

Empowering Inclusivity: Green Energy Technology for People with Disabilities

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Running Title: *Green Energy Technology for People with Disabilities*

Abstract: *This account delves into the convergence of green energy technology and its capacity to empower individuals with disabilities. As global attention increasingly turns towards sustainable development and renewable energy, it becomes essential to guarantee that these advancements are all-encompassing and within reach of every segment of society, including those with disabilities. The purpose of this composition is to outline the various methods through which green energy technology can be customized to address the distinct requirements of individuals with disabilities, thereby promoting inclusivity and equal involvement in the shift towards a more sustainable future. The account underscores the wide spectrum of disabilities and the specific obstacles they pose when devising and executing green energy solutions. It examines the potential of assistive technologies, universal design principles, and comprehensive policies in enabling these individuals to actively participate in and reap the benefits of green energy initiatives. Additionally, it showcases the societal impact of integrating these individuals into the green energy sector, emphasizing the value of diverse perspectives and contributions in propelling innovation and advancement. By shedding light on the potential challenges and prospects at the intersection of green energy technology and disability inclusion, this article aims to serve as a catalyst for further research, policy formulation, and industry endeavors that prioritize the empowerment and integration of people with disabilities in the realm of green energy. Ultimately, it advocates for a future in which sustainable energy solutions are genuinely inclusive and accessible to all, ensuring that no one is overlooked in the pursuit of a more environmentally friendly and fairer world.*

Keywords: Challenges - Discrimination - Diversity - Equity - Fuels - Pollution - Sustainable Development -

1. Abbreviations

PWDs People with Disabilities

GET Green Energy Technology

RET Renewable Energy Technology

2. Introduction

Industrialised societies run on energy. We do not have a energy crisis. As we know, energy can be converted from one form to another. Energy cannot be created or destroyed. But, there can be and there is an energy dilemma. The finite amount of fossil energy, for example is fast depleting with increased consumption across nations. The obvious solutions are reduce consumption, have zero population growth, shift to renewable energy, reduce greenhouse gas emissions, reduce environmental pollution, and cut down military expenditure (Jelly, 2020; Nelsen, 2011).

In simple words, energy is “an ability of abody to do work.” Available energy sources for sustainable development include fossil fuels, renewable energy, solar, wind, and nuclear energy. Energy comes in many forms: electrical, heat, mechanical, potential, nuclear, and light energy (Solanki, 2009). People have long used energy to make their lives easier and better. One of the first energy “inventions” was fire. People used the energy of fire to cook food, heat themselves, and give light (Herweck, 2007).

Clarification of Basic Terms

There is a difference between green, clean and renewable energy. Some forms of energy are renewable but not green or clean (such as with some forms of biomass energy). Green energy is that which comes from natural sources, such as the sun. Clean energy are those types which do not release pollutants into the air. Renewable energy comes from sources that are constantly being replenished, such as hydropower, wind power or solar energy (Keramitsoglou et al.2016). Criminal associations between entrepreneurs and politicians in the large scale production of energy are given the euphemism and nicknamed as “dirty” energy (Gennaioli & Tavoni, 2016).

Green energy is any energy type that is generated from natural resources, such as sunlight, wind or water. It often comes from renewable energy sources although there are some differences between renewable and green energy. Green energy resources do not harm the environment through factors such as releasing greenhouse gases into the atmosphere. As a source of energy, green energy often comes from renewable energy technologies such as solar energy, wind power, geothermal energy, biomass and hydroelectric power (including tidal energy, which uses ocean energy from the tides in the sea). Each of these technologies works in different ways, whether that is by taking power from the sun, as with solar panels, or using wind turbines or the flow of water to generate energy. Solar and wind power are able to be produced on a small scale at

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people's homes or alternatively, they can be generated on a larger, industrial scale (Bradley, 2003).

In order to be deemed green energy, a resource cannot produce pollution, such as is found with fossil fuels. Not all sources used by the renewable energy industry are green. For example, power generation that burns organic material from sustainable forests may be renewable, but it is not necessarily green, due to the CO₂ produced by the burning process itself. Green energy sources are usually naturally replenished, as opposed to fossil fuel sources like natural gas or coal, which can take millions of years to develop. Green sources also often avoid mining or drilling operations that can be damaging to eco - systems (Bhaskar et al.2022).

3. Applications

Green energy technology (GET) finds various practical applications in our daily lives. These include solar panels that capture sunlight and turn it into generating electricity in residential, commercial, and portable settings. Wind turbines are used for harnessing wind energy to power buildings, and electric vehicles for sustainable transportation. Additionally, energy- efficient appliances like refrigerators, air conditioners, and light bulbs help reduce electricity usage. Another type of green power called geothermal taps the energy that has been stored just under the earth's crust. While this resource requires drilling to access, thereby calling the environmental impact into question, it is a huge resource once tapped into. They have been used for bathing in hot springs for thousands of years and for steam to turn turbines and generate electricity. The flow of water in rivers, streams, dams or elsewhere produce hydroelectric power to generate electricity. Biomass energy is derived from organic materials such as wood pellets, sawdust and combustible organic agricultural waste to produce heat and electricity. While the burning of these materials releases greenhouse gas these emissions are still far lower than those from petroleum - based fuels. Having supplied just 2.7% of the world's fuel for transport in 2010, the biofuels are estimated to have the capacity to meet over 25% of global transportation fuel demand by 2050 (Pitachan, 2022).

GETs can significantly impact the daily lives of people with disabilities (PWDs) by improving accessibility, cutting energy expenses, and promoting environment friendly sustainable living. For instance, electric and hybrid vehicles can offer accessible transportation by incorporating features like electric wheelchair ramps and charging stations, making independent travel and mobility easier. Additionally, energy - efficient home appliances can decrease energy usage and lower utility expenses for those from low or fixed income nations or those with limited mobility (Banks, Kuper, & Polack, 2018). Solar panels for renewable energy, energy - efficient appliances, and home technologies with smart thermostats and energy - efficient building materials, solar water heaters, or solar powered lighting, can be combined to establish more accessible, sustainable, and comfortable living spaces for these people. These systems, controllable remotely or via voice commands, offer increased independence and convenience (Bricout et al.2021).

Furthermore, solar - powered assistive devices like hearing aids and communication devices, electric wheelchairs and scooters can be charged more sustainably, reducing reliance on traditional electricity sources or non - renewable energy sources (Vo et al.2018; Parving & Christensen, 2004).

Community support centers and facilities for PWDs can benefit from GETs like solar panels installed to provide clean energy for lighting, heating, and cooling, reducing operational costs and environmental impact for those utilizing the services even in areas with unreliable or limited access to the power grid. Natural day lighting is preferable to artificial electric lighting. GET can also be utilized for their recreational and leisure activities. For example, accessible outdoor spaces can incorporate renewable energy sources to power adaptive children's playground equipment, lighting for evening activities, and charging stations for electric mobility devices. The playful energy can be converted into electrical energy and be sufficient to light up the park and use of other small appliances like swings, sea - saw, and merry - go - round used in the playground (Raney, Hendry, & Yee, 2019; Khan & Saeed, 2017; Ellsworth, Oveson, & Salmon, 2017).

Moreover, accessible RETs seek to provide economic empowerment by creating training and employment opportunities in green jobs for PWDs, focused on renewable energy installation, maintenance, and repair can enable them to pursue careers in the renewable energy sector and learn about sustainable living practices (Hofmann & Strietska - Ilina, 2014; Bruyère & Filiberto, 2013). Renewable energy saw the creation of 11 million jobs worldwide in 2018, with this number set to grow as we strive to meet targets such as net zero. Therefore, considering current global trends, the emphasis on producing renewable energy to guarantee sustainability appears to be growing and broadening social change with impacts on the lives of even people with severe mental disorders (Carta et al.2013).

Empirical studies on GET applied to PWDs are nearly absent. In a rare attempt, Lovelock (2010) attempted a comparison of the environmental values and behaviours of persons with and without disability, long-standing illness or infirmity. No significant differences were found between respondents with/without disability for either their general environmental attitudes or their general ecological behaviour. In this regard, the declaration given by International Labor Organisation is noteworthy (Fundacion, 2023).

4. Opposition & Drawbacks

Although the general public appears to accept GET, there is also opposition to its implementation. Wojuola and Alant (2017), for example, found that the Nigerian public's understanding (inclusive of knowledge, beliefs, perceptions and attitude) of GET was negative owing to lack of information about how GET works. Further, the cost and corruption surrounding its implementation all created negative perceptions about GET among the public. There is a need for both formal and informal energy education in any country for its whole hearted acceptance.

Listed as drawbacks of RETs are their high capital and maintenance costs, substantial upfront expenses for installation, limited battery storage capacity contributing to pollution, efficiency issues, geographic limitations, space requirements, and potential displacement of communities and wildlife. A specific concern for PWDs involves the physical accessibility of renewable energy infrastructure. For instance, remote locations of wind or solar farms may pose challenges for PWDs to reach, and the design of certain renewable energy technologies may not fully consider their needs. It is crucial for green energy initiatives to prioritize inclusivity and accessibility, ensuring that PWDs can fully engage in and benefit from the shift to sustainable energy (Borch & Strandbakken, 2019; Iravani, Akbari, & Zohoori, 2017; Maradin, 2021).

5. Measures of Green Energy

Measures of green energy applications for PWDs can include ensuring that RETs and infrastructure are accessible and inclusive for them. This can involve designing solar panels, wind turbines, and other renewable energy systems with features that accommodate various disabilities, such as visual impairments or mobility challenges. Additionally, providing training and education on green energy technologies in formats accessible to such people is important, as well as ensuring that green energy initiatives consider their specific needs and perspectives in their planning and implementation.

At an individual level, **green audits** are possible by all of us. An energy audit is a process of measuring and analyzing the energy consumption and efficiency of a building, a device, or a system. An energy audit can help identify the sources and amounts of energy used, the areas and ways energy can be saved, and the potential benefits of switching to renewable energy sources. This is done by finding out which room in a house uses maximum of energy? The kitchen, bedroom, bathroom, living room, or others. Children, for example can be shown how different activities like running, sports, cycling, exercise use different types or levels of energies. Questions can be raised, such as: How green am I? How green is your lifestyle? How often do you eat animal based products? How much of the food you eat is unprocessed, un packaged, and locally grown? Which housing type best describes your home? What material is your house constructed with? How energy efficient is your home? What percent of your house's energy comes from renewable sources? Compared to your neighbors, how much trash do you generate? How far do you travel by car or moped every week? How often do you use a car pool or public transport?

Green audits for PWDs involve assessing the environmental accessibility and sustainability of spaces and facilities to ensure they are inclusive and supportive of such individuals. This can include evaluating the accessibility of green buildings, renewable energy systems, and sustainable infrastructure to ensure that they meet the specific needs of these people. The audits may focus on aspects such as wheelchair accessibility, sensory accommodations, communication access, and overall usability for individuals with diverse abilities. The goal is to promote environmental

sustainability while also ensuring that green initiatives are inclusive and accessible to all members of the community, including those with disabilities. Universal design and green building design was examined for key buildings in Malaysia to ascertain accessibility compliance for PWDs. However, it must be noted that access audit is different from green audit having different purposes. One assesses barriers to access while green audit also known as environmental audit, covers aspects such as energy efficiency, waste management, resource conservation, and compliance with environmental regulations (Ninno Muniz et al.2020; Yiing, Yaacob, & Hussein, 2013).

Suggested Green Energy Activities

There can be no denial of the need, rationale, or justification for implementing GET, exploring innovative eco - friendly practices and sustainable solutions to not only benefit the environment but also enhance learning experience for PWDs. Given below are some points suggested as green activities:

- Teach children to make **paper pin wheels** and run around enjoying their spin.
- To make a **solar bulb**, fill a clear, empty plastic bottle with water, and add two capfuls of bleach. Cover the plastic bottle, and then expose it to direct sunlight. By evening, your solar bulb will glow just like a regular bulb.
- To prepare **solar heated tea**, fill a glass with water and add tea to it. Stir the mixture from time to time. Leave it in a place where the sun reaches the glass. Even though sun is powerful as a source of energy, it requires time. After a couple of hours (depending on heat), the tea must be ready to serve.
- Teach them **sustainability, which** means something can continue to exist for an indefinite amount of time. Gardening is an easy example to present to children for this concept. If a tomato is grown, that tomato contains seeds. Those seeds can be replanted, and the cycle will continue.

Ask them to list the ways one can save energy.

Turn off the radio and television when no one is watching.

Turn off the lights when you are not using them.

Close your curtains to keep heat out when it's hot outside, and the cold out when it's cold outside. Curtains help act as a layer of insulation. About 40 percent of unwanted heat comes through windows and about 10 percent of heat energy lost from a building goes through the windows.

Use a solar - powered calculator instead of a battery - powered calculator.

Use a fluorescent bulb instead of an incandescent one.

Use a hand - operated can opener, not an electric one.

Don't use an electric toothbrush.

Recycle your pop cans, glass bottles, and plastic containers.

Pass the clothes you've outgrown to a brother or sister or to someone who needs them.

Tell someone if there is a leak in the taps or toilets.

Don't leave the refrigerator door open for a long time.

Use a sweater to stay warm in the winter instead of turning up the thermostat.

Eat less meat. The production of meat is incredibly energy and water - intensive and contributes to pollution of the air and waterways.

Bike or walk whenever possible to reduce vehicle emissions and the amount of energy required to produce and transport fuel.

Ride the bus instead of taking the car.

Take the stairs instead of the elevator or escalator. Elevator usage contributes to a significant fraction of the total energy used in buildings today. Plus, walking a few flights makes you healthier!

Exercise outdoors instead of using electrical machines whenever possible. Try going on a hike, swimming in a lake, going on a jog, or running up and down some stairs!

Use revolving doors whenever possible. This type of door prevents up to 18 percent of building heat loss by preventing outdoor air from being sucked in when a door is pulled open.

Challenge students to sort pictures according to whether the energy word is renewable or nonrenewable. For example, renewable pairs are kite - wind, dog - food, tree - sun, fire - wood, sail boat - wind. Examples of non renewable pairs are lamp - electricity, car - gasoline, television - electricity

6. Summary & Conclusion

International mandates such as the UN Convention on the Rights of Persons with Disabilities and the "leave no one behind" commitment of the 2030 Agenda for Sustainable Development have prompted a global push to incorporate a disability perspective into the ongoing green transition across various sectors like energy, transportation, construction, manufacturing, agriculture, water management, waste management, forestry, and tourism. A comprehensive roadmap is essential for the proposed shift to GET for PWD, with active involvement from public authorities, NGOs, corporations, educational institutions, labor unions, and worker representative organizations.

The impact of climate change and the resulting environmental crisis has affected PWDs as well. The workplace is experiencing increased digitization, and there is a need for a disability - inclusive approach to the green transition involving multiple stakeholders. The shift to a green economy and green jobs necessitates skill enhancement and accommodations for people with disabilities, who have generally been underrepresented in the greening processes, leading to overlooked opportunities for their inclusion. Currently, over 1.3 billion people worldwide,

approximately 16% of the population, live with some form of disability, and the global unemployment rate for this group, which is mostly of working age, stands at 7.6%, compared to 6.0% for those without disabilities. This number is projected to nearly double to 2 billion by 2050. Despite this significant and increasing prevalence, PWDs continue to face disadvantages in the labor market, encountering various challenges, barriers, and discrimination, resulting in substantial disparities compared to the general population.

Women with disabilities encounter a dual disadvantage in the labor market due to both their gender and disability status. The lack of digital accessibility compounds these difficulties, impeding their ability to effectively carry out tasks, collaborate, and communicate in the workplace, thereby constraining their prospects for career progression. Discriminatory biases are prevalent, leading to a higher likelihood of engaging in low - paying, part - time roles, often within the informal economy. They are also deprived of social protection, face shortened careers, reduced income, and frequently limited to part - time employment. Additionally, the recent Covid - 19 pandemic has exacerbated the employment and financial circumstances of PWDs. We need to be guided by the spirit of target 4.5 of Sustainable Development Goals to eliminate gender disparities by 2030 to achieve accessible, full and productive green spaces and employment for all PWDs.

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