



# U.S. Department of Energy Energy Efficiency and Renewable Energy

Bringing you a prosperous future where energy  
is clean, abundant, reliable, and affordable

## APPENDIX A: MYPP Drivers

Numerous legislative, administration, and department policies and procedures dictate both the need for, and the process and content of multi-year program planning over and above Program Manager's planning needs. These include:

- Government Performance and Results Act (GPRA)
  - Linkage of budget request to outputs and outcomes and to the Strategic Plan
- President's Management Agenda and Office of Management and Budget (OMB) Program Assessment and Rating Tool (PART)
  - Provide program justification
  - Set performance goals
  - Link dollars to planned activities
  - Establish targets/milestones
  - Measure progress and resulting benefits
  - Include decision points and end points
- Chief Financial Officer (CFO)
  - Report quarterly and annual milestones linked to DOE Strategic Goals
  - Management and Evaluation (ME-20) Program Plans
- Congress (House Rpt.108-554 - Energy and Water Development Appropriations Bill, 2005)
  - Beginning with submission of the fiscal year 2007 budget request, submit to Congress detailed five-year budget plans for all major program offices and a consolidated five-year budget plan for the entire department
  - Preparation of these five-year program plans and the comprehensive five-year DOE plan to be a Federal function

A program may consult with its contractors in developing its five-year plans, but the actual preparation of these plans is not to be contracted out; this work is to be done by Federal employees of the Department of Energy.

## **APPENDIX B:**

### **Building Technologies Technical Reports and Resources**

Below is a list of the various technical reports and resources developed by the Building Technologies Program that are used to inform decisions associated with this Multi-Year Program Plan.

#### **Case Studies**

- The Galloway Family Home
- Prairie Crossing Homes
- Consumer Information
- Energy Savers: Cool Summer Tips
- Energy Savers: Cool Summer Tips (Spanish Version)
- Energy Savers: Hot Winter Tips
- Energy Savers: Tips on Saving Energy & Money at Home
- Energy Savers Virtual Tour
- HeatSmart! Homeowners Can Save Money by Conserving Heating Oil

#### **EnergySmart Schools Brochures**

- Designing High Performance Schools
- Energy Design Guidelines for High Performance Schools: Arctic and Subarctic Climates
- Energy Design Guidelines for High Performance Schools: Cold and Humid Climates
- Energy Design Guidelines for High Performance Schools: Cool and Dry Climates
- Energy Design Guidelines for High Performance Schools: Cool and Humid Climates
- Energy Design Guidelines for High Performance Schools: Hot and Dry Climates
- Energy Design Guidelines for High Performance Schools: Hot and Humid Climates
- Energy Design Guidelines for High Performance Schools: Temperate and Humid Climates
- Energy Design Guidelines for High Performance Schools: Temperate and Mixed Climates
- Get Smart about Energy: Program Folder (Revision)
- How Parents and Teachers Are Helping to Create Better Environments for Learning
- How School Administrators and Board Members Are Improving Learning and Saving Money
- How School Facilities Managers and Business Officials Are Reducing Operating Costs and Saving Money
- Myths about Energy in Schools
- National Best Practices Manual for Building High Performance Schools

#### **High Performance Building Brochures**

- 4 Times Square
- Adam Joseph Lewis Center for Environmental Studies, Oberlin College
- BigHorn Home Improvement Center
- Cambria Office Building — Pennsylvania Department of Environmental Protection
- Clearview Elementary School
- NREL's Solar Energy Research Facility

- NREL's Thermal Test Facility
- NREL's Visitors Center
- Twenty River Terrace
- Zion National Park Visitor Center

## Technical Reports

- Advanced Sensors and Controls for Building Applications: Market Assessment and Potential R&D Pathways
- Better Duct Systems for Home Heating and Cooling
- Causes of Indoor Air Quality Problems
- Characterization of Commercial Building Appliances
- DOE Advanced Controls R&D Planning Workshop, June 11, 2003, Washington, D.C.: Workshop Results
- Electricity Consumption by Small End Uses in Residential Buildings
- Electroluminescent Plywood Desk Brochure
- Energy Conservation Using Scotopically Enhanced Fluorescent Lighting in an Office Environment
- Energy Consumption by Office and Telecommunication Equipment in Commercial Buildings, Volume I: Energy Consumption
- Energy Consumption Characteristics of Commercial Building HVAC Systems: Volume I, Primary Equipment
- Energy Consumption Characteristics of Commercial Building HVAC Systems: Volume II, Thermal Distribution, Auxiliary Equipment and Ventilation
- Energy Consumption Characteristics of Commercial Building HVAC Systems: Volume III, Energy Savings Potential
- Energy-Efficient Rehabilitation of Multifamily Buildings in the Midwest
- Energy Savings Potential for Commercial Refrigeration Equipment
- Energy Savings Potential of Solid State Lighting in General Lighting Applications
- Energy Use of Home Audio Products in the U.S.
- Energy Use of Set-Top Boxes and Telephony Products in the U.S.
- Energy Use of Televisions and Videocassette Recorders in the U.S.
- House of Straw – Straw Bale Construction Comes of Age
- HVAC Commercial Heating and Cooling Loads Component Analysis
- HVAC Residential Heating and Cooling Loads Component Analysis
- International Performance Measurement and Verification Protocol: Concepts and Options for Determining Energy and Water Savings, Volume I
- International Performance Measurement and Verification Protocol: Concepts and Practices for Improved Indoor Environmental Quality, Volume II

- Market Disposition of High-Efficiency Water Heating Equipment
- National Lighting Inventory and Energy Consumption Estimate, Volume 1
- Opportunities for Energy Savings in the Residential and Commercial Sectors with High-Efficiency Electric Motors
- The Promise of Solid State Lighting for General Illumination

### **Technology Fact Sheets**

- Advanced Wall Framing
- Air Distribution System Design
- Air Distribution System Installation and Sealing
- Air Sealing
- Attic Access
- Basement Insulation
- Ceilings and Attics
- Central Heat Pump and Air Conditioner Installation
- Combustion Equipment Safety
- Crawlspace Insulation
- Efficient Lighting Strategies
- Energy-Efficient Appliances
- Energy Efficiency Pays
- Heating and Cooling Equipment Selection
- Improving the Efficiency of Your Duct System
- Insulation
- Passive Solar Design
- Right-Size Heating and Cooling Equipment
- Slab Insulation
- Spot Ventilation
- Wall Insulation
- Water Heating
- Weather-Resistive Barriers
- Whole House Energy Checklist
- Whole House Fan
- Whole House Ventilation Systems
- Window Selection

### **Technology Roadmaps**

- Building Envelope Technology
- High Performance Commercial Buildings
- HVAC and Refrigeration (in cooperation with ARI)
- Residential Buildings (in cooperation with PATH)
- Solid-State Lighting
- Vision 2020: Lighting Technology
- Window Industry Technology
- Window and Envelope Updates

# APPENDIX C: Building Technologies Program Stage-Gate Framework

| Technology Development Stages            |   |   |  |  |  |  |   |
|--|---|---|--|--|--|--|---|
|  | Idea Generation   | Applied Research 1  | Exploratory Development 2  | Advanced Development 3   | Engineering Development 4  | Product Demonstration 5  | Commercialization and Sales 6   |
| Technical Activities                     | <ul style="list-style-type: none"> <li>Knowledge-Base Expansion                             <ul style="list-style-type: none"> <li>Scientific principles formulated and proven</li> <li>Empirical data and/or theoretical derivation</li> </ul> </li> </ul> | <b>Proof of Principle Experiment</b> <ul style="list-style-type: none"> <li>Conduct fundamental lab testing and/or modeling</li> <li>Collect data to support physical principle</li> <li>Set performance milestones for Gate 2</li> </ul>   | <b>Proof of Technology-Product Definition</b> <ul style="list-style-type: none"> <li>Fabricate lab bread board of concept</li> <li>Select technologies that have the best market entry potential</li> <li>Identify and prioritize alternative approaches for performance energy savings</li> <li>Set performance milestones for Gate 3</li> </ul>  | <b>Proof of Technology-Working Model</b> <ul style="list-style-type: none"> <li>Employ fully functional lab prototypes</li> <li>Specify applications and approaches</li> <li>Test prototype on several performance parameters</li> <li>Conduct proof of "design concept" testing</li> <li>Set performance &amp; cost milestones for Gate 4</li> </ul>  | <b>Engineering Prototype</b> <ul style="list-style-type: none"> <li>Test design features and performance limits, performance mapping</li> <li>Build field ready prototypes</li> <li>Perform field testing with customer feedback</li> <li>Prepare for manufacturing, marketing, certification code compliance</li> <li>Set performance &amp; cost milestones for Gate 5</li> </ul>   | <b>Production Prototype</b> <ul style="list-style-type: none"> <li>Test design features and performance limits, performance mapping</li> <li>Build field ready prototypes</li> <li>Perform field testing with customer feedback</li> <li>Prepare for manufacturing, marketing, certification code compliance</li> <li>Set performance &amp; cost milestones for Gate 6</li> </ul>  | <ul style="list-style-type: none"> <li>Commercialization</li> <li>Deployment</li> </ul> |
| Deliverables Required for Gate Decisions | <ul style="list-style-type: none"> <li>Peer-reviewed paper or journal article</li> <li>Documentation of proof of concept</li> </ul>   | <ul style="list-style-type: none"> <li>Correlations with building end use</li> <li>Analytical and/or empirical evidence of technology</li> <li>Performance viability, preferably lab and/or model data</li> <li>Written report of above</li> <li>Possible verification testing at another laboratory</li> </ul> | <ul style="list-style-type: none"> <li>Performance status and expectation for market entry</li> <li>Comparison to available technology baseline</li> <li>Preliminary market assessment                             <ul style="list-style-type: none"> <li>a. Cost</li> <li>b. Performance</li> </ul> </li> <li>Estimate of national energy savings potential</li> <li>Attributes and benefits of approach</li> </ul> | <ul style="list-style-type: none"> <li>Product specifications defined</li> <li>Cost/Benefit analysis for owners/operators</li> <li>Detailed market assessment                             <ul style="list-style-type: none"> <li>a. Cost</li> <li>b. Performance</li> <li>c. Market penetration</li> </ul> </li> <li>Estimates of national energy savings potential</li> <li>Identification of issues and technology status</li> <li>Technical performance</li> <li>Market barriers</li> <li>Public acceptance</li> <li>Legal – regulatory</li> <li>Health and safety</li> </ul> | <ul style="list-style-type: none"> <li>Partnership agreements                             <ul style="list-style-type: none"> <li>a. Manufacturing</li> <li>b. Licensing</li> </ul> </li> <li>Resolution of issues from advanced development stage</li> <li>Field test results and adjustments in design</li> <li>Evaluation of national energy savings potential</li> <li>Update detailed market assessment</li> <li>Cost/Benefit analysis for market</li> </ul> | <ul style="list-style-type: none"> <li>Partnership agreements                             <ul style="list-style-type: none"> <li>a. Manufacturing</li> <li>b. Licensing</li> </ul> </li> <li>Resolution of issues from advanced development stage</li> <li>Field test results and adjustments in design</li> <li>Evaluation of national energy savings potential</li> <li>Update detailed market assessment</li> <li>Cost/Benefit analysis for market</li> </ul> |   |
| Gate Expectations                        | <ul style="list-style-type: none"> <li>Strategic alignment</li> <li>Interested customers</li> <li>Competitive advantage</li> <li>Technical feasibility</li> <li>Gov't role</li> </ul>   | <ul style="list-style-type: none"> <li>Address priority building end use</li> <li>Proof of technical performance</li> <li>Met performance milestones</li> </ul>   | <ul style="list-style-type: none"> <li>Prove clear advantage over available technology</li> <li>Met performance milestones</li> </ul>  | <ul style="list-style-type: none"> <li>Meet owner / operator cost/benefit requirements (1-5 yr. payback)</li> <li>Demonstrate significant end-user demand (economics, safety, etc...)</li> <li>Technology status issues defined</li> <li>Met performance &amp; cost milestones</li> </ul>  | <ul style="list-style-type: none"> <li>Meet owner / operator cost/benefit requirements (1-5 yr. payback)</li> <li>Demonstrate significant end-user demand (economics, safety, etc...)</li> <li>Technology status issues defined</li> <li>Met performance &amp; cost milestones</li> </ul>  | <ul style="list-style-type: none"> <li>Ready for production and/or application by owner/operator</li> <li>Met performance &amp; cost milestones</li> </ul>   |   |

Adapted from Robert Cooper, "Winning at New Products: Accelerating the Process from Idea to Launch," Perseus Books Group, 3rd Edition, 2001, ISBN: 0738904633

## APPENDIX D: Analysis Taxonomy for Characterizing BT Analysis Reports

The Building Technologies Program uses the following table and methodology to characterize its analysis reports by subject area and type.

|                              | Market Data |                   |                            | Technical Characterization |                             |                   |                   |                     | Planning        |                    |               |
|------------------------------|-------------|-------------------|----------------------------|----------------------------|-----------------------------|-------------------|-------------------|---------------------|-----------------|--------------------|---------------|
|                              | Market Data | Voice of Customer | Economic Savings Potential | Core Data                  | Technical Savings Potential | Field Performance | Technical Options | Non-Energy Benefits | Program Options | Roadmaps Workshops | Future Trends |
| Entire Building Sector       |             |                   |                            |                            |                             |                   |                   |                     |                 |                    |               |
| Residential Whole Bldg       |             |                   |                            |                            |                             |                   |                   |                     |                 |                    |               |
| ZEHHPW Option Sets           |             |                   |                            |                            |                             |                   |                   |                     |                 |                    |               |
| Commercial Whole Bldg        |             |                   |                            |                            |                             |                   |                   |                     |                 |                    |               |
| IEQV                         |             |                   |                            |                            |                             |                   |                   |                     |                 |                    |               |
| Controls & Sensors           |             |                   |                            |                            |                             |                   |                   |                     |                 |                    |               |
| Daylighting                  |             |                   |                            |                            |                             |                   |                   |                     |                 |                    |               |
| Space Conditioning           |             |                   |                            |                            |                             |                   |                   |                     |                 |                    |               |
| Space Cooling                |             |                   |                            |                            |                             |                   |                   |                     |                 |                    |               |
| Space Heating                |             |                   |                            |                            |                             |                   |                   |                     |                 |                    |               |
| Thermal Distribution         |             |                   |                            |                            |                             |                   |                   |                     |                 |                    |               |
| Lighting                     |             |                   |                            |                            |                             |                   |                   |                     |                 |                    |               |
| H2O Heating                  |             |                   |                            |                            |                             |                   |                   |                     |                 |                    |               |
| Refrigeration                |             |                   |                            |                            |                             |                   |                   |                     |                 |                    |               |
| Other Equipment & Appliances |             |                   |                            |                            |                             |                   |                   |                     |                 |                    |               |
| Windows                      |             |                   |                            |                            |                             |                   |                   |                     |                 |                    |               |
| Opaque Envelope              |             |                   |                            |                            |                             |                   |                   |                     |                 |                    |               |
| Wall                         |             |                   |                            |                            |                             |                   |                   |                     |                 |                    |               |
| Roof                         |             |                   |                            |                            |                             |                   |                   |                     |                 |                    |               |
| PV                           |             |                   |                            |                            |                             |                   |                   |                     |                 |                    |               |
| Distributed Energy           |             |                   |                            |                            |                             |                   |                   |                     |                 |                    |               |
| Foundation                   |             |                   |                            |                            |                             |                   |                   |                     |                 |                    |               |
| Analysis/Design Tools        |             |                   |                            |                            |                             |                   |                   |                     |                 |                    |               |
| Miscellaneous                |             |                   |                            |                            |                             |                   |                   |                     |                 |                    |               |