Introduction

Legitimacy for Renewables?

A Prologue from the Future

> 'It's amazing when you think of it', said Adell. […] 'All the energy we can possibly ever use for free. Enough energy, if we wanted to draw on it, to melt all Earth into a big drop of impure liquid iron, and still never miss the energy so used. All the energy we could ever use, forever and forever and forever'.
>
> —*Isaac Asimov,* The Last Question *(1956: 8).*

> There is no time for a new energy system to evolve gradually over centuries, as was the case for the fossil fuel-based system. […] The energy transition must … become a strategic tool to foster a more equitable and inclusive world.
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> —*Francesco La Camera Director-General, International Renewable Energy Agency (2023: 5)*

It may seem bizarre, perhaps even perverse, while facing the hottest years on record, with UN Secretary-General António Guterres announcing the era of 'global boiling', to begin a book on one of the most urgent dilemmas of our time with a quotation from a short science-fiction story written nearly 70 years ago (Guterres 2023; Niranjan 2023). But Isaac Asimov's story *The Last Question* neatly encapsulates some of the utopian fantasies associated with the promise of renewable energy. The story begins in 2061, a year now not all that distant, and only a decade beyond the mid-century deadline which the Paris Agreement sets for the global economy to achieve net zero emissions. Two technicians, Adell and Lupov, the 'faithful attendants' of the giant supercomputer Multivac, sit drinking in a deserted underground chamber ruminating on Multivac's latest achievement (Asimov 1956). Faced with the ever-increasing demand for energy to sustain human life on Earth and power interplanetary exploration, Multivac has designed and built a new and apparently inexhaustible energy source:

The energy of the sun was stored, converted, and utilized directly on a planet-wide scale. All Earth turned off its burning coal, its fissioning uranium, and flipped the switch that connected all of it to a small station, one mile in diameter, circling the Earth at half the distance of the Moon. All Earth ran by invisible beams of sunpower (Asimov 1956: 7).

While Adell celebrates Multivac's technological triumph – 'all the energy we can possibly ever use for free … forever and forever and forever' – his colleague Lupov sounds a warning note. 'Not forever', objects Lupov, pointing out that the 'invisible beams of sunpower' will only last as long as the lifespan of the Sun itself – around 10 billion years. Adell observes that this is probably long enough ('it will last our time, won't it?'), but as the story progresses through 'several trillion years of human history', we learn that Multivac's solution has only proved temporary. Once interstellar travel became possible, what had seemed an infinite supply of energy is nowhere near enough as humans colonise space: 'It took mankind a million years to fill one small world and then only fifteen thousand years to fill the rest of the Galaxy'. Human and non-human ingenuity and technological innovation run up against a fundamental limit: 'the net amount of entropy of the universe' (Asimov 1956: 9).

Present-Day Crisis

The fundamental limit made visible by the climate emergency is much closer to home, arising from the planetary boundaries of the biosphere, which sustains human life on Earth. These boundaries have been destabilised primarily by the burning of coal, oil, and gas, and by the hegemony of 'fossil capital' over the last 250 years. But as Francesco La Camera, Director-General of the International Renewable Energy Agency (IRENA), notes in his introduction to the *World Energy Transitions Outlook 2023*, 'there is no time for a new energy system to evolve gradually over centuries, as was the case for the fossil fuel-based' system (IRENA 2023: 13). According to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), the total remaining carbon budget, if global heating is to be kept below 1.5°C, is no more than 400 gigatonnes (Gt) (IPCC 2021). At present rates of annual global emissions, we will exhaust that carbon budget in less than 7 years (MRIGCCC 2021). The budget was later revised downwards, to 250 $GtCO_2$ as of January 2023, equal to around six years of current CO_2 emissions (Lamboll et al. 2023).

The IPCC, the International Energy Agency, and the Director-General of the United Nations (though apparently not the current President of the COP) are unanimous in their assessment: only a worldwide moratorium on new fossil fuel projects and a rapid and comprehensive transitioning of the world's energy system to renewable sources can avert a catastrophic breaching of the planetary boundaries of the Earth's climate system. According to the IEA, global renewable energy capacity must grow threefold by 2030 in order for the world to remain on a pathway to 1.5°C (IEA 2024).

Yet despite the urgency of this transition, and the need for what IRENA calls 'profound and systemic transformation of the global energy system', there is resistance, not only from the fossil-fuel industrial complex and its supporters in the media, institutions, and both mainstream and populist right-wing political parties, but on the ground, in the villages, places, and spaces where people encounter the expansion of renewable energy in their daily lives. Instead of embracing the promise of renewable energy, some reject it, or regard it with cynicism and mistrust. This book sets out to understand the reasons for this resistance, and the forms it takes, drawing on ethnographic case studies conducted in India, Germany, and Australia. While much of the local opposition to wind and solar farms appears to grow out of purely local concerns – who is benefiting and who is not, a lack of consultation and participation, the physical and visual impacts on local landscapes and their uses for agriculture and leisure – we argue that the deeper reasons must also be sought in the distinctive trajectory of the energy transitions we have studied, one shaped by what we call the neoliberalisation of renewable energy. In order to fully realise the promise of renewable energy, we contend, we must move beyond the neoliberal model of transition to a re-commoning of energy, one that no longer serves the pursuit of continuous economic growth.

Private Renewables – Models and Limits

The neoliberal model of transition, whose characteristics we document in the first section of the book, collides with boundaries which are not primarily the biophysical boundaries of planetary climate stability, but rather are social, political, and economic in nature. One of these is captured in an earlier report from IRENA, the *2021 World Energy Transitions Outlook: 1.5°C Pathway*. The report points to an immanent potential of renewable energy: the 'almost unlimited compression of clearing prices' (IRENA 2021: 163). In contrast with non-renewable forms of energy such as fossil fuels, renewable energy, like the 'invisible beams of sunpower' in Asimov's story, is at least potentially inexhaustible. Once the initial monetary and energy costs of building renewable energy are covered, additional electricity generation is effectively free, because unlike fossil fuels, there are no continuing fuel costs for solar and wind, only the costs of maintenance. Arguably, for the first time in human history (or at least since the publication of Asimov's story), we are presented with the possibility of nearly free universal and inexhaustible energy. As such, renewable energy holds out the promise of energy becoming a commons, but for the authors of the 2021 IRENA report, this is a problem, rather than something to be celebrated.

The problem consists in the lack of incentives for investors. IRENA's modelling points to the emergence of zero marginal cost for daytime electricity. But IRENA's blueprint for delivering the energy transition, with the urgency which climate science dictates, relies on the private sector to deliver 90% of investment finance. As renewables become cheaper, however, renewable energy ceases to deliver an 'acceptable' return on capital in liberalised energy markets designed according to principles of marginal pricing. As IRENA puts it, 'the more renewable energy enters the system, the lower its remuneration becomes, reducing prospects for cost recovery and paralysing new investments' (IRENA 2021: 163). Over time, with technology leapfrogging the necessity for large-scale renewable utilities, this public–private model is unsustainable. IRENA acknowledges that the 'misalignment' between the uptake of renewables and the structure of liberalised energy markets will necessitate a 'comprehensive rethinking of power system structures' (IRENA 2021: 164).

The boundary that becomes visible here is thus a boundary created by fossil capital itself. In the fossil fuel era, as William Stanley Jevons famously observed, demand for coal actually increased, rather than declined, as technological innovation made its use as an energy source more efficient. Asimov's story echoes the Jevons paradox in a science-fiction setting; 'all the energy we can possibly ever use for free', supplied by one small station orbiting the Earth, does not lead to a stabilisation of humans' energy use, but to an expansion, as ever-more energy is required to power the colonisation of other worlds. In one sense, we are still trapped in the Jevons paradox today; global fossil fuel use continues to expand along with the rapid growth of renewable energy. Instead of renewable energy replacing coal, oil, and gas, it appears to be simply complementing them as global energy demand grows. We assume that a plentiful supply of cheap energy will underpin a 'burgeoning global expectation of continuous economic growth, material accumulation and "progress"' (Strauss et al. 2013: 11).

According to the most recent analysis by the International Energy Agency, however, the peak moment for fossil fuels may be approaching: 'the momentum behind clean energy transitions is now sufficient for global demand for coal, oil and natural gas to all reach a high point before 2030' (IEA 2023: 18). Under the IEA's Stated Policies Scenario, 'the share of coal, oil and natural gas in global energy supply – stuck for decades around 80% – starts to edge downwards and reaches 73% by 2030' (IEA 2023: 18). Surveying the latest trends in the development of renewable energy, the IEA concludes that 'a pathway to limiting global warming to 1.5°C is very difficult – but remains open' (IEA 2023: 17).

More recent analysis from IRENA complements that of the International Energy Agency and offers a policy blueprint for how a 'pathway to 1.5°C' might be achieved. IRENA's *World Energy Transitions Outlook 2023* begins the 'comprehensive rethinking of power system structures' which the earlier *Energy Transitions Outlook 2021* envisaged (IRENA 2021: 164). The language of these reports may appear abstract and bloodless, too far removed from the brutal realities of the floods, fires, famines, droughts, and extreme temperatures which have already killed tens of thousands of people, displaced hundreds of thousands more, killed millions of non-humans, and destroyed their habitats (Dunne 2023; NOAA 2023; UNDRR 2023). But they signal an emerging paradigm shift in the framing of climate and energy policy by influential international institutions: IRENA explicitly states that the energy transition must become 'a strategic tool to foster a more equitable and inclusive world', and calls for 'systemic transformation', a recognition that business as usual will not deliver the pathway to 1.5°C the world needs (IRENA 2023: 5).

The *World Energy Transitions Outlook 2023* compares two scenarios: the 1.5°C Scenario, an 'energy transition pathway aligned with the goal … to limit global average temperature increase by the end of the present century to 1.5°C', and the Planned Energy Scenario, which 'is based on governments' energy plans and other planned targets and policies in place at the time of analysis' (IRENA 2023: 17). Broadly speaking, the 1.5°C Scenario describes what needs to happen to limit global temperature rise to 1.5°C; the Planned Energy Scenario describes what is actually happening. The 1.5°C Scenario requires cutting CO_2 emissions by around 37 Gt from 2022 levels and achieving net-zero emissions in the energy sector by 2050.

In order for this to happen, to give just one example, the global percentage of electricity generated from renewables must rise from the current figure of 28–68% by 2030 and 91% by 2050 (and the global percentage of electrical energy use in the total energy supply must also increase massively). In what may amount to the understatement of the century, IRENA observes that 'the energy transition is off-track' (IRENA 2023: 21). The gap between the 1.5°C Scenario and the Planned Energy Scenario, between what needs to happen and what the signatories to the Paris Agreement are actually doing, could best be described as a yawning chasm.

The 1.5°C pathway requires 1,000 GW of renewable power to be deployed every year from now until 2050, but in 2022, only 300 GW of renewables were added to global generation capacity. The share of renewable energy in the global energy mix must increase from 16% in 2020 to 77% by 2050 in IRENA's 1.5°C Scenario. This is the share of renewable energy in total primary energy supply, not just electricity generation; according to the report, 'total primary energy supply would remain stable due to increased energy efficiency and growth of renewables' (IRENA 2023: 25). In order to achieve these goals, what IRENA describes as 'an enduring investment gap' must be overcome; annual investment of US$5 trillion is required; despite global investment in 'all energy transition technologies' reaching a record level of US$1.3 trillion in 2022, the figure must more than quadruple to remain on the 1.5°C pathway (IRENA 2023: 25).

Overall, the emissions reduction goal is to be achieved only partly by renewables and electrification (respectively, 25 and 19%); it will also rely on energy conservation and efficiency (25%), along with a combination of hydrogen, carbon storage, biofuels, and nature-based offsetting (31%) (IRENA 2023: 52). Efficiency is central: IRENA states that in 2050 total global energy consumption will need to be about 5% below 2020 levels (IRENA 2023: 48). Averaged over the period from 2023 to 2050, economic growth is expected to remain at 1.5% annually, which equates to a more than 50% increase in the size of the world economy. Business-as-usual does deliver some efficiency gains, for instance, with IEA projections suggesting that with existing policies energy consumption will grow by 25% over the period. This underlines the efficiency gap to be filled: the ambition is heroic, and at odds with experience in which energy consumption rises with rising income and falling energy prices (Diesendorf 2022).

These are only a few of the numerous gaps in current energy and climate policy which must be overcome in order for the world to move decisively from the Planned Energy Scenario to the 1.5°C Pathway Scenario. In language which echoes one of the key demands of sections of the global climate movement – 'System change not climate change!' (Beer 2022) – IRENA states that a 'profound and systemic transformation of the global energy system' must be achieved, and with it 'a wholescale transformation of the way societies consume and produce energy' (IRENA 2023: 28). As the report notes, geopolitical developments, principally the war in Ukraine, have thrown up new and unforeseen barriers to such a transformation and caused governments to take retrograde steps, such as new investments in fossil fuel infrastructure (e.g. liquefied natural gas [LNG] terminals).

Despite these caveats, and the many gaps and obstacles which the *World Energy Transitions Outlook* identifies, IRENA argues that it is still possible to achieve a global transition to the 1.5°C pathway. Key energy transition pillars such as physical infrastructure and the skills base of populations must be strengthened and expanded, and policy and regulatory systems which IRENA says are 'still geared toward fossil fuels' must be redesigned to promote renewable energy and reduce emissions (IRENA 2023: 44). Perhaps most significantly, however, IRENA's recommendations contain an implicit critique of what we describe in Chapter 2 as the neoliberalisation of the energy transition and envisage a much greater role for public provision and public intervention in securing the shift to a 1.5°C pathway. IRENA notes that from 2013 to 2020, some 75% of global investment in renewables came from the private sector; however, much of this investment has flowed to 'the technologies and countries with the least associated risks' (IRENA 2023: 26). Thus, according to IRENA, 'stronger public sector intervention is required' to bring about 'greater geographical and technological diversity of investment': instead of focusing on mobilising private capital, climate and energy policy should encourage 'targeted and scaled-up public contributions' (IRENA 2023: 26).

A New State-Centrality?

In a significant departure from the market-friendly language of its *Global Renewables Outlook 2050*, published just two years previously, in 2023 IRENA was advocating for a fundamental shift in the role of the state in order to achieve the goals of the Paris Agreement. The 2023 Inflation Reduction Act (IRA), legislated in the USA after many months of resistance from Senator Joe Manchin, a West Virginia Democrat with strong links to the fossil fuel industry, provides striking evidence of the shift. While the IRA has many critics within the climate movement in the US, who argue that it does not go nearly far enough and makes too many concessions to the fossil fuel industry, both critics and supporters agree that the IRA is 'the biggest piece of climate legislation' ever passed in the United States, by a wide margin' (Climate and Community Project 2022: 1). Although Donald Trump had threatened to repeal it if elected, the IRA represents an explicit shift away from the approach which the Obama administration attempted to legislate in 2009–2010, which would have relied on the pricing of greenhouse gas emissions and the creation of market mechanisms such as a cap-and-trade scheme to reduce emissions over the long term. By contrast, the IRA mobilises direct funding for renewable energy development and foregrounds a much greater role for direct government intervention in order to achieve the goals of US climate policy.

The IRA allocated US$369 billion to Energy Security and Climate Change programmes over 10 years (Democrats 2023). It created a framework for the US to reduce domestic greenhouse gas emissions to around 40% of 2020 levels by 2030 and to massively expand both generation and manufacturing in the renewable energy sector, giving the US a 'competitive advantage in low-cost clean electricity and hydrogen production, infrastructure, geologic storage, and human capital' (Meyer 2022). According to analysis from Credit Suisse, by 2029, 'U.S. solar and wind could be the cheapest in the world at less than $5 per megawatt-hour' (Credit Suisse 2022).

Credit Suisse argues that the official figure of $369 billion which the IRA allocates to spending on climate and energy measures significantly underestimates the actual spending which is likely to occur, because the tax credits through which that spending flows are uncapped. Actual spending is likely to be more than $800 billion, more than double what the Congressional Budget Office estimates as the cost of the measures contained in the Act (Meyer 2022). The Act creates a 'green bank' with starting capital of $27 billion and authorizes the Department of Energy to lend up to $250 billion to finance renewable energy projects (Harris 2022). On the negative side of the ledger, the IRA makes major concessions to the fossil fuel industry, opening up vast swathes of public land to oil and gas exploration and exploitation, and expanding subsidies for CCS (Climate and Community Project 2022).

However, the Act also contains provisions which, according to analysis by researchers at the Climate and Community Project, 'could be a huge aid in stopping the financialisation of the clean energy transition' (ibid.). The current system of tax credits for investment in renewable energy, they argue, has become 'a major tax shelter for private banks and Wall Street', because project developers must go to massive banks like JP Morgan or Bank of America and try to 'sell' their tax break in return for funds. The IRA's direct pay option, they maintain, 'could unleash huge capacity in renewable energy deployment for governments, energy cooperatives, community groups, local business, and nonprofits'.

This is a conclusion broadly echoed by Bryant and Webber in their recently published *Climate Finance: Taking a Position on Climate Futures*. They argue that the IRA is designed to operate 'in a partially green Keynesian manner', steering public and private investment in such a way as to create domestic supply chains for renewable energy technology. In so doing, they suggest, the legislation seeks to bolster public support for spending on climate policy and to demonstrate 'possibilities for doing green industrial policy through and beyond the tools of the de-risking state' (Bryant and Webber 2023: 125–126). This turn to 'green Keynesianism', and the much greater role for the public sector and public intervention advocated by IRENA, implicitly addresses what might be termed the *legitimacy gap* in climate and energy policy. This 'legitimacy gap' is one of the central concerns of this book. To paraphrase the opening words of the popular 1970s science fiction series *The Six Million Dollar Man*, we have the renewable energy technology necessary to bring about a rapid decarbonisation of the global economy, but the 'blockages to doing so are fundamentally cultural and political' (Strauss et al. 2013: 10).

Major energy transitions depend, as a recent study of public participation in energy transitions concludes, on the support of major stakeholders and affected publics (Renn et al. 2020: 3). Our aim in this book is to make those stakeholders and affected publics visible, to understand their experience of transition as it unfolds around them, in the landscapes and regions in which they live, and how and why that experience might lead them to embrace or oppose it. The global trajectory of renewable energy development over the last three decades has created a perception that the energy transition is driven from above, by national states, supranational institutions, and transnational capital. The people and communities most affected by renewable energy development experience it as something happening *to* them, rather than *with* them. This perception can undermine the social legitimacy of the energy transition, and with it, broader social support for climate action.

Approach – The Book Ahead

Our approach builds on the analysis and methodology we developed in our previous book, *Beyond the Coal Rush. A Turning Point for Global Energy and Climate Policy?* In that book, we explored how the legitimacy of the coal-industrial complex was being challenged, both on the ground and at the level of national and transnational climate policy. We followed the contestation of coal mining in three ethnographic case studies in India, Germany, and Australia where local communities were opposing the opening up of new coal mines, or the expansion of existing mines. Based on these case studies, we argued that there was a process of articulation between these local struggles and the larger context of national and international climate policy and movements for climate action. The future of coal, we argued, and with it the future of the planet, was poised at a decisive and historic moment; the power of the coal industrial complex was beginning to unravel with the rapid shift into a new and rapidly intensifying state-renewables nexus (Goodman et al. 2020: xi, 232–234).

This book takes up where the previous book left off. As in the previous book, questions of legitimacy and agency are central. In the previous book, we documented how the legitimacy of the coal-industrial complex was being challenged, bridging the 'gap between climate policy and social action at local, national, and transnational levels' (ibd.: xii). This book employs a similar method, basing our findings on three ethnographic case studies of renewable energy development in India, Australia, and Germany. The shape of the emerging renewable energy system is the object of intense contestation in each of these countries. We approach it from the ground up, through a series of comparative case studies conducted over five years. The book delves into the intricate interplay of policy dynamics and local realities in the renewable energy transitions of Brandenburg (Germany), Karnataka (India), and South Australia. We employ a unique methodological approach, bringing together policy analysis and ethnographic research. By combining these methods, we aim to unravel the multifaceted layers of the socio-political landscape, shedding light on how renewable energy initiatives are conceived, implemented, and experienced on the ground.

The focus of our enquiry broadens beyond that of the previous book to place the local case studies in a regional context, in the new 'energyscapes' and 'energy regions' which are emerging with the expansion of wind and solar energy (Strauss et al. 2013: 11). We expand on the reasons for this broader regional focus in Chapter 2. It is worth reflecting for a moment on a distinctive feature of these 'energyscapes' which may appear obvious, but which is fundamental to the particular problems and challenges which renewable energy throws up.

People cannot live on, or in, a coal mine. As we noted in the previous book, fossil fuel extraction creates 'sacrifice zones' where other forms of human activity are excluded. Renewable energy, by contrast, holds out the promise of co-existence; it is possible, in theory at least, for cropping and grazing to continue on land where wind turbines are installed, and even in some limited form on solar farms. Humans can literally cohabit with solar energy – witness the widespread deployment of rooftop solar in Australia – and they may live close to wind turbines without experiencing the well-documented health effects associated with living close to a coal mine. There is scope, at least, for what two of the current authors have termed 'social co-existence' (Müller and Morton 2021: 65). But as our case studies show, this co-existence is not without tension, opposition, and resistance. While the landscapes in which wind turbines and solar arrays are deployed may be perceived (especially to outsiders) to be spatially empty, uninhabited, or underutilised spaces, they are in fact spaces in which people live, earn their livelihoods, enjoy recreation, and attach value to. The social legitimacy of renewable energy is produced *in* these spaces, and *by* the people who live in them, in a process of dynamic interaction with the policies and priorities of governments and investment capital.

The role of the neoliberal state is crucial to this process. Nation states, we argue, have largely acted as handmaidens to the neoliberalisation of renewable energy, a process we explore in greater detail in Chapters 1 and 2. Thus far, the principal development model of the energy transition, one hitherto legitimised and facilitated by national governments and international institutions (such as IRENA), has been dominated by globalised energy companies building large-scale wind and solar plants, and investment funds seeking 'sustainable' investment opportunities and capturing the income flow from renewable energy. There is investor euphoria for renewables, for upstream 'critical' minerals, and for downstream 'green' hydrogen. As recent legal actions and investigations by media and NGOs have shown, at least some of this euphoria, and the corporate rhetoric that accompanies it, is little more than greenwashing (Carbon Market Watch 2023). On the other hand, however, the International Energy Agency's latest World Energy Outlook predicts that renewable energy capacity is on track to increase two-and-a-half times by the end of the decade – not too far short of the goal of tripling global capacity by 2030 that governments set at the COP28 climate change conference (IEA 2024).