Co2 And Nox Are Achieved Bhoomiltd

Carbon monoxide (CO) is a toxic air pollutant produced largely from vehicle emissions. Breathing CO at high concentrations leads to reduced oxygen transport by hemoglobin, which has health effects that include impaired reaction timing, headaches, lightheadedness, nausea, vomiting, weakness, clouding of consciousness, coma, and, at high enough concentrations and long enough exposure, death. In recognition of those health effects, the U.S. Environmental Protection Agency (EPA), as directed by the Clean Air Act, established the health-based National Ambient Air Quality Standards (NAAQS) for CO in 1971. Most areas that were previously designated as "nonattainment" areas have come into compliance with the NAAQS for CO, but some locations still have difficulty in attaining the CO standards. Those locations tend to have topographical or meteorological characteristics that exacerbate pollution. In view of the challenges posed for some areas to attain compliance with the NAAQS for CO, congress asked the National Research Council to investigate the problem of CO in areas with meteorological and topographical problems. This interim report deals specifically with Fairbanks, Alaska. Fairbanks was chosen as a case study because its meteorological and topographical characteristics make it susceptible to severe winter inversions that trap CO and other pollutants at ground level.

The focus of this project was to develop the next generation of fuel injection technologies for environmentally friendly, hydrogen syngas combustion in gas turbine engines that satisfy DOE's objectives of reducing NOx emissions to 3 ppm. Building on Parker Hannifin's proven Macrolamination technology for liquid fuels, Parker developed a scalable high-performing multi-point injector that utilizes multiple, small mixing cups in place of a single conventional large-scale premixer. Due to the small size, fuel and air mix rapidly within the cups, providing a well-premixed fuel-air mixture at the cup exit in a short time. Detailed studies and experimentation with single-cup micro-mixing injectors were conducted to elucidate the effects of various injector design attributes and operating conditions on combustion efficiency, lean stability and emissions and strategies were developed to mitigate the impact of flashback. In the final phase of the program, a full-scale 1.3-MWth multi-cup injector was built and tested at pressures from 6.9bar (100psi) to 12.4bar (180psi) and flame temperatures up to 2000K (3150 F) using mixtures of hydrogen and natural gas as fuel with nitrogen and carbon dioxide as diluents. The injector operated without flash back on fuel mixtures ranging from 100% natural gas to 100% hydrogen and emissions were shown to be insensitive to combustor pressure. NOx emissions of 3-ppm were achieved at a flame temperature of 1750K (2690 F) when operating on a fuel mixture containing 50% hydrogen and 50% natural gas by volume with 40% nitrogen dilution and 1.5-ppm NOx was achieved at a flame temperature of 1680K (2564 F) using only 10% nitrogen dilution. NOx emissions of 3.5-ppm were demonstrated at a flame temperature of 1730K (2650 F) with only 10% carbon dioxide dilution. Finally, 3.6-ppm NOx emissions were demonstrated at a flame temperature over 1600K (2420 F) when operating on 100% hydrogen fuel with 30% carbon dioxide dilution. Superior operability was demonstrated for the hydrogen-natural gas fuel. The micro-mixing fuel injectors show great promise for use in future gas turbine engines operating on hydrogen, syngas or other fuel mixtures of various compositions, supporting the Department of Energy goals related to increased energy diversity while reducing greenhouse gases.

Fossil-fuel power plants account for the majority of worldwide power generation. Increasing global energy demands, coupled with issues of ageing and inefficient power plants, have led to new power plant construction programmes. As cheaper fossil fuel resources are exhausted and emissions criteria are tightened, utilities are turning to power plants designed with performance in mind to satisfy requirements for improved capacity, efficiency, and environmental characteristics. Advanced power plant materials, design and technology provides a comprehensive reference on the state of the art of gas-fired and coal-fired power plants, their major components and performance improvement options. Part one critically reviews advanced power plant designs which target both higher efficiency and flexible operation, including reviews of combined cycle technology and materials performance issues. Part two reviews major plant components for improved operation, including advanced membrane technology for both hydrogen (H2) and carbon dioxide (CO2) separation, as well as flue gas handling technologies for improved emissions control of sulphur oxides (SOx), nitrogen oxides (NOx), mercury, ash and particulates. The section concludes with coverage of high-temperature sensors, and monitoring and control technology that are essential to power plant operation and performance optimisation. Part three begins with coverage of low-rank coal upgrading and biomass resource utilisation for improved power plant fuel flexibility. Routes to improve the environmental impact are also reviewed, with chapters detailing the integration of underground coal gasification and the application of carbon dioxide (CO2) capture and storage. Finally, improved generation performance is reviewed with coverage of syngas and hydrogen (H2) production from fossil-fuel feedstocks. With its distinguished international team of contributors, Advanced power plant materials, design and technology is a standard reference for all power plant engineers and operators, as well as to academics and researchers in this field. Provides a comprehensive reference on the state-of-the-art gas-fired and coal-fired power plants, their major components and performance improvement options Examines major plant components for improved operation as well as flue gas handling technologies for improved emissions control Routes to improve environmental impact are discussed with chapters detailing the integration of underground coal gasification

Throughout the world, research and development in the field of vehicle transportation is increasingly focusing on engine and fuel combinations. The conventional and alternative fuels of the future are seen as fundamental to the development of a new generation of internal combustion engines that attain low well-to-wheel CO2 emissions along with near-zero pollutant emissions. These issues were debated during an international conference whose proceedings are presented in this book. This international conference attracted

specialists in the field, including participants from universities, research centres and industry.Contents : Future of liquid fuels, Engine and fuel-related issues in HCCI & CAI combustion, Energy conversion in engines from natural gas, Use of hydrogen in IC engines, Which fuels for low CO2 engines?

Climate Change : Looking forward, ninth report of session 2004-05, Vol. 2: Oral and written Evidence

Biodiesel has generated increased interest in the US and elsewhere recently as an alternative to petroleum-derived diesel. Because it can be produced from domestic feedstocks such as soybeans, canola oil, and even recycled cooking oil, biodiesel can help reduce dependence on foreign petroleum. Due to its high oxygen content, biodiesel typically burns more completely than petroleum diesel, and thus has lower emissions of hydrocarbons (HC), carbon monoxide (CO), and particulate matter (PM). However, biodiesel may increase or decrease nitrogen oxide (NOx) and carbon dioxide (CO2) emissions, depending on engine type, test cycle, and biodiesel feedstock. Therefore, the purpose of this study was to compare emissions from biodiesel blend 20% (B20) made from various feedstocks, in an on-road setting using a portable emissions measurement system (PEMS) and a chassis dynamometer setting for a test vehicle (1994 Chevy Silverado). The study tested 4 biodiesel feedstocks (soybean oil, canola oil, waste cooking oil, and animal fat) compared with ultra low sulfur diesel (ULSD) using on-road testing under real-world driving conditions with a Horiba On-Board Measurement System OBS-1300 on a highway route and arterial route, and chassis dynamometer with Urban Dynamometer Drive Schedule. Emissions of NOx and CO2 were measured second-by-second and compared for each feedstock with ULSD. For the dynamometer only, HC, CO, and PM were also measured. Biodiesel fuel specifications from each feedstock were tested and compared. The dynamometer test results showed statistically significant lower emissions of HC, CO, and PM from all B20 blends compared to ULSD. For CO2, on-road testing (arterial, highway, and idling) and dynamometer testing showed no statistically significant difference in emissions among the B20 blends and ULSD. For NOx, dynamometer testing showed only B20 from soybean oil to have statistically significant higher emissions. This is generally consistent with the on-road testing (arterial, highway, and idling), which showed no statistically significant difference in NOx emissions between ULSD and the B20 blends. The results above are specific to the 1994 Chevy Silverado tested, and cannot be generalized to other vehicles.

Abstract: One of the major environmental challenges facing our planet and living beings is the global warming. This phenomena, known as the gradual increase in the overall temperature of earth's atmosphere is mostly caused by the greenhouse eect which is a result of increased levels of greenhouse gases. Major constitutes of these gases are Carbon Dioxide (CO2) and Nitrogen Oxides (NOx). Transportation sector is responsible for releasing a signicant portion of these gases into the atmosphere. In recent decades, many endeavors such as using alternative fuels and modications in engine cycles have been made to control the amount of pollutants emitted from internal combustion engines. In this work, the impact of adding humidity to the input Oxidizer stream on reduction of NOx and Carbone Dioxide (CO2) of a CNG engine has been studied. With the addition of the humidity, the combustion temperature will be reduced which improves the engines lifespan. Non-Premixed combustion process in a single cylinder is simulated using the STAR CCM+ software from CD-Adapco company, using the Presumed Probability Density Function (PPDF) combustion model which is an accurate model for combustion. Simulation results indicate with 10% humid air, signicant reductions in NOx and CO2 are obtained, with a moderate increase in CO output.

This book focuses on the application of newly innovated analytical tools for sustainable development on regional economic and environmental issues in Korea. With a range of case studies, the authors explore a series of theoretical models and empirical methods including spatial CCE Model, multiregional Input-Output and econometric analysis, logit model, contingent valuation method, GIS, sample selection model, machine learning technique, stochastic frontier analysis, and panel analysis. These models and methods are tailored to spatial development issues such as agglomeration, clustering and industrial innovation, human capital and labor market, education and R&D investments and economic resilience for regional economies and unexpected disaster, and natural resources for environmental markets. Quantitative Regional Economic and Environmental Analysis for Sustainability in Korea is of particular interest to policy makers and practitioners, as well as research scholars active in sustainability science.

Over the past decade, the prospect of climate change resulting from anthropogenic CO2 has become a matter of growing public concern. Not only is the reduction of CO2 emissions extremely important, but keeping the cost at a manageable level is a prime priority for companies and the public, alike. The CO2 capture project (CCP) came together with a common goal in mind: find a technological process to capture CO2 emissions that is relatively low-cost and able be to be expanded to industrial applications. The Carbon Dioxide Capture and Storage Project outlines the research and findings of all the participating companies and associations involved in the CCP. The final results of thousands of hours of research are outlined in the book, showing a successful achievement of the CCP’s goals for lower cost CO2 capture technology and furthering the safe, reliable option of geological storage. The Carbon Dioxide Capture and Storage Project is a valuable reference for any scientists, industrialists, government agencies, and companies interested in a safer, more cost-efficient response to the CO2 crisis. *Succeeds in tackling the most important issues at the heart of the CO2 crisis: lower-cost and safer solutions, and making the technology available at an industrial level. *Contains technical papers and findings of all researchers involved in the CO2 capture and storage project (CCP) *Consolidates thousands of hours of research into a concise and valuable reference work, providing up-to-the minute information on CO2 capture and underground storage alternatives.

Iron Ore: Mineralogy, Processing and Environmental Sustainability, Second Edition covers all aspects surrounding the second most important commodity behind oil. As an essential input for the production of crude steel, iron ore feeds the world's largest trillion-dollar-a-year metal market and is the backbone of the global infrastructure. The book

explores new ore types and the development of more efficient processes/technologies to minimize environmental footprints. This new edition includes all new case studies and technologies, along with new chapters on the chemical analysis of iron ore, thermal and dry beneficiation of iron ore, and discussions of alternative iron making technologies. In addition, information on recycling solid wastes and P-bearing slag generated in steel mills, sustainable mining, and low emission iron making technologies from regional perspectives, particularly Europe and Japan, are included. This work will be a valuable resource for anyone involved in the iron ore industry. Provides an overall view of the entire value chain, from iron ore to metal Includes specific information on process/stage/operation in the value chain Discusses challenges and developments, along with future trends in the iron ore and steel industries Incorporates new, sustainable mining techniques

Special edition of the Federal Register, containing a codification of documents of general applicability and future effect ... with ancillaries.

This proceedings book includes papers that cover the latest developments in automotive vehicles and environment, advanced transport systems and road traffic, heavy and special vehicles, new materials, manufacturing technologies and logistics and advanced engineering methods. Authors of the papers selected for this book are experts from research, industry and universities, coming from different countries. The overall objectives of the presentations are to respond to the major challenges faced by the automotive industry, and to propose potential solutions to problems related to automotive technology, transportation and environment, and road safety. The congress is organized by SIAR (Society of Automotive Engineers from Romania) in cooperation with SAE International. The purpose is to gather members from academia, industry and government and present their possibilities for investigations and research, in order to establish new future collaborations in the automotive engineering and transport domain. This proceedings book is just a part of the outcomes of the congress. The results presented in this proceedings book benefit researchers from academia and research institutes, industry specialists, Ph.D. students and students in Automotive and Transport Engineering programs.

Aircraft emissions currently account for ~3.5% of all greenhouse gas emissions. The number of passenger miles has increased by 5% annually despite 9/11, two wars and gloomy economic conditions. Since aircraft have no viable alternative to the internal combustion engine, improvements in aircraft efficiency and alternative fuel development become essential. This book comprehensively covers the relevant issues in green aviation. Environmental impacts, technology advances, public policy and economics are intricately linked to the pace of development that will be realized in the coming decades. Experts from NASA, industry and academia review current technology development in green aviation that will carry the industry through 2025 and beyond. This includes increased efficiency through better propulsion systems, reduced drag airframes, advanced materials and operational changes. Clean combustion and emission control of noise, exhaust gases and particulates are also addressed through combustor design and the use of alternative fuels. Economic imperatives from aircraft lifetime and maintenance logistics dictate the drive for "drop-in" fuels, blending jet-grade and biofuel. New certification standards for alternative fuels are outlined. Life Cycle Assessments are used to evaluate worldwide biofuel approaches, highlighting that there is no single rational approach for sustainable buildup. In fact, unless local conditions are considered, the use of biofuels can create a net increase in environmental impact as a result of biofuel manufacturing processes. Governmental experts evaluate current and future regulations and their impact on green aviation. Sustainable approaches to biofuel development are discussed for locations around the globe, including the US, EU, Brazil, China and India.

This book investigates innovative solutions to increase the share of renewable engery in the global power mix, with a particular focus on improved and sustainable biomass conversion technologies. To this end, the book deals with an analysis of the generation mix of renewable energies (including biofuels, renewable waste and biogas) in the overall power balance of several countries. In addition, the possibilities of using bioenergy resources in the context of power generation are thoroughly analyzed. As one of the most important ways of converting biomass into energy, the combustion process is analyzed in detail, highlighting the vast potential for the use of innovative biofuels. In this context, a detailed classification of existing biofuels is established, reflecting the relationship between their energy properties and their potential use in industrial facilities. Additionally, the most efficient combustion technologies for the respective applications are discussed. Furthermore, the authors emphasize that the management of renewable waste, both from industry (tannery waste and oils from transport) and agriculture, requires an economic and environmental friendly approach. The challenges of burning various renewable waste fuels and upgrading industrial facilities are discussed, and the ideas and technologies presented in this book contribute to the UN Sustainable Development Goal (SDG) for "Affordable and Clean Energy". The book is a useful resource for professionals dealing with current and upcoming activities related to renewable energy combustion, and a good starting point for young researchers.

IPCC Report on sources, capture, transport, and storage of CO2, for researchers, policy-makers and engineers.

The objectives of this project were to carry out an experimental program to enable development and design of near zero emissions (NZE) CO2 processing unit (CPU) for oxy-combustion plants burning high and low sulfur coals and to perform commercial viability assessment. The NZE CPU was proposed to produce high purity CO2 from the oxycombustion flue gas, to achieve> 95% CO2 capture rate and to achieve near zero atmospheric emissions of criteria pollutants. Two SOx/NOx removal technologies were proposed depending on the SOx levels in the flue gas. The activated carbon process was proposed for power plants burning low sulfur coal and the sulfuric acid process was proposed for power plants burning high sulfur coal. For plants burning high sulfur coal, the sulfuric acid process would convert SOx and NOx in to commercial grade sulfuric and nitric acid by-products, thus reducing operating costs associated with SOx/NOx removal. For plants burning low sulfur coal, investment in separate FGD and SCR equipment for producing high purity CO2 would not be needed. To achieve high CO2 capture rates, a hybrid process that combines cold box and VPSA (vacuum pressure swing adsorption) was proposed. In the proposed hybrid process, up to 90% of CO2 in the cold box vent stream would be recovered by CO2 VPSA and then it would be recycled and mixed with the flue gas stream upstream of the compressor.

The overall recovery from the process will be> 95%. The activated carbon process was able to achieve simultaneous SOx and NOx removal in a single step. The removal efficiencies were>99.9% for SOx and>98% for NOx, thus exceeding the performance targets of>99% and>95%, respectively. The process was also found to be suitable for power plants burning both low and high sulfur coals. Sulfuric acid process did not meet the performance expectations. Although it could achieve high SOx (>99%) and NOx (>90%) removal efficiencies, it could not produce by-product sulfuric and nitric acids that meet the commercial product specifications. The sulfuric acid will have to be disposed of by neutralization, thus lowering the value of the technology to same level as that of the activated carbon process. Therefore, it was decided to discontinue any further efforts on sulfuric acid process. Because of encouraging results on the activated carbon process, it was decided to add a new subtask on testing this process in a dual bed continuous unit. A 40 days long continuous operation test confirmed the excellent SOx/NOx removal efficiencies achieved in the batch operation. This test also indicated the need for further efforts on optimization of adsorption-regeneration cycle to maintain long term activity of activated carbon material at a higher level. The VPSA process was tested in a pilot unit. It achieved CO2 recovery of> 95% and CO2 purity of>80% (by vol.) from simulated cold box feed streams. The overall CO2 recovery from the cold box VPSA hybrid process was projected to be>99% for plants with low air ingress (2%) and>97% for plants with high air ingress (10%). Economic analysis was performed to assess value of the NZE CPU. The advantage of NZE CPU over conventional CPU is only apparent when CO2 capture and avoided costs are compared. For greenfield plants, cost of avoided CO2 and cost of captured CO2 are generally about 11-14% lower using the NZE CPU compared to using a conventional CPU. For older plants with high air intrusion, the cost of avoided CO2 and capture CO2 are about 18-24% lower using the NZE CPU. Lower capture costs for NZE CPU are due to lower capital investment in FGD/SCR and higher CO2 capture efficiency. In summary, as a result of this project, we now have developed one technology option for NZE CPU based on the activated carbon process and coldbox-VPSA hybrid process. This technology is projected to work for both low and high sulfur coal plants. The NZE CPU technology is projected to achieve near zero stack emissions, produce high purity CO2 relativ ...

With the prospect of new layers of complexity being added to air pollution controls, and with electricity restructuring putting a premium on economic efficiency, interest is being expressed in finding mechanisms to achieve health and environmental goals in simpler, more cost-effective ways. The electric utility industry is a major source of air pollution, particularly sulfur dioxide (SO2), nitrogen oxides (NOx), and mercury (Hg), as well as unregulated greenhouse gases, particularly carbon dioxide (CO2). At issue is whether a new approach to environmental protection could achieve the nation's air quality goals more cost effectively than the current system. One approach being proposed is a "multi-pollutant" strategy -- a framework based on a consistent set of emissions caps, implemented through emissions trading. Just how the proposed approach would fit with the current (and proposed) diverse regulatory regimes remains to be worked out; they might be replaced to the greatest extent feasible, or they might be overlaid by the framework of emissions caps. In February 2002, the Bush Administration announced two air quality initiatives. The first, "Clear Skies," would amend the Clean Air Act to place emission caps on electric utility emissions of SO2, NOx, and Hg. Implemented through a tradeable allowance program, the emissions caps would generally be imposed in two phases: 2008 and 2018. The second initiative begins a voluntary greenhouse gas reduction program. This plan, rather than capping CO2 emissions, focuses on improving the carbon efficiency of the economy, reducing current emissions of 183 metric tons per million dollars of GDP to 151 metric tons per million dollars of GDP in 2012. In the 110th Congress, three bills have been introduced that would impose multipollutant controls on utilities. They are all four-pollutant proposals that include carbon dioxide. S. 1168 and S. 1177 are revised versions of S. 2724, introduced in the 109th Congress. S. 1201 is an expanded version of S. 150, introduced in the 109th Congress. All of these bills involve some form of emission caps, beginning in the 2009-2012 time frame, with a second phase in 2013-2015. They would employ a tradeable credit program to implement the SO2, NOx, and CO2 caps while permitting plant-wide averaging in complying with the Hg requirements. The provisions concerning SO2, NOx, and Hg in the 110th Congress bills are generally more stringent than the comparable provisions of S. 131 of the 109th Congress. It is difficult to compare the CO2 caps contained in these bills with the Administration's proposal concerning CO2 -- both because the Administration's proposal is voluntary rather than mandatory and because it is broader (covering all greenhouse gas emissions rather than just utility CO2 emissions).

The important advances achieved over the past years in all technological directions (industry, energy, and health) contributing to human well-being are unfortunately, in many cases, accompanied by a threat to the environment, with photochemical smog, stratospheric ozone depletion, acid rain, global warming, and finally climate change being the most well-known major issues. These are the results of a variety of pollutants emitted through these human activities. The indications show that we are already at a tipping point that might lead to non-linear and sudden environmental change on a global scale. Aiming to tackle these adverse effects in an attempt to mitigate any damage that has already occurred and to ensure that we are heading toward a cleaner (green) and sustainable future, scientists around the world are developing tools and techniques to understand, monitor, protect, and improve the environment. Emissions control catalysis is continuously advancing, providing novel, multifunctional, and optimally promoted using a variety of methods, nano-structured catalytic materials, and strategies (e.g., energy chemicals recycling, cyclic economy) that enable us to effectively control emissions, either of mobile or stationary sources, improving the quality of air (outdoor and indoor) and water and the energy economy. Representative cases include the abatement and/or recycling of CO2, CO, NOx, N2O, NH3, CH4, higher hydrocarbons, volatile organic compounds (VOCs), particulate matter, and specific industrial emissions (e.g., SOx, H2S, dioxins aromatics, and biogas). The “Emissions Control Catalysis” Special Issue has succeeded in collecting 22 high-quality contributions, included in this MDPI open access book, covering recent research progress in a variety of fields relevant to the above topics and/or applications, mainly on: (i) NOx catalytic reduction from cars (i.e., TWC) and industry (SCR) emissions; (ii) CO, CH4, and other hydrocarbons removal, and (iii) CO2 capture/recirculation combining emissions control with added-value chemicals production.

This book features carefully selected articles on emerging technologies for waste valorization and environmental protection. The term “waste valorization” is used particularly in engineering, economics, technology, business, environmental and policy literature to refer to any unit operation or collection of operations targeted at reusing, recycling, composting or converting wastes into useful products or energy sources without harming the environment. The book discusses the rudimentary concept, and describes a range of emerging technologies in the field, including nano, fuel-cell and membrane technologies, as well as membrane bioreactors. It also examines in detail essential and common processes in waste valorization, such as rigorous chemical engineering applications, mathematical modeling and other trans-disciplinary approaches. The chapters present high-quality research papers from the IconSWM 2018 conference.

This book focuses on the need to develop sustainable supply chains - economically, environmentally and socially. This book is not about a wish list of impractical choices, but the reality of decisions faced by all those involved in supply chain management today. Our definition of sustainable supply chains is not restricted to so-called "green" supply chains, but recognises that in order to be truly sustainable, supply chains must operate within a realistic financial structure, as well as contribute value to our society. Supply chains are not sustainable unless they are realistically funded and valued. Thus, a real definition of sustainable supply chain management must take account of all relevant economic, social and environmental issues. This book contains examples from a wide range of real-life case studies, and synthesizes the learnings from these many different situations to provide the fundamental building blocks at the centre of successful logistics and supply chain management.

All federal agencies, including EPA, are required under Executive Order (EO) 13123 to reduce life-cycle greenhouse gas emissions attributed to facility energy use by 30% below 1990 levels by 2010. A key approach to reducing facility greenhouse gas emissions, employed by EPA's Office of Administration and Resources Management (OARM), involves the purchase of "green power". Green power generally

includes renewables (wind, solar, biomass) and other clean energy technologies (municipal solid waste and landfill gas) that generate electricity. Green tags, which represent the positive environmental attributes associated with electricity production from green power sources, are sold through markets to electricity consumers. The analysis presented in this report meets the following three objectives: (1) establish the 1990 EPA emissions baseline in order to assess progress towards fulfillment of EO 13123, (2) examine the impact of EPA's green power purchasing on facility-related greenhouse gas emissions and air pollution, and (3) develop a strategy for future green power purchases. In order to achieve these objectives, this report describes a new method to estimate net emissions of CO2, SO2, NOX, and Hg. The estimation of net facility emissions is complicated by the purchase of green tags because it requires detailed knowledge of which conventional power plants are being offset by purchased green power. Different offset scenarios are analyzed in order to quantify the uncertainty inherent in estimating emissions offsets without hour-by-hour system dispatch data.

Containing papers presented at the 7th International Conference on Energy and Sustainability, this volume includes collaborative research between different disciplines, including materials, energy networks, new energy resources, storage solutions, waste to energy systems, smart grids and many other related subjects. Energy production and distribution matters as well as the need to respond to the modern world’s dependency on conventional fuels are topics of growing importance. The use of fossil fuels has generated an increasing amount of interest in renewable energy resources and the search for maintainable energy policies. Energy policies and management are of primary importance to achieve the development of sustainability and need to be consistent with recent advances in energy production and distribution. Challenges lie as much in the conversion from renewable energies such as wind and solar to useful forms like electricity, heat and fuel at an acceptable cost (including environmental damage) as in the integration of these resources into an existing infrastructure. A range of topics are covered, including: Energy policies; Renewable energy resources; Sustainable energy production; Environmental risk management; Green buildings; Energy storage; Energy management; Biomass and biofuels; Waste to energy; Processing of oil and gas; CO2 capturing and management; Pipelines; Energy efficiency; Smart grids; Energy and transport; Case studies.

In August 2018, the U.S. Environmental Protection Agency (EPA) proposed three actions in the "Affordable Clean Energy Rule" (ACE). First, EPA proposed to replace the Obama Administration's 2015 Clean Power Plan (CPP) with revised emission guidelines for existing fossil fuel steam electric generating units (EGUs), which are largely coal-fired units. Second, EPA proposed revised regulations to implement emission guidelines under Clean Air Act (CAA) Section 111(d). Third, EPA proposed to modify an applicability determination for New Source Review (NSR), a CAA preconstruction permitting program for new and modified stationary sources. The first action stems from EPA's finding that the CPP exceeded EPA's statutory authority by using measures that applied to the power sector rather than measures carried out within an individual facility. In the ACE rule, EPA proposed to base the "best system of emission reduction" (BSER) for existing coal-fired EGUs on heat rate improvement (HRI) measures. EPA did not propose a BSER for other types of EGUs, such as natural gas combined cycle units. In addition, EPA did not establish a numeric performance standard as the agency did in the CPP. Instead, EPA proposed a list of "candidate technologies" of HRI measures that constitute the BSER. States would establish unit-specific performance standards based on this list and other unit-specific considerations. Second, EPA proposed to revise the general implementing regulations to clarify EPA's and states' roles under Section 111(d) based on the agency's current legal interpretation that states have broad discretion to establish emissions standards consistent with the BSER. The proposed changes would, among other things, revise definitions and lengthen the time for development and review of state plans. Third, EPA proposed to revise the NSR applicability test for EGUs. According to EPA, this would prevent NSR from discouraging the installation of energy-efficiency measures. EGUs that adopt HRI measures and operate more efficiently may be used for longer time periods, thereby increasing annual emissions and potentially triggering NSR. Under ACE, NSR would not be triggered if the EGU modification did not increase emissions on an hourly basis, even if the modification increases annual emissions. EPA estimated emission changes under multiple scenarios. EPA projected that power sector emissions of carbon dioxide (CO2), sulfur dioxide (SO2), and nitrogen oxides (NOx) would increase under the ACE proposal compared to the CPP. EPA also projected that ACE would, in most scenarios, decrease CO2, SO2, and NOx emissions compared to a baseline without the CPP. Power sector emissions projections, comparing CPP and non-CPP scenarios, provide context for evaluating the potential impacts of the ACE proposal. The CO2 emission reduction differences between CPP and non-CPP scenarios are greater in the studies from earlier years. For example, a comparison between CPP and non-CPP scenarios from the past three Energy Information Administration analyses shows that the percentage difference has decreased from 16% (in 2016) to 8% (in 2018), reflecting the fact that many of the changes EPA expected to result from the CPP (i.e., natural gas and renewables replacing coal-fired units) have happened already due to market forces and other factors. Comparisons between modeling projections of electricity sector CO2 emissions should be made with caution, however, given potential differences in modeling assumptions about future economic conditions and underlying energy inputs (e.g., natural gas prices). EPA estimated that compared to the CPP, ACE would reduce compliance costs and yield lower emission reductions, thereby increasing climate-related damages and human health damages ("forgone benefits"). According to EPA, the estimated value of the forgone benefits would outweigh the compliance cost savings when replacing the CPP with ACE, yielding net costs.

Carbon dioxide utilisation is a growing field of research that spans early stage laboratory chemistry through to commercial exploitation. In 2013 the CO2Chem Network (www.co2chem.com) made a successful bid to hold the 14th edition of this major conference. This was the first time it was held in the United Kingdom and attracted over 270 delegates from 32 different countries. It was a condition of presentation that all the work submitted was new and novel. We invited submissions of new work for this Research Topic and manuscripts were subjected to deep peer review. We are pleased that these papers are now being collated into an eBook. We value the range and quality of the papers submitted. These range from novel capture, integration and process through to policy, public perception and economic evaluation. CO2Chem was proud to be chosen to organise this prestigious conference. CO2Chem was founded in 2010 as one of the Engineering and Physical Sciences (EPSRC) Grand Challenge Networks. It is now in its eighth year of operation and its third round of direct funding. It continues to be a forum for discussion and collaboration nationally and globally. We have for a long time associated ourselves with ICCDU and will continue to do so in the future. We hope that the papers presented here serve as a catalyst to further research in CDU and to engagement with ICCDU.

The Asia–Pacific Integrated Model (AIM) brings together more than 20 computer simulation models for development and analysis of policy in such diverse fields as climate change mitigation, air pollution abatement, and ecosystem preservation. This first book in a series on the development of AIM focuses on climate change issues and the evaluation of policy options to stabilize the global climate. It presents an overview of the models developed to date, their structure, and the results and analyses presented to policymakers and researchers at the levels of individual Asian countries, the Asia–Pacific region, and the world at large. The contents vary in scope from local to global issues, with discussions of the effects of climate policies, cost analyses of climate policies with their effects on trade, and global scenario analyses. Also included are impact analyses and the effects of promoting environmental technologies.

Written by economists and policy analysts at Resources for the Future, a Washington, DC, think tank with a tradition for independent, objective research, this collection of twenty-five 'memos to the President' offers constructive policy options for the elected administration on critical challenges related to energy, the environment, and natural resources. Each contributor to New Approaches on Energy and the Environment was asked to address the question: 'Based on your research and knowledge, what policy recommendation would you like to make to the next U.S. president?' Writing in advance of the 2004 election so as to keep their essays free of partisan interpretations, the authors were asked not to confine their suggestions to what the prevailing wisdom says is politically possible. They also took pains to

make their ideas accessible to a busy president as well as a wide range of readers interested in a concise and authoritative overview of the nation's energy and environmental policy choices. The results are provocative, sometimes controversial, but highly readable essays on topics including climate change, oil dependency, electricity regulation, brownfields revitalization, forest service administration, air and water quality, and environmental health issues such as food safety and the growing threat of antibiotic resistance. When the President takes office in January, 2005, he will confront competing perspectives about the priorities and approaches that should apply to energy and environmental policy: Americans want cleaner air and water and healthy and attractive surroundings, but they also want inexpensive fuel, comfortable cars and houses, and continued economic growth. New Approaches on Energy and the Environment provides thought-provoking, commonsense contributions to debates about important energy and environmental issues confronting the U.S. today.

As interest in pollutant emission from stationary and aero-engine gas turbines increases, combustor engineers must consider various configurations. One configuration of increasing interest is the staged, rich burn - quick mix - lean burn (RQL) combustor. This report summarizes an investigation conducted in a recently developed high pressure gas turbine combustor facility. The model RQL combustor was plenum fed and modular in design. The fuel used for this study is Jet-A which was injected from a simplex atomizer. Emission (CO2, CO, O2, UHC, NOx) measurements were obtained using a stationary exit plane water-cooled probe and a traversing water-cooled probe which sampled from the rich zone exit and the lean zone entrance. The RQL combustor was operated at inlet temperatures ranging from 367 to 700 K, pressures ranging from 200 to 1000 kPa, and combustor reference velocities ranging from 10 to 20 m/s. Variations were also made in the rich zone and lean zone equivalence ratios. Several significant trends were observed. NOx production increased with reaction temperature, lean zone equivalence ratio and residence time and decreased with increased rich zone equivalence ratio. NOx production in the model RQL combustor increased to the 0.4 power with increased pressure. This correlation, compared to those obtained for non-staged combustors (0.5 to 0.7), suggests a reduced dependence on NOx on pressure for staged combustors. Emissions profiles suggest that rich zone mixing is not uniform and that the rich zone contributes on the order of 16 percent to the total NOx produced.Peterson, Christopher O. and Sowa, William A. and Samuelsen, G. S.Glenn Research CenterCOMBUSTION CHAMBERS; GAS TURBINES; CONTAMINANTS; BURNERS; NITROGEN OXIDES; JET MIXING FLOW; EXHAUST EMISSION; HIGH TEMPERATURE; CARBON DIOXIDE; COMPRESSED GAS; OXYGEN; TEST FACILITIES; EXPERIMENT DESIGN

Permit trading is an environmental policy instrument that has received increasing levels of attention over recent years. Coming from the field of air quality management, with the European CO2 emissions trading system being the most prominent example, it enters new fields of application, such as land use policy and biodiversity protection, water quality and water quantity trading. This book gives an overview of these recent developments and discusses the possibilities and limits of permit trading in environmental policies. The advantages of permit trading are not only seen with respect to economic efficiency, which leads to achieving the environmental target at minimum cost, but also with respect to the instrument’s environmental effectiveness. By setting a cap for the overall emissions, a given environmental target can be met. This makes permit trading an interesting case for many environmental fields where safeguarding the environmental target plays a dominant role. Against this background, permit trading is discussed in environmental policy fields, where it has not been considered before, for example, land use management, biodiversity protection and water trading. Permit Trading in Different Applications analyses the properties of permit trading: its possibilities and limitations, its design options and its restrictions on a more general level. It demonstrates how lessons learnt in established policy fields like air quality management can be transferred to new and emerging fields of application. This collection will provide students and practitioners in environmental sciences and policy with valuable research into instrument choice and design with respect to permit trading.

Sustainable mobility has become the new imperative for transport policy. There have been a number of policy attempts at sustainable mobility globally, such as the development of more efficient conventional transport technologies, the promotion of efficient and affordable public transport systems and the encouragement of environmental awareness. Such policies have so often been presented as prerequisites for sustainable mobility that they are now taken for granted. But are any of these policies really successful? To what extent do they actually contribute (or fail to contribute) to sustainable mobility? Why do some policies succeed and others fail? Using an interdisciplinary approach which brings together various theories and methodologies, this book tests each of these policies - or hypotheses, as the author sees them - with detailed empirical investigations. It also argues that leisure-time travel should be included in any sustainable mobility policies, as it now accounts for 50 per cent of all annual travel distance in developed countries. The book concludes by suggesting fourteen theses of sustainable mobility for the EU and a new model for future best practice.

This thesis analyzes the potential for existing natural gas combined cycle (NGCC) power generation to displace coal generation thereby reducing emissions of CO2 and criteria pollutants regulated under the Clean Air Act. It also examines the potential for unused NGCC capacity to eliminate transmission congestion while simultaneously reducing CO2 and other criteria pollutant emissions. The average capacity factor of the entire natural gas fleet in year 2008 was 26%. The average capacity factor of NGCC units, a subset of the gas fleet, is 41%. NGCC units, however, are designed to operate at capacity factors as high as 85%. The delta of these two numbers has generated significant policy interest as a means for reducing C02 emissions through some type of environmental dispatch that would favor NGCC over coal generation without the need for additional capital investment. The maximum potential of natural gas power generation to displace inefficient coal generation was determined. This upper limit can provide regulators and policy makers with guideposts for further review. Various operational constraints including transmission limitations were then modeled to determine the extent to which these constraints limit fuel switching opportunities. An analysis was conducted to estimate the effects of fuel switching on transmission congestion. The conclusion of this analysis was that generation from potentially available NGCC capacity located in regions with high load centers can help alleviate the transmission congestion problem with minimal or zero capital investment for building new generation capacity. Next, an hourly dispatch model was developed that incorporates many of the complexities of the power system. This model dispatches generation from various power plants under two scenarios: a carbon unconstrained scenario (base case); and a carbon constrained scenario. Under the carbon constrained scenario, dispatch preference is give to NGCC generation over coal generation. Two regions were modeled: the Electric Reliability Council of Texas (ERCOT), which is primarily Texas; and the Florida Reliability Coordinating Council (FRCC), which is primarily Florida. Results from the two cases indicate that, without compromising system reliability: In the ERCOT region, displacing some coal generation with existing and available NGCC generation would lower CO2 emissions by nearly 22%, SO2 by 70% and NOx by 49%, compared to the base case. * In the FRCC region, displacing some coal generation with existing and available NGCC generation would lower CO2 emissions by nearly 10%, 502 by 38% and NOx by 25%, compared to the base case. The model results also indicate that for both ERCOT and FRCC, these emissions savings can be achieved with a 10% increase in electricity prices. This translates into a cost of emissions reductions of $20/ton of CO2 in ERCOT and $40/ton of CO2 in FRCC. This compares to the cost of emissions reductions from corn ethanol, which is about $750/ton of CO2, as reported by Congressional Budget Office'. Finally, a comparison was made between the results of the hourly dispatch model and the ReEDS model, a more complex model developed by Department of Energy's (DOE) National Renewable Energy Laboratory (NREL).

The book addresses all major aspects to be considered for the design and operation of aircrafts within the entire transportation chain. It provides the basic information about the legal environment, which defines the basic requirements for aircraft design and aircraft operation. The interactions between airport, air traffic management and the airlines are described. The market forecast methods and the aircraft

development process are explained to understand the very complex and risky business of an aircraft manufacturer. The principles of flight physics as basis for aircraft design are presented and linked to the operational and legal aspects of air transport including all environmental impacts. The book is written for graduate students as well as for engineers and experts, who are working in aerospace industry, at airports or in the domain of transport and logistics.