

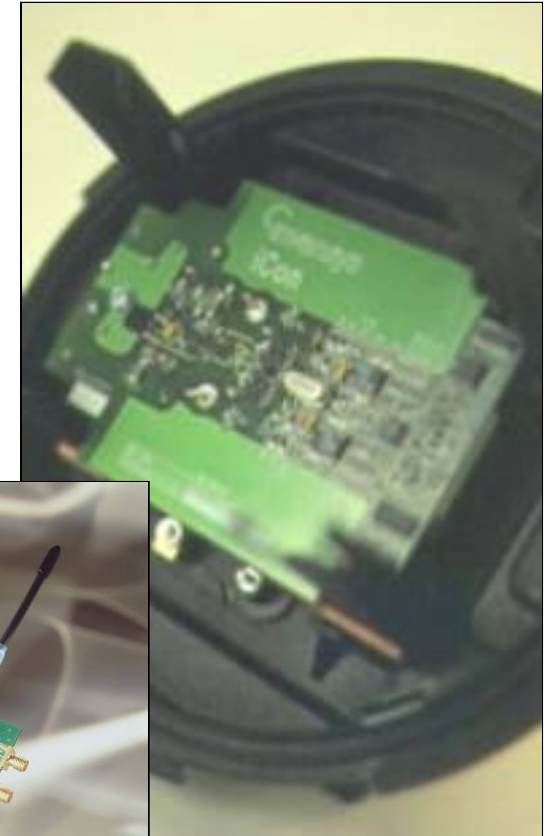
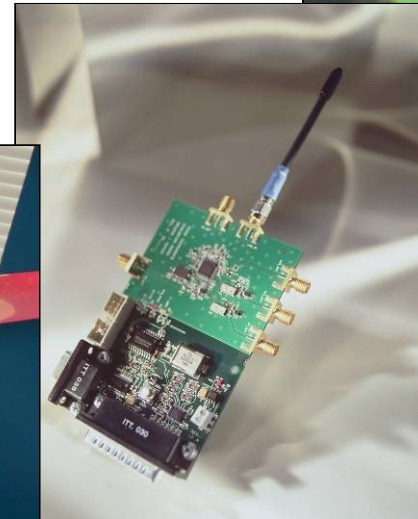
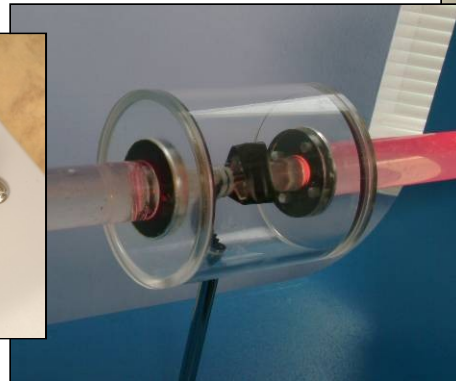
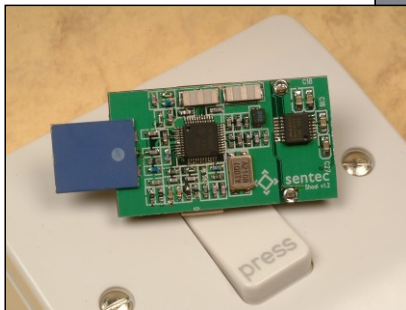
Smart Grids – Tying it all together

Or :

How I Learned to Stop Worrying and
Love The Grid

Background

- 10 years + in smart metering
 - Water, gas & electricity
- International experience in grids, metering and distributed energy



Reasons for Smart Grids?

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Increasing demand for energy

Increasing demand for power quality

Aging grid infrastructure

High price of primary fuel sources

Distributed and intermittent generation increasing

Demand side management more complex and popular

Stringent regulations on carbon emissions

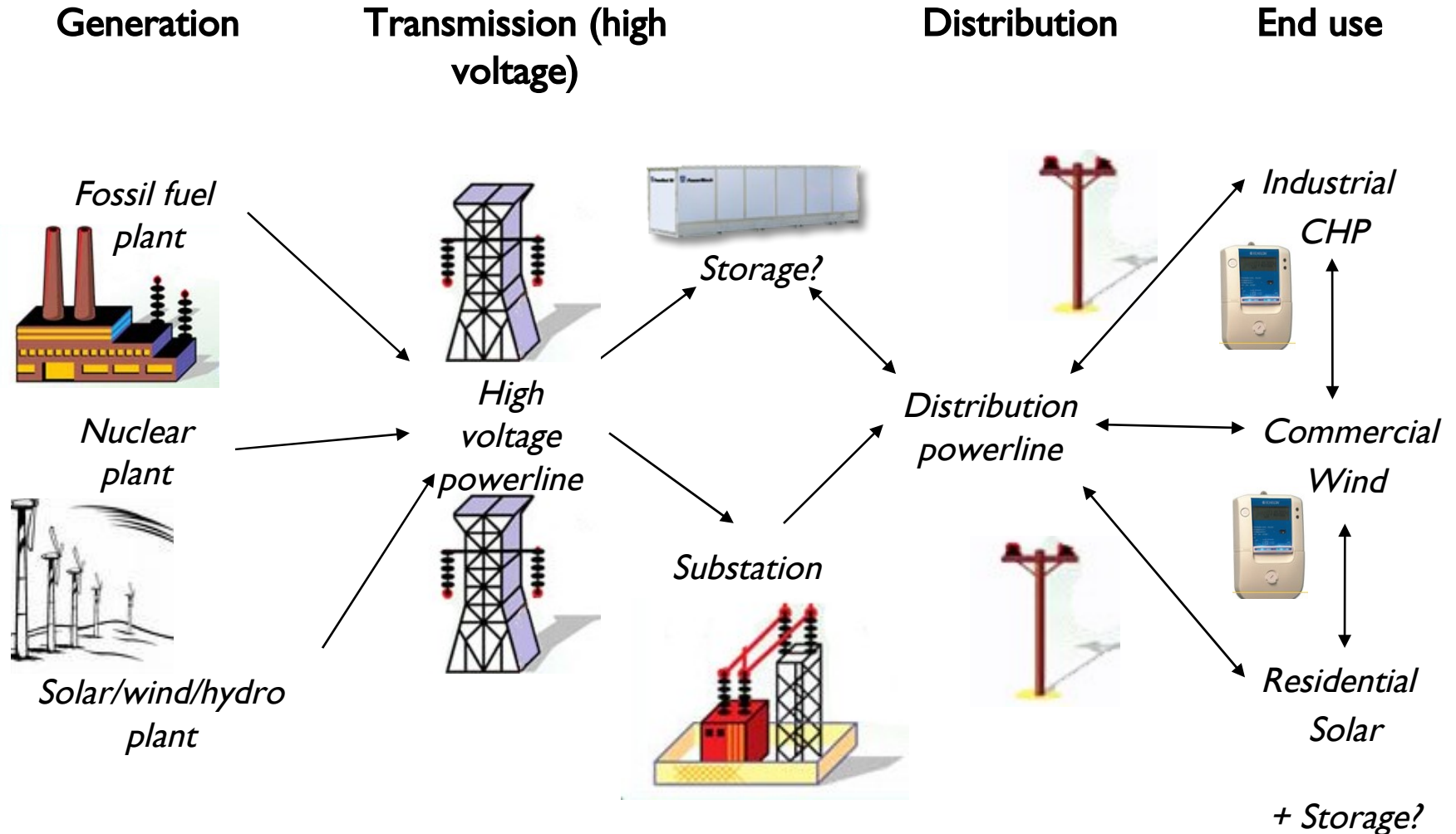
= \$1 trillion investment

Simulation of
Northeast blackout,
Aug 03

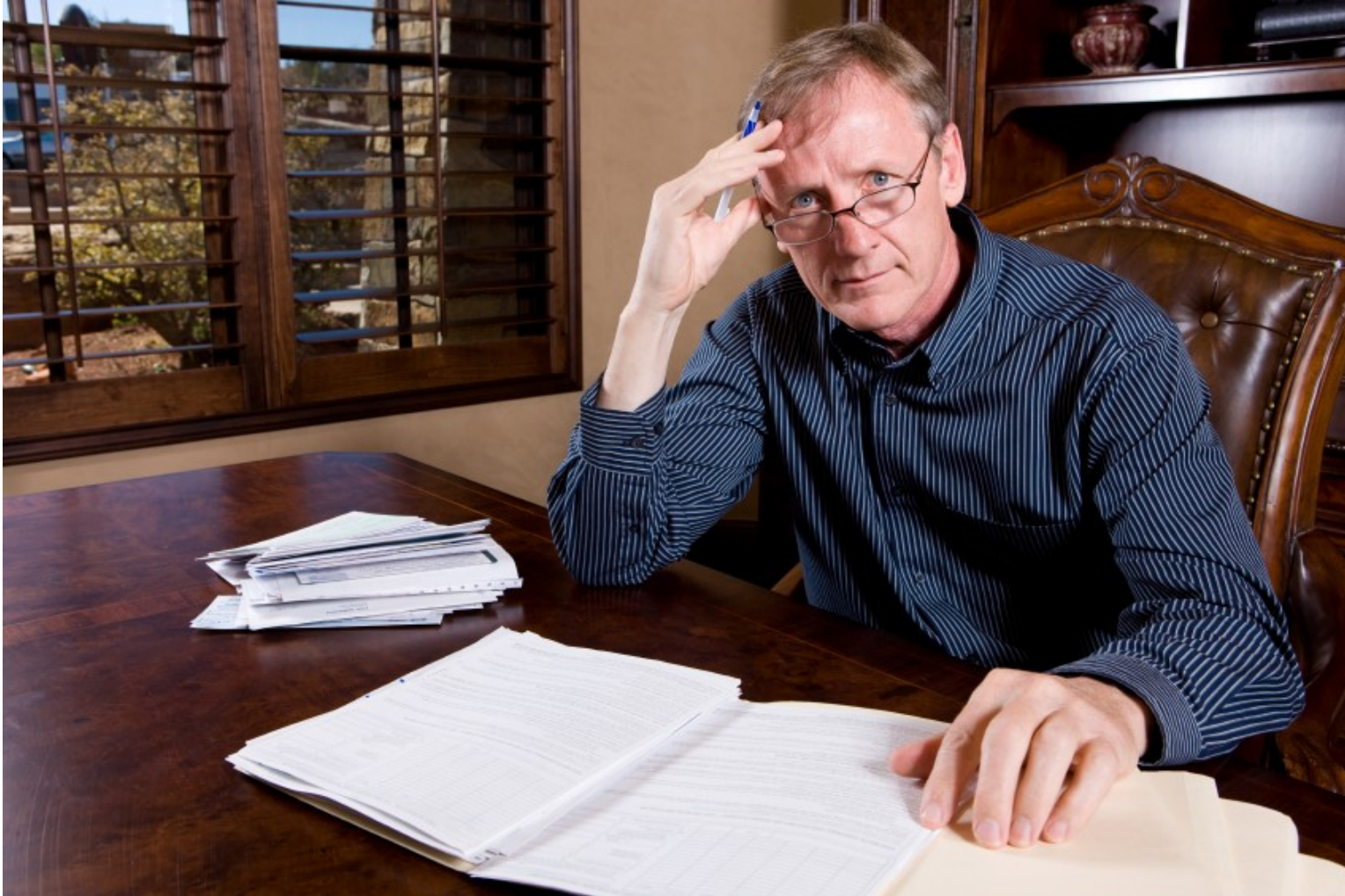
Characteristics of the Smart Grid

Characteristic	Yesterday	Tomorrow
Generation and Storage	Dominated by central generation. Little use of distributed generation, renewables or storage	Many distributed resources complement central generation
Resiliency	Did not protect assets until a disruption (e.g. Trips a relay after a fault). Vulnerable to terrorists and natural disasters.	Self healing: prevents many disruptions, minimises impacts from the rest. Resilient with rapid response
Optimisation	Little integration between grid and asset management	Deep integration of grid intelligence with asset management software
Power quality	Focus on reliability not quality	Power quality a priority with a variety of quality/price options to choose from
Market empowerment	Limited wholesale markets, poorly integrated. Limited customer choice, no price visibility	Robust, well integrated, computer managed wholesale markets. Many choices, time of use pricing visible

What is a smart grid anyway?



What will the consumer see?



Distributed generation

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MAKING A WORLD OF DIFFERENCE

- Benefits to utilities: virtual power plant, home energy control, demand smoothing, carbon scheme certifications
- Location and degree of control
 - Utility
 - Shared
 - Consumer
- Responsiveness of technique

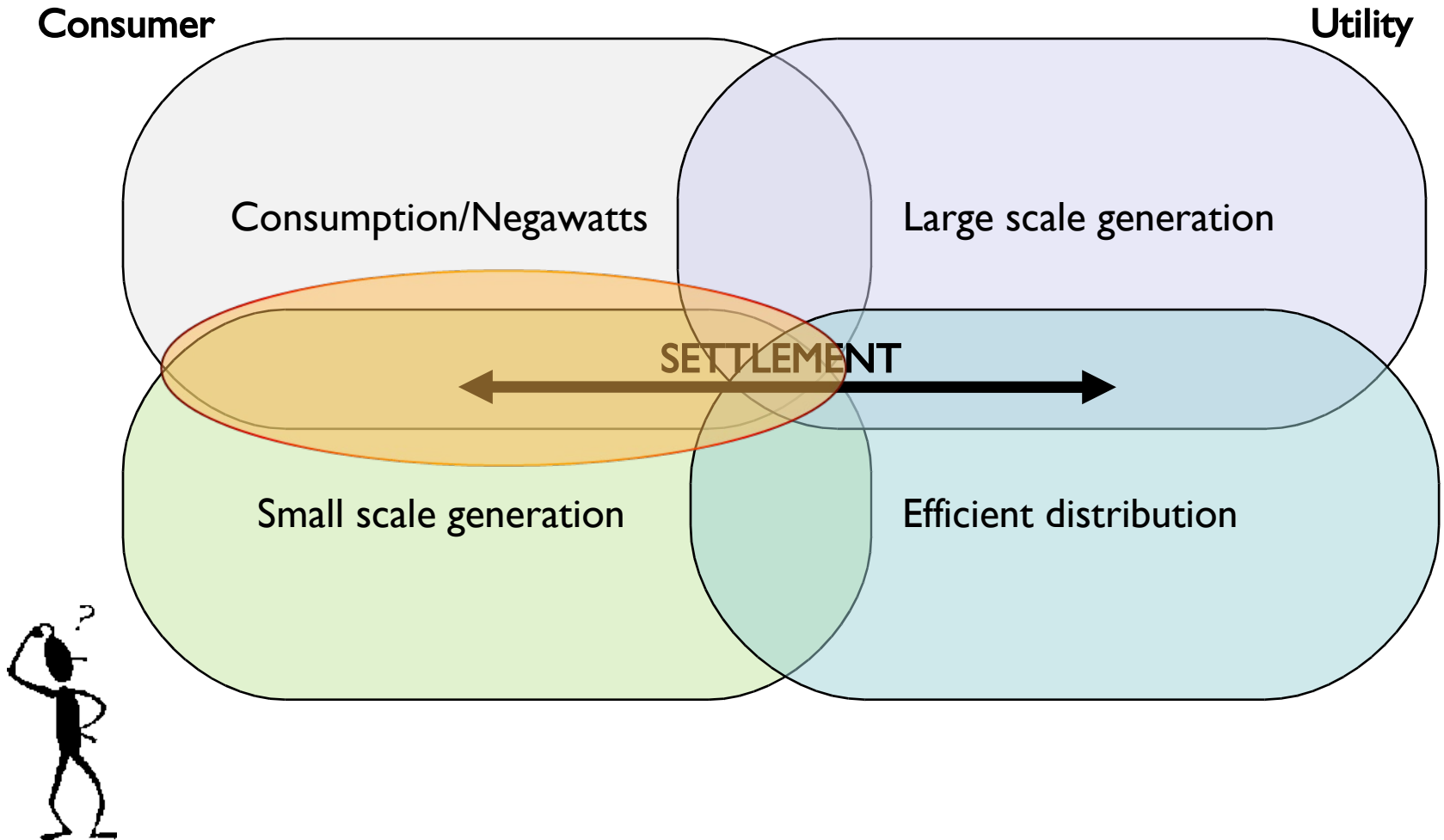
Demand side management

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MAKING A WORLD OF DIFFERENCE

- Commercial models already established >\$4 billion
- Value in peak shaving, outage recovery, fast reserve, smoothing intermittency
- Location and degree of control
 - Load control/dynamic demand
 - Aggregator groups
 - Demand response
- Tariffs and settlement
- Implications for distributed generation

The Jigsaw



Smart Grid Roadmap - I



Smart Grid Roadmap - 2



BOULDER, COLORADO

Summary

- The smart grid is not theoretical
- Combined with smart energy products, consumers can expect new benefits
- The market for controlling the home side of the smart grid is still emerging, but is potentially very valuable.
- Any questions?

More information

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