The need to monitor energy consumption is throwing up a range of solutions, not only for electricity meters themselves, but also for devices that allow consumers to monitor their power consumption on a regular basis.

Looking to improve the UK’s energy consumption and its greenhouse gas emissions, the Department for Energy and Climate Change hopes to see 47 million smart meters installed in 26 million properties by 2020. By using smart meters, it believes, consumers could reduce their bills by up to £100 a year.

Freescale has recently unveiled a reference design for a single phase electricity meter targeted at domestic applications. The design, which features the company’s ARM Cortex-M4 based Kinetis microcontroller, offers the ability to communicate using ZigBee. In this way, the device can communicate with the consumer and with utility companies over the emerging ‘smart grid’.

Called the MK30X single phase electricity meter reference design, the approach is said to address the need for accuracy and low cost by providing efficient a/d converters, combined with an embedded programmable gain amplifier to increase the accuracy of energy measurement. It also features a shunt sensing circuit implementation.

The device selected for the reference design is the Kinetis MK30X256, which features 256 kbyte of flash, 256 kbyte of FlexNVM, 4 kbyte of FlexRAM and 64 kbyte of sram. “Our Kinetis line is the most scalable portfolio of ARM Cortex-M4 mcus in the industry,” said Bruno Baylac, director and general manager of Freescale’s Metering, Medical and Connectivity Solutions business. “Our MK30X single phase electricity meter reference design further demonstrates the versatility of the Kinetis line.”

Support for 32 bit math operation allows the design to run fast Fourier transform (FFT) based metering algorithms, which calculate metering quantities from elementary voltage and current harmonics. The design also includes a 128 bit unique identification, while the 32 k FlexMemory not only provides every meter with an individual identifier, but also tamper detection. Firmware, based on the MDX real time operating system, enables designers to customise the reference design to meet their particular requirements.

According to Freescale, the reference design is suitable for meters measuring currents of up to 120 A. Capable of working with voltages ranging from 85 to 264 V ac, the device is accurate to within 1% when measuring active and reactive energy. The Kinetis mcu features an lcd driver which can address up to 320 segments. In this case, the design drives a 4 x 40 segment lcd.

The designer can choose any measured value – including V, A, W, kWh, time and date – simply by pushing one of the device’s built in buttons.

The designer can also choose from a range of communication interfaces for remote collection of data. One option is Freescale’s MC1322x ZigBee platform. This comprises low power, 2.4GHz transceiver, a 32 bit ARM7 based mcu, hardware acceleration and a set of mcu peripherals. Typically, this module draws 29 mA in transmit mode with the mcu active. The module communicates with the host Kinetis mcu using the i2c interface. With a data rate of 250 kbit/s, the MC1322x platform has a typical range of 300 m.

For more on the reference design, go to www.freescale.com/smartenergy