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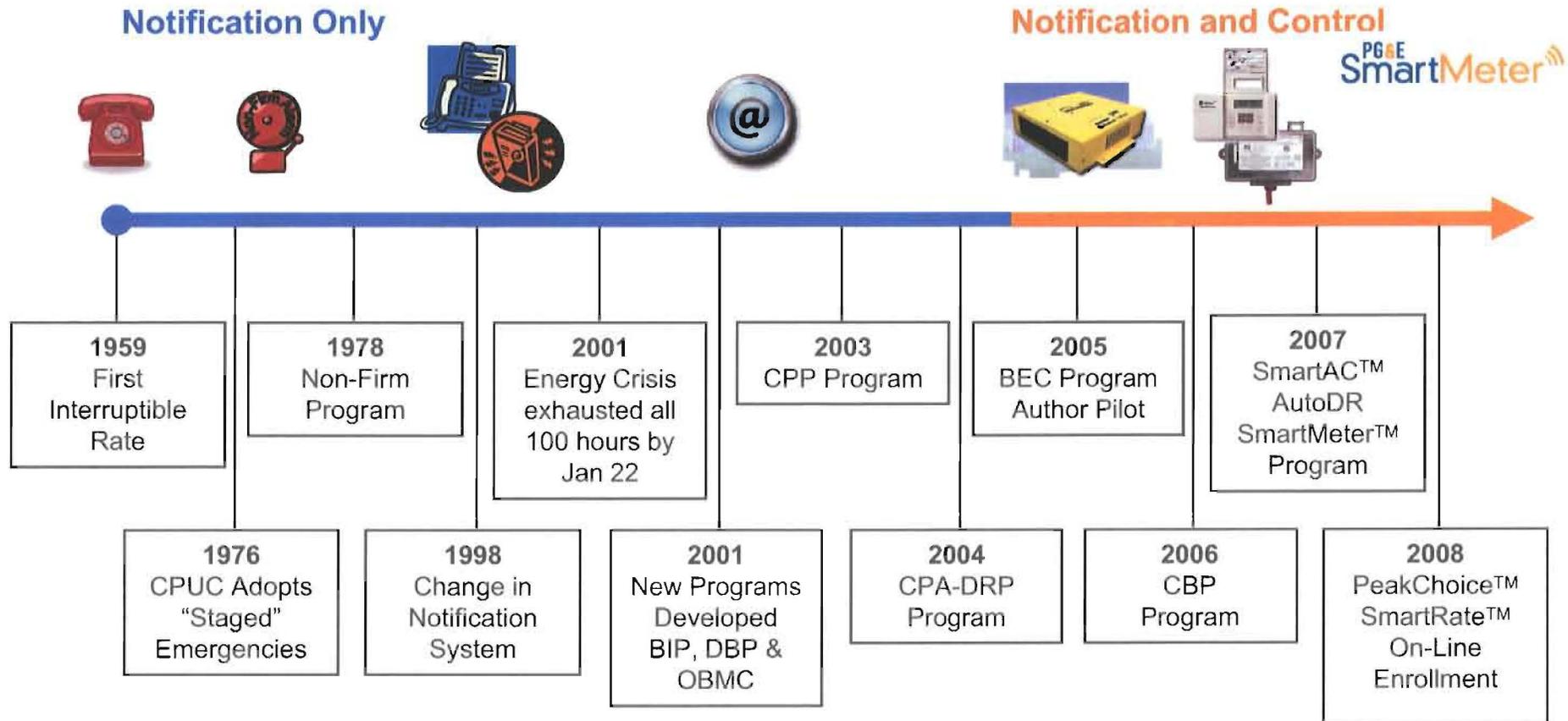
CALIFORNIA ENERGY COMMISSION

**Load Management Standards
Workshop on Enabling Technologies
June 19, 2008**



*Pacific Gas and
Electric Company™*

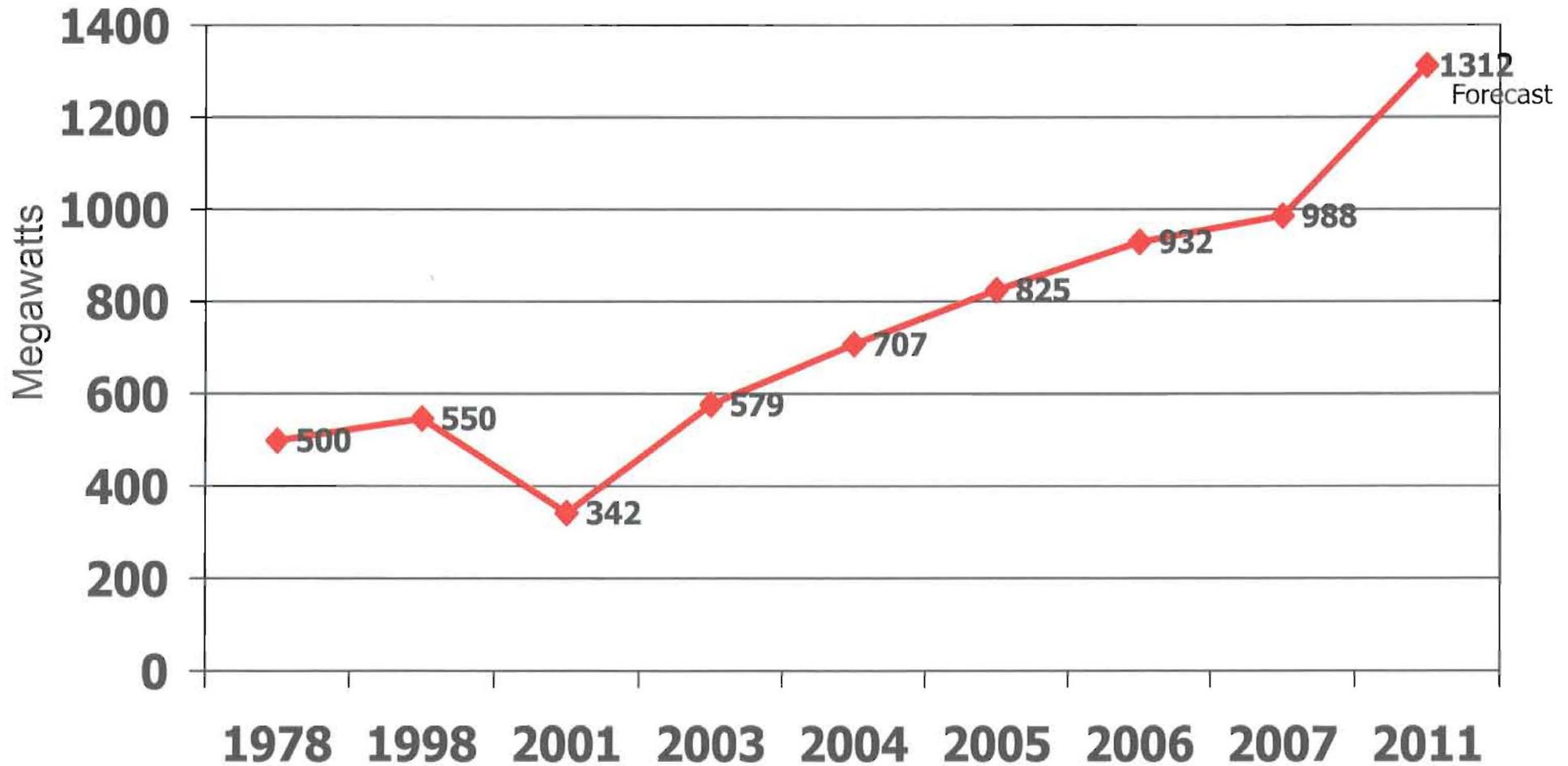
Enabling Technologies: Past, Present, Future



- BIP - Base Interruptible Program
- BEC - Business Energy Coalition
- CPA-DRP - California Power Authority – Demand Reserves Partnership

- CBP - Capacity Bidding Program
- CPP - Critical Peak Pricing
- DBP - Demand Bidding Program
- OBMC - Optional Binding Mandatory Curtailment (OBMC)

Demand Response Participation



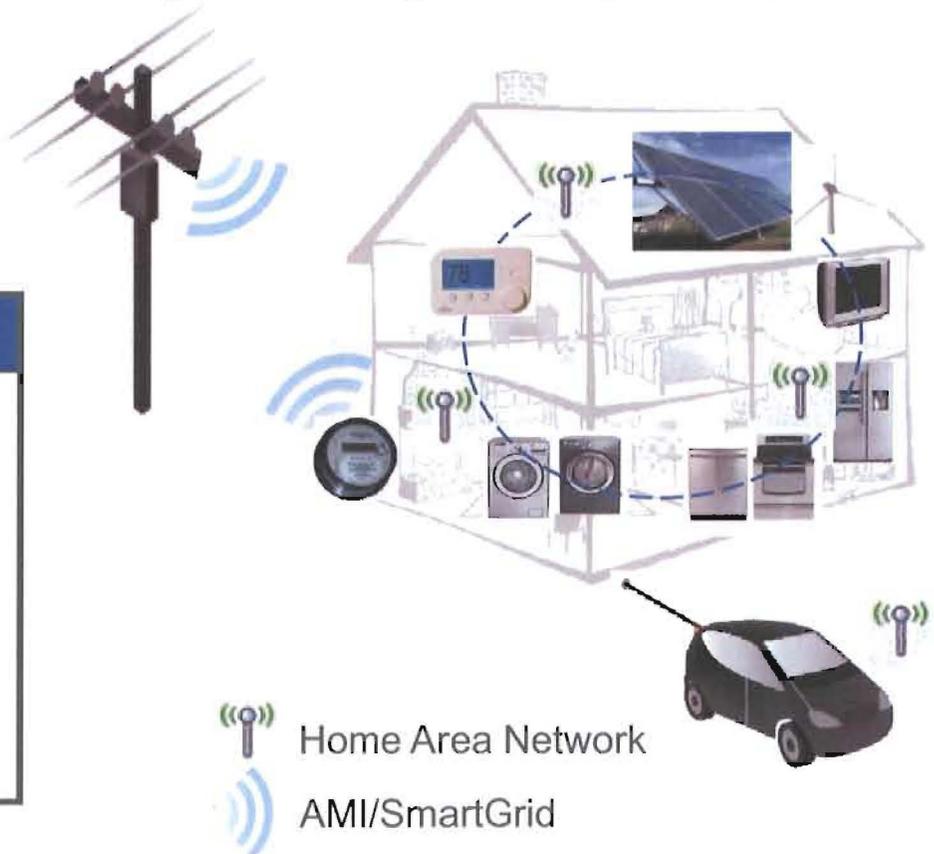
* MWs prior to 2008 based on Subscribed MWs. Starting in 2009 MWs based on actual reductions.

Communications Technologies

- Many developing load management activities (both demand side management and energy efficiency) require two-way communications capability
 - California’s IOUs are installing the communications infrastructure to support these developing load management opportunities

Home Area Network Concept

HVAC, IP-enabled appliances and distributed generation will all be tied together through an integrated EMS



AMI/SmartGrid	Home Area Network
<ul style="list-style-type: none"> • Powerline Carrier • Radio Frequency • Third-party <ul style="list-style-type: none"> – Cellular/3G – Leased Lines – WiMAX 	<ul style="list-style-type: none"> • Zigbee • 6LoWPAN • Homeplug • WiFi • LonWorks • ZWave • Insteon

Requirements to Make this a Reality...

- In order to achieve commercial success, HAN architecture will need to adhere to the following tenets:

Key Tenet	Consideration
Open Architecture	True IP addressability end-to-end. Example of consumer electronic devices which have gradually migrated to open IP from proprietary solutions
Interoperability	Enhance value and broad appeal of network by ensuring interoperability of multiple devices for the HAN (i.e.: Metcalfe's Law); Further, "install" must be easy and simple and not require a call to a "help line"
Future Flexibility	"Flash" download alternative communications protocols (i.e.: 6LoWPAN) Integrate Homeplug and Zigbee into a common application layer to drive efficient designs, common silicon, and integration of both PLC and wireless HAN as standard components in smart meters
Scale Economies	Create a sizeable market opportunity and set clear technology requirements to provide device manufacturers a clear development path

- Ensuring a large market opportunity with standardized, interoperable product will help develop this market. It is critical to avoid "feature creep" – or hedging strategies by implementing "back-up to back-up" measures – that have the potential to add cost, confuse manufacturers and introduce delay (e.g.: "format war") as manufacturers will be tempted to "wait it out" until a clear market and specifications emerge

Current and Future Potential HAN Applications

- Load Shifting/Shaping/Limiting
- AC Cycling
- Automated Demand Response
- In-Home Displays
- Energy Management Systems
- PHEV SmartCharging
- Distributed Generation/Storage Control

Benefits of Enhanced Communications

SmartAC[®] + SmartMeter^{PG&E} in the near future...



- Two-way communication via meter
- Disconnects identifiable via interval data
- Participation and Load impact measurable via interval data
- PCT = In-Home Display
- Potential DIY installation

Other Emerging Technologies

In-Home Displays and Smart Appliances



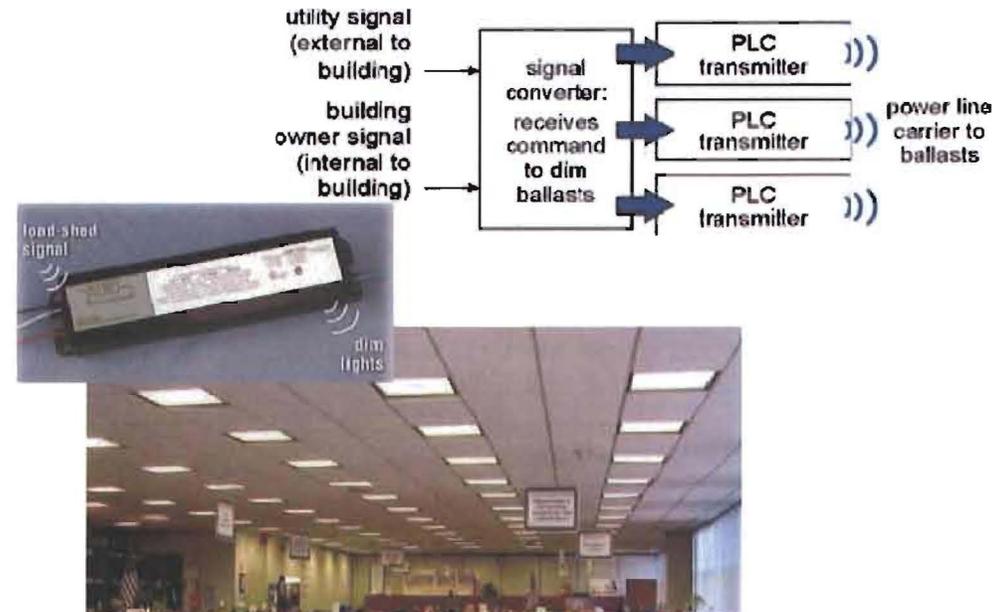
- Energy savings through information feedback
- Instantaneous and cumulative cost information

Comfort Control



- Local and remote processing to optimize control of:
 - Temperature
 - Humidity
 - Weather
 - Historical data
 - Pre-cooling

Integrated Wireless Lighting



- Optimizing around passive and active variables including daylight, ambient light, task specific or occupancy
- Controls provide both energy efficiency and demand response benefits

PeakChoice

- PeakChoice allows customers to create a semi-customized DR program to meet their personal requirements and needs
- Participants can tailor the program by selecting from the following options:

Reduction Amount & Commitment Level

*How many kW you can reduce
Making a best effort to reduce vs. committing to reduce*

Event Duration

Number of hours you have to reduce for each event

Event Notification Lead Time

*Minimum notice you need before you
reduce energy*

Event Window

What time of day an event can occur

Maximum Number of Events

Number of events you will participate in

Number of Consecutive Event Days

*Number of consecutive event-days you
can participate in*