



NEW RIVER CLASS FERRY

AC and DC Electrical Loads Analysis

Prepared for: NCDOT • Raleigh, NC

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PREPARED BY

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GENERAL NOTES

1. This report is intended for regulatory submittal.

REVISIONS

REV	DESCRIPTION	DATE	APPROVED
-	Initial issue	8/7/2017	TMH WA 48360

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1 PURPOSE

A New River Class Ferry is to be constructed for the North Carolina Department of Transportation (NCDOT). The vessel will be a 184 ft x 45 ft x 10.5 ft double-ended roll-on/roll-off vehicle and passenger ferry with an open vehicle space. The vessel will be owned and operated by the NCDOT, and will provide ferry service within Pamlico Sound and surrounding rivers of North Carolina. An electrical loads analysis has been performed to determine the required capacity of the generators, batteries, battery chargers, and electrical equipment.

2 PROCEDURE

An electrical loads analysis was performed to establish the electrical demand loads during each vessel operation mode. Electrical loads were taken from [1] and vessel system designs. The loading conditions were transit, in port, and emergency. Data from [2] was also used to perform calculations.

3 ELECTRICAL LOADS ANALYSIS

An electrical loads analysis was performed for transit, in port, and emergency operation conditions. These conditions established the electrical supply requirements throughout the vessel operation modes.

The transit load case determined the load which must be supplied for normal operation during transit, including the operation of one fire pump, one bilge pump, all heat pumps and heaters for passenger and crew space HVAC.

The in port load case accounts for operations at the terminal and vessel loading. The emergency operation load condition considered the operation of the emergency switchboard loads including one fire pump and one bilge pump as supplied by the emergency generator. This condition was used to size the emergency generator.

Within the emergency operation load condition, the required battery bank capacities were calculated. The battery banks were sized to provide a 30 minute supply of power. The battery chargers were sized to power the highest load condition, with a margin to charge the batteries.

Motor horsepower values were converted to kW based on data in [3]. Each load was assigned a Duty Factor (DF) for each operational mode. These are based on guidance in References [4] and [5], operational requirements, and generally accepted marine practice. Duty Factors are considered to be the proportion of rated load at which the item operates multiplied by the proportion of a typical 24 hour period during which the item operates. Symbolically, $DF = (\text{Operating Power}/\text{Rated Power}) \times (\text{hours of operation per day}/24 \text{ hours})$. If the quotient of operating power/rated power is unknown, it was assumed 1.0. The loads analysis is shown in Appendix A.

4 RESULTS

The results of the analysis are given in Appendix A. They show that total load under the transit condition with a 10% margin for future growth is approximately 164 kVA, and the load for in port with a 10% margin for future growth is approximately 66 kVA. Under both the transit and in port load case, one 187.5 kVA (150 kW at 0.80 power factor) generator will provide

sufficient power. Furthermore, the 200A shore power connection will be sufficient to supply vital loads and modest HVAC loads. The connected load of the emergency generator with a 10% margin for future growth is 69.6 kVA, which is within the emergency generator capacity of 81.25 kVA (65 ekW at 0.80 power factor).

5 CONCLUSIONS

Examination and calculations show that the proposed configuration of two 150 ekW ship service generators and a single 65 ekW emergency generator will be adequate for all vessel loads. Battery capacities are shown on [1]. Charger models and capacities are given in [6].

6 REFERENCES

- [1] Elliott Bay Design Group, "AC and DC Electrical One Line Diagram, Rev. -," 16101-200-300-1, Seattle, WA, 2017.
- [2] US Naval Sea Systems Command (NAVSEA), "Design Data Sheet: Calculation of Surface Ship Endurance Fuel Requirements DDS 200-1 Rev. 1," Washington, DC, 10/04/11.
- [3] J. W. Carpenter, NFPA-70 National Electric Code, Article 430 - Motors, Motor Circuits, and Controllers, Quincy, MA: NFPA, 2011.
- [4] US Coast Guard, NVIC 2-89, Guide for Electrical Installations on Merchant Vessels and Mobile Offshore Drilling Units, Washington, DC: USCG, 1989.
- [5] SNAME, T&R Bulletin 3-11, Marine Steam Power Plant Heat Balance Practices, New York, NY: SNAME.
- [6] Elliott Bay Design Group, "NEW RIVER CLASS FERRY Technical Specification, Rev A," 16101-200-832-1, Seattle, 2017.

Appendix A

Electrical Loads Analysis

Ckt No.	Description	Connected Load		Transit		Demand Load		Emergency		Remarks
		HP	KVA	DF	(KVA)	DF	(KVA)	DF	(KVA)	
S. S. SWITCHBOARD - 208V 3 PH 4W										
201	Emergency SWBD Bus Tie		64.37		59.00		10.55		0.00	
202	Panel P202 - Engine Room End A		32.31		6.28		6.84		0.00	
203	Panel P203 - Engine Room End B		14.91		3.32		2.50		0.00	
204	Panel P204 - Pilot House		28.83		9.74		7.81		0.00	
205	Panel P205 - Hold Ventilation		15.82		14.24		6.46		0.00	
206	Panel P206 - HVAC 1		33.75		33.75		13.50		0.00	
207	Panel P207 - HVAC 2		32.00		19.80		12.80		0.00	
208	Fire Pump No. 2	25.00	26.74	0.00	0.00	0.00	0.00	0.00	0.00	
209	Rescue Boat Davit		8.75	0.10	0.88	0.10	0.88	0.00	0.00	
210	Bilge Pump No. 2	5.00	5.98	0.00	0.00	0.00	0.00	0.00	0.00	
211	Main Engine A JW Heater		1.88	0.00	0.00	0.90	1.69	0.00	0.00	
212	Main Engine B JW Heater		1.88	0.00	0.00	0.90	1.69	0.00	0.00	
213	EOS Lights		0.15	0.90	0.14	0.90	0.14	0.00	0.00	
214	EOS Battery Charger (DC2)		1.40		1.40		1.40		0.00	
215	Blank (3P)									
216	Blank (3P)									
217	Blank (3P)									
218	Blank (3P)									

Total House Load Summary (kVA) =	268.8	148.6	66.3	0.0
Future Growth Margin	10%	26.9	14.9	6.6
End of life load (kVA)		295.6	163.4	72.9
Load %		157.7%	87.2%	38.9%

Load and Generator Summary

Generator Rating	eKW	KVA
Generator No. 1	150.00	187.50
Generator No. 2 (Standby)	0.00	0.00

Total Generator Capacity=	187.50
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Ckt No.	Description	Connected Load		Demand Load						Remarks
		HP	KVA	Transit DF	(KVA)	In Port DF	(KVA)	Emergency DF	(KVA)	
3 PH, 4W, 208 V, 60Hz Distribution										
Engine Room Panel A - P202										
1	Zero Discharge Pump No. 1 (Pole 1)	5.00	5.98	0.00	0.00	0.10	0.60	0.00	0.00	
2	Zero Discharge Pump No. 2 (Pole 1)	5.00	5.98	0.00	0.00	0.00	0.00	0.00	0.00	
3	Zero Discharge Pump No. 1 (Pole 2)			0.00		0.00		0.00		
4	Zero Discharge Pump No. 2 (Pole 2)			0.00		0.00		0.00		
5	Zero Discharge Pump No. 1 (Pole 3)			0.00		0.00		0.00		
6	Zero Discharge Pump No. 2 (Pole 3)			0.00		0.00		0.00		
7	Air Compressor No. 1 (Pole 1)	5.00	5.98	0.10	0.60	0.10	0.60	0.00	0.00	
8	Air Compressor No. 2 (Pole 1)	5.00	5.98	0.00	0.00	0.00	0.00	0.00	0.00	
9	Air Compressor No. 1 (Pole 2)			0.00		0.00		0.00		
10	Air Compressor No. 2 (Pole 2)			0.00		0.00		0.00		
11	Air Compressor No. 1 (Pole 3)			0.00		0.00		0.00		
12	Air Compressor No. 2 (Pole 3)			0.00		0.00		0.00		
13	MSD (Pole 1)	1.50	2.02	0.90	1.82	0.90	1.82	0.00	0.00	
14	Thruster Oil Cooler A (Pole 1)		0.55	1.00	0.55	1.00	0.55	0.00	0.00	
15	MSD (Pole 2)			0.00		0.00		0.00		
16	Thruster Oil Cooler A (Pole 2)			0.00		0.00		0.00		
17	MSD (Pole 3)			0.00		0.00		0.00		
18	Thruster Oil Cooler A (Pole 3)			0.00		0.00		0.00		
19	Engine Room Lights		0.50	0.90	0.45	0.90	0.45	0.00	0.00	
20	Engine Room Receptacles (4)		1.00	0.40	0.40	0.30	0.30	0.00	0.00	
21	Void A Lights		0.10	0.90	0.09	0.90	0.09	0.00	0.00	
22	Hold Receptacles (4)		1.00	0.20	0.20	0.30	0.30	0.00	0.00	
23	Thruster Room A Lights		0.10	0.90	0.09	0.50	0.05	0.00	0.00	
24	Main Deck Receptacles		1.00	0.20	0.20	0.20	0.20	0.00	0.00	
25	Main Deck Deck Lights		2.10	0.90	1.89	0.90	1.89	0.00	0.00	
26	Spare			0.00		0.00		0.00		
27	Blank			0.00		0.00		0.00		
28	Blank			0.00		0.00		0.00		
29	Blank			0.00		0.00		0.00		
30	Blank			0.00		0.00		0.00		
Totals			32.31		6.28		6.84		0.00	

Ckt No.	Description	Connected Load		Demand Load						Remarks
		HP	KVA	DF	(KVA)	DF	(KVA)	DF	(KVA)	
3 PH, 4W, 208 V, 60Hz Distribution										
Engine Room Panel B - P203										
1	Ballast Pump No. 1 (Pole 1)	2.00	2.58	0.20	0.52	0.10	0.26	0.00	0.00	
2	Ballast Pump No. 2 (Pole 1)	2.00	2.58	0.20	0.52	0.00	0.00	0.00	0.00	
3	Ballast Pump No. 1 (Pole 2)			0.00		0.00		0.00		
4	Ballast Pump No. 2 (Pole 2)			0.00		0.00		0.00		
5	Ballast Pump No. 1 (Pole 3)			0.00		0.00		0.00		
6	Ballast Pump No. 2 (Pole 3)			0.00		0.00		0.00		
7	Thruster Oil Cooler B (Pole 1)		0.55	1.00	0.55	1.00	0.55	0.00	0.00	
8	Potable Water Pump No. 1	1.00	1.46	0.60	0.88	0.10	0.15	0.00	0.00	
9	Thruster Oil Cooler B (Pole 2)			0.00		0.00		0.00		
10	Potable Water Pump No. 2	1.00	1.46	0.00	0.00	0.00	0.00	0.00	0.00	
11	Thruster Oil Cooler B (Pole 3)			0.00		0.00		0.00		
12	Waste Oil Pump	1.50	2.02	0.00	0.00	0.10	0.20	0.00	0.00	
13	Generator Heater No. 1		0.13	0.00	0.00	0.90	0.11	0.00	0.00	
14	Void B Lights		0.10	0.20	0.02	0.50	0.05	0.00	0.00	
15	Generator Heater No. 2		0.13	0.10	0.01	0.90	0.11	0.00	0.00	
16	Thruster Room B Lights		0.10	0.20	0.02	0.50	0.05	0.00	0.00	
17	Starting Battery Charger No. 2 24DC		1.50	0.10	0.15	0.10	0.15	0.00	0.00	
18	Engine Room Lights No. 2		0.30	0.20	0.06	0.90	0.27	0.00	0.00	
19	Engine Room/EOS Receptacles (4)		1.00	0.40	0.40	0.30	0.30	0.00	0.00	
20	Transfer Span Power Supply		0.00	0.00		0.00		0.00		
21	Hold Receptacles (4)		1.00	0.20	0.20	0.30	0.30	0.00	0.00	
22			0.00	0.00		0.00		0.00		
23	Spare			0.00		0.00		0.00		
24				0.00		0.00		0.00		
25	Blank			0.00		0.00		0.00		
26	Blank			0.00		0.00		0.00		
27	Blank			0.00		0.00		0.00		
28	Blank			0.00		0.00		0.00		
29	Blank			0.00		0.00		0.00		
30	Blank			0.00		0.00		0.00		
Totals			14.91		3.32		2.50		0.00	

Ckt No.	Description	Connected Load		Demand Load				Remarks		
		HP	KVA	Transit DF	(KVA)	In Port DF	(KVA)		Emergency DF	(KVA)
3 PH, 4W, 208 V, 60Hz Distribution										
Pilot House Panel - P204										
1	Ship's Network System		0.20	0.90	0.18	0.90	0.18	0.00	0.00	
2	CCTV System		0.25	0.90	0.23	0.90	0.23	0.00	0.00	
3	Search Lights A (2)		2.50	0.10	0.25	0.00	0.00	0.00	0.00	
4	Search Lights B (2)		2.50	0.10	0.25	0.00	0.00	0.00	0.00	
5	Navigation Lights (Primary)		0.46	1.00	0.46	0.00	0.00	0.00	0.00	
6	Pilot House Window Heaters		2.50	0.00	0.00	0.00	0.00	0.00	0.00	
7	01 Deck Deck Lights		2.10	0.50	1.05	0.50	1.05	0.00	0.00	
8	Crew Head Exhaust Fan		0.63	0.90	0.56	0.90	0.56	0.00	0.00	
9	Pilot House Window Wipers		0.50	0.50	0.25	0.00	0.00	0.00	0.00	
10	Passenger Lounge Exhaust Fan	0.50	0.81	0.90	0.73	0.50	0.40	0.00	0.00	
11	Water Heater		2.50	0.60	1.50	0.60	1.50	0.00	0.00	
12	Pilot House Refrigerator and Coffee Maker		1.65	0.70	1.16	0.70	1.16	0.00	0.00	
13	Pilot House Lights		0.11	0.90	0.10	0.90	0.10	0.00	0.00	
14	Crew Lounge Refrigerator		0.88	0.70	0.61	0.70	0.61	0.00	0.00	
15	Crew Lounge Coffee Maker		1.25	0.50	0.63	0.50	0.63	0.00	0.00	
16	Crew Lounge Microwave		1.50	0.20	0.30	0.20	0.30	0.00	0.00	
17	Pilot House Receptacles (4)		1.00	0.10	0.10	0.10	0.10	0.00	0.00	
18	Crew Lounge Lights		0.05	0.90	0.05	0.90	0.05	0.00	0.00	
19	Crew Lounge Receptacles (4)		1.00	0.10	0.10	0.10	0.10	0.00	0.00	
20	Passenger Lounge Lights		0.19	0.90	0.17	0.90	0.17	0.00	0.00	
21	Passenger Lounge Receptacles A (5)		2.00	0.10	0.20	0.00	0.00	0.00	0.00	
22	Vending Machines and Drinking Fountain		1.50	0.00	0.00	0.00	0.00	0.00	0.00	
23	Passenger Lounge Receptacles B (5)		2.00	0.10	0.20	0.00	0.00	0.00	0.00	
24	Spare		0.00	0.00		0.00		0.00		
25	Pilot House Flood Lights		0.75	0.90	0.68	0.90	0.68	0.00	0.00	
26	Spare		0.00	0.00		0.00		0.00		
27	Spare		0.00	0.00		0.00		0.00		
28	Spare			0.00		0.00		0.00		
29	Spare			0.00		0.00		0.00		
30	Blank			0.00		0.00		0.00		
Totals			28.83	9.74		7.81		0.00		

Ckt No.	Description	Connected Load		Transit		Demand Load				Remarks
		HP	KVA	DF	(KVA)	DF	(KVA)	DF	(KVA)	
3 PH, 4W, 208 V, 60Hz Distribution										
Hold Ventilation - P205										
1	Engine Room Supply Fan A (Pole 1)	5.00	5.98	0.90	5.39	0.50	2.99	0.00	0.00	
2	Engine Room Supply Fan B (Pole 1)	5.00	5.98	0.90	5.39	0.00	0.00	0.00	0.00	
3	Engine Room Supply Fan A (Pole 2)			0.00		0.00		0.00		
4	Engine Room Supply Fan B (Pole 2)			0.00		0.00		0.00		
5	Engine Room Supply Fan A (Pole 3)			0.00		0.00		0.00		
6	Engine Room Supply Fan B (Pole 3)			0.00		0.00		0.00		
7	Void A Supply Fan	0.50	0.81	0.90	0.73	0.90	0.73	0.00	0.00	
8	Void B Supply Fan	0.50	0.81	0.90	0.73	0.90	0.73	0.00	0.00	
9	Thruster Room A Supply Fan	0.50	0.81	0.90	0.73	0.90	0.73	0.00	0.00	
10	Thruster Room B Supply Fan	0.50	0.81	0.90	0.73	0.90	0.73	0.00	0.00	
11	EOS Supply Fan		0.63	0.90	0.56	0.90	0.56	0.00	0.00	
12	Spare			0.00		0.00		0.00		
13	Spare			0.00		0.00		0.00		
14	Spare			0.00		0.00		0.00		
15	Blank			0.00		0.00		0.00		
16	Blank			0.00		0.00		0.00		
17	Blank			0.00		0.00		0.00		
18	Blank			0.00		0.00		0.00		
19	Blank			0.00		0.00		0.00		
20	Blank			0.00		0.00		0.00		
21	Blank			0.00		0.00		0.00		
22	Blank			0.00		0.00		0.00		
23	Blank			0.00		0.00		0.00		
24	Blank			0.00		0.00		0.00		
25	Blank			0.00		0.00		0.00		
26	Blank			0.00		0.00		0.00		
27	Blank			0.00		0.00		0.00		
28	Blank			0.00		0.00		0.00		
29	Blank			0.00		0.00		0.00		
30	Blank			0.00		0.00		0.00		
Totals			15.82		14.24		6.46		0.00	

Ckt No.	Description	Connected Load		Demand Load				Remarks	
		HP	KVA	Transit DF	(KVA)	In Port DF	(KVA)		Emergency DF
3 PH, 4W, 208 V, 60Hz Distribution									
HVAC 1 - P206									
1	EOS Heat Pump	5.63	1.00	5.63	0.40	2.25	0.00	0.00	
2	Pilot House Heat Pump	5.63	1.00	5.63	0.40	2.25	0.00	0.00	
3			0.00		0.00		0.00	0.00	
4			0.00		0.00		0.00	0.00	
5			0.00		0.00		0.00	0.00	
6			0.00		0.00		0.00	0.00	
7	Crew Room Heat Pump	5.63	1.00	5.63	0.40	2.25	0.00	0.00	
8	Passenger Lounge Heat Pump No. 1	5.63	1.00	5.63	0.40	2.25	0.00	0.00	
9			0.00		0.00		0.00	0.00	
10			0.00		0.00		0.00	0.00	
11			0.00		0.00		0.00	0.00	
12			0.00		0.00		0.00	0.00	
13	Passenger Lounge Heat Pump No. 2	5.63	1.00	5.63	0.40	2.25	0.00	0.00	
14	Passenger Lounge Heat Pump No. 3	5.63	1.00	5.63	0.40	2.25	0.00	0.00	
15			0.00		0.00		0.00	0.00	
16			0.00		0.00		0.00	0.00	
17			0.00		0.00		0.00	0.00	
18			0.00		0.00		0.00	0.00	
19	Spare	0.00	0.00		0.00		0.00	0.00	
20	Spare	0.00	0.00		0.00		0.00	0.00	
21	Spare	0.00	0.00		0.00		0.00	0.00	
22	Blank		0.00		0.00		0.00	0.00	
23	Blank		0.00		0.00		0.00	0.00	
24	Blank		0.00		0.00		0.00	0.00	
25	Blank		0.00		0.00		0.00	0.00	
26	Blank		0.00		0.00		0.00	0.00	
27	Blank		0.00		0.00		0.00	0.00	
28	Blank		0.00		0.00		0.00	0.00	
29	Blank		0.00		0.00		0.00	0.00	
30	Blank		0.00		0.00		0.00	0.00	
Totals			33.75		33.75		13.50	0.00	

Ckt No.	Description	Connected Load		Demand Load				Remarks		
		HP	KVA	Transit DF	(KVA)	In Port DF	(KVA)		Emergency DF	(KVA)
3 PH, 4W, 208 V, 60Hz Distribution										
HVAC 2 - P207										
1	Engine Room Unit Heater No. 1	5.00		0.00	0.00	0.40	2.00	0.00	0.00	
2	Engine Room Unit Heater No. 2	5.00		0.00	0.00	0.40	2.00	0.00	0.00	
3				0.00		0.00		0.00		
4				0.00		0.00		0.00		
5				0.00		0.00		0.00		
6				0.00		0.00		0.00		
7	EOS Heaters (2)	4.00		0.90	3.60	0.40	1.60	0.00	0.00	
8	Pilot House Heaters (2)	5.00		0.90	4.50	0.40	2.00	0.00	0.00	
9				0.00		0.00		0.00		
10				0.00		0.00		0.00		
11				0.00		0.00		0.00		
12				0.00		0.00		0.00		
13	Crew Lounge Heaters (2)	3.00		0.90	2.70	0.40	1.20	0.00	0.00	
14	Passenger Lounge Heaters (2)	5.00		0.90	4.50	0.40	2.00	0.00	0.00	
15				0.00		0.00		0.00		
16				0.00		0.00		0.00		
17				0.00		0.00		0.00		
18				0.00		0.00		0.00		
19	Passenger Lounge Heaters (2)	5.00		0.90	4.50	0.40	2.00	0.00	0.00	
20	Spare	0.00		0.00		0.00		0.00		
21				0.00		0.00		0.00		
22				0.00		0.00		0.00		
23				0.00		0.00		0.00		
24				0.00		0.00		0.00		
25	Spare	0.00		0.00		0.00		0.00		
26	Spare	0.00		0.00		0.00		0.00		
27	Blank			0.00		0.00		0.00		
28	Blank			0.00		0.00		0.00		
29	Blank			0.00		0.00		0.00		
30	Blank			0.00		0.00		0.00		
Totals		32.00		19.80		12.80		0.00		

Ckt No.	Description	Connected Load		Transit		Demand Load		Emergency		Remarks
		HP	KVA	DF	(KVA)	DF	(KVA)	DF	(KVA)	
EMERGENCY SWITCHBOARD - 208V 3 PH 4W										
201	Fire Pump No. 1	25.00	26.74	1.00	26.74	0.10	2.67	1.00	26.74	
202	Thruster Controls A	7.50	8.64	1.00	8.64	0.00	0.00	1.00	8.64	
203	Thruster Controls B	7.50	8.64	1.00	8.64	0.00	0.00	1.00	8.64	
204	Panel EP204 - Engine Room		4.96		3.33		2.84		6.14	
205	Panel EP205 - Pilot House		7.65		4.49		3.27		6.67	
206	Bilge Pump No. 1	5.00	5.98	1.00	5.98	0.10	0.60	1.00	5.98	
207	EGEN Starting Battery Charger 24DC		0.50	0.10	0.05	0.10	0.05	1.00	0.50	
208	Emergency Generator JW Heater		1.25	0.90	1.13	0.90	1.13	0.00	0.00	
209			0.00	0.00			0.00		0.00	
210			0.00	0.00			0.00		0.00	
211			0.00	0.00			0.00		0.00	
212			0.00	0.00			0.00		0.00	
213			0.00	0.00			0.00		0.00	
214			0.00	0.00			0.00		0.00	
215			0.00	0.00			0.00		0.00	
216			0.00	0.00			0.00		0.00	
217			0.00	0.00			0.00		0.00	
218			0.00	0.00			0.00		0.00	
219			0.00	0.00			0.00		0.00	
220			0.00	0.00			0.00		0.00	
221			0.00	0.00			0.00		0.00	
222			0.00	0.00			0.00		0.00	
223			0.00	0.00			0.00		0.00	
224			0.00	0.00			0.00		0.00	
225										
226										
227	Blank (3P)									
228	Blank (3P)									
229	Blank (3P)									
230	Blank (3P)									

Total Load Summary (kVA) =	64.4	59.0	10.6	63.3
Future Growth Margin	10%	6.4	5.9	6.3
End of life load (kVA)	70.8	64.9	11.6	69.6
	Load %			85.7%

Load and Generator Summary

Generator Rating	KW	KVA
Emergency Generator	65.00	81.25
		0.00
Total Generator Capacity =	81.25	

Ckt No.	Description	Connected Load		Demand Load				Remarks		
		HP	KVA	Transit DF	(KVA)	In Port DF	(KVA)		Emergency DF	(KVA)
3 PH, 4W, 208 V, 60Hz Distribution										
Emergency Engine Room Panel - EP204										
1	Engine Room Emergency Lights	0.16		0.90	0.14	0.90	0.14	1.00	0.16	
2	EOS Emergency Lights	0.08		0.90	0.07	0.90	0.07	1.00	0.08	
3	Void A Emergency Lights	0.08		0.20	0.02	0.90	0.07	1.00	0.08	
4	Thruster Room A Emergency Lights	0.08		0.20	0.02	0.90	0.07	1.00	0.08	
5	Void B Emergency Lights	0.08		0.20	0.02	0.90	0.07	1.00	0.08	
6	Thruster Room B Emergency Lights	0.08		0.20	0.02	0.90	0.07	1.00	0.08	
7	Engine Order Telegraph	0.13		0.50	0.06	0.10	0.01	1.00	0.13	
8	Machinery Alarm and Monitoring System	0.38		0.90	0.34	0.20	0.08	1.00	0.38	
9	Fire Detection System	0.50		0.90	0.45	0.90	0.45	1.00	0.50	
10	Propulsion Monitoring and Indication	0.50		0.90	0.45	0.10	0.05	1.00	0.50	
11	EOS Console	0.25		0.90	0.23	0.90	0.23	1.00	0.25	
12	Starting Battery Charger No. 1 24DC	1.00		0.10	0.10	0.10	0.10	1.00	1.00	
13	Spare	0.00		0.00		0.00		0.00		
14	Engine Room Battery Charger (DC1)	1.65			1.43		1.43		2.83	
15	Spare	0.00		0.00		0.00		0.00		
16	Spare	0.00		0.00		0.00		0.00		
17	Blank			0.00		0.00		0.00		
18	Blank			0.00		0.00		0.00		
19	Blank			0.00		0.00		0.00		
20	Blank			0.00		0.00		0.00		
21	Blank			0.00		0.00		0.00		
22	Blank			0.00		0.00		0.00		
23	Blank			0.00		0.00		0.00		
24	Blank			0.00		0.00		0.00		
25	Blank			0.00		0.00		0.00		
26	Blank			0.00		0.00		0.00		
27	Blank			0.00		0.00		0.00		
28	Blank			0.00		0.00		0.00		
29	Blank			0.00		0.00		0.00		
30	Blank			0.00		0.00		0.00		
Totals		4.96		3.33		2.84		6.14		

Ckt No.	Description	Connected Load		Demand Load				Remarks		
		HP	KVA	Transit DF	(KVA)	In Port DF	(KVA)		Emergency DF	(KVA)
3 PH, 4W, 208 V, 60Hz Distribution										
Emergency Pilot House Panel - EP205										
1	Pilot House 12V Battery Charger (DC3)		0.50		0.20		0.23		0.23	
2	Navigation Lights (Secondary)		0.46	0.90	0.42	0.90	0.42	1.00	0.46	
3	Pilot House 24V Battery Charger (DC4)		1.88		0.35		1.27		1.29	
4	Spare		0.00	0.00		0.00		0.00		
5	ESS System IP Phone/Command Intercom		0.13	0.20	0.03	0.20	0.03	0.60	0.08	
6	Infrared Night Vision		1.25	0.90	1.13	0.00	0.00	1.00	1.25	
7	Public Address and General Alarm System		0.38	0.20	0.08	0.10	0.04	0.80	0.30	
8	Radar with AIS and Chartplotter		0.90	0.90	0.81	0.10	0.09	1.00	0.90	
9	Pilot House Console		0.50	0.90	0.45	0.20	0.10	1.00	0.50	
10	EGEN Room Emergency Lights		0.08	0.10	0.01	0.90	0.07	1.00	0.08	
11	Pilot House Emergency Lights		0.06	0.90	0.05	0.90	0.05	1.00	0.06	
12	Crew Lounge Emergency Lights		0.03	0.90	0.03	0.90	0.03	1.00	0.03	
13	Passenger Lounge Emergency Lights		0.94	0.90	0.85	0.90	0.85	1.00	0.94	
14	Life Raft Launching Lights		0.45	0.00	0.00	0.00	0.00	1.00	0.45	
15	01 Deck Emergency Lights		0.11	1.00	0.11	1.00	0.11	1.00	0.11	
16	Spare		0.00	0.00		0.00		0.00		
17	Spare		0.00	0.00		0.00		0.00		
18	Spare			0.00		0.00		0.00		
19	Blank			0.00		0.00		0.00		
20	Blank			0.00		0.00		0.00		
21	Blank			0.00		0.00		0.00		
22	Blank			0.00		0.00		0.00		
23	Blank			0.00		0.00		0.00		
24	Blank			0.00		0.00		0.00		
25	Blank			0.00		0.00		0.00		
26	Blank			0.00		0.00		0.00		
27	Blank			0.00		0.00		0.00		
28	Blank			0.00		0.00		0.00		
29	Blank			0.00		0.00		0.00		
30	Blank			0.00		0.00		0.00		
Totals			7.65		4.49		3.27		6.67	

Ckt No.	Description	Connected Load		Demand Load								Remarks
		HP	KVA	Shore		Cruise		Maneuver		Emergency		
				DF	(KVA)	DF	(KVA)	DF	(KVA)	DF	(KVA)	
2W 24VDC Distribution												
Panel 24DC1 - Engine Room												
1	Main Engine A Control Power		0.20	1.00	0.20	1.00	0.20	1.00	0.20	1.00	0.20	
2	SSDG A Control Power		0.20	1.00	0.20	1.00	0.20	1.00	0.20	1.00	0.20	
3	Reduction Gear A Control Power		0.25	1.00	0.25	1.00	0.25	1.00	0.25	1.00	0.25	
4	Thruster A Control Power		0.25	1.00	0.25	1.00	0.25	1.00	0.25	1.00	0.25	
5	Machinery Alarm and Monitoring		0.25	1.00	0.25	1.00	0.25	1.00	0.25	1.00	0.25	
6	Tank Monitoring System		0.25	1.00	0.25	1.00	0.25	1.00	0.25	1.00	0.25	
7	Fire Dampers w/ Electric Actuators		0.25	0.10	0.03	0.10	0.03	0.10	0.03	1.00	0.25	
8	Spare		0.00	0.00		0.00		0.00		0.00		
9	Spare		0.00	0.00		0.00		0.00		0.00		
10	Spare		0.00	0.00		0.00		0.00		0.00		
11	Spare		0.00	0.00		0.00		0.00		0.00		
12	Blaank											
13	Blank											
14	Cross Connect to 24DC2											
Totals			1.65	1.43		1.43		1.43		1.65		

Ckt No.	Description	Connected Load		Demand Load								Remarks
		HP	KVA	Shore		Cruise		Maneuver		Emergency		
				DF	(KVA)	DF	(KVA)	DF	(KVA)	DF	(KVA)	
2W 24VDC Distribution												
Panel 24DC2 - EOS												
1	Main Engine B Control Power		0.20	1.00	0.20	1.00	0.20	1.00	0.20	1.00	0.20	
2	SSDG B Control Power		0.20	1.00	0.20	1.00	0.20	1.00	0.20	1.00	0.20	
3	Reduction Gear B Control Power		0.25	1.00	0.25	1.00	0.25	1.00	0.25	1.00	0.25	
4	Thruster B Control Power		0.25	1.00	0.25	1.00	0.25	1.00	0.25	1.00	0.25	
5	Engine Order Telegraph		0.25	1.00	0.25	1.00	0.25	1.00	0.25	1.00	0.25	
6	Main Switchbd Ctrl Pwr DC UPS		0.25	1.00	0.25	1.00	0.25	1.00	0.25	1.00	0.25	
7	Spare			0.00		0.00		0.00		0.00		
8	Spare			0.00		0.00		0.00		0.00		
9	Spare											
10	Blank											
11	Blank											
12	Blank											
13	Blank											
14	Cross Connect to 24DC1											
Totals			1.40	1.40		1.40		1.40		1.40		

Ckt No.	Description	Connected Load		Demand Load								Remarks
		HP	KVA	Shore		Cruise		Maneuver		Emergency		
				DF	(KVA)	DF	(KVA)	DF	(KVA)	DF	(KVA)	
2W 24VDC Distribution												
Panel 24DC3 - Pilot House Nav/Com												
1	Radar No. 1	0.27		0.00	0.00	1.00	0.27	1.00	0.27	1.00	0.27	
2	Radar No. 2	0.27		0.00	0.00	1.00	0.27	1.00	0.27	1.00	0.27	
3	AIS	0.25		1.00	0.25	1.00	0.25	1.00	0.25	1.00	0.25	
4	Integrated Alarm System	0.20		0.00	0.00	1.00	0.20	1.00	0.20	1.00	0.20	
5	Electronic Horn	0.50		0.00	0.00	0.20	0.10	0.20	0.10	0.20	0.10	
6	Nav Lights and Control Panel	0.03		0.50	0.02	0.50	0.02	0.50	0.02	0.50	0.02	
7	Fog Signal Timer	0.10		0.10	0.01	0.10	0.01	0.10	0.01	0.10	0.01	
8	Tank Monitoring System	0.10		0.50	0.05	1.00	0.10	1.00	0.10	1.00	0.10	
9	Thruster Control and Monitoring	0.25		0.10	0.03	0.20	0.05	0.30	0.08	0.40	0.10	
10	Spare											
11	Spare											
12	Spare											
13	Blank											
14	Blank											
Totals		1.97		0.35		1.27		1.29		1.32		

Ckt No.	Description	Connected Load		Demand Load								Remarks
		HP	KVA	Shore		Cruise		Maneuver		Emergency		
				DF	(KVA)	DF	(KVA)	DF	(KVA)	DF	(KVA)	
2W 12VDC Distribution												
Panel 12DC1 - Pilot House Nav/Com												
1	VHF Radio No. 1	0.03		0.50	0.02	1.00	0.03	1.00	0.03	1.00	0.03	
2	VHF Radio No. 2	0.03		0.50	0.02	1.00	0.03	1.00	0.03	1.00	0.03	
3	Loud Hailer	0.06		1.00	0.06	1.00	0.06	1.00	0.06	1.00	0.06	
4	Depth Sounder/Weather Displays	0.02		1.00	0.02	1.00	0.02	1.00	0.02	1.00	0.02	
5	GPS Chart Plotter No. 1	0.05		1.00	0.05	1.00	0.05	1.00	0.05	1.00	0.05	
6	GPS Chart Plotter No. 2	0.01		1.00	0.01	1.00	0.01	1.00	0.01	1.00	0.01	
7	Infrared Camera	0.10		0.10	0.01	0.10	0.01	0.10	0.01	1.00	0.10	
8	Satellite Compass	0.01		1.00	0.01	1.00	0.01	1.00	0.01	1.00	0.01	
9	Anemometer	0.01		1.00	0.01	1.00	0.01	1.00	0.01	1.00	0.01	
10	Spare	0.00		0.00		0.00		0.00		0.00		
11	Spare	0.00		0.00		0.00		0.00		0.00		
12	Spare	0.00		0.00		0.00		0.00		0.00		
13	Blank	0.00		0.00		0.00		0.00		0.00		
14	Blank	0.00		0.00		0.00		0.00		0.00		
Totals		0.32		0.20		0.23		0.23		0.32		