



BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

Exploring Bay Area Energy Future as Part of Climate Protection Strategy

2014 Efforts of
Advisory Council

Prepared for the
Board of Directors
2015



Advisory Council 2014 Activities

- Objective
 - Explore **Bay Area's energy future**, investigating technical issues related to Air District's Climate Protection Program
 - #10 in 10-Point Climate Action Work Program
- 10 regular **meetings**
- 6 expert **speakers**
 - Universities, national laboratory, CA Energy Commission, EPRI
- 4 **reports**





Advisory Council: Topics and Speakers

Bay Area Energy Future

- **Mark Jacobson**, Professor, Stanford (100% wind, water, solar pathway)
- **Jim Williams**, PhD, E3 (all available measures pathway)
- **Jane C.S. Long**, PhD, LLNL/EDF (action plan, feasibility, all available measures pathway)
- **Emilio Camacho**, Esq., CA Energy Commission (innovation)
- **Daniel Kammen**, Professor, UC Berkeley (Bay Area energy and climate opportunities)
- **Haresh Kamath**, EPRI (energy storage and integrated smart grid)





Energy Future: Big Picture

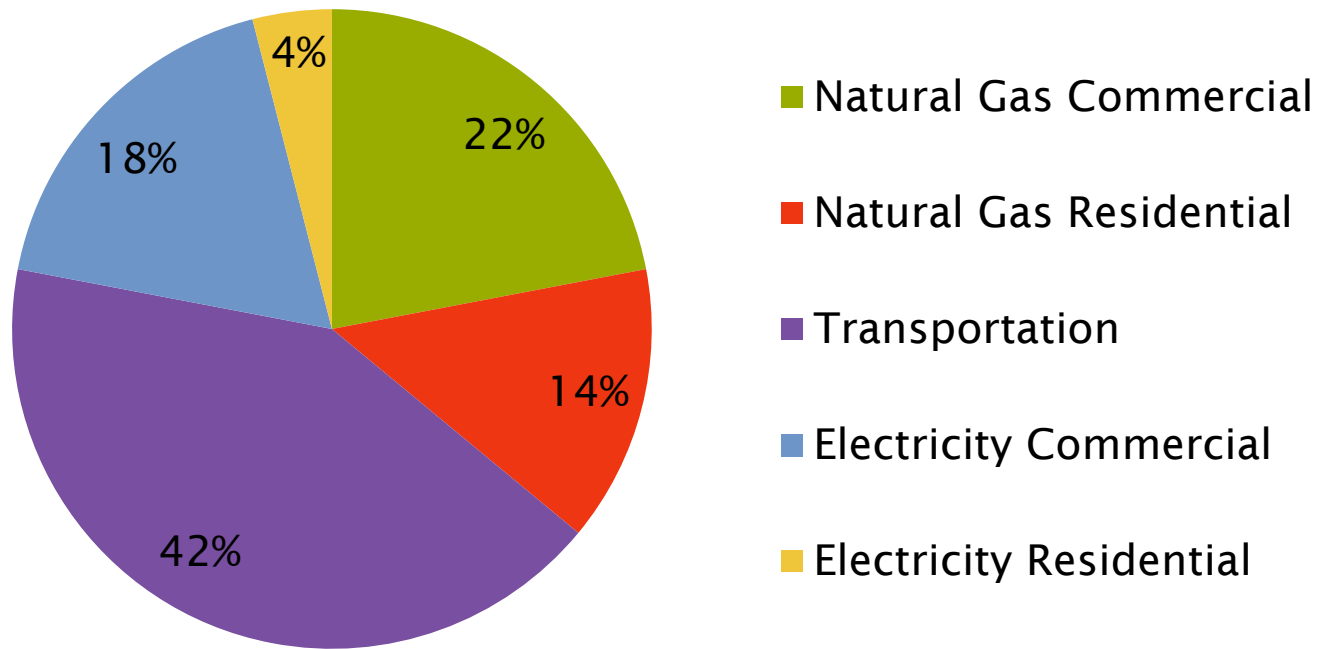
- **Efficiency**
 - Especially uses that cannot be easily electrified
- **Electrification**
 - All feasible fossil-fuel combustion uses
- **Decarbonization**
 - Electricity supply (e.g., renewables) and fossil fuels





Energy Future: Where We Are – Bay Area

Bay Area Energy Consumption (percent) in 2012



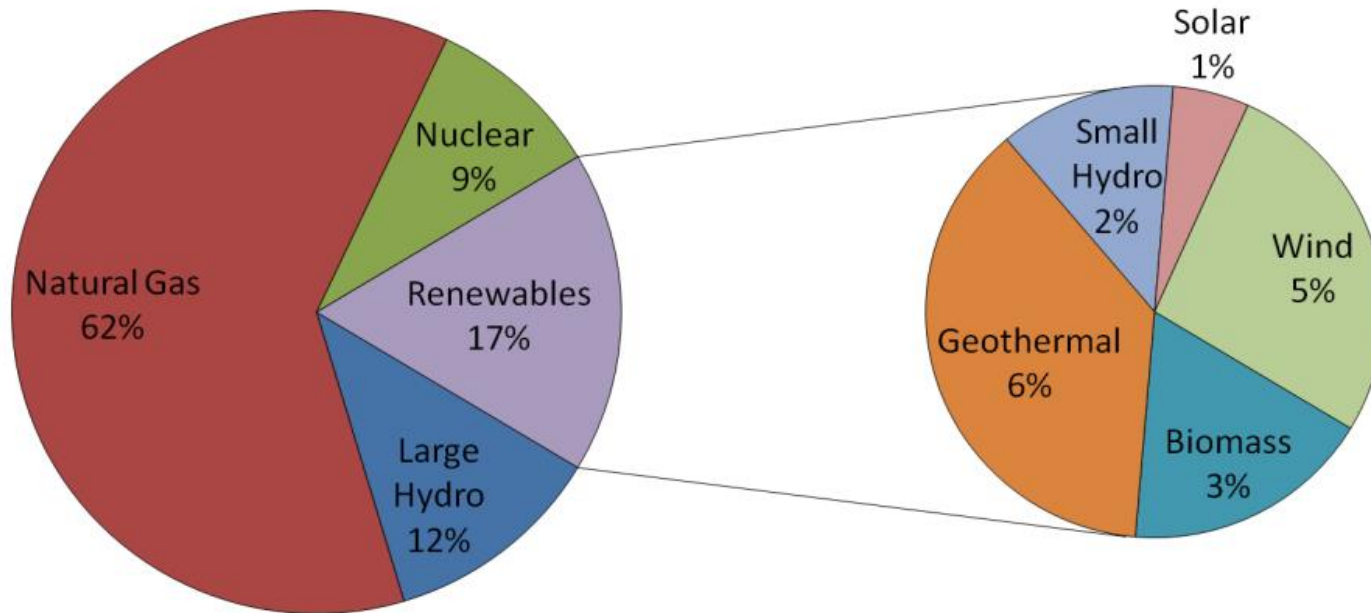
Source: California Energy Commission and Air Resources Board





Energy Future: Where We Are - State

CA In-State Electricity Generation in 2012

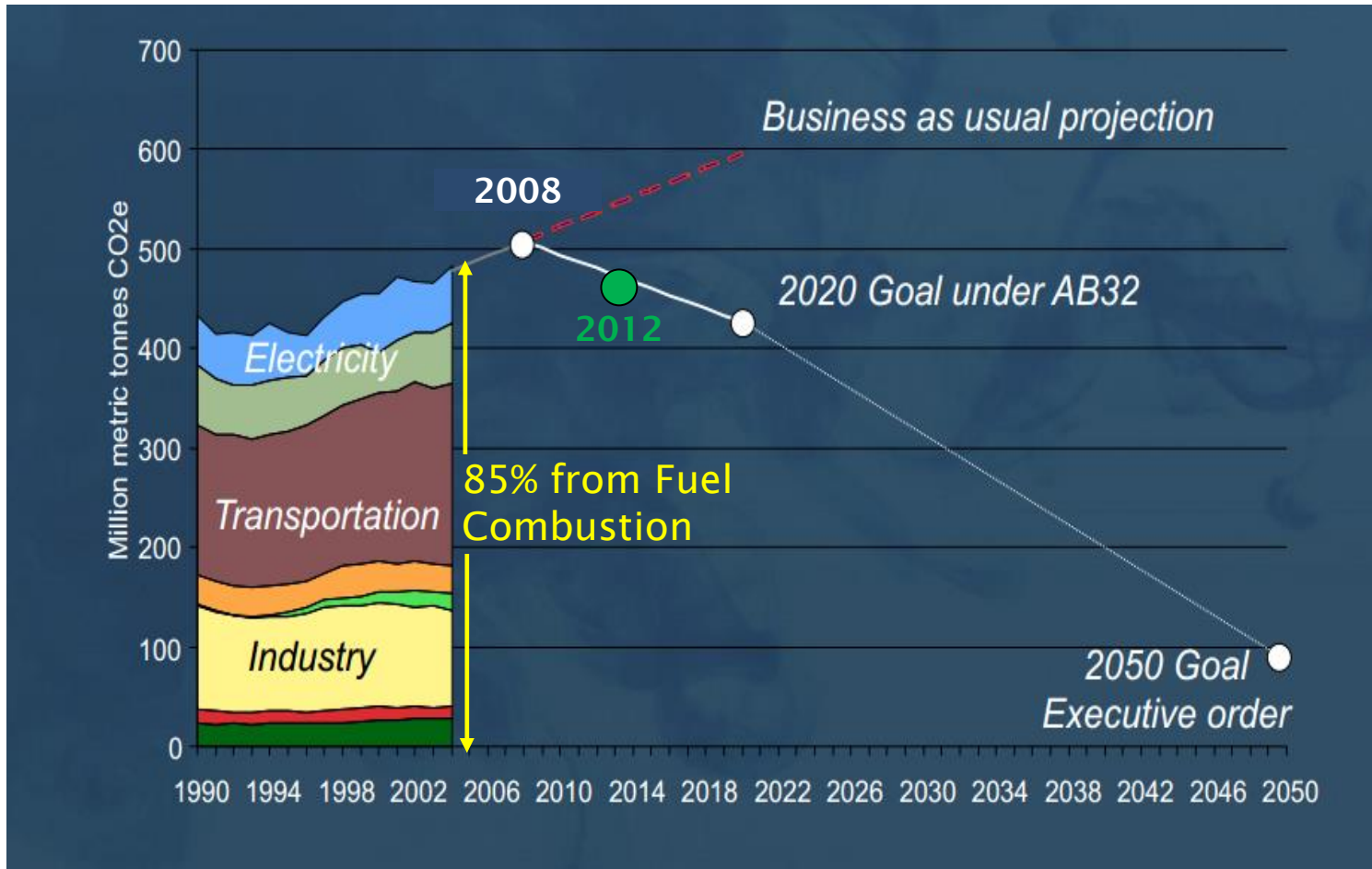


Sources: California Energy Commission, QFER and SB 1305 Reporting Requirements. In-state generation is reported generation from units 1 MW and larger.





Energy Future: Where We Are Going

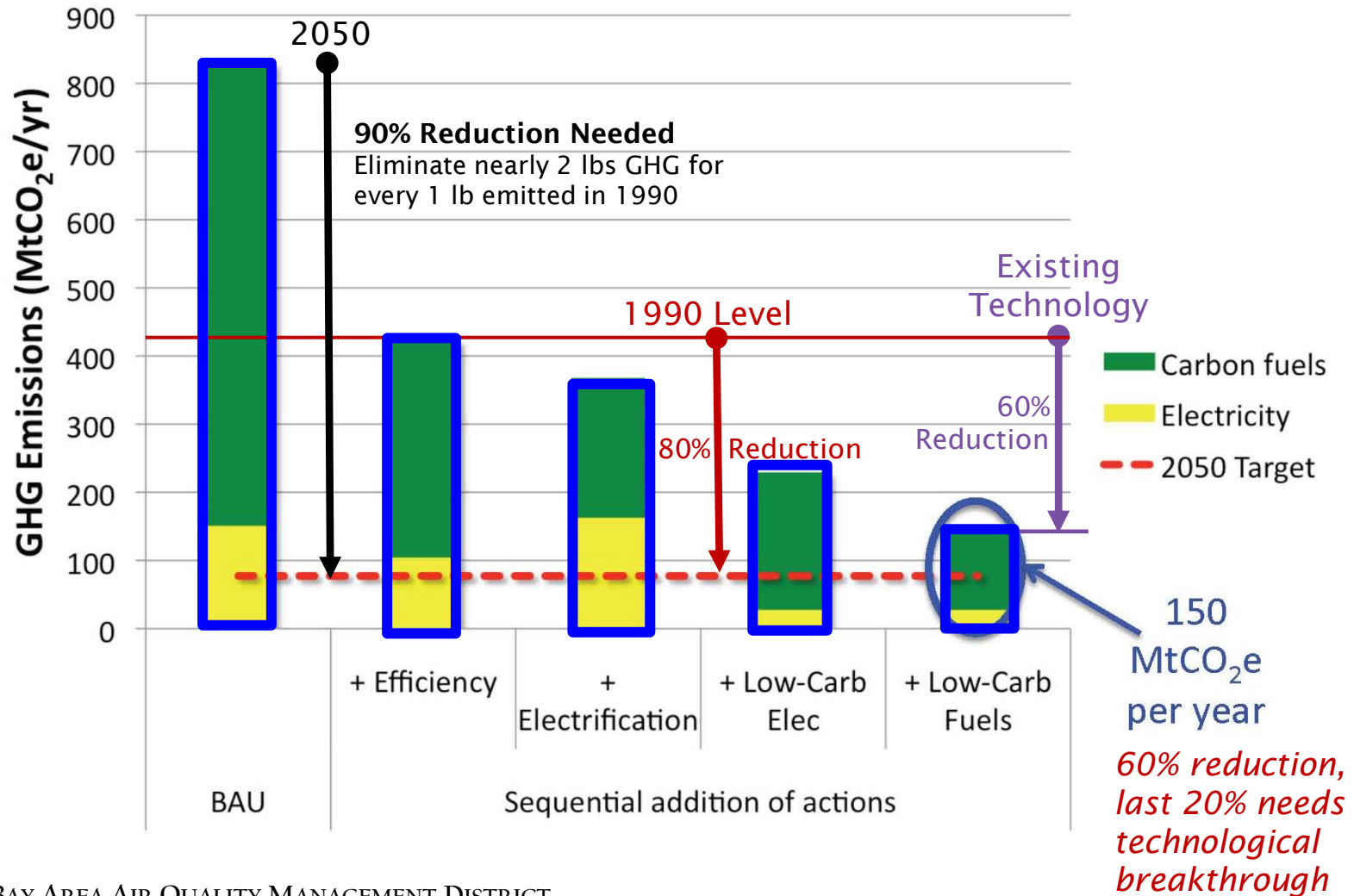


Source: Dr. Jim Williams, Energy and Environmental Economics, Feb. 2014





Energy Future: How We Can Get There





Energy Future: Two Points on Spectrum

1. 100% Wind, Water, and Solar

- All renewables including energy conservation and efficiency gains
- Maximizes air quality and climate benefits with no air emissions

Issues: Technical challenges, large number, permitting, variability, grid reliability

2. All Available Measures

- All possibilities, including wind, water, solar plus biofuels, carbon capture, energy storage, and nuclear
- 60% reduction in carbon doable with known technologies; remaining 20% reduction challenging

Issues: Technical challenges, negative side effects, use of fossil fuels for back up power with associated emissions, public acceptance





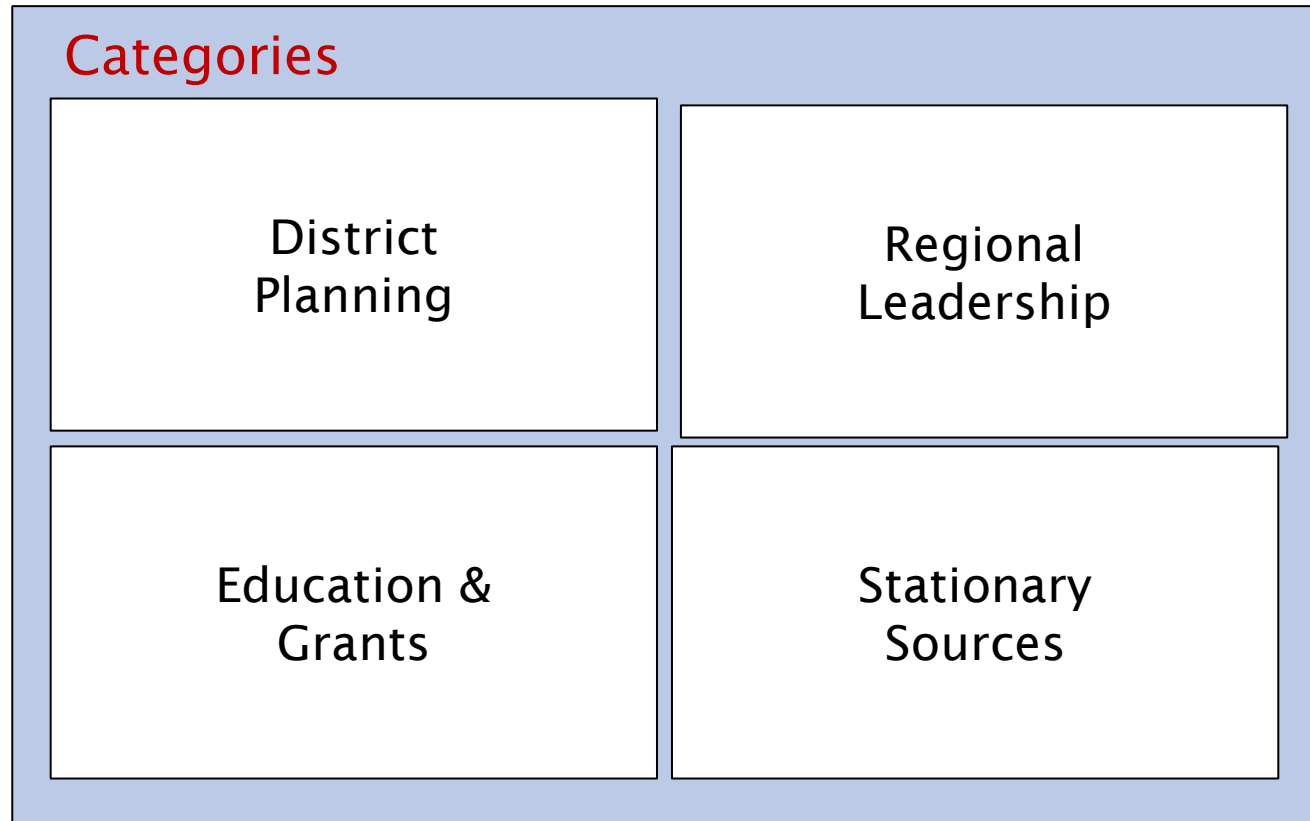
Energy Future: Major Challenges

- **Energy storage**
 - Critical to renewables success, pumped storage most readily available now, batteries, hydrogen, and compressed air not ready yet
- **Grid reliability & load balancing**
 - Integrated “smart” grid, demand management
- **Carbon pricing**
 - Needed for market-based solutions
- **Environmental & social equity**
 - Energy costs and availability, land use
- **Political leadership**
 - Many difficult decisions, cost, reliability, public acceptance





Recommendations





Recommendations: District Planning

Continue **multi-pollutant approach** to reduce GHG emissions, limit unintended consequences, negative effects from other airborne pollutants

- Identify **Air District's most appropriate role** vis-à-vis Bay Area energy future
- Conduct study to project how Bay Area future energy trends may impact or complement **Air District's clean air plans**
- Integrate **implications of future energy trends** into Air District's clean air and climate plans, modifying plans if necessary



Chevron oil refinery, Richmond, CA (www.wtsp.com)





Recommendations: Regional Leadership

Collaborate with state, regional, and local agencies to **incorporate energy considerations** into Air District's Regional Climate Action Strategy

- **Consult and coordinate** with relevant agencies and stakeholders in energy-related planning
 - State and federal agencies
 - ARB, CEC, CPUC, EPA, DOE, ISO
 - Regional and local agencies:
 - MTC, ABAG, Publicly Owned Utilities
 - Private sector
 - EPRI, PG&E, refineries, other





Recommendations: Education

- **Integrate latest information on energy** behavior-oriented recommendations into Air District's public education and outreach efforts
- **Concepts** could include:
 - Greater efficiency for appliances, cost savings
 - Energy audits/upgrades to residences, offices
 - Electric vehicles
 - Public transit





Recommendations: Grants

- **Integrate future energy-related criteria** into grant proposal evaluation and selection
- **Expand incentives** to encourage/support more desirable energy sources and behavior





Recommendations: Stationary Sources

- Integrate GHG emission reductions into new and existing **Air District's permitting rules**
- Explore ways to reduce GHG emissions from large numbers of **small stationary sources** of CO₂ (furnaces, boilers, water heaters)
- Evaluate proliferation and potential use of **backup generators** (understand significant growth in number and look for opportunities to use energy storage devices instead)





Thank You!

- We appreciate your time and interest
- Questions or comments?