



## ETEC Project Executive Summary

### I. Project Context

- “Energy is the golden thread that connects all the Sustainable Development Goals.”<sup>1</sup>

Back in 2015 “The General Assembly of the United Nations” adopted “The 2030 Agenda for Sustainable Development”. Therein Goal 7 has mandated to “ensure universal access to affordable, reliable and modern energy services” (7.1), and to “expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all [...but] in particular least developed countries” (7.b) – whereby stated SDG7 agenda items are to be accomplished “by 2030”<sup>2</sup>

- “The access deficit in Sub-Saharan Africa”

By 2021 however, a “joint report of the custodian agencies [...] International Energy Agency (IEA), International Renewable Energy Agency (IRENA), United Nations Statistics Division (UNSD), World Bank, World Health Organization (WHO)” is conceding, that “the access deficit in Sub-Saharan Africa has risen by more than 50 percent since 2000”, hence “urgent progress is needed”. “7 [countries] have proportions of their respective populations with access at or below 5 percent, including Democratic Republic of the Congo, Ethiopia, Madagascar, Mozambique, Niger, Uganda, and Tanzania”<sup>3</sup>.

- “The Affordability Gap”...

Researchers have discovered, that across the sub-Sahara, (clean) “energy poverty” is co-existing with “extreme poverty” – a phenomenon academically euphemised as “the affordability gap”, which may occur if “disruptions” “cause delays in payments”<sup>3</sup>!

It is, therefore, needless to say that “the access gap will become more challenging to close”<sup>3</sup> along the 2030 Agenda’s “endeavour to reach the furthest behind first”<sup>4</sup> – because: “Unserved people continue to live mainly in scattered, hard-to-reach settlements with weak infrastructure, making the equation between affordability and financial viability ever harder to solve.”<sup>3</sup>

- ... as result of a “Viability Gap”

Consequently, these interventions for “the furthest behind” not only have to “provide supply-side subsidies”, but as well “demand-side subsidies in the off-grid sector [which] aim directly at lowering the price consumers pay and making solutions affordable to the poorest households.”<sup>3</sup>

- Economically unviable yet sustainable?

But if, in order “to account for both supply- and demand-side transition barriers”<sup>4</sup> – even “the reliance on grant funding meant this programme was only able to run for a set length of time”<sup>5</sup>, how on earth could “access to electricity” become the preferred solution and its global “percentage of population” the critical “Indicator 7.1.1”<sup>6</sup> of SDG7?

Actually, the equation of “Sustainable Energy for All”<sup>7</sup> with “access to electricity” yet predated SDG7, with the latter containing no further specification about a certain kind of “modern energy for all”<sup>2</sup>!

1 “Secretary-General’s remarks at High-Level Symposium on Global Energy Interconnection”, UN, Nov 2017: <https://tinyurl.com/4GjC>

2 UN/RES70/1, “Transforming our world: the 2030 Agenda for Sustainable Development”, NYC, Sep 2015, PDF: <https://tinyurl.com/3aD9>

3 IRENA, “Tracking SDG7: The Energy Progress Report 2021”, Jun 2021, PDF, pg 13,60: <https://tinyurl.com/5hK4>

4 UNDP, “What does it mean to leave no one behind?”, Aug 2018: <https://tinyurl.com/43Dp>

5 SeforALL, “The Role of End-User Subsidies in Closing the Affordability Gap”, “Case Study – Ghana”, PDF, pg. 14: <https://tinyurl.com/6YBD>

6 World Bank in partnership with UN Energy and SE4ALL, “Metadata for Goal 7”, PDF, pg. 2: <https://tinyurl.com/6YCM>

7 SEFA (later rebranded as SeforALL), “Sustainable Energy for All: An Overview”, Apr 2013: <https://tinyurl.com/6YEK>



- “Modern Energy” Generation – by more than century-old conceptual designs?

Little known is the fact that even today's *“microchip-governed e-world is utterly dependent on an electricity supply whose fundamental design remains beholden to thermal- and hydropowered-generation systems, both reaching the commercial market in 1882 [sic!], which still provide more than 80 percent of the world's electricity. And we aspire to make it available at least 99.9999 percent of the time, so that it can serve as the cornerstone of everything electronic.”*<sup>8</sup>

- Because of Electrification “Energy-Conversion Efficiency Is Falling”<sup>9</sup>

SDG7 Target 7.3 mandates to *“double the global rate of improvement in energy efficiency”*! Instead, as a result of the ever expanding electrification in the developed world, today already *“about two thirds of the total primary input go directly into heating the universe without performing first any useful work, and only a third provides desired energy services, while in 1950 it was a 50/50 split.”*<sup>9</sup>

- Technologically inefficient yet ecologically sustainable?

This overall *“retrogression”* in *“energy efficiency”* has been caused by the increasing substitution of *“direct fuel uses”*<sup>9</sup> from primary energy carriers with secondary *“modern energy services”*. Needless to say, since energy-conversion, -provision or -storage all carry a price tag, unavoidably the latter must turn out less *“affordable”*.

Therefore, at the baseline of any more sustainable energy supply project must stand the question, whether *“direct fuel uses”* might not be more applicable in order to meet those SDG7 Targets?

## II. Project Baseline

- Back to a Sustainable Future – by Organic Solar Energy

*“During the Paris Exposition in 1900, a small diesel engine was operated on arachide- (peanut-) oil by the French Otto company. It worked so well that only a few insiders knew of this inconspicuous fact. The engine was built for petroleum and was used for the plant oil without any change.”*<sup>10</sup>

*“The French Government at the time thought of testing the applicability to power production of the Arachide, or earth-nut, which grows in considerable quantities in their African colonies, and can easily be cultivated there.”*<sup>11</sup>

- The Ultimate Resource of “Green Energy”: Vegetable Oil

Indeed nature is providing the most affordable and sustainable organic solar energy-collectors and storage devices, imaginable. Whether generated by means of photovoltaic or photosynthesis panels, better known as leaves, its ultimate end – solar power – must be kept at disposal till consumption:

The best green battery there is, vegetable oil, contains  $\geq 10$  kWh of energy per litre. To deliver the same amount in form of electric energy, it would require a *“10kWh Powerwall”* battery system. Such a device<sup>12</sup> will cost *“unaffordable”* US\$2600 and weight 100 kg due to its battery pack with 100-times less energy-density than the oil bottle's 1 kg. Its *end of life* is reached after *“6000 cycles”*, leaving the owner with a heap of hazardous residue – unlike any entirely bio-degradable veg-oil battery unit!

8 Smil, *“The Miraculous 1880s”*, IEEE Spectrum, Jun 2015: <https://tinyl.io/5jJL>

9 Smil, *“Energy-Conversion Efficiency Is Falling”* (print title), IEEE Spectrum, Jan/Feb 2021: <https://tinyl.io/5ieJ>

10 Diesel, *“Die Entstehung des Dieselmotors”*, Springer Berlin, 1913, translating from German, PDF, pg 115: <https://tinyl.io/68tv>

11 Wikipedia, *“Biodiesel”*, 2. Historical background, 2<sup>nd</sup> paragraph ff: <https://tinyl.io/68vB>

12 OSM Inc., *“10kWh Powerwall Home battery System”*, Shenzhen China, 2021: <https://tinyl.io/6830>



- [“Electronic Marvels Turn Into Dangerous Trash in East Africa”](#)

*“In Dar es Salaam, for example, laborers who collect heavy lead acid batteries used in cars, power backup systems and rooftop solar systems frequently break them open with machetes and drain the acid into the ground by hand. [...] A lot of e-waste must be sent abroad for proper recycling that meets international standards.”<sup>13</sup> Nonetheless, these “modern energy services” – leaving behind toxic wastelands during material-extraction, production and decommissioning<sup>14</sup> – are labelled as “sustainable”, “renewable”, “clean or “green”!*

- [“Green Energy’s Dirty Secret: Its Hunger for African Resources”](#)

*“The dirty secret of the green revolution is its insatiable hunger for resources from Africa and elsewhere that are produced using some of the world’s dirtiest technologies. What’s more, the accelerated shift to batteries now threatens to replicate one of the most destructive dynamics in global economic history: the systematic extraction of raw commodities from the global south in a way that made developed countries unimaginably rich while leaving a trail of environmental degradation, human rights violations, and semipermanent underdevelopment all across the developing world.”<sup>15</sup>*

- [“Push Down to Lift Up” – Subsidising Sustainable Development Investment](#)

By 2009 the UN “Global Green New Deal” (GGND) promised “to make a big push”: *“In the first decade-and-a-half, it will require globally funded guarantees, or price supports, to subsidize investment.”<sup>16</sup> The 2021 “joint report of the custodian agencies” however conceded, that “interventions [...] focused on [...] providing supply-side subsidies (concessional financing, results-based financing, and grants) as a first step in closing the access gap [...] have not been able to bridge the affordability gap that prevents the poorest and most vulnerable consumers from obtaining electricity”.<sup>3</sup>*

- [Bridging the Gap – and Subsidising Sustainable Development](#)

In a nutshell, the ETEC Project is proposing to bridge “supply- and demand-side transition barriers”<sup>4</sup> by simply empowering “the furthest behind”<sup>3</sup> – with a fractional amount of the usual subsidies – to manage the entire energy-supply and -access value chain single-handedly!

The baseline to this end consists of home-growing oil plants and thus yielding unrivalled renewable and sustainable bio-fuel! These means of hands-on energy supply will literally *em-power* the grassroots to become architects of their own future; by following Diesel’s blueprint, “small engines used primarily by small, independent producers”<sup>17</sup>, are bringing to pass local circular economic growth.

### [III. The Project as “Emergency Response”](#)

- [“Access to clean, renewable energy is, quite simply, the difference between life and death.”<sup>18</sup>](#)

As a matter of fact, “indoor air pollution from using combustible fuels for household energy caused 4.3 million deaths in 2012, with women and girls accounting for 6 out of every 10 of these.”<sup>19</sup>

(About half of the death count has sparked the massive COVID-19 emergency response.)<sup>20</sup>

13 Yee, “Electronic Marvels Turn Into Dangerous Trash in East Africa”, NYTimes, May 2019: <https://tinyl.io/6YxT>

14 Bonelli, “Lithium will not decarbonise our world”, University of Amsterdam, Dec. 2021: <https://tinyl.io/6Z1H>

15 van Staden, “Green Energy’s Dirty Secret: Its Hunger for African Resources”, Foreign Policy, Jun 2022: <https://tinyl.io/6Z1Y>

16 AtKisson, “A Global Green New Deal for Climate, Energy, and Development”, UNDESA, Dec 2009, PDF: <https://tinyl.io/5lrE>

17 Smil, “Diesel Engine at 120”, IEEE Spectrum, Jan 2017, PDF: <https://tinyl.io/6Zrh>

18 Guterres, “Opening remarks to High-level Dialogue on Energy”, UN Headquarters, Sep 2021: <https://tinyl.io/6X2n>

19 UN SDG 7, “Affordable and Clean Energy | Facts and figures”, United Nations, 2021: <https://tinyl.io/5dQ7>

20 “WHO Coronavirus (COVID-19) Dashboard”, “Global Situation”, 30/01/2021: <https://tinyl.io/3ame>



- UN Secretary-General: “Leave no one behind’ mantra matters more than ever”<sup>21</sup>
- ✗ “Current trends suggest that unless rapid action is taken to scale up clean cooking, the world will fall well short of the SDG 7 target of universal access to clean cooking fuels and technologies—by almost 30 percent”;
- ✗ “In fact, the access deficit in Sub-Saharan Africa has risen by more than 50 percent since 2000”<sup>23</sup>!

Relevant studies literally beat around the bush as to why in sub-Saharan Africa “the *“triple benefits” of improved health and time savings for households, conservation of forests and associated ecosystem services, and reduced greenhouse gas emissions, have proven elusive to achieve at a cost affordable to users*”<sup>22</sup> Also the “World Bank’s Energy Sector Management Assistance Program (ESMAP)” resorted to “ACKNOWLEDGING UNCERTAINTY” [sic], “because clean cooking is a complex intervention, it is quite difficult to attribute an outcome to a single driver or barrier”<sup>23</sup>.

Whatsoever, “more focused attention is needed to improve access to clean and safe cooking fuels and technologies [...and] to expand the use of renewable energy beyond the electricity sector”!<sup>19</sup>

- Accomplishing the “proven elusive to achieve” by “rapid action”

In fact adequate fuel-crops and optimised hardware are on stand-by for immediate implementation:

1. A decade ago, the German company B/S/H<sup>24</sup>, a subsidiary of Siemens and Bosch, started marketing the off-grid cooker “Protos”<sup>25</sup>, which would gasify vegetable oil. Its technology proved to be clean and its energy supply renewable. Regrettably the project was shut down, after the mandatory blending of “biofuels”<sup>26</sup> into motor vehicle fuels by Developed Countries gained negative publicity<sup>27</sup>. From now on the annual need of a family for plant oil would instead “green” one day’s fuel consumption of a heavy goods vehicle by 20%.
  2. ETEC has already secured cooperation with the German developer of “Protos”. This expert in thermodynamics<sup>28</sup> salvaged about 800 stoves from the discarded stocks. Improvements on the cooker are in testing, as well as a cooler and an electric generator powered by veg-oil. Even a walk-behind tractor might be an option.
  3. The “Green Climate Fund” (GCF) to begin with, a fund established within the framework of the UNFCCC, is ready to assist its designated “Priority Group” of Least Developed Countries with grants!<sup>29</sup>
- ETEC Community Interest Statement

As a result of **1.+2.+3.**, the “rapid action”, requested by the UN’s “custodian agencies”, could instantly be “taken” “to scale up clean cooking”. And this time, all designated “clean energy” subsidies are meant to create domestic wealth not returns off-shore.

Accordingly it stands to reason, that ETEC as a company is dedicated to work for the community interest — not for profit!

21 UN News, “Leave no one behind’ mantra matters more than ever [...] Guterres”, Apr 2020: <https://tinyl.io/43EA>

22 Petrokofsky et al., “The Importance of [...] Modern Cooking Energy Services”, Aug 2021, PDF: <https://tinyl.io/6PLQ>

23 ESMAP, “What Drives the Transition to Modern Energy Cooking Services?”, Feb 2021, PDF: <https://tinyl.io/6SLA>

24 Wikipedia, “BSH Home Appliances”: <https://tinyl.io/62A5>

25 Shiroff, “Protos The Plant-Oil Cooker”, presentation in Bonn, Jan 2011, PDF: <https://tinyl.io/61mt>

26 DIRECTIVE 2009/28/EC, ANNEX V, “A. Typical and default values for biofuels...”, Apr 2009: <https://tinyl.io/62ZQ>

27 N.N., “Palm oil: Cooking the Climate”, Greenpeace International, Nov 2007: <https://tinyl.io/62aK>

28 Prof. Dr.-Ing. Wirbser, Head of Research Laboratory, Karlsruhe Institute of Technology: <https://tinyl.io/62cy>

29 GCF: [https://www.greenclimate.fund/countries?f\[\]=field\\_country%253Afield\\_group:Least%20Developed%20Countries](https://www.greenclimate.fund/countries?f[]=field_country%253Afield_group:Least%20Developed%20Countries)



- Proposed Implementation Measures

In any project, many details depend on the local circumstances and mutual understanding among all parties involved. Thus it would be advisable to begin with a few pilot projects in different regions of Tanzania. However, the following applications of “*direct fuel use*” should find general approval:

- ✓ To equip each woman with a plant-oil cooker for free;
- ✓ To establish a workshop for cooker manufacturing and repairs;
- ✓ To qualify local apprentices who assume these task in the workshop;
- ✓ To distribute the most applicable oil-seeds according to the conditions on the ground;
- ✓ To procure all equipment for the final oil-production — which will require electricity;
- ✓ To operate an electric generator<sup>30</sup> with micro-grid, for energy supply of community facilities such as water pumps, farm-produce processing lines, workshops, etc.;
- ✓ To acquire a walk-behind tractor easing the field work...

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30 Multifuel-Generators, “Diesel – Vegetable Oil – Waste Vegetable Oil – Pyrolysis Oil”, ATG Germany: <https://tinyt.io/65TW>