POWERING A BRIGHT FUTURE

Northwest Earth Institute
DISCOVER CHANGE, TOGETHER.

POWERING A BRIGHT FUTURE

Thank you for your interest in sustainable energy solutions.

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Please contact us at **contact@nwei.org** if you have any questions. We'd love to hear from you!

Best regards,
Lacy Cagle, Curriculum Director,
and the NW Earth Institute Staff

DISCUSSION COURSE ON

POWERING A BRIGHT FUTURE

Northwest
Earth Institute
DISCOVER CHANGE, TOGETHER.

By

Northwest Earth Institute
107 SE Washington St., Suite 240
Portland, OR 97214
(503) 227-2807
Email: contact@nwei.org
www.nwei.org

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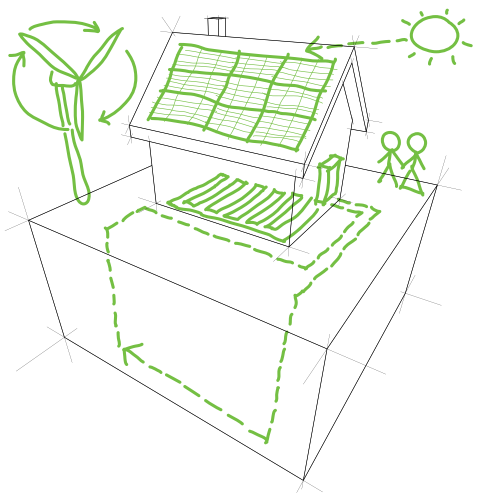


INTRODUCTION

Energy allows mobility, growth, adaptability and development. Access to reliable energy allows children to study after dark, families to heat their homes and refrigerate their food, medical staff to perform life-saving procedures, and businesses to grow and expand. Fossil fuels allow Americans the privilege to live lives of relative ease and versatility. Life without fossil fuels is difficult to imagine.

Energy can be a very complex and confusing topic, once you start to consider access, security, production, environmental impacts, and all the other related issues. Add climate change to the mix and it becomes politically charged as well. What is the best information available? What are our options for taking action now and planning for the future? How can we all find common ground? What does "sustainable energy" mean? What does it look like?

Powering a Bright Future addresses many of the relevant issues surrounding energy and its use, but this discussion course is in no way exhaustive. In fact, it's likely that you will wonder why we don't address a particular energy issue in this course — mountaintop removal, tar sands extraction, and arctic drilling are just a few examples of issues related to energy sourcing that are not covered. This course is not intended to completely cover energy as a topic. It is meant instead to generate interest in energy issues, inspire discussion around solutions, and drive personal learning and action.

Powering a Bright Future can be used alone or in combination with our *Change Is Our Choice* discussion course on climate change. Each session includes readings, questions for the group, a "Putting It into Practice" list of suggested actions and "Further Readings and Resources."

When you meet with your discussion group, we invite you to bring your own experience and critical thinking to the process. The readings are intended to invoke meaningful discussion. Whether you agree or disagree, you will have an opportunity to clarify your views and values.

The course also includes weekly Action Plans to guide you in making personal changes. Each week, group members will take one step in completing their Action Plans. During the next group meeting, participants share the action steps they have taken, along with their successes and challenges. We also suggest sharing your long-term goals with your group during the optional Celebration session. The Celebration is encouraged as a way for your group to mark the completion of the course, share personal goals and progress, and consider ways the group might continue to work together to create change in the community.

For information on how to start a discussion group, visit www.nwei.org/organize-course/. There you'll find organizing guides and resources you can use to organize a discussion course group. You may also contact our office at (503) 227-2807. We encourage you to become a member of NWEI and support our efforts to engage new people and communities in creating change for good; please visit www.nwei.org/donate or complete the "Become a Member of NWEI" form on page 54.

Thank you for participating in the Northwest Earth Institute's discussion course, *Powering a Bright Future*. On behalf of the thousands of organizations, workplaces and volunteers who are involved in promoting Northwest Earth Institute programs, we trust that your experience with this course will be of deep and lasting value.

GUIDELINES

FOR THE FACILITATOR, OPENER AND NOTETAKER

For each session of this course, one participant brings an "opening," a second participant facilitates the discussion , and a third participant takes notes on each person's commitment to action. The roles rotate each week with a different group member doing the opening and facilitating. This process is at the core of the Earth Institute culture — it assumes we gain our greatest insights through self-discovery, promoting discussion among equals with no teacher.

✦ ✦ ✦

FOR THE SESSION FACILITATOR

As facilitator, your role is to stimulate and moderate the discussion. You do not need to be an expert or the most knowledgeable person about the topic.

Your role is to:

- Remind the designated person ahead of time to bring an opening.
- Begin and end on time.
- Ask the questions included in each chapter, or your own.
- Make sure your group has time to talk about their commitments to action — it is a positive way to end each gathering.
- Keep discussion focused on the session's topic. A delicate balance is best — don't force the group into the questions, but don't allow the discussion to drift too far.
- Manage the group process, using the guidelines below:

  A primary goal is for everyone to participate and to learn from themselves and each other. Draw out quiet participants by creating an opportunity for each person to contribute. Don't let one or two people dominate the discussion. Thank them for their opinions and then ask another person to share.

  Be an active listener. You need to hear and understand what people say if you are to guide the discussion effectively. Model this for others.

  The focus should be on personal reactions to the readings — on personal values, feelings, and experiences.

  The course is not for judging others' responses. **Consensus is not a goal.**

The facilitator should ensure that the action item discussion:

- allows each person's action item to be discussed for 1-2 minutes;
- remains non-judgmental and non-prescriptive;
- focuses on encouraging fellow group members in their commitments and actions.

FOR THE SESSION OPENER

- Bring a short opening, not more than a couple of minutes. It should be something meaningful to you, or that expresses your personal appreciation for food or the natural world. Examples: a short personal story, an object or photograph that has special meaning, a poem, a visualization, etc. We encourage you to have fun and be creative.
- The purpose of the opening is twofold. First, it provides a transition from other activities of the day into the group discussion. Second, since the opening is personal, it allows the group to get better acquainted with you. This aspect of the course can be very rewarding.

FOR THE NOTETAKER

At the end of each session, each participant will commit to one action item they will complete before the next meeting. They will share their action with the group, and it is your responsibility as notetaker to record each person's commitment to action.

Each week the notetaker role will rotate. During the portion of discussion focused on action items, the notetaker from the previous meeting will read aloud each person's action item, and group members will have the opportunity to share their successes and struggles in implementing their actions. The new notetaker for that week will then record each person's commitment for the next meeting.

For more information on the NWEI process and organizing a course, see www.nwei.org/organize-course/.

COURSE SCHEDULE FOR POWERING A BRIGHT FUTURE

This course schedule may be useful to keep track of meeting dates and of when you will be facilitating, providing the opening, or taking notes.

Course Coordinator : _____ Phone : _____

Location For Future Meetings : _____

SESSION	DATE	OPENER	FACILITATOR	NOTETAKER
Shedding Light on Energy				
The Big Picture of Energy Generation				
Shifting Power				
			PLANNERS	
Celebration*				

*After the last regular session, your group may choose to have a final meeting and Celebration. This meeting celebrates the completion of the course, and may include a potluck lunch or dinner. It is an opportunity for evaluation and consideration of next steps.

EVALUATION

PART 1. PLEASE FILL OUT WEEKLY. Rate the three sessions. You can choose to print this evaluation or complete it online at www.nwei.org/evaluations

	POOR CHOICE ·····EXCELLENT					COMMENTS:
1. Shedding Light on Energy	1	2	3	4	5	
2. The Big Picture of Energy Generation	1	2	3	4	5	
3. Shifting Power	1	2	3	4	5	

Were the following articles helpful? Circle "Y" if we should use the article next time or "N" if we should look for better reading material. Leave blank if you didn't read it or have no opinion.

COMMENTS:

1. Shedding Light on Energy
   - Powering a Bright Future..... Y N
   - Powering Sustainable Energy for All..... Y N
   - Alex Steffen on Carbon-Zero Cities..... Y N
   - A Chance to Change the World..... Y N

2. The Big Picture of Energy Generation
   - A Clean Energy Future..... Y N
   - Complications and Consequences of Fossil Fuel Extraction . Y N
   - Bringing the Fight Home to Refinery Towns ..... Y N
   - Fracking Democracy..... Y N
   - In the Energy Wars, It's Solar Power: 1, Fossil Fuels: 0. For Now..... Y N
   - Forest Glen Oaks Dairy Farm ..... Y N
   - Evolution of Renewable Energy ..... Y N

3. Shifting Power
   - Using Energy Efficiently..... Y N
   - Why This Tea Party Leader Is Seeing Green on Solar Energy ..... Y N
   - Energy Efficiency ..... Y N
   - Low-Cost and No-Cost Tips for Saving Money and Using Less Energy..... Y N
   - Henry Red Cloud: Solar Warrior for Native America ..... Y N
   - The Texas Town That Just Quit Fossil Fuels..... Y N
   - Question the Norm ..... Y N

PART 2. PLEASE COMPLETE AT END OF COURSE.

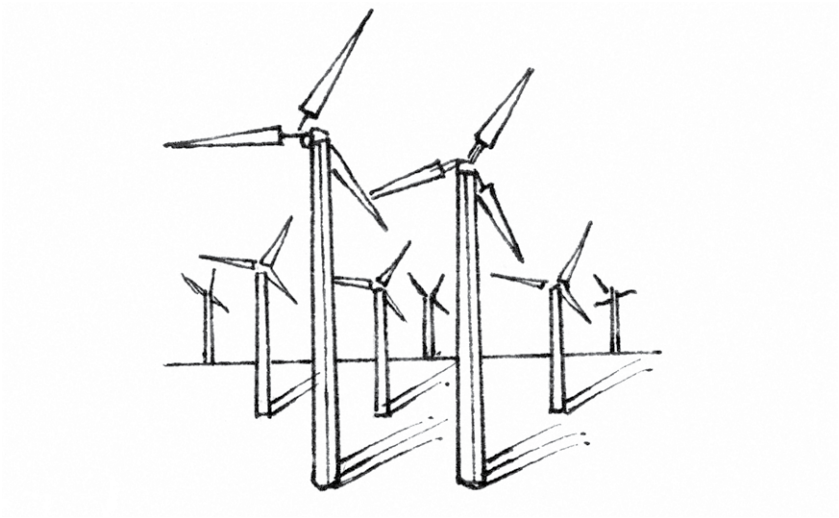
Has the course made a difference in your life? Yes No

Please describe what actions you are taking or you plan to take in response to this course.

Please list other articles or books that we should consider for this course. Identify chapter(s)/page(s) and the session where they should be included.

What has been the most valuable aspect of this course?

Complete your evaluation online at **www.nwei.org/evaluations**, or send your completed evaluation via email to contact@nwei.org or via snail mail to NWEI, 107 SE Washington St., Suite 240, Portland, OR 97214. Thank you for your participation!



SHEDDING LIGHT ON ENERGY

"A thing is right when it tends to support the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise."

— ALDO LEOPOLD

SESSION GOALS

- **Get to know each other and plan for future meetings.**
- **Explore the big picture of energy issues.**
- **Start connecting big energy issues to your everyday energy habits and consumption.**
- **Commit to action around energy issues.**

SESSION DESCRIPTION

The first session of this course serves as an introduction: both to introduce everyone to each other if you don't know each other already, and to get everyone on the same page about the major energy issues we face and how we use energy in our daily lives. From this first session, you will start considering ways to reduce your energy consumption and to creatively solve energy issues in your homes, workplaces and communities.

SUGGESTED GROUP ACTIVITY

Using National Geographic's Personal Energy Meter (environment.nationalgeographic.com/environment/energy/great-energy-challenge/personal-energy-meter/), calculate your energy footprint. Share your findings with your group.

ADDITIONAL RESOURCES

Interested in finding out more about the topics presented in this session? Please visit **www.nwei.org/resources** for suggested resources.

Circle Question

Think outside the grid: how can you more effectively use the energy of the sun in your own life?

Circle questions should move quickly — each member responds briefly without questions or comments from others. Facilitator guidelines are on page 5.

SUGGESTED DISCUSSION QUESTIONS

1. **When you think about the big picture of energy as presented in this session, how does it make you feel? What do you want to do in response?**
2. **Did the "Energy Reality" video surprise you in any way? What stood out to you about our use of fossil fuels in the last 300 years?**
3. **In "Powering Sustainable Energy for All," Ban-Ki Moon says of the possibility of sustainable energy for all: "The obstacles are not so much technical as human. We need to raise sustainable energy to the top of the global agenda and focus our attention, ingenuity, resources, and investments to make it a reality." What roles do you see individuals, communities, and nations playing in this shift?**
4. **What do you think of Alex Steffen's claim that "it is possible and more practical to talk about rebuilding systems to use much less energy than it is to think about trying to meet greater demands of energy through clean energy alone"?**
5. **What is your city or your employer/organization doing to be more energy efficient? If you do not know, how can you find out? If you do know, what role are you playing in supporting their efforts?**
6. **In "A Chance to Change the World," Richard Heinberg talks about our use of fossil fuels and what will happen if we continue using them as we are today. In order to make change, we need to understand what it is that needs changing. What area of fossil fuels, energy, or climate change do you wish to know more about in order to make positive change?**
7. **Please share your score and what you learned from National Geographic's Personal Energy Meter.**
8. **In what ways can you reduce your energy use and improve your quality of life at the same time?**

PUTTING IT INTO PRACTICE

- ❑ Over the next few weeks, notice what other entities (like ExxonMobil as mentioned in "A Chance to Change the World") are shaping our national conversations about climate change and energy security. Do you agree or disagree with those you notice?
- ❑ Look into what your city or employer/organization is doing to become more energy efficient. Share what you learn with others.
- ❑ Go on a carbon diet: pick one area of energy consumption — transportation, food, heating are all good examples — and take steps to significantly reduce your carbon footprint in that area.
- ❑ Track all of the ways you use energy in any given day or week by keeping a list. Review the list to see how you can reduce your use. (Examples: What lights are left on at night that do not need to be? How many times do you make an extra trip in the car when you could combine errands to drive less? Are you wearing a t-shirt inside your house in the winter because it's so warm and a sweater in the summer because the AC is so cool? Try adjusting your thermostat to use less energy.)

DEFINITIONS

Fossil fuels are formed by the decomposition of plant and animal matter from millions of years ago. The three primary fossil fuels are coal, oil and natural gas. When burned to produce energy, these fuels emit many pollutants, including CO_2, which can lead to global warming and associated climate changes when atmospheric concentrations of CO_2 increase past a certain point. Fossil fuels currently account for 80% of the world's energy use.

POWERING A BRIGHT FUTURE

By Lacy Cagle

Everything we do is connected to energy in one way or another because energy is the *ability or capacity to do work*. Food gives our bodies energy to get through the day, go to work or school, ride our bikes, and play with the kids in our neighborhood. The sun shines light and heat energy on us, growing plants and drying our clothes on the line. Gasoline supplies the energy to get a car down the road and up a hill. Energy stored in a battery helps start our cars and power our cell phones and tablets.

Energy allows mobility, growth, adaptability and development. Access to reliable energy allows children to study after dark, families to heat their homes and refrigerate their food, medical staff to perform life-saving procedures, and businesses to grow and expand. Fossil fuels have allowed Americans the privilege to live lives of relative ease and versatility, making foods and experiences that were previously extravagantly luxurious available to the masses. In our present culture, life without fossil fuels is difficult to imagine.

But large scale energy production, transportation and use are also fraught with complications that affect every aspect of our lives and our world. Producing energy to power our global economy is a dirty business, with significant consequences. For example:

- In 2010, a 'blowout' occurred at BP's Deepwater Horizon oil rig, located over 50 miles from the southeast Louisiana coastline. Eleven workers died, and the platform burned for days before collapsing and sinking 5,000 feet to the sea floor. Oil streamed from the well for three months before it was capped, spewing an estimated 5 million barrels of oil (210 million gallons) into the local ecosystem. The disaster devastated the local ocean and marsh ecosystems, and people who relied on the ocean for their employment (particularly from fisheries and tourism) lost work, some for over a year after the incident.
- In 2011, the magnitude 9.0 Tōhoku earthquake created a tsunami that hit Japan, resulting in a nuclear meltdown of three of six nuclear reactors at the Fukushima I Nuclear Power Plant, and the consequent evacuation of 300,000 people. As of 2015, the plant is still leaking.
- In the Appalachian Mountains, coal companies use explosives to remove up to 400 vertical feet of mountain, in order to get to the coal seams underneath. Mountaintop removal mining deforests land, destroys mountains, pollutes waterways and harms both workers and those living in the area where the mining occurs. Mountaintop removal mining also employs fewer worker than traditional mines, allowing coal companies greater profit without necessarily returning that financial benefit to surrounding communities.
- The burning of fossil fuels releases substantial amounts of carbon dioxide into the air, contributing to the greenhouse effect and causing climate change (aka global warming, anthropogenic climate disruption). Climate change causes

Have you considered how much CO_2 is hiding in your everyday items? Take a look at just a few of the ways you could be emitting unnecessary CO_2. Think about some of the other items in your life that go to waste.

Are there steps you could be taking to reduce your footprint?

Item	CO_2 Emissions
Bottle of Water (16 oz.)	160g
A Letter	200g
Small Catalog	1,600g
Driving 1 Mile	850g
1 ton of Fertilizer	2.7 tons
1 ton of Fertilizer Used in Excess	12.3 tons
World Average Person	7 tons per year
Average American	28 tons per year

CO_2 Emission data from: "How Bad are Bananas: The Carbon Footprint of Everything" by Mike Berners-Lee

more intense storms (like Hurricane Katrina and Superstorm Sandy) that flood regions, destroy houses, kill people and disrupt our access to energy.

- While they are without a doubt more environmentally friendly in comparison to fossil fuels, even renewable energy sources offer their own complications. Dams that are built for hydroelectric power generation change water flow, alter or destroy river habitats, and negatively affect fish and border species. The manufacturing of solar panels can create greenhouse gases, including nitrogen trifluoride and sulfur hexafluoride, which are thousands of times more potent than carbon dioxide. Large scale wind production sites mar the beauty of wild places and disrupt the habitat and migration patterns of local species.

Is it possible to power our current economy using environmentally sustainable energy sources? What is required to create a sustainably powered world that is equitable, just and prosperous? Two things are certain: We need to invest in renewable energy technologies (both research and development) to significantly reduce our dependence on fossil fuels. And we need to find ways to conserve energy and consume less. The first is a great political challenge. The second requires a significant cultural shift. Can it be done? We believe so, if we all roll up our sleeves and get to work. We'll explore just how to do that in the rest of this course.

This article was written by Lacy Cagle for *Powering a Bright Future*. Lacy is Director of Learning and Engagement at Northwest Earth Institute (www.nwei.org) and Executive Director of the Zahniser Institute (www.zahniserinstitute.org).

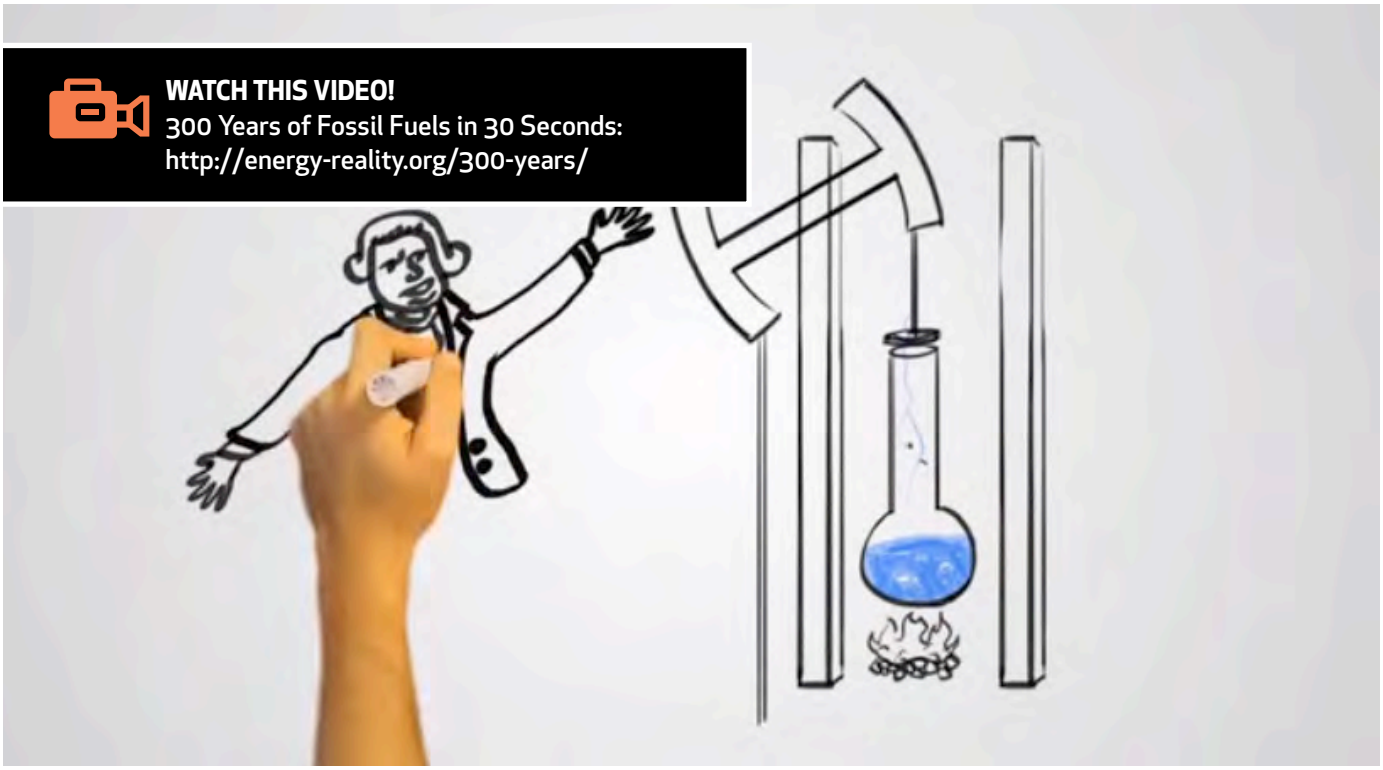
POWERING SUSTAINABLE ENERGY FOR ALL

By Ban Ki-Moon

As a child growing up during the Korean War, I studied by candlelight. Electric conveniences such as refrigerators and fans were largely unknown. Yet within my lifetime, that reality changed utterly. Easy access to energy opened abundant new possibilities for my family and my nation.

Energy transforms lives, businesses and economies. And it transforms our planet — its climate, natural resources and ecosystems. There can be no development without energy. Today we have an opportunity to turn on the heat and lights for every household in the world, however poor, even as we turn down the global thermostat. The key is to

WATCH THIS VIDEO!
300 Years of Fossil Fuels in 30 Seconds:
http://energy-reality.org/300-years/



provide sustainable energy for all.

To succeed, we need everyone at the table — governments, the private sector and civil society — all working together to accomplish what none can do alone. The United Nations is well-placed to convene this broad swathe of actors and forge common cause between them. That is why I have established our initiative, Sustainable Energy for All. Our mission: to galvanize immediate action that can deliver real results for people and the planet.

As I see it, we face two urgent energy challenges.

The first is that one in five people on the planet lacks access to electricity. Twice as many, almost 3 billion, use wood, coal, charcoal or animal waste to cook meals and heat homes, exposing themselves and their families to harmful smoke and fumes. This energy poverty is devastating to human development.

The second challenge is climate change. Greenhouse gases emitted from burning fossil fuels contribute directly to the warming of the earth's atmosphere, with all the attendant consequences: a rising incidence of extreme weather and natural disasters that jeopardize lives, livelihoods and our children's future.

Sustainable energy for all by 2030 is an enormous challenge. But it is achievable. My vision is for a world with universal energy access coupled with significantly improved rates of energy efficiency and a doubling of renewable energy in our mix of fuel sources. The obstacles are not so much technical as human. We need to raise sustainable energy to the top of the global agenda and focus our attention, ingenuity, resources, and investments to make it a reality.

Consider the precedent of cellular phones. Twenty years ago, universal access to mobile communications seemed preposterous. Yet as governments put proper frameworks in place and the private sector invested resources and pioneered business models, the communications revolution exploded.

A similar paradigm can emerge in sustainable energy. Developing countries can leapfrog conventional options in favor of cleaner energy solutions, just as they leapfrogged land-line based phone technologies in favor of mobile networks. Industrialized countries can and should support this transition to low-emission technologies, not least through their own example.

This is the right thing to do to reduce poverty and protect our planet. It also happens to be the smart thing to do for expanding business opportunities in the world's fastest growing marketplaces. Mobilizing private capital is essential, particularly at a time when public budgets are under strain.

With the right policy frameworks in place, the return on investment can be enormous: increased productivity and growth, job generation, included for grass-roots entrepreneurs, improved public health, enhanced energy security and a more stable climate.

Over the past five years the renewable energy industry has experienced tremendous growth. Capacity is expanding. Performance is improving. Prices are declining. New products are emerging that require less energy. This is a solid foundation upon which to build the next great energy transition.

At least 118 countries have set policy targets or created supportive renewable energy policies. Yet we can, and must, do more. In the lead up to Rio conference on sustainable development, I am urging governments, the private sector and other stakeholders to make concrete commitments that drive action on the ground.

Governments can advance more ambitious national energy plans and targets, provide financial support, and moderate perverse tariffs. Companies can make operations and supply chains more energy-efficient and form public-private partnerships that expand sustainable energy products. Investors can provide seed money for clean technologies. Governments, industry and academia can all contribute new research.

Some argue that in times of economic uncertainty, sustainability is a luxury we cannot afford. I say that we cannot afford to wait. Science and economics reach the same conclusion: advancing economic growth, lifting people out of poverty and protecting our planet are all part of the same agenda: the sustainable development agenda. What connects them is energy. Sustainable energy for all is an idea whose time has come. Turning ideas into action depends on us all.

In 2014, renewable sources of energy accounted for about 10% of total U.S. energy consumption and 13% of electricity generation. (source: www.eia.gov)

Ban Ki-Moon is secretary general of the United Nations. This article first appeared in the January 11, 2012 edition of *The New York Times*.

ALEX STEFFEN ON CARBON-ZERO CITIES

By Theresa Riley

In 2003, environmental journalist Alex Steffen and Jamais Cascio started a blog called Worldchanging that focused on innovative solutions to the planet's problems. The blog attracted a global audience and became one of the most trafficked sustainability sites on the internet. Wired columnist Bruce Sterling called it "the most important website on the planet" and it won numerous awards, including two Webbys, before shutting down in 2010 due to lack of funding. Since then, the site has merged with Architecture for Humanity and will re-launch in October of this year.

Alex Steffen recently published an ebook, Carbon Zero: Imagining Cities That Can Save the Planet, that explores the technology and design innovations that could "transform our cities into low-carbon engines of prosperity." Earth Day founder Denis Hayes says that Steffen "may be the world's boldest, most innovative thinker about future cities." We caught up with him to talk about some of the ideas in his book. This is an edited version of our conversation.

Theresa Riley: What inspired you to write *Carbon Zero?*

Alex Steffen: Having paid attention to the debate about climate change as it's emerged over the last two decades, it's felt to me that we are approaching the problem of climate change with unclear eyes. Because much, though not all, of climate change is caused by the burning of fossil fuels, we have this tendency to think that the solution is to replace fossil fuels. And certainly fossil fuels are bad. They're things we should be moving away from as quickly as possible. But the idea that we are going to be able to take our entire society as it currently works and simply change the source of energy and make it sustainable is not actually congruent with reality.

What I wanted to do was to take a different approach than the normal climate change approach of, "Let's talk about solar, wind and wave," and instead talk about how we use energy. Because the reality is that how we use energy is not a given. There are a lot of different ways of building a prosperous society and some of them use much less energy than others. And it is possible and more practical to talk about rebuilding systems to use much less energy than it is to think about trying to meet greater demands of energy through clean energy alone.

Riley: Why the focus on cities?

Steffen: There are three reasons. We are already an overwhelmingly urban species. The percentage of humanity that's predicted to live within one day's travel of a city rises up to 95 percent by 2050, which means that almost everybody will be living either in a city or within urban systems. If you're going to solve a problem, you might as well solve the problem that most of humanity is having, right?

Secondly, cities are themselves the center point around which all of these systems turn. Cities are responsible for the vast majority of the creation of the economy. They're also places into which we pour the vast majority of resources, the vast majority of energy and the places where a huge percentage of the decisions about how systems are built and how products designed, etc., happen. So if you change cities, you actually change all of those other systems as well.

And on top of that, cities are this weird creature: they're big enough to be very important but they're also small enough for little groups of people to make a difference.

Riley: What does it mean to be a carbon-zero city?

Steffen: Carbon zero simply means that the emissions

you are releasing either are zero or balance out to zero. It's very difficult if not impossible to design a city that doesn't emit some CO2, but there are things that cities can do to take carbon back out of the air and balance some of what they're doing.

The real challenge here is that we have to think about our consumption. It's not enough to just think about what happens within the city itself, because increasingly in a global economy much of the manufacturing, much of the agriculture, etc., is done somewhere else. If all you were going to do was look at the actual numbers for fossil fuels burned in your city, you would get a very incomplete picture. You need to ask, what's the consumption footprint of that city? And that is hard, although there are some really excellent people starting to do it. The Stockholm Environment Institute has some really great programs going on this, and there are others. It's one of the things that potentially may become much easier as we start to gain the capacity to digitize our cities and systems and understand the data flows within them. It's really just a number crunching problem with the added complexity of some of those numbers we don't yet count. There's nothing all that theoretically challenging about it, it's just that we haven't quite caught up to doing that.

Riley: You write about consumption-based footprinting and concepts like people-focused streets, walkability and deep walkability. What do you mean by those terms?

There are a lot of different ways of building a prosperous society and some of them use much less energy than others.

Steffen: People-focused streets is a term that I take from the Danish architect Jan Gehl. He uses it to describe streets that a person walking along has the experience of being in their own realm, that the street is meant for them. So there may be cars, there may be bicycles, there may be streetcars, but the feeling is that you are walking along a street where you are meant to be.

Deep walkability extends that idea. Deep walkability describes a city that is built in such a way that you can move from one area to another on foot, on bicycle, on transit and have an experience that remains a pleasant one, that you feel you are welcome not just in the neighborhood but moving between neighborhoods. And the reason that's important is that if you have only a few neighborhoods scattered through a city that are inaccessible to one another, you still are pretty much car-dependent. It's only when you gain the ability to actually move across the city without a car that you start to see big shifts in behavior and the impacts of them. And those behaviors are really significant.

One of the amazing things about walkability is that we know already that there is a correlation between density and transportation emissions, that as a place gets denser, its transportation emissions go down. It's not really rocket science. If you have a denser place, you have more things nearby to which you can walk and therefore you have less need to get in a car. Also, denser places support better transit, etc. But when you add walkability to that, one of the things you get is the ability to live in a much more locally focused way. You start to have people not only driving less, but getting rid of their cars. You start to have people living very urban lives in terms of their consumption by, for example, sharing the things that they use rather than buying their own, and that can range from anything from a gym — if you live in a 800 square foot apartment, you're very unlikely to own your own home gym — to things like power tools. Cities that are walkable and dense and high-tech offer enormous opportunities to take that kind of surplus capacity and share it.

Riley: What are some of the cities that are taking steps toward becoming carbon-zero cities? What are they doing?

Steffen: Many of the best examples aren't in the United States. Copenhagen has done a remarkable job creating streets that are focused on bicycles and pedestrians. Freiburg, Germany has done an amazing job of focusing on

WATCH THIS VIDEO!
Alex Steffen: The Shareable Future of Cities:
https://www.youtube.com/watch?v=mjDjbJJlqZ0

energy efficiency and on clean energy. Melbourne has come up with terrific plans to take new growth and channel it into specific districts that will be higher density along transit lines — leaving the rest of the city at a lower, perhaps more comfortable density — but still offering the benefits of density to everybody. Vancouver is worth looking at. They've actually managed to reduce the percentage of their population that owns cars while growing at a pretty steady clip, creating one of the world's most livable cities.

If you want to look within the U.S., New York City has done a terrific job of taking many small good ideas and integrating them into plans and policies. The PlaNYC approach has led to a lot of really good things. Portland, Oregon has brought transit and bikes into what was a very low-density city, and used growth management to channel new growth inwards rather than out to sprawl. There are many other cities: Chicago, San Francisco, Seattle, even Los Angeles — which I think most Americans tend to think of as irredeemably auto-focused and smoggy — even L.A. has managed to come up with a lot of great ideas for how to start transitioning into a more sustainable place.

Riley: How does technology factor in, particularly at the consumption level?

Our task is to imagine a society that can deliver comparable or better prosperity and well-being using a small fraction of the energy and materials that we use today.

Steffen: I think we are still in the early stages of grappling with what technology is already doing today to our cities. Our task is to imagine a society that can deliver comparable or better prosperity and well-being using a small fraction of the energy and materials that we use today. Why do we use all this energy now? Where are all these materials going? A lot of energy is used simply to move us around really spread out places in our cars, or to heat inefficient buildings, or to power inefficient appliances. Those are all problems that we can fix. Many of those things can be made better, but also can be approached in a different way that let's many more people have the benefit of them without having to make many more of them.

That's not a very 20th century way of thinking. It was almost the definition of 20th century prosperity that you had more stuff. But I think we've both culturally and technologically hit a point where the idea that more stuff doesn't equal more prosperity is sinking in. There are plenty of people out there talking about how difficult it is for some of us to just deal with all the stuff we already have, from packed closets that need organizers to storage spaces to maintenance costs, etc. Lots of people are reevaluating whether or not they need giant garages full of stuff and finding that they don't. But we are also starting to understand that there's a freedom that can come from having access to things but not owning them. Some of that freedom is financial. Borrowing a drill from your friend or renting it from a tool library is much cheaper than buying a drill. But part of that freedom is not having to worry about as many things, having a life that's lighter in your material responsibilities, so that you can focus on things that actually are important to you.

Riley: And what about non-people-focused technology? Green buildings, for example.

Steffen: The advances in green building over the last thirty years have been totally amazing. We now know how to build structures that essentially need little to no heating and cooling energy. They're so efficiently designed, so well sited, so well insulated that they can be quite comfortable without a lot of air conditioning or heating. That's pretty amazing in and of itself. We're also starting to understand that buildings that were not built with those standards can be retrofitted. That it's possible to take older buildings, especially well-built older buildings, and basically transform them into very efficient structures.

Riley: What can people living in cities do to get involved and push their cities to transform?

Steffen: One of the biggest things that people can do is begin to see their own cities as places of transformation. We have almost two centuries now of people describing cities as the source of the problem, old school environmentalists who saw nothing good in them. So we're all having to relearn how to think of cities as engines that create solutions. Simply learning how to appreciate what in your city is already working well and trying to think about how those things could be made to work better. That's important. We have a lot of learning together to do here.

Secondly, trying to push your city to join up with others — there are great civic groups all around the country who are doing this — to adopt really ambitious goals about climate change and climate action. It matters, what we're trying to do. Cities that are embracing the idea of bold action are generally producing better solutions.

We unfortunately already live on a planet where the climate has changed and will continue to change no matter what we do now. We're playing a game of making the problem less bad rather than preventing it. And that means that every city is going to have to deal with questions of disaster management, building systems that are more rugged. Many things work for both of those goals: a place that's less auto-dependent is also a place that's better braced to deal with natural disasters. But it's important that we don't lose sight of the ultimate goal, which is that we're trying to make sure that our cities are safe, great places to live, but also to make sure that the same is true for our planet.

Watch Steffen's recent TED talk in which he presents some green projects that expand our access to things we need — while reducing the time we spend in cars. Peak Oil:

A CHANCE TO CHANGE THE WORLD

By Richard Heinberg

Worcester Polytechnic Institute in Worcester, MA invited Rex Tillerson, CEO of ExxonMobil, to give the commencement speech at its 2011 graduation ceremonies on May 14. When students heard this, many were surprised and upset. The students then invited Richard Heinberg, Senior Fellow of Post Carbon Institute, to give an alternative commencement speech. This is what Richard Heinberg had to say.

ExxonMobil is inviting you to take your place in a fossil-fueled twenty-first century. But I would argue that Exxon's vision of the future is actually just a forward projection from our collective rear-view mirror. Despite its high-tech gadgetry, the oil industry is a relic of the days of the Beverly Hillbillies. The fossil-fueled sitcom of a world that we all find ourselves still trapped within may, on the surface, appear to be characterized by smiley-faced happy motoring, but at its core it is monstrous and grotesque. It is a zombie energy economy.

Of course, we all use petroleum and natural gas in countless ways and on a daily basis. These are amazing substances — they are energy-dense and chemically useful, and they yield enormous economic benefit. America started out with vast reserves of oil and gas, and these fuels helped make our nation the richest and most powerful in the world.

THE END OF THE CHEAP OIL ECONOMY

But oil and gas are finite resources, so it was clear from the start that, as we extracted and burned them, we were in effect stealing from the future. In the early days, the quantities of fuel available seemed so enormous that depletion posed only a theoretical limit to consumption. We knew we would eventually empty the tanks of Earth's hydrocarbon reserves, but that was a problem for our great-great-grandkids to worry about.

But we have already harvested the low-hanging fruit of our oil and gas endowment. The resources that remain are of lower quality and are located in places that are harder to access than was the case for oil and gas in decades past. Oil and gas companies are increasingly operating in ultra-deep water, or in arctic regions, and need to use sophisticated technologies like hydrofracturing, horizontal drilling, and water or nitrogen injection. We have entered the era of extreme hydrocarbons.

This means that production costs will continue to escalate year after year. Even if we get rid of oil market speculators, the price of oil will keep ratcheting up anyway. And we know from recent economic history that soaring energy prices cause the economy to wither: when consumers have to spend much more on gasoline, they have less to spend on everything else.

But if investment costs for oil and gas exploration and extraction are increasing rapidly, the environmental costs of these fuels are ballooning just as quickly. With the industry operating at the limits of its technical know-how, mistakes can and will happen. As we saw in the Gulf of Mexico in the summer of 2010, mistakes that occur under a mile or two of ocean water can have devastating consequences for an entire ecosystem, and for people who depend on ecosystem services. The citizens of the Gulf coast are showing a brave face to the world and understandably want to believe their seafood industry is safe and recovering, but biologists who work there tell us that oil from the Deepwater Horizon disaster is still working its way up the food chain.

Of course the biggest environmental cost from burning fossil fuels comes from our chemical alteration of the planetary atmosphere. Carbon dioxide from oil, gas, and coal combustion is changing Earth's climate and causing our oceans to acidify. The likely consequences are truly horrifying: rising seas, extreme weather, falling agricultural output, and collapsing oceanic food chains. Never mind starving polar bears — we're facing the prospect of starving people.

THE MISINFORMATION MACHINE

But wait: Is this even happening? A total of nearly half of all Americans tell pollsters they think either the planet isn't warming at all, or, if it is, it's not because of fossil fuels. After all, how can the world really be getting hotter when we're seeing record snowfalls in many places? And even if it is warming, how do we know that's not because of volcanoes, or natural climate variation, or cow farts, or because the Sun is getting hotter? Americans are understandably confused by questions like these, which they hear repeated again and again on radio and television.

Now of course, if you apply the critical thinking skills that you've learned here at WPI to an examination of the relevant data, you'll probably come to the same conclusion as has been reached by the overwhelming majority of scientists who have studied all of these questions in great depth. Indeed, the scientific community is nearly unanimous in assessing that the Earth is warming, and that the only credible explanation for this is rising levels of CO2 from the burning of fossil fuels. That kind of consensus is hard to achieve among scientists except in situations where a conclusion is overwhelmingly supported by evidence.

I'm not out to demonize ExxonMobil, but some things have to be said. That company plays a pivotal role in shaping our national conversation about climate change. A 2007 report from the Union of Concerned Scientists described how ExxonMobil adopted the tobacco industry's disinformation tactics, and funded some of the same organizations that led campaigns against tobacco regulation in the 1980s — but this time to cloud public understanding of climate change science and delay action on the issue. According to the report, between 1998 and 2005 ExxonMobil funneled almost $16 million to a network of 43 advocacy organizations that misrepresented peer-reviewed scientific findings about global warming science. Exxon raised doubts about even the most indisputable scientific evidence, attempted to portray its opposition to action as a positive quest for "sound science" rather than business self-interest, and used its access to the Bush administration to block federal policies and shape government communications on global warming. All of this is well-documented.

And it worked. Over the course of the past few years one of our nation's two main political parties has made climate change denial a litmus test for its candidates, which means that climate legislation is effectively unachievable in this country for the foreseeable future. This is a big victory for ExxonMobil. Its paltry $16 million investment will likely

translate to many times that amount in unregulated profits. But it is a disaster for democracy, for the Earth, and for your generation.

But here's the thing. Everyone knows that America and the world will have to transition off of fossil fuels during this century anyway. Mr. Tillerson knows it as well as anyone. Some people evidently want to delay that transition as long as possible, but it cannot be put off indefinitely. My colleagues at Post Carbon Institute and I believe that delaying this transition is extremely dangerous for a number of reasons. Obviously, it prolongs the environmental impacts from fossil fuel production and combustion. But also, the process of building a renewable energy economy will take decades and require a tremendous amount of investment. If we don't start soon enough, society will get caught in a trap of skyrocketing fuel prices and a collapsing economy, and won't be in a position to fund needed work on alternative energy development.

In my darker moments I fear that we have already waited too long and that it is already too late. I hope I'm not right about that, and when I talk to young people like you I tend to feel that we can make this great transition, and that actions that have seemed politically impossible for the past forty years will become inevitable as circumstances change, and as a new hearts and minds comes to the table.

Even in the best case, though, the fact that we have waited so long to address our addiction to oil will still present us with tremendous challenges. But this is not a problem for ExxonMobil, at least not anytime soon. When the price of oil goes up, we feel the pain while Exxon reaps the profits. Even though Exxon's actual oil production is falling due to the depletion of its oilfields, corporate revenues are flush: Exxon made almost $11 billion in profits in just the past three months. This translates to jobs in the oil industry. But how about the renewable energy industry, which everyone agrees is the key to our future?

For the past forty years, every U.S. president, without exception, has said we must reduce our country's dependence on imported petroleum. Addiction to oil has become our nation's single greatest point of geopolitical, economic, and environmental vulnerability. Yet here we are in 2011, still driving a fleet of 200 million gasoline-guzzling cars, trucks, and SUVs. The inability of our elected officials to tackle such an obvious problem is not simply the result of ineptitude. In addition to funding climate denial, fossil fuel companies like Exxon have contributed to politicians' election campaigns in order to gain perks for their industry and to put off higher efficiency standards and environmental protections. Denying looming fuel supply problems, discouraging a transition to renewable energy, distorting climate science — these are all understandable tactics from the standpoint of corporate self-interest. Exxon is just doing what corporations do. But once again, it is society as a whole that suffers, and the consequences will fall especially on your generation.

Mr. Tillerson may have informed you about his company's Global Climate and Energy Project at Stanford University. Exxon is now funding research into lowering the cost and increasing the efficiency of solar photovoltaic devices, increasing the efficiency of fuel cells, increasing the energy capacity of lithium-ion batteries for electric cars, designing higher-efficiency engines that produce lower emissions, making biodiesel fuel from bacteria, and improving carbon capture and storage. This is all admirable, if it is genuine and not just window-dressing.

Here's a reality check in that regard: Exxon is investing about $10 million a year in the Global Climate and Energy Project — an amount that almost exactly equals Mr. Tillerson's personal compensation in 2010. Ten million dollars also equals about three hours' worth of Exxon profits from last year. You tell me if you think that is a sensibly proportionate response to the problems of climate change and oil depletion from the world's largest energy company.

Even if Exxon's investments in a sustainable energy future were of an appropriate scale, they come late in the game. We are still in a bind. That's because there is no magic-bullet energy source out there that will enable world energy supplies to continue to grow as fossil fuels dwindle.

Renewable energy is viable and necessary, and we should be doing far more to develop it. But solar, wind, geothermal, tidal, and wave power each have limits and drawbacks that will keep them from supplying energy as cheaply and as abundantly as we would like. Our bind is that we have built our existing transport infrastructure and food systems around energy sources that are becoming more problematic with every passing year, and we have no Plan B in place. This means we will probably have less energy in the future, rather than more.

A CHANCE TO CHANGE THE WORLD

Again, I am addressing my words especially to you students. This will be the defining reality of your lives. Whatever field you go into — business, finance, engineering, transportation, agriculture, education, or entertainment — your experience will be shaped by the energy transition that is now under way. The better you understand this, the more effectively you will be able to contribute to society and make your way in the world.

We are at one of history's great turning points. During your lifetime you will see world changes more significant in scope than human beings have ever witnessed before. You will have the opportunity to participate in the redesign of the basic systems that support our society — our energy system, food system, transport system, and financial system.

I say this with some confidence, because our existing

energy, food, transport, and financial systems can't be maintained under the circumstances that are developing — circumstances of fossil fuel depletion and an unstable climate. As a result, what you choose to do in life could have far greater implications than you may currently realize.

Over the course of your lifetime society will need to solve some basic problems:

- How to grow food sustainably without fossil fuel inputs and without eroding topsoil or drawing down increasingly scarce supplies of fresh water;
- How to support 7 billion people without depleting natural resources — including forests and fish, as well as finite stocks of minerals and metals; and
- How to reorganize our financial system so that it can continue to perform its essential functions — reinvesting savings into socially beneficial projects — in the context of an economy that is stable or maybe even shrinking due to declining energy supplies, rather than continually growing.

Each of these core problems will take time, intelligence, and courage to solve. This is a challenge suitable for heroes and heroines, one that's big enough to keep even the greatest generation in history fully occupied. If every crisis is an opportunity, then this is the biggest opportunity humanity has ever seen.

Making the best of the circumstances that life sends our way is perhaps the most important attitude and skill that we can hope to develop. The circumstance that life is currently serving up is one of fundamentally changed economic conditions. As this decade and this century wear on, we Americans will have fewer material goods and we will be less mobile. In a few years we will look back on late 20th century America as time and place of advertising-stoked consumption that was completely out of proportion to what Nature can sustainably provide. I suspect we will think of those times — with a combination of longing and regret — as a lost golden age of abundance, but also a time of foolishness and greed that put the entire world at risk.

Making the best of our new circumstances will mean finding happiness in designing higher-quality products that can be re-used, repaired, and recycled almost endlessly; and finding fulfillment in human relationships and cultural activities rather than mindless shopping. Fortunately, we know from recent cross-cultural psychological studies that there is little correlation between levels of consumption and happiness. That tells us that life can in fact be better without fossil fuels.

So whether we view these as hard times or as times of great possibility is really a matter of perspective. I would emphasize the latter. This is a time of unprecedented opportunity for service to one's community. It's a time when it will be possible to truly change the world, because the world has to change anyway. It is a time when you can make a difference by helping to shape this needed and inevitable change.

As I travel, I meet young people in every part of this country who are taking up the challenge of building a post-petroleum future: a 25-year-old farmer in New Jersey who plows with horses and uses no chemicals; the operator of a biodiesel co-op in Northampton; a solar installer in Oakland, California. The energy transition will require new thinking in every field you can imagine, from fine arts to banking. Companies everywhere are hiring sustainability officers to help guide them through the challenges and opportunities. At the same time, many young people are joining energy and climate activist organizations like 350.org and Transition Initiatives.

So here is my message to you in a nutshell: Fossil fuels made it possible to build the world you have inhabited during your childhood and throughout your years in the education system. Now it's up to you to imagine and build the world after fossil fuels. This is the challenge and opportunity of your lifetimes. I wish you good cheer and good luck as you make the most of it.

Richard Heinberg is a senior fellow at the Post Carbon Institute and the author of *The Party's Over: Oil, War, and the Fate of Industrial Societies, Peak Everything: Waking Up to the Century of Declines,* and *The End of Growth: Adapting to Our New Economic Reality.*

"Everyone is entitled to his own opinions, but not to his own facts."

— SENATOR PAT MOYNIHAN

Action Plan

STEP ONE: PERSONAL ENERGY FOOTPRINT

Before you meet with your group for Session 1, measure your general energy footprint using National Geographic's Personal Energy Meter: environment.nationalgeographic.com/environment/energy/great-energy-challenge/personal-energy-meter/

National Geographic's "The Great Energy Challenge" offers many resources for learning about energy issues, energy news, and going on an energy diet.

Using what you learn from the Personal Energy Meter, figure out where you can make reductions at home or at work.

ASSESS YOUR CURRENT SITUATION.
Which areas provide the most opportunity for significant reductions?

IDENTIFY AREAS TO IMPROVE OR TRANSFORM.
Which areas are most meaningful to you and your community? Which areas are most appealing for you to work on?

BRAINSTORM REALISTIC ACTIONS.
What are some ways you can work toward climate literacy, adaptation, or resiliency within your community? Realistically consider your abilities, competencies, and resources.

TIP: KEEP TRACK OF YOUR ACTION PLAN!
Track your progress on a mobile app like Evernote or Productivity Wizard, Save paper, and share your progress with others.