Global Smart Grid Deployment

US-Mexico Smart Grid Workshop * March 29, 2012

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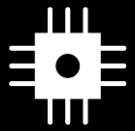
Intelligence is being infused into the way the world works



Our world is becoming

INSTRUMENTED

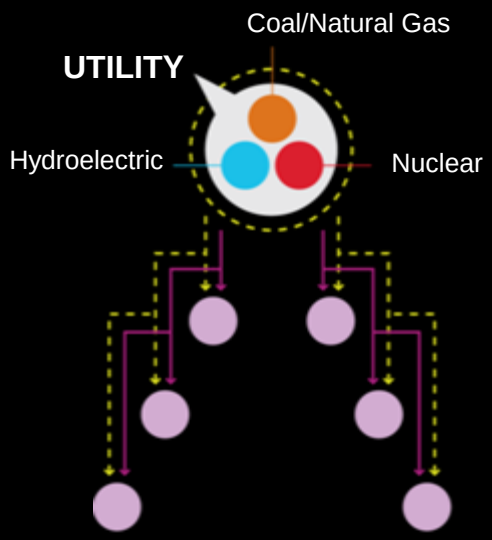
Our world is becoming

INTERCONNECTED

Virtually all things, processes, and ways of working are becoming

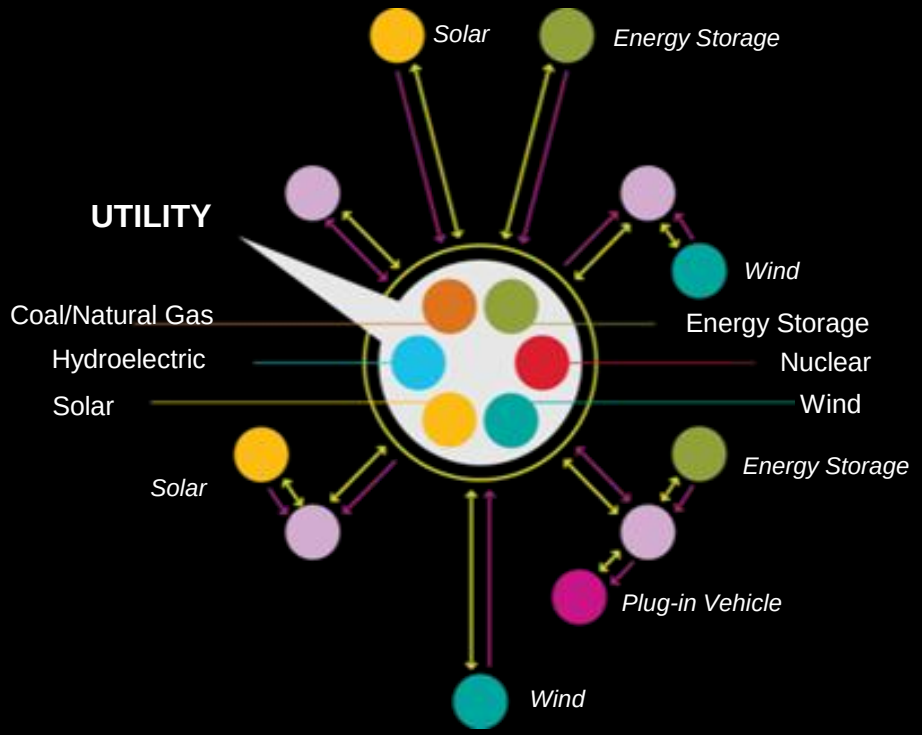
INTELLIGENT

The energy and utilities value chain needs to evolve



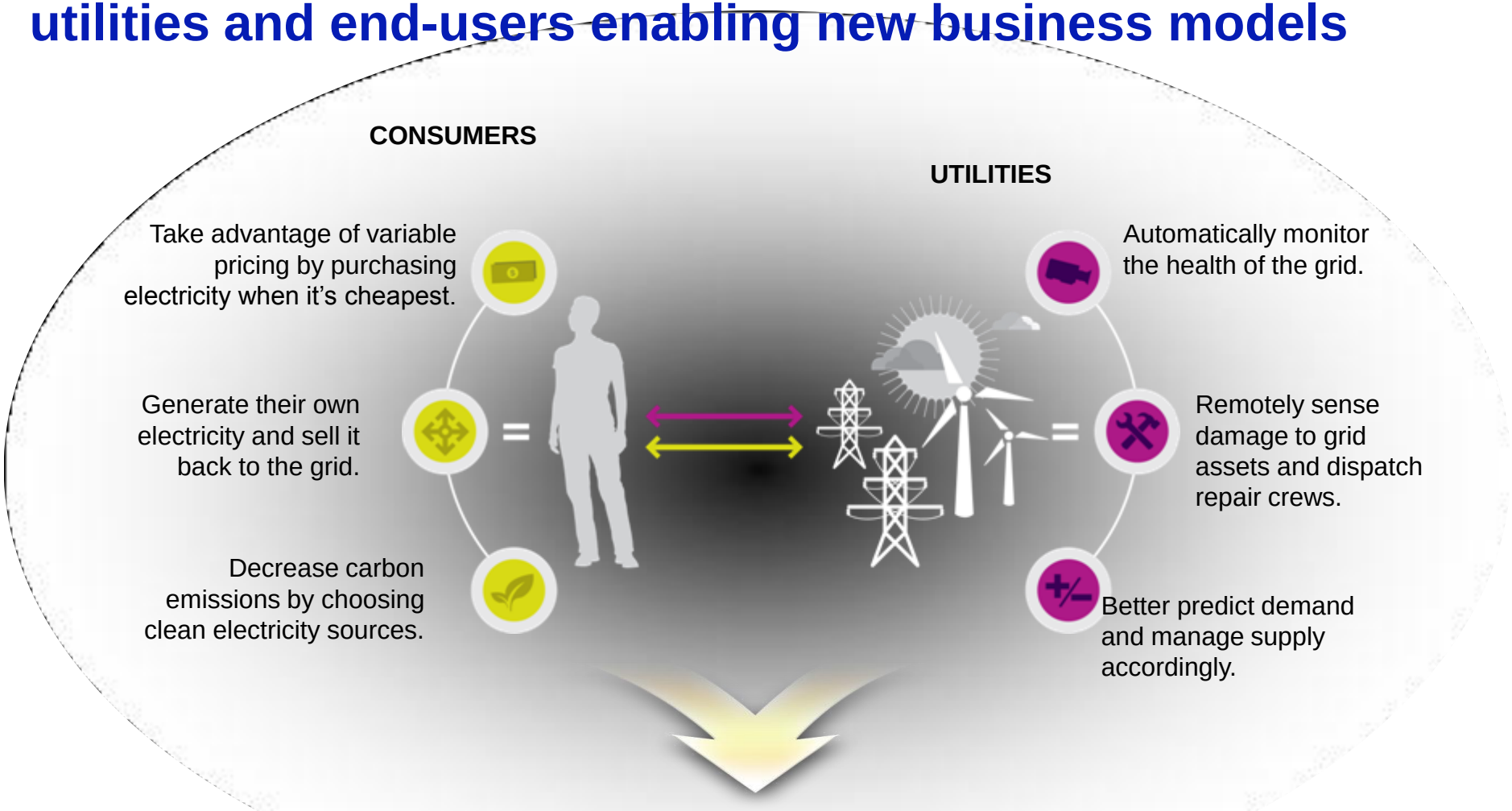
TRADITIONAL

Consumer
Power Flow
Periodic Information Flow
Continuous Information Flow



THE INTELLIGENT UTILITY NETWORK

With new capabilities to redefine the relationship between utilities and end-users enabling new business models

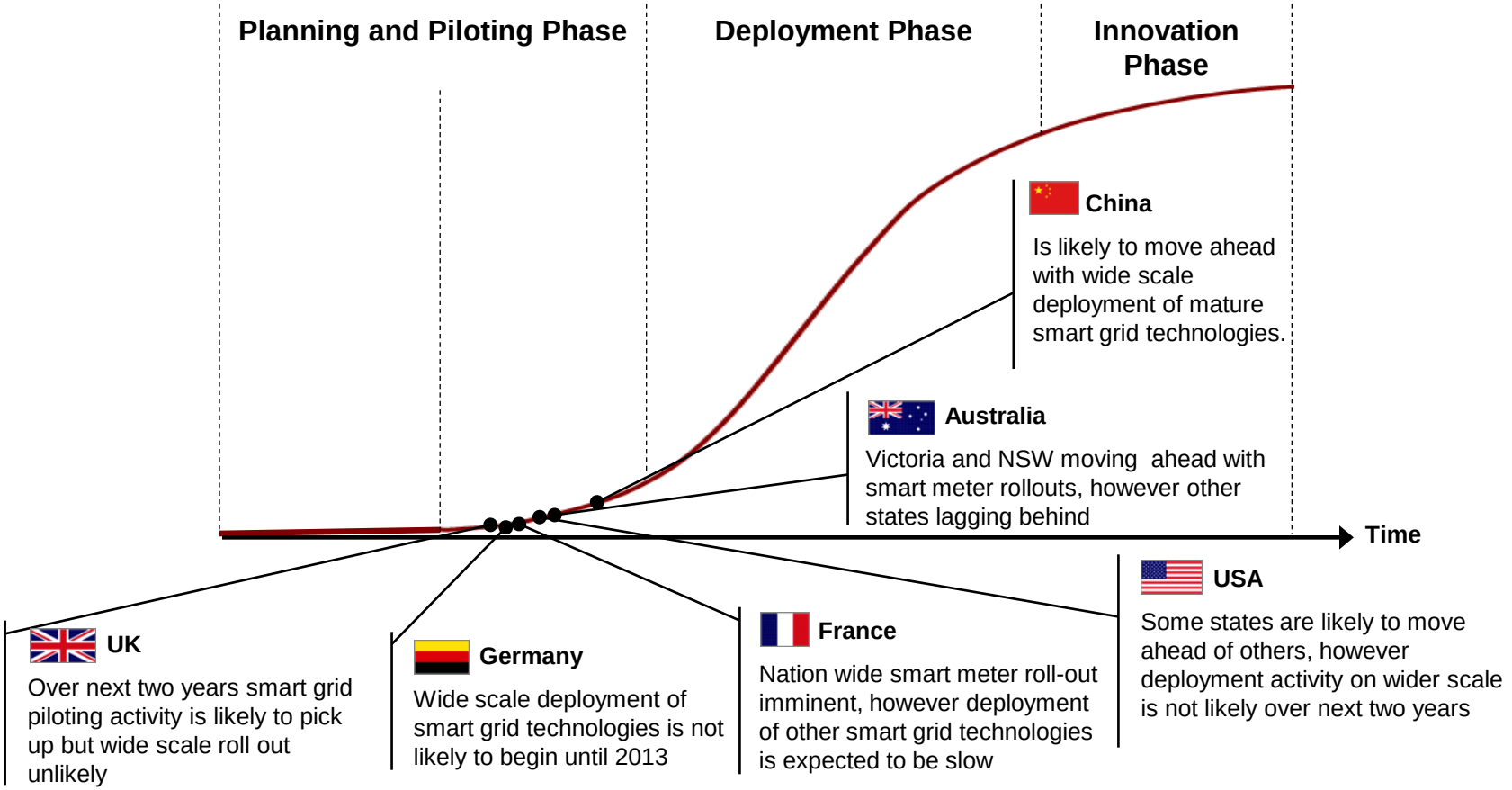


Participatory Network

A wide variety of grid and network technology evolve to enable shared responsibility, and consumers' strong interest in specific goals creates new markets (virtual and physical) and new product demands, which balances benefits more equally between the consumers and utilities

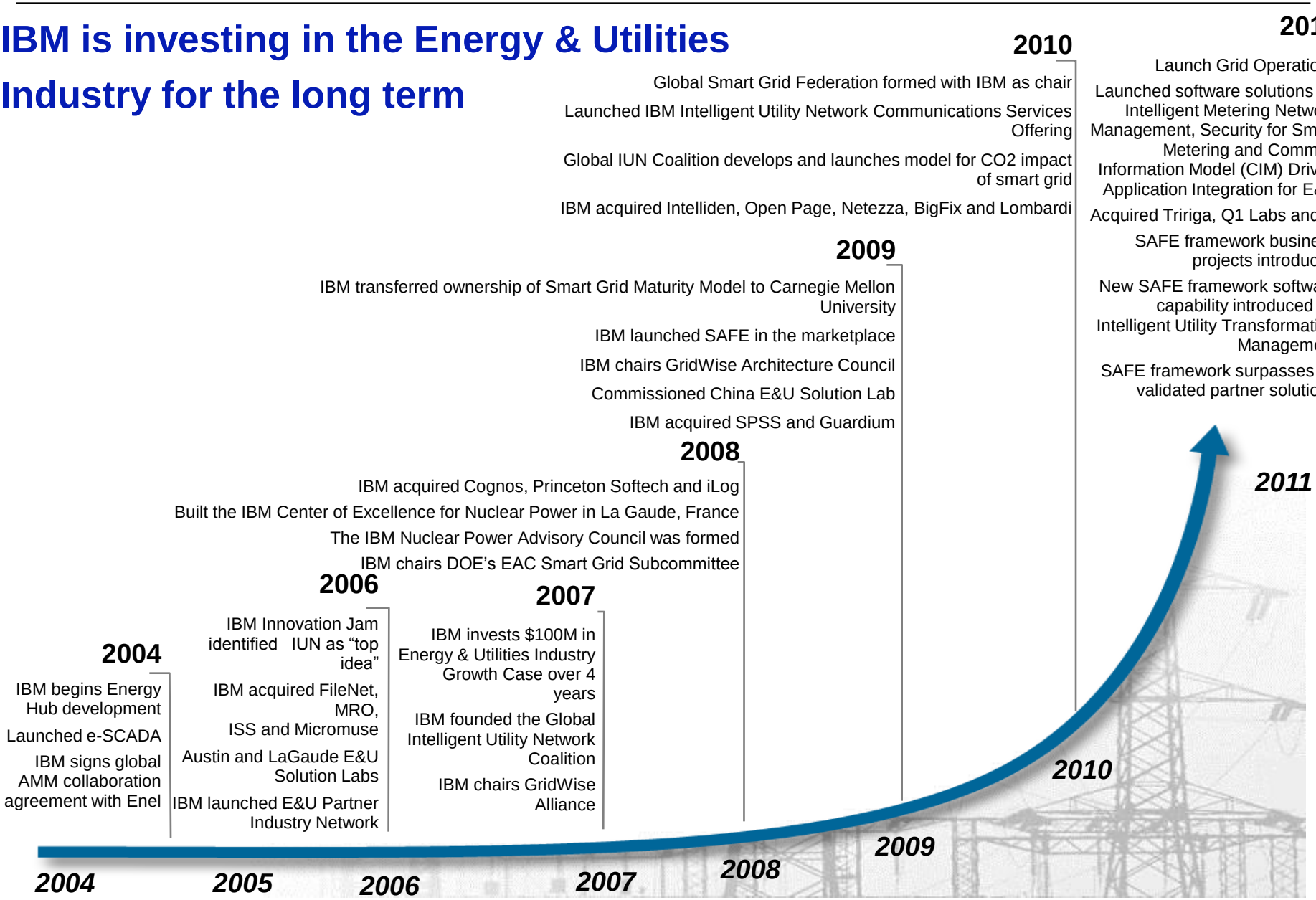
China, Australia and USA have made relatively more progress in terms of smart grid planning and piloting

Relative assessment of smart grid market stage in key countries

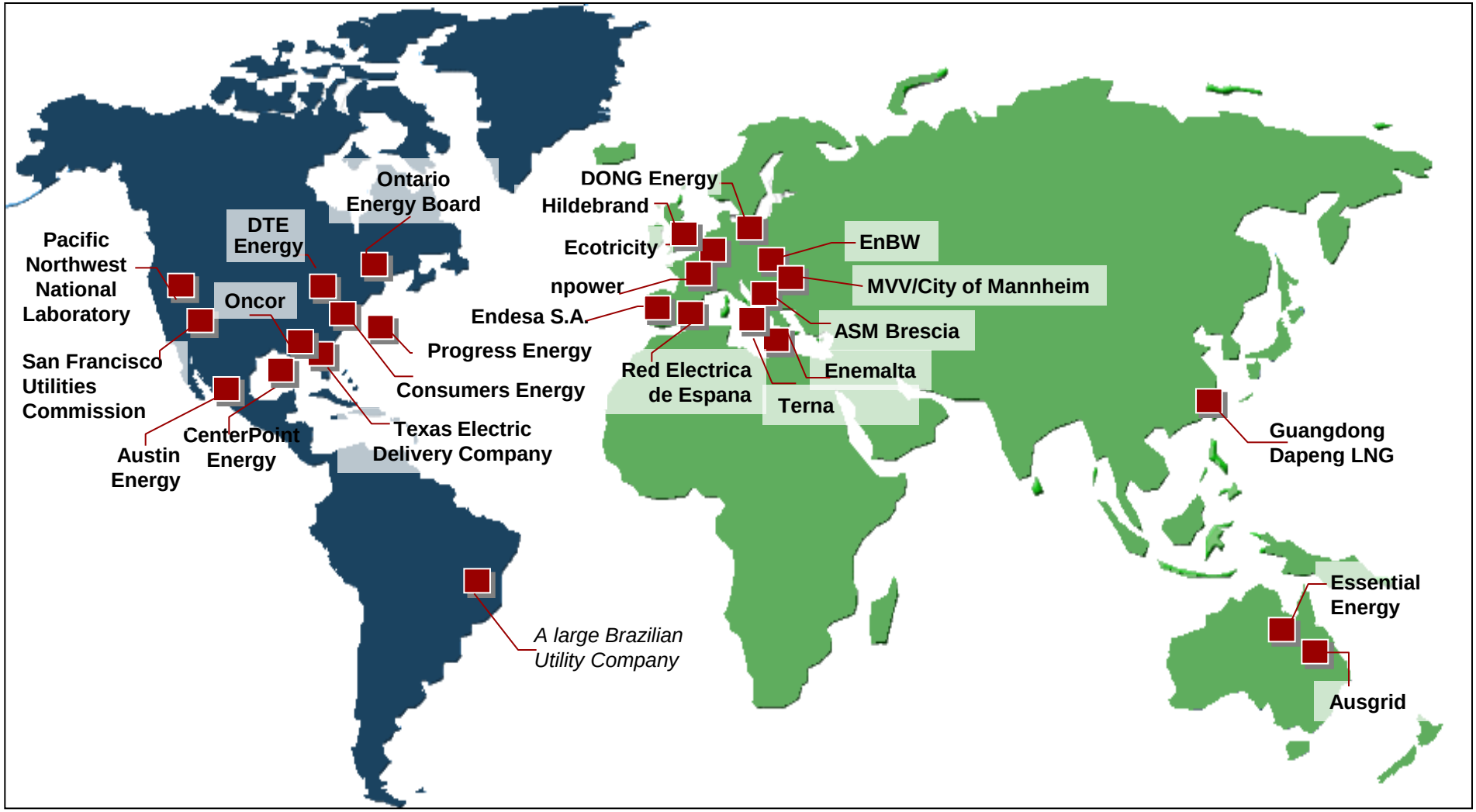


NOTE: A country placed higher along the chart indicates that it has made relatively more progress in terms of its smart grid plans and vision, however it shouldn't be interpreted as higher degree of market maturity as the smart grid vision of each of these countries is different

IBM is investing in the Energy & Utilities Industry for the long term



IBM has worked with clients around the world to develop solutions which transform the energy value chain



CAROLINAS - Progress Energy

Using Smart Grid in a balanced generation strategy.

The need

Progress Energy will be asked during the coming years to provide for continuing growth in customer demand, deal with rising fuel costs, and respond to climate change, while balancing the cost impacts of new generation and renewable energy.

Solution

Progress Energy, along with its strategic partner, IBM, developed a multi-year roadmap and investment plan to prioritize Smart Grid project evaluation and implementation.

What makes it smarter

- Advanced analytics engine forecasts, coordinates and models a comprehensive view of Smart Grid energy and efficiency capabilities
- Grid management functionality replaces emergency voltage reduction with utility-side demand response capability for routine operational use
- Transitions past demand side investments to Smart Grid compatible infrastructure to preserve, re-purpose and extend benefits

"Securing our energy future requires a diverse, balanced strategy to meet the energy needs of a growing population, (leveraging) transformational technologies such as the Smart Grid."

Bill Johnson, Chairman, Progress Energy

Solution Components

- *IBM Research*
- *IBM Global Services*
- *IBM IUN Tiger Team*

DENMARK - Dong Energy

Making the most of the intelligent electrical grid.

Business challenge

DONG Energy is Denmark's largest energy company. Increasing marketplace and regulatory demands along with a need for future infrastructure reinvestment drove Danish utility company DONG Energy to look for a way to better manage and utilize its electrical distribution network in order to respond to outages faster and more efficiently.

Solution

DONG Energy teamed with IBM to implement an Intelligent Utility Network (IUN), installing remote monitoring and control devices that give the company an unprecedented amount of information about the current state of the grid. The new solution also involves extensive analysis of the data provided by the remote devices, as well as reengineering of DONG Energy's business processes. The IBM designed service-oriented architecture (SOA) IT infrastructure to accommodate the new processes. SOA makes IT processes far more flexible and scalable, improving DONG Energy's responsiveness.

Benefits

- Potential to reduce outage minutes by 25-50 percent
- Fault search time reduced by one-third
- Estimated capital savings on planned grid reinforcements of up to 90 percent, when fully implemented

"It turns out that the real key isn't the fact that we've got visibility into the grid, though that was our initial goal. It's that we now have information available on grid performance that we didn't have before. We can do a lot with that information."

Peter Vinter,
power grid specialist,
DONG Energy

Solution Components

- *Global Business Services*
- *IBM Software Group*
- *IBM Business Partner PowerSense*

TEXAS – Center Point Energy

Breaking new ground in grid reliability through the power of automation

The need:

Like the rest of the electric transmission and distribution industry, Centerpoint Energy needs to deliver power more efficiently and reliably in the face of growing consumer expectations, environmental concerns and increasing costs. The company also saw the opportunity to break new ground in grid management practices.

The solution:

Subject to approval by its regulators, CenterPoint Energy plans to leverage a mix of leading edge communication technologies, smart meters and first-of-a-kind process innovations to create one of the industry's first intelligent utility networks.

What makes it smarter:

- Improved ability to leverage information, make the grid more reliable and operations more efficient
- Reduction in the frequency and duration of power outages through proactive management and automated response
- Near real-time electric use data provided by smart meters to the utility and to the consumer

"We expect that the Intelligent Grid will improve electric power line grid planning, operations, and maintenance, enabling us to deliver power more efficiently. We also expect the technology to contribute to fewer and shorter outages."

—Tom Standish
Group President, Regulated Operations
CenterPoint Energy

Solution components:

IBM Global Business Services

IBM Global Technology Services

IBM Global Technology Services Strategic Outsourcing

IBM Research

IBM WebSphere® Message Broker

IBM BladeCenter®

IBM Business Partners Itron, Inc., eMeter, Corinex, Arteche

GERMANY - Energie Baden-Württemberg

Laying the groundwork for “smarter” energy consumption and generation.

Business challenge

With its power generation reliant on more variable sources, Energie Baden-Württemberg (EnBW) sought to add a corresponding flexibility on the demand side by empowering its customers to make “smart” power consumption decisions that lessened energy demand at peak times.

Solution

EnBW worked with IBM to put in place a first-of-a-kind solution that generates and displays the underlying price of electricity as it changes throughout the day. In addition to providing a basis for changing consumption behavior, it also establishes a low-cost platform for changing EnBW’s customer facing processes like billing. With this solution, EnBW has put in place the means to fundamentally transform power consumption patterns for the betterment of the consumers as well as the environment. By enabling true usage-based billing, EnBW redefined its value proposition and achieved differentiation in the German marketplace.

Benefits

- Lower cost and more efficient power generation through reductions in peak energy consumption
- Improved ability to absorb alternative energy sources into the power grid
- Lower energy costs for the customer

“Our goal is not just to adapt to the changing energy industry, but to help shape it in a way that helps our customers and improves our efficiency. With IBM’s vision and expertise in this area, we are well along this path”

Hellmuth Frey, project manager, Energie Baden-Württemberg

Solution Components

IBM Global Business Services
IBM Global Technology Services

ISLAND OF MALTA - Enemalta and Water Services Corporations

Building a smarter energy and water system.

Business challenge

On the island nation of Malta, electricity is generated entirely by imported fossil fuel, and electrically powered desalination plants provide over half its water supply. Meanwhile, rising sea levels threaten Malta's underground freshwater source. This complex series of challenges required immediate attention to ensure that the country delivers affordable, secure energy while protecting the environment. In addition, to meet this challenge, both Enemalta and Water Services Corporations are undergoing an internal transformation process geared towards increased efficiency.

Solution

The Maltese national power and water utilities are partnering with IBM to help their country become the first in the world to build a nationwide smart grid and a fully integrated electricity and water system. 250,000 interactive meters will monitor electricity usage in real time, set variable rates, and reward customers who consume less energy and water. Furthermore, in assisting in the transformation of both utilities, IBM is entrusted to implement a customer relationship management (CRM) and Billing solution, as well as Enterprise Resource Planning (ERP) core modules, while a new Web portal will be instilled for both utilities to better interact with their end customers.

Benefits

- Data from the intelligent meters can be analyzed to help lower costs, adopt efficient and sustainable consumption patterns and cut greenhouse gas emissions
- By addressing water and power issues as a system citizens can make smarter decisions about how and when they use power

Solution Components

- *IBM Global Business Services*
- *IBM Research*
- *IBM System x, System p*
- *IBM Tivoli*
- *IBM Lotus*
- *IBM WebSphere*
- *ISV/ Alliance Partners: SAP*

BRAZIL – CPFL

What if intelligent sensors could shorten the time it took to repair electrical outages?
A large Brazilian energy company is installing sensors, remote terminal units and meters in its electrical grid to improve service delivery.

Business challenge:

The utility company needed to find a way to locate problems in its complex underground electric mesh network in order to shorten the time it took it to repair outages.

Solution:

An interconnected and sensored network brings smart solutions. Working with IBM, the company deployed a system that incorporates sensors, meters and intelligent devices across its energy grid to monitor a range of indicators and send alarms when thresholds are reached. The solution automates real-time reports, which allows problems to be detected quicker. And facilitating analysis of multiple variables (temperature, level of O2, status of transformers…) helps staff determine the appropriate tools to dispatch for repair, improving productivity and lowering costs.

Benefits:

- Increase speed of repair times
- Decreases of system outages

"Our underground electrical network is vast and complex. The IBM solution allows us to sense when and where faults occur, enabling us to repair outages much more quickly than before."

Solution components:

IBM® System x® 3500
IBM Tivoli® Monitoring, Tivoli Netcool®/OMNIbus
IBM Global Technology Services

CHINA - Guangdong Dapeng LNG (DPLNG)

Creating a new energy supply from the ground up.

Business challenge

To satisfy its growing need for power, China is turning to natural cleaner, "greener" energy sources—most notably natural gas, with the joint venture known as DPLNG leading this pioneering effort. With five power plants and millions of customers dependent on it as an energy source, DPLNG needed to put processes in place that would ensure the efficient, reliable and safe production of natural gas from liquefied natural gas (LNG).

Solution

DPLNG teamed with IBM Global Business Services to design and deploy a comprehensive business process framework from the ground up that lays the foundation for the reliable delivery of natural gas to millions of residents in China's fastest growing region. A key part of IBM's role was to design and deploy the scheduling and management processes that maintained the balance between gas processing and distribution, and ensure the facility's reliability in the natural gas supply chain.

Benefits

- Maximization of efficiency through flexible, integrated processes
- Ability to dynamically optimize LNG receiving processes as demand grows
- Maximization of reliability and safety—and minimization of downtime risk—through the use of proactive asset management practices

"Establishing a solid operational foundation was imperative for the successful launch of DPLNG. IBM created the business process structure that allowed us to move seamlessly from the construction phase into the operational stage."

Tom King, President, DPLNG

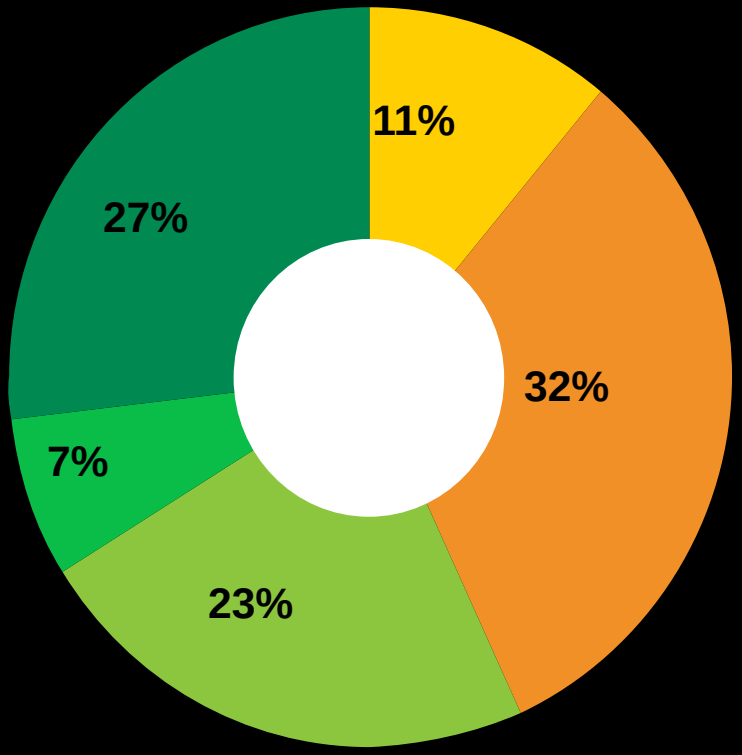
To build an intelligent grid there are major challenges and potential solutions

- Infrastructure is expensive so we must show **RETURN ON INVESTMENT**
- Consumers must support it but need a clear **VALUE PROPOSITION**
- Utilities/Regulators being pushed but need new **BUSINESS RISK MODEL**

Demonstrate return on investment

Benefits by area for an illustrative utility
More than two million customers

$605 Million



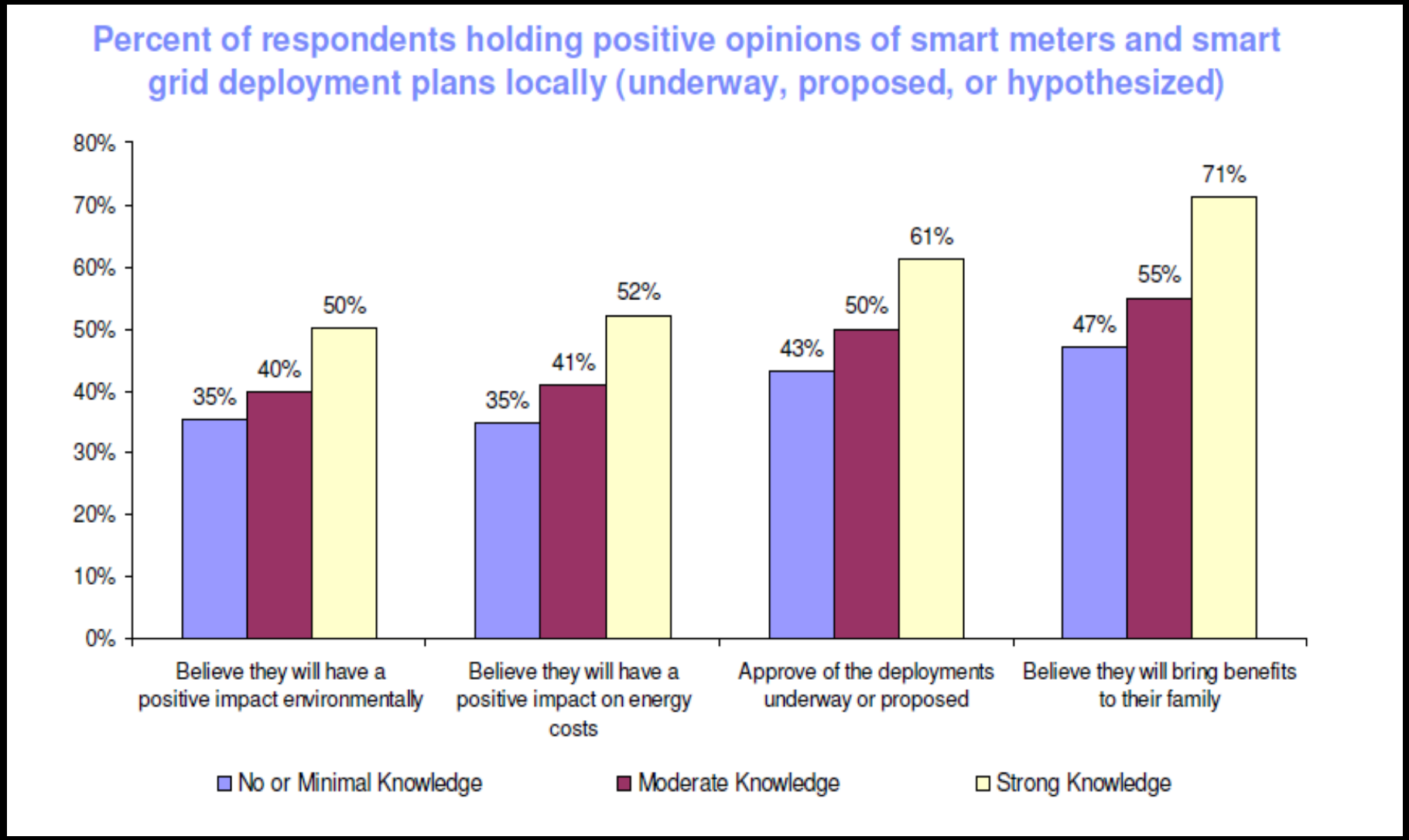
T&D O&M Costs
Reducing T&D O&M costs for maintenance, metering, field operations, restoration and call center activities

T&D CapEx
Generation CapEx
Reducing Generation and T&D capital investment through better asset management, voltage/VAR optimization, distribution automation and capacity forecasting

Energy Costs
Reduced energy cost by controlling line losses and identifying theft and other commercial losses

Environmental
Reducing emissions through automated operations, lower energy consumption and reduced line losses

Good news = knowledge increases support for Smart Grid
Bad news = 40% did not know meaning of $kWh



Regulatory and Business Structures must evolve along with speed of technology, a monumental challenge

- Speed of technology change
  RATE CASE REFORM
- Revenue erosion from reduced sales
  ENERGY SERVICES MODEL
- Resource planning on supply-side
  IRP GRID ASSETS


WELCOME TO
Global Intelligent Utility Network Coalition
2011 Mid Year Meeting
JUNE 27-30
Campinas, São Paulo, Brazil
IBM

The Global Intelligent Utility Network Coalition – advancing smart grid for over 150 million consumers around the world

The five tiers to building a strong smart grid platform

Develop a Robust Consumer Education Plan Early

Create Long Term Roadmap with Articulated Outcomes

Adopt or Establish Interoperability Standards

Create Regulatory & Financial Incentives for Investments

Establish Clear Data Privacy and Security rules

ありがとう * شكرا * 謝謝 * Merci * Danke * धन्यवाद * תודה * terima kasih * با تشکر از شما * gracias * tack * آپ کا شکریہ * σας ευχαριστώ * спасибо * gratias agimus tibi * *Thank you!*

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