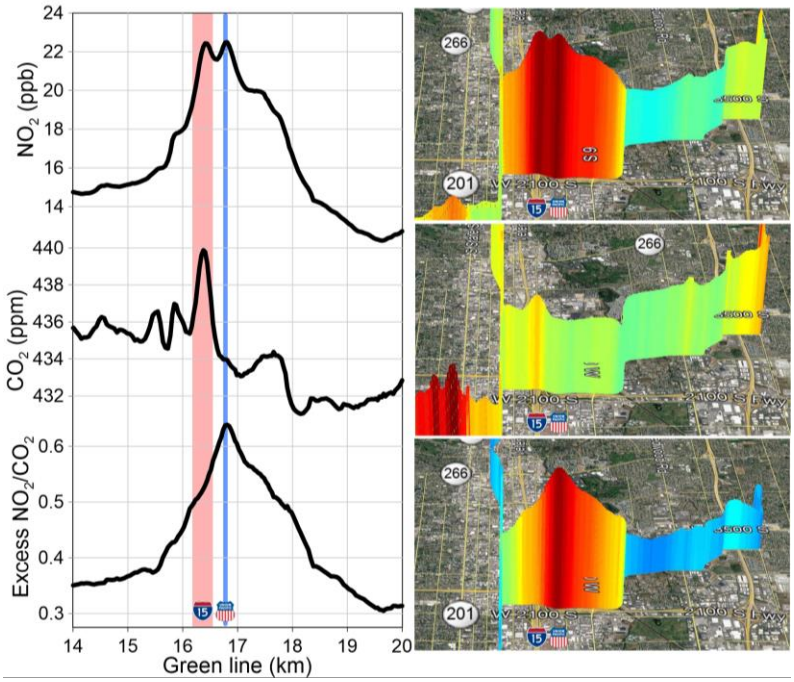
UTAH DEPARTMENT of ENVIRONMENTAL QUALITY
AIR QUALITY

Freight Switcher Locomotives in Utah:

- There are approximately 63 freight switchers operating in Utah, 45 of which are operated by Union Pacific Railroad (UPRR)
- Almost all switchers operate within Utah's $PM_{2.5}$ nonattainment counties
- In 2014, switchers emitted 407.9 tons of NOx and 8.8 tons of direct $PM_{2.5}$
    - UPRR switchers represented about 75.2% of these totals
- UPRR switchers operate at three railyards: one in Weber County and two in Salt Lake County
    - NOx emissions at the Roper yard in South Salt Lake are high enough to be detected as a distinct "peak" by the University of Utah TRAX air quality study monitors

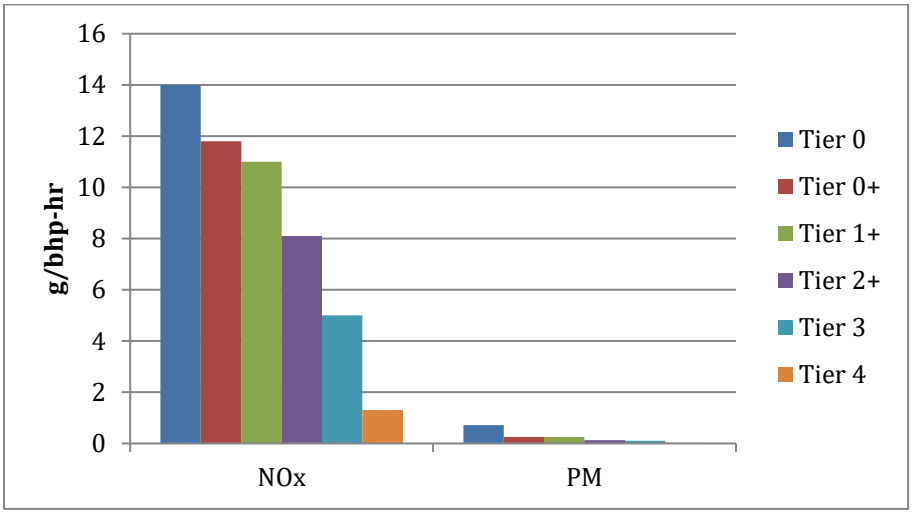
Figure 1 - University of Utah TRAX Monitor Data



Locomotive Emission Standards:

- EPA locomotive emissions standards for NOx and PM are shown in Figure 2
- In 2018, approximately 30% of UPRR's switchers met the Tier 0 standard, while the remaining 70% met the slightly cleaner Tier 0+ standard
- **Replacing a Tier 0+ switcher with a Tier 4 switcher would result in an 89.0% reduction in NOx and an 88.5% reduction in direct PM**

Figure 2 - EPA Switcher Locomotive Standards



Regulatory Limitations:

- Section 209(e) of the Clean Air Act (CAA) prohibits states from establishing emissions standards for locomotives
- States wishing to reduce locomotive emissions have typically resorted to a combination of MOUs and incentive programs to encourage the adoption of cleaner technologies

Economics of Switcher Locomotives:

- A recent analysis by UDAQ estimated the lifecycle emission reduction cost of replacing a typical switcher in Utah with a new Tier 4 model to be $3,412/ton of emissions reduced
    - This is well within the range of emissions reduction costs ($238-$6,560/ton) for area source rules recently adopted by the Utah Air Quality Board and is well below the cost of controls required for many of Utah's large point sources

Tier 4 Repower:

- Manufacturers have recently developed EPA-certified "repower" options to bring older locomotives up to Tier 4 standards
    - A repower entails dismantling old locomotives and then reassembling them with new engines and emissions control equipment
- UPRR estimates that a single repowered unit will reduce NOx emissions by 80 to 105 tons over its life-cycle
- One such repower option developed by Progress Rail/Caterpillar has an estimated unit cost of $1.5 million, but requires an additional $400,000-$500,000 in installation expenses
- UPRR has expressed interest in repowering one or more switchers to evaluate this technology in Utah
    - The company has identified approximately a six repower-compatible GP38 units that operate primarily in the Salt Lake nonattainment area
    - The company would require 75% of total incremental project costs to consider the repowering option
    - Any state appropriations could be leveraged via other funding sources such as federal Diesel Emission Reduction Act (DERA) grants (25% private/35% state/40% federal)