



Energy Outlook White Paper Preliminary Draft



2016 AQMP White Paper Workgroup Meeting

September 15, 2015

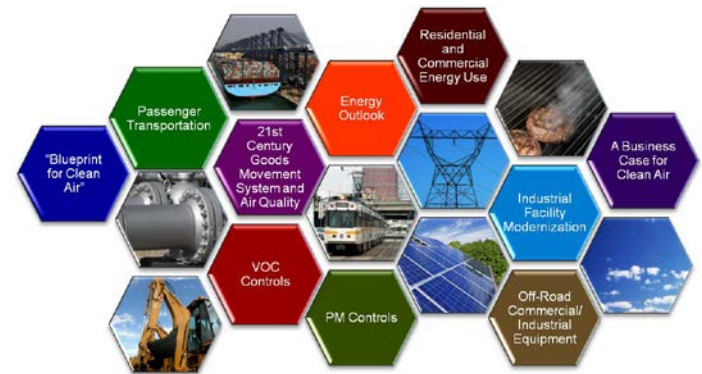
Aaron Katzenstein, Ph.D.

Planning, Rule Development & Area Sources



2016 AQMP White Papers

- 10 White Papers
 - Blueprint for Clean Air (Preface)
 - 21st Century Goods Movement Systems and Air Quality
 - Passenger Transportation
 - Residential and Commercial Energy Use
 - VOC Controls
 - PM Controls
 - A Business Case for Clean Air
 - Off-Road Commercial/Industrial Equipment
 - **Energy Outlook**
 - **Industrial Facility Modernization**
- 8 Draft White Papers presented at September 4th Governing Board
- White Paper Website
 - Search - “2016 AQMP White Papers”



Context – Energy Outlook White Paper

- Large reductions in NO_x needed for ozone and PM_{2.5} attainment
- NO_x emissions result from energy use derived from fuel combustion
 - Review of energy resources (electricity, natural gas, liquid fuels, others)
- Changing Energy Landscape in Basin
 - New technologies
 - Regulations and policies
 - Retirement of old equipment
- Smart implementation
 - Reduce infrastructure needs
 - Maximize benefits (emissions, reduce redundancy and capacity)

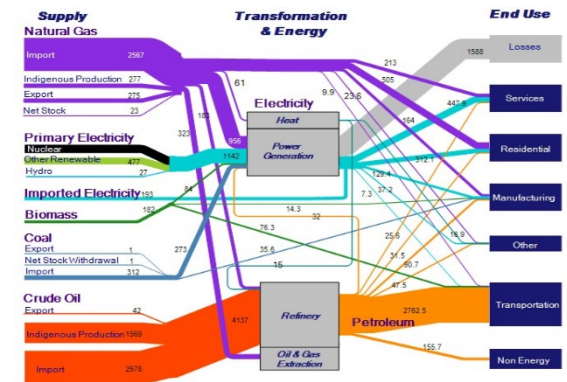


Outline

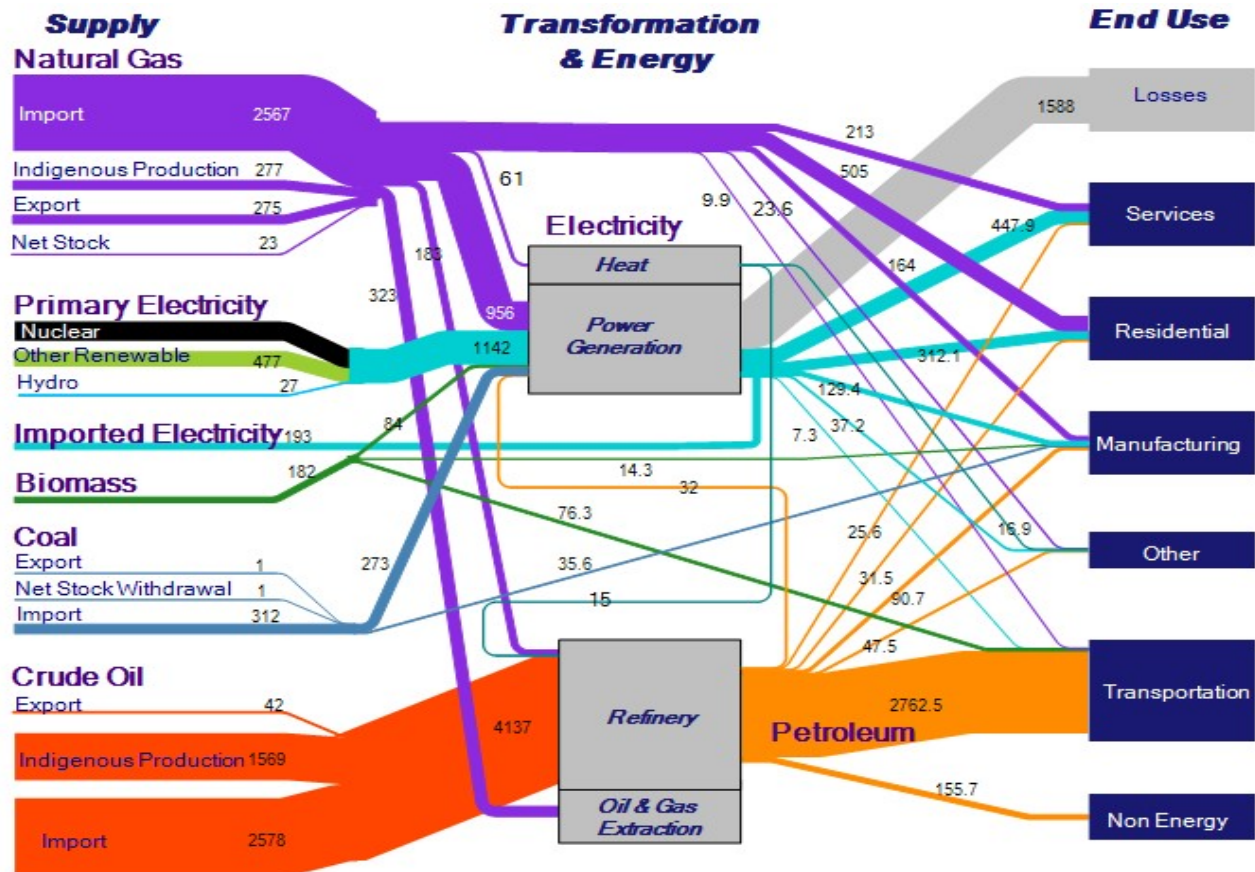
- I. Purpose
- II. Background
- III. Emissions by Energy Type
- IV. Policies and Regulations Impacting Energy Use in California
- V. Energy Landscape
- VI. Scenario Analysis
- VII. Findings and Recommendations for 2016 AQMP
- VIII. References

Background – Overview of Energy Use

- Review of traditional energy use
 - Natural Gas – heating and electricity
 - Liquid Fuels – transportation
 - Electricity – stationary uses
- Previous regulatory impacts on energy choices
 - Coal
- Energy losses

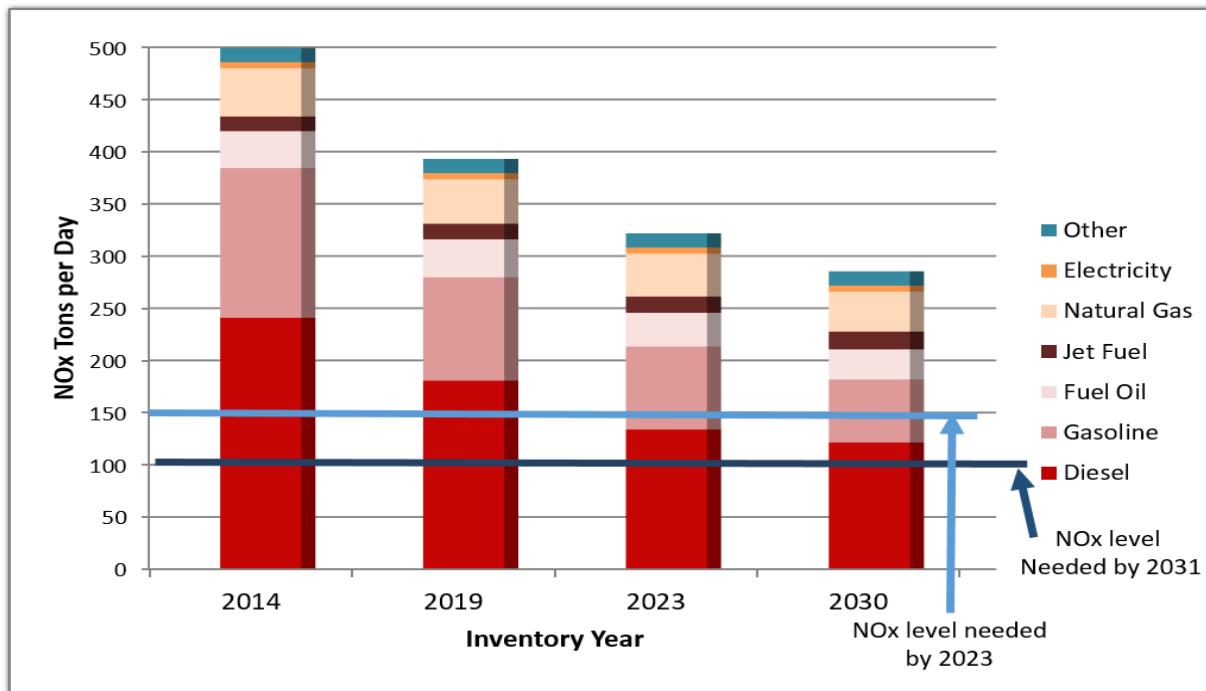


Overview of Energy Use Continued



Energy flows in California in 2008

NOx Emissions by Energy Type



2012 AQMP inventory NOx annual average by energy type*.

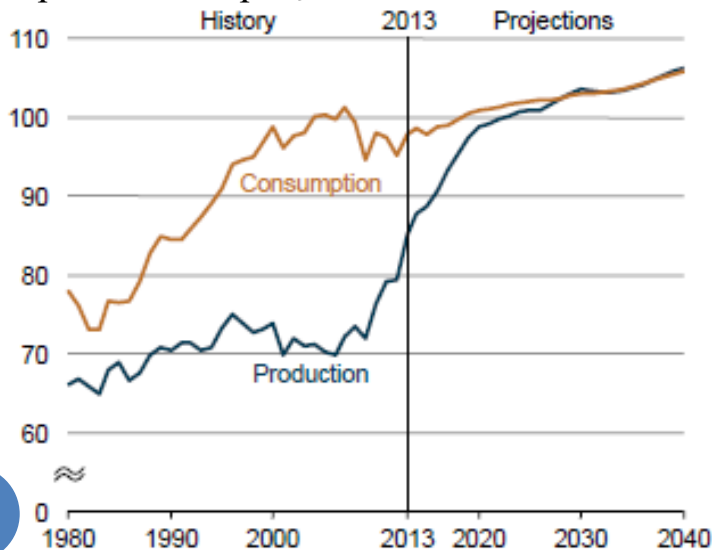
*- Based on 2012 AQMP; figure is being updated with 2016 AQMP inventory.

Energy Landscape

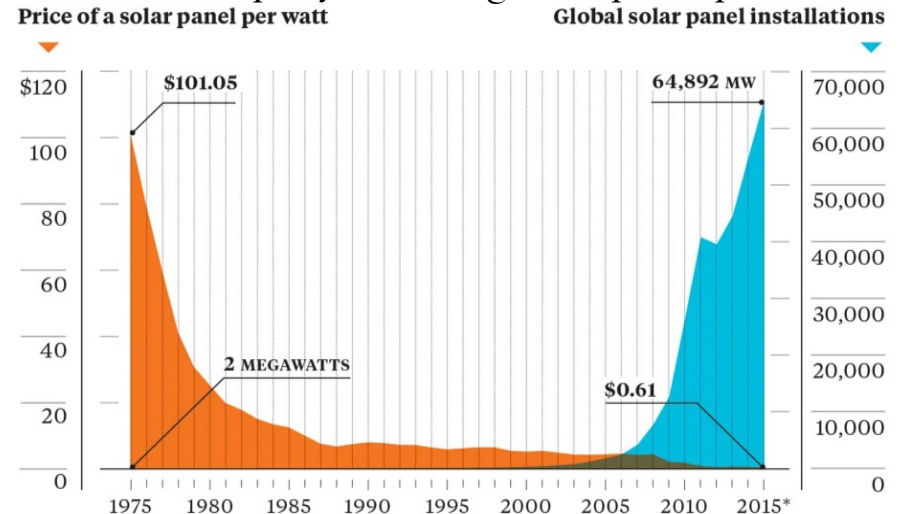
Reviews changes, challenges, and new technologies by energy type:

- Electricity, Natural Gas, Liquid Fuels, and Other
- New technologies and renewable fuels
- Initial discussion reviews two large energy changes

U.S. production projected to match consumption



Rapidly declining solar panel prices

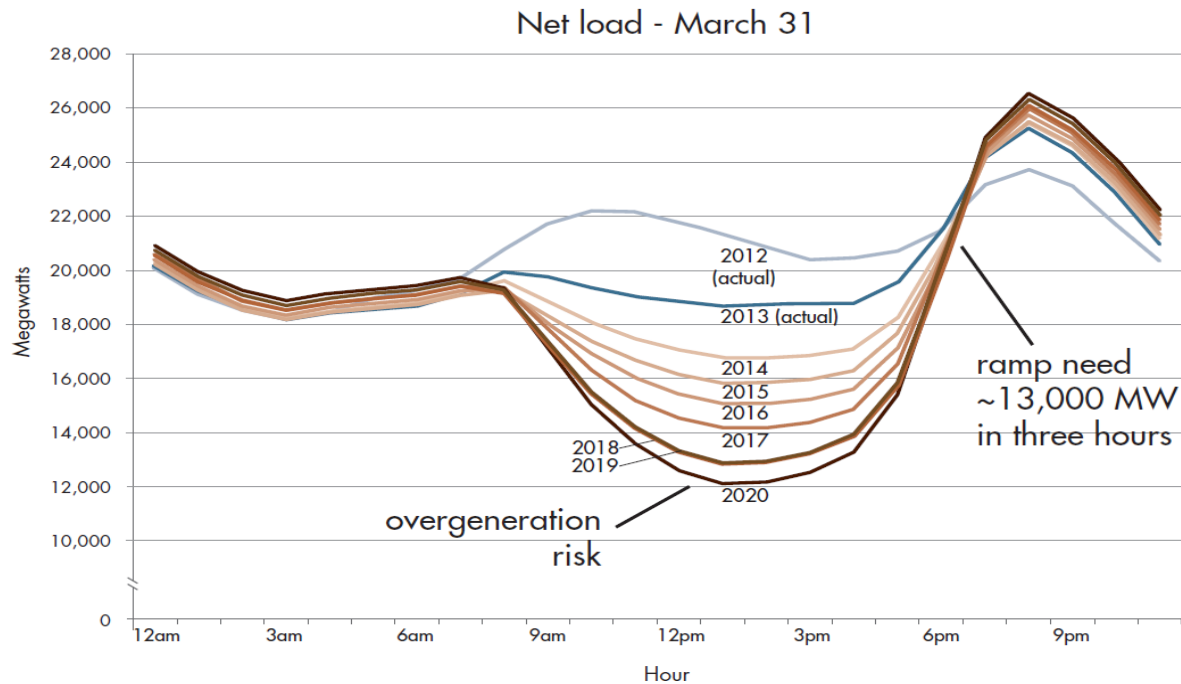


Energy Landscape – Electricity

- Rapidly changing generation, infrastructure, and end uses
 - Implementing large amounts of renewable generation
 - Basin infrastructure needs – San Onofre, Once Through Cooling
 - Integrating increasingly higher electric transportation energy needs
 - Demand side management
 - New technologies

Energy Landscape – Electricity Continued

- Large amounts of renewable generation
 - Grid stability (Demand = Supply)
 - Ramping rates, overgeneration
 - Need for controllable flexible resources



Energy Landscape – Electricity Continued

- New technologies and grid management
 - Storage as a needed flexible resource
 - Smart integration of electrified transportation
 - New demand response technologies



The World's Biggest Battery Is Being Built For Southern California's Grid



AES is building a 400 MW-hour lithium-ion battery for SCE as an alternative to gas peaker plants.

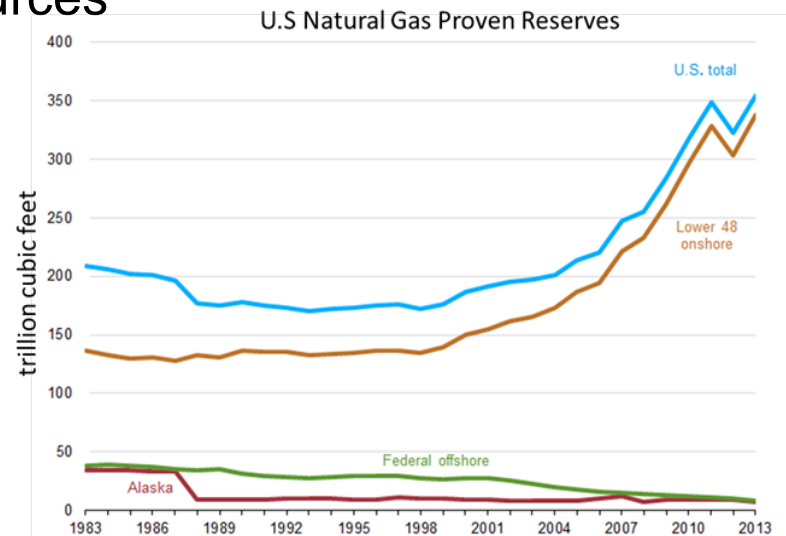
Eric Wesoff
November 12, 2014

The world's biggest battery is coming to California.

Last week, Southern California Edison (SCE) revealed the winners of a massive 250-megawatt energy storage procurement round, one that could set new

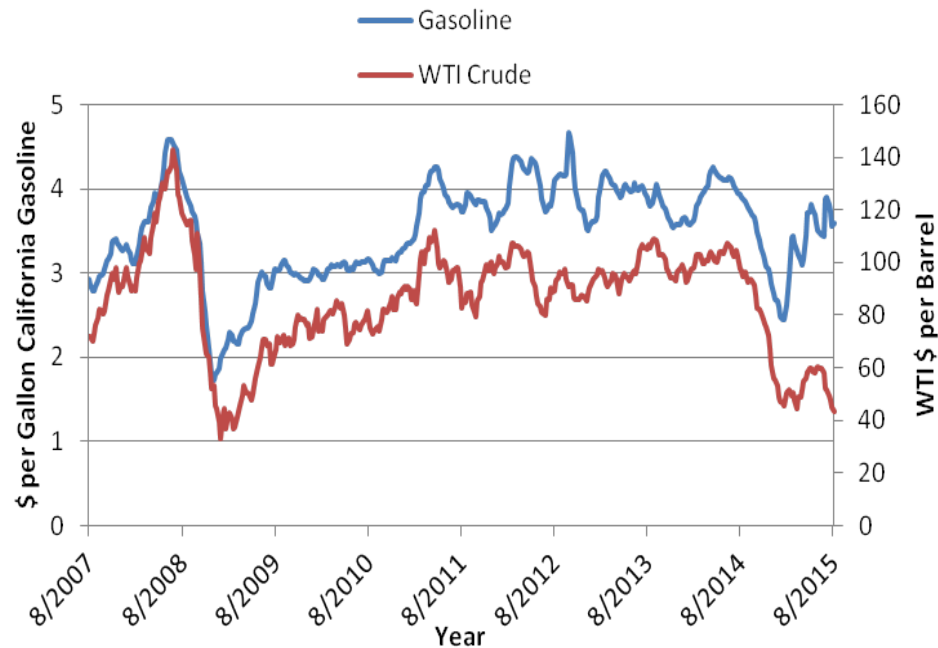
Energy Landscape – Natural Gas

- Increased supply and reserves
 - Decline in prices
- Use of storage for seasonal supply and storage
- GHG benefits and disbenefits
 - Renewable methane
- New technologies and energy sources
 - Oxy generation
 - Power to gas
 - Fuel cell



Energy Landscape – Liquid Fuels

- Supply Constraints
- Renewables
- New end use technologies

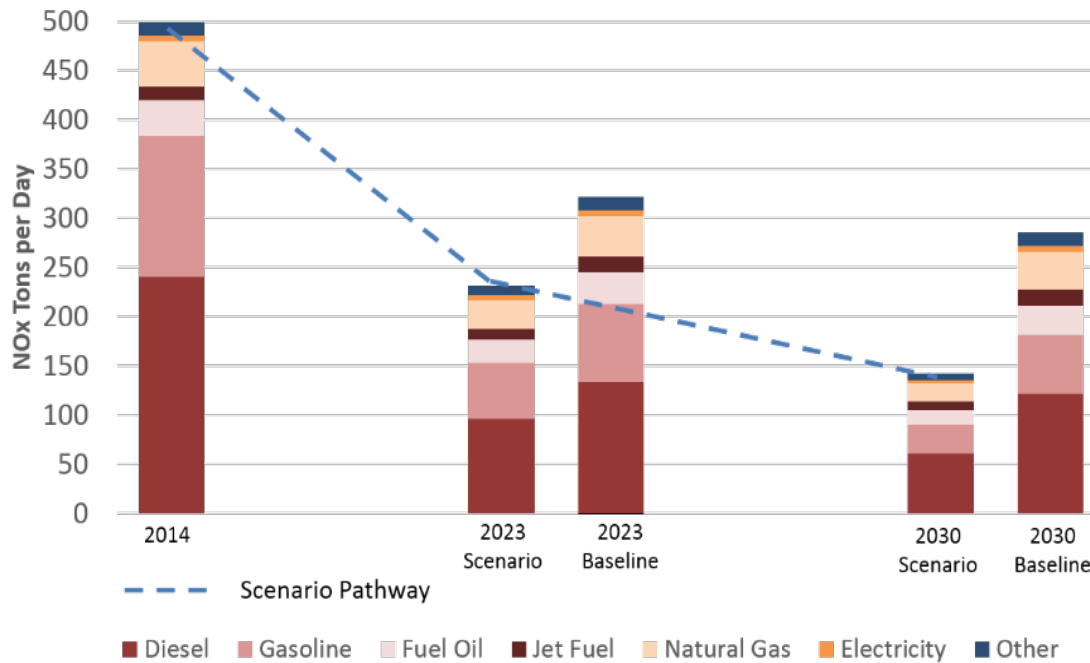


Energy Landscape – Other

- Hydrogen
 - Sources of hydrogen
 - Transport
- Further discussion on renewable energy

Scenario Analysis

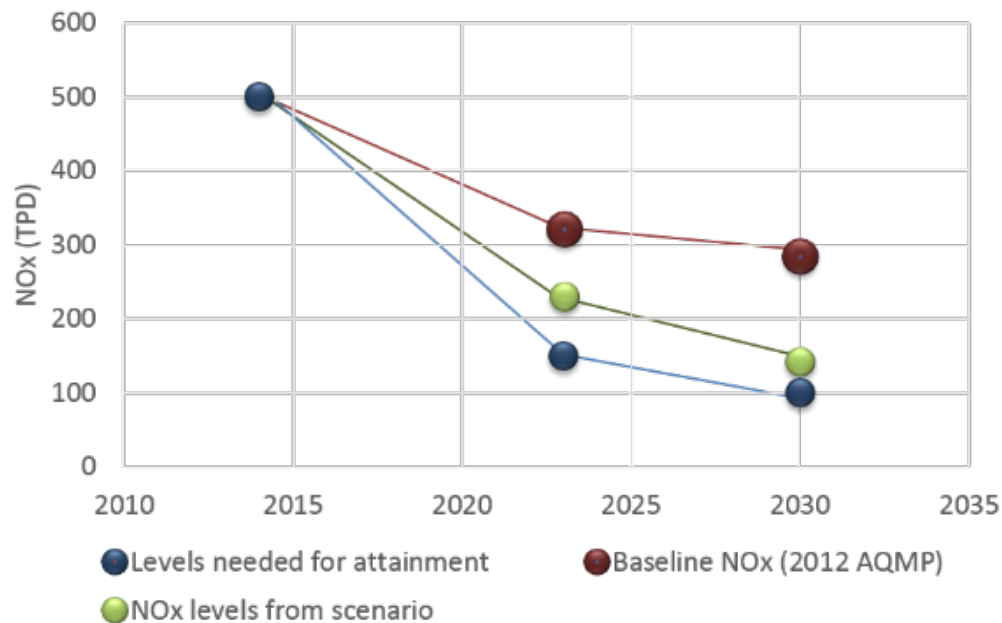
- Reviewed potential impact on Basin NOx from Governors 50/50/50 targets



Scenario applied to 2012 AQMP NOx inventory*.

*- Based on 2012 AQMP; figure is being updated with 2016 AQMP inventory.

Scenario Analysis



Scenario applied to 2012 AQMP NOx inventory*.

Recommendations

- Actions, planning efforts, programs, control strategies that SCAQMD might further pursue in each energy category
 - Electricity, Natural Gas, Liquid Fuels, and Other
- Some Key Recommendations:
 - Review energy storage applications and the benefits they can have on reducing need for fossil generation.
 - Support development of battery storage price index.
 - Understand potential supply of renewable natural gas from applicable waste streams in the Basin.
 - Consider criteria pollutants in well to wheels lifecycle analysis.
 - Support the development of an index to monitor amounts of hydrogen used in transportation along with price tracking metric.

Process/Next Steps

- Workgroup presenting preliminary draft
 - Tuesday September 15, 2015
- Incorporate Workgroup and other comments
 - Requesting comments by September 30th
- Present draft to SCAQMD Governing Board
 - Governing Board meeting October 2, 2015
- Finalize Energy Outlook white paper
 - Governing Board meeting November 6, 2015