

Hybrid Technology Greening Locomotives



Why Do We Need Hybrid Locomotive Technology?



- **Reduced Air/Noise Pollution**
 - 80 – 90 % reduction in diesel particulate emissions
 - Reduced engine idling time
 - Significant reduction in noise pollution/complaints from the public
 - Reduced ground contamination from oil spillage
 - Exceeds government requirements

Why Do We Need Hybrid Locomotive Technology?



- **Increased Intermodal Volume**
 - Larger vessels/fewer port calls
 - Reduced truck traffic volume

Additional Benefits for using Hybrid Technology



- **Lower Operating Costs**
 - Up to 80% reduction in fuel consumption
 - Lower maintenance expenses
 - Oil changes
 - Engine rebuilds
 - No need for maintenance pit
 - Reduced down time

Additional Benefits for using Hybrid Technology



- **Safety**

- Increased Operator Visibility

- Reduced Operator Fatigue

- Reduction in vibration

- Reduction in noise/emissions levels

- Reduction in health claims and insurance costs

Additional Benefits for using Hybrid Technology



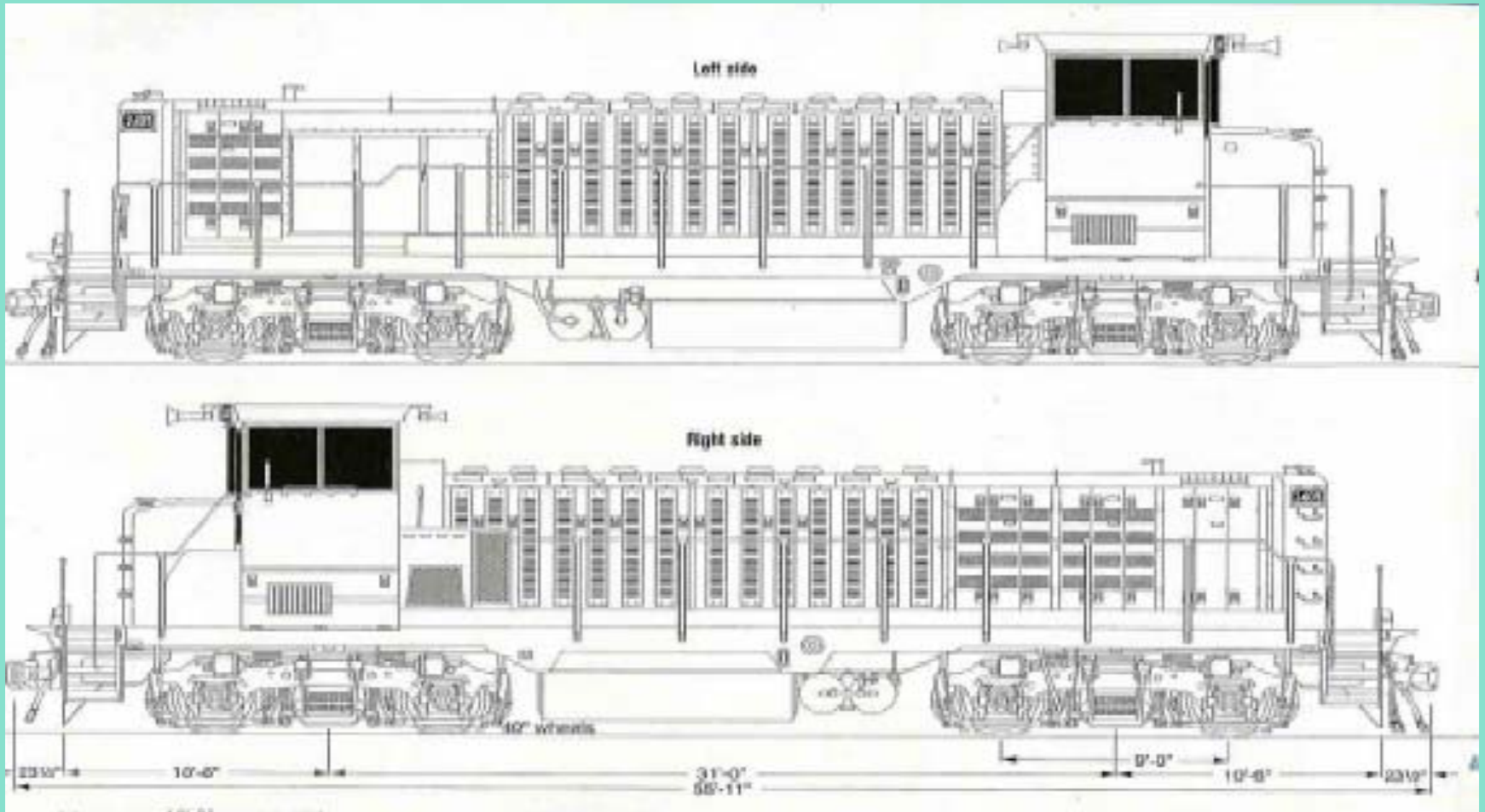
- **Purchase Price**

- Subsidized with pollution-control grants through government and power authorities
- Lower capital expense—new technology on old locomotive bed is more cost efficient than purchase of new standard unit

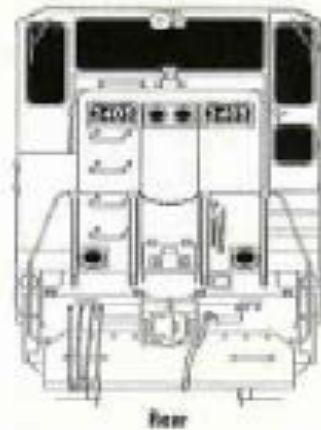
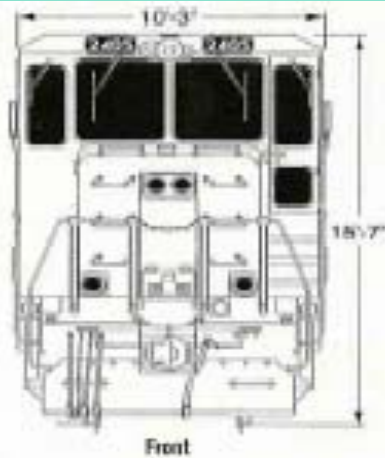
Additional Benefits for using Hybrid Technology



- **Improved Performance**
 - Slip control system provides superior pulling power
 - Minimal oil seepage results in reduced wheel slippage and sand usage
 - Operator comfort and familiarity



February 1, 2006



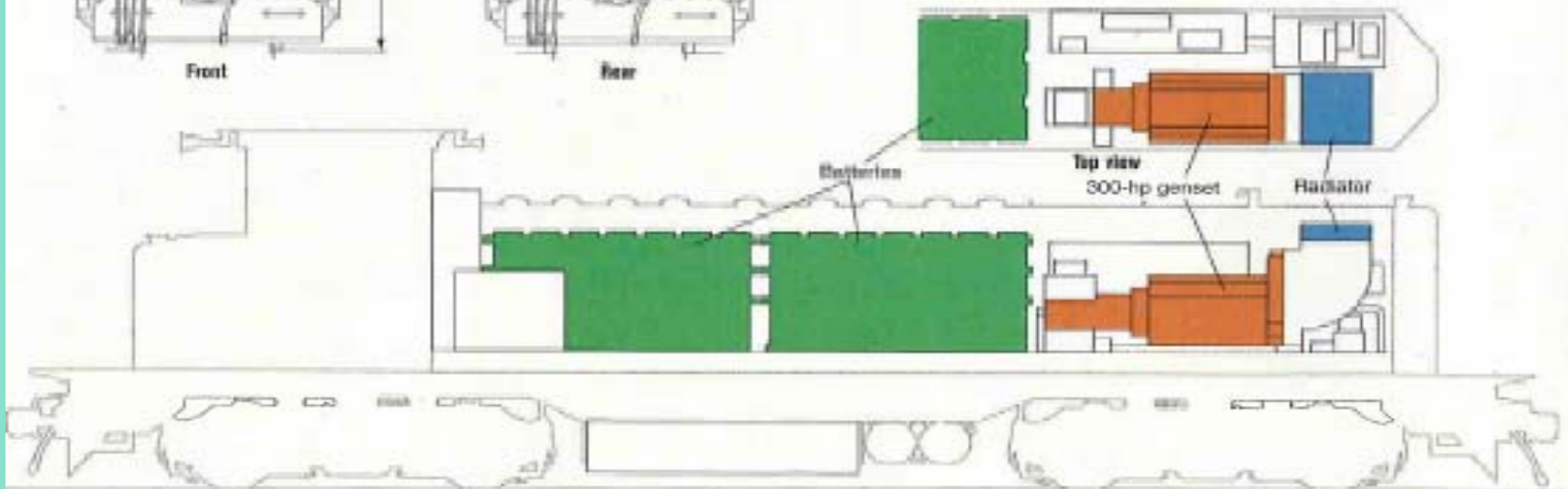
H0 scale (1:87.1)

To convert H0 scale drawings to your scale copy at these percentages:

N 54.4 percent S 135.1 percent O 181.4 percent

Drawn for *Model Railroader* magazine by
RICK JOHNSON

Magazine purchaser may have photocopies of these drawings made as an aid to personal or commercial model making or tool design, but does not have the right to distribute copies of the drawings to others.



Location of hybrid power components

Additional Technologies Available to Reduce Emissions/Noise/Fuel Use



- **Automatic Engine Stop-Start Controls**
 - Shuts down/restarts engine with preset limits
- **Diesel Driven Heating System**
 - utilizes engine heat to warm oil & water systems
- **Auxiliary Power Unit**
 - Provides heat/power/cab comfort
- **Shore Power Plug in Unit**
 - Uses land power to keep operating systems primed



Auxiliary Power Unit



Diesel-Driven Heating System



Shore Power Plug-in Unit

February 1, 2006