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CASE STUDY

Concessions: Nuru's experience in the DRC's electricity sector

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The electricity sector in the Democratic Republic of Congo (DRC) is fraught with challenges, with only 21 percent of the country connected. This case study looks at the experience of Nuru, a private solar mini grid company, with concessions as it scaled up operations in eastern DRC. It aims to provide insights for stakeholders involved in expanding energy access in similar contexts.

Nuru

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Commercial activities taking place under the street lights

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Front cover photo: Solar power plant and the neighbourhood that is part of its distribution concession zone.

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ABBREVIATIONS

ANSER	Agence Nationale de l'Électrification et des Services Énergétiques en Milieu Rural et Périurbain (National Agency for Electrification and Energy Services in Rural and Peri-urban Areas)
ARE	Autorité de Régulation du Secteur de l'Electricité (Electricity Sector Regulatory Authority)
CapEx	Capital Expenditure
DRC	Democratic Republic of Congo
EoI	Expression of Interest
FCAS	Fragile and Conflict Affected Settings
GDP	Gross Domestic Product
kW	Kilowatt
MEHR	Ministry of Energy and Hydraulic Resources
MW	Megawatt
OpEX	Operating Expenditure
P-RECs	Peace Renewable Energy Credits
SME	Small and Medium Enterprises
SNEL	Société Nationale d'Electricité (National Electricity Company)
USD	United States Dollar

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Executive summary

The electricity sector in the Democratic Republic of Congo (DRC) is fraught with challenges, with only 21 percent of the country connected. The country's struggle to address energy poverty and meet rising energy demand is both a consequence and a symptom of its complex context of fragility and insecurity. Increasing access to electricity is a national priority, but the financing required exceeds the government's fiscal capacity. Acknowledging these constraints, the electricity sector was liberalised in 2014, granting private players the right to generate, distribute, and commercialise electricity. This case study looks at the experience of Nuru, a private solar mini grid company, as it scaled up operations in different sites in eastern DRC, alongside the gradual maturation of the regulatory environment.

Different legal regimes regulate the private sector electricity activities in the DRC, depending on the generation capacity and the ownership of land (public or private) over which the electricity activities are undertaken. In the DRC, concessions are a legal structure that allow a private player to provide electricity services exclusively to a demarcated publicly-owned geographical site over a specified period of time. The guarantee of monopoly power over service delivery for the duration of the concession contract attracts private players because of the opportunity to recoup investments and earn adequate returns, and provides potential investors confidence that their investments will be secured.

Regulation of electricity services in urban areas is mandated by the Electricity Sector Regulatory Authority (ARE). Nuru's sites are all urban and, hence, regulated by the procedures established by the ARE for concessions. Although the ARE's submission, review and approval processes have streamlined over the years, this was not the case when Nuru entered the market. The weak regulatory environment at that time was the result of ambiguity in the electricity law, low capacity within government and limited understanding of the regulations, and lack of standardisation of application requirements and procedures across provinces and nationally.

Nuru was also challenged by the lack of accurate demand estimates on willingness and ability to pay of potential end-users, and meeting expectations of investors. Nuru managed these constraints by focusing on selecting distribution sites that would enable them to minimise capital and operating expenditures and achieve full utilisation of the energy systems rapidly. Another challenge was to manage grievances and sensitivities of the communities they served who had experienced war, armed group violence and fragility. These challenges persist.

There are important insights that can be drawn from Nuru's experience with concessions in the DRC for private players and policymakers looking to scale up energy access in similar contexts. Private solar mini grid operators should strengthen the relationship with the regulator; proactively engage with relevant government actors at all levels and

throughout the course of the project; and regularly interact with local communities. Policymakers should update policies so that they are more aligned with solar mini grid requirements; streamline application submission, review and evaluation processes; clearly define the roles and responsibilities of different policy actors; structure stronger concession contracts; and build technical capacity both within the government and the solar mini grid sector.

1. Introduction

The challenge of electricity access in the DRC is profound with only 21 percent of the country connected. Increasing access to electricity is a national priority, but the financing required exceeds the government's fiscal capacity. Acknowledging these constraints, the electricity sector was liberalised in 2014, granting private players the right to generate, transmit, distribute, trade and commercialise electricity. A distribution concession allows private players the exclusive legal right to provide electricity service in a designated area, over a specified period of time. This case study follows the experience of Nuru, a private solar mini grid operator, on the process of acquiring distribution concessions from their inception of a prototype eventually servicing two customers, to deploying the largest off-grid solar mini grid in Africa, and to securing more than USD 40 million financing to add a further 13.7 Megawatt (MW) installed capacity to their current portfolio. In doing so, the case study takes a narrative approach to documenting the regulatory environment around distribution concessions, its evolution, the challenges faced, and lessons learned. The aim of the case study is to present anecdotal evidence and insights for policymakers and private players looking to scale up energy access in similar contexts.

The following section provides the country context in order to situate the electricity sector challenges. **Section 3** describes concessions. **Section 4** looks at the regulatory environment governing distribution concessions in the DRC. **Section 5** presents Nuru's experience with distribution concessions across their different sites, including how the process evolved from their first sites to later sites, the challenges faced and how they were addressed. **Section 6** discusses lessons learned that may be useful in similar settings, and the last section concludes.

2. Context

The DRC is the second-largest country in terms of total area in Africa with a population of almost 100 million,[1] a youth asset of 67 percent,[2] and an annual GDP growth rate of 8.9 percent in 2022.[3] This land-locked country, enclosed by nine neighbours, is blessed with extraordinary mineral reserves estimated to be worth USD 24 trillion; vast arable land; tremendous biodiversity; and the second largest tropical forest in the world[4] that serves as a global carbon sink.[5] Despite this immense natural endowment, or arguably because of it, the DRC has faced political unrest and armed conflict from the time of its independence six decades ago and is counted amongst the five poorest nations in the world with almost 80 percent of the population living in extreme poverty.[6]

Consequently, and as can be expected, the electricity sector in the DRC is fraught with challenges. A dismal 21 percent of the country is connected, with urban access just above 40 percent and rural access only at 1 percent, and the electricity supply frequently being unreliable and of low quality. Of the power that is generated, 99.7 percent is from hydro and the remaining is from oil, gas and coal (0.2 percent) and solar (0.1 percent).[7] This is a positive for the country because it does not have to invest in energy transition and can focus on scaling existing generation, but challenging at the same time because its high reliance on hydropower makes it vulnerable to climate change and extreme weather events.[8] It is also important to reflect on the low proportion of electricity generation from solar despite its well-distributed potential across the country (see **Figure 1**).

Weak governance is part of the reason behind the low energy access; the other contributor being the persistent bouts of conflict resulting in large population movements that make electricity demand unpredictable. High on the DRC's power sector priority is to increase access to electricity, but the investment needs of the sector vastly exceed the government's fiscal capacity. The parastatal utility, Société nationale d'électricité (SNEL), struggles to expand energy access, and private investments and operators are necessary if national electrification targets are to be met. Lack of capacity at the government level to enforce policies and regulations and at the sectoral level of engineers and technicians is an additional contributor, as is the poor transport infrastructure – the DRC is the size of Western Europe but has as many paved roads as Luxembourg.[9]

1 World Bank, n.d.
2 United Nations Children's Fund, 2021; Please note that youth is defined as population between 0-24 years old.
3 Ibid.
4 International Trade Administration, 2024
5 United Nations Environment Programme, 2023
6 World Bank, n.d.; Pease note that this is accurate as of 2020. The international poverty line is set at $2.15 using 2017 prices. This means that anyone living on less than $2.15 a day is considered to be living in extreme poverty (World Bank, 2022).
7 World Bank, n.d.; Please note that the last available data is from 2015.
8 World Bank, n.d.
9 Audinet et al., 2020

Gloomy conditions and forecasts, however, have not deterred committed Congolese entrepreneurs from providing glimmers of hope. Nuru (meaning 'the light' in Swahili) is a private Congolese electricity company that is attempting to surmount the energy access challenge and, in the process, generate the proof of concept of commercially viable solar mini grids in fragile and conflict affected settings (FCAS). From a humble beginning in June 2017 of generating and distributing 55 kilowatt (kW) in the city of Beni, to successfully receiving Series B funding for over USD 40 million to construct 13.7 MW projects in July 2023,[10] Nuru has defied expectations and impressively scaled operations in different sites in eastern DRC. Nuru's progress has come alongside the gradual maturation of the electricity regulatory environment in the DRC. In addition to looking at how Nuru has achieved this, the case study looks at the contribution the government-issued distribution concession agreements have played in facilitating this growth and increasing electricity access in the areas that Nuru serves.

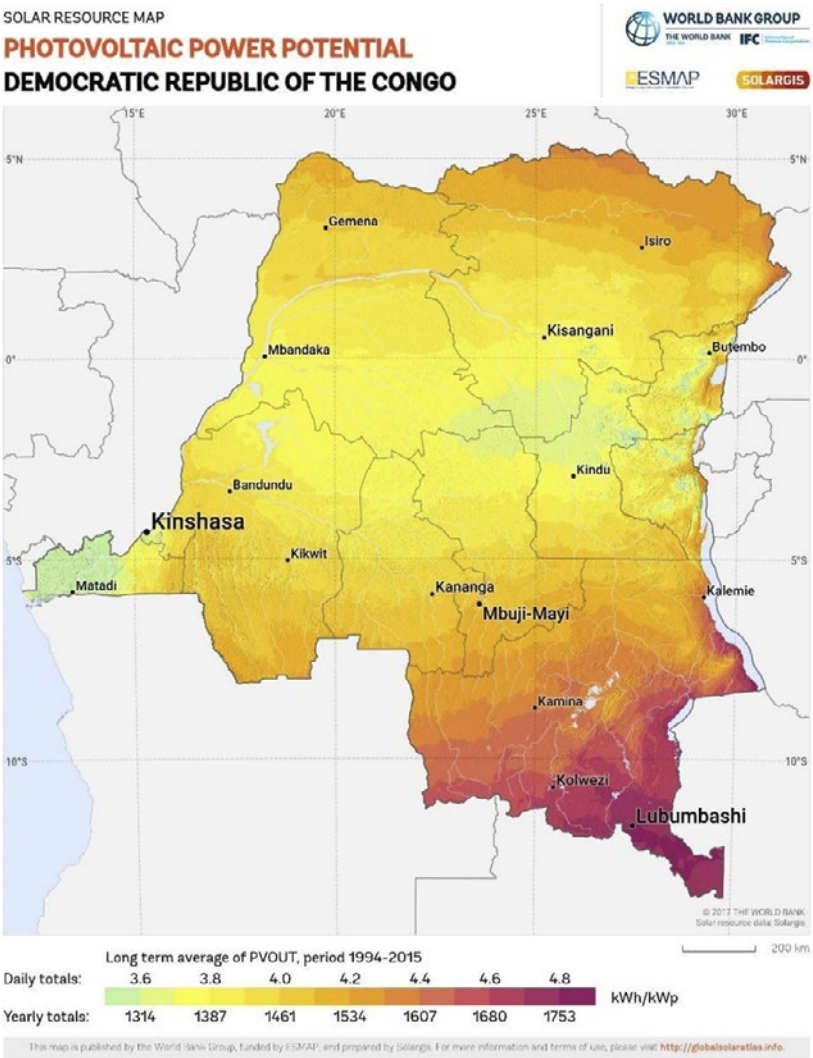
Mill owner using electric grain mill

10 Global Energy Alliance for People and Planet, 2023

3. What are concessions?

Concessions are a legal arrangement whereby the government allows a private player (concessionaire) the right to provide services (such as electricity) on public property designated for this purpose for a specified period of time and under conditions of significant market power. Over the years, countries globally have attempted to address the challenge of expanding and maintaining infrastructure by restructuring public utilities and encouraging private sector participation, and concessions are one way this has been done. Concession arrangements transfer the risks and responsibility of service provision from the public to the private sector.[11] In return, the guarantee of monopoly power over service delivery for the duration of the concession contract attracts potential concessionaires because of the opportunity to recoup their investments and earn adequate returns, and provides potential investors confidence that their investments will be secured.

Figure 1. Photovoltaic power potential in the DRC[12]



11 Kerf et al., 1998
12 Solargis, n.d.

There are different types of concessions depending on:

1. The segment(s) of the electricity provision (generation, transmission and, distribution) – a concession can be granted to a private operator for the right to provide all three segments or, where flexibility exists for unbundling electricity provision, either a combination of two (for e.g., transmission and distribution) or only one (for e.g., distribution).

2. The number of end-users (may not necessarily be new and can be existing customers) – for e.g., for large populations, national utility concessions are generally established with the objective of supporting the national government in reforming an underperforming electricity utility.

3. Remoteness and sparseness of the community to be connected – for e.g., in South Africa, the government experimented with solar home system concessions whereby a private party was contracted to maintain solar home systems in a sparsely settled area located far from the existing grid.[13]

Traditionally, mini grid concessions are awarded for servicing relatively small, remote communities that cannot be connected cost-effectively by extending the national grid. As mini grids are located close to the community, they rarely require a high- or medium-voltage transmission network and are often either small integrated generation and distribution systems, or distribution-only systems that procure power from the national utility or other larger-scale generator for onward sale to local communities. More recently, however, mini grid concessions have been awarded for urban areas that have large, dense populations and where the government lacks the capacity to connect these areas in the foreseeable future. The DRC is one such example.

In mini grid concessions, the concessionaire undertakes the most risk. These typically relate to operations, collection and system losses, changing demand, inflation, fluctuating interest and exchange rates, and the threat of the arrival of the national grid (although this can be dispelled if concession contracts are drawn up to explicitly state the concessionaire's rights and responsibilities if and when the national grid reaches the concessioned area). The government may share the risk burden by subsidising capital and fuel costs. The end-users may share some of the risk burden by paying higher prices through indexing tariffs to inflation.[14]

13 Hosier et al., 2017
14 Hosier et al., 2017

There are different ways mini grid concessions can be set up, and these can broadly be classified under one of the following:

- Top-down: this is the standard public tendering process where the government and relevant agencies pre-define the concession sites and call for proposals under prescribed conditions;[15]
- Bottom-up: this is where the government and relevant agencies call for proposals to electrify unspecified areas at a certain service standard;[16] and
- Laissez-faire: under this approach the private developer negotiates directly with the community to be connected on tariff setting. There is no pre-defined territory allocated by the government, and there is no requirement for a permit (primarily because of the low capacity that will be generated).

The following sections delve deeper into the concession regime in the DRC, and how Nuru's experience with winning concession contracts evolved with consecutive sites.

4. Concessions in the DRC

The long-term viability of a concession agreement between the two primary partners – the government and the private operator – and partners who may have a stake in the overall arrangement (notably, potential investors and local community) will depend on the clarity, transparency, consistency and enforceability of the regulations. This section presents the regulatory ecosystem that governs the solar mini grid distribution concessions in the DRC.

4.1 Regulations and regulators

In the DRC, the Electricity Law (no. 14/002), put in effect in June 2014, addressed the various aspects of the electricity sector, including generation, transmission, distribution, and the role of regulatory authorities. The law removed SNEL's monopoly and opened up the sector for private developers and operators to produce, transport, distribute, trade and commercialise electricity, specifically mentioning mini grids.[17] It treated all sources of electricity without distinction, i.e., renewable sources were not preferred or favoured over non-renewable sources.[18] However, a decree issued later set out the terms, conditions, obligations and enforcement measures for the implementation of renewable energy projects.[19] In 2016, two separate decrees (no. 16/ 013 and 16/ 014) in April mandated the creation of the Electricity Sector Regulatory Authority (ARE) and the National Agency for Electrification and Energy Services in

15 Jacquot et al., 2019
16 Ibid.
17 USAID, 2019
18 Barba & Diamantis, 2023
19 Ibid.

Rural and Peri-urban Areas (ANSER). However, it was only in the first half of 2020 that both became operational.[20]

At the national level, the Ministry of Energy and Hydraulic Resources (MEHR) oversees the electricity sector. Whereas originally ARE and ANSER offices were only located in the capital city, Kinshasa, they have now started to expand regionally.

4.2 Legal regimes for regulating electricity activities

In the DRC, concessions, licences and authorisations are required under the law for electricity generation greater than 99 kW, and for transportation and distribution. The applicable legal regimes will depend on:

1. the ownership of land over which the specific electricity activity (generation, transportation or distribution) will be undertaken (i.e. public or private); and

2. the size of the generation capacity.

Concession contracts are required by law for electricity generation greater than 99 kW, and for transportation and distribution that takes place on state-owned property. On the other hand, electricity activities on privately-owned or privately-leased property are regulated under licencing contracts for generation capacity equal to or greater than 1000 kW and authorisations for generation capacity greater than or equal to 100 kW and less than 1000 kW (see **Table 1**).

Table 1. Legal regimes regulating electricity provision by private sector[21]

Legal regimes	Ownership	Electricity activities	Generation capacity
Concession	Public	Generation, transportation and distribution	> 99 kW
License	Public	Generation	> 1000 kW
Authorisation	Private and Public (if power lines cross public property to a location less than 10 metres from generation)	Generation, transportation and distribution	> 100 kW to 999.9 kW
Declaration	Private	Generation	55 kW to 99 kW
Freedom	Private	Generation	≤ 50 kW

20 Hosier et al., 2017
21 Electricity Sector Regulatory Authority, n.d.

To illustrate how the above is reflected on ground, Nuru operates as an end-to-end utility and is involved in generating and distributing electricity as well connecting and billing customers. Under the existing regulatory regime, Nuru must obtain a production licence because it is their company policy to construct the electricity generation plants on private land. Nuru must also obtain a distribution concession because the distribution network (electric wires and poles) will be erected on public land. As this case study follows Nuru's journey on acquiring concessions, the focus is on distribution concessions. The case is different for hydropower generation where the private operator uses the dam and water resources that are exclusively on public property and, therefore, requires a production concession to generate hydroelectricity. If the hydropower operator is additionally distributing electricity over public land, then it would also require a distribution concession.

4.3 Exclusive right to electricity distribution

Under the distribution concession, the mini grid operator is designated a concession site where it has the exclusive right to distribute electricity, unless there is an end-user with a daily consumption demand of 1 MW or above (verified as an eligible client by the regulator) that the concessionaire is unable to service. In these instances, another operator can enter the concession site and provide electricity to this particular high-demand end-user.

This exclusivity does not, however, bar solar home systems, diesel generator companies, and grid infrastructure less than 100 kW from doing business in the distribution concession zone – the restriction applies only to utility-scale operators greater than 99 kW. Additionally, a concessionaire's monopoly over distributing electricity is reined in by requirements to meet certain minimum levels of service under the concession agreement. These broadly include power quality, reliability and availability as well as maintaining customer service standards. The occurrence of persistent service standard failures may have consequences including termination of the concession agreement.

In the DRC, the government owns all the land and private ownership is time-bound to a maximum of 25 years, with the government retaining residual ownership. As a result, the maximum duration of a distribution concession is limited to 25 years to align with the land ownership laws.[22] At the end of the concession period, the government has the right to purchase the project from the energy service provider or renew the concession for another 25 years.

4.4 Approving authorities

The role of the regulator is primarily to assess, evaluate and recommend whether distribution concession proposals received should go ahead. The approving power lies with the political leadership. The governance structure in the DRC is decentralised. Therefore, there are different approving authorities for distributing electricity depending on:

22 Please note that although it is beyond the scope of this case study, similar time limit applies to production licences as well.

1. the installed capacity of the generation plant;

2. the geographical coverage, i.e. whether it is in one or more province; and

3. whether the developer is operating multiple generation plants with low-installed capacity.

For commercially distributing electricity from a generation plant with an installed capacity of under 99 kW, a concession agreement is not required. The developer simply submits a request for authorisation to the local authority, usually the mayor, and, if approved, the developer receives a letter of permission to distribute electricity. For projects equal to or above 99 kW, a distribution concession is required. If the service area lies within one province, the approving authority is the provincial government, essentially the Governor. If the electricity is to be distributed between two or more provinces, permission must be sought from the MEHR. A distribution concession is also required if a single developer wants to distribute electricity from two or more generation plants (each at under 100 kW) in the same area. This is to ensure that the distribution sites are clearly defined in order to prevent encroachment and protect the exclusionary rights of another existing developer who has a distribution concession contract and is servicing the same market.

4.5 Process of acquiring a concession

Nuru's distribution concession zones are all based in urban areas - Nuru self-classifies them as metro-grids – and are, hence, regulated by the ARE. Regardless of the approach (top-down or bottom-up) being followed for acquiring concessions, the general sequence of actions are as follows.[23]

1. **Proposal submission:** The operator submits a proposal to the ARE, as well as the central and provincial governments. The proposal includes the following:

    i. *technical file* that presents the design of the project, material and equipment specifications (e.g., on the standard, quality and performance), and demand assessment;

    ii. *financial and commercial study* that provides an analysis of the proposed tariff for distributing electricity based on assessment of willingness and ability to pay of the potential end-users to be serviced; and

    iii. *environment and social impact study* that provides details on land acquisition, potential challenges (e.g., whether there is agricultural activity on the land) and adequate mitigation plans.

2. **Proposal review:** The ARE then reviews the proposal to ensure all documentation is complete. If not, the operator is asked to provide the missing documents/ details. Once documentation is complete,

23 Please note that (although it is beyond the scope of this case study) the same procedure applies for licences and authorisations.

ARE issues a 'letter of receivability' to the operator indicating that all requisite material has been received. The proposal is evaluated based on:

i. *standard checks on the operator* – e.g., who are the owners of the company? How long has the company been in business? Does it have authorisation to operate from the MEHR? Is it registered with the tax authorities? Are there any existing or settled legal issues against the company by any actor?

ii. *proposal contents* –e.g., is the electricity generation sufficient to fulfil the demand in the area requested for concession? Does the financial return profile provide a balance between making the project bankable and simultaneously affordable to the targeted end-users? Are there any environmental issues with the land, such as how will the land be acquired, are people living on the land?

3. **Proposal evaluation:** The ARE proceeds to assess whether the project is subject to public market considerations. If the project is indeed on the public market, ARE issues a notice for the expression of interest (EoI), spanning a period of seven days, and subsequently evaluates all received applications and offers. However, if the project falls outside the realm of the public market, the ARE proceeds to evaluate the proposal on its own merit. In both cases, if the proposal complies with all the requirements (and is the winning tenderer if an EoI was floated), the ARE issues a favourable notice *(avis favorable)*, followed by the official approval (*avis conforme*) along with the project specifications (*cahier de charges*) within 30 days (or 60 days if further investigation is required).

4. **ARE recommendation:** The ARE dispatches the *avis favorable* to the approving authority and simultaneously publishes it on its official website (**www.ARE.gouv.cd**).

5. **Formal decision:** The approving authority then reviews the recommendation received from the ARE. It may choose to conduct another review of the proposal by calling a steering committee of experts on public procurement, electricity, and environment. If it is deemed that the proposal should be approved, the authority officially signs the concession title and the operator (now concessionaire) is issued an invoice for the concession agreement. The concession agreement is handed over to the concessionaire once the payment has been made.

6. **Publication of decision:** The ARE initiates the publication of the title in the official government gazette, essentially formalising the granting of the concession and ensuring public awareness of the approved status.

The process described above is currently applicable and illustrated in the **Annex**. As we will see later, Nuru's initial experiences of applying for distribution concessions was different, primarily because the regulator was only established after a few years, resulting in the approving authority also being the reviewing and evaluating authority in the early years after the sector's liberalisation. The next section details how Nuru

navigated the weak regulatory environment, plurality of key actors that often lacked capacity, and incumbent interests to successfully secure distribution concessions.

It is important to note that acquiring the distribution concession is one of the multiple steps that an operator has to undertake if is involved in generation, distribution, and billing and collection. Before applying for a distribution concession, the operator should have already conducted a feasibility study and received its approval, conducted an environment and social impact assessment and acquired an environmental certificate, as well as obtained a land agreement. The production licence and distribution concession should be applied for at the same time. The tariff approval process is critical for the overall viability of the project and should be managed alongside the distribution concession approval process to ensure that the distributed electricity is paid for by the end-users. The ARE is responsible for analysing the tariff proposal submitted, formulating an opinion, and forwarding these to relevant ministries. The ministries issue an interministerial decree that is subsequently published by the ARE in the official government gazette for public awareness and compliance. This process is expected to be completed within 45 days. This is followed by construction on the site, a site commissioning report, and a generation conformity certificate (issued by the ARE confirming that the generation conditions comply with the official standards set for the safety of people, property and the overall public electricity service). **Figure 2** shows the sequence of the key actions.

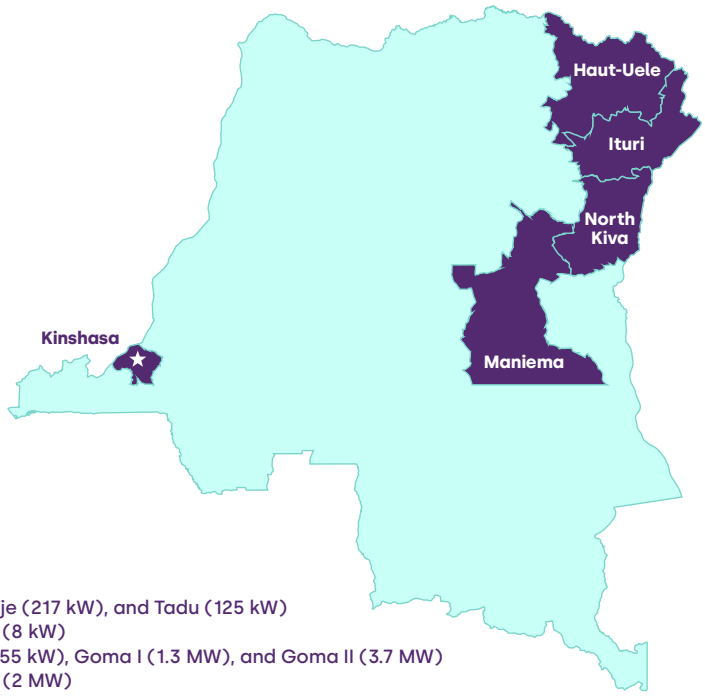
Figure 2. Key actions for establishing a solar mini grid in the DRC

5. Nuru: A bright idea

Nuru was ideated at a university in the province of North Kivu by co-founders Jon Shaw and Archip Lobo where poor access and lack of reliable electricity was disrupting normal life. The vision was to provide world-class connectivity to five million customers.[24] Nuru currently has four operational sites, and an additional three that are under development across four provinces in the east and north-east of the country (see **Figure 3**).

In June 2017, Nuru's first site in Beni became operational. By the end of 2018, Nuru was successfully able to secure Series A funding of around USD 4.5 million, which was proof that investors were confident that Nuru was not only a great idea, but that the idea could also generate revenues. The financing was used to develop Goma I (1.3 MW) which became operational at the start of 2020, and Faradje (217 kW) and Tadu (125 kW) in mid-2021. When Goma I became operational, it was the largest off-grid solar mini grid in Africa at that time. Nuru secured Series B funding of more than USD 40 million in July 2023. This funding is planned to be used towards further developing Bunia (8 MW), Kindu (2 MW) and Goma II (3.7 MW) that were started in 2020. Series B funding is mostly used for scale by companies that have successfully utilised Series A capital and have revenue coming in.[25]

Figure 3. Nuru's sites in the DRC



Province	Site
Haut-Uele	Faradje (217 kW), and Tadu (125 kW)
Ituri	Bunia (8 kW)
North Kivu	Beni (55 kW), Goma I (1.3 MW), and Goma II (3.7 MW)
Maniema	Kindu (2 MW)

24 Nuru SASU, n.d.
25 DigitalOcean, n.d.

Nuru followed the bottom-up approach to acquiring distribution concessions for their projects. The rest of the section describes Nuru's criteria for selecting their distribution concession sites, their experience in applying for distribution concessions and why that differed from the practice outlined in the law, and how they build community support to serve as a mitigation strategy against adverse events.

5.1 Selecting a site for distribution concession

There are three expectations from a private solar mini grid company when operating in FCAS, as illustrated in **Figure 4**, namely:

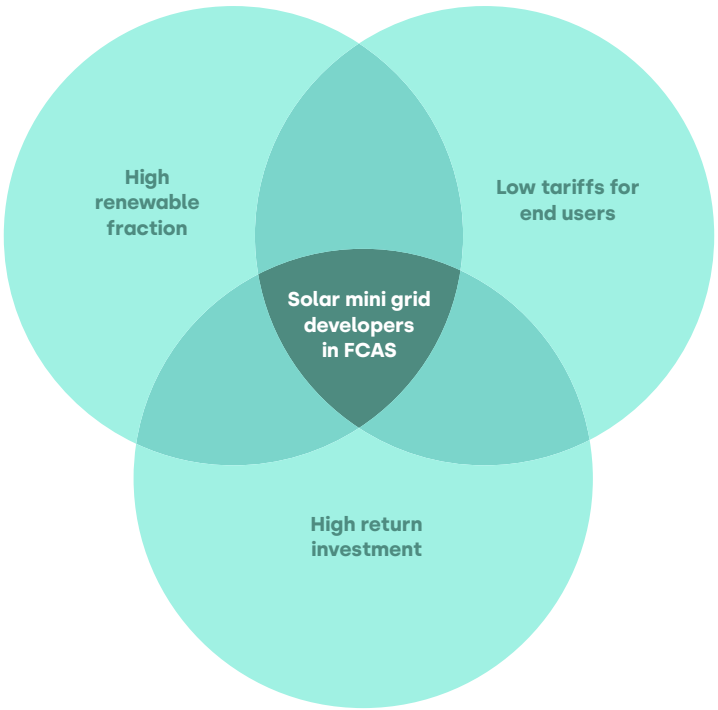
1. high return on investment requirement to pay the high cost of investor capital resulting from the real and perceived risks associated with frontier markets;

2. an obligation to maintain a high renewable fraction in the energy mix to meet climate transition markers, which inevitably means greater battery storage, resulting in increased capital expenditure (CapEx); and

3. the expectation to charge low tariffs to end-users who are poor and for whom affordability is a concern.

However, these expectations cannot all be simultaneously met. Developers try to manage this challenge by focusing on selecting a site that would enable them to minimise capital and operating expenditure (OpEx) to the greatest extent possible and through trying to achieve 100 percent utilisation of the energy systems quickly.

Figure 4. Expectations from solar mini grid operators in FCAS



Site selection

Site selection is a key determinant to achieving a commercially viable business model. Nuru's pilot site was 55 kW in the city of Beni, North Kivu, and it eventually served two customers. It was not designed to be ambitious, rather the objective was to be able to assess and identify earlier on the qualifying prerequisites for selecting future sites. In addition to solar irradiance, Nuru identified four criteria for site selection:

1. **Existing un-served and under-served demand:** The DRC has large, high productive use urban zones that are not connected to the national grid and, hence, are effectively unelectrified. The only source of reliable electricity is from diesel generators, which is expensive. Nuru targets markets where there is potentially one or more big commercial and industrial (C&I) end-user(s) who can serve as an anchor customer(s) and help guarantee return on the investment. Nuru also assesses the presence of retail customers, such as small and medium enterprises (SMEs) and households, to diversify their customer portfolio and add to revenues secured from C&I customers.

2. **Local regulatory environment:** Receiving buy-in from local government actors is critical to securing distribution concessions as they approve project proposals. Nuru initiates engagement with government officials at the provincial and local level to understand their policies and priorities regarding electricity access to ensure that their proposal aligns with the existing agenda. For instance, they seek to understand where preferred zones are and what are the expected timelines. This is also an opportunity for Nuru to convey their expectations of the support and commitment they require from the local government actors. Most importantly though, these interactions allow Nuru to gauge whether they can be trusted to work with integrity.

3. **Existing competition:** Before penetrating a market, it is important to know whether there are existing players in the market, the proportion of the market that is already captured, the quality and reliability of electricity service they are providing, etc. This allows Nuru to understand the different challenges that may arise and prepare mitigation strategies accordingly.

4. **Functioning supply chain:** There are two factors of the supply chain that are critical when finalising a site:

    i. *Presence of basic infrastructure:* All-weather roads are essential for delivering equipment to sites, especially batteries which are very heavy. Roads in the DRC tend to be unsurfaced and moving freight efficiently in the absence of road infrastructure is a challenge. Nuru's existing and future sites have some limited road infrastructure, but they are in generally poor condition. For Goma I, batteries shipped from the United States made it safely to the border, but were damaged en route to the site on the road. For the upcoming Bunia site, Nuru plans to build a road from the generation site to the main road heading into the city. Apart from

roads, other forms of access infrastructure such as railways, ports and airports exist in the DRC but are often in disrepair. For the upcoming Kindu site, due to the poor road quality, Nuru will aim to freight equipment by train, which only runs a few times per year. Beni, Goma, Bunia and Kindu have domestic airports but airlifting heavy equipment is not financially viable for the projects.

ii. *Availability of human resources:* Skilled staff are required during the construction phase of the solar mini grid as well as later for operations and maintenance of equipment, billing and collection, and handling end-user communications (such as complaints redressal). Nuru does a survey of available schools in the potential concession site. If there is a technical school in the area or nearby, that provides a good indicator that there will be some level of existing human capacity that would be easy to train with the skills required. Where human capacity is lacking, skilled workforce has to be brought in from outside, which adds to costs and has to be budgeted in earlier on at the project development phase.

Rapidly achieving full asset utilisation

Correctly estimating the willingness and ability to pay is critical for project design. However, in the DRC, one challenge with calculating willingness and ability to pay is that there is no reliable data on population estimates - the last census took place in 1984. This leads to uncertainty and unreliable predictions. In Bunia, for instance, the mayor's office estimates the city's population to be 1.5 million, whereas the United Nations World Population Report estimates it at 0.75 million. Another issue is that it is hard for potential end-users to accurately express what their willingness and ability to pay for electricity is when they have never experienced electricity before, or are used to electricity that is unreliable and of low-quality.

At the same time, Nuru's approach to building a business model for their solar mini grid projects is to make the projects commercially viable in the absence of subsidies. This means that the tariff charged to the end-users is cost-reflective, i.e., it covers the CapEx and OpEx costs, as well as the return on investment that has to be achieved in order to attract the investment needed to build the site. Nuru acknowledges that, consequently, the tariff it charges is expensive.

To address this disconnect, when Nuru enters a new market, it strategically under-sizes the energy systems against the projected demand by half. In other words, Nuru builds energy systems that are intended to be utilised by what is anticipated to be half the real demand. They do this to reach 100 percent utilisation as quickly as possible, which helps to avoid costly unutilised capacity. Once Nuru is in the market, it has access to real-time data on demand, which makes scaling up operations by incrementally adding capacity to energy systems more accurate. Full utilisation also allows Nuru to display the success of their operations and negotiate subsidies (for e.g., results-based financing in the form connection-based or tariff-reduction subsidy) with investors that can then be transferred to the end-users (in the form of lower tariffs).

5.2 Applying for distribution concessions

Nuru's prototype site in Beni did not require a distribution concession to commercialise electricity because it was under the 99 kW threshold. However, for their next project, Nuru wanted to deploy 1.3 MW in Beni. The regulatory environment was still nascent at that time and ARE had not yet become operational. Therefore, the procedure in place was to submit the request for a distribution concession for review and evaluation to the approving authority, in this case the Governor of North Kivu. Nuru was informed that the site that they had selected for concession distribution had already been allocated to another operator. This was a massive blow in terms of costs incurred and time lost in proposal preparation, and Nuru also had to handle the added stress of dealing with investors and the complexity of improvising on the designed strategy.

Nuru was then directed to consider Goma, another city in the same province, to deploy the 1.3 MW project instead. When they entered the Goma market, they learned that there were on-going disputes between existing operators on distribution concession boundaries. This situation led to the re-drawing of the distribution concession zone that had already been approved and allocated to Nuru. Whereas earlier, the zone included mixed-income communities, the new zone, although bigger, had some of the poorest communities in Goma with no existing electricity infrastructure. Fortunately, Nuru had successfully secured funding from the Humanitarian Grant Challenge at that time which provided the necessary capital to build a new distribution network that would not have been possible otherwise.

The weak regulatory environment at that time was a result of ambiguity in the Electricity Law of 2014, low capacity and a limited understanding of the law within the government, and lack of standardisation of application requirements and procedures across provinces and nationally. Additionally, political motivations and extortion demands from decision-makers influenced outcomes. The operationalisation of the ARE in 2020 turned the tables. The ARE was staffed with competent officials who had the required technical expertise, there was greater clarity on the application requirements, and better streamlining of processes. Most importantly, there is now a distinction between the reviewer and the approver, whereas earlier both these powers previously rested with the Governor. As a result, Nuru's experience with applying for distribution concessions for Series B sites (Bunia, Kindu and Goma II) has been an encouraging one.

Two recent developments are expected to further strengthen the role of ARE as a key player. First, the World Bank has earmarked funds to improve capacity and, second, ARE has started the process of opening regional offices and expanding their presence outside of Kinshasa. The latter development is of particular importance to Nuru, because when ARE was only based in the capital, Nuru had to maintain a separate team there (more than 1,500 km away from Goma where Nuru is headquartered), simply to nudge the regulatory machine to act timely.

There has been a lot of positive development with respect to the organic evolution of the DRC's regulatory environment around distribution

concessions, and primary stakeholders have learned along the way. The regulator is committed to creating a fair and level playing field for the operators. The politics of the energy sector has also changed and generally improved for the better. And Nuru has a much stronger relationship with government counterparts than a few years ago – the flights to Kinshasa to meet with the regulator whenever a clarification was required from Nuru have now been replaced by calls.

Nonetheless, as the market matures new challenges come up. Covid-19 and the Russia-Ukraine war were external shocks that had a huge impact on diesel prices, making it more expensive for Nuru to run back-up generators. The existing structure of the distribution concession contract does not allow for tariff adjustment from fluctuations in OpEX (such as diesel prices) which creates a huge risk for developers and investors. Moreover, the quality of project proposal documents, such as environmental and social impact studies and the terms of the concession contracts, are not yet at par with investor standards.

5.3 Incorporating a conflict lens through community engagement

None of Nuru's distribution concession sites are in active war zones per se, but they operate in fragile and conflict affected communities that have experienced war, armed group violence, and fragility. The DRC has experienced two wars (1996 to 1997 and 1998 to 2003) with ongoing pockets of violence in eastern DRC. The country's struggle to address energy poverty and meet rising energy demand are both a consequence and a symptom of the country's complex context of fragility and insecurity. Weakened by decades of poor governance, broken infrastructure, and violence and corruption, the DRC has more than a hundred armed groups, millions of people living as refugees or in internal displacement camps, and millions more in need of humanitarian assistance.

Given the highly sensitive contexts that Nuru operates in, they understand that engagement with local communities in the distribution concession zone is critical. If there is no buy-in from the communities that are to be served, issues of power theft, infrastructure damage, end-user complaints, etc. will be common. Additionally, the DRC has a relationship-based culture. Nuru maintains close contact with formal and informal community leaders on a regular basis which starts when Nuru is considering a site for a distribution concession. Nuru has an in-house community liaison team comprising of members from the local community who are responsible for maintaining relations with the community. When recruiting locally for site managers and technicians, Nuru pays close attention to the community demographics. For instance, in Bunia, Nuru has made a conscious effort to ensure that hiring patterns do not exacerbate existing grievances between the dominant Hema and Lendu communities. Nuru also understands that the contexts it has chosen to work in are unpredictable and volatile, particularly around elections. Nuru has trained local staff to keep abreast of any adverse incidents, protests, rallies or any event that may deteriorate the prevailing local peace and has also trained them on mitigation actions.

Installation of streetlights allow communities to stay out longer

Another contribution that Nuru makes towards the community is the provision of free public street lighting. To date, Nuru has set up 458 streetlights across 50 km of low-voltage and 15 km of medium-voltage network across their four operational sites and more are planned when the new sites will be deployed. Streetlights are greatly appreciated by the community because they provide a sense of security, allowing people to stay out longer into the evening to conduct business and personal activities. It also demonstrates Nuru's commitment to the community. These streetlights are financed through grants and Peace Renewable Energy Credits (P-RECs).[26] P-RECs are an innovative instrument that supports the developer by monetising renewable energy generated in FCAS (and creating an additional stream of income), while supporting corporations to comply with their to their sustainability and social responsibility commitments. The purchase of P-RECs from Goma I by Microsoft financed the deployment of streetlights in the Ndosho neighbourhood. An assessment of this social impact project observed that residents reported a heightened sense of security, with women benefiting more as they could conduct business at night, and they experienced a reduction in gender-based violence when compared to the Mugunga neighbourhood that had not yet received streetlights.[27]

26 Please see the case study on *Blended Finance and Fragile Settings: P-RECs and P-RECs Aggregation Facility* for a more detailed discussion.

27 Energy Peace Partners, 2022

6. Lessons learned

Important insights can be drawn from Nuru's experience with distribution concessions in the DRC from the discussion above. Policymakers and private players looking to scale up energy access in similar contexts should consider the following.

Policymakers should consider:

- **Modernising regulatory frameworks:** Currently, operators in the DRC must navigate separate processes for acquiring production licences and distribution concessions, which creates unnecessary complexity. Developing policies tailored to the context of solar mini grids can streamline operations by allowing operators to consolidate all electricity activities under one contract.

- **Streamlining administrative processes:** Policymakers should prioritise streamlining application procedures and reducing administrative burdens. Effective communication of policies and procedures is essential to ensure clarity and efficiency in the application process.

- **Improving review processes:** Enhancing the efficiency of review processes and reducing approval timelines is crucial. Delays in obtaining approvals, as experienced by Nuru in Faradje and Tadu, can significantly impact project viability and necessitate costly interim measures. Policies should aim to expedite approval procedures to facilitate timely project implementation.

- **Improving cross-governmental communication:** Several government offices are involved in energy governance in the DRC from specialised regulatory offices to provincial governments. It is important that the energy planning processes are designed to enhance inter-governmental communication and transparency in order to strengthen collaboration and information-sharing.

- **Clarifying government roles:** Clearly defining the roles and responsibilities of various government departments and agencies involved in electricity projects is essential for effective coordination and project delivery.

- **Capacity building:** Policymakers should invest in building technical capacity within government institutions at both national and provincial levels, as well as within the emerging solar mini grid sector. Strengthening technical expertise facilitates informed decision-making and effective project oversight.

- **Digital platforms for information sharing:** Implementing digital platforms, such as online portals or databases, for sharing energy-related information and data among government offices improves accessibility and transparency. These platforms can host documents, reports, and datasets, allowing stakeholders to access information in real-time and facilitating informed decision-making.

- **Risk mitigation in concession contracts:** Developing concession contract terms that acknowledge and address risks and externalities affecting mini grid investments is crucial. By mitigating potential barriers and uncertainties, policymakers can create a conducive environment for private sector participation.

- **Grantor funding support:** Grantors can play a crucial role in supporting developers by providing funding to cover project development costs associated with securing distribution concessions. This may include grants, concessional loans, or technical assistance to offset expenses related to legal, regulatory, and administrative processes. By providing financial support for project development activities, grantors can help reduce the financial burden on developers and increase the feasibility of energy access initiatives.

- **Innovative financing mechanisms:** Grantors can explore innovative financing mechanisms, such as results-based financing or performance-based incentives, to incentivise developers to achieve specific milestones in securing distribution concessions. These mechanisms align funding with project outcomes and encourage developers to prioritise transparency, accountability, and compliance in their site development efforts.

Private solar mini grid providers should consider:

- **Collaboration with regulators:** Building constructive relationships with regulators is essential. This entails mutual capacity building, and proactive anticipation and prompt resolution of issues. Policies and procedures should be developed through inclusive, consultative processes that consider the interests of all stakeholders.

- **Engagement with government actors:** Engaging with relevant government entities at all levels from project inception ensures alignment with electricity objectives and local priorities. This engagement also fosters an understanding of the socio-economic and political landscape, facilitating effective project planning and implementation.

- **Community engagement:** Regular engagement with local communities is critical, particularly in FCAS. Investing in community partnerships fosters support for project initiatives and enhances resilience against potential disruptions.

- **Increased project development costs:** The complexity of developing and securing distribution concessions requires additional resources for legal fees, regulatory compliance, and administrative expenses. The need for specialised expertise in navigating regulatory processes and engaging with government stakeholders may also result in higher consulting or advisory fees. As such, developers need to factor in these additional costs when planning their site development budgets.

- **Extended project timelines:** The intricacies of securing distribution concessions, coupled with the need for transparent and accountable processes, can lead to extended project timelines. Delays in obtaining regulatory approvals, navigating bureaucratic processes, and addressing compliance requirements can prolong the site development phase. This can result in increased project costs due to extended personnel and operational expenses.

- **Risk mitigation measures:** Developers should allocate resources to risk mitigation measures, to address uncertainties associated with securing distribution concessions. This may include contingency funds to account for potential delays or unforeseen regulatory challenges, as well as insurance premiums to cover project risks such as political or regulatory changes.

Daily monitoring of the control system

7. Conclusion

This case study aims to underscore the critical role concessions can play through providing a legal structure and being an enabler for attracting private investment to scale up energy access. Concessions are a useful instrument to deploy for countries that face a significant energy gap and for governments that do not have the financial capacity to bridge the gap. Private players are attracted to markets that are safe for their investments. Nuru's success demonstrates that commercially viable solar mini grids are workable even in fragile and conflict settings when private operators are given exclusive rights to distribute electricity.

The regulator is responsible for ensuring a fair and transparent concession application process. Clear communication and well-designed procedures ensure that all interested parties have an equal opportunity to compete. Additionally, the regulator must oversee transparent review, evaluation, and approval processes to maintain integrity and foster trust.

Community engagement is critical. The concessionaire will be servicing the community for the duration of the concession contract, and their continued buy-in is important for project sustainability. A persisting challenge is that it is difficult to attain full energy access with cost-reflective tariffs in the concessioned areas as the costs may be higher than what the end-users can afford. In these instances, developers often look to secure concessional financing that would allow for subsidies that lower tariffs and add more customers.

In terms of achieving universal energy access, there is still a lot of ground to cover. In terms of facilitative regulations and streamlining processes, the DRC has made significant improvements over the years. In terms of demonstrating that a private electricity player can scale up, Nuru has set an example. Investors are also encouraged to play their role in supporting the energy ecosystem and generating impact.

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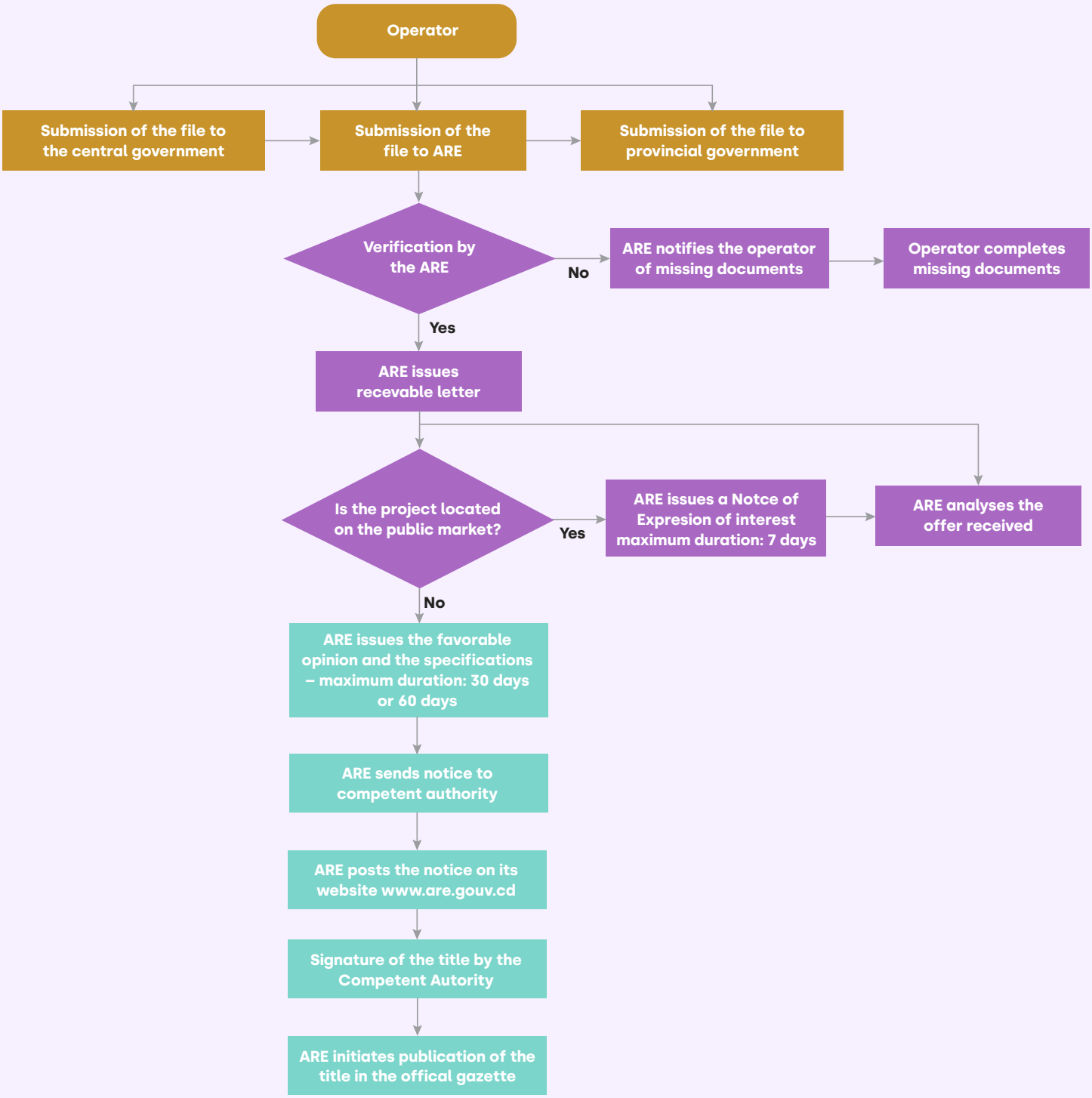
Annex: Procedure for applying for concessions[28]



28 Electricity Sector Regulatory Authority, n.d.

Construction of gatehouses at the Goma II site

The **State Fragility initiative** (SFi) is an International Growth Centre (IGC) initiative that aims to work with national, regional, and international actors to catalyse new thinking, develop more effective approaches to addressing state fragility, and support collaborative efforts to take emerging consensus into practice. SFi brings together robust evidence and practical insight to produce and promote actionable, policy-focused guidance in the following areas: state legitimacy, state effectiveness, private sector development, and conflict and security. SFi also serves as the Secretariat for the Council on State Fragility.

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