

Humanitarian need and the re- electrification of northwest Syria

Situation report



January 2022

Key takeaways

- As of May 2021, a new Turkish led electricity project in northwest Syria was implemented increasing electricity usage in areas which had previously been dependent on solar power or generators as the sole electricity sources.
- As a result of the project's implementation, electricity consumption increased by 32% as of October 2021 in the opposition-controlled northwest.
- Though many registered for the new system, the relatively high (and rising) cost of the new electricity source and previous investment in solar energy systems have limited subscriptions to the main network.
- With this in mind, the HAT measured changes in humanitarian need before and after the re-electrification was completed, and related changes in need to electricity consumption dynamics.
- The quantitative analysis did not provide any evidence that an increase in electricity consumption had a positive effect on sector needs; rather, re-electrification may have had a stabilizing effect.
- This significant increase in the cost of electricity due to the depreciation of the Turkish lira will surely lower consumption and suggests that demand for main network electricity is currently elastic and subject to changes in household income.
- Complimentary programming that includes sector-based interventions (for example, water pump repair for farmers) alongside electricity-focused projects (for example, financial assistance to purchase electricity) are needed to maximize the humanitarian benefits of a consistent electricity supply.

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Repair works on Idleb's electricity infrastructure. The northwest reelectrification project has enabled small businesses and large scale commercial enterprises to develop, however prices remain high for the general population.

Introduction

The Syrian government ceased supplying electricity to Idlib when opposition groups took control in 2015, forcing citizens to rely on solar power and rationed, sporadic supply of power from small-scale providers using diesel generators.¹ However, in May 2021, households and businesses in Idlib gained access to a reliable electricity source for the first time in six years after the completion of a re-electrification project that repaired and reinstalled transmission lines and rehabilitated six high-voltage stations.² The project was a collaborative effort between a private Turkish company and the Syrian Salvation Government-affiliated Public Electricity Corporation, which was later reformed into a company named Green Energy.^{3,4}

Electricity is now delivered to the major cities in the opposition-controlled northwest, and the re-electrification of villages and towns is underway. Green Energy has also supplied electricity to several water stations and hospitals. Electricity is priced per kilowatt and has fluctuated according to the depreciation of the Turkish lira (see Table 1). Residents interviewed by the Syrian Observatory for Human Rights stated that they may not be able to afford the new supply and many would continue to use solar panels despite their lower power capacity, largely because they had already invested in the infrastructure.⁵ However, they expected that the new electricity supply would improve important facilities such as schools and hospitals.

According to local sources, re-electrification has increased commercial use of electricity. Additional electricity availability has reduced the operational costs of businesses because paying for amperage is more cost efficient than paying for access to a private generator. Local sources have reported that increased electricity supply has stimulated the opening of businesses, particularly small industrial workshops that are reliant on electric power tools. Though electricity only accounts for a small proportion of the total operating cost for most businesses, electricity security ensures stable or higher productivity levels for manufacturing.⁶

The re-electrification project should be praised for its success in repairing infrastructure and delivering electricity in opposition-controlled areas; however, any positive humanitarian impact remains unclear. The HAT measured the impact of the re-electrification program on local humanitarian needs using night lights reflectance data and humanitarian needs monitoring data from HNAP. The results showcase the significant increase in electricity consumption caused by the program, but did not identify any positive change in humanitarian need.

1 France 24, [Rebel-held Syria shifts power - towards solar. France24, July 2021](#)

2 Including the stations of Salqin, Abu Kasha, Kilani (known as Ain al-Zarqa station), Idlib 230, Kasih and Dana.

3 While Green Energy is a private company, and not officially part of the SSG, its CEO was an official in the SSG's Directorate of Drinking Water and is known for his affiliations with the SSG

4 Anadolu Agency, [Electricity supplied from Turkey illuminates Idlib in Syria](#), May 2021.

5 The Syrian Observatory for Human Rights, [With Support of the Salvation Government | Turkish private company accomplishes last stages of providing power supply to Idlib](#). May 2021

6 ODI, Scott, A., Darko, E., Lemma, A., and Rud, J-P. 2014. How does electricity insecurity affect businesses in low and middle income countries?' 2014

This suggests humanitarian actors in opposition-controlled areas should consider complimentary programming that includes sector-based interventions alongside electricity-focused projects. For example, providing financial assistance to purchase electricity, perhaps as part of the survival minimum expenditure basket, in conjunction with sector-specific interventions designed to optimize the new electricity access, such as assisting businesses to purchase electrical machinery, repairing electrical systems in schools, or providing or repairing water pumps for farmers.

Subscription type	Price per kilowatt (TRY)			
	May 2021	Aug. 2021	Nov. 2021	Jan. 2022
Domestic use	0.9	1	1.20	1.98
Commercial/Industrial use	1	1.20	1.40	2.40

Table 1. Perkilowatt price of electricity in opposition-controlled northwest Syria

Measuring electricity consumption

Night light reflectance (NLR) is the amount of observable light produced at night and is indicative of overall electricity consumption. It is often used as a proxy measure for economic development.⁷ The HAT uses data measuring the level of NLR collected by the VIIRS satellite.⁸ The VIIRS satellite records nightly NLR at a relatively high spatial resolution, and the Earth Observation Group uses this data to produce monthly and annual composites.^{9,10} The monthly images are preferable to nightly images because geographic coverage is not affected by cloud cover and outliers are less problematic because all the NLR values recorded during the month are averaged.

The total NLR within the opposition-controlled areas, according to the October 2021 zone of control boundary, was measured at the national and subdistrict level. The national level measurements, shown in Figure 1, highlight the significantly higher electricity consumption as a result of the re-electrification project. Specifically, electricity consumption increased by 32% from October 2020 to October 2021, which is about 9% lower than the pre-conflict (October 2012) level of electricity consumption.

The distribution of NLR in November 2021 (Figure 2, right box) has become significantly more dispersed compared to the November 2012 distribution (Figure 2, left box). Before the conflict, NLR was concentrated in and around Idleb and other large cities and towns, but during the conflict the

7 Townsend, A.C. and Bruce, D.A. 2010. The use of night-time lights satellite imagery as a measure of Australia's regional electricity consumption and population distribution. *International Journal of Remote Sensing*, 31(16), 4459-4480, 2010

8 Jasiński, T. Modeling electricity consumption using nighttime light images and artificial neural networks. *Energy*, 179(15), 831-842. 2019

9 The HAT used NLR to measure regional GDP in Syria in the following report: [Using night lights to measure economic output in Syria](#), May 2021.

10 Monthly and annual NLR image composites are released with an 3-month publication lag.

population (along with economic activity) was re-concentrated northward away from the southern conflict zones to Ad Dana, Sarmada, Atarib, and along the Turkish border, particularly around the Bab Al-Hawa crossing.

Changes in per-capita NLR (NLRpp)¹¹ from October 2020 to October 2021 were measured at the subdistrict level to assess the general distribution of change in electricity consumption caused by the re-electrification effort. The distribution of electricity consumption growth, found in Figure 3, highlights a concentration of additional electricity consumption in the central subdistricts, specifically Idleb (+42%), Salqin (+39%), and Ariha (+39%). NLRpp tended to increase more in subdistricts with lower baseline (October 2020)¹² NLRpp, but grew at a slower rate in subdistricts with high population growth, suggesting residents, returnees and IDPs face barriers to accessing significant amounts of electricity.^{13,14}

The Saraqab and Ehsem subdistricts along the southeastern border were the only regions that experienced a negative change in NLRpp, likely the result of infrastructure expansion challenges caused by the ongoing significant armed conflict occurring in the area. In fact, the average NLRpp growth rate of subdistricts intersecting the M4 highway was 14%, lower by 8% than those not intersecting the highway (22%).

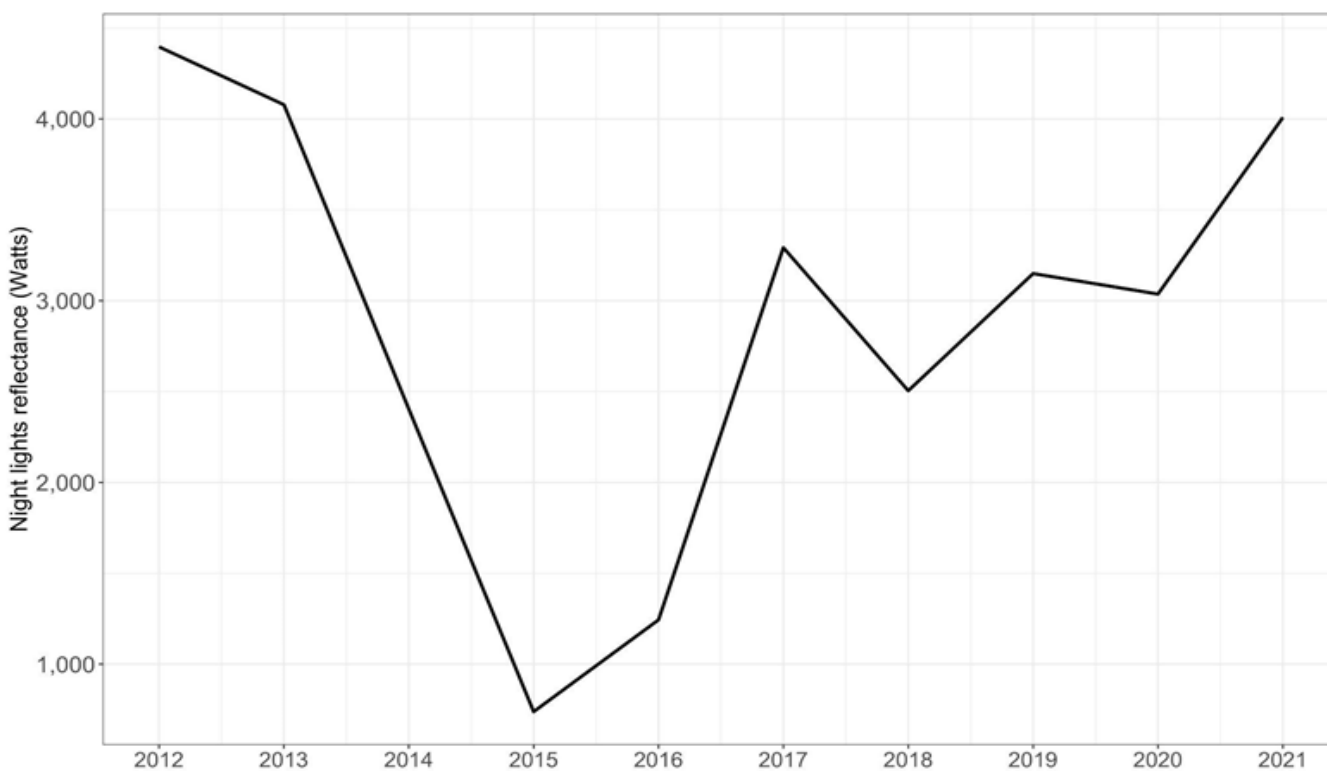


Figure 1. NLR in opposition-controlled areas. NLR values converted to Watts. NLR calculated using October images from 2012 to 2021

11 NLR per-capita was used to account for the population size, which is a major source of variation in regional total NLR. Population data obtained from HNAP's Mobility and Needs Monitoring dataset.

12 Pearson's correlation between subdistrict-level NLRpp (Oct. 2020) and NLRpp growth rates: $r = -0.40$ ($p=0.05$).

13 Pearson's correlation between (Oct.'20 to Oct.'21) NLRpp growth rates and resident and returnee growth rates: $r = -0.52$ ($p=0.012$).

14 Pearson's correlation between (Oct.'20 to Oct.'21) NLRpp growth rates and IDP growth rates: $r = -0.57$ ($p=0.007$).

Re-electrification and humanitarian need

The change in humanitarian need in opposition-controlled communities from October 2020 to October 2021 was analyzed to measure the effect of electrification on related sectors.^{15,16} Specifically, livelihoods, basic services, education, WASH, and health were selected for analysis because they are directly affected by electricity consumption. Community-level sector needs for each population group were obtained from HNAP's Mobility and Needs Monitoring (MNM) dataset.

Paired t-tests measuring the difference in sector needs between October 2020 and October 2021 in opposition-controlled communities were calculated to measure the relationship between sector needs and re-electrification. The results are found in the annex (Table A1).¹⁷ Livelihoods, basic services, and health were the only sectors that statistically significantly changed from October 2020 to October 2021 among residents and IDPs. The proportion of IDPs and residents in need of livelihoods increased by an average (per community) of 2.2% among IDPs and 2.5% among residents. The proportion of the IDP and resident population in need of basic services increased by about 1%, and the proportion of IDPs and residents in need of healthcare increased by 1.6 and 1.8%. The general lack of change in need and

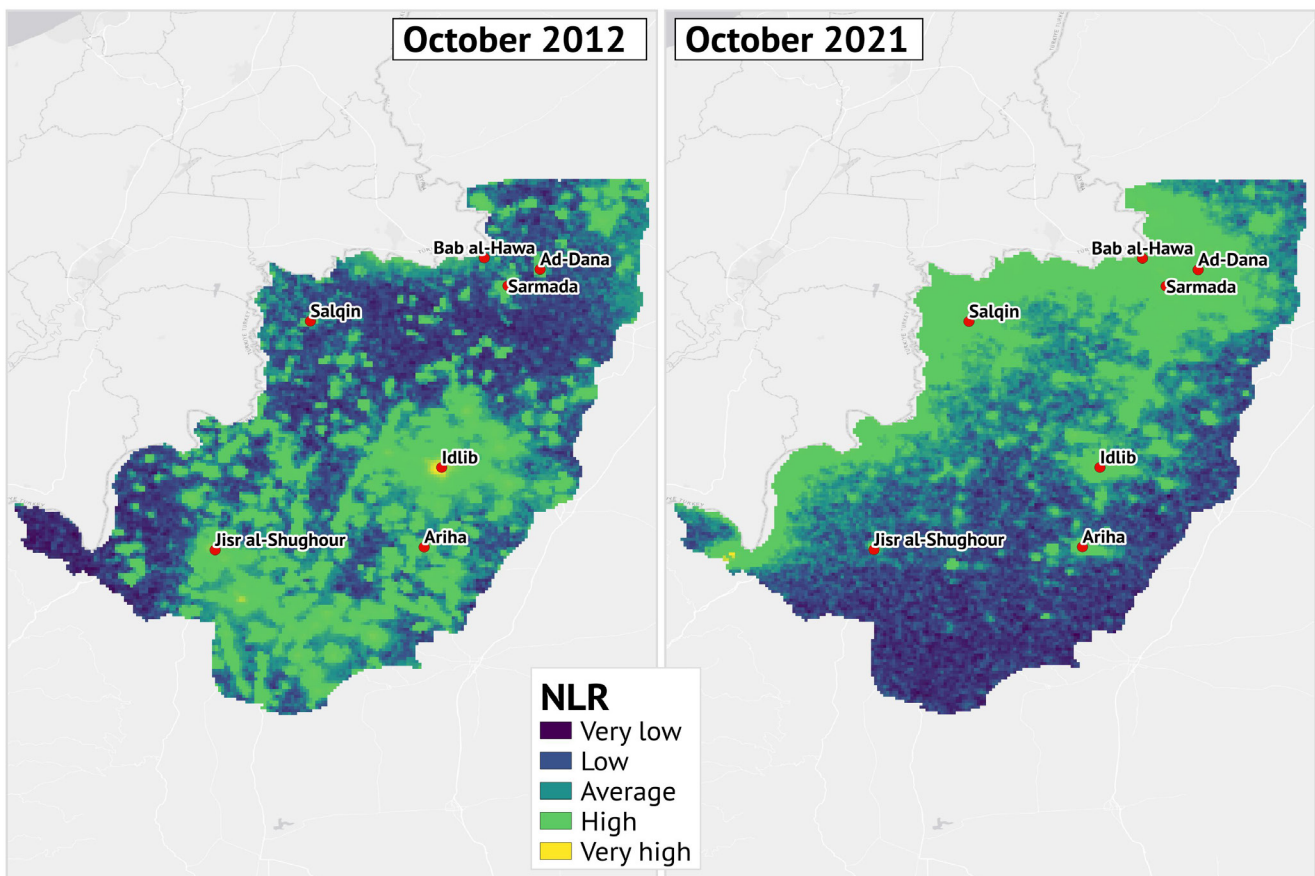


Figure 2. NLR in opposition-controlled areas in October 2012 and October 2021

15 According to October 2021 boundaries.

16 This boundary was chosen to exclude communities now under Syrian government control.

17 Focus is placed on the resident and IDP populations because they are the largest groups in the area.

observed modest increases in livelihoods, basic services, and health needs among both major population groups indicate that the re-electrification has not improved the humanitarian situation in opposition-controlled areas.

The growth in NLRpp from October 2020 to October 2021 was related to the annual change in sector needs to assess whether needs changed more or less in communities with differing levels of additional electricity consumption. The descriptive statistics do not suggest any difference in the change in needs between the NLRpp growth quartiles. To confirm this, multivariate regressions measuring the average change in needs in communities in the highest quartile of NLRpp growth rates while controlling for the baseline level of need and total group population were computed. As expected, community membership in the top quartile of NLRpp growth had no statistically significant effect on the change in sector need.¹⁸

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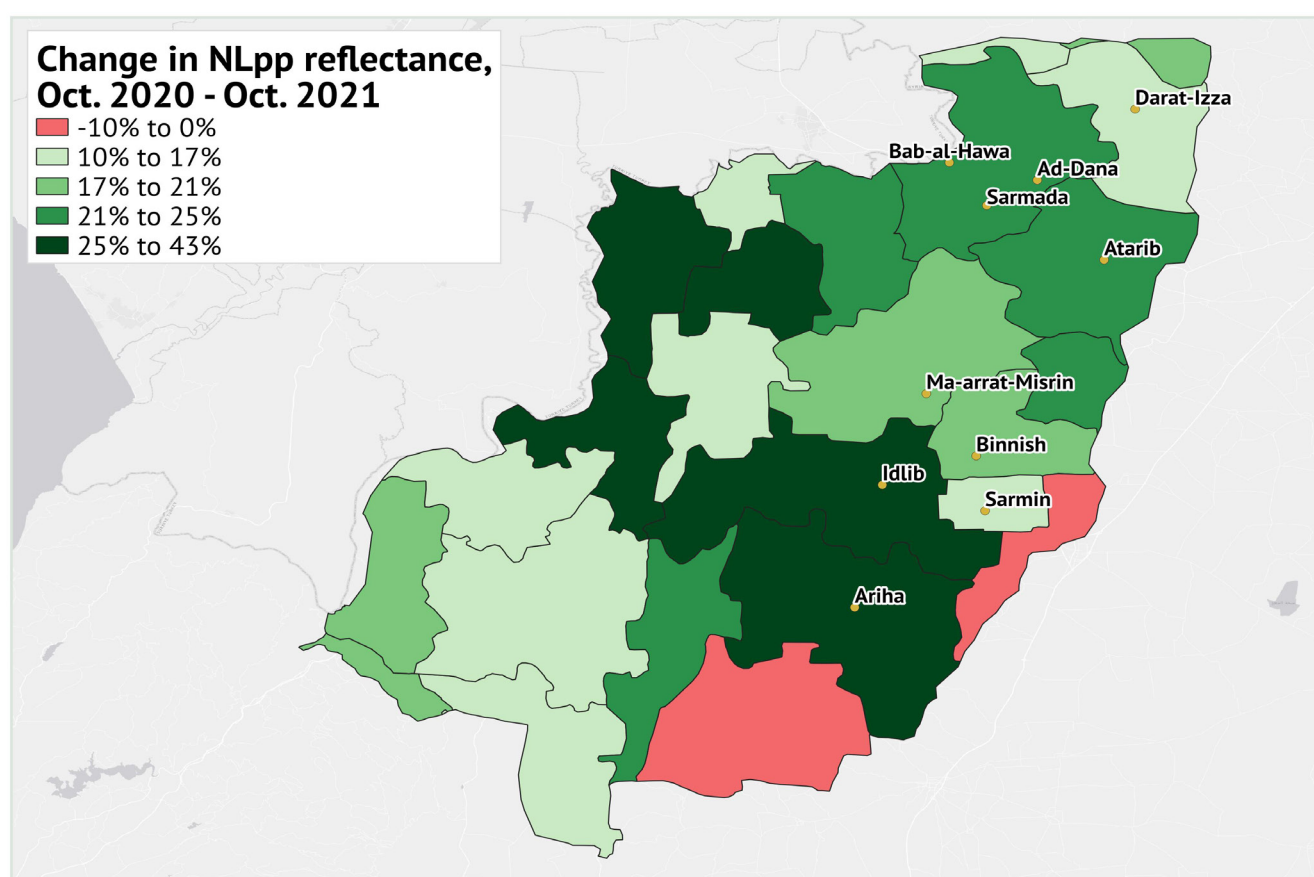


Figure 3. Changes in the NLRpp in the subdistricts under opposition-control, from October 2020 to October 2021.

18 Assuming 200 kilowatts per day, using the daily wage of an unskilled worker. The average wage in markets assessed by WFP in opposition controlled areas were used in the analysis.

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Population group (n)	Quartile of NLRpp change	Livelihoods	Basic services	Education	WASH	Health
Residents (302)	1	2.86%	-0.15%	-1.11%	-0.80%	0.48%
	2	1.67%	0.89%	-1.32%	1.75%	3.29%
	3	1.81%	1.49%	-1.39%	2.39%	3.09%
	4	3.79%	2.56%	-1.11%	-0.32%	0.43%
IDPs (284)	1	2.47%	0.76%	-2.11%	-1.51%	0.11%
	2	1.72%	2.21%	-0.60%	2.35%	2.42%
	3	3.08%	2.04%	1.18%	2.08%	3.45%
	4	1.80%	0.42%	-0.66%	-0.01%	0.42%

Table 2. Average changes in sector needs (Oct. '20 to Oct. '21) calculated for each quartile of NLRpp growth in communities under opposition control.

The quantitative analysis did not provide any evidence that an increase in electricity consumption had a positive effect on sector needs; rather, re-electrification may have had a stabilizing effect. However, the overall level of need remains very high in opposition-controlled areas, with 40% or more of the resident population and 50% or more of the IDP population in need among any of the analyzed sectors. This evidence suggests the development potential offered by electricity provision has been somehow under-utilized.

Turkish lira depreciation

The Turkish lira depreciated against the US dollar by 26% over three months, from 10.7 TRY per USD in November 2021 to 13.5 TRY in December 2021, and remains approximately the latter rate as of January 2022. Electricity purchased from the main network has become noticeably less affordable due to the depreciation of the lira. Table 3 contains the cost of one month of mains network electricity in every month that the per-kWh price changed.²⁰

The cost of one month of electricity from the main network increased by about 7 working hours (8.5% additional hours); 38% in dollar terms and 120% in lira terms. This significant increase in the cost of electricity will surely lower consumption and suggests that demand for main network electricity is currently elastic and subject to changes in household income.²¹

20 Assuming 200 kilowatts per day, using the daily wage of an unskilled worker. The average wage in markets assessed by WFP in opposition controlled areas were used in the analysis.

21 Long-run electricity price increases in opposition-controlled areas are expected if Green Energy maintains their monopoly on electricity provision in the region.

	May '21	Aug. '21	Nov. '21	Jan. '22
Electricity cost (TRY)	180	200	240	396
Electricity cost (USD)	21.33	23.67	22.25	29.44
Daily wage, unskilled labor (TRY)	18.79	19.29	24.59	38.08
Working hours needed to purchase (affordability)	86.22	93.31	87.85	93.58

Table 3. The working hours needed to afford one month of electricity for domestic use (200kW/month) in opposition-controlled areas.

Implications for humanitarian action

The evidence presented in this report suggests that the development potential provided by the expanded and rehabilitated electricity network has not improved the overall humanitarian situation, which presents an opportunity for complimentary humanitarian programming including sector-specific assistance and interventions related to electricity. The HAT emphasizes the potential of complimentary livelihoods assistance as a means to capitalize on the fortunate expansion of electricity access in opposition-controlled areas. Such a program would provide financial support for electricity costs alongside complementary capital assistance for SMEs and capacity development initiatives to increase workforce capacity and improve skills matching.^{22,23} Complimentary livelihoods interventions have been observed to facilitate livelihood diversification and generate higher incomes in less-developed contexts.^{24,25}

Though the potential of projects offering complementary interventions in opposition-controlled areas is clear, it is important to consider the legal and political issues around the design and implementation of infrastructure-related interventions, which can include re-electrification projects. Specifically, humanitarian organizations should proceed with caution when contracting with electricity providers in the region, such as Green Energy, due to the company's relationship with the Syrian Salvation

22 Cook, P. Infrastructure, rural electrification and development. [Energy for Sustainable Development](#), 15, 304-313. 2011

23 About 60% of communities in opposition-controlled areas reported a lack of employment opportunities that match people's skills as a barrier to accessing livelihoods for residents and IDPs, according to REACH's October 2021 Humanitarian Overview of Syria assessment.

24 Bastakoti, B.P. The electricity-livelihood nexus: some highlights from the Andhikhola Hydroelectric and Rural Electrification Centre (AHREC). [Energy for Sustainable Development](#), 10(3), 26-35. 2006

25 Apergisa, N. and James E. Payne, J.E. 2011. A dynamic panel study of economic development and the electricity consumption-growth nexus Author links open overlay panel. [Energy Economics](#), 33(5), 770-781.

Government, and by extension, Hay'at Tahrir al-Sham, which remains classified as a terrorist organization by the US, Russia, the UN Security Council and Turkey. Therefore, humanitarian organizations must reach a clear understanding with donors about these risks along with an assurance that vendors and partners will be thoroughly vetted in order for such complimentary projects to be implemented.

Annex

Population group (n)	Sector need	November 2020 (% of pop)	November 2021 (% of pop)	Result
All groups (398)	Livelihoods***	59.446	61.271	t = 3.983 p-value = 0.000
	Basic Services*	58.757	59.703	t = 2.039 p-value = 0.042
	Education	47.659	47.255	t = -0.603 p-value = 0.547
	WASH	53.568	53.802	t = 0.352 p-value = 0.725
	Health**	51.641	53.208	t = 2.923 p-value = 0.004
Residents (302)	Livelihoods***	54.397	56.927	t = 4.596 p-value = 0.000
	Basic Services*	55.636	56.831	t = 2.039 p-value = 0.042
	Education	45.639	44.113	t = -1.894 p-value = 0.059
	WASH	48.719	49.474	t = 0.906 p-value = 0.366
	Health**	48.470	50.295	t = 2.767 p-value = 0.006
IDPs (366)	Livelihoods***	63.347	65.544	t = 4.969 p-value = 0.000
	Basic Services*	61.637	62.902	t = 2.439 p-value = 0.015
	Education	48.975	48.951	t = -0.036 p-value = 0.971
	WASH	55.913	56.549	t = 0.880 p-value = 0.379
	Health**	52.850	54.486	t = 2.73 p-value = 0.007

Returnees (51)	Livelihoods**	59.059	64.157	t = 3.162 p-value = 0.003
	Basic Services**	59.941	63.431	t = 3.051 p-value = 0.004
	Education	50.431	53.059	t = 1.172 p-value = 0.247
	WASH	65.490	65.275	t = -0.154 p-value = 0.878
	Health*	58.863	61.902	t = 2.392 p-value = 0.021

*Table 1A. Paired t-test results of community sector needs change between October 2020 and October 2021 in opposition-controlled areas. The results measure the difference between the proportion of the population group in need before (Oct '20) and after (Oct '21) the re-electrification program was active. Statistically significant differences are identified by *(p<0.05), **(p<0.01), ***(p<0.000) in the second column next to the name of the sector.*

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The Humanitarian Access Team (HAT) was established in Beirut in March 2015 in response to the collective challenges facing the remote humanitarian response in Syria. HAT's most important function is to collect and analyze disparate data and information. Since 2015, HAT analysis has provided a forward-looking template for international interventions in Syria, and facilitated an increasingly adaptive, integrated, and ultimately impactful international response to the conflict.

