Energy, the environment and accumulation

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My argument:

- Physics, orthodox economics and other disciplines mask the nature and properties of energy.
- 'Unmasking' leads to a conceptualisation of energy that enables a deeper understanding of energy's role within social reality and thus the accumulation process—*and how the mode's institutional forms, and their conjunction, mediates/controls the inherent tensions and conflicts*
- The accumulation imperative drives the energy-environment relation.
- The environment does not have a relation with accumulation independent of energy.
- Wage-labour is KEY to understanding the energy-environment-accumulation relation.

Overview

- Background and context
- How physics and orthodox economics excised energy from social reality
- For other disciplines: the sun as the ultimate source of energy
- What is this *thing* called energy?
  - Six properties are identified (although these are not mutually exclusive)
  - The tensions and contradictions inherent to social relations arising from the properties of 'energy'
- Concluding remarks

Background and context

- The successive accumulation regimes of capitalism are characterised by the **fuels** used to generate energy, and the patterns of consumption arising
- The term 'energy' is used quite blithely
  - It is rare for its conceptualisation to be questioned
- The dominant 'energy' policy narrative is framed in dualisms
- The energy consumer is framed as a rational, self-interested and autonomous agent
- The goals of energy policies are generally expressed in physical units
- The so-called 'energy crisis' is at the centre of current global and national political debates

Background and context

- These debates are framed by one-dimensional explanations
- Policy responses are little more than short-term political compromises
- Why?
  - There is limited analysis of energy's fundamental role in the complexity of social reality
  - Energy studies tend to focus on discrete areas
  - The social and physical sciences have given us a rather lop-sided and patchy understanding of energy and social reality
    - The concept of energy is articulated in quantitative (concrete) and asocial terms by physical scientists
    - Not a concern for many social scientists; limited focus through specific aspects like 'energy markets'

Background and context

- This leads to a misconstrued understanding of social reality with 'energy' disembodied from the environment and capitalism

- I am seeking to advance an explanation of the increasingly complex energy-environment-accumulation relation
- My **starting point** is 'energy' **not** the environment
- I am **not** seeking to **quantify** the energy-environment-accumulation relation which reinforces the abstraction of physics and orthodox economics
- I am seeking to determine the role played by the mode to contain and mediate the inherent tensions and contradictions in social relations arising from the properties of 'energy'

“we refer to something we-know-not-what with the word ‘energy’ … We know that energy circulates and remains constant, as well as knowing the laws of its manifestations, but we don’t know what it consists in—we have no positive descriptive conception of it. Given that it is basic to physical reality, then, we lack knowledge of a fundamental aspect of the world. We know its abstract mathematical character, and its role in empirical theories, but our knowledge does not penetrate to its underlying essence. We use the word ‘energy’ to designate a theoretically useful enigma” (McGinn 2022: 174)

How physics and orthodox economics excised energy from social reality

- McGinn's statement situates energy as an object of physics
- Physics focuses on aspects that yield to **mathematical treatment**
- Einstein's $e = mc^2$ tells us that energy and mass are the same, and informed theories that became core tenets of physics
- Thermodynamics are also two fundamental 'laws' of physics
  - First law: energy, in a closed system, cannot be created or destroyed, only changed in form i.e. remains constant
    - This treats energy as a **natural fact, something abstract but in balance with nature**
  - Second law: every change in energy form will produce entropy (waste)
    - Entropy is a further abstraction, difficult to measure, and contradicts the first law

How physics and orthodox economics excised energy from social reality

- The abstraction of thermodynamics asserts energy as a normative ideal of natural law reflecting the discoverers' beliefs
- This presents science as hypothesis testing and discovery with the laws of nature ever-existent until a scientist detects!
- Despite the unclear objective nature of energy, physics has accorded energy the highest honour: as the basic physical reality
- This has led to acceptance of energy as a natural fact

How physics and orthodox economics excised energy from social reality

- Appropriation of the energy metaphor, mathematical formalisms, and functional properties of 'energy physics' informed the late 19th – early 20th C neoclassical quest for natural laws to explain human behaviour
- Nevertheless, energy has been generally ignored as a factor input in the standard Cobb-Douglas Production Function (CDPF)
  - If included, it is treated as having no relation to capital and labour BUT these inputs cannot produce anything without energy
- The 'energy blindness' of economics derives from its mathematical-deductivism in which physics is grounded (and rests on closed systems)
- It portends a social reality inherently mathematical and a ubiquity of closed systems
  - **This is not the nature of social phenomena nor, I posit, energy**

For other disciplines: the sun as the ultimate source of energy

- Ecological, geographic, historical, sociological, climate, spatial and other studies commonly present the sun as the ultimate source of energy used by humanity
- The Earth's biosphere relies almost exclusively upon nuclear reactions of the sun
- Sources of renewable energy are directly and indirectly related to the sun
- These studies distinguish between:
  - 'primary energy' (natural resources that provide fuel to generate energy), and
  - 'final energy' (final forms of energy for end-use consumption)

This treatment of energy by physics, economics, and other disciplines, I posit, masks several critical points about the nature and properties of 'energy' as well as use of the term. If revealed, this enables a deeper understanding of energy's relation to social reality and its co-constitutive relation with the environment, and capitalism more generally.

What is this *thing* called energy?

- The term is often conflated with concrete, tangible forms of fuels
- Yet, energy does not have a concrete or physical form
- Feudal and agrarian capitalist societies depended on animate labour to produce this *thing* called energy—a **capacity**—that enabled economic and social activities
- Technologies and transport expansion increasingly replaced animate labour as the source from which this **capacity** was produced
- Fuel sources need to be harvested or extracted, and subjected to processes of conversion, storage, and transport before the **capacity** of energy is available; wastes also directly result from these processes
- The example of coal …

The example of coal: A brief depiction

- Coal swiftly became a key fuel for electricity generation after the Second World War.
- Coal is mined (underground & surface methods) and then transported.
- It may require specialised storage and to improve efficiency when burnt, may be crushed, screened etc.
- Burning coal produces heat to generate steam to spin turbines to generate electricity.
- Networks of power lines, transformers, sub-stations move the electricity generated for connection to consumers which, in turn, requires *inter alia*, artefacts like wiring, metering, switches, power points, machinery and appliances for consumption.
- Wastes are produced from coal mining, its processing and burning.

What is this *thing* called energy?

- This brief depiction of coal, along the spectrum from its extraction to conversion for electricity generation and subsequent consumption, indicates that a concrete fuel source is not synonymous with the **capacity** of energy created, captured and consumed
  1. This capacity takes a different form than a fuel source
  2. This capacity is not produced without a **significant transformation** of its fuel source through a labyrinth-like regime of arrangements
- This depiction, despite being a static snapshot for *one* fuel source, also starts to illuminate **several properties** about the production, actualisation (or realisation), and consumption of the **capacity** of energy

What is this *thing* called energy?

FIRST PROPERTY:

- The production of the **capacity** of energy requires an array of technologies and other capital goods, all of which require capital investment
- Technologies, capital goods, and investment are insufficient conditions in themselves
- **Wage-labour is required** to both create, and subsequently apply, technologies and capital goods in the ongoing process of accumulation that produces the **capacity** of energy

- *The inherent conflicts of the social relation of wage-labour is contained by the **mode** primarily through the wage-labour nexus (also the role of the state, the monetary regime)*

What is this *thing* called energy?

SECOND PROPERTY:

- The arrangements to harvest/extract, and transform, fuels to produce the **capacity** of energy for consumption all require **wage-labour** plus in doing so, there are significant social, spatial, and environmental impacts; for example:
  - Infrastructure networks causes irreversible changes to the environment, damages to communities, and disasters
  - Loss of life/contamination from nuclear reactor leakages
  - Marine environments & livelihoods destroyed by oil spills
  - Desecration of indigenous cultural sites from mining operations
- *In addition to the wage-labour nexus, the **mode** 'contains' these 'production impacts' through the role of the state, the form of competition, and the international position*

What is this *thing* called energy?

THIRD PROPERTY:

- Just as expanded reproduction cannot occur unless surplus value is realised (and reinvested) following its generation, the **capacity** of energy needs to be **realised** following its production
- The accumulation process generates energy's **capacity** **but** that is inaccessible for consumption unless its **realisation** occurs
  - Consumption—**realisation**—cannot occur without a cornucopia of artefacts (technologies, capital goods, commodities, etc)
    - The production and availability of artefacts requires capital investment but **wage-labour is the imperative input**
- *The **mode**'s dominant institutional forms to 'contain' the tensions and contradictions arising from energy capacity realisation are the wage-labour nexus, the monetary regime, and the form of competition*

What is this *thing* called energy?

FOURTH PROPERTY:

- The demand to consume the **capacity** of energy is **derived**
- Demand derives from the use that this capacity provides
  - e.g., powering surveillance systems, transport, communications, household appliances, the internet; operating technology and machinery to convert materials into commodities
- Social practices also drive demand which, in turn, are driven by the accumulation imperative that creates 'energy cultures'
  - e.g. social practices of illumination, space heating/cooling, cleanliness, comfort, convenience, communication
  - e.g. aluminium = 'packaged electricity' in metallic form

What is this *thing* called energy?

FOURTH PROPERTY (cont.):

- Like other properties, **wage-labour is the imperative input** to create the artefacts and commodities required for social practices and 'energy cultures'

- *The wage-labour nexus and the form of competition are the mode's dominant institutional forms containing and mediating the tensions and contradictions arising from social practices and energy cultures*

What is this *thing* called energy?

FIFTH PROPERTY:

- The production and realisation of energy's capacity also involves an alignment of financial processes, legal contracts, government policies through an assemblage of institutions
- There are also alliances of policymakers and incumbent firms, the use of instrumental forms of power (e.g. positions of authority, money), discursive strategies (shaping what/how issues are discussed, problem definition, solutions advanced) and technology strategies (e.g. technical innovation)

- *The role of the state, the monetary regime, the form of competition and the international position are all key determinants of this property*

What is this *thing* called energy?

SIXTH PROPERTY:

- The capacity of energy is not produced or realised without decisions, ownership and control by capital and the state
- This property creates inequities—energy injustices
  - Household energy unaffordability
  - Energy sacrifice zones (culturally diverse communities of production sites)
  - Unequal access to new energy sources
  - Regulatory mandated web provision of information

- *The state and the wage-labour nexus are the key institutional forms to contain the tensions and contradictions arising from this property*

Concluding remarks

- Energy is a capacity, not a concrete form, to do something; it extends human capabilities
- The capacity of energy cannot be conceived of as independent of human activity; it is a consequence of human activity
  - **Wage-labour** is KEY to understanding the nature and properties of the capacity of energy
  - The capacity of energy cannot be produced or realised without wage-labour
- The capacity of energy 'creates' relations between human beings and other technical objects which would not exist without this capacity
- The production and realisation of the capacity of energy is core to accumulation regimes

Concluding remarks

- The environment-accumulation relation does not occur independently of the production and realisation of energy
- Capitalism's relation to the environment reflects the production and realisation of the capacity of energy
- The production and realisation of the **capacity of energy creates a co-constitutive relation with the environment**
  - The environment is the 'tap' and 'sink' for energy's capacity to be produced and then consumed
  - Accumulation's dependency on the capacity of energy creates a **co-dependency** on the environment
  - There are different aspects of commodification and functionality in the energy-environment relation

Concluding remarks

- For the capacity of energy to 'function' it needs 'insertion' in social and technical networks of use
- The capacity of energy is relational because the social and technical networks in which it is 'inserted' reproduce or transform social relations
- Social relations are not essential for the causal powers of energy but social relations are essential for the capacity of energy to 'exist'
  - And thus, the mode contains and mediates the inherent conflicts of social relations
- *The energy-environment-accumulation relation is not a social relation or institutional form but is shaped by social relations and institutional forms*

Thank-you!

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