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# SMART 2020: Enabling the low carbon economy in the information age

## United States Report Addendum Report Summary

# Report summary

U.S. carbon emissions today total 6 billion tons, and if current trends continue, they will reach 6.4 billion tons by 2020. The Intergovernmental Panel on Climate Change (IPCC) has called for an overall greenhouse gas emissions reduction of 60-80% below 2000 levels by 2050 to avoid significant environmental damage.<sup>1</sup> Businesses and policy-makers alike now recognize that climate change is a global problem that demands immediate and sustained attention.

The information and communications technology (ICT) industry can enable a large portion of that reduction. By providing actors with the information necessary to make better decisions about energy consumption, ICT solutions can reduce the carbon footprint of human activity while improving quality of life. Altogether, ICT enabled solutions could cut annual CO<sub>2</sub> emissions in the U.S. by 13-22% from business-as-usual projections for 2020. This translates to gross energy and fuel savings of \$140-240 billion dollars.<sup>2</sup>

Four main ICT opportunities to cut emissions are described in this report.

- A **Smart Grid** built on better information and communication could reduce CO<sub>2</sub> emissions by 230-480 MMT of CO<sub>2</sub>, and save \$15-35 billion in energy and fuel costs.
- More efficient **Road Transportation** could reduce travel time and congestion, shaving off 240-440 MMT of CO<sub>2</sub> emissions and saving \$65-115 billion.
- **Smart Buildings** that consume less energy could abate 270-360 MMT of CO<sub>2</sub> and save \$40-50 billion.
- **Travel Substitution** through virtual meetings and flexible work arrangements could reduce CO<sub>2</sub> by 70-130 MMT and save \$20-40 billion.

In many cases, the technology to implement these ICT solutions already exists.

However, many economic, behavioral and informational challenges continue to stand in the way of realizing these gains, and markets have thus far been too slow in alleviating them.<sup>3</sup> Achieving these reductions will therefore require government policies to speed progress.

First, the U.S. government should publicly recognize the important role that ICT can play in realizing efficiency gains, as European and Japanese leaders have already done. Second, it should establish a national "Center of Excellence" to establish standards and metrics for CO<sub>2</sub> emissions, consolidate and validate data, coordinate public-private collaboration and share best practices. Third, it should encourage the deployment and adoption of ubiquitous broadband, since connectivity is the backbone of all ICT solutions. Finally, the government can create market mechanisms that reward energy efficiency and emissions reduction by monetizing carbon.

The monetization of carbon is an important step toward an energy-efficient economy, but results from this policy may be slow to materialize. Instituting a carbon monetization policy should be done carefully and deliberately. ICT can be a vital component of such a policy by increasing energy efficiency quickly. In order for this to happen, further policies specific to each ICT-enabled opportunity area are necessary:

- **Smart Grid:** While states are the primary regulators of utilities, the federal government should offer financial incentives to states that reform utility rate structures. This provides utilities with the motivation to reduce energy consumption and encourages investment in Smart Grid technologies. The federal government should lead by example and integrate Smart Grid technologies into federally-owned utilities.
- **Road Transportation:** The federal government should provide incentives for states to increase the capability of road and public transportation infrastructure to

<sup>1</sup> Royal Commission on Environmental Pollution Report, 2000.

<sup>2</sup> Based on reduction of fuel consumption from Road Transportation and Travel Substitution. EIA, "U.S. Imports by Country of Origin," 2007; EIA, "How Dependent are We on Foreign Oil?" August 22, 2008; EIA Annual Energy Outlook 2008.

<sup>3</sup> IPCC WG3 "Mitigation of Climate Change," May 2007

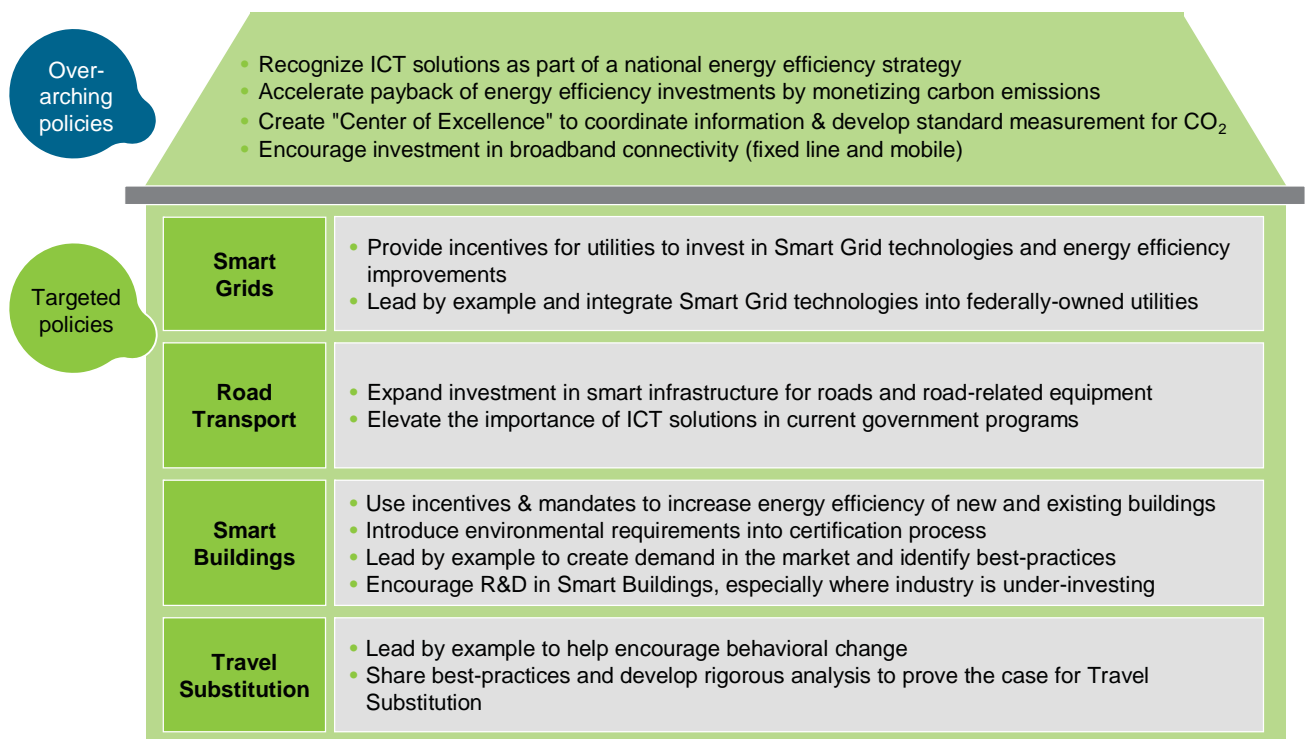
capture, analyze and act on real-time information. It should also elevate the importance of ICT solutions in current government programs.

- **Smart Buildings:** The government should drive the adoption of smart buildings through a combination of mandates and incentives – most likely at the local or state level. It can encourage the inclusion of energy efficiency requirements into the certification process for building professionals in order to spread expertise in the field. The government should also set the example by commissioning high-performing

buildings and supporting investment in R&D in both the public and private sectors.

- **Travel Substitution:** The government can address behavioral challenges by embracing travel substitution (both flex work and virtual meetings) for government workers and by creating a repository of best-practices in that area.

**Figure 1: Summary of recommended policies**

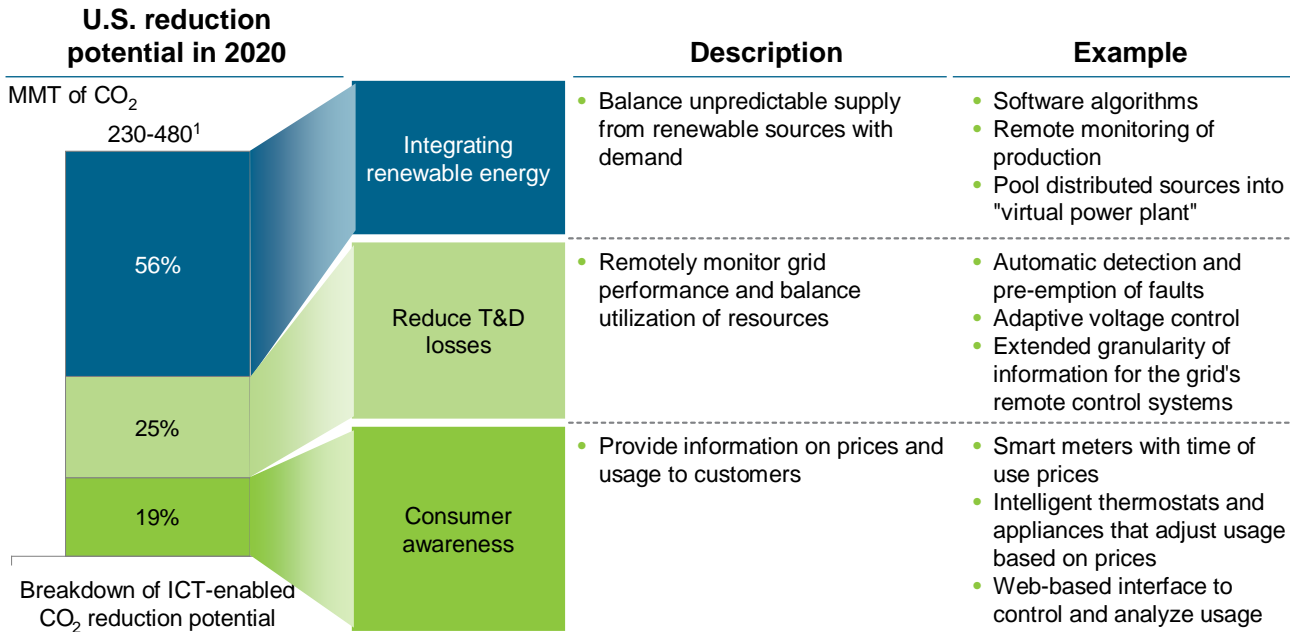


Although government action is needed to leverage ICT-enabled efficiency gains to their fullest, the ICT industry also bears responsibility for reducing its own emissions. Today, the ICT sector contributes 2.5% of U.S. CO<sub>2</sub> emissions, and that share is expected to grow to 2.8% by 2020, as the nation shifts toward a service- and information-based economy. The ICT industry

recognizes both the symbolic and practical significance of reducing its own emissions and meet that challenge with continued innovation and technological breakthroughs. Together with government, academia and other industries, ICT is well equipped to help the U.S. overcome its energy and environmental challenges. ●

# Summary of Smart Grid opportunity

## What ICT can do



1. Multiple levers contribute to the reduction potentials. The mid-point was used to obtain the percentage break-downs. See appendix for details.

## What stands in the way

### Challenges

- Technical**
  - Limited technical maturity
  - Technology sequencing and dependency
  - Need for interoperability
- Economic**
  - Low tolerance for errors
  - Complex business case for utilities
- Behavioral**
  - Lack of awareness

## What should happen

### Policy

**Provide incentives for utilities to invest in energy efficiency**

**Lead by example with federally owned utilities**

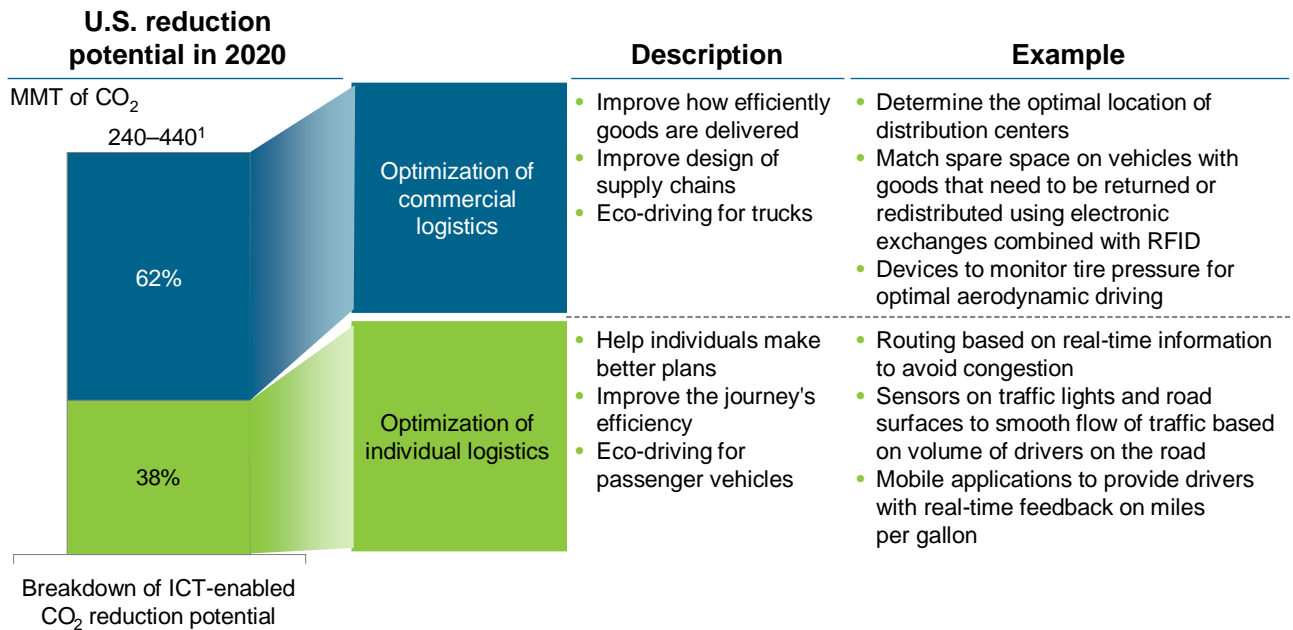
### Key considerations

- Incentives for demand reduction are most critical
- Adoption of smart meters can help address technology sequencing issues
- Promote open competition and encourage partnerships
- Capitalize on strong signaling effect
- Strive for scale to drive down costs
- Publicize benefits and the lessons from experience to encourage other adopters

Challenges where government intervention is most necessary are underlined

# Summary of Road Transportation opportunity

## What ICT can do



1. Multiple levers contribute to the reduction potentials. The mid-point was used to obtain the percentage break-downs. See appendix for details.

## What stands in the way

	Challenges
<b>Technical</b>	<ul style="list-style-type: none"> <li>Limited technical maturity</li> <li>Complicated user experience</li> </ul>
<b>Economic</b>	<ul style="list-style-type: none"> <li><u>Infrastructure investment needed</u></li> </ul>
<b>Behavioral</b>	<ul style="list-style-type: none"> <li>Limited flexibility to optimize supply chain</li> <li><u>ICT improvements overlooked</u></li> <li>Potential privacy concerns</li> <li>Cultural barriers</li> </ul>

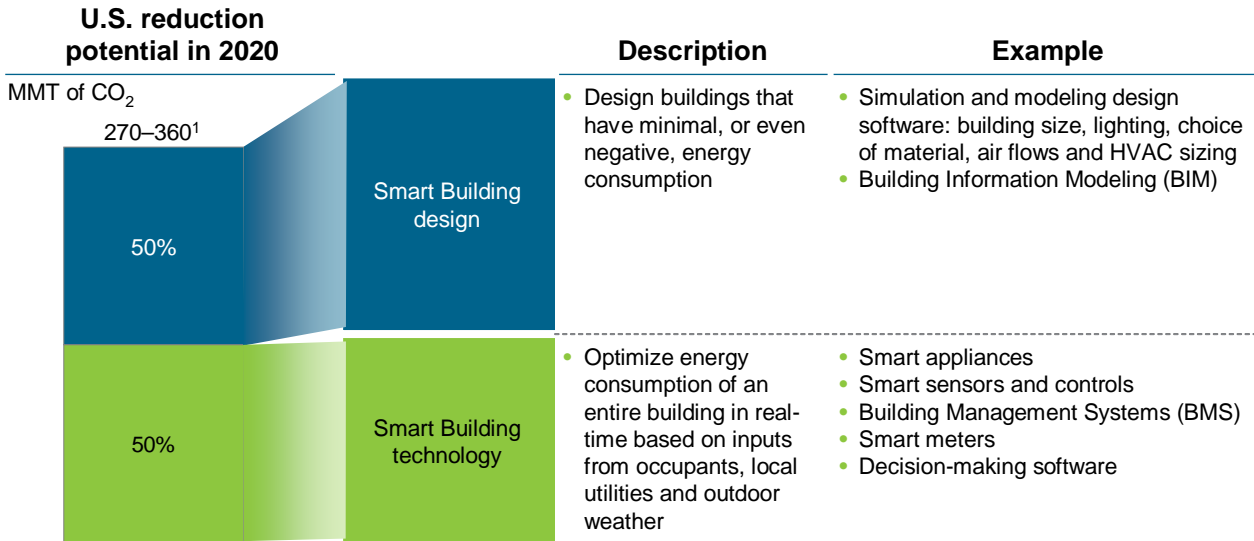
Challenges where government intervention is most necessary are underlined

## What should happen

Policy	Key considerations
<b>Invest in smart infrastructure</b>	<ul style="list-style-type: none"> <li>Need to focus on investments that are system-wide; refrain from one-off investments</li> <li>Invest in solutions that fit into a larger vision and strategy for urban congestion management</li> </ul>
<b>Elevate importance of ICT in current government programs</b>	<ul style="list-style-type: none"> <li>Promote ICT elements that can save companies and individuals money</li> <li>Publicize and encourage stories of ICT solutions that work across the value chain</li> </ul>

# Summary of Smart Building opportunity

## What ICT can do



Breakdown of ICT-enabled CO<sub>2</sub> reduction potential

1. Multiple levers contribute to the reduction potentials. The midpoint was used to obtain the percentage break-downs. See appendix for details.

## What stands in the way

### Challenges

- Technical**
  - Limited interoperability
  - Limited deployment of Smart Grid infrastructure
- Economic**
  - Misaligned incentives
  - High up-front cost
- Behavioral**
  - Shortage of expertise

## What should happen

### Policy

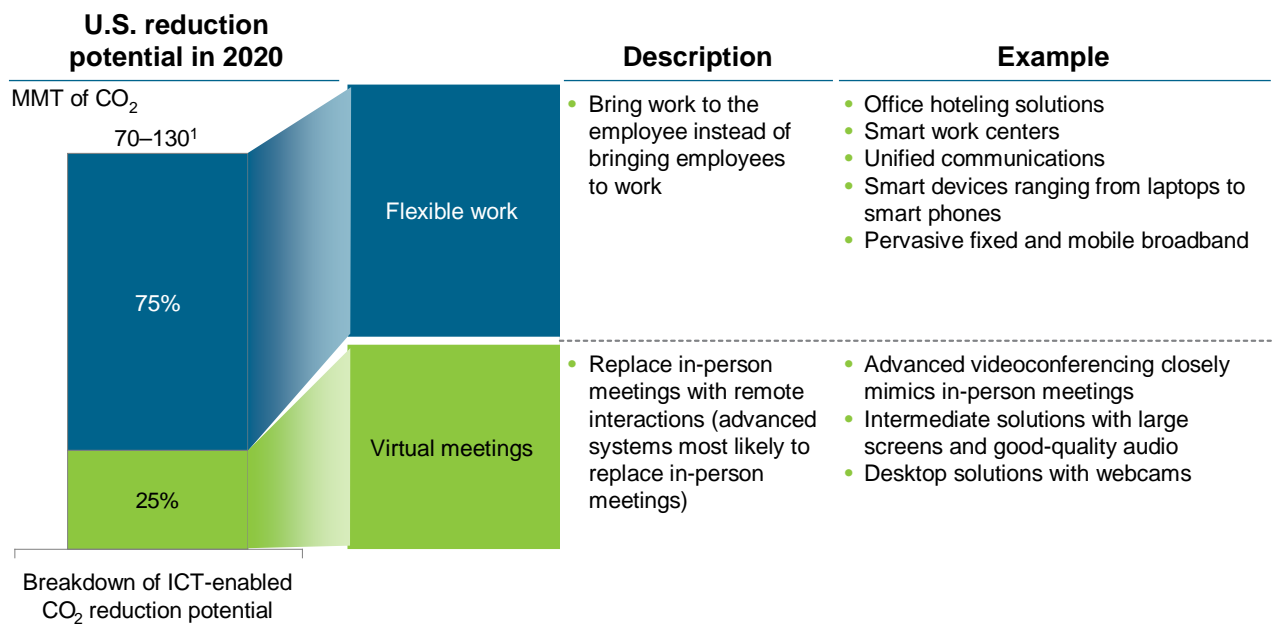
### Key considerations

- Combine mandates and incentives to drive change**
  - Support consistent, performance-based building standards
  - Balance "carrot" and "stick"
- Add environmental requirements in certification process**
  - Address the shortage of expertise
  - Build on existing efforts
- Lead by example**
  - Both new builds and retrofits
  - Share learnings with building and ICT industry
- Invest in R&D**
  - Support investment in both public and private sector

Challenges where government intervention is most necessary are underlined

# Summary of Travel Substitution opportunity

## What ICT can do



1. Multiple levers contribute to the reduction potentials. The mid-point was used to obtain the percentage break-downs. See appendix for details.

## What stands in the way

### Challenges

- Technical**
  - Limited challenges
- Economic**
  - Adverse government regulation
- Behavioral**
  - Unfavorable work culture
  - Experience unknown
  - Employee sense of isolation

Challenges where government intervention is most necessary are underlined

## What should happen

### Policy

**Lead by example with both flex work and virtual meetings**

**Share best-practices**

### Key considerations

- Provide adequate support to ensure initiatives are successful
- Consider encouraging government contractors to adopt as well
- Accurate data can drive long lasting behavior change
- Link with "Center of Excellence"
- Do not duplicate initiatives already underway

