Webinar
Fossil fuel systems and how to change them

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1. Ways in which fossil fuels are central to capitalism

2. How fossil fuels were commodified

3. Fossil fuels are produced and consumed by and through technological systems, which are embedded in social and economic systems

4. The politics of technologies

5. Confronting the systems

6. The longer term
1. Fossil fuels and capitalism, Kazakhstan 2022

The oil workers’ demands, 4 January
• 1. [Liquefied petroleum] gas for 50 tenge (about 10p)/litre
• 2. The resignation of the government
• 3. [Former president Nursultan] Nazarbayev to get out of political life
• 4. The release of political prisoners (Erzhan Elshibayev and others)
• 5. The return of the stolen money

Source: Galym Ageleuov / People & Nature
2. How fossil fuels were commodified

As the result of a long process, culminating in the domination of capitalism in Europe in the 18th and 19th centuries, capital commodified labour. It also commodified fuels and energy carriers (e.g. electricity).

Karl Marx on commodity fetishism: relations between people are presented to them in “the fantastic form of a relation between things”

Chinese coal miners, 1637
What is “energy”, though?

**Larry Lohmann:** “‘energy services’ themselves, because of their history and structure, are ill-suited in many ways to democratic commoning, anti-colonialism and anticapitalism”

**David Schwartzman:** “the renewable energy transition includes real challenges of extractive industries especially mining which must be confronted, but in a full global transition terminating fossil fuels, it is the only path to having any chance of avoiding climate catastrophe”

**Simon Pirani:** “I would hope to supersede – rather than dismiss – the idea of ‘energy services’, including past work by Lovins, and current work e.g. by Arnulf Grubler, Charlie Wilson et al, on the gigantic possibilities inherent in what they call ‘demand reduction’”

*Energy, capitalism and social justice – a discussion*
Limits to commodification

- Hundreds of millions of people live outside the system of commodified, mainly fossil-fuelled, energy.
- Worldwide, biofuels are the no. 1 household energy carrier. They account for seven-tenths of household energy consumption outside the rich world.

The no. 1 household fuel. Photo: Penn State university
Most people in Africa have no electricity.

Worldwide, the number of people living on the borders of the commodified system is growing.
From the 19th century, the European labour movement fought for free or cheap municipal services for urban workers.

The struggle for electricity and fuel as a right, not a paid-for privilege, has continued in the era of neoliberalism, especially among millions of newly-urbanised people in shanty towns.

“Light is not a luxury, it’s a right”. Shanty town dwellers demonstrate in Madrid, Spain
### 3. Fossil fuels are produced and consumed by and through technological systems ...

<table>
<thead>
<tr>
<th>Primary energy</th>
<th>Final energy</th>
<th>Useful energy</th>
<th>Energy services</th>
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<tbody>
<tr>
<td>Oil</td>
<td>Petrol</td>
<td>Acceleration/overcoming air resistance</td>
<td>Getting from place to place</td>
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<td><strong>Technologies:</strong></td>
<td>oil wells - refineries - car manufacture - cars, roads, parking spaces</td>
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<td>Coal</td>
<td>Electricity and heat</td>
<td>Light and heat emission</td>
<td>Illumination and warmth after dark</td>
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<td><strong>Technologies:</strong></td>
<td>mines - power stations - electricity and heat networks - light bulbs, radiators</td>
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*Energy is “consumed” throughout the system, not only at the end*
Technological systems that produce fossil fuels

► Oil and gas production started in the US. Middle Eastern countries, and Russia, later on became big centres of production.

► The “upstream” comprises exploration, drilling and production. Among the multiple ancillary industries are rig construction and equipment manufacture.

► Oil refining, gas processing and transportation are huge industries.

► The big technological development of the 21st century = combination of horizontal drilling and fracturing (“fracking”). This led to a big increase in US production and made the US once again a net hydrocarbons exporter.
What fuel “consumption” actually means
The UK energy balance (2013) as measured by the International Energy Agency

<table>
<thead>
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<th>Inputs:</th>
<th>Where it goes</th>
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<tr>
<td>20% coal</td>
<td>33% used in processes (= transformation)</td>
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<td>30% oil</td>
<td>8% energy</td>
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<tr>
<td>34% gas</td>
<td>industry own use &amp; losses</td>
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<td>10% nuclear</td>
<td>21% used to make electricity</td>
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<td>6% renewables</td>
<td>4% Oil refineries, blast furnaces, heat plants etc</td>
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<th>67% final uses</th>
<th>12% industry</th>
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<td>19% road transport</td>
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<td>1.5% other transport</td>
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<td>21% residential</td>
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<td>9% commercial and public services</td>
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<td>3% non-fuel use</td>
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<td>(=petrochemicals &amp; fertilisers)</td>
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<tr>
<td>1.5% other</td>
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NOTE. These figures do NOT include international aviation and shipping, or military uses
Figure 2. The proposed data structure represented as a Sankey diagram for all anthropogenic global GHG emissions in 2010.

From: Bajzelj et al., “Designing climate change mitigation plans that add up”. Environmental Science & Technology 47 (2013), pp. 8062-8069
How technological systems “consume energy”

“Rejected energy” in the US system, as seen by physicists
• Energy is expended, and often wasted, at each stage of its passage through the technological systems

• Most politicians pretend that by (i) substituting renewable electricity generation for coal- and gas-fired generation, (ii) introducing technofixes such as electric cars, and (iii) “reducing consumption” by final users (a little), they are doing something about climate change. These are delusions

• To combat delusions, and work out which technologies are compatible with tackling climate change and social injustice, society as a whole needs to develop its understanding of these technological systems and of alternatives

Note. A modelling exercise showing that energy throughput globally could be cut by 40% by 2050, while the Millennium Development goals are achieved: A. Grubler, C. Wilson et al, “A low energy demand scenario for meeting the 1.5deg target”, Nature Energy 3:2018
Example of a system of consumption: Road transport

- Transport systems based on motor vehicles depended on cheap oil, which became available at the start of the 20th century.
- Motor-based systems took shape first in the USA, then a pioneer of oil production and a rising world power.
- Cheap oil underpinned American geopolitical dominance in the mid 20th century.
- Rising production outside the rich world, and nationalism, culminated in the 1970s oil price shock.
- Oil and neocolonialism: Nigeria’s crude exports always exceeded its total domestic energy use, which is mostly from non-commercial biofuels.

Nigeria: domestic final use of energy, and crude oil supply
millions of tonnes of oil equivalent

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<tr>
<td></td>
<td>Coal, peat, oil and oil products</td>
<td>Gas</td>
<td>Hydro &amp; other renewables</td>
<td>Electricity</td>
<td>Crude oil (exported)</td>
<td>Crude oil (domestic use)</td>
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<td>1971</td>
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In the 1920s and 30s, the US car manufacturers lobbied effectively against rail transport between cities and public transport within cities.

After the second world war, road building received more than 4 x as much state funding as the Marshall Plan for reconstruction in Europe.

In the 1980s, car makers responded to fuel efficiency regulation by marketing SUVs to millions of US families.

The export of the US system of car-based urban transport was central to post-war “consumer culture” in Europe.
Technological systems have to be transformed, to cut the throughput of fossil fuels

- Urban transport systems
- Urban built environments
  - Electricity networks
  - Industrial systems
  - Agricultural systems
- Communications systems
- Military and aviation systems

How far can this transformation go, without social and economic transformations?
Angela Merkel’s reaction to Greta Thunberg’s speech at the UN climate summit: “She gave a rousing speech – but also one which, in my view, underplayed the role of technology and innovation, particularly in the field of energy, but also in the field of energy savings, in opening up opportunities for us to achieve our goals”
Technofixes that are in vogue

• Electric vehicles. *Unless the electricity is made entirely from renewables, they may not produce fewer CO2 emissions than petrol cars. They are made of emissions-intensive materials and use emissions-intensive roads and parking spaces.*

• Hydrogen for industrial processes and heating. *It can be made by taking carbon out of natural gas (which then has to be stored) or electrolysis (very electricity-intensive).*

• Carbon dioxide removal. *Mechanical means of taking CO2 out of the air – currently used for enhanced oil recovery.*

More on: [electric vehicles here](#); [hydrogen here](#); and [CO2 removal here](#)
Marxists on techno-fixes

- Holly Jean Buck: “Industrial carbon removal technologies are important because they can remove legacy carbon from the atmosphere. [...] There is a powerful climate justice case for doing this.” (Ending Fossil Fuels, p. 53)

- Andreas Malm: “The demand for nationalising fossil fuel companies and turning them into direct air capture utilities should be THE central transitional demand for the coming years.” (Corona, Climate & Chronic Emergency, p. 143)

- Andreas Malm: “The left has its taboos to give up. They include deep-seated hostility to nuclear power, aversion to centralised solar power plants and other large-scale infrastructure, and blanket rejection of any talk of geoengineering.” (Sapinski et al, Has It Come to This, p. 157)

My view. Technology is not neutral. A future socialist society will have to change technologies, not just take control of current ones. Social movements should embrace proven technologies that society needs and capitalism obstructs (heat pumps, insulation, public transport, decentralised renewables), not state-centred geoengineering that may never work.

See my review of Malm, Corona, Climate & Chronic Emergency.
London: despite “green” image, Labour champions the climate-trashing Silvertown tunnel

5. Combating those technological, social & economic systems (one project at a time)

How fast do greenhouse gas emissions need to go down? Tyndall Centre, GLA and TfL

- **Tyndall Centre carbon budgets**: 5-year budgets, million tonnes CO2 equivalent, left-hand scale.
- **London environment strategy**: 5-year budgets, million tonnes CO2 equivalent, left-hand scale.
- **TfL projections of transport emissions**: For modelled regional network, million tonnes CO2 equivalent per year, 2012-2036, right-hand scale.

**Tyndall centre carbon budgets** are set to enable London to contribute to keeping global warming at 1.5 degrees.

**London Environment Strategy** = emissions trajectory scenarios by GLA, assuming "additional electricity and gas grid decarbonisation" but not "increased action at city level". For the 2020s, this trajectory is close to the carbon budgets in the London "Zero Carbon Strategy".

**TfL projections of transport emissions** = TfL projections of change in transport emissions from the regional network, as shown in the Silvertown Tunnel Environmental Statement.
6. Longer term: three possible paths

1. “Changes to, or adaptations of, existing technological systems that could reduce fossil fuel use rapidly.” These changes could happen under capitalism, potentially in very bad ways.

2. Changes that amount to “superseding the technological systems in their current form”, including “moving to fully integrated decentralised electricity networks, geared to multiple small electricity producers, [...] thereby reducing or ending the need for fossil-fuel-fired power stations. This would be (is being) resisted by electricity companies”. I don’t know whether this could happen under capitalism or not.

3. “The transformation of the social and economic systems that underpin the technological ones.” In plain language – moving past capitalism. This would unleash the best opportunities for ending fossil fuel use, in large part because the uses of fuel would be transformed.

From S. Pirani, Burning Up, pp. 188-190
"Insightful, precise and well-written, Burning Up turns energy consumption on its head. Pirani fills a crucial gap ... Anybody fighting climate change should read this" - Mika Minio-Paluello, campaigner at Platform London and co-author of The Oil Road: Journeys from the Caspian Sea to the City of London (Verso, 2013)

"This meticulous depiction of how fossil fuels are woven into our human systems - not only technological but also economic, social and political - is an invaluable aid to getting them back under control" - Walt Patterson, author of Electricity vs Fire (2015)

"Explains the technological, social and economic processes that have prioritised a particular way of satisfying society's demand for energy services" - Michael Bradshaw, Professor of Global Energy, Warwick Business School, UK, author of Global Energy Dilemmas (2013)