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- Save Money By Metering Electricity Usage
- Easily Connect Submeter To Existing WiFi Networks



Shark® 100-S Economic WiFi Submeter Real Time

Monitoring Only











Submetering is using meters to measure parts of total load measured by the Electric Utility's Master Meter/s

Usually:

- · Submetering is encouraged by the state and federal governments, US and Canada
- The load side of the Master Meter, owned by the Electric Utility, is the POCC
- The Submeters do not measure the total load seen by the master meter, e.g., Meters do not measure their own load ٠





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Studies of Residential and Commercial Submetering show 15 to 30% reductions in energy usage are typical

•Los Angeles Air Force Base (AFB) -27% Engineered Systems Magazine

•Carlyle Towers and Scott Towers -25% New York State Energy Research and Development Authority

•ConEd/New York State Energy Research and Development Authority -21% <u>History of Submetering</u>

•BJ's Warehouse Chain Claims Large Savings from Submetering Building Operating Management





Residential Submetering

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Target Customers:

- Condos
- Co-ops
- Large Apartment Buildings
- **Submetering** is the measurement and billing of electricity use in separate units of a master metered building. The Submeters are owned by the building owner the utility continues to read the building's master meter and issue a single billing to the owner.
- Building owner buys energy at bulk rate and bills tenants for usage instead of utility; rate is guaranteed to be lower than residential rates in most states.
- Submetering is often linked to Building Energy Management System to improve efficiency





Why Submeter? Residential

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- Submetering Saves Energy. An analysis of Submetered buildings (where data has been made available) conclusively illustrates that annual savings of 18-30% of total tenant electrical consumption was achieved in the first year.
- Submetering Energy Savings Persist Over Time. Submetering savings have proven to be maintainable over long periods of time as demonstrated in a number of studies. Some likely reasons are that: (a) conservation is reinforced by the resident's receipt of an electric bill; and (b) residents will invest in efficiency (e.g., more efficient refrigerators and lighting) because they will reap the benefits directly.
- Approximately 60-70% of Tenants Benefit from Submetering. The only tenants who fare worse under Submetering than under other means of allocating electric cost are those who use excessive amounts of electricity. Those residents who find that their electric bills are excessive have the ability to reduce cost by reducing consumption.
- **Submetering is Fair**. Submetering simply restores the "user pay" concept. Tenants who leave windows open and leave on lights will pay for their actions or change their habits.



 Submetering Benefits Owners - Submetering largely eliminates a volatile, variable, and difficultto-control factor from a building's operating budget. Owners can better predict costs when the only electricity usage to be considered is for common areas under management control. Submetering is a competitive tool for owners - submeters lower energy costs.





Residential Savings

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CARLYLE TOWERS ENERGY USE



Source: New York State Energy Research and Development Authority

Impact of Submetering in Residential Buildings

Carlyle Towers Cooperative

Location: 138-10 Franklin Avenue Flushing (Queens), New York Size: 194 units (15 floors) (74 one bedroom; 90 two bedroom; 30 three bedroom units) Common Areas: Lobby, laundry, garage, and commercial tenant

Results

- 18% savings in building electric costs, after adjusting for weather and utility rates.
- 25% reduction in average apartment energy consumption
- 73% of apartments now pay less for energy

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Commercial Submetering

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Target Customers:

- Hospitals
- Government Facilities
- Airports
- Schools And Universities
- Shopping Centers
- Commercial Offices
- Large Retail Stores
- Chain Stores

- **Submetering** is the measurement and billing of electricity use in separate units of a master metered building or group of buildings. The Submeters are owned by the property owner. The utility continues to read the master meter and issue a single billing to the property owner.
- The Property Owner buys energy at bulk rate and bills tenants for usage.
- Commercial Submeters Measure both Energy Usage and Demand, and occasionally Time-of-Use (TOU). The ability to link to an Energy Management System is often required.





Why Submeter? Commercial

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Plus: Demand Management

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Why Submeter? Commercial

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Demand: Is the average rates of energy usage during a time period, typically 15 or 30 minutes, e.g., 200 kWh for 15 min/15 min= 800 kW Demand

Manage Demand Charges:

- Commercial and Industrial Electric Bills include large Demand Charges based on Peak Usage during a month.
- New Peak Demand charges typically are carried for a year.
- Maximum Demand can be changed just by changing when loads are started.

Submetering Exposes the Sources of Demand Peaks





Economics of Submetering

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Example: Air Force Base Sees Energy Savings Take Off <u>ACHM News</u>

Situation: Los Angeles Air Force Base, 150-acre Government offices, research and development laboratories, military housing, and other facilities. Accurate energy metering was an issue at the site where only one master utility meter measured energy usage for the entire base. Energy Manager, Ed Wilson, says, "We knew we were using a lot of energy and we were trying to determine where it was being used and at what time of day. But, we really had no idea which buildings were using more or less energy."

Project: 36 meters were installed at the service entrances of 14 main buildings, totaling about 100,000 square feet. Data was collected from the submeters and then relayed to the energy manager's computer. The submeter's store information for up to 36 days in 15-minute increments and maintain data in case of a power interruption.



Payback: Less than three years after the Base's submetering system was implemented, energy consumption decreased more than 27 percent from the established 1985 baseline. Utility costs decreased 23 percent from an established 1990 baseline — during a period in which electricity rates increased by 4.5 percent.

Overall, Los Angeles AFB has saved more than \$1 million annually on its utilities, and is likely to save more in California's tightening energy market.

Savings = \$1 M/year /36 meters = \$27,800/year/meter

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Industrial Submetering

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Target Customers:

- Process Industries
- Industrial Facilities
- Grocery Stores
- Businesses with Energy Management Systems
- Submetering is the measurement of key pieces of the total energy used by a business so that the pieces can be benchmarked and energy trends monitored.
- Industrial Submeters Measure Energy, Demand, and often Time-of-Use (TOU) and Load Profile Recording
- Industrial Submeters also often measure the Quality of Power delivered by the Electric Utility





Why Submeter – Industrial

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- Allocate Energy Costs Submetering allows facility owners to equitably distribute actual energy costs to departments or tenants, to assign accountability to energy users and to provide incentives for energy users to reduce costs.
- Benchmarking To Discover Opportunities For Energy Efficiency Improvements – It is possible with Submetering to measure who is using energy, how much they are using and when it is being used. That information can then be used to pinpoint the cause of utility demand charges and compare energy efficiency with similar users.
- Lowering Energy Costs Knowing energy-use data is critical for negotiating energy procurement contracts and is a powerful visual analysis tool to explain consumption and demand patterns.
- Measure And Verify Energy Conservation Projects Submetering can be used in audits before and after energy upgrades to measure how much energy a project is saving.
- Identify Performance Problems In Processes and Equipment A proper Submetering setup can signal excessive energy use with specific pieces of equipment, systems or processes.



- Limit Demand Optimizing system performance requires use of real-time energy data to indicate how much energy is being used at virtually any time of day. Submeter data can also forecast building demand and can help consumers to implement routines that curtail use. Linking Submetering with Energy Management Systems provides a much higher level of control.
- Identify Power Quality Problems Monitoring Power Quality Protects Equipment and improves up-time
- · Verify The Accuracy of Utility Bills

Submetering Provides the information Needed to Control of Energy Costs





Demand Reduction Example

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A Light Manufacturer who operates on 2 shifts. The typical electricity cost is about \$150,000 per year; the facility was paying, in a typical summer month, \$12,000 electricity. (All figures are rounded)



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Demand Reduction 2

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Using Submetering the Demand Management System Lowers Peak Demand by Sequencing Loads



Typical Daily Demand



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Total Energy Usage is not changed but information from Submeters to Energy Management System provides a 5% or \$1061/mo savings.

Before - \$24,307 per month		After - \$23,246 per month	
56,000 kWh (off peak) @ \$0.0770/kWh	\$4,312	56,000 kWh (off peak) @ \$0.0770/kWh	\$4,312
120,000 kWh (on peak) @ \$0.0877/kWh	10,524	120,000 kWh (on peak) @ \$0.0877/kWh	10,524
Demand (482 kW) @ \$19.65/kW	9,471	Demand (430 kW) @ \$19.65/kW	8,449
Total	\$24,307	Total	\$23,246

Source: LIPA Rates 2005

Information from Submeters provides Energy Management Systems with new ways to reduce Energy Costs

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Shark Series





Economical Meter Solutions

RK®100

Feature Layout

ENTER

MENU

G Electro Industrie GaugeTech

141 OAD

MAX

MIN

LM2

%THD

PRG

S. 10

IDA

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VOLTS L-N

В

VOLTS L-L

W/VAR/PF

VA/Hz

VARh

S VAh

0

Wh Pulse

MEGA

SHARK

Wh

- Revenue Grade Energy and Demand Metering (ANSI C12.20 (0.2%) and IEC 687 (0.2%) Accuracy Classes
- Multifunction Meter: Voltage, Current, Power, Frequency, Energy, etc.
- Power Quality Measurements (%THD and Alarm Limits)
- V-Switch® Field Upgrade without Removing Installed Meter
- 3 Line .56" Bright Red LED Display
- % of Load Bar for Analog Meter Perception
- Interface to Energy Management Systems -RS485 Modbus & DNP - 57.6K Baud
- IrDA Port for PDA Remote Read
- Easy to Install, Ultra Compact and Fits Both ANSI and DIN Cut-Outs





% THD Screen -

IRDA

Programming

Port

% of Load

"Analog Feel" Bar



User Screen

Select

Revenue Test Pulse



Advanced Meter Solutions

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Adds up to 4 Megabytes of on-board mass memory

- Multiple logs allow for data trending and analysis
- Utilizing V-Switch[™] 5 and 6, the meter utilizes advanced power quality recording
- Expandable I/O including:
 - 10/100BaseT Ethernet
 - 0-1MA or 4-20MA analog outputs
 - Relay outputs
 - Status outputs
 - Fiber Optic Communication









Economical Wireless Submeter

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Advanced Submeter

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WiFi Submeter with Extensive Datalogging

- Utilizes all the features of the SHARK® 100S and adds 2 Megabytes Flash memory
- 3 Historical logs, Limits (Alarm Log) and System Events log
- Real-Time Clock that allows for time-stamping
- System Events recording for anti-tampering security
- Utilizes Modbus RTO or Modbus TCP for downloading stored logs. Highly compatible.







Easy to Use

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Replaces Several Meters

- Voltage L-N, L-L
- Current I, In, % Load
- Power Delivered & Received Watts
- Energy Delivered & Received Wh
- Complex Lagging & Leading vars, PF
- Apparent Power VA, VAh
- Frequency
- Easy to Read Indoors Easy to Read Multi Line Backlit Display
- Easy Testing Test Pulse Output
- KYZ Pulses outputs when needed
- Enhance Functionality without removing the meter using V Switches



Flexible Communications

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- 2 Standard Comm Ports and RS485 (Back)
- High Speed RS-485 Multi Drop Communications (9.6 to 57.6K)
- Optional WiFi wireless 802.11 Ethernet
- 10/100 Base T RJ45 Ethernet
- KYZ Pluses to Older Equipment
- RS-232 Serial Communications
- Modbus TCP Protocol
- Modbus RTU or ASCII Protocols

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Easy to Install

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One Meter for All Applications

- Wide voltage range 0 416V L-N, 0-721V L-L
- Flexible Inputs Programmable VT and CT Ratio
- Singlephase, Network, and 3 Phase Circuits
- 50 or 60 Hertz
- Meets ANSI and IEC Standards
- Switched Circuits Can Use External Supply Voltage

EMS Open Protocols

- Modbus TCP, RTU, & DNP
- 2 Comm Ports IrDA (Face) and RS-485 (Rear)
- Easy to verify installation using Tests
 Pulses
- KYZ pulse outputs to RTUs and EMS
- Ultra Compact and fits both DIN and ANSI Cutouts

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WiFi Networking

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- Simple, over the counter wireless 802.11 architecture that is easy to integrate and reliable.
- Each meter is uniquely identified and can be used over any existing wireless or wired Ethernet LAN.
- Just install the meter, plug in the IP address and it is automatically on your LAN wirelessly.
- Simply extend the network by adding WIFI access points.

Benefits of Wireless Ethernet over Dedicated 900 MHz Spread Spectrum

- Standard Infrastructure (No Dedicated Hardware)
- Low Cost to Deploy and Expand
- Superior Speed Over Dedicated Wireless Networks
- Significantly Easier to Configure and Maintain
- Standard Modbus TCP Data Stream
- Can be Easily Integrated through Internet





Commercial & Industrial

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Simultaneous Dual Communication Paths

- Wireless Reading and easy links to Energy Management Systems set the Shark® meter apart from other meters in C&I applications.
- The Shark ® meter also is uniquely capable of working with RTUs, Industrial Controls and SCADA because of its sophisticated Modbus and DNP protocol support.
- Compatibility with the Nexus® line of Industrial Meters and an extensive list of EIG Modbus compatible load control devices provide powerful solutions to C&I metering problems.

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El Solutions - Submetering



World Metering Standards









Compliance

- IEC 687 (0.2% Accuracy)
- ANSI C12.20 (0.2% Accuracy)
- ANSI (IEEE) C37.90.1 Surge Withstand
- ANSI C62.41 (Burst)
- IEC1000-4-2 ESD
- IEC1000-4-3 Radiated Immunity
- IEC 1000-4-4 Fast Transient
- IEC 1000-4-5 Surge Immunity

The Shark® Monitor is a World Revenue Grade Meter

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V-Switch Technology



- Purchase the capability you require now and field upgrade functionality as needed
- Upgrades are done with software, no need to remove or open the meter

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V-Switch Technology

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Shark® 200

V33 Volts, Amps, kW, kVAR, PF, kVA,Freq. kWh, kVAh, kVARh, 2 Megabytes Datalogging memory and Limit Exceeded Alarms

Shark® 200S Submeter Only





El Submetering Software

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E-Billing EXT is an automated bill generation software for use with EIG meters and submeters.

Features

- Works with Nexus® meters, the Shark® 200 meter and the Shark 200-S® submeter and Energy Manager HMI
- Allows you to set time of use, rate structures, taxes, penalties and additional charges
- Generate bills and email billing reports to customers
- Works with either Communicator EXT 3.0 or HMI EXT Billing databases

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E-Billing EXT Architecture

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Energy Manager HMI – A True Client/Server System

HMI EXT is a fully functional SCADA HMI package allowing you to obtain a complete graphical view of your electrical distribution system. Metered points are configured easily using standard tags to display the different readings within the system. Using the Modbus based infrastructure, users can configure the HMI system to poll any Modbus-based device for data viewing and control. This package communicates to all equipment necessary for a comprehensive energy management solution.

Features Include:

- Advanced SCADA
 Architecture
- Direct Access via Ethernet or Network
- Modbus TCP Support
- Real Time Trending
 and Graphing
- Alarms and Events Logging
- Advanced Security
- Emailing and Paging on Event





EI Submetering Software

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Using Shark® 200-S stored logging

- Utilizes standard data logs in Shark® 200-S submeters
- Provides high reliability because interval profiles are generated utilizing existing logs
- Low cost plug-and-play solution for economical deployment







The El Advantage

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Flexible Communications

- -Interface to Energy Management Systems
 - Modbus TCP or RTU
 - DNP 3.0
- -Internet and Local Communications
 - PDA Reading
 - WiFi Wireless Internet
 - Ethernet/LAN 10 Base T
 - RS-232/485

Simply Powerful

- -Revenue Grade Metering
- -Easy to use Hardware and Software
- -Easy to Install

Complete Solutions

- -Compatible with existing EMS Systems
- -Shark® & Nexus® Meters
- -Energy Manager HMI and E-Billing EXT software
- -I/O and Control Options











Makes The Big Jobs Easy!

