Item 3-2	*The Department seeks information on annual product shipments from 1990 to 2005 (both domestic and imports), and the corresponding shipment-weighted average efficiency of these shipments. Additionally, what units of measure are typically used for annual shipments of this equipment (e.g., cases per year, linear-feet per year, square-feet per year (display-area-based), cubic-feet per year (refrigerated-volume-based), etc)?*

3.2 Product Classes

The Department intends to separate the commercial refrigeration equipment covered under this rulemaking into product classes. The criteria for separation into different classes are: type of energy used and capacity or other performance-related features, such as those that provide utility to the consumer or others deemed appropriate by the Secretary, that justify the establishment of a separate energy conservation standard. (42 U.S.C. 6295(q) and 6316(e) added by section 136(h)(3) of EPACT 2005)

The Department proposes the product classes listed below, defined according to equipment characteristics such as door-type and orientation. The proposed product classes differentiate equipment without doors by orientation because the Department expects that orientation provides utility that has a significant impact on the energy efficiency and energy consumption of equipment without doors.

1. Self-contained commercial refrigerators without doors
   - (a) horizontal
   - (b) semi-vertical
   - (c) vertical

2. Self-contained commercial freezers without doors
   - (a) horizontal
   - (b) semi-vertical
   - (c) vertical

3. Self-contained commercial refrigerator-freezers without doors
   - (a) horizontal
   - (b) semi-vertical
   - (c) vertical

4. Remote condensing commercial refrigerators with doors
   - (a) solid doors
   - (b) transparent doors

5. Remote condensing commercial refrigerators without doors
   - (a) horizontal
   - (b) semi-vertical
   - (c) vertical

6. Remote condensing commercial freezers with doors
   (a) solid doors
   (b) transparent doors

7. Remote condensing commercial freezers without doors
   (a) horizontal
   (b) semi-vertical
   (c) vertical

8. Remote condensing commercial refrigerator-freezers with doors
   (a) solid doors
   (b) transparent doors

9. Remote condensing commercial refrigerator-freezers without doors
   (a) horizontal
   (b) semi-vertical
   (c) vertical

10. Ice-cream freezers with doors
   (a) solid doors
   (b) transparent doors

11. Ice-cream freezers without doors
   (a) horizontal
   (b) semi-vertical
   (c) vertical

Item 3-3	*The Department requests feedback on the proposed classes for the commercial refrigeration equipment covered under this rulemaking, and the criteria used in creating the classes.*
Item 3-4	*Can the terms "horizontal," "semi-vertical," and "vertical" be used to describe equipment orientation? If so, how should these be defined (e.g., based on the angle of the air-curtain or load-line with the vertical, with 0–30° being vertical, 30–60° being semi-vertical, and 60–90° being horizontal)?*
Item 3-5	*What product classes, if any, can be combined for standards-setting purposes because of their similarities?*
Item 3-6	*Can analyses for any one of these product classes be applied or extrapolated to another product class?*
Item 3-7	*Should all of these product classes be considered (e.g., do any of these product classes have few or no shipments)?*
Item 3-8	*Would it be appropriate to extend the standards prescribed for self-contained commercial refrigeration equipment with doors in EPACT 2005 to similar remote condensing equipment with doors and ice-cream freezers with doors covered in this rulemaking? If so, what methodology would be appropriate?*

The energy conservation standards prescribed in EPACT 2005 for self-contained commercial refrigerators, freezers, and refrigerator-freezers with doors take the form of upper limits on daily energy consumption as a function of the volume of the refrigerated space.

Metrics were not specifically established in EPACT 2005 for any of the commercial refrigeration equipment covered under this rulemaking.

Item 3-9	*The Department seeks feedback on appropriate test metrics for the commercial refrigeration equipment covered under this rulemaking (e.g., a metric based on volume for equipment with doors and a metric based on case length, total display area or volume for products without doors).*

3.3 Technology Assessment

The Department typically uses information about existing and past technology options and prototype designs as input in identifying technologies manufacturers could use to attain higher energy efficiency levels. In consultation with interested parties, the Department intends to develop a list of technologies that should be considered in the analysis. Initially, this list will include all those technologies considered to be technologically feasible and will serve to establish the maximum technologically feasible design. In the screening analysis, DOE will eliminate from consideration technologies that have not been incorporated in commercial equipment or in working prototypes, or that fail to meet certain criteria as to practicability to manufacture, install, and service, as to impacts on product utility or availability, or as to health or safety. (Process Rule, sections 4(a)(4) and 5(b))

The Department is collecting information on technologies that could be used to improve the energy efficiency of commercial refrigeration equipment. The Department is currently considering the specific technologies and designs listed below.

The following technologies and designs are relevant to all product classes:

1. Higher efficiency lighting (e.g., T8 fluorescent lamps, light-emitting diodes (LEDs));
2. Higher efficiency lighting ballasts (e.g., electronic ballasts instead of magnetic ballasts);
3. Remote lighting ballast location (i.e., outside the refrigerated space);
4. Higher efficiency expansion valves (e.g., dual-port thermostatic expansion valves (TXVs) and electronic expansion valves (EEVs));
5. Higher efficiency evaporator fan motors (e.g., electronically commutated motors (ECM));
6. Increased evaporator surface area or efficiency to achieve lower case-evaporator temperature differential (with a possible increase in fan energy);
7. Evaporator-fan-motor controllers;
8. Higher efficiency evaporator fan blades;
9. Low-pressure-differential evaporators;
10. Anti-sweat heater controls;
11. Case-insulation increases or improvements;
12. Defrost mechanism (hot-gas defrost rather than electric defrost); and
13. Defrost-cycle control (partially or fully demand-based defrost rather than partially or fully time-based defrost).

The following design is relevant to equipment without doors only:

Air curtain design (optimization of the discharge air grille (DAG) configuration and velocity profile to minimize ambient air infiltration).

The following technologies and designs are relevant to self-contained equipment only:

1. Higher efficiency compressors (e.g., variable-speed compressors);
2. Liquid-to-suction heat exchanger (LSHX) (subcool liquid refrigerant with suction line);
3. Increased condenser surface area or efficiency to achieve lower ambient-condenser temperature differential (with a possible increase in fan energy);

4. Higher efficiency condenser fan motors (e.g., electronically commutated motors (ECM));

5. Condenser-fan-motor controllers; and

6. Higher efficiency condenser fan blades.

Item 3-10 What technologies or designs, if any, should be added to or removed from the above list?

3.4 Baseline Units

Once the Department establishes product classes, it will select a baseline model as a reference point for each product class, against which it can measure changes resulting from energy conservation standards. The baseline model in each product class represents the characteristics of equipment in that class. Typically, a baseline model would be a model that just meets current required energy conservation standards. Because there are no existing standards for the commercial refrigeration equipment covered under this rulemaking, the Department will select baseline models using a different method (e.g., the unit with the highest energy consumption or the typical unit). The Department proposes to use information provided by stakeholders in selecting appropriate baseline models.

Item 3-11 The Department seeks feedback on how to select a baseline model for each product class.

The Department will use the baseline models in the engineering analysis and the life-cycle cost and payback-period analysis. To determine energy savings and changes in price, the Department will compare each higher-energy-efficiency or lower-energy-consumption design option with the baseline model.

Item 3-12 The Department seeks information on what particular components and features characterize the baseline model in each product class (e.g., materials, dimensions, insulation, refrigerant type, compressors, evaporators, condensers, expansion devices, fans, motors, air-curtains, anti-condensate devices and controls, defrost mechanisms and controls, lighting, etc.).

4 SCREENING ANALYSIS