



Plug and Play SCADA

Whether you read a single point or a million, whether you want to buy or rent, whether you want to use the service strictly online or have a server at your site: Wherever you are located, we offer you a simple and affordable Smart Metering service.



Plug and Play Scada sports an **Innovative Distributed Architecture** that allows the customer to choose hosting on our servers online for a nominal fee, or installing a server at his site

if he so wishes, without sacrificing the convenient internet login, or losing the capability of hands-on support and administration from the supplier.

This translates to higher reliability, suitable for a Process Control environment - trusted by Mondi Merewent and O.R. Tambo airport - since the communication can be hard-wired from the meters right to the actual server, without relying on inherently unreliable internet connections or modem communications.



It also translates to higher availability and performance, since billing and other processes running on one server does not affect any other server's performance. If you run out of steam, simply install another server.



Server Spec:

Linux Open Suse 11.0

Intel(R) Core(TM)2 Quad CPU Q6600 @ 2.40GHz

cache size : 4096 KB

Memory 4GB

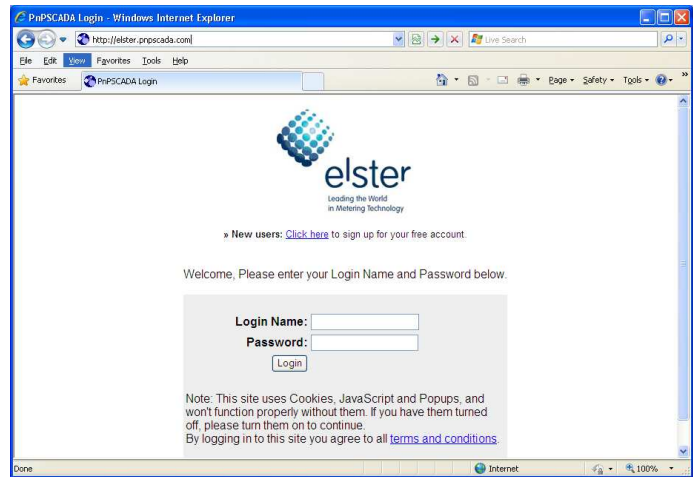
SATA 250GB disk space

100mbit ethernet port

Security and Identity

Identities and passwords of users are protected by up to 256-bit Secure Sockets Layer encryption.

Administrators can create users and grant them to see/use different functionalities and data, based on Roles. Many users can be assigned to the same permission set, by assigning them to the same Role.



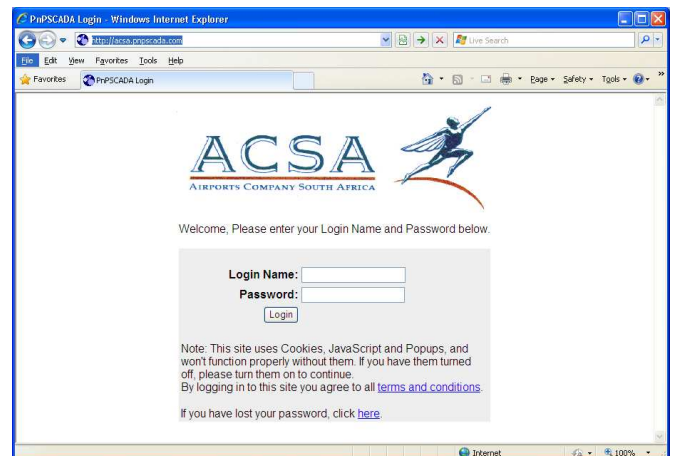
While Plug and Play Scada sports full scalability and modularity across many sites and many servers, the user is protected from this complexity through what we call a 'glass wall'. The **Glass Wall** allows the user to log in on any server, and be redirected transparently to the server on which his account exists, or to swap between servers dynamically as needed if he has accounts on more than one server.

Our GPRS modems also take advantage of a Glass Wall, meaning that they transparently redirect to the server on which they are configured. Although we support APN functionality, our GPRS modems do not require an APN.

We automatically create a separate web address and (optional) banner image for every shopping center or site. This is very important for when you have

duplicates in your Login Names,

for example 'Shop01'. From past experience we know that multiple shopping centers tend to give login names to their clients based on their account number or their shop number, and hence, duplicates between shopping centers exist. In order to give every shop its own unique login, we provide each center with its own unique web address.



As part of our commitment to service excellence, we automatically create remote backups of your valuable data every day, in case your box is stolen or destroyed, or you mess up your configuration beyond recall. A full restore of your complete configuration can be done in less than 2 hours*.

Energy Use Simply

Many large energy consumers cite their utility bill as a major source of dissatisfaction with their current utility service. Bills arrive late, contain errors, or fail to present information in a format that is comprehensive and concise.

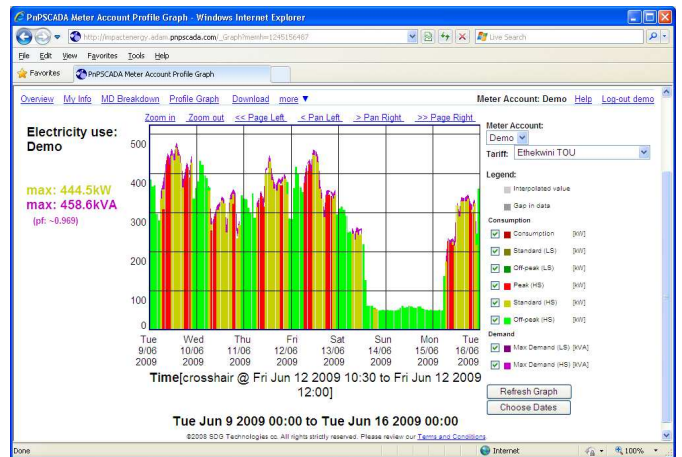
* Conditions Apply

This is aggravated by the introduction of increasingly complex tariff structures used to promote demand side energy management.

In order to recover and control your energy costs effectively, you need to transfer your energy costs to the customer fairly and transparently.

Plug and Play Scada gives the customer a simple clean interface where he can interact with his **Profile Graph**:

Energy and demand used every half hour becomes visible to the customer in a simple, colorful and powerful TOU sensitive graphic display, fully zoom- and pan-able. Water usage graphs are also supported.



A full costs breakdown in **Currency terms** is available at the touch of a button with

Tariff	Description	Units	Rate[R]	Amount
Peak (LS)	Total #10839-481kVh	84136.77kVh	0.2294	R6,172.54
Standard (LS)	Total #10839-481kVh	86593.31kVh	0.1534	R13,266.23
Off-peak (LS)	Total #10839-481kVh	83475.72kVh	0.1193	R6,958.69
Max Demand (LS)	# 973#1 2009-05-22 12:00	490.01kVA	46.1922	R22,600.31
Sub Total:				R55,757.51

Total before VAT: R55,757.51
 VAT(14.0%): R7,806.05
 Total: R63,563.56

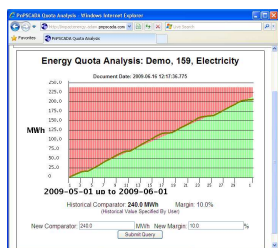
our Provisional Billing facility, meaning that the information moves from the Engineering domain into the Accounting domain, where it can be more effectively understood and interpreted by an Accountant or Shop Manager.

A Formalized Billing Wizard - with comparisons to the billing of the last 3 months - is also provided to the administrator client.

Formalized Bills can also be exported to third party programs, for example **SAP** and **SAMRAS**.

For your customer to support your energy saving initiatives, it is imperative that they should have access to load data and pricing information in order to make sound energy choices.

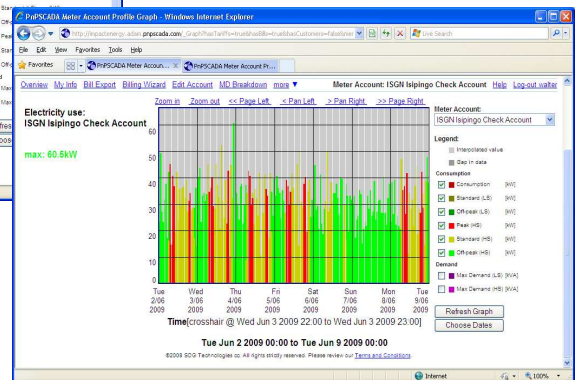
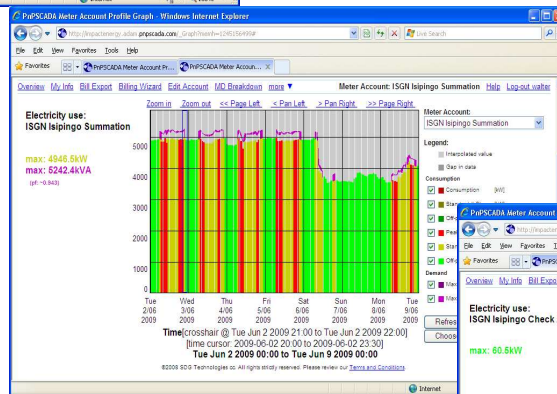
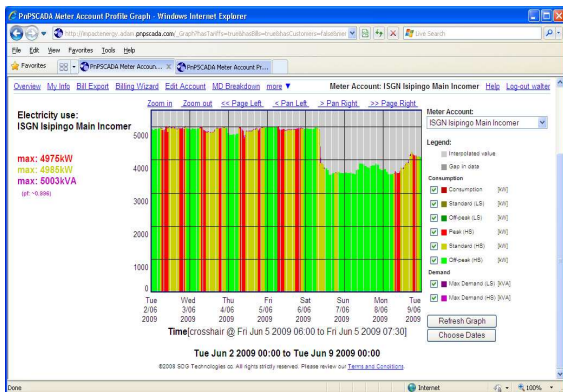
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Tariff Item	Avg	Max	Load Factor
Peak (LS)	341.70	446.70	70.43
Standard (LS)	337.74	477.20	70.35
Off-peak (LS)	216.52	476.53	45.85
Max Demand (LS)	340.71	490.01	71.35

Meter	Social Number	Active Energy	Billed Energy	Demand of Meter	Power Factor
Meter 10839-481	10839-481	12248.000 kWh	142.500 kWh	1481.893 kVA	0.990
Meter 10839-481	10839-481	1791.290 kWh	1791.290 kWh	1791.290 kVA	0.979
Meter 10839-481	10839-481	21.000 kWh	21.000 kWh	21.000 kVA	0.987
Meter 10839-481	10839-481	4165.220 kWh	3821.000 kWh	3100.712 kVA	0.756
Meter 10839-481	10839-481	4211.280 kWh	4104.250 kWh	3176.100 kVA	0.717
Meter 10839-481	10839-481	6.000 kWh	6.000 kWh	6.000 kVA	0.985
Meter 10839-481	10839-481	8.000 kWh	8.000 kWh	8.000 kVA	0.985
Meter 10839-481	10839-481	97.500 kWh	97.500 kWh	248.000 kVA	0.792
Meter 10839-481	10839-481	112.500 kWh	112.500 kWh	318.000 kVA	0.707
Meter 10839-481	10839-481	1716.780 kWh	1716.780 kWh	4615.000 kVA	0.708
Meter 10839-481	10839-481	2968.780 kWh	2968.780 kWh	3107.500 kVA	0.681

Plug and Play Scada offers flexibility in the ability to generate **Summated Accounts** for multiple meters.



These summated accounts correctly diversify demand by calculating the simultaneous maximum demand for a number of metering points.

Summated Accounts are also used for **Check Metering**, where meter readings for different meters are subtracted from each other: the main minus the check meter should always be close to zero. This effectively provides continuous auditing of all your energy accounts, giving total peace of mind that your meter readings are absolutely reliable.

An additional innovation of Plug and Play Scada is to provide an accurate **Virtual Generator Meter** per customer, complete with full profile.

This means that you can have a Generator room supplying a whole building, without having to connect every meter to the Generator room via hard wires.

This separation of profile happens in software: at the moment when the generator power comes on-line, the real time totals on all the meters are read, and the profile split.

This approach limits the inaccuracy of the profile to a few seconds either way which is better than the 1 minute profile approach - providing that you have your server on site.

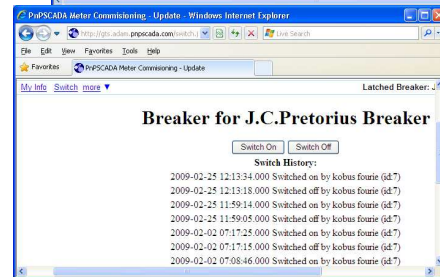
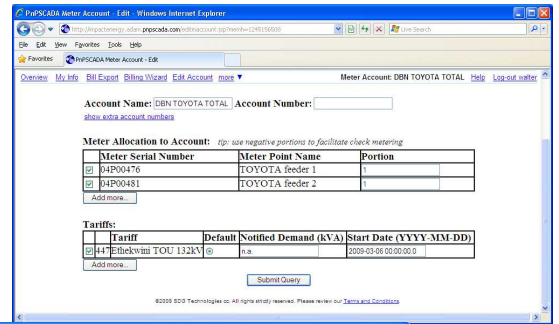
The non-Generator Meter Account is then equal to the normal Meter minus the Generator Meter, and easily configured using a Summated Account.

The full Plug and Play Scada **Back Office Functionality** is available to the administrator user. No more waiting for the supplier to change your configuration! Support is still available on request, but all the tools to edit tariffs, TOU calendars, meter accounts and more are readily available to you via your Web Browser.

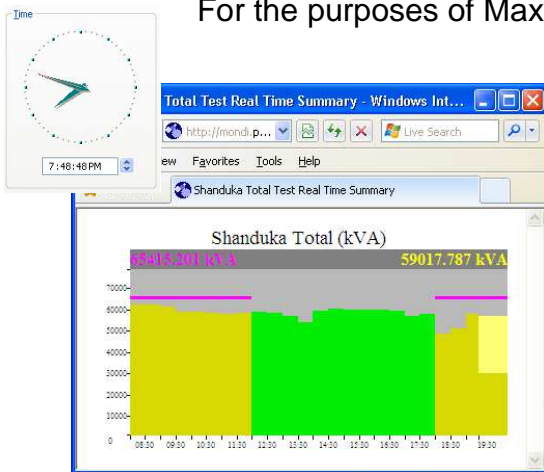
Load Control

Accurate Energy Accounting is only one half of the Smart Metering puzzle. In order to enforce energy savings, or control energy saving more rigorously, it is often necessary to switch off excessive load.

This can be done manually, or automatically through Load Scheduling and Demand Control.



For the purposes of Maximum Demand Control, whether manual or

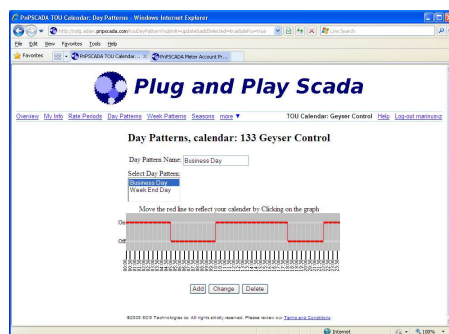


automatic, Plug and Play Scada provides

Real Time Maximum Demand

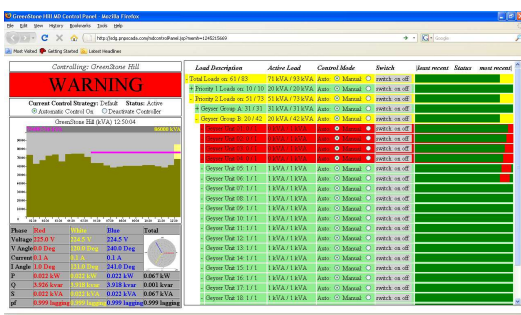
Prediction functionality, to show the customer in real time where his maximum demand for the current half hour will be, if he keeps up his current Rate-Of-Use, as well as the kVAh already consumed in the current half hour and the current billing period's MD.

This functionality is also supported across multiple Metering Points, configured by means of a Summated Meter Account.



In many cases the desired control pattern for a load is already known to a user, for example switching off geysers during Peak TOU period. This **Load Schedule** can be

configured via a period in a TOU Calendar.



Plug and Play Scada provides both

Instantaneous Demand Control, as well as **Billing Maximum Demand Control**. The first works via real time values of currents and voltages, and the second from the kWh total in the meter for a particular half hour. The first protects your system against overload (tripping), and the second limits your MD cost on your Bill.

Plug and Play Scada allows the definition of Aggregate Load Groups, making managing your loads for load switching easier.

Plug and Play Scada can also interface to your existing real time Scada system via SNMPv3 or OPC.

Advantages of Web Browser Application approach:

- Using a Web Application for your enterprise wide software instead of a Windows Application holds many operational advantages, which can be loosely grouped into 4 categories: Ease of Use, Speed, Reliability and Scope.
- Not only does this translate into optimal User Friendliness, not only does it save you **Money and Time** in easy-to-measure ways throughout, but the possible Scope of implementation is much wider: more people can have easy access to the system, including your customers. Implementing a customer friendly solution means that your AMR must have a Web Browser interface to its full functionality.

Ease of Use

- Training & Skills Transfer: Most people can already use a Web Browser, so the very first part of most application training, which is how to get into the program is already solved, and if not, can be taught to users via a normal computer literacy course, without the need for special training personnel.
- Training & User confidence: The last part of application training, which is fostering user self-confidence in using the program, is already largely solved before you even start, since most people are familiar with using a Web Browser already.
- Installation is easy: most PCs already have a Web Browser installed. This saves the Time and Money it would have taken to install the Client Application on new PCs - that can easily be measured.
- Upgrades to client software is automatic. Since the software runs on the server only, no client software needs to be installed and kept up to date. The latest version is always automatically 'installed', with no Time and no Money cost.
- Support is much easier: if basic internet browsing access works - e.g. doing a search on Google - then all functionality on the client's box will be working sufficiently well to use the system. There is no need for AMR support to worry about the drivers, hardware, version of the Operating System, automatic windows updates, anti-virus software or serial and/or USB port configuration, since the real work happens on the server. This translates to a lot less time spent on support (for both the user and the supplier), and money saved.
- Technicians can access the web page from their notebook computers through wireless Internet, to configure meters onto the system, and in order to check communications in real time, without having to install special software or hardware, and without configuring USB to serial drivers on their computers.

Speed

- Training is faster to set up, especially On Site training, since lengthy installation of special software is not needed.
- People learn to use the program quicker, since most are already familiar with Web Browsers.
- Installations are instantaneous: most computers already have web browsers.

- Upgrades are instantaneous: only the server needs to be upgraded, and the supplier can do this remotely and centrally.
- Response from meters in the field is instantaneous, since the Data Collection, Database and the Load Research are all happening on or near the web server. There is no delay in the user receiving real time information from the field straight in his Web Browser.
- Applications perform Lightning Fast, even on slow PCs: since servers generally have better performance than client workstations, a client running on a mediocre PC can benefit from very fast applications because most of the work is done on the server side.
This translates to a saving in terms of Money: your client workstations does not have to be top of the range.
- Installation of meters onto the AMR should be quicker, since technicians themselves can confirm communication between the system and the meter before they leave site. They can also configure commissioning information on the web site, and their changes to meter parameters are logged in a secure Commissioning Log, which can be used to print formal Commissioning Sheets.

Reliability

- ActiveX settings are often problematic to enable, as well as posing a security risk to your enterprise. Plug and Play SCADA solves these support problems before they happen, by functioning perfectly without ActiveX. More reliable, more secure.
- The Server and Client software is automatically kept in track, since most software runs on the server, and the pages running on the client is loaded again every time the server is browsed. With normal distributed Windows Programs (Client/Server), you have to spend a lot of Time and Money while doing an upgrade to ensure that the Server and Client software versions remain in track, and in a large organization, or if you give the Client Software out to your clients, to ensure that everyone is upgraded can turn into a support nightmare. Using a Web based application, no energy is lost to this exercise.
- Windows Applications are open to abuse from viruses. Since the Web Server is running Linux and protected by firewalls, the danger from viruses is virtually non-existent.
- Windows Applications sometimes fail because of the environment in which they are installed - including drivers, serial port and USB port drivers, display drivers, hardware and previously installed software - is unsuitable, or becomes unsuitable because of Automatic Windows Updates. Running within a Web Browser, which must be able to run in any case, and for a much larger support base, this translates to greater reliability for the Web Application.
(Communication normally happens via Secure Socket Layers, which means all communication between the client and server is protected by 265-bit encryption. Client accounts can be restricted, so that - even if a user's password falls into the wrong hands - any damage can be limited.)
- The data on the Client and Server remains in track: It is easy to take a daily remote backups of the entire state of the system, and complete system restores can be done if needed. There is no data kept on the client side that can go out of track with the central system.

- Remote Support is much easier, cheaper and more dependable to a few central uniform web servers than to thousands of Client stations, which are all non-uniform.
- The user has the option of running on another O/S, for example Linux Ubuntu, which can be more reliable in some instances than Windows.

Scope

- **Greater Accessibility:** Users can access the system from any web browser. That means they can benefit from the system at times when they would not normally be able to do so with a Windows Program - because it is not installed - for example: When they are out of the office; when their PC has crashed; when they were upgraded to a new Computer or Operating System.
We also do not need ActiveX to be specially enabled on a new install: Plug and Play SCADA works with the default settings.
- **Collaborative Energy Management:** You can practically allow thousands of people onto the system, e.g. your customers, via a secure Web Login; which is not practical via a dedicated Windows Program. For your customers to support your energy initiatives, it is imperative that they should have access to load data and pricing information in order to make sound energy choices. If you do not have customer buy-in for your energy initiatives, your energy use pattern will not change. To this end, you need to transfer your energy costs to the customer fairly and transparently, and therefore you need to give them a secure Internet login where they can see how their energy use patterns look, and exactly how much it costs, and why.
The fact that Plug and Play SCADA also does not require ActiveX for the Web interface and is intuitive to use, makes it practical to roll out access to thousands of clients, preempting the need for prohibitive levels of support.

To be able to support a million meters or more, the Plug and Play Scada architecture utilizes a distributed computing approach.

In order to be able to be literally infinitely expandable, Plug and Play Scada uses Vertical Distribution, instead of Horizontal Distribution. Here follows a discussion of our reasons for this approach:

Vertical vs. Horizontal Distribution for an AMR:

AMR is an inherently vertical application, where customers' accounts (with meters and bills) are generally separate from each other. People don't want to see each other's bills. Consequently, we have found that the better performing distribution model to follow for AMR is also the vertical distribution model as opposed to the horizontal distribution model.

Horizontal distribution, which is typical in a standard multi-tier architecture, typically means that the database, server application and client program runs on 3 different machines:

Presentation Server (Rich Client)
Application Server/s
Database Server/Cluster

This is a generally complex solution, where you need dedicated administrators and support staff to configure the interrelations between the various components, including but not limited to different versions and upgrade paths, complex change management procedures, and the like. This Complexity translates to Big, Slow and Expensive, from an organizational point of view.

Except for the complexity, the performance of the above system is also not very fast, since not only is the Database Server a bottleneck, but for the Application Servers to read and write data to the database, they have to do network communication, which is relatively slow if you compare it to a memory copy operation.

In the case where the Meter Reading service is also running on a separate server to the one the user is connected to, the performance problem worsens to the extent that it becomes impractical to give the user real time updates to what is happening in the field – and in systems where it is done, updates generally come through the many different layers and servers relatively slowly – if it works at all.

As far as truly redundant Stand-by systems are concerned, Multi-Tier Distributed system as above is very difficult, complex – and in some cases impossible - to configure, since there are so many inter-related layers that must be separately managed and made redundant. With computers, even the smallest inconsistency in configuration or code can render a Master/Standby system effectively inoperative. You will never really know it works until the emergency happens, and by then it is too late.

But the biggest problem with the above model is Scalability. The Database Server is still a bottleneck, and can support only a fixed – albeit large – amount of data/customers/meters. So people end up buying very very expensive hardware for their servers, and still sit with a very real ceiling.

To solve these problems, we follow a vertical distribution model:

Web Browser (thin client)	Web Browser (thin client)	Web Browser (thin client)
Application & DB Server	Application & DB Server	Application & DB Server

Each Plug and Play Scada server is atomic, with no complex interrelationships for which you need expensive dedicated administrators. All your administrators can be busy with your real work, which is managing your AMR and your login permissions.

No Rich client, which needs to be installed and maintained and upgraded, so no army of support technicians to upgrade everyones computers: all your support staff can be busy with your real work, which is supporting your AMR, meters and billing.

Since each server is atomic, it is much easier to install, and you can be more flexible in your installations: you have more flexibility of where you can put the server. In process control (and Load Control), it is often wise to put the server as close to the field as possible, to increase the reliability of your control and communications.

Access from the Application layer to the DB layer is lightning fast, because it exists on the same machine.

Real Time feedback from the field is instantaneous, since the same machine that connects to the meter connects to the user.

Redundancy is easier to configure, since the server represents a single point of failure, and its complete configuration, state and data is easily backed up on a regular basis for Fail-over or Standby purposes.

Performance across the board is much faster, since database tables are smaller. With multiple large related tables in an SQL database, certain queries generally results in exponential performance loss. With smaller tables, the chances for this happening is much reduced. Backups are faster, bills run faster, checking algorithms run faster, system recoveries are faster, and if another customer on another server becomes active, or fails, it does not affect your performance.

Perhaps the biggest advantage of the vertical distribution model is the fact that it is infinitely scalable. This also translates to a cheaper cost in servers, since you don't have to buy the most expensive servers, with the administrative personnel to run it. Simply put less meters on each server, and have more – cheaper – servers.

All in all, a Vertically Distributed AMR system can read a lot more meters for the same money. It is inherently faster, more reliable, more affordable and more powerful than the traditional multi-tier Client/Server architecture.