APPENDIX F

ENERGY RESOURCE DEMAND CALCULATION

Rule 1612.1

Proposed Rule 1632

Proposed Rule 1633

Proposed Rule 2507

Estimated Natural Gas Usage from Rule 1612.1
Class 7 & 8 Vehicles and Refuse Trucks

Assumptions

1. Yard hostlers receiving credit under Rule 1612.1 use liquefied petroleum gas (LPG)
2. 10% turnover rate for Class 7 & 8 vehicles and refuse trucks (10% annual population replacement)
3. Annual Rule 1612.1 participation rate for Class 7 & 8 vehicles and refuse trucks is 20% of 10% annually replaced vehicles (i.e., 10% of 10%) = 2.0%
4. 2001 participation rate is 50% less since implementation starts July 2001 = 1.0%
5. 2003 participation shifted to 2002 to take advantage of meeting higher October 2002 on-road standard = 1% + 1% = 2%
6. No additional participation after 2003 (PR 1612.1 application submittal date ends January 2004)
7. District population of Class 7 & 8 = 81,869 vehicles
8. District population of refuse trucks not Subject to Rule 1193 = 1,000 vehicles
9. Class 7 & 8 vehicles: 5,133 gallons diesel/vehicle/year
10. Refuse trucks: 10,400 gallons diesel/vehicle/year
11. 1.42 therms/gallon diesel
12. 100,000 Btu/therm
13. 100 ft^3 natural gas/92,800 Btu

Natural Gas Demand Calculations

Class 7 & 8 Vehicles

Year 2001 = 81,869 vehicles x 0.10 turnover x 0.10 participation x 5,133 gallons per vehicles per year x 1.42 terms per gallon x 100,000 Btu per therm x 100 ft^3 nat. gas / 92,800 Btu / 365 days per year / 1,000,000 = 1.762 million ft^3 natural gas per day

Year 2002 = 81,869 vehicles x 0.10 turnover x 0.20 participation x 5,133 gallons per vehicles per year x 1.42 terms per gallon x 100,000 Btu per therm x 100 ft^3 nat. gas / 92,800 Btu / 365 days per year / 1,000,000 = 3.523 million ft^3 natural gas per day

Year 2003 = 1.762 + 3.523 = 5.285 million ft^3 natural gas per day

Refuse Trucks

Year 2001 = 1,000 vehicles x 0.10 turnover x 0.10 participation x 10,400 gallons per vehicles per year x 1.42 terms per gallon x 100,000 Btu per therm x 100 ft^3 nat. gas / 92,800 Btu / 365 days per year / 1,000,000 = 0.0436 million ft^3 natural gas per day

Year 2002 = 1,000 vehicles x 0.10 turnover x 0.20 participation x 10,400 gallons per vehicles per year x 1.42 terms per gallon x 100,000 Btu per therm x 100 ft^3 nat. gas / 92,800 Btu / 365 days per year / 1,000,000 = 0.0872 million ft^3 natural gas per day

Year 2003 = 0.0436 + 0.0872 = 0.1308 million ft^3 natural gas per day

Estimated Natural Gas Usage from PR 1632
Fuel Cells for Marine Vessel Hotelling

Assumptions

1. 4,275 marine vessel port calls per year (Marine Vessel Inventory Report, ARCADIS)
2. Total average hours of hotelling for 4,275 calls per year = 229,542 (ARCADIS)
3. Natural gas usage = 240,000 ft^3 per 24 hours (Marine Fuel Cell Inc., 2001)
4. Annual PR 1632 participation rate is 10%
5. No participation in 2001
6. No additional participation after 2003

Year 2002 = 229,542 hours per year x 0.10 participation x 240,000 ft^3 per 24 hours / 365 days per year / 1,000,000 = 0.629 million ft^3 per day

Year 2003 = 0.629 + 0.629 = 1.258 million ft^3 per day

Estimated Electric Usage from PR 1633
Truck and Trailer Refrigeration

Assumptions

1. 10% annual participation rate
2. 2001 participation rate 50% less since implementation starts July 2001 = 5%
3. No additional participation after 2003 (PR 1633 application submittal date ends January 2004)
4. District population of refrigerated units = 17,900 (CARB, 2001*)
5. Total operating time per trailer = 1,341 hours per year (CARB, 2000**)
6. Refrigerated units operate 65 percent on diesel and 35 percent on electricity
7. Standby electric motor = 15 horsepower (hp) (Carrier Transicold, Operation and Service Manuals, 1996, 1997)
8. 1 hp = 0.7457 kilowatt

Electric Demand Calculations

Year 2001 = 0.35 x 17,900 units x 0.05 participation rate x 1,341 hours per year x 15 hp per unit x 0.7457 kW/hp x 1 gigawatt / 1,000,000 kW= 4.699 gWh per year

Year 2002 = 0.35 x 17,900 units x 0.1 participation rate x 1,341 hours per year x 15 hp per unit x 0.7457 kW/hp x 1 gigawatt / 1,000,000 kW= 9.397 gWh per year

Year 2003 = 4.699 + 9.397 + 9.397 = 23.49 gWhr per year

* Archana Agrawal, CARB, 2/6/01 fax to Zorik Pirveysian of SCAQMD

** Public Meeting to Consider Approval of California's Emission Inventory for Off-Road Large Compression-Ignited Engines (>25HP) Using New Offroad Emissions Model, January 2000

Estimated Electric Usage from PR 2507
Agricultural Pumps

Assumptions

1. Turnover rate is 7 years
2. 10% annual participation rate of turnover rate (10% of 1/7 = 1.4%)
3. 2001 participation rate 50% less since implementation starts July 2001 = 0.7%
4. No additional participation after 2003 (PR 2507 application submittal date ends January 2004)
5. District population of stationalry agricultural pumps = 217
6. Replacement motor = 150 hp
7. 0.65 load factor
8. 2,000 operating hours per year
9. 1 hp = 0.7457 kilowatt

Electric Demand Calculations

Year 2001 = 0.007 x 217 units x 2,000 hours per year x 150 hp x 0.65 x 0.7457 kW per hp x 1 gigawatt / 1,000,000 kW= 0.2209 gWhr per year

Year 2002 = 0.014 x 217 units x 2,000 hours per year x 150 hp x 0.65 x 0.7457 kW per hp x 1 gigawatt / 1,000,000 kW= 0.4418 gWhr per year

Year 2003 = 0.2209 + 0.4418 + 0.4418 = 1.105 gWhr per year