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The Social Justice and Human Rights Benefits of Domestic Renewable Energy

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Abstract

Focusing upon the United Kingdom reveals that centralised provisions of energy have historically failed to uphold standards of human rights. Even if a transition is made to renewable energy, existing centralised distribution systems cannot promise improvement. This work would recommend the transition to domestic renewables, whereby energy is harnessed and used *in situ*, as it may support the more desirable notion of social justice with regard to energy usage. Domestic renewables are likely to become an inevitability, as the equipment becomes both more affordable and efficient; this may already be occurring in some developing societies, where domestic renewables are attractive to sectors of the society who are off-grid.

Keywords

Renewable energy; decentralised energy; social justice; human rights; energy transitions

1. Introduction

With the progression of the twenty-first century, the use of renewable energy is likely to become more commonplace and its harnessing may be expected to be more widely distributed. Added to this, energy usage is predicted to grow in the near future and the additional energy must be acquired somehow[1, 2]. Moreover, as the technological development of harnessing and storing equipment (from hereon collectively referred to as 'harnessing equipment') makes it both more affordable and more available, one may expect it to be more prevalent.

Here, using the United Kingdom (UK) as an example, it is noted that it plans to rely upon both wind power and nuclear in the future ([3], p. 7); with the possibility of supplying hydrogen via existing gas pipelines ([3], p. 24). However, this plan has provided an overview and encouraged the usage of existing centralised, infrastructure in the form of grids and pipelines: without seemingly fully considering the decentralised alternatives[3].

Moreover, it became apparent whilst researching this work, when using the UK as a case study, that the previous centralised supplies were capable of allowing breaches of human rights to occur. Hence, it is necessary to consider how the introduction of renewables, when using the infrastructure of the centralised supplies, may counter this potential shortcoming. This reasoning informs the approach taken here.

However, this approach raises further questions such as: *how should renewable energy be harnessed?* And in particular, *should it be harnessed in a decentralised fashion? With many local harnessing sites that largely bypass a centralised grid?* These thoughts are extremely relevant as it should be realised that harnessing equipment is becoming increasingly viable on a very small scale. Also, harnessing equipment such as solar panels, wind turbines and heat pumps may even be used in combination[4]. In addition, storage is possible via a range of methods with batteries becoming more practical[5]. Moreover, the reader should appreciate that renewable energy is both widespread and unlimited[6]; with several sources, such as wind power, solar power, energy via heat pumps, and ground source energy available at most locations[7].

Additionally, once the necessary equipment has been installed and paid for, it should produce unlimited energy at a price more economical than conventional fuels. Hence, all things considered, it is accepted here that any *identifiable entity* could install its own harnessing equipment, gain

[1] Based upon policy makers' stated policies for energy usage, total energy usage is likely to grow by a quarter from 2018 to 2040 ([1], p. 35).

[2] For at least a decade, the drivers of increased energy usage have been predicted to be the middle-income households ([2], p.134): although the poorer households are expected to remain without assets requiring energy, such as refrigerators and air conditioners, as worldwide incomes increase, an effective threshold emerges whereby households attaining a certain income level purchase the first of such assets. This causes an increase in energy usage. In general, the most affluent households should already possess energy using assets and are not expected to increase energy usage.

[3] The committee advising the UK Government, namely the Climate Change Committee, has focused upon existing rationale in their publication *The Sixth Carbon Budget: Buildings* [4].

[4] For example, research has been undertaken to optimise systems utilising differing types of energy sources simultaneously ([5], pp. 667-77), ([6], pp. 148-159).

[5] Currently, independent organisations such as the Energy Saving Trust provide advice for home usage [7].

[6] Renewable energy is unlimited and is consequently replenished: in 2011, Massachusetts Institute of Technology calculated that 10,000 times the human energy needs reach the Earth from the Sun [8].

[7] If it is considered that roughly eight groupings of renewables exist, then there should be an opportunity for most persons to benefit utilising a variety of sources. The sources being: solar power; wind power; hydroelectric power; wave power; tidal power; biofuels; energy via heat pumps; and geothermal power.

energy from various sources, and attain a state of self-sufficiency with regard to 'domestic' energy, i.e., energy harnessed and used on the same premises. Such entities, as examples, may include individuals, and families; although it is recognised that the principles demonstrated here may also be used by communities, educational establishments, hospitals, and businesses.

The above benefits of domestic harnessing, when combined with the benefits of both realising social justice with regard to energy usage and attaining a human right to energy that also arise from such arrangements, which will be explained later, result in this work recommending that domestic renewables should be introduced.

That said, this work does not maintain that centralised supplies cannot offer social justice and human rights: but after reading this work, the reader should be aware that the centralised path is not the only way to proceed. It is possible that many industrialised nations would be tempted to follow the central route without an adequate discussion of alternative arrangements, and without realising the full advantages that domestic renewable energy could provide.

As noted, the focus of this work is strictly domestic harnessing as defined here: as opposed to energy for transport or manufacturing within a society[8]. Also, the reader should be aware that this work is not an empirical study: it is born of political philosophy and expounds ideas by using logic, reason, and argument. Moreover, although this paper focuses upon contemporaneous problems, it attempts to provide solutions that may occur over a longer time span, when technology improves and is more widespread. That said, the work here should not be considered to be too theoretical as all the solutions offered here *could already* be accomplished using current technology.

In elucidating the above, four subsequent sections are presented. Firstly, the problems that are associated with centralised energy provision are noted: it inadvertently breaches human rights, and the experience of the UK is used here. Secondly, an argument is provided for society to adopt a method of domestic harnessing that supports attaining both social justice and human rights in the area of energy provision. Thirdly, this is followed by some thoughts regarding major concerns that may be precipitated by this approach; where examples from developing societies indicate that domestic energy provision is very relevant. Finally, the conclusions of this work are aired.

2. The Problems with Centralised Energy Provision

Electricity is currently generated from centralised power stations and supplied via a grid system to the consumer in many parts of the world. Similarly, gas is also provided from centralised sources and piped to the place it is used. On the face of it, these are successful arrangements, which have provided enough energy for people to have more comfortable lives and allowed societies to increase levels of industrialisation. However, this viewpoint does not recognise that centralised energy systems, particularly electrical grids, have been far from perfect in the way they distribute energy, and this section describes how centralised systems have allowed human rights breaches to occur in the UK. Furthermore, it is noted that grafting renewable energy supplies onto the centralised distribution systems may not necessarily solve the problems.

[8] It should be noted that energy used in transport, such as electric cars would require its own study concerning social justice and human rights issues. Also, it is realised that manufacturing concerns may be able to harness enough renewable energy to heat and light their premises, and this would be considered to be domestic energy provision here: although the actual energy required to engage in the processes of manufacturing is not the focus of this study.

Unfortunately, for the purposes here, the arbiters of human rights, namely the United Nations, did not consider the specific concept of energy provision when they established the Universal Declaration of Human Rights in 1948. Article 25.1 is of particular interest, as it is here that any mention of 'energy' would expect to be found:

> Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond his control ([9], p. 7).

Certainly, energy would be required to assure one's 'health and well-being', but more specifically, approximately half a century later the United Nations had firmly considered energy provision. The eighteenth point derived from the 'Johannesburg Declaration' from the World Summit on Sustainable Development is as follows:

> We welcome the focus of the Johannesburg Summit on the indivisibility of human dignity and are resolved, through decisions on targets, timetables and partnerships, to speedily increase access to such basic requirements as clean water, sanitation, adequate shelter, energy, health care, food security and the protection of biodiversity [10].

Hence, access to energy nestles within 'basic requirements'; and therefore, contemporary discussions concerning human rights may be considered to include energy provision[9]. Moreover, within any society, basic requirements may be understood as a *sufficient* amount of energy that would allow individuals to carry out routine tasks such as cooking, washing, maintaining their abode at a reasonable temperature, and providing lighting.

Looking at the UK as a case study, one particular set of incidents caused a reduced supply of electricity to consumers in the early months of 1974. One factor was a reduction in the flow of crude oil from the Middle East ([13], p. 14), and at the time, oil was used in some power stations ([13], p. 14). In a coal-rich nation such as the UK, one may have expected coal, as the major power station fuel, to be substituted to fill the energy shortfall. However, workers in the energy sector were disgruntled with their terms and conditions of work and they took industrial action; in particular, coal miners actioned an overtime ban and then followed this with an all-out strike ([13], p. 14). The government's response was to introduce a 'three day working week' limiting the working hours in many sectors of industry to reduce overall electricity demand ([13], p. 14).

The three day working week lasted for approximately two months from early January to early March of 1974 [14]. However, the overarching result experienced by society during this time was that the citizenry at large suffered deprivations including extensive power cuts and they were limited with regard to cooking, lighting, and heating [15]. Because of the combination of the duration of limiting power supply and the intrusiveness into individuals' lives, it is argued here that centralised energy provision breached human rights. In times of failed supply, many individuals affected cannot be said to have been provided with enough energy to maintain their 'health and

[9] Instituting a human right to renewable energy has previously been discussed by Adrian Bradbrook and Judith Gardam in 'Placing Access to Energy Services within a Human Rights Framework' ([11], pp. 389-415); whilst their later work with Monique Cormier signified a change in approach, emphasising how the provision of existing socioeconomic rights should incorporate securing adequate energy for all ([12], pp. 546-552).

well-being', as prescribed by the Universal Declaration of Human Rights; neither can they be said to have enjoyed the 'basic requirement' of energy as prescribed by the Johannesburg Declaration.

However, since the 1970s attempts have been made to improve the consumer's position. To provide some background, between the mid-1980s and early 1990s, the UK's energy supply was privatised and opened to competition [16]. A purported benefit of the privatised arrangement is that the consumer can 'shop around' and gain the best energy deal from a variety of companies; this was privatisation's *raison d'être,* and it should be noted that a 'marketplace', whereby one has a number of suppliers from whom one may purchase energy, is integral to this arrangement.

But one may ask, has this initiative worked? The question may be answered by reviewing national statistics for 2019, produced by the Department for Business, Energy and Industrial Strategy (BEIS), who calculated that 3.18 million households in England, being 13.4 per cent of all households, were estimated to be living in a state of 'fuel poverty' ([17], p. 1).

Although quite a complex definition of fuel poverty has been provided by BEIS[10], for the purposes here it may be understood as limitations placed on persons' lives. To explain, some recent research by Longhurst and Hargreaves [18], concerning the fuel poor in southern England, noted that people worry about energy bills and exercise vigilance over the energy they use (p. 5). This results in foreseeable actions such as rationing energy usage (p. 5): however, it may be surprising that some of the fuel poor go about their business by using the light from a television (p. 5). Moreover, some visit friends to 'warm up' (p. 5): whilst some risk becoming socially isolated by eschewing visitors as they find their fuel poverty to be embarrassing (p. 7). Many would feel that such limitations reveal that English society has failed to provide everybody with enough energy to fulfil notions of a basic requirement.

A major factor behind this conundrum occurred when the early twenty-first century saw energy price rises outstripping inflation[11]. A UK parliamentary report has cited various reasons for these increases: 'declining UK output, increased reliance on international markets, increased global demand, links between oil and gas markets, actions of some supplying countries, taxation and policies aimed at cutting carbon emissions' [20]. Although a variety of factors may be officially blamed for the rise in prices, the upward trend in price should have come as no surprise: stocks of all carbon-based fuels are diminishing, and in an energy market dominated by fossil fuels[12], energy prices will be expected to increase.

On the face of it, with a government adopting a future energy strategy based upon a combination of wind power and nuclear, consumers may expect a continuous and reliable supply of energy. In addition, many may expect the energy supply to be separated from the price

[10] Quite a complex definition of fuel poverty has been provided in this report with those living in energy inefficient households considered to be energy poor, as well as those who are left with relatively little disposable income after paying energy bills ([17], p. 3). Hence, households with high incomes may fall into this category if they have very high fuel costs: although the reader should appreciate that a strong correlation exists between energy poverty and households with low incomes ([17], p. 8).

[11] The Department of Energy and Climate Change (DECC) used a 2003 index for costs as 100 and measured the costs of consumer goods in terms of cash. The following figures for costs relate to that scale ([19], p. 21): 2014's fuel costs for home usage are valued at approximately 260 whilst 2014's consumer prices were valued at approximately 130: domestic energy prices have effectively doubled when compared to other goods in this time period.

[12] For total energy generation within the UK in 2019, according to BEIS, natural gas equivalent to 82.3 million tonnes of oil, coal equivalent to 6.6 million tonnes of oil, and petroleum equivalent to 150.3 million tonnes of oil were used within a total energy supply equivalent to 280.9 million tonnes of oil [21]; hence, by this measurement, approximately 85% of the UK'S energy generation depended upon fossil fuels.

increases plaguing a shrinking resource. However, two factors must be noted here: firstly, if the principle is accepted that harnessing equipment produces very cheap energy in domestic settings, then this prospect will be enticing for those who can afford the initial investment[13]; secondly, if it is accepted that domestic harnessing equipment will become more efficient and more affordable, then it is likely that such beneficial technology will enter society and become commonplace[14]. Hence, it may be expected that the more affluent consumers will be the first to move over to domestic provision, whilst the poorer consumers, would remain as paying customers, being dependent upon a government strategy to assure their energy supply.

The situation may be further exacerbated as greater numbers of harnessing entities leave the grid: with those that remain potentially being forced to pay more for the services of that grid ([25], p. 5). The poorer members of society may end up paying increasing grid costs and parallels may be drawn with the problems associated with using the shrinking resource of fossil fuels. In response, there may be those who would say that the most impoverished persons could always be assured a supply of energy at an affordable price. For instance, they could be offered cheaper energy at times when supply outstrips demand: such as during the night.

However, using energy at night, may be very inconvenient for some. Moreover, if this arrangement requires subsidies, then some of the subsidisers may feel chagrin at this form of 'taxation': especially, when it is realised that alternative arrangements are possible with the impoverished removed from the marketplace altogether, by being allowed to harness their own energy.

One major objection to criticising a centralised system may come from those adopting a broadly utilitarian viewpoint. They may say that, as a centralised the system worked for the vast majority of the people for the vast majority of the time, citizens should be prepared to continue with it. However, now the problem is that the erratic weather associated with climate change has thrown a new variable into the mix.

For instance, recent events in the UK would add further impetus to introducing domestic energy schemes. The very unusual weather conditions of Storm Arwen in late November 2021 left over 200,000 homes without power in the UK [26], and over one week later there were still an anticipated 9,000 homes without power [27]. Once more, but now due to stormy weather, not all persons enjoyed their basic requirement of energy. Moreover, some will have suffered physically due to lack of heat; not to mention the worry of anticipating future power outages.

Returning to look at the UK's future plans, the question arises, would renewables feeding into a centralised system solve the above problems? To start, centralised renewables would not remove the potential for industrial action disrupting energy supply. In fact, with fewer people, in more strategic and skilled positions, then any failings of the system may have a more magnified effect. This can be demonstrated by remembering the UK's power shortages of 1974 where power station workers also took industrial action: although stocks of coal buffered the effects of industrial action by the miners so that it took a few weeks for their industrial action to be felt,

[13] Using solar panels as an example, one commercial website estimates repayment periods of 8-10 years in the UK [22]; of course, this will be dependent upon installation costs, the equipment bought, the amount of light received, the potential to sell energy to a grid, and the amount of energy used. Currently in the UK, solar panels can add value to a home, but his is expected to become a more attractive feature in the future as persons become more aware of their environmental value [23]

[14] For example, Frank Geels and Johan Schot described a societal process whereby beneficial technological innovations enter a dominant 'regime' and become an integral part of that 'regime' ([24], p. 400).

industrial action by power station workers was felt within hours ([13]: 14). This reflected the difficulty in operating complex equipment without the full cooperation of highly skilled workers ([13]: 14). Hence, a centralised structure employing modern technology could be more susceptible to a range of human foibles, which may even include illness, malfeasance, poor maintenance, misjudgement, and staff absences.

It has already been noted that centralised renewables would not necessarily stop unaffordability and may exacerbate this problem where the affluent are able to opt out of the system. However, where the distribution is handled by private companies, they may also be pressurised into raising charges to maximise profits; in order to satisfy shareholders. Possibly the most unscrupulous may achieve this by limiting supply and effectively raising the price of energy; with the final cost falling upon remaining users, including the poorer members of society.

With regard to the new challenges provided by the erratic weather associated with climate change, it is not beyond reason that severe weather conditions could temporarily shut, or even destroy, centralised sources of energy generation; these would include fields of solar panels or wind farms. This would be in addition to damaging the distributing infrastructure such as power lines and grid systems. It is possible that the scale of problems that climate change may visit upon centralised harnessing may be so problematic as to cause human rights breaches.

An advantage of decentralised renewable energy should be immediately apparent here. If a storm hits a locality, then it would not be able to stop power completely over the whole area. To explain, some streamlined solar panels would expect to remain in place, whilst some stubborn wind turbines would cling to walls, and heat pumps in sheltered spots would persist. Additionally, if a storm is anticipated, then harnessing equipment can be secured and safeguarded; and brought back into use quite rapidly.

Overall, the UK's systems of energy provision have not assured human rights with failings caused by a trio of conspiring factors, being: industrial contention; rising prices due to the reliance upon the shrinking resource of fossil fuel; and unpredictable weather. A strategy based upon renewable energy distributed via a centralised approach, would not necessarily solve any of these problems. As the beneficial technology of small-scale harnessing introduces itself in domestic settings, the centralised supply of energy may become less important. Overall, the future may not have been adequately anticipated.

3. An Argument for Introducing Domestic Renewable Energy

This section notes that the introduction of domestic renewables has many benefits, which will be described here. In particular, it has the capacity to negate the problems associated with centralised energy provision and provide for a human right to energy; but with more investment, it should be capable of attaining the superior and more desirable condition of social justice within the sphere of domestic energy usage.

Accepting that energy strategies feeding into a centralised distribution system may be susceptible to allowing human rights breaches to occur, then why not introduce a superior supply that avoids the pitfalls associated with centralised supply?

This prompts the question, *what constitutes a superior supply?* Certainly, decentralised, small-scale harnessing equipment will take advantage of the fact that renewable energy is widespread and unlimited, and also that harnessing equipment is increasingly available and affordable on a

smaller scale. Additionally, once the harnessing equipment has been installed and paid for, it should produce unlimited energy at a cheaper price than conventional fuels. Augmenting this, the fear of a reduced or intermittent supply should be lessened, and harnessers should be removed from the marketplace and need not fear unaffordable energy costs. It was also noted that domestic harnessing equipment may be safeguarded when turbulent weather can be anticipated, although such conditions need not cause complete power outages over whole regions. Hence, it is now argued that domestic renewables, which benefit from the advantages of renewable energy, whilst further avoiding the problems of a centralised supply, would constitute a superior arrangement.

Certainly, it would be expected that the introduction of domestic harnessing equipment, with adequate equipment available to all, would be better able to tackle the problems associated with centralised distribution. In addition, domestic renewables could be associated with a concept of a *human right to energy*. A concept that would allow satisfying human rights via a defined amount of energy that should be available to each person, or alternatively, tasks that may be completed by each person.

The problem here, is that with a relatively small amount of extra effort, domestic renewables would allow the enhanced concept of social justice within the sphere of energy provision, to be introduced. At this point, it may be wise to define 'social justice', and it may be understood as being a concept of awarding goods above the level of merely having one's rights satisfied. It allows an element of equality, whereby all members of a society may relate to each other as equals, and its absence may 'undermine' a desired sense of 'fellowship' within society ([28], p. 197). For the purposes here, it may be understood as allowing all to carry out the aforementioned tasks of cooking, washing, maintaining an abode at a reasonable temperature, and providing lighting, to the point where all relate to each other as equals in this respect.

To elucidate, the difference between a human right and social justice, within the sphere of energy provision, may be explained by the task of cooking. A household may be assured enough energy so that its members enjoy enough microwaved food to live healthy lives: but *some* households in the UK would need more energy to cook the culturally important meal of a roast dinner on Sunday. It is considerations akin to the latter example that should be supported to forge a more inclusive society.

Hence, when harnessing equipment has been installed, it should be realised that some would need more energy than others to attain social justice. Certainly, some may need a larger wind turbine than others, whilst others may need a larger battery; in some cases, it may be merely a matter of leaving harnessing equipment running for longer, which effectively requires no extra effort or expense. In the long run, it may be miserly to deny allowing the establishment of sufficient equipment to allow social justice to occur. This additional cost for additional gains should be viewed as investing in society and therefore aiming to attain social justice may be considered to be the main goal here.

Turning to look at other commentators on the status of renewable energy, the results of this work may be framed in the terms previously summarised by van Veelen & van der Horst [29]. For instance, this work largely supports the concept of 'energy democracy' being an idealistic and more equitable end state to be reached in society (p.20). Moreover, a variant of 'material democracy' should be attained, where a greater number of people have 'more equitable access' to the resource of energy, and the physical presence of harnessing equipment should be

instrumental in 'reshaping society' (p.24). Nevertheless, as communities could partake in domestic arrangements and share equipment, there is also room for the 'associative democracy' favoured by most proponents of energy democracy, whereby local, self-governing, and voluntary bodies (pp. 23-4), exercise control over harnessing equipment and energy distributions.

At this point, some readers may expect this work to ally itself with an overall notion of 'energy justice' that concentrates upon distributing energy and alleviating energy poverty. Indeed, this work may share some common ground with those forms of energy justice that promote 'substantial equality' and account for inequalities in position ([30], pp. 2): as this work encourages a greater equality of opportunity with regards to energy access; and could allow the differing energy needs of individuals to be addressed[15].

However, this work may correspond more fully with the past work of Devine-Wright [31], who put forth the proposition of a popular 'energy citizenship' where people become 'active' participants rather than 'passive stakeholders' (p.71). Certainly, this work would agree with much of what he felt an energy citizenship would comprise: persons would be more aware of energy generation and usage (p.72); and one could expect the emergence of a more independent populous, that exercises self-sufficiency with regard to its energy supply (p. 77). However, Devine-Wright did not emphasise some of the aspects expected here, that persons would: gain more decision-making capabilities in their lives; become knowledgeable in the type of renewable sources that they can best utilise; and he seemingly overlooked the advantages of being freed from anticipating energy bills, allowing persons both extra time and extra resources to concentrate upon activities they prefer.

In response to these benefits, there may be those who say that the populace would now face the new worries of both maintaining and purchasing equipment. However, it should be realised that some harnessing equipment requires very little maintenance: for example, solar panels should have a useful lifespan of 25 years [32]. Hence, exchanging the underlying worry of regular energy bills and potentially intermittent supplies of energy, for maintenance costs and replacement costs that can be anticipated far in advance, would be a fair exchange for many. Possibly some devices may require an annual service from an engineer, but on the face of it, many would face less stress as 'active' energy citizens.

Further extrapolating the spirit of the work described here, reviewers of ethical theory should also note some benefits here. For instance, in any utilitarian calculation of happiness a more satisfied society should arise as all would be provided with enough energy for them to enjoy a flourishing home life. Additionally, advocates of deontology may note that domestic arrangements concentrate more upon treating persons as 'ends': rather than calculating how much energy can be generated and transported in total. Also, once domestic harnessing has been accepted as a facet of life, proponents of virtuous living may expect a culture to emerge where people will expect others to be provided with sufficient domestic energy. Hence, advocates of many current ethical theories should see some benefit here.

In total, domestic renewables could offer a form of social justice with regard to energy supply. In doing this it should satisfy a human right to energy, provide a form of energy democracy, and encourage the establishment of active citizens who are knowledgeable about their energy supply.

[15] The scenario described here would not ally itself with all definitions of energy justice, as a variety of definitions exist with the more complex of them being difficult to translate into policy ([30], pp.1-2).

Overall, it should allow the development of a more content and inclusive society with regard to energy supply.

4. The Societal Concerns around Domestic Renewable Energy

It should not be lost to the reader that domestic renewable energy has the capability to produce profound changes in society. Hence, some concerns surrounding society and the widespread usage of domestic renewable energy are now noted and addressed. For those concerned about the costs of introducing a new energy generating regimen, a method for a cost-effective introduction is suggested. And for those who are concerned that a process of domestic energy provision may bring forth unwelcome societal upheaval, then a discussion of some societal responsibilities that may be expected to accompany domestic harnessing is provided: it is noted that the new responsibilities may be largely accommodated within society's current collection of legal obligations.

4.1 How May Society Introduce Domestic Renewable Energy?

After identifying domestic renewable energy as the way forward, the question remains as to how society may facilitate its introduction. One method is suggested, followed by some criticisms of this approach. It is then noted how obstacles present in greater society, such as conventions for favouring centralised distribution, which would impede the introduction of domestic renewables, would ultimately subside. This section then ends noting that the regions of developing societies that lack adequate centralised energy provision may be better served by affordable domestic arrangements. Furthermore, the tempestuous weather associated with climate change may make the domestic approach more appealing.

One straightforward way of introducing domestic renewables may be by simply installing harnessing equipment in the homes of society's most disadvantaged and allowing them to become self-sufficient with regards to their energy supply. This may be accompanied by the provision of adequate insulation and energy saving devices. Immediately, this move would bear fruit as it would preclude the human rights breaches, associated with centralised energy supply, from occurring in a vulnerable sector of society.

There would be costs associated with this, although any taxpayers could expect to benefit in two ways. Firstly, this move can expect to be accompanied by reduced welfare payments as taxpayers need not now fund the disadvantaged's energy costs[16]. Secondly, domestic harnessing equipment should become a more widespread asset in society and its overall costs should reduce due to benefitting from the economies of scale incurred during mass production; hence, taxpayers would now have the option of buying affordable harnessing equipment and they may expect to enjoy a very economic energy supply[17]. Overall, the costs associated with a gradual move to

[16] Some research in Mexico would support this proposition. Prior to 2018, the previous Federal administration planned to introduce a national programme comprising distributed photo-voltaic energy generation; specifically in households where the rooftop could accommodate the apparatus ([33], p.3). It was calculated that the arrangement would be cost effective, with the government's capital outplay being repaid and those households benefitting from the equipment, that previously required their energy costs to be subsidised, would no longer require any subsidy ([33], p.30-1).

[17] In addition, when a notion of domestic energy firmly establishes itself, there may exist organisations, from which identifiable entities may rent or lease domestic harnessing equipment to gain energy.

renewables, via assuring the disadvantaged a supply of renewable energy, would not be prohibitive, and domestic renewables should be affordable for all when a market develops for such goods.

Rather than taxpayers paying the full initial subsidy, after an initial round of installing basic harnessing equipment, there may be those who feel that the disadvantaged should be encouraged to act as prosumers and sell energy to others; and from their proceeds they should buy the additional harnessing equipment, energy saving devices, and insulation they may need. Although such a notion would assist in establishing active, energy citizens within society, such a situation should only be considered to be a temporary phenomenon. It would be temporary because, increasing numbers of entities gaining enough energy for their own usage would mean fewer opportunities to sell energy. A few prosumers may remain in society to sell energy to manufacturing concerns, as one example, but they should consider themselves to be fortunate. Additionally, encouraging prosumers may ultimately increase the length of time needed to attain the widespread introduction of harnessing equipment, as such an introduction would contain less government stimulus encouraging mass production.

At this point, the length of time that this technology would need to be introduced can only be estimated. Sovacool [34] has written about timespans for the introduction of new energy regimens. He noted that the rapid introduction of nuclear energy in France, assisted by centralised decision-making (p. 209), took only ten years (p. 203): whilst the transition from coal to oil, gas or electricity took France 65 years (p.204). Sovacool also gave various analyses of the stages of introduction of new energy regimens (p.203-4), and the example of his three-stage introduction may be useful here, whereby: a slow introductory phase is followed by rapid uptake of the technology, ending in a slow phase of reaching maximum commitment. Here the ideal would to be for governments to fund the introductory stage and act as a catalyst, allowing market forces to operate in the stage of rapid growth. Here, a suggested timespan for the introductory stage could last 10 years, the rapid growth could continue for another 10 years, and a slow final phase could take 10 years; hence, an introduction, consisting of a hybrid public-private sector approach, estimated to take 30 years, could be expected.

That said, the introduction may be far more rapid. Apart from rapid introduction occurring where governments decide it is in a nation's interest, there are other 'drivers' of change today such as the scarcity of fossil fuels, climate change, technical innovation, and the sociological knowledge concerning the benefits of change towards less polluted living environments ([34], p. 210-11)[18].

After installation, some may fear that a surfeit of capacity in production may arise. However, the correct combination of harnessing equipment, would allow an identifiable entity only to fulfil its needs. To explain via a very simple scenario: in sunshine most energy may arise from solar panels and any excess energy may be stored; in windy conditions most energy may arise from wind turbines and again the excess energy may be stored; and when renewable energy is

[18] Some recent research in the Mexican city of Aguascalientes suggests that there remains grass roots support for the change to renewables which some residents may be prepared to finance themselves ([35], pp. 1121-2). This is after a new Federal administration favouring conventional energy sources replaced the previous administration which favoured renewables. If this engrained enthusiasm for renewables can be promoted, then introductions of 20 years' duration may be more likely.

unavailable, the stored energy may be retrieved. The correctly calculated combination of harnessing equipment would allow such scenarios to occur.

That said, the question should be asked, is a surfeit of energy really such a bad thing? A surplus of energy would allow society to continue in times of overcast skies followed by wind-free spells. This would be especially true if the energy can be fed into a grid system, stored, and retrieved later. A surplus of energy should therefore be looked upon as an insurance policy for times when energy cannot be harnessed.

At this point some readers may feel that a gross presumption has been made; if it is felt that domestic equipment can compensate for all the irregularities of supply from wind and solar, as examples. Some may maintain that each harnessing entity would need its own hydrogen storage facility to counter intermittent supply, and further note that this is currently both expensive and impractical [36]. The response here, is that although the solution described is currently only really available to those with a large storage capacity, including those with access to grid systems, when battery technology becomes more viable, this will be expected to be an option for all. Consequently, the solution is currently not impossible, but it should be viewed as a more relevant solution in the future.

Others may feel that the weakest link in the scenarios described is the reliance upon small-scale wind power. Received wisdom is that 'wind turbines and buildings do not generally mix' causing potential damage to buildings and turbulence that reducing productivity ([37], p. 341). But when it is realised that there are a variety of turbines available that may be affixed to all areas of buildings ([37], p. 305), along with devices that channel and concentrate the flow of wind ([37], p. 342), then less emphasis should really be placed upon the received wisdom.

Moreover, as a suggested quantity, if wind power contributes to 10% or more of an entity's total energy requirements, then it seems reasonable that it should be considered as a potential energy source. After such considerations, if wind turbines affixed to buildings, are still considered to be too trivial a contribution, then a harnessing entity may have the option of siting a wind turbine remotely or becoming part-owners of such a turbine. Hence, there are many ways that a seemingly insignificant contribution from wind power can be brought into the energy mix; largely by applying ingenuity to the situation.

There may also be those who maintain that society is licensing inefficiency when compared to the centralised method. However, it should be noted that a major inefficiency in the centralised approach has been the loss of energy in transmission due to electrical resistance in cabling; presently estimated at 5% of energy generated in the United States [38]. Renewables should not experience such a loss, as both wind power and solar radiation, as examples, bring energy directly to the site of harnessing. Moreover, the topic of energy efficiency would not be expected to be a major discussion point when renewable energy is an unlimited and plentiful resource.

In addition, there are those who may predict more government involvement in order for societies to retain the levels of taxation they gain from supplies of energy. From a governmental viewpoint, domestic supplies may reduce the amount of taxation gained by society, as harnessed energy may be used *in situ* and consequently remain an untaxed asset. If this is the case, the pressure will be on governments to replace lost revenue, and some may fear that society will have less ability to use taxation to cool overheating economies or stimulate sluggish situations. Moreover, it may be feared that the funding of traditional public sector activities such as social services, healthcare and education may be hindered.

It is possible that governments could raise monies from granting licences to harnessing sites or even raise tax by metering actual energy used. For instance, in Germany, those who harness and use solar energy on their own property, who are not small businesses, must pay a 19% sales tax on the used energy, as per the cost of energy from the public grid [39]. However, it should be noted that throughout history, people have found ways of avoiding paying tax, and distributed collection cannot ever be expected to raise as much revenue as the simpler, centralised arrangements.

That said, it may be argued that society already has enough opportunity to gain revenue and it will be expected to retain the stalwarts of fiscal policy such as income taxes, corporation taxes, sales taxes, and excise duties. Governments therefore retain many opportunities for gaining revenue to make good any shortfall that arises due to popular domestic energy harnessing. Therefore, it is possible that society will return to a taxation base similar to that established before the advent of power stations and grids.

Apart from the potential for direct objections to the suggested method of introduction, there may be some less tangible obstacles within greater society that may impede the process. For instance, Sovacool [34] noted that large sums of 'capital and effort' have been 'sunk' into current energy arrangements (p.205), implying that society would like to maximise the utility value from these assets. Additionally, many 'incumbent actors' may wish to contain and subvert innovation (p.205), implying that they would wish to maintain their wealth, status, and power.

More recent research by Baker and Phillips [40], would suggest that Sovacool's general position was realised in certain parts of the world. When using South Africa as an example, the state energy provider, namely Eskom, which enjoyed a monopoly, had previously refused to ratify purchasing energy from independent providers providing renewable energy (p. 184), leaving less energy powering South Africa. To make problems worse, such obstacles have been joined by governments seemingly being slow to react to technological change (p. 191): after wealthier households and businesses had installed domestic harnessing equipment for renewables, there remained a lack of 'regulatory clarity' as to how energy may be bought or sold from independent energy providers. (p. 188).

However, in any society introducing renewables, much intransigence may come from some members of the populace, as many persons who currently enjoy the convenience of centrally produced energy would need to be convinced of the efficacy of a domestic regimen, and they may also fear suffering some upheaval when moving over to the new arrangement. As the new technology introduces itself, they may feel *forced* to participate, and not necessarily feel enthusiastic about this new technology; moreover, the domestic arrangements described here cannot be said to embrace the concept of a 'participatory form of democracy' that may be favoured by many proponents of energy democracy ([29], p.23): some may feel that the material democracy that accompanies domestic harnessing has been thrust upon them. Nevertheless, as the harnessing equipment is gradually introduced, and it can be demonstrated that it works perfectly for the majority, with less problems than previous arrangements, it can be expected to be welcomed into society.

A few words concerning the introduction of renewables must be addressed to those who may say that this section has focussed upon the potential, future experience of regions that have already heavily invested in the infrastructure for centralised distribution. Taking an international stance, Devine-Wright noted how decentralised generation would increase the 'well-being and quality of life, particularly in developing countries' ([31], p. 73). Here, this work would agree with

these sentiments. Internationally, if domestic arrangements are accepted, then it may be expected that future energy usage should represent a vast improvement upon past circumstances, as renewable energy should be enjoyed globally, and access to such energy would not be contingent upon the society in which one happened to reside. It should provide a greater equality of opportunity with regard to obtaining energy as all should have access to it. Furthermore, greater equality of condition can be expected as the routine tasks of cooking, washing, maintaining an abode at a reasonable temperature, and providing lighting should be available to all.

Certainly, for regions that have not invested in distributing infrastructure, it may be more practical to follow the route of domestic provision. In 2004, the United Nations noted that decentralised energy provided a way forward to alleviate poverty in developing societies: they explained that although centralised schemes may benefit the better off in urban areas, decentralised schemes including renewables, would benefit the poorer rural areas ([41], pp. 35-6). A supporting factor is that many developing societies cannot afford the costly expense of extending grids to rural areas where a greater proportion of their population live ([12], p. 535), and it would not be in any private company's interest to act where they must award their shareholders with profit as opposed to providing a public service ([12], p. 534). In addition to this, the United Nations Development Programme (UNDP) contemplated the introduction of decentralised renewables in developing societies, noting how a combination of both public and private finance could be utilised ([42], p. 87).

Subsequent to the assessments of both academics and international bodies, by 2015, decentralised harnessing equipment began to establish itself in African regions where the majority of the populace were off-grid. For instance, in many sub-Saharan African nations, a growing private sector led by entrepreneurs selling energy from solar sources had emerged [43]; moreover, the presence of accompanying government policies, such as reducing sales taxes on harnessing equipment was often actioned to encourage their uptake [43].

By the 2020s, the International Energy Agency [44] had noted that the introduction of grid systems in Africa had been 'drastically slow' (p. 109). Conversely, the uptake of solar systems in the home, from which televisions, fans, and lightbulbs can be operated for a limited time, had 'accelerated since 2015' (p. 109), with sales reaching 'around 1.3 million units between July 2020 and June 2021' (p. 109). That said, the African government's current policies were felt to 'fall far short' of reaching the goal of providing universal access to energy (p. 106): nevertheless, with over 550 million Africans expected to be without energy in 2030 (p. 106), Africa can expect to be a region where domestic renewables will prosper.

It is arguable that the need for domestic energy provision via renewables, for those off-grid, had already been anticipated by Bangladesh. In 2014, it received financing from the World Bank to supply solar panels for home usage in rural areas [45]. Prior to this the World Bank considered schemes of this type have been to be successful and these additional solar panels increased the amount used in Bangladeshi homes to nearly 3.5 million. As Bangladesh will repay the loan over forty years, this provides a form of financing many developing societies should consider.

Prior to concluding this section, one benefit of the decentralised approach was prompted by the case study of the UK: whereby decentralisation would preclude a complete power outage occurring over a whole area suffering stormy weather. However, this facet of decentralisation may be enormously more important to developing societies confronted by climate change. To explain,

The Philippines was struck by Typhoon Rai in December 2021 which occurred later than such events would be expected: 200 municipalities were without power six days later; at least 375 people died; and over 600,000 persons remained displaced a week later [46]. When confronted with such desperate situations, societies on the front line of climate change may be forced to change to decentralised energy supplies.

In concluding this section, a method has been suggested as to how industrialised nations should take steps to introduce domestic renewable energy. However, it is also noted that certain developing societies may be currently favouring an overall decentralised approach to energy provision. As some of the developing societies will not have to deal, to the same extent as their industrialised counterparts, with the obstacles that may hinder the introduction of domestic renewables, they may be in a prime position to pursue a domestic approach. That said, climate change may make it imperative for some latitudes to change to distributed harnessing.

4.2 Society's Responsibilities

Although an argument has been supplied for the harnessing of domestic renewable energy, and a method of introduction has been suggested, it is possible that many vestiges of the former grid-based supply would remain. Furthermore, it will be argued that society should already hold the basic conventions to deal with any new responsibilities that emerge from the domestic arrangement. A few of the main responsibilities are featured here and it should be observed that they do not comprise an exhaustive listing.

Some may argue that the usage of the existing grid systems to transfer energy to areas experiencing a shortfall will remain necessary and so the grid may be viewed as an energy 'safety net'. Additionally, sometimes an energy user will be expected to harness energy remotely as they cannot generate energy *in situ*, and therefore they may expect to transport their energy via a major grid. Moreover, some of society's most disadvantaged may be so infirm as to be unable to manage harnessing equipment in any way, and therefore need to be provided with energy directly and the existing grid would be the best way to do this. Hence, keeping a grid may be imperative to upholding the spirit of social justice.

With fewer entities using a grid it will provide society with a conundrum as to whether to retain it. If so, it may be funded via charges to users, with the main users such as manufacturing bearing the brunt of the cost. On the other hand, if a grid is considered to be a public good then it may be funded largely from general taxation. The complex issue may be decided differently by differing societies.

Additionally, although the grid system is a centralised structure and may fall foul of the problems associated with the centralised generation of energy, it should be appreciated that the aforementioned problems would all be of far lesser importance: it is logical that with fewer persons dependent upon a centralised supply, those problems would be lessened. Nevertheless, for those who remain reliant upon a grid system to transport their energy, some problems associated with central supply would unfortunately remain and society should anticipate the problems and provide adequate remedies.

Also, the introduction of domestic harnessing would be expected to require some novel concerns to be accommodated by society. However, such concerns are likely to be able to be handled by minor adjustments to society's existing regulations. For instance, on a small scale, the

use of renewables may provide some new dangers to individuals that governments may wish to limit. As a hypothetical example, a contraption that harnesses solar power by utilising concave mirrors and magnifying lenses may be outlawed in the home due to its risk as a fire hazard. Hence, governments will be expected to act parentally and some energy generating methods will be controlled due to their inherent danger. Although this may require new amendments to existing laws, most societies would be expected to already have legislation in place to deal with this.

Accompanying the parental role, society may also be expected to perform a monitoring role: in order to measure individuals' levels of usage and ensure that social justice is upheld. As many societies already have the infrastructure to see that human rights are upheld, when localities are visited by social workers as an example, the monitoring should be an extension of established services.

A further concern for domestic renewable energy is the perceived harm that installing harnessing equipment may pose to neighbours. For instance, some may fear that homeowners may be forced to fell trees to allow their neighbours to access solar energy; others may fear noise from a turbine; whilst others may recoil at the addition of a heat pump to historic architecture. It would be expected that societies already have rules in place to prevent such disputes arising; however, as already noted, the ubiquity of renewable energy would allow various energy sources to be utilised to diffuse any quarrels.

At this point, many may exclaim that this work has previously suggested that developing societies should aim for domestic generation and it therefore contains an element of contradiction by leaving the option open for placing continued reliance upon grid systems. However, societies that are developing their energy infrastructure have the opportunity to learn from the UK's experience and refrain from being *too reliant* on a centralised system.

Possibly, developing societies should consider the principle of an energy safety net without a grid. For instance, utilising community batteries; or maintaining 'libraries' of harnessing equipment. That said, each particular society would have its own concerns about introducing domestic harnessing and this would inform the regulations and responsibilities operating.

The above has attempted to demonstrate that the continued use of energy distributing infrastructure would be likely to complement the domestic arrangements. Also, the appliance of existing regulations, to domestic renewables, will provide much continuity of standards.

5. Conclusion

The case study of the UK provides a prime example of where human rights breaches have been caused by a centralised supply of energy; with breaches caused by intermittent energy supplies and energy becoming increasingly unaffordable. These difficulties have recently been joined by the prospect of erratic, tempestuous weather, causing power outages over whole areas, making the introduction of domestic supplies more relevant. Additionally, it was noted that merely grafting renewable energy sources onto a centralised method for distribution does not promise to eradicate the problems associated with centralised energy supplies. However, it should also be noted that the beneficial technology of domestic renewables, with increasing affordability, increasing efficiency, and a resultant desirability for consumers, seemingly possesses an inevitability with regards to its introduction: this may sound the death knell for dominant supplies of domestic energy via centralised arrangements.

A domestic supply of energy derived from renewable sources, produced by a wide variety of independent harnessers, would expect to have many advantages. It would counter the aforementioned problems of centralised supply, whilst at the same time, taking advantage of renewable energy's widespread and unlimited nature. Moreover, it could institute social justice with regard to energy supply whilst also yielding a human right to energy. In addition it also promises to produce an active energy citizenship, with such citizens more knowledgeable about their energy supply, with all individuals treated ethically.

Focusing upon industrialised societies, the main changes that governments may like to enact would be to introduce the relevant harnessing equipment into certain sectors of society, such as society's most disadvantaged members: this should rapidly address the human rights breaches associated with centralised energy distribution for this sector of society. Moreover, this will precipitate a market for domestic harnessing equipment as it will be cheaper to produce, and more desirable by providing a more economic energy supply.

At the time of writing, governments of developing societies have offered varying levels of support. For instance, the South African government has seemingly been slow to see the benefits of domestic arrangements, although some of its businesses and more affluent citizens have been equipping themselves in this regard. Widening the scope to look at Africa as a whole, the benign taxation policies of some governments have seemingly been helpful in allowing entrepreneurs to provide renewable electricity locally. However, the idea of providing energy via domestic arrangements seems to have taken root on the continent and the purchase of solar harnessing systems are becoming more popular; and potentially providing the demonstration of the inevitability of domestic arrangements introducing themselves. Notably, the government of Bangladesh has seemingly already had the foresight to realise the usefulness of domestic energy provision in rural regions.

However, in the case of the Philippines, the spectre of unpredictable, turbulent weather now haunts some societies, and they may be forced to seek decentralised energy provision as it should be more resilient in situations where whole areas suffer storm damage.

In addition, it should be noted that many of the new responsibilities required when using the domestic approach may be accommodated within a society's current legislation.

A corollary of the findings is that if industrialised nations continue to concentrate on distributing renewables via a centralised distribution system, then the global harnessing of domestic renewable energy may only truly be hastened when industrialised societies realise that domestic arrangements have worked *successfully* in developing societies. That said, all societies should really be considering their own domestic energy transformation.

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