Introduction to Special Topic
Weekend and Weekday Differences in Ozone Levels

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This month’s Journal of the Air & Waste Management Association contains nine technical articles,1-9 and EM contains two summary articles,10,11 which follow this introduction, concerning a counterintuitive phenomenon that has been observed in the Los Angeles metropolitan area (SoCAB, the South Coast Air Basin) for many years. Ozone (O₃) precursor emissions of oxides of nitrogen (NOₓ) and volatile organic compounds (VOCs, also somewhat equivalently termed non-methane hydrocarbons [NMHCs] and reactive organic gases [ROGs]), and carbon monoxide (CO) are lower on weekends than on weekdays. In spite of these lower emissions, weekend maximum 1-hr O₃ concentrations are approximately 30% higher than those on weekdays. This phenomenon has been observed in several other cities. Weekend O₃ concentrations are not accompanied by increases in particulate matter (PM₁₀ and PM₂.₅), for which mass and nitrate concentrations are similar or lower on weekends than on weekdays.

These articles discuss the reasons for this effect, which include different limiting regimes for VOC and NOₓ differences in diurnal emissions patterns, and different emissions activities (notably, less trucking and commercial use of non-road engines on weekends). For several authors, the scientific results imply that California’s emphasis on future NOₓ emissions reductions will be ineffective, and may even be counterproductive in the middle to short term, in further reducing O₃ levels in the SoCAB.

These peer-reviewed articles provide a classic example of the interaction between science and policy. The authors agree that both VOC and NOₓ emissions controls have improved southern California air quality over the past 30 years, although the decrease has been more pronounced on weekdays than on weekends. They also agree that the weekend O₃ enhancement is real and that it corresponds with lower VOC and NOₓ emissions and different VOC/NOₓ ratios. They do not agree on the quantification of the effect, with Cross et al.11 noting the weekend increment is lower when comparing the highest O₃ days that exceed national ambient air quality standards. They disagree on the extent to which weekend emissions simulate the effects of future emissions controls that would affect both weekdays and weekends. They also disagree on the extent to which a statewide rule for vehicle emissions might be tailored to specific times and places within the state. Several authors recognize the uncertainty of current emissions estimates and its amplification when projecting these into the future.

The importance of these articles is that they allow these areas of agreement and disagreement to be clearly defined and documented. This can then focus further scientific study to obtain more issues of agreement. Lawson10 identifies unknowns in emissions from non-road engines (e.g., construction equipment) and high emitting vehicles that are detected by on-road tests but are missed in periodic inspection and maintenance checks. Croes et al.,11 identify upgrades to models as well as emissions experiments that need to be conducted. These articles provide a technical basis for a well-reasoned policy debate on the extent to which planned NOₓ reductions should be better balanced with, or replaced by, VOC reductions.

These special topic issues of the Journal and EM assist in disseminating this information. Peer-review of the Journal articles has tightened their logic and honed their presentation. The presentation of different policy interpretations of the results in EM allows decision-makers to evaluate the arguments and their scientific basis for themselves.

The Journal’s Editorial Review Board thanks all of the authors and reviewers of these papers for their efforts on this topic. We also encourage our readership to identify additional special topics with environmental policy implications and to cooperate with A&WMA’s publication editors to create similar issues in the future.

REFERENCES