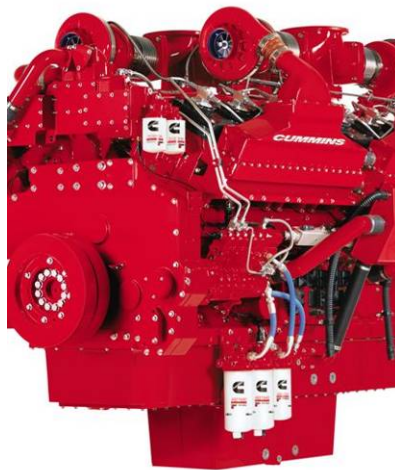




Engine Challenges to Meet Future Emissions

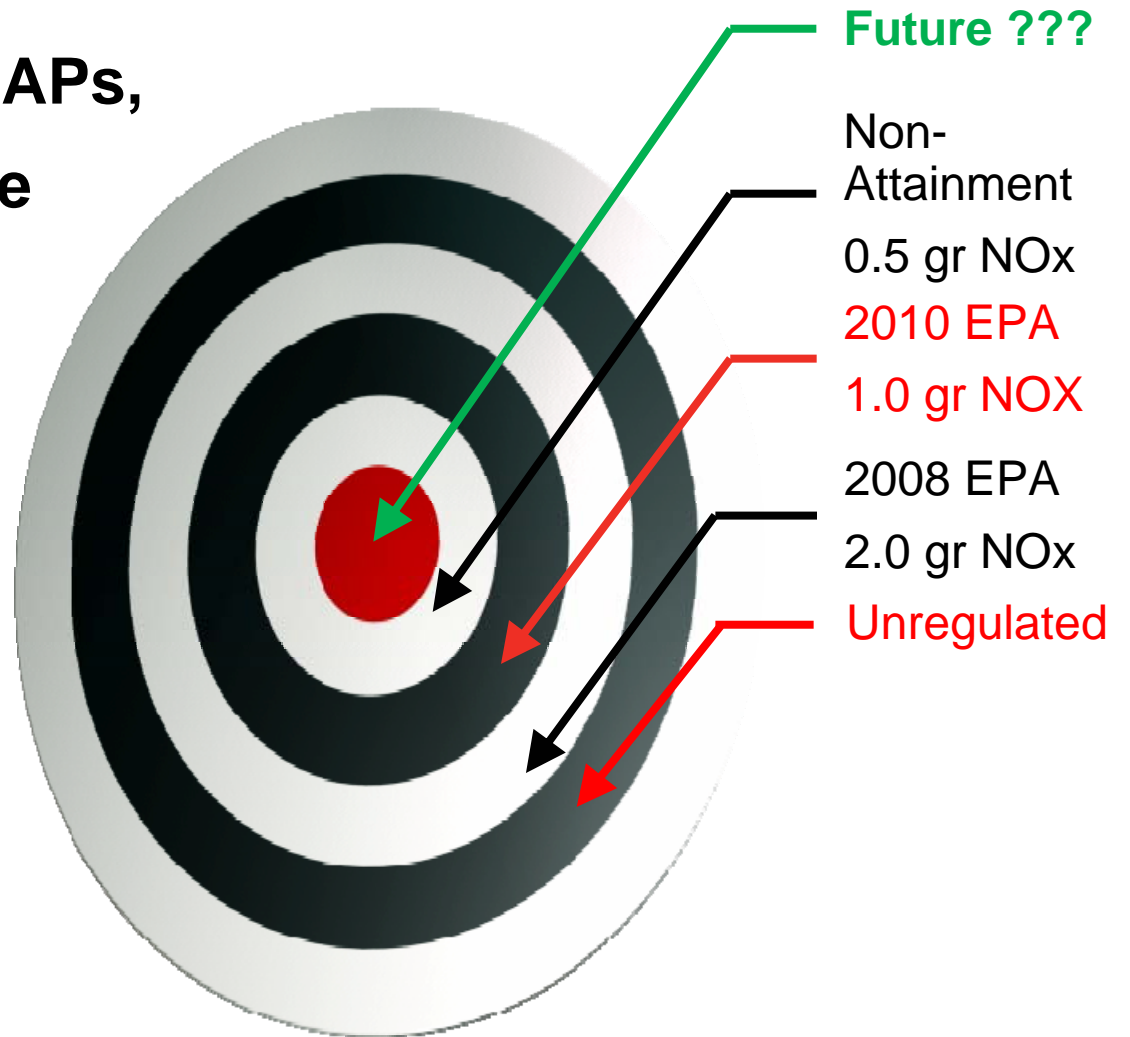
Gas / Electric Partnership
September 9, 2010

Chuck Dewees
Cummins Inc.

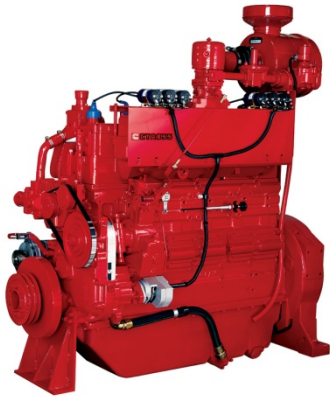


Emissions Targets

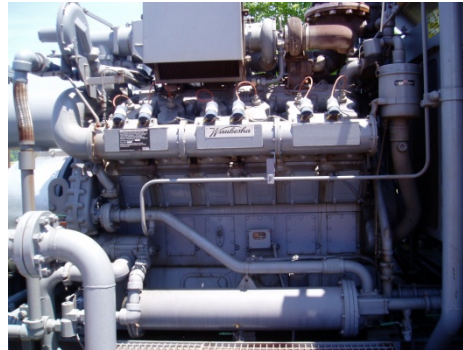
**NOx, CO, VOC, HAPs,
Formaldehyde**



Technology Used before 2008



Uncontrolled
Rich Burn



Lean Burn



Advanced Lean Burn –
Open Chamber



Advanced Lean Burn –
Pre-Chamber Ignition



Rich Burn w/ 3WC

Today's Technology For EPA 2010 1 gr/hp hr NOx



Uncontrolled
Rich Burn



Lean Burn



Advanced Lean Burn –
Open Chamber



Advanced Lean Burn –
Pre-Chamber Ignition



Rich Burn w/ 3WC

Today's Technology For Non-Attainment 0.5 gr/hp hr NOx



Uncontrolled
Rich Burn



Lean Burn



Advanced Lean Burn –
Open Chamber

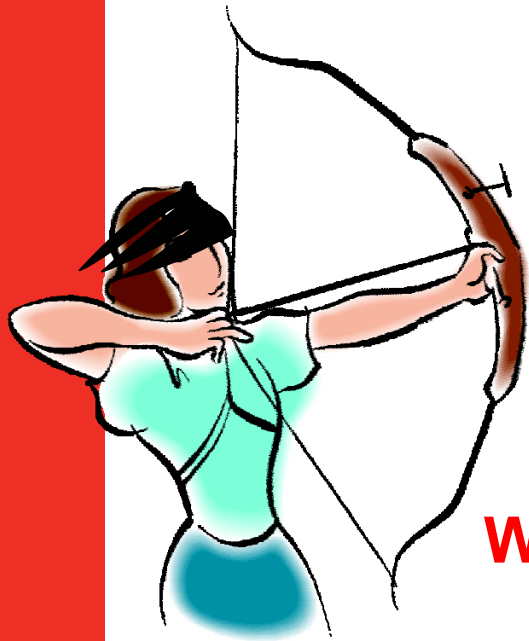


Advanced Lean Burn –
Pre-Chamber Ignition



Rich Burn w/ 3WC

How Low Can Emissions Regulations Go?



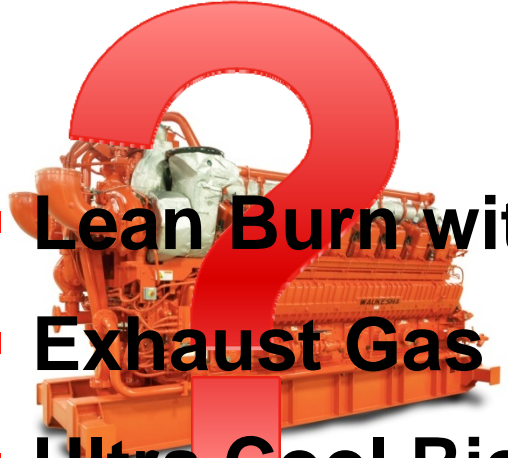
Will local regulations continue to be more stringent than the EPA?

What about the rest of the world?

Carbon Footprint?

Technology For the Future ??? gr/hp hr NOx

- **Lean Burn with S**
- **Exhaust Gas Recirculation**
- **Ultra Cool Rich Burn**
Advanced Lean Burn – Advanced Lean I
- **Homogenous Charge**
Pre-Chamber Ignition Open Chambr
- **Compression Ignition**
- **???**





Questions?

