TECHNICAL STANDARDS MANUAL

VERSION 2.1

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TEXAS PACE AUTHORITY

OVERVIEW

For any PACE program to succeed, its property owners, lenders, and community leaders must be able to confidently and objectively evaluate projected energy and water utility savings. The purpose of this technical standards manual is to outline the technical requirements necessary to qualify a project for the PACE in a Box program.

Once a project satisfies all underwriting requirements of PACE in a Box,[1] it must meet three technical requirements outlined in this manual. **First**, the property's current water and energy use is measured so that a baseline for comparison is established. **Second**, each potential energy or water conserving measure is evaluated to determine projected savings compared to the baseline in a technically sound, consistent and transparent manner. Findings from these two steps together are compiled in a document referred to as an energy /water assessment report. PACE law requires that each report is evaluated by an independent third party reviewer (ITPR). **Third**, after the project retrofit activities are completed, the project must be reviewed by the ITPR to ensure that the project meets the intent of the energy/water assessment report, is properly completed, and is operating as intended.

On their own initiative, property owners are encouraged to maintain the retrofits to ensure they receive the ongoing and full benefit of the improvements over time. Best practices are discussed further in the PACE Technical Standards Best Practices Guide for Property Owners.[2]

[1] See **PACE in a Box** Section 6.
[2] See **PACE in a Box** Section 8

Reference Materials

Accepted methods for data collection, measurement, and savings calculations should be used on proposed projects. This manual references several technical documents which will assist in determining pre-retrofit energy and water consumption, predicting retrofit energy and water savings, and verifying whether an installed measure or group of measures is performing as intended.

The technical methodology incorporated into the review process relies primarily upon the PACE in a Box (Section 6 – Guide to PACE Project Underwriting and Technical Standards) guidelines and the Investor Confidence Project (ICP) - Energy Performance Protocols (EPP) for Standard and Large Commercial Facilities.[3] Should there be a a condition where the guidelines and the protocols are in conflict, the guidelines should be followed.

The ICP EPP contain processes that form a framework for bringing together all aspects of project implementation from establishing a baseline and audit, through M&V. They have been created by a large stakeholder community of industry experts and are continuously reviewed and improved. PACE in a Box relies on the EPP because they are the result of a nationwide effort to standardize the technical review of energy efficiency projects to bring uniformity and reliability on a national scale. The EPP help ensure that conservation measures are evaluated consistently throughout the state and create a national standard for lender review of PACE projects.

The EPP technical processes are based on nationally accepted standards. The technical standards in EPP relating to baseline determination/calculation, performing energy assessments, and guidelines for performance measurement and verification of energy and water conservation measures respectively are:

- American Society for Testing and Materials (ASTM) E2797-11, Building Energy Performance Assessment (BEPA) Standard (data collection and baseline calculations for the energy audit, building asset data);
- International Performance Measurement and Verification Protocol (IPMVP) (latest edition);
- American National Standards Institute/Building Owners and Managers Association (ANSI/BOMA) Z65.3-2009 (gross floor area measurement);
- ASHRAE Guideline 14-2002 (measurement of energy and demand savings);
- ASHRAE Procedures for Commercial Building Energy Audits (latest edition);
- National Institute of Standards and Technology (NIST) Life-Cycle Costing Manual, NIST Handbook 135 (latest edition);
- ASHRAE Standard 202, Commissioning Process for Buildings and Systems (latest edition);
- ASHRAE Guideline 4, Preparation of Operating and Maintenance Documentation for Building Systems (latest edition);
- ASHRAE Guideline 1.4, The Systems Manual for Facilities; (latest edition);
- ASHRAE Handbook-2011, Fundamentals, Chapter 39 (Codes and Standards); and

[3] http://www.eeperformance.org

- ASHRAE Guideline 14, Whole Building Performance Path (2002 edition).

Other acknowledged resources that may be considered are:

- The Alliance for Water Efficiency (AWE) Conservation Tracking Tool; and
- EPA WaterSense Product Guide.

INDEPENDENT THIRD PARTY MONITORING

The Texas PACE law requires an independent third party review the water or energy baseline conditions and the projected water or energy savings for each proposed qualified project. It is the responsibility of the Independent Third Party Reviewer (ITPR) to validate projected future energy or water savings. Additionally, after a qualified project is completed, the ITPR must verify that the qualified project was properly completed and is operating as intended.[4] This requirement provides assurances to the PACE in a Box program, the property owner, and the lender that due diligence has been executed, that a standard of consistency has been applied throughout the PACE process, and that a professional licensed engineer has validated the expected energy and water savings from the proposed project.

Third Party Review Process

Site Visit 1 / Reviewer's Certification

Once an engineer, contractor or installer has prepared an energy/water assessment report, a qualified ITPR selected by the property owner makes a site visit and reviews the energy/water assessment report using the EPP to determine if the report complies with PACE in a Box guidelines. When the project is deemed compliant with EPP/Pace in a Box guidelines, the ITPR prepares a Reviewer's Certification to the PACE program.

The Reviewer's Certification shall include:

- A statement that the ITPR has no financial interest in the project.
- A letter stating the savings (energy, demand, water, and cost) expected project life, and cost are reasonable, arein compliance with PACE in a Box program guidelines, and follow the EPP protocols.
- A Texas Professional Engineer signature and engineering seal.

An application for PACE financing will not be considered complete until Reviewer's Certification is submitted.

Site Visit 2 / Statement of Compliance

Once the project retrofit activities have been completed, the ITPR must revisit the site to confirm that the improvements were properly installed, meet EPP guidelines, and are operating as intended. The reviewer must submit a Statement of Compliance to the PACE program indicating that the project was properly completed and is operating in accordance with the PACE in a Box guidelines.

The Statement of Compliance shall include:

- A statement that the ITPR has no financial interest in the project;

[4] Texas Local Government Code Chapter 399.011

- A project documentation review letter that covers the PACE Project Report, detailed engineering drawings, designs, and specifications, copies of mechanical, electrical, plumbing, and building permits, and copies of equipment test and balance commissioning reports as well as any change orders; and
- A Texas Professional Engineer signature and engineering seal.

Retainage funding for the qualified project will not be provided for progress beyond the construction phase, if applicable, until the Statement of Compliance is received by the PACE program.

The process described above is required by PACE in a Box. The PACE program does not guarantee projected savings, and it is the responsibility of the property owner to exercise best practices to protect his interests through a contract with the engineer, contractor or installer responsible for the project's success as recommended in the energy/water assessment report.[5]

Independent Third Party Reviewer Qualifications

To be of value, the work of the ITPR must be both professionally qualified and without conflict or relationship to the project they are reviewing. An ITPR must be a licensed Professional Engineer with energy/water efficiency experience. Preferably, the Professional Engineer should have one of the following certifications:

- American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE)
  - Building Energy Assessment Professional (BEAP)
  - Building Energy Modeling Professional (BEMP)
- Association of Energy Engineers (AEE)
  - Certified Energy Manager (CEM)
  - Certified Measurement and Verification Professional (CMVP)
  - Certified Energy Auditor (CEA)
- Building Commissioning Association
  - Certified Commissioning Professional (CCP)

Ideally, the same ITPR should follow a project from initial review to project completion.

[5] See **PACE in a Box** Technical Best Practices Guide in Section 8

FULL ASSESSMENT PROTOCOL

A project satisfying the underwriting requirements in PACE in a Box must also satisfy the Technical Standards required in this manual. This section establishes the basic protocol for complying with PACE in a Box technical standards. A proposed project qualifying for a FAST TRACK Protocol established in Section IV, shall use the technical standards in that section.

The Full Assessment Protocol divides an energy/water conservation project into four basic tasks:

1. Establish a Baseline. Establish energy and water baseline conditions (collecting utility provider information, consumption and cost data);
2. Prepare an Energy and Water Assessment. Create an Energy/Water Assessment Report (projecting savings of proposed projects when measured against the baseline data);
3. Implement the Project (installation of energy conservation measures (ECM) and/or water conservation measures (WCM)); and
4. Verify Completion and Operation. Verification that the qualified project was properly completed and is operating as intended.

Projects can range from installation of a single ECM or WCM, such as a new high efficiency boiler, installation of low-flow toilets, or a renewable energy system, to a whole building energy and water upgrade involving multiple, interactive ECMs and WCMs. Many projects will also achieve both energy and water savings, such as an energy efficiency measure that reduces heat load, thereby also reducing cooling tower water use.

Establish a Baseline

A sound energy and water usage baseline consists of collecting the utility provider information and establishing the critical starting point for accurate projection of potential savings and measurement after implementing ECMs/WCMs. The baseline establishes how much fuel, electricity, and/or water a facility used over the previous 12-month period. It also factors in the impact of independent variables such as weather, occupancy, and operating hours on the property's energy/water use.

For the majority of energy projects, the requirements for establishing a baseline are outlined in the ICP EPP. These protocols currently target energy measures in commercial facilities, but are readily adapted to other projects including applicable areas of industrial and agricultural energy as well as water conservation. The EPP provide a roadmap for key elements in performing a successful energy/water retrofit project.

For water conservation projects, the requirements for establishing a baseline are outlined in Federal Energy Management Program's M&V Guidelines: *Measurement and Verification for Federal Energy Projects*, Version 2.2/3.0. The M&V Guidelines provide applied methodologies for baseline accomplishment. At this time, these protocols do not provide a high level of detail for baselining water efficiency projects. As future nationally recognized protocols are developed, the PACE Technical Standards will be updated for water projects.

The following table outlines which protocols should be used for establishing a baseline based on facility, project type, and scope.

Facility Type	Full Assessment Requirements
Standard Commercial / Multifamily	Energy: ICP EPP - Standard Commercial (Baselining – Core Requirements, Rate Analysis, Demand, Load Profile, Interval Data) Water: M&V Guidelines v2.2 (Sec VII, p203)*
Large Commercial / Multifamily	Energy: ICP EPP - Large Commercial (Baselining – Core Requirements, Rate Analysis, Demand, Load Profile, Interval Data) Water: M&V Guidelines v2.2 (Sec VII, p203)*
Industrial (Facility)	Energy: ICP EPP - Large Commercial (Baselining – Core Requirements, Rate Analysis, Demand, Load Profile, Interval Data) Water: ICP EPP - Large Commercial (Baselining – Core Requirements, Rate Analysis, Demand, Load Profile, Interval Data)
Agricultural (Facility)	Energy: ICP EPP - Standard Commercial, ICP EPP - Large Commercial (Baselining – Core Requirements, Rate Analysis, Demand, Load Profile, Interval Data) Water: ICP EPP - Standard Commercial, ICP EPP - Large Commercial (Baselining – Core Requirements, Rate Analysis, Demand, Load Profile, Interval Data)
Distributed Generation[6]	Energy: IPMVP Concepts and Practices for Determining Energy Savings in Renewable Energy Technologies Applications (Pages 4-6) Water: IPMVP *Concepts and Options for Determining Energy and Water Savings*, 2012 (Section 4)

*M&V Guidelines: Measurement and Verification for Federal Energy Projects Version 2.2; Sec VII M&V for Water Projects.

[6] For purposes of the **PACE in a Box** Technical Standards, the Term "Distributed Generation" includes energy generation technologies such as CHP, co-generation, small wind, solar, and biomass systems that generate electricity on the customer's side of the retail electric meter and technologies such as solar water heating and geothermal heat pumps that utilize renewable energy resources to reduce electricity consumption and demand.

The protocols listed above are intended as minimum requirements for an energy and water assessment report to be considered for funding.

Energy and Water Audit

The EPP rely upon industry accepted ASHRAE Procedures for Commercial Building Energy Assessment as a technical basis. These procedures define the level of effort for energy audits and provide best practices for auditors and associated project deliverables. ASHRAE also provides necessary sample audit forms and templates for data collection during the audit process.

The level of audit selected is contingent on the complexity of the facility and its installed systems and components, as well as the number and types of anticipated energy and/or water saving opportunities. Information collected during the energy/water audit is integral in determining the facility energy/water baseline conditions. The auditor will also identify energy and water savings opportunities which meet threshold investment requirements and provide verifiable energy and water savings while conducting the audit.

Industrial and Agricultural Projects

For industrial and agricultural projects, an ECM/WCM may affect the facility, a process or equipment used within the facility, or a distinct area outside the facility. Depending on the project, a different protocol shall be used. See Exhibit A for Industrial Protocols and Exhibit B for Agricultural Protocols.

Distributed Generation (DG)

DG projects have no pre-retrofit conditions as typically encountered in an energy conservation project. Since DG delivers energy rather than conserves or reduces energy, establishing a pre-retrofit baseline is not a strict project requirement. Metering of delivered energy without a baseline is often recommended in the M&V approach.

DG protocol requirements can be found in IPMVP Concepts and Practices for Determining Energy Savings in Renewable Energy Technologies Applications Volume III; August 2003. Other specific information relevant to DG measurement and verification can be found in IPMVP Concepts and Options for Determining Energy and Water Savings Volume I, January 2012.

Prior Audit

A prior ASHRAE Level II or Level III energy/water audit may be used provided that it was completed within the last three (3) years and that:

- Specific ECMs/WCMs were detailed in the audit and are still viable;
- Energy / water savings were projected for each proposed ECM/WCM;
- Any major facility renovations and/or building additions that occurred after the last audit do not negate relevant findings of the prior audit; and
- Changes in facility equipment and/or facility end-use do not negate findings of the prior audit.

The level of effort associated with updating the project baseline is dependent on the date of prior audit. If the audit is older than six months, additional energy/water use data will be available, and must be included in the updated audit.

In the case where a previous audit was completed in the last six months, savings calculations may be taken directly from the report if applicable. For older energy/water audits, still within the three year allowable time frame, the following items must be verified and accounted for in updated savings calculations:

- Any change in energy/water and/or demand rates or billing structure;
- Any change to existing facility, system, or project area that significantly affects savings; and
- Any change in building use and/or occupancy that significantly affects savings.

Projected Savings

EPP provide processes that should be used in projecting energy and water conservation savings. Models, spreadsheets, and similar tools must be based on "open book" methodology with sufficient explanation and documentation that savings calculations are transparent and results are readily verifiable. The use of "closed book" calculation methods or proprietary software is prohibited unless all methodologies associated with their use are well documented by transparent savings calculations and readily verifiable results.

The following table outlines the protocols that should be used to determine projected savings.

Facility Type	Full Assessment Requirements
Standard Commercial / Multifamily	Energy: ICP EPP - Standard Commercial (Savings Calculation) Water: M&V Guidelines v3.0 (Sec 11.6)*
Large Commercial / Multifamily	Energy: ICP EPP - Large Commercial (Savings Calculation) Water: M&V Guidelines v3.0 (Sec 11.6)*
Industrial (Facility)	Energy: ICP EPP - Large Commercial (Savings Calculation) Water: M&V Guidelines v3.0 (Sec 11.6)*
Agricultural (Facility)	Energy: ICP EPP - Standard Commercial, ICP EPP - Large Commercial Water: M&V Guidelines v3.0 (Sec 11.6)*

Distributed Generation	Energy: IPMVP Concepts and Practices for Determining Energy Savings in Renewable Energy Technologies Applications (Page 5, Examples pgs. 9-17) Water: IPMVP *Concepts and Options for Determining Energy and Water Savings*, 2012 (Section 4)

*M&V Guidelines: Measurement and Verification for Federal Energy Projects Version 3.0.
The protocols listed above are intended as minimum requirements for an energy assessment report to be considered for funding.

Verifying Completion and Operation

The Texas PACE law states, "After a qualified project is completed, the local government shall obtain verification that the qualified project was properly completed and is operating as intended."[7] The following table outlines the protocols that should be used for verifying proper project completion and operation.

Facility Type	Full Assessment Requirements
Standard Commercial / Multifamily	Energy: ICP EPP - Standard Commercial (Operations, Maintenance, and Monitoring, Measurement and Verification) Water: M&V Guidelines v3.0 (Sec 11.6)*
Large Commercial / Multifamily	Energy: ICP EPP - Large Commercial (Operations, Maintenance, and Monitoring, Measurement and Verification) Water: M&V Guidelines v3.0 (Sec 11.6)*
Industrial (Facility)	Energy: ICP EPP - Large Commercial (Operations, Maintenance, and Monitoring, Measurement and Verification) Water: M&V Guidelines v3.0 (Sec 11.6)*
Agricultural (Facility)	Energy: ICP EPP - Standard Commercial(pgs. 19-22), ICP EPP - Large Commercial (Operations, Maintenance, and Monitoring, Measurement and Verification) Water: M&V Guidelines v3.0 (Sec 11.6)*
Distributed Generation	Energy: IPMVP Concepts and Practices for Determining Energy Savings in Renewable Energy Technologies Applications (Page 5, Examples pages 9-17) Water: IPMVP *Concepts and Options for Determining Energy and Water Savings*, 2012 (Section 4)

*M&V Guidelines: Measurement and Verification for Federal Energy Projects Version 3.0

[7] Texas Local Government Code chapter §399.011(b)

FAST TRACK APPROACH

The FAST TRACK approach allows for faster implementation of projects. These projects must meet specific eligibility criteria in order to utilize the FAST TRACK process. The FAST TRACK approach reduces project expenses associated with audit costs and, in some cases, the time required to review the proposed project. The property owner and contractor must decide whether the project qualifies for the FAST TRACK approach and whether this approach is applicable. For those projects that do not qualify under the FAST TRACK eligibility criteria, the FULL ASSESSMENT protocols are required. The qualifications for an ITPR under the FAST TRACK approach are the same as qualifications for a FULL ASSESSMENT.

The FAST TRACK approach is deemed relevant and appropriate for the three (3) project types specified below. The required procedures and documentation are unique to each project.

Type 1 – Like-for-Like Replacement. The FAST TRACK approach may be used for a project that involves like-for-like replacement of energy/water inefficient equipment with more energy/water efficient equipment. Examples may include a lighting retrofit or A/C unit upgrade.

Type 2 – Single-Measure Efficiency Projects. The FAST TRACK approach may be used for projects that install single efficiency measures such as window film, additional insulation, or reflective roof coating.

Type 3 - Distributed Renewable Generation. The FAST TRACK approach may be used for a project that involves only the installation of an industry accepted renewable energy system such as solar photovoltaic (PV).

Projects that fall within the above criteria do not qualify for the FAST TRACK approach if the project value to building appraisal ratio exceeds 0.10 (10%).

Establishing a Baseline

The following information is required to establish a baseline for a FAST TRACK approach project.

Site Visit

- Confirm building characteristics and major components
- Records collection (equipment, systems, utilities)
- Staff/occupant interviews
- Walk-through inspection (written and photo documentation)
- Verification of all collected information by a third party reviewer

Records/Data Collection

- Building construction data
- Equipment data – HVAC, etc.
- Building operating data
- Energy consumption data
- Water consumption data
- Weather data
- Previous audit reports

Note: Not all items listed will be applicable. Data collected is at the discretion of the professional performing the baseline work and subject to third party review.

Pertinent Interviews (optional)

- Concerning general building characteristics
- Operations of major building systems/components
- Past building operational history (service call logs)

Note: Verification of all collected information is required as part of the Site Visit to determine if there has been significant change; if verified, it is not necessary to conduct repeat interviews.

Review/Analysis of Collected Materials

- Data conversion and normalization
- Determine building energy and water consumption metrics
- Perform modeling and simulation as applicable
- Determine renewable energy system production as applicable

Preparation of Final Assessment Report

- Includes building energy/ water cost and performance
- Energy and use by area (HVAC, lighting), fuel (gas, electric), indoor v. outdoor water usage

If a unit of energy or water using equipment is beyond its useful service life, the work associated with the baseline analysis can be considerably reduced. Document the building's age, condition, operating parameters, and expected useful life based on manufacturer's warranty data or ASHRAE guidelines. If the project is a distributed renewable generation project, collect and document information on building structure and orientation relevant to installation, production and maintenance. For WCMs not all baseline data collection and analysis apply.

Projected Savings

The requirements in this section are derived in part from the EPP for commercial facilities and are applicable to multifamily units. For single component/system ECMs or WCMs, the contractor should provide appropriate annotations to assist in determining whether a listed requirement is necessary.

The following are considered the minimum requirements in determining savings from energy and water conservation measures under a FAST TRACK approach:

- Use of "open book" methodology, spreadsheet or software used in savings calculations;
- Detailed outline for savings calculation methodology; should be transparent and easily replicated by independent third party reviewer;
- Reasonable comparison of energy/water pre-retrofit estimates to historical end use data (for single measure/single component retrofits, use only necessary data set for calibration);
- Consideration of interactive effects of related loads or systems and potential for additional ECMs/WCMs which would affect the appropriate capacity or cost-effectiveness of equipment being replaced;
- Validation of return on investment (ROI) figures based on previous audit or newly incorporated data sets;
- Validation of ECM/WCM implementation costs including labor and materials estimates; and
- Validation of savings.

The following items are the minimum that must be verified and accounted for in savings calculations for projects that propose the installation of an industry accepted renewable energy system, e.g., solar photovoltaic (PV), approved for interconnection by local utility:

- Current energy and demand rates;
- Applicability of incentives, rebates, and local utility requirements;
- Current distributed renewable generation component pricing, including design and installation of systems;
- Current electrical and/or building code requirements; and
- Current zoning and emissions requirements as they impact the project.

Verifying Completion and Operation

The Texas PACE law states, "After a qualified project is completed, the local government shall obtain verification that the qualified project was properly completed and is operating as intended."[8]

The requirements in this section follow M&V as referenced in the EPP for standard and large commercial facilities in conjunction with *IPMVP Concepts and Options for Determining Energy and Water Savings Volume I, January 2012.* The requirements support projects with a single component replacement or multiple ECMs/WCMs or distributed renewable generation system, qualifying as a FAST TRACK project.

For single component/system conservation measures, the following are the minimum requirements in verifying completion and operation of installed measures under the FAST TRACK method:

- ITPR review of the installation of the required number and type of ECMs/WCMs as specified in the audit and project design/construction documents; and
- ITPR review of the proper installation and operation of all ECMs/WCMs as specified in the audit and project design/construction documents:
  - Ensure that operation and function meet design intent of the project;
  - Determine that installed ECMs/WCMs will provide savings as estimated in original audit findings and commensurate with baseline analysis; and
  - Determine that installed ECMs/WCMs will meet or exceed service life estimates based on observed operation.

For distributed renewable generation projects, the following are the minimum requirements in verifying completion and operation of installed measures under the FAST TRACK method:

- ITPR review of the installation of the required number and type of system components as specified in the audit and project design/construction documents; and
- ITPR review of the proper installation and operation of all components as specified in the audit and project design/construction documents:
  - Ensure that operation and function meet design intent of the project;
  - Determine that the installed system will provide savings as estimated in original audit findings and commensurate with baseline analysis; and
  - Determine that the installed system will meet or exceed service life estimates based on observed operation.

[8] Texas Local Government Code chapter §399.011(b)

REPORTING

The property owner is required to provide a post-construction Annual Savings Reports to the PACE administrator to measure impact of the PACE program. This report shall be submitted during the term of the assessment or through a term negotiated between the PACE Program Administrator and the property owner. Information required within the post-construction Annual Savings Reports shall be determined between the PACE Program Administrator and the property owner. These Annual Savings Reports shall be submitted by the property owner. Section 5 of PACE in a Box outlines the reporting requirements of individual PACE projects.

EXHIBITS A & B

Exhibit A INDUSTRIAL PROTOCOL

Industrial energy/water conservation projects can impact 1) the facility, 2) a process inside the facility, or 3) a combination of the facility and process inside the facility. It will be necessary to determine the affected area of the facility or the site before moving forward with the auditing and baseline determination process. This protocol serves as a general guideline for the facility owner.

Industrial Energy/Water Protocol (Facility)

For ECMs/WCMs considered to affect, conserve or reduce energy/water resources in the facility and are not directly linked to any process application, the EPP for Standard and Large Commercial will be followed as applicable. The sections below reference the appropriate EPP and indicate the minimum procedures and documentation required. Since all targeted measures or combination of measures are not known at this time, applicable portions of the EPP will be followed as necessary.

Establishing a Baseline

1. Document	2. Section Reference
3. ICP EPP Standard Commercial	4. Baselining – Core Requirements, Rate Analysis, Demand, Load Profile, Interval Data
5. ICP EPP Large Commercial	6. Baselining – Core Requirements, Rate Analysis, Demand, Load Profile, Interval Data

Savings Calculation

7. Document	8. Section Reference
9. ICP EPP Standard Commercial	10. Savings Calculation
11. ICP EPP Large Commercial	12. Savings Calculation

Verifying Completion and Operation

13. Document	14. Section Reference
15. ICP EPP Standard Commercial	16. Operations, Maintenance, and Monitoring, Measurement and Verification
17. ICP EPP Large Commercial	18. Operations, Maintenance, and Monitoring, Measurement and Verification

Industrial Energy/Water Protocol (Process)

For ECMs/WCMs considered to affect, conserve or reduce energy/water resources for a selected process in an industrial facility, it is expected that most measures will conform to appropriate *IPMVP Concepts and Options for Determining Energy and Water Savings Volume I, January 2012.* In particular, Option A – Retrofit Isolation: Key Parameter Measurement or Option B – Retrofit Isolation: All Parameter Measurement will provide the necessary requirements for savings verification, while other sections of the IPMVP document will be pertinent to establishing the baseline.

Establishing a Baseline

Document	Section Reference
ICP EPP Standard Commercial	Baselining – Core Requirements, Rate Analysis, Demand, Load Profile, Interval Data
ICP EPP Large Commercial	Baselining – Core Requirements, Rate Analysis, Demand, Load Profile, Interval Data

Savings Calculation

19. Document	20. Section Reference

21. ICP EPP Standard Commercial	22. Savings Calculation
23. ICP EPP Large Commercial	24. Savings Calculation

Verifying Completion and Operation

25. Document	26. Section Reference
27. ICP EPP Standard Commercial	28. Operations, Maintenance, and Monitoring, Measurement and Verification
29. ICP EPP Large Commercial	30. Operations, Maintenance, and Monitoring, Measurement and Verification

Reporting

The property owner is required to provide a post-construction Annual Savings Reports to the PACE administrator to ensure the success of the PACE program. This report shall be submitted during the term of the assessment or through a negotiated duration between the PACE Program Administrator and the property owner. Information required within the post-construction Annual Savings Reports shall be determined between the PACE Program Administrator and the property owner. These Annual Savings Reports shall be submitted by the property owner. Section 5 of PACE in a Box outlines the reporting requirements of individual PACE projects.

Exhibit B AGRICULTURAL PROTOCOL

For agricultural conservation projects, it is necessary to determine the affected area of the facility, site, or property. In general, a proposed project for agricultural energy/water conservation may affect 1) a facility related to agricultural operations, 2) an isolated equipment component or system (pumps, motors, etc.), or 3) a distinct water use area (i.e., irrigation). This protocol serves as a general guideline to direct the facility owner towards actions which have a basis in proven engineering concepts.

Agricultural activities outside the facility differ from those normally encountered in commercial and/or industrial areas in that water use and the energy associated with delivery of water may account for a larger percentage of costs relative to the overall energy/water budget. This may be especially true in the farming sector including greenhouse operations.

Agricultural Energy Protocol (Facility)

For ECMs/WCMs considered to affect, conserve or reduce energy/water resources in an agricultural facility and that are not directly linked to agricultural irrigation or any process application outside the facility, the EPP for Standard and Large Commercial should be followed as applicable. The sections below reference the appropriate EPP and indicate the minimum required items as listed in the document. Since all targeted measures or combination of measures are not known at this time, applicable portions of the EPP should be followed as necessary.

Establishing a Baseline

Document	Section Reference
ICP EPP Standard Commercial	Baselining – Core Requirements, Rate Analysis, Demand, Load Profile, Interval Data
ICP EPP Large Commercial	Baselining – Core Requirements, Rate Analysis, Demand, Load Profile, Interval Data

Savings Calculation

Document	Section Reference
31. ICP EPP Standard Commercial	32. Savings Calculation
33. ICP EPP Large Commercial	34. Savings Calculation

Verifying Completion and Operation

Document	Section Reference
35. ICP EPP Standard Commercial	36. Operations, Maintenance, and Monitoring, Measurement and Verification
37. ICP EPP Large Commercial	38. Operations, Maintenance, and Monitoring, Measurement and Verification

Agricultural Energy Protocol (Equipment/Systems)

Implementing water-efficiency in the agricultural sector where the majority of water and energy are consumed in irrigation most often use IPMVP Option A (Retrofit Isolation: Key Parameter Measurement) although Option B (Retrofit Isolation: All Parameter Measurement) is also viable depending on the specific measure and the affected equipment or system. The sections below reference the appropriate IPMVP protocols and indicate the minimum required items as listed in the document. Since all targeted measures or combination of measures are not known at this time, applicable portions of the IPMVP should be followed as necessary.

Establishing a Baseline

Document	Reference
IPMVP Concepts and Options for Determining Energy and Water Savings Volume I	Chapter 4 (as applicable); selection criteria Fig. 4 p. 33 and Table 3 p. 34

Savings Calculation

39. Document	40. Reference
41. IPMVP Concepts and Options for Determining Energy and Water Savings Volume I	42. Chapter 4 (as applicable); selection criteria Fig. 4 p. 33 and Table 3 p. 34

Verifying Completion and Operation

43. Document	44. Reference
45. IPMVP Concepts and Options for Determining Energy and Water Savings Volume I	46. Chapter 4 (as applicable); selection criteria Fig. 4 p. 33 and Table 3 p. 34

Agricultural Water Protocol

Water conservation projects are intended to provide savings through reduced water consumption as a result of improved performance of water consuming equipment, fixtures, or controls. Savings can also result from reduced water supply charges, sewer charges, and/or energy costs depending on the conservation measure implemented. Energy savings are commonly achieved from reduced water heating, and additional savings may be realized for facilities that use pumps to boost water pressure or to irrigate with groundwater, or at facilities with on-site water treatment systems. The performance of many common water conservation projects can be accounted for through short-term measurements and usage factors can be estimated, water savings are most often verified using IPMVP Option A (Retrofit Isolation: Key Parameter Measurement).

Key issues related to water conservation projects which should be observed are:

- Determining equipment inventory for baseline and post-installation;
- Establishing existing equipment performance for each type of device/system;
- Determining usage characteristics of each type of device/system;
- Determining post-installation equipment performance for each type of device/system; and
- Accounting for any known or observed interactive effects.

The sections below reference the appropriate IPMVP protocols and indicate the minimum required items as listed in the document. Since all targeted measures or combination of measures are not known at this time, applicable portions of the IPMVP should be followed as necessary.

Establishing a Baseline

Document	Reference
IPMVP Concepts and Options for Determining Energy and Water Savings Volume I	Chapter 4 (as applicable); selection criteria Fig. 4 p. 33 and Table 3 p. 34

Savings Calculation

Document	Reference
IPMVP Concepts and Options for Determining Energy and Water Savings Volume I	Chapter 4 (as applicable); selection criteria Fig 4 pp. and Table 3 p. 34

Verifying Completion and Operation

Document	Reference
IPMVP Concepts and Options for Determining Energy and Water Savings Volume I	Chapter 4 (as applicable); selection criteria Fig. 4 p. 33 and Table 3 p. 34

Reporting

The property owner is required to provide a post-construction Annual Savings Reports to the PACE administrator to measure the impact of the PACE program. This report shall be submitted during the term of the assessment or through a term negotiated between the PACE Program Administrator and the property owner. Information required within the post-construction Annual Savings Reports shall be determined between the PACE Program Administrator and the property owner. These Annual Savings Reports shall be submitted by the property owner. Section 5 of PACE in a Box outlines the reporting requirements of individual PACE projects.