



**STAFF REPORT: INITIAL STATEMENT OF REASONS
FOR THE PROPOSAL TO ESTABLISH A DISTRIBUTED
GENERATION CERTIFICATION PROGRAM**

**Stationary Source Division
Project Assessment Branch**

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**State of California
AIR RESOURCES BOARD**

**STAFF REPORT: INITIAL STATEMENT OF REASONS
FOR PROPOSED RULEMAKING**

Public Hearing to Consider

**ADOPTION OF THE PROPOSAL TO ESTABLISH
A DISTRIBUTED GENERATION CERTIFICATION PROGRAM**

To be considered by the Air Resources Board on November 15, 2001, at:

California Environmental Protection Agency
Headquarters Building
1001 I Street
Sacramento, California

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**State of California
AIR RESOURCES BOARD**

**PROPOSED REGULATION TO ESTABLISH A DISTRIBUTED GENERATION
CERTIFICATION PROGRAM**

**Executive Summary
and
Technical Support Document**

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**Staff Report: Initial Statement of Reasons for the
Proposed Distributed Generation Certification Program**

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**State of California
AIR RESOURCES BOARD**

**Staff Report: Initial Statement of Reasons for the
Proposed Distributed Generation Certification Program**

Executive Summary

I. INTRODUCTION

This executive summary presents the Air Resources Board (ARB or Board) staff's proposal for establishing a certification program that includes emission standards for electrical generation technologies, as required by SB 1298.

Senate Bill 1298 (SB 1298), which was chaptered on September 27, 2000, requires the ARB to adopt uniform emission standards for electrical generation technologies that are exempt from air pollution control or air quality management districts' (districts) permit requirements. The statute also directs the ARB to establish a certification program for technologies subject to these standards. SB 1298 focuses on electrical generation that is near the place of use, and defines these sources as "distributed generation" (DG). Therefore, electrical generation technologies that are subject to the proposed emission standards and certification program will be referred to hereafter as "distributed generation" or "DG" technologies in this report.

SB 1298 requires the ARB to:

- 1) Adopt a certification program and uniform emission standards for electrical generation technologies that are exempt from air districts' permitting requirements; and
- 2) Issue guidance to the air districts on the permitting or certification of electrical generation technologies under their regulatory jurisdiction.

SB 1298 mandates two levels of emission standards for affected DG technologies. The law requires that the first set of standards be effective no later than January 1, 2003, and reflect the best performance achieved in practice by existing DG technologies that are exempt from district permits. The law also requires that, by the earliest practicable date, the standards be made equivalent

to the level determined by the ARB to be the best available control technology (BACT) for permitted central station power plants in California. The emission standards must be expressed in pounds per megawatt hour (lb/MW-hr) to reflect the efficiencies of various electrical generation technologies.

This report will discuss only the ARB staff's proposed certification program for DG technologies that are exempt from districts' permitting requirements. The district guidance is presented in a separate ARB report entitled Guidance for the Permitting of Electrical Generation.

This executive summary provides an overview of the development of the DG Certification Regulation, a summary of the ARB staff's recommendations, and a brief discussion of the environmental and economic impacts resulting from the proposal. Volume II of this report, the Technical Support Document, provides a more detailed presentation of the technical basis for the proposed DG certification requirements.

II. BACKGROUND

1. What is the purpose of SB 1298?

Some businesses are expected to consider supplementing or replacing electricity from central station power plants with distributed generation sources that are near the place of use. On an equivalent energy production basis (i.e. pounds of air pollutant per kilowatt-hour of electricity produced), DG emissions can be an order of magnitude higher than emissions from central station power plants. If more businesses employ DG technologies, the emissions from these sources could have a negative impact on air quality and public health in California. DG sources are located near the place of consumption and can have a localized impact on public health. SB 1298 requires that each DG unit is either certified by the ARB for use or subject to the permitting authority of a district. Developing uniform emission standards for DG technologies will ensure the deployment of only the cleanest DG equipment in California.

III. PUBLIC OUTREACH

The ARB staff's proposal was developed in a public process that involved all affected parties. The ARB staff held five public consultation meetings throughout the State during the development of the DG certification program to solicit ideas and comments on proposed certification requirements and emission levels. A DG workgroup was formed to assist the ARB staff with identifying and resolving issues during the development of the DG program. The workgroup, comprised of over 90 representatives of affected industry, environmental groups and district staff, met six times between January and June 2001, in Sacramento.

Information about the proposed DG program was distributed at community meetings as part of the ARB's Children's Environmental Health and Environmental Justice programs.

An e-mail list server was created to notify potentially affected industry and other interested parties of the progress of the ARB's DG certification program. Approximately 700 individuals from federal, state, and local government, environmental groups, and industry subscribe to the list server. The ARB staff created and has maintained a website to facilitate the dissemination of up-to-date information of the progress of the DG program at <http://www.arb.ca.gov/energy/dg/dg.htm>.

In addition to the workgroup meetings and public consultation meetings, the ARB staff met numerous times, face-to-face and by phone, with stakeholders to discuss specific issues of interest.

The ARB staff apprised the air districts and the United States Environmental Protection Agency (U.S. EPA) of the DG certification activities through the workgroup meetings and California Air Pollution Control Officer's Association's (CAPCOA) Engineering Managers Committee meetings. The ARB staff also held several conference calls with district staff to obtain the districts' perspectives on the ARB staff's proposed DG program.

IV. OVERVIEW OF DG TECHNOLOGIES

1. What types of sources are subject to the DG certification program?

The DG technologies that are exempt from district permitting requirements are subject to the certification program. Stationary DG sources fall under the districts' authority but districts have chosen to exempt many of these units from permits or other control requirements. The ARB staff reviewed the exemption levels in each of California's 35 air district rules to determine what types of technologies are generally not permitted by the air districts. Exemption levels vary among California's 35 air districts. Some examples of technologies that will most likely be subject to the DG certification program and emission standards are microturbines, small reciprocating engines, external combustion engines, and fuel cells. Engines that are exempt from district permit requirements are smaller units, such as those with less than a 100 horsepower rating. Microturbines exempt from district permits are typically 30 kw to 70 kw in size.

2. What are the uses of DG technologies?

Many smaller DG technologies are just now entering the market, making it difficult to predict their future uses. It is likely that most DG technologies will be used to supplement electricity that is supplied by the grid. However, the installed

cost per kilowatt for most DG technologies are generally much higher than the installed cost/kw for central station power plants. For example, an average installed cost/kw for a central station power plant is \$510 while the installed cost/kw for a microturbine can be up to \$1,500.

DG technologies can be integrated into combined heat and power (CHP) packages where the waste heat from the combustion process is used for heating water or for chilling purposes. DG units that are integrated with CHP are more cost attractive than DG units that produce power only. For this reason, DG technologies that include CHP packages are likely to be most attractive to users that also have a use for the heat provided.

A few unpermitted DG technologies are currently operating in California. Most of these units are at research facilities or at local utility districts where applicability and reliability are being evaluated. The uncertainty in the future cost and reliability of electricity in California makes it difficult to project future sales of DG technologies. However, DG equipment manufacturers claim that they will experience increased sales over the next few years.

3. How were emission standards determined for DG technologies?

SB 1298 requires the ARB to establish at least two levels of emission standards for DG technologies that are exempt from air district permit requirements. The first level must reflect the best performance achieved in practice by existing DG technologies and must become effective no later than January 1, 2003. By the earliest practicable date, the standards must be made equivalent to the level determined by the ARB to be the best available control technology for permitted central station power plants.

In order to establish emission standards for DG technologies, test data were needed for these sources. Although source testing had been conducted on some microturbines at a research center at University of California at Irvine and through the Electric Power Research Institute (EPRI), this data was not publicly available. Consequently, early in the regulatory development process, the ARB staff requested any available source test data from potentially affected manufacturers to help staff identify the lowest achievable emission levels from these technologies. The ARB staff received data from five manufacturers. The ARB staff also conducted a source test on a microturbine located at an electric utility office in Sacramento and used the results to confirm the manufacturers' test data.

In order to develop the second required set of emission standards, the ARB staff analyzed BACT determinations for central station power plants in California. The ARB staff used data included in the 1999 ARB report entitled Guidance for Power Plant Siting and Best Available Control Technology. The report includes BACT determinations for central station power plants that

generate 50 megawatts or greater of electricity. The ARB staff reviewed the BACT determination in this report for combined-cycle gas turbines, which is the configuration used in all new central station power plants. The BACT determinations were converted to an equivalent lb/MW-hr emission standard with an adjustment for a ten percent total system (transmission and distribution system) average line loss factor.

4. How were the compliance dates determined?

SB 1298 requires new DG technologies to meet the lowest achievable emission standards that reflect the best performance achieved in practice by existing DG technologies, commencing January 1, 2003. The law also requires that these technologies meet the emission limits of central station power plants by the earliest practicable date. To determine a reasonable compliance date for DG technologies to meet central station BACT levels, the ARB staff surveyed manufacturers regarding how long it would take to achieve these levels. Manufacturers indicated to the ARB staff that it would take a minimum of four years to develop a new product. A 2007 compliance date was chosen to give manufacturers a five year lead time (from the time the certification program is approved by the Board) to develop a technology that can meet the SB 1298-mandated standards equivalent to central station power plants. To assist manufacturers with meeting these standards, the ARB staff included provisions for calculating a credit for highly efficient CHP packages that are integrated with DG technologies.

V. SUMMARY OF THE PROPOSED DG CERTIFICATION PROGRAM

1. What does the proposed DG certification program require?

After January 1, 2003, manufacturers of new electrical generation units that are exempt from district permit requirements must have their equipment certified by the ARB to the proposed emission standards. There are 35 air districts in California. The ARB staff will assist the manufacturers with determining exemption levels for each district. If a proposed unit is not subject to the district's permit requirements, it must be certified by the ARB before it can be sold, leased, or operated in that district. Equipment operating before January 1, 2003 will not be subject to the proposed standards. Certifications are valid for four years or until January 1, 2007.

The ARB staff is proposing two sets of emission standards for oxides of nitrogen (NO_x), carbon monoxide (CO), volatile organic compounds (VOCs), as defined by ARB Test Method 100, and particulate matter (PM). As was previously mentioned, the first set of standards is effective on January 1, 2003, and the second set of standards becomes effective on January 1, 2007. DG technologies must be able to maintain the emission standards levels that they

are certified to for 15,000 hours. The 15,000 hours requirement is within the expected useful life of nonselective catalytic reduction units that may be integrated with some technologies (i.e. reciprocating engines) seeking certification and is also within many manufacturers' warranty periods. A summary of the emission standards for 2003 is included in Table I.

Table I -2003 Emission Standards (lb/MW-hr)

Pollutant	DG Unit not Integrated with Combined Heat and Power	DG Unit Integrated With Combined Heat and Power
Oxides of Nitrogen (NO _x)	0.5	0.7
Carbon Monoxide (CO)	6.0	6.0
Volatile Organic Compounds (VOCs)	1.0	1.0
Particulate Matter (PM)	An emission limit corresponding to natural gas with fuel sulfur content of no more than 1 grain per 100 standard cubic feet (scf)	An emission limit corresponding to natural gas with fuel sulfur content of no more than 1 grain per 100 standard cubic feet (scf)

Emission standards have been set for DG units that are not integrated with combined heat and power packages and for DG units that are integrated with combined heat and power packages. DG units that are certified without integrated CHP must meet the more stringent standard. These standards are based on achievable limits that were determined from the ARB staff's review of DG manufacturers' emissions data. DG units that are certified with integrated CHP are given an emission credit that is reflected in a slightly higher emission standard value. The emission credit is equivalent to the emissions from a boiler that would otherwise be used to produce the process heat coming from the DG unit. These standards provide recognition of the emissions benefits of CHP applications.

A manufacturer can use an energy credit for meeting either set of emission standards if the DG unit is integrated and certified with a zero emission technology including, but not limited to, a photovoltaic cell, wind turbine, non-reformer fuel cell, or Stirling-cycle engine that uses waste heat or solar energy. The electrical output of the zero emission technology can be added to the electrical output of the DG unit subject to certification to calculate the lb/MW-hr emission rate of the integrated package. This credit provides recognition of the emissions benefit of zero emission technologies.

A summary of the 2007 emission standards is included in Table II.

Table II-2007 Emission Standards (lb/MW-hr)

Pollutant	Emission Standard
Oxides of Nitrogen (NO _x)	0.07
Carbon Monoxide (CO)	0.10
Volatile Organic Compounds (VOCs)	0.02
Particulate Matter (PM)	An emission limit corresponding to natural gas with fuel sulfur content of no more than 1 grain per 100 scf

As was mentioned earlier, the 2007 standards are based on the 1999 BACT determinations for central station power plants adjusted for a total system average line loss factor of ten percent. Manufacturers of DG technologies that are integrated with highly efficient CHP will be able to calculate an energy credit for usable process heat. This credit can be used to meet the 2007 standards.

To assist zero emission technologies to enter the California market, provisions are also included to allow zero emission technologies to seek voluntary certification. It is expected that manufacturers of these technologies may seek voluntary ARB certification for marketing purposes.

2. Are there exemptions to the certification requirements?

Certain technologies are exempt from certification requirements. A technology does not have to be certified if it does not emit an air contaminant. An electrical generation technology does not have to be certified if it is registered under the ARB's Portable Equipment Registration Program. In addition, certification is not required if an electrical generation technology will only be used when electrical or natural gas service fails or for emergency pumping of water for fire protection or flood relief.

3. What is the application process?

Manufacturers seeking certification will submit an application package to the ARB for review. The following information must be included in the application for the ARB to determine eligibility for certification:

- Name of the applicant and contact information;
- a description of the DG unit and model number;
- maximum output rating;
- fuel for which certification is being sought;
- any air pollution control equipment that is integrated with the technology;
- and

- emissions test data, supporting calculations, quality control/assurance information, and all other information needed to demonstrate compliance with the emission standards and durability requirements.

Upon finding that the DG technology meets the requirements for certification, an Executive Order of Certification will be issued by the ARB. The Executive Order will describe the DG unit and indicate if the unit was certified with an integrated CHP package, zero emission technology, and/or air pollution control equipment. The Executive Order will also indicate that the certification is required only in those districts where the specific DG unit is exempt from district permit requirements.

4. What are the testing requirements?

Manufacturers must include a source test report with their applications for certification demonstrating that their equipment meets the emission limits. ARB test methods, or alternative approved procedures must be used. Specific testing parameters are included in the certification requirements. Before commercial operation, each DG unit manufactured for sale, lease, or use in California must be monitored for NO_x emissions using an approved NO_x screening device. The monitoring information will be used by the ARB staff at a later date as part of a quality control review of the emission test data.

5. What are the certification fees?

To recover costs incurred by the ARB staff to process a request for DG certification, a \$2,500 application fee will be due at the time an application package is submitted. Technologies seeking a recertification (every four years) will be assessed a \$2,500 fee. To provide an economic incentive for the cleanest DG technologies, DG units that can meet the 2007 standard by 2003 will not be assessed a fee for the 2003 standard certification. For the same reason, zero emission technologies that are seeking voluntary certification will not be assessed a fee.

6. Will there be another review of electrical generation technologies?

To address the inherent uncertainties associated with emerging technologies, the ARB staff will conduct another review of DG technologies and report the findings to the Board by July 2005. This will give manufacturers and the ARB staff two and a half years after the first set of standards are in place to evaluate information on the performance and capabilities of DG technologies as well as evaluate DG deployment in California. The review will address newly available emissions data, source testing procedures, operating conditions, operational modes, reliability, and emissions durability for these technologies.

The review will also include an evaluation of any new BACT determinations for central station power plants and an evaluation of any control measures under development or recently-adopted by the ARB that could have a bearing on the 2007 standard.

7. Are there other requirements in the proposal?

The proposed certification regulation also contains provisions addressing recordkeeping, labeling requirements, recertification requirements, and enforcement.

8. What are the key unresolved issues?

While ARB staff has been able to resolve the majority of concerns raised by manufacturers and environmental groups, there are some issues for which general consensus has not been reached.

Some manufacturers and environmental groups do not believe that electrical generation technology used for emergency purposes only should be exempt from the certification requirements. These units, which provide essential electricity during loss of electrical or natural gas services, are generally run on diesel fuel and subject to district permit requirements. The proposed emission standards in the certification program essentially eliminate diesel-fueled engines from being eligible for certification. The ARB staff is now evaluating control measures for diesel PM and expects to present a proposed control measure for diesel-fueled engines to the Board next year.

Some manufacturers and environmental groups do not believe that DG units should be exempt from the certification requirements if they are registered under the ARB's Portable Equipment Registration Program (PERP), because the emission limits in the PERP are higher than the proposed limits in the certification program. The ARB staff does not anticipate many units subject to the certificate requirements to fall under the definition of portable equipment. The ARB staff is currently considering changes to the PERP, including modifying emission limits, and anticipates presenting amendments to the Board next year.

Some industry sources believe that the 2007 compliance date by which DG units must meet central station power plant emission levels is too stringent. Manufacturers indicated to ARB staff that it would take four years to research and develop a new product. A 2007 compliance date was chosen to give manufacturers a five year lead time (from the time the certification program is approved by the Board) to develop a technology that can meet the central station power plant BACT levels.

VI. IMPACTS OF THE PROPOSED CERTIFICATION PROGRAM – HEALTH, ENVIRONMENTAL, ECONOMIC

1. Are there any health impacts as a result of the certification program?

The DG certification program will ensure that distributed generation is deployed in a way that avoids a negative effect on air quality and public health. If uncontrolled, emissions from DG technologies could negatively impact air quality and public health. Setting state-of-the-art emission standards now for emerging DG technologies will help protect California citizens from these new sources of air emissions.

2. Are there any significant adverse environmental impacts associated with the proposed certification program?

The ARB is committed to evaluating community impacts of proposed measures, including environmental justice concerns. The proposed certification program is not expected to result in significant negative environmental impacts in any community. The result of the proposed certification program will be reduced exposures to small sources of electrical generation for all communities.

3. Are there any significant adverse economic impacts associated with the proposed certification program?

Manufacturers' efforts to comply with the 2003 emission standards are not expected to result in any significant adverse economic impacts. Affected manufacturers have indicated to the ARB staff that they expect their technologies to meet the 2003 emission standards by January 1, 2003. However, there will be an economic impact on some manufacturers with meeting the 2007 standard. These manufacturers have indicated that they will incur research and development costs to redesign their technologies to meet the 2007 standards which could also result in higher product cost. Manufacturers have indicated that it may cost several million dollars to accomplish its redesign. The ARB staff is also aware that it will be difficult for some DG technologies such as reciprocating engines to ever meet BACT levels for central station power plants, regardless of compliance dates, because of the prohibitive cost of additional emission control devices that would be needed to meet the standards. However, these manufacturers can use an energy credit if they sell their products integrated with CHP packages. With this credit, fewer additional controls would be needed to allow the DG unit to meet the 2007 standard.

The overall statewide cost of the proposed certification program for the 2003 standards is estimated to be \$370,000 with an estimated individual business cost of \$11,000 to \$21,500.

Some technologies may not initially or may never meet the emission standards, which may delay availability or reduce product choices. This could potentially increase the price of DG technologies. Also products may increase in price when manufacturers redesign their products to meet the 2007 standards. To offset these possibilities, the ARB staff's proposal provides credits for CHP and zero emission technology packages to enable manufacturers to remain competitive and still meet the emission standards established by SB 1298.

VII. NEXT STEPS

If the proposed certification program is approved, the ARB staff must implement and enforce the certification program. The ARB staff will conduct outreach to educate stakeholders on the certification program. While waiting for the California Office of Administrative Law (OAL) to approve the DG certification program, the ARB staff will process a limited number of voluntary pilot certifications for manufacturers. These pilot certifications will provide manufacturers with an opportunity to request an early provisional certification of their DG technology unit that is conditional upon final OAL approval of the program. Finally, the ARB staff will complete an electrical generation technology review and report the findings to the Board by July 2005.

VIII. RECOMMENDATION

The ARB staff recommends that the Board approve the proposed certification requirements and emission standards for DG technologies. The proposal addresses the requirements in the statute, public health protection, and the impacts on industry and presents the most reasonable approach to meeting the mandates of SB 1298.

**State of California
AIR RESOURCES BOARD**

**Staff Report: Initial Statement of Reasons for the
Proposed Distributed Generation Certification Program**

**Volume II:
Technical Support Document**

I. INTRODUCTION

A. Overview

Senate Bill 1298 (SB 1298), which was chaptered on September 27, 2000, requires the ARB to adopt uniform emission standards for electrical generation technologies that are exempt from air pollution control or air quality management districts' (districts) permit requirements. The statute also directs the ARB to establish a certification program for technologies subject to these standards. A copy of the SB 1298 legislation is included in Appendix A.

SB 1298 focuses on electrical generation that is near the place of use, and defines these sources as "distributed generation." Thus, electrical generation technologies that are subject to the proposed emission standards and certification program will be hereafter referred to as "distributed generation" or "DG" technologies in this technical report.

Exemption levels vary among California's 35 air districts. Some examples of technologies that will most likely be subject to the DG certification program and emission standards are microturbines, small reciprocating engines, external combustion engines, and fuel cells. Engines that are exempt from district permit requirements are smaller units, such as those with less than a 100 horsepower. Microturbines exempt from district permits are typically 30 kw to 70 kw in size.

SB 1298 mandates that the ARB establish at least two levels of emission standards for affected DG technologies. The law requires that the first set of standards be effective no later than January 1, 2003, and reflect the best performance achieved in practice by existing DG technologies that are exempt from district permits. The law also requires that, by the earliest practicable date, the standards be made equivalent to the level determined by the ARB to be the best available control technology (BACT) for permitted central station power plants in California. The emission standards must be expressed in pounds per megawatt hour (lb/MW-hr) to reflect the efficiencies of various electrical generation technologies.

In addition to developing the certification program, the ARB is required to issue guidance to the air districts on the permitting or certification of electrical generation technologies that are under their regulatory jurisdiction. The guidance shall address BACT determinations for these technologies. As is required in the certification program, these BACT determinations must, by the earliest practicable date, be made equivalent to the level determined by the ARB to be BACT for permitted central station power plants in California. The non-regulatory district guidance, Guidance for the Permitting of Electrical Generation Technologies, is not part of this Initial Statement of Reasons. However, it is important to note that the ARB staff is proposing comparable emission levels,

where applicable, for both the district guidance and the proposed DG certification program.

B. Purpose of Legislation

Some businesses are expected to consider supplementing or replacing electricity from central station power plants with distributed generation sources that are near the place of use. On an equivalent energy production basis (i.e. pounds of air pollutant per megawatt-hour of electricity produced), emissions from some DG technologies can be an order of magnitude higher than emissions from central station power plants.

If more businesses employ DG technologies, the emissions from these sources could have a negative impact on air quality and public health in California. SB 1298 requires that each DG unit is certified by the ARB for use or subject to the permitting authority of a district. Developing uniform emission standards for DG technologies will ensure the deployment of only the cleanest DG equipment in California.

In response to SB 1298, the ARB staff is proposing requirements for a DG certification program that include proposed emission standards. The ARB staff's proposal is included in Appendix B. The remainder of this technical report will discuss the public input process during the development of the proposed certification program; provide an overview of DG technologies and emissions from electrical generation technologies; discuss the specific requirements of the proposed certification program; and discuss the public health, economic and environmental impacts of the ARB staff's proposal.

II. PUBLIC OUTREACH

This chapter contains a summary of the ARB staff's efforts to communicate with all affected parties in a public process during the development of the proposed DG certification program. During the development of the proposed DG certification program, the ARB staff met numerous times with electrical generation technology manufacturers, environmental groups, representatives of DG technology users, and air district staff to discuss potential certification requirements and emission standards. In addition, the ARB staff also communicated with staff from other state air quality agencies that are developing DG programs.

A. General Public Involvement

A little more than a month after SB 1298 was chaptered by the California Secretary of State, the ARB staff held a public consultation meeting to discuss the requirements in SB 1298 and to solicit ideas on the general direction that the ARB staff should take to develop the required DG certification program. Questions were developed in advance of the workshop for consideration by potential stakeholders. The questions addressed applicability, potentially affected technologies, the certification process, and possible components of the district guidance. At this November 8, 2000, public consultation meeting, stakeholders were given the opportunity to present their suggestions for implementing the DG certification program.

Four additional public consultation meetings were held in July 2001 on the ARB staff's proposed draft certification regulation. The first was held July 11, 2001 in Sacramento. The second was held in Diamond Bar (Los Angeles area) on July 17, 2001. The third was held on July 18, 2001 in San Francisco, and the last was held on July 19, 2001 in Fresno. An overview of the draft certification program was presented by the ARB staff at each of the consultation meetings prior to inviting discussion and comment by the stakeholders.

The ARB staff created and has maintained a website to facilitate the dissemination of up-to-date information on the progress of the DG program at <http://www.arb.ca.gov/energy/dg/dg.htm>. An e-mail list server was also created to notify potentially affected industry and other interested parties of the ARB staff's progress in developing the DG certification program. Approximately 700 individuals from federal, state, and local government; environmental groups; and industry subscribe to the list server. A DG fact sheet in English and Spanish was made available at various community meetings held by the ARB. These meetings were conducted as part of the ARB's Children's Environmental Health and Environmental Justice programs.

B. Industry Involvement

A workgroup was formed in January 2001 to assist the ARB staff with developing a certification program. The workgroup consisted of approximately 90 individuals representing manufacturers of microturbines, engines, fuel cells and other DG technologies; environmental groups; the California Energy Commission; the California Public Utilities Commission; utility companies; the United States Environmental Protection Agency (U.S. EPA); local air districts; and other interested parties. The first workgroup meeting was held on January 29, 2001, in Sacramento. Subcommittees were created at this meeting to address specific issues associated with developing a DG certification program. The subcommittees met at the ARB offices on February 15, March 6, and March 27, 2001. Workgroup meetings were held again on May 1 and June 4, 2001 to discuss draft versions of the DG certification requirements. Following the workgroup and public consultation meetings, staff revised the draft DG certification requirements to reflect consideration of the verbal and written comments received.

In addition to the workgroup and public consultation meetings, staff met numerous times, face-to-face and by phone, with industry representatives to discuss and resolve issues specific to that industry. During the development of the proposed certification program, the ARB staff held over 15 meetings with individual industry groups and had over 100 telephone calls with industry representatives.

C. Government Agency Involvement

During the development of the DG program, the ARB staff apprised the air districts and U.S. EPA of the DG certification activities through the California Air Pollution Control Officer's Association's (CAPCOA) Engineering Managers Committee meetings. Representatives from some of these agencies were also members of the ARB's DG workgroup. The ARB staff also held several conference calls with district staff to obtain the districts' perspective on the ARB staff's proposed DG program.

The Texas Natural Resource Conservation Commission (NRCC) issued a new standard air permit for electric generating units in May 2001. The ARB staff reviewed the new Texas permit rule and communicated with staff from the Texas NRCC during the development of ARB's proposed DG certification program.

The ARB staff has also been participating in the Distributed Generation Emissions Collaborative Working Group. The Working Group includes representatives from various state public utility commissions, other state air quality programs, manufacturers, and the National Resources Defense Council. The Working Group's activities are organized and coordinated by the Regulatory Assistance Project, a non-profit organization that provides workshops and

education assistance to state public utility regulators on electric utility regulation. The goal of the Working Group is to develop a national model rule for emissions from DG technologies by the fall of 2001.

D. Issues

While the ARB staff has been able to resolve the majority of concerns raised by manufacturers and environmental groups during the development of the certification program, there are some issues for which general consensus has not been reached.

Some manufacturers and environmental groups do not believe that electrical generation technology used for emergency purposes only should be exempt from the certification requirements. These units, which provide essential electricity during loss of electrical or natural gas services, are generally run on diesel fuel and subject to district permit requirements that restrict the number of hours per year the unit can run. The proposed emission standards in the certification program are at levels that essentially eliminate diesel-fueled engines from being eligible for certification. The ARB staff currently has a program to address sources of diesel emissions. The ARB staff identified particulate matter (PM) from diesel-fueled engines as a toxic air contaminant in 1998. Last year, the ARB staff evaluated possible risk reduction measures for diesel PM emissions and presented its finding in a report entitled Risk Reduction Plan to Reduce Particulate Matter Emission from Diesel-Fueled Engines and Vehicles. The ARB staff is now evaluating control measures for diesel PM and expects to present a proposed control measure for diesel-fueled engines to the Board next year.

Some manufacturers and environmental groups do not believe that DG units should be exempt from the certification requirements if they are registered under the ARB's Portable Equipment Registration Program (PERP), because the emission limits in the PERP are higher than the proposed limits in the certification program. The ARB staff does not anticipate many units subject to the certificate requirements to fall under the definition of portable equipment. Portable equipment can be used no more than one year and a day at one location. The ARB staff is currently considering changes to the PERP, including modifying emission limits, and anticipates presenting amendments to the Board next year.

Some industry sources believe that the 2007 compliance date by which DG units must meet central station power plant emission levels is too stringent. Some sources suggested moving the compliance date to 2010 or later. SB 1298 requires DG technologies to meet central station BACT levels at the earliest practicably date. Manufacturers indicated to ARB staff that it would take four years to research and develop a new product. A 2007 compliance date was chosen to give manufacturers a five year lead time (from the time the certification program is approved by the Board) to develop a technology that can meet the

central station power plant BACT levels. Manufacturers can calculate a credit for highly efficient CHP packages that are integrated with DG units. With this credit, fewer additional controls and product design would be needed to allow the DG unit to meet the 2007 standard.

III. OVERVIEW OF DG TECHNOLOGIES

This chapter provides an overview of DG technologies that are most likely to be affected by the proposed certification program. The overview includes a discussion of the types of DG technologies, their possible uses, and the number of units operating in California.

A. Descriptions of DG Technologies

Electrical generation technologies that are exempt from districts' permit requirements will be subject to the ARB's certification program. Stationary DG sources fall under the districts' authority but districts have chosen to exempt many of these units from permits or other control requirements. The ARB staff reviewed the exemption levels in each of California's 35 air district rules to determine what types of technologies are generally not permitted by the air districts. A summary of district exemptions is included in Appendix C. Unpermitted DG technologies include fossil-fueled and zero emission technologies. The fossil-fueled technologies include microturbines, fuel cells, reciprocating engines, and external combustion engines. Zero emission technologies include, but are not limited to, wind turbines, photovoltaic cells, external combustion engines that use only waste heat or solar energy, and some fuel cells. Some DG technologies, such as fuel cells and external combustion engines, can fall under both categories.

1. Microturbines

Microturbines are high-speed, single-rotor turbines that are generally less than 100 kilowatts (kw) in size and usually burn natural gas. They can operate alone or in parallel with a number of units.

2. Fuel Cells

A fuel cell is an electrochemical device that combines hydrogen with oxygen to produce electricity, heat, and water. A fuel cell consists of an anode, cathode, and electrolyte. Electrochemical oxidation and reduction reactions take place at the electrodes to produce electrical current. Each individual fuel cell produces less than one volt, so cells are stacked to obtain the desired voltage. There are four types of fuel cells: phosphoric acid, molten carbonate, solid oxide, and proton exchange membrane. The hydrogen fuel can be supplied through a hydrogen tank or with a reformer that extracts the hydrogen from a fossil fuel such as methane or natural gas. Fuel cells that use a reformer to create their hydrogen source can emit small quantities of air pollutants.

3. Reciprocating Engines

Reciprocating engines generate power from the combustion of an air/fuel mixture. The combusted mixture provides rotational energy to drive equipment such as an electrical generator.

4. External Combustion Engines (Stirling-cycle engines)

A Stirling-cycle engine is a closed loop engine where heat is provided outside the engine to move a piston. The heat can be from any source such as waste heat, solar energy, or combustion gases.

5. Zero Emission Technologies

Zero emission technologies have no air emissions. They include, but are not limited to, wind turbines, photovoltaics, external combustion engines that use only waste heat or solar energy, and non-reformer fuel cells.

Wind turbines: Wind turbines generate electricity when wind passes by blades that are mounted on a rotating shaft. As the wind moves the blades, the rotation of the blades turns a generator that produces electricity.

Photovoltaics: Photovoltaics directly convert sunlight into electricity through the use of solar cells, which are grouped together to form a panel. The panels can be grouped together to produce the desired voltage.

B. **Uses of DG Technologies**

Most smaller (70 kw and below) DG technologies are just now entering the market, making it difficult to predict their future uses. It is likely that most DG technologies will be used to supplement electricity that is supplied by the grid. However, the cost per kilowatt for producing electricity from DG units is generally much higher than the cost of electricity supplied from the grid. Integrated DG units with combined heat and power (CHP) packages can make the cost of DG technologies more competitive with the grid. In a CHP package, the waste heat from the combustion process or the electrochemical reaction (such as in a fuel cell) is captured and used for heating water or for chilling purposes. In areas where the cost of electricity from the grid is high, CHP packages are an even more attractive option. For this reason, future sales of DG technologies in California are expected to include CHP packages.

The smaller DG technologies are just now entering the commercialization stage. To date, manufacturers have placed their DG units primarily at research facilities and at local utility districts in California. The units have been placed at these sites primarily to demonstrate applicability and reliability. Most new

proposals for DG technologies include single DG units with CHP packages, although some proposals do include clustering of several units that can provide hundreds of kilowatts of electricity output. In some situations, the DG manufacturer can secure natural gas contracts for their customers with prices that are lower than their existing commercial rates. This decrease allows the cost of securing DG technology supplied electricity to be more competitive with grid supplied electricity.

The future electricity market in California is uncertain making it difficult to project future sales and use of DG technologies. However, manufacturers of DG technologies claim that they will experience increased sales over the next few years.

To provide a better understanding of potential DG uses in California, a comparison of the purchase and installation cost per kilowatt output (installed cost/kw) for typical DG technologies and a central station power plant is included in Table 1. The table indicates that the installed cost of DG technologies is higher than that of central station power plants. Of course, as more technologies are manufactured and sold over the next few years, the cost/kw of DG technologies would be expected to decrease. For now, adding CHP packages to DG units makes purchasing and using DG technologies more attractive especially in areas where the cost of electricity from the grid is high.

Table 1-Installed Cost per Kilowatt of Electrical Generation Technologies

Technology	Installed Cost/kilowatt
Central Station Power Plant	\$510
Natural Gas Internal Combustion Engines	\$600
External Combustion (Stirling-cycle) Engines	\$1000
Microturbines	\$1000-1500
Wind	\$1000-4000
Solar	\$2500-8000
Fuel Cells	\$4000-4500

C. Inventory of DG Technologies

Individual unpermitted sources are not included in the district inventories or in the statewide emissions inventory that is maintained by the ARB.

Consequently, the ARB staff relied on conversations with manufacturers to determine how many unpermitted DG technologies are operating in California and where they are located.

The ARB staff has identified 25 potentially affected DG technology manufacturers that are at various stages of commercialization. The manufacturers include: 16 fuel cell manufacturers; 4 microturbine manufacturers; two reciprocating engine (without CHP packages) manufacturers; two reciprocating engine (with CHP packages) manufacturers; and one Stirling-cycle engine manufacturer. It is unclear if all of the identified manufacturers will actually sell their products in California, but all have indicated an interest in doing so in the future.

Most of the microturbines located in California are at research facilities and local utility districts and are used primarily to demonstrate their applicability and reliability. To date, only a few units have been purchased and installed for use at commercial sites. The South Coast Air Quality Management District will be placing approximately 150 microturbines at public buildings throughout the district using funds from with the Los Angeles Department of Water and Power (LADWP) and AES Settlement Funds.

The few stationary fuel cells that are operating in California are either located at the United States Department of Defense facilities or are undergoing evaluation by utility companies. The stationary fuel cell community is currently served by one commercial product, a 200 kW phosphoric acid fuel cell. However, the fuel cell manufacturing community is engaged in a strong commercialization effort and is currently establishing a manufacturing capability to meet an emerging market.

Small well-controlled natural gas-fired reciprocating engines (without CHP), using nonselective catalytic reduction, are now available for sale in California. Well-controlled reciprocating engines that are integrated with CHP have been installed at a number of locations in California. One manufacturer of these units indicated to the ARB staff that approximately 100 of their units have been installed in California.

Stirling-cycle engines are expected to be commercialized in 2002.

As can be seen from the information presented above, very few smaller DG technologies are currently being operated in California. However, manufacturers are aggressively pursuing new customers for their technologies and expect to initiate or increase sales in California over the next few years.

IV. EMISSIONS FROM ELECTRICAL GENERATION TECHNOLOGIES

To develop the emission standards required in SB 1298, the ARB staff evaluated emissions data from DG technologies that would be exempt from district permit and BACT determinations for central station power plants. This chapter includes a discussion of the ARB staff's analysis of air emissions from these electrical generation sources.

A. Emissions from DG Technologies

SB 1298 mandates two levels of emission standards for affected DG technologies. The law requires that the first set of standards be effective no later than January 1, 2003, and reflect the best performance achieved in practice by existing DG technologies that are exempt from district permits. The law also requires that, by the earliest practicable date, the standards be made equivalent to the level determined by the ARB to be BACT for permitted central station power plants in California. The emission standards must be expressed in lb/MW-hr to reflect the efficiencies of various electrical generation technologies.

1. Fossil-Fueled Technologies

As was mentioned in the previous chapter, DG sources include fossil-fueled technologies that emit air pollutants and non-polluting zero emission technologies. To evaluate possible emission standards for 2003, the ARB staff had to first analyze source test data for fossil-fueled DG technologies not subject to district permits.

Source test data for these types of technologies are not readily available because these technologies are not required to be source tested for permitting purposes. Although source testing had been conducted on some microturbines at a research center at University of California at Irvine and through the Electric Power Research Institute, this data was not publicly available. Consequently, early in the regulatory development process, the ARB staff requested any available source test data from potentially affected manufacturers to help staff identify the lowest achievable emission levels from these technologies.

The ARB staff received emissions data from manufacturers of three microturbines, one reciprocating engine, and a phosphoric acid fuel cell integrated with a reformer. A summary of the manufacturers' source test data is included in Table 2. The ARB staff also conducted a source test on one microturbine located at an electric utility district office in Sacramento. The test results were comparable to the manufacturers' test data. The ARB source test results can be found in Appendix D.

Table 2-Test Data from Manufacturers

	Power level*	ppm @ 15% O2			lb/MW-Hr		
		NOx	VOC***	CO	NOx	VOC***	CO
Microturbines							
Technology #1	100%	3	0	10	0.2	0	0.4
	75%	1	45	158	0.07	1	6.1
	50%	63	0	46	4.2	0	1.9
Technology #2	100%	5	0	5	0.3	0	7.6
	75%	5	0	125	0.3	0	4.3
	50%	6	14	122	0.4	0.3	4.6
Technology #3	100%	24	3	3	1.2	0.04	0.08
	75%	30	6	5	1.5	0.09	0.2
	50%	63	35	130	3.3	0.5	4.3
Technology #4**	100%	31	na	36	1.3	na	0.9
	75%	28	na	112	1.3	na	3.3
	50%	27	na	220	1.8	na	5.9
Natural Gas Engine Equipped With Nonselective Catalytic Reduction							
Technology #1	SCAQMD BACT level	9	25	55	0.5	0.5	1.9
	Technology Data	3	8	24	0.2	0.2	0.8
Fuel Cells							
Technology #1	100%	2.4	0.7	<0.1	0.06	0.02	<0.002
	50%	2.9	0.9	3.3	0.1	0.04	0.08

All emissions based on using natural gas

* As percent of maximum load

** lb/MW-hr estimated from data submitted in ppm format

*** Data reported as both total hydrocarbons (THC) and VOCs

As was expected, the lowest emissions level in Table 2 came from the fuel cell with the integrated reformer. These emissions are near the level of a central station power plant. On an equivalent energy production basis (i.e. pounds of air pollutant per megawatt-hour of electricity produced), the other DG technologies' emissions were near an order of magnitude (10 times) greater than current BACT limits for central station power plants.

When evaluating emissions limits for DG technologies, the ARB staff also evaluated BACT determinations for DG technologies that were subject to district permit requirements. As indicated in Table 2 above, the South Coast Air Quality Management District's BACT determination for NOx for small natural gas-fired reciprocating engines is equivalent to 0.5 lb/MW-hr, which is comparable to some of the emission levels identified in the manufacturers' source test data.

2. Zero Emission Technologies

Although the proposed emission standards will not apply to nonpolluting technologies, the ARB staff evaluated zero emission technologies and considered standards that would promote hybrid DG technologies that integrate fossil-fueled technologies with zero emission technologies. Zero emission technologies include, but are not limited to, photovoltaic cells, wind turbines, fuel cells that use non-reformer hydrogen sources, and external combustion engines (Stirling-cycle engines) that use only waste heat or solar energy.

B. Central Station Power Plant Emissions

1. BACT Determinations

In order to develop the second required set of emission standards, the ARB staff analyzed BACT determinations for central station power plants in California. The ARB staff used data included in the 1999 ARB report entitled Guidance for Power Plant Siting and Best Available Control Technology (1999 ARB Power Plant Guidance). The report includes BACT determinations for central station power plants that generate 50 megawatts or greater of electricity. Staff reviewed the BACT determination in this report for combined-cycle gas turbines, which is the configuration used in all new central station power plants. As was done for the analysis of data obtained from existing DG technologies, the BACT determinations were converted to an equivalent lb/MW-hr standard assuming an efficiency rate of 50 percent for central station power plants.

2. Line Losses

Some electricity is lost as it is transmitted from central station power plants to the place of use. According to the California Energy Commission, the total system (including transmission and distribution systems) average line loss factor in California is ten percent. Line loss is minimized with DG technologies. Line

losses affect the amount of electricity that is ultimately received by the end user and affects the lb/MW-hr emissions rate for central station power plants. Consequently, the ARB staff applied the ten percent total system line loss factor to the BACT determinations to determine the emission rates for central station power plants that DG technologies must ultimately meet. The emission rates are included in Table 3.

Table 3- BACT Determinations for Combined-Cycle Gas Turbine Configurations Greater than 50 MW

Power level*	ppm @ 15% O ₂			lb/MW-Hr		
	NOx	VOC	CO	NOx	VOC	CO
100%	2.5	2	6	0.07	0.02	0.10

C. Combined Heat and Power

Combined heat and power applications produce both electric power and process heat from the combustion/processing of the same fuel. Process heat refers to the thermal energy used to heat water that is consumed by the occupants of a building. CHP packages can increase the efficiency of DG technology to over 80 percent. Because of its environmental benefits, the ARB staff considered a credit for CHP applications when proposing emission standards for DG technologies. A CHP credit was developed for both the 2003 and 2007 emission standards.

The 2003 standards include a category for technologies that use 60 percent efficient CHP. The CHP standards are based on crediting the emissions from a boiler that would otherwise have been used to heat water. The ARB staff assumed a boiler emission rate of 30 ppm of NOx, which equates to the reasonable available control technologies (RACT) levels for existing natural gas boilers in most air districts.

A different approach was taken for determining the 2007 CHP credits. The 2007 requirements allow for an energy credit for technologies that use highly efficient CHP. DG technologies that can achieve a minimum efficiency of 60 percent (electrical plus process heat output/fuel used) at all times and an annual average efficiency of 75 percent, can use the credit to meet the 2007 standards. The credit can be determined by allowing the process heat to be added to the total energy production of the DG unit (lb/MW-hr = emissions from unit (lb/hr) / [MW (electrical) + MW (process heat)]) at the rate of 1 MW-hr for each 3.4 million Btu of process heat. This allowance is comparable to the CHP credit in the new Texas rule for electric generating units and is also supported by environmental groups. An example follows:

A unit with a fuel input of 270 kw provides 75 kw of electrical output and an equivalent process heat requirement of 130 kw. The process heat requirement can dip to 90 kw. Emissions are at 3 ppm at 15 percent O₂ or 0.15 lb/MW-hr.

Minimum overall efficiency:	61 percent
Average overall efficiency:	76 percent
lb/MW-hr:	0.15
lb/MW-hr with CHP credit:	0.05

V. THE PROPOSED DG CERTIFICATION PROGRAM

This chapter contains a summary of the proposed DG certification program including proposed emission standards and certification requirements. It also reviews the basis and rationale for selecting the provisions being proposed and the alternatives considered by the ARB staff in developing this proposal. A copy of the proposed certification program requirements is located in Appendix B.

A. Summary of the Proposed Emission Standards and Certification Requirements

1. Affected Sources

After January 1, 2003, manufacturers of new electrical generation units that are exempt from district permit requirements must have their equipment certified by the ARB to the proposed emission standards. There are 35 air districts in California. The ARB staff will assist the manufacturers with determining exemption levels for each district. If a proposed unit is not subject to the district's permit requirements, it must be certified by the ARB before it can be sold, leased, or operated in that district. Equipment operating before January 1, 2003 will not be subject to the proposed standards.

The types of technologies that will be subject to the emission standards are microturbines, reformer-based fuel cells, small reciprocating engines, external combustion engines, or any combination thereof.

Certain types of technologies are exempt from certification. A technology does not have to be certified if it does not emit an air contaminant. This would include zero emission technologies including, but not limited to, wind turbines, photovoltaics, and fuel cells that do not use reformers. A technology does not have to be certified if it is registered under the ARB's Portable Equipment Registration Program (PERP). Equipment used in portable applications is already subject to emission standards under PERP. A technology does not have to be certified if it is to be used only when electrical or natural gas service fails or for emergency pumping of water for fire protection or flood relief.

2. Emission Standards

DG technologies must be certified to two levels of emission standards by two different deadlines with the ultimate standards reflecting current BACT determinations for central station power plants, as required by SB 1298. The first set of standards is effective on January 1, 2003, as required by SB 1298. The second, more stringent, set of standards will become effective on January 1, 2007.

a. 2003 Emission Standards

The 2003 standards have been set for NO_x, CO, VOCs (as defined in ARB Test Method 100), and PM. The standards are based on the ARB staff's review of manufacturers' source test data (with the exception of the PM standard, which is based on fuel sulfur content). The California Public Utility Commission regulates sulfur content in natural gas. The two major California utility companies that purchase natural gas specify levels no higher than one grain of total sulfur per 100 standard cubic feet (1 gr/100 scf). As was done in the 1999 ARB Power Plant Guidance, an emission limit for PM will correspond to natural gas with fuel sulfur content of not more than 1 grain/100 scf, as supplied by a regulated entity. The manufacturers' source test data were all based on natural gas fuel.

Emission standards have been set for 2003 for DG units that are not integrated with combined heat and power packages, and for DG units that are integrated with combined heat and power packages. Table 4 presents the proposed 2003 emission standards.

Table 4- 2003 Emission Standards

Pollutant	DG Unit not Integrated With Combined Heat and Power	DG Unit Integrated With Combined Heat and Power
Oxides of Nitrogen (NO _x)	0.5	0.7
Carbon Monoxide (CO)	6.0	6.0
Volatile Organic Compounds (VOCs)	1.0	1.0
Particulate Matter (PM)	An emission limit corresponding to natural gas with fuel sulfur content of no more than 1 grain/100 scf	An emission limit corresponding to natural gas with fuel sulfur content of no more than 1 grain/100 scf

DG units that are certified without integrated CHP must meet the more stringent standard. These standards are based on achievable limits that were determined from the ARB staff's review of DG manufacturers' emissions data. DG units that are certified with integrated CHP are given an emission credit that is reflected in a slightly higher emission standard value. The emission credit is equivalent to the emissions from a boiler that would otherwise be used to produce the process heat coming from the DG unit. These standards provide

recognition of the emissions benefits of CHP applications. The CHP standards can be used by the manufacturer if the DG technology is integrated with the CHP package and the unit can achieve a minimum 60 percent efficiency (electrical and process heat output/fuel used).

A manufacturer can use an energy credit for meeting either set of emission standards if the DG unit is integrated and certified with a zero emission technology including, but not limited to, a photovoltaic cell, wind turbine, non-reformer fuel cell, or Stirling-cycle engine that uses waste heat or solar energy. The electrical output of the zero emission technology can be added to the electrical output of the DG unit subject to certification to calculate the lb/MW-hr emission rate of the integrated package.

b. 2007 Emission Standards

The 2007 emission standards are based on the 1999 Board approved BACT determinations for central station power plants with an adjustment for a ten percent total system average line loss factor. Highly efficient DG technologies that are integrated with CHP packages will be able to use an energy credit to meet the emission levels.

Manufacturers have indicated to the ARB staff that it takes a minimum of four years to research and develop a new product. The 2007 compliance date was chosen to provide manufacturers a five year lead time (from the time the certification program is approved by the Board) to develop a technology that can meet the stringent standards for central station power plants. The 2007 emission standards are presented in Table 5.

Table 5 -2007 Emission Standards

Pollutant	Emission Standard (lb/MW-hr)
Oxides of Nitrogen (NO _x)	0.07
Carbon Monoxide (CO)	0.10
Volatile Organic Compounds (VOCs)	0.02
Particulate Matter (PM)	An emission limit corresponding to natural gas with fuel sulfur content of no more than 1 grain/100 scf

Manufacturers of DG technologies that are integrated with CHP will be able to calculate an energy credit for the usable process heat. This credit can be used to meet the 2007 standards. The credit allows the process heat to be added to the total energy production of the DG unit at the rate of 1 MW-hr for each 3.4 million Btu of process heat produced. To encourage the use of high efficiency CHP, the credit can be taken when the DG technology is integrated

with the CHP package, and the unit can achieve a minimum 60 percent efficiency (electrical and process heat output/fuel used) at all times and an annual average efficiency of 75 percent.

c. Demonstration of Emissions Durability

Manufacturers must demonstrate that the 2003 and 2007 emission standards can be met for 15,000 hours of operation when the DG units are operated and maintained according to manufacturers' recommendations. The 15,000 hours requirement is within the expected useful life of nonselective catalytic reduction units that may be integrated with some technologies (e.g. reciprocating engines) seeking certification and are also within many manufacturers' warranty periods. Applicants will be asked to provide a plan to the ARB that outlines how they will demonstrate that their product meets or will meet the standards for 15,000 hours. Some technologies are so new that they have not yet run for 15,000 hours. In these cases, manufactures can perform a statistical analysis that predicts changes in emission rates from the equipment over time. This practice is consistent with other certification programs conducted by the ARB.

d. Electrical Generation Technology Review

DG technologies are just beginning to enter the market. The future operating conditions and operational modes for these technologies and ability to maintain emission standards are uncertain at this time. Source testing methods and protocols may need further refinement and customizing to account for the range of DG applications. To address these concerns, the ARB staff will complete another review of DG technologies and emissions data and report the findings to the Board by July 2005. This will provide manufacturers and the ARB staff two and a half years after the first set of standards are in place to collect information on the performance and capabilities of their technologies.

The review will also include evaluations of any new BACT determinations for central station power plants and any control measures under development or recently adopted by the ARB that could have a bearing on the 2007 standard.

3. Application Process

Manufacturers seeking certification will submit an application package to the ARB for review. Application forms will be available on ARB's DG website at <http://www.arb.ca.gov/energy/dg/dg.htm>

The following information must be submitted to determine if the DG unit is eligible for certification:

- Name of the applicant and contact information;

- a description of the DG unit and model number;
 - maximum output rating (kilowatt);
 - fuel for which certification is being sought;
 - any air pollution control equipment that is integrated with the technology;
- and
- emissions test data, supporting calculations, quality control/assurance information, and all other information needed to demonstrate compliance with the emission standards and durability requirements.

Upon finding that the DG technology meets the requirements for certification, an Executive Order of Certification will be issued by the ARB. The Executive Order will describe the DG unit and indicate if the unit was certified with an integrated CHP package, zero emission technology, and/or air pollution control equipment. The Executive Order will also indicate that the certification is required only in those districts where the specific DG unit is exempt from district permit requirements.

4. Testing Requirements

Manufacturers must include a source test report with their certification application demonstrating the emission limits of their equipment. ARB test methods or alternative approved test procedures must be used. The test cycle will be similar to the D1 test cycle in the International Organization for Standardization (ISO) 8178 standard. Each valid test run must be conducted for three power production loads: 50, 75, and 100 percent of generator gross output. For each valid test run, the results for each tested load shall be averaged according to the following weighting factors:

- 1) 50 percent load results shall be given 20 percent weight;
- 2) 75 percent load results shall be given 50 percent weight; and
- 3) 100 percent load results shall be given 30 percent weight.

Three valid runs must be conducted on the equipment. (This is standard source testing procedure.) In order to express the emission rates in lb/MW-hr, the electricity generated must be measured during each run. Before commercial operation, each DG unit manufactured for sale, lease, or use in California must be monitored for NO_x emissions at full power using an approved NO_x screening device. Manufacturers of DG technologies that can meet the 2007 standards by 2003 (such as fuel cells with reformers) will not be required to monitor for NO_x emissions. This monitoring information may be requested by the ARB staff at a later date as part of a quality control review of the equipment's test data.

5. Other Requirements and Provisions

Provisions are included to allow zero emission technologies to seek voluntary certification. Some manufacturers of these technologies may want

ARB certification for marketing purposes. Label requirements are included and are designed to be consistent with other engine certification programs and to provide flexibility to manufacturers to meet the labeling needs of various certification entities. The labels must contain the year of the conforming emission standards, the fuel type used for certification and the number of the Executive Order of Certification. Certifications are valid for four years or until January 1, 2007. Some manufacturers may be certified between the years 2003 and 2007 and can only meet the 2003 emission levels. These manufacturers' applications would only be valid until January 1, 2007.

6. Certification Fees

To recover the cost incurred by the ARB staff to process a request for DG certification, a \$2,500 application fee will be due at the time an application package is submitted. Technologies seeking a recertification (every four years) will be assessed a \$2,500 fee. To provide an economic incentive for the cleanest DG technologies, DG units that can meet the 2007 standard by 2003 will not be assessed a fee for 2003 certifications. For the same reason, zero emission technologies that are seeking voluntary certification will not be assessed a fee.

7. Enforcement

Provisions have been included for revoking, denying, or suspending a certification for specific reasons. Provisions for inspections of certified units are also included. Manufactures may be subject to penalties if found to be in violation of the certification requirements.

B. Basis and Rationale for Certification Requirements

SB 1298 requires the ARB to set emission standards for DG technologies not subject to district permit requirements and to develop a certification program for these technologies. The ARB staff used a number of methods to develop what we believe are reasonable emission standards and certification requirements. The ARB staff contacted staff from other certification programs such as the South Coast Air Quality Management District's Water Heater Certification Program (Rule 1121) and the ARB's Small Off-Road Engines (SORE) program to gain a general understanding of establishing a certification program. The ARB staff also evaluated emission standards and requirements in the Texas Natural Resource Conservation Commission's new rule for electric generating units.

The ARB staff gathered source test data from manufacturers and reviewed air district rules to determine achievable emission limits for these technologies. The ARB staff also communicated with manufacturers and toured sites housing DG units to gain an understanding of their design and the process that would be involved with redesigning them to meet tighter standards.

The ARB staff believes the proposal addresses the requirements in the statute, public health protection, the impacts on industry, and presents the most reasonable approach to meeting the mandates of SB 1298.

C. Alternatives Considered

1. No Action

One alternative would have been not to develop the proposed DG certification program and emission standards. This alternative, however, would not satisfy the mandates in SB 1298.

2. Set 2003 Emission Standards at Zero or Near-Zero Limits

Another alternative would have been to set the 2003 emission standards at zero or near zero, which can be achieved by some types of DG technologies such as wind turbines, fuel cells, and photovoltaic cells. However, this alternative would eliminate most fossil-fueled DG technologies from the certification process and from competition in California.

3. Set Final Emission Standards at a Later Date

A third alternative would have been to extend the compliance date for the emissions standards that reflect BACT levels for central station power plants (2007 standards). This alternative would delay the intent of the legislation, which is to protect public health from exposure to electrical generation sources at the earliest practicable date.

Manufacturers have indicated that it takes about four years to develop a new product. Manufacturers will have to redesign their DG technologies and increase their efficiencies to meet 2007 standards. Consequently, the ARB staff has proposed a four-year interval between the required 2003 emission standards and the final emission standards that must reflect BACT for central station power plants. To assist manufacturers with meeting these standards, the ARB staff included provisions for an energy credit for technologies that are integrated with highly efficient CHP packages.

The ARB staff is aware that it will be difficult for some DG technologies to ever meet emission levels from central station power plants, regardless of the compliance date. For example, manufacturers of small natural gas reciprocating engines will need to greatly increase their electrical efficiency and add additional air pollution control equipment to meet the 2007 standard, which may be cost prohibitive. However, a number of engine manufacturers and the U.S. Department of Energy (DOE) are working together on the Advanced

Reciprocating Engine Systems (ARES) program. The goal of this program is to create a natural gas powered engine that will be at least 50 percent efficient. Although this program is applicable to engines greater than 1 MW, the information gained from the program could be applied to smaller engines to assist them with ultimately meeting the 2007 standards.

D. Alternatives that Would Lessen Impacts on Small Business

The ARB staff has determined that about 50 percent of potentially affected manufacturers are small businesses. All but one of these businesses are manufacturers of fuel cells. It will be several years before most of these manufacturers are at the commercialization stage and some of these businesses may, for various reasons, never sell products in California. Consequently, the potential impacts of complying with the proposed requirements on these small businesses are uncertain at this time. Provisions have been included in the proposed program to exempt the fee for fuel cell certification applications submitted to the ARB staff before January 1, 2007. Provisions have also been included to provide credits that other small manufacturers can use to help them comply with the certification requirements.

VI. POTENTIAL HEALTH IMPACTS OF PROPOSED CERTIFICATION PROGRAM

This chapter discusses the potential health impacts of the proposed certification program, including the benefits of the proposed emission standards and their potential health impacts.

No adverse health impacts are expected from the proposed certification program. The emission standards in the certification requirements are more beneficial to public health than the much higher emissions that are currently allowed to be emitted from these unpermitted sources. If uncontrolled, emissions from DG technologies could negatively impact air quality and public health. On an equivalent energy production basis (i.e. pounds of air pollutant per kilowatt - hour of electricity produced), DG emissions can be an order of magnitude higher than emissions from central station power plants. Consequently, if more power production shifts from central station power plants to near-the-place-of-use electrical generation, air emissions and associated exposure to California citizens could increase. Setting state-of-the-art emission standards now for emerging DG technologies will help protect California citizens from these new sources of air emissions. In addition, encouraging these DG technologies to meet central station power plant emission levels as soon as practicable will further protect public health in California.

The proposed DG certification program promotes the use of combined heat and power which increases the efficiency of the fuel used in the certified DG technology. Increasing the efficiency of these units results in lower fuel consumption and reduces overall air emissions including carbon dioxide, a greenhouse gas. This, in turn, reduces the impact on global warming. The ARB staff's proposal also promotes the use of zero emission technologies such as wind turbines, photovoltaics and non-reformer fuel cells. These technologies have no air emissions, and thus have a positive impact on public health.

Through the proposed DG certification program, the ARB will be regulating new DG sources before they enter the market. Future emission inventories for California will reflect the lowest practical emissions levels from these sources.

The ARB staff could have set 2003 standards at zero or near zero levels, which can be achieved by some types of DG technologies such as wind turbines, fuel cells, and photovoltaic cells. More stringent 2003 emission standards would be more protective of public health. However, this alternative would eliminate most fossil-fueled DG technologies from the certification process and from competition in California. It would also drastically reduce the types and numbers of DG technologies that are available to California users and could increase product cost.

The ARB staff could have required central station power plant emission levels to be met before 2007. Requiring DG technologies to meet these emission levels before 2007 would also be more protective of public health. However, similar to the argument above, this alternative would eliminate most fossil-fueled DG technologies from the certification process and from competition in California. Based on our conversations with manufacturers, it takes four years to research and develop a new product. The 2007 compliance date was chosen to provide manufacturers a five year lead time (from the time the certification program is approved by the Board) to develop a technology that can meet the stringent standards for central station power plants and stay competitive in California.

VII. ENVIRONMENTAL IMPACTS OF PROPOSED CERTIFICATION PROGRAM

The ARB staff has conducted an analysis of the potential environmental impacts of the proposed DG certification program. Based on our analysis, we have determined that the proposed DG program would have no significant adverse environmental impacts.

A. Legal Requirement

The California Environmental Quality Act (CEQA) and the ARB policy require an analysis to determine the potential adverse environmental impacts of proposed regulations. Since the ARB's program involving the adoption of regulations has been certified by the Secretary of Resources (see Public Resources Code section 21080.5), the CEQA environmental analysis requirements are allowed to be included in the Initial Statement of Reasons for a rulemaking in lieu of preparing an environmental impact report or negative declaration. In addition, the ARB will respond in writing to all significant environmental issues raised by the public during the public review period at the Board hearing. These responses will be contained in the Final Statement of Reasons for the proposed DG certification program.

Public Resources Code section 21159 requires that the environmental impact analysis conducted by the ARB include the following: (1) an analysis of the reasonably foreseeable environmental impacts of the methods of compliance; (2) an analysis of reasonably foreseeable feasible mitigation measures; and, (3) an analysis of reasonably foreseeable alternative means of compliance with the proposed DG certification program. Regarding reasonably foreseeable mitigation measures, CEQA requires an agency to identify and adopt feasible mitigation measures that would minimize any significant adverse environmental impacts described in the environmental analysis.

B. Reasonably Foreseeable Environmental Impacts of the Methods of Compliance with the DG Certification

The ARB staff has not identified any significant adverse environmental impacts from complying with the emission standards in the certification program. A few possible environmental impacts are:

- 1) A reciprocating engine manufacturer seeking certification by ARB staff may have to add a catalyst to the DG unit in order to meet the proposed emission standards. Used catalyst material may be considered hazardous waste, but there are methods for properly disposing of this type of waste. The used material can be

processed in such a way that it is no longer considered hazardous waste, and the waste can then be disposed of as solid waste.

- 2) The proposed emission standards essentially limit DG units to natural gas. This could reduce the supply of natural gas for other sectors of the market. However, DG units account for a very small portion of the total natural gas market.

C. Reasonably Foreseeable Feasible Mitigation Measures

As previously discussed, ARB is required to do an analysis of reasonably foreseeable feasible mitigation measures. ARB staff has concluded that no significant adverse environmental impacts should occur from implementation of the proposed certification program. As a result, no mitigation measures would be necessary.

D. Reasonably Foreseeable Alternative Means of Compliance with the DG Certification Program

The ARB is required to do an analysis of reasonably foreseeable alternative means of compliance with the proposed certification program. Alternatives to the proposed certification program are discussed in Chapter V. Based on the discussions in Chapter V, the ARB staff concluded that the proposed DG certification program provides the greatest degree of flexibility and the least burdensome approach to reducing public exposure to emissions from new DG technologies.

E. Environmental Justice

The ARB is committed to evaluating community impacts of proposed regulations, including environmental justice concerns. The proposed DG certification program is not expected to result in significant negative impacts in any community. The result of the certification program will be reduced exposures to new small sources of electrical generation for all communities.

F. State Implementation Plan Impacts

DG technologies have not yet penetrated the California market and are not part of the inventory that is used for the State Implementation Plan. Through the proposed DG certification program, the ARB will be regulating these new sources before they enter the market. As was mentioned earlier, future emission inventories will reflect the lowest emissions achievable from these sources.

VIII. ECONOMIC IMPACTS OF PROPOSED CERTIFICATION PROGRAM

This chapter discusses the economic impacts that the proposed DG certification program may have on businesses.

Manufacturers' efforts to comply with the 2003 emission standards are not expected to result in any significant adverse economic impacts. All but one potentially affected manufacturer have indicated to the ARB staff that they expect their technologies to meet the 2003 emission standards by January 1, 2003. One manufacturer indicated that it is incurring a one to two million-dollar research and development cost to redesign its technology to meet the 2003 standards. However, the certification requirements was one of several factors that determined the manufacturer's decision to redesign its product, included interest in developing an environmentally friendly product, and meeting emissions requirements in other states' air regulations.

Efforts to comply with the 2007 emission standards could result in an adverse economic impact on a few manufacturers. A few manufacturers have indicated that they will incur research and development costs to redesign their technologies to meet the 2007 standards which could also result in a higher product cost. A few manufacturers indicated to the ARB staff that it may cost several million dollars to accomplish their redesign. The ARB staff is also aware that it will be difficult for some DG technologies such as reciprocating engines to ever meet BACT levels for central station power plants, regardless of compliance dates, because of the prohibitive cost of additional emission control devices that would be needed to meet the standards. However, manufacturers can use an energy credit if they sell their products integrated with CHP packages. With this credit, fewer add-on controls and/or product redesign would be needed to allow the DG unit to meet the 2007 standard.

Some technologies may not initially or may never meet the emission standards, which may delay availability or reduce product choices. This could potentially increase the price of DG technologies. Also products may increase in price when manufacturers redesign their products to meet the 2007 standards. To offset these possibilities, the ARB staff's proposal provides credits for CHP and zero emission technology packages to enable manufacturers to remain competitive and still meet the emission standards established by SB 1298.

The overall statewide cost of the proposed certification program for the 2003 standards is estimated to be \$370,000 with an estimated individual business cost of \$11,000 to \$21,500. Businesses will incur costs for conducting an emissions source test on the DG model that is being certified, preparing a certification application, which includes supporting documentation, and paying an application fee.

Because most DG technologies are just entering the commercialization stage, the ARB staff is unable to determine the cost for manufacturers to comply with the proposed 2007 levels at this time. Compliance costs for the 2007 standard will be evaluated in more detail during the ARB staff's technical review in 2005, when more information becomes available on DG technologies.

The proposed certification program is not expected to cause a noticeable change in California employment or business status. The proposed regulation may have a positive impact on business by providing incentives for zero emission technologies (e.g. non-reformer fuel cells, wind turbines and photovoltaics) to penetrate the California market and expand production.

A. Legal Requirement

Section 11346.3 of the Government Code requires State agencies to assess the potential for adverse economic impacts on California business enterprises and individuals when proposing to adopt or amend any administrative regulation. The assessment shall include a consideration of the impact of the proposed regulation on California jobs, business expansion, elimination, or creation, and the ability of California businesses to compete.

Also, State agencies are required to estimate the cost or savings to any State or local agency and school district in accordance with instructions adopted by the Department of Finance. The estimate shall include any non-discretionary cost or savings to local agencies and the cost or savings in federal funding to the State.

Health and Safety Code section 57005 requires the ARB staff to perform an economic impact analysis of submitted alternatives to a proposed regulation before adopting any major regulation. A major regulation is defined as a regulation that will have a potential cost to California business enterprises in an amount exceeding ten million dollars in any single year. The proposed certification program is not a major regulation.

B. Businesses Affected

The businesses that may be affected by the DG certification program fall primarily into four Standard Industrial Classifications (SICs)/new North American Industry Classifications (NAICs). A list of the industries that the ARB staff has been able to identify is provided in Table 6.

Table 6- Potential Industries Affected by the Proposed Distributed Generation Certification Program

SIC/NAIC	Industry
3511/333611	Turbine and turbine generator set units manufacturing
3519/333618	Other engine equipment manufacturing
3621/335312	Motor and generator manufacturing
3629/335999	Fuel cells, electrochemical generators manufacturing

The ARB staff has identified 25 manufacturers that will potentially be impacted by the proposed certification program. Only four of these companies are in California. The manufacturers include the following: 4 microturbine manufacturers; 4 reciprocating engine manufacturers (with and without combined heat and power packages); 1 external combustion (Stirling-cycle) engine manufacturer; and up to 16 fuel cell manufacturers. It is unclear if all of the identified manufacturers will actually sell their products in California, but all have indicated an interest in doing so in the future. Table 7 summarizes potentially affected manufactures by technology type and location.

Table 7- DG Manufactures by Technology Type and Location

DG Technology	Non-California Company	California Company	Total
Microturbines	3	1	4
External Combustion Engines	1	0	1
Internal Combustion Engines	3	1	4
Fuel Cells	14	2	16
Total	21	4	25

C. Cost Impacts to Businesses

Costs to affected businesses for complying with the proposed certification requirements can be divided into three major areas: the cost of an application fee, the cost for preparing a certification application package, and the cost to perform emission source testing. The three major areas are listed below:

1. Application Fees

Initial certification under the proposed certification program will require an application fee of \$2,500. This fee is based on an estimate of 40 hours of the ARB staff time to review the certification applications. Manufacturers of technologies that are seeking voluntary certification (those technologies that do not emit an air contaminant) will not be required to submit a fee. Manufacturers of technologies that meet the 2007 emission standards by 2003 will not be required to submit a fee for 2003 certification. Certifications are valid for four years. A \$2,500 fee is proposed for recertification.

2. Application Preparation Costs

Based on the ARB staff's communications with manufacturers, the estimated cost to prepare a certification application package that contains all of the required information and supporting data is \$6,000. This estimate is based on the hourly labor cost of \$75 per hour for 80 hours.

3. Source Testing Costs

Manufacturers will be required to provide a source test report in their certification application to demonstrate compliance with the proposed emission standards. The estimated cost for performing the source tests and analyzing the results is \$5,000. The cost estimate is based on surveying private source testing companies.

Manufacturers, except manufacturers of DG technologies that can meet the 2007 standards by 2003 (such as fuel cells with reformers), will be required to monitor the NO_x emissions of each new DG unit that is manufactured for sale, lease or operation in California prior to its commercial operation. The monitoring can be performed using a portable NO_x analyzer that is calibrated according to U.S. EPA's Conditional Test Method 22. Some manufacturers may have to purchase a portable analyzer to comply with this requirement. One manufacturer gave the ARB staff an estimate of \$8,000 for purchasing an acceptable NO_x analyzer.

The overall statewide cost for complying with the 2003 standards is estimated to be \$370,000 with an estimated individual business cost of \$11,000 to \$21,500. Table 8 presents the cost per technology type to comply with the 2003 standards.

Table 8-Cost for Complying with DG Certification Requirements per Technology

DG Technology	Number of Manufacturers	Cost (\$)	Total (\$)
Microturbines	4	21,500	86,000
External Combustion Engines	1	21,500	21,500
Internal Combustion Engines	4	21,500	86,000
Fuel Cells*	16	11,000	176,000
Total Cost			369,500

* Assuming all potentially affected fuel cell manufacturers will be using a reformer.

Manufacturers have indicated that they will have to redesign or increase add-on emission control devices to their technologies to meet the 2007 standards. To minimizing the economic impact to manufacturers for complying with these standards, the ARB staff included provisions in the certification requirements for an energy credit for highly efficient combined heat and power packages that are integrated with DG technologies. Manufacturers may choose to sell their units in 2007 with integrated CHP to possibly reduce their redesign or add-on emission control costs.

Because most DG technologies are currently at the development stage, the ARB staff is unable to determine the cost for manufacturers to comply with the proposed 2007 standards at this time. A few manufacturers have indicated that it could take several million dollars of research and development cost to comply with the 2007 standard. Compliance cost for the 2007 standard will be evaluated in more detail during the ARB staff's technical review in 2005, when more information becomes available on DG technologies.

D. Potential Impact on Business Competitiveness

The proposed regulation is not expected to adversely impact California business competitiveness because all affected manufacturers that make products for sale into California will be required to meet the same emission standards requirements. Of the 25 potentially affected DG manufacturers that the ARB staff was able to identify, only four are located in California.

E. Potential Impact on Employment

The proposed regulation is not expected to cause a noticeable change in California employment. The proposed regulation may actually have a positive

impact on employment by providing incentives for zero emission technologies (e.g. non-reformer fuel cells, external combustion engines using waste heat or solar energy, wind turbines, and photovoltaics) to penetrate the California market and expand production.

F. Potential Impact on Business Creation, Elimination, or Expansion

No significant change is expected to occur to the California business status as a result of the proposed DG program.

G. Potential Impact on State or Local Agencies

The proposed certification program should have no significant economic impact on state or local agencies. There are no state or local agencies that manufacture DG technologies.

The ARB will incur costs in 2002 to certify distributed generation technologies to the January 1, 2003 emission standards. The proposed certification fee of \$2,500 will offset these costs. The ARB staff will also conduct outreach in 2002 to educate stakeholders on the DG certification requirements, and will be conducting a technical review of DG technologies in 2005 to determine if the 2007 emission standards and other proposed requirements should be revised. The ARB staff submitted a Budget Change Proposal (BCP) to add two person years to ARB's budget for implementing the requirements of SB 1298, which will include the outreach and technical review. The BCP was approved by the Department of Finance and became effective for Fiscal Year 2001-2002.

The ARB staff will also be responsible for enforcing the requirements in the DG certification program including ensuring that DG units are meeting their certified limits in the field. Additional resources may be needed for the ARB staff to perform inspection and/or field testing of certified units. Testing equipment may be purchased to perform the field tests. Enforcement may require one additional full time position. It is not known now whether existing personnel will be reassigned to this or new personnel hired. The cost for these additional resources may be \$100,000 per year, as well as, a one-time cost of \$50,000 for testing equipment.

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