



EMCOMM 2001 Emergency Power Operation




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Emergency Power Operation




Factors Effecting Power Requirements

- Receive Current, Transmit Current, and Duty Cycle
- Modulation Mode: CW, SSB and FM
- Output Power Level & Antenna Gain
- Emergency Scenario: Duration, Severity
- Net Control vs. Net Participant




48 Hour Emergency Scenario

- Continuous Operation Phase: 4 hours total, Continuous operation of HF and VHF nets
- Intermittent Phase I: 12 hours total, 20 minute HF net at top of hour, 20 minute VHF net at bottom of hour
- Intermittent Phase II: 32 hours total, 10 minute HF net at top of hour, 10 minute VHF net at bottom of hour.




Tx Duty Cycles for Different Modes

Mode	Transmit Duty Cycle
CW	44%
PSK-31	100%
SSB	30%
FM Phone	100%
VHF FM Digital	100%



Tx Duty Cycles for Different Phases of Scenario

Phase	Net Control Station	Participant Station
Continuous	33%	5%
Intermittent 1	11%	2%
Intermittent 2	6%	1%



Current Requirements For Typical Rigs (12 VDC Source)

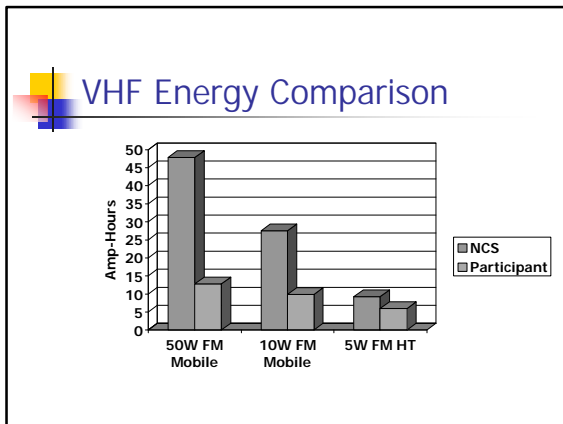
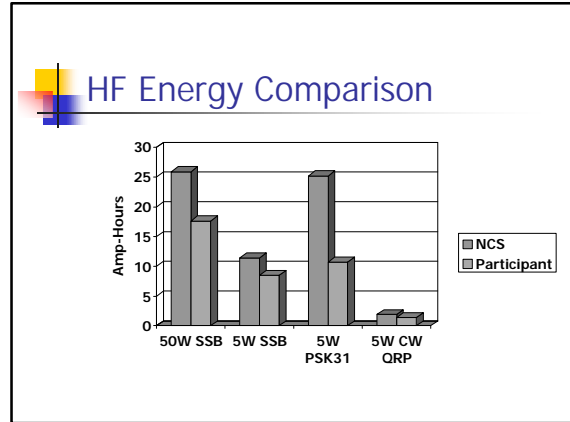
Rig Type / Current in Amps	P _{rx}	P _{tx} =5W	P _{tx} =10W	P _{tx} =50W	P _{tx} =100W
HF All Mode Base Station	1.2	5.7	6.4	11.4	18.2
HF Low Power CW/SSB Rig	0.6	4.5		10.0	
HF QRP CW Rig	< 0.1	0.5			
VHF FM Mobile	0.5		5.2	9.8	
VHF FM Handheld	0.4	1.33			

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Power and Energy Requirements*, HF Net, P_{tx}=50W, SSB Mode

*Power values specified in amps and energy values in amp-hours assume a 12 volt DC source.


Phase	NCS Station Current (A)	NCS Station Energy (A-H)	Participant Station Current (A)	Participant Station Energy (A-H)
Continuous Phase:	1.9	7.7	1.3	5.2
Intermittent Phase I:	0.6	7.7	0.4	5.2
Intermittent Phase II:	0.3	10.5	0.2	7.1
Total Energy, Amp Hours:		25.9		17.5



- ### Power Requirement Summary I
- Receiver S units are typically 3 to 6 dB.
 - 5 Watts is 10 dB less than 50 Watts.
 - That typically means 2 or 3 S units.
 - If you are S9+20 dB at 50 W, you will be S9+10 dB at 5 W.
 - QRP CW and QRP PSK31 rigs use the least power by a substantial margin.
 - PSK31 rigs require additional power to support a computer system.


- ### Power Requirement Summary II
- Use a gain antenna on VHF if possible.
 - 3 dB gain equivalent to doubling Tx power
 - Yagi beam for directivity
 - Colinear for omnidirectional
 - Don't use a Dx antenna on HF for regional coverage. Use NVIS!

- ### Power Wiring
- Size the gauge to the radio.
- Practical minimums:
- 10 AWG for 100 W HF Base Rigs
 - 12 AWG for Low Power HF Rigs
 - 14 AWG for 50W VHF Mobile Rigs
 - 18 AWG for VHF HTs




Power Connectors & Fuses

- Use quality connectors with high current ratings. Minimums:
 - 30 Amp for 100 W HF Base Stations.
 - 15 Amp for Low Power HF Rigs and VHF Mobiles.
 - 5 Amp for HF QRP Rigs and VHF HTs.
- Use fuses with the proper ratings. Connector ratings above are a good starting point for maximum fuse ratings.




Factors in Selecting Generators: Output Voltage

- Generated voltage: 110 volt AC or 12 volt DC or both?
- If dual voltage, 12 volt output typically useful for charging batteries. Often not enough for running HF rigs directly.
- If 110 VAC, how generated?
 - Direct from a winding?
 - Inverter?




Factors in Selecting Generators: Output Current

- At least 20 amps at 12 volts or 3.5 amps at 110 volts for 100 watt HF rigs
- At least 12 amps at 12 volts or 2 amps at 110 volts for 50 watt VHF rigs




Relative Audio Noise Levels

■ 10 dB Rustling leaves.	■ 70 dB Truck interior
■ 30 dB Quiet room.	■ 80 dB Busy city street.
■ 50 dB Classroom.	■ 110 dB Jackhammer
■ 60 dB Conversation at 3 foot distance.	



Factors in Selecting Generators: Audible Noise Level

- How close to the generator will you be operating?
 - If near the operating point, prefer under 60 dB. Typically < 1000 watts.
 - If remote from operating point, prefer under 80 dB. Typically > 2000 watts.



Factors in Selecting Generators: Other Factors

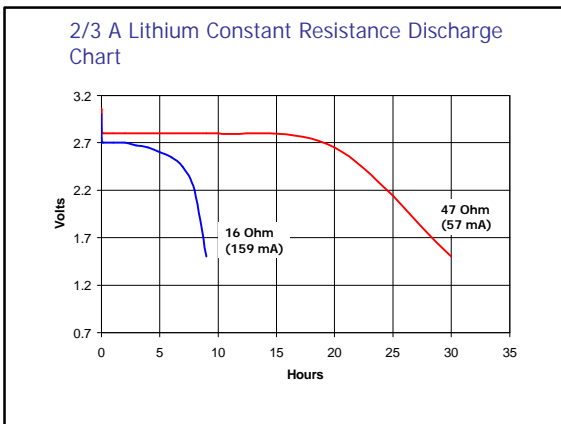
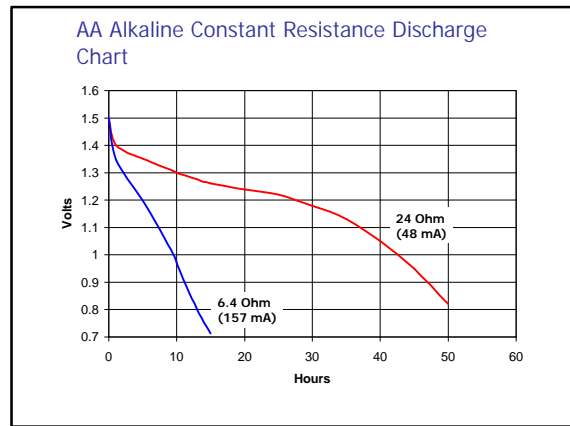
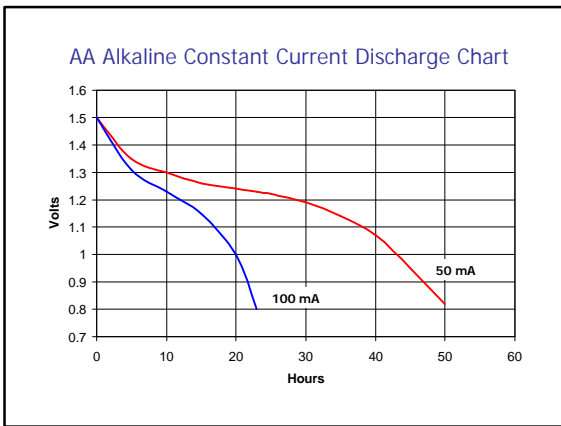
- RFI: Generally not specified by manufacturer. Expect some.
- Computers to be powered (packet or PSK-31)? Prefer inverter type to direct winding type.

Battery Types

- Non-rechargeable (primary)
 - Lower Maintenance
 - No need to look for charger during emergency
 - Need to keep adequate supply on hand
- Rechargeable
 - Need to keep charged
 - May be able to recharge during emergency

Primary Batteries

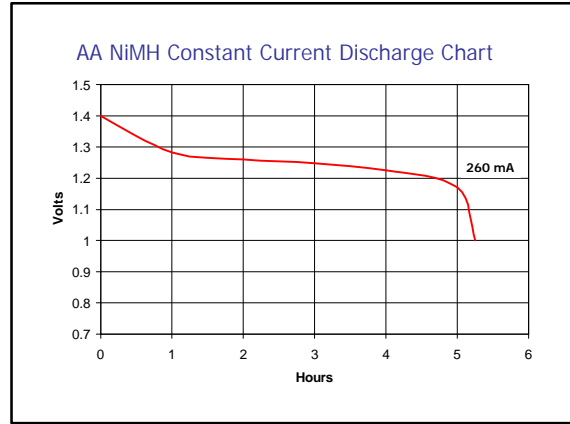
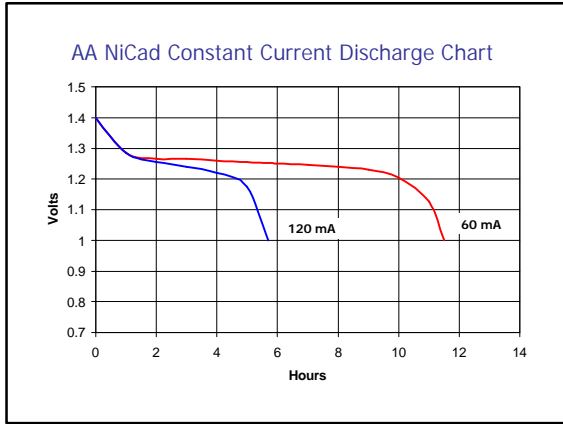
- Alkaline
 - 1.5 V per cell
 - Advantages
 - Low Cost
 - Generally available
 - Drawbacks
 - Voltage decreases as batteries are used
 - Loses 4% of capacity per year of storage
- Lithium
 - 3.0 V per cell
 - Advantages
 - Stable Voltage during use
 - Long shelf life
 - Drawbacks
 - Higher Cost
 - Not Available in larger sizes



Rechargeable Batteries

- NiCad
 - 1.2 V / cell
- NiMH
 - 1.2 V / cell
- Lithium Ion
 - 3.7 V / cell
- Lead-Acid
 - 2.1 V / cell

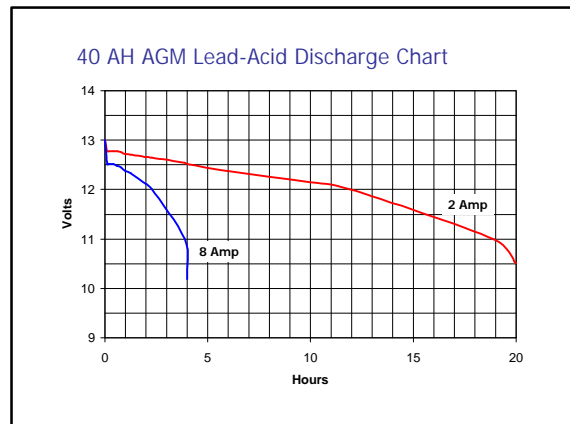
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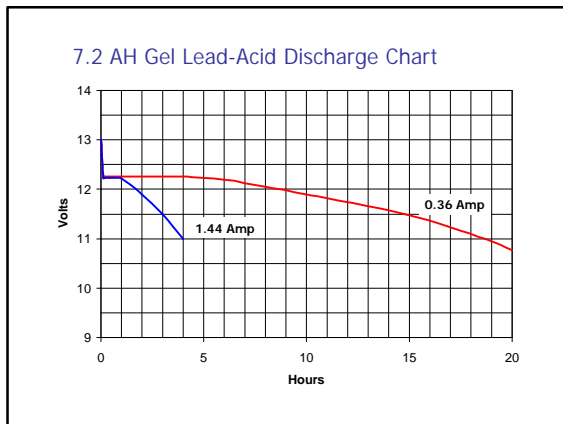
- ### NiCad and NiMH battery care
- Do not discharge below 1.0 V per cell
 - Deep discharge periodically
 - Store at room temperature or cooler
 - Do not overcharge

- ### Lead-Acid Battery Types
- Starting (car battery)
 - Deep Cycle or Marine
 - Wet or flooded cell
 - Valve Regulated (VLRA)
 - Gel cell
 - Absorbed Glass Mat (AGM)

- ### Lead-Acid Battery Ratings
- Ampere Hour (AH)
 - Reserve Capacity (RC)
 - Minutes of discharge at 25 A
 - $AH = RC \times 0.6$



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Lead-Acid Battery care

- Recharge as soon as possible after discharge
- Recharge at least once every 2 months
- Store at room temperature or cooler
- Size battery to use less than 80% of capacity
- Do not discharge below 10.5 V

Sealed Lead-Acid Battery care

- Do not recharge with current greater than 20% of the Amp Hour rating
- Pay attention to maximum charging voltage specification on VLRA batteries