Building Technologies Program

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Strategic Analysis of Emerging Technologies – Envelope

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Emerging Technologies Team within the context of BTP

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Emerging Technologies: Research, development and commercialization of technologies five years or less to market ready

Commercial and Residential Integration Teams: Stimulate market push and pull

Standards and Codes Teams: Minimum equipment standards and building codes accelerate market penetration

Emerging Technologies strategic analysis informs decision making

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- The Prioritization Tool aims to provide an objective comparison of new and existing technologies/measures
- It estimates potential energy savings and costs of conserved energy using a widely accepted methodology and validated sources of input
- This enables a “level playing field” comparison of technologies
- Outputs are reviewed through various “lenses” with stakeholders
- Results inform decision making, resulting in a balanced portfolio and quantitative BTP/ET goals
- The process is “evergreen” with continual refinement of inputs and methodology

Output: Energy savings by 2030 with DOE activity/investment (staged)

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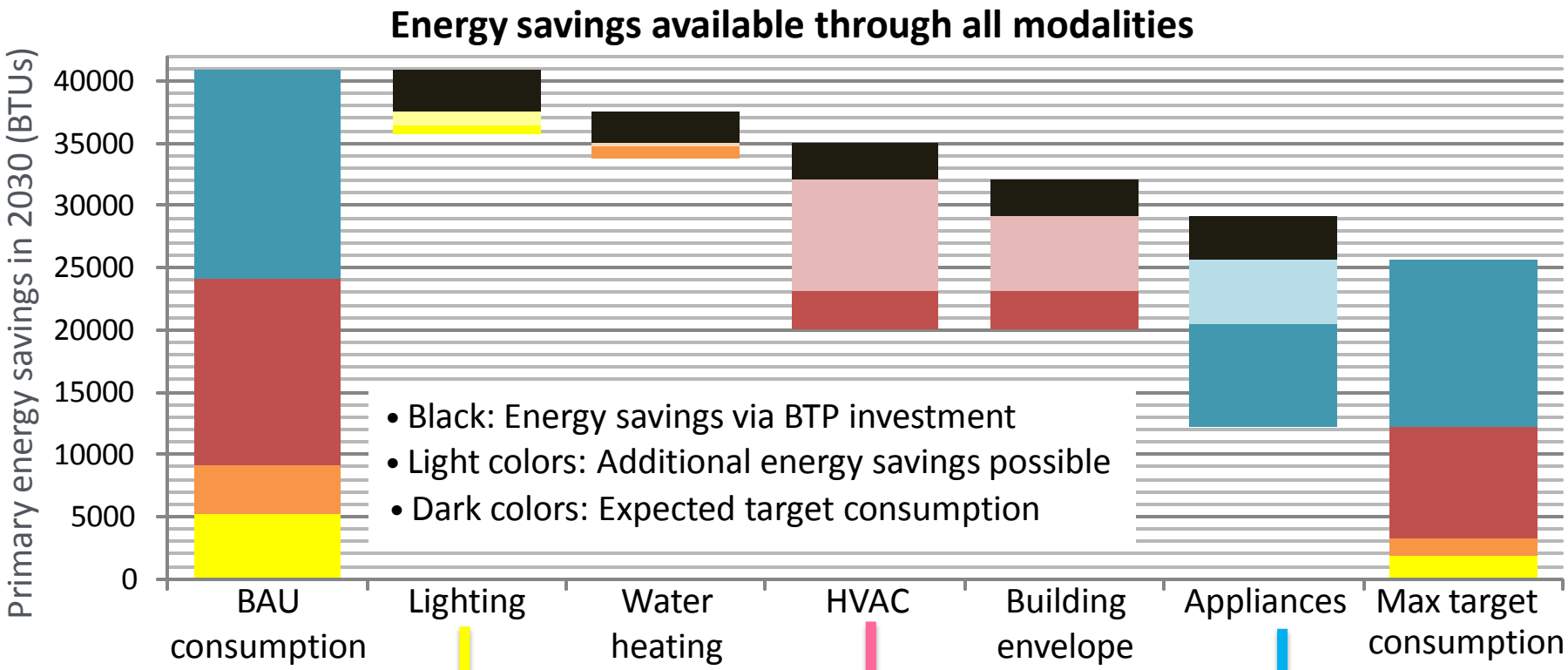

LED lighting offers exceptional opportunity to transform end-use

WH technologies are far from maximum efficiencies

Huge potential for energy savings in HVAC and Envelope which require R&D and/or market stimulation

Appliance standards drive down energy use

Prioritization Tool: inputs, methodology and outputs

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Inputs

Each measure (e.g. technology) requires four data inputs:

- **Performance improvement:** technical energy savings
- **Cost:** incremental cost of the technology over common baseline
- **Market:** stock this measure (e.g. technology) can impact
- **Supporting information:** lifetime, adoption rate, code/standard date, etc.

Metho-dology

We apply standard analysis methodology:

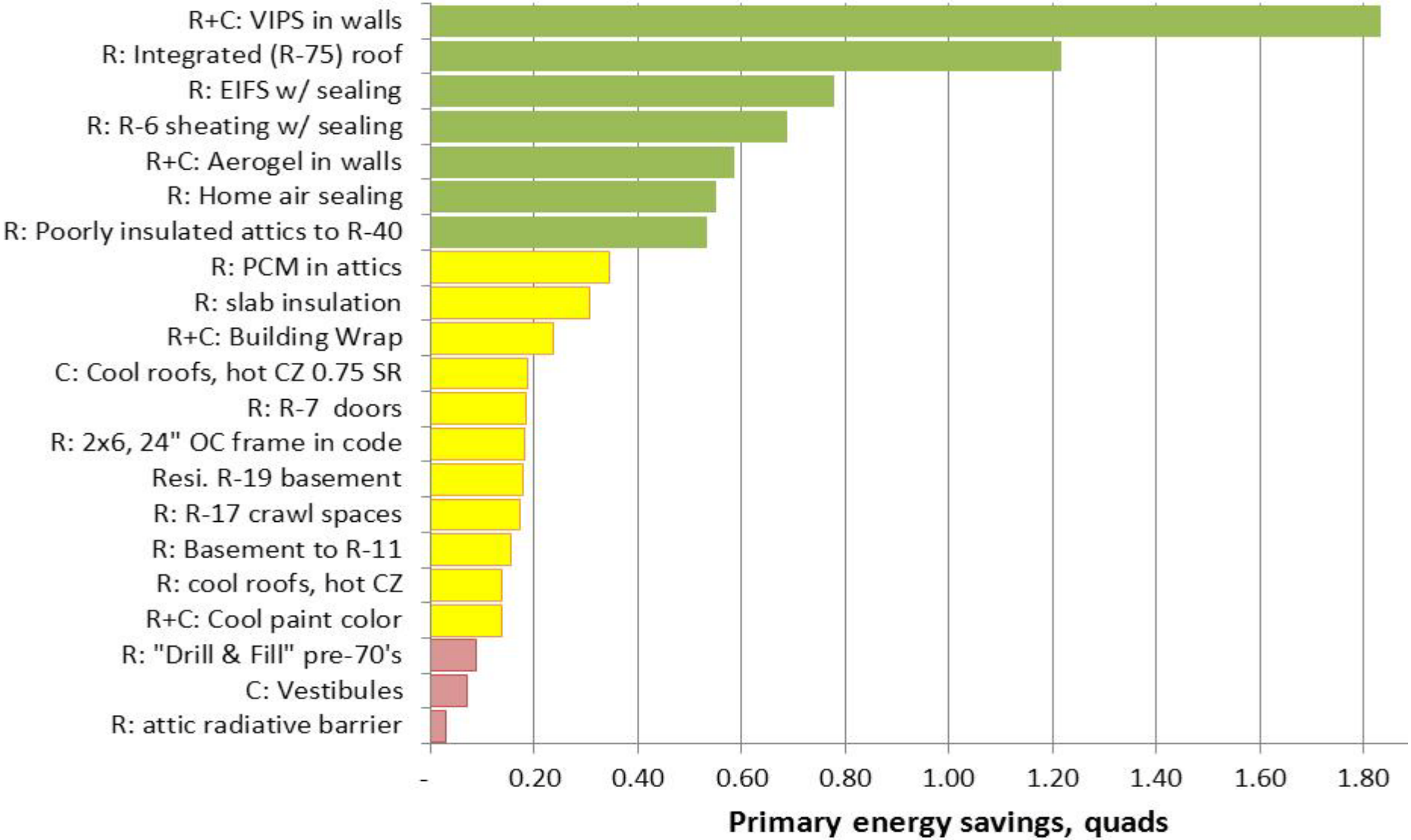
- **Energy savings (technical potential):** maximum technical savings is percent savings multiplied by market energy use
- **Stock and flow dynamics (two family):** end-of-life equipment stock turn-over used to determine practical limit to technology adoption
- **Staging framework:** overlapping savings identified by segmenting energy use; measure with lowest cost of conserved energy stages first
- **Technology diffusion:** innovator/follower dynamics
- **Cost of conserved energy:** present value cost of technology divided by lifetime energy savings (i.e. $/MMBTU)

Outputs

This produces useful outputs (e.g. strategic game board) that can be tested through sensitivity analyses and viewed through various lenses such as:

- Maximum technical potential
- Energy savings vs. cost of conserved energy (no interaction – unstaged)
- Energy savings vs. cost of conserved energy (interaction – staged)
- Adoption adjusted energy savings potential

Technical Potential (maximum energy savings, no cost)



Unstaged Maximum Adoption Potential (no interaction among measures)

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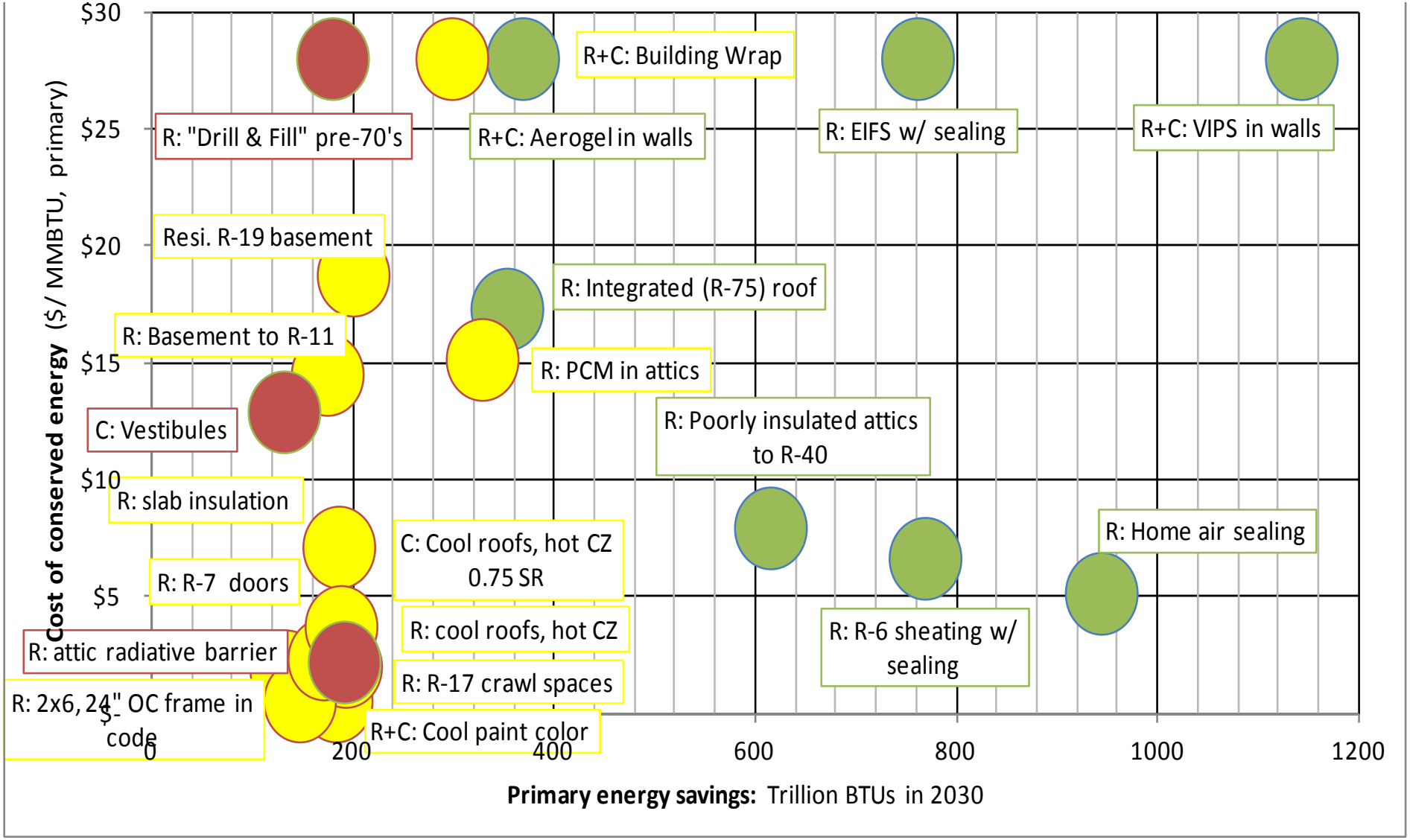

Staged Maximum Adoption Potential (low cost measures grab savings first)

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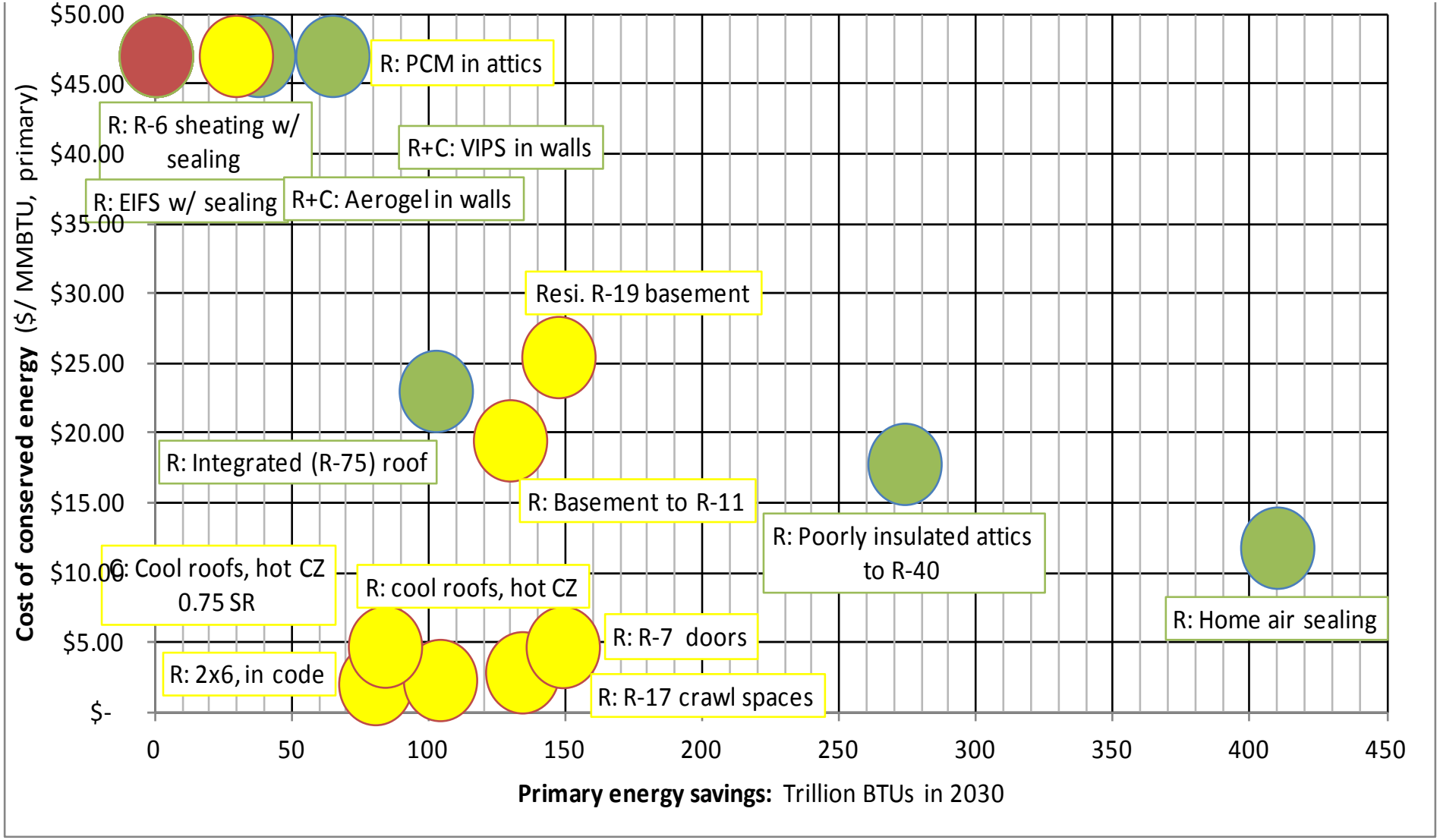

Inputs for review at your leisure…

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1. Description of the measure	2. Energy savings			3. Incremental price	4. units & capacity	5. Market description	6. Market size, 2030	7. Site energy use (TBTUs), 2030	8. Source energy use (TBTUs), 2030	9. Economic potential (TBTUs), 2030	10. CCE ($/MMBTU)
	Percent	Persist	Fuel switch?								
R: R-30 walls (existing homes)	83%	P		$20,800.00	per home; 2600 square feet wall space	R: Heating and cooling lost through walls in existing homes	74.2	731.1	934.8	817.2	$70.74
R: R-6 sheathing w/ sealing	51%	P		$2,548.00	per home; 2,600 sq.ft. insulation	R: Heating and cooling lost through walls and infiltration in existing homes with siding	54.2	1,195.0	1,527.9	763.1	$6.68
R: VIP in walls	75%	P		$20,046	per home; 2,600 sq.ft. insulation	R: Heating and cooling lost through walls in all homes	141.3	1,251.2	1,599.8	567.6	$123.59
R: Sheathing to EIFS upgrade	53%	P		$13,052	per home; 2,600 sq.ft. insulation	R: Heating and cooling lost through walls in existing homes	74.2	731.1	934.8	488.5	$72.54
C: VIP in walls	75%	P		$4	per square foot; wall: floor space of .9, window fill ratio of 0.4	C: Heating and cooling lost through walls in all buildings	93,550.2	738.6	856.7	316.7	$35.01
R: R-30 walls (new homes)	70%	P		$13,000.00	per home; 2600 square feet wall space	R: Heating and cooling lost through walls in new homes	39.1	346.1	442.5	278.6	$114.55
C: Aerogel in walls	47%	P		$2	per square foot; wall: floor space of .9, window fill ratio of 0.4	C: Heating and cooling lost through walls in all buildings	93,550.2	738.6	856.7	200.7	$31.47
R: 2x6, 24" OC frame in code	43%	P		$0	per home; 30x40 home, 2 stories, 10' per story	R: Heating and cooling lost through walls in new homes	39.1	346.1	442.5	191.6	$0.00
R: "Drill & Fill" pre-70's	60%	P		$6,500.00	per home; 30x40 home, 2 stories, 10' per story	R: Heating and cooling lost through walls in pre-1970 single family homes	38.6	199.0	254.5	152.7	$46.49
R: cool paint color	6%	P		$0.00	per home	R: Central cooling in hot climates	66.6	577.1	1,760.6	104.8	$0.00

Next steps…

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- Review inputs to measures (click on Excel spreadsheet) – if you think they are incorrect, provide a reputable source for alternatives
- Review outputs (charts in presentation) – if you think they are incorrect, help us determine why (e.g. through input review)
- Review NREL report (published summer 2012) to become familiar with methodology approach
- Experiment with 'Prioritization Tool Lite' – in early fall, tool will be released in the form of an "RFI" through Federal Registry
- Send feedback to: prioritization.tool@nrel.gov