1) **Attempt to close down summit, not lobby it.**
2) Attempt to delegitimise Kyoto process rather than appeal to reform or improve it just so that it can continue in a new form.
3) Best solution to climate change is rapid transition to 100% renewable energy
4) Access to energy is a human right, not a privilege. As such it should be free or low cost.
5) Energy resources, infrastructures and technologies should be based on common/public ownership as a not-for-profit sector that is outside of the world market, regardless of which energy sources.
6) A rapid transition away from fossil fuels will require common ownership of fossil fuels themselves, and associated infrastructures and technologies. (Note: I am currently writing an article on this theme).
7) Workers within the fossil fuel and nuclear energy sectors can play an important part in assuring a "just transition" away from these energy sources.
8) Capital has to pay the cost of rising petrol prices, not ordinary people.
9) "Peak Oil" will not be allowed to become an excuse for imposed austerity in the face of high profits from oil (and other energy) multinationals.
10) Similarly, climate change must not become a justification for coercive policies that limit freedom of movement and association.
11) Support for the initiative to create an International Renewable Energy Agency (IRENA), (http://irena.org/)and view it as by far the most progressive item on the "established" international agenda, but are also questioning its potential, since it is being established within the framework of the world market and capitalist relations.
12) A long term solution to the current energy and climate crisis is not possible within the framework of capitalist social relations.

Kolya Abramsky

Energy and Labor in the World-Economy

> This ship is a floating transporter of labor…about 5 million emigrate to find work…it's got 750 passengers…you can tell by looking at faces and hands that many are farmers, country people…the same poor sods who spent last night out on the sidewalk...the same people who are pushed and shouted at…who wait in huddled groups, for some official to deign to notice their existence…Their faces and their clothes are the color of the earth. Dark and Brown.[1]

1 Description of a ship transporting migrants for work in the oil industry in the Persian Gulf. *Midnight Notes, Midnight Oil: Work, Energy, War 1973-1992* (New York: Autonomedia, 1992), pp. 67-70. The similarity between this description and classic descriptions of slave ships during the Atlantic slave trade is striking.

> Dynamics of social conflict had far-reaching impacts on the historical evolution of large-scale energy industries…Given the pervasive influence of social movements in the evolution of modern energy systems, it is surprising that mainstream energy literatures have so often treated workers and activists as irrelevant or passive agents. The inattention to social dynamics of unrest is why mainstream analysts have been frequently unable to forecast eras of radical change in global energy industries.[2]

Part 1 Introduction, Towards Researching Energy and Labor in the World -Economy

This paper aims to lay the basis for a more in depth analysis of energy and labor in the world-economy which I intend to do in the future. I will point to two tasks. These are a) mapping the world-wide division of labor within the energy sector, b)tracing the relations that produce and shape this division of labor, and how the different parts relate to one another, within a wider analysis of capitalist relations. This paper will limit itself to the first task, only very superficially touching on the second one, which I will leave for the future.

This paper will identify, and partially answer, three broad questions.

1. How does energy relate to labor in general?
2. How does labor within the energy sector specifically operate?
3. How can an understanding of energy and labor contribute to understanding current concepts such as "energy crisis" and "transition towards renewable energy"?

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2 Bruce Podobnik, *Global Energy Shifts: Fostering Sustainability in a Turbulent Age* (Philadelphia: Temple University Press, 2006), p. 21.

Before starting, I will give some general definition of terms used in this paper, regarding both energy and labor.

Throughout history, different energy sources have been used at different times and places and in different combination with one another. There are multiple different energy sectors. These include, or have included, whale fat, wood, peat, coal, oil, nuclear, wind, solar, natural gas, bio-fuels, hydro-electric, cow dung. Each of these sectors has a specific division of labor associated with it. Energy requires technology to transform fuels for use as, for instance, motive force, heat, light etc. Examples of this are petrol and the internal combustion engine, or coal and the thermo-electric power station. Finally, energy may be more or less commodified.

Labor is understood in the broadest sense of the word, including anyone whose labor (or land or other natural resources) needs to be harnessed and/or commodified in order to produce surplus value. It does not prioritize industrial labor in the factory, nor urban labor over agricultural labor, nor waged labor over unwaged, nor "free" over "forced". Furthermore, it is based on the premise that real material hierarchies and conflicts of interest between workers exist.

In order to show the global dimensions of the division of labor associated with energy production, distribution and consumption, I refer to a map by Brooke Singer[3]. Singer's map depicts the flows of oil into the USA at the current moment in time, together with a

3 Brooke Singer, "The US Oil Fix," in Lize Mogel and Alexis Bhagat (eds.), *An Atlas of Radical Cartography* (Los Angeles: The Journal of Aesthetics & Protest Press, 2007).

number of social indicators associated with the populations of the countries which supply oil to the USA. This map is used as an example, in order to visualize some of the questions related to energy today and possible future scenarios. As the country with the highest per-capita energy consumption in the world today, the USA obviously plays a key role in the world-wide division of labor associated with energy. Later in the text, there will be a section devoted to discussing the specific situation of energy in the USA.

Part 2 Energy and Labor

> While machinery does not necessarily need inanimate energy, most modern machinery is totally and increasingly dependent on such energy. Historically, increases in both absolute and relative surplus values have required increased energy inputs.[4]

> [capitalism's] most successful means of containing working class struggle has been to produce technical relationships to make various energy inputs interchangeable in order to reduce dependence on inputs of human labor power as a proportion of the overall energy inputs animating dead labor. In doing this, individual capitals can better compete with each other by increasing the "productivity" of the input of human labor that remains.[5]

This section will examine the question of how energy relates to labor in general.

Throughout the history of the capitalist world-system, energy has impacted on labor in general in four important areas. 1) Mechanization has been used to enhance and/or replace human labor in order to increase productivity and manage class conflict, 2) artificial lighting has lengthened the working day 3) Cheap food, shelter, clothing and consumer goods have greatly reduced the cost of reproduction of labor. 4) Increasing the speed and reducing the speed of transportation has greatly increased labor mobility, both at a local level and world-wide, and for both forced and voluntary movement. As such,

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4 Peter Norre and Terisa Turner, *Oil and Class Struggle* (London: Zed Books, 1980), p. 15.

5 Thomas Keefer, *Of Hand Mills and Heat Engines: Peak Oil, Class Struggle, and the Thermodynamics of Production,* unpublished MA Thesis, York University, Toronto, 2005, p. 22.

energy has been a constitutive factor in shaping global class relations as a whole, not just within the energy sector. The replacement of coal with oil as the main global energy source throughout the twentieth century was particularly important for these processes.

Examples of these processes are numerous. The arc lamp was widely introduced in docks throughout the world in order to lengthen the working day of dock workers. Continuous production through shift work would have been impossible without cheap and readily available artificial lighting. Energy inputs have reduced the price of global transport, first through the steam ship and later the airplane to massively facilitate transnational migration, while cars have greatly increased the mobility of workers within countries.

Mechanization is a particularly important process through which energy and human labor impact on each other. It is worth examining the process in considerable detail. Energy is a substitute for human (or animal) work. The history of energy use is, for better or worse, a history of human labor being replaced or supplemented by outside energy sources – wood, coal, gas, oil, nuclear power, windmills…

Paradoxically, in the midst of all this "labor saving" technology, no one really does any less work than they did before. The wage relation that shaped the factory has not been done away with, nor have the unequal gender roles that shape so many households been replaced, nor have unwaged labor forms disappeared. Rather than doing away with unequal and exploitative patterns of work, energy-intensive appliances, vehicles and machines have simply rearranged people’s working patterns and structures. In fact, the replacement of human beings by machines and robots has often created huge pools of

deskilled and unemployed workers in its wake, and has frequently been met with resistance from workers.

However, it would be wrong to view the replacement of human labor as an unintended side effect of mechanization. Throughout the ages, mechanization has often been introduced *precisely* in order to replace and subvert human labor—that is, organized and rebellious human labor that threatens to escape the control of those who seek to control it, whether they be landlords, factory owners or agricultural companies. The Luddites stand out famously here, for smashing the looms which threatened their livelihoods[6].

> From the capitalist perspective, energy is recognized as the fundamental *technological tool for the international control of the working class*. First of all, *it is a replacement for labor*. Since World War II, capital has increasingly dealt with the working class on a daily basis by replacing labor with energy…In its immediate application to the process of production, energy frees capital from labor. It follows that control over the availability and price of energy means control over the technological conditions of class struggle internationally and also control over economic development. (italics in original)[7].

A more recent example of this can be seen in the South African gold mines. Facing strong resistance from miners in the post-World War II period, the mine owners invested heavily in mechanization, in order to replace workers. This was seen as the most effective way of breaking class struggle. For every 10 kg of gold produced in 1950 ten men were employed, and 99,000 KWh of electricity used. In 1975, five men were employed and 180,000 KWh of electricity were used[8].

In addition to the above examples, important examples of these processes can also be

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6Karl Marx, *Capital Volume 1* (London: Penguin/New Left Review, 1976), p. 554.
7 Midnight Notes, *op. cit.*, p. 124.
8 Norre and Turner, *op. cit.*, p. 18.

seen in the USA, where energy has made an important contribute to US hegemony. However, these will be dealt with in a later section.

All of the above shows the importance of energy to the capital-labor relation *in general*, not just within the energy sector itself. Hence, a transition to renewable energy is of importance not just to labor within the energy sector but for *all workers*[9].

Part 3 Labor in the Energy Sector

> Listen! We ought to be in a wood choppers union! Chop wood for breakfast! Chop wood, wash his clothes! Chop wood, heat the iron! Chop wood, scrub floors! Chop wood, cook his dinner![10]

The commercial energy sector has always involved the labor of many different people and geographical locations world-wide, relying on global commodity chains that operate within the wider context of capitalist relations, relations which are geographically uneven and hierarchical. Historically, energy sector workers (at least in the waged sector) and their unions have been well organized both within countries, and between countries. In May 2006, the International Federation of Chemical, Energy, Mine and General Workers' Unions (ICEM), represented approximately 20 million workers organized in 379 industrial trade unions in 123 countries[11].

The fact that energy is a strategic raw material means that energy workers (as well as

9 Keefer, *op. cit*. See also Thomas Keefer, "Marx, Machinery and Motive Power: the Thermodynamics of Class Struggle." Published online at: http://www.wwei.info/mediafiles/wwei/website-files/Keefer.pdf . ; George Caffentzis, "No Blood for Oil - Energy, Class Struggle and War 1998-2004." Published online, 2005, at: http:// www.radicalpolYtics.org

10Miner's wife in the film by Herbert Biberman, *Salt of the Earth* (Independent Productions/ International Union of Mine, Mill and Smelter Workers, 1954).

11 International Federation of Chemical, Energy, Mine and General Workers' Unions (ICEM): http://www.icem.org/

workers in raw materials associated with the sector) are strategically positioned. In addition to being a highly profitable exchange value, energy also has an essential use-value. This has contradictory effects[12].

On the one hand, there is a need to extract a high surplus value from them and to ensure high levels of output. Historically, the energy sector has often involved highly coercive labor forms, especially in periods of intensified inter-firm and inter-state rivalry. Examples are numerous. Nazi Germany, lacking its own source of oil, set about (in addition to attempting to access the oil rich Baku region of the Soviet Union and oil fields in Romania) generating a form of synthetic gasoline. The Nazi state, together with the industrial company I.G Farben sets its armies of forced laborers to the horrendous task of producing this fuel from goal. Synthetic gasoline supplied the Nazi army with over half the fuel that it used throughout the war, and 90% of the Luftwaffe's. Allied bombers bombed the production site in 1944[13]. Other examples of highly coerced labor forms within the energy sector include: coal mines using forced labor in the African colonies, to supply the European imperial powers[14] and convict labor in the post-Reconstruction US South in order to provide for the US industrialization process[15]. The period prior to World War II witnessed a renewed wave of coercion in energy sectors, both in the US

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12 Beverly Silver, *Forces of Labor - Workers' Movements and Globalization Since 1870* (Cambridge: Cambridge University Press, 2003).
Giovanni Arrighi, and Beverly Silver et al, *Chaos and Governance in the Modern World System* (Minneapolis: University of Minnesota Press, 1999).
Podobnik, *op. cit.*
Timothy Mitchell *Carbon Democracy* (Binghamton: Graduate Student Sociology Conference, 2007).
13Daniel Berman and John O'Connor, *Who Owns the Sun - People, Politics and the Struggle for a Solar Economy* (Vermont: Chelsea Green Publishing Company, 1996).
14 George Padmore, *The Life and Struggles of Negro Toilers* (Hollywood: Sundance Press, 1931).
15Alex Lichtenstein, *Twice the Work of Free Labor - The Political Economy of Convict Labor in the New South* (London/New York: Verso, 1996), pp. 105-126.

New Deal and in Stalin's rapid industrialization drive. During the events preceding the 1979 Iranian revolution striking oil workers were literally pulled out of their houses at the point of a gun to resume production[16]. Contemporary examples include bonded migrant labor in the Persian Gulf oil states[17] and paramilitary repression against oil workers in Colombia[18]. In the renewable energy sector, Brazilian sugar workers face conditions akin to slavery as they produce the raw material for US ethanol supplies. This latter example will be discussed in greater detail later in the text.

On a different level, most non-commercial energy use is based upon non-waged labor. Throughout much of the world, especially in rural areas, people do not satisfy their energy needs exclusively, or even predominantly, through the commercial use of energy, but rather through the non-commercial use of dung, wood and other biomass that provide heat, lighting and cooking fuel. More than one third of humanity, 2.4 billion people, currently rely on these fuels for their daily energy needs. Collection of such fuels is most commonly done by women and children, as part of "domestic work" without recourse to wages and the (limited) protection that the so-called "formal economy" and its trade unions, or other organizational forms, may be able to offer[19].

On the other hand, the strategic positioning of energy sector workers has also given them a robust bargaining power in relation to their employers and governments (as well as

16Norre and Turner *op. cit.*, p. 299.
17*Midnight Notes*, *op. cit.*
18Colombia Solidarity Campaign numerous articles about Colombian oil workers available at: http://www.colombiasolidarity.org.uk/
19Hugh Warwick and Alison Doig, *Smoke - the Killer in the Kitchen: Indoor Air Pollution in Developing Countries* (London: Intermediate Technology Development Group, 2004).

other workers). Worker struggles have frequently resulted in improved conditions and wages etc, and have also frequently had a knock on effect on the condition of workers in other sectors. Examples of this phenomenon are also numerous. These include the coal miners in the British general strike of 1926, oil workers in Iranian revolution of 1978-7920.

Perhaps the contradictory positioning of energy workers is most visible in oil workers in OPEC countries. Oil workers struggles played an important role in pushing the price of oil up in the 70s:

> In the first place, the motivations of the OPEC governments lay neither in simple greed, as they were popularly depicted in the West, nor even in justified repayment for decades of exploitation as some of their apologists have argued Rather, the need for control over oil production, higher oil prices and balance of payments surpluses was dictated by the growing, uncontainable demands of the workers and peasants in those countries.21

The consequent high revenues from oil have on the one hand meant that many social reforms have been granted, such as education and healthcare (paid for by industrialization and "development"), combined with harsh repression.

Part 3 The USA – A Country of Cheap Energy and Expensive Labor

Brooke Singer's world-petrol-map22 graphically illustrates how utterly the USA has subordinated the rest of the world to its energy needs. Two parallel pictures emerge: one of absolute selfishness and insensitivity to the energy needs of the rest of the world, and another of extreme vulnerability and dependence. Why has the US economy and

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20Silver, *op. cit.*
Arrighi and Silver, *op. cit.*
21Harry Cleaver, **"Close the IMF, Abolish Debt and End Development: a Class Analysis of the International Debt Crisis,"** *Capital & Class,* 39, 1989.
22Singer, *op. cit.*

population become so dependent on oil from around the world? What are the effects of this dependency?

"Cheap" energy has been a fundamental pillar of post-World War II economic growth in the USA and US hegemony, an essential part of a strategy aimed at simultaneously controlling unrest at the work place through mechanization, automation and robotization, while ensuring social peace through delivering a high standard of consumerist living. Access to abundant energy sources has also played an important part in ensuring social peace within the USA, both within industrial and agricultural production, and in relation to the reproduction of basic subsistence for the country's workforce.

> Rapidly rising labor costs have met steady oil prices. As a result, by 1970 the manufacturing sector of the US economy used 66% more energy but only 35% more labor than in 1958.[23]

If labor is expensive and hard to control, one of the most successful strategies that landlords, corporations and employers can adopt is to simply replace human beings with machines and robots, and subj ect workers to controlling and divisive disciplining. Namely, the pursuit of relative surplus value. This was an important factor in the automation of the car factories in Detroit in the 1950s, a process which followed on from a series of major strikes and wild cats in the sector. Automation itself sparked high levels of organized worker struggles (especially amongst Black workers, who bore the brunt of these changes and disparagingly dubbed the process "niggermation"), through organizations such as the Dodge Revolutionary Union Movement (DRUM) and the League of Black Revolutionary Workers[24].

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23 *Midnight Notes*, *op. cit.*, p.124.

24 Dan Georgakas and Marvin Surkin, *Detroit: I do Mind Dying - A Study in Urban Revolution* (Boston: South End Press, 1975).
Stewart Bird, Rene Lichtman, and Peter Gessner, in association with the League of Black Revolutionary Workers, *Finally Got the News* (Detroit: 1970).
Charles Denby, *Workers Battle Automation* (Detroit: News and Letters Pamphlet, 1960).
Charles Denby, *Indignant Heart: A Black Worker's Journal* (Boston: South End Press, 1989).

Cheap energy has also been essential to reducing the costs of living, in terms of food, shelter, clothing and transportation. In other words, it has been essential for reducing the cost of reproducing the labor force. It is possible to get a McDonalds "meal" for less than a dollar. Social unrest has been contained by facilitating high levels of consumerism that directly improve standards of living. These strategies have converted large (and the dominant) sectors of the US working class into consumers (also of energy), channeling post-war labor conflict into safe outlets while simultaneously driving economic growth.

Consequently, in the US, capital´s collective strategies to control labor, through the twin processes of mechanization and high levels of material consumption require abundant sources of cheap energy. Or, more accurately, they at least require the ability to control energy flows and prices. Energy prices, far from being inevitably decided by the so-called "invisible hand" of pure supply-and-demand, are in fact highly political[25]. Expensive energy can, at times, be useful for controlling the terms on which humans work. In the multiple and interconnected crises (political, economic, financial, energy, food…) of the 1970s, when social struggles were strong, a *direct* attack on labor (including wage cuts) would have been very difficult without provoking fierce resistance. A planned hike in energy (and food) prices provided a highly effective *indirect* attack on wages in the US as well as globally, since rising energy costs also meant a rising cost of living.

> In the current inflation this kind of manipulation of money has been joined by another – the administered increases in the prices of oil…have been achieved by restricting the availability of [this] commodity to back up the price increase…The resultant price

25 An interesting, though unrelated to the USA, discussion of the political nature of prices including energy prices, can be found in Bruno Ramirez, "The Working Class Struggle Against the Crisis: Self Reduction of Prices in Italy," *Zerowork,* 1, 1975.

> increases, that is, the increase in the amount of money required to obtain a given amount of commodity value, have acted to undercut working-class wages all over the world and are part of a world-wide counteroffensive by capital to stem the wage offensive.[26]

There are great problems, inequalities, conflicts and vulnerabilities associated with the current US energy system, and in particular Big Oil. In fact, as is graphically shown by Brooke Singer's map[27], there is no such thing as the "US energy system". Rather, it is merely a part of a bigger, and highly stratified, *global* energy system. These problems and inequalities are likely to become increasingly visible as global energy prices rise, and as new energy sources start to replace oil.

Without preparation, it is likely that labor in the USA will suffer an enormous and rapid assault, which forseeably could result in a resurrection (albeit in new circumstances) of forms of labor that had been virtually abolished in the energy-rich countries of the global north, especially the USA. One has only to look to the streets, fields and kitchens of India, to see the working (waged and unwaged) and living conditions that flourish in a context where commercial energy is expensive and scarce but labor is both abundant and cheap.

As such, it is important to be highly critical of frenzied efforts to "preserve the American way of life" by substituting oil in cars with a range of agro-fuels which rely on a variety of crops including maize, sugar cane, African palm or canola, through rearrangement of the world-wide division of labor. While the majority of such fuel-crops could be produced locally, and combined with a diversification of agricultural crops, the sheer

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26Harry Cleaver, *Reading Capital Politically* (Brighton: Harvester Press, 1979).
27Singer, *op. cit.*

volume needed, in the context of a world-market economy, is already tending towards monoculture production that is rapidly becoming concentrated in the hands of large multinational companies which intend to give the appearance of changing everything related to the current energy system, while in fact changing nothing at all. This will be addressed later in this text.

Part 4 "Energy Crisis" and a Transition to Renewable Energy

Podobnik[28] and Mitchell[29] have both identified the importance of labor struggle within the energy sector (combined with inter-firm and interstate hegemonic rivalry, topics which are beyond the theme of this paper) in provoking rapid globally reaching energy shifts from one dominant energy source to another, particularly in relation to the shift from wood to coal and from coal to oil. Struggles in the energy sector have undermined the profitability, stability and overall competitiveness of old energy sources, favoring the adoption of a new source, in what amounts to a "product fix" as described by Silver[30].

> Replacing coal with oil had the collateral advantage of destroying the power bases of traditionally militant mineworkers unions, where in many countries, communists occupied leading roles…[31]

This raises the question of the relation between different energy sectors to one another, and the role of labor in this process. From the point of view of capital, the bottom line is whether the profitability of the renewable energy sector can compete with the non-renewable sector. This question is not solely related to labor, but labor nonetheless is an important factor. One major factor preventing a wider adoption of renewable energies has

28Podobnik, *op. cit.*
29Mitchell, *op. cit.*
30Silver, *op. cit.*
31Berman and O'Connor, *op. cit*., pp. 52-53.

been the subsidy which the low cost of labor within the oil and coal sectors offers these sectors. In other words, the cost of Chinese and South African coal miners, and migrant Gulf and Colombian paramilitarily repressed oil workers. China moved from being the 7th biggest exporter of coal on world-markets in 1994 to being the 2nd biggest in 2002. Between 2000 and 2001, the volume of its coal exports rose by a massive 65.2%.[32] As the Chinese coal sector has expanded in recent years, both for domestic use and for export onto the world-market the number of worker casualties has increased. China's State Administration of Production Safety reported that 2,187 miners died in the first five months of 2005, a 9.7 increase over the same period in 2004, involving a total of 23 major accidents. This was a 274% increase over the same period in the previous year[33]. The conditions and rights of Chinese coal miners has been taken up as a major global campaign by ICEM, the International Federation of Chemical, Energy, Mine and General Workers' Unions, and in 2004 a Memorandum of Understanding was reached with the Chinese government in an effort to improve conditions through technological improvements[34].

However, the struggles of workers and effected communities within coal and oil are also causing increasing disruption and uncertainty within these sectors, making them less attractive options than they were in the past. Over the last years there has been important

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32Lawrence Medroth, "Impact of WTO Entry on the International Trade of Coal International Energy Agency report for China Mining 2002." Published online at: http://www.iea.org/textbase/papers/2002/lmwto.pdf#search=%22Impact%20of%20WTO

33ICEM, "Deaths in China's Mines a Recurring Nightmare." Published online at: http://www.icem.org/?id=76&doc=583

34ICEM, "*Memorandum of understanding."* Published online at: http://www.icem.org/index.php?id=76&doc=1396&la=EN

worker resistance to the privatization of oil throughout the world, a commodity which largely remains outside of the WTO framework. In Colombia the United Oil Workers Union carried out a number of general strikes lasting several weeks in 2004. In Iraq, under conditions of military occupation from outside and barbaric religious strife from within, the Iraqi oil workers, organized within the Iraqi Federation of Oil Unions (IFOU) have been at the forefront of both secular resistance and resistance to privatization of the Iraqi economy (and especially its oil) in violation of the Hague Convention. Furthermore, the oil workers have actively engaged in creating international solidarity networks in the UK, USA and other countries. Essentially, they are struggling for worker's control of the oil[35].

> In the late 1980s and early 1990s workers from Trinidad to Algeria to Nigeria to the Middle East were in revolt against austerity and structural adjustment policies imposed by the IMF and WB. They refused to starve while knowing that the most vital commodity on the planet was being extracted from their land in front of their eyes without equivalent…The oil proletariat's revolt since the early 1990s has moved out of the cities and into the countryside, e.g., in Chiapas in Mexico, Ogoniland in Nigeria, in Chechnya in Russia, and in the Caspian region. These people are demanding a return for the suffering that oil exploration and extraction has and will impose on them. They are beginning to put formidable roadblocks to the oil industry's desperate advance to the last remaining oil areas of the planet….They are the people who are living on top of the most important commodity in the world and who must be displaced and humiliated in order to make its extraction profitable.[36]

This, combined with other factors, such as resource scarcity, the availability of large quantities of surplus finance capital, climate change and renewed hegemonic rivalry (all of which are beyond the scope of this paper, but which I hope to deal with in the future), all indicated that the renewable energy sector may be poised for a rapid and far reaching expansion.

Renewable Energy and Labor[37]

35General Union of Oil Employees in Basra website: http://www.basraoilunion.org/

36 Caffentzis *op. cit.,* pp. 19, 20.

37 Much of this section relies on data provided in interviews with Preben Maegaard and Jane Kruse, respectively Director and Head of Information at the Nordic Folkecenter for Renewable Energy in

A rapid global expansion of the renewable energy sector is underway. The division of labor, workforce, and market associated with the renewable energies sector globally is still relatively small and young compared to most other global industries. The long term evolution of the global workforce, market and ownership structures within the industry is still a very open question. While there are no inevitable outcomes, this does not mean that it will be shaped by chance. On the contrary, the outcome will be almost entirely shaped, directly and indirectly, by human action.

Until relatively recently, renewable energies have employed comparatively few people, and production has still been largely motivated by environmental and ethically/ideologically motivated concerns, rather than simply pure profit. Cooperatives, rather than companies, have frequently been the owners of infrastructure, especially in relation to wind energy in Denmark. These factors have meant that working conditions and wages in the sector have generally been quite good, and there has been a broad convergence of interests between those who own renewable energy companies and the workers within these companies. To date there have been very few, if any, cases of industrial unrest within the sector. The renewable energy sector currently employs over 400,000 people world-wide. Until recently, most production has occurred in high wage countries, especially Germany, Denmark, Japan and to a lesser extent the USA. Germany is the single country with the largest number of people directly employed in renewable energies, with approximately 170,000 people. Of these, 35,000 are employed in solar PV, 55,000 in biomass and 75, 000 in wind.

Denmark, carried out in August 2006.

The sector is growing rapidly, by between 20-30% each year globally, and is set to continue growing rapidly in the future. As the numbers of workers involved increase, and as companies increase in size, the industry is going through a major restructuring process. As the global market expands, it is also becoming more concentrated. Small companies are being bought up by larger ones in a process of corporate merger, acquisition and joint venture. In the mid 1980s, there were 22 wind turbine manufacturers in Denmark. Now there are only 2. The history of the Danish windmill manufacturer Vestas is a good example of this process. In 1985 the company employed around 800 people. From 1989 the company opted to engage in mergers, buying out Danish Wind Technology, and Micon in 2004. Simultaneously it also entered into transnational joint-ventures, including with the Spanish company Gamesa (which later became independent). The company's website now describes itself as a "global hi-tech market-leading group with more than 10,600 employees (December 2005)". Denmark is also home to the largest wind turbine blade manufacturer in the world, LM. The company supplies blades to turbine manufacturers throughout the world. Major mergers in the sector include the following: Shell-Solar took over Siemens Solar in 2002, only to be taken over itself by SolarWorld from Germany in February 2006[38]. General Electric have been busy in the last years buying up a range of different renewable energy companies. This includes Tacke-Enron wind company, following the bankruptcy of Enron. General Electric USA also bought out Jenbacher, a leading Austrian manufacturer of cogeneration equipment, as well as in 2004 buying out the US solar PV manufacturer, AstroPower.

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38 Renewable Energy Access,"SolarWorld Acquires Shell's Solar Business." Published online at http://www.renewableenergyaccess.com/rea/news/story?id=42840

On the other hand, new companies are emerging throughout the world, bringing new areas of the world's population into the world-wide division of labor associated with renewable energy. This implies a major restructuring of the global workforce associated with renewable energies. Importantly, low wage areas of the world-economy are being drawn into the commodity chains associated with renewable energy. In a space of just a few years, the Indian wind turbine manufacturer Suzlon has become the 5th largest turbine producer in the world. The company is set to benefit enormously from the current expansion of installed wind capacity in the USA, and plans to install 650 MW there in the coming years[39]. China is also becoming a major site for windmill production, with a flourishing of major new companies such as Goldwind that have successfully managed to attract international financial flows. China has also rapidly become a world leader in solar thermal production and use, accounting for 55 percent of global solar heating capacity by the end of 2003[40]. Brazil is becoming one of the key global suppliers of sugar, the raw material for ethanol production for the world market, especially the USA, which is seeking to rapidly expand its ethanol consumption. Sugar is a low wage/low value raw material sector that is produced for export to a high wage consumer country in the world economy, where it will be processed into high value fuels, a division of labor characteristic of core-periphery relations in commodity chains[41]. Heralded as the great success of the renewable energy sector, such a worldwide expansion to low wage zones

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39 Oliver Lonker, "Wind Bonanza," *New Energy - Magazine for Renewable Energy*, August 4, 2006, p. 22.

40 Zijun Li, "Solar Energy Booming in China." Published online at: http://www.worldwatch.org/node/41

41 Via Campesina, *"Full Tanks at the Cost of Empty Stomachs: The Expansion of the Sugarcane Industry in Latin America."* Published online at: http://www.viacampesina.org/main_en/index.php?option=com_content&task=view&id=284&Itemid=27

of the world economy also provides the material basis to be able to compete much more successfully with the fossil and nuclear sectors.

The renewables sector is still a comparatively new and weak sector relative to other sectors. This has meant that different interests within the sector have found common ground, making possible an alliance between producers and consumers, small producers and large producers, small consumers and large consumers, ecological concerns and profit motives, workers and companies/employers, grid connection and stand alone, commercial and non-commercial energy use. All of this has been essential in building up the sector from nothing to the impressive position it is in now. However, as the industry continues to expand globally and to gain strength in relation to other industrial sectors, both in terms of market share and production capacity, this broad alliance is starting to come into question as conflicts of interest reveal themselves.

As companies are in fierce competition with one another globally, so too are their workers (and potential workers) in different parts of the world. While it is too early to really tell, there are some initial indicators that, just as with other energy sources, renewable energies is slowly becoming a site of worker unrest. As the sector expands, so too is the struggle over whether capital or labor should bear the costs. Early rumblings of labor unrest could already be seen in relation to the take over of the Danish wind turbine manufacturer Bonus by the German multinational Siemens. When management attempted to replace all the Bonus Flags at the main entrance to the company headquarters with Siemens flags, workers spontaneously laid down tools, and did not resume work until

half of the Siemens flags had been replaced with Bonus flags. This was on the very same day that Siemens officially took over Bonus. Perhaps more significantly, workers in low wage areas of the world have started resisting the role they are being assigned into the new global division of labor associated with the sector. Earlier this year, several hundred peasants, mostly women, belonging the Brazilian Landless Workers Movement, MST, occupied an ethanol sugar plant belonging to the US multinational Cargill[42]. In Colombia, autonomous black communities, themselves descendents of slaves, have been displaced and massacred by paramilitary terror in order to clear land for monoculture plantations of African Palm in order to produce palm oil for the world market. This has been resisted for many years by organizations such as the Process of Black Communities[43]. Resistance is also growing in relation to wind farms that serve industry over subsistence farming. In China 3 peasants were killed by police in the course of their protests[44]. In Mexico, Oaxacan indigenous communities are in an ongoing struggle against wind farm Mega-projects which are being built as part of an industrial corridor to serve the needs of US and Mexican capital, under the free trade agreement Plan Puebla Panama[45]. Interestingly, the Indian wind turbine manufacturer Suzlon, mentioned earlier, has introduced a corporate social responsibility program for workers which includes health care, evidence that the company considers it essential to keep its work force under

42Via Campesina *"Via Campesina women protest against a Cargill ethanol plant in São Paulo."* Published online at: http://www.viacampesina.org/main_en/index.php?option=com_content&task=view&id=283&Itemid=39

43Claire Hall, "Biodiesel, Palm Oil and Afro-Colombian Communities," Schumacher Institute for Sustainable Systems, December 2006, Challenge Paper 2. Published online at: http://www.schumacherinstitute.org.uk/downloads/challenge_papers/siss_cp2_BioFuels.pdf

44Liu Yong, "Warnings, jailings reported in China Protest Deaths", Reuters, China Digital Times. Published online at: http://chinadigitaltimes.net/2006/05/warnings_jailings_reported_in_china_protest_deaths http://chinadigitaltimes.net/2006/05/warnings_jailings_reported_in_china_protest_deaths_reut.php

45Al Giordano, "Don Marcos of La Selva vs. The Mega-Windmill of Capitalism," *Narconews*. Published online at: http://www.narconews.com/Issue40/article1607.html

control.

Another major factor effecting the expansion of the renewable energy sector and a possible transition is the millions of workers throughout the world who are currently employed within the fossil and nuclear energy sectors, and whose livelihoods directly depend on the continuance of these sectors. In recent years, there has been great hostility to the renewable energy sector coming from these (highly organized) workers, especially from many mass labor organizations in the largest energy consuming countries, where energy. workers represent a considerable proportion of the workforce, and where their opinions carry weight with policy makers. Due to extensive political lobby work from fossil and nuclear energy companies that seeks to equate higher levels of energy consumption, and in particular fossil fuel and nuclear, with higher standards of living, jobs and economic growth, a largely false division has been created between labor and renewable energies. Many of the major trade union groupings in these countries, such as the American Federation of Labor and Congress of Industrial Organizations (AFL-CIO) in the USA, or the European Trade Union Confederation (ETUC) within the EU, as well as the International Confederation of Free Trade Unions (ICFTU,) indeed do have a pretty clear record on denying the reality of climate change and the need for a transition to renewables. When they do recognize the need, they frequently are incredibly cautious, subordinating the demands of a transition to the renewable energy to the demands of job security in the existing energy sectors, and fail to clearly come down in favor of only using renewable energy[46]. In Ukraine, site of the Chernobyl disaster, anti-nuclear

[46] European Trade Union Confederation (ETUC), *The European Energy Policy,* Resolution Adopted by the ETUC Executive Committee in Brussels, March 14-15, 2006.

activists from the organization Rainbow Keepers have been beaten up by workers from the nuclear power stations, with an attack led by over 500 workers headed by a local trade union leader[47].

However, workers (including energy sector workers) organizations have not always show hostility to renewable energy, and there is no reason to assume it has to be this way in the future. Already in the 1950s, the United Auto Workers in the US took the US Atomic Energy Commission to court over the construction of the experimental Fermi nuclear reactor, assuming a leading role in the emerging movement against nuclear power, together with the International Union of Electrical Workers and United Paper Workers of America[48]. As early as the 1970s, organizations such as Environmentalists for Full Employment in the US produced and publicized numerous studies showing how a transition to renewable energy would have far reaching positive impact in terms of job creation. Furthermore, they demonstrated how high energy consuming sectors tended to actually destroy jobs, since energy inputs were used to power machines that made human labor redundant. Several important mass trade unions in the US came down heavily in favor of a rapid shift to publicly controlled renewable energy that would use and build on existing skills and workforces. Amongst those taking this stance were the International Association of Machinists and Aerospace Workers presided by William Winpisinger, the Sheetmetal Workers International Association, presided by Edward Carlaugh, the United Autoworkers Association, and even the Oil, Chemical and Atomic Workers International

(Buenos Aires: Trade Union Statement to COP104, December 6-17, 2004).

47 Rainbow Keepers "Environmentalist Camp attacked by Nuclear Power Plant Workers." Published online at: http://flag.blackened.net/agony/rainbow.html#rk

48John Fuller *We Almost Lost Detroit* (New York: Ballantine Books, 1975), p. 57.

Union. All of these unions belonged to the major trade union grouping, AFL-CIO[49].

In recent years there is again a growing movement towards what is becoming known as a "just transition", with many labor organizations recognizing the urgent need to address climate change and implement a transition to energies. The concept of "just transition" is based around ensuring that the transition is not carried out at the expense of workers in the existing energy sectors, but rather on their terms and utilizing their skills and knowledge, and retraining workers where necessary. Labor organizations which currently have a strong policy statement on just transition include the International Federation of Chemical, Energy, Mine and General Workers' Unions (ICEM), the Canadian Labor Congress (CLC), the Canadian Union, the Communication, Energy and Paper Workers Union of Canada (CEP), and the Environmental Justice and Climate Change Initiative in the USA, and the Transition Alliance in the USA. The multi-stakeholder dialogue in international conference, Bonn Renewables 2004 also included a significant voice from labor, albeit some more favorable to renewable energies than others[50].

49Richard Grossman and Gail Daneker, *Energy, Jobs and the Economy* (Boston: Alyson Publications, 1979).

50There are several important texts.

- Canadian Labour Congress, "Just Transition For Workers During Environmental Change." Published online at: http://canadianlabour.ca/updir/justransen.pdf#search=%22Just%20Transition%20For%20Workers%20During%20Environmental%20Change%22http://canadianlabour.ca/updir/justransen.pdf#search=%22Just%20Transition%20For%20Workers%20During%20Environmental%20Change%22 ;
- ICEM *Labor and Climate Change, an ICEM Position* (Brussels)
- Communication, Energy and Paper Workers Union of Canada (CEP), "Just Transition: A Labour Response to Environmental Problems." Published online at: http://www.cep.ca/policies/policy_915_e.pdf
- Bonn Renewables 2004, "Conference Documentation", published online at: http://www.renewables2004.de/en/documentation/default.asp

Conclusion – Transition, Class Struggle and Uncertain Outcomes

The twentieth century, especially in the post-World War II period, has seen "expensive labor" and "cheap energy" go hand in hand with one another. This has been an integral factor in preventing and containing class struggle throughout the world, as well as being an essential component of US hegemony. This begs the question will renewable energies offer the same possibilities for capital as oil has or not?

Some kind of major global energy shift is certain to occur[51]. The question is no longer *whether* a shift will occur, but rather what kind of shift it will be, based on which priorities and technologies, and, above all, who will reap the benefits and who will pay the costs? What might relationship between workers in renewable and non renewable energy sectors be? Who will be able to harness the labor necessary for production? (as well as knowledge, raw materials and money?). How will relations between waged and unwaged labor forms change?

As existing energy supplies becomes more expensive (in monetary, social, political and environmental terms), there is likely to be a corresponding effort on the part of capital to cheapen labor (not just in terms of reducing wages, but also other costs of labor), especially in parts of the world like the US where escalating labor costs have been at least partially kept at bay with cheap energy (unless the costs can be successfully exported to other parts of the world-wide division of labor). Given that cheap energy has been essential for reducing the costs of reproducing labor, who pay the increased costs of

51Podobnik, *op. cit.*

reproduction? Will capital be able to shift the increasing costs of reproduction onto labor (especially unwaged domestic and agricultural labor, predominantly carried out by women) or will labor refuse to accept this? And, if energy prices rise suddenly rather than gradually, we can also expect the assault on labor to be equally rapid and sudden, though this is rarely considered when discussing energy transition, and seems set to take people by surprise, especially those who will suffer most from the effects.

Another important area of with regard to labor and renewable energy concerns knowledge workers in the sector. Renewable energy is a highly specialized sector dependent on a still small number of trained personnel[52]. The ability to harness knowledge and inventive power produced through relations of cooperation of knowledge workers is becoming increasingly central to capital accumulation. An important uncertainty exists as to whether knowledge workers will devote their skills to the service of an expansion of the renewable energy sector on the terms of capital accumulation and global intellectual property regimes such as the WTO intellectual property agreement, or whether they will instead dedicate their services to social movements for non-commercial energy use. Who will get trained and for what purposes?

Most of the infrastructure for renewable energies (such as wind turbines, solar panels, ethanol stocks) etc simply do not yet exist on the necessary scale. Given how late transition to these new sources is being left, it will have to occur very rapidly once the existing energy regime suddenly loses its viability, as it almost certainly will in the very near future. The implications of this are that workers in the new energy sectors are going

52 *Bonn Renewables* 2004, *op. cit.*

to have to produce energy infrastructure very rapidly and under great pressure, a scenario which in all probability will necessitate very high levels of productivity being forcibly imposed on these workers in order to achieved the desired high levels of output in very short time spans.

On the one hand, these questions are likely to be important contributory factors in determining the outcome of current processes of global inter-state rivalry for control of accumulation processes in the sector, a question identified by Podobnik.

> What is probably most crucial is how ascendant nations like China, India, South Korea, and Brazil respond to contemporary energy challenges. If these nations tap their increasingly skilled working classes to mass produce fuel cells, wind turbines, solar panels, and components for the hydrogen infrastructure, then the transition to a renewable energy system can be greatly accelerated.[53]

However, as the above text has attempted to show, it is far from self-evident that the "industrial peace" that the renewable energy sector has known until now will continue. Indeed, it is quite possible that renewable energy production will become an important site of industrial labor unrest in the coming years, just as most other energy sectors have been in the past. Such unrest is especially likely to increase as the production of renewable energy infrastructure globalizes towards areas of the world with lower labor costs, in particular with India and China, as is clearly already underway in relation to wind and solar energy, or Brazil in the case of ethanol. The possibility of large-scale worker struggle within the sector raises important strategic questions for those struggling for a transition to renewable energies as well as workers within other energy sectors. And, the outcome of such struggles is very likely to play an important role in shaping the

53 Podobnik, *op. cit.*, p.256.

course of any future transition towards renewable energies.

On the other hand, there is the question of a renewed round of global class struggle within the world-wide division of labor as a whole, not just within the energy sector.

> The point I want to stress is that the "Peak Oil" hypothesis is now becoming an early 21st century justification for an attack on pensions, wages and workers' guarantees in the so-called advanced capitalist countries…The permanently increased energy costs presaged by the "Peak Oil" hypothesis are now a convenient way for capitalists to invoke the need for "austerity" (for their workers) long before the actual exhaustion of oil…is on the horizon. Thus, this hypothesis is an even more pernicious tool in class struggle than the energy limitation ideology of the 1970s…The hidden assumption…is that increased energy prices (for corporations) inevitably require a reduction of the wage rate instead of a reduction of the profit rate. In other words, Peak Oil politics assumes that the working class will finance the transition from cheap to expensive oil come what may. Given the present configuration of class forces in the US, this assumption is perhaps a good bet, but it is a far from necessary outcome.[54]

Considerations of the capital-labor conflict at which are central to a discussion on energy add a considerable element of uncertainty into any center of the expansion of the renewable energy sector, and the uncertainty to any discussion of transition to renewable energy. This invites cautious speculation about the extent to which renewable energy will provide a material basis for either the continued expanded reproduction of capitalist social relations or for the construction of non-capitalist social relations of production and reproduction, especially in the long term.

> For workers, however, if capital is less able to control them by using machinery, the period of energy price rises presents an opportunity to take advantage of capital's weakness. The "energy crisis"…therefore, promises to be a period of heightened workers' struggles, and the potential exists for working class victory despite, or even because of, depression, unemployment and war.[55]

There are no obvious or inevitable answers to these questions. They are not technical

54Caffentzis, *op. cit*., p. 175.
55Norre and Turner *op. cit.*, p. 23.

questions, but rather political ones. And, while there is plenty of room for more research in these questions, the questions are not fundamentally research questions. The answers lie with the concrete historical evolution of the renewable energy sector, the capitalist world-system, and the outcome of the intertwined struggles which shape these processes, struggles which in all probability we are only in the very early phases of in the current moment. There is an urgent need to appreciate the open nature of the "energy crisis" and its "solutions", in order to actively prepare for and participate in the struggles that these entail.