# TABLE OF CONTENTS

4 Highlights
6 This Year’s Gift
8 Five Years of Growth
10 A Prescient Report
12 Carnot Prize

16 Center Research
18 Envisioning a Climate Action Plan
19 Future of Philadelphia Gas Works
20 Global Fossil Flows
21 National Science Foundation Grant Award

22 Publications
24 Powering Our Future with Trash

30 Commentary
32 A Hard Look at Negative Emissions
36 Retreat? Not Just a Developing World Problem

40 Grants
42 Failed Carbon Tax Initiatives
44 Ride-Hail Research
48 IEA Fellowship, Taking Energy Education Global

54 Certificate Program

58 Events
60 Energy Transitions: The Critical Path

68 Senior Fellows
69 Faculty Fellows
70 Visiting Scholars

72 Advisory Board
73 Staff
74 About

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LETTER FROM THE DIRECTOR & DEAN

Here at the Kleinman Center, we like to say that we own Benjamin Franklin like nobody else on campus.

Most know him as the founder of the University of Pennsylvania. But we know him as America’s first energy scholar. Benjamin Franklin discovered electricity, invented the lightning rod, and organized fire insurance—thereby integrating impact across science, technology, and policy.

This spectacular new gift of $30 million empowers the Kleinman Center to carry forward Benjamin Franklin’s legacy of innovative excellence in energy policy.

In response to this gift, we are setting ambitious targets. We will expand the curriculum available to Penn students, attract top faculty to teach these students, and grow our influence over energy policy at home and overseas with smart, timely, and applied research.

We will still continue offering what we have developed: a graduate certificate in energy management and policy, the best internship opportunities available for Penn students, grants for innovative faculty research, a spectacular annual Carnot Prize event, and our own original research—ensuring that it gets into the hands of key decision-makers.

Financial gifts are essential to our operation and continuation, and for this, we thank our benefactors. Equally essential are those gifts of personal time and effort. Many of you reading this report have collaborated with us to dream, plan, create, and promote the work of the Center. For your generosity, we also thank you, and look forward to continuing our work together for many years to come.

Mark Alan Hughes
Faculty Director,
Kleinman Center for Energy Policy

Frederick Steiner
Dean and Paley Professor,
Stuart Weitzman School of Design
FIVE YEARS OF GROWTH: SELECT HIGHLIGHTS

2014
- FOUNDING OF THE KLEINMAN CENTER
  Thanks to a $10 million gift from Scott (C’94, W’94) and Wendy Kleinman

2015
- RENOVATION
  We establish a new home on Penn’s campus in the iconic Fisher Fine Arts Building
- VISITING SCHOLAR PROGRAM LAUNCH
  Christian Gollier, our first visitor, arrives from the Toulouse School of Economics

2016
- YEAR OF FIRSTS
  • First Publication
  • First Public Lecture
  • First Courses Taught
  • First Certificate Student
  • First Call for Grants
  • First Carnot Prize
- BLOG LAUNCH
  We provide timely commentary and a wider range of voices on our blog

2017
- PODCAST LAUNCH
  Energy Policy Now with Andy Stone broadcasts first podcast episode
- RENAISSANCE GIFT
  Anonymous $30 million gift establishes endowment fund
- IEA FELLOWSHIP BEGINS IN PARIS
  Peter Sopher, our first Kleinman Birol Fellow, spends the summer at the IEA

2018
- ACCOMPLISHMENTS TO DATE
  • Four Carnot Prizes
  • 16 visiting scholars
  • $620,000+ in faculty and Ph.D. grants
  • $350,000+ in student grants
  • 80+ papers and digests
  • 200+ blog posts
  • 36,500 podcast listens
  • Nearly 200 earned media and journal references
On June 21, 2019, Philadelphia residents awoke to a large explosion that resulted in fire at Philadelphia Energy Solutions (PES), the largest refinery in the eastern United States. In the aftermath, a Kleinman Center report suddenly took center stage, and was referenced in more than 75 media outlets.

The report, written nine months earlier by Director of Policy and External Affairs Christina Simeone, warned of the refinery's substandard equipment, continuing financial woes, widespread pollution, and failure to follow public comment rules.

Amidst mounting pressure, PES announced it would shut down the refinery.

ABOUT THE REFINERY

The sprawling 1,300-acre footprint of land located just a few miles southwest of Center City, Philadelphia has been home to petroleum storage and refining activities since 1866. PES is the current owner of the facility, the oldest and largest refinery on the East Coast.

LEGACY OF FINANCIAL WOES

After PES successfully navigated bankruptcy reorganization in August 2018, the report points out that—regardless of the unanticipated fire and current closure—the refinery would likely have faced a second bankruptcy on or before 2022 when its debts would mature.

LEGACY OF POLLUTION

The history of pollution contamination at the refinery site is profound, given it has been home to hydrocarbon processing for over 150 years. In some areas, contaminants have migrated offsite, and a drinking water aquifer used by the state of New Jersey could potentially be impacted.

Sunoco (owned by Energy Transfer Partners) is a part owner of PES and maintains legal liability for historic contamination at the site. Sunoco entered the facility into Pennsylvania’s voluntary Land Recycling Program (Act 2 of 1995) and struggled to characterize pollution at the site, stabilize migrating pollution plumes, develop site-specific risk-based pollution concentration standards to achieve (i.e. standards less stringent than statewide health standards), and complete other required tasks.

LACK OF PUBLIC INVOLVEMENT

Meanwhile, the City of Philadelphia, local communities, and other interested stakeholders were not allowed adequate opportunity to be informed or involved in remediation planning for the refinery. This is inconsistent with the legal requirements of Pennsylvania’s Act 2.

The omission of public involvement in the remediation planning for the refinery is a meaningful grievance. Given the magnitude, severity, and toxicity of the site’s contamination, coupled with its proximity to highly populated environmental justice neighborhoods, population centers, and drinking water resources, public involvement is critical to informing the municipality and community about existing risks, appropriateness of site-specific standards, and remediation options.

At the time of this annual report’s publication, public comment sessions are in full force—but organized by the city of Philadelphia; not Sunoco. The Kleinman Center is actively participating in these public comment sessions, gathering related Penn researchers to advise on the best use of Philadelphia’s contaminated refinery site.

“This does raise some really interesting questions that people should ask. Do we really understand the dangers of industrial petrochemical manufacturing in a highly populated area?”

—Christina Simeone
FEATURED IN THE WALL STREET JOURNAL
WHY A COAL MINISTER?

During his tenure, Piyush Goyal directed a fast-track effort to electrify 18,000 villages in remote parts of India. He was also instrumental in reforming India’s power markets and expanding renewable energy.

While India has relied heavily on coal to end energy poverty—like China in recent years and the United States decades ago—India’s coal expansion appears to have peaked and the permanent transition to cleaner energy is underway.

Piyush Goyal came to Penn campus last October, for our Carnot Prize award ceremony and lecture. Soon after he arrived, an emergency in India pulled him home immediately. Penn students, faculty, deans, and friends gathered that day to pay tribute to the minister, in his absence.

Aaswath Raman, assistant professor of electrical and systems engineering, gave a lecture in honor of the minister. His talk title: “Harnessing the Cold of Space as a Renewable Resource.”

That day, our faculty director promised to bring the award to Goyal in New Delhi.

“It is both a personal honor, as well as a tribute to the efforts of all involved in this great work throughout India, to be recognized with the Carnot Prize by the University of Pennsylvania.”

—PIYUSH GOYAL
In January, a team from the Kleinman Center for Energy Policy gathered in New Delhi for an award ceremony with Goyal’s friends and family and government officials.


“It is both a personal honor as well as a tribute to all of the efforts of those involved in this great work in India,” said Goyal, “to be recognized with the Carnot Prize.”

After the ceremony, Goyal met with the press, who covered the event.

“The international achievements of Minister Goyal are remarkable. [He] rolled out India’s comprehensive power sector reform, oversaw the world’s biggest and most successful LED lighting program, and deployed renewable energy sources. He also helped millions of Indians gain access to electricity.”

—Fatih Birol, 2016 Carnot Prize Winner, Executive Director of the International Energy Agency
CENTER
RESEARCH
FUTURE OF PHILADELPHIA GAS WORKS


PROJECT TEAM
Amy Chu, Temporary Lecturer and Researcher at Cal State University, San Francisco
Benjamin Paren, Doctoral Student, Materials Science and Engineering
Girish Sankar, MBA Student, Lauder Institute
Oscar Serpell, Research Associate, Kleinman Center

Philadelphia Gas Works, or PGW, is the largest municipally-owned utility in the United States. It manages more than 6,000 miles of pipelines and serves half a million customers with natural gas for heating and cooking. Annually, PGW delivers approximately 75 billion cubic feet of natural gas, emitting approximately 4.6 million tons of CO2 each year. Natural gas accounts for 17% of Philadelphia’s carbon emissions (2012 data).

Decarbonizing the PGW network is a challenge that the city of Philadelphia ignores at great financial and political risk. In its current state, PGW is an obstacle to the city achieving its ambitious emissions goal: an 80% reduction in CO2 emissions by 2050.

Furthermore, the utility represents a potential liability for Philadelphia and the region if and when a state or federal carbon price is imposed. PGW already holds over $1 billion in long-term debt and our research indicates that even a modest carbon price is imposed. PGW already holds over $1 billion in long-term debt and our research indicates that even a modest carbon price.

Philadelphia, and the region if and when a state or federal carbon price is imposed. PGW already holds over $1 billion in long-term debt and our research indicates that even a modest carbon price is imposed. PGW already holds over $1 billion in long-term debt and our research indicates that even a modest carbon price is imposed. PGW already holds over $1 billion in long-term debt and our research indicates that even a modest carbon price is imposed.

The current PGW business model is not sustainable in the world,” Mark Alan Hughes, director of the University of Pennsylvania’s Kleinman Center for Energy Policy, told a City Council committee.

Producing synthetic methane involves first splitting water using electrolys (resulting in hydrogen and oxygen) and then combining the hydrogen with CO2, pulled from the atmosphere. The electrolysis process is extremely energy intensive and the capture of atmospheric CO2 requires huge amounts of land.

This leaves us with two costly options. While synthetic methane is expensive to produce, electrochemical batteries are poorly suited for long-term seasonal storage and therefore require an overinvestment in capacity. No financially viable storage alternative exists right now—except perhaps the electrolysis of hydrogen. If hydrogen production is needed for both of these options, synthetic methane may be a more competitive option for Philadelphia and other cities around the world.

Our team is exploring both strategies for decarbonizing PGW, with the goal of determining the comparative costs and advantages of each pathway.
Pairing thirty years of United States Energy Information Administration (EIA) petroleum import data with historical monthly rainfall totals, a Kleinman Center team is developing a web-based visualization tool called the “Petroleum Import Visualizer” to better understand the relationship between severe weather and coastal oil operations in the United States.

The low-lying Gulf Coast, home to approximately half of U.S. crude and natural gas production and processing capacity, is particularly vulnerable to acute impacts from severe weather such as flooding and storm surge. Such storm events are expected to increase in frequency and intensity, exacerbated by long-term climate-driven changes such as sea level rise, storm surge, and subsidence.

According to the Department of Energy the United States is expected to become a net exporter in 2020, creating new resiliency challenges for dynamic supply chains in these vulnerable regions. Current responses such as ship re-routing, inventory stockpiling, and production recapture, may be insufficient in an oil export economy. Insight into historical system- and node-level impacts from acute, short-term disruptions will shed light on the future risk and resiliency of the U.S. fossil fuel trade.

The Petroleum Import Visualizer includes dynamic time series data from 1986–2016 for all major port regions in the U.S., including:

- Monthly total precipitation
- Petroleum import volumes by country, product, and company
- Crude oil price index

Our tool will allow for the selection of a single port, providing the user with additional graphical and time series information. Over the coming year we will continue to improve functionality, build more robust insight analytics, and identify historical storm events and global crude oil disruptions.

"The Kleinman Center is a ‘new energy treasure in Philadelphia.’"

—GREAT PHILADELPHIA CHAPTER OF THE ASSOCIATION OF ENERGY ENGINEERS
PUBLICATIONS
POWERING OUR FUTURE WITH TRASH

AUTHOR
Richard Ling, VIPER Student, School of Engineering and Applied Science and School of Arts and Sciences

Our vision includes educating the next generation of energy leaders. In practice, this doesn’t just take place in the classroom, but includes exposing students to the art and craft of applied research. Richard Ling’s waste-to-energy policy digest was made possible with support from our student grants program.

Read the full digest: kleinmanenergy.upenn.edu/policy-digests/powering-our-future-trash

Waste-to-energy technology, which uses trash to produce viable energy, has the potential to address two of the most urgent needs of this century—waste management and energy demand.

A GROWING NEED
Every year, our world produces around 2.1 billion tons of waste, which ultimately emits over 7.7 billion tons of greenhouse gases (GHG) over a 20-year breakdown period. Current tactics to combat GHG emissions from waste include recycling, composting, source reduction, and waste-to-energy (WTE) technology.

To date, roughly 2,200 WTE plants are active worldwide, which constitute roughly 300 million tons of disposal capacity. The U.S., by comparison, currently holds around 86 WTE facilities, which account for just 0.26% of the nation’s total generation capacity.

A UNIQUELY U.S. APPROACH
The United States is one of the few major countries that delegates renewable energy targets to the states, which engenders inconsistencies in nationwide adoption. Therein, state governments can create Renewable Portfolio Standards (RPS), which mandate local utilities to achieve a certain proportion of renewable power generation. As of the end of 2018, only 29 states and Washington, D.C. have adopted RPS, and the amount of capital allocated to each renewable practice (e.g. solar, wind, biomass, hydro, WTE) is in large part, determined by the “Tiers” of the RPS.

In order to make substantive progress towards renewable energy as a nation, more states should consider adopting RPS, or the U.S. should consider a federal mandate that sets measurable renewable energy targets for every state. In any case, these standards are crucial for widespread renewable energy adoption. In their 2018 U.S. Renewable Portfolio Standards Status report, the Lawrence Berkeley National Laboratory concluded that, “Roughly half of all growth in U.S. renewable electricity (RE) generation and capacity since 2000 is associated with state RPS requirements.”

DISADVANTAGED THROUGH POLICY
Tier 1 sources are given more renewable energy credit (REC) rates than Tier 2 sources. Tier 1 renewable sources include solar, wind, biomass, anaerobic digestion, geothermal, tidal power, renewable fuel cells, small hydro, and poultry-litter incineration facilities. Tier 2 sources include waste coal, distributed generation systems, municipal solid waste (MSW), and large-scale hydro.

Under the RPS, municipal solid waste is not considered to be a fully renewable resource, as the non-biogenic components (e.g. glass, plastics, metals, etc.) are technically non-renewable. However, the EPA defines renewable energy as, “fuel sources that restore themselves over a short period of time and do not diminish.” Not only does MSW replenish periodically, but it also experiences exponential growth: the World Energy Council projects that global waste generation will double to over 6 million tons per day by 2025 and may reach over 11 million tons per day by 2100. Thus, by the EPA’s own definition, MSW should be a fully renewable resource.

BEGINNING BETTER POLICY
A dangerous contradiction is thereby observed: the EPA’s strict classification of “renewable” MSW (i.e. the biogenic components) leads to greater landfill emissions. This should never occur in the realm of energy policy, as the main goal of renewable technologies is to foster a sustainable future for humanity.

The only way for the U.S. to become a global leader in waste management, besides source reduction, is to pursue a complete overhaul of our current model: we must enable WTE technologies to replace landfills and increase recycling and composting efforts throughout our nation.

To do so, the U.S. must enact favorable policies that designate WTE as a Tier 1 renewable resource, define MSW as a completely renewable feedstock, and provide favorable subsidies to new and existing WTE facilities.

“...It’s been an absolute pleasure writing for the Kleinman Center. I can’t thank you all enough for your support throughout the process.”

—RICHARD LING

COMPONENTS OF MSW BY PRODUCT TYPE IN WEIGHT (U.S.)

Durable Goods Non-durable Goods Containers & Packaging Food Yard Trimmings Other Wastes

THOUSANDS OF TONS


◼ Food

◼ Yard Trimmings

◼ Other Wastes

◼ Containers & Packaging

◼ Non-durable Goods

◼ Durable Goods
POLICY DIGESTS

November 7
COMPETITIVE IMPERATIVE: CHOICES FOR PENNSYLVANIA’S ENERGY FUTURE
Author: Christina Simeone, Director of Policy and External Affairs, Kleinman Center
From carbon pricing, to improving distribution system cybersecurity and resilience—here are choices to guide Pennsylvania’s energy future.

February 4
PLUGGING THE LEAKS: WHY EXISTING FINANCIAL INCENTIVES AREN’T ENOUGH TO REDUCE METHANE
Authors: Catherine Hausman, Visiting Scholar, Kleinman Center; Daniel Raimi, Senior Research Associate, Resources for the Future
While multiple sectors emit methane, a major contributor is the oil and gas industry. This digest explores methane’s impacts on climate change and the market forces shaping leaks and abatement.

November 28
WRONG ABOUT URBANIZATION? HOW EMERGING FACTORS COULD SHIFT PEOPLE AWAY FROM CITIES
Author: Oscar Serpell, Research Associate, Kleinman Center
More than half of the world’s population now lives in urban areas, and most analysts expect cities to double by 2050. Could changing factors slow this trend? And how might that impact our energy future?

March 5
BLACK MARKET CRUDE: ORGANIZED CRIME AND ENVIRONMENTAL EXTERNALITIES IN NIGERIA’S OIL SECTOR
Author: Jonah Rexer, Applied Economics Doctoral Student, Wharton
In oil-dependent Nigeria, the oil industry has been plagued with instability, organized crime, and illegal black markets. But have efforts to demobilize militant fighters had an impact on oil and gas infrastructure attacks and oil-related criminal violence?

February 25
TARGETING NET ZERO EMISSIONS: A NEW FOCUS FOR A MORE EFFECTIVE CLIMATE POLICY
Author: Oliver Gedien, Visiting Scholar, Kleinman Center
Temperature targets have advanced the climate policy debate but failed to catalyze appropriate action—net zero emissions targets can deliver on both ends.

March 31
POWERING OUR FUTURE WITH TRASH
Author: Richard Ling, VIPER Student, School of Engineering and Applied Science and School of Arts and Sciences
Waste-to-energy technology, which utilizes trash to produce viable energy, has the potential to address two of the most urgent needs of this century—waste destruction and energy demand.

April 1
WHY CARBON PRICING FALLS SHORT AND WHAT TO DO ABOUT IT
Author: Jesse Jenkins, Visiting Scholar, Kleinman Center
Paying close attention to distributional impacts and political economy constraints is key to understanding why governments around the world keep falling short on carbon pricing—and what can be done about it.

May 16
SUPERBLOCKS: BARCELONA’S PLAN TO FREE ITSELF FROM CARS
Author: David Roberts, Senior Fellow, Kleinman Center
In the quest to improve air quality, reduce noise pollution, and lessen congestion, one city embarks on a radical plan. In the process, its residents find community.
U.S. OFFSHORE WIND POWER: AN INDUSTRY IN MOTION

Author: Brandon Burke, Graduate Research Assistant, Kleinman Center

Compared to Europe, U.S. offshore wind is in its infancy and faces some of the same obstacles—relative high costs, supply chain constraints, potential impacts to fishing, and visibility concerns. But change is on the horizon.

COMPARATIVE PATHWAYS INTERIM REPORT

August 30

COMPARATIVE PATHWAYS INTERIM REPORT

Authors: Cornelia Colijn, Executive Director, Kleinman Center; Mark Alan Hughes, Faculty Director, Kleinman Center; Oscar Serpell, Research Associate, Kleinman Center

Global climate goals can be heavily influenced by local and regional policies, but only if those policies have local support and benefit local communities. This study explores energy policies that maximize local net benefits and outcomes for the Philadelphia region.

BEYOND BANKRUPTCY: THE OUTLOOK FOR PHILADELPHIA’S NEIGHBORHOOD REFINERY

Author: Christina Simeone, Director of Policy and External Affairs, Kleinman Center

Philadelphia Energy Solutions (PES) may face bankruptcy again by 2022. Meanwhile, Sunoco’s efforts to remediate legacy pollution at the PES refinery omitted public involvement requirements, raising serious legal questions and new engagement opportunities.

BETTING ON CLIMATE SOLUTIONS: WHY WE SHOULD SPREAD OUR CHIPS

May 9

Author: Karl Hausker, Senior Fellow, Kleinman Center

How can we decarbonize the electricity sector? Should “clean” mean renewable electricity only (wind, solar, hydro, geothermal, etc.)? Or does “clean” include all zero- and low-carbon sources of electricity?
COMMENTARY
Much faith is being put in the ability of negative emissions technologies to slow the pace of climate change. Glen Peters of Norway’s Center for International Climate Research (CICERO) looks at the potential of negative emissions strategies, and the steep challenges to implementing them.

The goal of the Paris Climate Accord is to limit global warming to 2 degrees Celsius, the point beyond which the impacts of climate change are feared to be most severe and enduring. Staying below the 2-degree limit will require two complementary strategies. The first, mitigation, is now familiar and involves limiting carbon dioxide emissions today by turning to cleaner energy and greater energy efficiency.

The second strategy, negative emissions, is equally important in limiting future climate impacts yet has received much less attention in public dialogue and policy circles. Technologies don’t yet exist in any practical sense, yet they will be counted upon to remove decades worth of carbon dioxide emissions from Earth’s atmosphere by the end of this century.

At their best, new negative emissions tools will play a vital role in holding climate change in check. But this may also give us a false sense of security that today’s carbon emissions can reversed at some point in the future.

“Essentially, we need to build a [negative emissions] industry three to four times the current oil and gas industry—just to clean up our waste.”

—GLEN PETERS

FEATURED PODCAST
A HARD LOOK AT NEGATIVE EMISSIONS

GUEST
Glen Peters, Research Director, Center for International Climate Research

The Energy Policy Now podcast with Glen Peters is “worthy of your time,” says Ben Geman of Axios. “The podcast is a lucid look at the potential for technologies such as direct air capture and afforestation, but also enormous challenges—around land use, ethics, cost and more—facing deployment.”
In its third season, the Energy Policy Now podcast offers clear talk on the policy issues that define our relationship to energy and its impact on society and the environment.

Former Forbes journalist Andy Stone is producer and host of the bi-weekly series. Since January 2017, he has conversed with more than 60 leaders from industry, government, and academia—shedding light on today’s pressing energy policy debates.

**Podcast**

**Producer & Host**

Andy Stone, Energy Policy Now

**What Our iTunes Fans Are Saying**

“This is a fantastic podcast. Host Andy Stone is an agile, knowledgeable interviewer, and his guests include an array of well-placed sources plugged-in to the energy and environment scene.”

“Energy policy affects all of us, more than ever. If you want to better understand today’s world (and tomorrow’s), here’s your podcast! Please keep them coming!”

“Love host Andy Stone’s ability to hone-in on key policy issues. He takes big, abstract energy topics and boils them down into meaningful, timely, and relevant conversations.”

“Great podcast on energy issues that I’ve heard lots of talk about but hadn’t had the opportunity to actually understand. The podcast was both clear and pretty sophisticated, and a great help. I’m really glad I found this.”

“Fantastic, insightful content. Well done.”

**This Year’s Episodes**

**Ending Water Wars**

Scott Moore, Kleinman Center and Penn Global China Program

**U.S. Offshore Wind Industry Arrives**

Brandon Burke, Kleinman Center
Jim Bennett, Bureau of Ocean Energy Management

**Handicapping EPA’s Deregulatory Climate Agenda**

Joseph Goffman, Environmental Law Program at Harvard University

**Decision-Making for Climate Leaders**

Mark Alan Hughes, Kleinman Center

**Grid Resilience in the Cyber Age**

Gladys Brown, Pennsylvania Public Utility Commission

**Gas Pipelines: A Threat to Electric Grid Resilience?**

William Hederman, Kleinman Center

**What IPCC 1.5 Degree Report Means for Global Climate Action**

Oliver Geden, German Institute for International and Security Affairs

**The Battle Over Methane Leaks**

Catherine Hausman, School of Public Policy at the University of Michigan
Ben Ratner, Environmental Defense Fund

**As India Eliminates Energy Poverty, Can It Also Fight Climate Change?**

Piyush Goyal, Government of India

**Van’s David Roberts on Energy, Climate, and the Media**

David Roberts, Kleinman Center

**Bold Climate Policy Is Coming. Investors, Take Note.**

Nathan Fabian, Principles for Responsible Investment

**Welcome to the Anthropocene, Our New Biogeophysical Home**

Wili Stafell, Australian National University

**Where Does the Defense Department Really Stand on Climate?**

Mark Nevitt, Penn Law

**China’s EV Juggernaut**

John Paul MacDuffie, Wharton

**Getting to the Right Carbon Price**

Dallas Burtraw, Resources for the Future

**Can Norway’s State Oil Company Be a Climate Champion?**

Stephen Bull, Equinor

**200 Years of Energy History in 30 Minutes**

Jesús Fernández-Villaverde, School of Arts and Sciences

**A Hard Look at Negative Emissions**

Glen Peters, Center for International Climate Research (CICERO)

**An Inside Look at the U.N.’s Effort to End Energy Poverty**

Rachel Kyle, Sustainable Energy for All (SEforALL)

**What’s the FERC, and How Is It Shaping Our Energy Future? (Part 1)**

Colette Honorable, FERC (formerly)

**What’s the FERC, and How Is It Shaping Our Energy Future? (Part 2)**

Colette Honorable, FERC (formerly)

**Why Coal Persists**

Anna Mikulska, Kleinman Center

**Three Pathways to Uphold America’s Paris Commitment**

Matthew Binatou, Pacific Northwest National Laboratory
Brad Townsend, Center for Climate and Energy Solutions

**Does Attribution Science Give Climate Litigators a Smoking Gun?**

Peter Frumhoff, Union of Concerned Scientists
Michael Burger, Sabin Center for Climate Change Law at Columbia University
For centuries, the Dutch have been contending with water. Today, 26% of land in the Netherlands is below sea level, with another 50% of total land mass reaching heights of less than 1 meter. It’s a Herculean effort to keep land previously reclaimed from the sea dry. An impressive 20,000-kilometer network of dikes combine with dams, levees, locks, sluices, and floodgates to prevent river flooding and storm surges from wiping out key economic and cultural hubs.

The Dutch are, for good reason, revered as the gold standard when it comes to water management.

The Delta Works, Room for the River projects, the Rijkswaterstaat, and district water boards all constitute engineering and management feats that have by-and-large protected the Netherlands from the deleterious effects having too much water and being too close to sea level. Add in the fact that Dutch children are taught to swim in pools with all their clothing on. And their shoes. You know, just in case. They seem to have thought of everything.

But future climate change may cause radical shifts in the Dutch ethos.

A new story by Vij Nederland sheds light on the 2019 Delta Programme Report, released in September, which supplements research under way at several Dutch universities, including Delft University of Technology. An appendix to the report points to accelerated climate related sea level rise. It warns that if global warming under the Paris Agreement is limited to a maximum of 2 degrees Celsius by 2050, the Dutch coast will still experience a 1-2 meter rise. In summary, projections suggest the Dutch delta will be habitable until 2050 under this scenario. And then, uncertainty reigns.

Now, if global warming exceeds 2 degrees Celsius (Climate Action Tracker suggests 3.3 degrees), models predict that sea level rise in the Netherlands may exceed 3 meters by 2100. Under this scenario it becomes virtually impossible to keep the water out. Huge sand replenishment projects (25 times the current effort!) would work around the clock. Dikes would be built higher and higher. Enormous pumping stations would transport river water up over the barriers and out to sea. Freshwater intrusion would become rampant.

The country’s €90 billion agriculture export economy would fracture. The Netherlands faces some big choices. Fortunately, it has some heritage for survival. 

Retreat. The most controversial plan of all gives reclaimed polders back to the sea, allows rivers to flow freely, and abandons—well, everything—for a planned move to the east. Because the Netherlands is densely packed, relocating populations within current borders is unlikely. So, there are (half joking) suggestions for “compulsory German language instruction for school-age children.”

If climate change doesn’t get the attention of a Dutch man or woman, watching the Netherlands fall into the sea from the German coast sure will. The idea is radical, and evokes anger and nationalism. Will huge swaths of the Netherlands secede to the Germans? Eighty years ago, this would have seemed absurd, but tomorrow this may seem like an okay deal to trade cultural heritage for survival.

The Netherlands faces some big choices. Fortunately, it has some resources. For people in developing countries combating coastal sea level, retreat is often the only answer.”

—CORNELIA COLIJN
FERC’s Order Redesigning PJM’s Capacity Market
Christina Simeone, Director of Policy and External Affairs, Kleinman Center

FERC recently issued an order proposing significant changes to PJM’s capacity market with the goal of protecting markets from state subsidies, giving stakeholders just 90 days to weigh in.

On Climate, Forget 2 Degrees. Let’s Talk Net Zero
Andy Stone, Energy Policy Now Producer & Host, Kleinman Center

By emphasizing temperature goals, it’s relatively easy for nations to appear to be doing more to address climate change than they really are, and harder for the public to discern the shortfall.

Beating the Authoritarian Playbook on Climate Change
Mark Alan Hughes, Faculty Director, Kleinman Center

What if President Trump embraced the climate crisis as a way to assert an authoritarian regime? Mark Alan Hughes envisions a scenario where energy independence and anti-immigration policies are pursued in the name of climate protection.

EVs Mean Growth for These Businesses
Christina Simeone, Director of Policy and External Affairs, Kleinman Center

In October, cumulative sales of plug-in electric vehicles in the U.S. hit the one million mark. That is good for the environment, and these businesses, too!

The Climate Under Kavanaugh
Mollie Simon, Communications Coordinator, Kleinman Center

How Judge Kavanaugh and Justice Kennedy differ on the Clean Power Plan.

The Case for Electrifying California’s Cars
Giridhar Sankar, Master of Business Administration, Wharton

Last semester, a team of Wharton MBA students competed in the University of Michigan Renewable Energy Case Competition where they made the case for electrifying California’s auto fleet.

Transforming PGW: A Sustainable Model for the Future
Mark Alan Hughes, Faculty Director, Kleinman Center

Hughes delivers testimony about the sustainability of Philadelphia Gas Works. Carbon neutrality would flip PGW from a dismal future liability to a competitive asset for at least the remainder of the 21st century.

The Kids Are Alright
Mollie Simon, Communications Coordinator, Kleinman Center

From Philadelphia to Europe, students are walking out of the classroom and into the streets to stress the urgent need for climate action.

Yamal LNG: Success Has Many Fathers, Indeed
Anna Mikulska, Senior Fellow, Kleinman Center

In Russia, Novatek’s success in liquid natural gas is tied to smart moves and serendipity.

After the Fire: Philadelphia’s Responsibility to the Bigger Picture
Mark Alan Hughes, Faculty Director, Kleinman Center

After the explosion and fire at the PES refinery, the City of Philadelphia should connect the dots among a range of related environmental issues, events, and crises and raise the visibility and influence of the City’s environmental policy makers.

Ecological Civilization and the Green New Deal: Our Last Shot
Oscar Serpent, Research Associate, Kleinman Center

Both China and the United States are fielding ambitious new sustainability plans. The planet’s climate future will be determined by whether or not they succeed.

Follow our blog: kleinmanenergy.upenn.edu/blog
GRANTS
When Associate Professor Ioana Marinescu became interested in carbon tax policy, she knew that collaboration with others would be crucial.

"On the face of it, this research really isn’t my area," she explained. “I’m a labor and public economist.” Which is why she reached out to an environmental economist and a state government political scientist.

In truth, however, the topic wasn’t so far afield from her work at Penn’s School of Social Policy and Practice—which is why it interested her. “I research labor markets and basic income. Carbon tax seemed related,” she said—like the “perfect marriage” of her past research on incentives, externalities, and revenue recycling schemes.

With Washington state’s recent failed carbon tax ballot initiatives, the landscape was ripe for research. Together with Soren Anderson, an associate professor in economics from Michigan State University and Boris Shor, an assistant professor in political science at the University of Houston, she designed a survey to measure public opinion. Not just in Washington, but across the nation, as a comparison.

The team found that the main predictor of voting was ideology: support for a carbon tax tends to be higher in more Democratic states. This means that a Washington-style carbon tax could potentially only pass in states with both Democratic majority and a popular initiative process (Massachusetts and California). This, of course, remains to be seen.

For Marinescu, the most surprising find from the survey, however, is that voters in other states reported higher support for the carbon tax than Washington.

If Washington state, with its Democrat majority, liked it enough to put in on the ballot (by popular initiative), how did it not pass in the end? And why, after the fact, did residents in other states report a 20% higher support of the carbon tax?

Marinescu’s team attributes this to the campaign effect. By listening to carbon tax campaign messaging, Marinescu explains, voters learn to either “hate it so much more, or like it so much less,” which matters at the polls.

“Twenty percent is eye-popping,” says Marinescu. “We can’t say what it was about the campaign. But we can say that the whole package affected voter behavior.”

If the campaign affect had this much pull in an ideologically supportive state like Washington, it seems that the success of a state carbon tax elsewhere looks doubtful.
Two Ph.D. students and Kleinman Center grant recipients captured our attention this year with innovative research into the effects of Uber and Lyft.

Two years ago, Wharton student Caitlin Gorback was planning to meet a friend at a bar. When she looked up the address, she was surprised to see it was rather far. Carless, she calculated that public transport would take her 45 minutes and would cost about $5. And then she considered Uber. She opened the app and saw the trip would cost $6 and take her door-to-door in 15 minutes. With the push of a button, her Uber was on its way.

Similarly, design student Summer Dong recalls a recent Lyft trip to the Philadelphia airport. “I was going to take Regional Rail on a weekday morning for $10, but I was running a little late and the train station was a 15-minute walk from my apartment.” Dong decided to take a Lyft for nearly the same price. In two minutes, his driver was there, “like a private chauffeur.”

For Gorback and Dong, examining their own consumer behavior inspired deeper research questions.

Gorback wondered if Uber and Lyft were changing the makeup of cities. With more access, were businesses able to locate farther out? Yes, her New York City data proved. But it seems that this growth on the outskirts happens for amenities like restaurants; not for dry cleaners or other essential services.

Dong wondered what impact Uber and Lyft had on public transit’s decline. He designed a survey to explore the tipping point between using ride-hail versus public transit. Dong found that consumers were overall more likely to use ride-hail, more likely to use it for recreation and fun, and also lacked awareness or concern about its environmental impact.

Dong was fascinated by the momentum of Uber and Lyft. “I feel like I’m part of that momentum,” he said. “They have certainly changed my way of travel.”

“Uber and Lyft open up new areas of the city, leading to more urban exploration” said Gorback, who explained that some researchers in her area thought she would find concentration and not dispersion as a result of ride-hail.

Gorback’s model used public data from Google and the Environmental Protection Agency, and her Kleinman Center grant helped her gather that data. Gorback explained that Google allowed her to pull free data for a couple thousand trips, but she needed data for about 20 million trips. “While that data is available, it’s also expensive.”

The Kleinman Center grant “opened up a whole new world for me,” said Dong. “It’s really easy to get siloed in your own area as Ph.D. students. I wasn’t considering the energy and environmental impact. This grant transformed my research into something better—something more interdisciplinary.”

Dong plans to use remaining Kleinman Center funds to conduct a follow-up survey to learn more about consumer ride-hail decision-making.

Gorback, meanwhile, reminds us that research doesn’t happen in a vacuum. Networks like the Kleinman Center are important, she said. And connections with people also inspire unique research questions.

“An economist goes to a bar,” Gorback laughed, “and this is what happened.”
Architecture and Energy Transitions: The Case of the Bauhaus Dessau Building
Author: Daniel Barber, Associate Professor, Architecture, Stuart Weitzman School of Design
How have energy transitions—including material, technological, and policy changes—impacted architectural ideas and projects? This study applies this question to the iconic Bauhaus Dessau building in Germany.

Endogenizing Fuel Price Risk (and Uncertainties)
Author: Steven Kimbrough, Professor, Operations, Information and Decisions, Wharton
As the recent literature indicates, risk assessment in power systems is underdeveloped and there is no general agreement on how to do it. This research explores critical assessment of methods for measuring risk, as relevant to fuel price risk in electric power systems.

Energy Cost Burdens for Low-Income Households
Author: Vincent Reina, Assistant Professor, City and Regional Planning, Stuart Weitzman School of Design
Co-Author: Constantine Kontokosta, Assistant Professor, New York University
How does energy efficiency and energy cost vary across demographic and income groups, neighborhoods, and regions? This study explores those variables and the implications of energy retrofits for renters and owners.

Fossil Fuels, the Building Industry, and Human Health
Author: Francia Trubiano, Associate Professor, Architecture, Stuart Weitzman School of Design
This project reviews existing research focused on the health impact of fossil fuel polymer-based materials used in buildings. The author will also explore where fossil fuel polymer-based materials are most typically used and what alternatives are being developed.

Fracking and Indigenous Demands in the South of Argentina
Author: Tula Falleti, Associate Professor, Political Science, School of Arts and Sciences
This project explores the environmental conflicts surrounding extractive industries and indigenous demands, particularly as they pertain to the southern Argentine province of Neuquén, where indigenous communities are interacting with oil companies.

Jump-Starting the Market: Subsidies and Firm Entry
Author: Felipa Flower-Goffin, Doctoral Student, Business Economics and Public Policy, Wharton
This study attempts to build a structural model of solar panel demand and supply that accounts for endogenous entry of solar installers. Using micro data on solar installations, the author will estimate the effect of subsidies on solar adoption.

FACULTY & PH.D. GRANTS


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Repowering Ulaanbaatar: Urbanization after Coal
Author: Stephanie Carlisle, Lecturer, Landscape Architecture, Stuart Weitzman School of Design
Co-Author: Nicholas Pevzner, Kleinman Center Faculty Fellow; Lecturer, Landscape Architecture, Stuart Weitzman School of Design
As air pollution in Ulaanbaatar, Mongolia becomes a major public health crisis, a change in energy supply seems inevitable. Examining what that transformation looks like is the goal of this research.

The Politics of Carbon Taxes at the State Level
Author: Ioana Marinescu, Assistant Professor, School of Social Policy and Practice
What drives support for a carbon tax? This project looks at the Washington State carbon tax referendum through a nationally represented survey—delving into specific questions about what drives support of a carbon tax.

Uber and Lyft’s Effects on Gasoline Consumption and Emissions
Author: Xiaoxia “Summer” Dong, Doctoral Student, City and Regional Planning, Stuart Weitzman School of Design
What are the effects of transportation network companies (TNCs) like Uber and Lyft on travel behavior and the transportation system? And what are the implications for energy consumption and emissions? This research explores these issues in the Philadelphia region.

Your Uber Has Arrived: Ridesharing and Emissions Impacts
Author: Caitlin Gorback, Doctoral Student, Real Estate, Wharton
When Uber enters a city, far-flung areas become more accessible—implying an increase in Uber trips and emissions. This project tests this growth of emissions and several policy interventions that might affect the flow of ridesharing.

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As air pollution in Ulaanbaatar, Mongolia becomes a major public health crisis, a change in energy supply seems inevitable. Examining what that transformation looks like is the goal of this research.
When Mary Lim began her MBA at Wharton, she knew she wanted global experience. And her summer as the Kleinman Birol Fellow at the International Energy Agency (IEA) in Paris, France not only gave her that—it thrust her into a timely research topic.

PREPARING FOR COP
In November, Chile will host the 25th Conference of Parties (COP), an international meeting of members of the United Nations to assess progress in dealing with climate change. Because of this upcoming milestone, Chile has been ramping up their national efforts around climate change and renewable energies.

In preparation for COP, Lim had the opportunity to work with IEA’s environment and climate change team on a project focused on Chile’s climate commitments.

Lim looked closely at Chile’s policies, specifically their National Determined Contribution under the Paris Agreement. She explored what they elected to contribute toward the Paris goals, if they are staying on track, and what they could be doing better.

FROM HERE TO THERE
“My two biggest goals coming into Wharton were getting more diverse industry experience and more international experience and this internship has kept me on that path,” said Lim.

During her undergraduate education, Lim studied international relations with a focus on energy and environment in different countries and their responses to climate change.

After completing her undergraduate degree at Georgetown University, she worked at KPMG with the power and utility team in Washington, D.C.

There she had utility clients and was able to get an understanding of energy from a business perspective. But when she came to Penn, she wanted to take a closer look at energy from the policy side. The Kleinman Birol Fellowship at the IEA perfectly fit her ambitions.

WHAT’S NEXT?
This fellowship has been a unique experience that has given Lim a good idea of what it means to work abroad and with people from diverse counties and backgrounds.

After graduation, she plans to go back into consulting, where she will be able to apply her professional background with her applied research and coursework from Penn.

“Energy touches everyone no matter where they are.”

—MARY LIM
“Interning at the Philadelphia Energy Authority exposed me to Philadelphia’s most environmentally progressive city officials and entrepreneurs, providing me with valuable experience working at the intersection of public and private sectors to advance sustainability and environmental equity in Philadelphia.”

— NICOLE LEONARD, MASTER OF CITY PLANNING, STUART WEITZMAN SCHOOL OF DESIGN
**TRAVEL**

Global Service–Learning Program: Argentina

Fahmida Lubna, Chemical and Biomolecular Engineering, School of Engineering and Applied Science

Global Service–Learning Program: Rwanda

Tina Abdi, Systems Engineering, School of Engineering and Applied Science

Penn Summer Abroad in Berlin and Rotterdam

Kimberlie Dupiton, Biology, School of Arts and Sciences

Lonard Encarnacion, Health and Societies, School of Arts and Sciences

Trapetas McGill, Political Science and Africana Studies, School of Arts and Sciences

Joseph Squillaro, Philosophy, Politics, and Economics, School of Arts and Sciences

Brea Watkins, Environmental Studies, School of Arts and Sciences

Supramolecular Chemistry and Self-Assembly over Multiple Scales and Forms Conference

Katharine Elbert, Master of Chemical Sciences, School of Arts and Sciences

Sustainable Solutions Competition

Richard Ling, VIPER student, School of Engineering Applied Science and School of Arts and Sciences

University of Michigan Renewable Energy Case Competition

Christina Chang, Master of Business Administration, Wharton

Alexander Dempsey, Master of Business Administration, Wharton

Laura Krivec, Master of Business Administration, Wharton

Girish Sankar, Master of Business Administration, Wharton

Wharton Latin American Conference

Arturo Chua, Master of Business Administration, Wharton

GREEN PROGRAM

The GREEN Program is an off-campus organization that helps support learning about sustainability out of the classroom and around the globe. This year, we helped support Penn students traveling with the GREEN Program to Iceland and Japan.

Iceland

Kailey Blair, Materials Science and Engineering, School of Engineering and Applied Science

Hae Min Kim, Mechanical Engineering and Applied Mechanics, School of Engineering and Applied Science

Japan

Anderson Myers, Electrical Engineering, School of Engineering and Applied Science

“The Knollman Center is a tremendous asset at Penn. I’m so grateful for the numerous educational and professional opportunities that the center has provided me.”

— Anna Cheyette, Environmental Studies, School of Arts and Sciences

“I easily learned more in half a week on the Penn Berlin and Rotterdam program than my entire semester abroad. It was so jam packed with exclusive learning opportunities.”

— Damien Kossis, Economics, Wharton

“What I liked especially about the GREEN program is that it allowed me to meet other college students from all around the nation from various backgrounds that all shared my interest in renewable energy. I can confidently say I came out of this brief yet impactful experience more mature and greatly more knowledgeable about the field of renewable energy.”

— Maher Abdel Samad, Economics, Wharton

“The trip to PJM helped me gain more insight in the energy field and has encouraged me to learn more about it in the future. A trip like this helps a freshman like me become familiar with some basics of an energy company. It was interesting to learn the difference between capacity and reserves, as well as how different desks communicate with each other in the control center.”

— Yide Zhao, Undeclared, School of Arts and Sciences
WHERE ARE THEY NOW

In 2015, the Kleinman Center began offering a Certificate in Energy Management and Policy—open to all interested Penn graduate students. Since then, 19 Penn students have entered the workforce with this credential. Here’s a look at the trajectory of a few of these graduates.

ROBERT RITCHIE
BUSINESS DEVELOPMENT MANAGER
ENERGY STORAGE AT NEXAMP
Lead development of energy storage projects from initial project analysis through project development and financing
Focus Areas: energy storage, solar, project development, strategy, stakeholder engagement, partnerships, energy policy, engineering

“The certificate gave me the chance to explore my interests outside of engineering and broaden my knowledge of energy policy, energy markets, and energy economics. This cross-functional program helped prepare me to look at issues from differing angles when taking on the many challenges of the renewable energy industry.”

MIRIAM POSNER
DIRECTOR OF CORPORATE ENGAGEMENT
ENVIRONMENTAL LEAGUE OF MASSACHUSETTS
Teach businesses to advocate for better environmental policy
Focus Areas: climate change, protecting land, water, and public health

“The certificate program exposed me to a cross-section of courses from different departments. Being able to think like an engineer, a lawyer, or a designer gives me an interdisciplinary perspective and helps me be nimble.”

YANN MANIBOG
DIRECTOR, FINANCE AND CORPORATE DEVELOPMENT
LINCOLN CLEAN ENERGY, LLC
Buy, sell, finance, and develop solar projects
Focus Areas: mergers and acquisitions, tax equity financing

“I wanted to get my MBA in order to transition to a career in clean energy…I don’t think I would have been able to rebrand myself as an energy professional without this certificate.”

2018–2019 GRADUATES

GREGORY ARPINO
Juris Doctor, Penn Law

WINSTON CHEN
Master of Business Administration, Wharton

JULIE UFFORD KEENAHAN
Master of Business Administration, Wharton; Kleinman Center Research Assistant

JONATHAN HESS
Juris Doctor, Penn Law

ERIC GILROY
Master of Business Administration, Wharton

“Some mini projects were incredibly helpful. They gave me an opportunity to look at the bigger picture of how the pieces fit together. The certificate program also exposed me to new perspectives and helped me think outside of the box.”

“Some night classes were quite interesting. I learned a lot from the diverse student body and the faculty.”

“Overall, I would recommend the certificate program to anyone interested in the energy sector.”

Learn more about our certificate program: kleinmanenergy.upenn.edu/certificate
EVENTS
How do we provide access to sustainable energy for the billion or more people who still lack electricity? To address this challenging question, we invited the U.N.’s Rachel Kyte—who spoke to a Kleinman Center audience in April.

Rachel Kyte, representative to the United Nations and CEO of Sustainable Energy for All has an important message to share with the world—and it isn’t just about energy and sustainability. It’s about people and fairness.

“It seems ridiculous to me that in 2019, in a world with so many sophisticated solutions to so many problems, we can’t find a way for almost three billion people to have access to a meal that’s cooked with clean fuels,” Kyte said.

Of those three billion people, the World Health Organization estimates that each year nearly four million people die from illnesses related to indoor air pollution caused by using kerosene and solid fuels like charcoal and dung in open fires. The people who do the cooking—mostly poor women in rural areas and their children—experience the greatest levels of exposure.

This is just one example of the critical issues that leaders must grapple with as the world attempts to decarbonize.

Kyte emphasized that leaders must walk “a critical path” of speeding up the transition to net-zero carbon economies while also meeting the needs of those in the world who have unreliable and unaffordable energy.

“Energy systems of the future will look nothing like the energy systems of the past.”

— RACHEL KYTE
OUR EVENTS

Lecture
September 18
EFFECTIVE CLIMATE ACTION: THE CASE FOR GREENHOUSE GAS NEUTRALITY

SPEAKER
Oliver Geden, Kleinman Center Visiting Scholar; Head of the EU/Europe Research Division, German Institute for International and Security Affairs

MODERATOR
Mark Alan Hughes, Faculty Director, Kleinman Center for Energy Policy

Roundtable
September 26
CYBERSECURITY: THREATS, BEST PRACTICES, AND IMPROVING THE REGULATORY FRAMEWORK

FBI KEYNOTE ADDRESS: CYBER THREATS TO CRITICAL INFRASTRUCTURE
Cerena Coughlin, Special Agent, FBI

PANEL I: EMERGING INDUSTRY BEST PRACTICES ON CYBERSECURITY IN THE UTILITY (ELECTRIC AND GAS) INDUSTRY

PANELISTS
Erfan Ibrahim, Founder, The Bit Bazaar, LLC
Steve Kunsman, Director, Product Management & Applications, ABB Grid Automation
Joseph McClelland, Director, Office of Energy Infrastructure Security, FERC
Jonathan Monken, Senior Director of System Resiliency, PJM
Maggie Powell, Senior Manager, Real Time Systems Security, Exelon

MODERATOR
William Hederman, Senior Fellow, Kleinman Center

Panel
October 17
REDUCING METHANE LEAKS: ACTIONS AND CHALLENGES

PANELISTS
Catherine Hausman, Kleinman Center Visiting Scholar; Assistant Professor, School of Public Policy, University of Michigan
Ben Ratner, Senior Director, Environmental Defense Fund

MODERATOR
Karen Goldberg, Vagelos Professor in Energy Research, Department of Chemistry, School of Arts and Sciences

Lecture
October 2
ELECTRIFY (ALMOST) EVERYTHING! TACKLING CLIMATE CHANGE WITH CLEAN ELECTRICITY

SPEAKER
David Roberts, Kleinman Center Senior Fellow; Energy and Climate Writer, Vox

MODERATOR
Mark Alan Hughes, Faculty Director, Kleinman Center for Energy Policy

Roundtable
November 29
GRID MODERNIZATION IN PJM STATES: ENABLING THE GRID, UTILITY, AND ‘PROSUMER’ OF THE FUTURE

PANEL I: EMERGING STATE (AND D.C.) GRID MODERNIZATION VISIONS & IMPLEMENTATION PLANS

Chairman Asim Hoque, Public Utilities Commission of Ohio
Chairman Betty Ann Kane, Washington, D.C. Public Service Commission
Chairman Brien Sheahan, Illinois Commerce Commission
Chairman Jason M. Stanek, Maryland Public Service Commission

PANEL II: GRID MOD (UTILITY FACILITATION OF EMERGING PROSUMERS)

Richard Perry Professor and Inaugural Director, Perry World House

SPEAKER
William W. Burke-White, Richard Perry Professor and Inaugural Director, Perry World House

SPEAKER
Aaswath Raman, Assistant Professor, Electrical and Systems Engineering, School of Engineering and Applied Science

Note: The guest of honor could not attend this event. We held the event in his honor and scheduled a follow-up event in India—where we presented him with the prize.
Explore past and upcoming events: kleinmanenergy.upenn.edu/events
The efforts you are undertaking at the Kleinman Center are producing broader, positive value for the rest of us around Penn.

—CARY COGLIANESE, PENN LAW
**SENIOR FELLOWS**

**KARL HAUSKER**
Karl Hausker is a senior fellow in the Climate Program at the World Resources Institute. His research interests center around deep decarbonization.

**HIGHLIGHTS**
- Podcast: Betting on Climate Solutions

**WILLIAM HEDERMAN**
William Hederman is independent senior adviser at Deloitte Touche, LLP and Executive Adviser at Agile PQ, Inc. He was Senior Advisor to Secretary Ernest Moniz at the U.S. Department of Energy.

**HIGHLIGHTS**
- Panel: Cybersecurity: Foreign Powers & U.S. Vulnerability

**KENNETH KULAK**
Ken Kulak is a partner at the law firm of Morgan Lewis where he advises clients on energy regulation and complex energy transactions. His clients include utilities, developers, investors, and cooperate energy users.

**HIGHLIGHTS**
- Event: Energy Law and Climate Change

**ANNA MIKULSKA**
Anna Mikulska is a nonresident scholar in energy studies and Rice University’s Baker Institute. Her research interests center around European energy markets and energy policy.

**HIGHLIGHTS**
- Class: Introduction to Energy Policy

**SCOTT MOORE**
Scott Moore is the director of the Penn Global China Program. He is a political scientist whose research focuses on environmental politics and policy reform, especially climate change, water resources, and ocean issues.

**HIGHLIGHTS**
- Event: Water @ Wilson: 50 Years of Water, Conflict, and Cooperation

**DAVID ROBERTS**
David Roberts is an energy writer at Vox, where he covers climate change, clean energy, and politics. Prior to Vox, Roberts was an energy and climate writer at Grist.

**HIGHLIGHTS**
- Event: Electrify (Almost) Everything!

**STEVE VISCHELLI**
Steve Viscelli is a lecturer in the Department of Sociology. His research focuses on work, labor market economics, and economic regulation. He is currently working to improve fuel efficiency in the trucking industry.

**HIGHLIGHTS**
- Blue Post: Climate Policy Won’t Work Without Considering Labor

**MICHAEL LEVY**
Michael Levy is an associate professor of epidemiology at the Perelman School of Medicine. He works at the interface of epidemiology, climate change, and statistics to prevent the transmission of infectious diseases in changing environments.

**FACULTY FELLOWS**

**ARTHUR VAN BENTHEM**
Arthur van Benthem is a professor of business economics and public policy at Wharton. Before his doctoral studies he worked as an energy economist at Royal Dutch Shell.

**HIGHLIGHTS**
- Lecture: Biosphere Summit: Politics, Policy, and the Environment

**NICHOLAS PEVZNER**
Nicholas Pevzner is a full-time lecturer in the Landscape Architecture Department at the Stuart Weitzman School of Design and co-editor-in-chief of Scenario Journal.

**HIGHLIGHTS**
- Publication: Power Issue of Scenario Journal

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For full bios, visit: kleimanenergy.upenn.edu/fellows
Dallas Burtraw has worked to promote efficient control of air pollution and written extensively on electricity industry regulation and environmental outcomes. Burtraw’s current research includes analysis of the distributional and regional consequences of climate policy, the evolution of electricity markets including renewable integration, and the interaction of climate policy with electricity markets. He has provided technical support in the design of carbon dioxide emissions trading programs in the Northeast states, California, and the European Union. He also has studied regulation of nitrogen oxides and sulfur dioxide under the Clean Air Act and conducted integrated assessment of costs, and modeled health and ecosystem effects and valuation, including ecosystem improvement in the Adirondack Park and the southern Appalachian region. Burtraw currently serves as the chair of California’s Independent Emissions Market Advisory Committee.

Burtraw holds a Ph.D. in economics and a master’s degree in public policy from the University of Michigan and a bachelor’s degree from the University of California, Davis.

Dallas Burtraw Senior Fellow, Resources for the Future

Dallas Burtraw in his Kleinman Center for Energy Policy office.

Oliver Geden is head of the EU/Europe Research Division at the German Institute for International and Security Affairs (SWP) in Berlin, which advises both the German Parliament and the German Federal Government. His work focuses on the European Union’s climate and energy policy, climate engineering, and the quality of scientific policy advice. He has been a visiting scholar at the University of California, Berkeley, and the Swiss Federal Institute of Technology (ETH), Zurich. During his time at SWP, he has been seconded to the Federal Foreign Office’s (AA) policy planning unit, and to the policy planning unit of the European Union’s climate and energy policy, climate engineering, and the quality of scientific policy advice. He has been a visiting scholar at the University of California, Berkeley, and the Swiss Federal Institute of Technology (ETH), Zurich. During his time at SWP, he has been seconded to the Federal Foreign Office’s (AA) policy planning unit, and to the policy planning unit of the Federal Ministry for Economic Affairs and Energy (BMWW). Geden studied anthropology, gender studies, and political science, and received a Ph.D. in social and cultural anthropology at Humboldt University Berlin.

Oliver Geden

Head of Research Division EU/Europe, German Institute for International and Security Affairs (SWP)

Oliver Geden in his office.

Darius Gaskins Senior Fellow, Resources for the Future

Darius Gaskins at the National Press Club in Washington DC.

Sarah Light, associate professor in the School of Public Policy at the University of Michigan and a faculty research associate to the U.S. Delegation to the U.N. Commission on Human Rights. She was a financial analyst at Goldman Sachs from 1994 to 1996. She was also special assistant and senior adviser to the U.S. Assistant Secretary of State for Democracy, Human Rights and Labor and environment and sustainability strategies at McKinsey & Company, among other projects. Prior to joining McKinsey, Templeton was special assistant and senior adviser to the U.S. Assistant Secretary of State for Democracy, Human Rights and Labor and adviser to the U.S. Delegation to the U.N. Commission on Human Rights. He was a financial analyst at Goldsmith Sachs from 1994 to 1996.

Templeton earned an A.B., magna cum laude, in philosophy and government at Harvard College and a J.D. from Yale Law School.

Mark Templeton

Clinical Professor of Law, Director of the Abrams Environmental Law Clinic, University of Chicago

Mark N. Templeton in his office.

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Dallas Burtraw Senior Fellow, Resources for the Future

Dallas Burtraw in his Kleinman Center for Energy Policy office.

Oliver Geden is head of the EU/Europe Research Division at the German Institute for International and Security Affairs (SWP) in Berlin, which advises both the German Parliament and the German Federal Government. His work focuses on the European Union’s climate and energy policy, climate engineering, and the quality of scientific policy advice. He has been a visiting scholar at the University of California, Berkeley, and the Swiss Federal Institute of Technology (ETH), Zurich. During his time at SWP, he has been seconded to the Federal Foreign Office’s (AA) policy planning unit, and to the policy planning unit of the Federal Ministry for Economic Affairs and Energy (BMWW). Geden studied anthropology, gender studies, and political science, and received a Ph.D. in social and cultural anthropology at Humboldt University Berlin.

Oliver Geden

Head of Research Division EU/Europe, German Institute for International and Security Affairs (SWP)

Oliver Geden in his office.

Darius Gaskins Senior Fellow, Resources for the Future

Darius Gaskins at the National Press Club in Washington DC.

Sarah Light, associate professor in the School of Public Policy at the University of Michigan and a faculty research associate to the U.S. Delegation to the U.N. Commission on Human Rights. She was a financial analyst at Goldman Sachs from 1994 to 1996. She was also special assistant and senior adviser to the U.S. Assistant Secretary of State for Democracy, Human Rights and Labor and adviser to the U.S. Delegation to the U.N. Commission on Human Rights. He was a financial analyst at Goldsmith Sachs from 1994 to 1996.

Templeton earned an A.B., magna cum laude, in philosophy and government at Harvard College and a J.D. from Yale Law School.

Mark Templeton

Clinical Professor of Law, Director of the Abrams Environmental Law Clinic, University of Chicago

Mark N. Templeton in his office.

Dallas Burtraw has worked to promote efficient control of air pollution and written extensively on electricity industry regulation and environmental outcomes. Burtraw’s current research includes analysis of the distributional and regional consequences of climate policy, the evolution of electricity markets including renewable integration, and the interaction of climate policy with electricity markets. He has provided technical support in the design of carbon dioxide emissions trading programs in the Northeast states, California, and the European Union. He also has studied regulation of nitrogen oxides and sulfur dioxide under the Clean Air Act and conducted integrated assessment of costs, and modeled health and ecosystem effects and valuation, including ecosystem improvement in the Adirondack Park and the southern Appalachian region. Burtraw currently serves as the chair of California’s Independent Emissions Market Advisory Committee.

Burtraw holds a Ph.D. in economics and a master’s degree in public policy from the University of Michigan and a bachelor’s degree from the University of California, Davis.

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PAUL BONNEY
Paul Bonney is the former senior vice president of legal and regulatory strategy for Pepco Holdings at Exelon Corporation.

MARK BROWNSTEIN
Mark Brownstein is the vice president and chief counsel of the U.S. Climate and Energy Program at the Environmental Defense Fund.

EMILY DUNCAN
Emily Duncan is a director of federal relations at National Grid, an electric and natural gas transmission and distribution utility.

SCOTT KLEINMAN
Scott Kleinman is co-president and lead partner at Apollo and founder of the Kleinman Center for Energy Policy.

SONNY POPOWSKY
Sonny Popowsky served for more than two decades as the consumer advocate of Pennsylvania.

JOHN QUIGLEY
John Quigley is the founding director of the Center for Environment, Energy & Economy and Lecturer at the Harrisburg University of Science and Technology and former secretary of the Pennsylvania Department of Environmental Protection.

LYNN SCARLETT
Lynn Scarlett is vice president for policy and government relations at The Nature Conservancy and former deputy secretary of the U.S. Department of the Interior.

MELVIN SCHLAGER
Marvin Schlager is the former chairman of the supervisory board of LyondellBasell Industries N.V.

FREDERICK STEINER
Frederick Steiner is dean and Paley Professor of the Stuart Weitzman School of Design at the University of Pennsylvania.

WILLIAM COHEN
Center Coordinator
Bill oversees office needs, supervises public events, tracks our budget, and provides technical support across many platforms. When possible, he diverts into design and research projects.

OSCAR SERPELL
Research Associate
Oscar is a researcher, writer, and data analyst. He is part of several key research projects and also writes blog posts and policy digests on timely energy policy topics.

CORNELIA COLIJN
Executive Director
Cornelia envisions, plans, and manages all center programming, while building connections with students, faculty, and leaders in the energy industry.

MARK ALAN HUGHES
Faculty Director
Mark provides the vision and direction for all center activities while also leading several major research projects, including Decision-Making Under Deep Uncertainty.

MOLLIE SIMON
Communications Coordinator
Mollie supports all digital and print communications, manages the center’s social media accounts, and drafts newsletters and announcements. She also writes and publishes content for our website, and regularly posts to our blog.

ANGELA PACHON
Research Director
Angela manages our research grants, visiting scholar program, and leadership series events while she develops scholarship and research collaborations across campus and beyond. She is also the author of many policy digests.

KIMBERLE SZCZUROWSKI
Administrative Assistant
Kim oversees scheduling, budgeting, event planning, and officer administration. She also helps manage our active student grants program.

LINDSEY SAMAROW
Director of Communications
Lindsey manages all things communications. She helps direct the voice of the center, manages all digital and print media, prepares content for publication, and serves as press contact.
MISSION
The Kleinman Center creates the conditions for policy innovation that support a just and efficient transition to sustainable energy.

VISION
Our vision is an energy system that optimizes productivity through smart demand, sustainable supply, and compensated externalities.

APPROACH
The Kleinman Center focuses on projects that:

• Foster thoughtful and impactful energy research.
  We support Penn research through a variety of programs and bring distinguished energy leaders and scholars to Penn for visits and residencies.

• Develop the next generation of energy leaders.
  We engage student learners by providing energy-related courses, a certificate program, lectures, internships, and grants for research and professional development.

• Create conditions for stakeholders to explore options and develop agendas.
  We convene thought leaders with diverse interests in settings that foster productive conversations and action.

HISTORY
The Kleinman Center for Energy Policy was established in 2014, with a generous term gift from Scott (C’94, W’94) and Wendy Kleinman. The center continues its work thanks to additional donor generosity, including this year’s anonymous $30-million gift.

“Outstanding faculty enable Penn to drive energy solutions. In addition to supporting innovative programming, this gift will enable Penn to hire new faculty who specialize in energy policy. Through their scholarship, these faculty will influence today’s critical energy policy decisions. Through their teaching, they will help develop tomorrow’s energy policy leaders.”

—PENN PRESIDENT AMY GUTMANN, REGARDING THE CENTER’S $30M GIFT

“The center...is quickly developing an international reputation as an ideas leader in energy policy.”

—GREATER PHILADELPHIA CHAPTER OF THE ASSOCIATION OF ENERGY ENGINEERS