EGR vs SCR?
Making sense of it all

In 2010, the U.S. Environmental Protection Agency will be changing its emissions standard to two-tenths of a gram of nitrogen oxides per horsepower hour.
This significant reduction will force the diesel engine industry to react strongly to meet the requirements.
It's not too soon to start thinking about which EPA-compliant engine you'll be buying: a smaller, lighter one that requires urea as an additive, or a larger, heavier one that doesn't.
So -- let's start with the basics:

What is SCR?
Selective Catalytic Reduction (SCR) - a form of after treatment to reduce NOx outside the engine. SCR feeds a small amount of ammonia-containing urea solution into the exhaust stream of a diesel engine. The ammonia combines with NOx to form harmless byproducts that are then discharged through the tailpipe. This reaction will reduce NOx emissions up to 90%. Urea (also called Ad-Blue) is a liquid reductant produced from synthetic ammonia and carbon dioxide. Currently, 90% of the urea produced worldwide is used as a fertilizer. In order to utilize the SCR system, trucks would need to have an onboard tank.

What is Cooled EGR?
Exhaust Gas Recirculation (EGR) - is a NOx emissions reduction technique that recirculates a portion of an engine's exhaust gas back to the engine cylinders. Engines employing EGR recycle part of the engine exhaust back to the engine air intake. The oxygen depleted exhaust gas blends into the fresh air entering the combustion chamber. Reducing the oxygen produces a lower temperature burn, reducing NOx emissions by as much as 50%. The recycled exhaust gas can then be cooled. This *"cooled EGR",* can create an even greater reduction in emissions by further lowering the combustion temperatures. When used with a DPF (diesel particle filter), emissions can be reduced up to 90%.

Now that you understand the basics of the two systems, let's see what happens when we compare them side-by-side:

Selective Catalytic Reduction (SCR)

- **It enhances thermal efficiency & fuel economy**
- **It reduces heat rejection and cooling system stresses, allowing for a smaller radiator and cooling fan and extending oil-drain intervals**
- **The smaller, lighter engine may equate to increased payload and less expensive injection system.**
- **Can reduce emissions up to 90%**
- **Ideal where fuel economy and weight are primary considerations and trucks operate on main travel lanes.**
- **Availability of urea - searching for suppliers may add out-of-route miles**
- **Consumption of urea is unpredictable, since its mixing ratio varies with driving conditions.**
- **Vehicles will be fitted with a NOx sensor to ensure the urea level is not neglected. Failure to maintain the urea tank will result in a minimum 40% reduction in torque output if the additive runs out.**

- **the urea system cost doesn't really scale with engine size. It's a fixed cost and as you move down in engine size, it starts to account for a larger percentage of the engine cost.**
- **Least effective in stop start situations such as city operations where the constant acceleration creates the most NOx.**
- **Unknown price stability of urea.**

Exhaust Gas Recirculation (EGR)

- **Ideal for users running less traveled routes and those eager to avoid replenishing urea**
- **No additive, no extra tanks, and the loss of payload and fuel capacity associated with SCR**
- **No risk of experiencing a power down event due to NOx monitoring**
- **the addition of EGR coolers increases overall engine size and the additional heat loads could mean an increase of 10 to 30% cooling capacity might be required**
- **Technical risk related to the SCR catalyst and doser is eliminated.**
- **The simpler fueling requirements are easier for hired drivers, thus good for small-fleet driver retention.**
- **When combined with a DPF can reduce emissions up to 90%**
- **Engines are larger and possibly heavier, depending on power rating**
- **Larger radiator and fan are needed to handle small increase in heat rejection**
- **The fuel cost is higher than the cost of fuel plus urea in an SCR system.**

2010 PLANS (announced to date):
Caterpillar – out of heavy-duty truck engine market
Cummins - EGR
Detroit Diesel - SCR using urea solution & catalyst
International - EGR
Mack - SCR using urea solution & catalyst
Paccar - Unannounced
Volvo - SCR using urea solution & catalyst

There are notable advantages & disadvantages to both systems. It seems to come down to dollars and cents. For operators, the major considerations are around the price stability over the operating life of the vehicle and the hassle factor associated with the purchase, storage and filling of the urea tank, along with your own belief on the future cost of Urea.