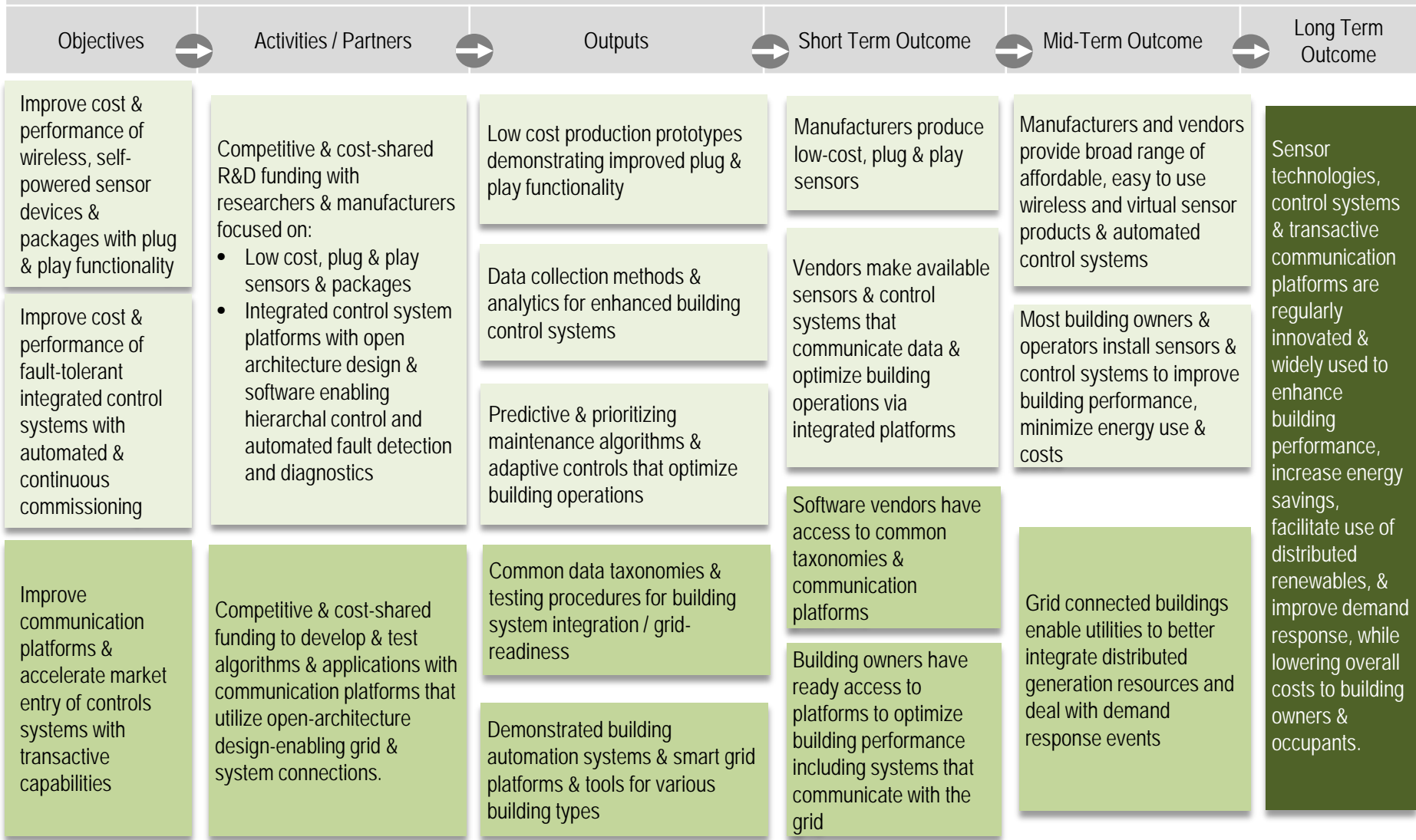**The Sensors and Controls Sub-Program develops cost-effective building energy management solutions to optimize energy performance, increase energy savings and reduce costs, as well as improve integration with electric grids and distributed renewable energy.**

Dec. 2015

External Influences: DOE budget, Spin-off products, Energy prices, Private sector R&D, Market incentives, Legislation / Regulation

Objectives	Activities / Partners	Outputs	Short Term Outcome	Mid-Term Outcome	Long Term Outcome
Improve cost & performance of wireless, self-powered sensor devices & packages with plug & play functionality	Competitive & cost-shared R&D funding with researchers & manufacturers focused on: • Low cost, plug & play sensors & packages • Integrated control system platforms with open architecture design & software enabling hierarchal control and automated fault detection and diagnostics	Low cost production prototypes demonstrating improved plug & play functionality	Manufacturers produce low-cost, plug & play sensors	Manufacturers and vendors provide broad range of affordable, easy to use wireless and virtual sensor products & automated control systems	Sensor technologies, control systems & transactive communication platforms are regularly innovated & widely used to enhance building performance, increase energy savings, facilitate use of distributed renewables, & improve demand response, while lowering overall costs to building owners & occupants.
Improve cost & performance of fault-tolerant integrated control systems with automated & continuous commissioning		Data collection methods & analytics for enhanced building control systems	Vendors make available sensors & control systems that communicate data & optimize building operations via integrated platforms	Most building owners & operators install sensors & control systems to improve building performance, minimize energy use & costs	
		Predictive & prioritizing maintenance algorithms & adaptive controls that optimize building operations			
Improve communication platforms & accelerate market entry of controls systems with transactive capabilities	Competitive & cost-shared funding to develop & test algorithms & applications with communication platforms that utilize open-architecture design-enabling grid & system connections.	Common data taxonomies & testing procedures for building system integration / grid-readiness	Software vendors have access to common taxonomies & communication platforms	Grid connected buildings enable utilities to better integrate distributed generation resources and deal with demand response events	
		Demonstrated building automation systems & smart grid platforms & tools for various building types	Building owners have ready access to platforms to optimize building performance including systems that communicate with the grid		

Impact

Meet cost & performance targets to enable optimized building performance, integration with the electrical grid, and automatic energy transactions with the grid.

Enable the development of cost-effective technologies that will be capable of reducing bldg. EUI 30% by 2020

Reduce EUI in all bldgs. 30% by 2030

Sensors and Controls Research and Development Logic Model

OBJECTIVE	ACTIVITIES	KEY OUTPUT	SHORT-TERM OUTCOME	MID-TERM OUTCOME	LONG-TERM OUTCOME
Improve sensor & control systems	Performance & cost reduction R&D of plug-n-play sensor packages & integrated control systems	Next-gen prototypes	Cost-effective advanced sensor & control systems	Range of affordable tech in market & installed	Building energy performance optimized by next-gen tech; buildings transact with grid
		Data collection methodologies			
		Predictive algorithms & adaptive controls			
Develop cyber-secure next-gen grid integration tech	Open-architecture communication protocol R&D that enables secure grid connection	Common data taxonomy & test procedures	Building systems that optimize performance, communicate with grid	Building systems improve utilities' DR* & DG* integration	
		Building automation system platforms & smart grid tools			

*DR = demand response
*DG = distributed generation

EXTERNAL INFLUENCES

- DOE Budget
- Spin-off Products
- Market Incentives
- Legislation / Regulation
- Energy Prices
- Private R&D