ANL Compact Building Load Submeter Commercialization

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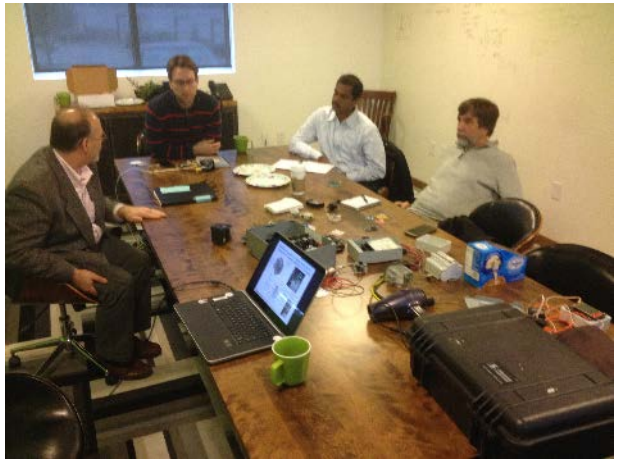
ANL
Theodore Bohn, Principal Electrical Engineer

Compact Building Load Submeter Commercialization

ANL: Ted Bohn; Principal Investigator
Ralph Muehleisen; Principal Building Scientist

2G Engineering: **Hardware/Firmware Developer, Mfg. contractor**
(Sun Prairie, WI) Hal Glenn; President/Co-owner
Josh Lange; Software-design engineer

Amzur Technologies: End Use Dashboard, Analytics Development
(Tampa, FL) Raymond Kaiser; Director, Energy Mgmt. Systems
Shankar Piriya; Software Products Developer



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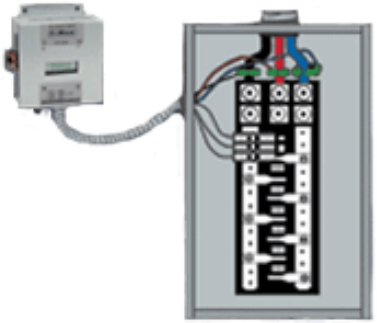
Problem Definition:

Building load electrical submetering can be bulky and expensive to instrument each branch circuit, and often has clumsy user interface software



As described in the results of the DOE Low Cost Submeter Challenge, the applicants were either over-featured/overpriced or insufficient quality/features

A better solution is needed.

SPECIFICATIONS	SUBMETER TYPE		
	Socket Type Electromechanical/Solid State		Electronic Non-socket Type
	Feed-thru Type	Current Xfmr Type	
INSTALLATION			
Installed Cost (estimated)			
Stand alone, up to 320A, 3Ø	$1,000	Not Applicable	$700
Stand alone, over 320A, 3Ø	Not Applicable	$2000 - $5000	$800
8-Meter Unit, 200A, 3Ø	$16,000	Not Applicable	$5,500
Installation Time	2–3 Hours	6–8 Hours	1 Hour
Power Interruption	2–3 Hours	6–8 Hours	None
Amperage Limitations	320 Amp, Max.	None	None
Space Requirements	2 Square Ft	11.7 Square Ft	0.25 Square Ft

Image/table Source: http://www.utilityproducts.com/articles/print/volume-16/issue-04/product-focus/meters-metering-devices/submetering-for-energy-savings-and-cost-reduction.html

Compact Building Load Submeter Commercialization

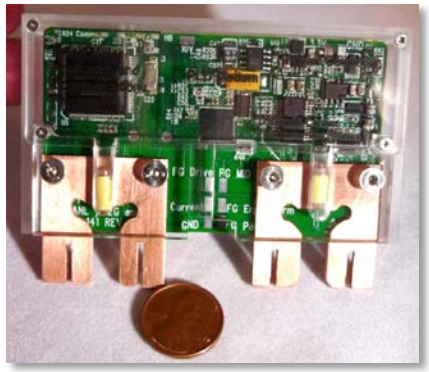
Technology Solution:

Evolution of EV End-use Meter to a Flexible Modular Package

Focus of this project/approach is to minimize:

- component cost/bill of materials for submeters-accessories
- current sensor cost/physical size and maintain accuracy
- installation volume required; minimal electrician labor
- commissioning time and complexity (possible QR Code link)

Project end goal is to create a commercial product via sustainable business proposition without perpetual government support



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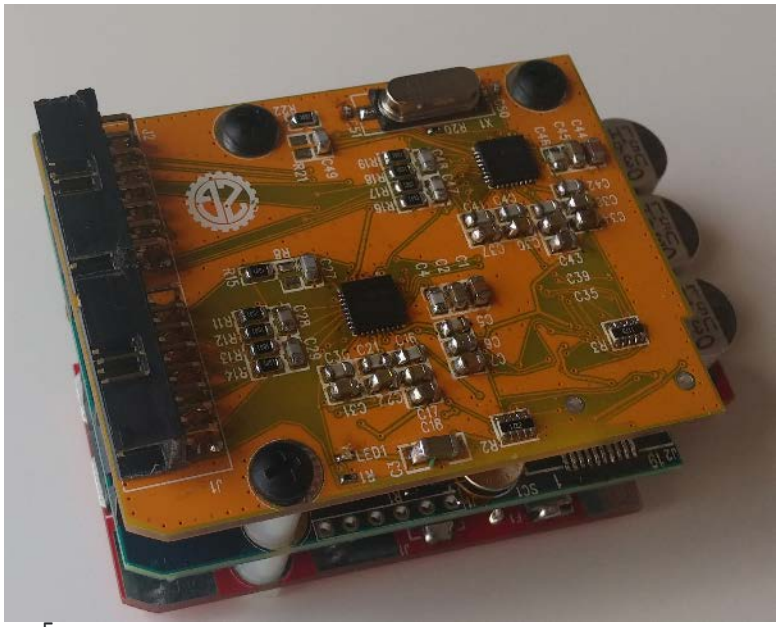
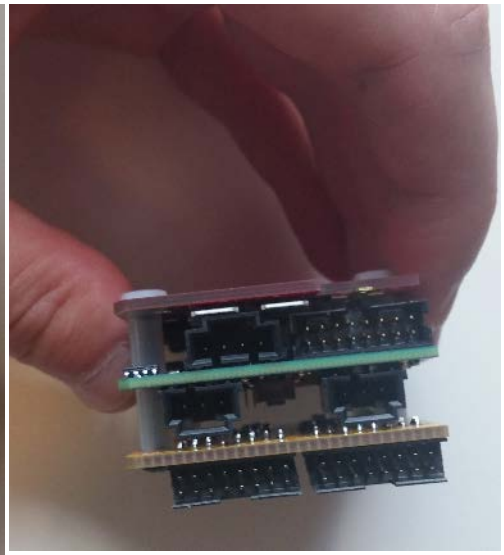
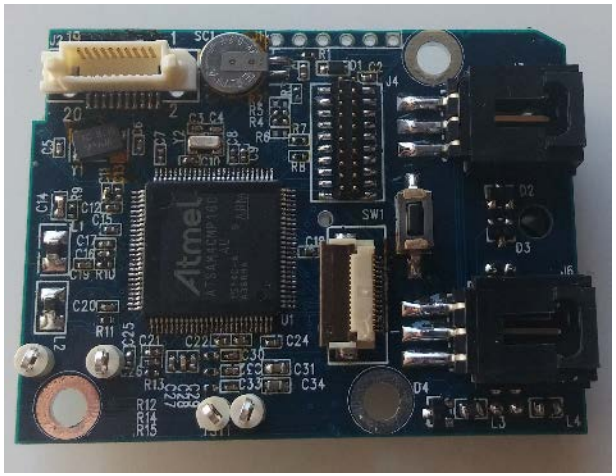
Advantage, Differentiation, and Impact

Modular reconfigurable compact submeter can be used for single AC or DC loads (built in 60A sensor) or in 16 channel expanded inputs (plus 3 phase base measurement)

Meter can be packaged inside circuit breaker frame/enclosure, using voltage tap points for sensing, logic power and PLC comm. Point of use measurement as well; low cost serial communication





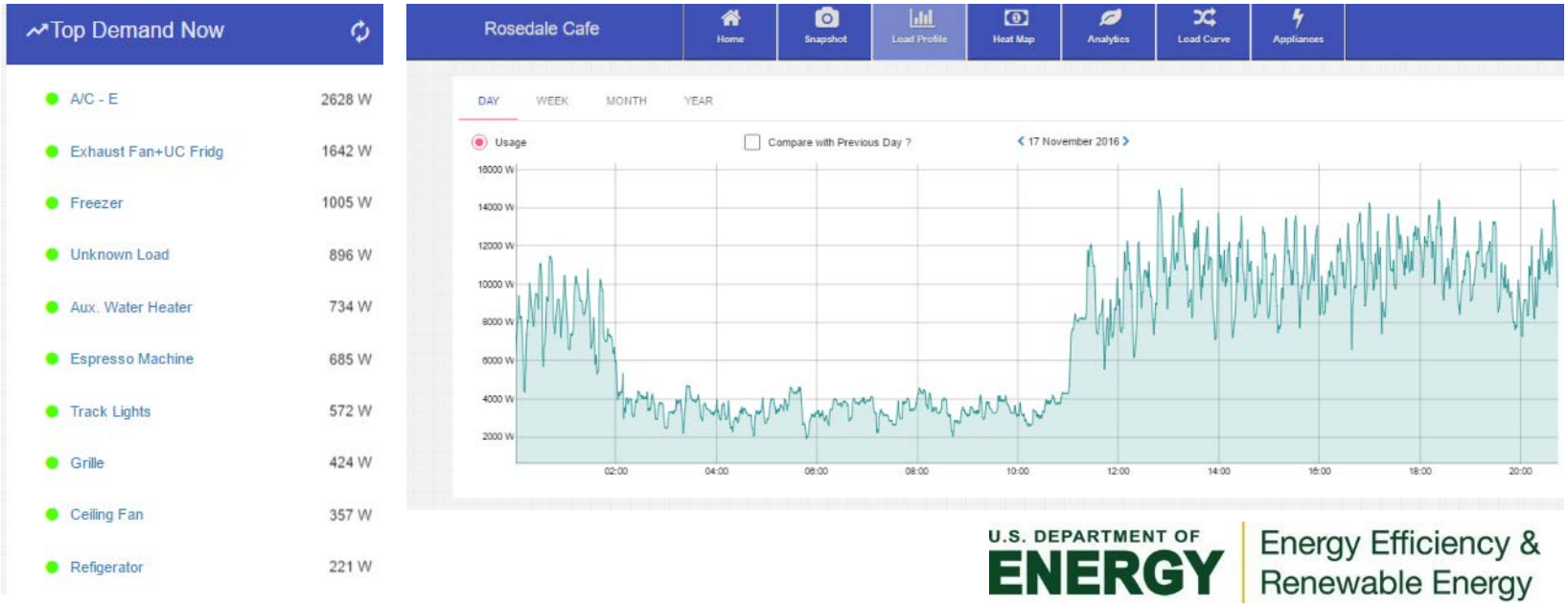


Compact Building Load Submeter Commercialization

ANL submeter provides a robust, low-cost, secure platform for DER Communications & Control (C&C)

Amzur Technologies provides an open source cloud-based DER management services suit via IEEE 2030.5 (SEP 2.0), Orange Button APIs and ANL submeter.

Target customers – Distribution System Operators, solar PV service providers, and property portfolio managers.



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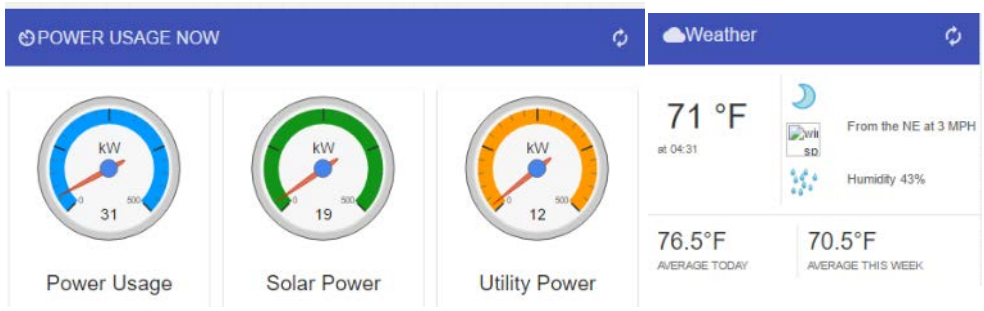
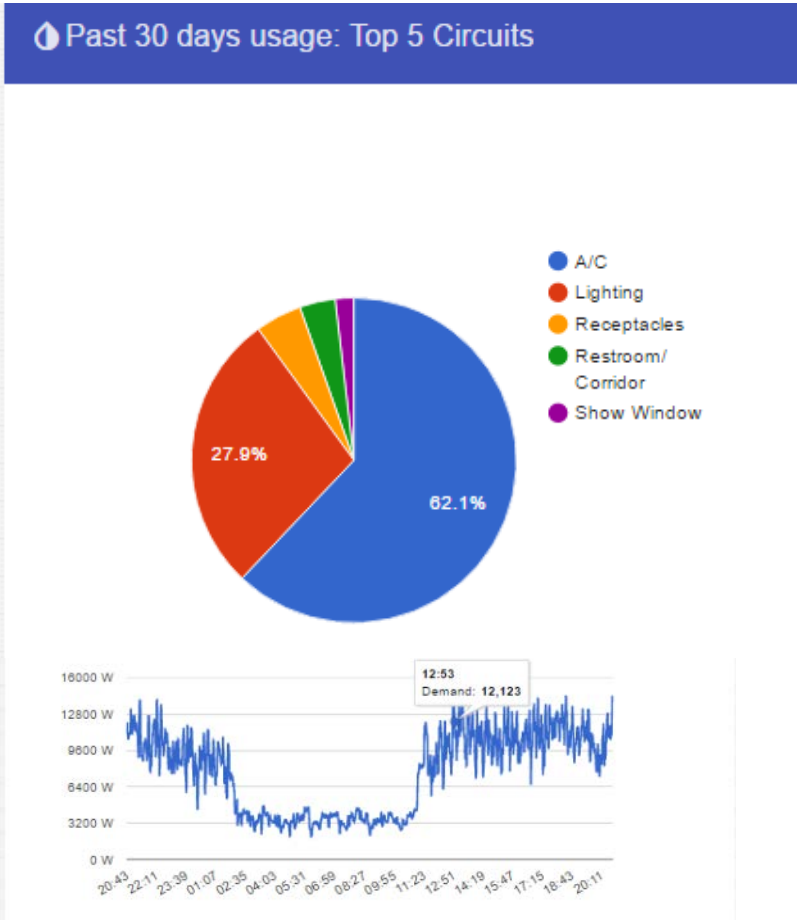
Dashboard easily tailored to specific Use Cases





- Open Source
- Easily customizable
- Green Button data format
- Orange Button API to submeter

Sites Past 30 Days Usage

Name	Kwh	Kwh Sq. Ft.	Cost	Cost Sq. Ft.
AMI Outfitters - Sears Cottage	497.14	0.46	50.71	0.05
Bob Brown Art	225.28	0.38	22.98	0.04
HGV Campus	275.16	0	28.07	0
Hometown Desserts	3792.24	3.79	386.81	0.39
Libby's Island Jewelry - Thelmas-by-the-Sea	607.24	0.38	61.94	0.04
Pilsbury Office	1196.71	1.2	122.06	0.12
Rosedale Cafe	4186.9	1.49	427.06	0.15
Thelmas-by-the-Sea Residence	1034.49	0.86	105.52	0.09

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Thank You

Argonne National Laboratory
Theodore Bohn, Principal Electrical Engineer

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Submeter Process Capabilities/Functions:

- Energy/cost allocation between tenants or departments
- Time-of-use metering for specific end uses (e.g. EV charging)
- Identification of concurrent loads for peak demand reduction
- Load disaggregation by branch circuit; better end-use analytics
- Multi-site load aggregation and real-time historical monitoring of consumption patterns for negotiating lower energy rates
- Measurement and Verification (M&V) of energy retrofits to meet utility incentive accounting reqs; ->advanced buildings controls
- Identifying system scheduling or operator errors
- Enabling ongoing/continuous equipment commissioning through monitoring of changes equipment energy consumption
- Fault detection and diagnostics via electrical signature analysis