GOT A MINUTE?

. . . I HAVE ANOTHER QUICK GENERATOR QUESTION.
Or...

STATIONARY AND PORTABLE STANDBY GENERATOR DESIGN CONSIDERATIONS FOR WATER AND WASTEWATER PROFESSIONALS
PRESENTED BY

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Wisconsin Wastewater Operators Association
2019 Conference
PURPOSE

• To equip municipal personnel with knowledge regarding the many factors to consider when specifying or selecting a standby generator.
• What regulations do I need to know about?
• DNR?
• Any others?
REGULATORY REQUIREMENTS

- Wisconsin Administrative Codes (Many)
- IBC – International Building Code(s)
- NFPA – National Fire Protection Association
- NEC – National Electrical Code
- Utility Company Requirements (Gas and Electric)
- EPA – Environmental Protection Agency
- UL – Underwriters Laboratories
• Where should it go?
• Location
• Location
• Location
PACKAGING

- Indoor
- Outdoor
- Portable (Towable)
Indoor

• BUILDING
  • HVAC
  • ELECTRICAL
  • FUEL STORAGE (LIMITS)

• MAINTENANCE
  • EASY ACCESS
  • PROTECTED

• AESTHETICS
Outdoor

- Clearances and Setbacks
  - BUILDING
  - UTILITY SERVICE
  - TANK

- Orientation
  - PREVAILING WINDS

- ENCLOSURE OPTIONS
  - SOUND
  - COLOR
  - CORROSION RESISTANCE
  - RODENT RESISTANCE
Outdoor

**THIS IS A GUIDE ONLY**
- PLEASE REFER TO GUIDELINES FOUND IN WISCONSIN ADMINISTRATIVE CODE CHAPTER ATCP 93
- CHECK LOCAL ORDINANCES AS THEY MAY BE MORE RESTRICTIVE THAN WI STATE CODE

**NOTES**
- COLLISION PROTECTION BARRIERS REQUIRED FOR UNITS IN VEHICLE TRAFFIC AREAS SEE CODE: ATCP 93.430 OCT 2013
- MIN DISTANCE FROM LOT LINE: PER NFPA 30 "TABLE 12.3.2.1.1 (4)"
  - 275 GAL FUEL TANK: 5 FT
  - 275 TO 750 GAL FUEL TANK: 10 FT
  - >750 GAL FUEL TANK: 15 FT

**SETBACKS FROM EXISTING POTABLE WATER SUPPLIES: ATCP 93.260**

**ITEM NO.** | **QTY.** | **DESCRIPTION** | **PART NO.** | **MATERIAL** | **REV.** | **DUE DATE** | **DATE** | **NOTE**
---|---|---|---|---|---|---|---|---
1 | | | | | | | |
Portable/Towable

- Storage Location
- Tow Vehicle
- Loads to be Served
- Cord Storage
- Cord End Receptacle
- Options No Longer Available
  - Multiple Output Voltages
  - Multiple Plug Configurations
## COST COMPARISON

<table>
<thead>
<tr>
<th></th>
<th>STANDBY</th>
<th>TOWABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 KW DIESEL</td>
<td>$25,250</td>
<td>$34,500</td>
</tr>
<tr>
<td>125 KW DIESEL</td>
<td>$34,250</td>
<td>$71,500</td>
</tr>
</tbody>
</table>
• Diesel
• Natural Gas
• LP
DIESEL

- Wisconsin Requirements for Fuel System
  - Permit Required for Diesel Tanks
- Fuel Conditioning
- Exercise Under Load
- Impact of Recent EPA Requirements
- Sizing considerations
  - Typically want to exercise under load to at least 1/3 of capacity.
NATURAL GAS and LP

• Typically 125 KW and Below
  • Cost Escalates at 150 KW and Above.

• Fuel Availability Considerations
  • Gas service may be curtailed in a severe storm

• LP as Primary or Back-up Option
  • Vaporizer may be required.
## COST
### NATURAL GAS vs. DIESEL

<table>
<thead>
<tr>
<th>KW</th>
<th>Nat Gas</th>
<th>Diesel</th>
</tr>
</thead>
<tbody>
<tr>
<td>125kW</td>
<td>$30,900.00</td>
<td>$36,440.00</td>
</tr>
<tr>
<td>150kW</td>
<td>$42,400.00</td>
<td>$38,080.00</td>
</tr>
<tr>
<td>180kW</td>
<td>$74,560.00</td>
<td>$43,246.00</td>
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</tbody>
</table>
PRODUCT GRADE

- Used/Surplus
- Residential/Commercial
- Industrial
A BRIEF WORD FOR CHILDREN

A BOOK BY DAVID MACAULAY

TOILET!
USED/SURPLUS

• Age and Run Hours
• Availability of Parts and Service
• Design Life of Project vs. Equipment Life
• Cost of Testing and Refurbishing
• Evaluation of Risk/Benefit
• EPA Considerations
  • Are You the Current Owner?
  • Does it meet Current EPA Emissions?
• “If in Doubt . . . Throw It Out!”
RESIDENTIAL/COMMERCIAL

- Significant Construction Differences
- Limited Fuel Options
- Limited Generator/ATS Options
- Service and Support
INDUSTRIAL

• Product Quality
• Service and Support
• Extended Warranty
• Long Term Parts Availability
Sizing Considerations

“You’ll never earn a gold star for under sizing a generator!”

Abraham Lincoln
MOTOR AND LOAD TYPES

- Motor Starting Code Letter
- Submersible Centrifugal Pumps
- High Inertia Loads
- VFD/AFD Applications
- Constant Torque vs. Variable Torque
- Single Phase Loading
MOTOR STARTER TYPES

• Across the Line (FVR, FVNR)
• Reduced Voltage (SSRV)
• Drives (VFD/AFD)
LOAD CONTROL STRATEGIES

• Identify Critical Loads
• Hard-wired Control
• Load Shedding through Plant PLC
TRANSFER SWITCHES

- Manual
- Automatic
  - Paralleling
  - Distributed Generation
- Grounding and Bonding!
MANUAL TRANSFER SWITCH

• Chosen for Smaller, Less Critical Applications
• Double Throw Switch (no overcurrent protection)
• Service Entrance Rated Mechanically Interlocked Circuit Breakers with Utility Main Breaker and a “SUSE” Label.
• Kirk-Key Interlocked (No longer allowed by Alliant)
AUTOMATIC TRANSFER SWITCH

• Unattended Operation
• Permanent/Fixed or Portable Generator Installations
• Adjustable Control Parameters
• Metering and Event Logging
• Packaged with Generator
• Enclosure Options - Indoor/Outdoor/MCC
AUTOMATIC TRANSFER SWITCH

- Combined Main Disconnect/ATS
- 3-pole or 4-pole
- Open or Closed Transition
MONITORING/MAINTENANCE

- Monitoring Options
  - Local Basic
  - Analog or Digital
  - Remote Annunciator
  - Dry Contacts to SCADA
  - Network SCADA Interface
  - Remote Wireless (via Generator supplier)
MONITORING/MAINTENANCE

• Exercising
  • Manual
  • Automatic
  • Load
  • No-Load

• Minimum is Once per Month.
  • Recommend Weekly, Under Load
  • Annual or Every Two Years for Lightly Loaded Diesels
CONCLUSIONS

• Each project has unique requirements.
• It’s important to evaluate your options with appropriate from Supervisors, Operators, Engineer, and Generator Suppliers.
CONCLUSIONS

• Standby Power Systems are critical components in reliable water and wastewater systems.
• Recognize and evaluate the appropriate factors when selecting your next standby generator.
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