**Appendix: Summary of EIA's October 6, 2015 SNAP Petition for Additional Listings of High-GWP ODS Substitutes as Unacceptable**

| End-Uses | New/ Retrofit | High-GWP ODS Substitute | Approx. GWP-100 Range | Date | Proven Alternatives | GWP-100 | Use Restrictions/Notes |
|---|---|---|---|---|---|---|---|
| Fire Suppression (Total Flooding) | N/A | $SF_6$, HFC-23, and HFC-23 blends (R-508A, R-508B) | 13,000-22,800 | January 1, 2017 or one year after final rule | Carbon dioxide, nitrogen, argon | 0-1 | |
| | | | | | Water, Water mist systems | 0 | |
| | N/A | HFC-236fa, HFC-125, HFC-227ea, PFC-218, PFC-410 | 3,000-8,860 | January 1, 2019 | Powdered Aerosol A | 0 | Consider narrowed use restrictions for HFC-134a. |
| | | | | | HFC-134a | 1430 | |
| Fire Suppression (Streaming Agents/ Portable Extinguishers) | N/A | HFC-227ea, HFC-236fa, PFC-614 | 3,350-9,160 | January 1, 2019 | Carbon dioxide, nitrogen, argon | 0-1 | Dry chemical agents are widely used for Class B fire suppression in applications including petroleum refineries and aircraft<br><br>Carbon dioxide and the other inert gases are available and sufficient for most applications requiring a 'clean agent'. |
| | | | | | Water | 0 | |
| | | | | | Dry chemical (Sodium bicarbonate, potassium bicarbonate and monoammonium phosphate) | 0 | |
| Cold Storage Warehouses | New and retrofit | R-507A, R-404A, HFC-227ea, R-407A, R-410A, R-410B | 2000-3,985 | January 1, 2019 | R-717 | 0 | |
| | New and | R-134a,R-407F, R-407C, R- | 1,430-2,000 | January 1, 2022 | R-744 | 1 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | retrofit | 420A | | | | | |
| | New | R-513A, R-450A | 604-700 | Immediate | Evaporative/ Desiccant Cooling | 0 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Industrial Process Refrigeration | New and retrofit | HFC-23, and HFC-23 blends (R-508A, R-508B) | 13,000-14,800 | January 1, 2017 or one year after final rule | R-290<br>R-600a<br>R-1270 | <5 | |
| | New and retrofit | HFC-236fa, R-507A, R-404A, HFC-227ea | 3,350-8,060 | January 1, 2019 | R-744 | 1 | |
| | New and retrofit | R-407A, R-410A, R-410, R-134a | 1,430-3,000 | January 1, 2022 | R-717 | 0 | |
| | | | | | Stirling Cycle | 0 | |
| | New | R-513A , R-405A | 604-700 | Immediate | Evaporative /Desiccant Cooling | 0 | |
| Very Low Temperature Refrigeration | New and retrofit | HFC-23, and HFC-23 blends (R-508A, R-508B) | 13,000-14,800 | January 1, 2017 or one year after final rule | R-170 Ethane<br>R-1150 Ethene | <6 | |
| | New and retrofit | R-507A, R-404A, R-422, R-422B, R-422C | 3,000-3,985 | January 1, 2019 | R-744, liquid $CO_2$, liquid argon, R-728 (liquid nitrogen) | 0-1 | |
| Refrigerated Transport | New and retrofit | R-507A, R-404A, R-406A, , R407A/B/C/D, R-422C/D, R-421A/B, R-424A, R-426A | 1,500-3,985 | January 1, 2019 | Cryogenic liquids: R-744, liquid $CO_2$, liquid argon, R-728 (liquid nitrogen and direct nitrogen expansion) | 0-1 | January 1, 2022 effective date provides the time required to develop infrastructure for cryogenic TR refueling. |
| | New | R-448A ,R-449A, R-513A, R-450A | 604-1,400 | Immediate | R-717*[1] | 0 | |
| | New and Retrofit | HFC-134a | 1,430 | January 1, 2022 | | | |
| Industrial | New and | R-507A, R-404A | 3,900-3,985 | January 1, 2019 | R-717 vapor | 0 | |

[1] e.g. ammonia or ammonia/$CO_2$ cascade systems for marine refrigeration

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Process Air Conditioning | retrofit | | | | compression and absorption | | |
| | New and retrofit | R-407C/F, R-410A/B, HFC-134a | 1,430-2,230 | January 1, 2022 | R-744* including in ammonia/$CO_2$ cascade | 1 | |
| | New | R-513A, R-450A | 604-700 | Immediate | Evaporative Cooling | 0 | |
| Reciprocating, Screw, Scroll and Centrifugal Chillers | New and retrofit | HFC-236fa, R-417A (ISCEON 59), R-404A, R-507, R-507A, HFC-134a, HFC-245fa, HFC-227ea, KDD6, R-410B, R-421A, R-422D, R-424A, R-434A, R-422B, R-422C, R-427A, R-423A, R-420A, SP34E, R-414B (Hot Shot), Hot Shot 2, FOR12A, FOR12B. | 1,430-8,060 | January 1, 2019 | R-717 Vapor compression & absorption | 0 | 2019 timeline allows time to transition centrifugal chillers to HFO1233zd and time for revision of standards for GWP<20 alternatives in other chillers including A2, A2L, and A3 refrigerants.<br><br>R-410A is only widely used in scroll chillers and if not listed unacceptable across the board, could be restricted only to use in scroll chillers after 2019. |
| | | | | | Water/Lithium Bromide | 0 | |
| | | | | | Stirling cycle | 0 | |
| | New and retrofit | R-410A | | January 1, 2022 | R-290/R-600a/R-441A* | <4 | |
| | | | | | HFO-1234ze (medium pressure)<br>HFO-1233zd (low pressure) | 1-7 | |
| | New | R-513A, R-450A | 604-700 | Immediate | Evaporative Cooling | 0 | |
| Household refrigerators and freezers | New | R-507, R-507A, R-404A, R-428A, R-421B, R-434A, R-401B, R-402A, R-402B , R-409A, R-409B, R-406A, R-407C, R-407F, R-420A, R-422B, R-422C, R-422D, R-427A, R-426A, R-424A, R- | 1,200-3,985 | January 1, 2017 | R-600a<br>R-290 | <4 | January 1, 2019 timeline for R-134a allows sufficient time to develop revised standards for GWP<20 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | 426A (RS-24), KDD5/R-438A and KDD6 | | | | | alternatives to allow safe and cost effective equipment using A2, A2L, and A3 refrigerants to enter the U.S. market. |
| | New | R-513A, R-450A | 604-700 | Immediate | | | |
| | New | R-134a | 1,430 | January 1, 2019 | | | |
| Vending machines | New | R-450A, R-513A | 604-700 | Immediate | R-744 | 1 | |
| | Retrofit | FOR12A, FOR12B, HFC–134a, KDD6, R–125/290/134a/600a (55.0/1.0/42.5/1.5), R–404A, R–407C, R–410A, R–410B, R–417A, R–421A, R–422B, R–422C, R–422D, R– 426A, R–437A, R–438A, R–507A, RS-24 (2002 formulation), SP34E. | 1,100-3,985 | R-507A and R-404A as of January 1, 2019 and the rest January 1, 2022 | R-290<br>R-600a<br>R-441A | <4 | These have already been listed unacceptable in new equipment under Rule 20. |
| Commercial ice machines | New | R-448A, R-449A, R-513A, R-450A | 604-1,400 | Immediate | R-717 | 0 | |
| | New and retrofit | R-507A, R-404A | 3,000-3,985 | January 1, 2019 | R-290*<br>R-600a* | <4 | |
| | New and retrofit | HFC-134a, R-406A, R-407A/B/C, R-411A/B | 1,430-3,000 | January 1, 2022 | R-744* | 1 | |
| Supermarket Systems and remote condensing units | New | R-448A, R-449A, R-513A, R-450A | 604-1,400 | Immediate | R-744 | 1 | |
| | New and retrofit | R-407A, R-407C, R-407F, R-427A, R-421A, R-410A, R-410B | 2,000-2,500 | January 1, 2022 | R-717 with secondary loop | 0 | |
| | Retrofit | HFC-227-ea | 3,350 | January 1, 2019 | R-290, R-600a and R- | <4 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | 441A in condensing units* | | |
| Medium-temperature Stand-alone equipment | New and retrofit | R-513A, R-450A | 604-700 | Immediate | R-290<br>R-600a<br>R-441A | <4 | |
| Low-temperature stand-alone equipment | New and retrofit | R-448A, R-449A, R-513A, R-450A | 604-1,400 | Immediate | R-290<br>R-600a<br>R-441A | <4 | |
| Medium- and Low-temperature stand-alone equipment | Retrofit | FOR12A, FOR12B, R–134a, HFC–227ea, KDD6, R–125/290/134a/600a (55.0/1.0/ 42.5/1.5), R–404A, R–407A/B,/C, R–407F, R–410A/B, R–417A, R–421A,/B, R–422A/B/C/D, R–424A, R–426A, R– 428A, R–434A, R–437A, R–438A, R–507A, RS-24 (2002 formulation), RS-44 (2003 formulation), SP34E, THR-03. | 900 to 3,985 | January 1, 2022 | R-290<br>R-600a<br>R-441A | <4 | These have already been listed unacceptable in new equipment under Rule 20. |
| Water coolers | New | R-513A, R-450A | 604-700 | Immediate | R-290*<br>R-600a* | <4 | HCs not SNAP listed, but UL has certified for sale in U.S. |
| | New and retrofit | R-404A, R-507, R-507A | 3,000-3,985 | January 1, 2019 | | | |
| | New and retrofit | R-134a, R-421A/B, R-424A, R-426A, R-438A, R-422A/B/C/D, R-407A/B, R-407F | 1,430-3,000 | January 1, 2022 | | | |