

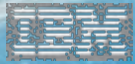
ICT Enabling Greener Society



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IBM Corporation



***Building A Smarter
Planet***



Energy & Environment Focus



The Bad News: ICT accounts for 2% of global CO₂ emissions



The Good News: ICT can significantly contribute to control and reduce the 98% of CO₂ emissions caused by other activities and industries

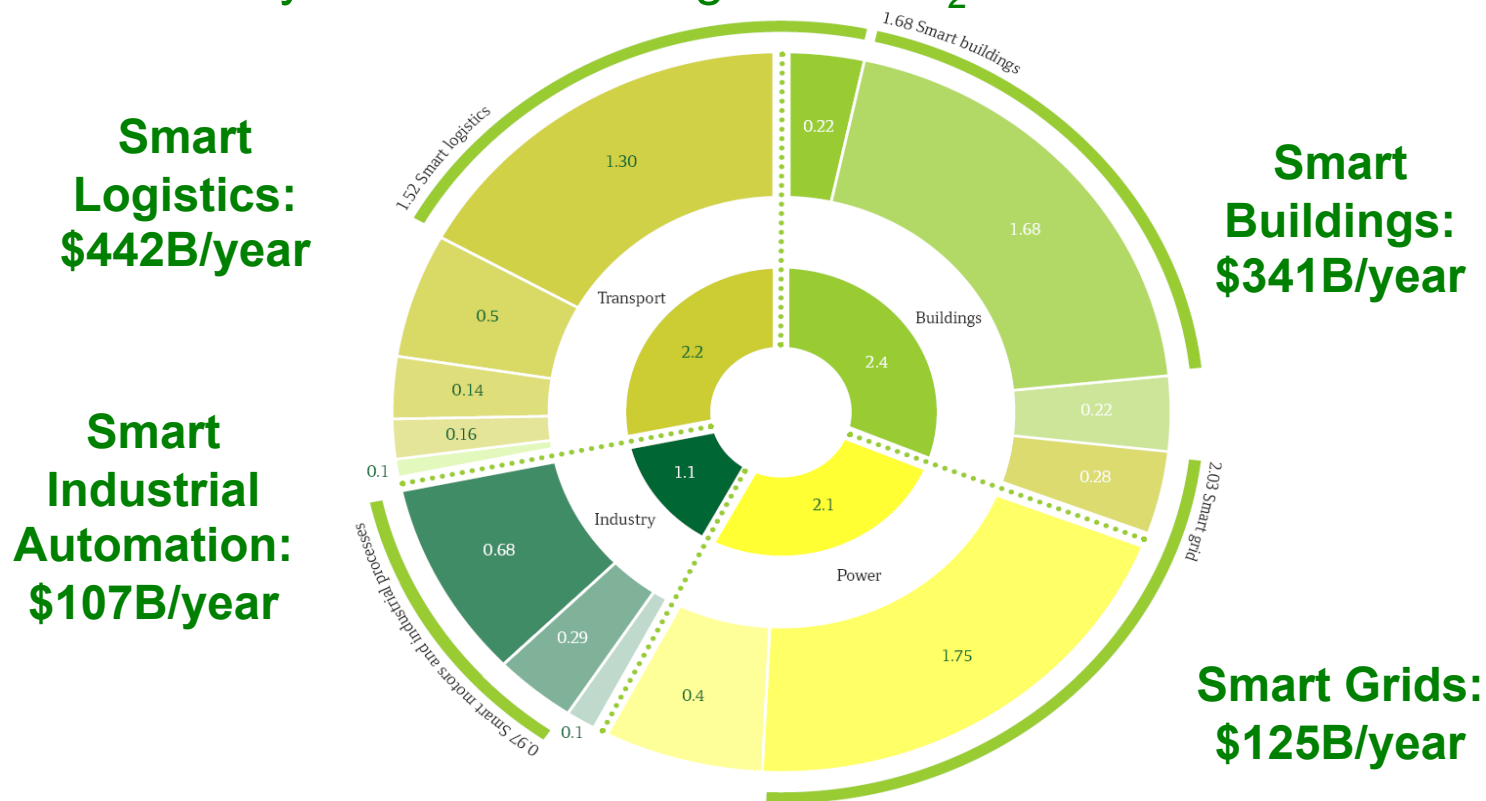
“... you can’t make a product greener, whether it’s a car, a refrigerator or a traffic system, without making it smarter — smarter materials, smarter software or smarter design.” - Thomas L. Friedman

Sources: Gartner, Green IT, October 12, 2007; “The Green Road Less Traveled” by Thomas L. Friedman, The New York Times, July 15, 2007, <http://select.nytimes.com/2007/07/15/opinion/15friedman.html?scp=2&sq=thomas%20friedman%20july%202007%20greener%20smarter&st=cse>



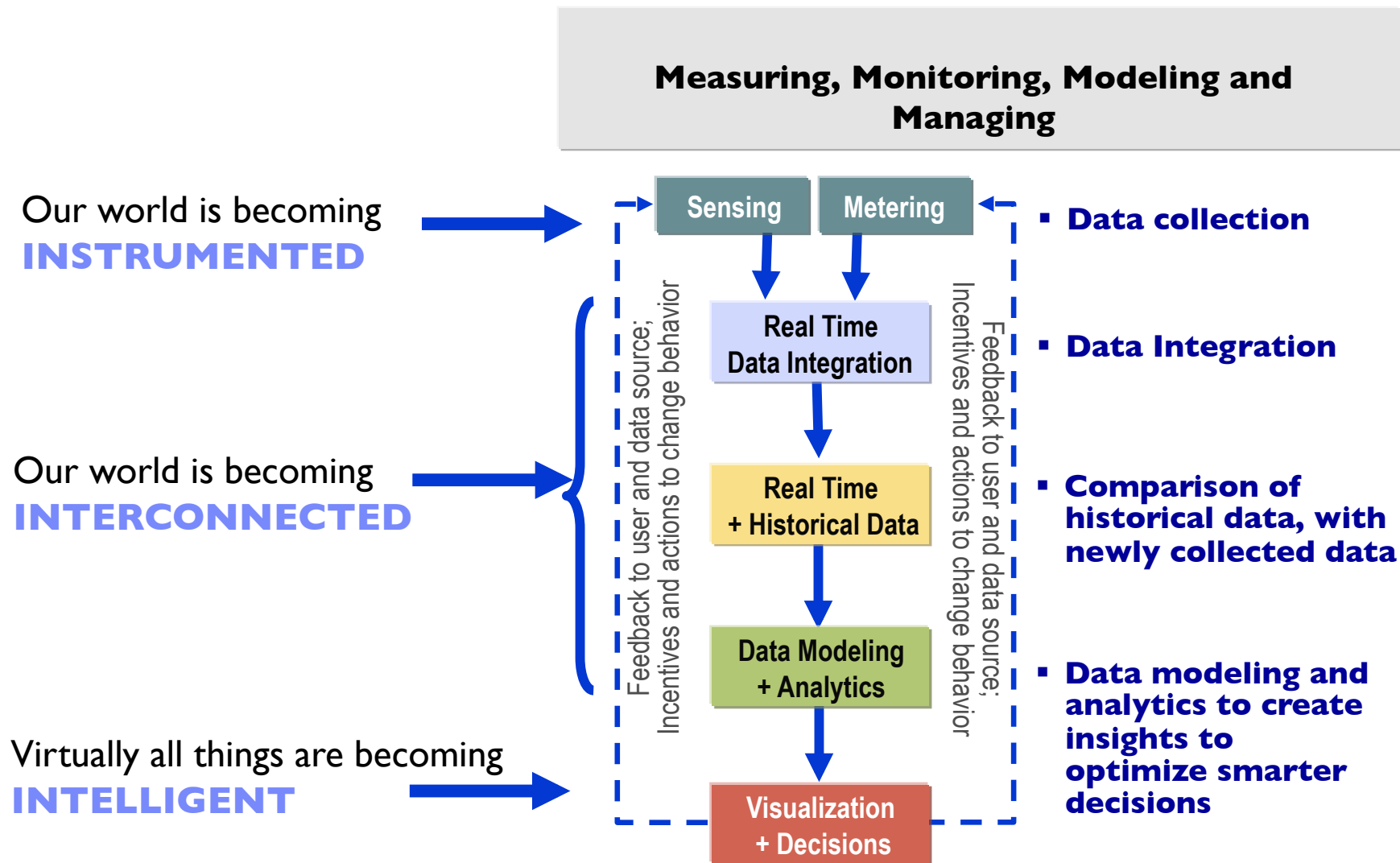
Tackling climate change is good for the climate and economy

Information and Communications Technology (ICT) can significantly improve energy efficiency and reduce GHG emissions, driving potentially \$1 Trillion in energy savings per year by 2020 and 7.8 Gigatons CO₂e abatement

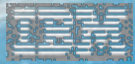




What does it mean to become Smarter?

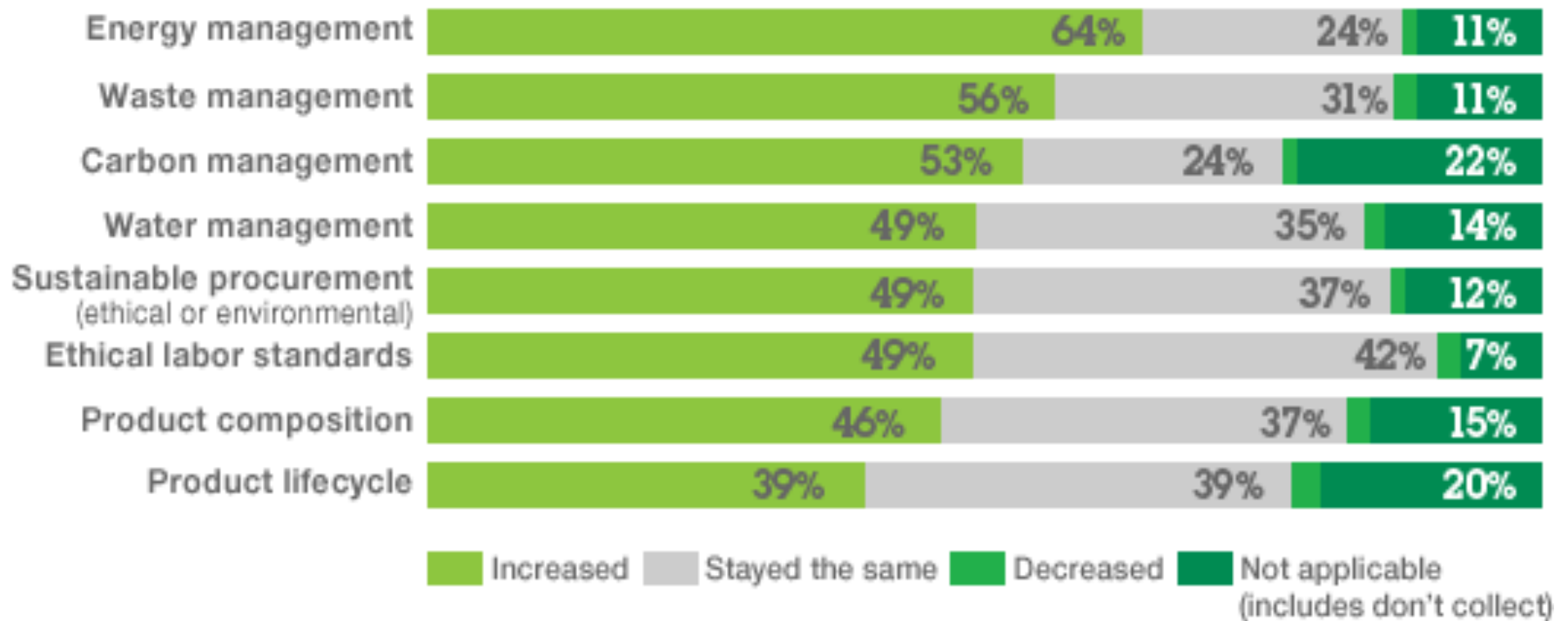


Source: IBM Corporate Strategy



Instrumentation increasingly captures more data... now to make it into real intelligence to enable smarter decisions for a greener society

Change in information collection over the past three years (Percent responses)



Source: IBM Institute for Business Value 2009 CSR Study



IBM addresses energy & environment challenges

Smarter ICT Infrastructure

Green IT, Data Centers, Networks



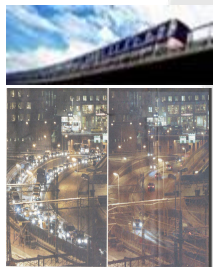
- Energy Efficient, Virtualized, Dynamic IT/DC
- Monitoring & verification of efficiency goals
- Cloud computing,
- Intelligent Site Operations
- *IBM and client case studies: Up to 40% to 80% energy use reduction, up to 85% less floor space*

Mobility Services

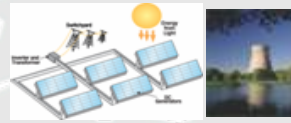


- Reduce traffic and pollution
- Retain and attract talent
- Cut facility costs/impact

Smarter Transportation Systems



- Reduce traffic congestion
- Reduce CO₂ emissions
- Increase mass transit usage
- Improve environment
- *Stockholm case study: Reduced traffic congestion 25%, Carbon emissions 15%*



Smart Grid

- Reduce energy usage
- Improve grid management, reduce outages
- *U.S. case study: 10% energy use reduction, up to 50% reduced load on electric grid*

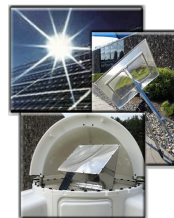
Smarter Water Management



- Flood avoidance
- Reduce water usage
- *IBM case study: 27% reduced water usage, with 30% increase in manufacturing output, saving \$M in energy and water cost*

Sustainable Business Solutions & Services

- Strategy
- Corporate Social Responsibility
- Green Sigma TM
- Green SNOW - Supply Chain Network Optimization Workbench
- *Smarter Cities*
- *Smarter Buildings*
- Cap and Trade Systems



Alternative Energy Research

- IT to ET: Applying IT cooling technologies to concentrator PV
- IBM know-how in thin films, advanced photovoltaic materials
- Nanomembranes for desalination
- *Energy storage, modeling and analytics for optimization in energy efficiency and renewable energy, etc.*

Smarter Cities Bring it All Together – with intensive use of information technologies for sustainable development

Intelligent Transportation Systems

- Road Usage Charging/Congestion Pricing
- Integrated Fare Management
- Traffic Information Management

Public Safety

- Smarter Surveillance Systems
- Emergency Management Integration
- Micro-Weather Forecasting
- Cyber-security

Energy Management

- Smarter Building Management
- Automated Meter Management
- Smart Grid – Demand Management
- Energy Network Monitoring & Stability
- Proactive management of the alternative energy mix

Telecommunications

- Fixed and mobile operators
- Media Broadcasters

Water Management

- Water purity monitoring
- Water use optimization
- Waste water treatment optimization

Environmental Management

- City-wide Measurements
- Key Performance Indicators (KPI's)
- Energy, Water, Waste, CO₂ Management
- Scorecards
- Reporting



THANK
YOU

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IBM has a long history of environmental tradition and leadership.



1976: Think!, the company magazine, devoted an entire issue to IBM's energy conservation and environmental programs

1990: Think! Devoted an entire issue to IBM's environmental programs – beginning IBM's annual Corporate Environmental Reporting

1991: Established IBM's Product Stewardship Program



1997: IBM becomes the first major multi-national to earn a single global registration to the ISO 14001 environmental management system standard

96%

2006: Amount of IT product and product waste processed by IBM's product End-of-Life Management operations that was **reused or recycled**

2006: IBMers * "Jam" on innovation for a better planet, and IBM invests in Big Green Innovations

50%

1990 - 2008: Between 1990 and 2008, IBM's global energy conservation actions reduced or avoided CO₂ emissions equal to 50% of its 1990 emissions



95%

1987 - 2006: Reduction in hazardous waste generation since the 1987 base year of this pollution prevention metric

1971: T. J. Watson Jr. issued IBM's first corporate policy on environmental protection

1989: IBM offers its first product take-back program

1992: IBM becomes charter member of Energy Star Program



1994: Established Global Materials Recovery Center Network for product re-use and recycling

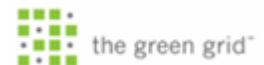
2007: Invested in Intelligent Utility Networks, Intelligent Transportation Systems, Project Big Green



Collaborating to develop solutions ...



WORLD RESOURCES INSTITUTE





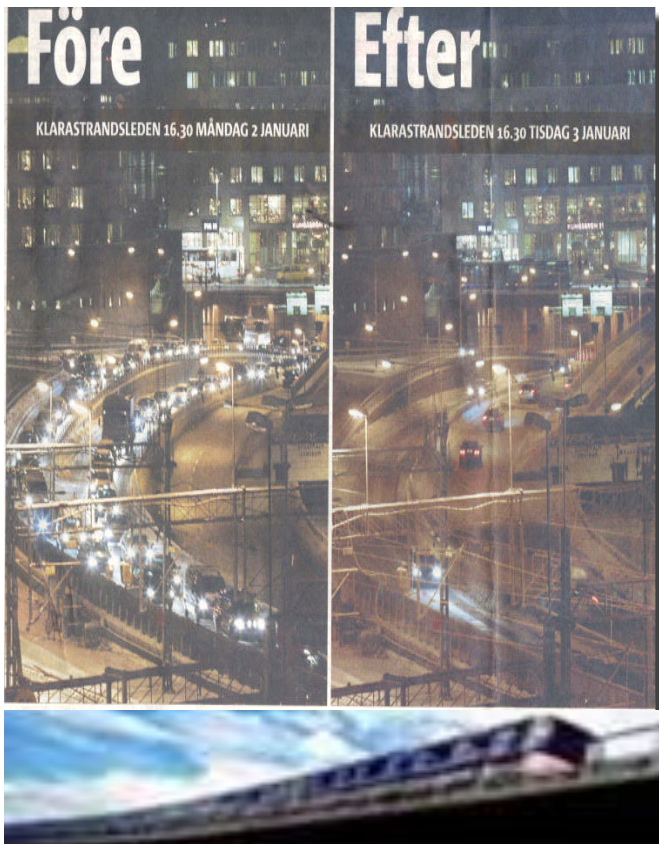
Energy Efficient Technologies and Services



- **Energy efficient solutions:**
 - **Green IT and Green Datacenters**
 - **Servers and storage continually more energy efficient**
 - **New and retrofit equipment**
 - **Rear Door Heat Exchanger**
 - **Measurement & Management Technology**
 - **Monitoring & verification of efficiency goals through Energy Efficiency Certificates**
 - **Virtualization, consolidation**
- **Benefits and studies:**
 - **40% to 80% energy use reduction**
 - **Up to 85% less floor space**



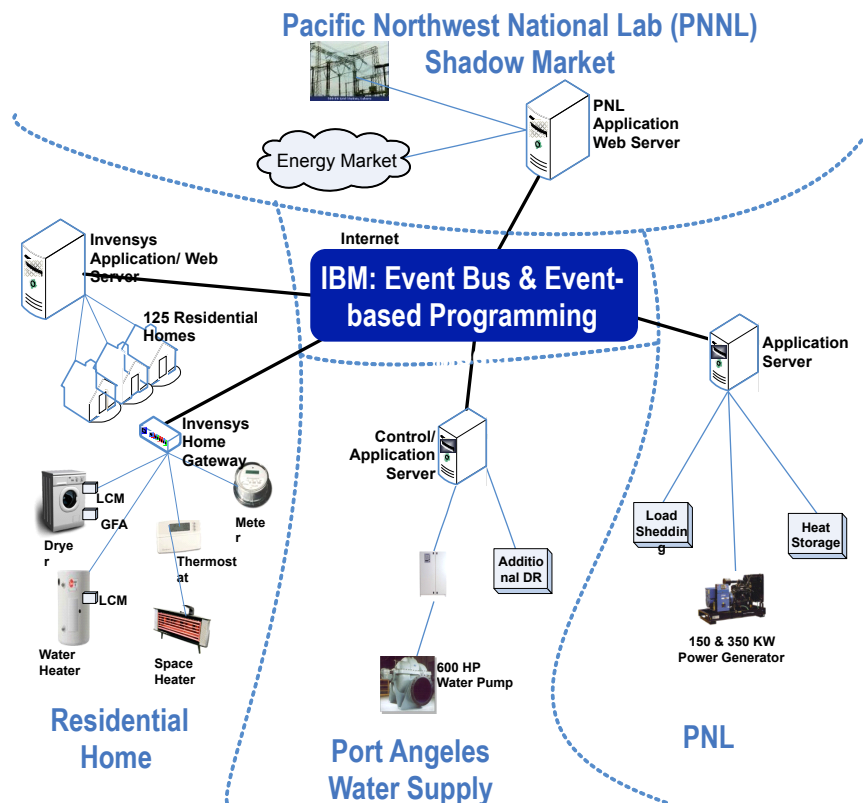
Intelligent Transportation Systems



- **Integrated transportation solutions:**
 - Road user charging
 - Congestion pricing
 - Integrated fare management
- **Benefits:**
 - Reduce traffic congestion
 - Reduce CO₂ emissions
 - Increase mass transit usage
 - Improve environment
- **Stockholm case study with clear results:**
 - Reduced traffic congestion 25%
 - Reduced carbon emissions 15-40%
 - \$120M/yr in revenue to City, 4 yr payback
 - Congestion charges fund transit improvements



Intelligent Utility Networks

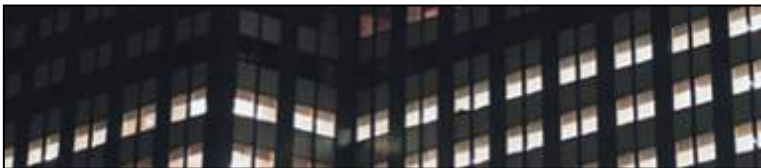


- **Smart Grid Solutions:**
 - Smart grid management
 - Smart meters
 - Smart appliances
 - Smart integration
- **Real-time energy market**
- **Dynamic response to constraints on the grid**
- **Benefits in PNNL case study**
 - Reduced peak load demand on the energy grid 15% to 50%
 - Reduced consumer energy bills by 10%

Smarter Buildings

The interconnection of physical assets and information technology can optimize efficiency, production and consumption in many types of buildings.

Smarter Commercial Building



- Provides integrated facilities operations information for owners/operators in order to optimize energy usage and services based on tenant's needs.

Smarter Airport



- Provides efficient passenger and cargo services, climate control, wi-fi access, track maintenance tasks and help achieve security and safety compliance

Smarter Network Operations

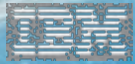


- Integration of active and passive network management enables optimized operations, reduces truck rolls and reduces energy while improving network performance.

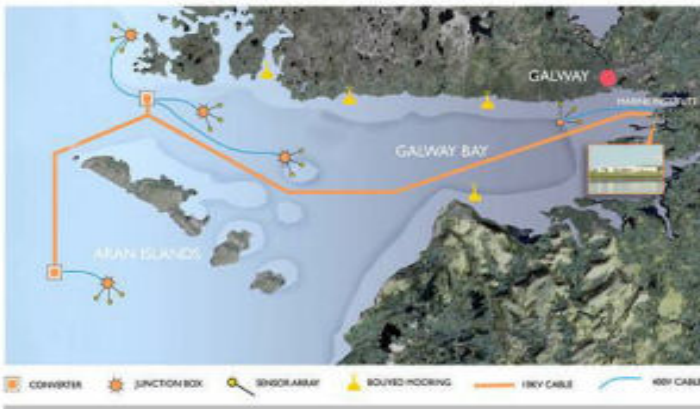
Smarter Data Center



- Integrated facilities and IT insight to energy efficiency of datacenter and the correlation of IT and facilities information.



Smarter Water Management



- **Strategic Water Information Management Solutions – SWIM**
 - Sensing and Monitoring
 - Data Integration, Workflow, Management
 - Deep Thunder – Advanced Micro-weather prediction
 - Storm Impact and Response Prediction
- **IBM Advanced Water Management Centers of Excellence**
 - Amsterdam, Netherlands
 - Dublin, Ireland
- **Benefits**
 - Flood forecasting, predictive modeling
 - Environmental analysis & prediction
 - Reduced water usage and costs
 - IBM case study: 27% reduced water usage, 30% increase in manufacturing output, saving \$M in energy and water



Looking toward the future... IBM Energy and Environment Research

- **IT to ET: Leveraging Information Technology as Energy Technology**
 - Cooled concentrator photovoltaic system from 1600°C to 85°C
 - Thin membranes for photovoltaic materials
- **Energy Storage Research – Lithium/Air**
- **Nanomembranes for filtration of salts and toxins from water for desalination**
- **Modeling analytics for optimization in energy efficiency and renewable energy**
- **Cyber-security research and development**

