

Johnson Controls believes that improving energy efficiency in buildings is the first and most important step toward reducing the costs and environmental impact of our country's energy use. Because of our long commitment to energy efficiency and sustainability, we were recently asked to share our perspectives and suggestions with the House Subcommittee on Energy and Environment, a U.S. House of Representatives committee exploring a range of climate change policies for the United States.

Our testimony is one element of a broader and ongoing effort to match our corporate vision: a more comfortable, safe and sustainable world. We'd like to share this perspective with you. For more information about what we are doing in energy efficiency and sustainability, please visit:

www.johnsoncontrols.com/efficiencynow

Johnson Controls Testimony to House Subcommittee on Energy and Environment

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Congressional Hearing Topic:

**"Energy Efficiency: Complementary Policies
for Climate Legislation"**

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Introduction

Chairman Markey and Members of the Subcommittee on Energy and Environment, thank you for the opportunity to provide testimony on complementary policies for climate legislation. My name is Iain Campbell, and I am Vice President and General Manager within the Building Efficiency Business of Johnson Controls, Inc, a global multi-industry company with sales of \$38 billion in 2008.

In this testimony I would like to share our views on energy efficiency from the perspective of our Building Efficiency Business. We are a world leader in providing energy efficiency products and services within commercial and industrial buildings. Specifically, in our work we manufacture, install, operate, service and retrofit the technical systems and equipment that consume – and control – energy in buildings. Based on this “on-the-ground” view of the opportunities and barriers to energy efficiency, we would like to make three key points in this testimony:

1. Complementary policies, including an Energy Efficiency Resource Standard, are a critical component of any effective and comprehensive climate change policy.
2. These policies must focus on unlocking the vast energy efficiency potential within the existing commercial and industrial building market; it is our view that the performance contracting approach represents a proven and highly effective model.
3. Finding and training workers to do the important work of improving energy efficiency within buildings across the United States is a central and significant challenge. It also represents a significant opportunity for our citizens.

About Johnson Controls and the Building Efficiency Business

Johnson Controls is the global leader that brings ingenuity to the places where people live, work and travel. By integrating technologies, products and services, we create smart environments that redefine the relationships between people and their surroundings. Our team of 140,000 employees creates a more comfortable, safe and sustainable world through our products and services for more than 200 million vehicles, 12 million homes and one million commercial buildings. We have three main businesses:

- Power Solutions – We are the largest producer of automotive batteries in the world and are producing and developing new advanced battery systems for hybrid and plug-in hybrid electric vehicles.
- Automotive Experience – We make automotive interiors using sustainable manufacturing techniques to help make driving more comfortable, safe and enjoyable.
- Building Efficiency – We provide products and services to public and private sector customers to optimize energy use, and improve comfort and security for buildings and homes.

In my role I am responsible for three businesses uniquely focused on driving energy efficiency. The first, the Technical Service Business, focuses on maintaining, repairing and replacing building automation systems as well as heating, cooling and refrigeration equipment. These activities are a critical part of ensuring the building systems deliver the best outcomes using the least amount of energy. The second, the Solutions Business, is specifically focused on delivering deep energy savings at the whole-building level in

a self-funding manner. This work is typically delivered in what's known as "performance contracting." We have been delivering performance contracting for over 20 years, with over 1900 projects executed, and \$4B in energy performance guarantees, and over 11 million metric tons of GHG emissions avoided since 2001. We are increasingly integrating small-scale renewable technologies into these projects. The third, the Global Workplace Solutions Business, offers integrated facility management for Fortune 500 companies, managing more than one billion square feet worldwide. In this business we manage massive property portfolios for the world's leading companies across the globe, focusing on providing the highest level performance using the fewest resources.

Johnson Controls and our Perspective on Climate Change

We believe that businesses can and should incorporate responses to climate change into their core corporate strategies by taking concrete steps in the U.S. and abroad to establish and meet greenhouse gas (GHG) emission reduction targets, and/or invest in low and zero GHG products, practices and technologies.

As a result, and starting with our own footprint, we have joined the EPA Climate Leader Program, and have pledged a 30% carbon intensity reduction from 2002 to 2012 within our own facilities. We are already making important progress toward this goal, relying primarily on energy efficiency improvements across our operations to meet it. We are also members of the Pew Center Environmental Leadership Council – the largest U.S.-based association of corporations focused on addressing the challenges of climate change.

We are also helping our clients and partners take action against climate change. We employ people across a wide variety of job classes to drive energy efficiency improvements in existing and new buildings every day and in every state across America. We are also partners on many of the cutting-edge technology initiatives designed to attack climate change. For example, our industrial refrigeration systems are a critical component in virtually all carbon capture and sequestration projects currently underway. Finally, our hybrid car battery systems are critical part of the current and next-generation plug-in hybrid transportation systems.

In sum, we are a company deeply committed and financially involved in driving energy efficiency in our own and our customers' operations. We hope this background and experience will provide useful insights and suggestions to the committee.

Role of Energy Efficiency

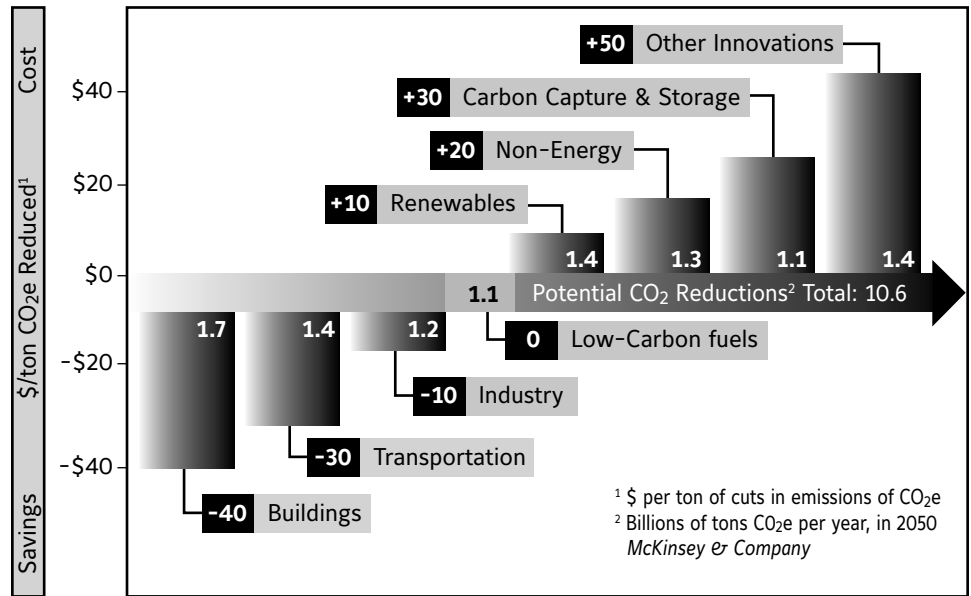
Energy efficiency should be the first priority in addressing climate change. It is imperative to promote efficiency in order to contain the cost of climate protection policies. A new working paper including a set of consensus recommendations to cut the cost of addressing climate change through energy efficiency is attached to this testimony.¹

Some refer to energy efficiency as the fifth fuel, a new source of energy that we can tap to drive economic growth. We believe energy efficiency should be considered the first fuel, and everyone's first step in reducing carbon emissions. Efficiency means getting more valuable services from our energy resources, not sacrifice or deprivation. Energy efficiency is the fastest, cheapest, and cleanest energy source.

Cost effectiveness

There is broad consensus that energy efficiency reservoir is large and can be tapped at low cost. Studies by the Intergovernmental Panel on Climate Change (IPCC) conclude that the potential to reduce emissions through energy efficiency is very large in several sectors, with a particularly large opportunity in the buildings sector.² Not only is the potential impact of energy efficiency large, it is also the least-cost way of meeting emission reduction targets.

“Cost curve” analysis published by a variety of organizations including the McKinsey Global Institute, Natural Resources Defense Council, and the World Wildlife Fund suggest that some carbon abatement strategies actually have a “negative cost” or a positive net present value—that is, the savings over the lifetime of an investment more than pay for the initial cost.³ The majority of these “negative cost” measures are improvements to the efficiency of our buildings, vehicles, and factories.



The conclusion of the McKinsey & Co. analysis is that the measures necessary to stabilize greenhouse gas concentrations in the atmosphere at 450 parts per million have a net cost near zero, as a result of the “negative cost” energy efficiency measures.

Good for consumers and businesses

Improving efficiency is good for everyone. Efficiency improvements not only reduce emissions, but also save consumers and businesses money. Energy prices are escalating and would continue to rise with a price on carbon. Energy efficiency will reduce the impact of climate policies on consumer’s energy bills. It will lower energy spend for American businesses large and small, enabling them to better compete in the global economy. Smarter, more efficient buildings not only have lower utility bills, but also improve health, safety, and comfort.

Creates good domestic jobs

Complementary energy efficiency policies have the potential to create a substantial wave of new domestic green-collar jobs districts across the country. Efficiency improvement projects are relatively labor-intensive and require local skilled workers.

Increased energy efficiency investment activity will allow companies like Johnson Controls to provide opportunities for many new workers at all levels to join our team. Meeting the world's energy and climate challenges will require thousands of new building technicians, building operators, energy engineers, construction crews, and manufacturing workers.

According to the American Council for an Energy Efficient Economy, "a 20 percent to 30 percent energy efficiency gain within the U.S. economy might lead to a net gain of 500,000 to 1,500,000 jobs by 2030."⁴

Technology available today

A wide variety of energy-efficient technologies are available and cost-effective today. Global climate dynamics do not allow us to take a "wait and see" approach or to wait for a silver bullet technology breakthrough. While R&D to develop new technologies is certainly valuable, it is far more important to break down the barriers to the deployment of cost-effective technologies that are already available to us.

Compared to other climate solutions, energy efficiency improvements have rapid impacts. Efficiency projects don't face multi-year lead times or potential delays due to community resistance or legal disputes. We don't have to conduct long studies to build certainty that efficiency will indeed reduce emissions. Our company realizes energy savings opportunities for customers in a few short months through whole-building retrofits. Energy efficiency resources available today can be the bridge fuel to the low-carbon economy we need in coming decades.

Variety of complementary policies needed

Johnson Controls supports a comprehensive federal policy approach to reduce global climate risks.

First, energy prices must reflect the full costs to society so that consumers and businesses make decisions based on the true economics. We support putting a price on carbon, encouraging time of use pricing, and making smart grid investments to give energy users the information they need to make decisions based on true and complete economics. These policies will create a market pull for climate protection investments.

Although a price on carbon is essential, it alone is not sufficient to capture the full economic potential for efficiency-driven emission reductions due to a number of well-known market barriers to capturing the potential of energy efficiency, such as such as split incentives and lack of information. Complementary policies are needed to improve energy efficiency at the scale and speed necessary to confront the global climate challenge.

One of the most valuable complementary policies is an Energy Efficiency Resource Standard (EERS) such as the legislation Representative Markey has recently introduced. An EERS consists of electric and gas end-use savings targets for retail utilities, with flexibility to achieve them through a market-based trading system. Such a standard,

supported by appropriate measurement and verification protocols, would dramatically ramp-up efficiency investment while helping utilities to find low-cost ways to decrease their overall emissions.

A comprehensive set of complementary policies would both stimulate demand for energy efficiency as well as raise minimum performance standards. Building codes are an important policy lever and should be increased to reflect the life-cycle cost effectiveness of available technology and design/construction practices. Voluntary high performance building codes, often based on green building rating systems, should be incentivized based on the additional energy and emissions reductions they achieve. At Johnson Controls, we have achieved LEED Gold certification for our Building Efficiency headquarters and are targeting LEED Platinum for our entire Corporate and Power Solutions campus. Funding to help educate builders and enforce building codes is also important.

Equipment standards are another important policy that addresses the problem of mismatched financial incentives between builders and owners. As a major HVAC equipment manufacturer, we see the business impact of these mismatched incentives through the low volume shipments of our most efficient models. Incentives that would create additional demand for the industry's highest efficiency products would drive additional research and development, increased manufacturing efficiencies and allow minimum equipment performance standards to be increased over time.

Lack of information on energy efficiency and operating costs is another key barrier to energy efficiency. Standard and effective performance labeling of buildings and equipment, in a manner similar to the European Union, would help educate current and prospective building owners and create additional demand for energy efficiency.

Technology can also provide critical information to building owners and operators to help them reduce energy use, particularly during critical periods of high energy demand. SmartGrid technology, with supporting utility rate structures, will allow electricity prices to more accurately reflect the true cost of generation, transmission and distribution. Enabling technology, such as smart meters and integrated building management systems, can provide building owners and operators with real-time feedback on current energy consumption and reduction opportunities. These systems can also automatically respond to energy price and other signals to reduce demand, use stored energy or increase on-site generation. Policies that incentivize the accelerated development, demonstration and deployment of smart grid and smart building technology are encouraged.

Additional incentives are needed for existing buildings

With 1.08 billion square feet of new construction forecasted for this year alone,⁵ establishing complementary policies to enhance energy efficiency in new buildings is an important step.⁶ But these opportunities are dwarfed by the prospects of raising energy efficiency in the approximately 72 billion square feet of existing building stock. Identifying complementary policies to unlock the unique energy efficiency potential within the existing building market is critical.

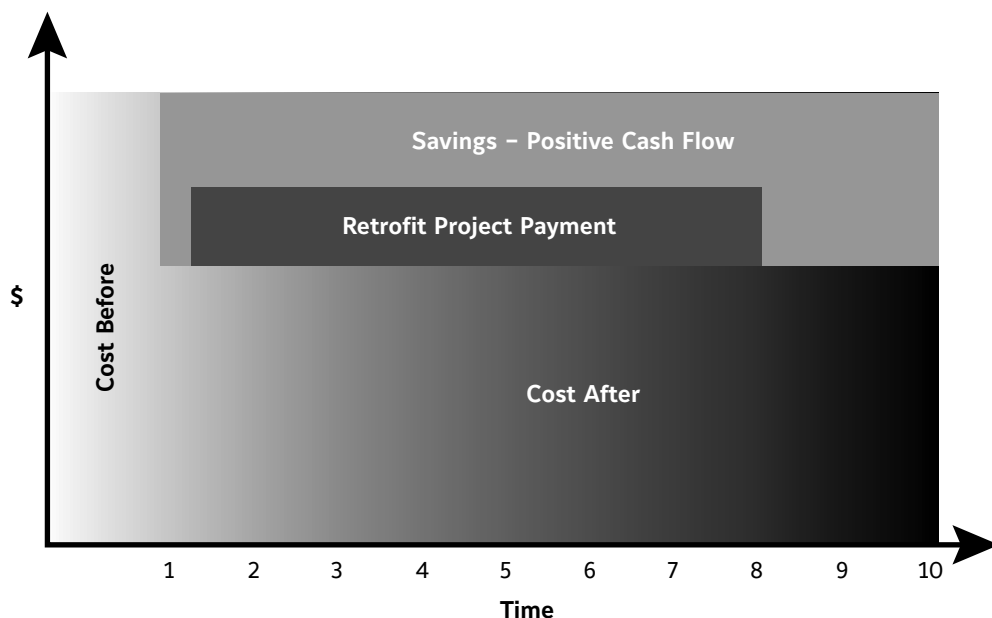
There are a broad range of barriers that prevent the raising of energy efficiency levels in existing buildings. One critical barrier is a series of incentive mismatches. The mismatches begin with energy generators that are incentivized to produce more energy (not use less); the mismatches follow on to building owners who are incentivized to

spend less up front on energy intensive equipment (even if it costs them more in the long term); to tenants who are not incentivized to ask for more energy efficient equipment because they may not be around long enough in the building to reap the benefits.

There are other barriers that contribute to prevent large scale energy efficiency. These include: (1) the relatively-low priority of energy efficiency improvements against other capital investments within a business despite having positive cash flow; (2) a complex and lengthy process of analyzing the opportunity, developing acceptable projects, implementing them, and then ensuring savings are realized; and (3) lack of information, expertise and confidence on how to monitor and verify projects to ensure that they deliver promised energy savings. These barriers have been effectively overcome in the public sector using performance contracting.

Performance contracting is a successful model

Performance contracting has been a successful model for implementing energy efficiency retrofits in the public sector for over twenty years. In this program, energy and operational savings over a specified time period are used to fund infrastructure improvements through a lease arrangement provided by a third-party financial institution. The projects are typically designed such that the annual energy and operational savings are greater than or equal to the required payments over the term of the contract.



The performance contractor takes complete turn-key responsibility for the project including preliminary energy audits, detailed design and engineering, business case analysis, installation, commissioning, performance measurement and verification. These projects include a variety of building improvements including lighting and mechanical system retrofits, technology upgrades, renewable energy installations, operator training and occupant education. The energy and operational savings are guaranteed by the contractor over the term of the contract. After the completion of the contract, all of the energy and operating savings revert back to the building owner.

Performance contracting provides a number of advantages that are important elements of a successful energy and climate policy. This programmatic approach to existing building retrofits results in significantly greater energy reductions and lower long-term operating costs. The ability to bundle short payback improvements (e.g., lighting retrofits) with longer payback improvements (e.g., solar panels) into a single project provides a cost-effective way of investing in clean energy technology.

Performance contracting is a competitive, market-based approach that leverages public funding with private investment. The energy performance guarantees provided by the contractor are backed up by a rigorous measurement and verification process based upon international standards. This performance-based approach should be a model for all federal and state energy programs seeking to assure accountability and reward demonstrated accomplishment.

To provide some examples of the performance contracting model, a few case studies are useful.

Performance Contracting Case Studies

University of Massachusetts, Amherst, Mass.

For instance, under a 10-year performance contract beginning in 2005, Johnson Controls implemented over 45 energy conservation measures worth \$42 million at the University of Massachusetts. The measures are guaranteed to more than pay for themselves over the life of the contract. Johnson Controls conducted a detailed audit to refine the costs and savings estimates for each conservation measure. More than 300 electric, water and steam meters were installed throughout the campus, which allowed us to establish a baseline for energy use and to measure the effectiveness of improvements.

Improvements include adding electric cogeneration at the power plant, installing electrical infrastructure upgrades, adding variable speed drives to motors, and upgrading fume hoods. New, more energy efficient chillers were installed, steam lines were replaced, lighting retrofits were made and water conservation measures were implemented.

Technology implementation includes extensive use of the Johnson Controls Metasys® building management system for improved monitoring and control of equipment throughout the campus, maximizing energy savings, cost savings and comfort. In summary, this single campus will include:

- A \$42 million investment in energy savings projects
- \$56 million in guaranteed energy and operational savings over a 10-year contract term
- A reduced deferred maintenance backlog
- Significant long-term savings, allowing the university to invest in new projects
- An improved learning environment for students and staff

Johnson Controls is supporting the University of Massachusetts during the 10-year contract with a full time performance assurance specialist. The specialist's primary responsibility is the measurement and verification of energy savings. As an energy consultant, the specialist works closely with university staff to identify and quantify additional energy savings opportunities.

Johnson Controls also participates in campus outreach programs, such as offering training classes in energy conservation, which are provided to the dorm Resident Assistants, along with providing informational packages that are distributed to new students. Energy conservation contests between dorms have highlighted the role each of us can play in reducing energy use, reinforcing the economic and environmental importance of energy and water conservation in the campus community.

Wyandotte Public Schools, Wyandotte, Mich.

The Wyandotte Public Schools district serves 4,700 students in 11 facilities spanning more than 900,000 square feet. The district has been working with Johnson Controls since 1998, implementing three back-to-back performance contracts that have allowed significant building and energy efficiency improvements while delivering \$6.9 million in cost savings to the district.

Johnson Controls replaced windows and doors at the high school, conducted many upgrades and enhancements to the heating and cooling systems, and installed a Metasys building management system at all schools. The roof at the middle school was replaced and a 10 kilowatt solar photovoltaic system was installed.

The high school was restored to its role as the centerpiece of the Wyandotte community. In addition to energy savings, the photovoltaic system provides students with first-hand experience in learning about solar energy. Johnson Controls involvement included helping to develop a curriculum to teach about energy efficiency and sustainability. As a result of these efforts, the Wyandotte School District became the first district in Michigan to be fully certified under the US Environmental Protection Agency's ENERGY STAR® program.

Oak Ridge National Laboratory, Oak Ridge, Tenn.

In August of 2008, Oak Ridge National Laboratory (ORNL) signed an \$89 million energy savings performance contract with Johnson Controls to apply advanced energy conservation solutions, including a biomass gasification system, to the campus. The project was the first signed initiative of the U.S. Department of Energy's Transformational Energy Action Management (TEAM) Initiative, which is an action plan to dramatically transform the DOE's energy, environmental and transportation management.

The project's cornerstone is a wood gasification biomass system, which will take the place of the existing natural gas steam plant and steam distribution system. By using woody biomass from the region as the main energy source for the facilities, ORNL will reduce fossil fuel consumption by 80 percent. Furthermore, the biomass plant will significantly reduce greenhouse gas emissions – enough to be equal to planting 32 million trees.

Johnson Controls is delivering an innovative suite of energy efficiency solutions, including the installation of a "super boiler," advanced electric metering, energy efficient lighting, water conservation measures, compressed air cooling, comprehensive HVAC improvements and a Metasys building management system to ensure that mission critical standards are maintained.

The new "super boiler" will be up to 94 percent efficient. This is a significant improvement when compared to traditional large-scale boilers, which often operate in the 50 to 60 percent efficiency range. The water conservation measures will also reduce water usage by more than 115 million gallons annually, resulting in a long-term

reduction of 16 percent. As a whole, the entire project will reduce energy intensity in the labs and office buildings by 30 percent, meeting ORNL's long-term energy reduction goal and significantly contributing to the goals of the TEAM initiative.

It is estimated that the biomass gasification system, "super boiler," and energy efficiency improvements will generate \$8 million annually in energy and operational savings. As a result, ORNL expects to save more than \$144 million over the 18 year term of the contract.

To kick off the energy efficiency upgrade project, Johnson Controls participated in an energy efficiency & sustainability education event at the lab, handing out information packets about the planned upgrades and educating employees regarding ways each of us can reduce energy use and live more sustainably.

Incentives Needed for Private Sector Retrofit Projects

While performance contracting has been successful in the public-sector, there are additional barriers to adoption in the private-sector. The mismatch of incentives between property owners and tenants and the frequency of ownership turnover results in requirements for extremely short investment paybacks. To address this, we recommend establishing a program that would encourage large scale, deep retrofitting of privately owned commercial buildings or portfolios of buildings. The program should provide incentives for efficiency improvements based on demonstrated energy reductions of no less than 20%. Increased incentives should be available to encourage 30% or greater reductions. The incentive would take the form of a rebate per square foot and would be provided to building owners, or their agents, on an annual basis after measurement and verification.

Another barrier is the availability of third-party financing because of the difficulty in using building assets as collateral to secure the loans. A loan guarantee, proportional to the targeted energy savings level, should be established to help attract capital from private sources to fund the improvements.

Availability of skilled labor both an opportunity and a challenge

There is a huge job creation potential associated with investments in energy efficiency in existing buildings. The Center for American Progress estimates that a \$100B in "green" investment has the potential to create 935,000 direct jobs, 586,000 indirect jobs, and 496,000 induced jobs. In the building retrofit sector, the primary job creation is in skilled workers needed to perform the retrofits.

Building retrofit projects require understanding of both new technology and the financial implications of energy efficiency projects.

Large numbers of additional energy engineers are needed. As stated by ACEEE, "A new generation of energy efficiency practitioners, researchers, and policymakers needs to be trained and deployed to solve the problems we face."

For skilled labor, this means the creation of certificate programs (similar to NABCEP North American Board of Certified Energy Practitioners, the certification for solar installers) to ensure supply of workers with the right skills to install, commission and service energy efficiency projects. Potential providers of these programs could include: military, unions and trade associations, revitalized vocational education in public schools, technical colleges and community/workforce development programs.

Public and private investment is needed to provide education at multiple levels. Skilled trade workforce education can be delivered through trade associations, revitalized vocational education programs, and military training programs.

Johnson Controls, Inc. has made a commitment to training employees in the Building Efficiency business globally. Employees at all levels are learning about green building technology and energy efficiency. We are training the next generation of mechanics and technicians through our Career Connect program. Johnson Controls, Inc. now has over 500 LEED Accredited Professionals around the globe.

Hybrid and Plugin Hybrid Electric Vehicles (HEV and PHEV)

We feel it is important to identify one additional efficiency opportunity related to transportation: hybrid electric vehicles (HEV) and plug-in hybrid electric vehicles (PHEV). Currently, most hybrid vehicles operate on nickel metal hydride batteries. Johnson Controls is the first to begin producing lithium ion batteries for commercially available HEVs – the Mercedes S Class and the BMW 7 Series. For the future, Li-ion is the chemistry of choice for PHEVs because it is lighter, more powerful and takes up less space. Recently, Ford announced at the DC Auto Show, its partnership with us to have Johnson Controls provide the battery system for Fords PHEV.

The recent economic stimulus legislation passed by Congress, the American Recovery and Reinvestment Act, begins a comprehensive approach to provide incentives for advanced battery technology and PHEVs. It includes funding for: advanced battery manufacturing; converting the federal fleet to energy efficient vehicles; state and local governments to purchase fuel efficient trucks and buses, and to install needed infrastructure for PHEVs; targeted manufacturing and consumer purchase tax incentives; and continued research, development and deployment of advanced vehicle technology.

Climate change legislation should build upon this approach and continue to provide incentives to develop advanced battery manufacturing, stimulate production of PHEVs, and develop the Smart Grid technologies necessary to ensure that maximum benefits are derived from the electrification of our vehicle fleet. This will be critical to our addressing our carbon abatement challenge, reducing our dependence on oil, and to strengthen our energy and national security position.

Summary

Thank you for inviting us to introduce you to our company, and to share our perspective on complementary policies for climate legislation. As you consider options for addressing climate change, we hope this testimony will provide useful insights and recommendations.

As a world leader in providing energy efficiency products and services within commercial and industrial buildings, we believe we have a unique “on-the-ground” view of the opportunities and barriers to energy efficiency. From this vantage point, we would like to summarize three key points made in this testimony:

1. Complementary policies, including an Energy Efficiency Resource Standard, are a critical component of any effective and comprehensive climate change policy
2. These policies must focus on unlocking the vast energy efficiency potential within the existing commercial and industrial building market; it is our view that the performance contracting approach represents a proven and highly effective model
3. Finding and training workers to do the important work of improving energy efficiency within buildings across the United States is a central and significant challenge. It also represents a significant opportunity for our citizens.

We strongly believe in the need to increase the nation’s focus and investment in energy efficiency. Energy efficiency should be the first priority in addressing climate change as a way of containing the cost of climate protection policies and creating new jobs. We need to focus on efficiency now...it’s never been more important.

Thank you again for the opportunity to testify.

Notes

1. Energy Efficiency in Climate Change Working Group (2009) “Reducing the Cost of Addressing Climate Change Through Energy Efficiency” Consensus recommendations for future federal climate legislation in 2009 from a broad coalition of groups that includes Johnson Controls [ATTACHED].
 2. Intergovernmental Panel on Climate Change (Working Group III to the Fourth Assessment Report of the IPCC), Climate Change 2007: Mitigation 9, 10 tbl.SPM.3 (Bert Metz et al. eds. 2007), available at <http://www.ipcc.ch/ipccreports/ar4-wg3.htm>.
 3. For one example, see the McKinsey & Co. report, “Reducing US Greenhouse Gas Emissions: How Much at What Cost” at http://www.johnsoncontrols.com/publish/etc/medialib/jci/be/commercial/energy_efficiency/documents.Par.73391.File.dat/Reducing_GHG-How_Much_at_What_Cost.pdf.
 4. Laitner, J., McKinney, V. (2008) “Positive Returns: State Energy Efficiency Analyses Can Inform U.S. Energy Policy Assessments.” American Council for an Energy-Efficient Economy. Report Number E084.
 5. 2009 McGraw Hill Construction Outlook Report
 6. DOE, Commercial Building Energy Consumption Survey (CBECS); http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/detailed_tables_2003.html
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