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CGNP's Recommendation for 3 Points to Emphasize in The Final Version of the 2015 IEPR

â€¢ To fight climate change, California needs to maximize its use of carbon-free electricity generation via nuclear, hydro, geothermal, wind, and solar.

â€¢ DCPP is a powerful means to reduce carbon emissions associated with electric power generation. DCPP's calculated annual CO2 avoidance is between 10.12 - 13.08 million metric tons (MMT.) The PG&E - supplied statistic of 0.000613 MMT annual DCPP CO2 avoidance contained in their 2013 publication is in error.

â€¢ CEC statistics show that the strategy of encouraging the use of Compressed Natural Gas (CNG) in vehicles is significantly underutilized in California. CNG use in vehicles would result in substantial emissions reductions relative to gasoline or diesel-power, yielding significant air quality improvements in the South Coast and San Joaquin Valley air basins. The continued use of DCPP's nuclear power would assist in the conservation of this cost-effective means to improve air quality. The current high cost of electric vehicles (EVs) argues against any significant air quality improvements associated with EV adoption.

â€¢ CGNP strongly urges these 3 points should be emphasized in the final version of the 2015 IEPR.

Additional submitted attachment is included below.

Front Matter - CGNP Response to 2015 IEPR Draft

by Gene A. Nelson, Ph.D.

Abstract:

- **To fight climate change, California needs to maximize its use of carbon-free electricity generation via nuclear, hydro, geothermal, wind, and solar.**

- **DCPP is a powerful means to reduce carbon emissions associated with electric power generation. DCPP's calculated annual CO2 avoidance is between 10.12 - 13.08 million metric tons (MMT.) The PG&E - supplied statistic of 0.000613 MMT annual DCPP CO2 avoidance contained in their 2013 publication is in error.**

- **CEC statistics show that the strategy of encouraging the use of Compressed Natural Gas (CNG) in vehicles is significantly underutilized in California. CNG use in vehicles would result in substantial emissions reductions relative to gasoline or diesel-power, yielding significant air quality improvements in the South Coast and San Joaquin Valley air basins. The continued use of DCPP's nuclear power would assist in the conservation of this cost-effective means to improve air quality. The current high cost of electric vehicles (EVs) argues against any significant air quality improvements associated with EV adoption.**

- **CGNP strongly urges these 3 points should be emphasized in the final version of the 2015 IEPR.**

1. Fighting Climate change

A number of references are provided in the appendix regarding the importance of fighting climate change by emphasizing the production of electricity via nuclear, hydroelectric, geothermal, wind, and solar. As an interim step, substituting natural gas for dirty coal power represents an improvement, however, there are substantial carbon dioxide emissions associated with the combustion of natural gas (NG) in California. Utilizing the recently-released actual and modeled natural gas demand for all sectors in California (2013), via the CEC 15-IEPR-03 docket, CGNP has determined that the CO2 emissions associated with this NG demand yield 2015 state totals in the range of 124-130 MMT CO2 emitted annually. Please refer to the CEC and author's versions of Table 1 and two graphs showing trends from Table 1 for additional details.

Table 1: Actual and Modeled Natural Gas Demand for All Sectors in California (2013)

Million Cubic Feet per Day						
Low Demand/ High Price Case	2013	2015	2020	2025	2030	% Change 2013-2030
Residential	1,369	1,450	1,502	1,521		11%
Commercial	564	548	602	650		15%
Industrial	1,627	1,592	1,543	1,537		-6%
Transportation	22	29	60	147		568%
Power Gen	2,821	2,626	1,721	1,260	1,378	-51%
State Total	6,403	6,245	5,428	5,115	5,582	-13%
Mid Demand Case	2013	2015	2020	2025	2030	
Residential	1,369	1,451	1,472	1,453		6%
Commercial	564	550	593	622		10%
Industrial	1,627	1,608	1,563	1,557		-4%
Transportation	22	30	67	164		645%
Power Gen	2,821	2,695	1,918	1,702	1,773	-37%
State Total	6,403	6,334	5,613	5,498	5,920	-8%
High Demand/ Low Price Case	2013	2015	2020	2025	2030	
Residential	1,369	1,452	1,488	1,481		8%
Commercial	564	550	611	655		16%
Industrial	1,627	1,641	1,637	1,650		1%
Transportation	22	110	251	615		2695%
Power Gen	2,821	2,822	2,811	2,337	2,478	-12%
State Total	6,403	6,575	6,798	6,738	7,532	18%

Source: Energy Commission, Supply Analysis Office. Natural gas demand for residential, commercial, and industrial sectors were provided by the Demand Analysis Office.

Natural Gas Infrastructure

Most of California's natural gas supply comes from outside the state. The primary production areas for imported natural gas are the Southwest, the Rocky Mountains, and Canada, while the state produces less than 10 percent of its demand requirements.

Several interstate pipelines deliver the natural gas to the California border, and from there, intrastate pipelines take the natural gas to the Citygate [1]and the local distribution pipelines or to storage facilities for later use. California has 13 operating natural gas storage facilities, all of

1 Citygate is a location where natural gas changes possession from one company to another. It can be a physical location such as a hub or compressor station, or a virtual location only.

Table 1: Actual and Modeled Natural Gas Demand for All Sectors in California (2013) - Adapted by Gene Nelson, Ph.D.

Millions of Cubic Feet Natural Gas per Day											
Millions of Metric Tons (MMT) of CO2 / Year											
Low Demand/ High Price Case	2013	**2013**	2015	**2015**	2020	**2020**	2025	**2025**	2030	**2030**	% Change 2013-2030
Residential	1,369	**27**	1,450	**29**	1,502	**30**	1,521	**30**			11%
Commercial	564	**11**	548	**11**	602	**12**	650	**13**			15%
Industrial	1,627	**32**	1,592	**32**	1,543	**31**	1,537	**30**			-6%
Transportation	22	**0**	29	**1**	60	**1**	147	**3**			568%
Power Gen	2,821	**56**	2,626	**52**	1,721	**34**	1,260	**25**	1,378	**27**	-51%
State Total	6,403	**127**	6,245	**124**	5,428	**108**	5,115	**101**	5,582	**111**	-13%
Mid Demand Case	2013	**2013**	2015	**2015**	2020	**2020**	2025	**2025**	2030	**2030**	
Residential	1,369	**27**	1,451	**29**	1,472	**29**	1,453	**29**			6%
Commercial	564	**11**	550	**11**	593	**12**	622	**12**			10%
Industrial	1,627	**32**	1,608	**32**	1,563	**31**	1,557	**31**			-4%
Transportation	22	**0**	30	**1**	67	**1**	164	**3**			645%
Power Gen	2,821	**56**	2,695	**53**	1,918	**38**	1,702	**34**	1,773	**35**	-37%
State Total	6,403	**127**	6,334	**125**	5,613	**111**	5,498	**109**	5,920	**117**	-8%
High Demand/ Low Price Case	2013	**2013**	2015	**2015**	2020	**2020**	2025	**2025**	2030	**2030**	
Residential	1,369	**27**	1,452	**29**	1,488	**29**	1,481	**29**			8%
Commercial	564	**11**	550	**11**	611	**12**	655	**13**			16%
Industrial	1,627	**32**	1,641	**33**	1,637	**32**	1,650	**33**			1%
Transportation	22	**0**	110	**2**	251	**5**	615	**12**			2695%
Power Gen	2,821	**56**	2,822	**56**	2,811	**56**	2,337	**46**	2,478	**49**	-12%
State Total	6,403	**127**	6,575	**130**	6,798	**135**	6,738	**133**	7,532	**149**	18%

119.58 pounds of CO2 per 1,000 cubic feet of natural gas (NG) = 1.1958 x 10^5 pounds per NG MCF Source: US EPA Carbon Calculator

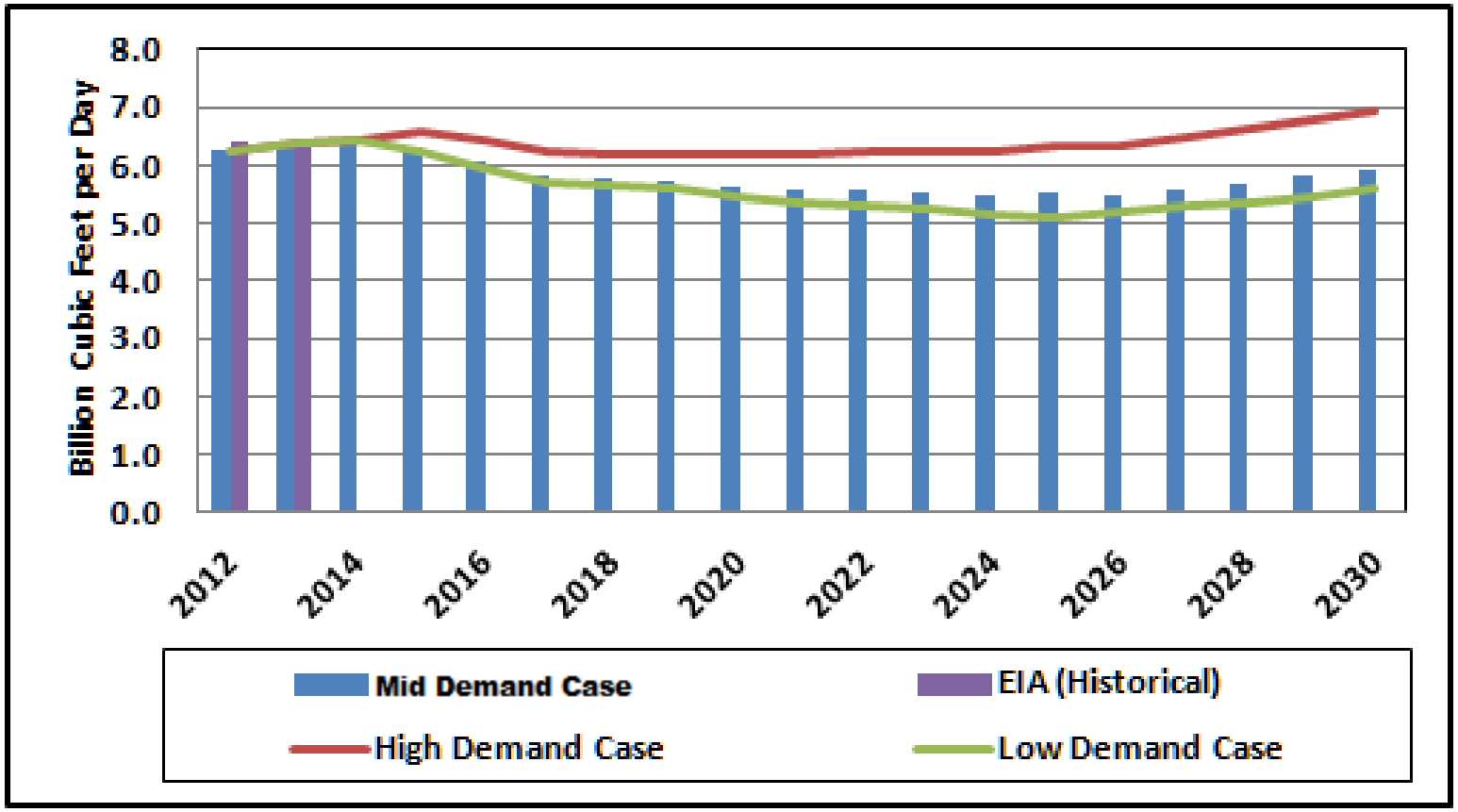
0.019811394 = scaling factor relating NG MCF/day to MMT CO2/year

Source: Energy Commission, Supply Analysis Office. Natural gas demand for residential, commercial, and industrial sectors were provided by the Demand Analysis Office.

California Energy Commission

CA Total Natural Gas Demand:

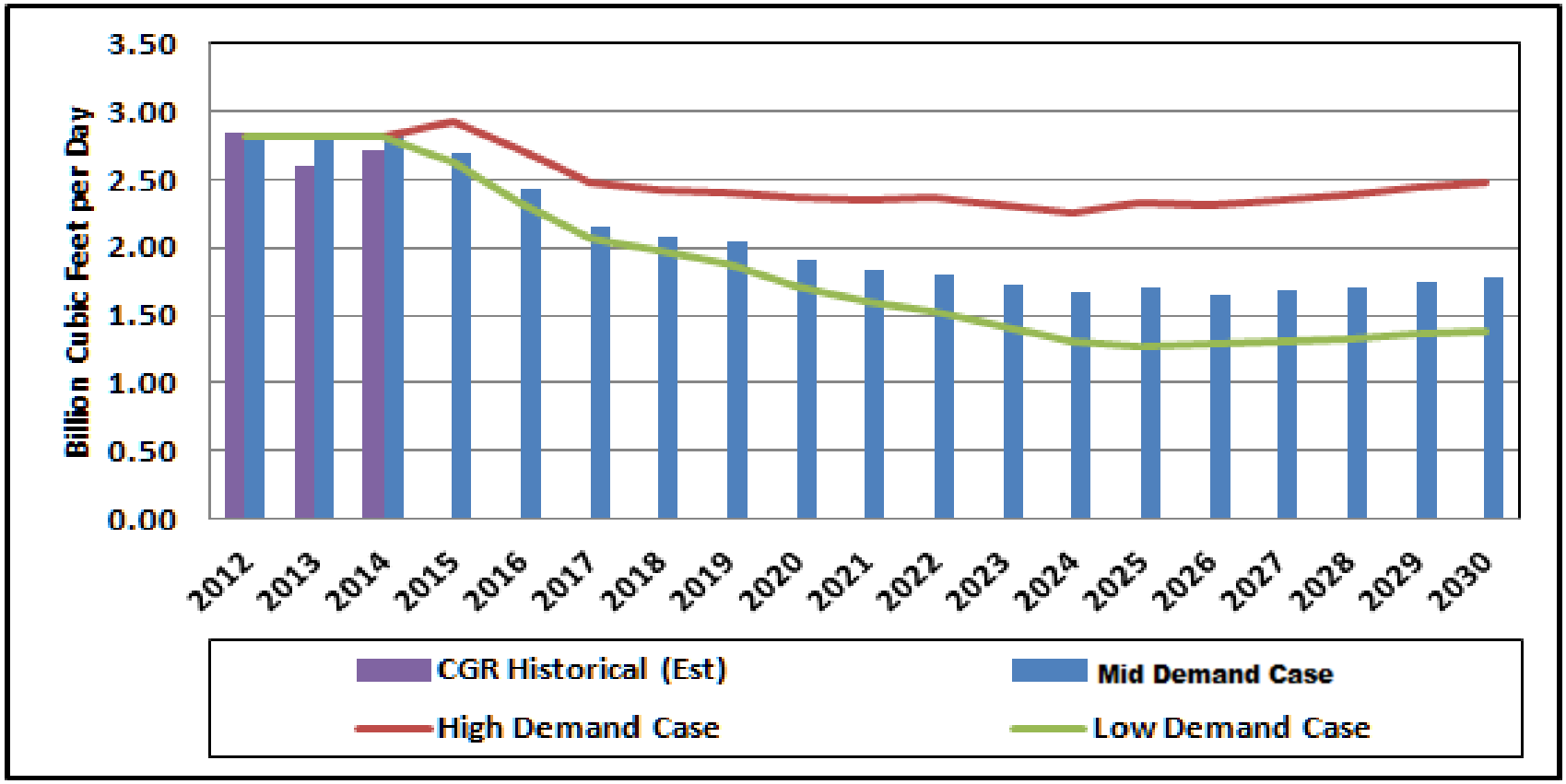
Implementation of renewable generation dampens California's demand



California Energy Commission

Natural Gas Demand (CA) for Power Generation:

Power Generation Demand Falls as Renewable Generation Increases



2. DCPP is a Powerful Means to cut carbon emissions associated with electric power production - and conserve natural gas for the transportation sector.

Calculations via two different methods show DCPP's annual CO2 avoidances are between 10.12 and 13.08 Million Metric Tons (MMT.)

Typical annual CO2 emissions are 14,020 pounds per household, assuming approximately 943 kWh per month = 11,316 kWh/year (1.)

1.238953694	Pounds CO2 per kWh	DCPP Production = 18 TWh/year	2.23012E+10	Pounds CO2 Avoided by DCPP/yr

= 22,301.2 million pounds of avoided CO2/year by DCPP
= 10.12 MMT of avoided CO2 by DCPP

(1.) Source: http://www3.epa.gov/carbon-footprint-calculator/
"Assumptions" tab for electricity production

The Union of Concerned Scientists published a report in February, 2014 examining the increased use of natural gas for electricity generation. Within the methodology section of "The Climate Risks of Natural Gas" EIA electricity production by energy source tabulations for 2012 are provided. Natural gas-powered generation (31% of total,) provided 1,241,920 GWh while producing 493 MMT of CO2, yielding a ratio of 0.396 MMT CO2 per TWh. Thus, comparing to only natural gas generation, DCPP's 18 TWh corresponds to 7.145 MMT CO2. The above U.S. average included dirtier coal-fired power production. Coal, which produced 37% of US power in 2012, emits 1.003 MMT CO2 per TWh.
Total gas-fired and coal-fired power production was 2,759.123 GWh and produced 2,005 MMT CO2.

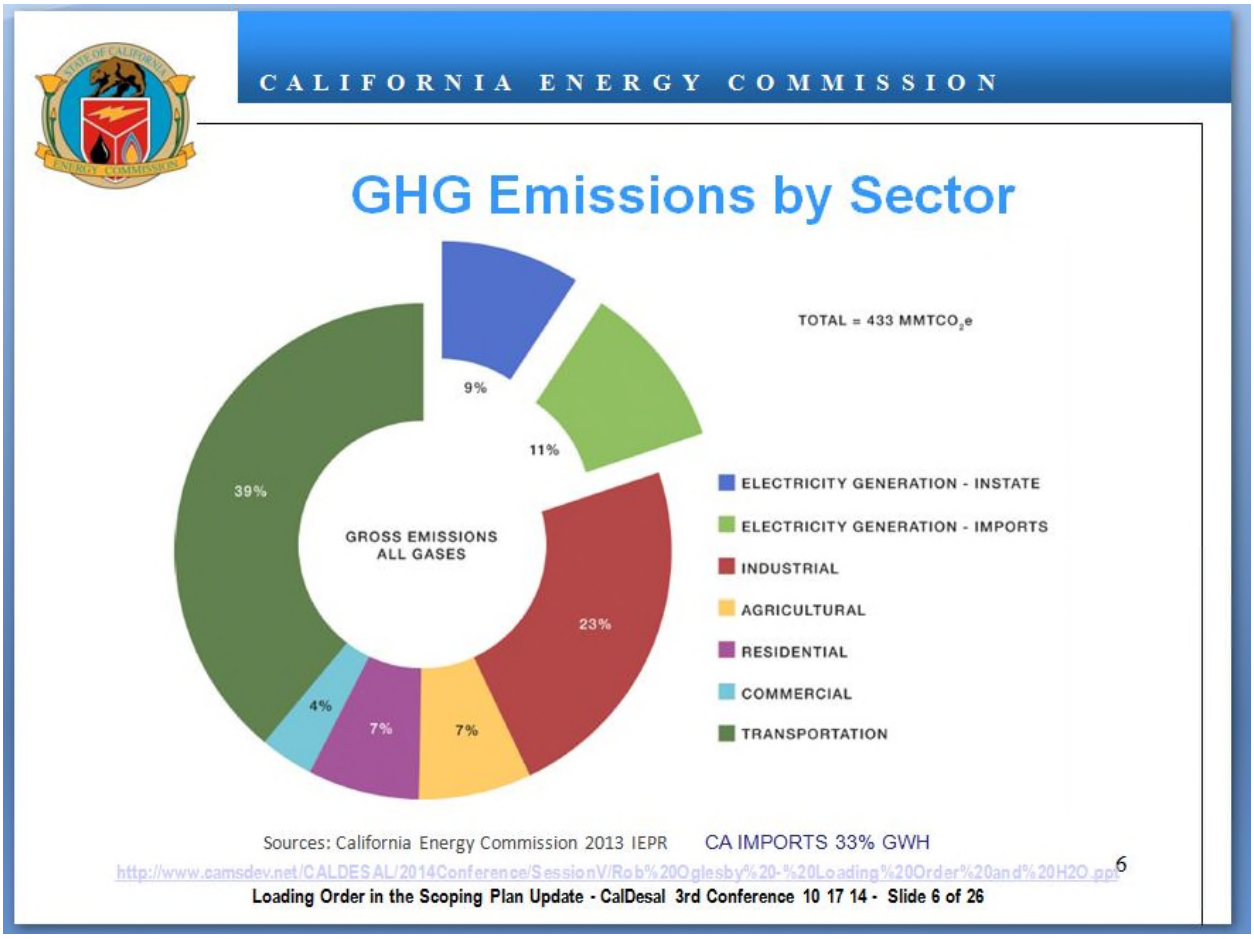
Thus, the composite emissions are 0.727 MMT CO2/TWh.
Based on this figure, **DCPP avoided 13.08 MMT CO2 annually**.
Source: http://www.ucsusa.org/sites/default/files/legacy/assets/documents/clean_energy/Infographic-Climate-Risks-of-Natural-Gas-Methodology-and-Assumptions.pdf

Note that the estimate that DCPP eliminated **613 metric tons (0.000613 MMT) of CO2** in 2011 on page 48 of 72 of the 2013 PG&E report, "Economic Benefits of Diablo Canyon Power Plant" appears to contain an error.

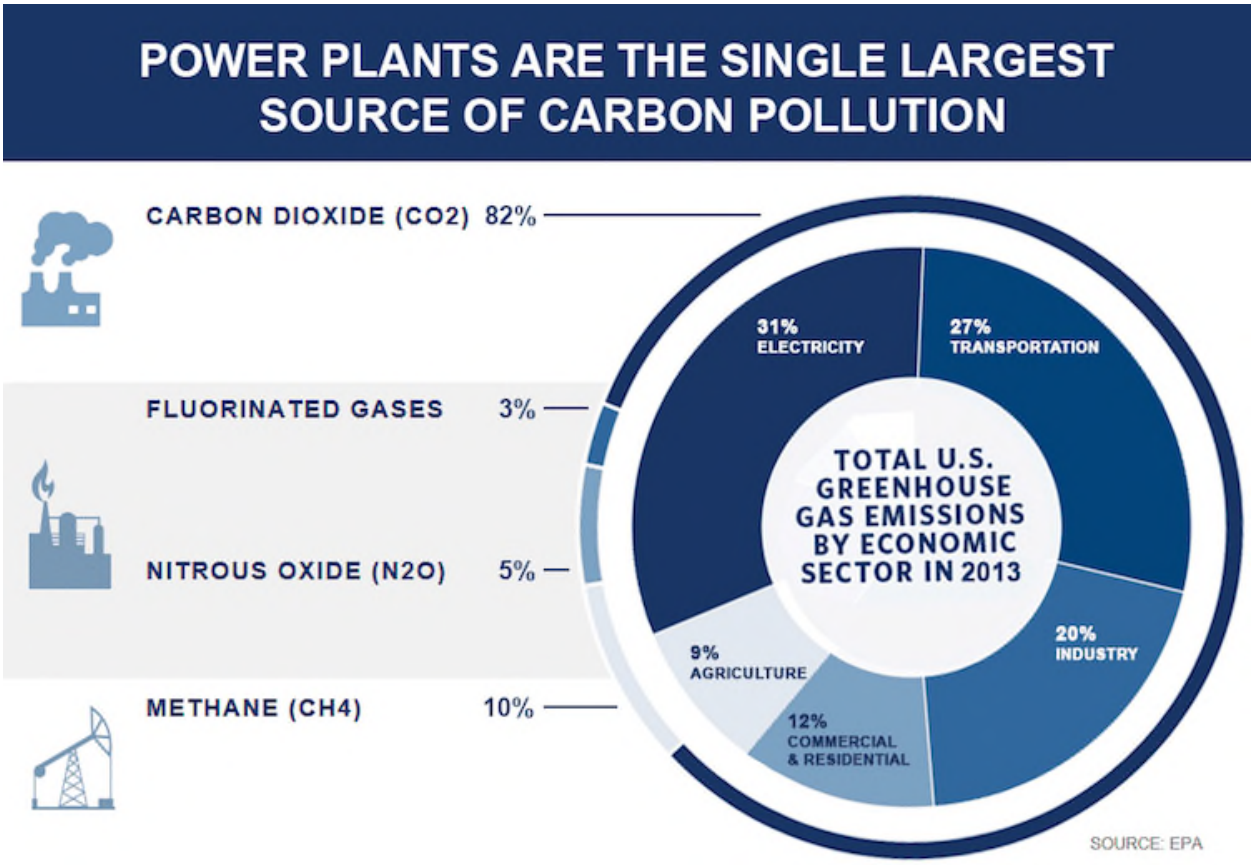
Source: http://www.pge.com/includes/docs/pdfs/shared/edusafety/systemworks/dcpp/PGE_Economic_Impact_Report_Final.pdf

3. A California program to substantially expand the use of natural gas for the transportation sector should be implemented.

Here are some relevant 2014 statistics from Robert Oglesby, CEC Executive Director. He notes that transportation accounts for 39% of California's GHG emissions. Compare this statistic with the entire U.S. on the next page to appreciate the need for this policy.



James Conca, Ph.D. includes this graphic showing 27% of the U.S. GHG emissions are associated with the transportation sector in "Only One Loser In Obama's Clean Power Plan" *Forbes Magazine* nuclear, energy, and the environment blog on 4 August 2015



California's cost-effective solution to reducing GHG emissions associated with the transportation sector is CNG. The distribution network is expanding. Vehicles may be retrofitted from gasoline or similar fuels to CNG for a modest cost.

Here are some cost statistics from the *Consumer Reports* 2016 Buying Guide issue, page 174, Electric cars/plug in hybrids that illustrate why electric vehicles (EVs) are not currently cost-competitive.

Model	Cost
Tesla Model S P85D	$127,820.00
Tesla Model S (85 kWh)	$89,650.00
BMW I3 Giga	$50,450.00
Ford Focus Electric	$40,990.00
Ford C-Max Energi	$34,940.00
Mitsubishi I-MIEV SE	$33,630.00
Nissan Leaf S	$29,860.00

The following appendix includes a variety of information, including the complete files that these three recommendations are based on. Also included are some published pro-DCPP advocacy articles published by CGNP Board members and a relevant NRC document summarizing the positive DCPP seismic safety findings of NRC experts. This NRC document also includes a brief statement by Gene Nelson, Ph.D., summarizing the NRC meeting's conclusions.