





### AVIATION OPERATIONAL MEASURES FOR FUEL AND EMISSIONS REDUCTION WORKSHOP

Ground Support Equipment Emission Reduction Options

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# Presentation







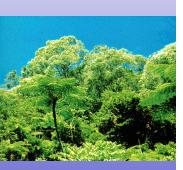
 Overall strategy
 Applicability of technology to equipment types and operation
 Other initiatives
 Conclusion





# **Emission Reductions**







No single solution
 Infrastructure requirements
 Operational requirements
 Equipment availability
 Technology availability
 Cost considerations





# Electric GSE









→Applicability →	Benefits/Challenges
♦Belt loaders	♦Zero emissions
◆Bag tractors ◆Aircraft tractors *	Lower maintenance costs
♦Forklifts	Increased equipment reliability
◆Container loaders ◆Cargo tractors	✦High infrastructure cost
*Limited Basis	Additional ramp     space
Airport Pane	

Ottawa, 5-6 November 2002





























































# Compressed Natural Gas









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- ✦Bag tugs
- ♦Belt loaders
- OEM type equipment (Ford, GM Etc)
- ♦ Forklifts

- → Benefits/ Challenges
  - Lower emissions
     (compared to
     gasoline higher for
     HC and CO
     compared to diesel)
     Infrastructure
     (limited availability,
     high cost for fill
     stations)





# Liquid Petroleum Gas









\* Limited use

Benefits/Challenges

◆Lower emissions (compared to gasoline - higher for HC and CO compared to diesel)

♦Safety concerns (employee strains)

 $\diamond$  Tank location

**♦**Cost















Gasoline/Diesel Retrofit with 2 or 3 Way Catalytic Converters

Applicability
Diesel and
closed-loop
gasoline
engines where
kits are
available

 Benefits/Challenges ♦Lower emissions ♦ Reduced fuel cost  $\diamond$  Open loop systems  $\diamond$ Engine run times  $\diamond$ Installation location and space on GSE ♦ Many different engines (many sizes and Mfg)















# Diesel Retrofit with Particulate Traps

Applicability

All current and older model diesels where kits are available

Benefits/Challenges

>85% particulate reduction

 $\diamond$ Installation location

*♦Cost* 

 $\diamond$  Maintenance

♦Life span

♦Not certified for all equipment

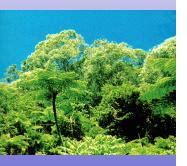
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♦*Run time* 













Emerging Technology with Significant Potential

- Possible
  - Applicability
    - ♦Bag tugs
    - ♦Belt loaders
    - ♦Jet tractors
    - ♦ Cargo tractors
    - ♦Container loaders
    - ♦ Chargers
    - ♦OEM type equipment

- Benefits/Challenges
  - ♦Zero emissions
  - No charge time, fueling could be similar to
    - conventional fueling
  - Less invasive infrastructure
  - $\diamond$ Availability
  - ♦ Technology, cost and timeline

Canada











## Solar Power Developing Technology

Applicability
Fuel service
carts

♦Other GSE

## → Benefits/ Challenges

♦Zero emissions

- No infrastructure required
- $\diamond$ Limited applicability
- Presently only used to assist other power sources

























→Tow-barless tractors
→Lavatory carts
→Fuel carts













































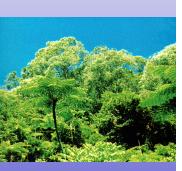






# Conclusion









 →No one solution fits all needs
 →Technology is still developing
 →Aviation industry is utilizing what is available
 →Cost





### Transports Canada <u>AVIATION OPERATIONAL MEASURES FOR</u> <u>FUEL AND EMISSIONS REDUCTION</u>

## **WORKSHOP**

# Thank you !



