

**Deerhaven Unit 2**  
**2011 Turbine**  
**Upgrade/Replacement**

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**Background**

- Air Quality Control System (AQCS) resulted in a loss of 4.7 MW in Net Generation and a 350 BTU/KWH Heat Rate penalty
- Turbine Upgrade/Replacement to regain performance was included in the AQCS construction permit.

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**Project Goals**

- Performance
  - Gain 6-9 MW Net Generation
  - Improve Heat Rate  $\geq 350$  BTU/KWH
- Financial
  - IRR  $\geq 15.4\%$

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### Project Scope

- Replace the High Pressure/Intermediate Pressure (HP/IP) Turbine with upgraded current design
- Refurbish existing Low Pressure (LP) Turbine and replace existing turbine seals with upgraded design

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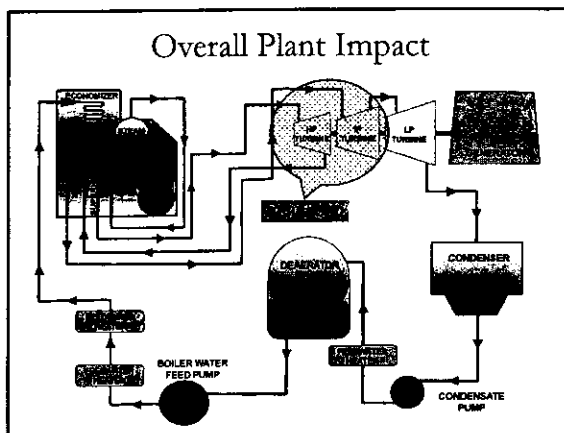
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### Overall Plant Impact




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### Manufacture & Installation

- Awarded to Siemens, the Original Equipment Manufacturer (OEM)
  - Turbine blading manufactured in Hungary
  - Rotor & Casing manufactured in Germany

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### Project Team

- Overall Project Research and Coordinator: Randy Casserleigh
  - Project Manager Mechanical: Dave Hollandsworth, Energy Supply Principal Engineer
  - Project Manager Electrical: Donny Thompson, Energy Supply Principal Engineer
  - Installation and Commissioning Engineer: Lonnie Little, Energy Supply Engineer Utility Designer III
  - Project Training and Simulation: Doug Beck, Energy Supply Director of Job Knowledge & Proficiency Development
- Project Sponsor: Melissa Jones, Deerhaven Production Manager

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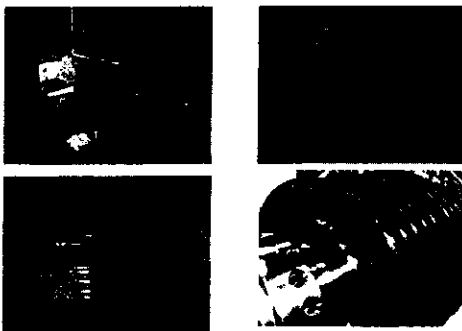
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### HP/IP Turbine Blades



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### HP/IP Turbine Casing



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HP/IP Turbine Rotor



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Overhead View (before)



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Overhead View (after)



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## DH2 Outage

Outage Duration:

October 1, 2011  
through  
November 16, 2011

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## Turbine Project Time Lapse Video

[Play Siemens provided video]

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## Project Actual Results

- Performance:
  - 13 MW Net Generation [vs. Project Goal of 6-9 MW]
    - (242 to 255 MW)
  - 494 BTU/KWH Heat Rate Improvement  
[vs. Project Goal of  $\geq 350$  BTU/KWH]
    - (10,009 to 9,515 BTU/KWH)
- Financial:
  - IRR = 29.73% [vs. Project Goal of  $\geq 15.4\%$ ]

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This is a Story of ...

- STRATEGIC THINKING
- FINANCIAL RESPONSIBILITY
- PROJECT MANAGEMENT
- CUSTOMER BENEFIT

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Questions?

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