TRADE UNIONS FOR ENERGY DEMOCRACY

Working Paper No. 9

ENERGY TRANSITION: ARE WE WINNING?

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Trade Unions for Energy Democracy (TUED) is a global, multi-sector initiative to advance democratic direction and control of energy in a way that promotes solutions to the climate crisis, energy poverty, the degradation of both land and people, and responds to the attacks on workers' rights and protections.

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Energy Transition: Are We Winning?

By Sean Sweeney and John Treat

During 2015 and 2016, a number of significant public and political figures have made statements suggesting that the world is moving away from fossil fuels and that the battle against greenhouse gas emissions (GHGs) and climate change is therefore being won. Statements of this kind are frequently accompanied by assurances that the transition to renewable energy or a low-carbon economy is both "inevitable" and already well underway. Some (but by no means all) environmental and climate justice NGOs seem to have been affected by this optimism, as have some unions. While far from universal, it has crept into progressive discourse in ways that are palpable and significant.

If the optimists are correct, the political implications for trade unions and social movements are profound. For unions, it would mean focusing aggressively on the need to protect the livelihoods of the tens of millions of workers around the world who currently work in fossil fuels and rallying around the principle of "just transition" encoded in the preface to the Paris Agreement. But it would also mean that the need to wage a determined and protracted political struggle against fossil fuels and "extractivism" would immediately become less urgent. In this scenario, trade union efforts would rightly focus on working to shape the next energy system as it rises from the ashes of the old.

But what if proclamations of fossil fuels' demise are wrong? What if the "momentum" has not shifted, and the transition to renewables-based power is neither inevitable nor well underway? In that case, the struggle against the current model of ownership that drives the growth of fossil fuels and extractivism—that is the struggle for democratic control and social ownership of energy—remains vital, and demands redoubled effort and commitment across all sections of our movement. It would mean that the level of urgency in the struggle *for* energy democracy must be increased, activism stepped up, and fresh approaches embraced, encouraged, and endorsed.

Needless to say, it is important for unions and their allies—in the environmental movement, indigenous communities, racial justice formations, and others—to have a clear sense, first, of what is happening with the global energy system and, second, what is likely to happen in the future. Our politics must be grounded in both a clear-eyed approach and an analysis based on facts.

The Ideology of Optimism

The optimistic "end of fossil fuels" message has deep ideological significance. If true, it could be taken to validate the central ideological tenet of neoliberal, market-based approaches to addressing climate change and ecological degradation—namely, that economic growth can be *decoupled* from emissions and can therefore continue more or less as it has done for the past two or more centuries. This view lies at the heart of the "ecological modernization" perspective, which both imagines and advocates for a new phase of capitalist expansion: in a phrase, "green growth."

Rarely heard before 2008, the term "green growth" has come to occupy a prominent position in policy discourse at the international level. In 2011, the United Nations Environment Program (UNEP) published its 600-page *Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication*, which articulated an approach that won considerable support from the international trade union community. The World Bank adopted its *Inclusive Green Growth: The Pathway to Sustainable Development* in 2012. The "green economy" was also a major focus of the "Rio+20" United Nations summit in June 2012.[1]

It is therefore no accident that key spokespersons for the "green growth" narrative (such as Nicholas Stern, Al Gore, and others) have in recent years been among the most optimistic of the optimists. Given that background, it is therefore vital that trade unions take a serious look at the evidence that has been advanced in succeeding years in favor of the "green growth" narrative to which they have given their nominal approval.

The World Is Not Moving Away from Fossil Fuels

The main goal of this paper is to show that the world is, unfortunately, not moving away from fossil fuels—far from it. For that reason, much of the recent "we are winning" optimism is misplaced, misleading, and disarming. It must be rejected and replaced with a more sober perspective that draws hope and confidence not from a selective and self-deceiving interpretation of limited data but from the rising global movement for climate justice and energy democracy and that is armed with clear programmatic goals and a firm commitment to achieve them.

Beyond this introduction, the paper is divided into three parts. First, we give some examples of "end of fossil fuels" optimism, highlight its apparently contagious nature, and summarize the data that seem to sustain it. These data include: (1) the recent fall in global coal consumption; (2) lower recent investments in fossil fuels; (3) rapidly accelerating deployment of renewable energy; (4) improvements in energy intensity; (5) a marked slow-down in the growth of global energy demand; and (6) the apparent stalling of CO_2 emissions levels.

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Next, we unpack this optimism by examining the data within the context of the overall energy system, considering both historical trends and future projections. In doing so, we show that the era of fossil fuels is not only far from over but, based on current trends, that the use of fossil fuels is expected to *increase* until 2030 at the earliest and any projected declines after 2030 appear to be contingent upon *political* decisions.

We show that the trends that substantiate the "we are winning" optimism are both real and significant but if taken out of context—as the optimists seem to do—create a false impression. Real changes at the economic level underpin the optimism, as do recent political developments, but the overall conclusion which the optimists draw from the data on which they focus is not consistent with the full range of facts.

Despite the several positive trends noted above and discussed in more detail below, the major recent studies leave little doubt that the world is *not* moving away from fossil fuels. On the contrary, they show that although there are changes taking place within the overall energy economy, what is happening cannot be considered a full-force *transition* to a renewables-based energy system. Renewables are today a thorn in the side of major fossil fuel interests (particularly coal companies) but they are not seriously challenging the dominance of fossil-fuel-based power. Furthermore, when measured against the climate targets adopted at COP21 in Paris in December 2015, the progress in renewable energy deployment to date, while very real, is profoundly inadequate in terms of its contribution to reducing emissions to levels that are consistent with the "well below 2 degrees Celsius" threshold. Any suggestion that the energy transition is underway and unstoppable—however qualified—is deeply misleading.

Finally, we conclude by considering the programmatic and movement-building implications of the data, what they indicate about the challenges ahead, and where the basis of a more realistic optimism is to be found.

Data and Reliability of Projections

In preparing this paper, we have reviewed the recent major reports on energy trends as well as a range of responses to them. The International Energy Agency's (IEA) *World Energy Outlook (2015)* makes projections to 2040, while BP's *Energy Outlook 2016* makes projections to 2035. BP's *Statistical Review of World Energy 2016* provides historical data on world energy markets. For renewable energy trends, we cite *Bloomberg New Energy Finance (2016)* and the IEA publication titled *Next Generation Wind and Solar Power (2016)*. Data are referenced from IRENA's *Renewable Energy Statistics 2016* as well as the authoritative REN21 reports, the most recent being the *Renewables 2016 Global Status Report*. For oil production and consumption, IEA and BP data are used, and also the U.S.-based Energy Information Administration's *International Energy Outlook (2016)*. For the latest data on accumulating GHGs, we reference NOAA's *Annual Greenhouse Gas Index* (AGGI), updated in Spring 2016. We have also cited other studies where we feel it is necessary or appropriate.

It is important to point out that these studies lie well inside the political mainstream. While the analyses they offer are unlikely to represent "fringe" views, it should be kept in mind that some of them have been challenged by voices in the policy community and the environmental movement.[2] The criticism that most concerns us here is the claim that major agencies like the IEA have consistently underestimated the growth of renewable energy, and their projections for renewable energy are therefore likely to be too conservative. While this criticism seems almost certainly to be valid to a point, the far more optimistic alternative projections offered by the critics seem to err significantly in the other direction. We return to this important issue below.

The Case for Optimism

We're still behind on the scoreboard, but the momentum has shifted. We are winning.
— Al Gore[3]

Countries want to do this... It will be a story of much more attractive growth.
— Nicholas Stern[4]

The end of fossil fuels is near, we must speed its coming.
— Greenpeace[5]

During the last year or two, a significant number of prominent and influential policy and political figures have made statements claiming or implying that the "era of fossil fuels" either has ended, is in the process of ending, or is at least beginning to end. This message seems to have found some traction among climate activists, and it has been echoed by some major NGOs.

The sources of this optimism—which seems to be contagious—are essentially twofold. First, political pressure to control emissions is rising. This pressure is reflected not only in the Paris Agreement, but also in the growth of protests against new fossil fuel infrastructure projects and against the wave of international investor-protection treaties (TPP, TTIP, TiSA, etc.) that prioritize the interests of fossil fuel companies and other major blocs of capital over local communities, governments, and the environment. Such political pressure is perhaps the primary source of optimism expressed by key environmental NGOs and other progressive movements and groups.

The second source of optimism is found in certain economy-related trends (such as emissions levels, investment in renewable energy, etc.), which, it is said, seem to be "moving in the right direction." For the advocates of "green growth," these trends have revived the optimism they almost universally shared prior to and during the "great recession" of 2008-2009.[6] For convenience, we call this "economy-based optimism" in order to distinguish it from the optimism generated by rising political pressure. The rapid growth of renewable energy during the last decade is frequently cited as evidence in favor of this optimistic stance, as is the crisis of profitability facing many fossil fuel companies due to the well-documented fall in prices for coal, oil, and gas.

Sources of Economy-based Optimism

We identify six trends or sets of data that could seem to provide an empirical basis for the recent economy-based optimism. These are: (1) falling coal consumption, (2) falling investment levels in fossil fuels, (3) the sharp rise in both renewable energy investment and deployment, (4) improving energy intensity, (5) slowing energy demand, and (6) the leveling-off of global CO_2 emissions.

Falling Coal Consumption

A central feature of the "end of fossil fuels" argument is the global crisis facing coal. Coal-fired power stations are today the leading single source of energy-related CO_2 globally, so coal consumption levels are particularly important from an emissions and climate standpoint.[7]

The 2015 decline in coal consumption was around 1.8% from 2014 levels according to BP,

but more recent data from the IEA (August 2016) reports a 2.8% drop—the largest annual decrease since IEA records began in the 1970s.[8] The fall in global coal consumption has been particularly noticeable in China and the US. According to a paper by Qi *et al.*, published in *Nature Geoscience* in July 2016, coal consumption in China fell 3.6% in 2015, and a dramatic 9.7% in the first half of 2016.[9] In the US, coal consumption fell almost 13% in 2015.[10]

A wave of bankruptcies affecting several major coal companies has followed the fall in demand for coal and the drop in coal prices, culminating in the filing for bankruptcy protections by, for example, Peabody Energy, the world's largest private-sector coal producer.[11] Many analysts are now talking about a "structural decline of coal," with Moody's Investor Services announcing a drop in coal industry earnings of more than 10% in 2016. Moody's placed 55 companies in coal and other mining industries "under review for downgrade based on the belief that a severe decline in the mining industry represents a fundamental shift in the operating environment, rather than a cyclical downturn."[12] According to Bloomberg New Energy Finance, "More than half the assets in the global coal industry are now held by companies that are either in bankruptcy proceedings or don't earn enough money to pay their interest bill."[13]

Falling Investment in Fossil Fuels

Investment levels in fossil fuels have fallen dramatically during the 2014-2016 period. According to BP, in 2015 upstream investment in fossil fuels fell by 24% from 2014 levels. The IEA also reported a sharp drop in investments in coal, oil, and gas, attributing it to "a sharp fall in prices since late 2014 with cuts in capital expenditure, most notably in North America.... In addition, low oil and gas prices have also led to cuts in investment in upstream and transportation infrastructure."[14]

Consultant Wood Mackenzie predicts that the oil and gas industry will cut $1 trillion from planned spending on exploration and development because of the slump in prices. Worldwide investment in the development of oil and gas resources from 2015 to 2020 will be $740 billion lower than anticipated before the 2014 price plunge—a 22% drop. An additional $300 billion will be cut from exploration spending.[15]

In an October 2015 paper titled *New Economics of Oil*, BP's Group Chief Economist Spencer Dale noted, "The most significant change [in oil economics] stems from the US shale revolution: the rapid growth of on shore oil production in the US, typically using hydraulic fracturing (or fracking) techniques to extract oil from shale and other types of so called tight rocks."[16] Indeed, US shale oil drilling has made a major contribution to the global oversupply of oil that has led to falling prices and investment levels.

BP and the IEA both suggest the fall in prices for coal, oil, and gas due to oversupply is the main explanation for the fall in investment levels. Both also suggest that rising political pressure on fossil fuels had contributed to the deteriorating investment climate for fossil fuels—although they offer no quantitative estimates that might shine light on the relative importance of each factor.

Rising Investment and Deployment of Renewable Energy

In the immediate aftermath of the financial crisis of 2007–2008, political support for renewable energy waned and investment levels decelerated, even falling in key regions. But investments in renewables have made a strong recovery in the past two years. According to the authoritative Renewable Energy Policy Network for the 21st Century (REN21), a self-described "multi-stakeholder" organization (consisting mostly of renewable energy associations and UN agencies), new global invest-

ment in renewable power and fuels rose by 5% over 2014 to a record $285.9 billion in 2015, exceeding the previous record of $278.5 billion in 2011.[17] Bloomberg New Energy Finance (BNEF) reported the figure for 2015 to be even higher—$329 billion[18]—but predicted that investment levels for 2016 would be considerably lower.[19]

According to the IEA, global investment during 2015 in solar and wind power combined ($270 billion) was more than double that invested in fossil fuel generation capacity ($130 billion).[20] UNEP interpreted this to mean that renewables had reached a major milestone, and that "structural change is underway."[21]

Alongside investment levels, the rate of deployment of renewables has also grown impressively. According to the Global Wind Energy Council, total global wind power stood at nearly 74 GW in 2006. By 2015 it had grown to nearly 433 GW.[22] Navigant Research's *World Wind Energy Market Update 2016* reports that 63.1 GW of wind power capacity was added in 2015, a 23.2% increase from 2014.[23] During the same nine-year period, solar PV increased from 6.5 GW to 224 GW of installed capacity globally, according to the European Photovoltaic Industry Association. Solar added 50 GW in 2015 alone—a 25% increase over 2014.[24]

According to REN21, "The world now adds more renewable power capacity annually than it adds (net) capacity from all fossil fuels combined. By the end of 2015, renewable capacity in place was enough to supply an estimated 23.7% of global electricity, with hydropower providing about 16.6%."[25]

Improving Energy Intensity

Energy intensity—the average amount of energy needed to produce a unit of GDP—is the key variable at the heart of debates over the possibility of "decoupling" economic growth from rising emissions (an issue we discuss in more depth below). In its latest *Statistical Review of World Energy*, released in June 2016, BP reported that global average energy intensity declined by 2% in 2015. BP characterized this drop in energy intensity as one of the year's key developments because, although similar to the 2% annual improvement during the past decade, 2015 was the first time such a decline in energy *intensity* accompanied a decline in energy *prices*.[26] Typically, one would expect lower energy prices to result in more energy being used in productive processes relative to other inputs, and thus *greater* energy intensity, other things being equal.

Slowing Energy Demand

Meanwhile, the overall rate of growth in global demand for energy has been slowing. According to BP, global energy demand grew by just 1.0% in 2015, similar to the rate of growth seen in 2014 (1.1%) but roughly half the average rate seen over the past ten years (1.9%).[27] While acknowledging that this drop is due at least in part to sluggish overall economic growth, the major sources of data (such as IEA, BP, and EIA) project that slower growth in energy demand is likely to continue in the years ahead as economies, while still growing, become more energy efficient and as energy intensity levels accordingly improve.

Leveling-off of CO_2 Emissions

In November 2015, the European Commission's Joint Research Center made headlines after it released its *Trends in Global CO_2 Emissions*. The report noted, "After a decade of annual increases of 4%, on average, and two years (2012 and 2013) of slowing down to about 1%, the growth in global CO_2 emissions almost stalled, increasing by only 0.5% in 2014 compared to the record level in 2013."[28]

In a report released in September 2016, the IEA estimated that global CO_2 emissions in 2014 in-

creased 0.8% over 2013 levels. It noted, "This was much lower growth than in 2013 (1.7%), and far below the average annual growth rate since 2000 (2.4%). In absolute terms, the emissions growth in 2014 (0.25 $GtCO_2$) was one of the smallest observed since 2000."[29]

According to BP, the IEA, and others, the leveling off of CO_2 emissions in 2014 and 2015[30] was the result of the combined effect of the economic trends discussed above—namely, falling coal consumption (particularly in China and the US), the rise in renewable energy, the slowing of energy demand (due in part to the economic slowdown in China), and improving energy efficiency (lower levels of energy intensity).

Towards Decoupling?

For the neoliberal and "green growth" policy mainstream, the fact that these encouraging developments have occurred during a period of economic expansion is of immense ideological value. In particular, it allows its main representatives to argue that "we are winning" and "we are growing" are intrinsically linked, providing vindication of the market-driven and market-based paradigm. On this view, the data summarized above offers hope that economic growth will soon no longer be accompanied by rising emissions levels, thus breaking the pattern of more than two hundred years of capitalist economic activity.

In March 2016, the IEA stated, "the link between economic growth and emissions growth is weakening."[31] One month later, the World Resources Institute (WRI) reported that no less than 21 countries had decoupled growth from emissions. "This emerging trend," it noted, "demonstrates the feasibility, and increasing prevalence, of the transition to cleaner modes of economic activity."[32] For Nicholas Stern—perhaps the world's best-known defender of the potential for sustained and progressive "decoupling"—such a prospect would mean that his "better growth, better climate" is no longer just a hopeful formulation but is now unfolding at the level of the global economy.

Optimism Unpacked

We now take a closer look at the trends and data that have contributed to the recent optimism as well as to other data that tend to be overlooked by "we are winning" spokespersons. When viewed from this wider (and more complete) perspective, a very different picture emerges.

Overall Primary Energy Demand

One of the most important sets of data that undermines optimistic projections concerns the upward trajectory of overall energy demand. If demand for energy continues to rise, even if more slowly than GDP, then reducing emissions becomes far more difficult. According to the reference ("current policies") scenario of its latest *World Energy Outlook*, IEA projects that overall global energy demand will continue to increase robustly in the coming decades, rising by roughly one-third between now and 2040.[33] Projections from the US Energy Information Agency's *International Energy Outlook 2016* are similar.

BP's Energy Outlook 2035 projects a similar rise, with global energy demand growing by 34% between 2016 and 2035, while projecting that global GDP will more than double (+107%) during the same period.[34]

In other words, the major mainstream sources of data agree that recent improvements in energy efficiency, while impressive, will not reduce overall energy demand over the next 20–25 years.

The Crisis of Profitability in the Fossil Fuel Sector

Improvements in energy intensity and the recent economic slowdown in China have *slowed the rise* in global demand for energy, but demand continues to increase nonetheless. However, the slowdown occurred at a time when the global supply of coal, oil, and gas was increasing. In the case of oil, the increase in shale oil production in the US prompted OPEC to step up production in an attempt to drive out (mostly US) competitors who produce oil at higher costs. Similarly with gas: shale gas drilling in the US flooded the global market with excess supply, and prices fell accordingly.

We have therefore witnessed the overproduction of fossil-fuel-based energy, particularly oil and gas. This overproduction has led to a more than 50% collapse in the price of oil from early 2014 to early 2016 and a similar fall in the price of gas.[35] In the case of coal, the steady rise in consumption over the past two decades came to a grinding halt during the last two or three years as a result of the sharp fall in coal use in the US power generation sector and, even more significant, the slowdown in the Chinese economy. These factors have led to a *crisis of profitability* across the fossil fuel sector. This, in turn, has led to falling investment levels.

As noted above, the investment atmosphere for fossil fuels has also deteriorated as a result of the Paris Agreement along with shareholder and other forms of activism aimed at financial institutions and investors. It is therefore necessary to distinguish between the *political* challenges facing fossil fuel companies and their likely immediate and future impacts and the *economic* challenges precipitated by oversupply, falling prices, and the slump in investment.

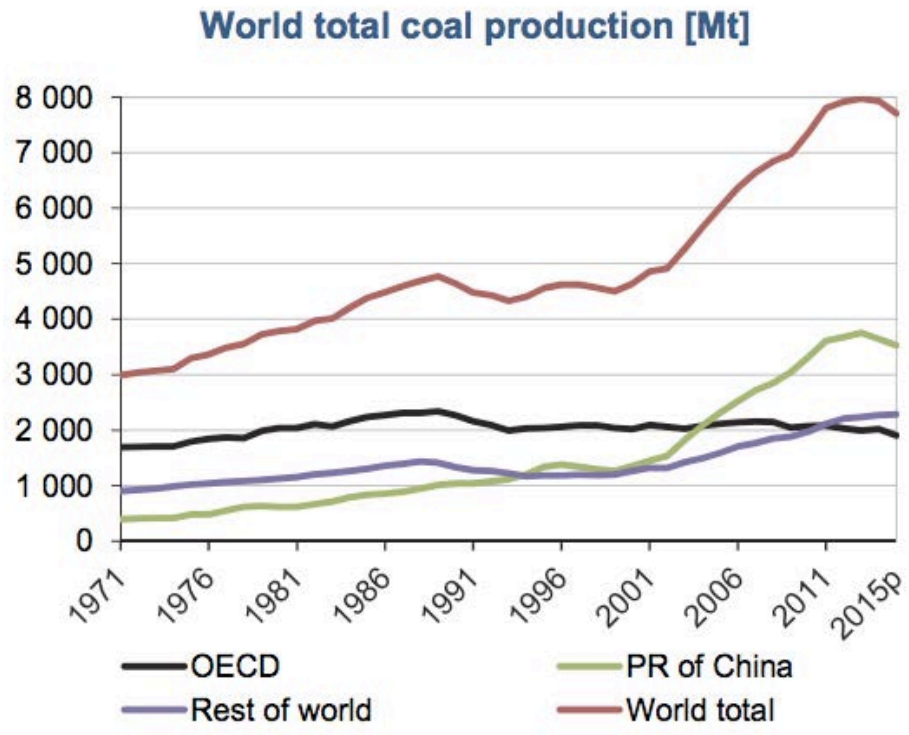
The optimistic narrative has tended to attribute the crisis of profitability to the deteriorating economics of fossil fuels *vis-à-vis* the growing competitiveness of renewable energy, thus giving the impression that the economic position of renewables is strengthening and that this is happening *at the expense of fossil fuels*. Similarly, falling investments in fossil fuels are often juxtaposed against rising levels of investments in renewable energy, giving further weight to the idea that there is a simple, interdependent, "zero-sum" relationship between fossil-fuel-based power and renewables.

This will be discussed in more detail below, but for now it is safe to say that the present crisis of profitability facing fossil fuels is largely the result of global oversupply, which has led to falling prices and, finally, a slump in investment levels. The slowing down of energy demand and rising levels of energy efficiency have also contributed to this. However, the impact of renewables on the crisis of profitability is currently quite marginal. It is also worth noting that since early 2016, gas and oil prices have rebounded significantly as the market adjusts to the imbalance between supply and demand.[36] If this continues, the profit margins of oil and gas companies are likely to improve.

Coal's Crisis in Perspective

Led by China and the US, the recent slump in global coal use has attracted considerable attention and has been seen as a sign of a shift in the global energy system—a shift in the right direction.

But it is important to remember that global coal use has *doubled* since the mid 1980s. In non-OECD countries, coal use for electricity has



Source: IEA, *Global Coal Trends*, August 2016.[37]

grown by 748% since 1971, according to recent IEA data.[38]

The enormous growth in global coal use in recent decades has, in the past two or three years, clearly stalled. The three percent annual drop in global coal consumption in 2015 actually constituted a new record. But the significance of the three percent fall has been overstated. According to one major NGO, 2015 was apparently "the year global coal consumption fell off a cliff."[39] Particularly misleading is Nicholas Stern's declaration that China had, in 2015, "entered the era of post-coal growth."[40] To use this term to describe a country whose coal consumption rose a staggering 560% from 1980 to 2013 and that today burns roughly half the world's annual coal production is clearly ludicrous.[41] China's use of coal may have peaked, but to suggest that it has entered "an era post coal growth" reflects a commitment to finding an optimistic interpretation of the facts that has become both desperate and dishonest.

Rising Levels of Gas Consumption

Another important trend that is seldom referenced by the optimists is the global rise in the use of gas—even though this is one of the main drivers of falling coal consumption. Globally, gas consumption grew by 2.2% in 2015, only slightly lower than its 2.4% average annual growth over the past decade.[42] In the US, the growth of gas-fired electricity generation has been largely at coal's expense, and this trend is expected to continue. The US Energy Information Administration (EIA) forecasts that gas will surpass coal as the dominant US power generation feedstock in 2016, mainly as a result of the availability of cheap shale gas.[43] BP projects that, globally, gas will surpass coal as the leading fuel source for primary energy around 2030.[44]

BP's *Statistical Review of World Energy 2015* also shows how, when measured in Metric Tons of Oil Equivalent (Mtoe), the global growth of gas consumption in 2015 (69.3 Mtoe) was considerably *larger* than the growth in renewable power (48.3 Mtoe).[45] The fact that energy generated from gas is today growing faster than energy generated by renewables does not sit comfortably with the "end of fossil fuels" optimism, but the rising level of natural gas consumption is nevertheless a key feature of the changes currently taking place in the global energy system. It is also a change with potentially enormous consequences due to "fugitive" methane from fracking operations—an issue to which we return below.

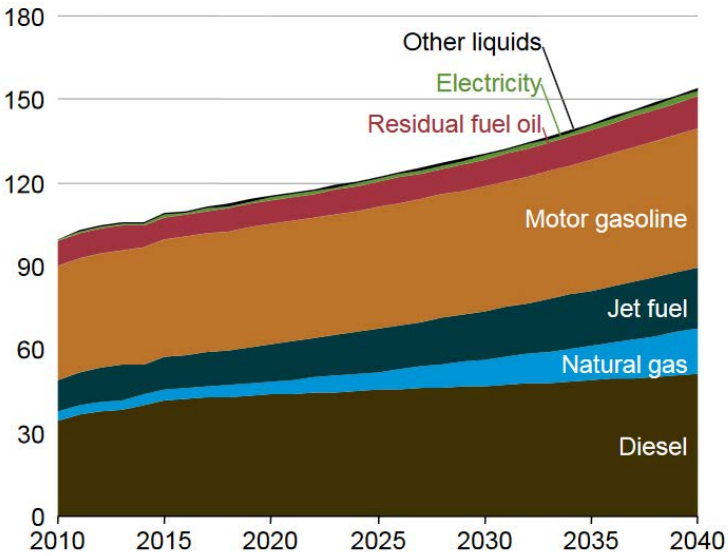
Global Oil Consumption and the Transportation Sector

Accompanying the growth in the global use of gas is a rise in global oil consumption. According to recent IEA data (August 2016) oil demand for the fourth quarter of 2016 had risen to a little over 97 million barrels per day (bpd), up from 93 million bpd in the same period three years earlier (2013). According to BP, oil production also rose in 2015, by 3.2%.

The growth in oil consumption is not difficult to explain. In power generation, renewables provide an increasingly viable alternative to coal and gas, but oil-based fuels are overwhelmingly dominant in the transportation sector. Low oil prices may have impacted oil-sector profits and depressed upstream investment, but these same low prices have led to increased consumption. The transportation sector in 2012 accounted for 25% of total world delivered energy consumption. However, transport-related energy use is expected to increase by 1.4% each year from 2012 to 2040, with non-OECD transportation energy use increasing by 2.5% annually, according to the EIA.[46]

Cheap oil has bolstered the global sales of cars and light trucks, of which almost 89 million were purchased in 2014. This marks a 16% increase since 2011, and more than quadruple the annual sales recorded in 1965. Of the 89 million vehicles sold in 2014, fewer than 600,000 were powered by electricity (EVs)—considerably less than one percent.[48] Curiously,

World transportation sector delivered energy consumption by energy source, 2010-40 (quadrillion Btu)



Source: EIA, 2016.[47]

the IEA's *Global EV Outlook 2016* declared 2015 "the year electric vehicles went mainstream," while at the same time pointing out that EVs reduced oil demand by only 10,000 barrels per day, a mere 0.01% of daily oil consumption.[49] Again, the headline's optimism is completely out of step with the sobering reality presented by the data.

Meanwhile, according to the IPCC and the IEA, transport-related emissions are currently around 17% of total global GHGs and transport generates 24% of global emissions from fuel combustion[50]—levels that are expected to continue to rise. In the OECD countries, transport contributes up to 30% of emissions in some instances, but countries like China and India are in a phase of rapid motorization. According to the IPCC, the ownership of light duty vehicles (LDVs) is expected to double in the next few decades, from one billion vehicles to two billion, with non-OECD countries accounting for two-thirds of new vehicle purchases.[51]

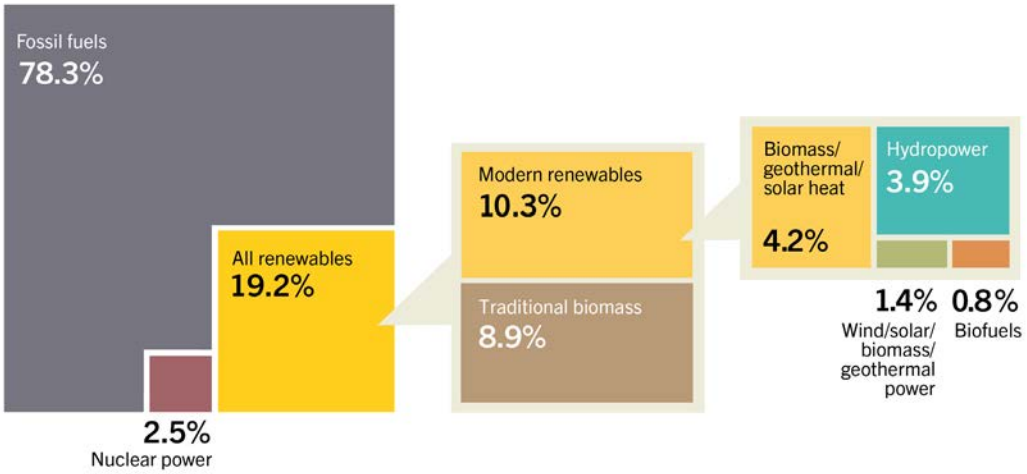
Renewable Energy's Growth

Renewable energy's impressive rise is one of the main arguments supporting the idea that the world is "moving away from fossil fuels." Of course, the steady global rise in the use of gas and oil, shown above, should be enough to refute this claim. But the impressive growth of renewables has kept alive the idea that a full-force energy transition is underway in power generation, which remains the world's leading source of CO_2 emissions.

What the data actually show is that, at the end of 2015, wind and solar PV combined still generated just 4.9% of global electrical power.[52] Hydropower remains the main source of renewable energy and accounts for more than 16% of electricity generation globally. But while hydro capacity is rising roughly 3% per year, much of today's capacity was installed decades ago, and its potential for further expansion is far more constrained than for so-called "modern renewables" like wind and solar, so the main hope for a renewables-based electricity sector currently rests on these two technologies.

According to REN21, fossil-fuel-based and nuclear power still accounts for 76.3% of global electricity production. If we include other sectors, such as transport and agriculture, fossil fuels currently account for 78.3% of energy consumption globally.

Estimated Renewable Energy Share of Global Final Energy Consumption, 2014



Source: REN21, *Renewables 2016 Global Status Report*.

Given the currently low levels of wind and solar power generation globally, it is highly misleading to suggest that renewable energy is displacing fossil-fuel-based power. The percentage of electricity generated by fossil fuels—66% in 2015 according to the IEA—has barely changed since 1990, while at the same time the volume of electricity generated has grown globally by roughly 50%, having accelerated since the early 2000s.

The rise in investment levels for renewables is certainly very significant. As noted above, investment in generation capacity of renewables in 2015 was more than double that of fossil fuels. UNEP's claim that this signals a "structural shift" should be monitored over the next several years, but beneath the headline even UNEP acknowledges that the significance of this investment milestone needs to be seen in context of "the huge weight of conventional generation capacity already built" and recognizes that "new, clean technologies only accounted for just over 10% of world electricity [in 2015]."[53]

In 2012, the IEA estimated that in order to be consistent with containing warming to two degrees Celsius, investment in renewables would need to be in excess of $1 trillion each year, from 2012 to 2050.[54] According to Bloomberg New Energy Finance, total global investment in renewable energy for 2015—a record year, surpassing the previous record in 2011 by three percent—amounted to just under one-third of the required level, at $329 billion.[55]

Are the Projections for Renewables Wrong?

Some research groups and NGOs have accused organizations like the IEA of being too conservative in their projections for renewable energy. Those challenging the IEA's projections note that the 400% increase in non-hydro renewables since 2003 suggests that renewable energy is growing *exponentially*, and falling prices for renewable energy, coupled with rising political pressure to reduce emissions, will see renewables grow dramatically in the coming decades.

Supporting this argument, energy analyst Adam Whitmore showed that in each of its recent annual *World Energy Outlook* (WEO) reports, the IEA has needed to modify its projections to "catch up" with the reality of much faster deployment levels than it had previously projected.[56]

Another important challenge to the IEA's *WEO* projections has come from the Energy Watch Group (EWG), an international network of scientists and parliamentarians. In a September 2015 report,[57] the group also showed how wind and solar had outperformed the levels of deployment the IEA projected under its "New Policies Scenario" (NPS).[58] EWG points out that, in its *WEO* of 2010, the IEA's NPS projected that solar PV would only reach 177.6 GW of installed capacity in 2024—a level it actually achieved in January 2015, nine years earlier than projected. (The 177.6 GW of installed capacity actually achieved in 2015 was roughly triple what IEA had projected for that year.) Similarly, the IEA's *WEO 2002* projections for wind energy in 2030 were exceeded in 2010.

The core of EWG's argument is that IEA continues to assume *linear* rather than logistic growth for the deployment of renewables.[59] In other words, IEA's projections fail to take account of the *accelerating* growth of renewables over the past decade—an acceleration that EWG projects can and perhaps will continue.

In light of these criticisms, it is prudent for unions to carefully monitor the actual growth of renewable power and compare this growth to projections from IEA. The same should apply for the projections of all the studies cited in this paper, which invariably fall well within the policy mainstream. The claim made by EWG and oth-

ers—that renewables will continue to outperform IEA projections by some distance, annual modifications notwithstanding—may turn out to be correct.

However, exceeding IEA projections is one thing; a decisive shift towards renewable power in the electricity sector—within the timeframe necessary in order to limit dangerous climate impacts—is another thing entirely. UNEP and BNEF data show that, in 2014, 103 GW of renewable energy capacity (wind, solar, and small hydro) came on line globally. As a result, the proportion of electricity generated by renewables (excluding large hydropower) grew 0.6% in 2014, to 9.1%. Meanwhile, the proportion of fossil-fuel-based electricity fell by 3.2% in the two-year period between 2012-2014.[60] These changes are significant, but they do not yet signal the kind of transformation of the power sector that the optimists say (and perhaps believe) is already underway. Relative changes within the overall energy mix should not be confused with changes in the overall levels of production and consumption of any given form of energy. By focusing only on the levels of growth achieved in deployment of renewable energy in recent years, outside the context of the broader growth in overall energy demand and consumption during that same period, we risk drawing conclusions that are completely out of touch with reality.

The Challenge Facing Renewables-Based Generation

The extent of the challenge facing those fighting for a renewables-based energy future was captured in an April 2015 assessment offered by energy analyst Jesse Jenkins.[61] Jenkins considered two scenarios:

- **Scenario 1** entailed a linear growth of renewable energy capacity at 100 GW a year, meaning "renewables would continue with strong percentage annual growth for the next few years, but see the growth rate decline over time."

- **Scenario 2** entailed global non-hydro renewable electricity generation expanding at a compound annual growth rate of nearly 10% per year, which would mean renewable generation would double roughly every 7 years.

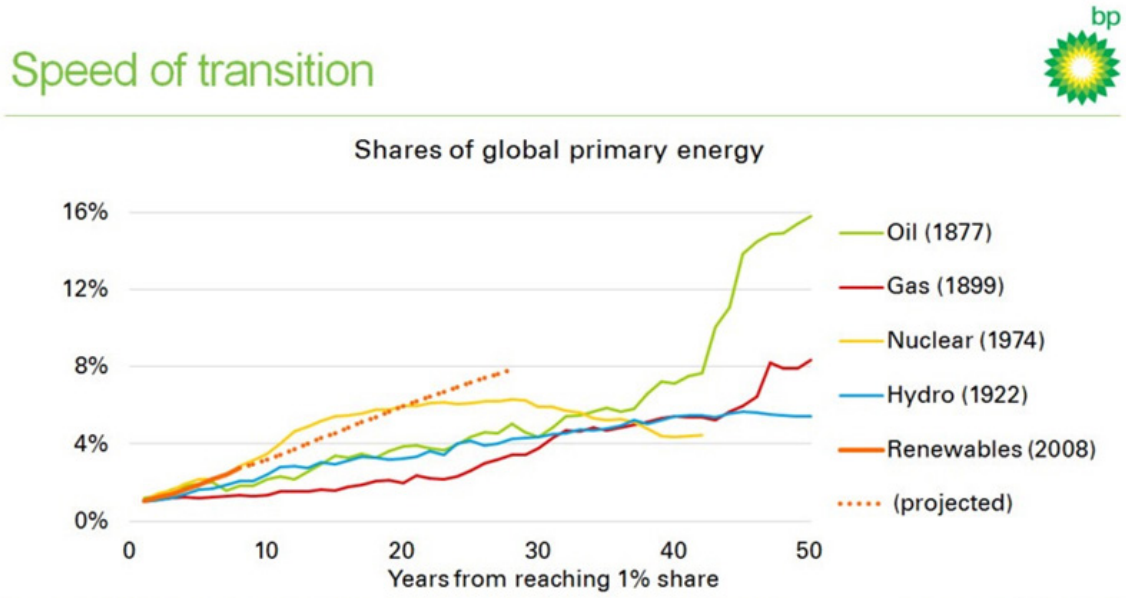
Jenkins examined both scenarios in the light of an anticipated 80% growth of global electricity demand between 2015 and 2040 (based on IEA projections), as well as considerable growth in both large hydro and nuclear power generation. He concluded that linear growth (100 GW per year) would actually see the proportion of renewables-based generation *decline* over time. Merely *sustaining* renewables' present share of 10% would require 286 GW of new capacity coming on line each year. According to Jenkins, "Renewables will keep fossil energy's *share* of the global electricity market from expanding much in this scenario, but as global demand is growing as well, fossil fueled electricity generation will continue to increase in absolute terms."

Meanwhile, Jenkins argues that the levels of exponential growth assumed in Scenario 2—doubling every seven years—cannot be sustained. As he points out, "The simple mathematics of compounding growth [means] it will take far more effort to sustain 10% growth a decade from now than it does today."

Importantly, the only way renewable energy can begin to displace fossil fuels in the electricity sector is if they grow *faster* than the global demand for electrical power. This would require renewable power generation to grow by 30% per year in order to hold the proportion of fossil-fuel-based power at present levels. Renewables would need to grow by 40% or so per year in order to shrink the proportion of fossil-fuel-based power by roughly one percent per year

(assuming nuclear and large hydro remain more or less constant in terms of their share of power generation).

BP's *World Energy Outlook* draws attention to an additional set of sobering data regarding projected rates of deployment for renewable energy sources. Specifically, the report provides historical data for the uptake of oil, gas, nuclear, hydro, and renewables, starting the clock at the point where each source had achieved 1% of the overall fuel mix. *In no historical case has any new energy source achieved 8% of the overall energy mix in less than 40 years*. According to BP, it will require another 20 years before renewables will reach 8% share of the total energy mix.[62]



Source: BP, *World Energy Outlook*

If displacing fossil fuels in electrical power generation were not formidable enough, displacing them in the overall energy mix will be even more difficult, given the deeply entrenched, systemic dependency on fossil fuels in transport, heating systems, and industrial agriculture.

Are Emissions being "Decoupled" from Economic Growth?

The announcement that CO2 emissions had leveled off in 2014, and then again in 2015, made headlines around the world.[63] According to BP's data, emissions rose 0.5% in 2014[64] and just 0.1% in 2015.[65] Such a dramatic slowdown has never occurred during a period of economic growth. Nevertheless, the suggestion that slowing emissions means the global economy is heading towards a "decoupling" of growth from emissions is deeply misleading, for several reasons.

First, the World Resources Institute's (WRI) claim (discussed above) that decoupling constitutes a "global trend" fails to account for the fact that *19 of the 21 countries that are apparently leading this trend have effectively "offshored" much of their carbon footprints* by way of deindustrialization and a shift towards service and "knowledge" sectors. A number of studies have shown that, if the embodied or embedded carbon in imported products were taken into account ("consumption-based accounting") the emissions levels of the richer countries, rather

than falling, would show a significant *increase* in recent years.[66]

Second, growth in emissions from the energy supply sector accelerated from 1.7% per year during the period 1990–2000 to 3.1% per year from 2000–2010.[67] For this reason, while the recent deceleration of emissions levels over the last two or three years is noteworthy, it follows a period of particularly high annual increases. On its own, a deceleration does not signal a "turning point." Historically, the growth of emissions has seen many periods of deceleration that turned out to be temporary. Indeed, UNEP's *Global Trends in Renewable Energy Investment 2016* stated that energy-related emissions are not forecast to peak until the late 2020s at the earliest. "The emissions trends for the power sector," reported UNEP, "remains alarming despite the commitments made in COP 21."[68] The IEA notes that, even if the "national contributions" (INDCs) in the Paris Agreement are fully implemented, emissions will remain on an upward course. According to the IEA, "There is no peak in sight for world energy-related CO_2 emissions in the INDC Scenario: they are projected to be 8% higher than 2013 levels in 2030."[69]

Third, as with data on global coal consumption, the inconvenient history of CO_2 emissions over several decades cannot be brushed aside by two or three years of lower annual increases. Emissions to date have already produced a historically unprecedented and dangerous level of atmospheric CO_2, now over 400ppm, possibly permanently. For this reason, while the recent *slower* rate of emissions growth indicates a *decrease* in the rate at which damage to the earth's climatic system is being done, this is hardly sufficient cause for celebration. The scientific consensus demands the steady *reduction* of emissions. Increasing emissions more slowly is therefore emphatically not a "step in the right direction." It is, rather, another step in the *wrong* direction—one that makes the Paris targets even *more* difficult to achieve.[70]

Finally, a meaningful assessment of progress towards meeting GHG emissions reduction targets cannot be limited to CO_2 emissions alone. Anthropogenic emissions of non-CO_2 GHGs—mainly methane, nitrous oxide, and fluorine compounds—have been estimated to make up roughly 25% of total GHGs, as measured in "CO_2 equivalent" (CO_2e),[71] although there is reason to believe that even this figure may be far too low (see below). For this reason, we cannot meaningfully assess progress towards meeting GHG emissions reduction targets while looking at CO_2 alone. It is necessary to include data on methane and other gases. Methane is especially important, and we must now consider it in more detail.

Methane: An Under-Reported Threat

Methane's contribution to global warming has become a source of controversy in recent years. Studies have shown that global emissions levels for methane are increasing, and scientists have estimated that 40% of the increase is due to the growth of the oil and gas sector.[72] For several years now, peer-reviewed studies in the US have shown how drilling for shale gas and shale oil, along with hydraulic fracturing, releases large volumes of "fugitive" methane into the atmosphere.[73]

However, there is also clear evidence that gas companies have underreported the levels of methane being vented or leaking from drill sites and have funded "studies" that have been used to suggest that the quantities of methane being released are far lower than they actually are.[74] A comprehensive atmospheric study released in November 2013 by Harvard University's Department of Earth and Planetary Sciences claims that, based on methane measurements in the south-central United States, the oil and gas industries may be emitting nearly five times the methane that had previously been estimated by the Emission Database for Global Atmospheric Research (EDGAR).[75]

More recently, a study published in the scientific journal Nature looked at carbon isotopes to identify the "fingerprints" of atmospheric methane, in order to get a more accurate picture of the contributions from various sources. The authors found that after accounting for certain natural sources of methane (e.g., geological seepage), "emissions attributable directly to the global fossil-fuel industry (natural gas, oil and coal production) are 20–60% higher" than currently counted in global inventories.[76] While improvements made by the natural gas industry in recent years have helped lower the rates of methane leakage from their operations, the impact of such improvements has been negated by increases in production.

It would be difficult to overstate the significance of this issue. Even a modest level of methane leakage from drilling sites—between 1.5%–3%—would effectively cancel out all the GHG-related benefits of burning gas instead of coal.[77] Per molecule, the global warming potential (GWP) of methane is far higher than that of CO_2: 34 times higher than CO2 as a heat-trapping gas over a hundred-year time scale, and 86 times more powerful over a twenty-year time frame, according to the IPCC.[78] In the US, the Environmental Protection Agency (EPA) has continued to refer publicly to the global warming potential (GWP) of methane as "more than 25 times greater" than CO_2 over a hundred-year time scale, which is forty percent lower than the GWP of methane used by the IPCC for the same time scale.[79] Noting that methane has a lifetime of just 12.4 years in the atmosphere, IPCC scientists have proposed using a twenty-year time frame to set emissions reduction targets, rather than the somewhat arbitrary hundred-year time frame currently in use.[80]

Based on these calculations, leading climate scientist Cornell Professor Robert Howarth recently told the White House, "Total greenhouse gas emissions—after dipping slightly in 2007—have been rising since at their most rapid rate ever, due to shale gas development and large methane emissions…. Reliable data from satellite and airplane surveys show much higher emissions and indicate that global increases in methane in the atmosphere over the last decade may well be the result of increased emissions from the United States."[81] Elsewhere Howarth notes, "Because of the increase in shale gas development over recent years, the total greenhouse gas emissions from fossil fuel use in the USA rose between 2009 and 2013, despite the decrease in carbon dioxide emissions…. In this analysis, methane contributes 28% of total fossil fuel emissions for the USA in 1980 and 42% in 2013."[82]

Clearly, any calculation of global GHG emissions data that either ignores or undercounts the contribution of methane from shale gas and shale oil drilling must be rejected. To be fair, as its title suggests, *Trends in Global CO_2 Emissions: 2015 Report* does not claim to be anything other than a report on CO2 emissions. It is not a report on GHG emissions as a whole. That is why "good news" reporting based on such data alone is misleading. Accounting for the global warming potential (GWP) of all GHGs would, the evidence suggests, tell a different story altogether—a story that sharply conflicts with the "we are winning" narrative.

The Paris Targets and the Emissions Challenge

In the context of the science-based targets adopted at COP21 in Paris ("well below 2 degrees Celsius" and "net zero emissions"), slowing or even halting the rise of emissions is simply not good enough. As noted above, energy use and emissions levels are rising more slowly than global GDP, but they continue to rise nonetheless.

Meanwhile, many who share the "we are winning" optimism acknowledge there is still a long

way to go in the battle against emissions and climate change. But just how far is "a long way"?

Numerous studies have attempted to answer this question. The IEA, EIA, BP, and others all acknowledge that, in the context of continuing economic growth and rising energy use, the challenge to reduce emissions to the levels required by the science is daunting, bordering on impossible. A landmark 2012 paper by PricewaterhouseCoopers (PWC) entitled *Too Late For Two Degrees?* calculated that "the required improvement in global carbon intensity to meet a 2 degrees Celsius (2°C) warming target has risen to 5.1% a year, [every year] from now to 2050." Governments' ambitions to limit warming to 2°C, it concluded, seemed "highly unrealistic."[83]

Two years later, in 2014, the actual annual reduction in carbon intensity had increased from 1.3% to an unprecedented 2.7%—a major improvement. But in its 2015 report, PWC says, "Our analysis concludes that to prevent warming in excess of 2°C, the global economy needs to cut its carbon intensity by 6.3% a year, every year from now [2016] to 2100."[84] In other words, *in just two years the required annual improvements in carbon intensity to stay within the 2°C threshold increased from 5.1% to 6.3%*. If the actual improvements continue at roughly 3% per year for even just a few more years, the subsequent annual required improvements would be impossible to achieve.

These are startling numbers. They capture the enormous challenge posed even by the two degree Celsius threshold. The challenge of keeping overall warming "well below two degrees Celsius"—as adopted at COP21 in Paris—is even more formidable. Unions and their allies must face the reality of this challenge head on and be absolutely clear about its implications.

Conclusion: Toward Winning, for Real

The only way to avoid the pessimistic scenarios will be radical transformations in the ways the global economy currently functions.
— PricewaterhouseCoopers, Too Late for Two Degrees?[85]

We are still emitting massive amounts of CO2 annually—around 36 billion tonnes from fossil fuels and industry alone. There is a long way to net zero emissions.
— Corinne Le Quéré, Tyndall Center, UK[86]

An acceleration in the transformation of energy use and production is needed to set global emissions on course to complete decarbonization, as required for climate stabilization.
— Global Carbon Project[87]

In this paper, we have shown that the world is not moving away from fossil fuels, and that the "era of fossil fuels" is certainly not over. We have also shown that, while renewable energy is growing quickly—and perhaps significantly more quickly than suggested by established sources such as the IEA—the transition to a renewables-based electricity system is proceeding only incrementally. There is, therefore, no basis for the belief that a substantial transition away from fossil fuels is either imminent or inevitable. Meanwhile, other key economic sectors (most

obviously transport) continue to be almost entirely dependent on fossil fuels.

These conclusions are broadly consistent with the analysis offered in the TUED framing document *Resist, Reclaim, Restructure: Unions and the Struggle for Energy Democracy*, published in early 2013. Not only do the trends that are plainly observable today run counter to the "we are winning" optimism, the climate challenge under the current economic system grows more formidable with every passing year.

When seen in the context of the Paris targets, it is clear that optimistic interpretations of the present trends and developments in the global energy economy—some of which even proclaim an imminent decoupling of growth from emissions—are not only groundless; they are also deeply misleading. Moreover—and of even greater concern to those fighting for a viable and just future—such interpretations are distracting and politically disarming.

Movement Rising

What has changed in the four years since *Resist, Reclaim, Restructure* was written is the impressive growth in awareness and activism in many parts of the world—around "extractivism" and climate change and in search of viable alternatives to the continuing expansion of fossil-fuel-based energy.

Divestment activism has also had a significant impact, as fossil fuel interests have been targeted by those who have raised both moral and economic arguments as a means of influencing investors both small and large. Proposed fossil fuel projects, such as new mines, drilling sites for shale gas and oil, power stations, pipelines, refinery expansions, and coal and gas export terminals, etc., are today almost routinely challenged in many parts of the world by community groups, farmers, peasants, indigenous people, and—in some instances—unions.[88] This rising movement can be a source of genuine optimism for unions and social movements everywhere.

Programmatic Shift

Unions around Trade Unions for Energy Democracy, the "Climate Jobs" campaigns, and other initiatives have pointed out that, as a movement, we can call for "more ambition" on the part of world leaders to address climate change, but we must also address our movement's own "ambition deficit." At the level of program, more unions are openly supporting calls to extend public control and social ownership to power generation and other key sectors. Led by the ITUC, the idea of "just transition" has not only been incorporated into the Paris Agreement, it has opened up a global debate about the need for just transition measures at the level of individual workers and workplaces, communities, labor market policies and protections, and—over time—by way of deep restructuring of the global political economy.

One of the political features of the post-Paris period so far has been the growing willingness of both key actors and hard working activists from a range of movements to accept that radical change is needed. There is a heightened understanding of both the *urgency* of the crisis and its *systemic* roots.

A growing number of unions today also acknowledge the massive distance between the requirements established by the scientific community and the likely developments at the level of the "real economy." This was laid bare by the Paris outcome. Awareness of the gulf between the capitalist political economy and the need for a radical change of course has not just given impetus to the climate movement; it has also helped make it more militant and determined. This has coincided with the rise of other movements and social forces that intersect with the

climate and labor movements around racial justice, anti-austerity and the fight against corruption, and the erosion of democratic rights.

Our Optimism

The challenge facing human civilization is sobering. But the challenge appears more manageable when it is connected to a narrative that is prepared to confront existing ownership relations. The struggle for democratic control of energy (and other key sectors) is today crucial for many reasons. Achieving such control over energy production, distribution, and use is a means (but not the only means) to confront the expansionist dynamics of the political economy while at the same time reconfiguring our approach to defining and meeting human needs on the basis of a more equitable distribution of wealth and a qualitative extension of democratic control over major economic decisions.

Energy systems controlled by ordinary people in partnership with well-run and accountable public agencies have the potential to manage and reduce energy demand for certain economic activities while providing electrical power to everyone for basic needs and truly sustainable forms and levels of human and social development. This comes with the potential to dramatically but sensibly scale up renewable sources of power and to plan a phased and rapid transition away from fossil fuels—a transition that will be liberated from the destructive logic of profit and commodification. An ambitious deployment of renewable energy, outside of a forced dependence on chaotic markets, would provide a platform for the development of low-carbon mobility, aided by public transport. It would also enable us to begin to re-imagine the further development of our neighborhoods, communities, and cities and allow for the development of sustainable farming, posing an alternative to fossil-fuel dependent industrial agriculture.

By promoting a false optimism, the advocates of "green growth" have decoupled their own ideologically driven aspirations from indisputable and genuinely grave realities. Their historical mission—to be the pioneers of a new phase of "sustainable" capitalism—has been a complete failure. Their attempt to keep this mission alive is now based on the selective and misleading presentation of certain facts, while at the same time turning a blind eye towards the larger and much more disturbing picture. This reveals a level of desperation reminiscent of elite groups in the past—be they slave owners, feudal lords, or colonial rulers—who declared a new dawn just as the sun was disappearing beneath the horizon.

It falls to us to face the bleak reality that the world's ruling elites have created and embrace the real source of hope: *our* communities, *our* movements, *our* organizations, *our* people. It falls to us to move the world away from fossil fuels. No one else will do it.

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88. Naomi Klein has written eloquently of the emergence of "blockadia"—a new generation of "climate warriors" fighting front-line battles to protect their homes and the planet. In places ranging from the Niger Delta in Nigeria to Cuninico in Peru to Standing Rock, North Dakota, local and indigenous communities have fought back against extraction and transportation projects that threaten the soil, water, and air on which they depend. Such struggles stand as vital examples of what is both possible and necessary to secure the transition to a livable future that we urgently need.