NSRP | National Shipbuilding Research Program

Power Panel & Breaker Commonality

GENERAL DYNAMICS
Bath Iron Works

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11/08/17

San Diego, CA

Agenda

- Mission Statement
- Summary
- Tasks
- Benefits of Commonality
- Schedule
- Recap
- Status

Project Mission Statement

- Identify Where Opportunities Exist with Consolidating Power Panels and Circuit Breakers to Reduce the Number of Variants and Push Commonality into Ship Designs

Project Summary

- Mission:
  - Many Variants of Power Panels & Breakers
  - Many Different Applications
  - Multiple Ship Programs
- Objectives:
  - Identify Existing Opportunities for Consolidation
  - Reduce the Number of Variants and Breaker – Panel Combinations
  - Drive **Commonality** into Ship Designs

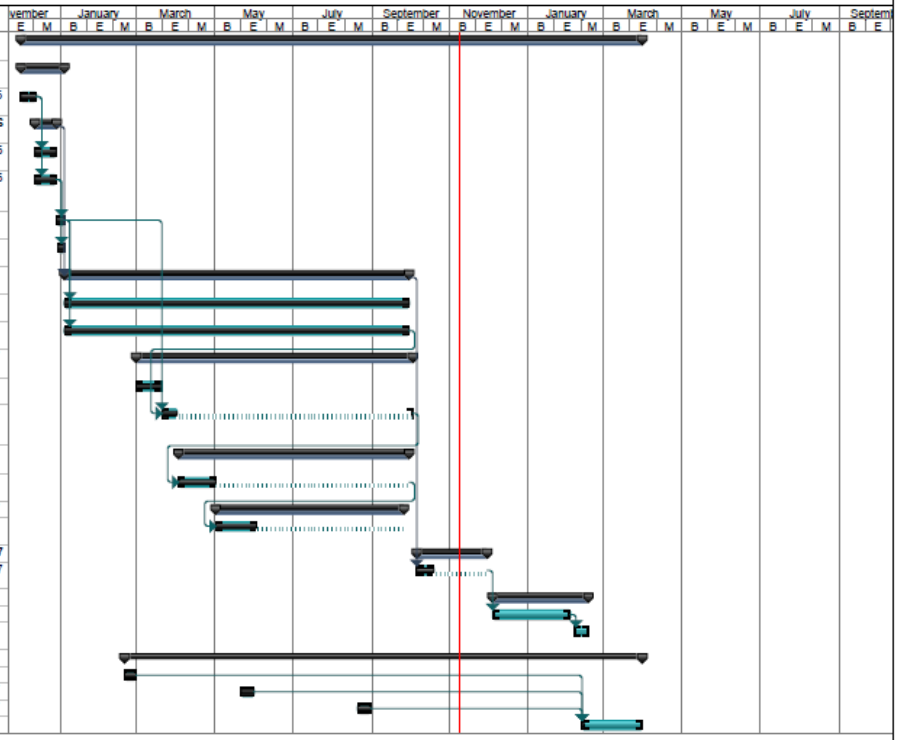
Project Tasks

- Create Power Panel and Breaker Master List 100% Complete
- Research & Determine Requirements 100% Complete
- Research Applicable Products 100% Complete
- Determine Product Opportunity 100% Complete
- Breaker Shock & Vibration Testing Procedure 100% Complete
- Design, Build, & Test Demonstrator 50% Complete
- Generate Report and Presentation 20% Complete

Project Schedule

NSRP ETP: Power Panel and Breaker Commonality — Date: Wed 11/8/17 — Rev. -

ID	Task Name	Description	Start	Finish
1	**1 Power Panel & Breaker Commonality Project**	**NSRP ETP Project**	**Thu 12/1/16**	**Fri 3/30/18**
2	**1.1 Product List**	**Create Power Panel and Breaker List**	**Thu 12/1/16**	**Tue 1/3/17**
3	1.1.1 Create Master List	Determine currently active list of installed power panels and breakers shipyard wide	Thu 12/1/16	Mon 12/12/16
4	**1.1.2 Reduce to a Grouped List**	**Reduce list to groups based on level of usage and attributes**	**Mon 12/12/16**	**Wed 12/28/16**
5	1.1.2.1 Power Panel Attributes	Power Panel Size, Connections, Circuit Types, EGFD, Neutral Bus Bars, etc.	Mon 12/12/16	Wed 12/28/16
6	1.1.2.2 Breaker Attributes	Rated Voltage, Rated Current, Ranges for Overload Protection, Short-Circuit Protection, Number of Poles, Mounting Style, Operating Temp, etc.	Mon 12/12/16	Wed 12/28/16
7	1.1.3 Determine Selected Shipyard Product List	Choose a set of products from the grouped list to investigate product design and construction	Thu 12/29/16	Tue 1/3/17
8	1.1.4 Solicit Vendors	Solicit Vendors for Project Support	Fri 12/30/16	Tue 1/3/17
9	**1.2 Requirements**	**Determine/Research Requirements**	**Wed 1/4/17**	**Fri 9/29/17**
10	1.2.1 Determine Requirements	Determine existing military and commercial requirements for the product list	Wed 1/4/17	Fri 9/29/17
11	1.2.2 Research Requirements	Research requirements for breaker design, construction and testing	Wed 1/4/17	Fri 9/29/17
12	**1.3 New Products**	**Find More Applicable Products**	**Wed 3/1/17**	**Mon 10/2/17**
13	1.3.1 Research Similar Products	Research similar products that meet the required criteria and offer more value if applicable	Wed 3/1/17	Mon 3/20/17
14	1.3.2 Evaluate Products	Create evaluation matrix and assess how various panels and breakers compare to requirements design and operating features	Tue 3/21/17	Mon 10/2/17
15	**1.4 Product Applicability**	**Find Product Opportunity**	**Mon 4/3/17**	**Fri 9/29/17**
16	1.4.1 Compare Products and Applications	Use the evaluation matrix to assess and downselect product list constituting opportunistic candidates for commonality	Mon 4/3/17	Fri 9/29/17
17	**1.5 Test Procedures**	**Breaker - Shock & Vibration Testing**	**Tue 5/2/17**	**Mon 9/25/17**
18	1.5.1 Generate Test Procedure	Determine if breakers require testing, and generate testing procedures	Tue 5/2/17	Mon 9/25/17
19	**1.6 Demo**	**Create Demonstrator**	**Fri 10/6/17**	**Wed 11/29/17**
20	1.6.1 Design Demo	Construct demonstrator to test the largest set of breakers available	Fri 10/6/17	Wed 11/29/17
21	**1.7 Test Demo**	**Test Demonstrator**	**Mon 12/4/17**	**Fri 2/16/18**
22	1.7.1 Lab Test	Send the demonstrator to a lab for testing	Mon 12/4/17	Fri 2/2/18
23	1.7.2 Assess Product Test Performance	Assess product testing results	Tue 2/6/18	Fri 2/16/18
24	**1.8 Report Out**	**Create Report**	**Mon 2/20/17**	**Fri 3/30/18**
25	1.8.1 Status Report	Generate a report of progress	Mon 2/20/17	Tue 2/28/17
26	1.8.2 Status Report	Generate a report of progress	Mon 5/22/17	Wed 5/31/17
27	1.8.3 Status Report	Generate a report of progress	Mon 8/21/17	Wed 8/30/17
28	1.8.4 Final Report / Presentation	Generate a report of findings and recommendations.	Mon 2/12/18	Fri 3/30/18



Project: NSRP PP&B Commonality
Date: Wed 11/8/17

Task — Project Summary — Inactive Milestone — Manual Summary Rollup — Progress
Split — External Tasks — Inactive Summary — Manual Summary — Deadline
Milestone — External Milestone — Manual Task — Start-only
Summary — Inactive Task — Duration-only — Finish-only

Page 1

Overview From Previous Update

- Breaker and panel master lists are developed
- Opportunities exist for standardization and commonality based on technical characteristics
  - Some attribute comparison has been completed and reported, but some more assessment will occur
- Based on current product availability and not having a specific baseline for comparison purposes, decision is to pursue testing of COTS style breakers and panels
  - This aligns with original project plan

Commercial Demonstrator

- Demonstrator will be a
  - Six circuit panel
  - Hold various sizes of FDC style breakers, representing good all around option to consider for many applications
  - Will be hard mounted to test fixture for light weight shock testing per Mil-Std-901E
- Reviewed option for shock mounting, but this would extend the scope and require many other considerations for program introduction (couple examples follow)
  - Shock loops for cables
  - Different structural arrangements for shock mount interface
  - Increased space consumption

More About Testing

- Testing a panel that *might* serve several applications creates a baseline; it is not expected to meet all testing requirements, but
  - Failure assessment can be used to determine where requirements were not met and ideas generated regarding how to meet requirements: cost and type of modifications required
  - What options exist to use straight COTS products (i.e., shock mounting)
  - What benefits might be earned from using COTS products
  - If a hybrid product is needed, how do costs and benefits compare
  - What is likelihood of necessary manufacturer support being available
- It is likely COTS product lines offer more flexible options (especially along the lines of performance related requirements)
- Not aware that this type of testing has been done recently; data and assessment can be used for other baseline uses

Path Forward

- Conduct testing of the panel and breakers
- Conduct post test evaluation
- Generate options for breaker consolidation based on
  - Opportunities that may exist with COTS families of breakers and panels (comparing to MIL-STD requirements)
  - Determinations of longer term opportunities for panel standardization based on breaker standardization
- Develop cost benefit analysis
- Generate a report of findings and recommendations

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