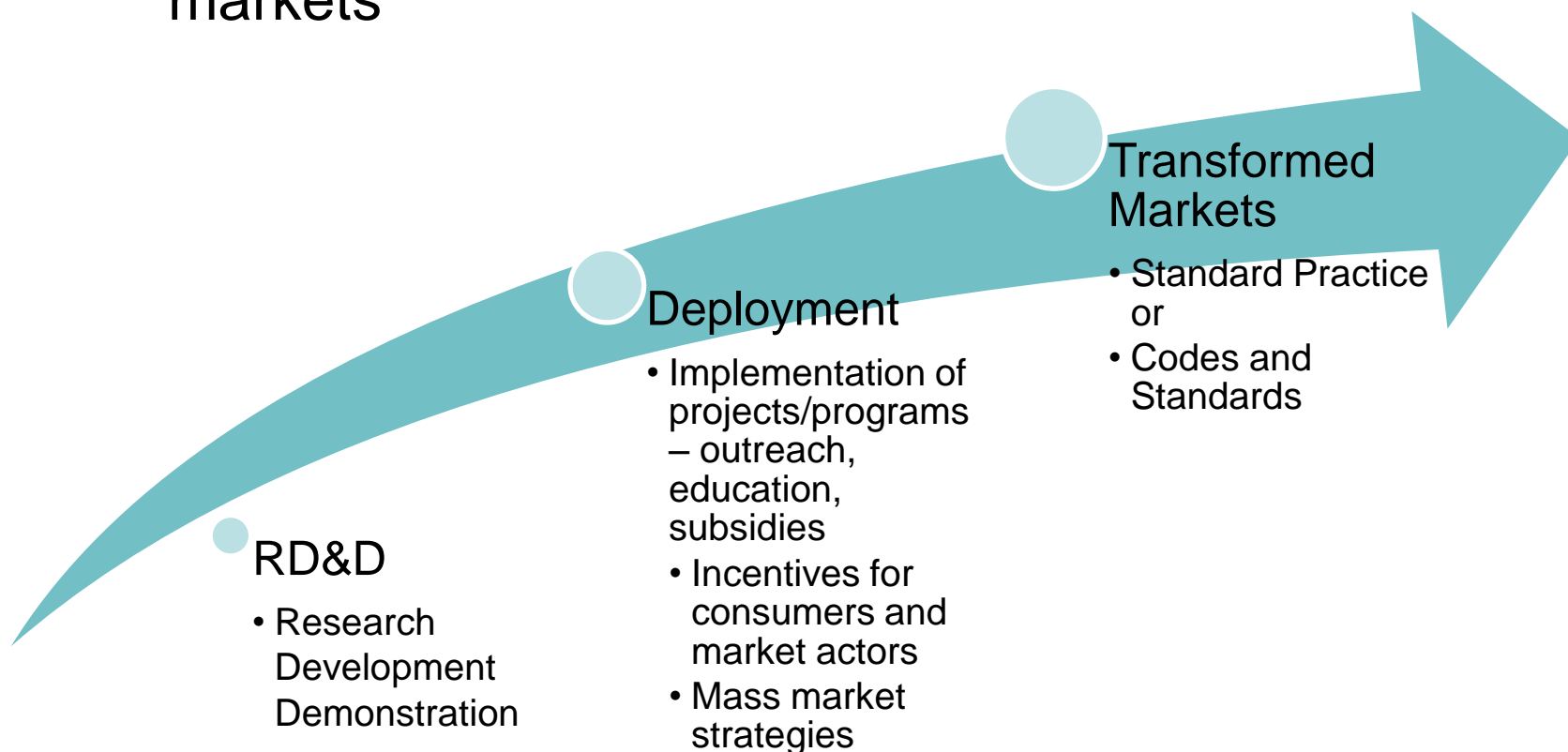
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## Efficiency Action Continuum

- EM&V is a tool to support the transformation of markets





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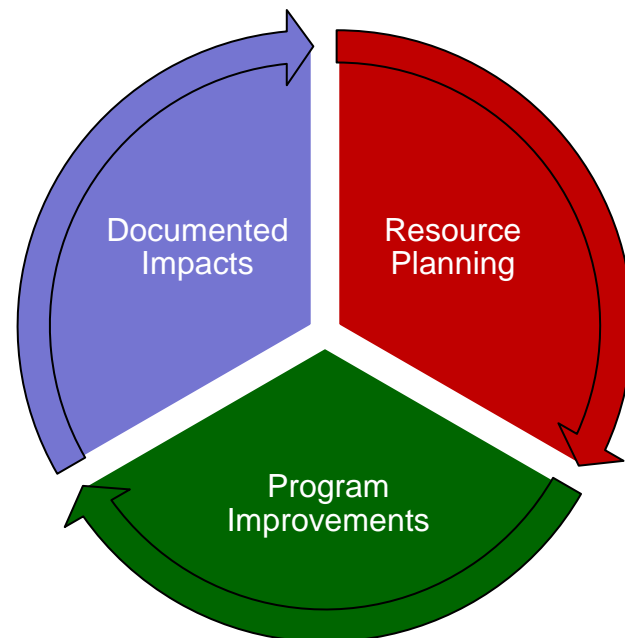
## EM&V Definitions

- **Evaluation** – The performance of studies and activities aimed at determining the effects of a program or portfolio
- **Measurement and Verification**– Data collection, monitoring, and analysis associated with the calculation of gross energy and demand savings from individual projects. Often a subset of Evaluation.
- **EM&V** – “Evaluation, Measurement, and Verification is a catchall for determining both program and project impacts



## Why Evaluate?

- **PROOF of effectiveness**
  - Document impacts to determine if programs have met their goals. Is this a good use of ratepayer dollars?
- **Resource Planning**
  - Support planning by understanding the contributions of EE compared to other energy resources. DATA
- **Improve Programs**
  - Identify ways to improve current programs as well as select future projects.





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## General Evaluation Types

- Impact Evaluation
  - Quantifies changes associated with program(s) – direct and indirect
- Process Evaluation
  - Measures procedures associated with program design and implementation
- Market Effects Evaluation
  - Analyzes how overall supply chain and market for EE products have been affected – attribution and sustainability
- Cost-effectiveness Evaluation



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## Impact Evaluation Results – Net or Gross

- **Gross savings** – change in energy consumption/demand that results directly from program-promoted actions taken by program participants
- **Net savings** – the portion of gross savings that is attributable to a particular program. Often extremely challenging.
  - Accounts for “Freeriders” and “Spillover”
  - Many approaches to determine –confidence in results varies

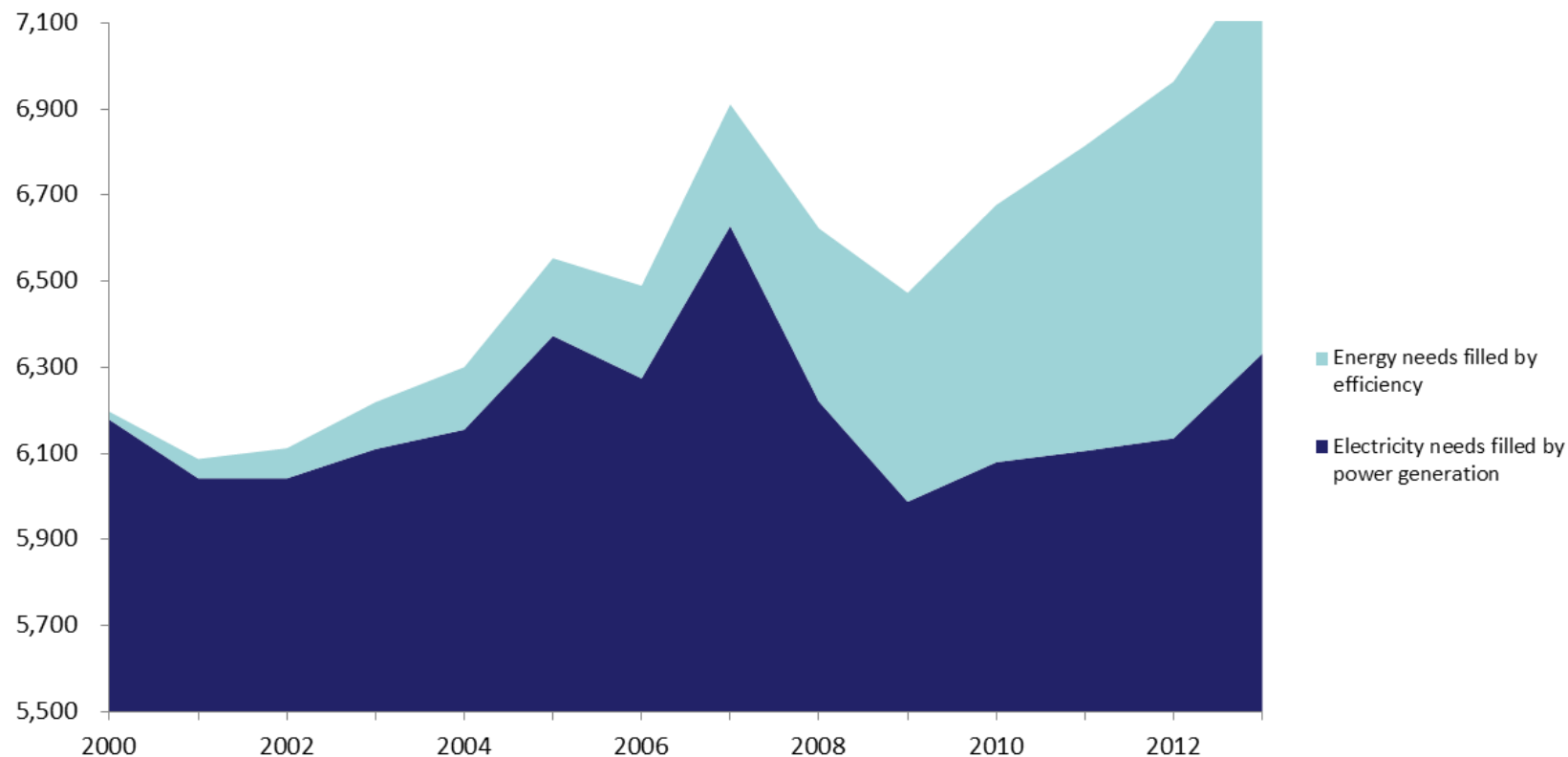


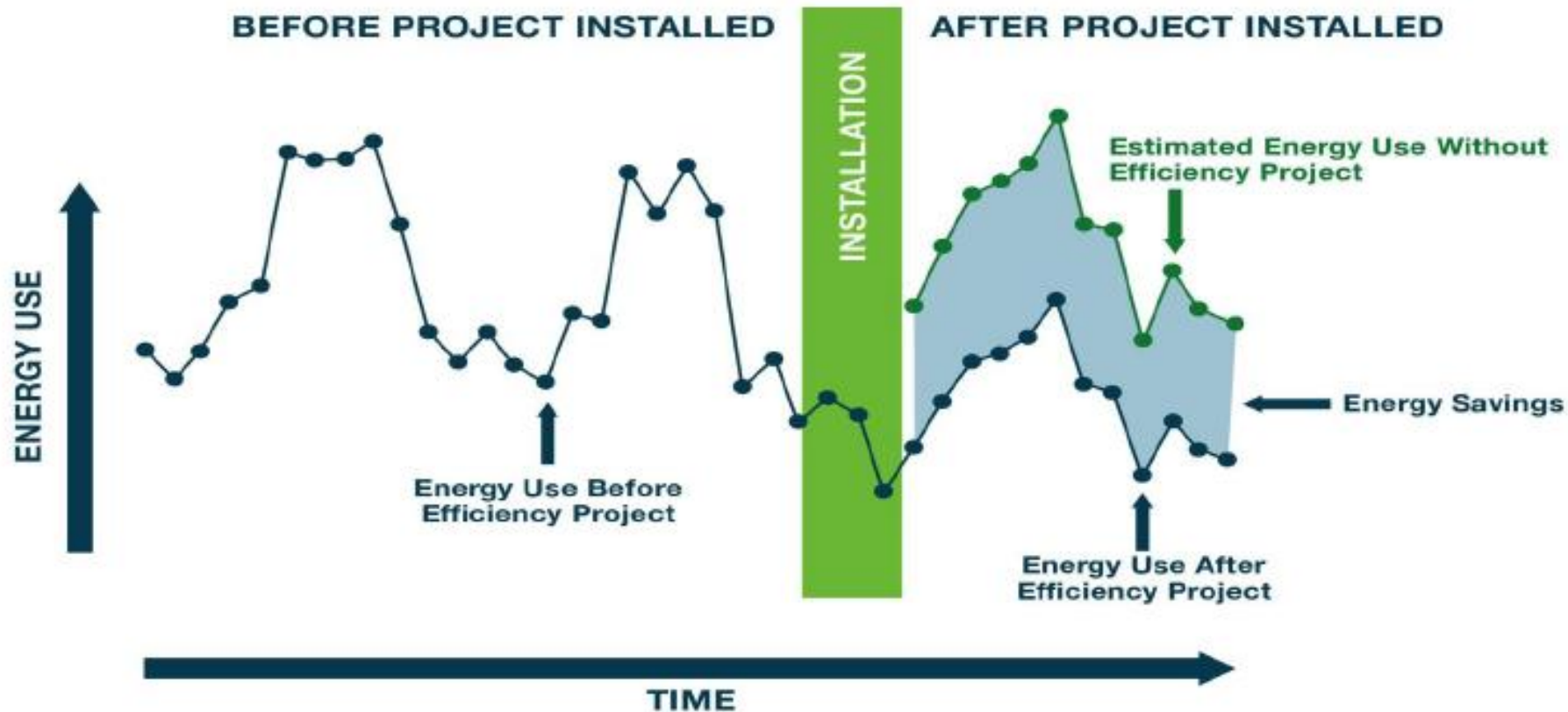
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## Cannot Measure What is not There – Savings are *Estimated*





Graph of Energy Consumption Before, During And After Project Is Installed



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## Estimating Energy Savings

- Baseline from which to measure savings
- Deemed savings
  - Based on historical and verified data
  - Applied to conventional EE measures implemented in the program
  - Technical Reference Manuals
- Consumption data analysis of metered energy use – comparing energy use of program participants with control group
- Using standard protocols (such as IPMVP) to determine savings of a sample of projects, apply to all projects in program



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## Planning – Implementation- Evaluation Process

- Evaluations should be completed within or soon after portfolio cycle
- Feedback for
  - Ongoing program improvement
  - Resource planning
  - Assessing performance
- Inform future evaluations



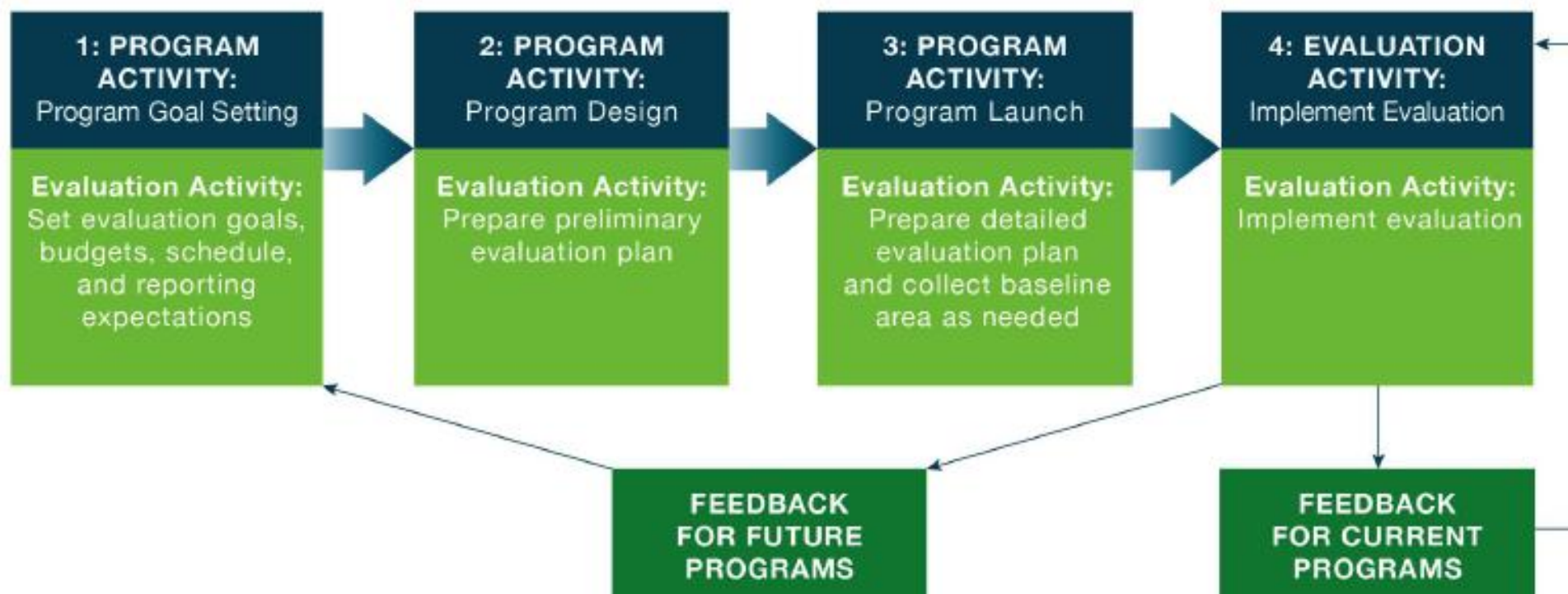


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## Ideal Program/Evaluation Workflow







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## Structure for Evaluation Planning

- Create an overall EM&V Framework
  - Multi-year
  - Broad budgets
  - Match evaluation with implementation
- Annual Plans
- Specific Evaluation Research Plans
- Site Specific M&V Plans
- Reporting



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## To Each His Own

- Evaluation requirements, methodologies, and assumptions **vary considerably**
- It is, however, helpful to have some statutory authority for regulators to perform evaluations
- As long as *details* of evaluation rules and procedures are addressed in regulatory setting
  - More expertise
  - More ability to thoroughly examine issue



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## How good is good enough?

- **Deemed savings** (TRM) often used to save time and money, but need to be updated regularly by rigorous, full scale evaluations
- Less need for statistical precision and methodological rigor when used for purposes of ‘general oversight’ and prudence
- Need for methodological rigor and precision increases when discretionary monetary allocations are at stake (e.g. performance incentives)

## EM&V = Risk Management

- Certainty of savings v. amount of effort utilized to obtain certainty
- Establish level of performance confidence and risk for efficiency relative to risk of not getting the savings





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One State's Consideration of Risk

# **VERMONT'S EM&V FRAMEWORK**



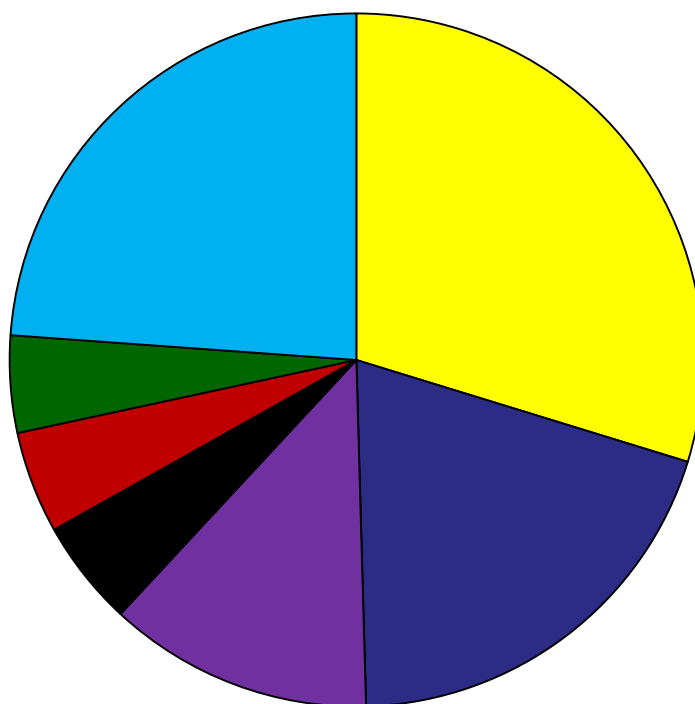
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## Department of Public Service 2015-17 EEC Evaluations

Approximately \$4 million or 2.5%



- Market Characterizations\*
- Behavioral Evaluation
- Annual Savings Verification
- Technical Advisory Group and Technical Reference Manual
- Overall Performance Assessment
- Regional Coordination
- Other

Does not include Program Administrator funding



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## EEC Funded Evaluations 2015-2017 – “Other”

- **Geographic Targeting**
- **Benchmarking** – Relative comparison of EEUs versus program administrators in other jurisdictions
- **Non-Resource Acquisition** – Evaluation of *outcomes* (in addition to initiatives) as identified in EVT’s NRA proposal
- **Administrative Efficiency**- Measurement relative to established business process efficiency metrics
- Miscellaneous Others



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## Plus – Forward Capacity Market Evaluation

- Increased rigor and precision for custom program savings = \$2 million over three years
  - Significant on-site metering
- Creates opportunity for revenues as EE can participate in this regional market





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## Questions

