

# Automated Reporting Guide For The MTC Production Tracking System (PTS)

Prepared by:  
The Cadmus Group, Inc.  
Technical Administrator For The PTS  
&  
Terra Novum  
PTS Training & Technical Support

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## **Notice and Acknowledgments**

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## **Abstract and Keywords**

This guide provides instructions on how to automatically report energy production data, collected by a Data Acquisition System (DAS), to the Production Tracking System (PTS). The primary objective of the Production Tracking System (PTS) is to provide MTC with the means to monitor and evaluate the performance of a wide range of renewable energy distributed generation systems installed in Massachusetts through assistance from the Renewable Energy Trust (RET). A secondary objective is to provide the Massachusetts Technology Collaborative (MTC) with the information necessary to monitor and evaluate the effectiveness of the various renewable energy installations programs. Finally, the PTS supports the production payment approach used within certain grants to partially fund the installation of photovoltaic (PV) systems in Massachusetts.

To report data automatically to the PTS, a valid System Representative username and password for each of the systems that will be reported on is required.

### *Keywords*

Automated Reporting  
Energy Production  
Data Acquisition System (DAS)  
Fuel Cell  
Grantee  
Meter  
Photovoltaic  
Production Payment Approach  
Production Reporting  
Production Tracking System (PTS)  
System Owner  
System Registration  
System Representative

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## FAQ

### *What is Automated Reporting?*

Automated Reporting offers an alternative to the process of manual meter reading and subsequent reporting to the MTC Production Tracking Systems (PTS). This option is only available for systems tracked by a Data Acquisition System (DAS).

#### Automated Reporting may make sense for you if:

You have, or will have, a DAS that collects and stores data locally, or you are subscribed to a service that monitors your system remotely and provides access to data via a web site. If a manual monthly meter reading will be inconvenient for you, then you should consider Automated Reporting. Because MTC requires a revenue quality meter, make sure the DAS uses a revenue quality meter.

#### Automated Reporting may not make sense for you if:

You have a smaller system and do not want to spend additional money on a DAS, or pay a monthly fee for a remote monitoring service.

### *How will production data be communicated from a meter to the PTS?*

Data collected automatically from a revenue quality meter *will not* be transmitted directly to the PTS. This data will need to be collected and stored on a computer, or server, that can then relay the data to the PTS on a monthly basis. This Data Acquisition System (DAS) may be administered locally at the system, or remotely through a DAS type service offered by a vendor. To help in establishing automated reporting to the PTS the MTC developed sample source code (VB.NET or Java<sup>1</sup>) and compiled clients. (Available at <http://ar.masstech-pts.org/downloads/>) At a minimum users will need to modify the sample source code to enable automated reporting. MTC's vendor (The Cadmus Group), upon pre-approval of MTC, is available to provide users with technical assistance with the AR interface process. MTC will also publish contact information for software vendors and DAS service providers that have already integrated Automated Reporting capabilities into their products at <http://ar.masstech-pts.org/downloads/>.

### *Will Automated Reporting cost more than manual monthly reporting?*

For systems that have, or plan to have, a Data Acquisition System installed that includes a revenue quality meter, there will be no extra cost. If you plan to set up the monthly reporting to the PTS yourself, then you should allow for time for development to

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<sup>1</sup> Additional sample source codes in VB 6 and Perl are planned for release in 2004.

incorporate and edit the MTC provided source code clients into your DAS. More time may be needed if you plan on developing your own client from scratch.

If the plans for your system did not originally include a Data Acquisition System, then you should expect some additional costs that could include: meter communications capability, DAS software, hardware (i.e. computer/server), installation and service fees. For smaller systems this cost could represent a significant proportion of the overall project cost.

### *Do I need programming experience to enable automated reporting to the PTS?*

If you plan to set up the monthly reporting to the PTS yourself then, at a minimum, you will be required to incorporate and edit the MTC source code clients into your DAS. (Available at <http://ar.masstech-pts.org/downloads/>) Previous programming experience in one of the sample client languages VB.NET or Java is recommended.<sup>2</sup> Other languages and platforms may be used as the open standard SOAP is employed. However, MTC does not anticipate providing sample clients in any additional languages.

MTC has approached DAS vendors and service providers about incorporating PTS Automated Reporting capabilities into their products. Your vendor or service provider may have already included this capability in your DAS, or have the ability to add the capability. Contact your vendor or go to <http://ar.masstech-pts.org/downloads/> for a list of products that have incorporated Automated Reporting capabilities.

### *Is MTC specifying any meter communication standards for automated reporting to the PTS?*

No. As the meter will not communicate directly with the PTS, no specific communication standards are required. The revenue quality standard for accuracy and reliability still applies.

### *What data should be reported and when?*

#### Mandatory

MTC requires that monthly production with a corresponding time stamp be reported. The monthly production can be taken in one of two ways:

- (1) Registry reading (preferred). A registry reading with corresponding time stamp is preferred. If possible, the reading should be taken at midnight on the last

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<sup>2</sup> Additional sample source codes in VB 6 and Perl are planned for release in 2004.

day of each month. Otherwise, the reading should be taken within 5 days before, or after, midnight of the last day of each month. The data should be reported to the PTS no later than midnight on the 5th day of each month.

(2) Interval data summary. If an automated registry reading is not available, then summation of interval data collected over the life of the meter is an acceptable alternative. This summation of interval data will serve as a proxy to the registry maintained at the site. As needed, the summation (proxy registry) should be adjusted to coincide with the true registry.

### Recommended

In addition to the mandatory data, MTC, for program evaluation and research purposes, would also like to collect interval data (15 minute). The ability to report interval data has been incorporated in the Automated Reporting sample code. See the *Setting Up Automated Reporting* section of this guide for details.

### *How can I get more help?*

For assistance with the PTS contact the PTS Administrator:

The Cadmus Group, Inc.  
57 Water St.  
Watertown, MA 02472  
Phn: (617) 673-7103  
Fax: (617) 673-7001  
[PTS@cadmusgroup.com](mailto:PTS@cadmusgroup.com)

## Introduction

The primary objective of the Production Tracking System (PTS) is to provide MTC with the means to monitor and evaluate the performance of a wide range of renewable energy distributed generation systems installed in Massachusetts through assistance from the Renewable Energy Trust (RET). A secondary objective is to provide the Massachusetts Technology Collaborative (MTC) with the information necessary to monitor and evaluate the effectiveness of the various renewable energy installations programs. Finally, the PTS supports the production payment approach used within certain grants to partially fund the installation of photovoltaic (PV) systems in Massachusetts.

Automated Reporting offers an alternative to the process of manual meter reading and subsequent reporting to the MTC Production Tracking Systems (PTS). This option is only available for systems tracked by a Data Acquisition System (DAS). Data collected automatically from a revenue quality meter will not be transmitted directly to the PTS. This data will need to be collected and stored on a computer, or server, that can then relay the data to the PTS on a monthly basis. This DAS may be administered locally at the system, or remotely through a DAS type service offered by a vendor. Figure 1 on the next page shows both options.

MTC has approached DAS vendors and service providers about incorporating PTS Automated Reporting capabilities into their products. Your vendor or service provider may have already included this capability in your DAS, or have the ability to add the capability. Contact your vendor or visit <http://ar.masstech-pts.org/downloads/> for a list of products that have incorporated Automated Reporting capabilities.

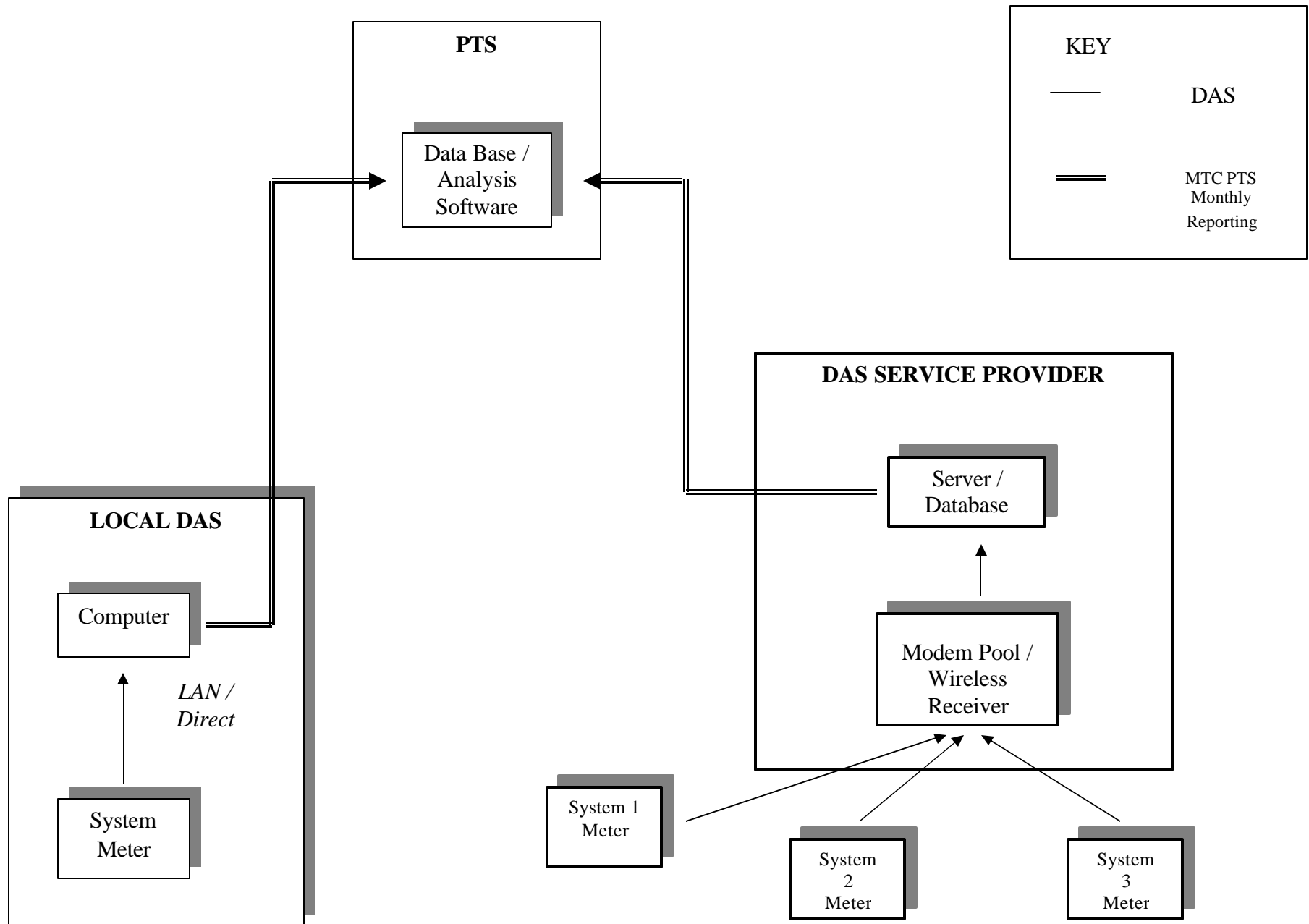
Sample code (VB.NET or Java)<sup>3</sup> and compiled reference clients are available for those interested in establishing automated reporting to the PTS to enable monthly transfer of data from the computer or server compiling the data. (Available at <http://ar.masstech-pts.org/downloads/>) At a minimum users will need to modify the sample source code to enable automated reporting. MTC's vendor (The Cadmus Group), upon pre-approval of MTC, is available to provide users with technical assistance with the AR interface process.

If you plan to set up the monthly reporting to the PTS yourself then, at a minimum, you will be required incorporate and edit the MTC provided source code clients into your DAS. Previous programming experience in one of the sample client languages VB.NET or Java is recommended. Other languages and platforms may be used as the open standard SOAP is employed. However, MTC does not anticipate providing sample clients in any additional languages.

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<sup>3</sup> Additional sample source codes in VB 6 and Perl are planned for release in 2004.

FIGURE 1: PTS AUTOMATED REPORTING SCHEME



## Automated Reporting Options

There are three options for establishing automated reporting to the PTS. Two require either third party DAS software or services that have PTS incorporated Automated Reporting features. The third requires integrating a sample source code for PTS reporting with your DAS. DAS software and service providers should follow this third option to integrate PTS reporting features in their products.

### *Vendor Supplied System*

If you currently monitor your renewable energy system through a local DAS, or you in the process of planning a system that will include one, the DAS software provider may have already incorporated, or be able to incorporate PTS Automated Reporting capabilities into your system. Make sure that the meter used in for the DAS is certified Revenue Quality. For a current list of vendors that have added PTS reporting features to their products contact the MTC.

### *Vendor Supplied Service*

If you currently, or you plan to, employ a DAS service that monitors your system's performance remotely, then you may already have the ability to report data automatically. Your DAS service provider may have incorporated PTS Automated Reporting capabilities into their system. For a current list of providers that have added PTS reporting features to their products contact the MTC.

### *Sample Source Code Integration*

If you want to enable your local DAS for PTS Automated Reporting yourself, or you are a DAS vendor or service provider that wants to incorporate PTS Automated Reporting functionality into your product, you will need to perform some minimal programming.

Sample code (VB.NET or Java)<sup>4</sup> and compiled reference clients are available for those interested in establishing automated reporting to the PTS to enable monthly transfer of data from the computer or server compiling the data. (Available at <http://ar.masstech-pts.org/downloads/>) At a minimum users will need to modify the sample source code to enable automated reporting. MTC's vendor (The Cadmus Group), upon pre-approval of MTC, is available to provide users with technical assistance with the AR interface process. See the next section "Setting Up Automated Reporting" for more detail on how to set up an Automated Reporting client if the above situation does not fit how your DAS functions.

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<sup>4</sup> Additional sample source codes in VB 6 and Perl are planned for release in 2004.

## Setting Up Automated Reporting

### *Data Acquisition System*

As noted in previous sections, a functioning Data Acquisition System that uses a Revenue Quality meter is a prerequisite. This system can be either completely local or rely on remote monitoring services. See Figure 1, pp. 9.

### *Transmitting Data From the DAS to the PTS*

Data is transferred from the DAS to the PTS using an open standard called SOAP (Simple Object Access Protocol) that uses many of the same underlying technologies as the World Wide Web (ie; http protocol). Sample source code (VB.NET or Java)<sup>5</sup> and compiled reference clients are available at <http://ar.masstech-pts.org/downloads/> to enable monthly data transfer from the computer or server compiling the data. At a minimum users will need to modify the sample source code to enable automated reporting. MTC's vendor (The Cadmus Group), upon pre-approval of MTC, is available to provide users with technical assistance with the AR interface process. The sample code is a starting point for your own work on creating a client to transfer the data to the PTS. The sample code: (1) takes in a delimited data file for a single system (2) creates an XML file based on the data file, and (3) validates and transmits the XML file across a SOAP connection to the PTS. For a copy of the sample code go to <http://ar.masstech-pts.org/downloads/>.

There are three steps that need to be completed to enable automated reporting to the PTS.

1. For each system, read the appropriate data from your Data Acquisition System's data storage and create an XML file based on the schema provided by MTC (<http://ar.masstech-pts.org/pts-ar.xsd>). Please read the schema carefully, as some elements are required and others are optional. Note that the elements must be nested and ordered exactly as shown in the schema.
2. Connect to the Automated Reporting Web Service ([http://ar.masstech-pts.org/pts\\_ar.asmx](http://ar.masstech-pts.org/pts_ar.asmx)), including the proper authentication information in the SOAP headers, detailed here: [http://ar.masstech-pts.org/pts\\_ar.asmx?op=postdata](http://ar.masstech-pts.org/pts_ar.asmx?op=postdata)
3. Transfer the contents of the XML as a string argument to the "postdata" or "testpostdata" method. The testpostdata method will not be binding and all transactions will be rolled back. This can be used for development and testing of your own application. Both methods will return a string containing an XML file

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<sup>5</sup> Additional sample source codes in VB 6 and Perl are planned for release in 2004.

holding the return value, conforming to the schema located here:  
<http://ar.masstech-pts.org/arresults.xsd>

## Data to Transmit

### Mandatory Monthly Data

- (1) **System Representative account information (username & password).**  
These must be added to the SOAP header in order to authenticate when posting data. Data may be posted only for those systems for which the specified account is the designated System Representative.
- (2) **System ID.** The designated PTS System ID of each system for which data is to be posted must be included. This can be looked up on the PTS website <http://www.masstech-pts.org/>
- (3) **Monthly Registry reading.** A registry reading with corresponding time stamp is required. If possible the reading should be taken at midnight on the last day of each month. Otherwise, the reading should be taken within 5 days before, or after, midnight of the last day of each month. The data should be reported to the PTS no later than midnight on the 5th day of each month. If an automated registry reading is not available then summation of interval data collected over the life of the meter is an acceptable alternative. This summation of interval data will serve as a proxy to the registry maintained at the site. As needed, the summation (proxy registry) should be adjusted to coincide with the true registry
- (4) **System Type.** Must be one of the following: “PV” (Photovoltaic), “FC” (Fuel Cell), “HE” (Hydroelectric), “LF” (Landfill Gas), “WE” (Wind Energy), “OE” (Ocean Thermal, Wave or Tidal Energy), “BM” (Advanced Biomass Power Conversion), “ST” (Solar Thermal Electric).
- (5) **Timestamp for monthly reading.** The date and time the registry reading was taken. This must be in the XML “dateTime” format as follows: yyyy-MM-ddThh:mm:ss. Note that leading zeros must be used for single digit elements (e.g. “01”, not “1”). The “T” is a literal time specifier.
- (6) **Technology-specific data.** For all system types except “FC” (Fuel Cell), no technology-specific data is required. For Fuel Cells, *Hours of Operation*, *Fuel Consumption*, and *Fuel Cost per Therm* are required.

### Recommended Monthly Data

#### **All technologies**

Service Cost (\$) The total spent on maintenance activities during the monthly reporting period.

This can serve as a default. For example, if a maintenance contract costs \$10 per month on average then \$10 could be used as the default. During a month when additional maintenance or repair costs are encountered, the service costs for the month should be reported manually to the PTS.

### Recommended Interval Data

In addition to the mandatory data, MTC, for program evaluation and research purposes, would also like to collect interval data (15 minute). The ability to report interval data has been incorporated in the Automated Reporting sample code.

#### **All technologies**

Current Output (kW)

Timestamp for interval data (same format as monthly)

Registry Reading (kWh)

System Efficiency (%)

Average Temperature (Fahrenheit) *Air temperature if PV, Unit temperature if Fuel Cell*

#### **Photovoltaic**

Average power (kW)

Average Wind Speed (mph)

Average Irradiance (watt/m<sup>2</sup>)

Current Inclination (%) *for tracking units*

Current Azimuth (%) *for tracking units*

#### **Fuel Cell**

Total heat production (mmBTU)

## Acronyms/Definitions

- **AR.** PTS Automated Reporting
- **BM.** Advanced Biomass Power Conversion
- **DG.** Distributed Generation.
- **FC.** Fuel Cell
- **Grantee:** The Grantee Account is for those responsible for the overall administration of a MTC grant. The Account is used to register renewable energy systems that will be coming on line in the near future. This account username and password may be shared with delegates to assist with the registration of renewable energy systems. A Grantee Account holder may also be signed up for System Owner and System Representative accounts in some cases.
- **HE.** Hydroelectric
- **LF.** Landfill Gas
- **MTC.** The Massachusetts Technology Collaborative
- **OE.** Ocean Thermal, Wave or Tidal Energy
- **Production Payment.** A payment made by the MTC to the recipient of a grant under the SMI Installations Program. These grant recipients will generally be the developer of a group of SMI PV Systems or, in some instances, the owner of a single SMI PV System that has a rated capacity of at least 10 kW.
- **PTS.** The MTC Production Tracking System
- **PTS Administrator.** MTC contractor responsible for developing and administering the PTS
- **PV.** Photovoltaic
- **RET.** The Renewable Energy Trust of the Massachusetts Technology Collaborative.
- **SMI.** The Solar to Market Initiative of the Renewable Energy Trust.
- **SMI PV System.** A PV system installed through partial funding under the Renewable Energy Trust's SMI Installations Program.
- **ST.** Solar Thermal Electric
- **System Meter.** This is the meter measuring system power production. Do not confuse this with other meters that might be at the site. MTC requires a meter that meets the "utility revenue quality" standard.
- **System Owner.** The System Owner account is for individuals or organizations that are a principal owner of a renewable energy system and for whom the Grantee wants to provide access to view the production data collected.
- **System Representative.** The System Representative account is for those responsible for entering monthly production data for a renewable energy system. The account allows access to the production reporting section of this site. No other user type has access to this section.
- **WE.** Wind Energy