December 3, 2009

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RE: Technical brief summarizing approach and analysis of potential GHG emission reduction measures.

Introduction

The purpose of this technical memo is to clarify the technical approach, methods and analysis of proposed GHG reduction measures contained in the Preliminary Draft Napa Countywide Community Climate Action Plan. (Please note the key supporting data worksheets from the Napa Carbon Model are also attached.)

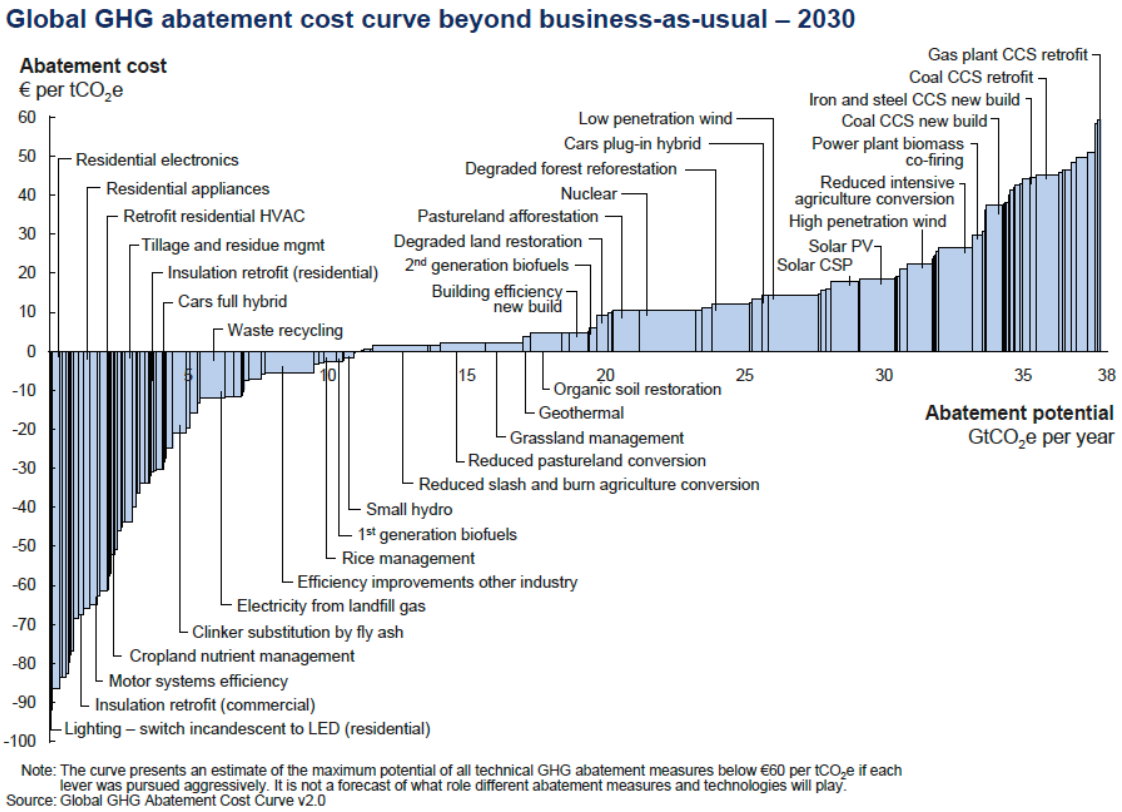
Overall, the prioritization and categorization of potential actions is based on the work of McKinsey & Company, who developed the Global GHG Abatement Cost Curve, and the work of the California Energy Commission and others to develop the "loading order," a hierarchy of GHG reduction measures that helps ensure the most cost-effective measures (lowest cost per ton of GHG reduced) are prioritized. Both of these approaches to prioritizing potential actions are summarized below.

Global GHG Abatement Cost Curve

With the support of major international companies and organizations, McKinsey & Company, developed a global GHG abatement database. The database contains an in-depth evaluation of the potential impacts and costs of reduction strategies across 10 sectors and 21 world regions given a 2030 time perspective.

The findings from this evaluation of international GHG emissions are published in "Pathways to a Low Carbon Economy, Version 2 of the Global Greenhouse Gas Abatement Cost Curve." This cost curve provides a quantitative basis for assessing the high impact and high leverage actions (Figure 1).

Figure 1: Global GHG abatement cost curve beyond business-as-usual--2030[1]



Note: The curve presents an estimate of the maximum potential of all technical GHG abatement measures below €60 per tCO_2e if each lever was pursued aggressively. It is not a forecast of what role different abatement measures and technologies will play.
Source: Global GHG Abatement Cost Curve v2.0

The report defines three major and two minor categories of measures from this cost curve:

1. Energy Efficiency (opportunity to reduce worldwide BAU emissions 14 $GtCO_2e$ per year in 2030). Includes improving the efficiency of vehicles, buildings, and industrial equipment.
2. Low-carbon energy supply (opportunity to reduce BAU emissions 12 $GtCO_2e$ per year in 2030). Includes all measures that shift energy supply from fossil fuels to low-carbon alternatives.
3. Terrestrial carbon—forestry and agriculture (opportunity of 12 $GtCO_2e$ per year in 2030). Includes halting deforestation, reforesting marginal areas of land, and sequestering more CO_2 in soils through changing agricultural practices.
4. Very high cost technical abatement opportunities (opportunity of 3-6 $GtCO_2e$ per year in 2030). Examples include early infrastructure and equipment retirement or retrofit in both the Power and Industrial sectors.
5. Behavioral changes beyond technical abatement measures (opportunity for 3.5-5 $GtCO_2e$ per year in 2030). Examples include reducing business and private travel, shifting road transport to rail, accepting higher temperature variations, reducing

[1] The McKinsey cost curve summarizes technical opportunities to reduce emissions. The width of each bar represents that opportunity's potential to reduce emissions in a specific year compared to the BAU development. The height of each bar represents the average cost of avoiding 1 tonne of CO_2e by 2030. The costs are in 2005 real Euros and represents a weighted average across all sub-opportunities, regions and years. The graph is ordered left to right from the lowest-cost abatement opportunities to the highest-cost.

appliance use, and reducing meat consumption. Report acknowledges that changing behavior is difficult and the abatement depends heavily on effective incentives.

In general, energy efficiency and low-carbon energy supply opportunities provide the greatest reductions for the least cost in developed regions. In fact, many of the energy efficiency and renewable energy opportunities have a net economic benefit over their lifetime and as energy prices climb they become even more profitable.

California Energy Commission (CEC) Loading Order

In 2003, the California Energy Commission (CEC) adopted a "loading order," a hierarchy of measures or opportunities to reduce GHG emissions based on their costs and benefits. The loading order hierarchy is derived from studies such as the McKinsey & Company report discussed above and specific cost-benefit data for California. The CEC established the following hierarchy to serve as a guideline for policy development.

1. Decrease electricity consumption by increasing energy efficiency and conservation;
2. Reduce demand during peak periods through demand response; and,
3. Meet new generation needs first with renewable and distributed generation resources and then with clean fossil-fueled generation.

The California loading order is generally characterized as: efficiency, renewable energy, and clean generation technologies. Moreover the loading order serves as a reasonable guide to prioritize local actions that will have the greatest impact at the least cost.

Cost-Benefit Analysis – Napa Countywide Climate Action Plan

The California loading order hierarchy and global GHG abatement cost curve form the technical framework for the Sonoma Carbon Model, which was adapted for Napa for this project.

The Napa Carbon Model is a mathematical representation of all of the significant sources of direct and indirect carbon dioxide emissions in Napa County, and the quantity of emissions from each source. This model also incorporates a representation of "opportunities for intervention" (OFI). The OFI are a means for quantifying emissions reduction from a particular measure or set of measures. The OFI are sector specific and refer to a range of reduction measures, both on the energy supply side, and on the energy demand side.

The Carbon Model gives us a mathematical way for quantifying the effect of emissions reduction measures in various sectors. It allows us to answer questions regarding "how much will be achieved" by a possible measure. It also allows us to answer questions of scale, i.e., "what is the necessary scope of the measures" to reach the overall target. If a cost can be associated with a particular measure, we can evaluate the cost effectiveness, i.e., the amount of carbon reduction per dollar invested.

The model is organized in a fashion similar to a standard emissions inventory. In fact, it is built using inventory source data. The model includes baseline data for electricity use, natural gas use and transportation in Napa County for the years 1990 and 2005. The model also contains projections for "business as usual" levels in each sector for the year 2020. The model was developed using statistics from the California Energy Commission studies on end use of electricity and natural gas in the residential and commercial sectors. The transportation data come from Metropolitan Transportation Commission studies of Bay Area travel forecasts. As much as possible, statistics that are local to Napa County were used. In some cases, statewide or national averages were used.

Expand Transportation and Mobility Options

Transportation emissions are 53% of the total 2005 countywide emissions. However, the transportation measures identified to reduce emissions represent only 33% of the total emissions reductions necessary to meet the target objective of a 15% reduction from the 2005 baseline or a 30% reduction from the 2020 business as usual (BAU) forecast.

Furthermore, only 15% of the 33% reduction is anticipated to come from land use and transportation policy changes and actions at the local level. The remaining 18% reduction is expected from increases in the federal and state fuel efficiency standards spurred by the California Clean Car Law.

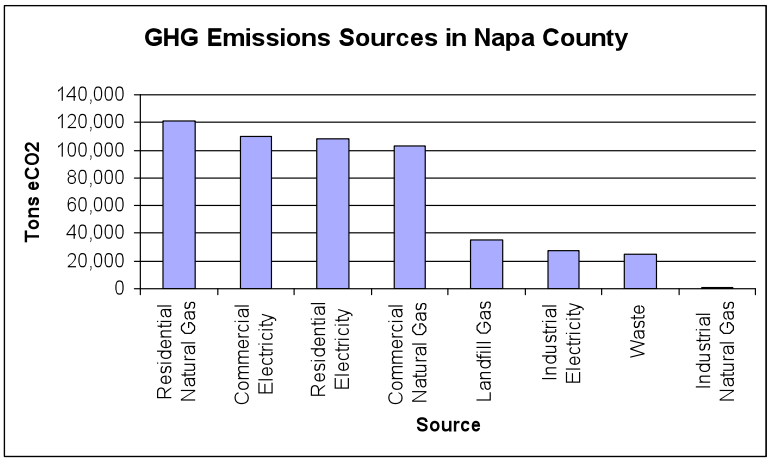
The Napa County Transportation and Planning Agency estimates that the 15% reduction in transportation emissions will cost between $42 and $62 million. The emission reduction actions that require little initial investment other than staff time are the land use and transportation planning actions that affect the future rate of growth of emissions due mostly to new development. In sum, these "no cost" local measures comprise 6% of the overall target reductions.

Objectives	Implementer	Feasibility	Potential Metric Tons GHG Reduced	Estimated Investment	Investment per Metric Ton GHG Reduced
Objective TM1 Reduce demand for fossil fuel by decreasing vehicle miles traveled					
Slowing down the anticipated growth rate of new vehicle miles traveled *(Actions TM1.1, TM1.2, TM1.3, TM1.4, TM1.5)*	All Jurisdictions, NCTPA	Moderate	25,000 or 6% of total target reduction	Nominal – these are mostly planning actions and regulatory changes	Nominal
Increasing the number of people using transit, walking or biking*(Actions TM1.5, TM1.6, TM1.7, TM1.8, TM1.9, TM1.10)*	All Jurisdictions, NCTPA	Challenging	40,000 or 9% of total target reductions	Expand Bus service: $10M VineTrail: $32-48M Park and Ride Lots: $3M Tourist Shuttles: unknown	$1,125 to $1,525 per ton of GHG reduced

Objectives	Implementer	Feasibility	Potential Metric Tons GHG Reduced	Estimated Investment	Investment per Metric Ton GHG Reduced
Improving the overall fuel efficiency of the transportation system (Action TM1.11)	All Jurisdictions, NCTPA, EPA and CARB	Easy (reductions due mostly to CA Clean Car Law)	80,000 or 18% of target reduction	Improved traffic signalization and flow: $1M	(efficiency improvements due to traffic signalization alone not determined)
Reduce length of trips (Action TM 1.12	All Jurisdictions, NCTPA	Moderate	Difficult to quantify	Nominal – these are predominantly planning actions and regulatory changes	Nominal
Reduce # of trips (actions TM 1.13,TM 1.14)	All Jurisdictions, NCTPA	Moderate	Difficult to quantify	Nominal – these are predominantly planning actions and regulatory changes	Nominal
Objective TM2 Encourage and support the switch from fossil-fuel powered vehicles to renewable energy powered vehicles.					
ACTION TM2.1: Adopt consistent policies and programs that help businesses and organizations with fossil-fuel powered fleet vehicles switch to vehicles powered by clean, renewable energy sources. (See also LG1.)	All Jurisdictions, NCTPA	Moderate	To be determined	Nominal – these are predominantly planning actions and regulatory changes	Nominal

Improve Buildings and Energy Efficiency

As shown in the chart below electricity and natural gas use in residential and commercial buildings are the largest sources of emissions after transportation in Napa County. The industrial sector is small compared to the residential and the commercial sectors. In addition to being a relatively small source of emissions in the County, the industrial sector tends to be highly technically specialized in terms of measures that significantly impact emission levels. Financial incentives and instruments for industry also tend to be specialized. For these reasons, this analysis of potential reduction measures focuses on the impacts and costs of reducing emissions from electricity and natural gas used in the residential and commercial sectors.



Moreover, given the transportation sector is not only the source of the majority of the County's emissions, but also the sector least amenable to reduction solutions, Napa County must aggressively pursue electricity and natural gas reduction measures to achieve the 2020 GHG emission target. Since transportation reduction measures can achieve up to 33% of the total reductions required, the buildings and energy sector must achieve the remaining 67% reduction: 24% reduction resulting from efficiency improvements and at least 43% reduction from switching the electricity supply from a predominately fossil fuel base to renewable sources and by using renewable energy sources for building heating and cooling and water heating.

Objectives	Implementer	Notes and Assumptions	Potential Metric Tons GHG Reduced from BAU	Estimated Investment	Annual Savings (electricity & NG costs avoided)	Investment per Metric Ton GHG Reduced
Objective BE1: Reduce energy demand through conservation and efficiency.						
Improving the efficiency of existing buildings *(Actions BE1.1, BE 1.2, BE 1.3)*	All Jurisdictions (Implement AB811 Program)	Assumes 60% of residential households participate and improve efficiency by 40% per household	27,000 metric tons or 6% of target reduction	$133 million *(residential only)* or annual repayment cost of $12.5 million (financed at 7% over 20 yrs)	$11.5 million annually (annual savings does not include projected utility rate escalation)	Program is revenue neutral (annual cost roughly equal to annual savings assuming rate escalation)
	Community Choice Aggregator (CCA)	Assumes implementation of alternative appliance rebate programs (appliances not covered by AB811 program)	5,000 metric tons or 1% of target	$39 million (annual repayment of $3.7 million financed at 7% over 20 yrs. Repayment amount represents end-user costs only other 50% is funded through electric rate)	$3.7 million annually	Program is revenue neutral (annual cost roughly equal to annual savings)
	Municipal Water Utility (e.g. water utility could cover all other water using appliances not covered by AB811)	High performance efficiency programs that eliminates upfront purchase costs and indebtedness (e.g. PAYS program)	30,000 metric tons or 6% of target (assumes 80% uptake and 60% efficiency improvement. Renters are also eligible)	$102 million (annual repayment of $9.7 million financed at 7% over 20 yrs)	$9.6 million annually	Program is revenue neutral (annual cost roughly equal to annual savings)
Reducing the growth of electricity and natural gas use *(Actions BE1.4, BE1.5)*	All Jurisdictions (e.g. implement green building ordinances)	Less than 3% of total emissions in 2020 are due to growth in electricity and natural gas. This growth will be reduced even further by Title 24 changes.	up to 15,000 metric tons or 3% of target reduction	Costs depend on development	Savings depend on development	Higher purchase prices for high efficiency buildings are recoverable by owner over time.

Objectives	Implementer	Notes and Assumptions	Potential Metric Tons GHG Reduced from BAU	Estimated Investment	Annual Savings (electricity & NG costs avoided)	Investment per Metric Ton GHG Reduced
Objective BE2: Improve the energy supply by switching from fossil fuels to renewables.						
Switching from Fossil Fuels to Renewables (Action BE2.1, BE2.2)	All Jurisdictions and CCA	BAU emissions assumes PG&E achieves 33% renewable fuel mix by 2020. Thus anticipated reductions are in addition to this.	Up to 126,000 from electicity and 110,000 from NG or 53% of target reduction	$760 million (this bond amount for new assets covers electricity only)	Levelized cost is $0.07 kWh (total kWh produced over 30 yrs divided by debt service bond plus $0.03 for M&O	Given current rates, this low emitting energy portfolio is competitive.