Global Energy Management Program

BUSINESS SCHOOL

UNIVERSITY OF COLORADO **DENVER**

Statement of Energy Principles and Values

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The Global Energy Management Program at the University of Colorado Denver Business School provides business and leadership education exclusively tailored for the energy industry. The program was designed in partnership with key Denver energy executives to help companies develop their leadership succession pipeline and continues to maintain strong industry partnerships through an active Advisory Council. GEM provides both graduate degree and professional development options for individuals, companies and organizations who are looking to bring a business focus to their existing energy expertise.

GEM's core offering is a Master of Science degree which maintains a global perspective and covers all sectors of the industry (traditional, renewable, alternative and unconventional). GEM's focus is to provide a highly-relevant, applicable and current curriculum that students can immediately use. Courses in the MS degree are delivered via a hybrid-online format which allows full-time working professionals to enroll, no matter where they work or live. GEM started its first cohort of students in January 2009 and now has over 300 students and alumni worldwide.

In addition to the MS degree program, GEM also offers professional development opportunities for individuals looking to improve their working knowledge in specific areas without pursuing a full-degree. The GEM Program, as a part of a state academic institution, believes it is uniquely positioned to help foster collaboration among all key entities represented in the energy industry. It strives to provide well-balanced and comprehensive view points in all of its educational products. Therefore, the program welcomes opportunities to collaborate and join all sectors of the industry.

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GEM Statement of Energy Principles

The energy industry makes modern life possible, but also impacts the environment, leading to strong disagreement about how to produce and deliver energy. The good news is that there is a lot more agreement than many of us think. In order to move forward, we need to agree on what we agree on – and acknowledge that agreement – before we try to debate where we disagree. These ten principles are intended to establish a common ground and platform for further discussion.

Introduction

Energy is a crucial part of human life. We could not live without the most basic energy, that which our bodies take from food and the warmth of the sun. We could not progress without more advanced forms of energy. For millennia humankind survived on muscle power, wood, and wind, but made little progress on the building blocks of what we would consider modern life: agriculture, medicine, communication, transportation, industry, and so on.

It was not until the first practical steam engines began to appear in the 18th century – and, with them, the birth of the modern energy industry in the form of coal – that we began to grow beyond the most traditional forms of economic activity. Since then energy and economic development have been inextricably linked, with each new stage of one leading to the next new stage of the other. Today, though, a significant part of the world's population still lives with little or no access to modern energy, with adverse effects on their health, well-being, and prospects for advancing their quality of life.

Energy should be an unmitigated good but it is not; as with almost all human activity, the production and use of energy comes with economic, environmental, and social impacts. Some of these are positive and some are minor, while others are negative and can be very significant. Within the overall imperative to supply the world's people with the energy they need, it is crucial to work assiduously to achieve a balance between the positive need for energy and growth and the concurrent negative impacts. Principled and passionate disagreements have arisen and will continue to arise over just where that balance exists.

In order to maintain economic growth and raise the developing world out of energy poverty, worldwide energy demand will grow significantly over the next several decades. As a society, we must do our very best to provide energy in the safest, most efficient, most affordable, and most environmentally and socially sustainable way that we can; however, we must provide it.

To do this, and to minimize and mitigate negative impacts, we will need to use all of the technology and all of the energy sources at our disposal. If the goal of providing the world with abundant, affordable, and sustainable energy is to be achieved, all energy stakeholders, including government, environmental groups, and advocates of all different energy sources and technologies must temper their passions, refrain from demonizing each other, and work together to balance competing interests and issues.

A broad collaboration of diverse interests needs a sound foundation if it is to succeed. This begins by identifying those key points on which most players can agree, or – with a little stretch – can come to agree. These ten principles are offered in that spirit, to help simplify the debate and provide a platform for productive discussion upon which stakeholders of all kinds can coalesce to work toward a positive result for everyone.

Each of the ten sections has two parts, a statement of principle intended as an objective point to provide for discussion, accompanied by a more subjective value statement that helps to define the GEM program.

GEM Energy Principles

1. All human life and well-being depend on the ability to use energy.

2. Energy technology is always evolving; there is no “end point.”

3. The production and use of energy in any form always have some impact on the environment; this impact must be integral to energy decisions and priorities.

4. Energy has both value and cost, and must be used efficiently, maximizing work performed for energy produced.

5. Alleviation of energy poverty is crucial to global stability and progress.

6. There are multiple stakeholders in the production and use of energy in any form; all will assert their interests.

7. Energy producers and suppliers have a right to a fair profit that takes into account investment, innovation, effort, operational effectiveness, and business and technological risk.

8. Sustainable energy production and use must balance economic, environmental, and social imperatives; this balance evolves over time with innovation and changes in the human condition.

9. Energy security considerations have profound effects on global stability and prosperity; these must be evaluated thoroughly, leading to prudent decisions that maximize the common good.

10. The energy sector, broadly defined, is a force for good in the world and should be seen as such.

Principle #1: All human life and well-being depend on the ability to use energy.

Energy is defined as the capacity to do work. Energy exists on its own in the universe, but to do work, humans must harness and direct it. Any work, including hunting and gathering for food and construction of basic shelter, requires energy. So does a trip to the grocery store or to Mars; so does lighting a house or using a computer. By definition, all human activity, even the basic bodily metabolism, depends on energy. The act of employing energy to do work forms the basis of the energy industry.

The use of energy is the most fundamental of all human activity. At its most primitive energy requires no other industry; animals who have no other industry must still obtain and expend energy to live. Every other human industry – agriculture included – depends on the production and use of some form of energy, even if that energy is only in the form of human or animal muscle power.

Human progress through the ages has depended on evolution of energy technology; each new stage of civilization has embodied new modes of energy. In the modern world, access to energy correlates strongly with income and societal well-being. The chart on the left below illustrates the relationship between energy consumption and per capita gross domestic product (GDP).

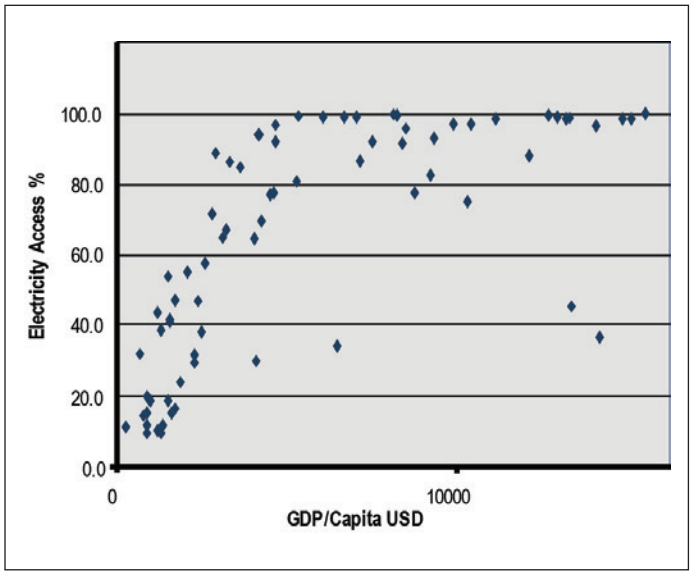


Fig. 1: GDP per capita vs. electricity access
UNDP: Integrating Energy Access and Employment Creation to Accelerate Progress on the MDGs in Sub-Saharan Africa;
Source: GDP per capita, World Bank; Electricity access, IEA.

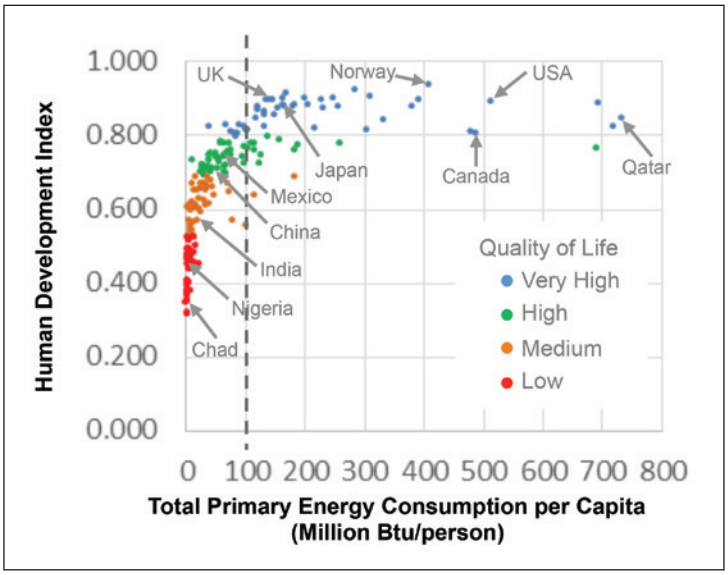


Fig. 2: HDI vs. per capital energy consumption
Human Development Index (HDI): A composite index measuring average achievement in three basic dimensions – a long and healthy life, knowledge and a decent standard of living.
Source: UNDP; EIA

Yet there are limits; beyond a certain point marginal increases in per capita energy use yield less and less additional improvement in overall quality of life. The chart on the right uses the UN Development Program's (UNDP) Human Development Index (HDI) as a measure of quality of life, showing that above approximately 100 million Btu per person (about 16.7 barrels of oil equivalent) additional per capita energy consumption yields little incremental gain.[1] Quality of life is subjective. Although the HDI may not reflect everyone's views, and some differences (such as miles driven or large needs for heating or cooling) are built in to some countries' energy use, this graph still suggests that at some point energy's influence on our quality of life becomes less about how much energy we use and more about how well we use it.

GEM Value #1: Energy is Fundamental

Energy is a basic human need, crucial to well-being and economic progress. Many considerations exist that may affect how much energy we produce, how we produce it, and how we use it but the there is no doubt that energy must be available to the people who need it, and the mission of the energy industry is to provide it.

Principle #2: Energy technology is always evolving; there is no "end point."

Aside from human muscle power the earliest form of energy used by people was fire, in prehistoric times. About 7,000 years ago, people began to use wind for sailing and animal power for plowing and pulling loads. The first water wheels appeared just over 2,000 years ago. Although these technologies improved with time, wind, water, and traditional biomass constituted more or less the whole of human access to energy until the steam engine became useful in the 1700's.[2] If we say that the human story goes back about 1,000,000 years, this covers about 999,750 of them.

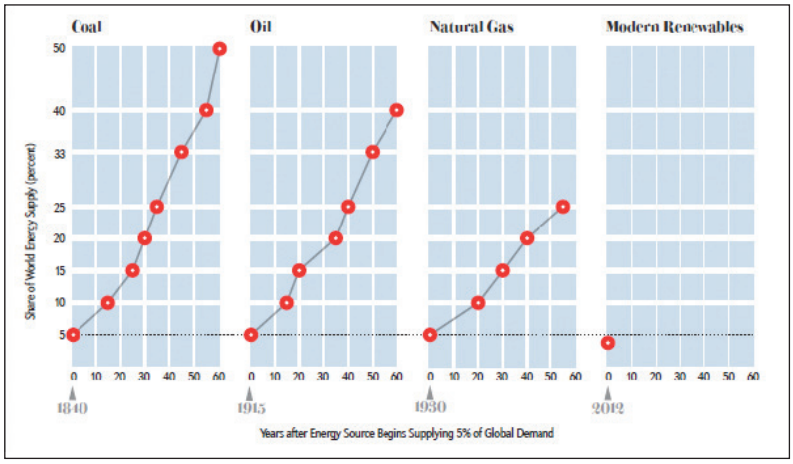


Fig. 3: Rate of Adoption for Primary Energy Sources
Each new energy source takes longer to become dominant than the one before it.

Things have changed a lot in the last 250 years. The nature of the work we do has changed drastically and the energy technology and sources that we use to do that work have changed with it. About 250 years ago, steam became our most advanced energy technology and brought with it the rise of coal. About 120 years later – halfway to now – both electricity and the internal combustion engine became commercial and we started to use oil and hydro power. About 60 years ago – half of that – the first nuclear electricity appeared. About 30-40 years ago – you can see where we're going with this – modern solar and wind technologies began to make economic sense.

Vaclav Smil, of the University of Manitoba, deftly illustrates that, despite the increasingly rapid rate of change in our *most advanced* energy technologies, our *most dominant* energy technologies change much more slowly. In the 19th century – the age of coal – traditional biomass, mainly wood, was actually still the dominant fuel. In the 20th century – the age of oil – more than half of the world's energy still came from coal.[3]

Today – even as we focus on nuclear and renewables – fossil fuels provide more than 80% of the energy we use and more than 1 billion people still rely on traditional biomass. This shows the power of "technological inertia." The layering of infrastructure combined with the continuing growth of overall energy demand, dictates that new technologies take a long time to deliver a significant portion of the world's overall energy consumption, no matter how fast they grow in absolute terms.

The overall trend of energy technological evolution is toward cleaner, cheaper, denser, more portable, and more efficient – to deliver more power using ever fewer resources and space, and creating more output and less pollution per unit of power produced.[5] The rate of change is accelerating and each new step of technology was essentially unimagined two steps earlier. We can discern technological directions and anticipate trends, but we do not know with certainty what the future of our energy technology looks like. It is entirely possible that the next dominant form of energy (and, possibly, the work we do with it) will come from a breakthrough that we haven't even thought of yet. In practice, this suggests that we should take long-term projections of energy use and its effects with a grain of salt; certainly we should not ignore them, but we must also realize that more likely than not the future we see in the distance will change several times before it reaches us.

GEM Value #2: Energy Technology

Technology must sometimes be nurtured by industry, government, or both. In the US, the federal government greatly subsidized the railroads, giving a huge boost to steam and coal. Nuclear power would at best have taken decades longer without the effort of the Manhattan Project. Even today's hydraulic fracturing technology benefitted from Department of Energy research.[4] This is not to say that any of these technologies could not have arisen without government support or to imply that government should "pick winners" in technology. It does imply that immature technologies need time to take hold – the first steam or internal combustion engines could not do as much work as a team of six horses – and it is important to provide conditions that allow them to grow.

Principle #3: The production and use of energy in any form always have some impact on the environment; this impact must be integral to energy decisions and priorities.

The production, distribution, and use of energy in any form always affect the environment in some way. Some of these effects are negligible and some are transient; others are serious and cumulative, and over time can cause environmental degradation that can negate the very quality of life improvements that the energy is intended to achieve. As energy must be available to meet human needs, it must also be produced, distributed, and used in a way that avoids as much adverse environmental impact as possible and best mitigates impact that cannot be avoided.

Environmental considerations should be an integral part of energy strategy on global, regional, and local levels. Examples include: careful selection of energy sources, efficiency at every step in the energy value chain, employment of operational best practices, accounting for cost externalities, prudent energy use, thorough land restoration, and effective mitigation strategies for residual effects.

Fig. 4: Three Gorges Dam, China, January 14, 2015
The world's largest source of carbon-free energy, obscured by haze drifting in from elsewhere in China.

All of these considerations come with costs that inevitably affect energy prices. Prices, in turn, affect the ability of energy consumers to purchase and use energy. The question – and the trade-off – is one of affordability. What is the share of environmental costs that must be factored into current prices versus the share that can be deferred on the assumption that future technology and the earth's natural regenerative ability will come to the rescue?

GEM Value #3: Environmental Responsibility

Responsible environmental organizations can help keep energy operators on track, and they can also provide the rest of the industry with a barometer of societal values. Environmental groups should have a role in the energy sector, providing feedback and working with operators on continual improvement in operating practices to deliver needed energy in the most environmentally responsible way. It is important for the operating side of the industry to recognize that many environmental groups want to help, not simply to shut down major sources of energy. It is also important for environmentalists to recognize that most operators do care about the environment, and for both groups to view each other as allies, even if there is some tension in the alliance and disagreement on priorities and timing.

In short, we must make available the energy that people need at prices they can afford, and we must also push both availability and affordability to their limits in an honest effort to minimize environmental impact.

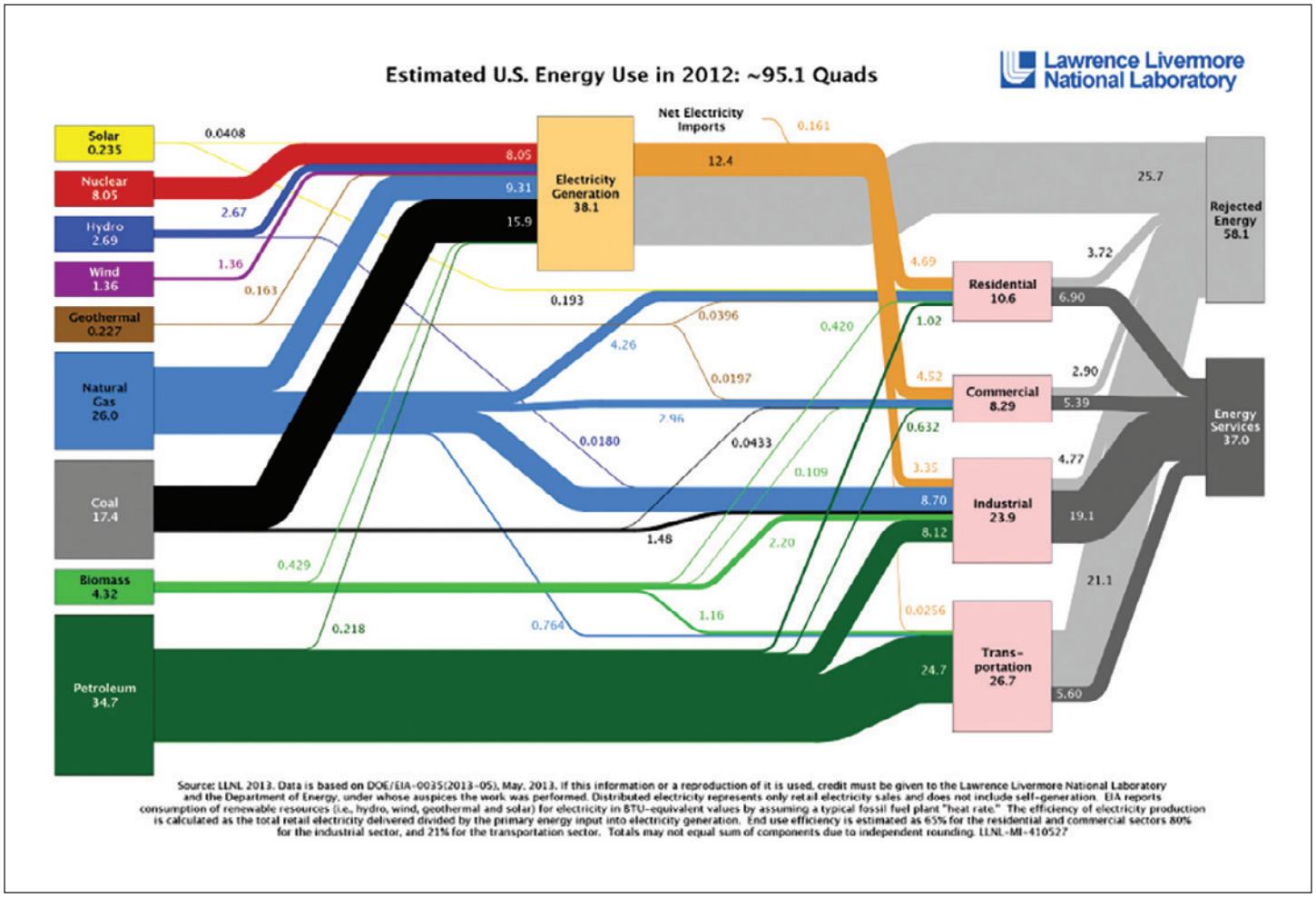
There are many different environmental concerns associated with energy, but the most significant at the present time is climate change. We can debate the rate of climate change, the degree to which it is caused by human activity, the net effects, and what can or should be done to stop or mitigate it. What is beyond debate is that climate change is occurring, that human activity has at least some role in it, and that it's a bad idea to dump more greenhouse gas into the atmosphere than we absolutely have to.

Even with the most concerted effort possible, complete elimination of all adverse environmental impact from the energy value chain is not a realistic goal. Reduction of adverse environmental impact to levels that the earth can process (possibly with human help, such as reforestation or carbon capture) may be more realistic.

However, carbon mitigation strategies must be designed transparently and discussed on their merits as means to promote cleaner energy production, not as covert schemes to promote or shut down segments of the industry; they must also be achieved over a time frame that allows technology to evolve within the limits of affordability.

Principle #4: Energy has both value and cost, and must be used efficiently, maximizing work performed for energy produced.

Lawrence Livermore National Laboratory estimates that 60% of energy produced in the United States does no useful work.[6] Similarly, the International Energy Agency (IEA) estimates that 30% of energy produced worldwide is "lost."[7] These two figures are not directly comparable as they look at different aspects of energy using different criteria, but the general meaning of both is clear: a significant proportion of the energy we produce is wasted due to inefficiency in production or use – losses occur at every step of the energy value chain.



Lawrence Livermore National Laboratory: https://www.llnl.gov/

Fig. 5: Energy Used and Lost (Quad = 1 quadrillion Btu)

Most losses, though, result from two specific sectors: electrical power generation and transportation. Simply put, the machines that we use to convert primary energy into either electricity or motion are just not as efficient as we would like them to be. Other losses, such as inefficient use of energy in industry, homes, or commercial establishments, and the energy we use to produce energy are also important. In many cases, these can be reduced significantly using existing technology.

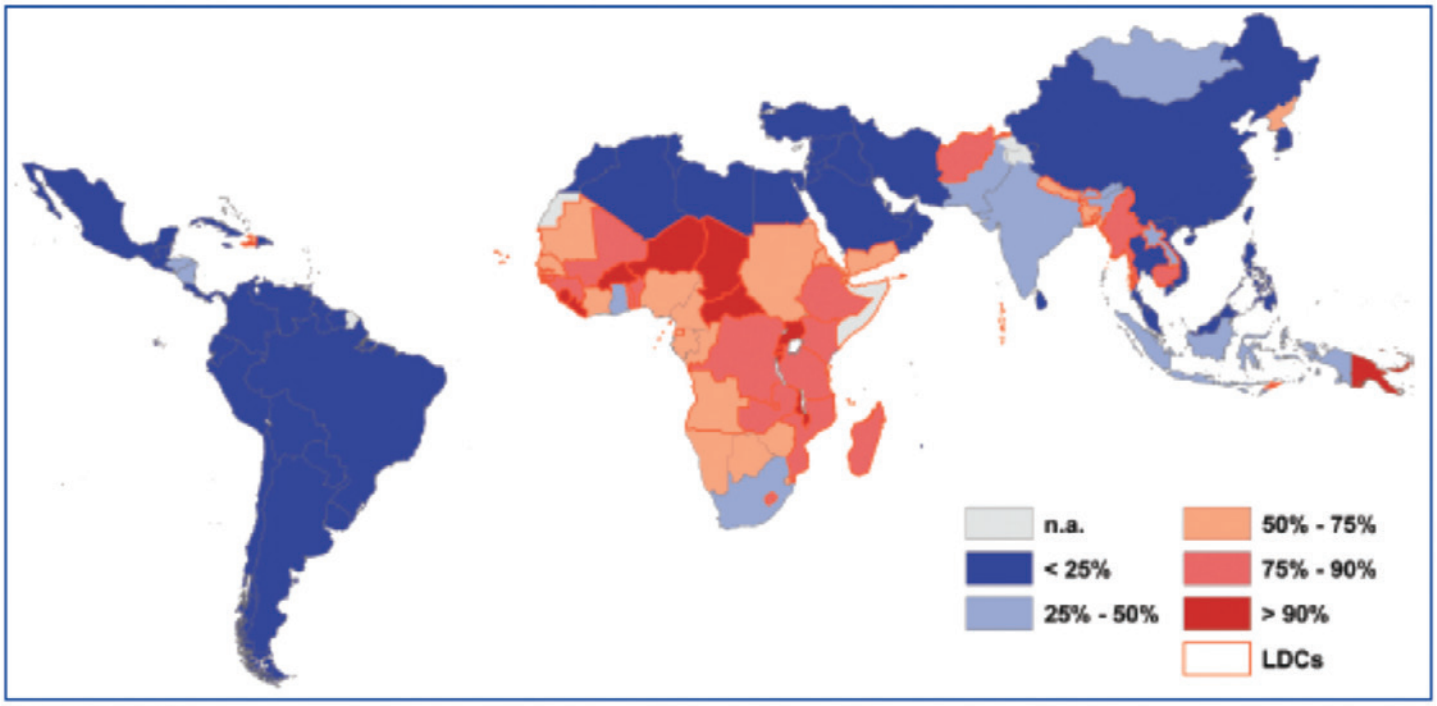
GEM Value #4: Energy Efficiency

Over time, technological innovation has steadily improved energy efficiency, but much room for further improvement remains. Recovering usable energy from energy wasted is just as viable a source of energy as any other – especially since it's been paid for once already in both economic and environmental terms. Every energy user should be aware of where energy comes from, how they use it, and how much it costs.

Principle #5: Alleviation of energy poverty is crucial to global stability and progress.

The IEA defines energy poverty as lack of access to electricity or to clean cooking facilities.[8] 1.3 billion people lack access to electricity, and 2 billion lack access to safe cooking fuel, burning charcoal, wood, or dung indoors. In developing countries, millions more must cope with intermittent energy supplies and rolling blackouts. Even in the developed world, where energy is available and reliable, millions of people cannot consistently afford it, which is another form of energy poverty.

This is not just a matter of convenience or lifestyle. Lack of access to energy effectively precludes any form of modern economic activity and therefore development. Lack of access to safe cooking fuels significantly raises rates of illness and death from indoor air pollution. Intermittent energy makes sustained industrial activity difficult if not impossible.



N.A. = not available.

Fig. 6: Share of people without energy access for developing countries, 2008
UNDP: The Energy Access Situation in Developing Countries
http://www.undp.org/content/undp/en/home/librarypage/environment-energy/sustainable_energy/energy-access-in-developing-countries.html

Clearly there is a moral issue at stake; it is simply wrong to condemn billions of people to a life of poverty, poor health, drudgery, and isolation because of energy scarcity. There are also pragmatic economic, political, and strategic issues in the form of untapped human resources and markets, excessive health care costs, and real or potential instability in multiple parts of the world.

This does not imply that there is an absolute right to energy at no cost – available and affordable energy is not the same as free energy. There are many costs associated with providing and using energy, and these must be paid. Affordability is relative; what is affordable to some is not affordable to others, and energy technology choices must take this into account.

GEM Value #5: Alleviating Energy Poverty

All people have a right to a stable and affordable energy supply sufficient to enable a safe, comfortable, productive, and dignified life.

The United Nations has declared the decade of 2014-2024 as the Decade of Sustainable Energy for All (http://www.se4all.org/), with three specific goals:

- Ensure universal access to modern energy services.
- Double the global rate of improvement in energy efficiency.
- Double the share of renewable energy in the global energy mix.[9]

It is important for the energy industry and all of its stakeholders to support these goals

Principle #6: There are multiple stakeholders in the production and use of energy in any form; all will assert their interests.

Everyone is a stakeholder in energy. Energy is so fundamental to every other activity in the modern world that each of us has a stake in its production and availability. The potential effect of energy production and use on the earth's climate further amplifies this. We can view stakeholders in terms of shared interests, such as energy companies, energy users, environmentalists, communities, regulators, and so on.

Fig. 7: Production in the Back Yard
July 25, 2015; Frederick, Colorado

At the *global* level everyone is affected by, and in some way affects, the energy industry. We drive more – or less – depending on the price of gasoline. We have more – or less – disposable income each month depending on the cost of heating, cooling, and lighting our homes and businesses. As consumers we affect the energy industry by the decisions we make every day on the products we buy and the forms of energy they use. We influence energy and climate policy, subsidies, and taxes through the political process. At this level, the stakeholder relationship is relatively diffused, and the interests of any individual stakeholder are similar to the interests of millions of similar stakeholders.

GEM Value #6: Stakeholder Focus

The principle to be followed is to balance the positives and the negatives in order to bring the most value to the most people, while scrupulously controlling any potential ill-effects.

Regardless of the nature of the stakeholder relationship, all stakeholders have the right to reasonable expectations and accommodation within the energy sector.

- Energy consumers should be able to expect reliable supplies of affordable energy with at least controlled impact on the environment.
- Energy producers and distributors should be able to expect a stable and profitable work environment if they adhere to regulations and follow industry best practices.
- Communities in which energy is produced should be able to expect to share economic benefits with as little disruption to their lives as possible and with absolute safety for their health and well-being.

It's different at the *local* level. This is the level where a drilling rig or a wind farm is in sight of your house, or where your income depends on profitable installation of solar panels. At the local level, stakeholder relationships are concentrated, not diffused; stakeholder interests are more personal, and people have personal motivation to affect energy decisions. By their proximity to the industry and by the very nature of individual and local decision-making, the per capita effects on and of individual stakeholders are magnified compared to the global level.

All energy-related decisions involve some kind of trade-off, with wide diversity in interests and impacts. Some stakeholder groups have more power than others, but they all have some; in today's world the propensity to use that power is growing and the need to respect broad stakeholder interests is more and more an essential condition for doing business.

Principle #7: Energy producers and suppliers have a right to a fair profit that takes into account investment, innovation, effort, operational effectiveness, and business and technological risk.

Between market capitalism and state capitalism – the system that includes quasi-governmental entities such as national oil companies – virtually all of the world's energy is produced and delivered under some kind of market-based model. There are many distortions to this model around the world, such as subsidies, taxes, government policies, regulation, avoidance of cost externalities, and any number of others that change time horizons and obscure economic transparency; ultimately, though, over the long run energy producers must show some kind of profit in order to stay in operation. Even non-market entities such as small co-ops, government-owned utilities, or energy operations in fully socialist economies must either cover their costs through operations or rely on external funding like subsidies or donations in order to operate.

In order to produce or deliver energy – and to make a profit while doing it – an organization must first make some kind of investment, take some kind of risk, and show some capability to operate effectively. The way different organizations do these things varies by their specific niche in the industry, by their specific organizational goals and culture, and by their overall competency. Regardless of these differences, however, every organization must do these things and in doing them successfully that organization is entitled to earn a profit.

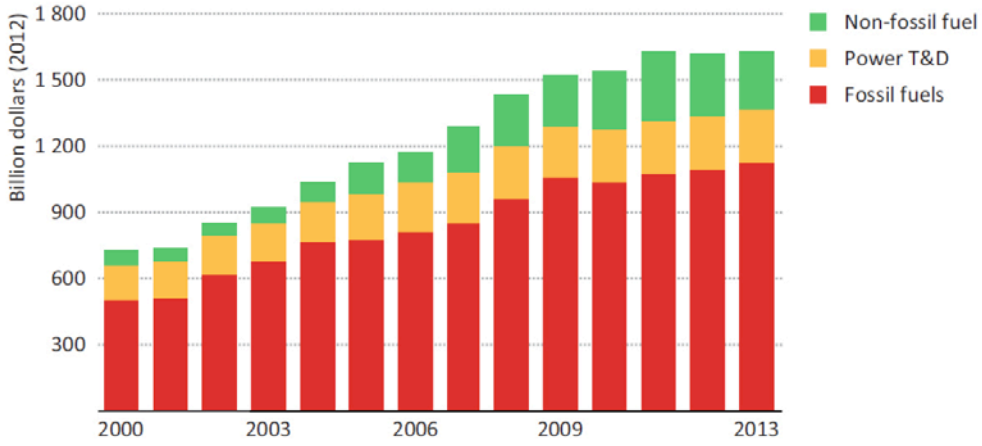


Fig. 8: Investment in global energy supply by fossil fuel, non-fossil fuel and power transmission & distribution

Notes: Non-fossil fuel includes all renewable technologies, nuclear and biofuels.
International Energy Agency; World Energy Investment Outlook, 2014;
http://www.worldenergyoutlook.org/investment

In a market economy, profitability plays a broader role than simply returning wealth to an organization's owners or other beneficiaries. Profitability is the critical variable in the allocation of resources, whether on an organizational or a societal level. We invest our resources in activities that will earn profits and – absent the kinds of market distortions described above – we expect the market laws of supply and demand to regulate profits in a way that reflects society's priorities. The profitability of any activity rises and falls over time in relation to the value that society places on that activity. The energy sector as a whole is no exception to this rule; neither are any of its individual components. The question we should ask here is how much of our societal resources – financial or otherwise – should be invested in the production and distribution of energy, and what kind of return – financial or otherwise – that investment should bring to us. It is beyond question that for-profit businesses will do the heavy lifting in the evolution of the energy industry and that profitable returns will drive them forward.

GEM Value #7: Profitability

It would be unreasonable to expect companies to produce and deliver energy without earning profits. Times change and business conditions change with them. What is a viable, or even dominant, business model in one era may be a dinosaur in another. As the rate of technological change increases, it is not unreasonable to expect the rate of business change to increase with it. While the principle of profitability must be respected, it is not an absolute guarantee that every organization is automatically entitled to profits.

Bad decisions, poor operating effectiveness, adverse market conditions, technological failure, and change in society's priorities can all put a company out of business. In order to expect lasting profits a company must be effective on most if not all dimensions, including its ability to change with time, technology, and consumer preferences.

Principle #8: Sustainable energy production and use must balance economic, environmental, and social imperatives; this balance evolves over time with innovation and changes in the human condition.

Sustainability refers to the stable performance of an activity over an extended period of time; with energy, environmentalism is clearly part of this but it is not the whole. The presence of multiple stakeholders who can exert power over energy decisions compels new ways of operating in multiple dimensions. The days when energy producers could operate as they pleased are gone, both in the developed and in the developing world. Companies must now also include environmental and social concerns in their overall balance of priorities, and economics remain fundamental. The challenge lies in the reality that each of these three imperatives often conflicts with both of the others, hence the concept of balance.

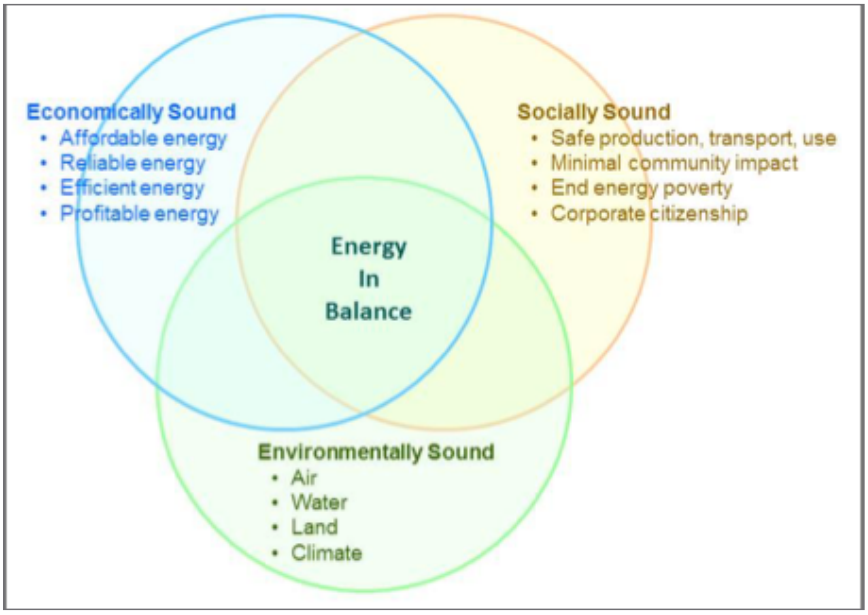


Fig. 9: Economic, Environmental, and Social Balance

- First and foremost, energy must be sustainable *economically*. This means that it must be produced and delivered profitably, reliably, efficiently, and at a price consumers can afford. Energy can be produced and delivered below cost for short periods of time, to amortize capital or maintain market share during price downturns, or to subsidize development of new technology – these situations are temporary, not sustainable over the long term. In the long run, without economic sustainability energy will not be produced at all.

- Energy production must also be sustainable *environmentally*. This is easy to state as a concept, much harder to define precisely or express in the form of specific goals. Over the long term, human energy production and use should not cause more negative effects to the environment than nature and technology can correct. Because of the effect of greenhouse gases, current science appears to mandate a much higher share for renewable and perhaps nuclear energy in the overall energy portfolio. The timing of this mandate is unclear and in the short and medium term some level of environmental degradation is inevitable if we are to meet economic and social energy needs – the balance is to minimize this to the greatest possible degree, mitigate the effects as much as possible, and work to achieve environmental equilibrium quickly. Without eventual environmental sustainability the earth could someday be rendered unlivable, or at least much more unpleasant.

- In the modern world, energy must be sustainable *socially*. Social sustainability of energy is a relatively new concept, and involves a number of different considerations linked by a common thread of equitable treatment for all stakeholders. First and foremost, this means the rapid reduction and eventual elimination of energy poverty. Next, social sustainability requires an equitable distribution of energy benefits and costs, especially where energy is produced – equitable does not imply equal, but the preponderance of benefits from producing energy should not accrue to one stakeholder while the preponderance of cost, including environmental and quality-of-life cost, falls on another. Energy operations must be as safe as possible, both for neighbors and energy company employees. Operations must be managed to minimize impact on neighbors. Communities where energy is produced should benefit from the production, through taxes and local spending, and also through both corporate citizenship and employment. Without long-term social sustainability, companies will not be allowed to operate.

GEM Value #8: Balanced Sustainability

True energy sustainability requires a balance of economic, environmental, and social imperatives. This balance requires all stakeholders to reconsider cherished assumptions, tone down rhetoric, and compromise. In the modern energy world, nobody gets 100% of what they want; everyone must recognize multiple imperatives to achieve a balance and be prepared to adapt as the balance point changes over time.

The balance between economic, environmental, and social sustainability is not a constant point of equilibrium. It changes with both time and geography, and evolves along with the other factors that create wealth and quality of life.

The role of regulation changes along with it. Economics are primarily market-driven and change with technology, market conditions, and the state of the global economy and political situation. Environmental and social imperatives are not mainly driven by markets, but by non-market conditions and change with the expectations of people at a given place and time.

Effective regulation is a critical component of the energy spectrum. At its best, regulation provides the framework for balancing the three critical imperatives. It ensures that cost externalities are accounted for, that the environment is protected reasonably, and that social interests are served, all while allowing for sufficient profit to maintain investment and keep energy producers and distributors engaged. Regulators are as important as any other participant in the energy sector.

Principle #9: Energy security considerations have profound effects on global stability and prosperity; these must be evaluated thoroughly, leading to prudent decisions that maximize the common good.

The IEA defines energy security as the uninterrupted availability of energy sources at an affordable price.

Because energy is so fundamental to all other economic activity and overall well-being, energy security is inevitably tied to national security. Every country on the planet considers energy as a vital component of its national security and will act to defend and enhance its energy security as far as its power will allow; often they will also act to undermine the energy security of countries they consider to be adversaries.

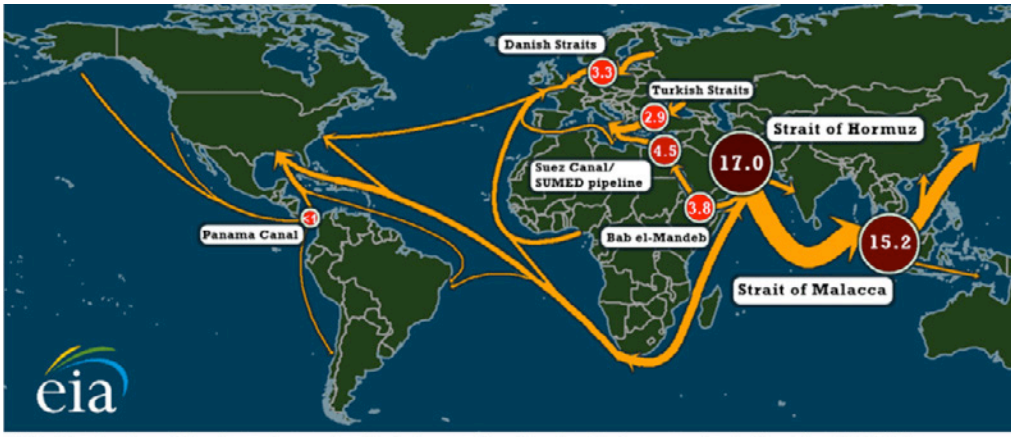


Fig. 10: Daily transit volumes through world maritime oil chokepoints
Sources: U.S. Energy Information Administration analysis based on Lloyd's List Intelligence, Panama Canal Authority, Eastern Bloc Research, Suez Canal Authority, and UNCTAD, using EIA conversion factors.

http://www.eia.gov/countries/analysisbriefs/World_Oil_Transit_Chokepoints/wotc.pdf

Energy is a global need and a global industry. Events in one part of the world can have profound effects on energy security in other parts of the world in terms of both supply and price. Therefore the energy sector and global geopolitics are inextricably entwined.

Not all energy has equal geopolitical importance. As we stand now, in the early 21st century, oil is far and away the most important energy commodity from a purely geopolitical point of view.[10] Gas has some importance as well, mainly in the relationship between Russia and the rest of Europe, but most gas is still used where it is produced with little broad geopolitical effect (this may change as the worldwide LNG trade grows). Nuclear power has geopolitical significance arising from the potential to weaponize nuclear fuel, but not from its importance as an energy source. Other than substitution effects, neither these nor other energy sources used to generate electricity, coal included, have significant impact on global geopolitics. As technology evolves, the strategic significance of energy and of individual energy sources is likely to change as well, but for now the story is oil.

GEM Value #9: Energy Security

It would be unrealistic to suggest a principle that energy should never be used as a geopolitical lever, or even as a weapon. Like any strategic commodity, nations will use energy to achieve their goals in any way they can in times of war and in times of peace.

Especially in times of peace, though, it is not unrealistic to suggest that, as they consider the use of energy as a lever of policy, nations should recognize the interconnectedness of energy across economic and national lines and carefully take into account the effects of their policies on all energy stakeholders, whether they reside in their allied nations, adversary nations, or others that may be simply innocent bystanders.

Oil has been a potent geopolitical force for a century. In the pre-World War II era, it provided motivation for imperialism; during the war control of oil was a strategic objective for both sides in both the European and Pacific theaters. In the post-war period, oil was a catalyst for decolonization, alliances that would not otherwise occur, and the propping up of some governments alongside the destabilization of others. The fuel crises of the 1970's gave rise to OPEC and raised the geopolitical influence of many oil-producing countries that would likely have much less power without oil. This continues to the present day; as these principles are being written we see Russia using gas to influence policy in eastern Europe and the European Community, the United States using unconventional production to free its economy and policy from the influences of imported oil, and Saudi Arabia using its own production volumes to drive prices down to maintain its market share and global influence.

Principle #10: The energy sector, broadly defined, is a force for good in the world and should be seen as such.


Photo courtesy of Elephant Energy

Energy exists in the universe independently of people, but the energy industry does not. Energy is both produced and used by people and at all levels the industry is comprised of people, the vast majority of whom go to work every day with the motivation to work honestly, effectively, and safely to produce the energy the world needs at an affordable price, while safeguarding the environment as well as they possibly can. Most are part of the communities where they work.

Historically, the industry has not done well with its public interactions. Only in recent years have the ideas of environmental and stakeholder interests begun to take hold. This is changing, though, and it is changing fast. Environmental sustainability is moving beyond simple compliance and is fast becoming a core value for most energy companies and for the people in them. Social sustainability is not far behind. The need for increased transparency and responsiveness is increasingly recognized.

Errors and accidents can occur, and technology almost never evolves as fast as anyone would like it to. Occasionally financial and competitive pressures get the better of good judgment and regrettable decisions are made. This is no different from any other human activity and is rarer than many of us believe. The unfortunate difference with energy, though, is that the industry can be a dangerous one and when bad things do happen, the consequences can be severe and long-lasting. This is a fact of working with energy, but it is one that drives the core of the industry's behaviors every day; even though we may be shocked from time to time when something goes wrong, the truth is that – given the extent and complexity of energy operations – we should marvel every day at how effectively potential hazards are managed.

We can't live without energy, and we need all that we can get in order to maintain quality of life, lift people out of energy poverty, and provide for economic and social stability around the world. Bad things can happen in association with energy, but this is true of all human enterprise. Energy is a good for all mankind and the work of providing it is good work done overwhelmingly by good people who deserve to be recognized and appreciated for the work they do. We are all stakeholders in energy and we should all – both inside and outside the industry – be working together to provide and to use it responsibly.

GEM Value #10: Energy is Good

Fair and honest competition between different forms and sources of energy is healthy. So is a certain level of dynamic tension between energy operators, environmentalists, and regulators. Growing demand and the need to eliminate energy poverty will require all forms of available energy over the next 25-50 years. Trends must be toward increased supply, lower carbon, more efficiency and density, better distribution, and lower price, with each form of energy serving a different need for work. Competition for market share must focus first on serving energy users and stakeholders, and we must work together across the industry to serve global needs and continuously improve our operations. It serves nobody for advocates of one technology or another to undermine each other or to try to limit any other part of the industry. Overall demand growth means that gas and renewables can both increase drastically – and significantly increase their relative shares of the energy market – without causing major decreases in the need for either coal or oil. We need to use everything for many years yet; the question is how to use everything better.

There is very interesting and compelling work being done on this in the United Kingdom by the Molten Group (http://www.molten-group.com/) and Naked Leader (http://www.nakedleader.com/). Their short video is worth watching (https://www.youtube.com/watch?v=mF4QWbO1cfA).

What's Next?

So what do we do with this? It's ten principles, not ten action items, and the principles themselves are a little vague about what to do next.

The principles are vague for a reason. As the saying goes, "the devil is in the details," and these principles deliberately leave the devil for later. The idea is that most responsible participants should be able to agree on these principles as stated and – using them as a stable base – productively debate the details. If all parties to the energy conversation can agree to these basic principles and stick to that agreement, then at least further discussion can focus on specific issues rather than bogging down in repetition of the basics. It's meant to be a starting point, not a finish line.

We can't do things as we have always done them. Operators can no longer rely on property rights and courts to run roughshod over communities or dodge regulations, but these behaviors have been dying anyway. At the same time we have to realize that, no matter what our hopes might be, the reality is that we're not going to have a world of 100% renewable energy with no adverse impacts to environment or community any time soon, or maybe ever; we will improve and may reduce our use of fossil fuels, but eliminating them from the mix is not a realistic option in the next 30 – 50 years at least.

What is left, then, is to focus our discussion on things we can actually do, and do those things as well as we possibly can. Every group of stakeholders has a part to play.

- *Energy Producers and Distributors:* Understand the real issues both globally and in the communities where you work. Commit to employing your own best practices at all times to mitigate the effects of your operations on your neighbors. Be transparent with the public about what you do and about what you can do better. Build and implement new technologies that provide ever more abundant, cheaper, efficient, and cleaner energy to the world.
- *Environmentalists:* Be the industry's conscience, not its enemy. Understand what is really achievable, and work with operators, community, and regulators to implement practical solutions in the here and now, even as you strive to stretch the limits of achievability for the future.
- *Community Leaders:* Know what your community really needs in its relationship with the energy industry, and work with operators in your community to achieve it. Whether your issue is jobs, water, traffic, noise, air quality, level of service, or anything else, set your priorities and work with your operators to meet them.
- *Regulators:* Understand your role in helping to balance economic, environmental, and social aspects of energy. Work with other regulators and other jurisdictions to eliminate redundant or conflicting rules.
- *Users of Energy:* Learn as much as you can about the energy you use and what you use it for, and do your best to use it efficiently. Take an active role in the conversation and hold all of the other players accountable to be productive and truthful.

As a society, we need all of these stakeholders to participate in the discussion to the best of their abilities. The best thing all of us can do is to tone down rhetoric, learn as much as we can about the others' needs and priorities, and tell the truth about our own. We need to leave exaggeration and embellishment behind us, compete fairly in both the marketplace of energy and the marketplace of ideas, and remember that we're all here to make sure the people of the world have the energy they need in the most responsible and sustainable way that we can get it to them.

About the Author

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Useful Web Sites

- Coursera; GEM MOOC - Fundamentals of Global Energy Business; https://www.coursera.org/learn/energy-business
- International Energy Agency; http://www.iea.org/
- Lawrence Livermore National Laboratory; https://www.llnl.gov/
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