



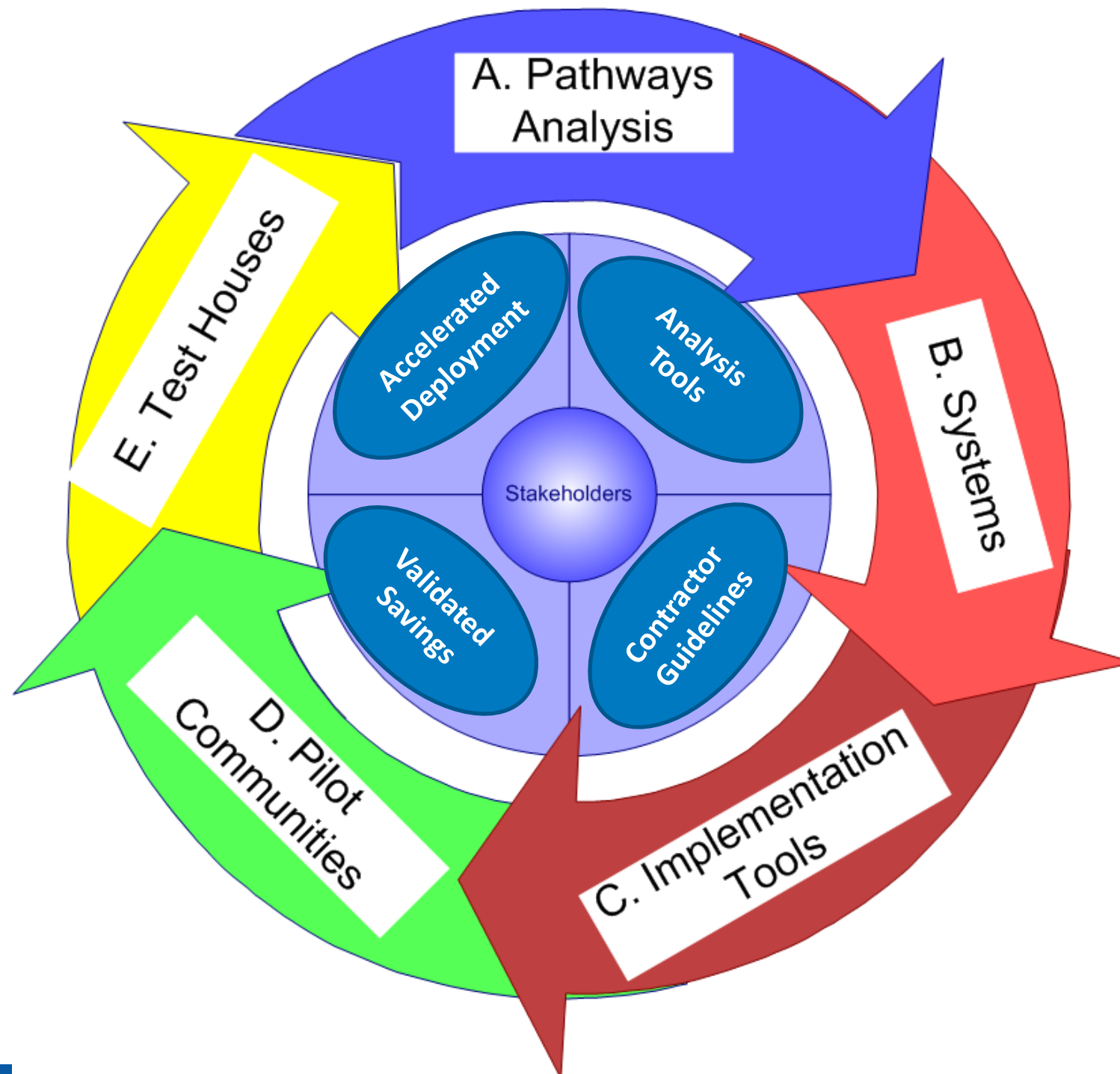
FY2011 Technology Pathways and Targets Overview for Existing and New Homes

Ren Anderson

**Building America Planning Meeting
November 2, 2010**

Washington DC

Key Residential Research Elements: 30% and 50% Savings in Existing and New Homes



Updated Performance Goals

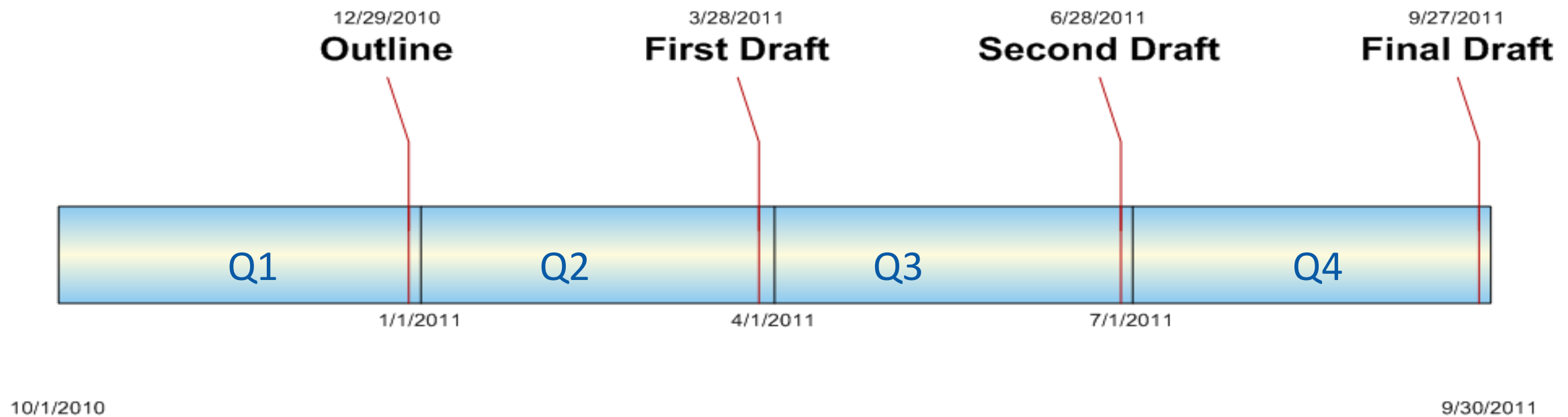
Existing Homes

Energy Savings	Hot/Mixed-Dry and Marine	Hot/Mixed-Humid	Cold (Includes Cold, Very Cold, and Subarctic)
Current “best in class”	2011	2011	2011
PMM: 30%	2012	2013	2014
PMM: 50%	2015	2016	2017

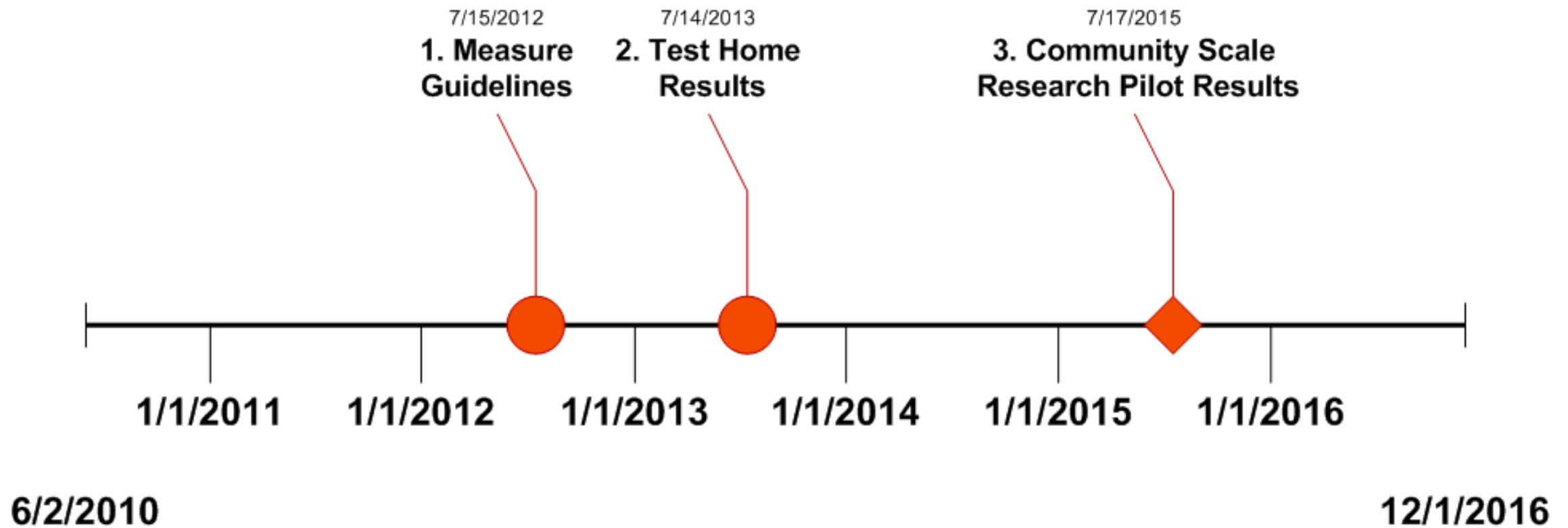
New Homes

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Example Program Management Milestone (PMM): Measure Packages for Existing and New Homes



Example Multi-Year Schedule: 30% Retrofit Savings in Hot/Mixed Dry Climate



Assumptions

		Existing Homes	New Construction
Building:	Vintage	1960s	2010
	Geometry	1280 sqft, 1 Story, 3 Beds, 2 Baths	2500 sqft, 2 Stories w/Garage, 3 Beds, 2 Baths
	Orientation	West-facing	West-facing
	Neighbors	At 15ft	At 15ft
	Eaves	2ft	2ft
	Window Area	15% of wall area (170 sqft)	15% of wall area (350 sqft)
	Window Distribution	Front/Back/Left/Right = 20/40/20/20%	Front/Back/Left/Right = 20/40/20/20%
	Heating/Cooling Set Points	71F/76F	71F/76F
Economics:	Analysis Period	30 years	30 years
	Inflation/Real Discount Rate	3%/3%	3%/3%
	Loan Period, Interest Rate	15 years, 7%	30 years, 7%

		Chicago	Seattle	Atlanta	Phoenix	Los Angeles	Houston
Utility Rates:	Electricity Rate (c/kWh)	11.5	7.1	8.9	10.0	12.5	11.6
	Natural Gas Rate (\$/Therm)	1.08	1.22	1.18	1.31	0.72	1.07

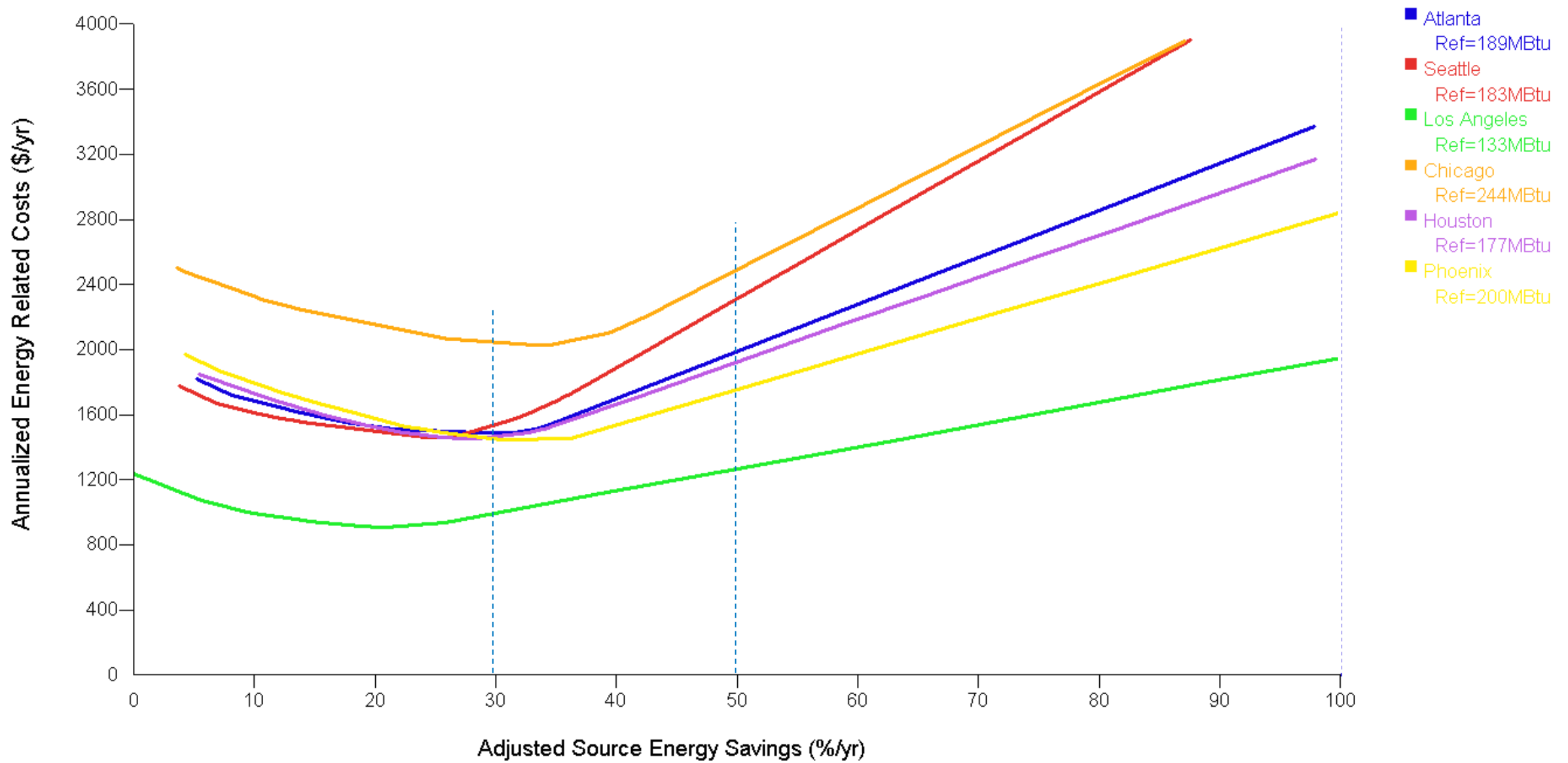
New Construction

B10 Reference Buildings -- New Construction

		Chicago	Seattle	Atlanta	Phoenix	Los Angeles	Houston
Walls	R + in. foam	R13+1"		R13			
Attic	R	R38		R30			
Foundation	Type R	Bsmnt 8ft, R10	Crawl R10	R5	Slab R0		
Windows	U SHGC	0.35 0.35		0.40 0.30			
Infiltration	SLA x 10 ⁶	36					
Fridge	Std or ES	Std					
Dishwasher	Std or ES	Std					
Clothes Washer	Std or ES	Std					
Lighting	% Fluor.	34%					
AC	SEER	13					
Furnace	AFUE	78%					
Ducts	Location R, Leak%	Bsmnt R0, 15%	Crawl		Attic R8, 15%		
Water Heater	Type EF	Tank 0.59					
Solar HW	sqft	0					
PV	kW	0					

Options are displayed when different than previous column.
IECC 2009 Reference

Cost/Performance -- New Construction



Option Packages -- New Construction

		Chicago		Seattle		Atlanta		Phoenix		Los Angeles		Houston	
		30%	50%	30%	50%	30%	50%	30%	50%	30%	50%	30%	50%
Walls	R + in. foam	R19+2"		R19+2"		R19+2"		R19	R19+2"	R19		R19	R19+2"
Attic	R		R60	R49	R60		R49		R49				R49
Foundation	Type R		8ft, R15	R15	R10					2ft R5			2ft R5
Windows	U SHGC	0.29 0.30	0.20 0.32	0.29 0.30	0.20 0.32	0.29 0.27	0.29 0.30	0.29 0.27		0.30 0.42		0.29 0.27	
Infiltration	SLA x 10 ⁶	18	8	18									
Fridge	Std or ES		ES		ES		ES		ES	ES		ES	
Dishwasher	Std or ES		ES	ES			ES		ES	ES		ES	
Clothes Washer	Std or ES	ES		ES		ES		ES		ES		ES	
Lighting	% Fluor.	100%		100%		100%		100%		100%		100%	
AC	SEER		17		15	15	17	17				17	18
Furnace	AFUE	92.5%		92.5%		92.5%							92.5%
Ducts	Location R, Leak%	Inside		Inside		Inside		Inside		Inside		Inside	
Water Heater	Type EF	Tankless 0.82	Tankless 0.96	Tankless 0.96		Tankless 0.82	Tankless 0.96	Tankless 0.82		Tankless 0.82		Tankless 0.82	
Solar HW	sqft												
PV	kW		1.34*		2.17*		1.99*		1.55*	0.30*	1.91*		1.95*

**30% options displayed when different than B10 reference building.
50% options displayed when different than 30%.**

*** Efficiency Gap: PV contribution does not count towards BA goal**

Existing Homes

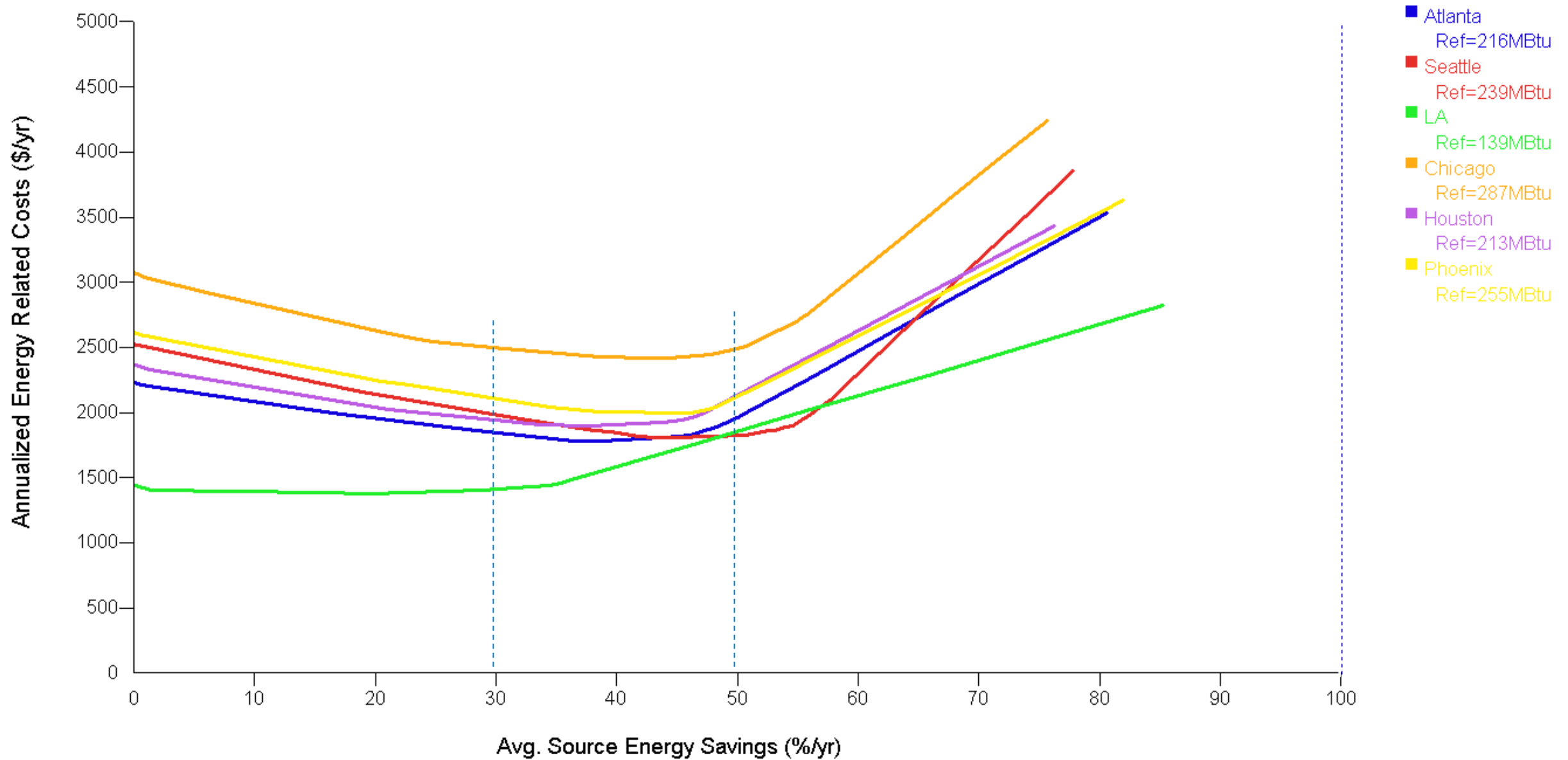
Pre-Retrofit Reference Buildings – Existing Homes

		Chicago	Seattle	Atlanta	Phoenix	Los Angeles	Houston
Walls	R	R0					
Attic	R	R19	R11				
Foundation	Type R	Bsmnt R0	Crawl		Slab		
Windows	U SHGC	0.87 0.62					
Infiltration	SLA x 10 ⁶	90					
Mech. Vent.	Type	Spot Vent					
Fridge	Std or ES	Old->Std*					
Dishwasher	Std or ES	Std					
Clothes Washer	Std or ES	Std					
Lighting	% Fluor.	20%					
AC	SEER	10->13*					
Furnace	AFUE	80%					
Ducts	Location R, Leak%	Bsmnt R0, 30%	Crawl		Attic		
Water Heater	Type EF	Tank 0.59					
HW Distribution	R	R0					
PV	kW	0					

Options are displayed when different than previous column.

* Assumes 50% remaining equipment life replacement at end of life.

Cost/Performance – Existing Homes



Option Packages – Existing Homes

		Chicago		Seattle		Atlanta		Phoenix		Los Angeles		Houston	
		30%	50%	30%	50%	30%	50%	30%	50%	30%	50%	30%	50%
Walls	R	R13		R13		R13		R13		R13		R13	
Attic	R	R49	R60		R38		R49		R60		R38		R38
Foundation	Type R	4ft, R10		R5	R15	R5	R15						
Windows	U SHGC		0.30 0.42		0.33 0.51		0.29 0.27		0.29 0.27				0.29 0.27
Infiltration	SLA x 10 ⁶	70	50		70		70		70				70
Fridge	Std or ES						ES		ES		ES		ES
Dishwasher	Std or ES												
Clothes Washer	Std or ES		ES		ES		ES		ES	ES			ES
Lighting	% Fluor.	60%		60%		60%		60%		60%		60%	
AC	SEER												
Furnace	AFUE		92.5%				92.5%						
Ducts	Location R, Leak%		R6, 15%					R6, 15%		R6, 15%		R6, 15%	
Water Heater	Type EF	Tankless 0.82			Tankless 0.82	Tankless 0.82	Tankless 0.96	Tankless 0.82		Tankless 0.82	Tankless 0.96		Tankless 0.96
PV	kW										1.38		0.48

30% options displayed when different than Pre-Retrofit reference building.

50% options displayed when different than 30%.

*** Efficiency Gap: PV contribution does not count towards BA goal**