Air Quality, Innovation, and Sustainability: Transportation Case Studies

NEDC Partners Meeting
September 12, 2013
Groton, CT

EMISSTAR

Energy and Emissions Technology Consulting

Outline

- On Innovation
- About Emisstar
- Case Studies
- Final Thoughts

What is Innovation?

- An innovation is something original, new and important that breaks into the market or into society.

- Innovation is also the application of new solutions, products, processes, services, technologies or ideas.

Invention → Innovation → Diffusion

What is the impact of innovation?

95%
Competition
feel innovation can drive a more competitive economy

91%
Go Green
feel innovation can create a greener economy

88%
Jobs
feel innovation is the best way to create jobs

86%
Partnership
feel partnership is more important than stand-alone success

87%
Society
feel we should bring value to society as a whole not only to individuals

Improve Lives
can successfully change citizens' lives in the next 10 years in:

- **90%** Communications
- **87%** Health Quality
- **84%** Job Market
- **84%** Environmental Quality

What drives Innovation?

66%
Value of Innovation
believe that innovation will happen when the general public is convinced of the value that innovation will bring to their lives

65%
Universities & Schools
feel that innovation happens when local universities and schools provide a strong model for tomorrow's leaders

62%
Patent Protection
agree that when the protection of the copyright and patent are effective then innovation can occur

58%
Private Investors
believe that innovation will occur wh private investors are supportive of companies that need funds to innov

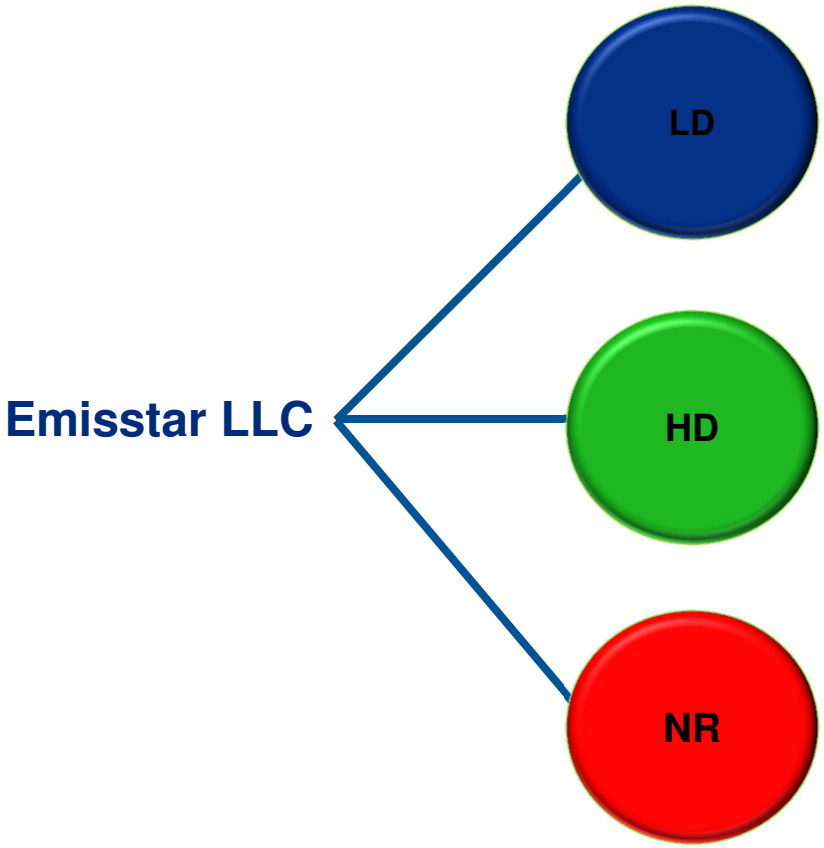
Budget Allocation 48%
believe that when government and public officials set aside an adequate share of their budget to support innovative companies, innovation can brew

Government Support 43%
think innovation can occur when governmental support for innovati efficiently organized and coordinat

Emisstar LLC

- Technology consulting firm
- 3 US Offices (NY, TX, CA)
- Energy and Emissions Focus – Transportation
- Alt Fuels, Vehicle Tech and Clean Energy
- Wide Range of Engineering, Verification Support and Testing Services
- Founded in 2005

Project Case Studies



Consolidated Edison of New York

- Utility work truck
- L-ion APU with solar charging
- Sustainability Pilot

Evans Cooling Systems

- Refuse collection truck (DSNY)
- Waterless HD engine coolant
- FE Testing @ chassis dyno VTF

MJ EcoPower Systems

- Rubber Tire Gantry for Port/Rail
- Hybrid Power Plant
- EPA Technology verification

Light Duty Case Study – Con Edison

- Eliminate vehicle on-board 10kW diesel GenSet

- Design, build and pilot fully integrated energy storage system to serve Con Ed field operations

- Utilize L-ion batteries, renewable energy + shore power.

- Focus on “sustainability”

Innovation

7.1 kWh eAPU

Value Proposition / Impact

7.1kWh APU

- *Replaces 10kW gen set*
  - No noise
  - No maintenance
  - No pollution
- *Sustainable energy technology*
  - PV integrated
  - Recharge 1-2x/week
- *Covers full range of utility work truck power requirements*
- *ROI from <u>DAY 1</u>*

Heavy Duty Case Study – EVANS Cooling Systems

- Product Validation Effort

HDTC

- Design, manage and execute a test to quantify FE benefits & engine effects on DSNY vehicles

EVANS
WATERLESS ENGINE COOLANT

- Utilize EVANS product innovation – a non-aqueous HD coolant system.

- Focus on “results”

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Innovation

HDTC	Market
- Waterless product	- Glycol based product
- Higher boiling temperature	- Lower boiling temperature
- No maintenance (1 fill)	- Maintenance item
- Fan resistor pack	- No cost savings
- Real cost savings	- Toxicity concerns
- Non toxic, non corrosive	- More corrosive

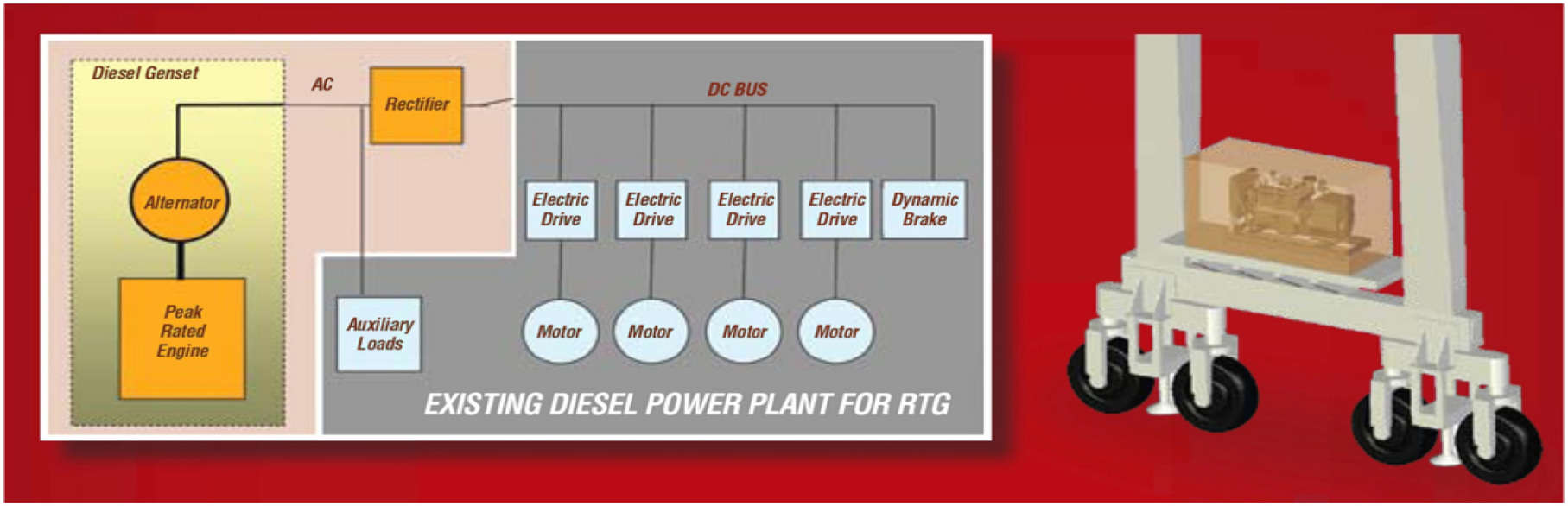
Value Proposition / Impact

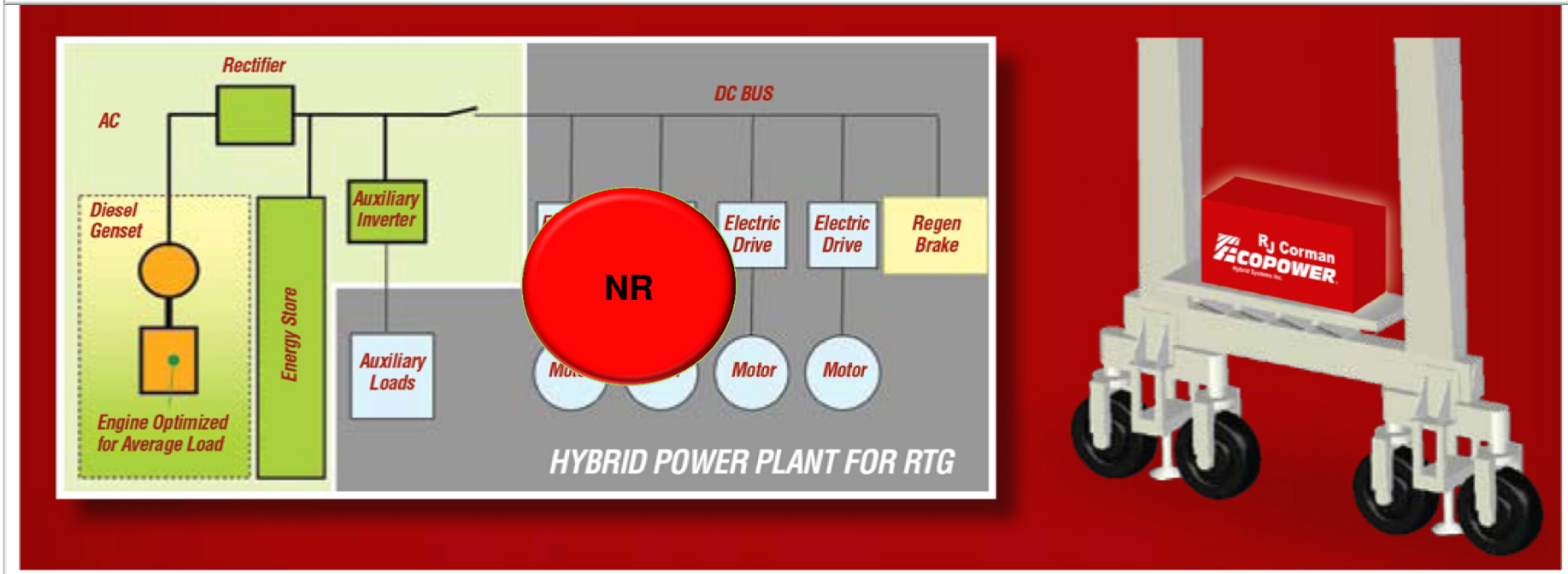
- 4.4 – 6.1 % improvement in MPG over 2 common duty cycles
  - NYCGTC
  - CBD (3x)
- Lower GHG emissions
- Lower PM emissions
- 7.0% increase in AVG coolant temperature
- Measurable effect
- < 1 year ROI

Non Road Case Study – MJ EcoPower Systems

- Design a new test cycle for RTG applications
- Quantify unique energy, air quality attributes of EcoCrane hybrid power plant
- Take innovative product through emerging to mature technology verification (USEPA)
- Make the verification flexible

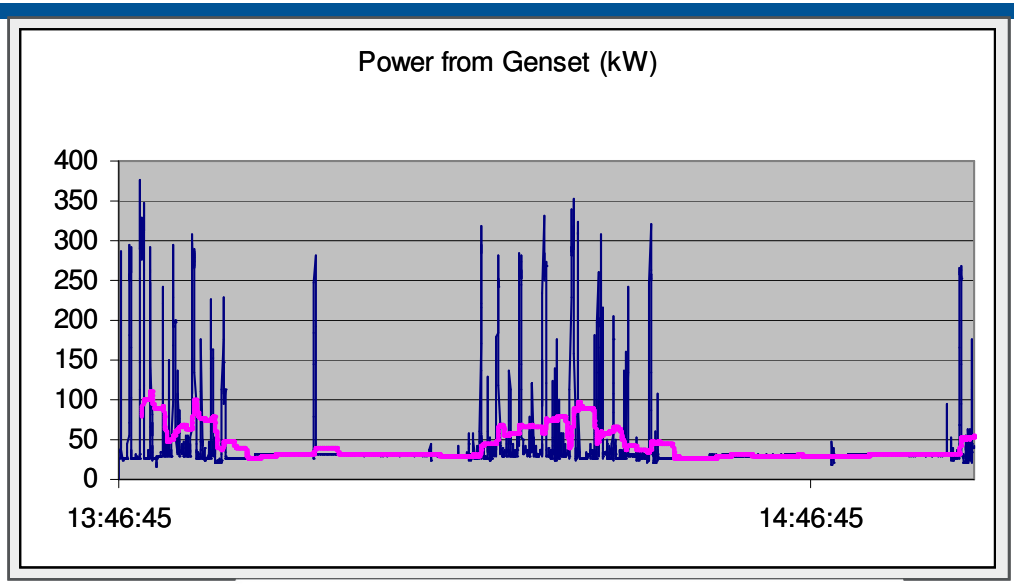
Innovation


Diesel Genset
AC
Rectifier
DC BUS
Alternator
Peak Rated Engine
Auxiliary Loads
Electric Drive
Electric Drive
Electric Drive
Electric Drive
Dynamic Brake
Motor
Motor
Motor
Motor
EXISTING DIESEL POWER PLANT FOR RTG

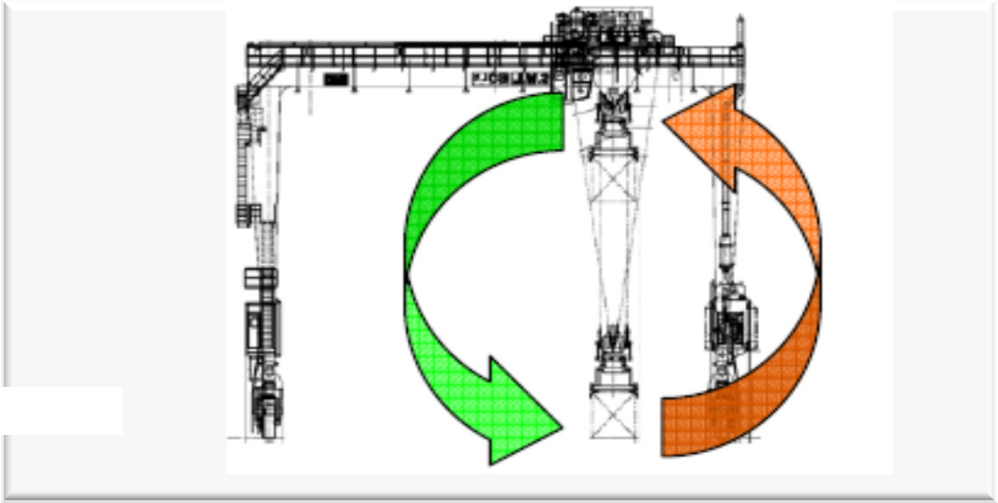

Rectifier
AC
DC BUS
Diesel Genset
Energy Store
Auxiliary Inverter
Auxiliary Loads
Engine Optimized for Average Load
NR
Electric Drive
Electric Drive
Regen Brake
Motor
Motor
HYBRID POWER PLANT FOR RTG

Innovation (2)

AVG Power vs. Peak Power
Using Smaller GenSet



Energy Recovery through
POWER REGENERATION



Innovation (3)

- *Hybrid conversion*
- *Ports America (POLA)*
- *Winter 2013*

Value Proposition / Impact

- EPA Verification Results
  - 56% reduction in FC
  - 74% reduction in PM
  - 84% reduction in NO_x
  - 96% reduction in HC
  - 91% reduction in CO

- Robust technology
- Superior energy and AQ benefits
- Measurable Results
- EPA Verified
- 3-4 year ROI

Conclusions

- There is no “magic bullet”
- Energy Savings and AQ benefits go hand in hand
- Will these technologies ever benefit society (diffuse)?
- Transportation and Sustainability
- Innovation matters
- Keep at it!

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