San Diego County Air Pollution Control District Comments on the Air Resources Board May 19, 2010, Public Meeting on Revising the Compressed Natural Gas Fuel Specifications for Motor Vehicles

I. GENERAL COMMENTS

The San Diego County Air Pollution Control District (District) acknowledges and supports changes to the compressed natural gas (CNG) fuel specifications needed to address local issues within California that may hinder the use of natural-gas-fueled vehicles (NGVs). However, any change to the compressed natural gas (CNG) fuel specifications must be done in such a way that it preserves the current and anticipated future emission reductions from NGVs and does not indirectly result in increased emissions from other sources. As discussed below, the District believes that, unless carefully crafted, any change to the existing regulations will remove an existing barrier to the importation of natural gas derived from liquefied natural gas (LNG) into San Diego and result in significant emission increases from this higher emitting natural gas fuel.

The District supports natural gas vehicle (NGV) use and wishes to encourage growth of these innately low-emitting vehicles. In addition, the District supports alternative supplies of natural gas for San Diego. However, the fuel that NGVs use and any alternative natural gas supplies must not result in significant excess emissions when compared to the current natural gas supply in order to avoid backsliding on hard-won emission reductions that have been achieved through District rules and ARB regulations. The growth of the NGV vehicle sector, which is purported to be the main purpose behind a change to the current fuel specification, cannot be allowed to occur if it will indirectly result in an increase in emissions from stationary sources and/or transmission emission leaks. Therefore, all direct and indirect emission increases from the facilitated importation of LNG-derived natural gas resulting from changes to the CNG fuel specifications must either be reduced to insignificance by treating the LNG-derived natural gas, or fully mitigated by other emission reductions so that the environmental benefits from use of NGVs and natural gas combustion in general are not merely offset by emission increases from other sources. Otherwise, the expeditious attainment of federal and state ambient air quality standards in San Diego and throughout California will be jeopardized.

II. USE OF IMPORTED LNG-DERIVED NATURAL GAS

The District's overarching concern with revising the CNG fuel specifications is that any revision must not indirectly result in unmitigated, significant emission increases of volatile organic compounds (VOCs), oxides of nitrogen (NOx), and other pollutants by removing a barrier to the importation of LNG-derived natural gas. The District has no issue with the use of imported LNG-derived natural gas provided that any resulting emission increases relative to the current natural gas supply from all sources are prevented or fully mitigated.

As noted in ARB's meeting presentation, imported LNG-derived natural gas has significantly higher content of hydrocarbons other than methane (ethane, propane,

butane, and pentane) than the imported pipeline gas that provides most of the natural gas supply in California, including the existing San Diego gas supply. It also has little or no inert content compared to existing supplies. Also as noted in ARB's meeting presentation, the effect of this composition change is to increase the Wobbe Index (WI) and decrease the Methane No. (MN), relative to the existing pipeline natural gas. In addition, the weight fraction of individual C2+ hydrocarbons (ethane, propane, butane, and pentane) may be increased as well as the weight fraction of VOCs (propane and higher hydrocarbons, or C3+).

As a result of these compositional differences from the typical interstate supplied natural gas currently used in California, significant increases in emissions may result directly from NGVs subject to the regulation, as well as indirectly from stationary combustion sources, since all sources are served by a common gas transmission and distribution system. Moreover, fugitive VOC leakage from the natural gas transmission and distribution system itself will be greatly increased. If the CNG fuel specifications are changed in a manner that encourages the use of LNG-derived natural gas—such as a statewide performance standard based on the WI and MN with no other restrictions on CNG composition—any resulting emission increases from the associated use of LNG-derived natural gas from NGVs and other indirectly affected sources must be fully analyzed and mitigated.

A. PROSPECTS FOR USE OF LNG-DERIVED NATURAL GAS

The importation of LNG-derived natural gas is not a theoretical concern since LNG infrastructure is already in place. Sempra LNG, a wholly owned subsidiary of Sempra Energy, owns the Energia Costa Azul (ECA) LNG terminal in Baja California Norte, Mexico, near Ensenada, Mexico. The ECA terminal is operational and directly connects to the San Diego Gas & Electric (SDG&E) gas transmission system at the Otay Mesa Border by means of the Transportadora de Gas Natural de Baja California (TGN) pipeline in Mexico which in turn connects to the Gasoducto Bajanorte (GB) LNG spur pipeline from the facility. SDG&E, TGN, and GB are wholly owned subsidiaries of Sempra Energy.

The LNG-derived natural gas entering San Diego through Otay Mesa would not be diluted by any other gas supply and would essentially reach San Diego with its composition unaltered. The LNG-derived natural gas can also indirectly reach San Diego—and the rest of Southern California—by being transported east on the GB pipeline in Mexico which connects to the North Baja Pipeline near Ogilby, California, which in turn connects to the Southern California Gas Company (SoCal Gas) system at Blythe, California, and also the El Paso pipeline at nearby Ehrenberg, Arizona. SoCal Gas, also a wholly owned subsidiary of Sempra Energy, currently receives westward flowing natural gas from the El Paso Pipeline at Ehrenberg. The El Paso Pipeline receipt point represents about 30% of the firm capacity of the SoCal Gas system, and directly serves southern portions of the South Coast Air Quality Management District (SCAQMD), all of Imperial County, and most of San Diego through Ehrenberg and Blythe. LNG-derived natural gas entering California by this route could be diluted to some extent by the flow of gas from the east on the El Paso Pipeline.

B. IMPACT OF IMPORTED LNG-DERIVED NATURAL GAS ON SOUTHERN CALIFORNIA NATURAL GAS SUPPLIES

The ECA terminal has a normal baseload LNG-derived natural gas send-out capacity of 1000 million standard cubic feet per day (MMscfd) with a peak capacity of 1300 MMscfd based on published reports. The maximum gas usage in Baja Norte California is about 300 MMscfd leaving up to 1000 MMscfd available for export to San Diego and the rest of Southern California.

The maximum firm capacity at Otay Mesa to supply gas into the combined SDG&E and Southern California Gas Company (SoCal Gas) system is about 400 MMscfd on a minimum consumption day (the physical capacity is higher when more gas is consumed). The average natural gas consumption in San Diego was about 330 MMscfd in 2008. It is obvious that there is sufficient capacity to deliver enough LNG-derived natural gas to the Otay Mesa receipt point to saturate nearly all of San Diego with LNG-derived natural gas. This was confirmed during the facility's shakedown in May, 2008, when LNG-derived natural gas reached most of the heavily populated area of San Diego. Since the firm capacity of the North Baja and GB pipelines is about 600 MMscfd, flows of LNG-derived natural gas by this route would represent about 50% of the firm capacity of the SoCal Gas transmission system from Blythe (1210 MMscfd) which serves Imperial County and the southern portion of the SCAQMD.

Moreover, all the permits are in place, according to Sempra LNG, to expand the ECA terminal and the corresponding GB pipeline in Mexico to a peak capacity of 2600 MMscfd. The foundations for two more LNG storage tanks, in addition to the two already operational, have already been laid. In addition, the Federal Energy Regulatory Commission (FERC) has approved an expansion of the North Baja pipeline to enable it to transport approximately 2700 MMscfd of LNG-derived natural gas. This could be done in a matter of a few months. When the ECA terminal is expanded, the southern portion of the SoCal Gas system would likely be receiving nearly 100% LNG-derived natural gas since the maximum firm capacity of pipeline from Blythe westward is only about 1200 MMscfd.

C. IMPACT OF CHANGES TO THE CNG FUEL SPECIFICATIONS ON IMPORTATION OF LNG-DERIVED NATURAL GAS

At this time, one half the ECA terminal is leased by Sempra LNG to a Royal Dutch Shell (Shell) subsidiary (which has assigned a portion of its rights to Gazprom Global LNG) and the other half is owned and operated by Sempra LNG. However, this arrangement could be changed if it was profitable for Sempra LNG to use the rest of the terminal. The ECA terminal can receive LNG cargoes from anywhere in the world and is currently fully operational although only the Sempra LNG half of the terminal is currently active at about 50% of capacity (i.e., 25% of the full terminal capacity). Market forces could make the entire terminal active at 100% capacity in a matter of weeks.

One such market force would be the establishment of customers for LNG-derived natural gas in San Diego or elsewhere in Southern California. Sempra LNG has ready customers

for that gas in SDG&E, which sells a large majority of the natural gas in San Diego, and SoCal Gas. Although the price for natural gas is higher in Asia than the California market, Sempra LNG has stated that it is profitable for them to import LNG through the ECA terminal. This is because the price Sempra LNG pays for its LNG is a price based on the Southern California Border Index price for natural gas rather than the higher price in Asian markets, which is often indexed to the price of oil.

The current CNG fuel specifications represent the final regulatory barrier to widespread importation of LNG into Southern California. Although LNG-derived natural gas does comply, or can be made to comply by nitrogen injection to lower the WI, with the California Public Utilities Commission (CPUC) standards for pipeline natural gas , it does not in general comply with the existing CNG fuel specifications.

SDG&E and SoCal Gas assert that LNG will be imported into the system regardless of the CNG fuel specification. However, in reality if imported LNG-derived natural gas is imported into the SDG&E system, SDG&E would have to discontinue sales of natural gas to CNG vehicle owners since they are served by the same gas transmission system as all other customers. This would result in the loss of revenue from the CNG customers for SDG&E and its parent company—Sempra Energy. SDG&E (and SoCal Gas) would also have to forego the revenue from the expected large expansion of this market in the future. This barrier would be removed by a statewide performance standard based solely on the WI and MN as proposed by SDG&E and the SoCal Gas. This is one reason, Sempra, SDG&E, and SoCal Gas have repeatedly sought to have the CNG fuel specifications amended since at least 2005.

III. IMPORTED LNG-DERIVED NATURAL GAS AND EMISSIONS

A. LNG COMPOSITION VARIABILITY

As noted above and in ARB's presentation, the composition of LNG-derived natural gas differs from the historical baseline gas by increases in ethane, propane, and/or butane and a decrease in inert species (nitrogen and carbon dioxide). Also as noted in ARB's meeting presentation, the composition of LNG-derived gas varies widely depending on the LNG source. The major sources of LNG are expected to be Tangguh, Indonesia, for Sempra LNG and Sakhalin Island, Russia, for Shell and Gazprom Global LNG. However, other LNG marketers could provide shipments from a large variety of sources. For example, the open season bidding held by North Baja Pipeline in conjunction with GB for the proposed expansion of the North Baja pipeline resulted in five companies signing precedence contracts for delivery of LNG-derived natural gas from the ECA terminal through the North Baja pipeline to the SoCal Gas system. The listed sources of the LNG included Sakhalin Island, Tangguh, and Australia (one company declined to indicate a source). In addition, companies could elect to purchase LNG on the spot market to fulfill their contracts. For example, up to one half of Sempra's Tangguh supply can be diverted by Tangguh PSC Contractors, the supplier, if it is more profitable. LNG purchased on the spot market could come from anywhere in the Pacific basin or potentially even from the Middle East.

Therefore, it is reasonable to estimate potential emission impacts, especially daily impacts, based on an expected worst-case LNG composition from the Middle East or the Pacific Basin. The District currently believes LNG from Malaysia, which is currently one of the largest LNG suppliers in the Pacific Basin, likely represents a worst-case LNG for estimating emission increases. The District notes that there is little public information currently available on LNG compositions, especially the composition upon arrival at ECA (LNG can become enriched in C2+ during transit since those hydrocarbons have higher boiling points than methane).

Since the importation of LNG will be driven by the volatile price of natural gas, the composition of natural gas experienced by users of SDG&E and SoCal Gas could rapidly change in a matter of days, including a return to interstate supplied natural gas. This is in contrast to the current situation where gas composition has remained relatively stable over time. This is of particular concern to facilities with permitted equipment because the equipment must be tuned to maintain compliance with permit limits for NOx and/or VOCs. It is also of major concern to the District due to the uncertainty this creates in predicting district-wide emissions, and due to the potential for increased non-compliance from sources regulated by the District.

B. EFFECTS OF IMPORTED LNG-DERIVED NATURAL GAS COMPOSITION ON NOX AND VOC EMISSIONS

A performance based standard based on the WI and MN does not serve to fully characterize NOx or VOC emission increases from LNG-derived natural gas. The upper limit on the WI and the lower limit on the MN may serve to characterize maximum NOx emissions from some engines, for example NGV engines. However, the District expects that neither the WI nor MN would be sufficient to fully characterize NOx emissions from many stationary source combustion devices. For VOC emissions from combustion devices, it appears that a reasonable parameter to correlate VOC emissions is the weight fraction (or weight percent) of C2+ hydrocarbons based on the SwRI engine testing. Finally, fugitive emissions from the gas transmission and distribution system are expected to be directly proportional to the weight fraction of VOCs in the natural gas.

Since the WI and MN are both functions of the hydrocarbon composition, it is possible that either one or both of these parameters may indirectly define maximum potential emissions. However, they can not be used to define the NOx or VOC emission potential of any particular natural gas. The relation of emissions to gas composition is more fully discussed below.

1. NGV Engines

NOx Emissions. The SwRI heavy-duty (HD) engine testing (Please see also comments on ARB Slide Nos. 27 and 48) has demonstrated that existing lean-burn engines used in NGVs exhibit increases in NOx when using natural gas with higher C2+ than existing interstate pipeline gas supplies such as would be the case with LNG-derived natural gas. The District notes no gas used during this testing was representative of the existing interstate pipeline gas used in San Diego in all respects. The gas most closely

representative did represent the existing WI in San Diego fairly well but had about twice the C3+ (on a volume basis) as the existing gas supply.

The District has examined the emission increases for NOx and finds they can be relatively well-correlated based on WI and/or MN with emissions increasing for higher WI and lower MN. For most engines tested, the emission increases correlates most strongly with the MN. The rich burn engine tested, which was equipped with a three-way catalyst (TWC) to control NOx and VOC emissions, does not show any significant NOx emission increase relative to a baseline gas across the range of gases tested. However, since the testing was confined to a new engine it is not clear if this will remain true as the engine and associated control system ages. A test of a stationary rich-burn engine sponsored by SoCal Gas with a TWC catalyst showed significant emission increases with increased WI.

VOC Emissions. Based on an examination of the VOC emissions in the SwRI testing, the ratio of VOC emissions to total organic gas (TOG) emissions correlate well with the weight fraction of ethane and propane in the fuel, with propane having the strongest effect. TOG in turn is correlated with the WI and/or MN, decreasing with increasing WI or decreasing MN. However, the proportional changes in TOG emissions are relatively small (10-35%) compared to the potentially large increases in weight fraction of C2+ hydrocarbons possible (a factor of more than 7 for VOCs) for reasonable worst-case LNG-derived natural gas compositions.

2. Stationary Combustion Equipment

NOx Emissions. Stationary combustion equipment can be tuned to operate well over a wide range of gas compositions. However, evidence shows that some important combustion equipment, when tuned to operate on a gas with a certain WI, has significantly increased NOx emissions with increases in the WI above the tuning WI. These impacts will be largest for devices that do not monitor and control the oxygen content of exhaust (i.e., boilers without O_2 trim systems) or control fuel flow to achieve a set output of energy. This is likely to be the case for much of the unpermitted commercial and industrial combustion equipment in San Diego.

In addition to WI effects, there is extensive experimental data that supports increases in NOx emissions not related to the WI. For example, an increase in propane content may cause a NOx emission increase even if the WI is unchanged. The District preliminarily estimates that this effect is on the order of a few percent increase in NOx for most commercial and industrial equipment without add-on NOx emission control devices for the range of LNG-derived gas compositions expected (equipment with add-on NOx emission controls have so far not shown NOx emission sensitivity to natural gas composition changes). The effect is important because it means NOx emission estimates can not be based solely on the WI.

VOC Emissions. By analogy with the SwRI HD engine test results, the District expects that these emissions are characterized by the weight fraction of C2+ in the fuel. The

analogy is especially relevant for San Diego because about 50% of the estimated VOC emission increase from stationary source combustion comes from lean-burn engines.

3. Fugitive VOC Emissions from Gas Transmission and Distribution

Although the natural gas composition may influence the fugitive leak rate (through changes in viscosity and density, for example) the District expects that the most important parameter to characterize VOC emissions is the weight fraction of VOC in natural gas. This can vary by a factor of more than seven over the range of expected LNG-derived natural gas compositions.

C. POTENTIAL EMISSION IMPACTS FROM LNG-DERIVED NATURAL GAS

Although more research is needed to fully quantify the magnitude of VOC and NOx emission increases, the District has concluded there are significantly increased emissions of both VOCs and NOx in San Diego from the use of LNG-derived natural gas from the following sources:

- NGVs
- Stationary combustion sources
- Natural gas transmission and distribution system (VOCs only)

The preliminary District estimates of emission increases in tons per day (tpd) from these emission sources are shown in Table 1. The estimates reflect emission increases that would potentially occur if the current CNG fuel specifications are replaced with a performance based standard (based on a maximum WI of 1385 and minimum MN of 80 as proposed by SDG&E and SoCal Gas) thereby resulting in the reasonably foreseeable use of LNG-derived natural gas throughout San Diego County. The emission estimates assume a likely worst-case LNG-derived natural gas composition (Malaysian) and, consistent with recent legal decisions under CEQA, are evaluated relative to the actual existing baseline gas composition. The emission estimates are preliminary and may be refined based on additional test results and stakeholder comments. However, the District considers them sufficiently accurate to demonstrate a significant emission increase in San Diego from such a regulatory change.

Preliminary Estimated NOx and VOC Emission Increases in San Diego from LNG-Derived Natural Gas

Category	NOx, tpd	VOC, tpd
Gas Transmission & Distribution	0	>5
Stationary Combustion Sources		
District Inventoried Combustion Sources	0.12	0.27
Residential Appliances	0.07	0.05
Unpermitted Commercial & Industrial Equipment	0.35	0.03
NGVs		
Transit & School Busses, 2010	0.13	0.06
Transit & School Busses, Future	≈ 0	0.14
Total, 2010	0.67	5.41

The large increase in VOC emissions from gas transmission and distribution (and VOC emissions in general) is due to the large difference in the weight percent VOC between the baseline gas (about 1.4%) and LNG-derived gas that was evaluated (about 11%). LNG-derived natural gas from sources with lower weight percent VOC would have corresponding lower, although still significant, emission increases. For example, the preliminary estimated emission increase from gas transmission and distribution for Tangguh LNG-derived natural gas is about 0.45 tons per day.

It should be noted that emission estimates for stationary permitted and unpermitted combustion sources reflect the expected populations of types of combustion devices in San Diego County and may not be applicable to other air districts. In particular, it is expected that most of the unpermitted commercial and industrial equipment in San Diego is relatively high NOx emitting devices using conventional, nonpremixed combustion equipment.

D. SIGNIFICANCE OF EMISSION IMPACTS

One of the District's primary goals is to attain the health protective state and federal ambient air quality standards. The District currently attains all the standards except for state and federal ozone standards and state particulate matter standards. In this context, the significance of these projected emission impacts cannot be overestimated. By way of comparison, the District would consider a rule change reducing emissions by 0.1 ton per

day of VOCs and NOx, which are ozone precursors, to be significant. But most concerning is the fact that the projected emission increases from the importation of LNG-derived natural gas would effectively nullify **all** of the VOC reductions, and more than half of the district-wide NOx average daily reductions projected to occur from the feasible control measures committed to as part of the District's 2009 Regional Air Quality Strategy to attain the state ambient air quality standards for ozone.

Furthermore, in 2009, the District would have complied with the 1997 federal 8-hour ozone standard except for one day with a 0.0850 ppm ozone level. Had the ozone level been 0.0849 for the 8-hour period, a difference of about 0.1%, the District would have complied with the standard. Thus, the projected emissions increases from LNG-derived natural gas may significantly affect the District's ability to attain and maintain attainment of air quality standards.

E. OTHER EMISSION IMPACTS

1. Particulate Matter

Relatively little testing has been done to quantify changes in particulate emissions from changes in fuel gas composition. The testing the District is aware of on premixed combustion devices (where the fuel and air are completely or partially premixed prior to combustion) has shown no consistent trend in particulate emissions with increasing C2+ in the fuel. However, recent tests on a nonpremixed lean-burn engine did show a significant increase in particulate emissions with increased C2+. This is likely because nonpremixed combustion devices can have regions of combustion with rich fuel to air ratios conducive to particulate matter formation. A reasonable expectation is that other nonpremixed combustion devices will show a similar trend. Therefore, potential emission increases of particulate matter from this type of equipment should be analyzed and its significance determined. More research, including testing, may be necessary to better establish the magnitude of the impact.

2. Toxic Emissions

Similarly to particulate matter, relatively little testing has been done to quantify changes in toxic emissions from changes in fuel gas composition. Testing that the District is aware of on premixed combustion devices has shown no consistent trend in toxic emissions with increasing C2+ in the fuel. However, emissions of toxic compounds such as benzene and polycyclic aromatic compounds (PAHs) would be expected to increase in concert with particulate matter. A reasonable expectation is that nonpremixed combustion devices would show an increase in these compounds based on the very limited testing for these devices. Therefore, potential emission increases of toxic air contaminants from this type of equipment should be analyzed and its significance determined. More research, including testing, may be necessary to better establish the magnitude of the impact.

3. NO_2 Emissions

There is experimental evidence that C2+ hydrocarbons are much more efficient than methane in converting nitric oxide, NO, to nitrogen dioxide, NO_2, under conditions typical of the exhaust from gas turbines. There is also at least one documented case where a "brown cloud" that is characteristic of elevated NO_2 emissions was observed from a turbine operating in Asia on LNG-derived natural gas. The cloud was attributed to the higher C2+ in the fuel compared to an identical North American turbine where no cloud was observed. This affect is only likely during low-load operation of turbines under conditions where add-on emission controls are not effective such as during startups and commissioning. Nevertheless, it may have important implications on the ability of turbine operators to be able to demonstrate they will not cause a violation of the ambient air quality standards for NO_2. The potential significance of this impact needs to be analyzed.

IV. COMMENTS ON SPECIFID ARB PRESENTATION SLIDES

A. SLIDE 7

The statement that a portion of potential LNG supplies do not meet the standard is literally correct but does not emphasize that nearly all likely LNG supplies would not meet the existing ARB standard when inert gas content is considered. Unless inert gasses are added to the LNG after it is revaporized, virtually no LNG-derived natural gas will have inert gasses more than 1.5%, the minimum allowed by current CNG fuel specifications.

B. SLIDE 15

The District agrees that addressing associated gas that does not currently meet the current CNG fuel specification is important. The District recommends that this be done in manner that restricts the applicability of the change to the affected local area and that does not remove the existing barriers to use of LNG-derived natural gas in the state—unless the significant impacts from use of LNG-derived natural gas are fully mitigated.

C. SLIDE 25

The NGV market is not restricted by limited access to LNG-derived natural gas. There is currently no shortage of natural gas in California.

D. SLIDE 27

The results from the Southwest Research Institute (SwRI) final report "Fuel Composition Testing Using DDC Series 50G Natural Gas Engines," Michael Feist, prepared for the Southern California Gas Company, August 2006, should also be considered in any estimates of emission increases from changes to the CNG fuel specification. One of the engines tested, was retested in the SwRI HD engine study in 2009. For this engine, the NOx emission increase and emissions for the CARB certification fuel were significantly higher in the 2009 testing than in the 2006 testing for unexplained reasons. SwRI

considers both the 2006 and 2009 test results as being equally valid for that engine. In addition, the other engine tested is likely still a significant part of the existing fleet in other air districts.

E. SLIDE 31

The legend for this graph provided by SoCal Gas does not indicate any Detroit Diesel TK or MK engines currently in service. Based on recent survey information, the District estimates about 7% of the existing San Diego natural gas-fueled transit bus fleet is powered by the TK engine (33 busses). The TK and MK engines may form an even higher proportion of NGV engines in other districts. To the District's knowledge, the GK engine has not been tested for its response to changes in natural gas quality, such as from LNG-derived natural gas, while the TK and MK engines have been tested.

F. SLIDES 43 AND 44

The appropriate baseline to use in estimating emission increases is not the worst possible composition (e.g., the lowest MN and highest WI) under the existing regulation. Rather it is the existing baseline natural gas composition in the area affected by the change in regulations. For San Diego, this is the composition of the imported pipeline gas passing through Ehrenberg on the El Paso Pipeline (see ARB Slide 14) with a WI, MN, and VOC content of about 1335, 100, and 0.5% by volume, respectively.

In addition, for NGV emissions, VOC emissions require consideration of the mass fraction of ethane and VOCs in the fuel hydrocarbons in addition to the MN and WI. Based on the SwRI HD Engine Study, propane, and presumably other VOCs, has a stronger affect on VOC emissions than ethane since ethane itself is not a hydrocarbon and can only significantly contribute to VOC emission increases through ethene, an intermediate product of ethane combustion. In this regard, the amount of VOCs in the fuel will have an even stronger effect on emissions of VOCs from rich-burn engines with TWCs than on lean-burn engines. Based on the SwRI testing, very little ethene or propene is present in the engine exhaust from rich-burn engines (downstream of the TWC) relative to the ethane and propane. This is probably because the TWC selectively removes the more reactive ethene and propene. Thus, ethane does not contribute significantly to VOC emissions from such engines.

G. SLIDE 45

Since the SwRI HD engine testing involved primarily new engines, any analysis of the emission impacts must also take into account the potential for emission increases with engine use from deterioration of the engine and add-on emission control systems (TWCs and oxidation catalysts). This is especially the case for rich-burn HD and light-duty (LD) natural-gas-fueled engines since emissions from gasoline-fueled LD vehicles, which use the same emission control technology (TWC), are known to have significant emission increases over time under real-world operation and maintenance conditions. In addition, unlike LD gasoline-fueled vehicles, NGVs are not subject to mandatory smog testing to

evaluate their emission status. The actual emission increase of the operational fleet must be analyzed to properly assess the emission impacts.

In this regard, the District preliminarily concludes that, based on an evaluation of the SwRI heavy-duty (HD) engine testing and considering impacts of engine emission increases with use, the magnitude of the VOCs will not decrease to insignificance over time as rich-burn engines replace the existing lean-burn engines in the transit bus fleet (the major source of NGV emissions in San Diego). The District notes that the rich-burn engine tested was new, required extensive repairs before testing—even though it was new, and relies on a TWC to achieve its low NOx and VOC emissions. The District's analysis did not consider the potential expansion of the NGV fleet or light-duty NGV emissions.

H. SLIDE 49

Test fuels for the SwRI LD engine test sponsored by SoCal Gas do not represent typical natural gas fuel compositions actually used in most of California. The highest MN for the fuels was about 89 while the lowest propane content was about 2% by volume. As indicated on ARB Slide 9, 87% of the gas supply is from imported interstate pipeline gas that has a MN of 95–100 and a VOC content of about 0.5% by volume. It is questionable if the natural gas compositions used in the test allow adequate baseline emission factors to be established.

I. SLIDE 54

Since emissions in the Sierra Research study are evaluated relative to CARB certification fuel rather than existing imported interstate pipeline gas used by most NGVs, the emission increases (or decreases) in this slide are not representative of the emission increases in most of California.

In addition, the nonmethane hydrocarbons (NMHC) increases indicated may underestimate the VOC emission increases. Test gases 2 and 3 in the SwRI LD vehicle study have increased propane but reduced ethane compared to the ARB certification gas. Based on the District's analysis of the SwRI HD engine study data for the one rich-burn engine tested, the expected increase in VOCs would be greater than the expected increase in NMHC because the smaller ethane (a NMHC but not a VOC) concentration in the fuel reduces the emission increase in NMHCs and masks the potential increase in VOCs. Ethane does not contribute significantly to the VOC emission increase from rich burn engines (Please see also comments on ARB Slides 43 and 44).

J. SLIDE 65

A change in regulations that enables the use of imported LNG will not significantly improve the availability or natural gas fuel meeting ARB specifications nor improve the NGV market in San Diego. San Diego does not directly receive any associated gas production. Approximately 95% of San Diego's gas supply is directly from imported interstate pipeline gas that has historically been compliant with the existing standards.

Based on monthly average gas compositions provided by SoCal Gas, there appear to be a few instances when gas supply from the coastal line, which does indirectly receive some California producer gas that is extensively blended with other supplies, had an inert content slightly below the existing CNG specifications. However, this line only carries about 5% of the natural gas supply in San Diego and only serves a small north coastal area of San Diego. The District recommends that any changes to the regulation to address this issue be limited to the affected area and limit the reduction in inert content to the amount needed to allow consistent compliance for the gas in the affected area.

K. SLIDE 74

The District has no objection to adopting a performance standard as long as it does not allow the importation of LNG-derived natural gas that significantly increases pollutant emissions—both from NGVs and stationary combustion sources and the gas transmission system—unless those emission increases are fully mitigated. Unless the emission increases are mitigated, emission benefits from the increased use of NGVs are likely to be dwarfed by increases in emissions from other sources if the regulatory changes enable imported LNG-derived natural gas to be used in San Diego.

V. COMMENTS ON SOCAL GAS/SDG&E PROPOSAL TO REVISE CARB MOTOR VEHICLE FUEL REGULATIONS

A. PAGE 2 BULLET NO. 3

Although it is still investigating the issue, the District has found little evidence that interstate sourced natural gas in San Diego County is below the minimum inert limit for CNG fuel.

B. PAGE 4 BULLET NO. 2

This bullet implies that interstate natural gas supplies almost never meet ARB fuel specification, when, in fact, most interstate supplies almost always meet the specifications.

C. PAGE 5 BULLET NO. 3

Any streamlined exemption process should provide opportunity for District participation in the process.

D. PAGE 6 BULLET NO. 1

Adoption of statewide performance based standards, as proposed by SoCal Gas and SDG&E, would result in importation of LNG-derived natural gas into San Diego County with significant emission increases of VOCs and NOx. The emission impacts must be mitigated to insignificance or they will interfere with San Diego County attaining the state and federal ambient air quality standards. The LNG-derived gas would also be imported into Imperial County and the SCAQMD.

E. PAGE 7 BULLET NO. 1

The SwRI LD vehicle testing indicates that NMHCs, which include VOCs, increased significantly when the MN decreased from 89 to 75. The WI for these tests was within the range allowed by the CPUC standards. The VOC emission increase is likely even greater than that indicated by the NMHC increase. Therefore, there are emission increases from light-duty vehicles associated with using natural gas allowed under the CPUC standards that deviates significantly from the typical existing supplies.

F. PAGE 9 BULLET NO. 3 AND PAGE 10 BULLET NO. 1

The District disagrees with the statements that there will be no impact on stationary sources emissions and no impact on mobile source emissions. The District also disagrees with the statements that adopting a statewide performance based standard will not result in an increase in the use of imported LNG-derived natural gas. Please see District comments above.

VI. RESIDENTIAL APPLIANCE SAFETY

Although appliance safety is outside the District's regulatory scope, public safety issues are another indirect impact that must be analyzed as part of this process. In particular, the safety of residential appliances when operating on LNG-derived natural gas needs to be confirmed to fully assess the impacts from any regulatory change that encourages the use of such natural gas.

Recent testing by the Air Conditioning Heating and Refrigeration Institute (AHRI), which includes natural gas appliance manufacturers, raises concerns that appliance safety may be jeopardized by using LNG-derived natural gas. The safety issues (high CO emissions) mostly occurred when an appliance tuned on a baseline gas was operated on a gas with a 4.4% higher WI and then challenged with over firing. The purpose of the over-firing challenge is to address: barometric pressure changes, altitude variations, manufacturing tolerances, installation tolerances, reasonable misapplication and misinstallation, aging of the appliance, and WI changes. The other factors are viewed as least as important as WI changes.

In response to some comments at the workshop, the District contacted the AHRI. According to an AHRI representative:

- No safety devices were rendered inoperative during the testing.
- The testing was conducted at rated input, which, in some cases, resulted in returning under-rated appliances to their specified rating. This is the same procedure as the national testing labs use throughout the world because there is no way to make sure the manufacturer always uses the same under-rated condition.

- The test procedures are periodically evaluated to determine their continued applicability to assessing appliance safety. The over-fire test is close to 90 years old but is still applicable to today's technology.