
**A CONCEPT NOTE ON THE
RWANDA NATIONAL ELECTRIFICATION PLAN (NEP) -2021 REVISION**



AUGUST 2021

1. Background and Objectives

Rwanda's National Strategy for Transformation (NST1) aims for the country to achieve middle-income status by 2035 and high-income status by 2050. As one of its core objectives, the strategy targets universal electricity access by 2024. The Sustainable Development Goals defines universal access to electricity for households as having an electricity connection in their house.

The Electricity Sector Strategic Plan (ESSP) associated to the NST1 lays out how to provide electricity to all households in Rwanda by 2024. The ESSP's specifies that universal access will be achieved through on-grid and off-grid electrification technologies.

NST1 target will be achieved through connecting households to the National grid (52 %) as whereas off-grid solutions -Stand Alone Solar Systems (SAS) and Micro grid (48%) as an interim solution.

To date, 65 % of Rwandan households have access to electricity. These includes 47.2% of households connected to the national grid whereas 17.8% are connected to off-grid systems.

To guide investments in electrification and achieve the access targets within the framework defined by the NST1 and ESSP, EDCL/REG has developed a 7-year Electricity Access Development Plan deduced from the National ('NEP 2018-2024') subject to revision periodically according to electrification status in the country.

This concept note presents the revised National Electrification Plan (NEP 2021) for Rural and Urban Electrification for the 4-year period 2021-2024.

The revision was developed in a consultative process with central and local Government entities up to village level.

After checking the status of electricity connection in all villages across the country and after considering the factors/criteria set forth during the revision of the 2018 NEP, it was found out that the situation changed like in the following:

- 89.9% of all villages fall in on-grid zone i.e., 13,314 villages out of 14,816 villages while,
- 10.1% of all villages fall in off grid zone (SAS & Microgrid) i.e., 1,502 villages.

Among the off-grid villages, a share of 182 villages (equivalent to 1.2%) are proposed for microgrid development while 1,320 (equivalent to 8.9%) villages are proposed to be electrified using Standalone Solar Home Systems.

2. Current Situation of Electricity Sector, Planned developments

Rwanda's low electrification rate is a barrier to economic development. At the end of June 2021, about 65% of the households in Rwanda had been electrified that includes 47.2% of households connected to the grid and 17.8% are connected using off-grid solutions mainly solar home systems.

Increasing access to electricity is a major objective for the government of Rwanda (GoR). By 2023/24, 100% of the population shall have access to electricity, whereby 52% will be connected to the national grid whereas 48% will be connected through Off-Grid technologies including micro-grid and interim Stand-alone Solar home systems.

So far with regards to administrative offices: 100% of District Offices, 100% of sector offices, 93% of cell offices are connected, respectively.

Foundations for the ambitious plans are in place. The existence of the Rural Electrification Strategy and Energy Sector Strategic Plan are both in place.

An operational Energy Agency, REG through its subsidiaries EDCL and EUCL which oversee development of energy projects as well as utility operations have been established since 2014.

Electrification projects are implemented by EDCL through a well-coordinated programs such as Electricity Access Roll Out Program (EARP) and Rwanda Universal Energy Access Program (RUEAP) with funds coming from Development Partners, the Government's budget, and donors.

Clear regulations provide and enable environment for the desired participation of private developers in electricity access.

This Plan encompasses urban and rural electrification. It covers electrification by connection to the main grid and by off-grid technologies where isolated mini-grids are supplied by renewable energy sources.

3. Criteria for NEP revision

- Productive customers were identified from industrial and commercial categories and prioritized according to their energy consumption.
- Extensions/villages considering productive customers having strategic importance for the country were also selected.

- Availability and funds mobilized so far for grid extension and off grid connections.

There are both economic and technical reasons for revising the NEP.

The economic reason is that grid connection is the least-cost electrification technology for settlements which meet the following conditions:

- (i) they are close to the main grid,
- (ii) they have a not-too-small population,
- (iii) the customers to be electrified are not scattered over a large area but concentrated. Rules of thumb for the first two conditions are within 5 km of the national grid.

Economic criteria are not the only criteria determining which settlements should be electrified when and by which technology. In Rwanda, the Government and many donors pursue the policy to connect all settlements in the vicinity of a Medium Voltage (MV) lines. The plan accounts for that policy by electrifying all settlements which are within 5 km of the existing electricity network especially the Medium Voltage line and those living in allowed residential premises according to approved land use plans.

4. National Electrification Plan revision approach and the results

Key information collected from each village:

A field visit (specifically for villages falling in off grid zone by NEP 2018) was conducted in Eastern province, to physically check and assess the situation in each village. After assessing the results in Eastern province, the methodology for other provinces was changed, then, phone call to village leaders were utilized. Below is a list of key elements that were collected/questioned in each village:

- GPS coordinates within the village for Eastern Province and telephone survey for remaining provinces
- Available public infrastructures: Schools, health post, Offices, etc.
- The number of households already connected to grid (if any)
- The number of households already connected to microgrid (if any)
- Total Estimated number of households in the village,
- Existing line (MV) passing in the village but without connecting.

5. NEP REVISION RESULTS PER PROVINCE

GIS Database and Electrification Programs determined with the Database.

The GIS database contains REG's existing and planned transmission network, the main HV (High Voltage)/MV and associated substations, low voltage networks (LV) and the location of potential sites for small hydro plants.

The GIS database provided the input data for EDCL planning, the software was used to determine the electrification program, the off-grid potential by using small hydro or small Photo-Voltaic (PV)-fueled plants and the "priority" off-grid projects. Calculations made outside that tool determined the number of customers who would be electrified by densification or fill-in connections even off grid, considering their proximity with the existing/ongoing and planned network.

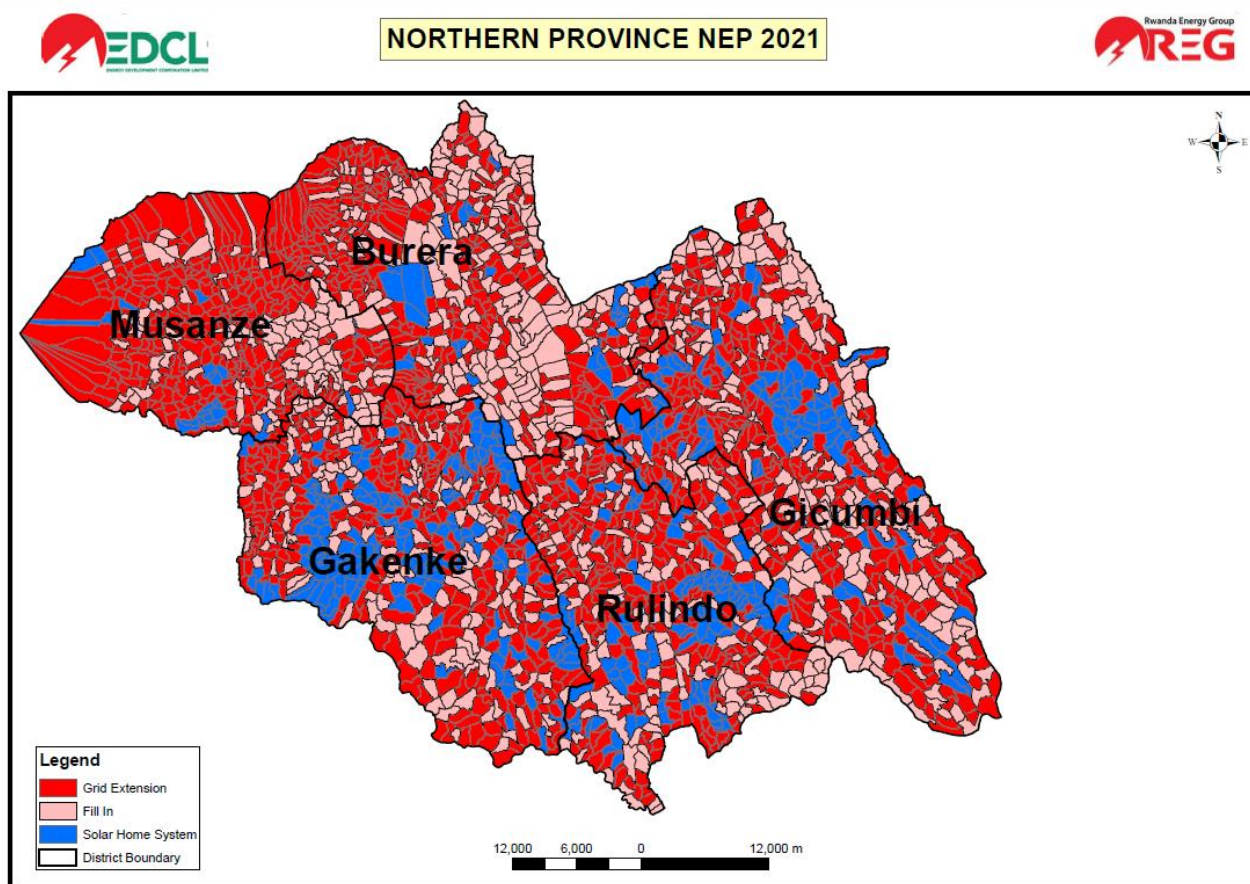
A. NORTHERN PROVINCE

The National Electrification Plan results as updated in 2021, considering the village level, revealed that the share per electrification technology in Northern province is reflected in the table below:

NEP NORTH 2018 (No.villages)			NEP NORTH 2021 (No.villages)		
GE & Fill-in	2,235	81%	GE & Fill-in	2439	88.9%
Microgrid	74	3%	Microgrid	24	0.9%
SAS	435	16%	SAS	281	10.2%
Grand Total	2,744	100%	Grand Total	2,744	100%

As seen from the above table, the total villages in North province were 2,744 and from them 74 were planned to be connected on Micro-grids (3%) while 435 to SAS (16%) and remaining 81% on grid network (Grid Extension-GE & Fill-in). Given the electrification speed that has happened from 2017, the assessment has shown that the electricity network has expanded rapidly and reached even some villages that initially were demarcated as off grid villages. Therefore, the share changed to 88.9% of villages to be connected on-grid electricity, while the remainder (10.2%) is proposed to be connected through SAS and 0.9% of villages will be connected through Microgrid.

MAP OF NEP RESULTS IN NORTHERN PROVINCE



B. SOUTHERN PROVINCE

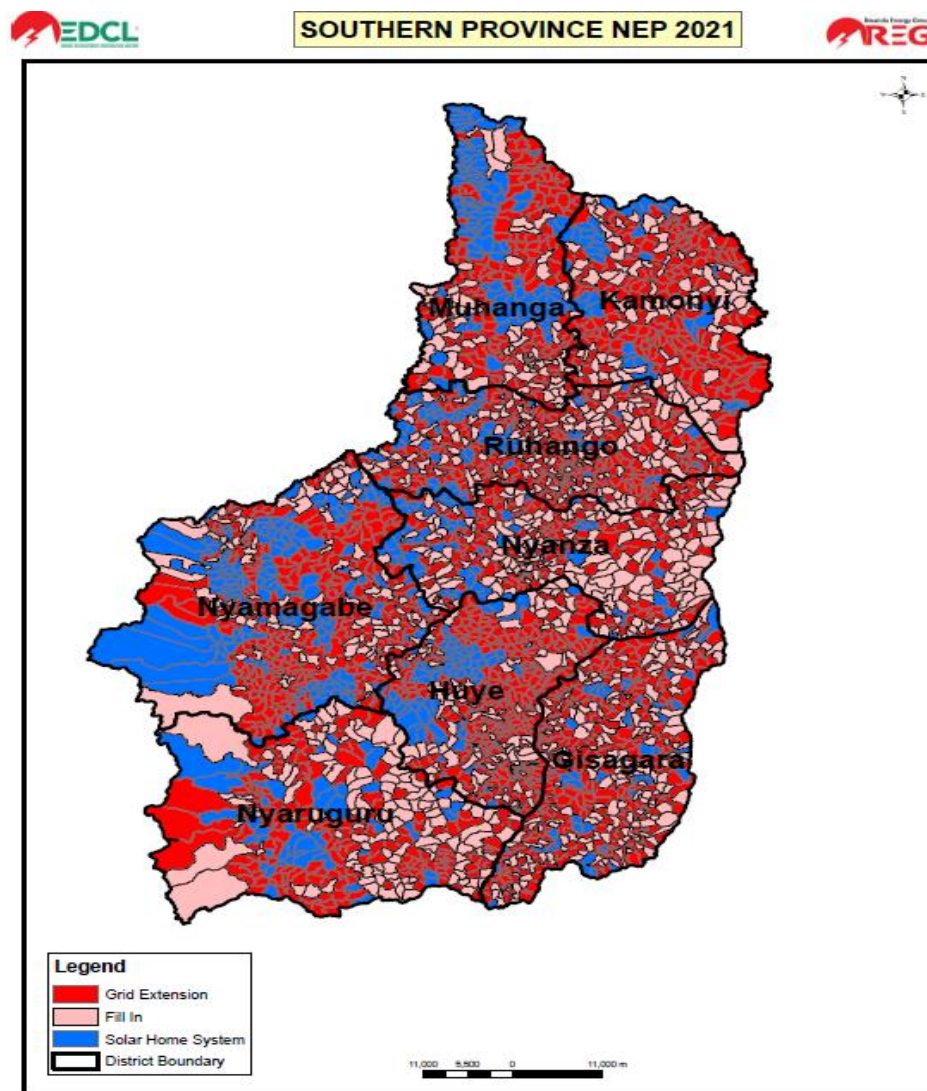
The National Electrification Plan results as updated in 2021, considering the village level, revealed that the share per electrification technology in Southern province is reflected in the table below:

NEP SOUTH 2018 (No.villages)			NEP SOUTH 2021 (No.villages)		
GE & Fill-in	2,741	78%	Grid	2,993	85.5%
Microgrid	266	8%	Microgrid	62	1.8%
SAS	494	14%	SAS	446	12.7%
Grand Total	3,501	100%	Grand Total	3,501	100%

As seen from the above table, the total villages in Southern province were 3,501 and 266 of them were planned to be connected on Micro-grids (8%) whereas 494 were supposed to relate to SAS (14%) and remaining 78% on grid network.

Given the electrification speed that has happened from 2017, the assessment has shown that the electricity network has expanded rapidly and reached even some villages that initially were demarcated as off grid villages. Therefore, the share changed to 85.5% of villages to be connected on-grid electricity, while the remainder (12.7%) is proposed to be connected through SAS and 1.8% of villages will be connected through Microgrid.

MAP OF NEP RESULTS IN SOUTHERN PROVINCE



C. WESTERN PROVINCE

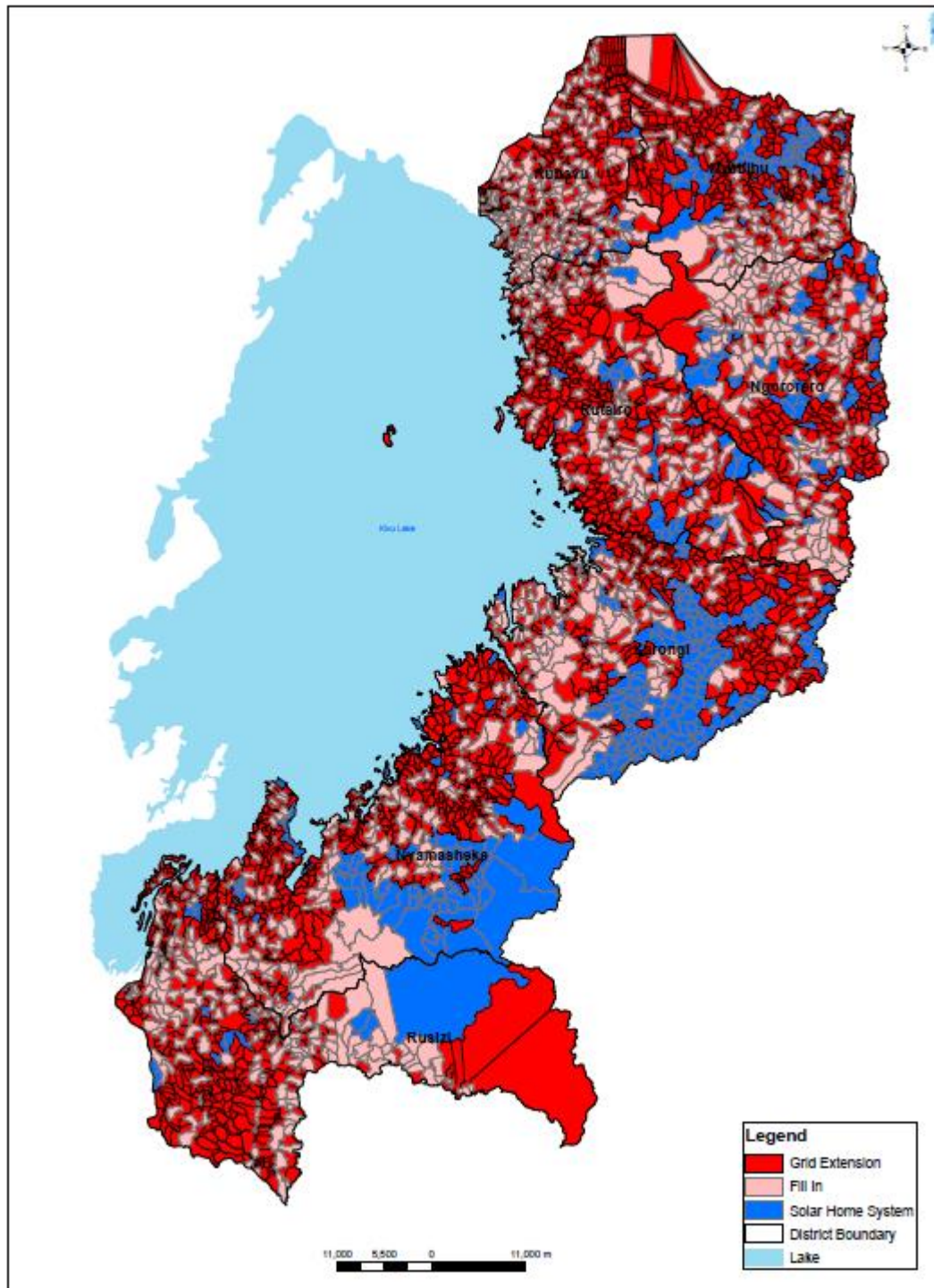
The National Electrification Plan results as updated in 2021, considering the village level, revealed that the share per electrification technology in Western province is reflected in the table below:

NEP West 2018 (No of Villages)			NEP West 2021 (No of Villages)		
GE	3,063	85%	Grid	3,309	91.5%
Microgrid	136	4%	Microgrid	16	0.4%
SAS	418	12%	SAS	292	8.1%
Grand Total	3,617	100%	Grand Total	3,617	100%

In Western Province, considering the table above, the total villages were 3,617 and from them 136 were planned to be connected on Microgrids (4%) while 418 to SAS (12%) and remaining 85% on grid network.

Given the electrification speed that has happened from 2017, the assessment has shown that the electricity network has expanded rapidly and reached even some villages that initially were demarcated as off grid villages. Therefore, the share changed to 91.5% of villages to be connected on-grid electricity, while the remainder (8.1%) are proposed to be connected through SAS and 0.4% of villages will be connected to Microgrid.

MAP OF NEP RESULTS IN WESTERN PROVINCE



D. EASTERN PROVINCE

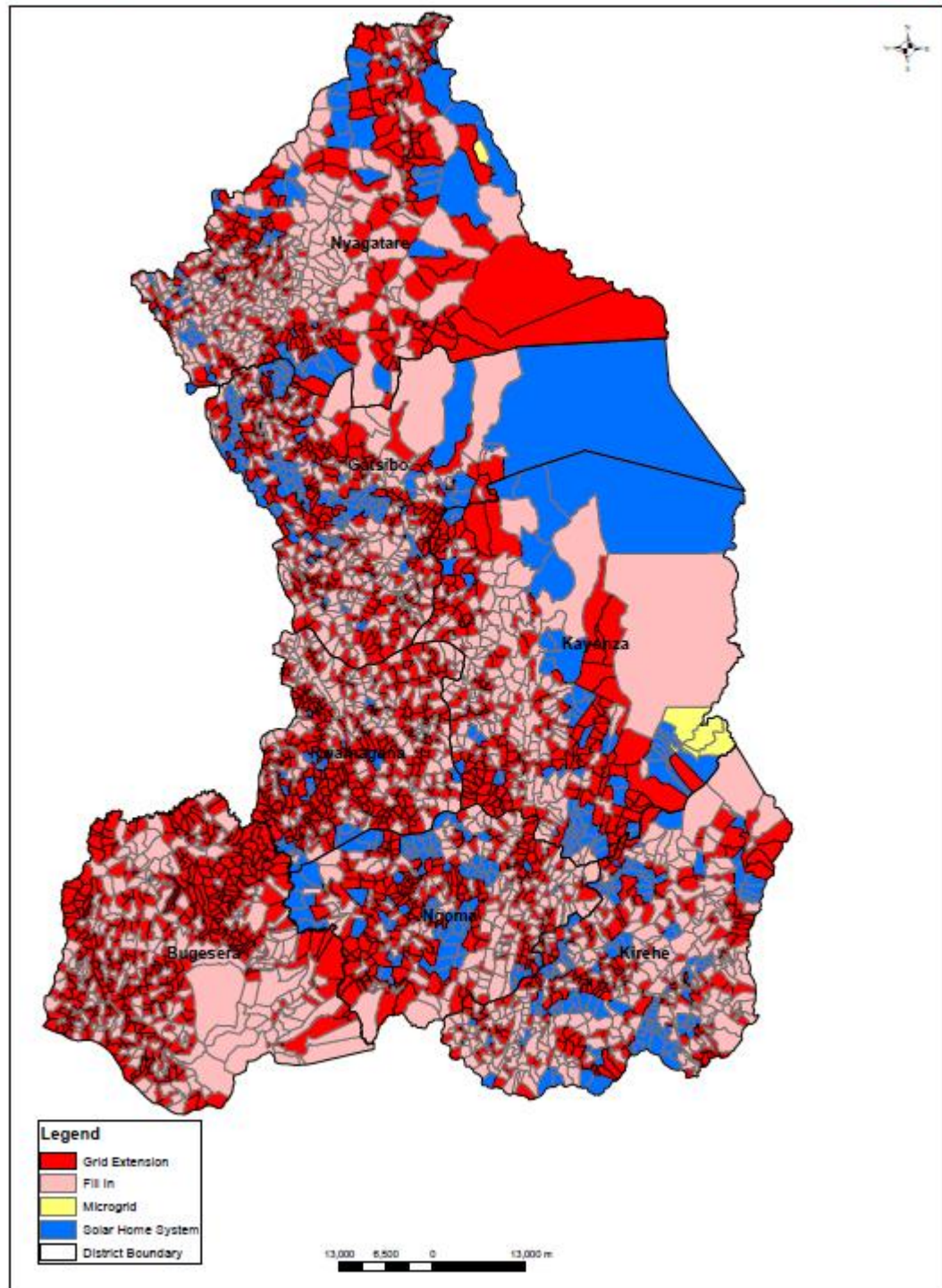
The National Electrification Plan results as updated in 2021, considering the village level, revealed that the share per electrification technology in Eastern province is reflected in the table below:

NEP West 2018 (No of Villages)			NEP West 2021 (No of Villages)		
GE	1,851	49%	Grid	3,410	89.9%
Microgrid	945	25%	Micro-grid	80	2.1%
SAS	995	26%	SAS	301	8%
Grand Total	3,791		Grand Total	3,791	100%

From the table above, the total villages in Eastern province were 3,791 and from them 945 were planned to be connected on Microgrids (25%) while 995 to SAS (26%) and remaining 49% on grid network.

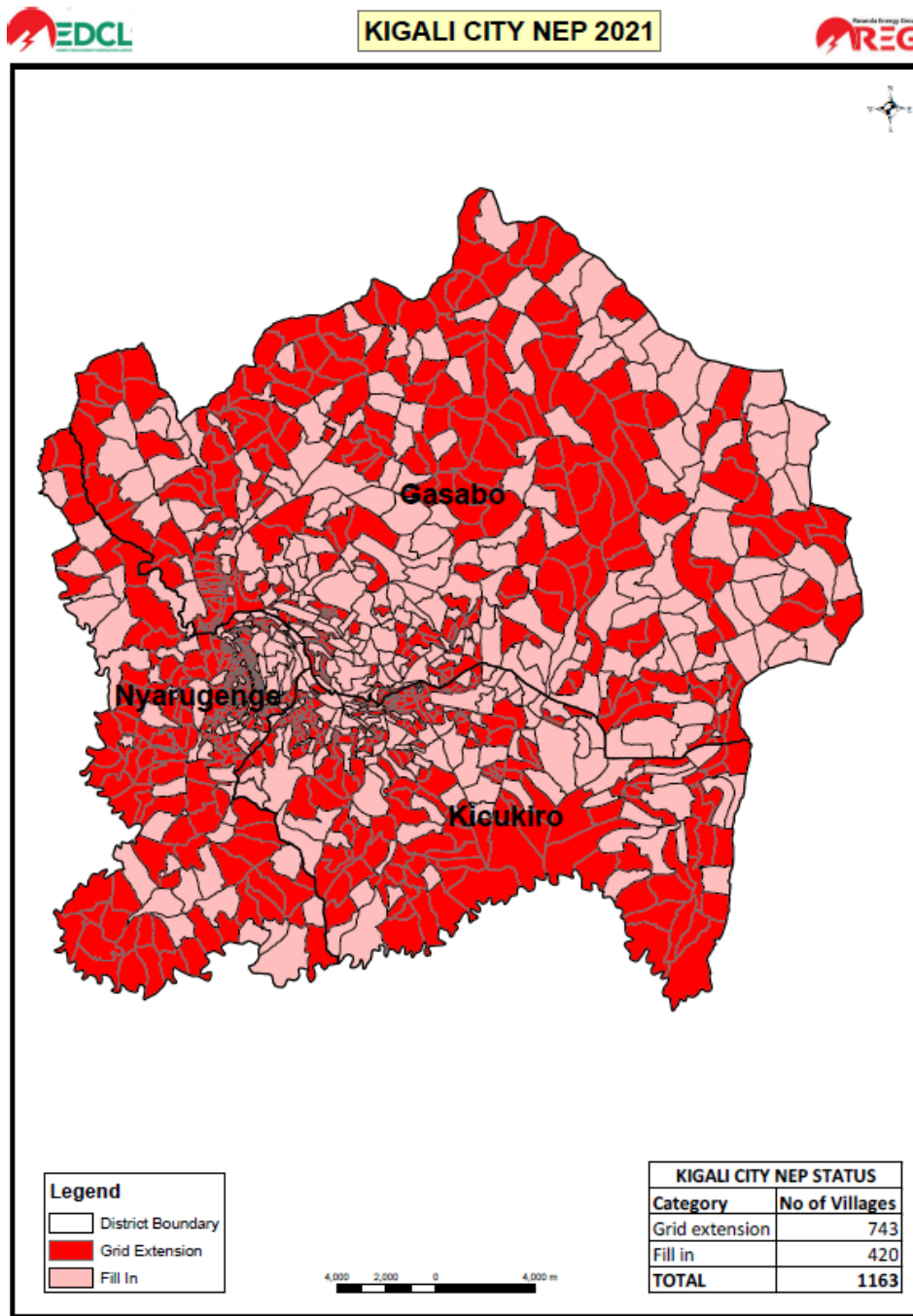
Given the electrification speed that has happened from 2017, the assessment has shown that the electricity network has expanded rapidly and reached even some villages that initially were demarcated as off grid villages. Therefore, the share changed to 89.9% of villages to be connected on-grid electricity, while the remainder (8%) is proposed to be connected through SAS and 2.1% of villages will be connected through Microgrid. The whole of BUGESERA district was planned to be electrified using on-grid technology being an airport city.

MAP OF NEP RESULTS IN EASTERN PROVINCE



E. KIGALI CITY

During this revision, the whole Kigali City was proposed to be connected 100% on grid since it is the Capital City. Funding was secured to put all villages in Kigali on the grid as reflected on the map below:



F. SUMMARY

The below table summaries the results of the NEP2018 revision in which NEP2021 provides: 13,314 villages (89.9%) of villages in on-grid share; 182 villages (1.2%) and 1,320 villages (8.9%) in off-grid share, microgrid and solar standalone systems, respectively.

Province	Electrification Technology per villages						Grand Total
	GE & Fill-In	%	Microgrid	%	SAS	%	
North	2,439	88.9%	24	0.9%	281	10.2%	2,744
South	2,993	85.5%	62	1.8%	446	12.7%	3,501
East	3,410	89.9%	80	2.1%	301	8%	3,791
West	3,309	91.5%	16	0.4%	292	8.1%	3,617
Kigali City	1,163	100.0%		0.0%		0.0%	1,163
Grand Total	13,293	89.7%	203	1.4%	1,320	8.9%	14,816

Among 13,314 villages proposed to be connected through Grid Extension and Fill-in connections, some of them have got funding while for others, the funding is not yet secured.

Therefore, 1016 (6.9%) villages demarcated for on-grid zone (Grid Extension-GE) are suggested to be temporarily connected through Standalone Solar Home Systems until funding will be secured to connect them to the grid. These villages will be allocated depending on funding availability and willingness of partners to operate in these villages vis-à-vis the electrification status.

However, an exercise will be conducted across all REG branches in all Districts to check and define which villages can be reserved for fill in by EUCL (within 100m from the Low Voltage Line) and those which can be filled in by EDCL since they might need line extensions.

Recommendation:

It is recommended that this revised NEP be considered by all stakeholders and development partners to fast track the implementation of NST1 targets.

Annexes:

1. Overall list of NEP Villages connection status (EXCEL FILE)