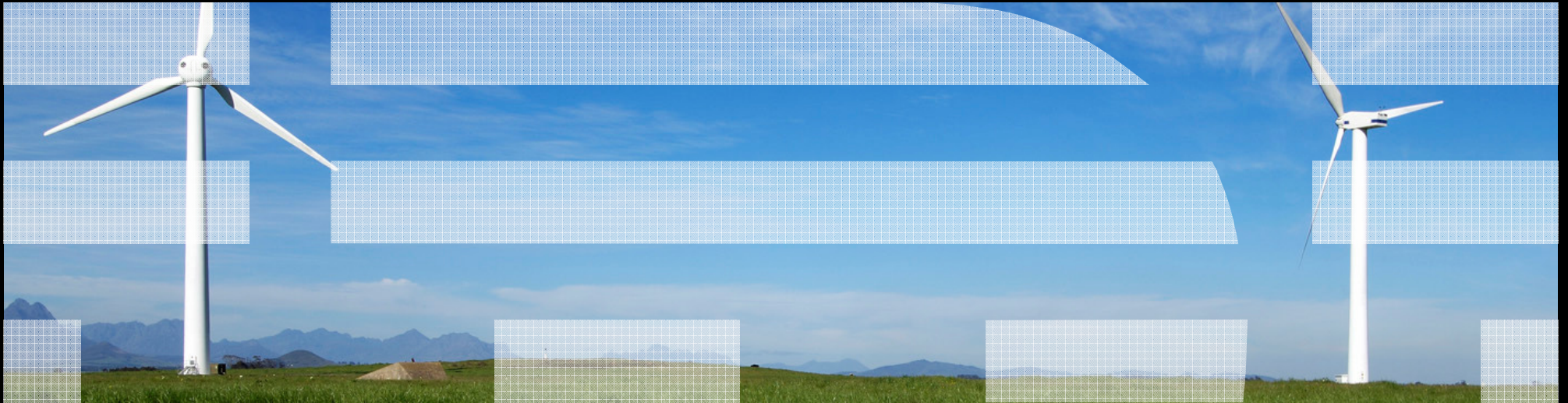IBM

Let's Build a Smarter Planet:
Energy and Utilities

The world is smaller and flatter.

The reality of living in a globally integrated world is upon us.

- Frozen credit markets and limited access to capital.
- Economic downturn and future uncertainty.
- Volatility in price and demand for energy worldwide.
- Growing concern about the effects of climate change.
- Increasingly empowered and interconnected consumers.

The world is connected:
economically, socially and technically.

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The need for progress is clear.

36.8%

Projected growth in worldwide energy demand by 2030.

170 billion

Kilowatt-hours wasted each year by consumers due to insufficient power usage information.

1/4

Proportion of worldwide CO_2 emissions created by power generation, the largest man-made source.

IBM

The opportunity for progress is clear.

15% reduction in peak loads

In the Pacific Northwest National Laboratory Smart Grid project, consumers decreased their overall peak load on the grid by 15% when offered the opportunity to save an average of 10% on their electricity bills.

$70 billion

The U.S. could save up to $70 billion in infrastructure spending over the next 20 years through better management of existing assets.

14% lower emissions

Smart grid technology has the potential to reduce the power sector's CO_2 emissions 14% by 2020.

IBM

The way the world works is changing—and leaders must lead through the unknown.
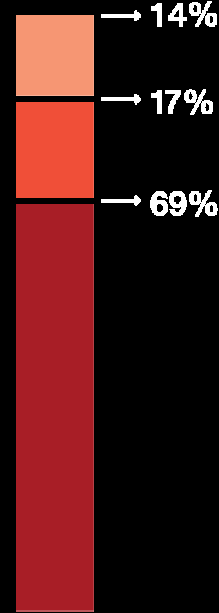
7 in 10

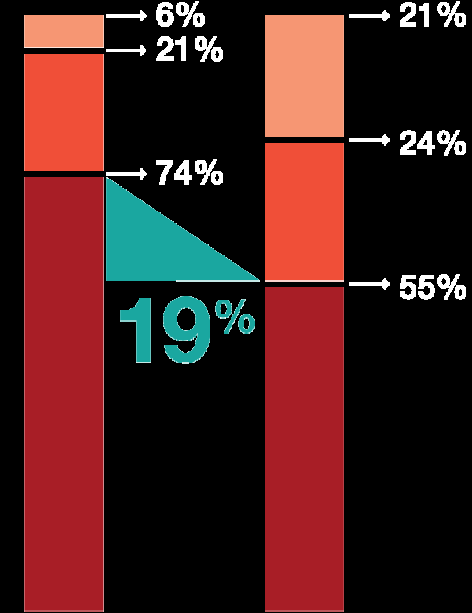Utilities CEOs anticipate turbulent change and bold moves.

19%

Drop in utilities CEOs' rate of success in managing change.

CHANGE NEEDED

- → 14%
- → 17%
- → 69%

2008

PAST CHANGE SUCCESS

- → 6%
- → 21%
- → 74%
- **19%**

- → 21%
- → 24%
- → 55%

2006   2008

No/limited Change

Moderate Change

Substantial Change

Source: 2008 IBM CEO Study

For energy and utilities organizations, this means finding a way to lead in a new environment shaped by three key factors.

CLIMATE CHANGE CONCERNS

As the debate over climate change has become much more public, governments around the world are responding with new energy policies, programs and legislation. Consumers are increasingly concerned about the environmental impact of the products they buy, including energy.

CONSUMER EMPOWERMENT

Energy and utilities organizations face an increasingly leveled playing field. Newly empowered consumers are leveraging provider choice options, actively managing their usage, moving toward self-generation of power and making their voices heard through multiple channels.

TECHNOLOGY INNOVATION

Lower-cost communications, more cost-effective computing and open standards are strengthening the business case for technology innovation in the energy and utilities industry. Technologies such as smart meters, network analytics and distributed generation are changing the way energy is created and delivered.

Source: IBM, "Plugging In the Consumer"

There is an imperative from government and consumers alike for energy and utilities organizations to transform themselves to ensure environmental responsibility, economic competitiveness and national security.

By leading innovation throughout the industry, their positive impact will be felt far beyond.

ENERGY AND UTILITIES

LOCAL AND GLOBAL ECONOMIES

ENVIRONMENT AND SOCIETY
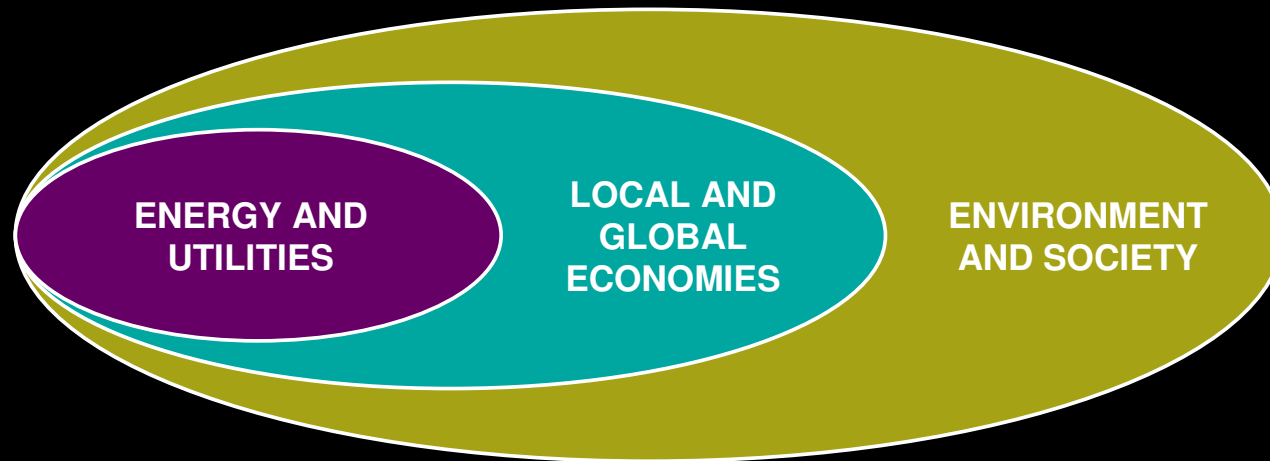
# This mandate for change is a mandate for smart.
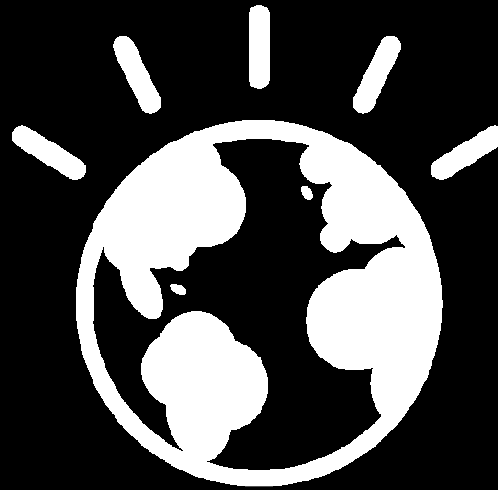
To deliver power more responsibly and more efficiently, energy and utilities organizations are working toward a smarter energy value chain.

TRANSFORMATION OF THE GRID
Transforming the grid from a rigid analog system to a dynamic and automated energy delivery system.

ENERGY AND UTILITIES

EMPOWERMENT OF CONSUMERS
Empowering consumers by providing them with near real-time, detailed information about their energy usage.
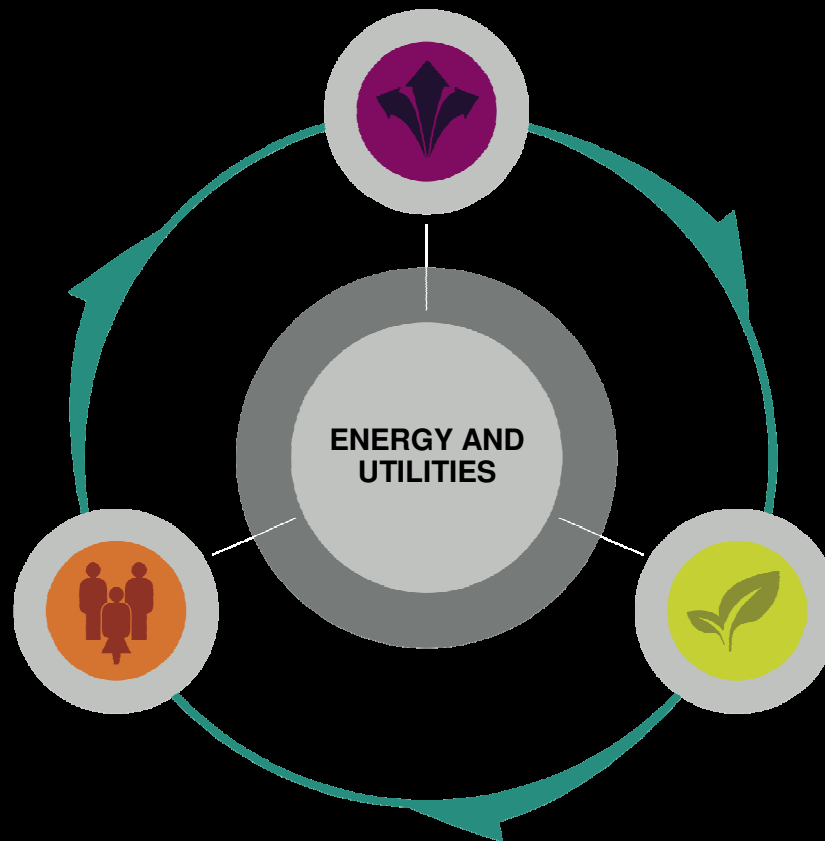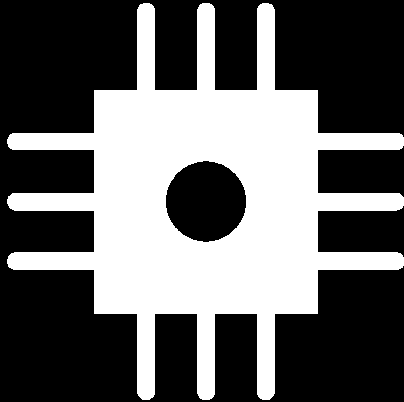
REDUCTION OF GREENHOUSE GAS EMISSIONS
Meeting stringent greenhouse gas emissions targets while maintaining sufficient, cost-effective power supply.

They are doing so by becoming
instrumented, interconnected and intelligent.

INSTRUMENTED

We now have the ability to measure, sense and see the exact condition of everything.

- Today, there are 1 billion transistors for each person on the planet.
- By 2010, 30 billion RFID tags will be embedded into our world and across entire ecosystems.
- In 2008, 6.7 million intelligent meters were used for advanced metering in the U.S., compared to 947,000 in 2006.

Remote monitoring devices tell when and where faults occur and where the inefficiencies are, enabling smarter sourcing and distribution of power.

IBM

INTERCONNECTED

People, systems and objects can communicate and interact with each other in entirely new ways.
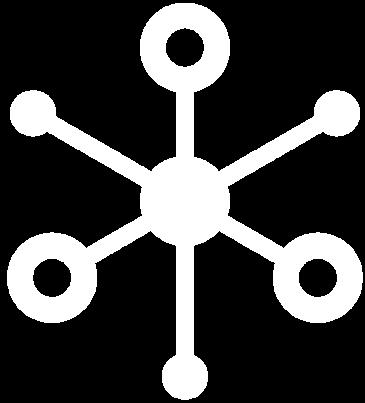
- The Internet of people is 1 billion strong. Almost one third of the world's population will be on the web by 2011.

- There are an estimated 4 billion mobile phone subscribers worldwide.

- Hybrid car sales in the US market are expected to cross the one million mark by 2012.

Virtual marketplaces between consumers and providers allow consumers to trade flexibility in usage for lower costs.

INTELLIGENT

We can respond to changes quickly and accurately, and get better results by predicting and optimizing for future events.
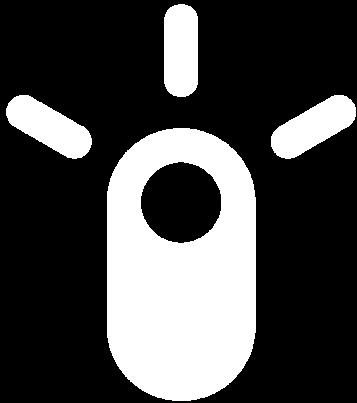
- Every day, 15 petabytes of new information are being generated. This is 8x more than the information in all U.S. libraries.
- An average company with 1,000 employees spends $5.3 million a year to find information stored on its servers.
- If the U.S. grid were just 5% more efficient, the energy savings would equate to permanently eliminating the emissions from 53 million cars.

Power grids use sensors, smart meters, digital controls and analytic tools to automatically monitor and control two-way energy flow.

IBM
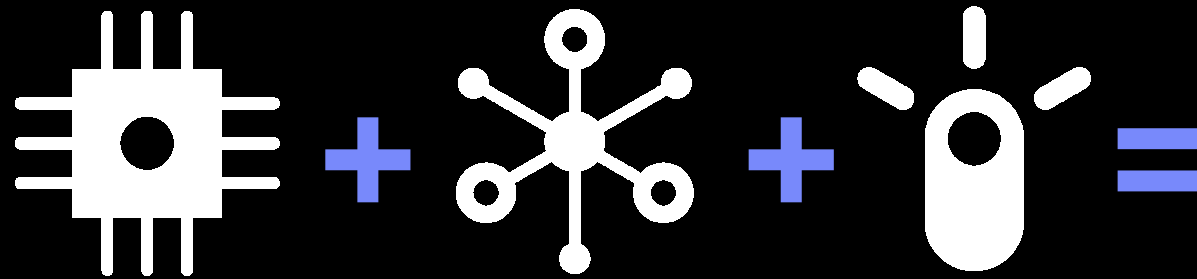
An opportunity for energy and utilities organizations
to think and act in new ways.

Transform the grid from a rigid, analog system to a dynamic and automated energy delivery system by driving operational excellence.

Empower consumers and improve satisfaction by providing them with near real-time, detailed information about their energy usage.

Reduce greenhouse gas emissions to meet or exceed environmental regulatory requirements while maintaining a sufficient, cost-effective power supply.

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Smart energy and utilities:
Transforming the grid.

SMART IS

Knowing exactly where a power outage occurs and instantly dispatching a crew to fix the problem.

SMART IS

Preventing outages before they occur by sensing potential equipment failures.

SMART IS

Extending asset life by sensing and managing the stress placed on aging equipment.

SMART IS

Reducing peak load by communicating with energy consumers and having them turn off non-essential machinery or appliances.

IBM

Smart energy and utilities:
## Transforming the grid.

DONG Energy: Installed remote monitoring and control devices to gain an unprecedented level of information about the current state of the grid, lessening outage times by a potential 25-50%.

CenterPoint Energy: Plans to leverage a mix of leading-edge communication technologies, smart meters and first-of-a-kind process innovations to create an intelligent utility network.

Energie Baden-Württemberg: Offers residential customers smart appliances and meters that enable them to adjust electricity consumption based on price—reducing waste and easing peak loads.
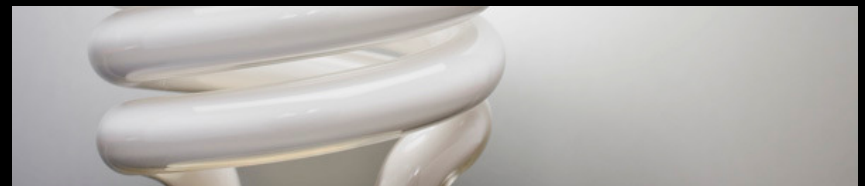
Pacific Northwest National Laboratory: Used intelligent measurement devices, smart appliances and a virtual marketplace to help manage stress in the electric grid, achieving a 50% reduction in short-term peak electricity distribution loads and a 15% reduction in overall peak loads.

Smart energy and utilities:
Empowering the consumer.

SMART IS
Analyzing customer energy usage and providing customized energy products and services to meet their needs.

SMART IS
Helping customers conserve energy by providing them with tools to proactively manage their energy usage.

SMART IS
Ensuring that customers are billed accurately and on time.

SMART IS
Helping customers establish a "smart home" that turns appliances on and off to reduce energy costs.

IBM

Smart energy and utilities:
Empowering the consumer.

Energie Baden-Württemberg: Lessened energy demand at peak times by offering customers smart appliances and meters that enable them to adjust their consumption based on price.

A Canadian regulator: Launched a pilot time-of-use program that rewards consumers for using less power during times of shortage or peak demand, leading participants to shift 25% of their usage away from peak hours.
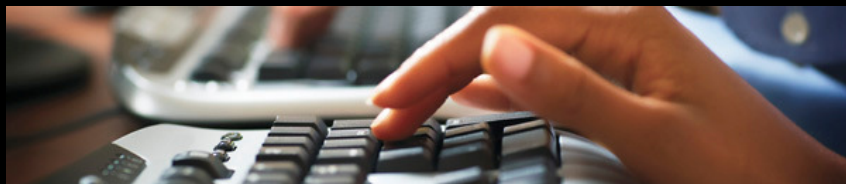
Ecotricity: Re-engineered its business processes and systems to enhance the speed and accuracy of billing while working toward the ultimate goal of a fully interactive, automated, multi-channel customer experience.
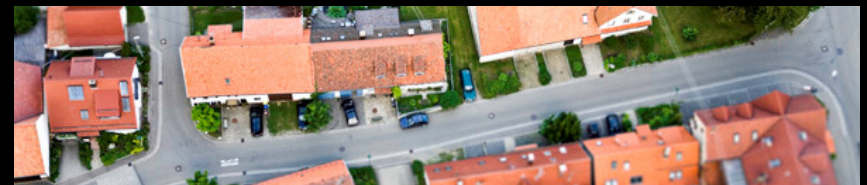
Pacific Northwest National Laboratory: Provided customers with smart appliances such as water heaters that can sense impending grid failures and automatically respond by cutting back on power consumption.

IBM

Smart energy and utilities:
Reducing greenhouse gas emissions.

SMART IS
Smoothing power demand in order to take advantage of off-peak supply such as wind.

SMART IS
Maintaining a sufficient, cost-effective power supply while managing stringent greenhouse gas emissions targets.

Smart energy and utilities:
Reducing greenhouse gas emissions.

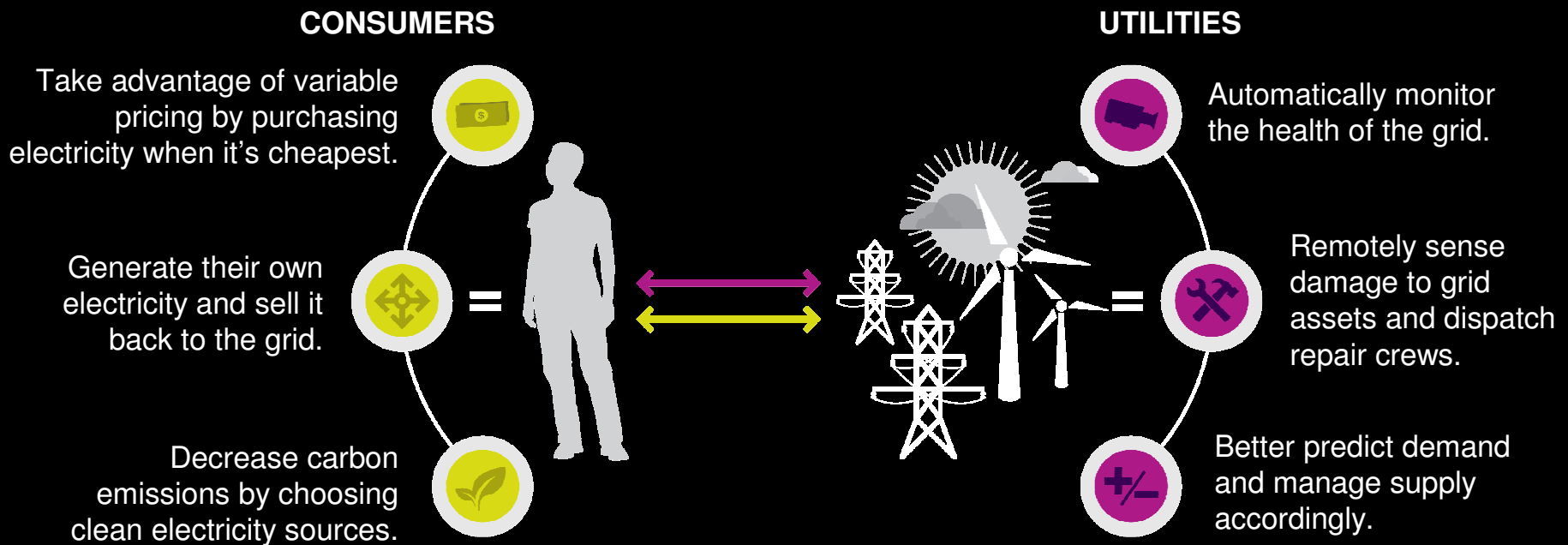
A German Power Company: Deployed a proof-of-concept Wind Generation Monitoring Solution that will connect numerous power plants to a central monitoring application, enabling better collection and use of raw data.

A Japanese Power Company: Implemented a software solution that allows the company to analyze and monitor the conditions of its plants in order to make continued improvements.

Having access to real-time information about the flow of energy in the grid enables utilities and consumers to make smarter, more responsible choices.

CONSUMERS

UTILITIES

Take advantage of variable pricing by purchasing electricity when it's cheapest.

Automatically monitor the health of the grid.

Generate their own electricity and sell it back to the grid.

Remotely sense damage to grid assets and dispatch repair crews.

Decrease carbon emissions by choosing clean electricity sources.

Better predict demand and manage supply accordingly.

Energy Flow

Information Flow

The result? A transformed grid that empowers consumers and provides the energy for a sustainable future.

TRADITIONAL GRID

Coal

UTILITY

Hydroelectric   Nuclear

SMART GRID

Solar   Energy Storage

UTILITY

Wind

Coal   Energy Storage
Hydroelectric   Nuclear
Solar   Wind

Solar

Energy Storage

Plug-in Vehicle

Wind

Consumer
Power Flow
Periodic Information Flow
Continuous Information Flow
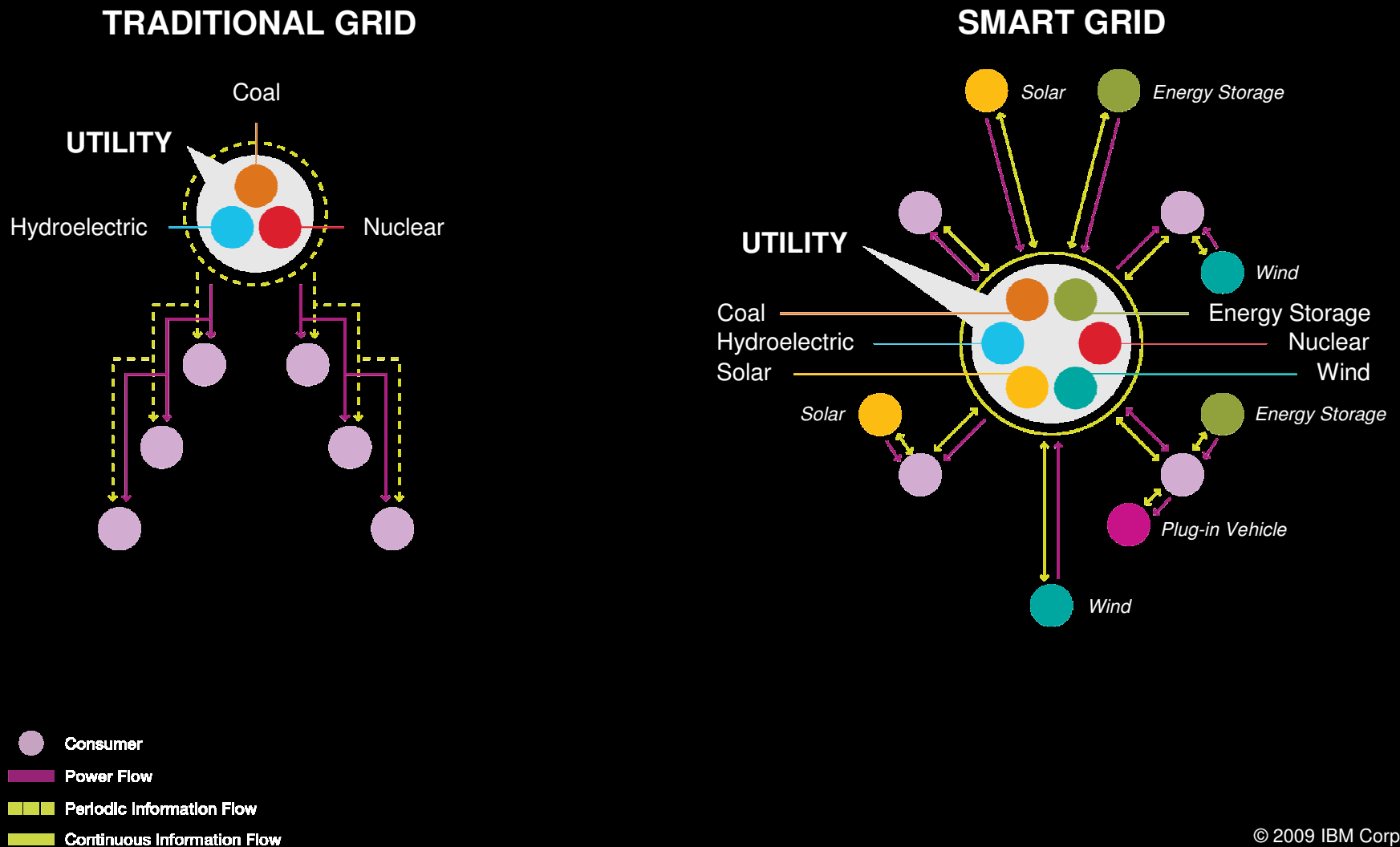
Why must we take action now?

VOLATILE DEMAND AND INCREASING COST

Changing business operations will create mismatches of power and high prices due to their continuing pressure on our inadequate infrastructure.

ENVIRONMENTAL CONCERNS

Consumers are increasingly concerned about the environmental impact of the products they buy, including energy. As a result, they are demanding that utilities provide them with new sources of energy and more information that will enable them to make smarter decisions.

CONSUMERS DEMAND A DIFFERENT MODEL

Consumers desire more information and reliability when it comes to their energy use and the system as a whole. Building a smarter infrastructure is a singular way to meet these demands while stimulating growth in the greater economy.

IBM

The imperative for energy and utilities organizations today is threefold.

FOCUS ON VALUE

Do more with less
- Cash/capital focus
- Flexibility

Focus on the core
- Business process
- Strategic initiatives

Re-align relationships
- Financial solidity of suppliers, partners and customers
- Revisit/renegotiate
- Collaborate

EXPLOIT OPPORTUNITIES

Build future capabilities
- Protect and acquire assets and talent
- Initiatives

Transform your industry
- Bold moves
- Position nationally and globally, where appropriate

ACT WITH SPEED

Manage change
- Clearly communicate simple goals
- Seek and leverage experience

Leadership
- Get the information to act
- Set the agenda

Risk and transparency
- Business performance management and analytics
- Risk management

IBM

IBM's solution strategy is aligned with the needs of energy and utility organizations.

ORGANIZATIONS ARE FOCUSED ON…	IBM IS DELIVERING…
Transformation of the grid	▪ Intelligent utility network optimization ▪ Communications & IT networks ▪ Systems integration & intelligence operations ▪ Advanced metering infrastructure optimization ▪ Enterprise asset management
Empowerment of the consumer	▪ Customer focused utility ▪ Customer intelligence and analytics ▪ Revenue assurance management ▪ Retailer strategy ▪ Contact center optimization ▪ Customer channel strategies ▪ Customer systems management ▪ Total data migration
Reduction of greenhouse gas emissions	▪ Plant asset performance management ▪ Knowledge management ▪ Energy value chain optimization ▪ Wind power suite ▪ Intelligent plant lifecycle management ▪ High performance computing ▪ Generation virtualization ▪ GHG emissions management

We've only just begun to uncover what is possible on a smarter planet.

- The world will continue to become smaller, flatter and smarter. We are moving into the age of the globally integrated and intelligent economy, society and planet.

- There's no better time to start building smarter energy and utilities organizations—focused on providing energy responsibly to empowered consumers. And there's no better time to invest in creating the kind of society we all desire.

Let's work together to drive real progress in our world.

APPENDIX

Where is IBM applying its expertise today?

WE ARE...

- Accelerating the adoption of smart grids worldwide through the Global Intelligent Utility Network Coalition.

- Aiding utilities in the development of smart grids by creating the Smart Grid Maturity Model.

- Collaborating in the GridWise Alliance and similar organizations around the world to promote smart grids

- Participating in the Department of Energy's Electricity Advisory Committee and its Smart Grid Subcommittee to help modernize the U.S. electric system

- Working on 7 of the 10 largest automated meter-reading projects.

- Exploring how to turn millions of electric vehicles into a distributed storage system.

- Running a Center of Excellence for Nuclear Power in LaGaude, France.

- Driving advanced IT in nuclear power generation through the Nuclear Power Advisory Council.

Sources for statistics

Page 4

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[4] IBM Pacific Northwest National Laboratory case study

[5] The Climate Group and McKinsey & Co.,
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[6] 2008 IBM CEO Study

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[7] IBM, "Plugging In the Consumer"

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[8] Sam Palmisano speech, November 12, 2008

[9] 2006 FERC Survey and 2008 FERC Survey

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[10] Sam Palmisano speech, November 12, 2008

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