**MEASUREMENT**

**Arduino Compatible Hardware**

- **Energy Monitor Shield**
  - Apparent power, real power, power factor and AC RMS voltage reading
  - 4 current sensor input
  - 1 9v AC RMS voltage sensor input
  - 433/868Mhz RFM12B wireless transceiver to transmit/receive data
  - Compatible with Arduino Uno, Leonardo, Duemilanove

**Current Sensor**
- Maximum current 30A or 100A
- Open size 13mm*13mm
- Output type current
- Connection plug 3.5mm jack

**Voltage Sensor**
- Compatible with shield
- Give AC RMS voltage sample to calculate real power, power factor, frequency and detect power flow direction
- Output 9V AC and 666mA
- 2.1mm barrel jack

**WIRELESS TRANSMISSION**

**Base Station**

- **NanodeRF SMT 433Mhz**
  - Open source Arduino-like board that has in-built web and wireless connectivity
  - 16MHz ATmega328 microcontroller
  - 10BASE-T Ethernet controller ENC28J60
  - Unique MAC address generator
  - SPI expansion memory
  - 433Mhz RFM12B wireless transceiver module
  - 6 analogue sensor lines with 10 bit A-D converter
  - Up to 14 digital I/O lines
  - Serial inter-Nanode bus
  - ATmega328P core running at 16Mhz
  - 32KB ISP flash memory
  - 1KB EEPROM
  - 2KB SRAM
  - 5V 250mA micro-USB power

**USB to serial UART**
- Upload Arduino software sketches and read serial data from shield
- Perform the same function as an FTDI cable but use a different chipset
- No driver required for Linux, drivers can be downloaded for Mac/Windows
- 5V VCC
- RTS auto-reset
- SILabs CP chipset
- USB compliant

**DISPLAY**

**Web server Emoncms**

- **Input and feeds**
  - Calculate KWh/d data from raw power data
  - Input is updated and calculation is done very fast for visualization
  - Allow server based calibration of inputs, multiplying inputs, histogram data creation

- **Input processing**
  - Configure a power input to log straight to Power feed
  - Add a power to KWh/d processor to Create KWh/d data
  - Add a histogram Processor to create KWh used at a given Power histogram data

- **Visualization**
  - Example screenshots of different visualization