

# ***Renewable Energy in Theater***



***On July 25, 2006, Al-Anbar commander and U.S. Marine Corps Maj. General Richard Zilmer submitted an MNF-W Priority 1 request for alternative energy solutions in theater.***

***The request focuses on the hazards inherent in American supply lines carrying fuel. Most of the fuel isn't even for vehicles...***

***...it's for diesel generators that provide power at U.S. bases.***



# Renewable Energy in Theater



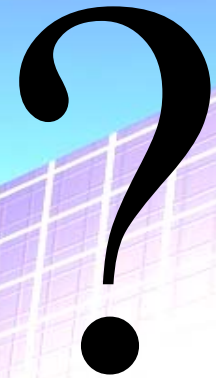
*Not as cost effective*

*Not a dependable resource*

*Difficult to deploy and set up*

*Too fragile for use in the field*

*Not as transportable as gensets*

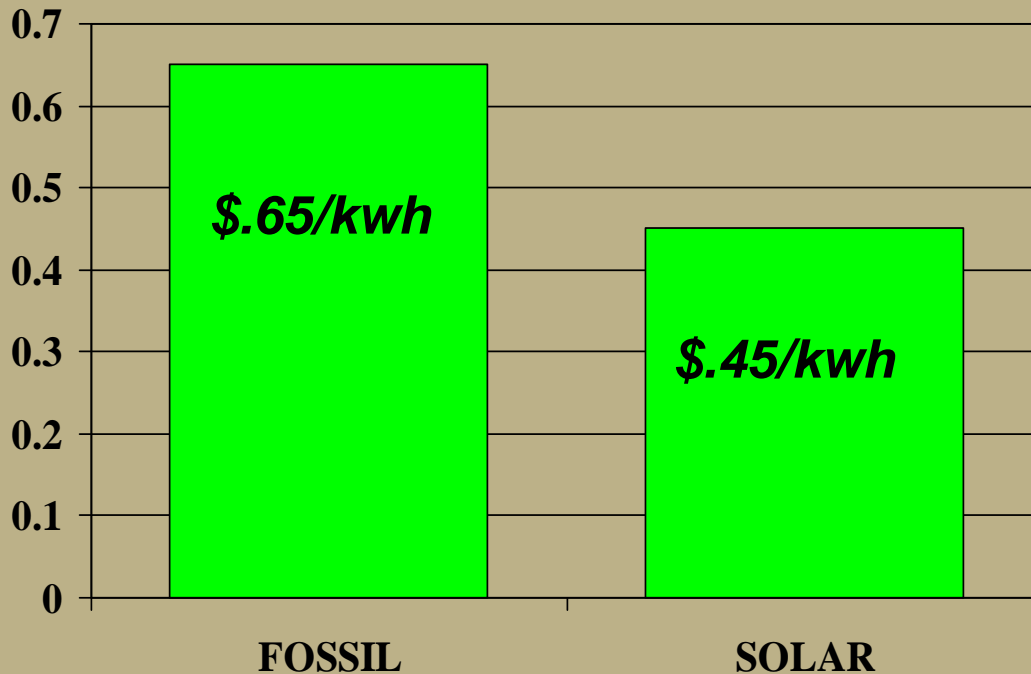


# Renewable Energy in Theater



## Solar power isn't cost effective

**Cost-per-kilowatt Comparison**



**Based on fuel cost of \$5  
per gallon-delivered  
3-year payback period**

# *Renewable Energy in Theater*



*Solar power generation is not dependable*



# *Renewable Energy in Theater*



*Solar is complicated & difficult to set up*





# *Renewable Energy in Theater*



*Solar is too fragile for use in theater*

*Fossil fueled generator*



*Solar*



# Renewable Energy in Theater

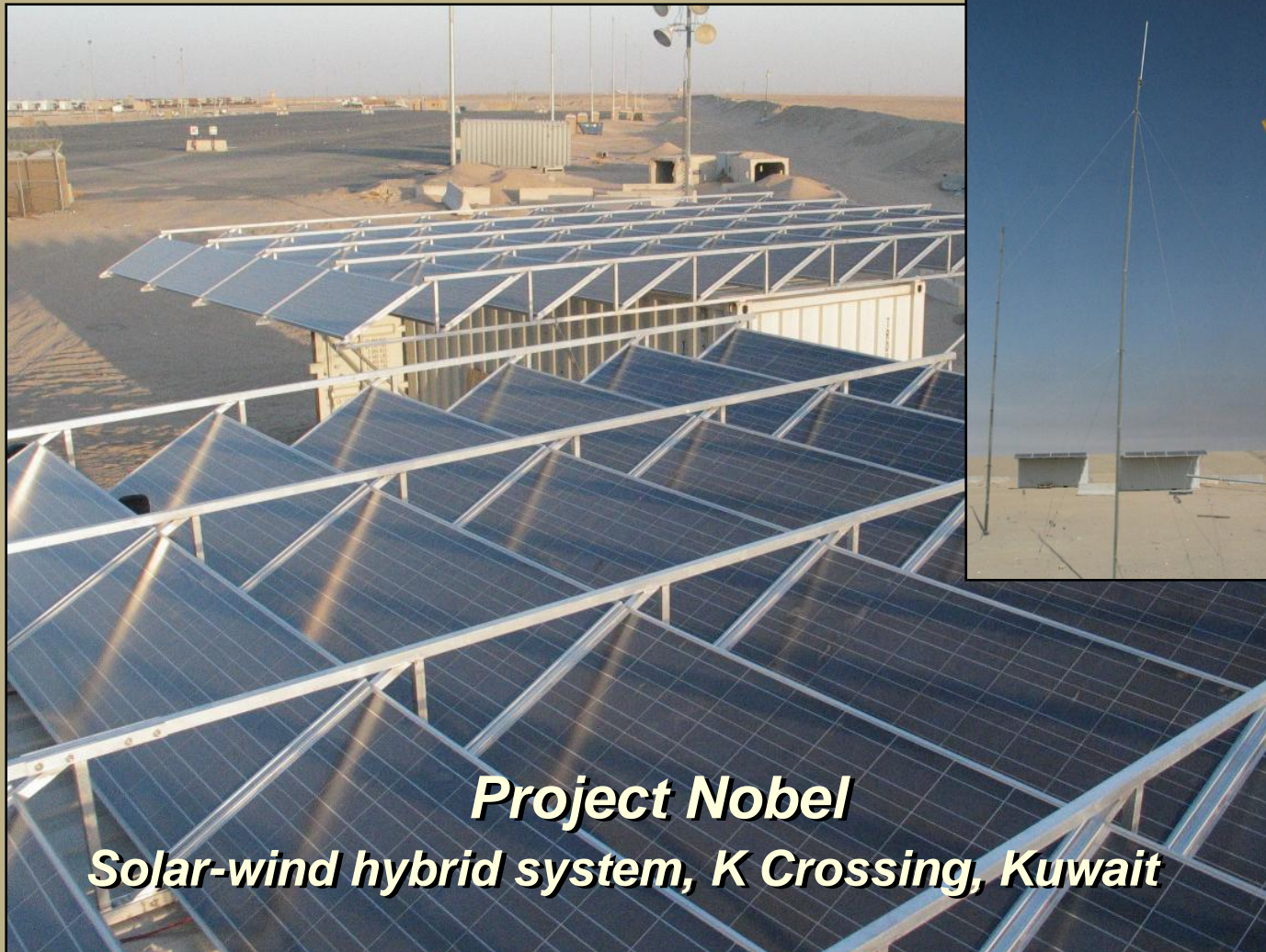


*Renewable systems aren't very transportable*



*Handsome old dude*

# *Renewable Energy in Theater*



***Project Nobel***  
***Solar-wind hybrid system, K Crossing, Kuwait***



# Renewable Energy in Theater



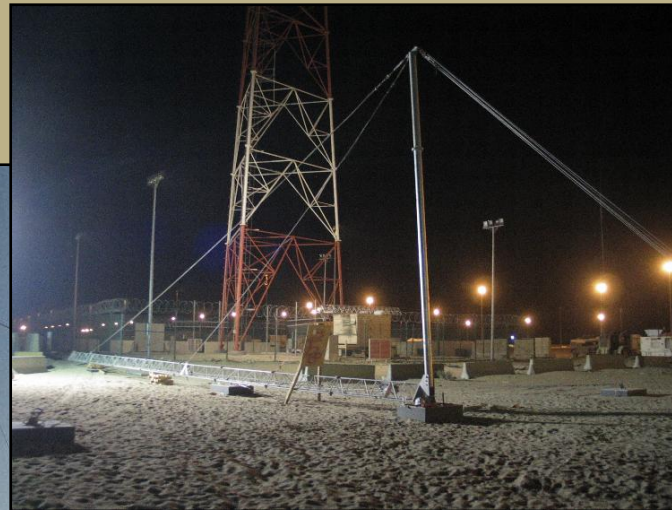
## Weather & environmental issues



# Renewable Energy in Theater



## *Crowded installation site*





# *Renewable Energy in Theater*



## *Changing personnel on the ground*



# *Renewable Energy in Theater*



*Spares not available at the corner hardware store*





# Renewable Energy in Theater



## Was it Worth It?



# *Renewable Energy in Theater*



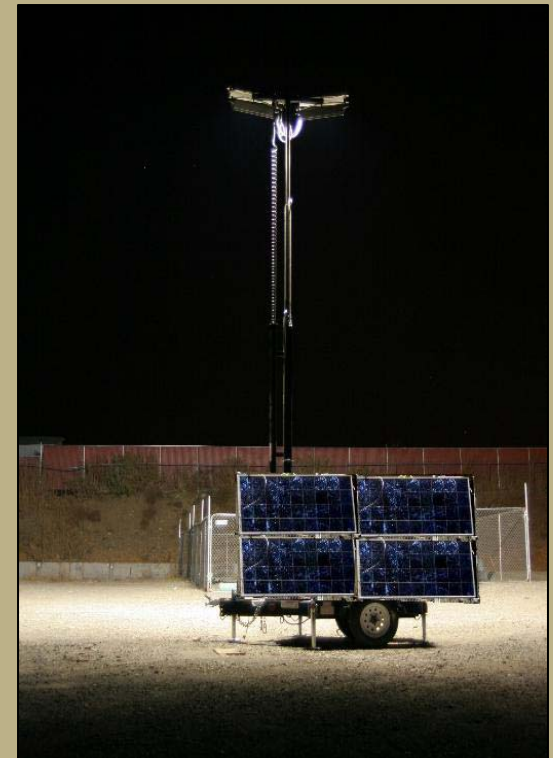
*How do we make solar solutions more portable?*



# *Renewable Energy in Theater*



## *Tactical, Solar-Powered Light Trailers*





# Renewable Energy in Theater



## Cost Comparison

**Diesel  
Light Trailer**

*Total Cost of Operation  
3-Year Amortized Annual Average*

**Solar  
Light Trailer**



Halide		Fluorescent
\$5,924.10	Purchase price	\$17,609.00
\$4,927.50	Fuel cost, annual	\$0.00
\$648.00	Maintenance, annual	\$648.00
\$2,190.00	Genset replace/rebuild	\$0.00
	Battery replacement	\$746.67
\$3,650.00	Annual operation	\$0.00
\$7,765.50	Total annual cost of operation	\$1,394.67
<b>\$29,220.60</b>	<b>Total 3-Year Cost of Operation</b>	<b>\$21,793.01</b>



**FUEL AT \$2.50 A Gallon, Delivered**



# Renewable Energy in Theater



## Cost Comparison

### Diesel Light Trailer

Total Cost of Operation  
3-Year Amortized Annual Average

### Solar Light Trailer



Halide		Fluorescent
\$5,924.10	Purchase price	\$17,609.00
\$19,710.00	Fuel cost, annual	\$0.00
\$648.00	Maintenance, annual	\$648.00
\$2,190.00	Genset replace/rebuild	\$0.00
	Battery replacement	\$746.67
\$3,650.00	Annual operation	\$0.00
\$23,360.00	Total annual cost of operation	\$1,394.67
<b>\$76,004.10</b>	<b>Total 3-Year Cost of Operation</b>	<b>\$21,793.01</b>



**FUEL AT \$10 A Gallon, Delivered**

# Renewable Energy in Theater



## Cost Comparison

### Diesel Light Trailer

*Total Cost of Operation  
3-Year Amortized Annual Average*

### Solar Light Trailer



Halide		Fluorescent
\$5,924.10	Purchase price	\$17,609.00
\$39,420.00	Fuel cost, annual	\$0.00
\$648.00	Maintenance, annual	\$648.00
\$2,190.00	Genset replace/rebuild	\$0.00
	Battery replacement	\$746.67
\$3,650.00	Annual operation	\$0.00
\$43,070.00	Total annual cost of operation	\$1,394.67
<b>\$135,134.10</b>	<b>Total 3-Year Cost of Operation</b>	<b>\$21,793.01</b>



**FUEL AT \$20 A Gallon, Delivered**

# *Renewable Energy in Theater*



## *Tactical Hybrid Power Trailer*

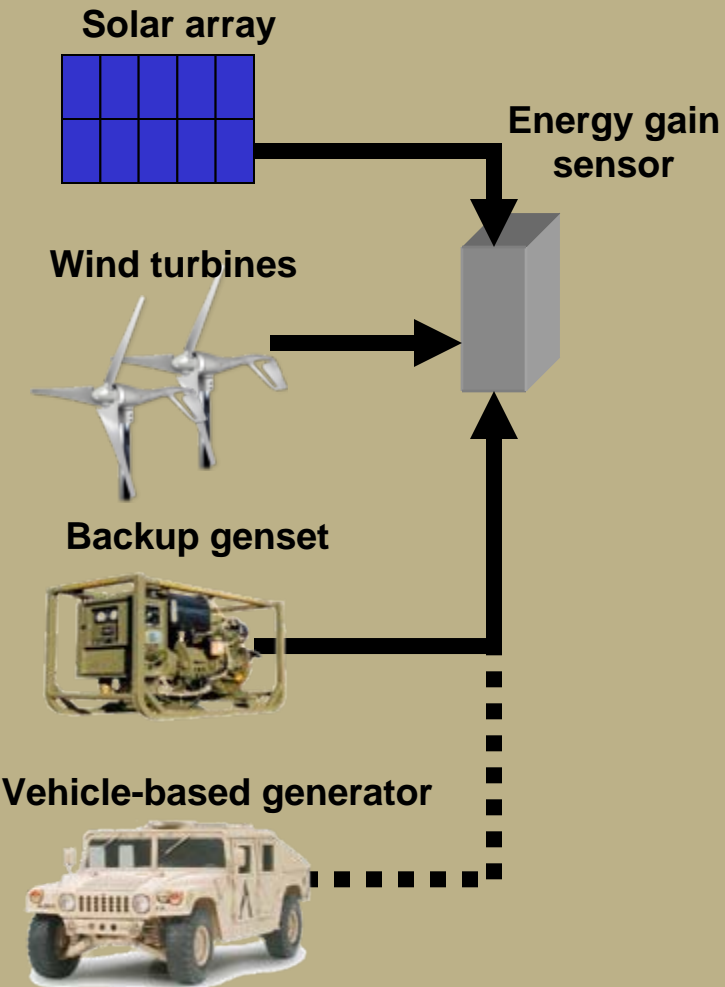
- *Dual wind turbines*
- *Fold-out solar array*
- *On-board backup genset*
- *Battery pack and inverter*
- *Computerized energy monitor*



# Renewable Energy in Theater



## Tactical Hybrid Power Trailer

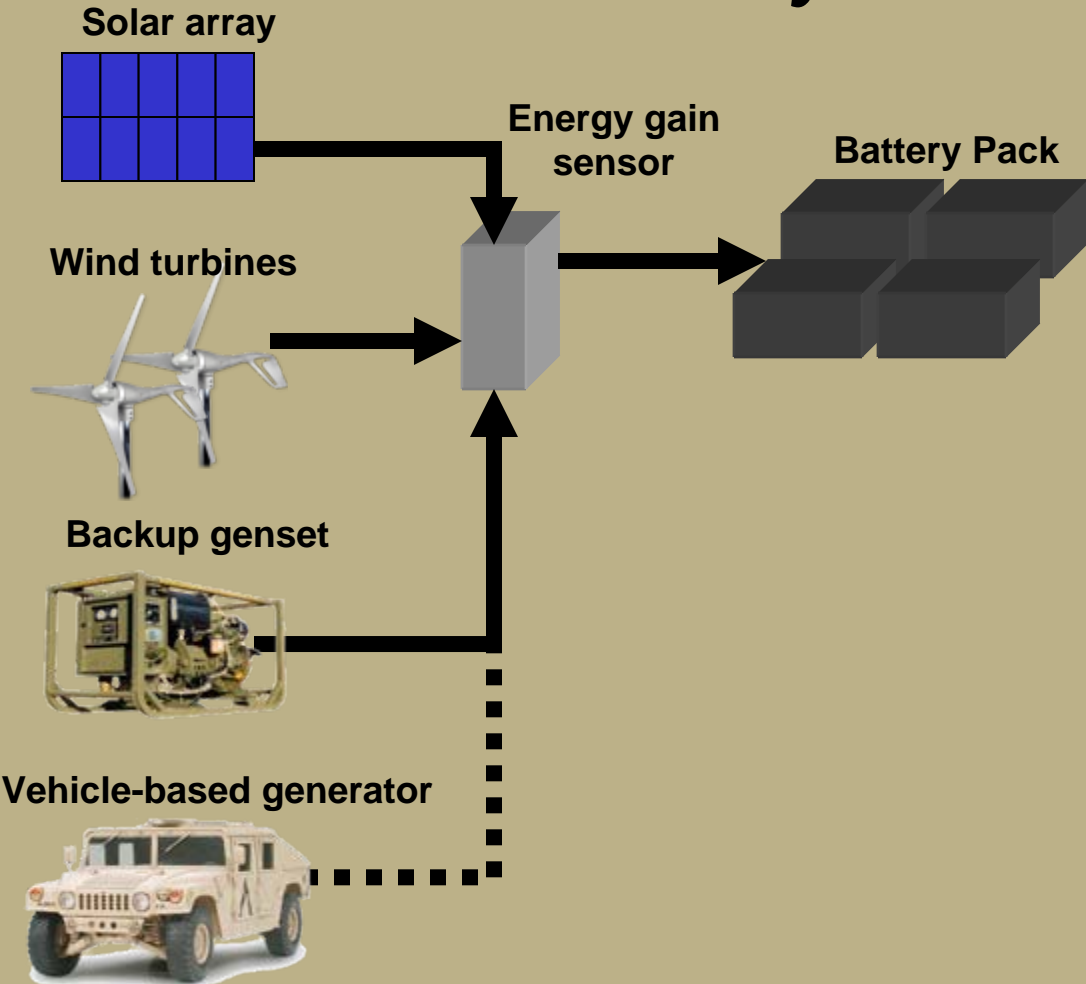




# Renewable Energy in Theater



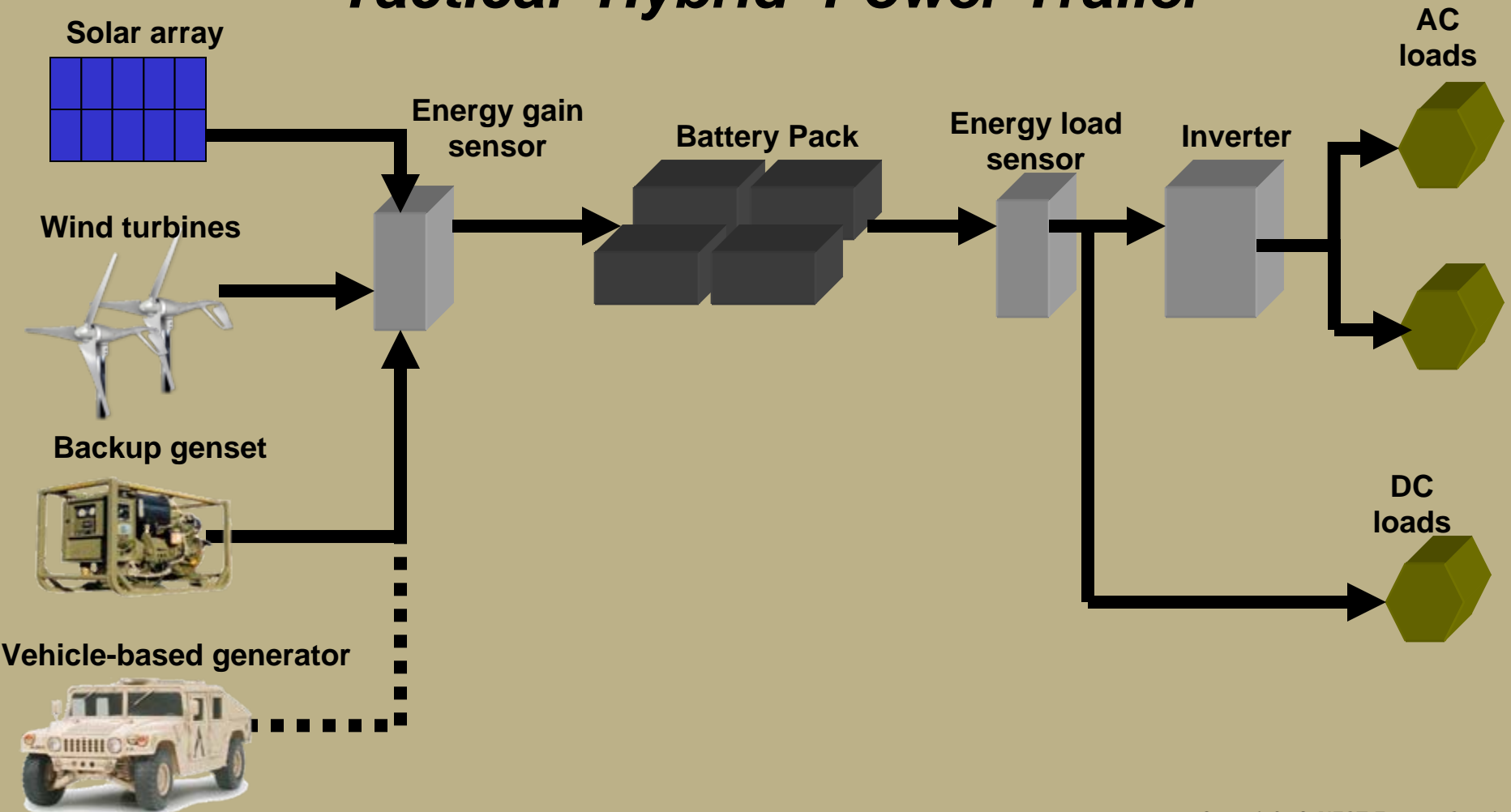
## Tactical Hybrid Power Trailer



# Renewable Energy in Theater



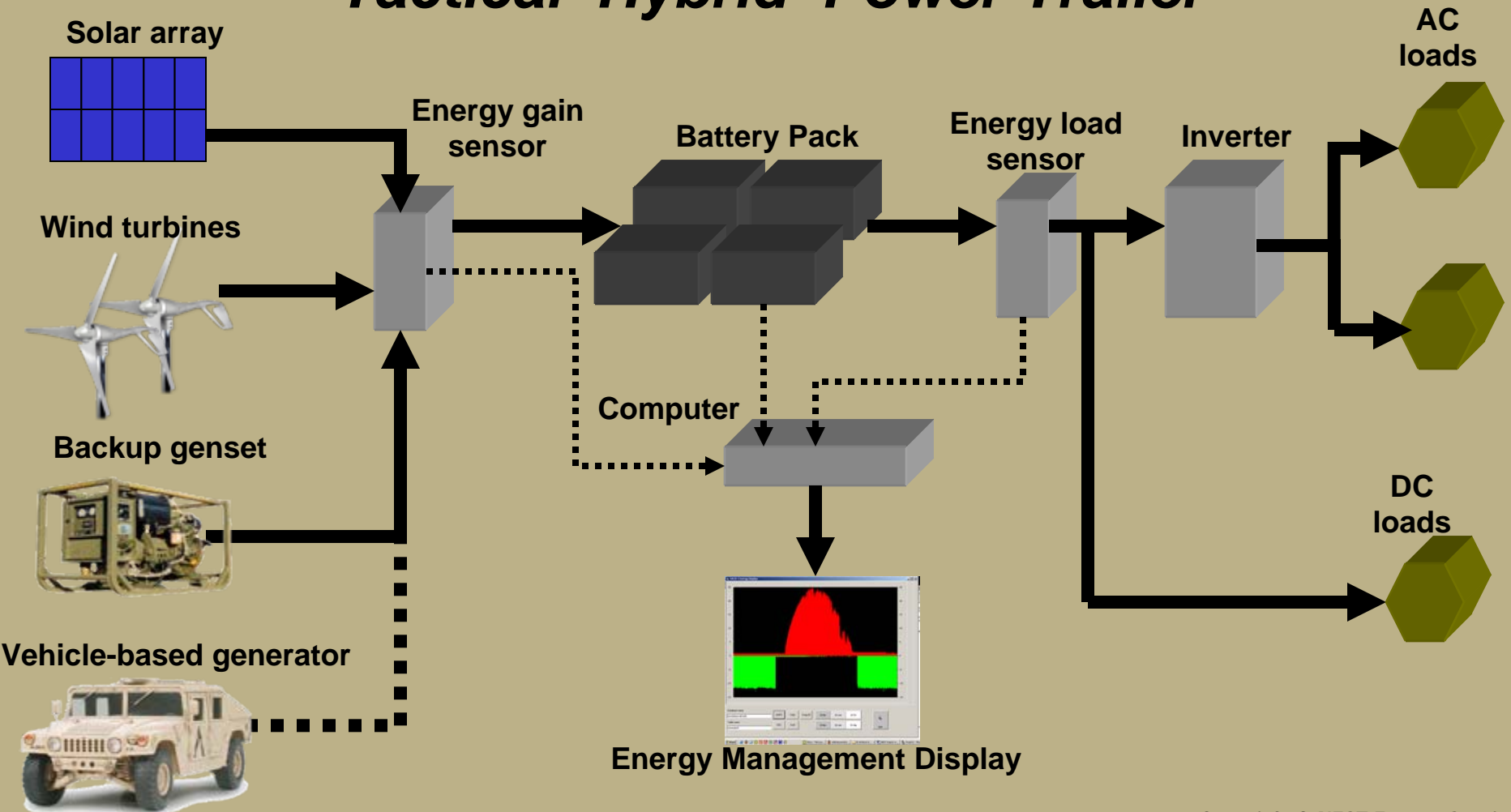
## Tactical Hybrid Power Trailer



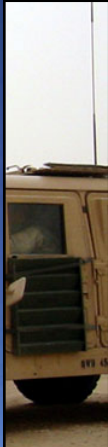
# Renewable Energy in Theater



## Tactical Hybrid Power Trailer



# Renewable Energy in Theater





# NES Energy Services LLC



# T



The Solinator®



Raptor Surveillance



Solar-powered  
Light Trailer



Condor Solar Station



Eagle Solar Station



Prescott Valley, AZ



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