AUTOMATION AND PROTECTION OF A NAVAL FACILITY MICROGRID WITH CHP & STANDBY GENERATION

IDEA Campus Energy 2015

PRESENTATION AGENDA

NSF Indian Head Microgrid

- Project Overview
- Operational Modes
- System Automation
- System Protection

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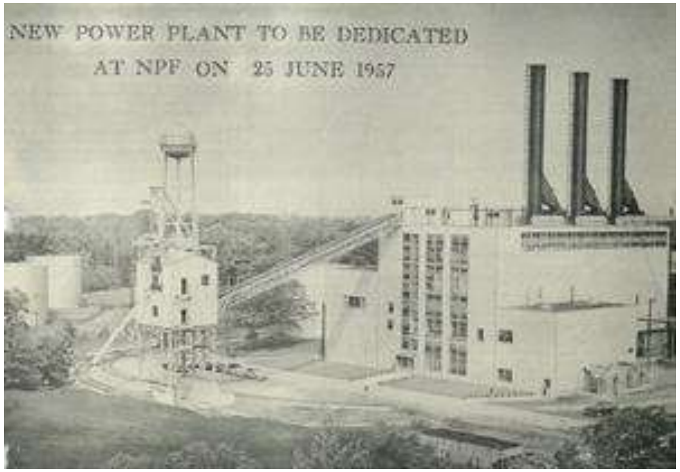
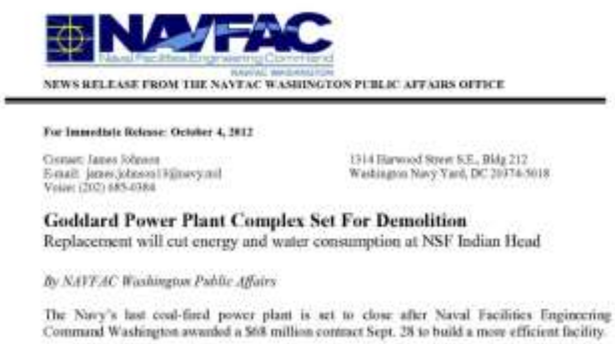
PROJECT OVERVIEW

Project Objectives

- Demolish Goddard Power Plant
- Increase Steam System Efficiency
- Modernize Electrical System




NAVFAC
Naval Facilities Engineering Command

NEWS RELEASE FROM THE NAVFAC WASHINGTON PUBLIC AFFAIRS OFFICE

For Immediate Release: October 4, 2012

Contact: James Johnson
E-mail: james.johnson13@navy.mil
Voice: (202) 685-0384

1314 Harwood Street S.E., Bldg 212
Washington Navy Yard, DC 20374-5018

Goddard Power Plant Complex Set For Demolition
Replacement will cut energy and water consumption at NSF Indian Head

By NAVFAC Washington Public Affairs

The Navy's last coal-fired power plant is set to close after Naval Facilities Engineering Command Washington awarded a $68 million contract Sept. 28 to build a more efficient facility.

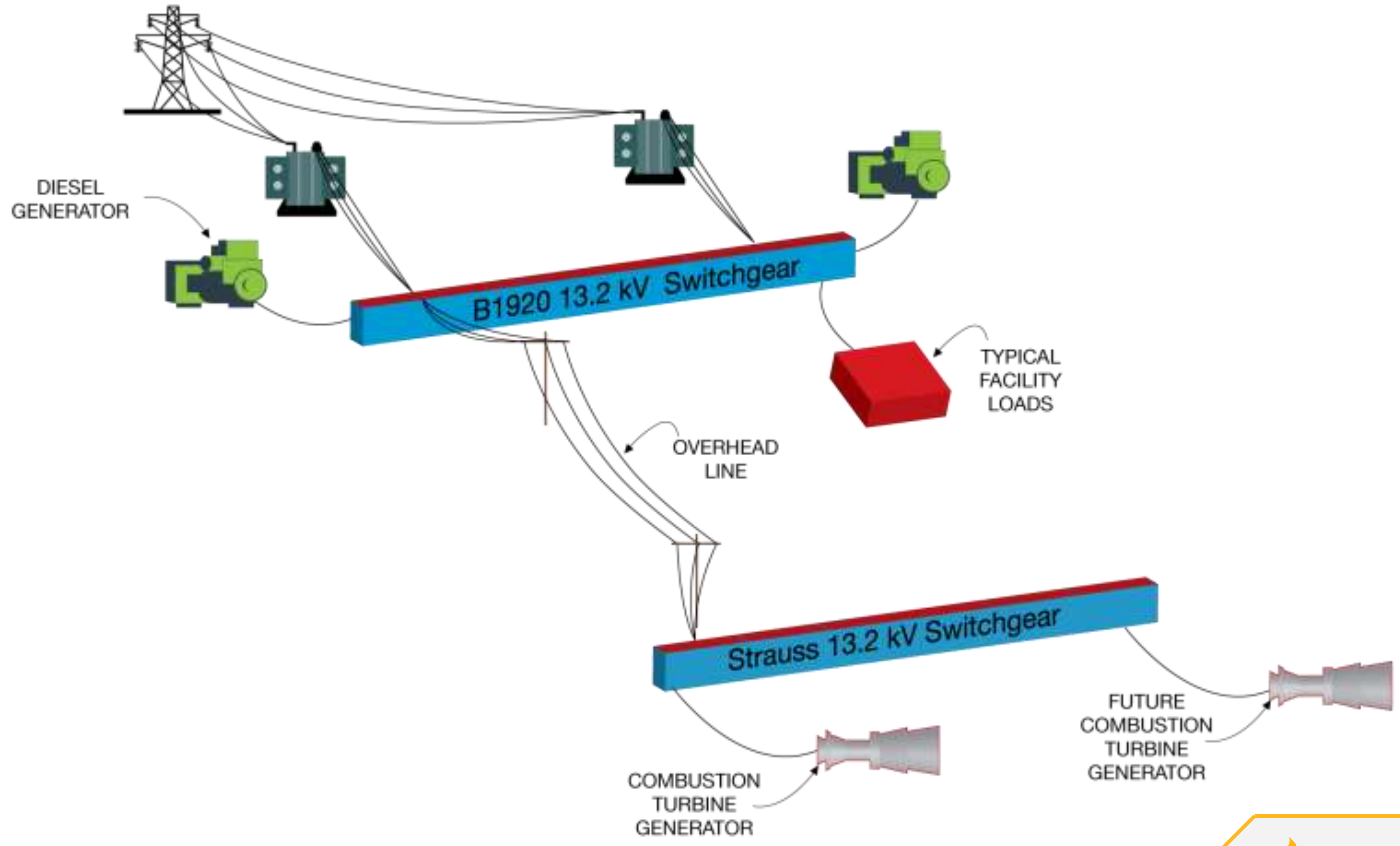
PROJECT OVERVIEW

13.2kV System Configuration

- Two 69-13.2kV Substation Transformers
- Two On-site Generation Locations
- Two 2.5MW Standby Generators at B1920
- One 4.6MW CT/HRSG at Strauss (plus one future)

PROJECT OVERVIEW

13.2kV System Configuration



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OPERATIONAL MODES

Design Criteria

- Maintain Power to Critical Loads
- Maintain Steam Production
- Performance of CT/HRSG Critical to Both

OPERATIONAL MODES

Six Sources = A Complex System

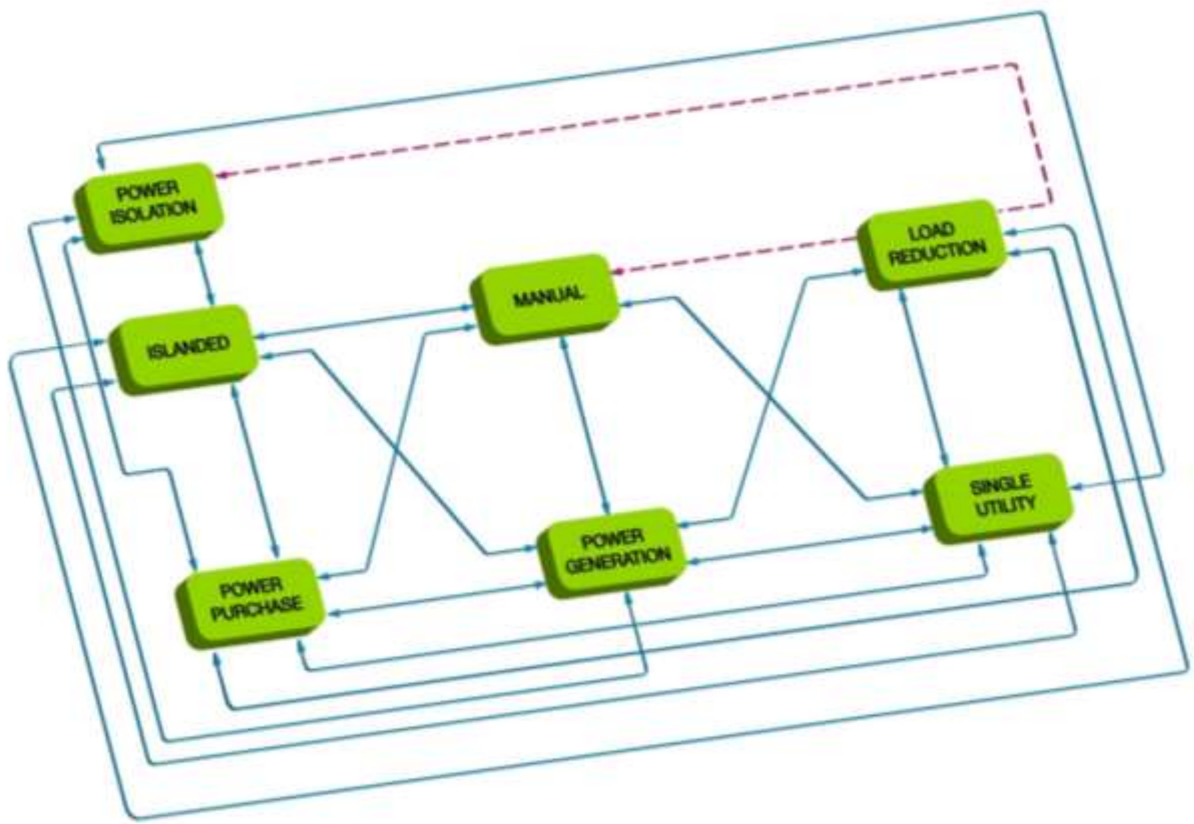
- Operational Modes; $2^6 = 64$ possibilities
- Transitions Between Modes are Critical
- What Triggers a Transition Event?

TRANSITION TABLE

ID	INITIAL MODE	FINAL MODE	TRIGGER EVENT	PREREQUISITE CONDITIONS	ACTIONS
14	POWER GENERATION	ISLANDED	NO UTILITY SOURCES AVAILABLE	LOSS OF BOTH SUBSTATION TRANSFORMER SOURCES	OPEN BLDG 1920 MAIN BREAKERS; RESPOND BASED ON SYSTEM LOAD LEVEL
15	POWER GENERATION	POWER ISOLATION	STRAUSS INTERCONNECTION LOST	LOSS OF POWER INTERCONNECTION BETWEEN STRAUSS AND BUILDING 1920	DECREASE LOAD ON CTG(S); OPEN CTG BREAKER(S); SHUTDOWN CTG(S); START DG(S) TO ALLOW STRAUSS TO CONTINUE STEAM PRODUCTION

OPERATIONAL MODES

Transition State Diagram



SYSTEM AUTOMATION

Design Approach

- Integrated System; Two Locations
- Independent Automation Processors
- Unmanned Operation

SYSTEM AUTOMATION

Operation Comparison

	POWER GENERATION	POWER PURCHASE	ISLANDED
UTILITY SOURCE	On-line	On-line	Off-line
CT/HRSG	On-line; Running at base load setpoint or to follow load	Off-line	On-line; Running to proportionally share load with diesel generators
DIESEL GENERATORS	Off-line	Off-line	On-line; Running to proportionally share load with CT/HRSG

SYSTEM AUTOMATION

Challenges

- System Complexity
- Communications Latency
- Operational Speed vs System Uptime
- Complement Protection Scheme

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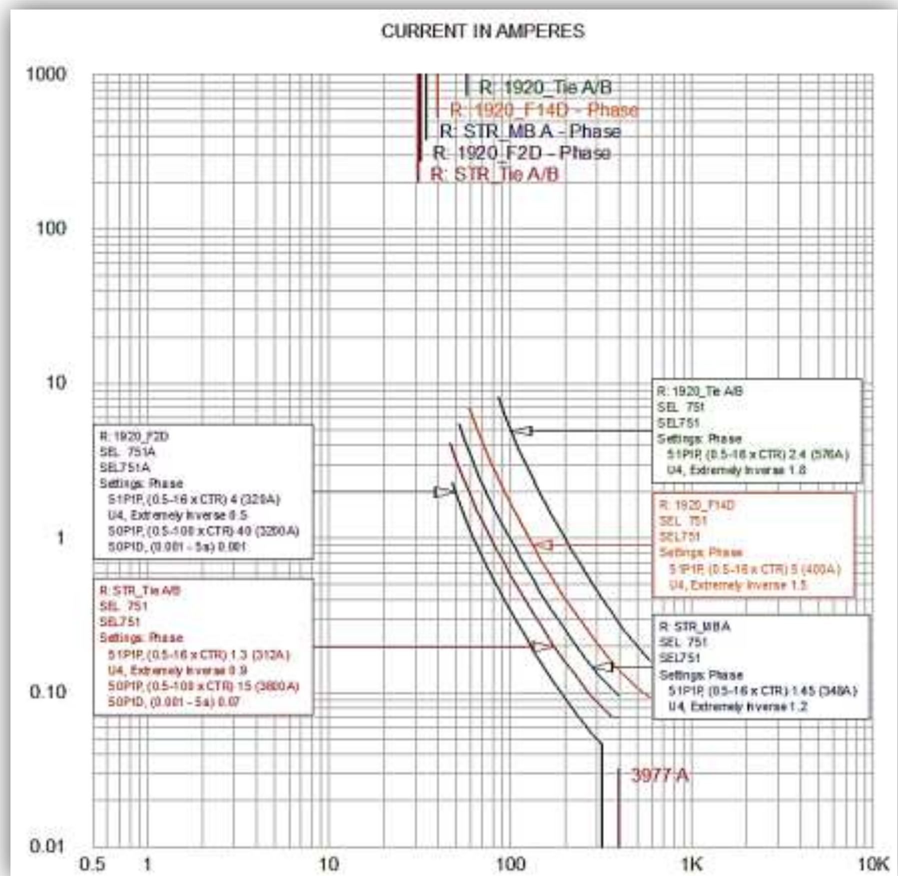
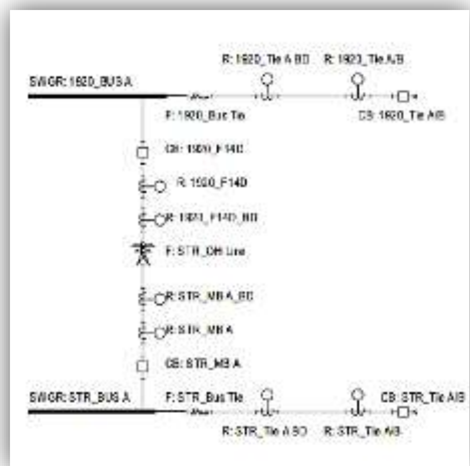
SYSTEM PROTECTION

Design Approach

- Meet Utility Interconnection Requirements
- Ensure Machine Protection
- Minimize System Outages
- Support Grid-connected & Islanded Modes

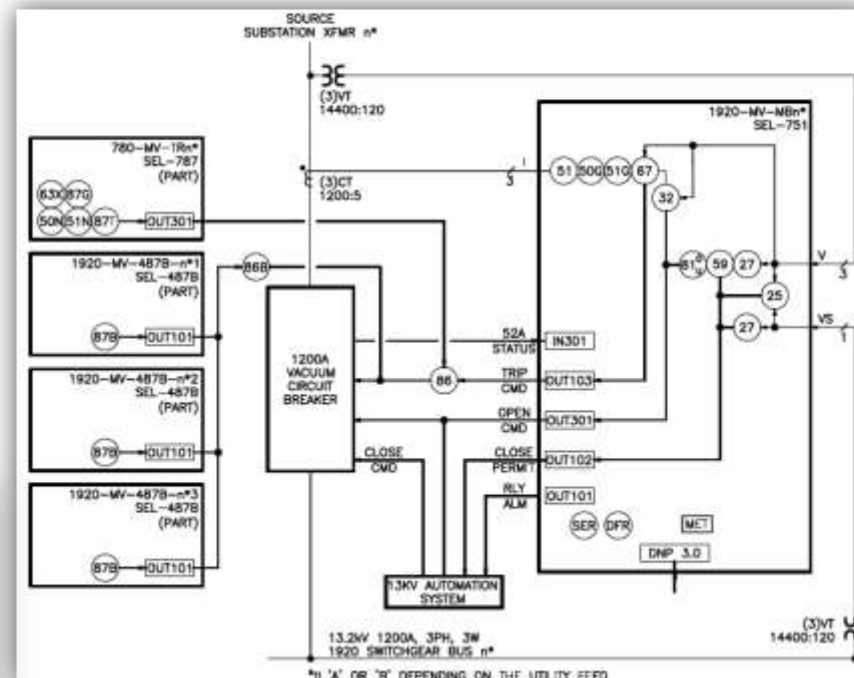




SYSTEM PROTECTION

Utility Interconnection

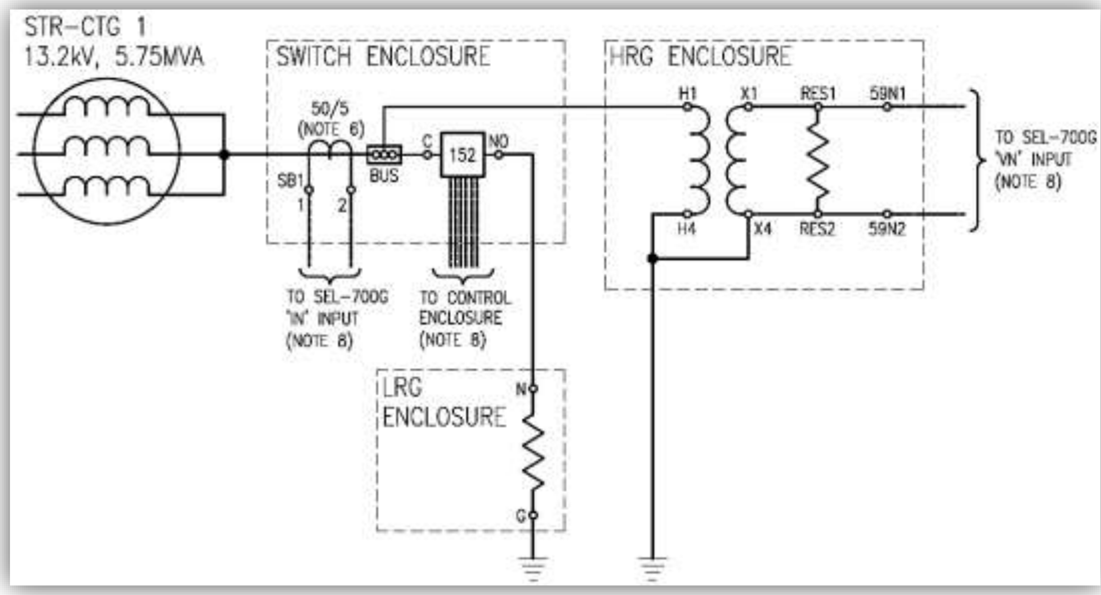
- No Export of Power
- Coordinate with Utility Reclosing Breaker
- Use of Frequency & Voltage Functions



SYSTEM PROTECTION

Grounding

- Low Resistance System Grounding
- Hybrid High/Low Resistance CT/HRSG Grounding



SYSTEM PROTECTION

Scheme Development

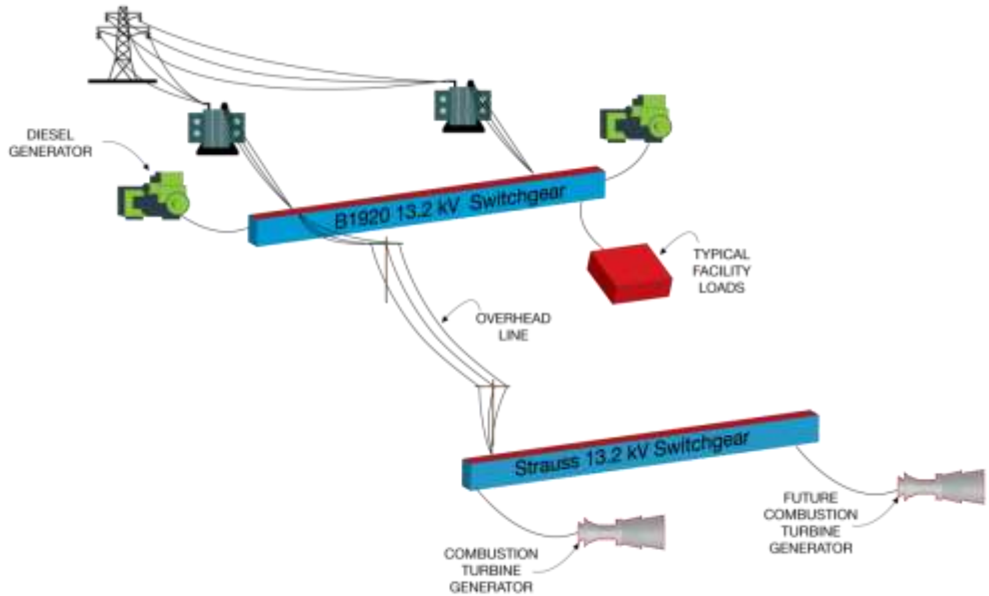
- Consider Multiple Sources
- Minimize Outages
- Coordinate with Automation System

CONCLUSION

Microgrids are Complex Systems

Evaluation of Scenarios is Critical

Intelligent, Automated Operations are Essential



Q&A

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