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IOWA UTILITIES BOARD

DISTRIBUTED/ONSITE GENERATION TECHNICAL POTENTIAL - IOWA ESTIMATE: 5 YEARS

Assumptions:

- Only those applications for technologies showing paybacks of 5 years or less are considered viable
- Load shapes used for "Typical Customers" serves as proxy load shape for entire customer group
- The viable DG units identified from each customer group will be assumed installed equally over the group (i.e., for a customer sub-group where 3 unit types have paybacks all less than 20 years, kW is estimated by assuming 1/3 from each unit type)
- Wind & PV systems deemed electric only, all other technologies deemed Combined Heat & Power
- # of customers for each "Typical" customer group are from load shape data provided by Alliant and correspond to Billing Premises.
- Due to capital-intensive nature of DG investments (& divergence from customer's key business line), only 10% of those meeting above criteria are estimated as likely to be installed, however, both 10% & 100% are presented
- Technical potential estimates will vary greatly depending on the assumptions used in the screening model to calculate simple payback (note: paybacks are calculated using numerous simplifying assumptions regarding utility rates, fuel costs, technology installation costs, etc.)

Customer Type/Sub-Group	Scenario Description Technology	Simple Payback (yrs)	# of Customers	Total Unit Installed Capacity (kW)	Installed Capacity from CHP Only	Total Installed Capacity (kW)	Total Installed Capacity (kW) CHP
Agricultural - Large	None meet payback criteria	N/A	6	0	0	-	-
Agricultural - Medium	None meet payback criteria	N/A	16	0	0	-	-
Agricultural - Small	None meet payback criteria	N/A	24	0	0	-	-
C/I Manufacturing - Large	None meet payback criteria	N/A	11	0	0	-	-
C/I Manufacturing - Medium	None meet payback criteria	N/A	331	0	0	-	-
C/I Manufacturing - Small	Micro - 30 kw, 90%CF/50%WH	4	978	44	44	43,228	43,228
C/I Manufacturing - Small	Micro - 45 kw, 90%CF/50%WH	4				-	-
C/I Manufacturing - Small	Micro - 60 kw, 90%CF/50%WH	4				-	-
C/I Manufacturing - Small	Micro - 75 kw, 90%CF/50%WH	4				-	-
C/I Manufacturing - Small	Recip/D - 11 kw, 90%CF/50%WH	5				-	-
C/I Mining - Large	None meet payback criteria	N/A	4	0	0	-	-
C/I Mining - Small	Micro - 30 kw, 90%CF/50%WH	5	54	43	43	2,311	2,311
C/I Mining - Small	Micro - 45 kw, 90%CF/50%WH	5				-	-
C/I Mining - Small	Micro - 60 kw, 90%CF/50%WH	5				-	-
C/I Mining - Small	Recip/D - 11 kw, 90%CF/50%WH	5				-	-
C/I Mining - Small	Recip/D - 68 kw, 90%CF/50%WH	5				-	-
C/I Nonclassifiable - Large	None meet payback criteria	N/A	7	0	0	-	-
C/I Nonclassifiable - Small	None meet payback criteria	N/A	114	0	0	-	-
C/I Utilities/Transp. - Cable TV	None meet payback criteria	N/A	181	0	0	-	-
C/I Utilities/Transp. - Sewerage	None meet payback criteria	N/A	1	0	0	-	-
C/I Utilities/Transp. - Warehouse	None meet payback criteria	N/A	75	0	0	-	-
C/I Utilities/Transp. - Water Supply	None meet payback criteria	N/A	83	0	0	-	-
C/I Wholesale Trade - Large	None meet payback criteria	N/A	6	0	0	-	-
C/I Wholesale Trade - Medium	None meet payback criteria	N/A	19	0	0	-	-
C/I Wholesale Trade - Small	None meet payback criteria	N/A	516	0	0	-	-
Commercial Assembly - Large	None meet payback criteria	N/A	9	0	0	-	-
Commercial Assembly - Small	None meet payback criteria	N/A	88	0	0	-	-
Commercial Health Care - Large	None meet payback criteria	N/A	10	0	0	-	-
Commercial Health Care - Medium	None meet payback criteria	N/A	56	0	0	-	-
Commercial Health Care - Small	Recip/D - 11kw, 90%CF/50%WH	4	398	11	11	4,179	4,179

Commercial Health Care - Small	Recip/NG - 10kw, 90%CF/50%WH	5				-	-
Commercial Hotel/Motel - Electric	None meet payback criteria	N/A	91	0	0	-	-
Commercial Hotel/Motel - Gas	None meet payback criteria	N/A	9	0	0	-	-
Commercial Housing - Large	None meet payback criteria	N/A	10	0	0	-	-
Commercial Housing - Small	None meet payback criteria	N/A	200	0	0	-	-
Commercial Mngmnt Services - Large	None meet payback criteria	N/A	5	0	0	-	-
Commercial Mngmnt Services - Small	Recip/D - 250kw, 90%CF/50%WH	4	15	191	191	2,865	2,865
Commercial Mngmnt Services - Small	Recip/D - 68kw, 90%CF/50%WH	5				-	-
Commercial Mngmnt Services - Small	Recip/NG - 255kw, 90%CF/50%WH	5				-	-
Commercial Office - Large	None meet payback criteria	N/A	8	0	0	-	-
Commercial Office - Small	Recip/D - 11kw, 90%CF/50%WH	4	205	11	11	2,153	2,153
Commercial Office - Small	Recip/NG - 10kw, 90%CF/50%WH	5				-	-
Commercial Personal Svcs - Large	None meet payback criteria	N/A	13	0	0	-	-
Commercial Personal Svcs - Small	Micro - 30 kw, 90%CF/50%WH	4	178	29	29	5,103	5,103
Commercial Personal Svcs - Small	Micro - 45 kw, 90%CF/50%WH	4				-	-
Commercial Personal Svcs - Small	Recip/D - 11kw, 90%CF/50%WH	4				-	-
Commercial Retail - Large	None meet payback criteria	N/A	8	0	0	-	-
Commercial Retail - Medium	None meet payback criteria	N/A	124	0	0	-	-
Commercial Retail - Small	None meet payback criteria	N/A	811	0	0	-	-
Commercial Schools - Large	None meet payback criteria	N/A	10	0	0	-	-
Commercial Schools - Medium	None meet payback criteria	N/A	54	0	0	-	-
Commercial Schools - Small	Recip/D - 11 kw, 90%CF/50%WH	4	1341	11	11	14,081	14,081
Commercial Schools - Small	Recip/NG - 10 kw, 90%CF/50%WH	5				-	-
Government - Large	None meet payback criteria	N/A	21	0	0	-	-
Government - Medium	None meet payback criteria	N/A	123	0	0	-	-
Government - Small	None meet payback criteria	N/A	1435	0	0	-	-
Residential - Electric Heat	None meet payback criteria	N/A		0	0	-	-
Residential - Gas Heat	None meet payback criteria	N/A		0	0	-	-
			7,648			73,918	73,918

	Total kW	CHP Only kW
Technical Potential: 10% of Units Installed:	7,392	7,392
Technical Potential: 100% of Units Installed:	73,918	73,918

APPENDIX 4C

Distributive/Onsite Generation Technical Potential

Minnesota Estimate

5 years or less payback

DISTRIBUTED/ONSITE GENERATION TECHNICAL POTENTIAL - MINNESOTA ESTIMATE: 5 YEARS

10/15/2001

Assumptions:

- Only those applications for technologies showing paybacks of 5 years or less are considered viable
- Load shapes used for "Typical Customers" serves as proxy load shape for entire customer group
- The viable DG units identified from each customer group will be assumed installed equally over the group (i.e., for a customer sub-group where 3 unit types have paybacks all less than 20 years, kW is estimated by assuming 1/3 from each unit type)
- Wind & PV systems deemed electric only, all other technologies deemed Combined Heat & Power
- # of customers for each "Typical" customer group are from load shape data provided by Alliant and correspond to Billing Premises.
- Due to capital-intensive nature of DG investments (& divergence from customer's key business line), only 10% of those meeting above criteria are estimated as likely to be installed, however, both 10% & 100% are presented
- Technical potential estimates will vary greatly depending on the assumptions used in the screening model to calculate simple payback (note: paybacks are calculated using numerous simplifying assumptions regarding utility rates, fuel costs, technology installation costs, etc.)

Customer Type/Sub-Group	Scenario Description Technology	Simple Payback (yrs)	# of Customers	Total Unit Installed Capacity (kW)	Installed Capacity from CHP Only	Total Installed Capacity (kW)	Total Installed Capacity (kW) CHP
Agricultural - Large	None meet payback criteria	N/A	5	0	0	0	0
Agricultural - Small	None meet payback criteria	N/A	15	0	0	0	0
C/I Manufacturing - Large	None meet payback criteria	N/A	14	0	0	0	0
C/I Manufacturing - Medium	None meet payback criteria	N/A	23	0	0	0	0
C/I Manufacturing - NEC	None meet payback criteria	N/A	5	0	0	0	0
C/I Manufacturing - Small	None meet payback criteria	N/A	76	0	0	0	0
C/I Sewerage System	None meet payback criteria	N/A	2	0	0	0	0
C/I Warehouse - Large	None meet payback criteria	N/A	1	0	0	0	0
C/I Warehouse - Small	None meet payback criteria	N/A	6	0	0	0	0
C/I Wholesale Trade - Large	None meet payback criteria	N/A	5	0	0	0	0
C/I Wholesale Trade - Medium	Recip/D - 68 kw, 90%CF/50%WH	3	23	40	40	909	909
C/I Wholesale Trade - Medium	Recip/D - 11 kw, 90%CF/50%WH	5				0	0
C/I Wholesale Trade - Small	None meet payback criteria	N/A	64	0	0	0	0
Commercial - Office	None meet payback criteria	N/A	12	0	0	0	0
Commercial Assembly - Large	None meet payback criteria	N/A	7	0	0	0	0
Commercial Assembly - Small	None meet payback criteria	N/A	17	0	0	0	0
Commercial Health Care - Large	None meet payback criteria	N/A	4	0	0	0	0
Commercial Health Care - Medium	None meet payback criteria	N/A	13	0	0	0	0
Commercial Health Care - Small	None meet payback criteria	N/A	19	0	0	0	0
Commercial Hotel/Motel - Electric	None meet payback criteria	N/A	3	0	0	0	0
Commercial Hotel/Motel - Gas	None meet payback criteria	N/A	5	0	0	0	0
Commercial Housing - Apartment Building	None meet payback criteria	N/A	7	0	0	0	0
Commercial Retail - Large	None meet payback criteria	N/A	12	0	0	0	0
Commercial Retail - Medium	None meet payback criteria	N/A	32	0	0	0	0
Commercial Retail - Small	None meet payback criteria	N/A	43	0	0	0	0
Commercial Schools - Large	None meet payback criteria	N/A	2	0	0	0	0
Commercial Schools - Medium	None meet payback criteria	N/A	11	0	0	0	0
Commercial Schools - Small	None meet payback criteria	N/A	73	0	0	0	0
Commercial Services - Large	None meet payback criteria	N/A	4	0	0	0	0
Commercial Services - Medium	None meet payback criteria	N/A	9	0	0	0	0
Commercial Services - Small	None meet payback criteria	N/A	52	0	0	0	0
Government - Large	None meet payback criteria	N/A	6	0	0	0	0

Government - Medium	None meet payback criteria	N/A	21	0	0	0	0
Government - Small	Recip/D - 11 kw, 50%CF/50%WH	4	66	11	11	693	693
Residential - Electric Heat	None meet payback criteria	N/A		0	0	0	0
Residential - Gas Heat	No Technologies Pass the Screen	N/A		0	0	0	0
			657			1,602	1,602
						Total kW	CHP Only kW
Technical Potential: 10% of Units Installed:						160	160
Technical Potential: 100% of Units Installed:						1,602	1,602

APPENDIX 4D

Distributed/Onsite Generation Options

Identification and Assessment Project

Minnesota

Update of October 2001 Assessment Report

June 11, 2003

Prepared by:

GDS Associates, Inc.

ALLIANT ENERGY CORPORATE SERVICES, INC.

Distributed/Onsite Generation Options Identification and Assessment Project - Minnesota -

Update of October 2001 Assessment Report

June 11, 2003

Prepared and Submitted by:



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INTRODUCTION

This report updates an earlier, October 2001, report prepared for Alliant Energy Corporate Services, Inc. (Alliant). The October 2001 report presented results from secondary research, model development, and technology screening efforts performed by GDS Associates, Inc. to assess and prioritize the potential for customer-sited/distributed generation for all customer classes within Alliant's Minnesota distribution utility service territory. GDS Associates was recently contracted to help Alliant revise this earlier assessment, in the following way:

- Add functionality to the model to recognize state and federal tax incentives for renewably-fueled technologies;
- Expand the technologies assessed to include bio-gas¹ fueled micro-turbines, mid-sized wind turbines (30 to 250 kW), and Stirling engines;
- Update installation costs on previously assessed technologies, and key performance characteristics where appropriate;
- Update existing fuel costs for natural gas and diesel fuel and add fuel cost projections for bio-gas and bio-diesel;
- Make other modifications to the existing Distributed/Onsite Generation Screening (DOGS) model as appropriate; and
- Utilize the modified DOGS model to reassess, identify and rank the potential for customer-sited generation at typical residential, small and large commercial, industrial and agricultural customer locations.

As a final element of this project, the model was used to re-estimate the economic potential for distributed generation installations within Alliant's Minnesota distribution utility service territory (Alliant-MN).

In total, 3,115 unique scenarios were run. 479 of these yielded positive payback results (358 of which were found to have paybacks of 30 years or less). A brief summary of results is presented below. This summary is followed by a discussion of the methodologies used by GDS when performing its work. Attachment 1 presents the simple payback results, sorted by customer type/subgroup and by technology, for all Alliant-MN scenarios that yielded a simple payback of 30 years or less. Attachment 2 provides detailed information on the five and ten-year economic potential assessments.

SUMMARY OF RESULTS

Key result areas include: (1) identification of technologies assessed and characteristics of each technology; (2) a listing of the customer groups and building types modeled as potential on-site generation candidates; (3) screening model results showing, by customer type, those distributed/onsite generation applications that yielded simple paybacks of 10 years or less²; and (4) a

¹ For this study, bio-gas refers to methane gas produced by landfills, digesters, and waste-water treatment facilities.

² For purposes of this summary, paybacks of 10 years or less are shown to represent the most viable options. Results from the 358 scenarios that yielded positive paybacks up to 30 years, are presented in Attachment 1. Scenarios with paybacks over 30 years were deemed not viable and are not shown in this report.

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Distributed/Onsite Generation Options Assessment Update

summary of the economic potential for distributed/onsite generation technologies in the Alliant-MN service territory. A presentation of results from each of these areas is as follows.

Technologies Assessed

Table 1 provides a listing of the various distributed/onsite generation technologies considered for assessment in this update. As shown in the Table, six of these technologies are considered to be commercially available (Reciprocating Engines – natural gas, diesel and bio-fueled, Microturbines – natural gas, diesel and bio-fueled, Fuel Cells – natural gas and bio-fueled, Wind Turbines, Photovoltaic Modules, and Stirling Engines – natural gas and bio-fueled), and two technologies are in various stages of demonstration and development (Concentrating Solar Power Systems and Hybrid Systems). A summary of key operating characteristics and updated cost information is provided for each technology in Table 2 (note that items shown in *italics* designate new or updated information from that used in the October 2001 report).

Table 1: Technology Availability and Target Customer Sectors

Technology	Commercially Available	Target Customer Sectors (for mature technologies)
Reciprocating Engines	Yes	Small and Large Commercial, Industrial, Agricultural
Microturbines	Yes	Small and Large Commercial, Agricultural
Fuel Cells	Yes	Small and Large Commercial, Industrial
Wind Turbines	Yes	Residential, Small and Large Commercial, Industrial, Agricultural
Photovoltaic Modules	Yes	Residential, Small and Large Commercial, Agricultural
Stirling Engines	Yes	Residential, Small Commercial, Agricultural
Concentrating Solar Power	No	DG technology not mature
Hybrid Systems	No	DG technology not mature

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Distributed/Onsite Generation Options Assessment Update

Prepared by: GDS Associates, Inc.

June 11, 2003

Table 2: Distributed Generation Technology Profile (information updated since October 2001 in presented in italics)

Technology	Target Market Sectors	State of Development	Operation & Maintenance	Installed Cost Range (\$/kW) (includes CHP)	Operating Fuels	Electric Power Output Range	Thermal Output Range (Btu/kWh)	Operating Temp	Operation Specs.	Physical Plant Footprint (ft ² /kW)
Reciprocating Engines	Comm., Indust.	Commercially available.	Costs ~ \$0.008-\$0.015/kWh	\$900-\$1,400/kW	Natural gas Propane Gasoline Dual Fuel Diesel Heavy Oil <i>Bio-gases (methane)</i>	10 kW-10 MW @ 21% - 43% eff.	1,000 - 16,000	316°-500°F	1.0-45 psig	0.22-31
Microturbines	Res., Comm. & Agricultural greenhouses	Commercially available.	\$0.005-\$0.01 per kWh.	\$1,500 - \$2,200 (natural gas) \$2,500-\$3,500 (bio-gas)	Natural gas Propane <i>Bio-gas</i> Diesel Waste-Fuels	30-2000 kW @ 25-30 eff.	4,000-15,480	400°-635°F	3-100 psig	0.15-0.35
Fuel Cells	Low Temp: Res, Comm High Temp: Comm, Indus	Development, Testing and Demonstration. <i>Commercially available, but still an emerging industry.</i>	\$0.005-\$0.01/kWh (low-temp.)	\$4,500-\$5,500/kW (low-temp)	Natural gas Propane Butane <i>Bio-gas</i> Diesel	Low Temp: 2-250 kW @ 30-40% eff. High Temp: 100 - 2,000 kW @ 45 - 55% eff	PAFC: 3,500-8,000 PEM: 2,000-3,250 MCFC: 1,400-1,800 SOFC: 540-1,100	140°-250°F 135°-165°F 170°-710°F 350°-420°F	15-50 psig	0.6 - 4
Wind Turbines	Res, Comm.	Commercially available.	\$0.005/kWh-\$0.03/kWh	<20kW: \$2,500-\$3,500 20-100kW: \$1,500-\$3,000 >500kW: \$800-\$1,000	<50kW: Wind >8mph >50kW: Wind>10mph	1kW - 3.6 MW @ 25% eff	None	None	n/a	<50kW: 15-90 50kW-500 kW: 0.24-110 >500kW: 250-300
Photovoltaic Modules	Res, Comm.	Commercially available.	\$0.001-0.004/kWh	\$8,000-\$10,000/kW	Global solar radiation (direct and diffuse)	10 watts to 100 kW	None	None	n/a	538
Stirling Engines	Res, Small Comm.	Development, Testing and Demonstration <i>Comm. avail, but not mass prod.</i>	\$0.015 +/- (Less O&M required w/free-piston type)	\$1,700-2,300	<i>Natural Gas Propane Bio-gas</i>	25 kW - kW	1,200	<200°F	2 psig	<1
Concentrating Solar Power	Res, Small Comm.	Engineering and Development	Dish/engine: 6-10 hrs/yr. 8k hrs between service.	\$1,400/kW	Direct Solar Rad. & supp. heat.	25 kW to 80 MW.	6,800	150°F	300 W/m ²	160-269

Customer Sectors/Building Type Categories

Table 3 identifies the customer categories and building types that were considered for potential on-site generation candidates. Commercial and industrial categories³ (selected using SIC major industry group codes where applicable) and load profile data (average monthly kWh, kW, and fuel usage) were taken directly from the October 2001 report and represent "typical" customers within each of these categories. Alliant-specific customer data was used to the extent possible. For modeling purposes, each building type was broken into sub-groups and applicable rate tariffs were identified and modified where necessary to reflect rate changes since the 2001 report.

Table 3 - Customer Sector/Building Type Categories

Customer Category/Type	Sub-Grouping	Applicable Rate Tariff
Residential - Single Family	Electric heat Gas heat	Residential Residential
Commercial – Assembly (SIC 84 - 86)	Large Small	Large Power & Lighting General Demand Metered
Commercial - Healthcare (SIC 80)	Large Medium Small	Large Power & Lighting Large Power & Lighting General Demand Metered
Commercial - Hotel/Motel (SIC 70)	Electric heat Gas heat	Large Power & Lighting General Demand Metered
Commercial – Housing (SIC 65)	Apartment Building	Large Power & Lighting
Commercial - Office (SIC 60 - 67, 73)	Typical Usage	General Demand Metered
Commercial – Services/NEC (SIC 73)	Large Medium Small	Large Power & Lighting Large Power & Lighting General
Commercial - Retail (SIC 52 - 59)	Large Medium Small	Large Power & Lighting Large Power & Lighting General Demand Metered
Commercial - School (SIC 82 - 83)	Large Medium Small	Large Power & Lighting Large Power & Lighting General Demand Metered
C/I - Sewerage System (SIC 49)	Typical Usage	Large Power & Lighting
C/I - Warehouse (SIC 42)	Large Small	Large Power & Lighting General Demand Metered
C/I - Wholesale Trade (SIC 50 - 51)	Large Medium Small	Large Power & Lighting Large Power & Lighting General Demand Metered
C/I - Manufacturing (SIC 20 - 39)	NEC Large Medium Small	Large Power & Lighting Large Power & Lighting Large Power & Lighting General Demand Metered
Agricultural - Dairy & Livestock (SIC 02)	Large Small	Large Power & Lighting Farm Rate
Government/Public Admin (SIC 91 - 97)	Large Medium Small	Large Power & Lighting General Demand Metered General

³ Landfills were not specifically listed as a separate category but are classified under SIC code 49. No Alliant data was available but electric and thermal loads for landfills are expected to be relatively low.

Prioritized Ranking

The modified screening model was used to run 3,115 separate scenarios to assess all unique combinations of customer category/technology type and appropriate fuel source applications.⁴ Based on results from these customer application scenarios, a prioritized ranking was created. Results from this ranking are presented in the following multi-paged Table 4. This table shows, the highest ranking, potentially viable technologies (paybacks less than 10 years) for each customer type. More detailed results and complete prioritized ranking lists are presented in Attachment 1.

Table 4 - Prioritized Ranking of Viable Technologies by Customer Subgroup

Customer Type/Sub-Group	Technology Configuration	Simple Payback (yrs)
Agriculture - Large	Stirling Engine, Bio-Gas fuel, 52 kW, 90 CF, 50 WHF	4
Agriculture - Large	Micro-Turbine, Bio-Gas fuel, 75 kW, 90 CF, 50 WHF	5
Agriculture - Large	Stirling Engine, Bio-Gas fuel, 25 kW, 90 CF, 50 WHF	5
Agriculture - Large	Micro-Turbine, Bio-Gas fuel, 45 kW, 90 CF, 50 WHF	6
Agriculture - Large	Micro-Turbine, Bio-Gas fuel, 60 kW, 90 CF, 50 WHF	6
Agriculture - Large	Micro-Turbine, Bio-Gas fuel, 30 kW, 90 CF, 50 WHF	7
Agriculture - Large	Stirling Engine, Bio-Gas fuel, 52 kW, 50 CF, 50 WHF	7
Agriculture - Large	Wind Turbine, None fuel, 250 kW, 24 CF, 0 WHF	8
Agriculture - Large	Micro-Turbine, Bio-Gas fuel, 75 kW, 50 CF, 50 WHF	9
Agriculture - Large	Stirling Engine, Bio-Gas fuel, 25 kW, 50 CF, 50 WHF	10
Agriculture - Large	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	10
Agriculture - Small	None with under 10 year payback	
C/I Manufacturing - Large	Wind Turbine, None fuel, 660 kW, 24 CF, 0 WHF	5
C/I Manufacturing - Large	Stirling Engine, Nat. Gas fuel, 52 kW, 90 CF, 50 WHF	8
C/I Manufacturing - Large	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	9
C/I Manufacturing - Large	Wind Turbine, None fuel, 250 kW, 24 CF, 0 WHF	9
C/I Manufacturing - Medium	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	10
C/I Manufacturing - NEC	Wind Turbine, None fuel, 660 kW, 24 CF, 0 WHF	6
C/I Manufacturing - NEC	Wind Turbine, None fuel, 250 kW, 24 CF, 0 WHF	10
C/I Manufacturing - Small	None with under 10 year payback	
C/I Sewerage Systems	Stirling Engine, Bio-Gas fuel, 52 kW, 90 CF, 50 WHF	5
C/I Sewerage Systems	Micro-Turbine, Bio-Gas fuel, 75 kW, 90 CF, 50 WHF	6
C/I Sewerage Systems	Stirling Engine, Bio-Gas fuel, 25 kW, 90 CF, 50 WHF	6
C/I Sewerage Systems	Micro-Turbine, Bio-Gas fuel, 45 kW, 90 CF, 50 WHF	7
C/I Sewerage Systems	Micro-Turbine, Bio-Gas fuel, 60 kW, 90 CF, 50 WHF	7
C/I Sewerage Systems	Micro-Turbine, Bio-Gas fuel, 30 kW, 90 CF, 50 WHF	8
C/I Sewerage Systems	Stirling Engine, Bio-Gas fuel, 52 kW, 50 CF, 50 WHF	9
C/I Sewerage Systems	Wind Turbine, None fuel, 250 kW, 24 CF, 0 WHF	9

⁴ The Methodology Section of this report provides detailed information on the modifications that were made to the screening model and the methods used to perform the screening and prioritization activities.

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June 11, 2003

Table 4 - Prioritized Ranking of Viable Technologies by Customer Subgroup (cont.)

Customer Type/Sub-Group	Technology Configuration	Simple Payback (yrs)
C/I Warehouse - Large	Wind Turbine, None fuel, 660 kW, 24 CF, 0 WHF	5
C/I Warehouse - Large	Stirling Engine, Nat. Gas fuel, 52 kW, 90 CF, 50 WHF	8
C/I Warehouse - Large	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	9
C/I Warehouse - Large	Wind Turbine, None fuel, 250 kW, 24 CF, 0 WHF	9
C/I Wholesale Trade - Large	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	6
C/I Wholesale Trade - Large	Wind Turbine, None fuel, 250 kW, 24 CF, 0 WHF	7
C/I Wholesale Trade - Large	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	8
C/I Wholesale Trade - Large	Micro-Turbine, Nat. Gas fuel, 30 kW, 90 CF, 50 WHF	10
C/I Wholesale Trade - Large	Micro-Turbine, Nat. Gas fuel, 45 kW, 90 CF, 50 WHF	10
C/I Wholesale Trade - Large	Stirling Engine, Nat. Gas fuel, 25 kW, 50 CF, 50 WHF	10
C/I Wholesale Trade - Large	Stirling Engine, Nat. Gas fuel, 52 kW, 50 CF, 50 WHF	10
C/I Wholesale Trade - Medium	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	3
C/I Wholesale Trade - Medium	Stirling Engine, Nat. Gas fuel, 52 kW, 90 CF, 50 WHF	3
C/I Wholesale Trade - Medium	Micro-Turbine, Nat. Gas fuel, 30 kW, 90 CF, 50 WHF	4
C/I Wholesale Trade - Medium	Micro-Turbine, Nat. Gas fuel, 45 kW, 90 CF, 50 WHF	4
C/I Wholesale Trade - Medium	Micro-Turbine, Nat. Gas fuel, 60 kW, 90 CF, 50 WHF	4
C/I Wholesale Trade - Medium	Reciprocating Engine, Nat. Gas fuel, 10 kW, 90 CF, 50 WHF	4
C/I Wholesale Trade - Medium	Reciprocating Engine, Nat. Gas fuel, 61 kW, 90 CF, 50 WHF	4
C/I Wholesale Trade - Medium	Stirling Engine, Nat. Gas fuel, 52 kW, 50 CF, 50 WHF	5
C/I Wholesale Trade - Medium	Wind Turbine, None fuel, 250 kW, 24 CF, 0 WHF	5
C/I Wholesale Trade - Medium	Micro-Turbine, Nat. Gas fuel, 75 kW, 50 CF, 50 WHF	6
C/I Wholesale Trade - Medium	Reciprocating Engine, Nat. Gas fuel, 27 kW, 90 CF, 50 WHF	6
C/I Wholesale Trade - Medium	Stirling Engine, Nat. Gas fuel, 25 kW, 50 CF, 50 WHF	6
C/I Wholesale Trade - Medium	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	6
C/I Wholesale Trade - Medium	Micro-Turbine, Nat. Gas fuel, 60 kW, 50 CF, 50 WHF	7
C/I Wholesale Trade - Medium	Reciprocating Engine, Nat. Gas fuel, 10 kW, 50 CF, 50 WHF	7
C/I Wholesale Trade - Medium	Reciprocating Engine, Nat. Gas fuel, 61 kW, 50 CF, 50 WHF	7
C/I Wholesale Trade - Medium	Micro-Turbine, Nat. Gas fuel, 30 kW, 50 CF, 50 WHF	8
C/I Wholesale Trade - Medium	Micro-Turbine, Nat. Gas fuel, 45 kW, 50 CF, 50 WHF	8
C/I Wholesale Trade - Medium	Wind Turbine, None fuel, 30 kW, 24 CF, 0 WHF	9
C/I Wholesale Trade - Medium	Reciprocating Engine, Diesel fuel, 11 kW, 90 CF, 50 WHF	10
C/I Wholesale Trade - Medium	Wind Turbine, None fuel, 10 kW, 24 CF, 0 WHF	10
C/I Wholesale Trade - Small	None with under 10 year payback	
Commercial Assembly - Large	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	5
Commercial Assembly - Large	Stirling Engine, Nat. Gas fuel, 52 kW, 50 CF, 50 WHF	8
Commercial Assembly - Large	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	8
Commercial Assembly - Large	Micro-Turbine, Nat. Gas fuel, 30 kW, 90 CF, 50 WHF	9
Commercial Assembly - Large	Stirling Engine, Nat. Gas fuel, 25 kW, 50 CF, 50 WHF	10
Commercial Assembly - Small	Wind Turbine, None fuel, 30 kW, 24 CF, 0 WHF	10

Table 4 - Prioritized Ranking of Viable Technologies by Customer Subgroup (cont.)

Customer Type/Sub-Group	Technology Configuration	Simple Payback (yrs)
Commercial Health Care - Large	Wind Turbine, None fuel, 660 kW, 24 CF, 0 WHF	5
Commercial Health Care - Large	Stirling Engine, Nat. Gas fuel, 52 kW, 90 CF, 50 WHF	6
Commercial Health Care - Large	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	7
Commercial Health Care - Large	Wind Turbine, None fuel, 250 kW, 24 CF, 0 WHF	7
Commercial Health Care - Large	Micro-Turbine, Nat. Gas fuel, 75 kW, 90 CF, 50 WHF	9
Commercial Health Care - Large	Reciprocating Engine, Nat. Gas fuel, 770 kW, 90 CF, 50 WHF	9
Commercial Health Care - Large	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	9
Commercial Health Care - Large	Reciprocating Engine, Nat. Gas fuel, 255 kW, 90 CF, 50 WHF	10
Commercial Health Care - Large	Stirling Engine, Nat. Gas fuel, 52 kW, 50 CF, 50 WHF	10
Commercial Health Care - Medium	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	4
Commercial Health Care - Medium	Stirling Engine, Nat. Gas fuel, 52 kW, 50 CF, 50 WHF	5
Commercial Health Care - Medium	Stirling Engine, Nat. Gas fuel, 52 kW, 90 CF, 50 WHF	5
Commercial Health Care - Medium	Micro-Turbine, Nat. Gas fuel, 30 kW, 90 CF, 50 WHF	7
Commercial Health Care - Medium	Micro-Turbine, Nat. Gas fuel, 45 kW, 90 CF, 50 WHF	7
Commercial Health Care - Medium	Stirling Engine, Nat. Gas fuel, 25 kW, 50 CF, 50 WHF	7
Commercial Health Care - Medium	Micro-Turbine, Nat. Gas fuel, 75 kW, 50 CF, 50 WHF	9
Commercial Health Care - Medium	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	9
Commercial Health Care - Medium	Reciprocating Engine, Nat. Gas fuel, 10 kW, 90 CF, 50 WHF	10
Commercial Health Care - Small	None with under 10 year payback	
Commercial Hotel / Motel - All Electric	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	5
Commercial Hotel / Motel - All Electric	Micro-Turbine, Nat. Gas fuel, 30 kW, 90 CF, 50 WHF	8
Commercial Hotel / Motel - All Electric	Stirling Engine, Nat. Gas fuel, 25 kW, 50 CF, 50 WHF	8
Commercial Hotel / Motel - All Electric	Stirling Engine, Nat. Gas fuel, 52 kW, 50 CF, 50 WHF	8
Commercial Hotel / Motel - All Electric	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	9
Commercial Hotel / Motel - All Electric	Micro-Turbine, Nat. Gas fuel, 45 kW, 90 CF, 50 WHF	10
Commercial Hotel / Motel - Gas Heat	Stirling Engine, Nat. Gas fuel, 25 kW, 50 CF, 50 WHF	8
Commercial Hotel / Motel - Gas Heat	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	9
Commercial Hotel / Motel - Gas Heat	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	10
Commercial Housing	Fuel Cell, Nat. Gas fuel, 200 kW, 90 CF, 50 WHF	4
Commercial Housing	Fuel Cell, Nat. Gas fuel, 250 kW, 90 CF, 50 WHF	4
Commercial Housing	Fuel Cell, Nat. Gas fuel, 1000 kW, 50 CF, 50 WHF	6
Commercial Housing	Fuel Cell, Nat. Gas fuel, 2000 kW, 50 CF, 50 WHF	6
Commercial Housing	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	6
Commercial Housing	Fuel Cell, Nat. Gas fuel, 250 kW, 50 CF, 50 WHF	7
Commercial Housing	Fuel Cell, Nat. Gas fuel, 200 kW, 50 CF, 50 WHF	8
Commercial Housing	Stirling Engine, Nat. Gas fuel, 52 kW, 50 CF, 50 WHF	9
Commercial Housing	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	9

Table 4 - Prioritized Ranking of Viable Technologies by Customer Subgroup (cont.)

Customer Type/Sub-Group	Technology Configuration	Simple Payback (yrs)
Commercial Retail - Large	Wind Turbine, None fuel, 660 kW, 24 CF, 0 WHF	5
Commercial Retail - Large	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	8
Commercial Retail - Large	Wind Turbine, None fuel, 250 kW, 24 CF, 0 WHF	8
Commercial Retail - Large	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	10
Commercial Retail - Medium	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	9
Commercial Retail - Small	None with under 10 year payback	
Commercial Schools - Large	Wind Turbine, None fuel, 660 kW, 24 CF, 0 WHF	5
Commercial Schools - Large	Wind Turbine, None fuel, 250 kW, 24 CF, 0 WHF	8
Commercial Schools - Large	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	10
Commercial Schools - Medium	Stirling Engine, Nat. Gas fuel, 52 kW, 90 CF, 50 WHF	6
Commercial Schools - Medium	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	7
Commercial Schools - Medium	Wind Turbine, None fuel, 250 kW, 24 CF, 0 WHF	8
Commercial Schools - Medium	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	9
Commercial Schools - Medium	Micro-Turbine, Nat. Gas fuel, 75 kW, 90 CF, 50 WHF	10
Commercial Schools - Medium	Stirling Engine, Nat. Gas fuel, 52 kW, 50 CF, 50 WHF	10
Commercial Schools - Small	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	7
Commercial Schools - Small	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	8
Commercial Schools - Small	Micro-Turbine, Nat. Gas fuel, 30 kW, 90 CF, 50 WHF	10
Commercial Schools - Small	Stirling Engine, Nat. Gas fuel, 52 kW, 50 CF, 50 WHF	10
Commercial Services - Large	Wind Turbine, None fuel, 660 kW, 24 CF, 0 WHF	6
Commercial Services - Large	Stirling Engine, Nat. Gas fuel, 52 kW, 90 CF, 50 WHF	9
Commercial Services - Large	Wind Turbine, None fuel, 250 kW, 24 CF, 0 WHF	9
Commercial Services - Medium	Wind Turbine, None fuel, 250 kW, 24 CF, 0 WHF	9
Commercial Services - Small	None with under 10 year payback	
Government - Large	Wind Turbine, None fuel, 250 kW, 24 CF, 0 WHF	9
Government - Medium	None with under 10 year payback	
Government - Small	Reciprocating Engine, Nat. Gas fuel, 10 kW, 50 CF, 50 WHF	7
Government - Small	Wind Turbine, None fuel, 30 kW, 24 CF, 0 WHF	7
Government - Small	Reciprocating Engine, Diesel fuel, 11 kW, 50 CF, 50 WHF	8
Government - Small	Wind Turbine, None fuel, 10 kW, 24 CF, 0 WHF	9
Government - Small	Wind Turbine, None fuel, 1 kW, 24 CF, 0 WHF	10
Residential - Electric/Gas Heat	None with under 10 year payback	

Economic Potential

The estimated economic potential for distributed generation installations in Alliant's Minnesota service territory is summarized in Table 5. These estimates are based on the assumptions specified in the Methodologies section of this report, including maximum payback periods of 5 and 10 years, and estimated market participation rates of 10%, 25% and 100%. Detailed results of this market potential assessment are presented in Attachment 2 of this report.

Table 5 – Distributed Generation Economic Potential (MW)

	10% Participation Rate		25% Participation Rate		100% Participation Rate	
	5 Year Payback	10 Year Payback	5 Year Payback	10 Year Payback	5 Year Payback	10 Year Payback
Total Distributed Generation Potential	5.3	13.5	13.2	33.7	52.6	134.8

METHODOLOGY

The work plan for this project grouped activities into three major categories: (1) Secondary Research; (2) Revisions to Existing Screening Model; and (3) Customer Group/Technology Screening, Prioritization and Economic Potential. The methodologies used to perform each of these activities are described briefly below.

Secondary Research

Key research activities included reviewing and updating the generation technologies and important performance/cost input information for use in the distributed/onsite generation screening tool. Based on initial comments received from the MN Department of Commerce, research was conducted and information was gathered regarding: state and federal tax credits and incentives for renewables; new technologies (bio-gas fueled micro-turbines, mid-sized wind turbines 30 to 250 kW, and Stirling engines); installation costs, operating characteristics (*i.e.*, capacity factor for wind turbines increased to 24%); and new fuels (bio-gas and bio-diesel). Table 2 in the previous Section provides a complete updated listing of the technologies, costs and operating characteristics. All changes from the October 2001 report are highlighted in the Table in *italics*.

In addition, service territory rate tariffs and demographics were reviewed with Alliant staff to verify that there had been no major changes to the key customer sectors (*i.e.*, number industrial, small and large commercial, residential, and agricultural customers, and relevant sub categories including manufacturing, hospitals, schools, office, retail, etc.) since the October 2001 report. For the most part, it was verified that the customer demographics and tariffs used previously were still valid. There were a few exceptions however (*i.e.*, some tariff changes were identified in the cogen rate area;

also, thermal loads were identified and added to a number of the customer building type categories that had not been previously addressed).

Screening Model Revisions

A critical activity in this update project was to review and modify the existing distributed/onsite generation screening (DOGS) model to incorporate revisions to technology assumptions, the inclusion of potentially relevant state and federal tax credits/incentives, and to recognize any changes to Alliant's rate tariffs, customer load profiles, and related demographics. A summary of state and federal tax credits/incentives that were added to the model are presented in Table 6. Included as a separate electronic file to this report is a copy of the revised DOGS spreadsheet model, incorporating all applicable changes.

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Table 6 – Potentially Relevant State and Federal Tax Credits/Incentives

Quantifiable Incentives

Program Name	Description	Incentive Type	Limitations	Incentive Base	Program Administration	Geography
Wind, Hydro, Digester Energy Generation Incentive	Payments for actual energy output (kWh), Not just rated capacity which may or may not be fully utilized once installed. Limited to 10 years.	Generation Incentive	Systems <2MW	\$0.015/kWh	MN Dept of Commerce, Energy Division	State
PV Rebate Program	Rebate program to buy-down up front cost of grid connected PV systems. Xcel only until 1/1/2004, then all MN grid-connected customers are eligible.	Rebate program	\$8,000 / system	\$2,000 / kW	MN Dept of Commerce, Energy Division - funded by Xcel Energy	State
2003 Climate Change Fuel Cell Buy-Down Program	Grants to buy down the cost of stationary fuel cell demonstration projects, including fuel-cell-powered plants. Approximately \$2.8 million available (10-14 projects). Any entity is eligible except for manufacturers or developers of Fuel Cell technologies and federal agencies.	Grants	3 kW – 3 MW	\$1,000/kW or 1/3 total project cost.	U.S. Dept of Defense, through U.S. Dept of Energy, National Energy Technology Laboratory (NETL)	Federal
Renewable Energy Production Incentive (REPI)	Provides financial incentive payments for electricity produced and sold by new qualifying renewable energy generation facilities. Eligible elec production facilities: those owned by state and local government entities (e.g. municipal utilities) and not-for-profit electric cooperatives that start operations between 10/1/93 and 9/30/03. Annual incentive payments of \$0.015/kWh (1993 dollars and indexed for inflation) for first ten year period of operation (subject to the availability of appropriations each Federal fiscal year). Period for payment under this program ends with fiscal year 2013. Qualifying facilities must use solar, wind, geothermal (with certain restrictions within the rulemaking), or biomass generation technologies (except municipal solid waste combustion).	Generation Incentive	1 st 10 Years of operation	\$0.015/kWh	U.S. Dept of Energy, Office of Power Technologies National Renewable Energy Laboratory	Federal
Wind and Biomass Renewable Electricity Production Credit (REPC) a.k.a. Wind Energy Production Tax Credit (PTC)	A per kilowatt-hour tax credit for electricity generated by qualified energy resources. Wind, closed-loop biomass, or poultry waste resources qualify. Available during first 10 years of operation. Provides a \$0.015/kWh credit (adjusted annually for inflation). The adjusted credit amount for 2003 is \$0/018/kWh.	Corporate Tax Credit	1 st 10 Years of operation	\$0.018/kWh	U.S. Internal Revenue Service	Federal
PV Sales Tax Exemption	PV devices are exempted from state sales tax. PV device: a solid-state electrical device (e.g. solar module) that converts light directly into DC electricity of voltage-current characteristics that are a function of the characteristics of the light source and the materials in and design of the device.	Sales tax exemption	No Max Limit	Varies w/device (MN DOC estimates 5% reduction in cost for PV)	MN Dept of Commerce, Energy Division	State

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Program Name	Description	Incentive Type	Limitations	Incentive Base	Program Administration	Geography
Wind Sales Tax Exemption	Wind energy conversion systems (WECS) used as an electric power source are exempt from sales tax. Includes: the materials used to manufacture, install, construct, repair, or replace WECS. WECS: any device (e.g. such as a wind charger, windmill, or wind turbine) which converts wind energy to a form of usable energy.	Sales tax exemption	No Max Limit	Varies w/device Cost (MN sales tax is 6%)	MN Dept of Commerce, Energy Division	State

Non-Quantifiable Incentives (Not included in DOGS Model)

Net Metering	Purchase of net excess generation at the average retail rate. Utilities must buy net excess generation at the average retail rate. Avg retail rate=total annual class revenue from sales - annual revenue from fixed charges ÷ annual class kWh sales. MN and WI only states to provide such rates.	Net metering rules	≤ 40 kW systems	Average retail rate	MN Dept of Commerce, Energy Division	State
Wind Systems Exemption	Property Tax Exemption (not including land)-replaced w/production based tax Note that systems <250 kW are allowed under other state legislation to negotiate a lower property tax rate w/local authority.	Property tax exemption	<250kW	exempt	MN Dept of Commerce, Energy Division	State
			250 kW - 2 MW systems	tax rate = \$0.012/kWh		
			2 - 12 MW systems	tax rate = \$0.036/kWh		
			>12 MW systems	tax rate = \$0.12/kWh		
PV Systems Exemption	Reduces property assessment by the value added from PV systems. Land portion is still taxable	Property tax exemption	No Max Limit	varies	MN Dept of Commerce, Energy Division	State
Agricultural Improvement Loan Program for Wind Energy	Low interest loan program. Loans to farmers for improvements to agricultural facilities. This includes wind energy conversion equipment. No loans for wind energy systems made to date.	State Loan Program	\$125,000 of loan principle	Up to 45% of loan amount financed at a low-rate.	MN Dept of Agriculture, Rural Finance Authority	State

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Program Name	Description	Incentive Type	Limitations	Incentive Base	Program Administration	Geography
Solar and Geothermal Business Energy Tax Credit	<p>This is a 10% tax credit to businesses that invest in energy property in the U.S. Solar energy property: equipment that uses solar energy to generate electricity, to heat or cool (or provide hot water for use in) a structure, or to provide solar process heat. Geothermal energy property: equipment used to produce, distribute, or use energy derived from a geothermal deposit (geothermal electric power equipment does not include, the electric transmission).</p> <p>Must be operational in the year credit is first taken. The property must be constructed by the taxpayer and used by the taxpayer. Excludes public utility property, passive solar systems, pool heating, or equipment used to generate steam for industrial or commercial processes.</p> <p>Credit may not be taken if project is subsidized or if it is financed from tax-exempt private activity bonds.</p>	Corporate Tax Credit	\$25,000/year plus 25% of the total tax remaining after the credit is taken. Remaining credit may be carried back to the three preceding years and then carried forward for 15 years.	10%	U.S. Internal Revenue Service	Federal
Renewable Energy Systems and Energy Efficiency Improvements Program	<p>Grant Program of \$23 million to agricultural producers or rural small businesses during 2003. Grant funds may be used to pay up to 25% of the eligible project costs. Minimum grant request of \$10,000. Max grant request of \$500,000.</p> <p>Eligible projects include those that derive energy from a wind, solar, biomass, or geothermal source, or hydrogen derived from biomass or water using wind, solar, or geothermal energy sources.</p> <p>Awards made on a competitive basis for purchase of renewable energy systems and energy improvements. The notice of availability of funds (NOFA) was issued on April 8, 2003, and applications are due to the USDA office for your state by June 6, 2003.</p>	Grants	\$10,000 - \$500,000	25% of eligible project costs.	U.S. Dept of Agriculture, Rural Business-Cooperative Service	Federal
Solar, Wind, and Geothermal Modified Accelerated Cost Recovery System (MACRS)	Businesses can recover investments in solar, wind, and geothermal property through depreciation deductions. The MACRS establishes a set of class lives for various types of property may be depreciated and ranges from 3-50 yrs. If in service after 1986, sol	Corporate Depreciation	5 years	Varies w/ value of property	U.S. Internal Revenue Service	Federal
Job Creation and Worker Assistance Act of 2002 - Special Depreciation	The Job Creation and Worker Assistance Act of 2002 an additional 30% depreciation on solar, wind, and geothermal property in the first year that it is placed in service. This depreciation only applies to property purchased after 9/10/2001 and before 9/11/2004 (and placed in service before 1/1/2005.	Corporate Depreciation	1 year	30% depreciation	U.S. Internal Revenue Service	Federal

Source: Database of State Incentives for Renewable Energy. www.dsireusa.org

Customer Group Screening, Prioritization and Economic Potential

The culminating set of activities associated with this update project required: (1) using the revised spreadsheet model to calculate a simple payback for each technology assessed for installation at specific customer type locations; (2) ranking, prioritizing and summarizing those technologies most likely to be viable within specific customer categories; and (3) using model screening results, along with other Alliant demographic information to estimate the economic potential for distributed generation within the Company's Minnesota service territory. Each of these steps is summarized in more detail below.

Simple Payback Calculations for Customer-Specific Applications:

Various size combinations of appropriate technologies were analyzed for each customer group and building type using GDS' revised distributed/onsite generation screening tool. Alliant's Minnesota-specific rate tariffs and average customer load profile data for each typical customer group/building type was modeled along with critical installation cost and operating characteristics of the technologies being assessed. In total, 3,115 unique scenarios were run. Thirty-six (36) separate generator size and type configurations were evaluated for each of thirty-five (35) individual customer sub groups at both a 90% and 50% capacity factor.⁵ Where applicable, a maximum heat recovery value of 50% was applied, and multiple fuel-use scenarios (*i.e.*, natural gas, diesel, bio-gas and bio-diesel) were considered.

Ranking and Prioritization:

Resulting simple payback information was recorded for each scenario run so that technologies could be rank ordered and a prioritized list of potentially viable customer-sited generation applications could be created. Table 4 in the previous Section summarizes these prioritized results. Sorted details of the model outputs are included in Attachment 1.

Economic Potential Assessment

The final activity associated with this project required the estimation of economic potential for distributed/onsite generation within Alliant's Minnesota service territory. In determining economic potential, applications for technologies showing paybacks of both 5 and 10 years or less were considered.

Within these payback criteria, economic potentials were estimated based on a 10%, 25% and 100% installation rate. Results assuming the 100% install rate provide an upper bound to this analysis. Other key assumptions made when developing these economic potential estimates include:

- End-use load profiles used for "typical customers" serve as proxy profile for the entire customer group;

⁵ Capacity factors of 24% and 33% were used when assessing the potential viability of wind and photovoltaic, respectively.

- As long as at least one technology within a specific customer group has a simple payback of 5 (or 10) years or less, that entire customer group was considered viable for distributed/onsite generation technology installations (the average capacity from all viable technologies was used as a proxy for unit size);
- Multiple units were applied to meet 100% of each specific customer groups peak load demand⁶;
- Number of customers for each "typical" customer group were derived from load data provided by Alliant, as used in the October 2001 Report, and correspond to the Company's Billing Premises.⁷

In closing, it is important to remind readers that the economic potential estimates and simple paybacks included in this report will vary greatly depending on actual customer counts, participation rates, individual customer economic and payback preferences, and numerous other simplifying assumptions used in the screening model including customer end-use profiles, utility rates, technology installation costs, etc. More detailed analysis and customer-specific assessment should be conducted before actual distributed/onsite generation investment decisions are made.

⁶ This is a change from the October 2001 Report, but more accurately reflects the installed capacity that would be viable at each customer site.

⁷ The commercial sector counts used in this analysis were established previously through a detailed review of Alliant's CIS billing data and may not fully capture the total number of customers that actually exist within each customer grouping. Residential counts for Alliant's Minnesota customers were also derived previously and were based on a combination of information presented in Electrical World's Directory of Electric Power Producers and Distributors, 1999, 107th Edition, and Alliant's own Annual Report for the Year 2000.

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ATTACHMENT 1A & 1B - Detailed Model Output and Sorted Results

PLEASE REFER TO EXCEL WORKBOOK ATTACHED ELECTRONICALLY TO THIS
REPORT (Report Attachments.xls)

EACH WORKSHEET WITHIN THE SUMMARY IS FORMATTED FOR DIRECT
PRINTOUT SO THAT PAGES CAN BE INSERTED HERE IN THIS REPORT

Two separate worksheets are included in this summary spreadsheet as follows:

- A. Customer Ranking: a 4-page prioritized list sorted by customer group and sub-sorted by quickest to longest payback;
- B. Technology Ranking: a 4-page prioritized list sorted by quickest to longest payback and sub-sorted by technology type;

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ATTACHMENT 2A & 2B - Economic Potential Scenario Results

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REPORT (Report Attachments.xls)

EACH WORKSHEET WITHIN THE SUMMARY IS FORMATTED FOR DIRECT
PRINTOUT SO THAT PAGES CAN BE INSERTED HERE IN THIS REPORT

Two separate worksheets are included in this summary spreadsheet as follows:

- A. Five Year Economic Potential: a 1-page list sorted by customer group and sub-sorted by quickest to longest payback;
- B. Ten Year Economic Potential: a 2-page list sorted by customer group and sub-sorted by quickest to longest payback;

ATTACHMENT 1A

30 YEAR PAYBACK OR BETTER - SORTED BY CUSTOMER GROUP & THEN BY PAYBACK

Customer Type/Sub-Group	Technology Configuration	Simple Payback (yrs)	Technology	Fuel	Capacity	Capacity Factor	Waste Heat Factor
Agriculture - Large	Stirling Engine, Bio-Gas fuel, 52 kW, 90 CF, 50 WHF	4	Stirling Engine	Bio-Gas	52	90	50
Agriculture - Large	Micro-Turbine, Bio-Gas fuel, 75 kW, 90 CF, 50 WHF	5	Micro-Turbine	Bio-Gas	75	90	50
Agriculture - Large	Stirling Engine, Bio-Gas fuel, 25 kW, 90 CF, 50 WHF	5	Stirling Engine	Bio-Gas	25	90	50
Agriculture - Large	Micro-Turbine, Bio-Gas fuel, 45 kW, 90 CF, 50 WHF	6	Micro-Turbine	Bio-Gas	45	90	50
Agriculture - Large	Micro-Turbine, Bio-Gas fuel, 60 kW, 90 CF, 50 WHF	6	Micro-Turbine	Bio-Gas	60	90	50
Agriculture - Large	Micro-Turbine, Bio-Gas fuel, 30 kW, 90 CF, 50 WHF	7	Micro-Turbine	Bio-Gas	30	90	50
Agriculture - Large	Stirling Engine, Bio-Gas fuel, 52 kW, 50 CF, 50 WHF	7	Stirling Engine	Bio-Gas	52	50	50
Agriculture - Large	Wind Turbine, None fuel, 250 kW, 24 CF, 0 WHF	8	Wind Turbine	None	250	24	0
Agriculture - Large	Micro-Turbine, Bio-Gas fuel, 75 kW, 50 CF, 50 WHF	9	Micro-Turbine	Bio-Gas	75	50	50
Agriculture - Large	Stirling Engine, Bio-Gas fuel, 25 kW, 50 CF, 50 WHF	9	Stirling Engine	Bio-Gas	25	50	50
Agriculture - Large	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	10	Wind Turbine	None	100	24	0
Agriculture - Large	Micro-Turbine, Bio-Gas fuel, 60 kW, 50 CF, 50 WHF	11	Micro-Turbine	Bio-Gas	60	50	50
Agriculture - Large	Micro-Turbine, Bio-Gas fuel, 45 kW, 50 CF, 50 WHF	12	Micro-Turbine	Bio-Gas	45	50	50
Agriculture - Large	Micro-Turbine, Bio-Gas fuel, 30 kW, 50 CF, 50 WHF	13	Micro-Turbine	Bio-Gas	30	50	50
Agriculture - Large	Wind Turbine, None fuel, 30 kW, 24 CF, 0 WHF	14	Wind Turbine	None	30	24	0
Agriculture - Large	Wind Turbine, None fuel, 10 kW, 24 CF, 0 WHF	17	Wind Turbine	None	10	24	0
Agriculture - Large	Wind Turbine, None fuel, 1 kW, 24 CF, 0 WHF	21	Wind Turbine	None	1	24	0
Agriculture - Small	Wind Turbine, None fuel, 30 kW, 24 CF, 0 WHF	13	Wind Turbine	None	30	24	0
Agriculture - Small	Wind Turbine, None fuel, 10 kW, 24 CF, 0 WHF	16	Wind Turbine	None	10	24	0
Agriculture - Small	Wind Turbine, None fuel, 1 kW, 24 CF, 0 WHF	19	Wind Turbine	None	1	24	0
C/I Manufacturing - Large	Wind Turbine, None fuel, 660 kW, 24 CF, 0 WHF	5	Wind Turbine	None	660	24	0
C/I Manufacturing - Large	Stirling Engine, Nat. Gas fuel, 52 kW, 90 CF, 50 WHF	8	Stirling Engine	Nat. Gas	52	90	50
C/I Manufacturing - Large	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	9	Stirling Engine	Nat. Gas	25	90	50
C/I Manufacturing - Large	Wind Turbine, None fuel, 250 kW, 24 CF, 0 WHF	9	Wind Turbine	None	250	24	0
C/I Manufacturing - Large	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	11	Wind Turbine	None	100	24	0
C/I Manufacturing - Large	Stirling Engine, Nat. Gas fuel, 52 kW, 50 CF, 50 WHF	14	Stirling Engine	Nat. Gas	52	50	50
C/I Manufacturing - Large	Wind Turbine, None fuel, 30 kW, 24 CF, 0 WHF	16	Wind Turbine	None	30	24	0
C/I Manufacturing - Large	Stirling Engine, Nat. Gas fuel, 25 kW, 50 CF, 50 WHF	17	Stirling Engine	Nat. Gas	25	50	50
C/I Manufacturing - Large	Wind Turbine, None fuel, 10 kW, 24 CF, 0 WHF	19	Wind Turbine	None	10	24	0
C/I Manufacturing - Large	Wind Turbine, None fuel, 1 kW, 24 CF, 0 WHF	23	Wind Turbine	None	1	24	0
C/I Manufacturing - Medium	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	10	Wind Turbine	None	100	24	0
C/I Manufacturing - Medium	Wind Turbine, None fuel, 30 kW, 24 CF, 0 WHF	14	Wind Turbine	None	30	24	0
C/I Manufacturing - Medium	Stirling Engine, Nat. Gas fuel, 25 kW, 50 CF, 50 WHF	15	Stirling Engine	Nat. Gas	25	50	50
C/I Manufacturing - Medium	Wind Turbine, None fuel, 10 kW, 24 CF, 0 WHF	16	Wind Turbine	None	10	24	0
C/I Manufacturing - Medium	Wind Turbine, None fuel, 1 kW, 24 CF, 0 WHF	20	Wind Turbine	None	1	24	0
C/I Manufacturing - Medium	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	21	Stirling Engine	Nat. Gas	25	90	50
C/I Manufacturing - Medium	Micro-Turbine, Bio-Gas fuel, 30 kW, 90 CF, 50 WHF	28	Micro-Turbine	Nat. Gas	30	90	50
C/I Manufacturing - NEC	Wind Turbine, None fuel, 660 kW, 24 CF, 0 WHF	6	Wind Turbine	None	660	24	0
C/I Manufacturing - NEC	Wind Turbine, None fuel, 250 kW, 24 CF, 0 WHF	10	Wind Turbine	None	250	24	0
C/I Manufacturing - NEC	Stirling Engine, Nat. Gas fuel, 52 kW, 90 CF, 50 WHF	12	Stirling Engine	Nat. Gas	52	90	50
C/I Manufacturing - NEC	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	13	Wind Turbine	None	100	24	0
C/I Manufacturing - NEC	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	14	Stirling Engine	Nat. Gas	25	90	50
C/I Manufacturing - NEC	Wind Turbine, None fuel, 30 kW, 24 CF, 0 WHF	18	Wind Turbine	None	30	24	0
C/I Manufacturing - NEC	Wind Turbine, None fuel, 10 kW, 24 CF, 0 WHF	22	Wind Turbine	None	10	24	0
C/I Manufacturing - NEC	Stirling Engine, Nat. Gas fuel, 52 kW, 50 CF, 50 WHF	23	Stirling Engine	Nat. Gas	52	50	50
C/I Manufacturing - NEC	Stirling Engine, Nat. Gas fuel, 25 kW, 50 CF, 50 WHF	27	Stirling Engine	Nat. Gas	25	50	50
C/I Manufacturing - NEC	Wind Turbine, None fuel, 1 kW, 24 CF, 0 WHF	27	Wind Turbine	None	1	24	0
C/I Manufacturing - Small	Wind Turbine, None fuel, 30 kW, 24 CF, 0 WHF	13	Wind Turbine	None	30	24	0
C/I Manufacturing - Small	Wind Turbine, None fuel, 10 kW, 24 CF, 0 WHF	16	Wind Turbine	None	10	24	0
C/I Manufacturing - Small	Wind Turbine, None fuel, 1 kW, 24 CF, 0 WHF	19	Wind Turbine	None	1	24	0
C/I Sewerage Systems	Stirling Engine, Bio-Gas fuel, 52 kW, 90 CF, 50 WHF	5	Stirling Engine	Bio-Gas	52	90	50
C/I Sewerage Systems	Micro-Turbine, Bio-Gas fuel, 75 kW, 90 CF, 50 WHF	6	Micro-Turbine	Bio-Gas	75	90	50
C/I Sewerage Systems	Stirling Engine, Bio-Gas fuel, 25 kW, 90 CF, 50 WHF	6	Stirling Engine	Bio-Gas	25	90	50
C/I Sewerage Systems	Micro-Turbine, Bio-Gas fuel, 45 kW, 90 CF, 50 WHF	7	Micro-Turbine	Bio-Gas	45	90	50
C/I Sewerage Systems	Micro-Turbine, Bio-Gas fuel, 60 kW, 90 CF, 50 WHF	7	Micro-Turbine	Bio-Gas	60	90	50
C/I Sewerage Systems	Micro-Turbine, Bio-Gas fuel, 30 kW, 90 CF, 50 WHF	8	Micro-Turbine	Bio-Gas	30	90	50
C/I Sewerage Systems	Stirling Engine, Bio-Gas fuel, 52 kW, 50 CF, 50 WHF	9	Stirling Engine	Bio-Gas	52	50	50
C/I Sewerage Systems	Wind Turbine, None fuel, 250 kW, 24 CF, 0 WHF	9	Wind Turbine	None	250	24	0
C/I Sewerage Systems	Micro-Turbine, Bio-Gas fuel, 75 kW, 50 CF, 50 WHF	11	Micro-Turbine	Bio-Gas	75	50	50
C/I Sewerage Systems	Stirling Engine, Bio-Gas fuel, 25 kW, 50 CF, 50 WHF	11	Stirling Engine	Bio-Gas	25	50	50
C/I Sewerage Systems	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	11	Wind Turbine	None	100	24	0
C/I Sewerage Systems	Micro-Turbine, Bio-Gas fuel, 60 kW, 50 CF, 50 WHF	12	Micro-Turbine	Bio-Gas	60	50	50
C/I Sewerage Systems	Micro-Turbine, Bio-Gas fuel, 45 kW, 50 CF, 50 WHF	13	Micro-Turbine	Bio-Gas	45	50	50
C/I Sewerage Systems	Micro-Turbine, Bio-Gas fuel, 30 kW, 50 CF, 50 WHF	15	Micro-Turbine	Bio-Gas	30	50	50
C/I Sewerage Systems	Wind Turbine, None fuel, 30 kW, 24 CF, 0 WHF	16	Wind Turbine	None	30	24	0
C/I Sewerage Systems	Wind Turbine, None fuel, 10 kW, 24 CF, 0 WHF	19	Wind Turbine	None	10	24	0
C/I Sewerage Systems	Fuel Cell, Bio-Gas fuel, 250 kW, 50 CF, 50 WHF	23	Fuel Cell	Bio-Gas	250	50	50
C/I Sewerage Systems	Wind Turbine, None fuel, 1 kW, 24 CF, 0 WHF	23	Wind Turbine	None	1	24	0
C/I Sewerage Systems	Fuel Cell, Bio-Gas fuel, 200 kW, 50 CF, 50 WHF	26	Fuel Cell	Bio-Gas	200	50	50
C/I Warehouse - Large	Wind Turbine, None fuel, 660 kW, 24 CF, 0 WHF	5	Wind Turbine	None	660	24	0
C/I Warehouse - Large	Stirling Engine, Nat. Gas fuel, 52 kW, 90 CF, 50 WHF	8	Stirling Engine	Nat. Gas	52	90	50
C/I Warehouse - Large	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	9	Stirling Engine	Nat. Gas	25	90	50
C/I Warehouse - Large	Wind Turbine, None fuel, 250 kW, 24 CF, 0 WHF	9	Wind Turbine	None	250	24	0
C/I Warehouse - Large	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	11	Wind Turbine	None	100	24	0
C/I Warehouse - Large	Stirling Engine, Nat. Gas fuel, 52 kW, 50 CF, 50 WHF	14	Stirling Engine	Nat. Gas	52	50	50
C/I Warehouse - Large	Wind Turbine, None fuel, 30 kW, 24 CF, 0 WHF	15	Wind Turbine	None	30	24	0
C/I Warehouse - Large	Micro-Turbine, Nat. Gas fuel, 75 kW, 90 CF, 50 WHF	17	Micro-Turbine	Nat. Gas	75	90	50
C/I Warehouse - Large	Stirling Engine, Nat. Gas fuel, 25 kW, 50 CF, 50 WHF	17	Stirling Engine	Nat. Gas	25	50	50
C/I Warehouse - Large	Wind Turbine, None fuel, 10 kW, 24 CF, 0 WHF	18	Wind Turbine	None	10	24	0
C/I Warehouse - Large	Wind Turbine, None fuel, 1 kW, 24 CF, 0 WHF	23	Wind Turbine	None	1	24	0
C/I Warehouse - Large	Micro-Turbine, Nat. Gas fuel, 60 kW, 90 CF, 50 WHF	26	Micro-Turbine	Nat. Gas	60	90	50
C/I Warehouse - Small	Wind Turbine, None fuel, 10 kW, 24 CF, 0 WHF	14	Wind Turbine	None	10	24	0
C/I Warehouse - Small	Wind Turbine, None fuel, 1 kW, 24 CF, 0 WHF	17	Wind Turbine	None	1	24	0
C/I Warehouse - Small	Solar PV, None fuel, 1 kW, 33 CF, 0 WHF	30	Solar PV	None	1	33	0
C/I Wholesale Trade - Large	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	6	Stirling Engine	Nat. Gas	25	90	50
C/I Wholesale Trade - Large	Wind Turbine, None fuel, 250 kW, 24 CF, 0 WHF	7	Wind Turbine	None	250	24	0
C/I Wholesale Trade - Large	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	8	Wind Turbine	None	100	24	0
C/I Wholesale Trade - Large	Micro-Turbine, Nat. Gas fuel, 30 kW, 90 CF, 50 WHF	10	Micro-Turbine	Nat. Gas	30	90	50
C/I Wholesale Trade - Large	Micro-Turbine, Nat. Gas fuel, 45 kW, 90 CF, 50 WHF	10	Micro-Turbine	Nat. Gas	45	90	50
C/I Wholesale Trade - Large	Stirling Engine, Nat. Gas fuel, 25 kW, 50 CF, 50 WHF	10	Stirling Engine	Nat. Gas	25	50	50

ATTACHMENT 1A

Customer Type/Sub-Group	Technology Configuration	Simple Payback (yrs)	Technology	Fuel	Capacity	Capacity Factor	Waste Heat Factor
C/I Wholesale Trade - Large	Stirling Engine, Nat. Gas fuel, 52 kW, 50 CF, 50 WHF	10	Stirling Engine	Nat. Gas	52	50	50
C/I Wholesale Trade - Large	Micro-Turbine, Nat. Gas fuel, 60 kW, 90 CF, 50 WHF	11	Micro-Turbine	Nat. Gas	60	90	50
C/I Wholesale Trade - Large	Micro-Turbine, Nat. Gas fuel, 75 kW, 90 CF, 50 WHF	11	Micro-Turbine	Nat. Gas	75	90	50
C/I Wholesale Trade - Large	Stirling Engine, Nat. Gas fuel, 52 kW, 90 CF, 50 WHF	11	Stirling Engine	Nat. Gas	52	90	50
C/I Wholesale Trade - Large	Wind Turbine, None fuel, 30 kW, 24 CF, 0 WHF	12	Wind Turbine	None	30	24	0
C/I Wholesale Trade - Large	Micro-Turbine, Nat. Gas fuel, 75 kW, 50 CF, 50 WHF	13	Micro-Turbine	Nat. Gas	75	50	50
C/I Wholesale Trade - Large	Wind Turbine, None fuel, 10 kW, 24 CF, 0 WHF	14	Wind Turbine	None	10	24	0
C/I Wholesale Trade - Large	Micro-Turbine, Nat. Gas fuel, 60 kW, 50 CF, 50 WHF	16	Micro-Turbine	Nat. Gas	60	50	50
C/I Wholesale Trade - Large	Reciprocating Engine, Nat. Gas fuel, 10 kW, 90 CF, 50 WHF	16	Reciprocating Engine	Nat. Gas	10	90	50
C/I Wholesale Trade - Large	Reciprocating Engine, Nat. Gas fuel, 255 kW, 50 CF, 50 WHF	17	Reciprocating Engine	Nat. Gas	255	50	50
C/I Wholesale Trade - Large	Wind Turbine, None fuel, 1 kW, 24 CF, 0 WHF	18	Wind Turbine	None	1	24	0
C/I Wholesale Trade - Large	Micro-Turbine, Nat. Gas fuel, 30 kW, 50 CF, 50 WHF	19	Micro-Turbine	Nat. Gas	30	50	50
C/I Wholesale Trade - Large	Micro-Turbine, Nat. Gas fuel, 45 kW, 50 CF, 50 WHF	19	Micro-Turbine	Nat. Gas	45	50	50
C/I Wholesale Trade - Large	Reciprocating Engine, Nat. Gas fuel, 61 kW, 90 CF, 50 WHF	19	Reciprocating Engine	Nat. Gas	61	90	50
C/I Wholesale Trade - Medium	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	3	Stirling Engine	Nat. Gas	25	90	50
C/I Wholesale Trade - Medium	Stirling Engine, Nat. Gas fuel, 52 kW, 90 CF, 50 WHF	3	Stirling Engine	Nat. Gas	52	90	50
C/I Wholesale Trade - Medium	Micro-Turbine, Nat. Gas fuel, 30 kW, 90 CF, 50 WHF	4	Micro-Turbine	Nat. Gas	30	90	50
C/I Wholesale Trade - Medium	Micro-Turbine, Nat. Gas fuel, 45 kW, 90 CF, 50 WHF	4	Micro-Turbine	Nat. Gas	45	90	50
C/I Wholesale Trade - Medium	Micro-Turbine, Nat. Gas fuel, 60 kW, 90 CF, 50 WHF	4	Micro-Turbine	Nat. Gas	60	90	50
C/I Wholesale Trade - Medium	Reciprocating Engine, Nat. Gas fuel, 10 kW, 90 CF, 50 WHF	4	Reciprocating Engine	Nat. Gas	10	90	50
C/I Wholesale Trade - Medium	Reciprocating Engine, Nat. Gas fuel, 61 kW, 90 CF, 50 WHF	4	Reciprocating Engine	Nat. Gas	61	90	50
C/I Wholesale Trade - Medium	Stirling Engine, Nat. Gas fuel, 52 kW, 50 CF, 50 WHF	5	Stirling Engine	Nat. Gas	52	50	50
C/I Wholesale Trade - Medium	Wind Turbine, None fuel, 250 kW, 24 CF, 0 WHF	5	Wind Turbine	None	250	24	0
C/I Wholesale Trade - Medium	Micro-Turbine, Nat. Gas fuel, 75 kW, 50 CF, 50 WHF	6	Micro-Turbine	Nat. Gas	75	50	50
C/I Wholesale Trade - Medium	Reciprocating Engine, Nat. Gas fuel, 27 kW, 90 CF, 50 WHF	6	Reciprocating Engine	Nat. Gas	27	90	50
C/I Wholesale Trade - Medium	Stirling Engine, Nat. Gas fuel, 25 kW, 50 CF, 50 WHF	6	Stirling Engine	Nat. Gas	25	50	50
C/I Wholesale Trade - Medium	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	6	Wind Turbine	None	100	24	0
C/I Wholesale Trade - Medium	Micro-Turbine, Nat. Gas fuel, 60 kW, 50 CF, 50 WHF	7	Micro-Turbine	Nat. Gas	60	50	50
C/I Wholesale Trade - Medium	Reciprocating Engine, Nat. Gas fuel, 10 kW, 50 CF, 50 WHF	7	Reciprocating Engine	Nat. Gas	10	50	50
C/I Wholesale Trade - Medium	Reciprocating Engine, Nat. Gas fuel, 61 kW, 50 CF, 50 WHF	7	Reciprocating Engine	Nat. Gas	61	50	50
C/I Wholesale Trade - Medium	Micro-Turbine, Nat. Gas fuel, 30 kW, 50 CF, 50 WHF	8	Micro-Turbine	Nat. Gas	30	50	50
C/I Wholesale Trade - Medium	Micro-Turbine, Nat. Gas fuel, 45 kW, 50 CF, 50 WHF	8	Micro-Turbine	Nat. Gas	45	50	50
C/I Wholesale Trade - Medium	Wind Turbine, None fuel, 30 kW, 24 CF, 0 WHF	9	Wind Turbine	None	30	24	0
C/I Wholesale Trade - Medium	Reciprocating Engine, Diesel fuel, 11 kW, 90 CF, 50 WHF	10	Reciprocating Engine	Diesel	11	90	50
C/I Wholesale Trade - Medium	Wind Turbine, None fuel, 10 kW, 24 CF, 0 WHF	10	Wind Turbine	None	10	24	0
C/I Wholesale Trade - Medium	Reciprocating Engine, Nat. Gas fuel, 27 kW, 50 CF, 50 WHF	11	Reciprocating Engine	Nat. Gas	27	50	50
C/I Wholesale Trade - Medium	Reciprocating Engine, Diesel fuel, 68 kW, 90 CF, 50 WHF	12	Reciprocating Engine	Diesel	68	90	50
C/I Wholesale Trade - Medium	Wind Turbine, None fuel, 1 kW, 24 CF, 0 WHF	12	Wind Turbine	None	1	24	0
C/I Wholesale Trade - Medium	Reciprocating Engine, Diesel fuel, 11 kW, 50 CF, 50 WHF	21	Reciprocating Engine	Diesel	11	50	50
C/I Wholesale Trade - Medium	Solar PV, None fuel, 1 kW, 33 CF, 0 WHF	21	Solar PV	None	1	33	0
C/I Wholesale Trade - Medium	Reciprocating Engine, Diesel fuel, 68 kW, 50 CF, 50 WHF	24	Reciprocating Engine	Diesel	68	50	50
C/I Wholesale Trade - Small	Wind Turbine, None fuel, 30 kW, 24 CF, 0 WHF	11	Wind Turbine	None	30	24	0
C/I Wholesale Trade - Small	Wind Turbine, None fuel, 10 kW, 24 CF, 0 WHF	14	Wind Turbine	None	10	24	0
C/I Wholesale Trade - Small	Wind Turbine, None fuel, 1 kW, 24 CF, 0 WHF	17	Wind Turbine	None	1	24	0
C/I Wholesale Trade - Small	Reciprocating Engine, Nat. Gas fuel, 10 kW, 50 CF, 50 WHF	25	Reciprocating Engine	Nat. Gas	10	50	50
C/I Wholesale Trade - Small	Solar PV, None fuel, 1 kW, 33 CF, 0 WHF	29	Solar PV	None	1	33	0
Commercial Assembly - Large	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	5	Stirling Engine	Nat. Gas	25	90	50
Commercial Assembly - Large	Stirling Engine, Nat. Gas fuel, 52 kW, 50 CF, 50 WHF	5	Stirling Engine	Nat. Gas	52	50	50
Commercial Assembly - Large	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	8	Wind Turbine	None	100	24	0
Commercial Assembly - Large	Micro-Turbine, Nat. Gas fuel, 30 kW, 90 CF, 50 WHF	9	Micro-Turbine	Nat. Gas	30	90	50
Commercial Assembly - Large	Stirling Engine, Nat. Gas fuel, 25 kW, 50 CF, 50 WHF	10	Stirling Engine	Nat. Gas	25	50	50
Commercial Assembly - Large	Reciprocating Engine, Nat. Gas fuel, 10 kW, 90 CF, 50 WHF	12	Reciprocating Engine	Nat. Gas	10	90	50
Commercial Assembly - Large	Wind Turbine, None fuel, 30 kW, 24 CF, 0 WHF	12	Wind Turbine	None	30	24	0
Commercial Assembly - Large	Wind Turbine, None fuel, 10 kW, 24 CF, 0 WHF	14	Wind Turbine	None	10	24	0
Commercial Assembly - Large	Micro-Turbine, Nat. Gas fuel, 45 kW, 50 CF, 50 WHF	16	Micro-Turbine	Nat. Gas	45	50	50
Commercial Assembly - Large	Micro-Turbine, Nat. Gas fuel, 30 kW, 50 CF, 50 WHF	17	Micro-Turbine	Nat. Gas	30	50	50
Commercial Assembly - Large	Wind Turbine, None fuel, 1 kW, 24 CF, 0 WHF	17	Wind Turbine	None	1	24	0
Commercial Assembly - Large	Reciprocating Engine, Nat. Gas fuel, 10 kW, 50 CF, 50 WHF	26	Reciprocating Engine	Nat. Gas	10	50	50
Commercial Assembly - Large	Solar PV, None fuel, 1 kW, 33 CF, 0 WHF	30	Solar PV	None	1	33	0
Commercial Assembly - Small	Wind Turbine, None fuel, 30 kW, 24 CF, 0 WHF	10	Wind Turbine	None	30	24	0
Commercial Assembly - Small	Reciprocating Engine, Nat. Gas fuel, 10 kW, 50 CF, 50 WHF	12	Reciprocating Engine	Nat. Gas	10	50	50
Commercial Assembly - Small	Wind Turbine, None fuel, 10 kW, 24 CF, 0 WHF	12	Wind Turbine	None	10	24	0
Commercial Assembly - Small	Wind Turbine, None fuel, 1 kW, 24 CF, 0 WHF	15	Wind Turbine	None	1	24	0
Commercial Assembly - Small	Solar PV, None fuel, 1 kW, 33 CF, 0 WHF	26	Solar PV	None	1	33	0
Commercial Health Care - Large	Wind Turbine, None fuel, 660 kW, 24 CF, 0 WHF	5	Wind Turbine	None	660	24	0
Commercial Health Care - Large	Stirling Engine, Nat. Gas fuel, 52 kW, 90 CF, 50 WHF	6	Stirling Engine	Nat. Gas	52	90	50
Commercial Health Care - Large	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	7	Stirling Engine	Nat. Gas	25	90	50
Commercial Health Care - Large	Wind Turbine, None fuel, 250 kW, 24 CF, 0 WHF	7	Wind Turbine	None	250	24	0
Commercial Health Care - Large	Micro-Turbine, Nat. Gas fuel, 75 kW, 90 CF, 50 WHF	9	Micro-Turbine	Nat. Gas	75	90	50
Commercial Health Care - Large	Reciprocating Engine, Nat. Gas fuel, 770 kW, 90 CF, 50 WHF	9	Reciprocating Engine	Nat. Gas	770	90	50
Commercial Health Care - Large	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	9	Wind Turbine	None	100	24	0
Commercial Health Care - Large	Reciprocating Engine, Nat. Gas fuel, 255 kW, 90 CF, 50 WHF	10	Reciprocating Engine	Nat. Gas	255	90	50
Commercial Health Care - Large	Stirling Engine, Nat. Gas fuel, 52 kW, 50 CF, 50 WHF	10	Stirling Engine	Nat. Gas	52	50	50
Commercial Health Care - Large	Micro-Turbine, Nat. Gas fuel, 60 kW, 90 CF, 50 WHF	12	Micro-Turbine	Nat. Gas	60	90	50
Commercial Health Care - Large	Stirling Engine, Nat. Gas fuel, 25 kW, 50 CF, 50 WHF	13	Stirling Engine	Nat. Gas	25	50	50
Commercial Health Care - Large	Wind Turbine, None fuel, 30 kW, 24 CF, 0 WHF	13	Wind Turbine	None	30	24	0
Commercial Health Care - Large	Micro-Turbine, Nat. Gas fuel, 30 kW, 90 CF, 50 WHF	15	Micro-Turbine	Nat. Gas	30	90	50
Commercial Health Care - Large	Micro-Turbine, Nat. Gas fuel, 45 kW, 90 CF, 50 WHF	15	Micro-Turbine	Nat. Gas	45	90	50
Commercial Health Care - Large	Wind Turbine, None fuel, 10 kW, 24 CF, 0 WHF	16	Wind Turbine	None	10	24	0
Commercial Health Care - Large	Reciprocating Engine, Nat. Gas fuel, 770 kW, 50 CF, 50 WHF	17	Reciprocating Engine	Nat. Gas	770	50	50
Commercial Health Care - Large	Micro-Turbine, Nat. Gas fuel, 75 kW, 50 CF, 50 WHF	18	Micro-Turbine	Nat. Gas	75	50	50
Commercial Health Care - Large	Reciprocating Engine, Nat. Gas fuel, 255 kW, 50 CF, 50 WHF	19	Reciprocating Engine	Nat. Gas	255	50	50
Commercial Health Care - Large	Micro-Turbine, Nat. Gas fuel, 30 kW, 50 CF, 50 WHF	20	Micro-Turbine	Nat. Gas	30	50	50
Commercial Health Care - Large	Micro-Turbine, Nat. Gas fuel, 508 kW, 90 CF, 50 WHF	20	Micro-Turbine	Nat. Gas	508	90	50
Commercial Health Care - Large	Micro-Turbine, Nat. Gas fuel, 848 kW, 50 CF, 50 WHF	20	Micro-Turbine	Nat. Gas	848	50	50
Commercial Health Care - Large	Wind Turbine, None fuel, 1 kW, 24 CF, 0 WHF	20	Wind Turbine	None	1	24	0
Commercial Health Care - Large	Micro-Turbine, Nat. Gas fuel, 60 kW, 50 CF, 50 WHF	23	Micro-Turbine	Nat. Gas	60	50	50
Commercial Health Care - Large	Fuel Cell, Nat. Gas fuel, 250 kW, 90 CF, 50 WHF	24	Fuel Cell	Nat. Gas	250	90	50
Commercial Health Care - Large	Fuel Cell, Nat. Gas fuel, 200 kW, 90 CF, 50 WHF	28	Fuel Cell	Nat. Gas	200	90	50
Commercial Health Care - Large	Micro-Turbine, Nat. Gas fuel, 45 kW, 50 CF, 50 WHF	30	Micro-Turbine	Nat. Gas	45	50	50
Commercial Health Care - Medium	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	4	Stirling Engine	Nat. Gas	25	90	50
Commercial Health Care - Medium	Stirling Engine, Nat. Gas fuel, 52 kW, 50 CF, 50 WHF	5	Stirling Engine	Nat. Gas	52	50	50
Commercial Health Care - Medium	Stirling Engine, Nat. Gas fuel, 52 kW, 90 CF, 50 WHF	5	Stirling Engine	Nat. Gas	52	90	50
Commercial Health Care - Medium	Micro-Turbine, Nat. Gas fuel, 30 kW, 90 CF, 50 WHF	7	Micro-Turbine	Nat. Gas	30	90	50
Commercial Health Care - Medium	Micro-Turbine, Nat. Gas fuel, 45 kW, 90 CF, 50 WHF	7	Micro-Turbine	Nat. Gas	45	90	50

ATTACHMENT 1A

Customer Type/Sub-Group	Technology Configuration	Simple Payback (yrs)	Technology	Fuel	Capacity	Capacity Factor	Waste Heat Factor
Commercial Health Care - Medium	Stirling Engine, Nat. Gas fuel, 25 kW, 50 CF, 50 WHF	7	Stirling Engine	Nat. Gas	25	50	50
Commercial Health Care - Medium	Micro-Turbine, Nat. Gas fuel, 75 kW, 50 CF, 50 WHF	9	Micro-Turbine	Nat. Gas	75	50	50
Commercial Health Care - Medium	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	9	Wind Turbine	None	100	24	0
Commercial Health Care - Medium	Reciprocating Engine, Nat. Gas fuel, 10 kW, 90 CF, 50 WHF	10	Reciprocating Engine	Nat. Gas	10	90	50
Commercial Health Care - Medium	Micro-Turbine, Nat. Gas fuel, 60 kW, 50 CF, 50 WHF	11	Micro-Turbine	Nat. Gas	60	50	50
Commercial Health Care - Medium	Micro-Turbine, Nat. Gas fuel, 30 kW, 50 CF, 50 WHF	13	Micro-Turbine	Nat. Gas	30	50	50
Commercial Health Care - Medium	Micro-Turbine, Nat. Gas fuel, 45 kW, 50 CF, 50 WHF	13	Micro-Turbine	Nat. Gas	45	50	50
Commercial Health Care - Medium	Wind Turbine, None fuel, 30 kW, 24 CF, 0 WHF	13	Wind Turbine	None	30	24	0
Commercial Health Care - Medium	Wind Turbine, None fuel, 10 kW, 24 CF, 0 WHF	15	Wind Turbine	None	10	24	0
Commercial Health Care - Medium	Wind Turbine, None fuel, 1 kW, 24 CF, 0 WHF	19	Wind Turbine	None	1	24	0
Commercial Health Care - Medium	Reciprocating Engine, Nat. Gas fuel, 10 kW, 50 CF, 50 WHF	22	Reciprocating Engine	Nat. Gas	10	50	50
Commercial Health Care - Small	Wind Turbine, None fuel, 10 kW, 24 CF, 0 WHF	15	Wind Turbine	None	10	24	0
Commercial Health Care - Small	Wind Turbine, None fuel, 1 kW, 24 CF, 0 WHF	18	Wind Turbine	None	1	24	0
Commercial Hotel / Motel - All Electric	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	5	Stirling Engine	Nat. Gas	25	90	50
Commercial Hotel / Motel - All Electric	Micro-Turbine, Nat. Gas fuel, 30 kW, 90 CF, 50 WHF	8	Micro-Turbine	Nat. Gas	30	90	50
Commercial Hotel / Motel - All Electric	Stirling Engine, Nat. Gas fuel, 25 kW, 50 CF, 50 WHF	8	Stirling Engine	Nat. Gas	25	50	50
Commercial Hotel / Motel - All Electric	Stirling Engine, Nat. Gas fuel, 52 kW, 50 CF, 50 WHF	8	Stirling Engine	Nat. Gas	52	50	50
Commercial Hotel / Motel - All Electric	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	9	Wind Turbine	None	100	24	0
Commercial Hotel / Motel - All Electric	Micro-Turbine, Nat. Gas fuel, 45 kW, 90 CF, 50 WHF	9	Micro-Turbine	Nat. Gas	45	90	50
Commercial Hotel / Motel - All Electric	Stirling Engine, Nat. Gas fuel, 52 kW, 90 CF, 50 WHF	11	Stirling Engine	Nat. Gas	52	90	50
Commercial Hotel / Motel - All Electric	Micro-Turbine, Nat. Gas fuel, 60 kW, 90 CF, 50 WHF	12	Micro-Turbine	Nat. Gas	60	90	50
Commercial Hotel / Motel - All Electric	Micro-Turbine, Nat. Gas fuel, 75 kW, 50 CF, 50 WHF	12	Micro-Turbine	Nat. Gas	75	50	50
Commercial Hotel / Motel - All Electric	Micro-Turbine, Nat. Gas fuel, 60 kW, 50 CF, 50 WHF	13	Micro-Turbine	Nat. Gas	60	50	50
Commercial Hotel / Motel - All Electric	Wind Turbine, None fuel, 30 kW, 24 CF, 0 WHF	13	Wind Turbine	None	30	24	0
Commercial Hotel / Motel - All Electric	Micro-Turbine, Nat. Gas fuel, 30 kW, 50 CF, 50 WHF	16	Micro-Turbine	Nat. Gas	30	50	50
Commercial Hotel / Motel - All Electric	Micro-Turbine, Nat. Gas fuel, 45 kW, 50 CF, 50 WHF	16	Micro-Turbine	Nat. Gas	45	50	50
Commercial Hotel / Motel - All Electric	Wind Turbine, None fuel, 10 kW, 24 CF, 0 WHF	16	Wind Turbine	None	10	24	0
Commercial Hotel / Motel - All Electric	Reciprocating Engine, Nat. Gas fuel, 10 kW, 90 CF, 50 WHF	17	Reciprocating Engine	Nat. Gas	10	90	50
Commercial Hotel / Motel - All Electric	Wind Turbine, None fuel, 1 kW, 24 CF, 0 WHF	20	Wind Turbine	None	1	24	0
Commercial Hotel / Motel - Gas Heat	Stirling Engine, Nat. Gas fuel, 25 kW, 50 CF, 50 WHF	8	Stirling Engine	Nat. Gas	25	50	50
Commercial Hotel / Motel - Gas Heat	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	9	Wind Turbine	None	100	24	0
Commercial Hotel / Motel - Gas Heat	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	10	Stirling Engine	Nat. Gas	25	90	50
Commercial Hotel / Motel - Gas Heat	Micro-Turbine, Nat. Gas fuel, 30 kW, 90 CF, 50 WHF	11	Micro-Turbine	Nat. Gas	30	90	50
Commercial Hotel / Motel - Gas Heat	Wind Turbine, None fuel, 30 kW, 24 CF, 0 WHF	13	Wind Turbine	None	30	24	0
Commercial Hotel / Motel - Gas Heat	Reciprocating Engine, Nat. Gas fuel, 10 kW, 90 CF, 50 WHF	14	Reciprocating Engine	Nat. Gas	10	90	50
Commercial Hotel / Motel - Gas Heat	Micro-Turbine, Nat. Gas fuel, 30 kW, 50 CF, 50 WHF	15	Micro-Turbine	Nat. Gas	30	50	50
Commercial Hotel / Motel - Gas Heat	Wind Turbine, None fuel, 10 kW, 24 CF, 0 WHF	15	Wind Turbine	None	10	24	0
Commercial Hotel / Motel - Gas Heat	Micro-Turbine, Nat. Gas fuel, 45 kW, 50 CF, 50 WHF	16	Micro-Turbine	Nat. Gas	45	50	50
Commercial Hotel / Motel - Gas Heat	Stirling Engine, Nat. Gas fuel, 52 kW, 50 CF, 50 WHF	16	Stirling Engine	Nat. Gas	52	50	50
Commercial Hotel / Motel - Gas Heat	Micro-Turbine, Nat. Gas fuel, 60 kW, 50 CF, 50 WHF	18	Micro-Turbine	Nat. Gas	60	50	50
Commercial Hotel / Motel - Gas Heat	Micro-Turbine, Nat. Gas fuel, 45 kW, 90 CF, 50 WHF	19	Micro-Turbine	Nat. Gas	45	90	50
Commercial Hotel / Motel - Gas Heat	Wind Turbine, None fuel, 1 kW, 24 CF, 0 WHF	19	Wind Turbine	None	1	24	0
Commercial Hotel / Motel - Gas Heat	Micro-Turbine, Nat. Gas fuel, 75 kW, 50 CF, 50 WHF	20	Micro-Turbine	Nat. Gas	75	50	50
Commercial Hotel / Motel - Gas Heat	Reciprocating Engine, Nat. Gas fuel, 10 kW, 50 CF, 50 WHF	30	Reciprocating Engine	Nat. Gas	10	50	50
Commercial Housing	Fuel Cell, Nat. Gas fuel, 200 kW, 90 CF, 50 WHF	4	Fuel Cell	Nat. Gas	200	90	50
Commercial Housing	Fuel Cell, Nat. Gas fuel, 250 kW, 90 CF, 50 WHF	4	Fuel Cell	Nat. Gas	250	90	50
Commercial Housing	Fuel Cell, Nat. Gas fuel, 1000 kW, 50 CF, 50 WHF	6	Fuel Cell	Nat. Gas	1000	50	50
Commercial Housing	Fuel Cell, Nat. Gas fuel, 2000 kW, 50 CF, 50 WHF	6	Fuel Cell	Nat. Gas	2000	50	50
Commercial Housing	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	6	Stirling Engine	Nat. Gas	25	90	50
Commercial Housing	Fuel Cell, Nat. Gas fuel, 250 kW, 50 CF, 50 WHF	7	Fuel Cell	Nat. Gas	250	50	50
Commercial Housing	Fuel Cell, Nat. Gas fuel, 200 kW, 50 CF, 50 WHF	8	Fuel Cell	Nat. Gas	200	50	50
Commercial Housing	Stirling Engine, Nat. Gas fuel, 52 kW, 50 CF, 50 WHF	9	Stirling Engine	Nat. Gas	52	50	50
Commercial Housing	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	9	Wind Turbine	None	100	24	0
Commercial Housing	Micro-Turbine, Nat. Gas fuel, 30 kW, 50 CF, 50 WHF	11	Micro-Turbine	Nat. Gas	30	50	50
Commercial Housing	Micro-Turbine, Nat. Gas fuel, 45 kW, 50 CF, 50 WHF	11	Micro-Turbine	Nat. Gas	45	50	50
Commercial Housing	Stirling Engine, Nat. Gas fuel, 25 kW, 50 CF, 50 WHF	11	Stirling Engine	Nat. Gas	25	50	50
Commercial Housing	Wind Turbine, None fuel, 30 kW, 24 CF, 0 WHF	12	Wind Turbine	None	30	24	0
Commercial Housing	Wind Turbine, None fuel, 10 kW, 24 CF, 0 WHF	15	Wind Turbine	None	10	24	0
Commercial Housing	Wind Turbine, None fuel, 1 kW, 24 CF, 0 WHF	18	Wind Turbine	None	1	24	0
Commercial Housing	Reciprocating Engine, Nat. Gas fuel, 10 kW, 50 CF, 50 WHF	20	Reciprocating Engine	Nat. Gas	10	50	50
Commercial Office	Wind Turbine, None fuel, 10 kW, 24 CF, 0 WHF	14	Wind Turbine	None	10	24	0
Commercial Office	Wind Turbine, None fuel, 1 kW, 24 CF, 0 WHF	17	Wind Turbine	None	1	24	0
Commercial Office	Solar PV, None fuel, 1 kW, 33 CF, 0 WHF	30	Solar PV	None	1	33	0
Commercial Retail - Large	Wind Turbine, None fuel, 660 kW, 24 CF, 0 WHF	5	Wind Turbine	None	660	24	0
Commercial Retail - Large	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	8	Stirling Engine	Nat. Gas	25	90	50
Commercial Retail - Large	Wind Turbine, None fuel, 250 kW, 24 CF, 0 WHF	8	Wind Turbine	None	250	24	0
Commercial Retail - Large	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	10	Wind Turbine	None	100	24	0
Commercial Retail - Large	Stirling Engine, Nat. Gas fuel, 25 kW, 50 CF, 50 WHF	12	Stirling Engine	Nat. Gas	25	50	50
Commercial Retail - Large	Micro-Turbine, Nat. Gas fuel, 30 kW, 90 CF, 50 WHF	14	Micro-Turbine	Nat. Gas	30	90	50
Commercial Retail - Large	Stirling Engine, Nat. Gas fuel, 52 kW, 90 CF, 50 WHF	14	Stirling Engine	Nat. Gas	52	50	50
Commercial Retail - Large	Wind Turbine, None fuel, 30 kW, 24 CF, 0 WHF	14	Wind Turbine	None	30	24	0
Commercial Retail - Large	Wind Turbine, None fuel, 10 kW, 24 CF, 0 WHF	16	Wind Turbine	None	10	24	0
Commercial Retail - Large	Micro-Turbine, Nat. Gas fuel, 45 kW, 90 CF, 50 WHF	18	Micro-Turbine	Nat. Gas	45	90	50
Commercial Retail - Large	Micro-Turbine, Nat. Gas fuel, 75 kW, 50 CF, 50 WHF	19	Micro-Turbine	Nat. Gas	75	50	50
Commercial Retail - Large	Wind Turbine, None fuel, 1 kW, 24 CF, 0 WHF	20	Wind Turbine	None	1	24	0
Commercial Retail - Large	Micro-Turbine, Nat. Gas fuel, 60 kW, 50 CF, 50 WHF	22	Micro-Turbine	Nat. Gas	60	50	50
Commercial Retail - Large	Micro-Turbine, Nat. Gas fuel, 60 kW, 90 CF, 50 WHF	23	Micro-Turbine	Nat. Gas	60	90	50
Commercial Retail - Large	Stirling Engine, Nat. Gas fuel, 52 kW, 90 CF, 50 WHF	23	Stirling Engine	Nat. Gas	52	90	50
Commercial Retail - Large	Micro-Turbine, Nat. Gas fuel, 75 kW, 90 CF, 50 WHF	24	Micro-Turbine	Nat. Gas	75	90	50
Commercial Retail - Large	Micro-Turbine, Nat. Gas fuel, 30 kW, 50 CF, 50 WHF	27	Micro-Turbine	Nat. Gas	30	50	50
Commercial Retail - Large	Micro-Turbine, Nat. Gas fuel, 45 kW, 50 CF, 50 WHF	28	Micro-Turbine	Nat. Gas	45	50	50
Commercial Retail - Medium	Wind Turbine, None fuel, 100 kW, 24 CF, 0 WHF	9	Wind Turbine	None	100	24	0
Commercial Retail - Medium	Stirling Engine, Nat. Gas fuel, 25 kW, 90 CF, 50 WHF	11	Stirling Engine	Nat. Gas	25	90	50
Commercial Retail - Medium	Stirling Engine, Nat. Gas fuel, 25 kW, 50 CF, 50 WHF	13	Stirling Engine	Nat. Gas	25	50	50
Commercial Retail - Medium	Wind Turbine, None fuel, 30 kW, 24 CF, 0 WHF	13	Wind Turbine	None	30	24	0
Commercial Retail - Medium	Micro-Turbine, Nat. Gas fuel, 30 kW, 90 CF, 50 WHF	15	Micro-Turbine	Nat. Gas	30	90	50
Commercial Retail - Medium	Wind Turbine, None fuel, 10 kW, 24 CF, 0 WHF	16	Wind Turbine	None	10	24	0
Commercial Retail - Medium	Stirling Engine, Nat. Gas fuel, 52 kW, 50 CF, 50 WHF	19	Stirling Engine	Nat. Gas	52	50	50
Commercial Retail - Medium	Wind Turbine, None fuel, 1 kW, 24 CF, 0 WHF	20	Wind Turbine	None	1	24	0
Commercial Retail - Medium	Micro-Turbine, Nat. Gas fuel, 60 kW, 50 CF, 50 WHF	23	Micro-Turbine	Nat. Gas	60	50	50
Commercial Retail - Medium	Micro-Turbine, Nat. Gas fuel, 75 kW, 50 CF, 50 WHF	23	Micro-Turbine	Nat. Gas	75	50	50
Commercial Retail - Medium	Micro-Turbine, Nat. Gas fuel, 30 kW, 50 CF, 50 WHF	29	Micro-Turbine	Nat. Gas	30	50	50
Commercial Retail - Medium	Micro-Turbine, Nat. Gas fuel, 45 kW, 50 CF, 50 WHF	29	Micro-Turbine	Nat. Gas	45	50	50
Commercial Retail - Small	Wind Turbine, None fuel, 10 kW, 24 CF, 0 WHF	14	Wind Turbine	None	10	24	0
Commercial Retail - Small	Wind Turbine, None fuel, 1 kW, 24 CF, 0 WHF	17	Wind Turbine	None	1	24	0