MEETING NOTICE AND AGENDA

ENERGY WORKING GROUP
The Energy Working Group may take action on any item appearing on this agenda.

Thursday, May 28, 2009

11:30 a.m. to 1:30 p.m. (This meeting is scheduled for 2 hours)

SANDAG Board Room, 7th Floor
401 B Street, Suite 800
San Diego, CA  92101-4231

Staff Contact: Susan Freedman
(619) 699-7387
sfr@sandag.org

AGENDA HIGHLIGHTS

- STATE LEGISLATIVE BILLS
- REGIONAL ALTERNATIVE FUELS ASSESSMENT
- REGIONAL ENERGY STRATEGY UPDATE
- REGIONAL CLIMATE ACTION PLAN

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To request this document or related reports in an alternative format, please call (619) 699-1900, (619) 699-1904 (TTY), or fax (619) 699-1905.
ITEM # | RECOMMENDATION
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1. | WELCOME AND INTRODUCTIONS

+2. | SUMMARY OF APRIL 23, 2009, ENERGY WORKING GROUP MEETING

   The April 23, 2009, meeting summary is attached for the Energy Working Group (EWG) review and approval.

3. | PUBLIC COMMENT

   Members of the public who would like to address the EWG on a topic not on the agenda should do so at this time. Speakers are limited to three minutes each.

+4. | STATE LEGISLATIVE UPDATE (20 MIN) DISCUSSION

   The Chair will lead a discussion of relevant energy bills identified at previous EWG meetings. A summary and analysis of selected energy bills is attached. The EWG will discuss whether SANDAG should support any of the pending energy bills.

+5. | DRAFT REGIONAL ALTERNATIVE FUELS, VEHICLES, AND INFRASTRUCTURE REPORT (30 MIN) DISCUSSION

   As part of the California Energy Commission (Energy Commission) partnership, SANDAG is developing a regional assessment of alternative fuels, vehicles, and infrastructure, and recommendations to support local government action. The draft report is attached. Staff will present draft findings and seek input from the EWG and public. A final report is due to the Energy Commission on September 15, 2009.

+6. | REGIONAL ENERGY STRATEGY UPDATE: GOALS AND POLICIES (40 MIN) DISCUSSION

   The Chair will brief the EWG on feedback received from the SANDAG Board at their May 22 meeting. The EWG will continue its discussions of proposed goals and policies for the inclusion in the RES Update. Attached are the draft goals and policies.
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<th>ITEM #</th>
<th>RECOMMENDATION</th>
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<td>+7.</td>
<td>REGIONAL CLIMATE ACTION PLAN (10 MIN)</td>
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<td>Staff will provide an updated timeline for Regional Climate Action Plan development. Due to unforeseen modeling delays, the date to submit a draft report to the Energy Commission is September.</td>
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<td>UPDATE ON RES AND RCAP PUBLIC WORKSHOP DATES</td>
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<td>SANDAG plans to hold a public workshop on the draft RES Update on the evening of July 9, 2009, at CCSE. The RCAP workshop is tentatively planned for early October.</td>
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<td>9.</td>
<td>SCHEDULING AGENDA ITEMS FOR FUTURE MEETINGS</td>
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<td>EWG members are invited to suggest topics for the upcoming meeting on June 25, 2009. The 2009 RES and RCAP development will continue to be primary agenda items.</td>
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+ next to an item indicates an attachment
SUMMARY OF APRIL 23, 2009, EWG MEETING

AGENDA ITEM #1: WELCOME AND INTRODUCTIONS

Energy Working Group (EWG) Chair Carrie Downey, City of Coronado, called the meeting to order at 11:45 a.m., and welcomed the group. She invited members and guests to introduce themselves.

AGENDA ITEM #2: SUMMARY OF MARCH 26, 2009, MEETING

Ms. Downey requested a change to the March attendance sheet to reflect that Escondido Councilmember Sam Abed, representing North County Inland, was present. She reminded everyone to sign in because attendance will be reflected in the summary.

Councilmember Donna Frye, City of San Diego, and Dave Weil representing UCSD, motioned to approve the summary. San Marcos Councilmember Rebecca Jones, representing North County Inland, seconded the motion, which passed without opposition.

AGENDA ITEM #3: PUBLIC COMMENT AND COMMUNICATIONS

Members of the public were given the opportunity to address the EWG on any topic not on the agenda.

Derek Turbide, San Diego Regional Sustainability Partnership and Clean Transportation Committee, announced the Alternative Transportation Solutions for San Diego workshop will be held on Wednesday, April 29, 2009, from 5 to 7 p.m. at the San Diego Automotive Museum in Balboa Park. Mike Evans noted that the San Diego Regional Chamber of Commerce recently endorsed the Tule Wind Project, a 200-megawatt wind farm. A member of the public recommended the EWG monitor AB 1106. A copy of the bill was given to staff, which will be disseminated through the EWG distribution list after this meeting.

Don Wood, C-3, announced that the Helix Water District has recently adopted a policy of net zero water demand for new construction and is considering replacing master metering with individual metering for new construction projects. Mr. Wood also noted that tiered rates for all customer classes should be adopted.
AGENDA ITEM #4: STATE LEGISLATIVE AND STIMULUS UPDATE

Ms. Downey thanked staff for their work in preparing the summary, as requested by the EWG. She inquired if there would be any objections to adding AB 1106 to the list of bills to follow. For the May meeting, Ms. Downey requested that staff provide an update on the bills and asked that everyone come prepared to discuss bills that they would like SANDAG to endorse.

Ms. Jones expressed concern about how SB 626 may trump local ordinances with regard to the statement, “…overcome any barrier to the widespread development” of electrical infrastructure for plug-in hybrids and electrical vehicles. She stated that local jurisdictions should not be forced to do it if it does not fit into their particular location; she would not object to SB 626 if it keeps local land use and zoning policies intact.

Ms. Downey said the intent of SB 626 is to encourage local jurisdictions to site electric plug-in stations, but the California Public Utilities Commission (CPUC) and Energy Commission should provide options or assistance to facilitate local jurisdictions to properly do this in order to have an infrastructure in place for the use of these technologies. She can take this to the SANDAG Board for its consideration.

Oceanside Councilmember Esther Sanchez, North County Coastal, stated that the problem with providing options is that many choose to opt out, which can make a voluntary law ineffective. Agreeing with Ms. Sanchez, Ms. Downey said she has no issue if the state were to impose a station upon every city but let the cities determine where they would like it to go. Andrew McAllister, California Center for Sustainable Energy, stated that AB 1106 is on the EWG bill list and we should consider all the feed-in tariff bills. Michael Meacham, City of Chula Vista, encouraged the group to consider putting SB 42 on their shortlist of bills to monitor. Mr. Evans remarked that SB 42 just went into a two-year cycle.

AGENDA ITEM #5: DRAFT REGIONAL ASSESSMENT OF ALTERNATIVE FUEL AND VEHICLE OPPORTUNITIES

Andrew Martin, SANDAG, discussed a draft report on the regional assessment of alternative fuel and vehicle opportunities. This report is a primary component of the SANDAG partnership with the Energy Commission. The purpose of the report is to identify alternative fuel vehicle opportunities for local government fleets and appropriate locations for siting alternative fuel infrastructure to increase the penetration of alternative fuel vehicles in the region. Major report components will include:

- Potential alternative fuels and vehicles and fleet applications in the region,
- Evaluation criteria for prioritizing investments in these different vehicles and fuels,
- Criteria for siting alternative fuel infrastructure, and
- Opportunities for integrating alternative fuels and/or vehicle components with regional transportation projects and investments.

Mr. Martin asked the EWG to provide input on the draft prior to its submittal to the Energy Commission for internal staff and peer review on April 30, 2009. The final report is due to the Energy Commission on September 15, 2009.
Ms. Downey inquired how many of the fuels under consideration are sufficiently developed technologically and available for immediate application, and the process for integrating such fuels into planned regional transportation projects or investments. Mr. Martin stated that the report analyzes both fuels that are currently accessible and ones that will be available in the future, and compressed natural gas (CNG) is a currently available technology which could be used. The process for integrating alternative fuel considerations into planned transportation projects or investments would involve identification of individual details and construction schedule of each project or investment and would also likely be contingent on available funding.

Susan Freedman, SANDAG, discussed the efforts undertaken with the regional vanpool program to illustrate this point. She stated that even before the completion of this report, staff has been working with the SANDAG Mobility Management Program to identify and obtain federal stimulus and state AB 118 funding to help cover infrastructure costs and implement alternative fuels and vehicles in the region. Mr. Weil inquired if funding opportunities will be identified in the report; Ms. Freedman affirmed that they will.

Ms. Downey asked if there is any ability to incorporate electric charging in the project design phase. Ms. Freedman stated staff is just looking at funding opportunities at this point. Ms. Jones asked how demand is gauged for plug-ins. Mr. Martin said that this analysis was done by the Energy Commission as part of the AB 118 Investment Plan.

Mr. McAllister raised the issue that vehicle driving range will impact consumer decisions to purchase electric vehicles. These cars typically have a relatively limited range of 100 miles or less, and although most trips are short, drivers are concerned about instances when they would need to travel longer distances. Mr. McAllister suggested SANDAG consider policies to mitigate for those long-distance trips and provide other options that would allow people to have an electric-only car and still travel on those longer trips.

Mr. Martin stated a lot of research has been done regarding this issue, however, the findings may not be widely known. He stated, for example, that the average person does not travel more than 30 to 40 miles per day. Thus, communicating this information to the market, including local government fleet operators, could help overcome potential consumer concern with electric vehicles.

Ms. Sanchez noted that implementation of the San Luis Rey Transit Center may be affected by funding problems. Mr. Martin said staff will look into this. Scott Anders, EPIC, stated that SANDAG’s traffic flow model would be integral in determining where to site the charging stations. He added that longer-distance travel issues would have to be addressed inter-regionally.

Mr. Evans recommended including an analysis on electric vehicle battery life and ways to encourage their reuse in the report. He also suggested that staff consider the coincidental impact of electric vehicle recharge on the electric grid. Additionally, he stated that it would be helpful to look at the overall efficiency and impacts associated with alternative fuels. He stated that emission per mile traveled could be used as an objective criteria to measure impacts.

A battery exchange model was noted where batteries are charged at night and swapped out at the fueling or charging stations during the day. Ms. Downey stated that the state of Hawaii is currently doing this. Risa Baron, SDG&E, stated the infrastructure for electric vehicles are in place in the region and reminded the EWG of the 50 charging stations built by SDG&E in the mid 1990s. She
stated that all those sites still exist and they are all pre-wired. To get these sites operational again, all that is needed is to coordinate with the site owners to upgrade the charging points to current standards. Ms. Downey asked if these sites are readily available in the state and where they are located. Ms. Baron said each investor-owned utility has a charging program, thus, they are readily available throughout the state and a list of sites can be made available.

Mr. Martin stated that staff received a list of existing electric charging points in the region from SDG&E, which includes information on the various states of disrepair of the sites. The location of existing electric charging points will be included in the draft report.

Ms. Sanchez recommended considering opportunities for alternative fuels in taxicab fleets. Ms. Downey stated that this is not something that an individual city will take on on its own; however, San Francisco has been successful in having all of the cabs running on CNG.

Mr. Turbide pointed out that the use of alternative fuels is not a one-size-fits-all kind of thing because there are going to be key fleets that are going to be good for one fuel and not for another. He stated that there are a lot of good examples of fleet experiences that should be looked into and he would be happy to help staff with preparation of the report in any way he can.

**AGENDA ITEM #6: REGIONAL ENERGY STRATEGY UPDATE GUIDING PRINCIPLES**

Ms. Freedman discussed the Regional Energy Strategy (RES) Update guiding principles. Over the last three EWG meetings, the EWG provided input on these principles. From comments received during the March meeting, staff made the following revisions:

- Change the language of guiding principle, Foster the Clean Technology Sector to Foster the Clean Energy Sector.

The Regional Planning Committee provided input at its April 3, 2009, meeting. The EWG was asked to consider recommending the Guiding Principles for inclusion in the RES Update.

Mr. Wood stated that although there was a discussion last meeting on how existing buildings will be the top energy-saving source over the next decade, he did not see any language in the draft encouraging building code and zoning changes that would encourage the retrofitting of existing buildings. Ms. Downey said she thought that the principle, Reduce the Energy Intensity of the Built Environment, captures this; however, the principle could be clarified. Mr. Wood suggested the words existing building and retrofit should be used in that principle.

With regard to zero net energy principle, Ms. Downey suggested the title should be clarified to state: Achieve Zero Net Energy In Existing and Future Residential And Commercial Buildings. Mr. McAllister stated that existing buildings may not fit under zero net energy, but language should state there is aggressive energy reduction for existing buildings. Mr. Anders recommended a separate guiding principle that states “aggressively pursue energy reductions in existing buildings” because it is a cornerstone of energy and greenhouse gas reduction. Ms. Downey asked if there would be any objection to the inclusion of an additional guiding principle, Aggressively Pursue Energy Reduction in Existing Residential and Commercial Buildings.
Heather Honea, SDSU, inquired where code compliance is addressed in the Update. Ms. Freedman stated that it is not addressed in the guiding principles; however, it was included in the RES policies for the energy efficiency goal. Rich Caputo, speaking to the Promote Education and Consensus-Building principle, recommended strengthening the public participation and stakeholder development process in areas of high conflict. Dave Carey, Port of San Diego, stated that this guiding principle is open-ended enough to include the kind of process Mr. Caputo is referring to.

Mr. Carey motioned to adopt the guiding principle as proposed with the inclusion of the principle, Aggressively Pursue Energy Reduction in Existing Residential and Commercial Buildings.

Ms. Downey asked if Mr. Carey would allow her to add the statement, “an open, transparent, inclusive planning process to include stakeholders,” in the Promote Education and Consensus-Building principle. Mr. Carey moved to adopt the guiding principles with these changes. Ms. Sanchez commented that they should make the distinction between community stakeholders and industry/commercial stakeholders. Ms. Downey said that both community and industry stakeholders will be included in the principle. Mr. McAllister seconded Mr. Carey’s motion. The motion passed without opposition.

Michael Meacham, City of Chula Vista, stated that the principle, Foster the Clean Energy Sector, is vague and suggested highlighting fostering the manufacturing and service sectors because there are tremendous opportunities that go beyond generating just energy, but creating fuels and vehicles locally as well. Ms. Freedman stated the principle was kept broad to include a wide range of industries. Staff has looked into developing and expanding a clean energy economic cluster, and within that is manufacturing, that will be included in the RES Update. She asked to receive input from Mr. Meacham and the group on development of that goal.

An inquiry was made if the group would recommend setting a guiding principle that articulates financial constraints. Ms. Downey stated the distributed generation and energy efficiency goals discussed this issue; however, funding considerations are best addressed separately from guiding principles.

**AGENDA ITEM #9: REGIONAL CLIMATE ACTION PLAN GUIDING PRINCIPLES**

This item was heard out of order so there would be adequate time for discussion of the recommendation.

Mr. Martin gave a brief presentation on the changes to the RCAP guiding principles. The guiding principles have been reviewed and discussed by the Regional Technical Working Group and Regional Planning Committee. Staff revised the guiding principles based upon the input received. The EWG is asked to review the amended guiding principles and recommend them for use in the RCAP.

Mr. Carey noted that a prior EWG discussion recommended the word serious be used instead of urgent in describing climate change; the guiding principles were revised to replace the word urgent with serious. Mr. Wood asked staff to consider modifying the language for the Achieve Zero Net Energy Residential and Commercial Buildings principle of the RCAP to be consistent with the principle in RES in regards to existing building retrofits. He added that the concept of zero net demand assumes that a new building will add to the demand to the grid system; while as for an
existing building, with a certain amount of demand already in place, zero net energy would not change its demand on the system at all. Therefore, there should be language in the guiding principle to reduce existing building energy demand through retrofits.

Ms. Downey suggest using the language, “aggressive strategies including regulations and incentives are employed to achieve zero net energy usage in new residential and commercial buildings and reduce energy demand in existing residential and commercial buildings through the deployment of energy efficiency and clean distributed generation.” Peter Livingston, County of San Diego, noted the distinction between the words usage and demand- usage refers to consumption, whereas, demand refers to the power. In regards to Mr. Livingston’s comment, the word demand was replaced with usage in the above statement. Ms. Baron stated that beyond just looking at individual buildings, the concept of community design and building orientation should be incorporated in planning to ensure and maximize energy efficiency and renewable opportunity. Mr. Wood said this idea could be incorporated under the principle, Achieve Zero Net Energy Residential and Commercial Buildings.

Mr. McAllister motioned to recommend inclusion of the guiding principles in the RCAP with the following amendments:

- Under the principle, Take Immediate Action, it will state, “…climate change is a serious global challenge…”
- Under Achieve Zero Net Energy Residential And Commercial Buildings, it will read: “Aggressive strategies including regulations and incentives are employed to achieve zero net energy usage in new residential and commercial buildings and communities and reduce energy usage in existing residential and commercial buildings through energy efficiency, clean distributed generation, and community planning efforts.”

Ms. Sanchez seconded the motion, which passed without opposition.

**AGENDA ITEM #7: REGIONAL ENERGY STRATEGY UPDATE: REGIONAL ENERGY EFFICIENCY GOALS AND POLICIES**

As a continuation to the discussion of the Regional Energy Efficiency Analysis provided by CCSE at the last meeting, Mr. McAllister discussed the analysis of cumulative energy efficiency savings that could be realized through incentives for energy efficiency technologies at varying levels. Mr. McAllister discussed four priority action areas, below, which the EWG should consider for inclusion in the RES Update that could generate meaningful energy savings within the existing residential sector. The EWG is asked to discuss these measures for use in the 2009 RES Update.

- Prioritize comprehensive existing residential retrofits
- Improve and/or expand weatherization programs
- Encourage educational opportunities for lighting
- Aggressive air conditioning (A/C) load reduction through efficient heating, ventilation, and air conditioning (HVAC) systems

Ms. Downey inquired if Mr. McAllister believes that local governments should require permits for new A/C installations. Mr. McAllister said he is not suggesting that permits be required where they are not currently. Ms. Downey stated an incentive for committing to these action items could be an
ability to increase a project’s footprint. Mr. McAllister noted that local government can use the
permitting process as a way to promote energy efficiency in existing buildings; this could be done
through providing information or imposing certain requirements for obtaining a permit. Mr. Caputo inquired how market limits were developed. Mr. McAllister stated that they were
obtained from the Energy Commission. Ms. Downey asked that questions be held until the next
meeting due to time constraints.

AGENDA ITEM #8: RES UPDATE GOALS AND POLICIES, AGENDA ITEM #10: RCAP POLICIES
These items were postponed to a future meeting due to the lack of time.

AGENDA ITEM #11: SAVE THE DATE FOR TWO PUBLIC WORKSHOPS
Ms. Freedman announced that SANDAG would like to hold a public workshop on the draft RES
Update on the evening of July 9, 2009, and a public workshop on the draft RCAP on the evening of
July 16, 2009. Both of these events will be at CCSE.

AGENDA ITEM #12: SCHEDULING AGENDA ITEMS FOR FUTURE MEETINGS
Items 8 and 10 will be rescheduled for a future meeting.

AGENDA ITEM #13: ADJOURN
The meeting was adjourned at 1:44 p.m. The next meeting will be on May 28, 2009.

SANDAG ENERGY WORKING GROUP MEETING
ATTENDANCE APRIL 23, 2009

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<td>South County</td>
<td>City of Coronado</td>
<td>Carrie Downey, Chair</td>
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<td>David Lloyd</td>
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<td>Sierra Club</td>
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<td>Greg Newhouse</td>
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<td>Regional Sustainability Partnership, Clean Transportation Cmt</td>
<td>Derek Turbide</td>
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**OTHER ATTENDEES:**

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<td>Don Wood, C-3</td>
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<td>Alexandra Hart</td>
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<td>Julie Gelfat</td>
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<td>Matt Valerio, Port of San Diego</td>
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<td>Javier Avila</td>
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<td>Danny King, City of Solana Beach</td>
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<td>Marty Turock, Clean Tech</td>
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<td>Linda Wagner, City of Chula Vista</td>
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<td>April Lassetter, Power House Services</td>
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<td>Rich Caputo, San Diego Renewable Energy Society</td>
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<td>Marina Som, SANDAG</td>
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STATE LEGISLATIVE UPDATE

Introduction

This report provides a status update on 15 bills that the Regional Energy Working Group (EWG) has been monitoring. Bills moving through the Legislature must pass out of their house of origin (i.e., Senate or Assembly) by Friday, June 5, 2009. Any fiscal or non-fiscal bill that has not passed out of its policy committee by now is considered a two-year bill.

Bills that will cost the state more than a previously established amount are placed on committee’s suspense file. Bills may be removed from the suspense file due to changes in cost estimates, amendments that remove the cost to the state, or political decisions. The Senate and Assembly Appropriations Committees will take up the suspense files on Thursday, May 28, 2009 (the date of the Energy Working Group meeting). In the Senate, any general fund or private fund bill that has a fiscal cost of more than $50,000, and any special fund bill that has a cost of more than $150,000, are automatically placed on the suspense file. In the Assembly, any bill that has a fiscal cost of more than $150,000 is automatically placed on the suspense file. Given the $21.3 billion budget shortfall that the Legislature must address, several, if not all, of the bills on the suspense file may not move forward.

Discussion

A summary of the energy-related bills being tracked by EWG is provided below. The information provided includes the current status of the bill, the last time it was amended, and a brief summary of the legislation.

Summary of Energy-Related Bills

CA AB 46  
AUTHOR: Blakeslee [R]  
TITLE: Energy: Energy Conservation Assistance  
LAST AMEND: 03/31/2009  
SUMMARY: Amends the provisions of existing law that provides for the administration of the State Energy Conservation Assistance Account that provides grants and loans to local governments and public institutions for energy use savings. Extends the operation of those provisions. Extends the financial assistance program and the Local Jurisdiction Energy Assistance Account that provides loans to local jurisdictions for energy projects.  
04/22/2009 In ASSEMBLY Committee on APPROPRIATIONS: To Suspense File.
CA AB 231  AUTHOR: Huffman [D]  
TITLE: Global Warming Solutions Act of 2006: Trust Fund  
LAST AMEND: 04/29/2009  
SUMMARY: Requires the State Air Resources Board to adopt a schedule of fees to be paid by the sources of greenhouse emissions, which would be deposited in the Climate Protection Trust Fund, for purposes of carrying out the Global Warming Solutions Act of 2006.  
05/13/2009 In ASSEMBLY Committee on APPROPRIATIONS: To Suspense File.

CA AB 531  AUTHOR: Saldana [D]  
TITLE: Energy Consumption Data: Disclosure  
LAST AMEND: 04/23/2009  
SUMMARY: Relates to uploading energy consumption data for the account specified for a building to the United States Environmental Protection Agency's Energy Star Portfolio Manager. Exempts an electric or gas utility from certain disclosure prohibitions when the utility is uploading the energy consumption data for the account specified for a building. Requires an owner or operator to disclose specified benchmarking data and rating to a prospective buyer, lessee of the entire building, or a building finance lender.  
05/13/2009 In ASSEMBLY Committee on APPROPRIATIONS: To Suspense File.

CA AB 920  AUTHOR: Huffman [D]  
TITLE: Solar and Wind Distributed Generation  
INTRODUCED: 02/26/2009  
SUMMARY: Revises provisions of the Public Utilities Act regarding electric utilities and solar and wind distributed generation. Relates to standard contracts and tariffs between the utility and customer-generators. Relates to net energy surpluses counting towards the utility's renewable portfolio standard purchasing requirements.  
05/06/2009 In ASSEMBLY Committee on APPROPRIATIONS: To Suspense File.

CA AB 1031  AUTHOR: Blumenfield [D]  
TITLE: Renewable Energy  
LAST AMEND: 05/05/2009  
SUMMARY: Relates to the local government renewable energy self-generation program. Clarifies the existing definition of a local government by including a community college district and would revise the definition of a local government to include an individual campus of the University of California or the California State University and a joint powers authority or agency. Requires the State Architect to prepare a report on the barriers to schools to installing solar or other renewable energy systems.  
05/20/2009 In ASSEMBLY Committee on APPROPRIATIONS: To Suspense File.
CA AB 1106  AUTHOR: Fuentes [D]  
TITLE: Renewable Electric Generation Facilities: Tariffs  
LAST AMEND: 05/06/2009  
SUMMARY: Requires every electrical corporation to file with the Public Utility Commission a standard feed-in tariff for the electricity generated by a renewable electric generation facility that is an eligible renewable energy resource and meets specified requirements. Requires the corporation to make the tariff available to any customer on a specified basis. Authorizes limitations upon a customer for completion of a renewable electric generation facility. Requires the development of tariffs for specified sources.  
05/20/2009 In ASSEMBLY Committee on APPROPRIATIONS: To Suspense File.

CA AB 1405  AUTHOR: De Leon [D]  
TITLE: California Global Warming Solutions Act of 2006  
LAST AMEND: 04/28/2009  
SUMMARY: Amends the State Global Warming Solutions Act of 2006 that requires the revenues collected from fees paid by the sources of greenhouse gas emissions regulated under the act. Establishes the Community Benefits Fund. Requires an unspecified percentage of revenues generated pursuant to the act include the above fees, to be deposited into the fund. Provides the moneys in the fund would go to the most impacted and disadvantaged communities in the state to accelerate greenhouse gas emission reductions.  
05/13/2009 In ASSEMBLY Committee on APPROPRIATIONS: To Suspense File.

CA SB 14  AUTHOR: Simitian [D]  
TITLE: Utilities: Renewable Energy Resources  
LAST AMEND: 03/24/2009  
SUMMARY: Revises the requirement for retail sellers of electricity to meet and exceed a specified percentage of their procurement targets from renewable energy resources. Requires an accounting system to verify compliance by retail sellers and local publicly owned electric utilities to comply with the renewables portfolio standards program. Relates to Public Utility Commission and Independent System Operator responsibilities under the program. Relates to thermal energy facilities certification. Requires reports.  
05/12/2009 To ASSEMBLY Committees on UTILITIES AND COMMERCE and NATURAL RESOURCES.

CA SB 32  AUTHOR: Negrete McLeod [D]  
TITLE: Renewable Electric Generation Facilities.  
LAST AMEND: 04/29/2009  
SUMMARY: Requires an electrical corporation to file with the Public Utilities Commission a standard tariff for electricity purchased from an electric generation facility located within the service territory of, and developed to sell electricity to, the electric corporation. Requires the facility to have a specified effective capacity. Amends provisions regarding owners, payments by a market price referent, peak demand, expedited interconnection procedures, net metering, ratepayer funded incentives and contracts.  
05/18/2009 In SENATE Committee on APPROPRIATIONS: To Suspense File.
CA SB 42  AUTHOR: Corbett [D]  
TITLE: Coastal Resources: Once Through Cooling  
LAST AMEND: 04/14/2009  
SUMMARY: Prohibits a state agency from authorizing, approving or certifying a new power plant or industrial facility that uses once-through cooling. Requires the implementation of a statewide policy on once-through cooling at coastal power plants. Requires a fee on power plants and industrial installations using once-through cooling.  
04/21/2009 Senate, Energy and Utilities

CA SB 412  AUTHOR: Kehoe [D]  
TITLE: Electricity: Self-Generation Incentive Program  
INTRODUCED: 02/26/2009  
SUMMARY: Extends the self-generation incentive program for non-solar distributed generation resources. Limits the eligibility for incentives to distributed generation resources that will support the state's goals for reduction of greenhouse gas.  
05/04/2009 In SENATE Committee on APPROPRIATIONS: To Suspense File.

CA SB 523  AUTHOR: Pavley [D]  
TITLE: Solar Feed-In Tariff Pilot Program  
LAST AMEND: 04/13/2009  
SUMMARY: Creates the Solar Feed-in Tariff Pilot Program. Requires specified electrical corporations to enter into agreements to purchase all of the electricity generated by the owner or operator of a solar energy generation facility located within the territory serviced by that electrical corporation at specified prices using a contract developed by the Public Utilities Commission. Limits the program to a specified city and other pilot cities to be selected by the commission.  
04/13/2009 Two-Year Bill

CA SB 626  AUTHOR: Kehoe [D]  
TITLE: Infrastructure: Plug-in Hybrid and Electric Vehicles  
INTRODUCED: 02/27/2009  
SUMMARY: Requires the Public Utility Commission in consultation with the Energy Commission, the State Air Resource Board, electric corporations, and the motor vehicle industry, to evaluate and implement policies to develop infrastructure sufficient to overcome any barriers to the widespread deployment and use of Plug-in hybrid vehicles.  
05/18/2009 From SENATE Committee on APPROPRIATIONS: Do pass as amended.

CA SB 663  AUTHOR: Benoit [R]  
TITLE: Neighborhood Electric Vehicles  
INTRODUCED: 02/27/2009  
SUMMARY: Authorizes the city of Palm Desert to establish a neighborhood electric vehicle transportation plan, subject to penalties.  
04/14/2009 Two-Year Bill
CA SB 722  AUTHOR: Steinberg [D]
TITLE: Greenhouse Gas Credits
LAST AMEND: 04/23/2009
SUMMARY: Makes it unlawful for a person to represent in an advertisement or in any other sales or promotional materials made available to the public for the sale of a greenhouse gas credit or emissions unless certain requirements are met and requires such a persons to maintain in written form and make available to any member of the public who request it certain information and documentation supporting the validity of that representation.
05/14/2009  In SENATE. Read third time. Passed SENATE. To ASSEMBLY.

Next Steps

Staff will continue to monitor these bills and report back to the EWG as they make their way through the legislative process.

Key Staff Contact: Susan Freedman, (619) 699-7387, sfr@sandag.org
DRAFT REGIONAL ALTERNATIVE FUELS, VEHICLES, AND INFRASTRUCTURE REPORT

Introduction

Increasing the use of alternative fuels and vehicles in the San Diego region can help contribute to federal and state goals for decreasing reliance on petroleum-based transportation fuels, reducing greenhouse gas (GHG) emissions, improving air quality, and promoting clean economic development. In addition, the recommended guiding principles for both the draft Regional Energy Strategy Update and the draft Regional Climate Action Plan explicitly address the linkages between increasing alternative fuel and vehicle deployment and achieving regional goals for reducing petroleum consumption and GHG emissions.

As part of the California Energy Commission partnership, SANDAG is developing a regional assessment of alternative transportation fuels, vehicles, and infrastructure. In accordance with the partnership agreement, the draft report was submitted to the Energy Commission for internal peer review on May 20, 2009. The draft report is focused on increasing the use of alternative fuels and vehicles in the fleets of local governments and their franchisees (e.g., refuse haulers). Moreover, the report addresses how a strategic regional approach to the initial deployment of alternative fuel vehicles and infrastructure to local government fleets can help lay the groundwork for and facilitate a wider rollout of alternative fuel vehicles to the general public.

The EWG is asked to review the attached draft report and provide staff with feedback by June 25 (the next EWG meeting). Staff also will distribute the draft for stakeholder input through the San Diego Regional Clean Fuels Coalition and other venues. In development of the first draft, SANDAG has received stakeholder input from local governments, public agencies, and regional stakeholders including the Clean Fuels/Cities Coalition, the San Diego Regional Airport Authority, the Air Pollution Control District, and San Diego Gas and Electric (SDG&E). Staff will present an overview of the draft report.

Discussion

Alternative fuel vehicles operate fully or in part on fuels other than gasoline or petroleum diesel, and include biofuels (i.e., ethanol and biomass-based diesels), electricity, hydrogen, natural gas, and liquefied petroleum gas (LPG or propane). These fuels can be used in a variety of local government fleet applications that range from light-duty passenger cars to heavy-duty vehicles like refuse haulers and sweepers to non-road applications such as forklifts.
The purpose of the draft report is to identify and recommend regional and local government actions to increase the deployment of alternative fuels and vehicles in the San Diego region. While primarily focused on identifying opportunities for alternatives fuels and vehicles in local government fleets, the draft report also provides analysis, tools, and recommendations that will enable SANDAG, its member agencies, and other regional stakeholders to facilitate a wider regional rollout of alternative fuels, vehicles, and infrastructure.

The major components of the draft report include:

- Federal and state policies and funding opportunities for alternative fuels;
- Detailed assessment and comparison of alternative fuels and vehicle technologies including key considerations such as amount of petroleum and GHG emissions reduction, fuel economy, fuel price, and availability and cost of vehicles and infrastructure;
- Analysis of opportunities for the integration of alternative fuel vehicles and infrastructure considerations with the core SANDAG function of regional transportation planning; and
- Tools to help local governments, including sample fleet and procurement policies, alternative fuel and vehicle cost calculators, and alternative fuel vehicle case studies for government fleets.

The draft report concludes with four sets of recommendations to help local government fleets and the region as a whole increase the use of alternative fuels and vehicles and develop the supportive infrastructure:

1. Priorities and recommendations for alternative fuels and vehicles in different vehicle classes tied to available funding opportunities and the unique characteristics of the region. This information is provided to help local governments, public agencies, and other fleet operators make decisions regarding alternative fuel purchases, new vehicle purchases and/or vehicle retrofits;
2. Potential near-term regional transportation projects and investments that could be expanded to include an alternative fuels component;
3. Possible collaborative approaches and measures to prepare the region for the rollout of alternative fuels and vehicles to the general public; and
4. Potential measures that SANDAG could undertake as follow-up to this report to facilitate a regional transition, particularly the identification of suitable locations for alternative fueling infrastructure. SANDAG can ensure that alternative fuel, vehicle, and infrastructure considerations are integrated with development of the regional transportation network and future regional growth.

The report also discusses existing regional efforts to increase the use of alternative fuels, including SANDAG participation in an effort to introduce electric vehicles into public fleets and support development of a regional electric vehicle charging network, and SANDAG coordination of public and private efforts to apply for federal economic stimulus funding for alternative fuels, vehicles, and infrastructure. The report will serve as a resource for SANDAG to continue providing guidance and coordination of the regional transition to alternative transportation fuels.
**Next Steps**

The internal peer review of the draft report by the Energy Commission will be completed in June 2009. Staff will consider the staff-level feedback and recommendations provided by the Energy Commission and integrate them into the report as appropriate. The EWG will continue to provide input to the report. The draft report will be presented to the Board of Directors for its input at its June 12, 2009, meeting and the Regional Planning Committee at its June 5, 2009, meeting. A public workshop to solicit additional stakeholder and public input will be held in summer 2009. The final report is due to the Energy Commission on September 15, 2009.


Key Staff Contact: Andrew Martin, 619-699-7319, ama@sandag.org
Task 3.3
Draft Alternative Fuels and Vehicles Program Report

A San Diego Regional Assessment of Alternative Fuels, Vehicles, and Infrastructure and Recommended Government Actions

CEC Agreement Number: 160-06-002
SANDAG OWP: 3003002

Submitted by the San Diego Association of Governments to the California Energy Commission

May 15, 2009

ACKNOWLEDGEMENTS

This Draft Report was prepared by SANDAG staff with the assistance of the SANDAG Energy Working Group and the San Diego Regional Clean Cities Coalition. It was developed with assistance from the California Energy Commission, as part of a regional energy strategies partnership.
The 18 cities and county government are SANDAG serving as the forum for regional decision-making. SANDAG builds consensus, plans, engineers, and builds public transit; makes strategic plans; obtains and allocates resources; and provides information on a broad range of topics pertinent to the region’s quality of life.

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As of May 1, 2009
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Executive Summary

The San Diego Association of Governments (SANDAG) has developed this regional assessment of alternative fuels, vehicles, and infrastructure to identify and recommend regional and local government actions that will expand the deployment of alternative fuel vehicles in the San Diego region. The scope of this report includes policy and program opportunities, fleet and franchisee applications, infrastructure options, and strategic regional collaboration. The report objective is to increase alternative fuel vehicle use and infrastructure availability by providing useful information and tools that will enable SANDAG, its member agencies and other regional stakeholders to take action. Increasing alternative fuel vehicle and infrastructure deployment in the San Diego region will contribute to federal, state, and regional goals for petroleum reduction, climate stabilization, improved air quality, and clean economic development.

To accomplish this, the report focuses on the following areas:

- Federal and state funding opportunities and incentives for alternative fuels, vehicles, and infrastructure.
- A detailed assessment of available alternative fuels, vehicle technologies, and infrastructure.
- Recommended alternative fuels for the San Diego region for different vehicle classes and fleet applications tied to the funding opportunities.
- Opportunities to integrate alternative fuel vehicles and/or infrastructure components into budgeted near-term regional transportation projects.
- Regional alternative fuel, vehicle or infrastructure efforts underway.
- Tools to help local governments, including sample fleet and procurement policies, alternative fuel and vehicle cost calculators, and alternative fuel vehicle case studies for government fleets.
- Report recommendations and next steps.

Alternative Fuel Vehicles (AFV) operate fully or in part on fuels other than gasoline or petroleum diesel, such as electricity, ethanol, hydrogen, natural gas, biomass-based diesels, and propane. These fuels can be used in a variety of fleet applications that range from light-duty passenger cars to heavy-duty vehicles like refuse haulers and sweepers. Alternative fuels also can be used in off-road applications such as forklifts, and agricultural and construction equipment.

State and federal energy policy provides significant opportunities for the San Diego region to increase the deployment of alternative fuel vehicles and infrastructure. Although petroleum fuels will play a decreasing but significant role in the region’s transportation fuel portfolio for the foreseeable future, a move away from petroleum to alternative fuels would provide the following benefits to the region and state:

- Protection against petroleum price volatility and supply uncertainty,
- Reduction of greenhouse gas emissions causing global climate change,
- Reduction of local air pollutant emissions that result in adverse public health impacts,
- Lessening of dependence on foreign petroleum imports, and
Executive Summary

- Creation of economic benefits in California by replacing imported petroleum fuels with alternative fuels and vehicle technologies produced in the state.

| Table 1. California Transportation-Fuel Policies and the San Diego Regional Impact |
|-------------------------------|-------------------------------|--------------------------------|
| Objectives | Goals and Milestones | San Diego Regional Impact* |
| GHG Reduction | Reduce GHG emissions to 1990 levels by 2020 and 80% below 1990 levels by 2050 | Regional targets for GHG reduction from passenger cars and light-trucks in 2020 and 2035 are currently under development |
| Petroleum Reduction | Reduce petroleum fuel use to 15% below 2003 levels by 2020 | 38% reduction below expected 2020 levels |
| Alternative Fuel Use | Increase alternative fuel use to 20% of on-road fuel demand by 2020 and 30% by 2030 | 398 million gallons by 2020 713 million gallons by 2030 |
| In-State Biofuels Use | Increase biofuel use to one billion gasoline gallons equivalent (gge) by 2010, 1.6 billion gge by 2020, and two billion gge by 2050 | 5% of fuels in 2010 6.5% of fuels in 2020 2050 tbd. |
| In-State Biofuels Production | Produce in California 20% of biofuels used in state by 2010, 40% by 2020, and 75% by 2050 | 16 million gallons by 2010 51 million gallons by 2020 2050 tbd. |

*No regional requirements exist for these policies. The targets are theoretical and based on San Diego Region population and fuel data and forecasts.

Over the course of developing this report, SANDAG has worked with the California Energy Commission (Energy Commission), local governments, public agencies, and regional stakeholders including the San Diego Regional Clean Cities Coalition, the Air Pollution Control District, San Diego Gas and Electric, the San Diego Regional Airport Authority, Port Authority, regional transit agencies, universities, and industry. Several positive results already have accrued from the undertaking of this regional alternative fuels assessment:

- SANDAG has served as facilitator for developing a San Diego regional strategic alliance on alternative fuels,
- SDG&E and a major auto manufacturer have asked SANDAG to be a partner to facilitate widespread introduction of electric vehicles (and associated infrastructure) to the San Diego region,
- SANDAG has facilitated public and private stakeholder meetings with the Energy Commission on potential AB 118 projects in the region,
- SANDAG has been invited to join the Board of the region’s Clean Cities Coalition and work with the Coalition to implement report recommendations.
- SANDAG is serving as the lead applicant for a comprehensive regional, public-private alternative fuels proposal to the U.S. Department of Energy and Energy Commission.

The report concludes with four sets of recommendations that if carried out will help prepare the region for wide-scale use of alternative fuels, vehicles and infrastructure.

- The first prioritizes alternative fuels for different vehicle classes. This information can help local governments, public agencies and other fleet operators in making decisions regarding new vehicle purchases and/or vehicle retrofits.
The second identifies potential regional, near-term budgeted transportation projects that could be expanded to include an alternative fuels component.

The third focuses on collaborative approaches and measure to prepare the region as a whole for alternative fuel vehicles.

The fourth comprises measures that SANDAG could undertake as follow-up to this report and that are not addressed in earlier recommendations.

In general, the information provided in this report can assist local governments and fleet owners in the San Diego region and all of California in the deployment of alternative fuels, vehicles, and infrastructure.
SECTION 1 - INTRODUCTION
A San Diego Regional Assessment of Alternative Fuels, Vehicles, and Infrastructure and Recommended Government Actions

SECTION 1. Introduction

California has adopted aggressive policies to increase the use of alternative fuels to power vehicles and off-road equipment, as well as address air quality and climate change concerns. The San Diego region is well-positioned to establish a robust alternative fueling network that will enable local fleet operators, and the general public, to select alternative fuel vehicles to replace traditional gasoline or diesel-fueled vehicles.

The choice of which alternative fuel will vary based on vehicle class and customer needs. The region will utilize alternative fuels that meet the state’s low carbon fuel standard (LCFS), which is determined by a full fuel cycle analysis (“well to wheels”). Fuels with lower carbon intensities than conventional gasoline and diesel qualify for the LCFS and are eligible for state aid to increase their deployment. The significant financial and technical resources of the state and federal government will be critical to increasing alternative fuels, vehicles and infrastructure in the San Diego region.

The state has enacted several laws that create a framework for lessening consumption of petroleum-based transportation fuels and reducing greenhouse gas emissions from the transportation sector. In general, California employs a three-pronged approach to implement this framework:

- Improve the fuel efficiency and lower greenhouse gas emissions from passenger vehicles (e.g., Pavley Standards, zero-emission vehicle [ZEV] program)
- Reduce the carbon intensity of transportation fuels (Low Carbon Fuel Standard); and
- Integrate regional land use and transportation planning to reduce emissions from vehicle travel (Senate Bill 375).

This report focuses on the first two approaches by examining how SANDAG can help local governments in the region accelerate the deployment of highly fuel efficient alternative fuel vehicles and develop the supportive infrastructure. SANDAG recognizes the critical importance of siting fueling stations, charging points, vehicle maintenance facilities, and other infrastructure necessary to support alternative fuel vehicles in coordination with vehicle purchases. Such regional coordination is needed to provide customers (e.g., fleet managers and the general public) with a level of certainty that infrastructure will be available to support their investment in an alternative fuel vehicle. Deployment of alternative fuel vehicles and development of supportive infrastructure, initially for local government fleets, will help the region lay the groundwork for a wider rollout of alternative fuel vehicles to the general public.

State and federal energy policy provides significant opportunities for the San Diego region to increase the deployment of alternative fuel vehicles and infrastructure. Although petroleum fuels will play a decreasing but significant role in the region’s transportation fuel portfolio for the foreseeable future, a move away from petroleum to alternative fuels would provide the following benefits to the region and state:

- Protection against petroleum price volatility and supply uncertainty,
- Reduction of greenhouse gas emissions causing global climate change,
- Reduction of local air pollutant emissions that cause adverse public health impacts,
• Lessening of dependence on foreign petroleum imports,
• Creation of economic benefits in California by replacing imported petroleum fuels with alternative fuels and vehicle technologies produced in the state, and
• Economic and workforce development in the clean energy sector by building new infrastructure to accommodate the development, production, and use of alternative fuels.

Accelerating the transition of local government fleets to alternative fuel vehicles is an important initial step to achieving these benefits in the San Diego region. Table 2 identifies key quantitative policy objectives for climate change, petroleum reduction, and alternative fuel use in the state and the San Diego region’s estimated per-capita portion based on forecasts of population and fuel consumption.

| Table 2. California Transportation-Fuel Policies and the San Diego Regional Impact |
|-------------------------------|---------------------------------|---------------------------------|
| **Objectives**                | **Goals and Milestones**        | **San Diego Regional Impact**   |
| GHG Reduction                 | Reduce GHG emissions to 1990 levels by 2020 and 80% below 1990 levels by 2050 | Regional targets for GHG reduction from passenger cars and light-trucks in 2020 and 2035 are currently under development |
| Petroleum Reduction           | Reduce petroleum fuel use to 15% below 2003 levels by 2020 | 38% (756 million gallons) reduction below expected 2020 levels |
| Alternative Fuel Use          | Increase alternative fuel use to 20% of on-road fuel demand by 2020 and 30% by 2030 | 398 million gallons by 2020, 713 million gallons by 2030 |
| In-State Biofuels Use         | Increase biofuel use to one billion gasoline gallons equivalent (gge) by 2010, 1.6 billion gge by 2020, and two billion gge by 2050 | 5% (82 million gallons) of fuel in 2010, 6.5% (129 million gallons) of fuel in 2020, 2050 tbd. |
| In-State Biofuels Production  | Produce in California 20% of biofuels used in state by 2010, 40% by 2020, and 75% by 2050 | 16 million gallons by 2010, 51 million gallons by 2020, 2050 tbd. |

*No regional requirements exist for these policies. Theoretical targets are based on San Diego Region’s population and fuel data and forecasts; targets not estimated for 2050 because population and fuel consumption data forecasts are not yet available for that year.

To undertake this assessment, SANDAG worked with local governments, public agencies, and regional stakeholders including the San Diego Regional Clean Cities Coalition, the Air Pollution Control District, San Diego Gas and Electric, the San Diego Regional Airport Authority, the Port Authority, regional transit agencies, universities, and private industry. Several positive results have already accrued from the undertaking of this regional alternative fuels assessment:
• SANDAG has served as facilitator for developing a San Diego regional strategic alliance on alternative fuels,
• SDG&E and a major auto manufacturer have asked SANDAG to be a partner to facilitate widespread introduction of electric vehicles and associated infrastructure to the San Diego region,
• SANDAG has facilitated public and private stakeholder meetings with the Energy Commission on potential AB 118 projects in the region,
SANDAG has been invited to join the Board of the region’s Clean Cities Coalition and work with the Coalition to implement report recommendations, and

- SANDAG is serving as the lead applicant for a comprehensive regional, public-private alternative fuels proposal to the U.S. Department of Energy and Energy Commission.

**Regional Planning Efforts**

As the Metropolitan Planning Organization (MPO) for the San Diego region, SANDAG is a logical entity for identifying locations for alternative fuel infrastructure that meets regional needs. As the transportation planning agency for the region, SANDAG can ensure that alternative fuel, vehicle, and infrastructure considerations are integrated with development of the regional transportation network. With its regional perspective, SANDAG can recommend specific alternative fuel and vehicle technologies to local governments and regional stakeholders that are tailored to the unique characteristics of the San Diego region. Lastly, SANDAG can facilitate a regional alternative fuel deployment by local governments and regional stakeholders through development of a unified regional vision, consistent programs, coordination of funding applications, and development of standardized guidelines for infrastructure siting, permitting, and education.

Over the course of developing this assessment, SANDAG has become identified as a leading source for information on policies, programs, funding opportunities, public and private partnerships, and other aspects related to alternative fuels. The agency also has facilitated several regional clean transportation efforts. As a result, SANDAG has been asked to help facilitate the introduction of electric vehicles (EVs) to public fleets and support a regional recharging network. The agency also has been asked to serve on several clean transportation committees including the San Diego Clean Cities Coalition Board, the San Diego County Regional Airport Authority’s Fly Green Task Force, and the San Diego Regional Sustainability Partnership.

Two plans currently under development address transportation energy issues: the Regional Energy Strategy (RES) Update and the Regional Climate Action Plan (RCAP). Both are scheduled for consideration by the SANDAG Board of Directors in late 2009. These plans, among others, will serve as foundations for addressing greenhouse gas reductions in the next update of the Regional Transportation Plan (RTP), which is scheduled for adoption in fall 2011.

The RES Update and RCAP recognize that energy use is responsible for more than 90 percent of GHG emissions in the San Diego Region. The largest contributors are on-road transportation (46 percent), electricity generation (25 percent) and natural gas end use (9 percent). Adopting energy efficiency measures for buildings, accelerating the deployment of alternative fuel vehicles, and considering the energy impacts of land use and transportation planning decisions, all contribute to meeting the state law to reduce GHG emissions economy-wide to 1990 levels by 2020 and the long-term goal of reducing GHG emissions to 80 percent below 1990 levels by 2050.

As of this writing, the SANDAG Energy Working Group has recommended a set of guiding principles for inclusion in the RES Update. The following principle explicitly addresses alternative fuels and vehicles:

*Ready the Region for Wide-Scale Deployment of Alternative Fuel Vehicles:* The region has convenient access to alternative transportation fuels that reduce our dependence
on foreign oil supply, reduce local economic impacts from oil price volatility and reduce greenhouse gas emissions.

The RCAP will provide a framework in which the region can make decisions regarding greenhouse gas emission reductions and adapting to climate change. The primary purpose of the plan is to analyze and recommend policies that can help the next update of the RTP achieve the soon to be established regional targets for GHG emission reductions from passenger cars and light trucks required by SB 375. In addition to improving land use and transportation planning coordination, SANDAG will examine the acceleration of alternative fuel vehicle deployment above and beyond state mandates as part of the climate change strategy for the region. As of this writing, the SANDAG Energy Working Group has recommended a set of guiding principles for inclusion in the RCAP. The following principle explicitly addresses alternative fuels and vehicles:

Increase Alternative Transportation Fuels and Vehicles: Infrastructure and policy promote the transition away from petroleum to vehicles and fuels with lower greenhouse gas emissions on a full fuel cycle basis.

Transportation Fuels: Petroleum and Alternatives

Before delving into the details of alternative fuels, the following section briefly explains the reasons for focusing on alternative fuels in the context of existing petroleum-based transportation fuels, expansion of alternatives, regional impacts and opportunities.

Petroleum is a fossil fuel derived from the remains of plants and animals that died millions of years ago, were buried, and compressed. Petroleum is a nonrenewable energy source because it takes millions of years to form. Oil is the raw material that petroleum products are made from and petroleum generally refers to crude oil or the refined products obtained from the processing of crude oil (gasoline, diesel fuel, heating oil, etc.)

The amount of crude oil produced domestically in the United States has been decreasing each year since the 1970s. However, the use of products made from crude oil has been growing, making it necessary to bring more oil from other countries. According to the Energy Information Administration (EIA), about 58 percent of the crude oil and petroleum products used in the United States are imported from other countries. The world's top five crude oil-producing countries are Saudi Arabia, Russia, Iran, China and the United States. Domestic offshore drilling accounts for about 24 percent of the nation's oil production.

After crude oil is removed from the ground, it is sent to a refinery by pipeline, ship or barge. At a refinery, different parts of the crude oil are separated into useable petroleum products. Crude oil is measured in barrels. A 42-U.S. gallon barrel of crude oil provides slightly more than 44 gallons of petroleum products including 20 gallons of motor gasoline and 7 gallons of diesel.

Gasoline and diesel are nonrenewable fuels made from petroleum. Gasoline is used in most U.S. passenger vehicles with internal combustion engines. According to EIA, Americans use about 385 million gallons of gasoline every day. Diesel can only be used in a diesel engine, a type of internal combustion engine used in many cars, boats, trucks, trains, buses, and farm and construction vehicles. Diesel fuel contains about 14 percent more energy per gallon than gasoline. Diesel technology also offers a greater power density than other fuels, which is discussed in Section 5.
When petroleum products are burned as fuel, they give off carbon dioxide (CO2), the primary greenhouse gas causing global climate change. The use of petroleum products also emits other pollutants - carbon monoxide, nitrogen oxides, particulate matter, and unburned hydrocarbons - that help form air pollution and at certain concentrations are harmful to human health.

According to the 2007 RTP, daily travel demand in the region was about 16.7 million daily trips and 85 million vehicles miles traveled (VMT) as of 2006. Nearly 100 percent of these trips and vehicle miles are made with gasoline and diesel vehicles, and account for about 1.5 billion gallons of gasoline and diesel consumption. The RTP forecasts that under a business-as-usual scenario, there will be 111 million VMT daily in 2030. Without efforts to increase deployment of alternative fuel or more fuel efficient vehicles, forecasted regional travel demand equates to annual gasoline and diesel consumption of 2.4 billion gallons by 2030. Avoiding the outcomes of this business-as-usual scenario and achieving petroleum reduction, climate stabilization, air quality, and green economy goals require the region to quickly and carefully undertake a new approach to transportation planning, which includes the deployment of alternative fuels, vehicles, and infrastructure.

**Report Components**

To initiate the transition to alternative fuel vehicles, this report aims to identify and recommend regional and local government actions that will expand their deployment in the San Diego region. The report seeks to provide useful information and tools that will enable SANDAG, its member agencies and other regional stakeholders to take action. To help the region accelerate the deployment of highly fuel efficient alternative fuel vehicles and develop the supportive infrastructure, the report addresses the following areas:

- **Section 2**: Federal and state funding opportunities and incentives for alternative fuels, vehicles, and infrastructure;
- **Section 3**: Overview of available alternative fuels;
- **Section 4**: Assessment of alternative fuel vehicle availability and potential fleet applications;
- **Section 5**: Analysis of alternative fuel and vehicle characteristics and performance including fuel energy content, fuel economy, driving range, and fuel prices;
- **Section 6**: Full fuel-cycle analysis of greenhouse gas emission, petroleum, and fossil fuel reduction associated with various alternative fuels and feedstocks;
- **Section 7**: Assessment of infrastructure considerations associated with alternative fuels including an inventory of existing alternative fuel infrastructure in the region;
- **Section 8**: Opportunities to integrate alternative fuel vehicles and/or infrastructure components into regional transportation projects.
- **Section 9**: Report Recommendations
  - Recommended alternative fuels for the San Diego region for different vehicle classes and fleet applications tied to funding opportunities;
  - Recommended near-term regional transportation projects to further investigate to incorporate alternative fuel vehicles and/or infrastructure.
  - Recommended regional and local government planning measures to ready the San Diego region for wide-scale deployment of alternative fuels, vehicles and infrastructure.

The report also features appendices with more detailed information to assist local governments, including: listing of important federal and state incentives for alternative fuels, links to learn
more about alternative fuel vehicle availability, detailed listing of alternative fuel vehicle models and prices for multiple vehicles classes that are purchased by the state of California, sample fleet and procurement policies including explanation of the process to participate in state of California vehicle contracts, alternative fuel and vehicle cost calculators, alternative fuel vehicle case studies for government fleets, address locations of existing alternative fuel infrastructure, and regional resources for more information on the topic of alternative fuels.
SECTION 2 - FEDERAL AND STATE RESOURCES FOR LOCAL AND REGIONAL GOVERNMENTS
SECTION 2. Federal and State Resources for Local and Regional Governments
Policies, Programs, and Funding

Significant resources exist at the federal level and state level to help direct the increased development and deployment of alternative fuels across California. These include policies, programs and financial assistance. California is a leader in this area and several laws are key policy drivers for the growth in alternative fuels, vehicles and infrastructure.

Due to the national recession, most governments are facing serious economic constraints. Even so, a window of opportunity exists for the region to take advantage of financial resources offered by the federal government (primarily through the American Recovery and Reinvestment Act of 2009) and state government (through the Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007).

By adopting a strategic regional approach, the San Diego region can promote a comprehensive approach to investment and deployment in alternative fuels, vehicles, and infrastructure. To this end, SANDAG identified regional projects and opportunities to take advantage of new federal, state, and local funding sources, and public-private partnerships. SANDAG also investigated its existing local, state and federal funding and resources to identify what might be leveraged. In particular, the Regional Transportation Investment Plan (RTIP) -budgeted transportation-related capital improvements projects for the next five years (2009-2013) - was reviewed to identify projects that could be augmented with an alternative fuel vehicle and/or infrastructure component. The RTIP includes projects to be undertaken by CALTRANS, SANDAG, the region's transit agencies, and local cities and the County.

Funding Allocations for Alternative Fuels in the United States

As part of the AB 118 Investment Plan, the Energy Commission performed a gap analysis to help determine where best to apply state funding for alternative fuels. They found that overall funding from federal, state and private sources totaled about $35 billion per year and that biofuels was the most funded fuel category. Of the $35 billion, research and development (R&D) expenditures totaled about $11 billion per year with most funding focused on biofuels, followed by fuel cells and batteries.

Overall, federal funding for alternative fuels has focused on three primary areas: next generation biofuels processes and pilot-plant construction; energy storage; and plug-in hybrid electric vehicles. The American Recovery and Reinvestment Act of 2009 (federal stimulus bill) allocates $3 billion for transportation programs and an additional $2 billion to transportation-related tax incentives. The Energy Commission has stated it will work with the Department of Energy (DOE) to leverage AB 118 funds and support projects in the clean energy sector that provide long-term economic benefits.

The American Recovery and Reinvestment Act of 2009

The American Recovery and Reinvestment Act of 2009 (ARRA, P.L. 111-5) was signed into law by President Obama on February 17, 2009. The stated purposes of the law include the following:

1. To preserve and create jobs and promote economic recovery.
2. To assist those most impacted by the recession.
3. To provide investments needed to increase economic efficiency by spurring technological advances in science and health.
4. To invest in transportation, environmental protection, and other infrastructure that will provide long-term economic benefits.
5. To stabilize state and local government budgets, in order to minimize and avoid reductions in essential services and counterproductive state and local tax increases.

Energy provisions are a featured part of ARRA. More than $42 billion is provided in appropriations for energy programs, mainly for energy efficiency and renewable energy. Most funding must be obligated by the end of FY2010. ARRA also provides more than $21 billion in energy tax incentives, primarily for energy efficiency and renewable energy. More than $11 billion is provided in grants for state and local governments through three DOE programs:

- The Weatherization Assistance Program (WAP);
- The State Energy Program (SEP), which provides states with discretionary funding for various energy efficiency and renewable energy purposes; and
- The new Energy Efficiency and Conservation Block Grant Program (EECBG), which helps reduce energy use and greenhouse gas emissions.

New transportation-related grant programs support state and local government and transit agency purchases of alternative fuel and advanced technology vehicles, multi-modal use of transportation electrification, and manufacturers’ development of facilities for advanced battery production. DOE ARRA funds for alternative transportation fuels include:

- $1.5 billion in grants for U.S. manufacturers to produce high-efficiency batteries and their components;
- $500 million in grants for U.S. manufacturers to produce other components needed for electric vehicles, such as electric motors; and
- $400 million for projects that demonstrate and evaluate plug-in hybrids and other electric infrastructure concepts.

Of the $21 billion in tax incentives, $14.1 billion is directed to renewable energy, $2.3 billion to energy efficiency, $2.2 billion for transportation, $1.6 billion for manufacturing, and $1.4 billion for state and local government energy bonds. When electric vehicles are purchased by U.S. residents, they can claim a tax credit of up to $7,500. Federal tax incentives are further addressed after the ARRA discussion.

ARRA’s Energy Efficiency and Conservation Block Grants

On March 26, 2009, the DOE released guidelines and funding allocations for the EECBG segment of ARRA. DOE allocated $351.5 million to the State of California for local governments to use for projects and programs to reduce total energy use.

The purpose of the EECBG Program is to assist local governments in creating and implementing strategies to:

- Reduce fossil fuel emissions in a manner that is environmentally sustainable and, to the maximum extent practicable, maximizes benefits for local and regional communities;
Section 2

- Reduce the total energy use of the eligible entities; and
- Improve energy efficiency in the building sector, the transportation sector, and other appropriate sectors.

The period of performance for these grants is three years. In keeping with the agenda of the ARRA, and supporting the goal of immediate investment in the economy, entities are required to commit all funds within eighteen (18) months from the effective date of the award. One EECBG area of emphasis is the development and implementation of transportation programs including:

- State, local and regionally-integrated planning activities like that in California Senate Bill 375, that coordinates transportation, housing, environmental, energy, and land use planning with the goal of reducing greenhouse gas emissions and vehicle miles traveled.
- Idle-reduction technologies and/or facilities to conserve energy, reduce harmful air pollutants, and reduce greenhouse gas emissions from freight movement.

The Energy Commission plays a role in the distribution of the EECBG funds as they pertain to smaller cities and counties. Large municipalities (i.e., Cities with populations greater than 35,000 and Counties populations greater than 200,000) apply directly to DOE for block grant funding. Smaller California cities and counties apply for block grants through the Energy Commission. For the San Diego region, the following cities will need to apply for funding through the Energy Commission.

- Del Mar
- Solana Beach
- Coronado
- Lemon Grove
- Imperial Beach

The Energy Commission anticipates receiving at least $33.6 million through the federal ARRA EECBG program and is waiting for guidelines from DOE for qualification requirements. They will hold workshops and conduct outreach on program requirements and the application process. Small cities and counties can sign up for updates and developments through the Energy Commission Block Grant Listserv.

Federal Tax Incentives for Alternative Fuels

The federal government provides tax incentives for alternative fuels, vehicles, and infrastructure. There are three key tax incentives for the retail sale of alternative fuels:

1. A tax credit for conventional ethanol of $0.45 per gallon,
2. A tax credit for biodiesel and renewable diesel of $1.00 per gallon, and
3. A credit of $0.50 per gallon for alternative fuels other than ethanol and biodiesel (e.g., LPG).

In addition, there are tax credits for small ethanol and biodiesel producers ($0.10 per gallon), and a tax credit for the production of cellulosic biofuels (up to $1.01 per gallon, depending on the fuel).

There also is a vehicle purchase tax incentive, established through the Emergency Economic Stabilization Act of 2008. The act established a tax credit for the purchase of plug-in vehicles, both battery-electric vehicles and plug-in hybrid electric vehicles. For passenger vehicles, the credit is a
maximum of $7,500, depending on the vehicle’s battery capacity. After 250,000 vehicles are sold, the credit is to be phased out.

An alternative fuel infrastructure tax credit is available for the cost of installing alternative fueling equipment placed into service after December 31, 2005. Qualified alternative fuels are natural gas, liquefied petroleum gas (propane), hydrogen, electricity, E85, or biodiesel blends containing a minimum of 20% biodiesel. The tax credit amount is 30 percent, not to exceed $30,000 for equipment placed into service before January 1, 2009; and a maximum of 50 percent, not to exceed $50,000, for equipment placed into service on or after January 1, 2009. Consumers who purchase residential fueling equipment may receive a tax credit of up to $2,000 for equipment placed into service after December 31, 2008. The maximum credit amount for hydrogen fueling equipment placed into service after December 31, 2008, and before January 1, 2015, is $200,000. The credit expires December 31, 2010, for all other eligible fuel types.

Appendix A contains additional federal energy policies. The appendix also contains a list of all federal and state tax incentives for alternative fuels, vehicles and infrastructure. It also contains a list of federal and state alternative fuel programs. Internet hyperlinks are provided for each incentive and program.

**State Resources for Local and Regional Governments**

In addition to federal policies and programs that provide financial assistance, California is dedicating significant resources to accelerate deployment of alternative fuels across the state. Key policy drivers related to transportation-energy include:

- **Global Warming Solutions Act of 2006 (AB 32)**
  - Reduce GHG emissions to 1990 Levels by 2020
- **Motor Vehicle Greenhouse Gas Emission Regulations in 2000 (AB 1493)**
  - Reduce GHG emissions from light-duty vehicles by 18% by 2020 and 27% by 2030
- **Reduce Petroleum Dependency from AB 2076 Report in 2001-2003**
  - Reduce on-road gasoline and diesel demand To 15% Below 2003 levels by 2020
  - Increase Use of Non-Petroleum Fuels To 20% of On Road Fuel Consumption by 2020 and 30% by 2030
- **Alternative Fuels Plan—AB 1007 of 2005**
  - Increase the use of alternative fuels in 2012, 2017 and 2022
- **Bioenergy Action Plan—Governor’s Executive Order in 2006**
  - Increase in-state biofuel production to 20% by 2010, 40% by 2020 and 75% by 2050
- **Carl Moyer Program and Proposition 1B incentives for Clean Diesel and Alternative Fuels and Technologies**
- **Low Carbon Fuel Standard—Governor’s Executive Order in 2007**
  - Reduce carbon intensity of California’s transportation fuels by at least 10% by 2020
- **Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act (AB 118) which is detailed below.**

The Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act, also known as *Assembly Bill (AB) 118*, provides approximately $200 million in annual incentive funding to promote alternative fuel and vehicle technologies and infrastructure. The purpose is to help develop and deploy innovative technologies that transform California’s fuel and vehicle types to help reduce petroleum demand and attain state air quality and climate change policies. AB 118 should help create the impetus for the long-term transition to alternative fuels. The incentive funding will be provided by three state agencies: the Energy Commission, the California Air Resources Board (ARB) and the Bureau of Automotive Repair (Table 3).

<table>
<thead>
<tr>
<th>State Agency</th>
<th>Program Name</th>
<th>Annual Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>California Energy Commission</td>
<td>Alternative and Renewable Fuel and Vehicle Technology Program</td>
<td>$120 million</td>
</tr>
<tr>
<td>California Air Resources Board</td>
<td>Air Quality Improvement Program</td>
<td>$30 million</td>
</tr>
<tr>
<td>Bureau of Automotive Repair</td>
<td>Enhanced Fleet Modernization Program</td>
<td>$50 million</td>
</tr>
</tbody>
</table>

Energy Commission and ARB projects will be funded beginning in 2009 while the Bureau of Automotive Repair program will begin January 1, 2010. While furthering California’s petroleum reduction and climate change goals, the programs cannot hinder implementation of other regulations or interfere with efforts to achieve and maintain ambient air quality standards and reduce emissions of toxic air contaminants. There is an economic development component to these programs to ensure that education, outreach and workforce training is provided that will:

- Attract and retain clean technology businesses;
- Fund financial incentives and private investment;
- Encourage market creation and informed consumer choice; and
- Leverage innovation and use renewable and waste resources.

The San Diego region is already taking steps to promote a clean energy sector. State and federal resources available could provide the extra leverage to cultivate this burgeoning economic cluster.

California Sustainability Goals for Alternative Fuel Projects

The Energy Commission established sustainability goals and criteria to ensure that alternative and renewable fuel and vehicle deployment projects, on a full fuel-cycle assessment basis (explained in Section 6 of this report) will not adversely impact natural resources, especially state and federal lands. The recommendations in this San Diego regional assessment are consistent with the state’s sustainability goals and criteria, as shown in Table 4. Local alternative fuel projects in the San Diego region seeking state funding will use the criteria and the full fuel-cycle analysis as guides.
Table 4. Sustainability Criteria for Funding Alternative Fuel Projects through AB 118

- Strong preference for projects with substantial reductions in GHG emissions
- Strong preference to projects demonstrating environmental protection, natural resource preservation and superior environmental performance
  - Projects that maximize use of waste streams as feedstocks
  - Use of existing best management practices (BMPs) from natural resource and pollution control agencies
  - Projects that use water efficiency and water use reduction measures, 2) use recycled or reclaimed water, and 3) reduce / eliminate point and nonpoint source wastewater discharge
  - Projects that use 1) renewable energy or 2) cogeneration in production, processing or distribution
  - Projects that use forest biomass resources collected or harvested in a manner that does not diminish ecological values & that are consistent with restoration, fire risk management & ecosystem management goals
  - Projects that create benefits to state natural resources or ameliorate degraded resources
  - Alternative fuel infrastructure projects that use 1) low carbon intensity fuels, 2) fuels produced in accordance with natural resource and superior environmental performance goals, or 3) fuels produced in accordance with a certified sustainability protocol
  - Preference to projects that 1) produce certified sustainable feedstocks, or 2) produce or distribute alternative fuels, in accordance sustainability certification standards

Source: CEC Investment Plan, Sustainability Evaluation Criteria for Funding Projects through AB 118

The Energy Commission Alternative and Renewable Fuel and Vehicle Technology Program

The Alternative and Renewable Fuel and Vehicle Technology Program (ARFVTP) will award approximately $120 million per year through 2015 to develop innovative technologies and alternative fuels and to deploy them into the marketplace. Eligible project types include:

- Improvements to the characteristics of alternative and renewable low-carbon fuels,
- In-state production and infrastructure for alternative and renewable low-carbon fuels,
- Improvements to light-duty, medium-duty, and heavy-duty vehicle technologies to lower greenhouse gas emissions,
- Acceleration of the commercialization of vehicles and alternative and renewable fuels, and Related workforce training, and program promotion and education.
The program will provide grants, loans, loan guarantees, revolving loans, and other appropriate measures to further the goals of AB 118. The Energy Commission will provide funding to entities, including public agencies, private businesses, public-private partnerships, vehicle and technology consortia, workforce training programs, fleet owners, consumers, recreational boaters, and academic institutions.

On April 22, 2009, the Energy Commission adopted the Investment Plan for the Alternative and Renewable Fuel and Vehicle Technology Program. The Investment Plan set funding allocations for alternative fuel types that will be re-evaluated on an annual basis. Allocations are based on a scenario of alternative and renewable fuels and advanced vehicle technology deployment, potential greenhouse gas reductions, the level of current public and private funding, and feedback received from stakeholders. The first funding allocations total $176 million for fiscal year (FY) 2008-2009 and FY 2009-2010 as shown in Table 5.

<table>
<thead>
<tr>
<th>Category</th>
<th>Investments</th>
<th>Total</th>
</tr>
</thead>
</table>
| Electric Drive            | ◦ Convert hybrid electric vehicles to plug-in hybrid vehicles  
◦ Electrify operations at the state’s major ports and truck stops  
◦ Develop & demonstrate advanced hybrid electric technologies for medium- and heavy-duty trucks  
◦ Increase the number of electric charging stations  
◦ Provide incentives to locate manufacturing facilities for electric vehicles and components in the state | $46 million |
| Hydrogen                  | ◦ Increase the number of hydrogen fueling stations                           | $40 million |
| Ethanol                   | ◦ Develop fuel production facilities that use waste material as feed stocks  
◦ Increase the number of E-85 fueling stations                           | $12 million |
| Renewable Diesel/ Biodiesel | ◦ Develop fuel production facilities that use waste material as feed stocks  
◦ Construct blending and storage terminal facilities                      | $6 million |
| Natural Gas               | ◦ Purchase medium- and heavy-duty vehicles for ports, school districts, and public fleets  
◦ Purchase light-duty vehicles for public fleets  
◦ Increase the number of fueling stations  
◦ Develop biomethane production plants                                   | $43 million |
| Propane                   | ◦ Purchase school buses and light duty vehicles for public fleets             | $2 million |
| Non-GHG                   | ◦ Establish workforce training programs  
◦ Continue research into sustainability issues  
◦ Conduct a public outreach and education  
◦ Provide program technical assistance  
◦ Conduct environmental/market/technology assessments  
◦ Develop standards and certifications                                      | $27 million |

TOTAL for FY 2008-09 and FY 2009-10 allocations: $176 million
The Air Resources Board Air Quality Improvement Program

The Air Quality Improvement Program (AQIP), a voluntary incentive program to implement AB 118, is administered by the ARB to fund clean vehicle and equipment projects, research on biofuels production and the air quality impacts of alternative fuels, and workforce training. The AQIP is funded through 2015 and the proposed budget for fiscal year (FY) 2009-10 is $42.3 million, as shown in Table 6. AQIP FY 2009-10 project solicitations are expected during Summer/Fall 2009. Project selection and funding is expected during Fall/Winter 2009 for the following areas:

- Vehicle and equipment projects
  - Accelerated deployment
  - Technology demonstration
- Research to determine the air quality impacts of alternative fuels
- Advanced technology workforce training

### Table 6. Projects Proposed for AQIP Funding in FY 2009-10

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Funding Target</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Deployment/Commercialization Projects</strong></td>
<td></td>
</tr>
<tr>
<td>Hybrid Truck and Bus Voucher Incentive Project</td>
<td>$25 million</td>
</tr>
<tr>
<td>Zero-Emission and Plug-In Hybrid Light-Duty Vehicle</td>
<td>$5 million</td>
</tr>
<tr>
<td>Rebate Project</td>
<td></td>
</tr>
<tr>
<td>Lawn and Garden Equipment Replacement Project</td>
<td>$2 million</td>
</tr>
<tr>
<td>Zero-Emission All-Terrain Agricultural Work Vehicle</td>
<td>$1.3 million</td>
</tr>
<tr>
<td>Rebate Project</td>
<td></td>
</tr>
<tr>
<td><strong>Advanced Technology Demonstration Projects</strong></td>
<td></td>
</tr>
<tr>
<td>Locomotives</td>
<td>$2 million</td>
</tr>
<tr>
<td>Marine Vessels</td>
<td>$1 million</td>
</tr>
<tr>
<td>Transit and School Buses</td>
<td>$3 million</td>
</tr>
<tr>
<td>Off-Road Equipment</td>
<td>$2 million</td>
</tr>
<tr>
<td>Agricultural Equipment</td>
<td>$1 million</td>
</tr>
<tr>
<td><strong>TOTAL PROPOSED FUNDING</strong></td>
<td>$42.3 million*</td>
</tr>
</tbody>
</table>

*Available AQIP funding based on the proposed FY 2009-10 State Budget.

The AQIP will complement ARB's other incentive programs, including Carl Moyer Memorial Air Quality Standards Attainment Program, Goods Movement Emission Reduction Program and Lower-Emission School Bus Program. AQIP can provide incentives to projects that do not fit within the statutory framework of these existing incentive programs, which focus on reducing near-term ozone and particulate matter pollution and exposure to toxics.

**The Bureau of Automotive Repair Enhanced Fleet Modernization Program**

The third AB 118 incentive program is the Enhanced Fleet Modernization Program (EFMP), which will be administered by the Bureau of Automotive Repair (BAR) to provide approximately $30 million in annual funding to retire the highest polluting vehicles in the areas of the state with the greatest air quality problems. EFMP will expand the BAR Consumer Assistance Program (CAP). The state provides up to $1,000 per vehicle through CAP for the retirement or repair of vehicles that fail their most recent Smog Check. BAR will administer the EFMP when it begins January 2010, but first ARB is required to establish the guidelines for its implementation.

For a substantial list of federal and state tax incentives and programs, see Appendix A.
San Diego
North Subregion:
Existing Alternative
Fuel Infrastructure

Infrastructure Type
- Biodiesel Production
- Biodiesel Fueling
- E85 Fueling
- CNG Fueling
- Propane Fueling
- LNG Fueling
- Hydrogen Fueling
- Electric Charging

April 2009
SECTION 3 - ALTERNATIVE FUELS OVERVIEW
SECTION 3. Alternative Fuels Overview

Alternative Fuel Vehicles (AFV) can operate on fuel other than gasoline or petroleum based diesel, such as electricity, ethanol, hydrogen, natural gas, biomass-based diesels, and propane. These fuels can be used in a variety of fleet applications that range from light-duty passenger cars to heavy-duty vehicles like refuse haulers and sweepers. Alternative fuels can also be used in off-road applications such as forklifts, and agricultural and construction equipment. The various alternative fuels are briefly described below.

Fuels and Infrastructure

The following section evaluates the origins and current use of fuel in the region and identifies existing distribution and fueling infrastructure.

Regional Gasoline and Diesel Consumption

Gasoline and diesel provide the vast majority of transportation energy in the region. In 2007, the region consumed approximately 1.5 billion gallons of gasoline and diesel fuel in on-road vehicle transportation. Under a business-as-usual scenario, annual gasoline and diesel consumption would increase to almost 2.4 billion gallons in 2030. Actual vehicle fuel consumption data and future projections for select years from 2000 to 2030 are provided below in Table 7.

<table>
<thead>
<tr>
<th>Year</th>
<th>Gasoline</th>
<th>Diesel</th>
<th>Total</th>
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<td>1,222,122,000</td>
<td>154,059,000</td>
<td>1,376,181,000</td>
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<td>1,283,877,000</td>
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<td>1,454,598,600</td>
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<td>2007</td>
<td>1,309,422,000</td>
<td>185,695,000</td>
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<td>2015</td>
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<td>223,177,000</td>
<td>1,804,740,000</td>
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<td>2020</td>
<td>1,745,982,000</td>
<td>246,121,000</td>
<td>1,992,103,000</td>
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<tr>
<td>2025</td>
<td>1,906,105,000</td>
<td>268,083,000</td>
<td>2,174,188,000</td>
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<tr>
<td>2030</td>
<td>2,082,980,000</td>
<td>294,032,000</td>
<td>2,377,012,000</td>
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</table>


Fuel Origin and Distribution

Petroleum Origin

United States petroleum production peaked in 1970 at around 11.6 million barrels per day (mmbd), and domestic production has since declined steadily, to approximately 8.3 mmbd in 2006. The gap between domestic supply and demand has been increasingly filled by imports. In 2005,
approximately 60 percent of California’s supply was produced in the United States, with 20 percent of the total supply originating in Alaska and 40 percent in California. Of the remaining 40 percent that was imported from abroad, the most significant sources were Saudi Arabia (14 percent of total supply), Ecuador (10 percent), Iraq (5 percent), and Mexico (3 percent). The San Diego region does not produce any significant quantity of petroleum and, therefore, must rely on imports.

**Gasoline Origin and Distribution**

San Diego County is part of a larger fuel distribution region in the southwestern United States, centered around the Los Angeles refinery center. The region—which includes counties in Southern California, as well as exports to Arizona, New Mexico, and parts of Nevada—is supplied by refineries in Los Angeles and by imports of finished gasoline and blending components received at the Port of Los Angeles. Gasoline is imported from Washington State, Gulf of Mexico states, and foreign sources, predominately in East Asia and Western Europe. California is not connected by pipeline to other oil refining centers, so all imports must arrive by ship. Out-of-state imports account for approximately ten percent of gasoline consumed in California, with the remaining 90 percent refined in-state. No refineries are found in the San Diego region.

All gasoline delivered to the San Diego region arrives through one Kinder Morgan pipeline that originates in the Los Angeles refinery center and ends at the Kinder Morgan terminal in Mission Valley.

**Alternative Fuels Overview**

**Electricity**

Battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) are powered by a source of electricity external to the vehicle, such as the electricity grid or a distributed energy source. As opposed to conventional vehicles powered by the internal combustion engine (ICE), BEVs run on electric motors powered by rechargeable battery packs. The BEV stores electricity in an energy storage device such as rechargeable battery packs. Electricity powers the vehicle’s wheels via an electric motor. BEVs have a limited energy storage capacity, which must be replenished by plugging into an electrical source external to the vehicle.

PHEVs are powered by an ICE and a rechargeable battery, which displaces the need for some or all of the need for ICE power and gasoline consumption. In both BEV and PHEV technologies the batteries must be charged externally (i.e., plugged-in). A plug-in is similar to a standard hybrid but is equipped with a battery that can be recharged by connecting a plug to an electric power source. Most PHEVs are passenger cars, but commercial passenger vans, utility trucks, school buses, and motorcycles also are available in plug-in versions. Standard hybrids are considered a vehicle efficiency improvement rather than an alternative fuel vehicle technology.

Medium- and heavy-duty trucks, buses, and non-road vehicles can saturate market niches earlier than passenger vehicles at a much lower level of manufacturing (3,000 to 5,000 vehicles per year) to achieve cost competitiveness with diesel vehicles. Hybrid hydraulic trucks use hydraulics, charged by the engine, to offer power boost to the engine and auxiliary functions. Electric hybrid trucks use the engine to recharge the batteries which assist the engine and auxiliary functions.
Biofuels: Biomass-based Diesel

Biomass-based diesel is a new broad term that includes biodiesel and renewable diesel, as well as specific feedstock- and process-based diesels such as algae-based diesel, biomass-to-diesel, and diesel from thermal depolymerization of industrial and processing waste. Of these fuels, only biodiesel is commercially available in California and the United States today. Biodiesel is simple to use, biodegradable, nontoxic, and essentially free of sulfur and aromatics.

Biodiesel refers to a non-petroleum-based diesel made from vegetable oils or animal fats using a process called transesterification, which produces a glycerol as a byproduct which remains mixed in with the biodiesel. Pure biodiesel contains no petroleum, but it can be blended at any level with petroleum diesel to create a biodiesel blend. Typical biodiesel blends range from 5 to 99 percent. Biodiesel can be legally blended with petroleum diesel in any percentage. Pure biodiesel (B100) or higher-level biodiesel blends with petroleum diesel can be used to fuel diesel vehicles. B100 and blends of B20 (20 percent biodiesel, 80 percent petroleum diesel) or higher are typically considered biodiesel fuel. Lower level blends (below B20) are considered diesel fuel.

Renewable diesel fuel can be made from similar feedstocks and can be used directly in an oil refinery, where the feedstocks are transformed into a diesel fuel through hydrocracking and hydrogenation. The refinery-based process produces no glycerol and the renewable diesel product is chemically identical to ideal diesel fuel, requiring no modifications for any diesel engine. Biodiesel works in any diesel engine with few or no modifications to the engine or the fuel system. All diesel vehicles, new and old, can use B5 blends.

The United States Navy and Marine Corps are two of the largest users of biodiesel in the San Diego region. Biodiesel blends are used in the City of Carlsbad vehicle fleet, UCSD bus fleet, and Hornblower Cruises marine vessels. The City of Chula Vista is planning to switch its diesel-based fleet to biodiesel in the near term. UCSD imports approximately 10,000 gallons of biodiesel monthly from an Orange County distributor, while other fleets are served by Soco Group, which sells approximately 25,000 gallons monthly in the region. Biodiesel is locally produced by New Leaf Biofuels.

Biofuels: Ethanol

Ethanol is an alcohol-based fuel derived from various plant materials (i.e., biomass feedstocks) including corn, sugar cane, barley, and wheat. Ethanol is produced by fermenting and distilling starch crops that have been converted into simple sugars. Ethanol can also be produced from cellulosic biomass such as trees and grasses and is called bioethanol.

Ethanol is most commonly used to increase octane and improve the emissions quality of gasoline. More than 95 percent of the gasoline in California contains a low-level blend of ethanol (about 6%) to oxygenate the fuel and reduce air pollution. E85 (85% ethanol, 15% gasoline) is considered an alternative fuel that can be used in flexible fuel vehicles (FFVs). FFVs are capable of operating on gasoline, E85 (85% ethanol, 15% gasoline), or a mixture of both.

Despite the limited availability of E85, the state features many flex-fuel vehicles, which are capable of running on either gasoline or E85. Energy Commission staff estimate that one to two percent of the California passenger vehicle fleet consists of FFVs, most of which are American-made light-duty trucks and sport utility vehicles.
Hydrogen

Hydrogen is not naturally occurring and must be produced from an energy source, such as natural gas or water. Hydrogen can be produced for use as a transportation fuel in fuel-cell vehicles, which generate electricity from hydrogen. Hydrogen fuel cell vehicles (FCVs) are zero-emission vehicles that produce no tailpipe GHG emissions. Fuel cells generate electricity through an electrochemical process, using hydrogen as the fuel, to power an electric motor which drives the vehicle. When the hydrogen is used in a fuel cell, only water and heat are produced. Hydrogen can be produced at a central station either through reforming hydrocarbon fuels like natural gas or electrolyzing water. In either case, the produced hydrogen is then delivered to fueling stations by truck or hydrogen pipeline to be pumped into vehicles' hydrogen tanks. Hydrogen can also be produced by reformation or electrolysis at the fueling station itself.

Today, very little hydrogen is produced for use as a vehicle fuel, and hydrogen for industrial purposes is produced through the reformation of natural gas. Hydrogen has the potential to be produced from low-carbon renewable resources, providing significant GHG benefits from well to wheels when used in a fuel cell vehicle.

Natural Gas

Natural gas has a high octane rating and excellent properties for spark-ignited internal combustion engines. It is non-toxic, non-corrosive, and non-carcinogenic. It presents no threat to soil, surface water, or groundwater. More than 99 percent of the natural gas used in the U.S. comes from domestic or other North American sources. However, increasing demand for natural gas in power plants will require new supplies from non-North American countries, increasing our dependence on foreign sources of energy. The Energy Information Administration (EIA) predicts that by 2025, more than 15 percent U.S. natural gas supplies will be imported from countries other than Canada and Mexico.

The vast majority of natural gas is a non-renewable fossil fuel extracted from gas and oil wells. Much smaller amounts are derived from supplemental sources such as synthetic gas, landfill gas and other biogas resources, and coal-derived gas. Because of the gaseous nature of this fuel, it must be stored onboard a vehicle in either a compressed gaseous (compressed natural gas, or CNG) or liquefied (liquefied natural gas, or LNG) state.

Compressed natural gas, or CNG, is a mixture of hydrocarbons, mainly methane. Found in gas wells or produced in conjunction with crude oil, natural gas is a clean-burning, domestically produced fuel that generates significantly fewer emissions than conventional gasoline or diesel when used to power vehicles. Although vehicles can use natural gas as either a liquid or a gas, most vehicles use the gaseous form. Compressed at pressures of 3,000 pounds to 3,600 pounds per square inch, the natural gas is stored on-board a vehicle in specially designed and constructed cylinders. Vehicles that run on CNG have engines and fuel systems that are optimized for gaseous fuel use.

To store more energy onboard a vehicle in a smaller volume, natural gas can be liquefied. To produce Liquefied Natural Gas (LNG), natural gas is purified and condensed into liquid by cooling to -260°F (-162°C). At atmospheric pressure, LNG occupies only 1/600 the volume of natural gas in compressed gaseous form. Because it must be kept at such cold temperatures, LNG is stored in
double-wall, vacuum-insulated pressure vessels. LNG fuel systems typically are used only with heavy-duty vehicles. LNG is clear, colorless, odorless, non-corrosive, and non-toxic.

**Propane**

Propane, also known as liquefied petroleum gas (LPG), is produced as part of natural gas processing and crude oil refining. Propane can be turned into a liquid at a moderate pressure (160 pounds per square inch [psi]) and is stored in pressure tanks at about 200 psi at 100 degrees Fahrenheit. When propane is drawn from a tank, it changes to a gas before it is burned in the engine. It is non-toxic and presents no threat to soil, surface water, or groundwater. Dedicated propane vehicles are designed to run only on propane; bi-fuel propane vehicles have two separate fueling systems that allow the vehicle to be powered by either propane or gasoline.

**Definitions**

Definitions for alternative fuel vehicle and engine types are provided below.

**Biofuel:** A solid, liquid or gaseous fuel obtained from relatively recently lifeless biological material and is different from fossil fuels, which are derived from long dead biological material. Also, various plants and plant-derived materials are used for biofuel manufacturing. The two most common types of biofuels are ethanol and biodiesel.

**Flex-fuel:** A flexible fueled vehicle has a single fuel tank, fuel system, and engine. The vehicle is designed to run on unleaded gasoline and an alcohol fuel (usually ethanol) in any mixture. These engines have sensors to analyze the fuel mixture, and adjust the fuel injection and timing. Since fuel composition and engine controls vary widely from one car to the next, flex-fuel vehicles do not ensure fewer emissions than dedicated gas-powered vehicles.

**Bi-fuel:** A bi-fuel vehicle has two separate fuel systems, one for gasoline or diesel and another for propane, natural gas, or hydrogen. Because these fuels are stored in pressurized tanks, they cannot be simply pumped into the gasoline tank. Like flex-fuel vehicles, bi-fuel vehicle emissions vary from car to car depending on engine controls and the fuel chosen - making them not necessarily cleaner than a dedicated gas vehicle.

**Dedicated:** A dedicated alternative fuel vehicle has only one fuel system. Unlike flex-fuel or bi-fuel vehicles, the vehicle only uses the alternative fuel.
San Diego North City Subregion: Existing Alternative Fuel Infrastructure

Infrastructure Type
- Biodiesel Production
- Biodiesel Fueling
- E85 Fueling
- CNG Fueling
- Propane Fueling
- LNG Fueling
- Hydrogen Fueling
- Electric Charging
SECTION 4 - VEHICLE AVAILABILITY AND FLEET APPLICATIONS
SECTION 4. Vehicle Availability and Fleet Applications

Alternative fuel vehicles are available for use in light-duty, medium/heavy-duty, and non-road applications. This section describes vehicle availability and fleet applications for these vehicle classes. The commercial availability of factory-made alternative fuel vehicles or retrofit technologies and their incremental costs compared to standard gasoline and diesel vehicles are also discussed. A summary of potential alternative fuel fleet applications is provided in Table 8. A listing of websites providing information about alternative fuel vehicle availability is provided in Appendix B. Information regarding alternative fuel vehicles and standard hybrid electric vehicles purchased by the state of California, including purchase price, is provided in Appendix C. Appendix D provides information on state of California vehicle purchase contracts, including explanation of how local governments can use the contracts and take advantage of the negotiated purchase prices, sample local government alternative fuel vehicle policies, and a listing of case studies on alternative fuel vehicles in government fleets. Links to tools and calculators for alternative fuel vehicles are provided in Appendix E.

<table>
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<tr>
<th>Fleet Application</th>
<th>Biodiesel (B20 or above)</th>
<th>Electricity</th>
<th>Ethanol (E85)</th>
<th>Hydrogen</th>
<th>Natural Gas</th>
<th>Propane</th>
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</thead>
<tbody>
<tr>
<td>Light-Duty Passenger Car or Truck</td>
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<td>PHEV, BEV</td>
<td>FFV</td>
<td>FCV</td>
<td>CNG</td>
<td>LPG</td>
</tr>
<tr>
<td>Taxicab</td>
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<td>HEV</td>
<td>--</td>
<td>--</td>
<td>CNG</td>
<td>LPG</td>
</tr>
<tr>
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<td>FFV</td>
<td>--</td>
<td>CNG</td>
<td>--</td>
</tr>
<tr>
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<td>B20</td>
<td>HEV</td>
<td>--</td>
<td>--</td>
<td>CNG, LNG</td>
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<tr>
<td>Sweeper</td>
<td>B20</td>
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<td>--</td>
<td>CNG</td>
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<tr>
<td>Forklift</td>
<td>--</td>
<td>BEV</td>
<td>--</td>
<td>--</td>
<td>CNG</td>
<td>LPG</td>
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<td>Low-speed Vehicle (e.g., traffic checker, neighborhood vehicle, other off-road vehicle)</td>
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<td>NEV</td>
<td>--</td>
<td>--</td>
<td>CNG</td>
<td>LPG</td>
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Light-Duty Vehicles

A variety of alternative fuel vehicles are available for light-duty fleet applications or will be in the near-future, including biodiesel (B5) passenger cars, battery electric vehicles (BEV), plug-in hybrid electric vehicles (PHEV), flex-fuel vehicles (FFV), hydrogen fuel cell vehicles (FCV), compressed natural gas (CNG) vehicles, and propane vehicles using liquefied petroleum gas (LPG). Some of these vehicles are factory-made and available commercially or will be in the near-future while others are available through after-market retrofits or conversions. Potential fleet applications include light-duty passenger cars, pick-up trucks, and sport utility vehicles (SUVs), vanpools, and taxicabs. A brief discussion of alternative fuel vehicles for light-duty applications is provided below.
Only one Original Equipment Manufacturer (OEM) produces a factory-made light-duty natural gas passenger vehicle (NGV): the Honda Civic GX. Several European auto manufacturers are interested in introducing NGVs into the US market, and are seeking regulatory support for bringing Euro-certified vehicles to the US market. Two firms are certified by the California Air Resources Board (CARB) to provide dedicated NGV retrofits in California. Baytech Corporation retrofits one General Motors (GM) 2001 model-year engine family, and BAF Technologies retrofits two Ford 2006 model-year engine families that include the Crown Victoria, F-Series Pickup, E-350 Van, and E-450 Shuttle. Light-duty CNG applications include passenger cars, vanpools, taxicabs, and traffic checkers. These companies should be contacted to obtain information about the cost of NGV retrofits. The cost of the light-and heavy-duty vehicles is substantially more than their gasoline and diesel counterparts. Factory-made light-duty NGVs have a cost premium of about $7,000.

Several OEMs offer Flex Fuel Vehicles (FFVs) capable of running on E85, gasoline, or some combination thereof, in the light-duty vehicle category, primarily Chrysler, Ford, and GM. For model year 2009, there are approximately three dozen models available, including eight sedans, 14 SUVs, nine pick-up trucks, and five vans. OEMs typically offer FFVs at the same price as comparable gasoline vehicles. Manufacturers of light-duty passenger vehicles, of which there is only one in California in 2009, do not currently accept biodiesel blends of B6-B20.

Neither BEVs nor plug-in hybrids are currently commercially available in California or the United States, but several are expected to become available in the near future. Nissan plans to introduce its BEV in a small number of early markets, including the San Diego region, starting in 2010. Tesla Motors will begin delivery of a battery-electric vehicle in July 2009 for a price of over $100,000. Factory-made BEVs and PHEVs will be appropriate for many light-duty vehicle fleet applications once they become available. Retrofit of standard hybrid vehicles to PHEVs is an existing option for light-duty fleet applications. After-market companies employ existing technology to convert standard hybrid electric vehicles to PHEVs. In a typical conversion, the relatively smaller battery of the standard hybrid is swapped with a larger battery pack that can be charged by regular electrical outlets.

Factory-made PHEVs are expected to provide greater benefits than converted PHEVs. A number of automakers are planning to introduce PHEVs in California beginning in 2010, including Toyota, General Motors, Ford, Volkswagen, Chevrolet, and a couple of California startup companies. In the meantime, retrofit vehicles provide an opportunity for the region to secure early GHG reductions and prepare the market for the introduction of new production PHEVs.

Plug-in hybrid electric vehicles are expected to cost between $6,000 and $12,000 more than comparable gasoline vehicles and battery electric vehicles and $8,000 to $15,000 more than gasoline vehicles. According to the Energy Commission, conversion costs for PHEVs are estimated at $11,000 per vehicle. Calcars.org estimates the following conversion costs by battery type: $6,000 to $10,000 for lead-acid, $8,000 and up for nickel-metal, and $10,000 and up for lithium chemistries.

According to the Energy Commission, mass market availability of light-duty electric drive passenger vehicles at affordable prices will require several automakers to manufacture vehicles in high volume assembly lines approaching 50,000 to 100,000 vehicles per year. It is likely that small commuter size

http://en.wikipedia.org/wiki/Plug-in_hybrid
battery electric vehicles, once produced in large volume, will be attractive in the market place and volume may grow to significant market share in this segment.

Retrofitting hybrid vehicles as plug-in hybrids can help condition the market for future electric vehicle sales by familiarizing consumers with the technology, thereby creating demand for batteries and vehicle components that could lead to cost reductions, design improvements, and development of a skill base for the maintenance of these vehicles. One company, A123 Systems, has received a waiver from ARB to retrofit up to 500 Toyota Prius vehicles to plug-in hybrid configuration.

There are currently no new light-duty propane vehicles available in California. Most propane vehicles are retrofits. The Roush F-150 is certified for retrofit applications by the U.S. Environmental Protection Agency, Air Resources Board. Roush Industries is developing a dedicated propane pickup truck to meet OEM-like standards. The California state fleet operates nearly 1,600 bi-fuel propane Ford F-150 pickup trucks. Las Vegas, Nevada operates propane taxicabs.

The average cost of converting a light-duty gasoline vehicle to a dedicated propane fuel vehicle ranges from $4,000 to $12,000. Retrofits for medium-duty applications cost between $7,000 and $12,000. Converting diesel engines to propane operation is possible, but not economically practical. The cost of a propane forklift is usually between $16,000 and $24,000, which is comparable to a gasoline-powered forklift and approximately $10,000 less than a diesel forklift. The initial cost of a propane vehicle is significantly more than a gasoline vehicle. The upfront costs of propane fleet vehicles can be offset by lower operating and maintenance costs over vehicles’ lifespan. Payback period varies based on vehicle usage. Payback period will be the shortest for vehicles that travel long distances and have high fuel consumption.

Hydrogen FCVs are significantly more expensive than other vehicles, and only available to a few demonstration fleets in the United States. Honda is leasing its fuel cell vehicle – the FCX Clarity – to customers for a price of $600 per month. However, the price of production of hydrogen fuel cell vehicles is not widely reported. Fuel cells are very expensive to manufacture and costs must come way down in order to be cost-effective for mass production and competitive with other vehicle technologies. Since fuel cells contain water, they experience significant problems in cold weather (i.e., temperature at which water freezes).

### Table 9.

**Light-Duty Vehicle Incremental Cost Comparison to Standard Gasoline Vehicles**

<table>
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<th>Vehicle</th>
<th>Purchase Price</th>
<th>Retrofit Price</th>
</tr>
</thead>
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<tr>
<td>Biodiesel (B20 or above)</td>
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<td>n/a</td>
</tr>
<tr>
<td>Plug-in Hybrid</td>
<td>$6,000 to $12,000</td>
<td>$11,000</td>
</tr>
<tr>
<td>Battery Electric*</td>
<td>$8,000 to $15,000</td>
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</tr>
<tr>
<td>Flex Fuel</td>
<td>Comparable</td>
<td>n/a</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>Significantly Higher</td>
<td>n/a</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>$7,000</td>
<td>Contact Retrofit Companies</td>
</tr>
<tr>
<td>Propane</td>
<td>Not for sale</td>
<td>$4,000 to $12,000</td>
</tr>
</tbody>
</table>

*The Nissan EV available to local government fleets in the San Diego region is expected to be available for an incremental cost of $10,000.

2 http://www.afdc.energy.gov/afdc/vehicles/propane_availability.html
3 http://www.ycstrans.com/profile.html
Medium- and Heavy-Duty Vehicles

Most major heavy-duty diesel engine vehicle manufacturers state that using biodiesel blends of up to B20 will not void their parts and workmanship warranties. A few heavy-duty manufacturers accept blends higher than B20. Several fleets in the Bay Area have been using B50 to B99 blends for over five years. If biodiesel fuels are standardized and accepted by all vehicle and engine manufacturers for all concentration levels and feedstocks, biodiesel blends could be used in up to one million diesel vehicles operating in California today. Heavy-duty fleet applications for biodiesel blends include diesel-powered work trucks, buses, refuse haulers, and non-road equipment.

The natural gas industry estimates that there are approximately 300 street sweepers and 1,900 refuse trucks fueled by natural gas in California. Medium- and heavy-duty vehicles powered by CNG or LNG are currently available from several manufacturers, including at least five refuse haulers and three sweepers. The most likely future markets for medium- and heavy-duty NGVs are short- and medium-haul applications. CNG will be the fuel choice for most applications – except for long-haul – when the price of CNG is competitive with diesel. At least three to four companies producing natural gas engines abroad are expected to enter the California market with existing or new engines for heavy-duty applications. Medium/heavy-duty fleet applications for CNG include shuttle buses, refuse haulers, sweepers, and work trucks. LNG also is used for refuse haulers and sweepers. In the San Diego region, CNG currently fuels a large number of transit buses while LNG fuels refuse hauler fleets such as those of Waste Management (located in the City of El Cajon) and the City of San Diego. Incremental costs for heavy duty NGVs are about $70,000 to $80,000 (for class 8 vehicles).

Propane engines and fueling systems are available for medium- and heavy-duty vehicles like school buses and street sweepers. Propane is viewed as an economical retrofit option for such fleet applications. Three companies currently offer propane conversions for gasoline engines, all are retrofits to medium-duty GM engines (6.0 and 8.1 L models). Cummins offers a propane-fueled version of its 5.9 L engine (B propane Plus). This engine is available new vehicles from multiple manufacturers including Eldorado National, Elgin Sweeper Company, Ottawa Truck, and Freightliner Custom Chassis Corporation.

Refuse haulers, transit and school buses, and utility trucks are all good candidates for hybrid electric and hydraulic hybrid applications. ISE Corporation, located in the City of Poway, produces both gasoline and fuel cell hybrid electric systems for heavy-duty applications. No factory-made battery electric or plug-in medium- or heavy-duty vehicles are currently available in California. E85 is not typically used in heavy- or medium-duty fleet applications, due in part to its relatively lower energy intensity compared to other fuels.

Non-Road Vehicles

Electricity has the potential to replace diesel fuel in a number of non-road markets, including neighborhood electric vehicles (NEVs) and fleet applications like forklifts. Currently, these vehicles are limited in number, but there is room for growth. Several factory-made low-speed NEVs are available for non-road applications, including passenger and cargo vans, crew and extended cab

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5 http://www.afdc.energy.gov/afdc/vehicles/natural_gas_availability.html
6 AB 118 Investment Plan. P. 28
trucks, and passenger vehicles. Propane and CNG have also been successfully used in off-road applications like forklifts. There are currently several thousand propane forklifts in California. There is technical potential to use hydrogen in several non-road applications, but none are commercially produced or available today, and there is no available timeline for when such technologies may become available to fleets or commercially.

**Maintenance Issues**

Propane engines have up to twice the lifespan of gasoline engines due to the high octane rating and low carbon and oil contamination characteristics. For these reasons propane vehicles have relatively lower maintenance costs - a primary advantage of propane vehicles in fleet applications. Spark plugs in propane engines can last 80,000 to 100,000 miles, while spark plugs in unleaded gasoline engines last around 30,000 miles. Forklifts powered by propane require less maintenance than gasoline and diesel forklifts.

Biodiesel blends result in a marked improvement in lubricity compared to petroleum diesel. Blends as low as one percent can provide up to a 65 percent increase in lubricity, which means biodiesel results in less engine wear than petroleum diesel. In general, blends greater than B20 can impact fuel system components such as natural rubber compounds that are incompatible with biodiesel. Manufacturers recommend that natural or butyl rubbers not be allowed to come in contact with pure biodiesel. Blends of B20 or lower do not typically exhibit degradation or need changes. If a vehicle’s fuel system contains these materials and users wish to fuel with blends greater than B20, replacement with compatible components is recommended. Lower level biodiesel blends are recommended in very cold climates, but in most of California’s moderate climate regions higher blends (B20 and above) can be used year-round without the problems associated with low temperatures. Automakers and engine manufacturers will need to show widespread acceptance of all biodiesel/renewable diesel blend concentrations for use in all diesel vehicles.

Other than lower gas mileage, drivers see little difference when using E85 versus gasoline. When considering total costs for electric vehicles, include the cost battery replacement at four-year intervals or about 20,000 miles ($1,000 or $2,000) against the cost of tune-ups, oil changes, mufflers, starters, water pumps, etc during the same four-year or 20,000 mile period for a standard gasoline or diesel vehicle. Electric motors require less maintenance than gasoline engines.

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SECTION 5 - FUEL AND VEHICLE CHARACTERISTICS AND PERFORMANCE
SECTION 5. Fuel and Vehicle Characteristics and Performance

This section compares the performance of alternative fuels and vehicles to standard gasoline and diesel fuels and vehicles. Fuel energy content, fuel economy, and fuel prices for alternative fuels and vehicles are discussed in this section.

In general, alternative fuels and vehicles provide horsepower, acceleration, levels of safety and a cruising speed similar to gasoline and diesel vehicles. In some instances, BEVs have smoother operation and better acceleration than standard vehicles. Pure biodiesel and blends have somewhat less power than petroleum diesel fuel. Table 10 describes energy content of alternative fuels compared to the amount of energy in a gallon of a gasoline and diesel. Fuel energy content is an important determinant of vehicle performance measures such as fuel economy and driving range.

Generally, alternative fuels have lower energy contents than an equivalent amount of gasoline. Pure biodiesel and blends have higher energy content than gasoline, but lower energy content than petroleum diesel. Reformulated California gasoline (5.7% ethanol) has an energy content of about 111,836 British Thermal Units (BTUs) per gallon; one gallon of petroleum diesel contains about 129,000 BTUs. An alternative fuel, E85 for example, contains about 81,800 BTUs per gallon, about 72-77% of the energy in one gallon of gasoline. This means that approximately 1.39 gallons of E85 are needed to provide the same amount of energy as one gallon of gasoline. Thus, gallons of gasoline equivalent (GGE) for E85 would be 1.39. Please refer to the following table for the energy content for other alternative fuels.

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Energy Content</th>
<th>Energy Comparison (% of gasoline energy)</th>
<th>Gallons of Gasoline Equivalent (GGE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline</td>
<td>114,000 BTU/gal</td>
<td>100%</td>
<td>1.0 gallon</td>
</tr>
<tr>
<td>Gasoline (reformulated, 5.7% ethanol)</td>
<td>111,836 BTU/gal</td>
<td>98%</td>
<td>1.019 gallons</td>
</tr>
<tr>
<td>Petroleum Diesel</td>
<td>129,500 BTU/gal</td>
<td>114%</td>
<td>0.88 gallons</td>
</tr>
<tr>
<td>B100</td>
<td>118,300 BTU/gal</td>
<td>103% (93% of diesel)</td>
<td>0.96 gallons</td>
</tr>
<tr>
<td>B20</td>
<td>127,250 BTU/gal</td>
<td>109% (99% of diesel)</td>
<td>0.90 gallons</td>
</tr>
<tr>
<td>CNG</td>
<td>900 BTU/cf</td>
<td>17.5% (1 lb)</td>
<td>126.67 cf / 5.7 lbs</td>
</tr>
<tr>
<td>Electricity</td>
<td>3,413 BTU/kwh</td>
<td>3% (1 kwh)</td>
<td>33.4 kwh</td>
</tr>
<tr>
<td>Ethanol (E85)</td>
<td>81,800 BTU/gal</td>
<td>72-77%</td>
<td>1.39 gallons</td>
</tr>
<tr>
<td>Hydrogen (by weight)</td>
<td>51,532 BTU/lb</td>
<td>44.4% (1 lb)</td>
<td>2.21 lbs</td>
</tr>
<tr>
<td>LNG</td>
<td>75,000 BTU/gal</td>
<td>64%</td>
<td>1.52 gallons</td>
</tr>
<tr>
<td>Propane</td>
<td>84,300 BTU/gal</td>
<td>73%</td>
<td>1.35 gallons</td>
</tr>
</tbody>
</table>

Sources: [http://www.afdc.energy.gov/afdc/fuels/properties.html](http://www.afdc.energy.gov/afdc/fuels/properties.html), [http://en.wikipedia.org/wiki/Miles_per_gallon_gasoline_equivalent](http://en.wikipedia.org/wiki/Miles_per_gallon_gasoline_equivalent)

Notes: Kwh = kilowatt-hour, lb(s) = pound(s), BTU = British Thermal Unit, cf = cubic foot
Fuel Economy

Miles per gallon of gasoline equivalent (MPGGE) is a metric used to allow for fuel economy performance comparisons among various alternative fuels and vehicles. MPGGE is based on the amount of heat energy in one gallon of gasoline. The equivalent fuel economy of an alternative fuel is equal to the amount of that fuel required to produce the same amount of heat energy and the distance the vehicle can travel on that same amount of energy. MPGGE is a measure of the distance vehicles can travel on an equal amount of heat energy.

Standard gasoline passenger cars have a range of about 300-400 miles and fuel economy of 21-22 miles per gallon. As shown in Table 11 below, standard hybrids, plug-in hybrids, and battery electric vehicles can travel about 40 percent to 250 percent farther than standard gasoline passenger cars using the same amount of energy. These alternative fuel vehicle technologies are more energy efficient than standard gasoline cars. CNG, propane, and E85 provide fuel economy performance similar to a standard passenger car running on gasoline. B20 provides similar fuel economy to a standard diesel passenger car, while B100 provides somewhat lower fuel economy.

<table>
<thead>
<tr>
<th>Alternative Fuel/Vehicle Technology</th>
<th>Fuel Economy (mpgge)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline internal combustion engine vehicle (ICEV), 2005 light-duty auto (LDA) mix</td>
<td>20.8</td>
</tr>
<tr>
<td>Gasoline, ICEV</td>
<td>22.33</td>
</tr>
<tr>
<td>CNG, ICEV</td>
<td>22.33*</td>
</tr>
<tr>
<td>Propane, ICEV</td>
<td>22.33</td>
</tr>
<tr>
<td>E85, Flex Fuel Vehicle (FFV)</td>
<td>23.00</td>
</tr>
<tr>
<td>E85, dedicated ICEV</td>
<td>23.89</td>
</tr>
<tr>
<td>B100, Diesel ICEV</td>
<td>26.31</td>
</tr>
<tr>
<td>ULSD, Diesel ICEV</td>
<td>28.80</td>
</tr>
<tr>
<td>B20, Diesel ICEV</td>
<td>28.80</td>
</tr>
<tr>
<td>Hydrogen, ICEV/Internal Combustion-Hybrid Electric Vehicle</td>
<td>29.02</td>
</tr>
<tr>
<td>Gasoline, hybrid electric vehicle (HEV)</td>
<td>30.14</td>
</tr>
<tr>
<td>Gasoline, plug-in hybrid electric vehicle (PHEV)</td>
<td>31.26</td>
</tr>
<tr>
<td>Hydrogen, Full Cell Vehicle (FCV) /Fuel Cell-Hybrid Electric</td>
<td>44.65</td>
</tr>
<tr>
<td>PHEV Grid Mode</td>
<td>80.38</td>
</tr>
<tr>
<td>Battery Electric Vehicle (BEV)</td>
<td>80.38</td>
</tr>
</tbody>
</table>


Notes:
*ACEEE reports that the Honda Civic GX, the only CNG passenger car for-sale in California, achieves 24 mpgge with city driving, and 36 mpgge with highway driving.

MPGGE = miles per gallon of gasoline equivalent

The lower fuel economy of E85 is due to the lower energy content of E85. As a result, about 1.39 gallons of ethanol are required to transport a vehicle the same distance as one gallon of gasoline. When accounting for the energy content of E85, costs are generally higher than gasoline on an energy equivalent basis. As a result, E85 will provide less range than the same FFV running on gasoline.

1 http://www.consumerenergycenter.org/transportation/afvs/ethanol.html
2 http://www.afdc.energy.gov/afdc/ethanol/e85_specs.html
Internal combustion engines convert less than 20% of gasoline energy into power that moves the vehicles. Vehicles using electric motors powered by hydrogen fuel cells are much more energy efficient. The energy in 2.2 lb (1 kg) of hydrogen gas is about the same as the energy in 1 gallon of gasoline. A light-duty fuel cell vehicle must store 11-29 lb (5-13 kg) of hydrogen to enable an adequate driving range of 300 miles or more. Because hydrogen has a low volumetric energy density (a small amount of energy by volume compared with fuels such as gasoline), storing this much hydrogen on a vehicle using currently available technology would require a very large tank—larger than the trunk of a typical car. Advanced technologies are needed to reduce the required storage space and weight. Because of its low energy content, it is difficult to store enough hydrogen on a vehicle to get it to travel more than 200 miles.

A CNG-powered vehicle gets about the same fuel economy as a conventional gasoline vehicle on a gasoline gallon equivalent (GGE) basis. A GGE equals about 5.7 lb (2.6 kg) of CNG. The driving range of a Honda Civic GX dedicated CNG sedan with a full tank filled at a pressure of 3,600 pounds per square inch (psi) is 200 to 225 miles. Most CNG stations fill at 3,600 psi, but if the vehicle is filled at 3,000 psi the vehicle’s range will decrease proportionately. Natural gas trucks, like many other alternative fueled vehicles, typically have a shorter driving range than their diesel counterparts. This shorter range is a result of natural gas having a lower energy content and difficulty in packaging the high-pressure storage cylinders on the truck. Adding additional storage cylinders can increase the truck’s driving range, but the added weight will reduce the amount of weight the vehicle can carry. LNG has a higher storage density than CNG, and therefore provides longer-range than CNG, which makes it a more viable alternative to diesel fuel than CNG for long-haul heavy-duty vehicle applications.

An electric motor is much more efficient than an ICE. Electric motors convert about 75% of battery energy to power the vehicle; an ICE converts about 20% of gasoline energy to power the vehicle. Range for BEVs is more limited than for conventional vehicles, and spans from 50 to 130 miles. The Nissan BEV offers a range of about 100 miles. A plug-in runs only on battery power at low speeds (e.g., below 35 miles per hour). Converted PHEVs can travel up to 50 miles or more before the battery needs to be recharged. The combination of an electric battery with an ICE affords PHEVs much greater range than BEVs, and comparable or even superior range to a standard gasoline vehicle. PHEVs feature higher fuel economy than standard hybrids because the vehicles use electricity to run in electric-mode longer and more often than standard hybrid cars, which offsets use of the ICE and gasoline consumption.

Dedicated propane engines typically have a shorter driving range than their gasoline and diesel counterparts. More propane is required to drive an equivalent range to a gasoline vehicle. Shorter range is the result of propane’s lower energy density and difficulty in packaging the high-pressure storage cylinders on the truck. A gallon of propane contains about 14-25\(^3\) percent less energy than a gallon of gasoline, and dedicated gas-injection propane vehicles have lower efficiency than gasoline engines. Hence the lower range than comparable gasoline engines. Bi-fuel propane engines offer similar range to gasoline engines. Driving range can be increased by adding additional storage tanks to the vehicle, but the extra weight will reduce the amount of weight the vehicle can carry.

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\(^3\) [http://www.consumerenergycenter.org/transportation/afvs/lpg_propane.html](http://www.consumerenergycenter.org/transportation/afvs/lpg_propane.html)
Biodiesel blends perform very similar to low sulfur diesel in terms of power, torque, and fuel without major modification of engines or infrastructure. One of the major advantages of biodiesel is that it can be used in existing engines and fuel injection equipment with little impact to operating performance. Biodiesel shows similar horsepower, torque, and haulage rates as conventional diesel fuel. B20 has similar heat content to that of petroleum diesel fuel (about 98 percent), which means a vehicle fueled with B20 will have about 99 percent of the driving range as when fueled with petroleum diesel. A gallon of B100 has about 91 percent of the heat content as a gallon of petroleum diesel.

**Fuel Price**

In addition to characteristics like energy content and fuel efficiency, fuel price is an important consideration in an analysis of alternative fuels and vehicles. Table 12 below provides the average price for gasoline, petroleum diesel, and alternative fuels tracked in the Clean Cities Alternative Fuel Price Report. The data provided is based on data collected from the West Coast of the U.S. in January 2009, the most recent date for which the information is available. The data is reported in average price per gallon and converted to average price per gallon of gasoline (GGE) and diesel gallon equivalent (DGE). As of January 2009, the price of CNG was lower than both gasoline and petroleum diesel on a GGE and DGE basis. The cost of other fuels was greater than gasoline and petroleum diesel.

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Average Price/Standard Deviation ($/gal)</th>
<th>Average Price ($/gge)</th>
<th>Average Price ($/dge)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline</td>
<td>$2.04 / 0.26</td>
<td>$2.04</td>
<td>n/a</td>
</tr>
<tr>
<td>Petroleum Diesel</td>
<td>$2.36 / 0.37</td>
<td>n/a</td>
<td>$2.36</td>
</tr>
<tr>
<td>B100</td>
<td>$3.48 / 0.89</td>
<td>$2.34</td>
<td>$2.57</td>
</tr>
<tr>
<td>B20</td>
<td>$2.72 / 0.47</td>
<td>$2.48</td>
<td>$2.53</td>
</tr>
<tr>
<td>CNG*</td>
<td>$1.81 / 0.54</td>
<td>$1.81</td>
<td>$2.03</td>
</tr>
<tr>
<td>Ethanol (E85)</td>
<td>$2.19 / 0.58</td>
<td>$3.09</td>
<td>$3.46</td>
</tr>
<tr>
<td>Propane</td>
<td>$2.50 / 1.05</td>
<td>$3.45</td>
<td>$3.85</td>
</tr>
</tbody>
</table>


Notes:
- Dge = diesel gallon equivalent
- *CNG price is reported per gge so no additional conversion is required.
- **Electricity is reported in price per kilowatt-hour (kwh).**

Prices of CNG fuel are generally less than gasoline and diesel fuel, on an equivalent energy basis. The average price of CNG on the west coast is $1.81 per GGE. Although CNG is exempt from federal excise tax, it is subject to a federal energy tax of $0.0485 per one hundred standard cubic feet, which is approximately $0.056 per GGE. In California, CNG is taxed at approximately $0.07 per GGE, compared to $0.18 per gallon for gasoline. CNG fuel is comparatively less expensive than gasoline and diesel. Only in a minimal number of high-mileage fleet vehicle applications are the fuel cost savings adequate to amortize the CNG vehicle capital costs. LNG Price information was not able to be obtained for this report.

On average, a gasoline gallon equivalent (GGE) of propane is more expensive than gasoline. Federal excise taxes for propane (13.6 cents per gallon) are lower than for gasoline (18.4 cents) and diesel fuel (24.4 cents per gallon). There is limited information available on the cost of hydrogen as a
transportation fuel. However, the cost is considered uneconomically high at present relative to alternative and conventional transportation fuels.

There are significant cost savings when you evaluate the cost to charge an electric vehicle versus the cost of gasoline. Electric vehicles with direct current (DC) electric systems get about 0.4 kilowatt-hours (kWh) per mile, while those with more efficient alternating current (AC) systems get about 0.174 to 0.288 kWh per mile. At an electricity rate of $0.13 per kWh, it would cost about $0.05 per mile for DC operation and $0.03 cents per mile for AC operation. The per-mile costs of a gasoline vehicle with a fuel economy of 25 miles per gallon would vary depending on the price of gasoline:

- $0.04 per mile when gasoline is $1.00 per gallon;
- $0.08 per mile when gasoline is $2.00 per gallon;
- $0.12 per mile when gasoline is $3.00 per gallon; and
- $0.16 per mile when gasoline is $4.00 per gallon.

The cost of charging an electric vehicle is lower than the cost of fueling a standard gasoline vehicle when the price of gasoline remains above about $1.25 per gallon.

A study by San Diego Gas & Electric (SDG&E) confirmed the advantages that PHEVs offer over standard hybrids and gasoline vehicles in terms of improved fuel economy and fuel costs, as well as tailpipe carbon dioxide (CO₂) emissions. SDG&E tested the performance of two 2007-model standard hybrid vehicles and then converted them into plug-in hybrids using a lithium-ion battery conversion kit. The results are shown in Table 13.

### Table 13.
**The Advantages of Plug-in Hybrid Electric Vehicle Retrofits versus Standard Hybrid Electric and Gasoline Vehicles**

<table>
<thead>
<tr>
<th>Performance Measures</th>
<th>Advantages of Plug-in Hybrid Retrofit Compared to</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standard Hybrid</td>
</tr>
<tr>
<td>Fuel Economy</td>
<td>60% improvement</td>
</tr>
<tr>
<td>Tailpipe CO₂ Emissions¹</td>
<td>37% reduction</td>
</tr>
<tr>
<td>Fuel Costs</td>
<td>18% reduction</td>
</tr>
</tbody>
</table>

Source: SDG&E Clean Transportation Program

Notes:
1. PHEVs also would indirectly generate GHG emissions associated with the generation of electricity used to charge the battery.
2. Standard hybrid represents performance by the same vehicle prior to the plug-in conversion.

Controlled experiments conducted by Recharge IT, an initiative of Google.org, also demonstrate that converted PHEVs achieve better fuel efficiency, lower CO₂ emissions, and cheaper fuel costs when compared with standard hybrid and gasoline vehicles.

The following table uses the average fuel price and fuel efficiency information to determine the price per distance and price differentials that alternative fuels require to cost-effectively compete with gasoline (Table 14). The analysis shows that per-mile costs for fuel are lower than standard gasoline vehicles for vehicles running on B20, CNG, standard hybrid and plug-in hybrid engines, and battery electric motors. The price differential column shows the price difference between a fuel and

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4 SDG&E time-of-use tariff for electric vehicles ranges from $0.12 - $0.15 per kWh during off-peak period.
gasoline required for that fuel to be a cost-effective alternative. The price differential is provided as a percentage for gasoline at any price, and as the per-gallon cost at existing gasoline prices. For example, the results for E85 indicate that this fuel must be priced at least 27 percent lower than gasoline in order to be cost-effective. At the current gasoline price this translates into a maximum cost for E85 of $1.49 per gallon. The table also shows that battery electric vehicles are more cost-effective to fuel than standard gasoline vehicles as long as the price of electricity is at or below $0.22 per kilowatt-hour (kWh).

Table 14.  
Alternative Fuel Passenger Car Cost Comparison to Gasoline

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Average Price</th>
<th>Fuel Economy</th>
<th>Price per Distance</th>
<th>Price Differential to Compete with Gasoline</th>
<th>Any Gasoline Price</th>
<th>Current Gasoline Price</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Per Unit</td>
<td>Per GGE</td>
<td>MPGGE</td>
<td>1 mile</td>
<td>100 miles</td>
<td></td>
</tr>
<tr>
<td>Gasoline</td>
<td>$2.04 gal</td>
<td>$2.04</td>
<td>22.33</td>
<td>$0.09</td>
<td>$9.14</td>
<td>n/a</td>
</tr>
<tr>
<td>Petroleum Diesel</td>
<td>$2.36 gal</td>
<td>$2.08</td>
<td>28.8</td>
<td>$0.07</td>
<td>$7.21</td>
<td>Max. 47% higher</td>
</tr>
<tr>
<td>B100</td>
<td>$3.48 gal</td>
<td>$3.45</td>
<td>26.31</td>
<td>$0.13</td>
<td>$13.09</td>
<td>Max. 19% higher</td>
</tr>
<tr>
<td>B20</td>
<td>$2.72 gal</td>
<td>$2.48</td>
<td>28.8</td>
<td>$0.09</td>
<td>$8.59</td>
<td>Max. 42% higher</td>
</tr>
<tr>
<td>CNG</td>
<td>$1.81 gge</td>
<td>$1.81</td>
<td>22.33</td>
<td>$0.08</td>
<td>$8.11</td>
<td>Equal Price</td>
</tr>
<tr>
<td>E85 (FFV)</td>
<td>$2.19 gal</td>
<td>$3.09</td>
<td>23</td>
<td>$0.13</td>
<td>$13.43</td>
<td>Min. 27% lower</td>
</tr>
<tr>
<td>Propane</td>
<td>$2.50 gal</td>
<td>$3.45</td>
<td>22.33</td>
<td>$0.15</td>
<td>$15.45</td>
<td>Min. -28% lower</td>
</tr>
<tr>
<td>HEV</td>
<td>$2.04 gal</td>
<td>$2.04</td>
<td>30.14</td>
<td>$0.07</td>
<td>$6.77</td>
<td>n/a</td>
</tr>
<tr>
<td>PHEV, Gasoline Mode</td>
<td>$2.04 gal</td>
<td>$2.04</td>
<td>31.26</td>
<td>$0.07</td>
<td>$6.53</td>
<td>n/a</td>
</tr>
<tr>
<td>Electric/PHEV Grid Mode</td>
<td>$0.13 kWh</td>
<td>$4.34</td>
<td>80.38</td>
<td>$0.05</td>
<td>$5.40</td>
<td>See above discussion</td>
</tr>
</tbody>
</table>

Notes  
Based on average fuel prices as reported in the Clean Cities Alternative Fuels Price Report, January 2009.  
Prices may not add due to rounding
San Diego South Subregion: Existing Alternative Fuel Infrastructure

Infrastructure Type
- Biodiesel Production
- Biodiesel Fueling
- E85 Fueling
- CNG Fueling
- Propane Fueling
- LNG Fueling
- Hydrogen Fueling
- Electric Charging

0 1 2 3 Miles
0 1 2 3 Kilometers

April 2009

SANDAG
SECTION 6 - GREENHOUSE GAS EMISSIONS AND PETROLEUM REDUCTION

Alternative fuels and vehicle technologies will be needed to achieve the state’s goals for greenhouse gas (GHG) emissions reduction, petroleum reduction, and climate stabilization. The potential GHG emission reductions, and petroleum and fossil fuel savings of alternative fuels compared to standard gasoline and diesel vehicles on a full fuel cycle basis is discussed below and summarized in Table 15.

Table 15. Full Fuel Cycle Comparison of Alternative Fuels to Standard Gasoline Vehicles

<table>
<thead>
<tr>
<th>Alternative Fuel</th>
<th>GHG Reduction</th>
<th>Petroleum Reduction</th>
<th>Fossil Fuel Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Biomass-based Diesel</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biodiesel (B20)</td>
<td>10-13%</td>
<td>15-17%</td>
<td>n/a</td>
</tr>
<tr>
<td>Renewable Diesel (RD30)</td>
<td>20%</td>
<td>29%</td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Electricity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hybrid Electric</td>
<td>25%</td>
<td>25%</td>
<td>25%</td>
</tr>
<tr>
<td>Plug-in Hybrid</td>
<td>48%</td>
<td>60%</td>
<td>46%</td>
</tr>
<tr>
<td>Battery Electric</td>
<td>72%</td>
<td>99.8%</td>
<td>65%</td>
</tr>
<tr>
<td><strong>Ethanol (E85)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midwest Corn</td>
<td>15-28%</td>
<td>70-73%</td>
<td>27-45%</td>
</tr>
<tr>
<td>California Corn</td>
<td>36%</td>
<td>70-73%</td>
<td>27-45%</td>
</tr>
<tr>
<td>Sugar Cane</td>
<td>68%</td>
<td>73-75%</td>
<td>72-80%</td>
</tr>
<tr>
<td>Cellulose</td>
<td>60-72%</td>
<td>73-75%</td>
<td>72-80%</td>
</tr>
<tr>
<td><strong>Hydrogen</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrolysis</td>
<td>26%</td>
<td>99.7%</td>
<td>13%</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>54%</td>
<td>99.7%</td>
<td>41%</td>
</tr>
<tr>
<td>Biomass</td>
<td>91%</td>
<td>99.7%</td>
<td>89%</td>
</tr>
<tr>
<td><strong>Natural Gas</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CNG – light-duty vehicle</td>
<td>20-30%</td>
<td>&gt;99%</td>
<td>4-13%</td>
</tr>
<tr>
<td>CNG – heavy-duty vehicle</td>
<td>11-23%</td>
<td>&gt;99%</td>
<td>2-8%</td>
</tr>
<tr>
<td>LNG – heavy-duty vehicle</td>
<td>11-16%</td>
<td>&gt;99%</td>
<td>3-7%</td>
</tr>
<tr>
<td><strong>Propane</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light-duty</td>
<td>18-20%</td>
<td>5% (from petroleum)</td>
<td>9-12%</td>
</tr>
<tr>
<td>Medium/Heavy-duty¹</td>
<td>2.3% higher than diesel; 18.6% lower than gasoline</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Non-road (forklift)²</td>
<td>2.7% lower than diesel; 19% lower than gasoline</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Source:

Plug-in hybrid retrofits offer the opportunity to obtain approximately 40-70 percent GHG emission reductions (depending on the electricity mix) compared to a gasoline vehicle and 15-30 percent

GHG emission reductions compared to a gasoline hybrid Toyota Prius. Plug-in hybrids demonstrate significant potential to reduce GHG emissions and petroleum and fossil fuel consumption.

BEVs do not produce any GHG or criteria air pollutant emissions at the tailpipe. Emissions attributed to the electricity powering the vehicle are those generated by the electricity grid or distributed energy source. Full fuel-cycle emissions of BEVs using today's electricity grid are as much as 70 percent lower than the emissions of conventional gasoline vehicles.

Electrification of non-road applications offers similar GHG emission reduction benefits to electric passenger vehicles: minimum 30 percent fuel savings, efficiency improvements, and GHG emission reductions. GHG emissions and petroleum consumption from medium- and heavy-duty truck applications can be reduced through hybrid electric and hydraulic hybrid technologies. Electric vehicles will become even cleaner on a full fuel-cycle basis as California shifts to a renewable electricity generation system and increases installation of renewable and clean non-renewable distributed generation.

Generally, the higher the biofuel concentration of the biofuel blend, the greater the potential GHG emission reductions. Depending on the feedstock, fuel production process, blend concentration and vehicle type, the various biodiesel and renewable diesel fuels could reduce greenhouse gas emissions by 61 to 94 percent compared to conventional diesel fuel.

Ethanol can achieve modest to substantial GHG emission reduction depending upon the type and location of the feedstock. According to the most recent analysis by the California Air Resources Board, the GHG emissions of corn-based ethanol produced in the Midwest and delivered to California, on average, slightly exceed the emissions of gasoline when indirect land use effects are taken into account. Corn-based ethanol produced in California can achieve GHG emissions reductions relative to gasoline, while alternate feedstocks like sugarcane and cellulosic ethanol can achieve much larger GHG emission reductions compared to corn-based ethanol and gasoline.

Vehicles operating on natural gas can reduce GHG emissions by as much as 30 percent compared to gasoline and diesel vehicles on a full fuel cycle basis. However, the use of biomethane in the same vehicles has a much greater greenhouse gas benefit, reducing emissions by as much as 97 percent.

Like BEVs, hydrogen fuel cell vehicles do not produce GHG emissions at the tailpipe. On a full fuel cycle basis, hydrogen can reduce GHG emissions by 26% to 91% depending on the method of producing hydrogen. Although on-site steam reformation of natural gas is not the ultimate goal, it does provide a number of near-term benefits such as a 50 percent “source-to-wheel” reduction in greenhouse gas emissions and a 40-90% reduction in emissions of smog forming and toxic emissions compared to today's gasoline-powered cars.1 Hardly any petroleum is consumed in hydrogen’s full fuel cycle.

How the electricity is generated is key to the electrolysis equation because it can be produced using fossil resources (i.e., natural gas and coal) or renewable resources like solar, wind, geothermal, hydroelectric, and, biomass. When using renewable resources the emissions can be zero. However, when hydrogen is produced using the current mix of sources on the California grid, particulate matter (PM) emissions and the greenhouse gas (GHG) emissions can be greater than those associated with gasoline on a well to wheel basis. The state has set goals to use renewable resources to produce hydrogen that exceed the State’s 20% Renewable Portfolio Standard (RPS) requirement.
This is because, for electrolysis to be a viable and sustainable method of producing hydrogen, it must employ more clean renewable electricity than what the grid alone currently provides.

Propane offers moderate GHG emission reductions. When produced along with natural gas, propane reduces GHG emissions by 9 to 19 percent compared to gasoline, slightly better than propane derived from petroleum. Emissions reductions are substantial when an engine, such as a forklift engine, is replaced by propane.3

SECTION 7 - ALTERNATIVE FUEL AVAILABILITY AND INFRASTRUCTURE
SECTION 7. Alternative Fuel Availability and Infrastructure

Widespread use of alternative fuels and deployment of alternative fuel vehicle technologies is contingent upon issues like the source and available supply of the fuel, capability to produce the fuel at a commercial scale, infrastructure to distribute the fuel to the region, and facilities for vehicle fueling or charging. A discussion of these issues as they relate to the deployment of alternative fuels and vehicles in the San Diego region is provided below. The address and type of access for existing alternative fueling and charging infrastructure in the region is provided in Appendix F. See Figures 1-5 at the end of Section 7 for the distribution of existing alternative fueling infrastructure in the region, and by the following subregions: South County, Mid-City and East County, North City, and North County.

Table 16.
Summary of Alternative Fuel Availability and Infrastructure

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Existing Fueling and Charging Infrastructure</th>
<th>Cost of Additional Fueling and Charging Infrastructure</th>
<th>Availability of Production and Distribution Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biodiesel Fueling</td>
<td>2 public, 5 private</td>
<td>Information not available</td>
<td>Storage and blending terminals, port off-loading sites needed</td>
</tr>
<tr>
<td>E85 Fueling</td>
<td>3 public</td>
<td>$100,000 to $250,000</td>
<td>Storage and distribution facilities needed in order to scale-up consumption</td>
</tr>
<tr>
<td>Electric Charging</td>
<td>19 public, 15 private or unknown*</td>
<td>Upgrade existing: $200 to $3,000 New Public: $2,500 to $5,000 New Residential: $1,300 to $1,500</td>
<td>Existing Electricity Grid and Distributed Energy Sources</td>
</tr>
<tr>
<td>CNG Fueling</td>
<td>7 public, 15 private</td>
<td>Home Refueling: $4,750 Small Station: $350,000 Medium Station: $500,000 Large Station: $950,000 Add Public Fast Fill Dispenser: $125,000</td>
<td>Existing Natural Gas Pipeline Network</td>
</tr>
<tr>
<td>LNG Fueling</td>
<td>2 private</td>
<td>Large Station: $1,200,000 Combined: LCNG and LNG Station: $1,600,000</td>
<td>Existing, but West Coast off-shore LNG terminals also needed</td>
</tr>
<tr>
<td>Hydrogen Fueling</td>
<td>1 public, 1 private</td>
<td>$500,000 to $5,000,000</td>
<td>Significant investment required</td>
</tr>
<tr>
<td>Propane Fueling</td>
<td>19 public</td>
<td>$65,000</td>
<td>Existing</td>
</tr>
</tbody>
</table>

Notes:
*All existing electric charging points must be upgraded for compliance with SAE standards.

Biofuel: Biomass-based Diesel

Biomass-based diesel refers to biodiesel and renewable diesel, including diesel derived from algae, biomass, and industrial and processing waste. Only biodiesel is commercially available today. Additional progress is needed to produce biomass-based diesel fuels from renewable feedstocks with low in GHG emissions, including waste sources and algae, and to demonstrate the viability of
these sources. Moving beyond these oils and into “second generation” feed sources and plants are necessary to reach higher blend levels and deeper GHG emission reductions. Biomass-based cellulose, waste, and algae are likely second generation feed sources.

California has 11 biodiesel plants with a combined 2009 theoretical capacity of 87 million gallons, although these plants will likely produce less than 25 million gallons in 2009 due to the relatively lower price of petroleum-based diesel. A change in the price disparity between biodiesel and petroleum diesel will be needed to improve the economics of commercial biodiesel production and its availability to local government fleets in the San Diego region.

The region currently features one biodiesel production facility operated by New Leaf Biofuel, which collects waste oil from restaurants for processing into pure biodiesel (B100). According to the Energy Commission, recycled cooking oil is the lowest-cost feedstock for biodiesel production. As of 2008, production was approximately 13,000 gallons per month. The company is developing a new processing facility with maximum production capacity of 140,000 gallons per month, the equivalent of about 1.68 million gallons of B100 per year.

Longer-term, deployment of blending and storage terminals is needed to increase the availability of biodiesel and renewable diesel to customers in the region as well as the state. California lacks bulk terminal, bulk storage, and terminal blending facilities for biodiesel. Moreover, a minimum of two deepwater port access offloading sites are needed for the state to access foreign supplies at a competitive economic level with petroleum. The Energy Commission is providing funding for blending and storage terminal projects to facilitate infrastructure development in the state.

Buying directly from biodiesel producers is the most likely method of purchase for fuel distributors and bulk B100 purchasers of biodiesel. Some individual consumers may also buy biodiesel directly from producers by the drum. Distributors will typically deliver or fill large quantities of fuel in pure form (B100) or other common mixtures like B20. A list from the National Biodiesel Board (NBB) of NBB biodiesel producers and marketers is available online.

Development of new technology or new types of infrastructure is not required for biodiesel fueling. Existing petroleum diesel fueling stations can dispense biomass-based diesel and biodiesel. Where new fueling pumps or stations are required to support biodiesel use by local government fleets, installation costs would be comparable to those for petroleum diesel fueling infrastructure. In general, the standard storage and handling procedures used for petroleum diesel can be used for biodiesel. The fuel should be stored in a clean, dry, dark environment. Acceptable storage tank materials include aluminum, steel, fluorinated polyethylene, fluorinated polypropylene, and Teflon. Copper, brass, lead, tin, and zinc should be avoided.

Existing public fueling pumps or stations in the San Diego region are located at Pearson Fuels in the City Heights community of the City of San Diego and at the Soco Group petroleum distribution facility in the City of El Cajon. Private biodiesel fueling stations are located at military installations throughout the region.

The statewide and local production of B100 provides a near-term opportunity for local governments in the San Diego region to employ blends of biodiesel in existing diesel vehicles and applications. Investments in biodiesel fueling infrastructure would be needed to support biodiesel use in fleet applications.
**Biofuel: Ethanol (E85)**

Over 90% of ethanol used in California is imported from outside the State. About 80% is produced from corn in the Midwest United States and transported to California by rail. Another 12% is comprised of foreign imports primarily from Brazil via marine transport. The approximately 8% produced in-state comes from three plants, none of which are located in the San Diego region. Two more plants are under construction and 14 are in the active development stages. California plants are idle as of April 2009 due to the relatively low price of oil and refined petroleum products like gasoline relative to ethanol blends of E85. A change in the price disparity between E85 and gasoline will be needed to improve the economics of commercial ethanol production and its availability to local government fleets in the San Diego region. Moreover, the Energy Commission reports that new storage and distribution facilities would be needed in the state to scale-up E85 consumption.

There are no fleet-based E85 fueling stations in the region, and public access to fueling stations is limited. E85 is currently available at Pearson Fuels in the City Heights community of the City of San Diego, Bressi Ranch Shell in the City of Carlsbad, and Oceanside Texaco in the City of Oceanside. New fueling stations would be needed to support the use of E85 in local government fleets in the region. The Energy Commission estimates the cost of new E85 fueling capacity at an existing or new station at $100,000 to $250,000.

There are factors hindering a transition to E85 in California and the San Diego region. One is the limited number of facilities dispensing E85. In addition, it is difficult for local government fleets to justify investments in expansion of E85 infrastructure with the current price differential between E85 and gasoline. Because one gallon of E85 has roughly three-quarters the energy content of one gallon of gasoline, vehicles running on E85 achieve lower fuel economy than gasoline. Therefore, the price of E85 must be proportionately lower than gasoline in order for fleet managers to economically justify a transition.

In addition, the Energy Commission reports that the most recent calculations from the California Air Resources Board indicate that corn-based ethanol produced in the Midwest results, on average, in higher GHG emissions on a full fuel cycle basis than gasoline. As a result, it would appear that E85 will only help the region contribute to GHG reduction targets if derived from corn ethanol produced in California or ethanol from lower carbon feedstocks other than corn. Additional investment in the production and distribution infrastructure to support large-scale ethanol production from such lower carbon sources is likely needed before local government fleets in the San Diego region can justify commitment of resources to E85 fueling infrastructure and vehicles.

**Electricity**

Unlike some alternative fuels, the infrastructure for the production and distribution of electricity to power battery electric and plug-in hybrid vehicles is already in place in the form of the existing power grid and distributed energy sources like photovoltaic solar panels. According to the Energy Commission, California’s existing electricity capacity could recharge as many as 4-million plug-in hybrids if charged during off-peak hours when electricity use is relatively low. However, existing

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Section 7

Electric charging infrastructure in the San Diego region is inadequate to support BEVs and PHEVs in local government fleet applications or on a commercial scale.

Recharging of BEVs and plug-in hybrids is as simple as plugging them into an electric outlet. Converted plug-in hybrids recharge their batteries through a standard household outlet (110/120-volt) and charge in five to six hours with a 5-kwh lithium-ion battery. OEM production plug-in hybrids are anticipated to recharge in as little as three hours using a 220/240-volt wall unit for an 8-kilowatt-hour battery. Nissan reports that the BEV they will introduce to local government fleets in the San Diego region in 2010 will charge in four to eight hours using a 220/240-volt wall unit.

There are approximately 32 existing electric charging stations in the San Diego region. Most if not all of these facilities were constructed in the late 1990s and early 2000s when first generation electric vehicles were sold in California. Locations include San Diego International Airport, Saturn dealerships, UCSD, Scripps medical facilities, and regional shopping center locations (e.g., Costco stores). With the phase out of electric vehicles, these stations do not receive much use. These sites feature various types of charging technology and are in various states of disrepair. They will need to be upgraded to support the next generation of battery electric and plug-in hybrid vehicles. The sites must be upgraded and new sites installed to meet the standards established by the Society of Automotive Engineers (SAE) for electric vehicle connections. Existing public access charge points need to be upgraded to include Society of Automotive Engineers (SAE) 1772 Level I compliant connectors to charge new OEM battery electric and plug-in electric vehicles. SAE has also developed standards for Level II compliant connectors (i.e., connections to 220/240-voltage). The SAE standards have been crafted to be compatible with electric vehicles from all manufacturers.

In addition to upgrading existing charge points, a much larger, strategic and more comprehensive regional network of new electric charging stations will be needed to support the thousands of battery electric and plug-in hybrid vehicles expected in the next few years. Installation of new charging sites will need to reflect the amount and location of local government fleet purchases. Moreover, installation of electric charge infrastructure in the San Diego region also will need to keep up with the broader roll-out of electric drive vehicles to the general public.

Level I and II connectors installed at fleet yards or locations where fleet vehicles are parked or stored when not in use should be adequate to support the integration of battery electric and plug-in hybrid vehicles into local government fleets. A comprehensive regional network of charging stations will need to consist of Level I and II connectors at residential and publicly accessible locations as well as infrastructure capable of quickly charging battery electric vehicles to facilitate longer-distance travel (i.e., trip distances equal to or greater than the approximately 100-mile range of battery electric vehicles). SAE Standards for Level III “fast-charging” are under-development and expected to be finalized in the near-future. Fast-chargers would charge battery electric vehicles to 80 percent capacity in an estimated 26 minutes. In addition, companies like Better Place have proposed “battery exchange” stations in which, instead of re-charging a vehicle’s battery, a vehicle’s depleted battery is exchanged for a fully-charged battery. Whatever the means or technology, substantial deployment of electric vehicles in the San Diego region will require installation of re-charging infrastructure that is time-competitive with standard vehicle re-fueling at gasoline and diesel service stations.
The following ratios are recommended for the installation of electric charging points:

- 1 charge point per vehicle to be installed at home base charging location
- 1 - 1.5 charge points per vehicle in a public access location
- Level III connectors, battery-exchange facilities, or a comparable technology to support long-distance battery electric vehicle travel should be sited along major regional and interregional corridors. At a minimum, such facilities will need to be sited at a ratio of one every 100 miles.

Although upgrade costs to existing infrastructure will range from $200 to $3,000 per site, future costs to expand the number of charge outlets at upgraded sites will be minimal.

<table>
<thead>
<tr>
<th>Type of Charging Point</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upgrade Existing Charge Point</td>
<td>$200 - $3,000</td>
</tr>
<tr>
<td>Install New Public Charge Point</td>
<td>$2,500 - $3,500</td>
</tr>
<tr>
<td></td>
<td>$3,000 - $5,000 (SDG&amp;E)</td>
</tr>
<tr>
<td>Install New Residential Charge Point</td>
<td>$1,300-$1,500</td>
</tr>
</tbody>
</table>

More detailed regional analysis of electric charging infrastructure to support the deployment of electric vehicles to the general public is outside the scope of this effort but will be performed by SANDAG at a future date.

**Natural Gas**

California produces 15.4 percent of its natural gas, and the rest is imported by pipeline from Canada and the Rocky Mountain and Southwestern states. To meet growing demand, California needs to develop additional supplies of natural gas. Because North American supply basins are maturing, additional reliance on imported supplies is needed, including liquefied natural gas (LNG). Since natural gas is already widely used in electricity generation and residential, commercial and industrial end-uses, substantial use of natural gas as a transportation fuel would create additional demand for new supplies of natural gas from imported or renewable sources, as discussed below.

Development of biomethane as a transportation fuel is a major part of the natural gas vehicle (NGV) industry’s long-term plan for viability. Biomethane from landfill gas has an extremely low carbon intensity compared to diesel, gasoline, and North American natural gas. Feasibly recoverable biogas from landfills, wastewater treatment, and dairy waste, if used to produce biomethane transportation fuel, could displace virtually all diesel used for transportation purposes and reduce GHG emissions by more than 24 million metric tons of carbon dioxide equivalent (MMTco₂e) per year in California. The Energy Commission has allocated funding incentives to support up to ten biomethane production plants in California.

LNG is produced both world-wide and domestically at a relatively low cost. Existing use of LNG for transportation purposes is derived from domestic sources. However, a majority of the world’s LNG supply comes from countries with the largest natural gas reserves: Algeria, Australia, Brunei,
Indonesia, Libya, Malaysia, Nigeria, Oman, Qatar, Trinidad, and Tobago. LNG is transported in double-hulled ships specifically designed to handle the low temperature of LNG. These carriers are insulated to limit the amount of LNG that evaporates. LNG carriers are up to 1,000 feet long, and require a minimum water depth of 40 feet when fully loaded. Currently there are approximately 140 LNG ships world-wide. LNG terminals in the United States are located along the East Coast and Gulf of Mexico. There are plans to construct two offshore LNG terminals along the west coast of the United States.²

When LNG is received at most terminals, it is transferred to insulated storage tanks specifically built to hold LNG. These tanks can be found above or below ground and keep the liquid at low temperature to avoid evaporation. Clean Energy operates an LNG plant in Boron, California that can produce up to 160,000 gallons of LNG per day and is designed to be upgraded to a maximum production capacity of up to 240,000 gallons of LNG per day.

Natural gas is readily available to end users through existing utility infrastructure. San Diego Gas & Electric (SDG&E) distributes natural gas to end-use customers for various non-transportation purposes. Natural gas fueling infrastructure can be linked to this existing regional network to provide natural gas as a transportation fuel for potential local government fleet applications. Significant financial and time investments in infrastructure to transport and distribute natural gas to end users have already been made. This gives fuels like CNG an advantage over other alternatives such as hydrogen, ethanol, and biodiesel, which require significant time and financial investments in infrastructure that would be needed to scale up production and distribution of those fuels to end users.

With the consumption of CNG increasing nationwide 145 percent during the past six years, the fueling infrastructure has also grown. California has more than 200 CNG fueling stations. In Southern California alone, there are more than 100 public fueling stations in major metropolitan areas from Los Angeles to the Mexican border. Another 50 stations are now under construction. There are 22 existing locations in the San Diego region offering CNG, with another two locations offering LNG. These facilities primarily support CNG and LNG use in public and private fleet applications including the region’s two primary transit agencies, multiple school districts, military facilities, refuse hauler Waste Management (LNG), and the cities of San Diego (LNG) and Chula Vista. In addition, UCSD has plans to construct a new CNG station and is actively seeking Federal Stimulus funding to support their efforts.

Fueling infrastructure for natural gas consists of the following seven types of facilities:

- CNG home refueling appliances
- Small-capacity CNG stations
- Medium-capacity CNG stations
- Large-capacity CNG stations
- Large-capacity LNG stations
- CNG dispensers added to existing gasoline stations
- Combined CNG and LNG stations (LCNG)

² [http://www.energy.ca.gov/4_WEST_COAST_PROJECTS_PROPOSALS_STATUS_UPDATE.PDF](http://www.energy.ca.gov/4_WEST_COAST_PROJECTS_PROPOSALS_STATUS_UPDATE.PDF)
Large amounts of capital are required to expand infrastructure. For the fleet operator, the overall economics are favorable if the fuel cost savings can amortize the additional equipment costs. This equation favors high fuel use applications, which is one reason why heavy duty vehicles are the fastest growing natural gas vehicle segment in California. Current cost estimates for natural gas infrastructure are provided in Table 18.

### Table 18. Current Cost Estimates for Natural Gas Infrastructure

<table>
<thead>
<tr>
<th>Type of Infrastructure</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home Refueling Appliance</td>
<td>$4,750</td>
</tr>
<tr>
<td>Small Station</td>
<td>$350,000</td>
</tr>
<tr>
<td>Medium Station</td>
<td>$500,000</td>
</tr>
<tr>
<td>Large CNG Station</td>
<td>$950,000</td>
</tr>
<tr>
<td>Large LNG Station</td>
<td>$1,200,000</td>
</tr>
<tr>
<td>Add Public Fast Fill Dispenser</td>
<td>$125,000</td>
</tr>
<tr>
<td>Combined LCNG &amp; LNG Station</td>
<td>$1,600,000</td>
</tr>
</tbody>
</table>

Source: AB 118 Investment Plan

Small, medium, and large CNG stations can be added to existing gasoline stations or built as “stand alone” CNG stations. It is also possible for a single station to dispense both CNG and LNG, and in fact LNG can be gasified to CNG with conventional pumps with less energy than it takes to compress pipeline gas to CNG, though CNG from LNG is more expensive than CNG from pipeline gas.

The state of natural gas infrastructure and supply would appear adequate to support deployment of CNG and LNG as fuels in appropriate local government fleet applications. The potential for growth in the regional use of LNG over the longer-term may be contingent upon the construction of West Coast LNG terminals or additional in-state LNG plants.

**Connection with Hydrogen**

Natural gas could also play a role in a hydrogen fuel future. Because natural gas and hydrogen are similar fuels with similar properties, lessons learned with NGVs can be applied to the development of hydrogen transportation systems. Moreover, natural gas fueling infrastructure can be used to dispense hydrogen. Use of hydrogen enriched natural gas (e.g., 20% hydrogen and 80% natural gas) in heavy-duty vehicles can reduce emissions from pure natural gas by about 50 percent.

**Hydrogen**

There are a number of ways that hydrogen can be produced including electrolysis of water, steam reformation of natural gas, biomass gasification and coal gasification to name a few. The two most common ways to produce hydrogen are steam reformation of natural gas and electrolysis of water at a central station. It is important to note that unlike other fuels, hydrogen is not an energy source but an energy carrier. Energy is required to create hydrogen fuel. After hydrogen is produced, it would be delivered to fueling stations by truck or pipeline for pumping into vehicles’ hydrogen tanks. Another option is for hydrogen to be produced by reformation or electrolysis at the fueling station.
Currently, most hydrogen is produced by steam reformation of natural gas, one of the cheapest methods. This process lays a foundation for increasing the use of renewable feed stocks because hydrogen stations that are constructed initially using natural gas could be modified to accept fuels derived from renewable and other sources of energy as they become available. Additionally, the experience gained and improvements made at stations using natural gas reformation could be applied to new reformation stations sited where renewable fuels such as biomass, municipal solid waste, and landfill gas can be used as the fuel source.

In addition to the infrastructure investments required to produce hydrogen, delivery of hydrogen to end users would require the building of an extensive system for transporting, distributing, and storing hydrogen. Significant investment of money and time would be required to deliver hydrogen to end-users.

Currently, very little hydrogen is produced for use as a transportation fuel. Moreover, the cost of production is currently expensive. With respect to fueling infrastructure, the San Diego region contains two hydrogen fueling stations: one publicly accessible station at the City of Chula Vista Corporation Yard and a private station located on the Camp Pendleton Marine Corps Base. The cost of additional hydrogen stations is estimated by the Energy Commission to range from $500,000 - $5,000,000 depending on the size.

**Propane**

The infrastructure of the propane distribution system is well-established. Propane is shipped from the point of production (natural gas or oil well) to bulk distribution terminals via pipeline, railroad, barge, truck, or tanker ship. Propane dealers fill trucks at terminals and distribute propane to end users, including retail fueling stations. Most propane consumed in the U.S. is produced domestically. Very little new infrastructure is needed to support propane forklifts; propane suppliers can maintain on-site storage tanks for fleets or have cylinder exchange programs.

Propane is widely available and its use could easily be expanded if demand for propane as a transportation fuel increases. There are currently 19 stations in the San Diego region that supply propane. There is potential to quickly expand the infrastructure for propane vehicle fueling, as existing propane stations can be used for vehicle fueling through the addition of fuel capacity, a tank pump, and metering equipment. Additional fueling infrastructure for propane can be installed at low cost at for publicly accessible stations, and upgrading existing propane infrastructure for vehicle fueling is cost effective as well. There is potential to quickly expand the infrastructure for propane vehicle fueling, as existing propane stations can be used for vehicle fueling through the addition of fuel capacity, a tank pump, and metering equipment.

Refueling of a propane vehicle involves filling the vehicle's on-board storage cylinder from a dispenser connected to a storage tank. Just as propane is stored in the engine fuel tank as a liquid, it is stored and handled as a liquid at the fuel dispenser. Propane is pumped from the dispenser storage tank into the vehicle tank. Propane refueling is comparable to the amount of time needed to refuel a gasoline or diesel vehicle (about 10-12 gallons per minute). The Energy Commission estimates that the average cost of a propane fueling station is $65,000.

New supplies of propane may become available with advancements in processes that derive propane from renewable sources. Bio-propane could give propane an additional advantage as a...
transitional fuel that will be beneficial economically and environmentally in the coming years. Although renewable sources of propane are not currently available commercially, they have potential as an alternative fuel option in the future. Renewable propane can be derived from several feedstocks such as algae, row crops, and wood. The derivation of renewable propane requires little additional energy use and results in a product that contains the same energy content as propane derived from petroleum. However, renewable sources of propane are not available in large quantities or commercially and would be unable to support a large vehicle population or fleet. At this time, renewable propane appears unlikely to play a large role as a transportation fuel in local government fleets in the San Diego region.
SECTION 8 - INTEGRATING ALTERNATIVE FUELS INTO REGIONAL INFRASTRUCTURE PROJECTS
SECTION 8: Integrating Alternative Fuels into Regional Infrastructure Projects

Regional Areas of Emphasis

One objective of this study was to identify how a Metropolitan Planning Organization (MPO) like SANDAG or other regional body can facilitate the increased use of alternative fuels and vehicles. One approach would involve the integration of alternative fuel vehicles and infrastructure considerations with the core SANDAG functions of regional transportation planning.

SANDAG took a broad view of its core transportation planning and implementation areas to determine opportunities for the integration of alternative fuel vehicles and infrastructure. Importantly, increased use of alternative fuels would advance the goals of the San Diego Regional Transportation Plan (RTP) (Figure 6.). Further analysis was undertaken to determine how the increased use alternative fuels and vehicles could be integrated into the four main components of the RTP (Figure 7.).

RTP Components

**Land Use - Transportation Connection**

- Connecting land use and transportation
  - Smart growth concept map
  - Smart growth and public health
  - Air quality
  - Better urban design for a healthier lifestyle
- Using land use and transportation plans to guide other plans and investments
  - Energy and climate change
  - Saving energy through transportation choices
  - Alternative transportation fuels and vehicles
- Incentives and collaboration

**Transportation Systems Development**

- Implementing the regional transit plan and network
- Flexible roadway system
- Goods movement and intermodal facilities
- Aviation and ground access
- Enhanced smart growth land use alternative
Planning across borders

**Transportation Systems Management**
- Congestion management program
- High occupancy toll lanes
- Advanced technologies and innovative services (smart parking)

**Transportation Demand Management**
- **RideLink**
  - Park and ride lots
  - Vanpools
  - Carpools
  - Transit
  - Guaranteed ride home

Using the four RTP components as a guide, a list of potential regional transportation program areas warranting further investigation was developed. The program area analysis focused on the identification of possible “shovel-ready” projects that could be enhanced with an alternative fuels or vehicles component and the identification of funding to support implementation of that enhancement. Focus areas for the San Diego region that could be analyzed further include:

- **Transit stations accessible from the managed lanes on Interstates 15, 805, and 5.** Potential for priority parking, charging stations, fueling stations on-site or in the vicinity:
  - Bus Rapid Transit centers are under construction or planned every 3 miles on the I-15 corridor, then the I-805 and I-5 corridors.
  - Federal and state funds could enable alternative fuel infrastructure enhancements during construction.

- **Establishing public access electric charging stations in opportune locations throughout the region:**
  - Partner with SDG&E to plan region-wide public charging network.
  - Address permitting or other municipal barriers to sting infrastructure in a regionally consistent manner.
  - Provide consistent outreach and information to local governments and regional stakeholders to integrate electric vehicles and infrastructure in local government fleets.

- **Bus rapid transit circulator routes, stations, infrastructure, vehicles:**
  - Purchase of alternative fuel buses with performance above and beyond existing state requirements.
  - Projects under construction that could be augmented include: Super Loop, Mid-City Rapid Bus and Escondido Rapid Bus.

- **Vanpools and other rideshare options:**
  - Retrofit vanpools from gasoline to CNG. SANDAG has over 650 vanpools and must purchase approximately 100 new vans annually due to new vanpool start-ups and turn-over of existing vans with high mileage.
  - In phases, converted compressed natural gas (CNG) vans can be purchased in public-private partnership through entities like the University of California San Diego (UCSD), Enterprise and VPSI (vanpool vendors) and natural gas-supplier Clean Energy.
Strategically identify vanpool vehicles for CNG conversion based on proximity of vanpool route to CNG fueling infrastructure.

- Goods movement projects to reduce idling, petroleum consumption, and GHG emissions:
  - Truck stop electrification (TSE) at the US-Mexico Ports of Entry (POE).
  - Conduct feasibility study of TSE at Otay Mesa crossing and third border crossing under development. Concept developed with EPA Region 9.
  - Identify alternative fuel infrastructure (stations and maintenance facilities) that could be incorporated into or in vicinity of the San Ysidro-Tijuana POE under redevelopment.

- Airport transportation coordination
  - Destination Lindbergh project to optimize San Diego International Airport.
  - Multi-modal transit station planned for airport reconfiguration.
  - Airport shuttle bus and taxi retrofits and new purchases.
  - Airport CNG fueling station and electric charging infrastructure.

Since many of these transportation areas are addressed by multiple regional, state, federal and even international entities, SANDAG considered a collaborative approach to benefit the region. Concurrently, state (such as AB 118) and federal (such as the stimulus) funding opportunities were under development. Regional discussions on alternative fuels transformed into strategies to fund and implement projects ready in the near-term. Staff also assessed near-term (i.e., in or before 2013) budgeted infrastructure projects included in SANDAG’s adopted 2008 Regional Transportation Improvement Plan (RTIP). RTIP projects include capital improvements, engineering and planning studies conducted by the California Department of Transportation (Caltrans), regional transit agencies, local governments and SANDAG. From these regional transportation program reviews, several projects have been identified and recommended for further study and are included in Section 9. Report Recommendations.
SECTION 9 - REPORT
RECOMMENDATIONS
SECTION 9. Report Recommendations

This section provides recommendations to maximize the economic, environmental, and social benefits of the transition to alternative fuels, vehicles, and supporting infrastructure in the San Diego region. Four types of recommendations are provided:

- The first recommendations prioritize alternative fuels and vehicles for different vehicle classes. This information can help local governments, public agencies and other fleet operators navigate the various alternative fuel and vehicle options and make decisions regarding new vehicle purchases, retrofits, and fuels that meet regional as well as their own objectives.
- The second set of recommendations identifies potential regional, near-term budgeted transportation projects that could be enhanced to include an alternative fuels component.
- The third set of report recommendations focus on preparing the region for a wider rollout of alternative fuel vehicles to the general public.
- The fourth and last series of recommendations are measures that SANDAG could undertake as follow-up to this report and that are not addressed in the other sets of recommendations.

In many cases, implementation of the recommendations and progress toward a regional transition to alternative fuels, vehicles, and infrastructure will be contingent upon the availability of funding to the region.

PART 1: VEHICLE AND FUEL RECOMMENDATIONS

Light-Duty Vehicle Applications: Passenger Cars and Light-Trucks

The following vehicle and fuel recommendations for light-duty vehicle applications are presented in order of priority.

Recommendation #1: Electricity

- For vehicles with limited range requirements (about 100 miles per day), battery-electric vehicles are recommended.
- For vehicles with longer range requirements (greater than 100 miles per day), use of plug-in hybrid electric vehicles (PHEV) is recommended. At present time, standard hybrid electric vehicles must be converted to PHEV, although PHEVs produced by OEMS are expected to become available in the marketplace in late 2010.
- Install Society of Automotive Engineers (SAE) Level I (110/120v) and Level II (220/240v) compliant electric charging points proportionate with vehicle conversions and purchases at a ratio of 1.5 charging points per vehicle to support initial introduction of BEV and PHEV vehicles (1 vehicle = 1 charging point at vehicle home base + 0.5 charging at public access location). The charging point-to-vehicle ratio can be lowered in the future as electric vehicles becomes more common.
- Coordinate vehicle conversions, purchases, and electric charging point installation with state and federal funding opportunities.

Pros

- At present, electricity is the best available option for GHG reductions at the tailpipe and on a full fuel cycle basis.
Opportunity for even greater full fuel cycle GHG reductions with anticipated increases in the state renewable portfolio standard (RPS) and distributed generation at charging point.

- Nearly 100 percent petroleum reduction.
- Best available fuel economy rating of 80 miles per gallon of gasoline equivalent (mpgge) according to the Energy Commission (some BEVs achieve significantly higher mpgge).
- In general, electricity is cheaper fuel than gasoline as long as gasoline is priced above approximately $1.25 per gallon.
- Infrastructure to distribute electricity to end-users – the existing electric grid – is already in place.
- Electric charging points are substantially less expensive to install than fueling stations for conventional and alternative fuels. Costs to expand the number of charge outlets at upgraded sites will be cost-effective.
- Battery electric vehicles will be available to public fleets in the San Diego region in 2010 at a price of approximately $27-$30,000.
- Battery electric vehicles will be available to the general public by 2012

- Government funding and incentives are available to cover the incremental costs of new and retrofitted battery electric and plug-in hybrid vehicles:
  - Federal tax credit of $7,500 per vehicle for battery electric,
  - A 10 percent federal tax credit is available for electric drive retrofits,
  - For FY08-FY10, an average of $10,000 per plug-in hybrid retrofit from the Alternative and Renewable Fuel and Vehicle Technology Program administered by the Energy Commission,
  - Up to $5,000 per vehicle rebate for battery electric vehicles (only $3,000 for battery electric vehicles with a range of 50 to 100 miles) and up to a $3,000 per vehicle rebate for plug-in hybrid vehicles from the Air Quality Improvement Program administered by the California Air Resources Board, and
  - If federal ARRA awards are received, vehicle and infrastructure costs may be reduced further.

Cons

- Vehicle/retrofit cost is greater than the cost of a standard gasoline vehicle.
- Battery electric vehicles may have limited range of about 100 miles.
- Large-scale production and commercial availability of battery electric and plug-in hybrid vehicles does not exist at present (but is expected in the near-term [1-3 years] future).
- Without proper planning, a significant market penetration of battery electric and plug-in hybrid vehicles could negatively impact the region’s electricity grid, including increased peak demand and increased minimum load demand.

Recommendation #2: Compressed Natural Gas

- Where electric vehicles are not an option, purchase new compressed natural gas (CNG) passenger vehicles.
- Consider retrofitting standard passenger vehicles to CNG vehicles.
- Consider deploying CNG vehicles in taxicab fleets.
- Take advantage of existing CNG fueling infrastructure where available, and construct and/or support construction of new CNG fueling infrastructure when needed to support vehicle purchase and/or retrofit.
- Coordinate vehicle conversions, purchases, and fueling station installation with state and federal funding opportunities.
Pros

- Full fuel cycle GHG emission reductions of 20-30 percent relative to standard gasoline vehicles.
- Nearly 100 percent petroleum reduction.
- CNG is cheaper than gasoline on a per-gallon-equivalent basis.
- Regional infrastructure to distribute natural gas to end-users - the existing natural gas pipeline network - is already in place.
- Approximately 22 existing CNG fueling stations in the region.
- Biomethane, if and when commercially available in the region, provides opportunity to achieve further GHG emission reductions (up to 97 percent compared to gasoline) using the same natural gas infrastructure, fueling stations, and vehicles.
- Government funding and incentives are available:
  - For FY08-FY10, an average of $6,667 per vehicle for the purchase of light-duty vehicles (the Energy Commission will consider funding vehicle retrofits to CNG) and $400,000 per fueling station from the Alternative and Renewable Fuel and Vehicle Technology Program administered by the Energy Commission,
  - Federal ARRA funding available to further offset costs of vehicles and infrastructure
- Can serve as transitional fuel to achieve early GHG reductions until other lower-carbon fuel options become commercially viable.

Cons

- Natural gas supplies are finite and non-renewable.
- Natural gas is heavily relied upon in non-transportation sectors, particularly electricity generation.
- Only one Original Equipment Manufacturer (OEM) offers a light-duty CNG passenger vehicle in California, which is more expensive (about $10,000) than a comparable gasoline vehicle.
- Fueling infrastructure to support rollout of CNG passenger vehicles to the general public would involve significant financial investment.

Recommendation #3: Ethanol (E85)

- Where fleets own Flexible Fuel Vehicles (FFV) and E85 is available, establish policies that require fueling with E85.
- If previous recommendations are not achievable, purchase FFVs for light-truck and sport utility vehicle applications. As stated above, establish policies that require fueling with E85 when fueling infrastructure is available.
- Install E85 fueling infrastructure to support FFV and any dedicated E85 vehicles. Take advantage of state funding for E85 fueling stations.
- Improve regional access to E85 fueling stations by siting new fueling infrastructure in currently under-served areas.
- Routinely monitor the in-state ethanol production industry, including the types of feedstocks. E85 will provide substantial benefits when feedstocks from biomass waste streams and bioenergy crops within California are used to produce ethanol at a commercial scale.

Pros

- Vehicle purchase price is similar to a comparable gasoline vehicle.
- E85 fueling infrastructure and vehicles for current generation ethanol also will be able to accommodate next generation ethanol produced from feedstocks with greater benefits.
Fueling stations already installed in the region.
Full fuel cycle petroleum reduction of 70-75 percent relative to a standard gasoline vehicle.
Government funding and incentives are available:
  - For FY08-FY10, an average of $100,000 per fueling station from the Alternative and Renewable Fuel and Vehicle Technology Program administered by the Energy Commission, and additional funds will be allocated to support low-carbon ethanol productions plant in California.

Cons
- Price of E85 is less economical than gasoline and other alternative fuels on a gallon of gasoline equivalent basis.
- Current generation of feedstocks has minimal or possibly negative GHG emissions performance, and the timing for commercial availability of next generation feedstocks is uncertain.
- Fueling infrastructure to support rollout of E85 to the general public would involve significant financial investment.
- FFVs are typically only available in the light-duty truck category (e.g., sport utility vehicles and pick-up trucks).

Recommendation #4: Propane
- Retrofit existing or newly purchased light-trucks
- Take advantage of existing propane fueling infrastructure in the region, where possible.
- Construct new fueling infrastructure to support vehicle retrofits.

Pros
- Infrastructure to support propane distribution to end-users is already in place.
- Potential for renewable propane to compete with other alternative fuels in future years.
- Full fuel cycle GHG reduction of 18-20 percent compared to standard gasoline vehicle.
- Nearly 100 percent of U.S. propane consumption is derived from domestic sources.
- Relatively lower fueling infrastructure costs ($65,000) than other alternative fuels.
- Government funding and incentives are available:
  - For FY08-FY10, a total of $1 million for light-duty vehicles in public fleets from the Alternative and Renewable Fuel and Vehicle Technology Program administered by the Energy Commission.
  - Federal incentives available to support propane fueling stations.
- Can serve as transitional fuel to achieve early GHG reductions until other lower-carbon fuel options become commercially viable.

Cons
- New OEM propane passenger cars or light trucks are not available for-sale in California.
- Propane retrofits are not available for passenger cars in California.
- Minimal petroleum reduction (5 percent) when propane is derived from petroleum.
- Lower GHG reduction that other alternative fuel options.
- Price of propane is less economical than gasoline and other alternative fuels on a gallon of gasoline equivalent basis.

Recommendation #5: Biodiesel
Manufacturers of light-duty diesel vehicles do not currently except biodiesel blends greater than B5. Therefore, the purchase of light-duty diesel vehicles and fueling with B5 would provide relatively minimal benefit compared to other alternative fuels in terms of increasing alternative fuel use,
lessening petroleum dependence, and reducing greenhouse gas emissions. If and when light-duty diesel vehicle manufacturers accept biodiesel blends of B20 and higher, this recommendation and the role of biodiesel in light-duty vehicles will be re-evaluated.

Recommendation #6: Hydrogen
The cost and availability of hydrogen fuel cell vehicles and infrastructure currently makes them uncompetitive. Regional investment in this technology is not recommended at this time. As the vehicles, production, distribution and fueling infrastructure become more available, this will be re-evaluated.

Medium and Heavy-Duty Vehicle Applications
Alternative fuel and vehicle selection is dependent on several factors including cost and availability of vehicles and fuel supply (including grant and tax credits available), whether franchisee is considering purchase of new vehicles or retrofits/conversions of existing fleet vehicles, and level of comfort with addressing maintenance and changing from standard practice. Therefore, recommendations are provided, but not prioritized, regarding each fuel.

Biodiesel
- Use biodiesel blends up to B20 in existing diesel vehicles and equipment (when consistent with manufacturer warranty). Make a priority of contracting with in-region and in-state biodiesel producers.

Natural Gas
- CNG is a recommended option for medium-duty applications such as vans and shuttle buses. Both CNG and LNG are recommended options for heavy-duty applications like refuse haulers and street sweepers. CNG is best suited to short- and medium-haul applications, while LNG is better suited for long-haul applications.
- In FY08-FY10, an allocation of $23 million will be made available for medium- and heavy-duty natural gas vehicle rebates through the Alternative and Renewable Fuel and Vehicle Technology Program administered by the Energy Commission.

Propane
- Propane retrofits are an option in the medium-duty vehicle class for application such as vans and cargo trucks (heavy-duty propane engines and vehicles are not available). Three companies in California provide propane retrofits for gasoline engines, and all apply to medium-duty GM engines (6.0 and 8.1 L models).
- Funding is available to support propane retrofits through the Alternative and Renewable Fuel and Vehicle Technology Program administered by the Energy Commission.

Hybrid Electric and Hydraulic Hybrid
- Although not alternative fuels, hybrid electric and hydraulic hybrid technologies are viable options for medium- and heavy-duty application such as refuse trucks, drayage trucks, utility trucks, as well as transit and school buses.
- Cost differentials compared to diesel trucks range from $35,000 for retrofits to 80,000 for new vehicles. In FY08-FY10, the ARB will offer $25 million in incentives for the purchase of new medium- and heavy-duty diesel hybrid vehicles through its Air Quality Improvement Program.
Non-Road Applications (Neighborhood electric vehicles, forklifts)

Electricity and propane are recommended as viable options to gasoline- and diesel-powered non-road vehicles as described below:

Electricity

- Battery electric non-road vehicles such as forklifts and neighborhood electric vehicles provide opportunities to reduce GHG emissions and petroleum consumption associated with non-road movement of people and cargo.
- Funding for non-road applications will be available through the Air Quality Improvement Program administered by the ARB.

Propane

- The purchase and maintenance costs of propane forklift are comparable to a gasoline-powered forklift.
- Fueling infrastructure costs are minimal to support propane forklifts.
- As described above, the full fuel cycle GHG and petroleum reduction benefits of propane are superior to gasoline.

Fueling Infrastructure

- Coordinate alternative fuel and/or vehicle purchase with fueling/charging infrastructure siting.
- When siting fueling infrastructure to support fleet vehicles, consider locations that can be leveraged or expanded to allow public access (at the same time or at a future date).
- Consider state and federal funding opportunities, public and private partnerships or private industry making entire investment to address infrastructure costs.
PART 2: TRANSPORTATION PROJECT RECOMMENDATIONS

Using the approach described in Section 8, staff reviewed projects budgeted and approved in the 2008 Regional Transportation Improvement Program (RTIP) for the potential to accommodate an alternative fuels, vehicles, or infrastructure component. Nineteen potential projects were identified for further investigation. Staff further prioritized the project list into three tiers for continued internal or inter-agency discussions, as shown in Table 19.

Additional meetings with regional stakeholders included local governments, alternative fuel distributors, a local refinery owner, fueling station owners, public agencies, transit agencies, APCD, goods movement and cross-border players, vanpool vendors, major universities, businesses, CCSE and SDG&E. These meetings generated strong interest in a coordinated regional approach for the expansion of alternative fuels, vehicles and infrastructure in the San Diego region.

<table>
<thead>
<tr>
<th>Table 19. RTIP Projects with Potential to Accommodate Alternative Fuels, Vehicles, or Infrastructure</th>
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<tbody>
<tr>
<td><strong>RTIP Project</strong></td>
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<tr>
<td>I-15 BRT Transit Stations Project</td>
</tr>
<tr>
<td>Metropolitan Planning</td>
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<tr>
<td>Mid-Coast Super Loop</td>
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<tr>
<td>Regional Rideshare Program</td>
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<tr>
<td>San Diego Smart Parking Pilot Project</td>
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<tr>
<td>I-5/805 Port of Entry</td>
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<tr>
<td>San Ysidro Intermodal Freight Facility</td>
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<tr>
<td>I-15 BRT Downtown Transit Stations</td>
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<tr>
<td>I-15 BRT Mid-City Transit Stations</td>
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## Escondido Maintenance Facility
Escondido at Washington and Centre City - improvements to maintenance facility including electronic gates, surveillance systems, video cameras, security [Bus refueling option]

## East County Bus Maintenance Facility
New bus facility in the City of El Cajon to provide capacity for operation and maintenance for 100-150 vehicles [Bus refueling option]

## South Bay Bus Maintenance Facility
In City of Chula Vista – expand existing facility from 4 to 9 acres to permit up to 150 buses [Bus refueling option]

## South Bay BRT
From Otay Ranch to downtown San Diego - plan, design, and construct transit stations, transit way, local street and road modifications, freeway modifications [designated alternative fuel vehicle parking and charging]

## Oceanside-Escondido Rail Project
From Oceanside to Escondido - design & construct 22 mile light rail (Sprinter) including 15 stations and maintenance facility - maybe completed [stations completed, but designate alternative fuel vehicle parking, add charging. Possible for maintenance facility to include alternative fuel component]

## Solana Beach Intermodal Transit Station
Solana Beach train station - construct parking structure, part of mixed-use transit oriented development [designated alternative fuel vehicle parking and charging]

## San Luis Rey Transit Center
In Oceanside - construct new multi-modal transit center as a component of a transit-oriented, mixed-use development which would include retail, commercial, residential and office space [designated alternative fuel vehicle parking and charging]

## I-15 BRT Operations and Vehicles
From Escondido to San Diego - planning, operations and vehicle acquisition for BRT service along I-15 corridor [include alternative fuel component to planning going forward]

## Rail Vehicles & Related Equipment
NCTD service area - locomotive purchase/overhaul, revenue vehicles, misc. support equipment including vehicles, spare components and signal equipment upgrade/replacement. Exempt Cat: Mass Transit - Purchase new buses and rail cars to replace existing vehicles or minor expansions of fleet. [SANDAG staff provided ARRA transit grant information for use (TIGGER)]

## Bus & Rail Rolling Stock
MTS service area - purchase replacement buses (9 mid-size CNG, 141 ADA small, 11 medium, 83 40-foot CNG, 10 high capacity) and Light Rail Vehicle rehabilitation, LRV Tires, rehabilitation of electronic control circuit for U2s and LRV HVAC retrofit [SANDAG staff provided ARRA transit grant information for use (TIGGER)]

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## PART 3: REGIONAL AND LOCAL PLANNING RECOMMENDATIONS

The third set of report recommendations focus on preparing the region as a whole for alternative fuel vehicles. A concerted regional approach to addressing infrastructure needs for alternative fuels is one of the foundations to successfully implementing several interrelated state and regional goals including climate change, petroleum dependence, economic prosperity, and air quality. A coordinated infrastructure strategy, by a regional entity like an MPO or APCD, is necessary to provide customers (e.g., fleet managers and the general public) with a level of certainty that infrastructure will be available to support their investment in an alternative fuel or vehicle. Deployment of alternative fuel vehicles and development of supportive infrastructure, initially for local government and public agency fleets, will help the region lay the groundwork for a wider rollout of alternative fuel vehicles that the general public can embrace.
1: Support a Regional Approach to Alternative Fuels Infrastructure Planning: Continue Development of a San Diego Regional Strategic Alliance

SANDAG has proposed to the Energy Commission the idea of forming a San Diego Regional Strategic Alliance consisting of a regionally-planned approach to increasing alternative fuel use, availability, and production. SANDAG could facilitate collaboration with other regional agencies and organizations\(^1\) working toward state and regional goals for reducing GHG emissions, lessening petroleum dependence, and advancing the use of alternative fuel sources. In a letter to the Energy Commission in November 2008, SANDAG provided the concept and framework for a regionally-coordinated approach. Early agency buy-in came from:

- San Diego Air Pollution Control District (APCD)
- Metropolitan Transit System (MTS)
- North County Transit District (NCTD)
- San Diego County Regional Airport Authority
- San Diego Gas and Electric (SDG&E)
- California Center for Sustainable Energy (CCSE)
- University of California, San Diego (UCSD)
- Other public agencies and private companies

The purpose of a strategic alliance is to ensure that regional infrastructure needs are identified and met in an orchestrated and timely manner that provides convenient and safe public access to refueling and recharging sites in line with demand. Whether for local government fleets or the general public use, the transition to alternative fuel vehicles will not reach a critical mass without a strong regional (as well as interregional) emphasis on providing for the necessary infrastructure. Regional coordination of the transition to alternative fuels from an agency like SANDAG communicates to the market (e.g., fuel producers and suppliers, vehicle manufacturers, potential customers, and others) that the San Diego region is committed to, and seeks to attract, investment in alternative fuels, vehicles, and infrastructure.

In response to early federal ARRA funding opportunities and state AB 118 opportunities, entities in the region have been coordinating efforts to submit regional, multi-stakeholder proposals. SANDAG is facilitating this effort with the San Diego Regional Strategic Alliance in mind. Additionally, the Alliance would be able to leverage existing regional partnerships, funding mechanisms and transportation investments. Possible actions include SANDAG regionally administering federal and/or state alternative transportation funds. This effort could be done in coordination with or similar to funds allocated through TransNet, a regional half-cent sales tax measure for transportation improvements and smart growth development. The San Diego Regional Strategic Alliance would utilize this report to find ways to accelerate the deployment of alternative fuels, vehicles and infrastructure in the region.

2: Support Rollout of a Regional Electric Vehicle Charging Network

The San Diego region will be one of a handful of US metropolitan regions in which Nissan will introduce all-electric vehicles (EV), which will be available to fleet operators in 2010 and the general

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\(^1\) See Appendix G for a listing of regional alternative fuel resources.
public by 2012. Nissan and SDG&E have partnered on this project and SANDAG is taking internal steps to become a formal partner.

Dependent on funding assistance, SANDAG will assist SDG&E and Nissan in identifying appropriate sites for 220W – 4- to 8-hour charging, 26-minute fast-charging, and/or battery swapping areas. The focus for SANDAG is the establishment of a region-wide network of public access charging stations for battery electric vehicles (BEV) and plug-in hybrid vehicles (PHEV). Depending on what level of funding that Nissan and ETEC receive through a federal transportation electrification grant, or SANDAG through a federal Clean Cities application, the San Diego region will see between 100 and 1,000 EVs available for purchase or lease in late 2010.

Nissan and SDG&E are seeking SANDAG assistance with:

- Identifying any permitting barriers for home, office and public recharging sites in the local jurisdictions.
- Developing and promoting a regionally consistent, standard approach to EV infrastructure permitting, training and installation.
- Adequate infrastructure siting across the region.

The Nissan EV has an anticipated range of 100 miles on a single charge and is expected to cost about $30,000. The San Diego region has committed to purchasing a minimum of 100 cars. SANDAG is working with SDG&E to introduce EV and PHEV information and resources to fleet operators from around the region and discuss opportunities to integrate these vehicles into fleets and install charging infrastructure. Siting of public access charging will be done cooperatively with SANDAG and the region’s local governments.

SANDAG and SDG&E have provided letters of support to the federal ETEC-Nissan proposal to support EV deployment, coordination and installation of electric charging infrastructure, and training of local dealerships to service the vehicles. SANDAG is submitting federal and state proposals on behalf of the region to secure funding to implement this project in addition to other alternative fuel projects.

3: SANDAG should further study the regional transportation projects in Table 19 and determine whether an alternative fuels component is feasible and beneficial.

SANDAG should further refine its list of potential projects from the RTIP. Working across the agency, staff should continue assessing the potential for each project and hold discussions with the appropriate lead agency if not SANDAG (e.g. Caltrans, transit agency, or local government).

4: Support economic development mechanisms and measures for the clean energy sector

SANDAG and local governments can leverage the transition to alternative fuels and vehicles to concurrently achieve environmental as well as clean economic development goals. Workforce training is necessary to ready the region for growth in the alternative transportation field. The region also should support the existing biotech cluster as it expands into research and development of alternative fuels.
**Workforce training and education**

- Provide training and education to existing construction workers and firms on clean energy materials and business practices.
- Local governments should enlist existing organizations like San Diego Workforce Partnership to explore new approaches to providing education and training opportunities to workers employed by temporary staffing agencies. The San Diego region has a large number residents employed in the temporary field.
- Utilize community colleges and university extension programs to provide programs to prepare older workers for the opportunity to remain actively employed and transition to Clean Energy fields.
- Local governments can partner with regional schools and Workforce Investment Boards (WIBs) to bring funding to the San Diego region to spur green economy knowledge and skills.
- Integrate green jobs initiatives into existing workforce systems.
- Leverage resources at universities, community and technical colleges, WIBs, community-based organizations, and economic development agencies:
  - Universities offer four-year degree programs and graduate degrees in business, engineering, and the sciences.
  - Community colleges offer both two-year business and technical degree programs and certification programs.
  - Technical High Schools offer trade preparation with hands-on technical laboratories, apprenticeship programs and some certification programs.
  - The Department of Labor, partnering with community colleges, technical high schools, unions and business offer job skills training programs and apprenticeships.

**Research and development of the next generation of clean fuels**

The [San Diego Center for Algae Biotechnology](http://www.sd-cab.org) (SD-CAB) was established in 2008 as a consortium of researchers from The Scripps Research Institute, University of California, San Diego, and Scripps Institution of Oceanography, in partnership with private industry.

- SD-CAB supports development of innovative, sustainable, and commercially viable algae-based biotechnology solutions for renewable energy, green chemistry, bio-products, water conservation, and carbon dioxide (CO2) abatement. The Center incorporates international research scientists from the fields of biology, chemistry, engineering, economics, and policy.
- It trains young scientists, educates the public, collaborates with private sector partners, and facilitates discussion with regional, state and national policy makers regarding the use of algae for energy independence and conservation of land and water, while encouraging the highest standards of academic excellence and objectivity.
- The center collaborates with the private sector to apply lab discoveries to the industrial world through robust research and development in biology, chemistry, and engineering.
- SD-CAB builds upon the large established cluster of biotechnology companies and research institutions in the region.
PART 4: ADDITIONAL RECOMMENDATIONS FOR SANDAG

- Use this report to inform development of its Regional Energy Strategy Update, Regional Climate Action Plan and Sustainable Region Program.
- Undertake an inventory of local government and member agency fleet vehicles, including factors such as the total number of vehicles by class and fuel type, and annual vehicle turnover.
- Develop an electric vehicle charging plan for the San Diego region. Potential elements could include but are not limited to:
  - Upgrade existing charge points to current SAE standards,
  - Develop criteria for public charging point siting,
  - Analysis of the impact to the region’s electricity grid,
  - Opportunities for charging with clean and renewable distributed generation
  - Electric vehicle charging tariffs,
  - “Fast-charging” considerations (i.e., SAE Level III vs. the battery exchange concept)
  - Guidelines and permit streamlining for residential installation (including both single- and multi-family dwellings),
  - Assistance with rebate applications for vehicle purchases.
- Create an action plan for the incorporation of alternative fuels and vehicles into SANDAG’s vehicle fleet, and the vehicle and equipment fleets of contractors, funding recipients, and the like, including vehicles used in the vanpool program. The plan should include the identification of fueling and/or charging infrastructure where necessary to support increased alternative fuel and vehicle use.
- Identify opportunities to integrate alternative fuels, vehicle, and infrastructure considerations into existing SANDAG funding programs for smart growth land use development.
- Streamline permitting for electric charger and alternative fueling infrastructure installation.
- Support in-region production of alternative fuels and vehicles, including research and development activities.
- Support electricity and natural gas tariffs for alternative fuel vehicles that encourage their use.
- Investigate joint procurement or aggregation options that would reduce the purchase cost of alternative fuels and vehicles for regional fleets.
- Identify ways to capture the economic benefits of the transition to alternative fuels and vehicles for the region and State.
- Identify region’s inventory of waste materials for potential use as biofuel feedstocks (biodiesel and ethanol) for production facilities
- Incorporate the identification of fueling-charging infrastructure locations into local government planning processes such as the General Plan.
- Develop detailed standards for the siting of fueling-charging infrastructure.
- Continue the study of opportunities for truck stop electrification and vehicle retrofits at the international border.
- Support electrification in non-road applications at San Diego International Airport and other regional airports where applicable.
APPENDICES
APPENDIX A - FEDERAL AND STATE ALTERNATIVE FUELS, VEHICLES, AND INFRASTRUCTURE LAWS AND INCENTIVES
Appendix A. Federal and State Alternative Fuels, Vehicles and Infrastructure Laws and Incentives

FEDERAL POLICY HISTORY

The 102nd Congress passed the Energy Policy Act of 1992 (EPAct 1992, P.L. 102-486). Among other provisions, this law requires the purchase of alternative fuel vehicles by federal agencies, state governments, and alternative fuel providers. Under EPAct 1992, a certain percentage— which varies by the type of fleet (i.e., federal, state, or fuel provider)— of new passenger vehicles must be capable of operating on alternative fuels, including ethanol, methanol, natural gas, or propane. EPAct 1992 established a tax credit for the purchase of electric vehicles, as well as tax deductions for the purchase of alternative fuel and hybrid vehicles.

Energy Policy Act of 2005
In light of high fuel prices in the early 2000s, continued growth in domestic and global petroleum demand, and other energy policy concerns, Congress began working on comprehensive energy legislation in 2001, which stalled in the legislature for several sessions until the 109th Congress passed the Energy Policy Act of 2005 (EPAct 2005, P.L. 109-58), which was signed by President Bush on August 8, 2005.

Energy Independence and Security Act of 2005
The Energy Independence and Security Act (EISA) of 2007 calls for improved vehicle fuel economy by tightening corporate average fuel economy (CAFE) standards. Passenger cars and light trucks must reach efficiency of 35 miles per gallon by the year 2020. EISA includes provisions to increase the supply of renewable alternative fuel sources by setting a mandatory Renewable Fuel Standard, requiring transportation fuel sold in the U.S. to include a minimum of 36 billion gallons of renewable fuels by 2022, including advanced and cellulosic biofuels as well as biomass-based diesel. In addition, EISA includes grant programs to encourage development of cellulosic biofuels, plug-in hybrid electric vehicles and other emerging electric technologies, and the inclusion of electric drive vehicles under EPAct 1992.

The 2008 Farm Bill
Recent Farm Bills, especially the 2002 and 2008 Farm Bills (P.L. 107-171 and P.L. 110-246, respectively), have included titles to promote biofuels and other farm-based energy supplies. The 2002 Farm Bill established programs to promote the development of biofuels and biorefineries; the 2008 Farm Bill expanded on these programs, and expanded existing biofuels tax credits to promote the development of cellulosic fuels—fuels produced from woody or fibrous materials such as perennial grasses, fast-growing trees, and agricultural and municipal wastes.
### Federal Alternative Fuels and Advanced Vehicles Incentives

- Advanced Technology Vehicle (ATV) Manufacturing Incentives
- Alternative Fuel Excise Tax Credit
- Alternative Fuel Infrastructure Tax Credit
- Alternative Fuel Mixture Excise Tax Credit
- Biobased Transportation Research Funding
- Biodiesel Income Tax Credit
- Biodiesel Mixture Excise Tax Credit
- Biomass Research and Development Initiative
- Cellulosic Biofuel Producer Tax Credit
- Fuel Cell Motor Vehicle Tax Credit
- Heavy-Duty Hybrid Electric Vehicle (HEV) Tax Credit
- Improved Energy Technology Loans
- Light-Duty Hybrid Electric Vehicle (HEV) and Advanced Lean Burn Vehicle Tax Credit
- Qualified Alternative Fuel Motor Vehicle (QAFMV) Tax Credit
- Qualified Plug-In Electric Drive Motor Vehicle Tax Credit
- Renewable Energy Systems and Energy Efficiency Improvements Grant
- Small Agri-Biodiesel Producer Tax Credit
- Small Ethanol Producer Tax Credit
- Value-Added Producer Grants (VAPG)
- Volumetric Ethanol Excise Tax Credit (VEETC)

### Federal Laws and Regulations

- Aftermarket Alternative Fuel Vehicle (AFV) Conversions
- Alternative Fuel Definition
- Alternative Fuel Definition - Internal Revenue Code
- Alternative Fuel Tax Exemption
- Clean Air Act Amendments of 1990
- Corporate Average Fuel Economy (CAFE)
- High Occupancy Vehicle (HOV) Lane Exemption
- Idle Reduction Equipment Excise Tax Exemption
- Idle Reduction Facilities Regulation
- Import Duty for Fuel Ethanol
- Renewable Fuel Standard (RFS) Program
- Tier 2 Vehicle and Gasoline Sulfur Program
- Updated Fuel Economy Test Procedures and Labeling
### Federal Programs

- Air Pollution Control Program
- Alternative Transportation in Parks and Public Lands Program
- Biobased Products and Bioenergy Program
- Clean Agriculture USA
- Clean Cities
- Clean Construction USA
- Clean Fuel Fleet Program (CFFP)
- Clean Fuels Grant Program
- Clean Ports USA
- Clean School Bus USA
- Congestion Mitigation and Air Quality (CMAQ) Improvement Program
- National Clean Diesel Campaign (NCDC)
- National Fuel Cell Bus Technology Development Program (NFCBP)
- Pollution Prevention Grants Program
- SmartWay Transport Partnership
- State Energy Program (SEP) Funding
- Voluntary Airport Low Emission (VALE) Program

### California Incentives

- Alternative Fuel and Vehicle Research and Development Incentives
- Alternative Fuel Vehicle (AFV) Rebate Program
- High Occupancy Vehicle (HOV) Lane Exemption
- Alternative Fuel Vehicle (AFV) and Fueling Infrastructure Grants
- Alternative Fuel Incentive Development
- Emissions Reductions Grants
- Heavy-Duty Vehicle Emissions Reduction Grants
- Lower-Emission School Bus Grants
- Alternative Fuel and Advanced Technology Research and Development
- Vehicle Emission Reduction Grants - Sacramento
- Electric Vehicle (EV) Parking Incentive - Sacramento
| Employer Invested Emission Reduction Funding - South Coast |
| Technology Advancement Funding - South Coast |
| Low-Emission Vehicle Incentives and Technical Training - San Joaquin Valley |
| Air Quality Improvement Program Funding - Ventura County |
| Alternative Fuel and Advanced Technology Vehicle and Infrastructure Incentives - Vacaville |
| Clean Vehicle Parking Incentive - Hermosa Beach |
| Clean Vehicle Parking Incentive - San Jose |
| Alternative Fuel Vehicle (AFV) and Hybrid Electric Vehicle (HEV) Parking Incentive - Santa Monica |
| Electric Vehicle (EV) Parking Incentive - Los Angeles Airport |

| California Laws and Regulations |
| Regional Climate Change Initiative |
| Alternative Fuel Vehicle Retrofit Regulations |
| Alternative Fuel Tax |
| Alternative Fuel and Advanced Vehicle Procurement Requirements |
| Alternative Fuel and Vehicle Policy Development |
| Hydrogen Energy Plan |
| Heavy-Duty Truck Idle Reduction Requirements |
| Low Emission Vehicle (LEV) Standards |
| Mobile Source Emissions Reduction Requirements |
| Fuel Efficient Tire Program Development |
| Alternative Fuel Promotion - San Jose |
| Fleet Fuel Use and Vehicle Acquisition Requirements - San Francisco |
| Neighborhood Electric Vehicle (NEV) Access to Roadways - Placer and Orange Counties |

| California Utilities/Private |
| Alternative Fuel Vehicle (AFV) and Hybrid Electric Vehicle (AFV) Insurance Discount |
| Electric Vehicle (EV) Charging Rate Reduction - SMUD |
| Electric Vehicle (EV) Charging Rate Reduction - LADWP |
| Electric Vehicle (EV) Charging Rate Reduction - SCE |
| Low-Emission Vehicle Electricity Rate Reduction - PG&E |
| Natural Gas Vehicle Home Fueling Infrastructure Incentive - South Coast |
| Low-Emission Taxi Incentives - San Francisco |
| Employee Vehicle Purchase Incentives - Riverside |
Resources:

The American Council for an Energy Efficient Economy (ACEEE) conducts engineering and economic studies of the potential for efficiency improvement and provides advice regarding the development of programs and policies to realize this potential in the market. They take an integrated approach to the issue, addressing how fuel efficiency relates to emissions, safety, clean production, and renewable fuels and seek to encourage manufacturers to produce high-efficiency, low-pollution vehicles and also to motivate consumers to purchase them. A cornerstone of this effort is ACEEE's Green Book®: The Environmental Guide to Cars and Trucks and its Web site: www.Greenercars.com.
Appendix B.  Alternative Fuel Vehicle Availability

The following Web sites contain information about the availability of alternative fuel vehicles and retrofits:

United States Department of Energy, Alternative Fuels Data Center
Light-duty and Low-speed vehicle search
http://www.afdc.energy.gov/afdc/progs/vehicles_search.php
Heavy-duty vehicle search
Flexible Fuel Vehicle Availability
Natural Gas Vehicle Availability
Propane Vehicle Availability
http://www.afdc.energy.gov/afdc/vehicles/propane_availability.html
Plug-in Hybrid Availability
http://www.afdc.energy.gov/afdc/vehicles/plugin_hybrids_availability.html
Electric Vehicle Availability
http://www.afdc.energy.gov/afdc/vehicles/electric_availability.html
Hydrogen Fuel Cell Vehicle Availability
http://www.afdc.energy.gov/afdc/vehicles/fuel_cell_availability.html

United States Environmental Protection Agency, Green Vehicle Guide
http://www.epa.gov/greenvehicles/

FuelEconomy.gov
http://www.fueleconomy.gov/feg/byfueltype.htm

California Air Resources Board, Drive Clean

California Energy Commission, Consumer Energy Center
http://www.consumerenergycenter.org/transportation/buying_a_car/index.html

California Department of General Services, Best Practices Manual, Vehicles/Transportation
http://www.green.ca.gov/EPP/Vehicles/lightDV.htm#types

Automotive News Guide to Hybrid Vehicles and Advanced Technology Powertrains
http://www.autonews.com/section/altfuels

Union of Concerned Scientists, Hybrid Center
http://www.hybridcenter.org/

Union of Concerned Scientists - Buying a Greener Vehicle

Propane Vehicles and Conversions:

BAF Technologies, CNG Conversions
http://www.baftechnologies.com/Home.html

Baytech Corporation, Compressed Natural Gas and Propane Vehicle Conversions
http://www.baytechcorp.com/
APPENDIX C - STATE OF CALIFORNIA ALTERNATIVE FUEL VEHICLE PURCHASES
## Appendix C. State of California Alternative Fuel Vehicle Purchases

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>Fleet Application</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hybrid Electric</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compact Hybrid 4-Door Sedan</td>
<td>Passenger car</td>
<td>$24,720</td>
</tr>
<tr>
<td>Compact Hybrid 4-Door Sedan</td>
<td>Passenger car</td>
<td>$24,720</td>
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<tr>
<td>Group I Hybrid 2-Wheel Drive SUV</td>
<td>Light-truck</td>
<td>$31,894</td>
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<tr>
<td>Group III Hybrid 4-Wheel Drive SUV</td>
<td>Light-truck</td>
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<tr>
<td>Group III Hybrid 4-Wheel Drive SUV</td>
<td>Light-truck</td>
<td>$47,590</td>
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<tr>
<td>Group III Hybrid Pickup, Reg. Cab</td>
<td>Light-truck</td>
<td>$34,740</td>
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<tr>
<td>Mid-Size Hybrid 4-Door Sedan</td>
<td>Passenger car</td>
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<tr>
<td>Mid-Size Hybrid 5-Door Hatchback</td>
<td>Passenger car</td>
<td>$22,953</td>
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<tr>
<td>Mid-Size Hybrid 5-Door Hatchback</td>
<td>Passenger car</td>
<td>$22,593</td>
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<tr>
<td><strong>Ethanol (E85)</strong></td>
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<tr>
<td>4-Door Large Sedan E-85</td>
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<td>4-Door Large Sedan E-85</td>
<td>Passenger car</td>
<td>$17,211</td>
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<td>4-Door Midsize Sedan E85</td>
<td>Passenger car</td>
<td>$16,925</td>
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<td>Group III Pickup 2WD Extra Cab E-85</td>
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<td>Group III Pickup 2WD Extra Cab E-85</td>
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<td>Group III Pickup 2WD Reg. Cab E-85</td>
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<td>Group III Pickup 2WD Reg. Cab E-85</td>
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<tr>
<td>Group III SUV 4WD E-85</td>
<td>Light-truck</td>
<td>$30,497</td>
</tr>
<tr>
<td>Group III SUV 4WD E-85</td>
<td>Light-truck</td>
<td>$30,697</td>
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<tr>
<td>Group IV Minivan 7-Passenger E-85</td>
<td>Van</td>
<td>$20,222</td>
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<tr>
<td>Group IV Minivan 7-Passenger E-85</td>
<td>Van</td>
<td>$20,472</td>
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<tr>
<td>Group V Minivan Cargo E-85</td>
<td>Van</td>
<td>$18,712</td>
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<tr>
<td>Group V Minivan Cargo E-85</td>
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<td>$18,962</td>
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<td>Group VI Cargo Van E085</td>
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<td>Group VI Cargo Van E085</td>
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<tr>
<td>Group II 8-Passenger Van E-85</td>
<td>Van</td>
<td>$19,585</td>
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<tr>
<td>Group II 8-Passenger Van E-85</td>
<td>Van</td>
<td>$19,785</td>
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<tr>
<td><strong>Compressed Natural Gas (CNG)</strong></td>
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<td></td>
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<tr>
<td>Dedicated CNG Group I 2WD Cab &amp; Chassis Crew Cab Min 167&quot; WB</td>
<td>Cargo Truck</td>
<td>$53,309</td>
</tr>
<tr>
<td>Dedicated CNG Group I 2WD Cab &amp; Chassis Crew Cab Min 167&quot; WB</td>
<td>Cargo Truck</td>
<td>$53,909</td>
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<tr>
<td>Dedicated CNG Group I 2WD Cab &amp; Chassis Extra Cab min 154&quot; WB</td>
<td>Cargo Truck</td>
<td>$52,367</td>
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<tr>
<td>Dedicated CNG Group I 2WD Cab &amp; Chassis Extra Cab min 154&quot; WB</td>
<td>Cargo Truck</td>
<td>$52,967</td>
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<tr>
<td>Dedicated CNG Group I 2WD Cab &amp; Chassis Reg. Cab</td>
<td>Cargo Truck</td>
<td>$50,918</td>
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<tr>
<td>Dedicated CNG Group I 2WD Cab &amp; Chassis Reg. Cab</td>
<td>Cargo Truck</td>
<td>$51,518</td>
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<td>Dedicated CNG Group I 4WD Cab &amp; Chassis Reg. Cab</td>
<td>Cargo Truck</td>
<td>$53,648</td>
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<td>Dedicated CNG Group I 4WD Cab &amp; Chassis Reg. Cab</td>
<td>Cargo Truck</td>
<td>$54,248</td>
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<tr>
<td>Dedicated CNG Group II 15K GVWR 2WD Cab &amp; Chassis Reg. Cab</td>
<td>Cargo Truck</td>
<td>$70,585</td>
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<tr>
<td>Dedicated CNG Group II 15K GVWR 2WD Cab &amp; Chassis Reg. Cab</td>
<td>Cargo Truck</td>
<td>$69,786</td>
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<tr>
<td>Dedicated CNG Group III 17.5K GVWR Cab &amp; Chassis Reg. Cab</td>
<td>Cargo Truck</td>
<td>$70,797</td>
</tr>
<tr>
<td>Dedicated CNG Group III 17.5K GVWR Cab &amp; Chassis Reg. Cab</td>
<td>Cargo Truck</td>
<td>$71,596</td>
</tr>
<tr>
<td>Dedicated CNG Group III Passenger Van</td>
<td>Van</td>
<td>$55,201</td>
</tr>
<tr>
<td>Dedicated CNG Group III Passenger Van</td>
<td>Van</td>
<td>$55,801</td>
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</table>
### Appendix C. State of California Alternative Fuel Vehicle Purchases

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>Fleet Application</th>
<th>Price</th>
</tr>
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<tbody>
<tr>
<td>Dedicated CNG Group IV Extended Passenger Van</td>
<td>Van</td>
<td>$58,481</td>
</tr>
<tr>
<td>Dedicated CNG Group IV Extended Passenger Van</td>
<td>Van</td>
<td>$59,081</td>
</tr>
<tr>
<td>Dedicated CNG Group V 2WD Cab &amp; Chassis Reg. Cab</td>
<td>Light-truck</td>
<td>$46,363</td>
</tr>
<tr>
<td>Dedicated CNG Group V 2WD Cab &amp; Chassis Reg. Cab</td>
<td>Light-truck</td>
<td>$46,963</td>
</tr>
<tr>
<td>Dedicated CNG Group V 2WD Pickup Reg. Cab</td>
<td>Light-truck</td>
<td>$46,628</td>
</tr>
<tr>
<td>Dedicated CNG Group V 2WD Pickup Reg. Cab</td>
<td>Light-truck</td>
<td>$47,227</td>
</tr>
<tr>
<td>Dedicated CNG Group VII 4WD Cab &amp; chassis Reg. Cab</td>
<td>Cargo Truck</td>
<td>$49,030</td>
</tr>
<tr>
<td>Dedicated CNG Group VII 4WD Cab &amp; chassis Reg. Cab</td>
<td>Cargo Truck</td>
<td>$49,630</td>
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<tr>
<td>Dedicated CNG Group VII Cargo Van</td>
<td>Cargo Van</td>
<td>$52,339</td>
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<tr>
<td>Dedicated CNG Group VII Cargo Van</td>
<td>Cargo Van</td>
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<tr>
<td>Dedicated CNG Group VII 4WD Pickup Reg. Cab</td>
<td>Light-truck</td>
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<tr>
<td>Dedicated CNG Group VII 4WD Pickup Reg. Cab</td>
<td>Light-truck</td>
<td>$49,904</td>
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</table>

#### Bi-fuel Gasoline and CNG

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>Fleet Application</th>
<th>Price</th>
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<tbody>
<tr>
<td>Group I Med. Duty Cab &amp; Chassis Bi-Fuel Gas &amp; CNG Reg. Cab 2WD</td>
<td>Cargo Truck</td>
<td>$81,682</td>
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<tr>
<td>Group I Med. Duty Cab &amp; Chassis Bi-Fuel Gas &amp; CNG Reg. Cab 2WD</td>
<td>Cargo Truck</td>
<td>$82,482</td>
</tr>
<tr>
<td>Group II Cab &amp; Chassis Bi-Fuel Gas &amp; CNG Reg. Cab 2WD</td>
<td>Cargo Truck</td>
<td>$70,786</td>
</tr>
<tr>
<td>Group II Cab &amp; Chassis Bi-Fuel Gas &amp; CNG Reg. Cab 2WD</td>
<td>Cargo Truck</td>
<td>$71,585</td>
</tr>
<tr>
<td>Group II Med. Duty Cab &amp; Chassis Bi-Fuel Gas &amp; CNG Reg. Cab 2WD</td>
<td>Cargo Truck</td>
<td>$84,140</td>
</tr>
<tr>
<td>Group II Med. Duty Cab &amp; Chassis Bi-Fuel Gas &amp; CNG Reg. Cab 2WD</td>
<td>Cargo Truck</td>
<td>$84,940</td>
</tr>
<tr>
<td>Group III Cab &amp; Chassis Bi-Fuel Gas &amp; CNG Reg. Cab 2WD</td>
<td>Cargo Truck</td>
<td>$71,797</td>
</tr>
<tr>
<td>Group III Cab &amp; Chassis Bi-Fuel Gas &amp; CNG Reg. Cab 2WD</td>
<td>Cargo Truck</td>
<td>$72,596</td>
</tr>
<tr>
<td>Group III Med. Duty Cab &amp; Chassis Bi-Fuel Gas &amp; CNG Reg. Cab 2WD</td>
<td>Cargo Truck</td>
<td>$84,761</td>
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<tr>
<td>Group III Med. Duty Cab &amp; Chassis Bi-Fuel Gas &amp; CNG Reg. Cab 2WD</td>
<td>Cargo Truck</td>
<td>$85,561</td>
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</table>

#### Propane (LPG)

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<tr>
<th>Vehicle Type</th>
<th>Fleet Application</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I Med. Duty Cab &amp; Chassis Dedicated LPG Reg. Cab 2WD</td>
<td>Cargo Truck</td>
<td>$59,032</td>
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<tr>
<td>Group I Med. Duty Cab &amp; Chassis Dedicated LPG Reg. Cab 2WD</td>
<td>Cargo Truck</td>
<td>$59,832</td>
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<tr>
<td>Group II Cab &amp; Chassis Dedicated LPG Reg. Cab 2WD</td>
<td>Cargo Truck</td>
<td>$47,636</td>
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<tr>
<td>Group II Cab &amp; Chassis Dedicated LPG Reg. Cab 2WD</td>
<td>Cargo Truck</td>
<td>$48,436</td>
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<tr>
<td>Group III Cab &amp; Chassis Dedicated LPG Reg. Cab 2WD</td>
<td>Cargo Truck</td>
<td>$48,647</td>
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<tr>
<td>Group III Cab &amp; Chassis Dedicated LPG Reg. Cab 2WD</td>
<td>Cargo Truck</td>
<td>$49,447</td>
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<tr>
<td>Group II Med. Duty Cab &amp; Chassis Dedicated LPG Reg. Cab 2WD</td>
<td>Cargo Truck</td>
<td>$61,490</td>
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<tr>
<td>Group II Med. Duty Cab &amp; Chassis Dedicated LPG Reg. Cab 2WD</td>
<td>Cargo Truck</td>
<td>$62,290</td>
</tr>
<tr>
<td>Group III Med. Duty Cab &amp; Chassis Dedicated LPG Reg. Cab 2WD</td>
<td>Cargo Truck</td>
<td>$62,111</td>
</tr>
<tr>
<td>Group III Med. Duty Cab &amp; Chassis Dedicated LPG Reg. Cab 2WD</td>
<td>Cargo Truck</td>
<td>$62,911</td>
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</table>

#### Neighborhood Electric

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>Fleet Application</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Utility NEV</td>
<td>Light-truck</td>
<td>$11,115</td>
</tr>
<tr>
<td>2-Passenger NEV</td>
<td>Passenger car</td>
<td>$10,230</td>
</tr>
<tr>
<td>2-Passenger NEV</td>
<td>Passenger car</td>
<td>$10,230</td>
</tr>
<tr>
<td>3-Door Hatchback NEV</td>
<td>Passenger car</td>
<td>$16,800</td>
</tr>
<tr>
<td>3-Door hatchback NEV</td>
<td>Passenger car</td>
<td>$16,300</td>
</tr>
<tr>
<td>4-Passenger NEV</td>
<td>Passenger car</td>
<td>$13,475</td>
</tr>
<tr>
<td>4-Passenger NEV</td>
<td>Passenger car</td>
<td>$13,475</td>
</tr>
<tr>
<td>Long Utility NEV</td>
<td>Light-truck</td>
<td>$12,575</td>
</tr>
<tr>
<td>Long Utility NEV</td>
<td>Light-truck</td>
<td>$12,575</td>
</tr>
<tr>
<td>Short Utility NEV</td>
<td>Light-truck</td>
<td>$11,115</td>
</tr>
</tbody>
</table>

Source: [http://www.bidsync.com/DPX?ac=agencycontview&contid=3695](http://www.bidsync.com/DPX?ac=agencycontview&contid=3695)
Appendix D. Sample Alternative Fuel and Vehicle Purchase Contracts, Policies, and Case Studies

State of California Vehicle Contracts

California Vehicle Purchase and Lease Policy
http://www.documents.dgs.ca.gov/osp/sam/mmemos/mm06_03.pdf
Hybrid Vehicle Purchase
http://www.bidsync.com/DPX?ac=agencycontview&contid=3694
Neighborhood Electric Vehicle Purchase
http://www.bidsync.com/DPX?ac=agencycontview&contid=4243
Alternative Fuel Vehicle Purchase
http://www.bidsync.com/DPX?ac=agencycontview&contid=3695
Trucks, Vans, and Utility Vehicles (Gasoline and Diesel)
http://www.bidsync.com/DPX?ac=agencycontview&contid=3712

About Statewide Vehicle Contracts
The Department of General Services competitively bids and makes vehicle contracts available to California governmental entities helping to meet their vehicle fleet needs. These vehicle contracts leverage pricing based upon California government business volume enhanced by manufacturer and dealer incentive programs provided to government. They also provide a broad spectrum of vehicles at an 8 to 12 percent cost savings over volume commercial fleet pricing (based upon KBB dealer invoice pricing). Generally, contract ordering begins in October and extends through the following March to June timeframe of the Model Year, depending upon manufacturer production schedules. The contracts provide for a 30-day notice of production cut-off dates.

The State of California vehicle contracts are available to any California Governmental entity defined by the California Government Code section 10298, including: county and city governments, K-12 education, special districts, colleges and universities. Customer agencies order directly from the contract dealer; an additional copy of the order goes to the California Department of General Services (DGS) Procurement Division.

DGS charges an administrative fee for use of the contracts. The fee is minimal compared to the time spent and costs agencies would otherwise incur during the specification development, negotiation and the bid process.

Contract notifications include contract terms, dealer contact information, and vehicle specifications. Customer agencies should contact the dealer(s) for help with model changes and pricing on options or deletions. All purchase orders must be complete, with all options, deletions, prices, colors, FOB points, etc., indicated before submittal to the dealer. Per the contract ordering procedures, all state and local agencies must submit a copy of purchase orders to Department of General Services, Procurement Division, Master Contracts.

We will post official ordering cut-off dates as the manufacturers make them available to us. Please submit orders as early as possible; dealers have the option of offering to roll-over contract pricing to the next model year after the manufacturer's order cut-off date but they are not required to do so. Orders may be sent to the dealer either by mail or by fax. If you fax an order in, please do not mail the hard copy or a duplicate order may be issued.

Sample Local Government Policies and Ordinances

Ann Arbor, Michigan - Green Fleet Policy
Seattle, Washington - Clean and Green Fleet
City of San Diego - Alternative Fuel Policy
Portland, Oregon - Biofuels Policy
Sacramento Region, California - Model Low-Emission Vehicle & Fleet Ordinance
San Francisco, California - Clean Vehicles and Alternative Fuels Ordinance
San Jose, California - Green Fleet Policy

Case Studies¹

Santa Monica, California
- BiFuel (CNG-Diesel) transfer tractor and trailer truck, CNG refuse hauler, CNG traffic checker

Bureau of Sanitation - Los Angeles, California
- LNG (dual-fueled) refuse hauler

Specialty Solid Waste and Recycling - Sunnyvale, California
- CNG refuse hauler

NorCal Waste - San Francisco, California
- LNG (diesel ignition) refuse hauler

Waste MGMT - Washington, PA
- LNG Refuse Hauler

Ann Arbor, Michigan
- Fuel Cell passenger vehicles,

Portland International Airport
- CNG, HEV passenger vehicles, B20 sweepers, CNG shuttle buses/vans, CNG, Propane off-highway vehicles

Seattle-Tacoma Airport
- Electric airport ground support equipment, CNG shuttle buses/vans, CNG, Propane passenger vehicles

San Jose Airport
- CNG shuttle buses and vans

Salt Lake City Airport
- CNG, B20 shuttle buses, electric, hybrid light-duty vehicles, CNG heavy-duty trucks

New York City, New York
- HEV taxis

Yellow Cab - San Francisco
- HEV, CNG taxis

Las Vegas, Nevada
- Propane taxis

Iowa State Police
- E85 police cars

Lake Jackson, Texas
- CNG passenger vehicles, refuse haulers, forklifts

Hoover, Alabama
- E85 police vehicle (Chevrolet Tahoe), B20 off-highway vehicle

Redwood National & State Parks
- HEV, Electric passenger vehicles, B20 medium/heavy-duty vehicles, Electric tractor

Carnegie Mellon University
- E85 police car, electric vehicles, B20 shuttle buses and vans

Fayetteville, Arkansas
- B-20 fire department vehicles

City of Vacaville, California
- CNG vehicles and electric vehicles

Clean Cities Program, US Dept of Energy

APPENDIX E - TOOLS
AND CALCULATORS
Appendix E. Tools and Calculators

Puget Sound Green Fleets
Green Fleets Calculator

Alternative Fuels and Advanced Vehicles Data Center, U.S. Department of Energy
Petroleum Reduction Planning Tool

Propane Calculator for fleets
http://www.propanecouncil.org/fleetcalculator/

Electric Vehicle Cost Calculator
http://www.ccds.charlotte.nc.us/~jarrett/EV/cost.php

Natural Gas Vehicle Cost Calculator

Flexible Fuel Vehicle Cost Calculator
http://www.afdc.energy.gov/afdc/progs/cost_anal.php?0/E85/

Cool Fleets (GHG emissions and lifecycle costs)
http://www.coolfleets.com/

Enhanced Efficiency Factor Costing Methodology
http://www.ofa.dgs.ca.gov/AFVP/EEFCM11.htm

Alternative Fuel Vehicles Incentives
http://www.driveclean.ca.gov/incentives_search.php

Alternative Fuel Prices
http://www.afdc.energy.gov/afdc/fuels/prices.html
APPENDIX F - SAN DIEGO REGIONAL ALTERNATIVE FUELS FACILITY LOCATIONS
### Appendix F. San Diego Regional Alternative Fuels Facility Locations

<table>
<thead>
<tr>
<th>Name</th>
<th>Facility Type</th>
<th>Address</th>
<th>City</th>
<th>Zip</th>
<th>Access</th>
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Sources:
- [http://www.afdc.energy.gov/afdc/fuels/stations_locator.html](http://www.afdc.energy.gov/afdc/fuels/stations_locator.html)
- [www.evchargermaps.com](http://www.evchargermaps.com)
- [www.weststart.net/ccm](http://www.weststart.net/ccm)

Notes:
* Card access only
** Credit card required
APPENDIX G – REGIONAL ALTERNATIVE TRANSPORTATION RESOURCES
## Appendix G. Regional Alternative Transportation Resources

<table>
<thead>
<tr>
<th><strong>San Diego Regional Clean Fuels Coalition</strong> (This is also the San Diego Regional Clean Cities Coalition)</th>
<th>Clean Fuels is a network of more than 80 volunteer, community-based coalitions, which develop public/private partnerships to increase use of alternative fuels &amp; alternative fuel vehicles; expand use of fuel blends; promote informed consumer choices; and advance use of idle reduction technologies in heavy-duty vehicles.</th>
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<tr>
<td><strong>California Center for Sustainable Energy (CCSE)</strong></td>
<td>CCSE manages the <a href="#">Fueling Alternatives Rebate program</a>, funded by the California Air Resources Board. This program provides rebates of up to $5,000 for consumers who purchase or lease new eligible modes of transportation, such as neighborhood electric, electric and compressed natural gas vehicles. CCSE also hosts the annual <a href="#">Street Smart</a> event where the public can learn about alternative transportation options.</td>
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<tr>
<td><strong>San Diego Gas and Electric (SDG&amp;E)</strong></td>
<td>SDG&amp;E runs a <a href="#">Clean Transportation Program</a> that focuses on three areas: (1) On-road and non-road electric vehicles, (2) Electric idling initiatives, and (3) Education and outreach.</td>
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<td><strong>San Diego EcoCenter for Alternative Fuel Education</strong></td>
<td>The EcoCenter provides alternative fuel education to 4th-8th grade students in San Diego County. It operates from the 6,000-square-foot EcoCenter that contains a theater and exhibit hall. They provide an environmental field trip experience to about 26,000 middle school students each year.</td>
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REGIONAL ENERGY STRATEGY UPDATE: GOALS AND POLICIES

Introduction

As part of its partnership with the California Energy Commission (Energy Commission), SANDAG is updating its Regional Energy Strategy (RES). The RES was last adopted by the Board of Directors in December 2003. In addition to the efforts of the Regional Energy Working Group (EWG), which oversees the RES Update, the Chair and staff present to other SANDAG committees to gain additional input on strategy development. EWG Chair Downey will brief the EWG on outcomes from the RES presentation to the SANDAG Board at its May 22 meeting, and staff will provide information on additions that were recommended by the Board, Regional Planning Committee, and Technical Working Group at their meetings over the past month.

The Energy Commission extended the interim deadline for SANDAG submitting a first draft from June 1 to July 10, 2009. This extension gives the EWG more time to discuss the energy goals and policies. There is no change to the timeline for the final plan to be completed. A public workshop is planned for the evening of July 7 at CCSE. A final draft is to be considered by the SANDAG Board of Directors in October 2009, with a final report submittal to the Energy Commission by the end of 2009.

Discussion

SANDAG adopted its first regional energy strategy in 1979. Subsequent regional energy strategies were adopted in 1984, 1994, and 2003. The RES Update will set a vision for the region to be met by following a series of guiding principles. Attachment 1 is the set of guiding principles recommended by the EWG at its April 23 meeting.

The draft goals address energy efficiency, electricity and natural gas demand, renewable and nonrenewable energy resources, the electricity grid, transportation energy, and energy intensity of the built environment (Attachment 2). In addition to updating the goals from the 2003 RES, staff is drafting goals in two new areas for consideration by the EWG:

- Border energy considerations (Binational, tribal, and county-to-county)
- Green economic development
At its April 3, 2009, meeting, the Regional Planning Committee recommended another issue area be addressed by the RES Updated goals:

- Water-energy considerations

In July 2009, the Energy Commission will provide staff-level feedback and recommendations for inclusion in a final draft RES Update. A final draft that addresses comments received during a public review period will be brought back to the EWG this summer.

Attachments:
1. Guiding Principles for the RES Update Recommended by the EWG
2. Draft RES Update: Goals and Policies

Key Staff Contact: Susan Freedman, 619-699-7387, sfr@sandag.org
Guiding Principles for the Regional Energy Strategy Update
Recommended by the Energy Working Group

Sustainably Meet Future Energy Needs
The region’s energy needs are met while maintaining environmental quality by employing resources efficiently, diversifying our fuel mix, and utilizing supplies that minimize cost.

Reduce Greenhouse Gas Emissions from Energy Use
Climate change is a serious global challenge to public health, the environment and the economy requiring all levels of government to engage in immediate and sustained cost-effective actions to reduce and mitigate greenhouse gas emissions and prepare for the impacts.

Promote Education and Consensus-Building
An open, transparent and inclusive planning process that includes community and business stakeholders, combined with education programs, increases public awareness and responsible energy decision-making in the region.

Foster the Clean Energy Sector
Economic development initiatives and workforce training programs position the region to supply a growing demand for energy efficient and renewable energy products and services.

Promote Social Equity and Environmental Justice
Energy planning and programs promote the principles of opportunity, inclusion, and equal access for disadvantaged populations and ensure fair treatment and meaningful involvement for all people regardless of race, ethnicity, gender, income, national origin, or geography.

Acquire Cost-Effective Electricity Resources in a Sustainable Manner
New resources come from energy efficiency, demand response, renewable energy, and distributed generation before resources from new transmission and fossil-fuel based generation are sought.

Implement the Smart Grid
The deployment of smart devices, controls, and communications modernize our electricity grid to improve reliability, power quality, and detect problems before service is affected.

Aggressively Pursue Energy Reductions in Existing Residential and Commercial Buildings
Net energy usage and costs from the region’s existing building stock are significantly reduced through targeted energy policies, programs and financing options.

Reduce Energy Demand and Renewable Energy System Cost
Policies and programs promote the integration of energy efficiency at a structure prior to the installation of a renewable energy system in order to reduce the size and cost of the renewable energy system.

Achieve Zero Net Energy Residential and Commercial Buildings
Aggressive strategies, including regulations and incentives, are employed to achieve zero net energy usage in new residential and commercial buildings and communities, and reduce energy usage in existing residential and commercial buildings and communities, through energy efficiency, clean distributed generation, and community planning efforts.

Reduce the Energy Intensity of the Built Environment
The energy intensity of community design, including buildings and travel options, is an integral component of land use and transportation planning.

Ready the Region for Wide-Scale Deployment of Alternative Fuel Vehicles
The region has convenient access to alternative transportation fuels that reduce our dependence on foreign oil supply, reduce local economic impacts from oil price volatility and reduce greenhouse gas emissions.
Draft Goals and Policies for the Regional Energy Strategy Update

Energy use is responsible for more than 90 percent of greenhouse gas (GHG) emissions in the San Diego Region. The largest contributors are on-road transportation (46 percent), electricity use (25 percent) and natural gas end use (9 percent). Adopting energy efficiency measures for buildings, accelerating the deployment of alternative fuel vehicles, and considering the energy impacts of land use and transportation planning decisions, all contribute to meeting the state law to reduce GHG emissions economy-wide to 1990 levels by 2020 and the long-term goal of reducing GHG emissions to 80 percent below 1990 levels by 2050.

ENERGY EFFICIENCY

Goal: Reduce total electricity consumption (GWh) across the region through aggressive but achievable energy efficiency measures.

Targets:

Targets for reducing total electricity consumption will be established for 2020 and 2030. Based on California Center for Sustainable Energy’s (CCSE) analysis, they have proposed three possible regional energy efficiency targets for the RES Update. A Base-Level Target, Mid-Level Target, or Full-Level target (depicted above) would require different levels of commitment to achieve. Within these totals, targets are identified for each electricity sector, including new and existing residential, commercial and industrial structures. The Base-Level Target is illustrated in the following table and Mid-Level in the graph as example.
The energy efficiency targets reflect a projection forward applying existing funding levels from the Public Goods Charge (PGC) program mechanism through San Diego Gas and Electric (SDG&E). Stretch targets for energy efficiency by sector are currently under analysis by the CCSE. The more aggressive goal would result if the region leverages other policies and programs outside the scope of PGC programs.

Based on analysis to date, the proposed Base-Level Targets will result in a 6.0 percent reduction in total electricity consumption below projected levels in 2020 and a 7.1 percent reduction in 2030. For the RES Update, energy efficiency is broadly defined as using less energy to accomplish the same
level of electrical output as a less efficient energy appliance or application. Energy efficiency can be more precisely defined by the potential for it, by type. For this goal, energy efficiency is defined as the market potential for energy efficiency penetration in each electricity sector.

**Policies:**

- **Leverage federal funding**
  - Energy Efficiency and Conservation Block Grants
  - Weatherization programs
  - State Energy Programs
- **Support renewable energy/energy efficiency financing options**
  - Assembly Bill 811
- **Support advanced metering infrastructure**
- **Support long-term energy efficiency plans**
  - CPUC Energy Efficiency Long Term Strategic Plan
    - Focus on energy efficiency market transformation
    - 100 percent of eligible and willing customers will have received all cost effective EE measures by 2020 (CPUC Plan)
- **Support California green building initiative directives**
  - 20 percent reduction of energy use in state-owned buildings by 2015
  - Recommended private commercial sector goals and compliance with Green Building Action Plan
- **Implement legislation that encourages energy efficiency**
  - SB 1037 (2005)
  - AB 2021 (2006)
  - AB 32 (2006)
  - AB 1109 (2007)
- **Support current legislative cycle energy efficiency bills**
- **Promote workforce development in the clean energy sector**

**REGIONAL PEAK DEMAND**

**Goal:** Reduce per capita electricity peak demand (MW) through targeted energy efficiency and demand response measures, and deployment of smart grid technologies.

**Target:**

<table>
<thead>
<tr>
<th></th>
<th>1990</th>
<th>2000</th>
<th>2010</th>
<th>2020</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Peak Demand</td>
<td>2690 MW</td>
<td>3163 MW</td>
<td>4405 MW</td>
<td>4925 MW</td>
<td>Tbd</td>
</tr>
<tr>
<td>Population</td>
<td>2,498,016</td>
<td>2,813,833</td>
<td>3,245,279</td>
<td>3,635,855</td>
<td>3,984,753</td>
</tr>
<tr>
<td>Per capita peak demand</td>
<td>1.08 kW</td>
<td>1.12 kW</td>
<td>1.36 kW</td>
<td>1.35 kW</td>
<td>Tbd</td>
</tr>
<tr>
<td>RES Goal</td>
<td>Tbd</td>
<td>Tbd</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Placeholder for graphs showing current San Diego regional peak load demand and desire to flatten load curve and achieve higher capacity factor]

Reducing electric demand through conservation, energy efficiency, and demand response activities are the first actions that should be taken by the region. Such demand-side measures can be considered a most reliable “supply resource” option and have been consistently shown to be the
easiest to achieve. Demand reduction delays the need for the construction of new generation and new transmission. Demand reduction reduces the output requirements placed on in-region power plants, thus improving air quality and community health.

Approximately one-third of energy demand in the SDG&E territory is derived from air-conditioning (A/C) units during peak summer periods. Not only does this affect overall consumption, but high A/C demand during summer peak periods has necessitated the use of less efficient regional peaker plants that have air quality impacts for the region.

In addition to demand-side measures, implementing a smart grid in the San Diego region will provide a reduction in peak demand, improve system availability and provide capacity improvements due to improved power flow. A smart grid is further detailed in the RES goal for the electricity grid. It includes smart devices, two-way communications and advanced control systems. A smart grid can detect and address emerging problems on the transmission and distribution system before they affect service and enable ratepayers that chose to participate to use smart devices that can cycle A/C units, set dryers or other energy intensive equipment to run at off peak hours energy is in greater supply and less costly.

**Policies:**

- Encourage participation in demand response programs
- Support fair and reasonable rate designs and incentives that encourage reductions in peak demand
- Support SDG&E in obtaining resources to implement a smart grid in San Diego region.
- Support and promote Develop aggressive A/C load reduction programs
- Support aggressive energy efficiency programs that prioritize existing building retrofits
- Support development of a regionally consistent and comprehensive energy efficiency building retrofit program

**CLEAN DISTRIBUTED GENERATION**

**Goal:** Increase the total amount of distributed generation (DG) resources (renewable and non-renewable) in the region to diversify the electricity resource mix and reduce summer peak demand with on-site or near-load resources.

**Targets:**

<table>
<thead>
<tr>
<th>Distributed Generation Technology</th>
<th>2008 (MW) actual</th>
<th>2020 Goal (MW) = 8% of State Goals</th>
<th>2030 Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydro (built out)</td>
<td>3.8</td>
<td>3.8</td>
<td>3.8</td>
</tr>
<tr>
<td>Bio</td>
<td>6.4</td>
<td>24</td>
<td>26.55</td>
</tr>
<tr>
<td>Steam (built out)</td>
<td>6.6</td>
<td>6.6</td>
<td>6.6</td>
</tr>
<tr>
<td>PV</td>
<td>49.4</td>
<td>210</td>
<td>249.29</td>
</tr>
<tr>
<td>CHP</td>
<td>341.0</td>
<td>264</td>
<td>397.79</td>
</tr>
<tr>
<td><strong>Total DG</strong></td>
<td><strong>407.2</strong></td>
<td><strong>508.4</strong></td>
<td><strong>684.03</strong></td>
</tr>
<tr>
<td>Net Peak Demand</td>
<td>4568.0</td>
<td>5411</td>
<td>6218</td>
</tr>
<tr>
<td><strong>Penetration of DG</strong></td>
<td>8.9%</td>
<td>9.4%</td>
<td>11.0%</td>
</tr>
</tbody>
</table>

The draft targets are to exceed 500 MW (9 percent of net peak demand) by 2020 and 684 MW (11 percent of net peak demand) by 2030. Targets by technology also have been established.

The overall targets have been revised downward from the 2003 RES after analysis by the California Energy Commission (Energy Commission) and CCSE of the market potential for these technologies shown that the earlier goals were unachievable. For the RES Update, distributed generation is defined as an onsite or near-load electricity generator, under 20 MW, serving either onsite load (or a portion thereof) or the regional utility grid. Technologies and fuels included in the definition of distributed generation are solar, wind, biomass and biogas, fuel cells, clean and efficient combined heat and power (CHP) systems, efficient microturbines, and internal combustion engines (ICEs). Advanced energy storage (AES) is included here as a recently added component of DG applications.

**Policies:**

- Implement legislation that encourages DG technologies and implementation
  - AB 32 (2006)
  - SB 1078 (2002)
  - AB 2466 (2008)
  - AB 1613 (2007)
- Continue incentive programs for distributed generation technologies
  - Self-Generation Incentive Program
  - California Solar Initiative
- Implement financing options that promote distributed generation
  - AB 811
- Support smart grid policy implementation
- Promote workforce development in the clean energy sector
LARGE-SCALE RENEWABLE ENERGY SUPPLY

Goal: Significantly increase the region’s total electricity supply from renewable energy resources.

<table>
<thead>
<tr>
<th>Targets:</th>
<th>2008 (actual)</th>
<th>2020</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renewable Resources</td>
<td>7%</td>
<td>33%</td>
<td>50%</td>
</tr>
<tr>
<td>Included in SDG&amp;E RPS</td>
<td>4568.0</td>
<td>5411</td>
<td>6218</td>
</tr>
</tbody>
</table>

Small-scale renewable resources are addressed in the distributed generation goal above. The 2010 and 2020 targets have been revised upward from the 2003 RES to reflect more aggressive state law and policy. The 2030 target from the 2003 RES remains unchanged. The draft targets for the RES Update call for increases in the amount of renewable energy resources to 20 percent by 2010, 33 percent by 2020 and 50 percent by 2030.

Renewable resources include supply that counts toward SDG&E meeting the renewable portfolio standard (RPS). California's RPS program requires electric corporations to increase procurement from eligible renewable energy resources to reach 20 percent by 2010. In November 2008, the governor signed Executive Order S-14-08 directing all state agencies to work toward achieving 33 percent by 2020. The Energy Commission, California Public Utilities Commission (CPUC) and California Air Resources Board (CARB) support the higher RPS goal for 2020, which still must be codified into law through legislation. The large-scale renewable energy goal also will include any renewable resources not counted in the DG goal.

Policies:
- In a regionally-consistent manner, assist local governments in the identification and removal of barriers to siting renewable energy installations in San Diego County.
- Assist local governments in identification of potential sites for renewable energy projects that will help the region and SDG&E meet renewable energy targets.
- Promote quality jobs for workers employed in the energy sector through training programs related to local renewable energy industries.
- Support cost-effective transmission access from areas rich in renewable resources to the San Diego region.
- Monitor the Renewable Energy Transmission Initiative (RETI) and consider its recommendations in future regional planning.

THE ELECTRICITY GRID

Goal: Modernize and expand the transmission and distribution grid to maintain required reliability, provide better access to renewable resources, provide competitively priced electricity, and implement a smart grid in the San Diego region.

The transmission grid provides for a number of functions, including providing access to out of region power, improving fuel diversity (in particular, renewable resources), providing access to
broader supplies in the market that help lower and stabilize electric prices, improving system stability and reliability, and creating opportunities for local generation to sell to markets outside San Diego. These benefits need to be balanced with the fact that siting issues for new transmission lines are often contentious and difficult to achieve due to the large number of parties that are affected by such projects (e.g. visual impacts, potential impacts on property values, habitat impacts).

California state law requires the utilities to follow a specific “Loading Order” when developing their resource plans. Under this law, utilities should seek new energy resources first from energy efficiency, demand response, renewable energy, and distributed generation before seeking resources from new transmission and fossil-fuel based generation. The state also identifies the lack of transmission access from areas rich in renewable resources to load centers as a major obstacle to meeting the RPS targets.

Transmission is an integral component of a balanced electricity strategy. Additional transmission capacity will enable the San Diego region to gain access to areas rich in renewable resources, significantly increase electricity supply from renewable energy, and assist the region in meeting its renewable energy target of 33 percent by 2020.

The San Diego Smart Grid Study was released by EPIC in 2006 and included extensive analysis of the technologies, utility and societal costs and benefits, scenarios for implementing a smart grid in the San Diego region.

<table>
<thead>
<tr>
<th>Summary of San Diego Smart Grid Study Cost-Benefit Analysis Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Annual Benefits</td>
</tr>
<tr>
<td>System Benefits (20-years)</td>
</tr>
<tr>
<td>Societal (Consumer-side) Benefits (20-years)</td>
</tr>
<tr>
<td>Total Capital Cost</td>
</tr>
<tr>
<td>Annual O&amp;M Cost</td>
</tr>
</tbody>
</table>

Source: EPIC, 2006
### Smart Grid Benefits for the San Diego Region

<table>
<thead>
<tr>
<th>Benefit Type</th>
<th>Societal $$</th>
<th>System $$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in congestion cost</td>
<td></td>
<td>$13.1M</td>
</tr>
<tr>
<td>Reduced blackout probability</td>
<td></td>
<td>$1.5M</td>
</tr>
<tr>
<td>Reduction in forced outages/ interruptions</td>
<td></td>
<td>$38.6M</td>
</tr>
<tr>
<td>Reduction in restoration time and reduced operations and management due to predictive analytics and self healing attribute of the grid</td>
<td></td>
<td>$11.3M</td>
</tr>
<tr>
<td>Reduction in peak demand</td>
<td></td>
<td>$25.6M</td>
</tr>
<tr>
<td>Other benefits due to self diagnosing and self healing attribute of the grid</td>
<td></td>
<td>$0.2M</td>
</tr>
<tr>
<td>Increased integration of distributed generation resources and higher capacity utilization</td>
<td></td>
<td>$14.7M</td>
</tr>
<tr>
<td>Increased security and tolerance to attacks/ natural disasters</td>
<td></td>
<td>$1.2M</td>
</tr>
<tr>
<td>Power quality, reliability, and system availability and capacity improvement due to improved power flow</td>
<td></td>
<td>$1.3M</td>
</tr>
<tr>
<td>Regional job creation and increased GDP</td>
<td></td>
<td>$28.3M</td>
</tr>
<tr>
<td>Increased capital investment efficiency due to tighter design limits and optimized use of grid assets</td>
<td></td>
<td>$0.2M</td>
</tr>
<tr>
<td>Tax benefits from asset depreciation, tax credits, and other</td>
<td></td>
<td>$3.1M</td>
</tr>
<tr>
<td>Environmental benefits gained by increased asset utilization</td>
<td></td>
<td>$2.4M</td>
</tr>
<tr>
<td><strong>Subtotals</strong></td>
<td>$69.7M</td>
<td>$71.8M</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$141.5M</strong></td>
<td></td>
</tr>
</tbody>
</table>

Source: EPIC, 2006

### Policies:
- Secure funding to conduct a feasibility study on the potential for establishing infrastructure corridors that could include pipelines, transmission lines, roadways, and cable.
- Support the adoption and deployment of smart-grid technologies.
- Support regional entities like SDG&E and Energy Policy Initiatives Center at University of San Diego in acquiring state and federal funds to implement smart grid for San Diego.
- Support cost-effective transmission access from areas rich in renewable resources to the San Diego region.
- Monitor the RETI and consider its recommendations in future regional planning.

### TRANSPORTATION ENERGY

**Goal:** Reduce petroleum dependence by accelerating the deployment and availability of cost-competitive alternative fuel vehicles in the San Diego region.

Transportation was not addressed in the 2003 RES except to call for further study. Refueling stations and other infrastructure that can accommodate alternative fuel vehicles must be in place to provide members of the public and fleet managers with a level of certainty that they can purchase alternative fuel vehicles without concern over finding a fueling station or maintenance facility. The state has enacted several laws to reduce reliance on petroleum-based transportation fuels.
Increasing the use of alternative fuels will help mitigate energy security concerns, provide a buffer from oil price volatility and emit fewer GHG emissions than petroleum-based fuels. Improved vehicle fuel efficiency required by state and federal standards also will help the region address these concerns.

The choice of which alternative fuel will vary based on vehicle class and customer needs. The region will utilize alternative fuels that meet the state's low carbon fuel standard (LCFS), which is determined by a full fuel cycle analysis (“well to wheels”). Fuels with lower carbon intensities than conventional gasoline and diesel qualify for the LCFS and are eligible for state aid to increase their deployment. Both the state and federal government have significant financial and technical resources available for increasing alternative fuels, vehicles and infrastructure.

**Policies:**

- Identify and secure state and/or federal funding to increase the deployment of alternative fuel vehicles and infrastructure for the region.
- Assist local and regional government fleets to purchase alternative fuel vehicles and use alternative fuels.
- Through public and private partnerships, increase the availability of alternative fuel vehicles and infrastructure in the San Diego region.
- Support local alternative fuel companies that can provide supply to the region.
- In a consistent regional manner, support the Identification and removal of permitting or other barriers to siting refueling/recharging stations and state-approved home refueling options.
- Identify regional transportation investment projects that could be augmented with an alternative transportation component.
- Coordinate with vanpool and carpool programs to replace fleet vehicles with more efficient models.
- Coordinate with regional transit agencies to identify and fund energy reduction technologies for the trolley and light rail.

**ENERGY CONSIDERATIONS FOR LAND USE AND TRANSPORTATION PLANNING**

**Goal:** Reduce the energy intensity of the built environment.

This is a new area of focus by the state, although SANDAG’s 1994 energy plan did recognize the need to consider maximizing mobility in community design and building structures with energy efficiency in mind. A proposed target for the RES Update is to increase the number of designated “Potential Smart Growth Areas” (PSGAs) that become part of adopted local plans. Since there are currently 111 PSGAs, attention should begin with areas already served by transit. To achieve this target, methods to address associated energy, water, transportation or other necessary infrastructure improvements must be considered.

Community design is strongly related to energy consumption. The energy intensity of a community is in large part determined by the design and layout of individual buildings and their spatial relation to each other and supporting transportation infrastructure. Local governments influence community design through their land use planning authority and local infrastructure decisions. Local governments provide the blueprint for future land use development and community design in
their communities through the General Plan. SANDAG conducts transportation planning for the region and provides land use planning guidance to local governments through the Regional Comprehensive Plan (RCP). In the San Diego region, a major objective of local land use and regional transportation planning is to identify the land and infrastructure needed to accommodate projected population, housing and job growth while maintaining and enhancing quality of life. The San Diego region is forecast to grow by another million residents by 2030, about 30 percent more people than today (2009).

Over the long term, the land use and transportation planning decisions made to accommodate future growth will have a large impact on the spatial distribution of buildings and places and how people travel among them. As a result, energy must be a primary consideration in land use and transportation planning.

**Policies:**
- Assist local governments in a regionally-consistent manner with incorporating energy-saving measures into general plans and development codes.
- Encourage and help local governments to incorporate Potential Smart Growth Opportunity Areas into their adopted land use plans.
- Support adoption of a resolution calling for zero net energy homes by 2020 and zero net energy commercial buildings by 2030.
- In a regionally consistent manner, promote the integration of efficient energy supply, distribution and use, and petroleum reduction measures into all facets of land-use planning and development.
- Assist local governments with policies and standards that emphasize pedestrians, bicycles, and public transit.
- Support funding and incentives for transportation demand management (TDM) programs like iCommute, carpools, vanpools and telecommuting.
- Support making walking, bicycling and public transportation practical choices for travel.

**NATURAL GAS**

**Goal:** Through energy efficiency measures and fuel diversification, reduce per capita natural gas consumption in the region.

Natural gas is the least polluting fossil fuel and the only fossil fuel that California allows to fuel in-state power plants. It is used for space conditioning and water heating and as a growing transportation fuel for some buses, heavy duty vehicles and passenger vehicles. It is less polluting and more energy efficient than diesel or gasoline.

[Placeholder for energy intensity of various types of natural gas (CNG, LNG, NG) and availability]

Regional natural gas consumption is expected to grow to 590 million metric therms (MMTh) in 2010, 660 MMTh in 2020 and 730 MMTh in 2030. As demand for natural gas continues to grow in the region, and with the passage of AB 32, priority must be made to utilizing natural gas in the most energy efficient manner and where applicable and cost-effective, replace it with a renewable fuel. Draft targets for the RES Update are to reduce per capita natural gas consumption by 10 percent in 2020 and 15 percent in 2030.
Significant opportunities exist to reduce the use of natural gas in the region, including the dismantling or repowering of aged power plants with more efficient combined cycle gas turbines, expanding the use of solar for hot water and solar pool heating, and reducing demand and peak demand by other energy efficiency measures. The passage of AB 1368 in 2006, placed a GHG emissions standard on power purchases of California utilities that will effectively prevent any high-emission baseload plants from being contracted within the state.

**Policies:**
- Monitor the availability and cost of natural gas supplies in light of increased regulatory and environmental restrictions on fossil fuels.
- Support policies that will provide more stable natural gas prices and reduce consumer exposure to market volatility.
- Increase use of solar water heating in residential, pool and commercial uses to offset natural gas demand.
- Promote the use of high efficiency distributed generation technologies like combined heat and power.
- Promote the weatherization and insulation of un-insulated homes built before the development of building energy codes.
- Increase and promote demand-side energy efficiency programs to reduce residential, commercial and industrial gas usage.
- Encourage the re-powering or replacement of older power plants in the county with high efficiency combined cycle gas turbines or a more efficient technology or fuel.

**ADDITIONAL STRATEGIC ENERGY GOALS UNDER DEVELOPMENT FOR EWG CONSIDERATION**

1. Water Energy Considerations
2. Clean Energy Economic Development Considerations
3. Border Energy Considerations

### 1. WATER- ENERGY NEXUS

**Goal:** Reduce the energy-intensity of regional water activities through a combination of water and energy conservation and efficiency strategies.

Moving water supply, water treatment, and customer end uses are extremely energy intensive activities. Water planning at the federal, state and local levels has historically failed to consider the energy implications of water supply, demand and waste. California’s water systems are uniquely energy intensive relative to national averages. We have pumping requirements for major conveyance systems which move water over long distances and thousands of feet in elevation lift. San Diego County is at the most energy intensive end of the State Water Project (SWP) and Colorado River Aqueduct. The future demand for additional sources of water and the limited supply requires us to identify conservation and efficiency options in resource planning, regulation and energy/water sector collaboration. Climate change is expected to lead to greater risk of drought or
water shortages in the summer months, and increased runoff and flooding might occur during the winter months.

**Key Energy-Water Findings for California (Energy Commission IEPR):**

- Electricity for water uses costs Californians at least $2 billion per year, and this electricity use and dollar figure are expected to grow.
- Urban water and wastewater facilities draw about 3,000 MW of power at peak use, with about 1,800 MW of that occurring in Southern California.
- Many of the peak demands for water and the energy required to treat and transport that water coincide with the peak seasonal energy demands experienced by the electrical utilities, particularly in Southern California.
- Water conservation is the most efficient strategy in addressing the need for additional water sources and achieving energy savings.
- Investment in conservation may forestall or avoid larger public investments for drinking water, clean water infrastructure, or power generation facilities, and it will help stretch available public water funds.
- Water recycling is a highly energy efficient water source with considerable potential.
- There is essentially zero potential for securing significant new freshwater sources in the state.
- Desalinated brackish water and seawater can relieve drought conditions, replace and restore groundwater, and provide a source of water for river and stream ecosystem restoration.
- Solutions to California’s water management issues are best planned and carried out on a regional basis.
San Diego Regional Water – Energy Findings

- End use energy dominates San Diego County’s water-use cycle (57% of total energy use or 3900 kWh/acre-foot of 6900 kWh/acre feet total)
- San Diego County Water Authority (SDCWA) estimates that at least an additional 100,000 acre-feet/year will be needed in 2020 (SDCWA supplies about 600,000 af/year currently).
- The Energy Commission identifies water conservation as the far superior water “source” from an energy perspective.
- The amount of energy used to deliver water from the State Water Project to residential customers in Southern California is almost 1/3 the total average household electric use in the region. (The SWP burns energy by pumping water 2,000 feet over the Tehachapi Mountains -- the highest lift of any water system in the world.)

San Diego Water Reclamation Progress
The San Diego region has already made substantial investment in water reclamation. The City of San Diego has constructed two reclamation facilities – North City Water Reclamation Plant (NCWRP) and South Bay Water Reclamation Plant (SBWRP). NCWRP has capacity to produce up to 24 million gallons per day (MGD) of recycled water, but existing beneficial reuse, consisting mostly of irrigation and some industrial purposes, total only about 6 MGD (City of San Diego, Water Reuse Study [2006]). The SBWRP produces from five to six MGD of recycled water that is then disposed through the ocean outfall, without application for domestic or industrial reuse. Thus, although the region has substantial capacity to produce recycled water with adequate quality, actual demand for

### TABLE 7
Estimated Energy Use Integral to Water End Use In San Diego County

<table>
<thead>
<tr>
<th>Water Use Category</th>
<th>Estimated Percent of Total Use in 2010 (8)</th>
<th>Estimated Energy Intensity (kWh/af) (8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>58%</td>
<td>0</td>
</tr>
<tr>
<td>Toilets and leaks</td>
<td>14%</td>
<td>0</td>
</tr>
<tr>
<td>Dishwashers</td>
<td>1%</td>
<td>27,200</td>
</tr>
<tr>
<td>Clothes washers</td>
<td>8%</td>
<td>11,650</td>
</tr>
<tr>
<td>Showers, faucets, and bathtubs (1)</td>
<td>12%</td>
<td>6,700</td>
</tr>
<tr>
<td>Landscape irrigation</td>
<td>23%</td>
<td>0</td>
</tr>
<tr>
<td><strong>Commercial, Industrial, and Institutional</strong></td>
<td>32%</td>
<td>27,200</td>
</tr>
<tr>
<td>Kitchen dishwashers</td>
<td>0.5%</td>
<td>0</td>
</tr>
<tr>
<td>Prerinse nozzles</td>
<td>0.2%</td>
<td>6,700</td>
</tr>
<tr>
<td>Other kitchen use</td>
<td>1.2%</td>
<td>Not Estimated</td>
</tr>
<tr>
<td>Laundries</td>
<td>0.6%</td>
<td>11,650</td>
</tr>
<tr>
<td>On-site wastewater treatment (2)</td>
<td>5.8%</td>
<td>800</td>
</tr>
<tr>
<td>Water-cooled chillers (3)</td>
<td>2.4%</td>
<td>57,700</td>
</tr>
<tr>
<td>Single pass cooling (3)</td>
<td>2.4%</td>
<td>0</td>
</tr>
<tr>
<td>Landscape irrigation</td>
<td>12.1%</td>
<td>0</td>
</tr>
<tr>
<td>Other heated water (4)</td>
<td>0.3%</td>
<td>6,700</td>
</tr>
<tr>
<td>Other unheated water (5)</td>
<td>6.5%</td>
<td>Not Estimated</td>
</tr>
<tr>
<td><strong>Agricultural (6)</strong></td>
<td>10%</td>
<td>Not Estimated</td>
</tr>
<tr>
<td><strong>Totals and weighted average (7)</strong></td>
<td>100%</td>
<td>3,900</td>
</tr>
</tbody>
</table>

Source: California Energy Commission IEPR
recycled water has not matched that capacity. None of the recycled water is currently used as potable water, due to lack of public acceptance.

Currently, a substantial portion of the reclaimed water processed by the MWD is never utilized. Instead, it is pumped back into the general wastewater lines where it is run through treatment processes again at the Point Loma water treatment facility, and disposed of in the Pacific Ocean. This represents a waste of water and the energy used to process and pump it.

**Water and Power Plant Findings**
- The Energy Commission will no longer approve the use of fresh water to provide makeup for conventional power plant cooling systems (i.e., favoring instead use of degraded or recycled water, or air-cooled systems), nor anything but use of zero-liquid discharge (ZLD) systems to handle any wastewater, unless such use is “environmentally undesirable or economically unsound”.
- Wind power and solar photovoltaic systems use no water during operations
- Distributed energy systems essentially are air-cooled machines, needing little to no water for power operations.

**Recommended Water – Energy Actions for San Diego Region:**
- Regional and local governments should collaborate with CWA, local water districts and SDG&E to undertake cooperative programs to increase water conservation and acceptance of reclaimed water for domestic use to help the region meet its goals of water source diversification
- The San Diego region needs to take whatever measures necessary to ensure that 100 percent of the reclaimed water that is processed is utilized in an effective manner – it’s too expensive to reclaim it and then dispose of it into the Pacific Ocean.
  - The San Diego region has recycled water resources available that could be utilized for power or other uses. The Palomar power plant in Escondido uses reclaimed water for cooling.
- Promote end use water conservation as an optimal means to reduce future water resource needs and energy intensive processes.
- Promote increased coordination on energy and water conservation measures among water agencies, local governments and SDG&E
- Promote energy efficiency, demand response and self-generation efforts at water pumping stations and treatment facilities
- Develop and promote innovative, regionally consistent water conservation programs to assist residential and commercial water customers
- Identify financing mechanisms that end users can utilize to reduce water usage such as those available for energy measures (i.e., on-bill financing (property tax or utility) and low interest loans).
- End use efficiency education programs that raise awareness and encourage conservation habits among residential and commercial customers.
- Incentives for reduction of lawn size & use of native arid plants that would reduce residential irrigation.
  - Provide sprinkler recommendations- limited days, or watering in the mornings and afternoons to avoid excessive evaporation.
2. CLEAN ENERGY ECONOMIC DEVELOPMENT CONSIDERATIONS
Developing/Expanding a Clean Energy Economic Cluster

Significant federal and state investment will be injected into the Clean Energy Sector:
- The American Recovery and Reinvestment Act (ARRA) provides $787 billion over the next ten years, with most of the spending occurring over the next two years.
- The act includes $48 billion in investments in job training and education, nearly $100 billion in funding for transportation and infrastructure, $20 billion in tax incentives for renewable energy, and more than $41 billion for energy-related programs.
- A substantial portion of these funds can be used to green our economy and communities while creating quality employment and training opportunities that provide pathways out of poverty.

Definitions of Green Economy- Clean Energy Economy
The state of California is finalizing a definition of “green jobs” for use in stimulus-related programs and funding. The state’s definitions will be used for the RES Update.

The US Conference of Mayors defines the ‘Green Economy’ as that part of economic activity which is devoted to the reduction of fossil fuels, the increase of energy efficiency, and the curtailment of greenhouse gas emissions. The economic advantages of the Green Economy include the macroeconomic benefits of investment in new technologies, greater productivity, improvements in the US balance of trade, and increased real disposable income across the nation. They also include the microeconomic benefits of lower costs of doing business and reduced household energy expenditures. These advantages are manifested in job growth, income growth, and of course, a cleaner environment. They listed the San Diego region as one of the top ten metropolitan areas for green jobs.

Another description of green jobs
Green jobs typically deal with reducing pollution or conserving resources. They are sometimes broken into two parts: engineers and scientists who create new technologies, and technicians who put new methods or products into use. The sectors include renewable energy, low-impact construction, biofuels, “clean transportation,” environmental compliance and conservation-minded water and waste management. In many cases, people have been doing green work for years without getting the label.

Green-Collar Jobs are:
- Jobs that preserve, restore, or improve the environment.
- Jobs that help save energy, advance new energy efficient technologies, and foster a more sustainable regional and national energy system.
- Either blue or white collar positions, updated to adopt sustainability as a core segment of the individuals’ job description.
- Career opportunity capable of supporting a family’s income, with the potential for advancement.

Green-Collar Jobs provide opportunities and advantages, such as:
- Creating new jobs or retraining the unemployed in a time of economic downturn.
- Providing opportunities for career advancement in the sustainability fields.
- Reducing our dependence on foreign oil, and strengthening national security.
Promoting the use of domestic renewable energy resources.
Reducing the tax burdens of inefficient public buildings and public housing.
Mitigating climate change by cutting green house gas emissions.

Some jobs will be created directly by the American Recovery and Reinvestment Plan, while others will grow out of normal economic growth created by businesses supporting infrastructure projects and support for the needs of the workers. Jobs in construction and manufacturing are projected to have the largest growth. These jobs will generally offer higher than average wages and include a significant percentage of union jobs, as well as jobs for women and minorities. Below is a sample of the jobs projected to be created from the federal recovery plan.

<table>
<thead>
<tr>
<th>GREEN INVESTMENTS AND JOBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>STRATEGIES FOR GREEN ECONOMIC INVESTMENT</td>
</tr>
<tr>
<td>------------------------------------------</td>
</tr>
<tr>
<td>Building Retrofitting</td>
</tr>
<tr>
<td>Mass Transit/Freight Rail</td>
</tr>
<tr>
<td>Smart Grid</td>
</tr>
<tr>
<td>Wind Power</td>
</tr>
<tr>
<td>Advanced Biofuels</td>
</tr>
</tbody>
</table>

Source: PERI

This is a unique time for this development with significant ARRA-based federal and state funding for this area, in particular with infrastructure investment and workforce development. Regional and local governments should identify and provide public policy support in order to foster the region’s Clean Energy Sector. We should strengthen our existing industries, our emerging growth companies, and our universities and research and development institutions that create new enterprises. These actions represent important opportunities for the region; they are part of the foundation on which our future economic prosperity depends.

In the most advanced economies worldwide, one or more industry clusters serve as the driving force of the regional economy. At the core of the cluster are geographic concentrations of interdependent, internationally competitive firms in related industries. Clusters include large companies and small companies, and both domestic and foreign firms. In addition to selling their products and services locally, cluster firms sell globally and bring outside dollars into our region.

Clean energy is being identified as one of the most promising new ventures for American manufacturing. The domestic market for solar panels, wind turbines, fuel cells, combined heat and power (CHP) systems, and biomass engines is projected to reach $226 billion annually by 2016.
Demand for solar and wind power will continue to expand over the next 20 years, and between 70 and 80 percent of the new jobs created in those industries will be in the manufacturing sector.

**Job Creation by Clean Energy Sector**

Studies and the influx of federal stimulus funding create the potential for significant growth in Clean Energy Sector. Several studies identify various levels of job creation.

- According to research by Roger Bezdek for the American Solar Energy Society (ASES), the renewable energy and energy efficiency industries created a total of 8.5 million jobs (direct and indirect) in 2006; 450,000 jobs in renewable energy and 8 million jobs in energy efficiency throughout the United States. As many as 1 out of 4 workers in the United States will be working in these industries by 2030. The 40 million jobs are not just engineering-related, but also include millions of new jobs in manufacturing, construction, accounting, and management.
- A report from the US Council of Mayors projects that 4.2 million new green jobs can be added to the US economy by 2038.
- According to the Center for Energy, Resources and Economic Sustainability at the University of California, Berkeley, California's energy efficiency policies created nearly 1.5 million jobs from 1977 to 2007, while eliminating fewer than 25,000.
- The EPA reports that investment in energy efficiency programs results in direct, indirect and induced employment increases in energy efficiency and related fields during the program life and thereafter. Examples of direct jobs include program staff and contractors required for measure installation. Indirect jobs include manufacturing and service positions that supply technologies rebated and installed by programs, and induced jobs result when the utility bill savings that accrue to participants are either saved or spent.

**Manufacturing**

Investing in renewable energy and energy efficiency manufacturing creates and retains permanent good jobs on the factory floor. The American Council for an Energy Efficient Economy conservatively estimates that every $1 million of investment in renewable energy systems creates approximately five full-time component manufacturing jobs. Every $1 million invested in energy efficiency programs creates three to four building-material manufacturing jobs and five energy efficient appliance manufacturing jobs. Investing in manufacturing also drives regional economic development: every dollar invested in manufacturing generates more associated (or induced) jobs – in other words, has a higher “multiplier effect” – than each dollar invested in other sectors of the economy, such as services. The Economic Policy Institute estimates that every direct manufacturing job supports an additional 2.9 indirect jobs in finance, transportation, supply chains, installers, and other related businesses.

**Green Construction**

Research has shown that both green and conventional construction projects are being bid and worked on by similar contractors, implying that green construction work does not require specialized workers. Instead, one of the key differences between green and conventional renovations is generally the materials used in the process. One problem that currently exists in the industry, however, is a knowledge gap across many contracting firms. Some firms are not fully aware of some green construction techniques or the wide variety of modern materials that can be used in a given renovation project. This makes them unable to effectively educate customers about the energy efficient building options that are available.
As green building technology becomes increasingly popular—due to advocacy programs like Energy Star® — traditional contractors will develop their skill sets and expand their knowledge bases in ways that will allow them to transform large numbers of ordinary buildings into some of the most energy efficient in the world. The existing stock of energy inefficient buildings offers an opportunity to reduce total electricity demand and create jobs for these workers.

Building Retrofit Workers
A 2008 study on green economy job opportunities by the Political Economy Research Institute (PERI) identifies a specialty trade contractor component of the construction sector will benefit the most from new clean energy employment opportunities. Many of the workers required to complete the renovation work and installations of efficiency upgrades fall under the classifications of the traditional construction trades that comprise this category. Ultimately, increasing demand for green building work can be expected to generate new employment opportunities for electricians, HVAC technicians, carpenters, plumbers, roofers, laborers, and insulation workers, among others. Increased demand for green retrofitting work will simultaneously stimulate demand for green building materials, providing additional sources of job gains in associated manufacturing industries.

San Diego Region’s Labor force through 2030
The San Diego region will experience major changes and shifts in its population over the next 30 years, which in turn will affect its labor force. We are growing and are expected to add nearly one million people; we are becoming more ethnically diverse – the Hispanic and Asian populations will nearly double, and the non-Hispanic White population will shrink by more than one percent; our median age is increasing and we are living longer – the number of seniors will double, and the number of octogenarians will nearly triple; and an increasing number of us are using temporary employment agencies to find jobs throughout our careers.

Workforce Training and Education for Clean Energy Sector
- Provide training and education to existing construction workers and firms on clean energy materials and business practices.
- Local governments should enlist existing organizations like San Diego Workforce Partnership to explore new approaches to providing education and training opportunities to workers employed by temporary staffing agencies. The San Diego region has a large number residents employed in the temporary field.
- Utilize community colleges and university extension programs to provide programs to prepare older workers for the opportunity to remain actively employed and transition to Clean Energy fields.
- Local governments can partner with regional schools and Workforce Investment Boards (WIBs) to bring funding to the San Diego region to spur green economy knowledge and skills.
- Integrate green jobs initiatives into existing workforce systems
- Leverage resources at universities, community and technical colleges, WIBs, community-based organizations, and economic development agencies
  - Universities offer four year Degree Programs and Graduate Degrees in Business, Engineering, and the Sciences.
  - Community Colleges offer both two year Business and Technical Degree Programs and Certification Programs.
  - Tech High Schools offer Trade preparation with hands-on technical laboratories, apprenticeship programs and some certification programs.
Dept of Labor, partnering with Community Colleges, Tech High Schools, Unions and Business offer Job Skills Training programs and Apprenticeships.

**Placeholders:** Growth of Industry- Clean Energy Products more Mainstream

[Placeholder for Table 9: Energy Star Program Key Indicators, 2000 and 2006]

[Placeholder for online longer RES chapter, include table of variations in Economic studies on Job Creation from Clean Energy Sector]

### 3. BORDER ENERGY CONSIDERATIONS

**Goal:** Integrate energy considerations into existing collaborative border initiatives.

Energy supply, usage and conservation in the San Diego region are impacted by actions of its neighbors and vice versa. San Diego County borders include Orange, Riverside and Imperial Counties, Mexico, and 17 tribal governments. Collaborative efforts are underway between SANDAG, its member agencies and its neighbors on various issues including transportation congestion management and goods movement. The San Diego region should integrate energy considerations into its border planning activities as the region strives to diversify its fuel sources, expand renewable energy resources, and address environmental and climate related pollutants from energy activities. The region cannot be successful in any of these areas without the involvement of our neighbors.

**SANDAG Borders Committee**

The SANDAG Borders Committee advises the Board of Directors on policy issues related to transboundary planning from three perspectives: interregional, binational, and tribal. Through periodic Tribal Summits, the Committee facilitates consultation between local jurisdictions and tribal governments. This government-to-government dialogue, establishes priority actions for the Borders Committee to pursue in partnership with the SCTCA. The current Advisory Members of the Borders Committee include representatives from Orange County Council of Governments (OCCOG), the Western Riverside Council of Governments (WRCOG), the Imperial Valley Association of Governments (IVAG), the Southern California Association of Governments (SCAG), Mexico (through the Consulate General of Mexico in San Diego), the Southern California Tribal Chairman’s Association (SCTCA), Caltrans, and the San Diego County Water Authority.

**Tribal Coordination**

The San Diego region is home to 18 Native American reservations represented by 17 Tribal Governments, the most in any county in the United States. The 17 sovereign domestic nations are from four cultural/ethnic groups: the Kumeyaay/Diegueño, the Luiseño, the Cupeño, and the Cahuilla. Native American reservations currently make up approximately four percent of the region’s land-base. All of the reservations are located within the unincorporated eastern portion of the county.¹

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Tribal governments in San Diego County and SANDAG are working together to develop and implement innovative government-to-government strategies to address transportation and other regional planning issues. The current government-to-government relationship is a federal/tribal relationship. For the most part, government-to-government relations between tribes and regional planning agencies, local governments, and counties is voluntary. SANDAG is committed to engaging tribal governments in the regional transportation planning process.

On January 26, 2007, the Southern California Tribal Chairmen’s Association (SCTCA) and SANDAG signed a Memorandum of Understanding incorporating the SCTCA as an advisory member on the SANDAG Board of Directors and Policy Advisory Committees (Transportation, Regional Planning, Public Safety, and Borders). Tribal leaders are now part of the regional decision-making process at a policy level, offering a tribal perspective to complex regional issues.

Southern California Tribal Chairmen’s Association (SCTCA) is a multi-service, non-profit corporation established in 1972 by a consortium of 19 federally-recognized Indian tribes in Southern California. Its mission is to protect, establish, and exercise the inherited and preserved sovereign rights of tribal governments. As an intertribal council, the SCTCA serves as a forum for a wide variety of issues for tribal governments in the region.

Existing tribal coordination includes goals, policy objectives and actions focused on improving communication and collaboration with tribal governments in areas of regional importance such as economic development, transportation, housing and water supply.

In 2002, a summit was held between SANDAG’s Board of Directors and the leaders of the region’s tribal governments. One outcome of the Summit was the assignment of a tribal liaison who has been working with the tribal governments to promote better government-to-government communications and coordination.

**Interregional Coordination**

How we grow inevitably affects those around us, just as growth around us affects our region. During the 1990s, the San Diego region's average annual population growth rate paralleled the national average. However, the rates in Orange, Riverside, and Imperial were substantially higher.

SANDAG, through the Borders Committee pursues the development and consolidation of interregional partnerships with neighboring jurisdictions in order to promote coordinated planning efforts which are mutually beneficial to both partners. Based upon the model developed through the Interregional Partnership with western Riverside, new partnerships will be developed with neighboring regions, including Imperial and Orange Counties, reflecting different levels of engagement and planning areas.

**Coordination with Southwestern Riverside County**

The I-15 Interregional Partnership (I-15 IRP) is a voluntary compact between local elected officials representing the Western Riverside Council of Governments (WRCOG), SANDAG, the Riverside County Transportation Commission (RCTC), and the Riverside Transit Agency (RTA), as well as Caltrans and other affected agencies and organizations.
The primary goal of the I-15 IRP is to foster collaborative strategies in economic development, transportation, and housing that will improve the quality of life for residents in both counties by reducing the impacts of interregional commuting, creating more jobs in housing-rich areas and more housing in jobs-rich areas. Centered on I-15, this two-county commute corridor extends from central San Diego to the cities of Lake Elsinore, Perris, and Hemet.

Through various grants, the partner agencies have been able to pursue two phases of the partnership. New funding from Caltrans has been secured by WRCOG, SANDAG and RCTC, to pursue a third phase. The emphasis for Phase III will be to develop a Strategic Transportation Implementation Plan to improve the transportation system in a 5- to 15-year time horizon, using a multi-modal approach. The I-15 IRP will also pursue coordinated economic development and housing strategies as identified in Phase II.

The primary goal of the San Diego - Imperial County I-8 Corridor Strategic Plan Joint Policy Advisory Group is to review and provide policy input on the development of the I-8 Corridor Strategic Plan. The Strategic Plan will identify issues, establish goals and objectives, and develop interregional strategies in the areas of transportation, housing, and employment to ensure adequate levels of service on the I-8 corridor. It also will identify employment opportunities in Imperial County, and integrate smart growth principles into planned land use/transportation projects that benefit the quality of life in the San Diego/Imperial County regions.

**Binational Coordination**

Given San Diego’s unique position as an international gateway, the Borders Planning and Coordination program recognizes economic development and homeland security as pressing cross-border issues. Through the Borders Committee, SANDAG implements a comprehensive binational planning program to address important binational/regional issues including intergovernmental relations, transportation infrastructure, homeland security, economic development, environmental planning and preservation, and other related issues.

- **SANDAG Annual Binational Event:** Participants from both sides of the border meet annually to discuss topics of mutual interest.
- **Otay Mesa-Mesa de Otay Binational Corridor Strategic Plan:** SANDAG and the City of Tijuana’s Instituto Municipal de Planeación are jointly working on the development of the Otay Mesa-Mesa de Otay Binational Corridor Strategic Plan in collaboration with the state of Baja California’s Secretaría de Infraestructura y Desarrollo Urbano, and Caltrans District 11. The strategic plan focuses on transportation, economic development, housing, and environmental issues.
- **Economic Impacts of Border Wait Times at the San Diego-Baja California Border Region:** SANDAG, in partnership with Caltrans District 11, has completed a study to estimate economic impacts of border delays on the economy of the San Diego and northern Baja California border region.
- **Transportation:** SANDAG coordinates a number of comprehensive planning efforts to improve border transportation and infrastructure along the U.S.-Mexico border.
- **Homeland Security:** San Diego’s position as home to the busiest binational land port of entry in the world places us on the frontline of national security efforts.
Economic Development: The San Diego region, combined with neighboring counties and northern Baja California, has the necessary scale and diversity to compete in the global marketplace.

Environment: SANDAG, in collaboration with a broad network of nongovernmental organizations, state, and federal agencies in the United States and Mexico are working to preserve and enhance ecosystem biodiversity throughout the borders region.

The Committee on Binational Regional Opportunities (COBRO) advises SANDAG’s Borders Committee concerning both short and long-term binational related activities, issues and actions; provides recommendations regarding binational border-related planning and development; and identifies ways to assist and coordinate with existing efforts in the binational area. The membership consists of elected officials and staff representatives of academia, business, community organizations, and the Mexican government. “The COBRO will serve as a working group to the SANDAG Borders Committee to facilitate a better understanding of the binational border-related issues and needs of the California-Baja California region.”

California-Baja California Border Region
The California-Baja California border region is experiencing increased levels of growth-induced energy demand. The growing energy demand in this border region adds to air quality problems caused by inefficient power plants and boilers, highly polluting industrial facilities, traffic congestion, and agricultural burning practices. Continued coordination between California-Baja California can help identify common issues, interdependencies and policies and actions to address energy planning and infrastructure on both sides of the border.

Overview from Energy Commission IEPR development (2005)
- California and Baja California share a 150 mile border, with a combined population of five million people. The regional population is expected to grow to eight million by 2025.
- For the years 2004-2009, the CEC and SDG&E forecast a 2.1 and 2.0 percent annual growth in electricity demand, respectively, for the San Diego/Imperial County region. The CFE’s 2003-2014 forecast expects a 7 percent annual increase in electricity demand for Baja California.
- Natural gas demand within the SDG&E region is forecast to grow between 1.2 and 1.6 percent annually. Natural gas demand in Baja California is expected to grow by as much as 7 percent annually, importing all its gas from the U.S. through two 30-inch pipelines connected to the SDG&E system.
- The San Diego–Tijuana border area has a combined population of nearly 4 million people, with approximately 2.8 million in the San Diego region and 1.2 million in Tijuana.

Cross-Border Electricity Exchange
- The Cerro Prieto Geothermal Plant in northern Baja California is connected to the U.S. grid at the Imperial Valley Substation by two 12-kv lines.
- SDG&E is connected to Tijuana and Tecate by two 12-kV lines.
- In mid-2003, Sempra and Baja California Power began transmitting electricity generated from newly constructed natural gas-fired plants near Mexicali, Mexico, to California over two 230-kV lines terminating at the Imperial Valley Substation.
- Three 34.5-kV lines connect Calexico to Baja California.
Opportunities for Enhanced Energy Efficiency Programs in Baja

The Western Governors’ Association report estimates a market potential for cost-effective energy efficiency projects with annual energy savings of approximately:

- 434,600 megawatt hours (MWh) and cost savings of about $22.8 million in the industrial (manufacturing) sector;
- 101,200 MWh and cost savings of $5.4 million in the commercial (hospitality) sector;
- 283,000 MWh and cost savings of about $15.4 million in the institutional (healthcare/hospitals, government, and education) sector.

Energy Saving Opportunities related to Transportation and Goods Movement

- Port of Entry (POE) truck stop electrification feasibility study
- Heavy duty truck retrofits for high-traffic regional trucking companies
- Electric recharging infrastructure and other alternative fueling infrastructure in the vicinity of the POEs

Possible Recommended Actions/Policies

- EWG and SANDAG COBRO and Borders Committee should coordinate on energy and climate related issues
- Participate in activities like the Border Energy Forum to promote successful efficiency programs for Border region
- Support funding opportunities for binational energy efficiency programs
- Coordinate the development of renewable energy, combined heat and power, and industrial efficiency programs to relieve stress on the regional system and achieve air quality improvements.
- Engage Mexican energy agencies in a coordinated decision making process to create mutually beneficial results.
REGIONAL CLIMATE ACTION PLAN

Introduction

The Energy Commission has extended the deadline for SANDAG’s submittal of a first draft of the Regional Climate Action Plan (RCAP). RCAP extension is due to internal and external delays in completion of smart growth enhancements to the transportation demand model. The transportation demand model will be used to estimate the potential greenhouse gas (GHG) emission reductions associated with policy measures identified in the RCAP.

EWG Chair Downey will brief the EWG on the outcome of the RCAP presentation to the SANDAG Board of Directors meeting on May 22, and staff will provide an update on efforts to continue RCAP development. The major components of the revised schedule are provided below.

- August 2009: Expected completion of model enhancements
- August or Sept 2009: EWG review of differences between original and new modeling method and results
- September 30, 2009: First draft submittal of RCAP to Energy Commission for peer review
- October 2009: Hold public workshop at CCSE in 1st week of month (tentative)
- October 23, 2009: Receive feedback from Energy Commission and stakeholders
- October 2009: Return to EWG to discuss input provided by stakeholders
- November 2009: Present draft RCAP to RPC and Board for input
- Dec 2009-Jan 2010: Return to RPC and Board for consideration of plan for adoption

Key Staff Contact: Andrew Martin, 619-699-7319, ama@sandag.org