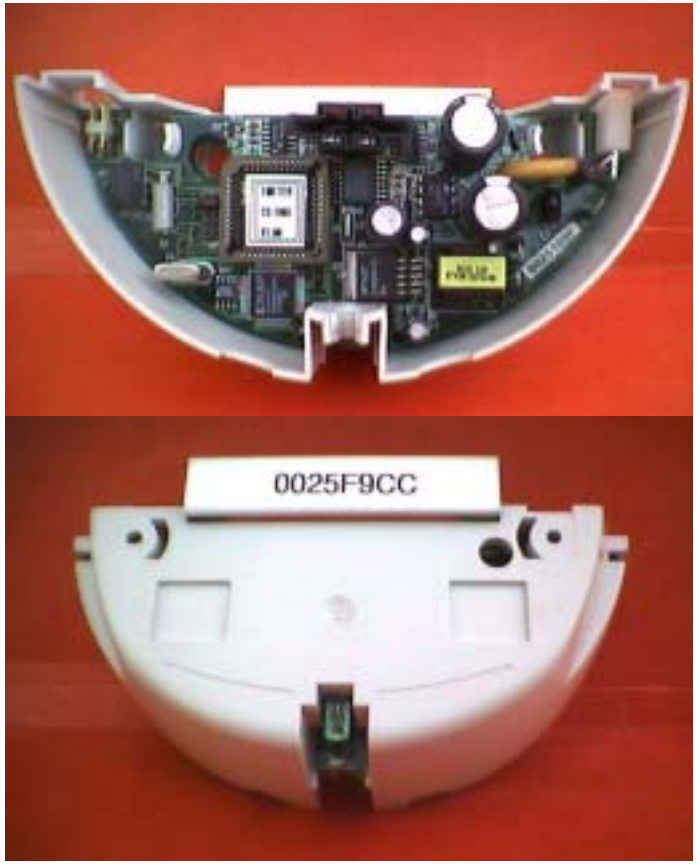
Research Opportunity Notice

Revenue Energy Metering

Classic Electromechanical Meter

- Inexpensive, <$50 installed
- Moving disk and gears
- Measures only KWh
- Long life without maintenance
- Standard product, interchangeable across vendors
- No Communications capability

Adding Communications to EM Meter

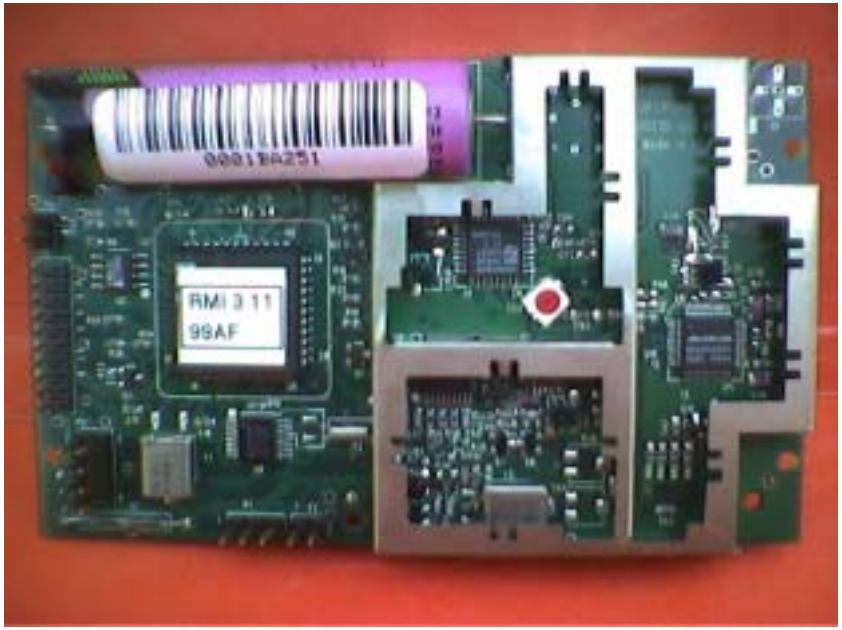


- **Drop in Module, Cost ~ $100**
- **Requires recalibration of meter**
- **Multiple module designs required for various meter types and networks**

Electronic Meter

- More expensive, $100-200 installed, single phase
- No moving parts
- Measures and records Voltage, Current, Power, Power Factor, etc.
- Supports TOU rates and static tariff structures
- Communications capability is an add-in

Adding Communications to Electronic Meter



- **Drop in Module, Cost ~ $100**
- **Module design is tightly coupled to meter design**
- **Multiple designs required for various networks**

Objective of Demand Response Project

- **Develop <u>enabling technology</u> for an integrated communicating revenue meter that can support dynamic tariffs and demand response (DR)**
  - Integrated sensors
  - Universal communications solution
  - Low cost, universal product

Possible Devices

- **Integrated revenue energy meter**
  - **NewMeter**
- **A smaller non-revenue energy measurement node for appliances, HVAC and process equipment, etc., may be considered later but it is not included in this RON**
  - **MeterNode**

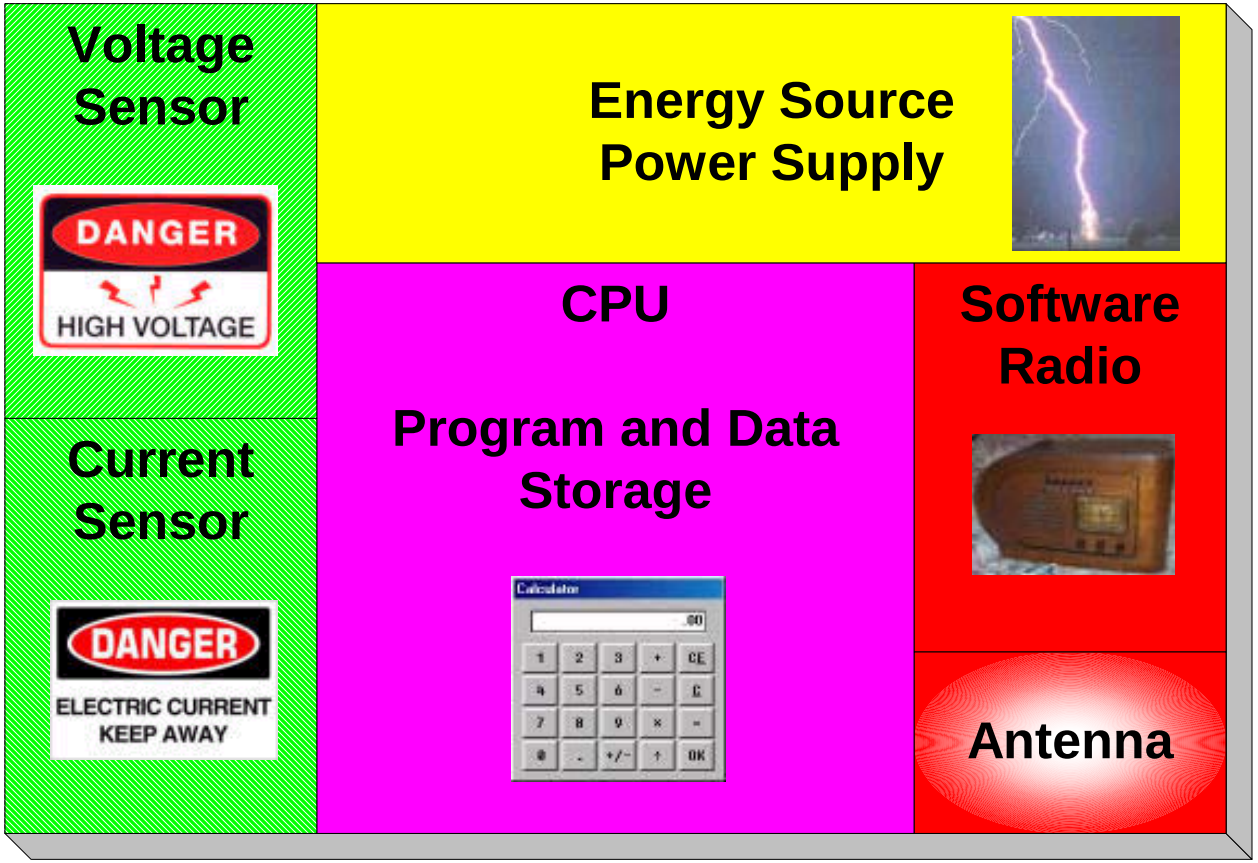
Goals of the NewMeter

- **Installed costs of <$50**
- **Flexible communications capability**
  - Cannot be “stranded”
  - Compatible with water and gas metering
- **Support for dynamic tariffs and DR**
- **System Platform capable of supporting**
  - Sensors
  - Actuators
  - Communications Links

Additional Goals

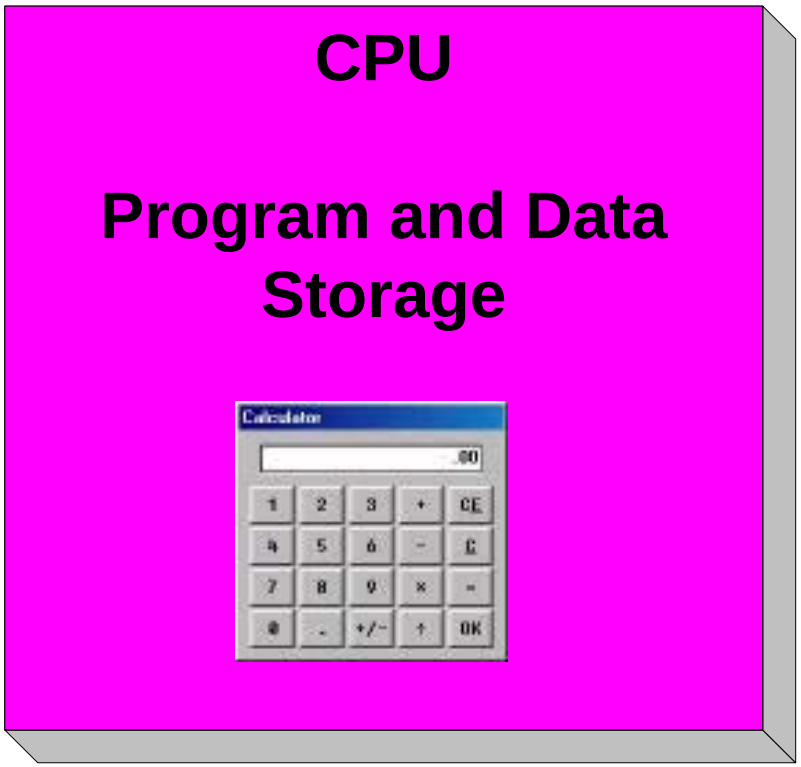
- Easy installation at residence entry or on individual appliances
- Communications range 10-300M with a very efficient wireless network
- Scavenge ambient energy
- Revenue quality measurements of Instantaneous volts and amps over long life
- Perform computations of power factor, power quality, etc.
- Store measured and computed data

Example NewMeter Implementation



NewMeter

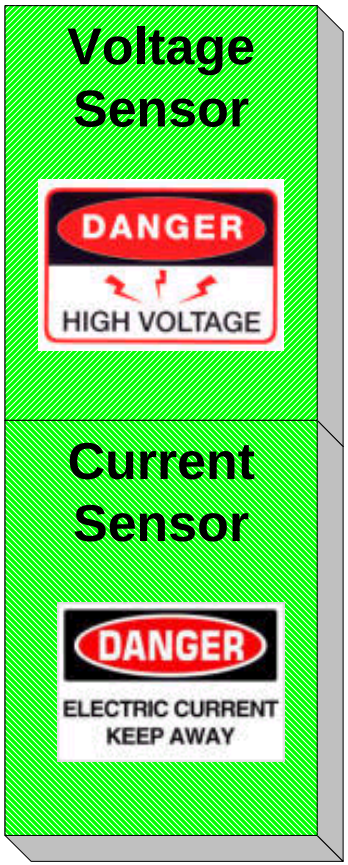
(Platform)



- **Hardware/Firmware reconfigurable remotely**
- **Reconfiguration is fail-safe**
- **Allows new features and tariffs to be added remotely**
- **Collects, stores, communicates**
  - Revenue quality measurements
  - Voltage
  - Current
  - Power

NewMeter

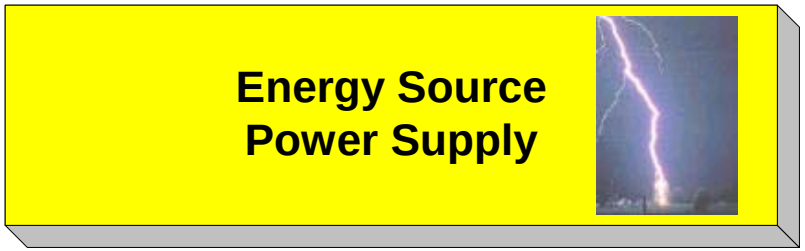
(Sensors)



- **Integral to chip for low cost, "smart" calibration**
- **Non-contact sensors allow easy installation**
  - At utility pole
  - At building without socket
  - At individual loads

NewMeter

(Power Supply)



- **Energy scavenged from line being measured**
- **Internal energy storage allows 15 minutes communications after power has failed**

NewMeter

(Communications)

- **Analog to Digital conversion at RF**
- **All processing is digital**
- **Totally reconfigurable for frequency band, modulation, protocol. Cannot be stranded**
- **Integral “smart” antenna**
- **WAN to the outside world**
- **LAN to sensors, actuators**

NewMeter

(Additional Specifications)

- **Installed cost <$50**
- **Housing supports easy installation indoor or outdoor**
- **Housing allows addition of additional features and capabilities**

Summary

The purpose of this RON is to solicit proposals for R&D tasks that will develop enabling technologies for the NewMeter, NOT to produce a product.

Areas of likely interest are:

- Voltage and Current Sensors
- Radios, radio networks, or other wireless links
- Energy scavenging and storage
- Operating systems
- Packaging
- Others not mentioned here