GOVERNMENT OF PUERTO RICO
PUBLIC SERVICE REGULATORY BOARD
PUERTO RICO ENERGY BUREAU

IN RE: PUERTO RICO ELECTRIC POWER AUTHORITY INTEGRATED RESOURCE PLAN	**CASE NO. CEPR-AP-2018-0001** **SUBJECT:** MOTION TO RESUBMIT TESTIMONY

LOCAL ENVIRONMENTAL ORGANIZATIONS' MOTION TO RESUBMIT TESTIMONY OF DANIEL GUTMAN

TO THE HONORABLE PUERTO RICO ENERGY BUREAU:

COME NOW, Local Environmental Organizations[1], by and through their legal counsel, respectfully set forth and pray:

1. Local Environmental Organizations submitted the Testimony of Daniel Gutman on Wednesday, October 23, 2019. The figures in Table 4 on page 12 of that testimony were not legible, due to a formatting error.
2. Local Environmental Organizations hereby submit a corrected copy of the Testimony of Daniel Gutman, with a corrected Table 4. No other changes or corrections were made to the testimony.

Respectfully submitted,

/s/ Raghu Murthy
Raghu Murthy
Earthjustice

[1] Comité Diálogo Ambiental, Inc., El Puente de Williamsburg, Inc. -Enlace Latino de Acción Climática, Comité Yabucoeño Pro-Calidad de Vida, Inc., Alianza Comunitaria Ambientalista del Sureste, Inc., Sierra Club and its Puerto Rico chapter, Mayagüezanos por la Salud y el Ambiente, Inc., Coalición de Organizaciones Anti-Incineración, Inc., Amigos del Río Guaynabo, Inc., Campamento Contra las Cenizas en Peñuelas, Inc., and CAMBIO Puerto Rico, Inc., ("Local Environmental Organizations")

CERTIFICATE OF SERVICE

We hereby certify that, on October 25, 2019, we have filed this Motion via the Energy Bureau's online filing system, and sent to the Puerto Rico Energy Bureau Clerk and legal counsel to: secretaria@energia.pr.gov; astrid.rodriguez@prepa.com; jorge.ruiz@prepa.com; n-vazquez@aeepr.com; c-aquino@prepa.com and to the following persons:

- PREPA (mvazquez@diazvaz.law; kbolanos@diazvaz.law)
- Sunrun (javier.ruajovet@sunrun.com);
- EcoElectrica (carlos.reyes@ecoelectrica.com and ccf@tcmrslaw.com);
- Grupo Windmar (victorluisgonzalez@yahoo.com, mgrpcorp@gmail.com);
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- Renew Puerto Rico (castrodieppalaw@gmail.com, voxpopulix@gmail.com);
- Arctas Capital Group (sierra@arctas.com, tonvtorres2366@gmail.com);
- SESA PR & Caribe GE (cfl@mcvpr.com);
- League of Cooperatives of Puerto Rico and AMANESER 2025 (info@liga.coop, amaneser2020@gmail.com)

Respectfully submitted on this day of October 25, 2019

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GOVERNMENT OF PUERTO RICO
PUBLIC SERVICE REGULATORY BOARD
PUERTO RICO ENERGY BUREAU

IN RE:	CASE NO.: CEPR-AP-2018-0001
Review of the Puerto Rico Electric Power Authority Integrated Resource Plan	

EXPERT TESTIMONY OF DANIEL GUTMAN

ON BEHALF OF LOCAL ENVIRONMENTAL ORGANIZATIONS

Comité Diálogo Ambiental, Inc., El Puente de Williamsburg, Inc. -Enlace Latino de Acción Climática, Comité Yabucoeño Pro-Calidad de Vida, Inc., Alianza Comunitaria Ambientalista del Sureste, Inc., Sierra Club and its Puerto Rico chapter, Mayagüezanos por la Salud y el Ambiente, Inc., Coalición de Organizaciones Anti-Incineración, Inc., Amigos del Río Guaynabo, Inc., Campamento Contra las Cenizas en Peñuelas, Inc., and CAMBIO Puerto Rico, Inc.

I. Introduction and Qualifications

Q: Please state your name, position, and business address:

A: My name is Daniel Gutman. I am a consultant in environmental analysis of air pollution. My business address is 407 West 44th Street, New York, New York l0036.

Q: On whose behalf are you testifying in this proceeding?

A: I am testifying on behalf of the following organizations: Comité Diálogo Ambiental, Inc., El Puente de Williamsburg, Inc.- Enlace de Acción Climática, Comité Yabucoeño Pro-Calidad de Vida, Inc., Alianza Comunitaria Ambientalista del Sureste, Inc., Sierra Club, Inc. and its Puerto Rico chapter, Mayagüezanos por la Salud y el Ambiente, Inc., Coalición de Organizaciones Anti Incineración, Inc., Amigos del Río Guaynabo, Inc., Campamento Contra las Cenizas en Peñuelas, Inc. CAMBIO PR, Inc.

Q: Please summarize your qualifications and work experience.

A: In more than a dozen matters, I have provided expert analysis of the harmful impacts of emissions from utility projects on human health. I have testified before administrative agencies as an expert, on behalf of the Environmental Protection Agency (EPA) and local environmental organizations. I hold a Bachelor of Science degree from the Massachusetts Institute of Technology and a Master of Science degree from the University of Illinois. My resume is attached as Exhibit A.

Q: What is the scope of your testimony?

A: I have been asked to review the air quality surrounding the major power plants in Puerto Rico and the implications of continued operation of the Puerto Rico Electric Power Authority (PREPA) power plants for air quality and public health.

II. PREPA's Violations and Health Impacts from Emissions at Puerto Rico's Fossil Fuel Power Plants

Q: What are the conclusions of your review?

A: My review indicates that if the current power plant output and fuel type are maintained in the future, then the area surrounding the Puerto Rico Electrical Power Authority (PREPA) power plants at Costa Sur, San Juan, and Aguirre will fail to comply with the Environmental Protection Agency's (EPA) 2010 sulfur dioxide National Ambient Air Quality Standard (NAAQS). The 2010 NAAQS sulfur dioxide standard was based on new health research that established for the first time a causal relationship between respiratory morbidity and short-term sulfur dioxide concentrations (75 FR 35525). Therefore, my review indicates that continued operation of these plants will cause harmful health impacts to Puerto Ricans living nearby.

Q: Considering the importance of compliance with the 2010 sulfur dioxide standard, what are your views for PREPA's preferred plans in the Integrated Resource Plan (IRP)?

A: Because of the expense and difficulty of either adding pollution control equipment or cleaner fuel, the best way for Puerto Rico to comply with the 2010 sulfur dioxide standard is for PREPA to move away from generation in fossil fuel power plants and toward generation from non-

polluting sources. PREPA's preferred plans, the Energy System Modernization Plan (ESM) and Scenario 4, invest too many resources into fossil fuel generation, and not enough in non-polluting sources.

Q: Please explain the air quality standards that PREPA must meet.

A: The Clean Air Act sets up a regulatory framework whose main purpose is protection and enhancement of air quality. To achieve this purpose, the Clean Air Act encompasses broad authority for EPA to evaluate health effects of air pollutants, set ambient air pollution standards, set emission standards for both new and existing equipment, and require states to submit plans to control air pollutants (or have EPA adopt its own plan).

Under §108 of the Clean Air Act, EPA issues "air quality criteria" to control certain air pollutants that are widespread in the human environment, largely because they are emitted whenever fuel is burned. These include sulfur dioxide, carbon monoxide, nitrogen oxides, particulate matter, ozone, and lead. Under §109 of the Clean Air Act, EPA has set National Ambient Air Quality Standards (NAAQS) "requisite to protect the public health" for each of these pollutants, which apply wherever the public is exposed. States submit plans under §110 to achieve NAAQS by dates set by EPA. Plans can include mechanisms such as state regulation of fuel type, required permits for major polluters (Clean Air Act, §172), economic incentives, etc. Since ambient concentrations are proportional to emissions, the purpose of the plan is to reduce emissions enough to meet ambient standards. EPA typically helps the states by setting emission standards for equipment, providing research on effectiveness of control techniques, providing guidance on developing a plan, and many other activities.

Q: Why are these air quality standards especially important in Puerto Rico?

A: In 2010, EPA adopted a stricter NAAQS for sulfur dioxide (75 FR 35520). This is particularly relevant in Puerto Rico, where power plants emit significant levels of this toxic chemical. The new standard is primarily designed to limit short-term high concentrations of sulfur dioxide that cause breathing problems. Short-term peaks of sulfur dioxide cause constriction of bronchial passageways and respiratory symptoms in susceptible populations, which include children, older adults, those with pre-existing respiratory disease, those who spend time exercising outdoors, persons of lower socio-economic status, and asthmatic individuals. Notably, the prevalence and severity of asthma is higher among Puerto Ricans (75 FR 35527). The health data, epidemiological, human exposure, and other data on the relationship between short-term sulfur dioxide exposure and adverse respiratory effects is convincing enough for the relationship to be characterized as causal, the "strongest finding" that EPA can make (75 FR 35520 [2010]).

Q: How does EPA determine compliance with standards in Puerto Rico?

A: EPA set a one-hour limit of 75 ppb (parts per billion) for sulfur dioxide, based on a three-year average of the 99th percentile daily maximum sulfur dioxide concentrations in an area. A short-term standard at the level adopted by EPA will reduce longer-term sulfur dioxide concentrations as well. Consequently, EPA eliminated its previous 24-hour and yearly average standards at the same time as it adopted a one-hour standard.

EPA recognized that violations of the 2010 sulfur dioxide standard could be expected near large facilities that burn oil or coal and emit more 2,000 tons of sulfur dioxide per year. EPA accordingly determined that areas near those facilities are of special concern. Prior to submitting a plan to meet the 2010 sulfur dioxide standard, air agencies must first determine whether their air is in

attainment or non-attainment with the standard. While air agencies could characterize their air quality using an existing air quality monitoring network, Puerto Rico's network apparently does not meet minimum standards for data collection. Consequently Puerto Rico characterized its air primarily using computer modeling, in accordance with EPA regulations (40 CFR §51.1203).

Q: Are PREPA's power plants in compliance with air quality standards?

A: No. In 2016, the Puerto Rico Environmental Quality Board (EQB) found that the areas around four PREPA power plants are likely in violation of the 2010 sulfur dioxide NAAQS—including the Aguirre, Costa Sur, San Juan, and Palo Seco plants. The EQB projections, based on actual sulfur dioxide emissions during the years 2013-15, are shown in the table below.[1]

Table 1. Summary of the Puerto Rico 1-hour SO_2 Designation Modeling Results, 2016.

Emission Sources with SO_2 emissions at or above 2,000 tpy	Name of geographical area	Maximum impact area (radius in kilometers)	1-Hour SO_2 Design Value ($\mu g/m^3$)	1-hour SO_2 NAAQS ($\mu g/m^3$)
PREPA Aguirre	Guayama-Salinas	5.4	232	196*
PREPA Costa Sur	Guayanilla	7.0	1,046	
PREPA San Juan	San Juan	3.6	343	
PREPA Palo Seco	San Juan	2.7	207	

* For sulfur dioxide, 196 $\mu g/m^3$ is equivalent to 75 ppb.

The EQB is expected to submit to EPA its Implementation Plan for achieving compliance with the 2010 sulfur dioxide standard later this year.[2] PREPA has three difficult options to achieve compliance, if it wishes to keep these plants running:

[1] Letter from EQB to EPA, December 19, 2016. A true and accurate copy of this letter, with Puerto Rico 1-Hour SO2 Designation Modeling Results including Appendix A, is attached as Exhibit B.

[2] See "Status of SIP Required Elements for Puerto Rico Designated Areas," at https://www3.epa.gov/airquality/urbanair/sipstatus/reports/pr_elembypoll.html.

- Lower the sulfur content of the oil burned at PREPA's power plants
- Install emission control equipment, or
- Reduce the maximum power generated.

Q: Can control equipment be effectively applied in Puerto Rico?

A: A previous study by Puerto Rico's Intersectoral Committee on Environmental Compliance and Energy Alternatives (ICECEA), convened by the Governor of Puerto Rico, found that three of the four power plants do not have the space for control equipment and that, in any case, the cost of installing and operating the equipment would have the effect of increasing the cost of electricity, making control equipment "not a viable compliance alternative."[3] The study also determined that using a lower sulfur fuel, for example one containing 0.3% sulfur instead of the current 0.5% sulfur, "is not an option, as it would increase energy costs significantly and would not comply with emission limits for contaminants imposed by new federal regulations."[4]

[3] ICECEA, Report on the Necessary Measures to Comply With New EPA Regulations, and the Conversion to, and Use of Natural Gas in, the Northern Power Plants 13, June 15, 2012, http://www.gdb.pr.gov/documents/FINAL-InformeCICAAEGobernador-English-firmado.pdf

[4] *Id.*.

According to the ICECEA report:

> As part of our evaluation, both the EQB and PREPA used dispersion models in order to determine the generating units' maximum emission levels. Both agencies agreed that in order to meet NAAQS compliance, [PREPA] must burn liquid fuel with a sulfur content of 0.1 percent per weight or less. This would imply that PREPA would be burning diesel in all of its combustion units. Currently, this fuel is only utilized in the most efficient combined cycle units, since its high cost is not economically feasible for use in other units. Increasing the use of No. 2 diesel fuel in turn increases the cost of fuel purchases.[5]

Furthermore, PREPA's current fuel risks exacerbating its non-compliance with the 2010 sulfur dioxide standard. Two power plants in Puerto Rico, the Aguirre and Palo Seco plants, are operating substantially below capacity, as shown in Table 2. If operations at either plant increase in the future without adding pollution control equipment or reducing the sulfur content of the fuel, sulfur dioxide emissions, and therefore sulfur dioxide concentrations, will increase above those projected in Table 1.

Table 2. Large SO_2 Sources in Puerto Rico.

Emission sources with SO_2 emissions at or above 2,000 tons/year	**Name of geographical area**	**SO_2 Emissions (tons/yr)**				**Average Emissions as % of Allowable**
		Allowable*	**2013**	**2014**	**2015**	
PREPA Aguirre	Guayama-Salinas	30,038	9,641	9,261	9,585	32%
PREPA Costa Sur	Guayanilla	11,506	6,975	8,337	9,323	71%
PREPA San Juan	San Juan	7,787	5,308	5,136	6,064	71%
PREPA Palo Seco	San Juan	17,344	5,701	3,128	2,979	23%

∗ Exhibit B, Puerto Rico 1-Hour SO2 Designation Modeling Results, Appendix A.

[5] *Id.*

Q: What would happen if current emissions levels were maintained?

A: If current emission levels are maintained in the future, areas surrounding the Palo Seco plant will comply with the 2010 sulfur dioxide NAAQS, while areas surrounding the other plants will continue to be in non-compliance. Modeling results show that the Palo Seco area did comply with the sulfur dioxide concentration standard in 2014 and 2015, but that the three-year average was pushed above compliance due to higher plant emissions in 2013, as shown in Table 3. If sulfur dioxide emissions from Palo Seco are maintained at the 2014-15 level, the surrounding area will eventually comply with the standard, which is based on a three-year average.

Table 3. Puerto Rico 1-hour SO_2 Designation Modeling Results, 2013–15.[6]

Emission sources with SO_2 emissions at or above 2,000 tons/year	**Name of geographical area**	**SO_2 Concentrations (µg/m³)**			**1-hour SO_2 NAAQS (µg/m³)**
		2013	**2014**	**2015**	
PREPA Aguirre	Guayama-Salinas	236	226	233	196*
PREPA Costa Sur	Guayanilla	1,003	1,037	1,098	
PREPA San Juan	San Juan	316	325	387	
PREPA Palo Seco	San Juan	263	172	185	

* For sulfur dioxide, 196 µg/m³ is equivalent to 75 ppb.

If the current power plant output and fuel type are maintained in the future, then the area surrounding the PREPA Palo Seco power plant is the only area that can comply with EPA's 2010 sulfur dioxide NAAQS. Areas surrounding the other major PREPA power plants—Costa Sur, San Juan, and Aguirre—will not be able to achieve compliance with that important health-based standard.

[6] Exhibit B, Puerto Rico 1-Hour SO2 Designation Modeling Results, Appendix A.

Because of the expense and difficulty of either adding pollution control equipment or cleaner fuel, the best way for Puerto Rico to comply with the 2010 sulfur dioxide standard is for PREPA to move away from generation in fossil fuel power plants and toward generation from non-polluting sources, as required by the recent Climate Change Mitigation, Adaption and Resiliency Law signed by Governor Ricardo Rosselló.[7] The requirements of this law should be reflected in Puerto Rico's forthcoming Implementation Plan for achieving the sulfur dioxide NAAQS.

Q: What has been PREPA's history in terms of compliance with sulfur dioxide standards?

A: PREPA has a history of poor compliance or non-compliance with federal air and water quality regulations governing its power plants. Prior to 1999, PREPA allowed virtually uncontrolled emissions of sulfur dioxide mist from its power plants, polluting nearby air and creating health problems for nearby residents.[8] A 1999 consent decree between PREPA and EPA, modified in 2004, addressed those failures in part by restricting the sulfur content of fuel burned at PREPA's facilities. Subsequent to the consent decree PREPA has apparently engaged in a scheme to falsify tests of fuel quality required by the consent decree.[9]

Provisions of the consent decree are incorporated into Title V air permits issued by the EQB. In addition to the sulfur content of fuel, these provisions include several aimed at ensuring proper maintenance and optimum operating conditions of the Aguirre power station. Title V of the Clean Air Act was adopted in order to consolidate the issuance and enforcement of permits under the authority of one agency (42 USC Chapter 85, subchapter V). Given PREPA's previous bad

[7] See Governor Ricardo Rosselló Signs Historic Climate Change Bill," May 23, 2019, available at http://prfaa.pr.gov/governor-ricardo-rossello-signs-historic-climate-change-bill/.
[8] Mary Williams Walsh, "At Puerto Rico's Power Company, a Recipe for Toxic Air, and Debt," New York Times, February 16, 2016, available at https://www.nytimes.com/2016/02/16/business/dealbook/at-puerto-ricos-power-company-a-recipe-for-toxic-air-and-debt.html.
[9] *Id.*

behavior, it is important that one agency, in this case the EQB, has oversight and enforcement authority over all activities covered by the Title V permit, including those provisions added as a result of the 2004 consent decree.

In particular, among PREPA's large power plants, PREPA's Aguirre power complex emits the most sulfur dioxide, while the Palo Seco power plant emits the least, as shown in Table 2 above. The area around the Aguirre plant does not comply with the 2010 sulfur dioxide NAAQS, as shown in Table 3, above.[10] Palo Seco is the only plant that could meet the 2010 sulfur dioxide standard while using the current fuel—0.5% sulfur oil. Consequently no modifications should be allowed to PREPA Aguirre's Title V permit that may dilute EQB's enforcement authority, since any such modification could hamper enforcement by EQB and weaken compliance with conditions of the permit, making the existing violation of the 2010 sulfur dioxide NAAQS worse and endangering the health of nearby residents.

Q: What other pollutants are emitted by PREPA's power plants?

A: Sulfur dioxide is only one of the pollutants emitted from PREPA's power plants. Emissions of other criteria pollutants are shown in Table 4, below. Of particular concern are emissions of nitrogen oxides, which contribute to formation of ozone (80 FR 65292 [2015]). and emissions of particulate matter—PM_{10} and $PM_{2.5}$—which exacerbate asthma symptoms and adversely impact respiratory function, especially of children, in the short term and increase death rates, especially of the elderly, in the long term (78 FR 3085 [2013]).

[10] The PREPA Aguirre Power Complex also does not comply with its Clean Water Act (CWA) permit. See https://echo.epa.gov/detailed-facility-report?fid=110000307800#pane3110000307800.

Table 4. Criteria Pollutants Emitted by PREPA Power Plants in 2014 (tons/year).[11]

Emissions Source	Carbon Monoxide	Nitrogen Oxides	PM 10	PM 2.5	Sulfur Dioxide	VOC
PREPA Aguirre	628	7,086	698	519	9,264	95
PREPA Costa Sur	327	8,897	876	677	8,336	30
PREPA San Juan	1,070	4,087	468	282	4,903	40
PREPA Palo Seco	208	2,407	230	167	3,125	32

A review of monitoring data that the EQB submits to EPA shows that EQB's monitoring program is substandard. Most EQB monitors fail to collect sufficient data to even determine whether areas of Puerto Rico meet federal air quality standards. Sometimes when EQB monitors do collect sufficient data, they show what should be violations of the federal standard. For example, in 2016, EQB ozone monitors showed violations of the federal one-hour ozone standard in Bayamón, Cataño, and Juncos municipalities. Unfortunately EPA revoked the one-hour ozone standard in 1997 believing that a new, lower 8-hour standard would protect against both short-term (1–3 hours) and medium-term (6–8 hours) exposures (62 FR 38856 [1997]). In Puerto Rico this appears not to have been the case. Consequently, emissions of nitrogen oxides from PREPA's fossil fuel power plants continue to pose a health hazard for island residents.

[11] EPA, Enforcement and Compliance History Online (ECHO) Air Pollutant Reports, available at https://echo.epa.gov/.

Q: What emissions are the comparable emissions for the AES Puerto Rico and EcoElectrica power plants?

A: Emissions for the AES and EcoElectrica power plants are shown in the Table 5.

Table 5. Criteria Pollutants Emitted by Other Power Plants in 2014 (tons/year).[12]

Emission Source	Carbon Monoxide	Nitrogen Oxides	PM 10	PM 2.5	Sulfur Dioxide	VOC
AES Puerto Rico	861	1,729	402	100	245	7
EcoElectrica, L.P.	204	311	49	49	0	7

Q: Does this conclude your testimony?

A: Yes.

[12] EPA, Enforcement and Compliance History Online (ECHO) Air Pollutant Reports, available at https://echo.epa.gov/ and EPA emission factors, AP-42, at https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors.

CERTIFICATION

I, Daniel Gutman, CERTIFY that the contents of my testimony are known to me and are the truth according to the best of my abilities and reasonable knowledge. The technical and operational aspects included in the testimony are based on information that has been gathered in good faith; but I cannot guarantee the truthfulness of information gathered from third parties.

Daniel Gutman

Daniel Gutman, M.S.

Before me, the undersigned Notary Public, personally appeared Daniel Gutman, who acknowledges that the above is true this day of October 23, 2019 in New York, NY.

( )Personally known OR

(X)Identification Document provided Driver's License.

JONATHAN JAMES SMITH
NOTARY PUBLIC-STATE OF NEW YORK
NO. 02SM6335228
QUALIFIED IN NEW YORK COUNTY
MY COMMISSION EXPIRES 01-04-2020

Notary Public Name, Signature, Seal

Jonathan James Smith
New York City, NY

Apostille

(Convention de La Haye du 5 Octobre 1961)

1. Country: United States of America

   This public document

2. has been signed by **Milton Adair Tingling**

3. acting in the capacity of **County Clerk**

4. bears the seal/stamp of the **county of New York**

Certified

5. at New York City, New York

6. the 23rd day of October 2019

7. by Deputy Secretary of State for Business and Licensing Services, State of New York

8. No. NYC-1357280

9. Seal/Stamp

10. Signature

STATE OF NEW YORK ★ DEPARTMENT OF STATE ★

EXCELSIOR

Whitney A. Clark

Whitney A. Clark

Deputy Secretary of State for Business and Licensing Services

Apostille (REV: 09/25/12)

Form 1

State of New York
County of New York } *ss:*

No. 618501

I, Milton Adair Tingling, Clerk of the County of New York, and Clerk of the Supreme Court in and for said county, the same being a court of record having a seal, **DO HEREBY CERTIFY THAT**

JONATHAN JAMES SMITH

whose name is subscribed to the annexed original instrument has been commissioned and qualified as a NOTARY PUBLIC.....
and has filed his/her original signature in this office and that he/she was at the time of taking such proof or acknowledgment or oath duly authorized by the laws of the State of New York to take the same: that he/she is well acquainted with the handwriting of such public officer or has compared the signature on the certificate of proof or acknowledgment or oath with the original signature filed in his/her office by such public officer and he/she believes that the signature on the original instrument is genuine.

IN WITNESS WHEREOF, I have hereunto set my hand and my official seal this
23rd day of October, 2019

Milton Adair Tingling

County Clerk, New York County

Daniel Gutman
407 West 44th Street
New York, New York l0036
212 586-3888

Education:

Massachusetts Institute of Technology Cambridge, Massachusetts	B.S., Physics June, l964
University of Illinois Urbana, Illinois	M.S., Physics February, l966

Summary of Consulting Experience:

Environmental Protection Agency

Chief analyst for the United States Environmental Protection Agency on traffic and environmental impacts of Westway, a highway proposed for Manhattan. Responsible for preparing cross-examination of State Department of Transportation witnesses and for developing and presenting EPA's direct testimony during administrative hearings.

Environmental Defense Fund
Scenic Hudson

Analyzed the local impact of increased sulfur dioxide emissions due to the proposed conversion to highsulfur coal of Orange and Rockland's Lovett and Danskammer, and the conversion to coal of Con Edison's Arthur Kill and Ravenswood power plants for presentation at administrative hearings.

The Municipal Art Society
STAND
The ATURA Coalition
Committee to Preserve Brighton Beach and
Manhattan Beach

Conducted traffic and air pollution analyses of several major development projects in New York City, including the Coliseum Redevelopment, Metrotech, Atlantic Terminal, and Brighton Beach projects.

Union of Concerned Scientists

Analyzed the potential for accidental releases of radioactive gases reaching New York City from the nearby Indian Point nuclear reactor.

Environmental Defense Fund
Natural Resources Defense Council

Provided technical analysis and evaluations of EPA regulations concerning all sulfur dioxide emitting facilities, as well as those specifically applying to copper smelters.

Association to Save the Hutch
Montgomery Township, New Jersey
Elizabeth and East Brunswick, New Jersey

Provided analyses of the air pollution and traffic impacts of the proposed expansions of the Hutchinson River Parkway, Route US 206 through Montgomery Township, and the New Jersey Turnpike.

Port Authority of New York and New Jersey

Evaluated the impacts of diesel particulates and carbon monoxide due to a proposed busway connecting the Holland and Lincoln tunnels just outside New York City.

Environmental Defense Fund

Investigated the environmental impacts of both toxic and non-toxic emissions from waste-to-energy resource recovery plant proposed for New York City for presentation at administrative hearing.

Citizens for Westpride

Analyzed traffic, air pollution, noise, sewage disposal, and zoning and density with respect to both a massive development proposed by the Trump Organization for a disused rail yard on the West Side of Manhattan, and a number of other projects in the immediate area.

The Parks Council
The Municipal Art Society
The Regional Plan Association

Devised a smaller-scale, more civic-minded alternative to the Trump project, based on relocating a portion of the West Side Highway in order to extend Riverside Park. Evaluated the air pollution and noise impacts of the relocated West Side Highway and investigated various noise control techniques. Known as Riverside South, this alternative was ultimately embraced by the developer and approved by the City.

The Municipal Art Society
Beekman Hill Association

Studied potential air pollution impacts of Con Edison's Waterside power plant in New York City on a proposed very tall, nearby building.

Environmental Defense
New York Lawyers for the Public Interest

Analyzed air quality impacts of diesel emissions from a proposed waste transfer station on nearby residential areas as part of an administrative hearing. Developed legal and technical arguments to require an air quality analysis of fine particulate matter (PM 2.5).

East River Environmental Coalition
Manhattan Community Board #3

In connection with an application by Con Edison to add two electric and steam generators to the East River power plant, analyzed air quality impacts, focussing on fine particulate matter, evaluated noise impacts, helped develop alternative proposals, analyzed the air quality and land-use impacts of the alternatives, and represented client groups in administrative hearings.

Natural Resources Defense Council
Coalition Helping Organize a Kleaner Environment
Borough President of Queens, New York

In connection with applications by Keyspan, SCS Astoria, Orion Power, and the New York Power Authority to add power plants in the Astoria section of New York City, analyzed air quality impacts, focussing on fine particulate matter, analyzed the air quality impacts of the alternatives, and represented client groups in administrative hearings.

Adirondack Communities Advisory League

Presented testimony in administrative hearings regarding impacts of toxic air emissions from a proposed landfill in Ava, New York.

Greenpoint/Williamsburg Waterfront Task Force
Borough President of Brooklyn, New York

In connection with an application by TransGas Energy to add power plants in the Greenpoint/Williamsburg section of New York City, analyzed air quality impacts, focussing on fine particulate matter, analyzed the air quality impacts of the alternatives, and represented client groups in administrative hearings.

Hell’s Kitchen Neighborhood Association

Prepared a major zoning and land use plan for the West Side of Manhattan between 30th and 42nd streets as an alternative to City-sponsored plan.

Exhibit B

COMMONWEALTH OF
PUERTO RICO
Environmental Quality Board

December 19th 2016

MRS. JUDITH A. ENCK
REGIONAL ADMINISTRATOR
USEPA -REGION 2
290 BROADWAY
NEW YORK NY 10007-1866

Dear Mrs. Enck:

PUERTO RICO'S MODELING RESULTS FOR THE 2010 PRIMARY S02 NAAQS RECOMMENDATION FOR NON-ATTAINMENT AREAS DESIGNATION

As required by Title 40 of the Code of Federal Regulations, Section 51.1203(d)(3), Air Agencies shall conduct and submit to the EPA Regional Office the Modeling Analysis for Emission Sources with $S0_2$ emissions on or above 2,000 tons per year (tpy), for its associate area and nearby area. Air Agencies shall conduct and submit Modeling Analysis on or before January 13th 2017.

PREQB performed a 1-hour S02 Designation Modeling Analysis for the following geographical areas of the Commonwealth of Puerto Rico: Guayama-Salinas, Guayanilla and San Juan. Table 1 summarizes Modeling Results.

Table 1. Summary of the Puerto Rico 1-hour S02 Designation Modeling Results.

Emission Sources with S02 emissions on or above 2,000 tpy	Name of Geographical area	Maximum impact area (radius in kilometers)	1-Hour S02 Design Value (µg/m3)	1-hour S02 NAAQS (µg/m3)
PREPA Aguirre	Guayama-Salinas	5.4	232	196
PREPA Costa Sur	Guayanilla	7.0	1,046	
PREPA San Juan	San Juan	3.6	343	
PREPA Palo Seco	San Juan	2.7	207	

According to the modeling results, the S02 emissions of the four facilities included in the study do not comply with the 1-hour S02 NAAQS of 196 $\mu g/m^3$.

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EQB
Environmental Quality Board
Commonwealth of Puerto Rico

Based on the Modeling Results, PREQB recommends to EPA the designation of Guayama-Salinas, Guayanilla and San Juan as Non-Attainment Areas for the 1-hour S02 NAAQS, and the designation of Unclassified/Attainment Area for the remaining geographical areas of the Commonwealth of Puerto Rico.

If you have any question, please, feel free to contact the PREQB's Air Quality Manager at (787)767-8181 x-3269, or Mrs. Lucia Fernandez, Chief of the Air Monitoring, Validation & Data Management Division at (787)767-8181 x-3254.

Cordially,

Weldin Ortiz-Franco
Chairman

Enclosure: *Puerto Rico I-hour S02 Designation Modeling Results*

c Mr. John Filippelli, CASO Director
Mr. Richard Ruvo, EPA Air Program Branch Director
Mrs. Carmen Guerrero, CEPD Director

Exhibit B

COMMONWEALTH OF
PUERTO RICO
Environmental Quality Board

PUERTO RICO 1-HOUR SO_2 DESIGNATION MODELING RESULTS

PUERTO RICO ENVIRONMENTAL QUALITY BOARD
AIR MONITORING, VALIDATION & DATA MANAGEMENT

SEPTEMBER 2016

EQB
ENVIRONMENTAL QUALITY BOARD
COMMONWEALTH OF PUERTO RICO

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List of Acronyms

DRR	Data Requirements Rule
NAAQS	National Ambient Air Quality Standards
SO_2	Sulfur Dioxide
PPB	Parts Per Billion
EPA	Environmental Protection Agency
EQB	Environmental Quality Board
PREPA	Puerto Rico Power Electric Authority
SO2TAD	SO_2 NAAQS Designations Modeling Technical Assistance Document

Introduction

This document presents the modeling results for the designation of the 2010 1- hour SO_2 NAAQS in Puerto Rico. In June 2010, the EPA promulgated the new 1-hour primary SO_2 NAAQS of 75 parts per billion (ppb), which is met at an ambient air quality monitoring site, when the 3-year average of the 99th percentile of 1-hour daily maximum concentrations does not exceed 75 ppb.

According to the 40 CFR Part 51, Data Requirements Rule (DRR)[1] for the 2010 1-hour SO_2 Primary NAAQS signed on August 10 2015, EPA is promulgating a rule directing state and tribal air agencies to provide data to characterize current air quality areas with large sources of SO_2 emissions (2,000 tons per year or more) to identify maximum 1-hour SO_2 concentrations in ambient air. The final rule set a process and timetable for agencies to either establish ambient monitoring sites or conduct air quality modeling and submit the air quality data to EPA.

On January 2016, EQB submitted EPA a list of the sources with SO_2 emissions over 2000 tons/yr. EQB determined three areas in Puerto Rico that have SO_2 sources with emissions over 2,000 tons/yr. The areas are San Juan, Guayama-Salinas and Guayanilla. The sources in San Juan area with SO_2 emissions over 2,000 tons/yr are PREPA San Juan and PREPA Palo Seco. In Guayama-Salinas area is PREPA Aguirre and in Guayanilla is PREPA Costa Sur.

EQB decided to characterize the air quality in the areas with SO_2 emissions sources over 2,000 tons/yr with dispersion modeling. The air quality model for the analysis is AERMOD, with three years of meteorological data and three years of actual SO_2 emissions, as recommended in the SO_2 NAAQS Designations Modeling Technical Assistance Document (SO2TAD)[2]. On July 2016, EQB submitted to EPA the Puerto Rico 1-Hour SO_2 Designation Modeling Protocol[3] for its revision and approval. After that, EQB started the modeling process for the 1-hour SO_2 standard designation.

Emission Inventory

The emission inventory used for the study was three years of SO_2 actual emissions data, from the years 2013 to 2015. EQB followed the recommendation in the SO2TAD of using the three most recent available years of SO_2 actual emissions. EQB used the SO_2 actual emissions certified data, submitted annually by PREPA.

This report is revised by the Inspection and Compliance Division of the Air Quality Area, to determine conformity with the air quality permit and regulations.

[1] Data Requirements Rule for 2010 1-Hour Sulfur Dioxide (SO_2) Primary National Ambient Air Quality Standard (NAAQS). 40 CFR Part 51.
[2] SO_2 NAAQS Designations Modeling Technical Assistance Document, USEPA. August, 2016.
[3] Puerto Rico 1-Hour SO_2 Designation Modeling Protocol. Environmental Quality Board. Air Quality Area. July, 2016.

The PREPA emission report presents the annual SO_2 actual emissions for the emission points of PREPA facility. For a complete information about the emission inventory, please refer to the modeling protocol document. A copy of the emission inventory table is in Appendix A.

Background Concentration

For the 1- hour SO_2 background concentration, EQB used the less conservative "first tier" approach recommended in the SO2TAD of the 1- hour SO_2 background concentration based on the monitored design value for the most recent 3-year period, regardless of the years of meteorological data used in the modeling. EQB have SO_2 air quality monitors in the vicinity of San Juan area, but are source oriented, for that reason they are not representative of the nearby sources impacts.

EQB determined more adequate use a regional site monitor that is impacted by similar natural and distant man-made sources. EQB selected the data from the Guayama SO_2 monitor to be used as background concentration for San Juan area. This background concentration is from the years 2010-2012 and also will be used in Guayama-Salinas and Guayanilla area. The concentration background is the most recent 3-year period design value for 1- hour SO_2 and the value is 58 $\mu g/m^3$ (22 ppb).

This background concentration will be used in Guayanilla because EQB does not have a SO_2 monitor in this municipality and the most representative air quality monitor for the area is the Guayama monitor. This background concentration is not source oriented and is impacted by similar natural and distant man-made sources. The concentration background data is in Appendix B.

Model

The model used for the SO_2 designation modeling is AERMOD. This model is the preferred recommended by EPA for air quality modeling studies. The version used is the most recent or 15181. The default options will be selected for each run. The urban option will be used in San Juan because the facilities are in an urban environment.

The input data for PREPA emission points is for the EQB emission inventory and the SO_2 actual emissions is from the PREPA annual emission reports. The emission sources inside the facilities are point sources (boilers and gas turbines) and actual stack height data will be used. The parameters for each emission point source and their coordinates were from the information provided by the facilities in their construction permits.

The AERMOD model output options MAXDAILY, MAXDCONT and MXDYBYYR output options will be selected to calculate the model 1-hour SO_2 design value. Background concentration[4] will be added to the 1-hour SO_2 model design value for the comparison with the NAAQS.

Meteorology

The SO2TAD recommends the most recent three years of meteorological data for the designation modeling, to allow the modeling to simulate a monitor. The SO2TAD also recommends that the meteorological data will be concurrent with the years of the actual SO_2 emissions used in the designation modeling. EQB will use three years of site-specific data, in the three areas of the designation modeling.

The three years of meteorological data are not concurrent with the three years of SO_2 actual emissions data, but EQB addressed this using the recommendation in the Section 7.4 Use of Older Meteorological Data[5] of the SO2TAD. The three years data periods were manually changed (change of the year on AERMET output files) as if these were the 2013 to 2015 data period.

The meteorology for the San Juan model is from the years 2007-2009, in Guayama-Salinas the meteorological data is from 2001-2003 and in Guayanilla is from 1991-1993. All this data was collected on-site. Full meteorological reports with the methodology used to process the data are available in the modeling protocol document[6].

Receptors

Two receptor grids were used in each run of the 1-hour SO_2 designation model. The receptor grids considered populated areas and places where is feasible to place an air quality monitor. Discrete receptors across the facility fenceline were used in all modeling cases.

The first receptor grid is a 250 meters of space to determine the facility maximum impact radius. This is an exclusionary grid used to determine where is the SO_2 maximum impact. A refined grid of 50 meter of space was used in the area of maximum impact concentrations, to determine compliance with the 1- hour SO_2 NAAQS. Discrete receptors were placed at the facility fenceline in all modeling runs. For complete information about the receptor grids, please refer to the modeling protocol document.

[4] See Air Quality Monitoring Design Value Report in Appendix B.

[5] Section 7.4: Use of Older Meteorological Data. SO_2 NAAQS Designations Modeling Technical Assistance Document, USEPA. August, 2016.

[6] Puerto Rico 1-Hour SO_2 Designation Modeling Protocol. Environmental Quality Board. Air Quality Area. July, 2016.

Model Results

The model results for the four emission sources in the modeling study are presented below. The 1-hour SO_2 NAAQS is represented by the model design value, which is calculated using the three years average of the 4th highest of the daily maximum. EQB used the following methodology to determine the SO_2 design value for each emission source in the study.

Separate modeling runs for each facility by year of meteorological and actual emissions data were performed to determine the SO_2 4th highest of the daily maximum by year. The modeling runs for each facility have the same receptor network and emission point parameters data, the only data that changes in each run is the SO_2 actual emissions and the concurrent meteorological data.

For each modeling run, the 4th highest value was determined using the MAXDAILY file. The SO_2 design value for each facility in the study is the three years average of the 4th highest. The SO_2 background concentration was added to this design value.

EQB used separate model runs because the receptor networks are extensive and this complicate the evaluation of the output files. The MAXDCONT file was used to determine the contribution of each facility emission point to the design value. Modeling runs output files are in the Appendix C and electronic copies of the MAXDAILY, MAXDCONT and MXDYBYYR files will be provided. The SO_2 designation modeling results are presented below.

A. PREPA San Juan

The model results for PREPA San Juan are presented in the next tables. The 1-hour SO_2 design value is above the NAAQS of 75 ppb or 196 µg/m^3. The maximum results impact area is approximately 3.6 km radius. The 4th highest for each modeling run, plus the background concentration and the SO_2 design value for PREPA San Juan are presented in Table 1. The Table 2 presents the modeling results by emission point or MAXDCONT output file data.

Commonwealth of Puerto Rico\Puerto Rico Environmental Quality Board
1-Hour SO_2 Designation Modeling Results

Table 1: PREPA San Juan 1-Hour SO_2 Modeling Results

Year	Coordinates (m)		SO_2 Concentrations µg/m^3			
	East	North	4th Highest Model Result	Background Concentration	Total Concentration	1-Hour SO_2 Design Value
2013	805450	2039622	258	58	316	343
2014	805550	2038922	267		325	
2015	805550	2038922	329		387	

Table 2: PREPA San Juan 1-Hour SO_2 Modeling Results by Emission Point

Year	4th Highest SO_2 Model Concentrations µg/m^3						
	SJ5/6	Boiler7	Boiler8	Boiler 9	Boiler10	Background Concentration	Total Concentration
2013	0.89787	64.81184	52.32642	66.97350	72.74486	58	315.75449
2014	0.21331	88.40702	108.53339	53.99018	15.75475		324.89865
2015	0.33223	99.65805	82.97753	144.13036	2.33466		387.43283

The modeling scenario with the highest SO_2 concentrations was 2015 and therefore have the maximum impact area with a radius of 4.1 km. The maximum impact area for 2013 and 2014 was approximately 3.4 km radius. The Figures 1-3 showed the modeling results isopleths and the 1-hour SO_2 4th highest concentration by year of data.

Figure 1: PREPA San Juan 1-Hour SO_2 Modeling Results Plus Background Concentration, Year 2013

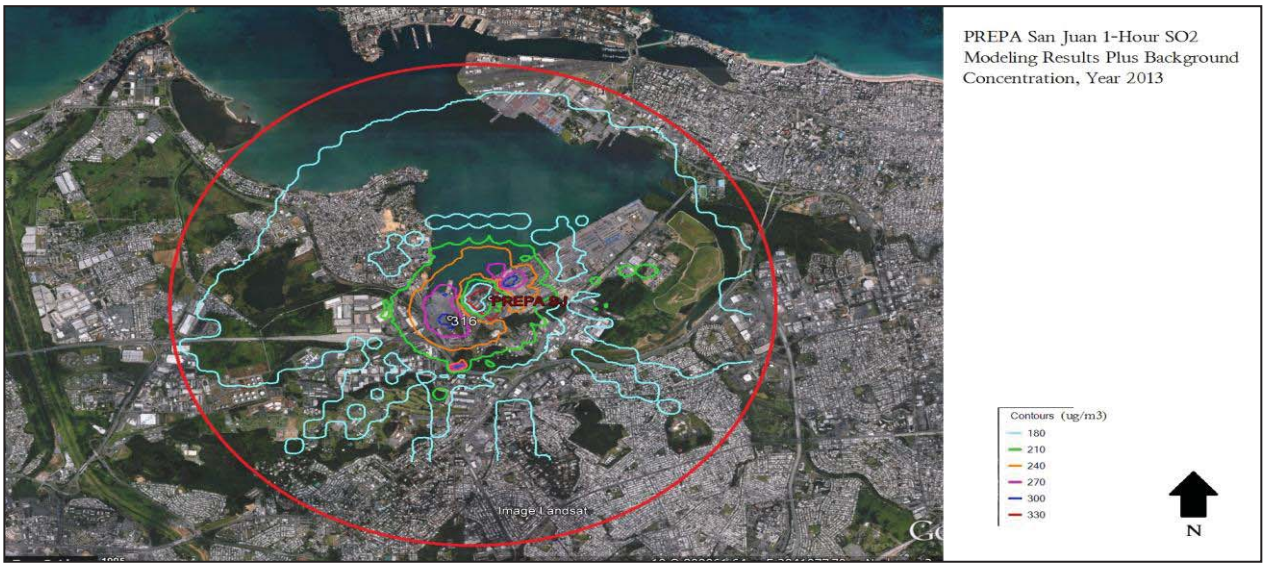


Figure 2: PREPA San Juan 1-Hour SO_2 Modeling Results Plus Background Concentration, Year 2014

Figure 3: PREPA San Juan 1-Hour SO_2 Modeling Results Plus Background Concentration, Year 2015

B. PREPA Palo Seco

The model results for PREPA Palo Seco are presented in the following tables. The 1-hour SO_2 design value is above the NAAQS of 75 ppb or 196 µg/m^3. The maximum results impact area is approximately 2.7 km radius. The 4th highest for each modeling run, plus the background concentration and the 1-hour SO_2 design value for PREPA San Juan are presented in Table 3. The Table 4 presents the modeling results by emission point or the MAXDCONT output file data.

Table 3: PREPA Palo Seco 1-Hour SO_2 Modeling Results

Year	Coordinates (m)		SO_2 Concentrations µg/m^3			
	East	North	4th Highest Model Result	Background Concentration	Total Concentration	1-Hour SO_2 Design Value
2013	800700	2043072	205	58	263	207
2014	800700	2043072	114		172	
2015	801550	2042022	127		185	

The SO_2 modeling results for 2013 data are over de 1-hour SO_2 NAAQS, the other years are below the standard. The three years average of the 4th highest is above the 1-hour SO_2 NAAQS. The next table presents the modeling results by the emission points of PREPA Palo Seco.

Table 4: PREPA Palo Seco 1-Hour SO_2 Modeling Results by Emission Point

Year	4th Highest SO_2 Model Concentrations µg/m^3								
	PS1	PS2	PS3	PS4	GT1	GT2	GT3	Background Concentration	Total Concentration
2013	38.50191	32.42061	29.33763	104.71084	0.00286	0.00532	0.00407	58	262.98324
2014	30.88408	34.61644	0.000	48.33751	0.03621	0.07657	0.07159		172.0224
2015	43.25716	47.47828	27.54117	8.59734	0.00056	0.09414	0.07945		185.0481

The modeling results for year 2013 were the highest and the maximum impact area have approximately 2.7 km radius. The modeling results for 2014 and 2015 were below the 1-hour SO_2 NAAQS. Figures 4-6 showed the modeling results isopleths and the 1-hour SO_2 4th highest concentration by year of data.

Figure 4: PREPA Palo Seco 1-Hour SO_2 Modeling Results Plus Background Concentration, Year 2013

Figure 5: PREPA Palo Seco 1-Hour SO_2 Modeling Results Plus Background Concentration, Year 2014

Figure 6: PREPA Palo Seco 1-Hour SO_2 Modeling Results Plus Background Concentration, Year 2015

C. PREPA Aguirre

The following tables presents the model results for PREPA Aguirre. The 1-hour SO_2 design value is above the NAAQS of 75 ppb or 196 µg/m^3. The 4th highest for each modeling run, plus the background concentration and the SO_2 design value for PREPA Aguirre are presented in Table 5. The Table 6 presents the modeling results by emission point or MAXDCONT output file data.

Table 5: PREPA Aguirre 1-Hour SO_2 Modeling Results

Year	Coordinates (m)		SO_2 Concentrations µg/m^3			
	East	North	4th Highest Model Result	Background Concentration	Total Concentration	1-Hour SO_2 Design Value
2013	792100	1988250	178	58	236	232
2014	790750	1988000	168		226	
2015	791500	1986500	175		233	

The SO_2 modeling results for PREPA Aguirre are over de 1-hour SO_2 NAAQS. The three years average of the 4th highest is 232 ug/m^3 and is above the 1-hour SO_2 NAAQS. The next table presents the modeling results by each emission point of PREPA Aguirre.

Table 6: PREPA Aguirre 1-Hour SO_2 Modeling Results by Emission Point

Year	4th Highest SO_2 Model Concentrations µg/m^3						
	AG1	AG2	CC1	CC2	AGGT	Background Concentration	Total Concentration
2013	92.42972	85.24826	0.08780	0.21629	0.00038	58	235.98245
2014	60.94587	106.07054	0.25548	0.35438	0.00489		225.63116
2015	81.81814	91.93863	0.76722	0.49448	0.02302		233.04149

The modeling results for year 2013 were the highest and the maximum impact area extends approximately 5.4 km from the source. The modeling results for 2014 and 2015 were also above the 1-hour SO_2 NAAQS and the maximum impact areas extends from the source, 5 and 4.7 km, respectively. Figures 7-9 showed the modeling results isopleths and the 1-hour SO_2 4th highest concentration by year of data.

Figure 7: PREPA Aguirre 1-Hour SO_2 Modeling Results Plus Background Concentration, Year 2013

Figure 8: PREPA Aguirre 1-Hour SO_2 Modeling Results Plus Background Concentration, Year 2014

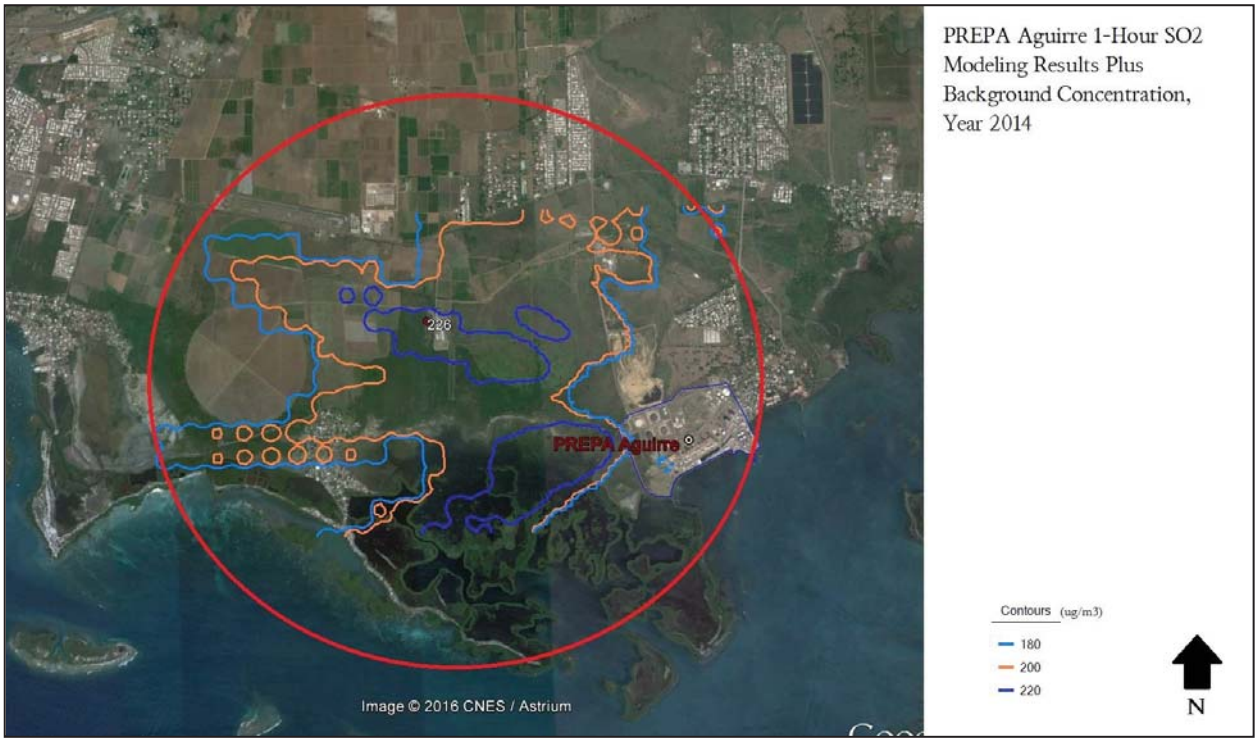
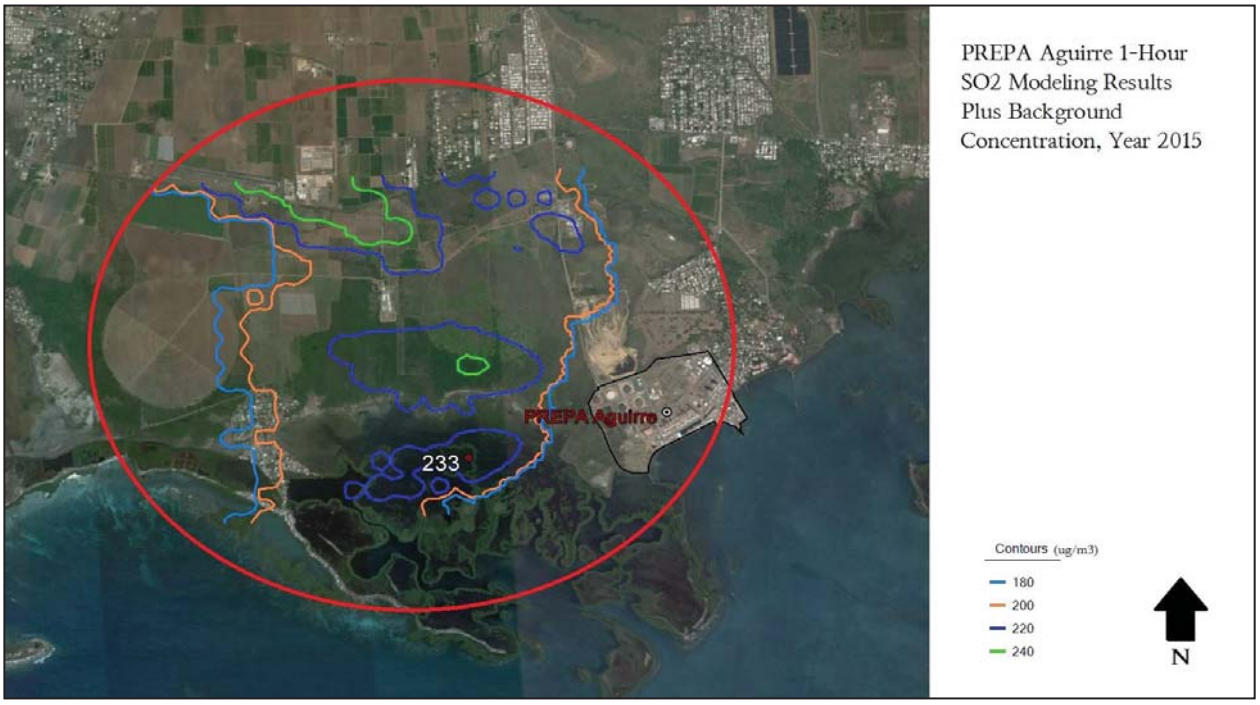


Figure 9: PREPA Aguirre 1-Hour SO_2 Modeling Results Plus Background Concentration, Year 2015



D. PREPA Costa Sur

The following tables presents the model results for PREPA Costa Sur. The 1-hour SO_2 design value is above the NAAQS of 75 ppb or 196 µg/m^3. The 4th highest for each modeling run, plus the background concentration and the SO_2 design value for PREPA Costa Sur are presented in Table 7. The Table 8 presents the modeling results by emission point or MAXDCONT output file data.

Table 7: PREPA Costa Sur 1-Hour SO_2 Modeling Results

Year	Coordinates (m)		SO_2 Concentrations µg/m^3			
	East	North	4th Highest Model Result	Background Concentration	Total Concentration	1-Hour SO_2 Design Value
2013	738250	1994900	945	58	1003	1046
2014	735250	1994800	979		1037	
2015	737400	1995750	1040		1098	

The SO_2 modeling results for PREPA Costa Sur are over de 1-hour SO_2 NAAQS. The three years average of the 4th highest is 1046 µg/m^3 and is above the 1-hour SO_2 NAAQS. The next table presents the modeling results by emission point of PREPA Costa Sur.

Table 8: PREPA Costa Sur 1-Hour SO_2 Modeling Results by Emission Point

Year	4th Highest SO_2 Model Concentrations µg/m^3						
	SC3	SC4	SC5	SC6	PB1	Background Concentration	Total Concentration
2013	3.74367	0.99801	303.53343	636.15715	0.10537	58	1002.53763
2014	0.0	0.0	515.76028	463.07010	0.00757		1036.83795
2015	17.03536	1.70005	511.64441	509.33306	0.00074		1097.71362

The modeling results for year 2015 were the highest and the maximum impact area extends approximately 7 km from the source. The modeling results for 2014 and 2015 were also above the 1-hour SO_2 NAAQS and the maximum impact areas extension from the source were also 7 km. Figures 10-12 showed the modeling results isopleths and the 1-hour SO_2 4th highest concentration by year of data.

Figure 10: PREPA Costa Sur 1-Hour SO_2 Modeling Results Plus Background Concentration, Year 2013

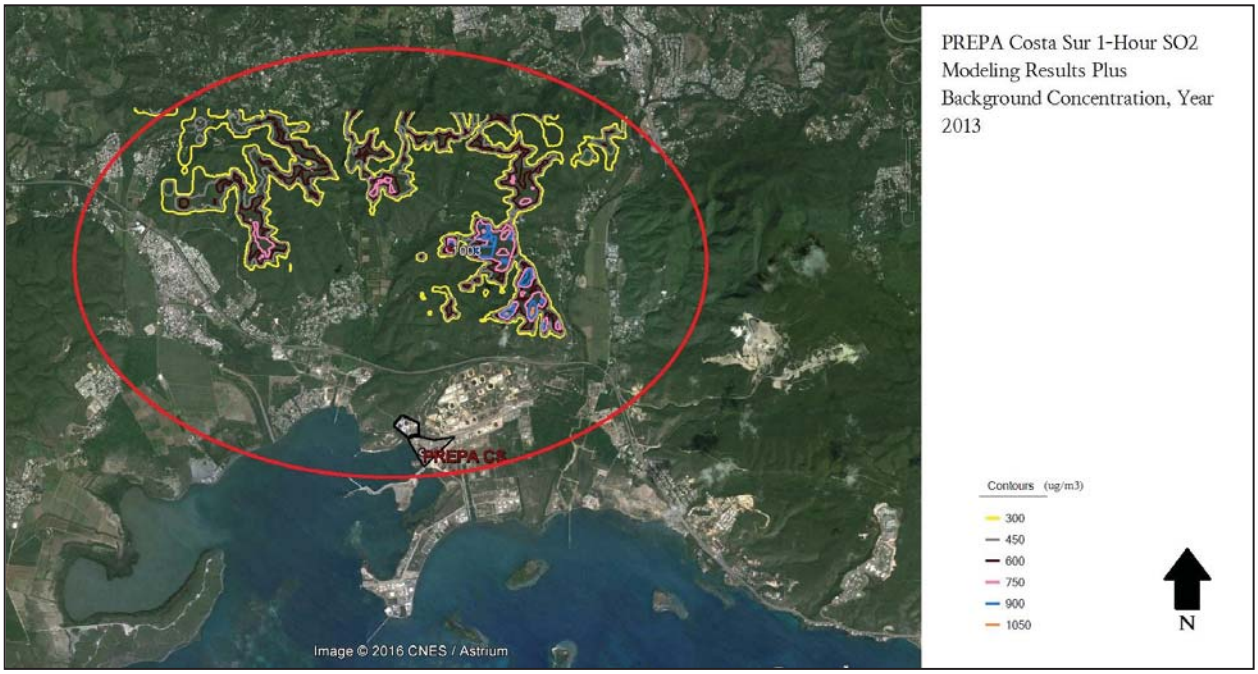


Figure 11: PREPA Costa Sur 1-Hour SO_2 Modeling Results Plus Background Concentration, Year 2014

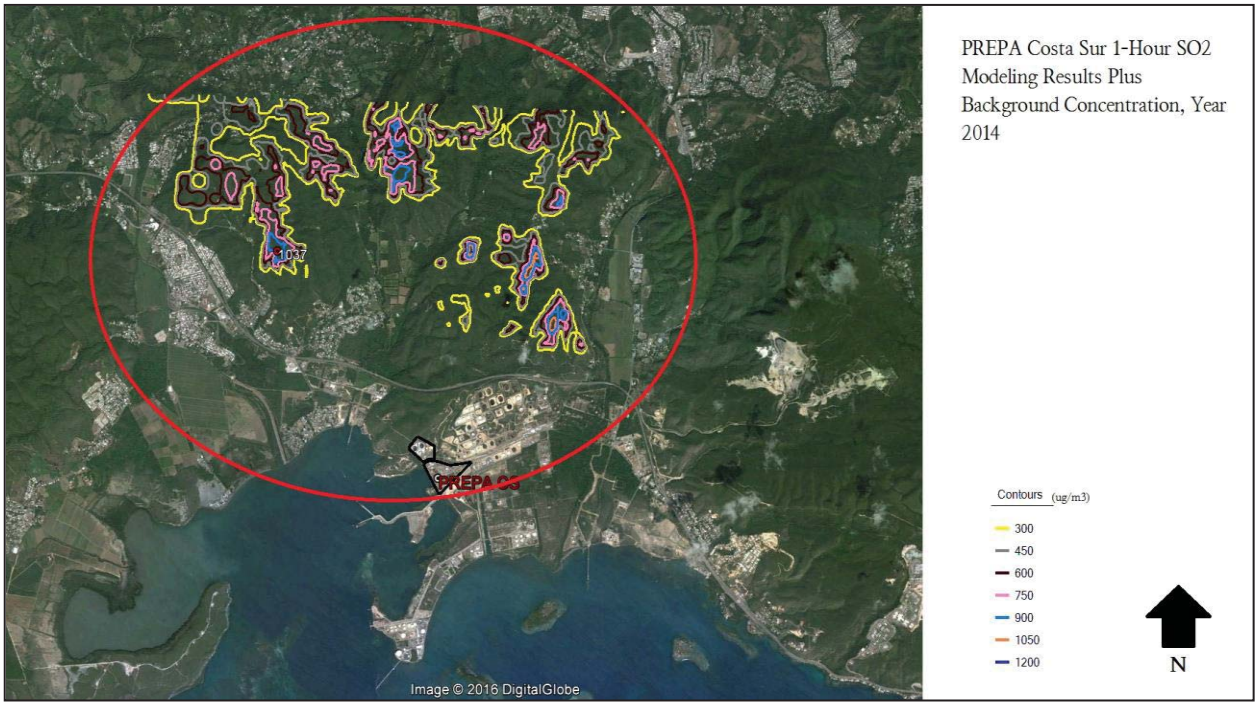
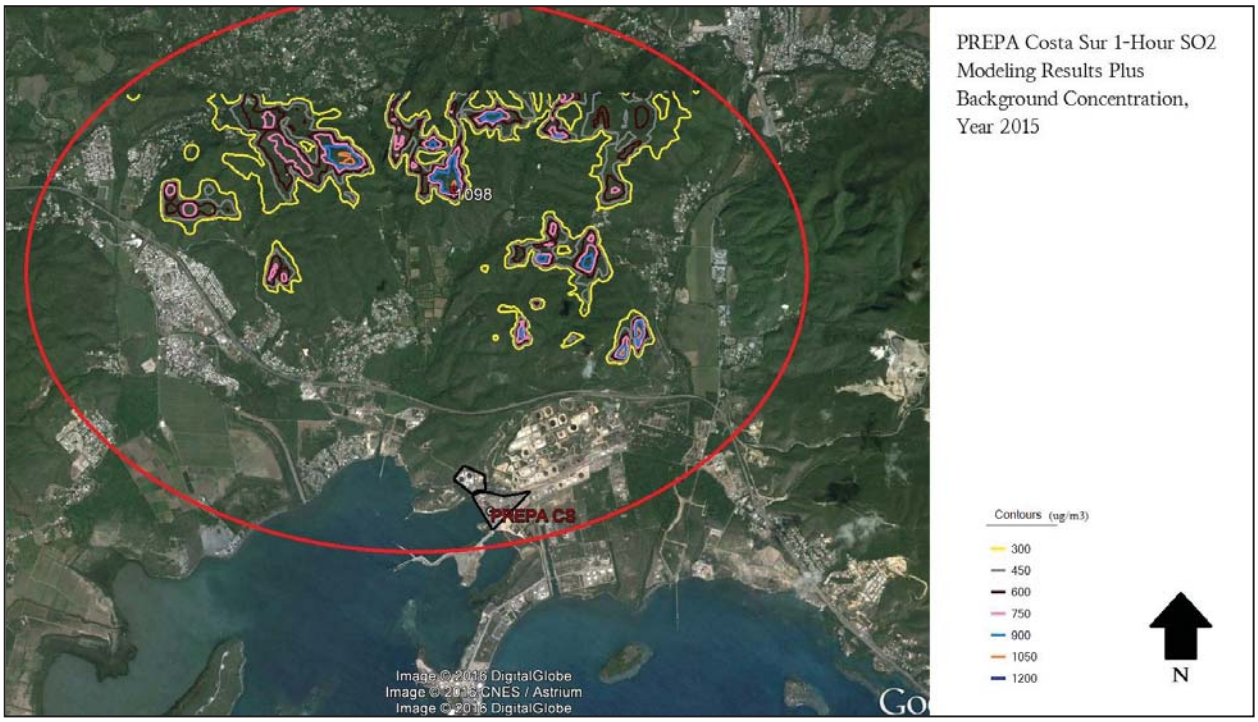


Figure 12: PREPA Costa Sur 1-Hour SO_2 Modeling Results Plus Background Concentration, Year 2015



Conclusion

According to the modeling results, the SO_2 emissions of the four facilities in the study do not comply with the 1-hour SO_2 NAAQS of 196 µg/m^3. The facility with the highest results was PREPA Costa Sur in Guayanilla, with the 1-hour SO_2 design value of 1046 µg/m^3. The facility with the lowest results was PREPA Palo Seco in San Juan area, with the 1-hour SO_2 design value of 207 µg/m^3. The model concentration results in all the areas under the study are above the 1-hour SO_2 NAAQS of 196 µg/m^3.

I. APPENDIX A: Emission Inventory for the 1-Hour SO_2 Designation Model

Commonwealth of Puerto Rico\Puerto Rico Environmental Quality Board
1-Hour SO_2 Designation Modeling Results

Emission Inventory for the 1-Hour SO_2 Designation Model

PUERTO RICO SO2 DESIGNATION EMISSION INVENTORY

Emission Unit	Address Physical/Postal	Municipality	SCC	Model Point ID	UTM East	UTM North	Control Equipment	Control Efficiency %	Actual Emissions (ton/yr) 2013	2014	2015	Stack Height (m)	Stack Diameter (m)	Stack Exit Velocity (m/s)	Stack Temperature (K)
PREPA San Juan															
HRSG 5&6	Mercado Central Ave, Zona Central Ave, PR-28, San Juan, PR PO Box 364267 San Juan, PR 00936-4267	San Juan	2-01-001-01	5|6	805942	2040125	n/a	n/a	360.45	250.2	362.31	85.6	5	29.2	422
Boiler 7			1-01-004-04	BOILER7	805971	2040146			1188.6	1446.8	1487.10	53.5	1.8	28.028	408.15
Boiler 8			1-01-004-04	BOILER8	805991	2040156			928.6	1657	1199.80	53.5	1.8	28.028	408.15
Boiler 9			1-01-004-04	BOILER9	805832	2040053			1339.8	1333.78	2971.20	55.2	1.8	29.46	408.15
Boiler 10			1-01-004-04	BOILER10	805813	2040043			1490.2	448	534.0	55.2	1.8	29.46	408.15
								Total	**5307.65**	**5135.78**	**6063.91**				
PREPA Palo Seco															
Palo Seco 1	Road 165, Km 3.8, Toa Baja PO Box 364267 San Juan, PR 00936-4267	San Juan	1-01-004-04	PS1	801146	2043049	n/a	n/a	1033.90	809.45	1012.66	53.5	2.5	27.46	430
Palo Seco 2			1-01-004-04	PS2	801116	2043049			854.10	839.15	1127.85	53.5	2.5	27.46	430
Palo Seco 3			1-01-004-04	PS3	801096	2043049			811.80	0.00	629.08	64.3	2.4	26.6	420
Palo Seco 4			1-01-004-04	PS4	801036	2043049			3000.00	1448.80	2203.18	64.3	2.4	26.6	420
Power Block 1			2-01-001-01	PSGT1	801017	2042968			0.19	1.90	0.02	12	2.9	19.19	783
Power Block 2			2-01-001-01	PSGT2	800987	2042968			0.38	4.32	3.48	12	2.9	19.19	783
Power Block 3			2-01-001-01	PSGT3	800967	2042968			0.31	4.40	3.08	12	2.9	19.19	783
								Total	**5700.68**	**3128.02**	**2979.36**				
PREPA Aguirre															
Boiler AG1	Road PR-3, Km 152.3, Salinas PO Box 364267 San Juan, PR 00936-4267	Salinas	1-01-004-04	AG1	795822	1987168	n/a	n/a	4992	3353	4472.33	75.9	2.5	58.6	422
Boiler AG2			1-01-004-04	AG2	795473	1987108			4623	5865	5025.10	75.9	2.5	58.6	422
Gas Turbines CC1-1 to CC1-4			2-01-001-01	CC1	792355	1986905			6.41	16.5	50.5	17.8	2.4	69.3	491
Gas Turbines CC2-1 to CC2-4			2-01-001-01	CC2	793106	1986822			19.51	26.3	35.4	17.8	2.4	69.3	491
AGGT2-1, 2-2			2-01-001-01	AGGT	793381	1987227			0.001	0.354	1.89	12.2	2.9	40.9	777
								Total	**9640.951**	**9261.154**	**9585.22**				
PREPA Costa Sur															
Boiler SC-3	Road 127, Guayanilla PO Box 560580 Guayanilla, PR 00656-0580	Guayanilla	1-01-004-04	SC3	773815	1991827	n/a	n/a	46.7	0	238.60	62.8	2.2	30.2	430
Boiler SC-4			1-01-004-04	SC4	773828	1991811			12.51	0	26.56	62.8	2.2	30.2	430
Boiler SC-5			1-01-004-04	SC5	773843	1991749			2188.72	4382.95	4572.5	75.9	3.2	30.8	422
Boiler SC-6			1-01-004-04	SC6	773856	1991724			4726.06	3953.48	4505.34	75.9	3.2	30.8	422
Power Block 1			2-01-001-01	PB1	773898	1991808			1.31	0.11	0.01	12	2.9	40.9	777
								Total	**6975.3**	**8336.54**	**9323.01**				