WEBINAR: IEA - High-level expert consultation on digitalisation, energy efficiency and smart grids

afternoon session

11 Mar 2020 17:00—18:30 CEST

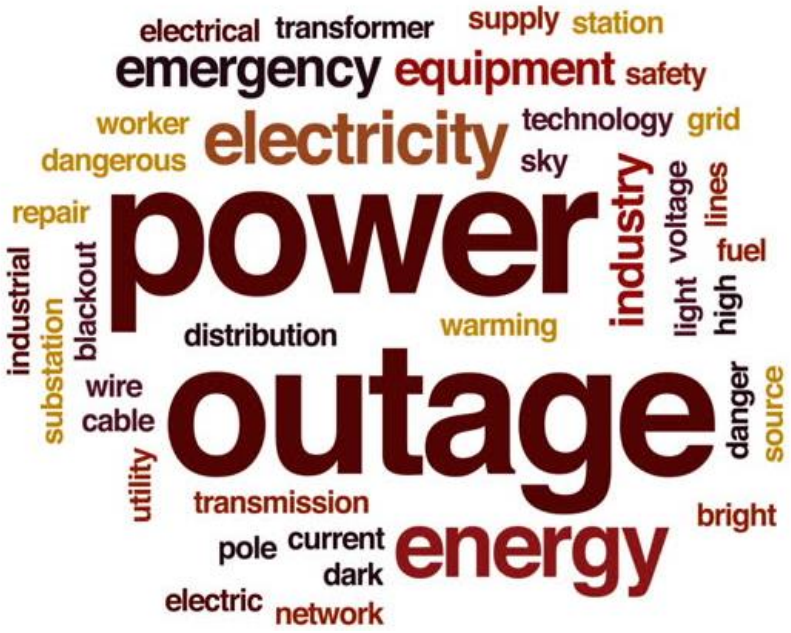
experience in improving power distribution in Senegal thanks to digitalisation

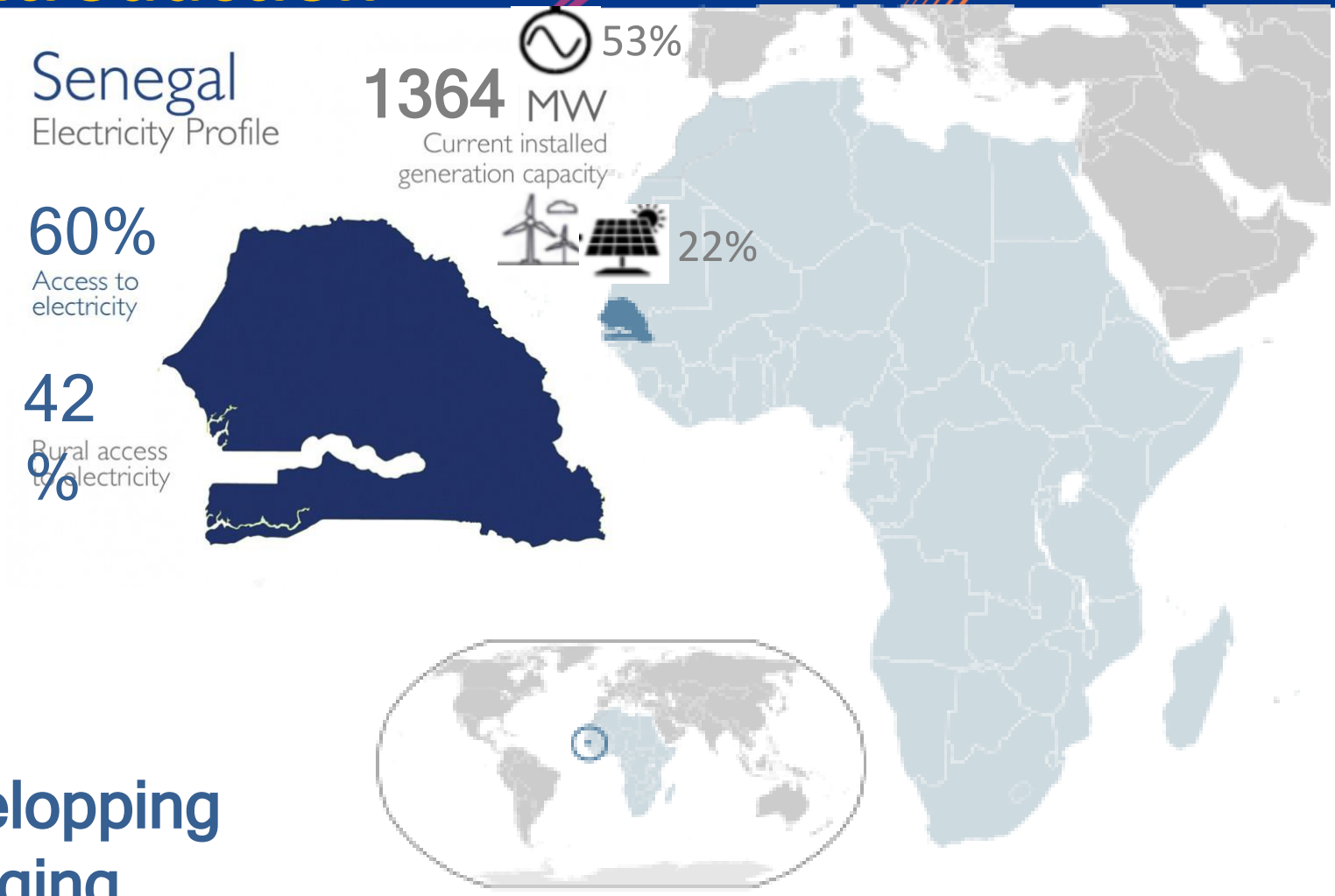
Présentation : Mouhamad Al Mansour KEBE, SENELEC, Sénégal.

Contents

- Introduction
- Improving Power distribution in Senegal
- Lessons learned
- Next Steps

Introduction



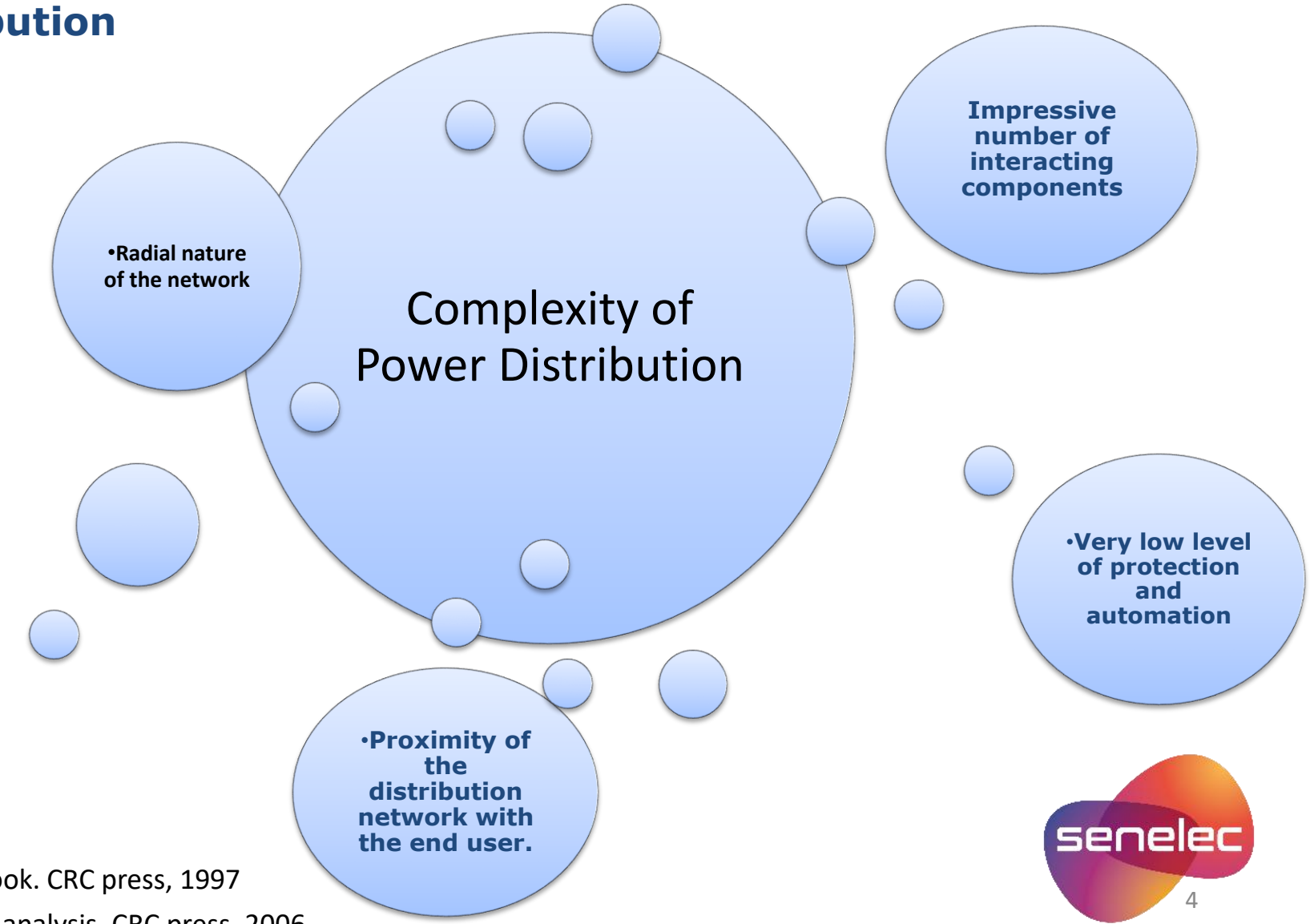


Delivering electricity in developping countries is very challenging

Improving Power distribution in Senegal

Complexity of Power Distribution

- about **80 % of outages at customers level occur due to** failure in the distribution system process (1);
- For a typical residential customer, **for every 90minutes of outages per year, between 70 et 80 minutes** is attributed to the problem in the distribution system;
- The « poor cousin » of electricity networks in terms of too development (2);
- Management problems in electricity distribution networks;
- Smarter management is neeeded: this has led to the émergence of smartgrids;



(1) WILLIS, H. Lee. Power distribution planning reference book. CRC press, 1997

(2) KERSTING, William H. Distribution system modeling and analysis. CRC press, 2006.

Improving Power distribution in Senegal

TELCO NETWORK IMPACT IN DEVELOPING COUNTRIES

- Development of telecommunications with mobile phones have been **changing the lives in developing countries** more than any other invention before
- wide variety of services with new needs and usages specific to emerging countries like **mobile money**



Improving Power distribution in Senegal

TELCO NETWORK IMPACT IN DEVELOPING COUNTRIES

- In developing countries **cellular network can actually be much more advanced** than energy infrastructures
- This situation is extremely encouraging and highlight the potential of **quick spread of smart grid in developing countries**.
- In One year Senegal changed **significatively power cut duration** thanks to distribution network automation with telco operators (GSM, GPRS, 3G)

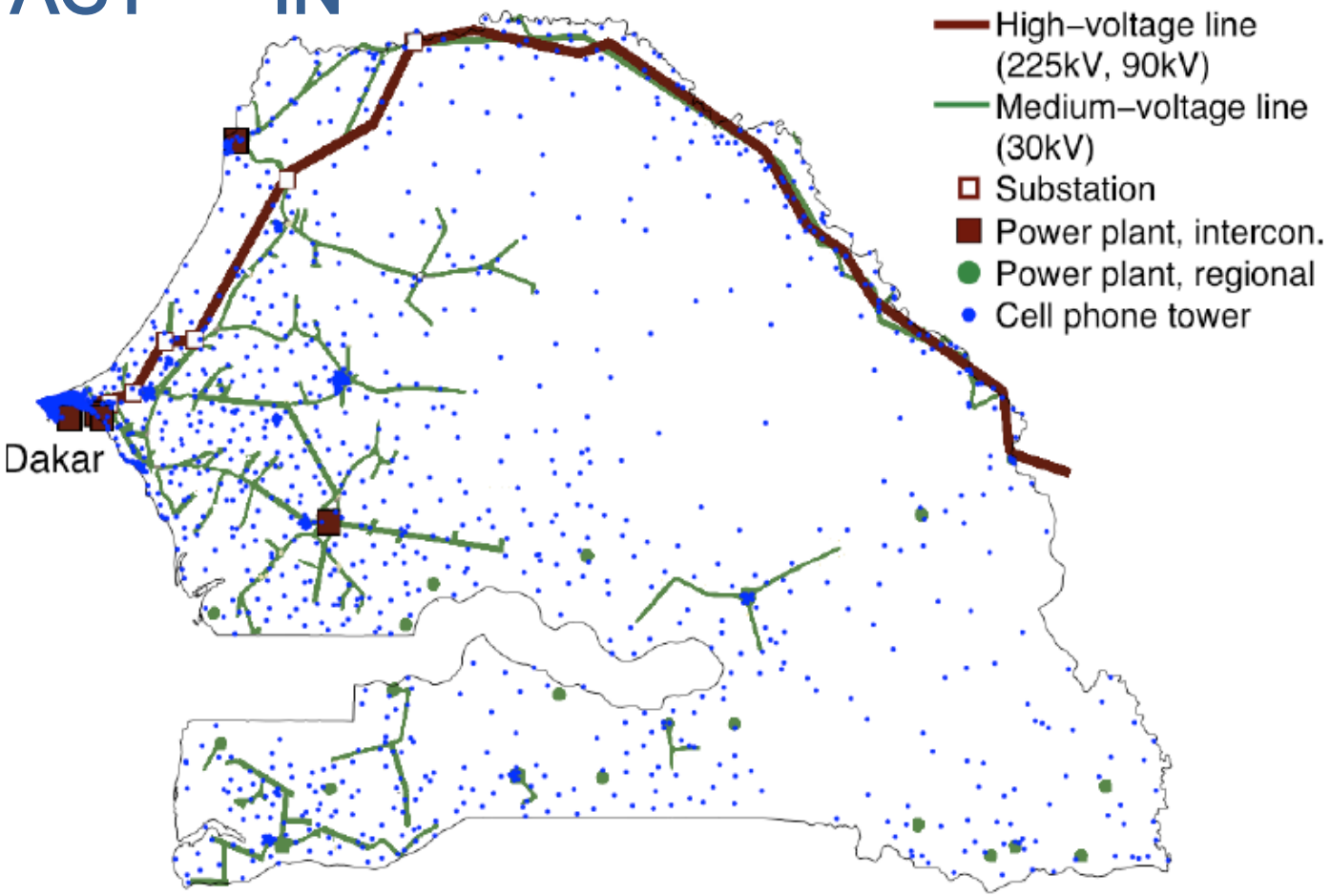


Figure – Existing electricity infrastructure in Senegal and location of the mobile phone towers [1]

Improving Power distribution in Senegal

☞ Distribution automation with GSM/GPRS

- **Very long fault search time on the distribution network (3 hours on average)**
- **Strategic choice since 2010 to install motorised HV switchgear on the network**
- **Good coverage of the telecom operators' network**
- **Implementation of a pilot project of remote control by GPRS/3G and mini SCADA from July 2017.**
- **Satisfactory pilot performance:**
  - From 03h00 to 30mn for the fault localization and isolation







senelec

Improving Power distribution in Senegal

☞Distribution automation with GSM/GPRS

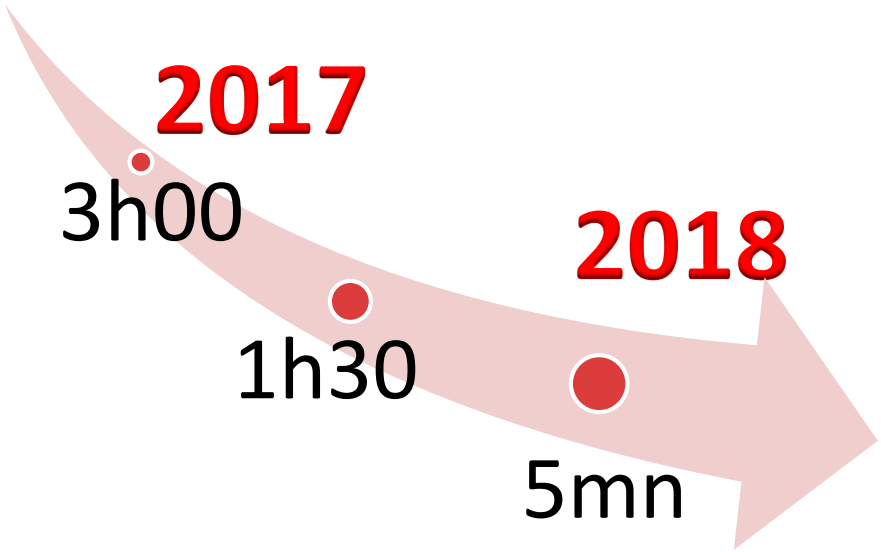
- Generalization of the solution having led to the following results in a second step:
- **On 20 feeders equipped with at least three(3) remote controls, we succeed to restore up 80 to 90% of the customers within 1 to 3 minutes..**
- **In 30 feeders that have two(2) or one (1) remote control points, we succeed in recovering between 10 and 50% of the customers between 1 and 3 minutes..**



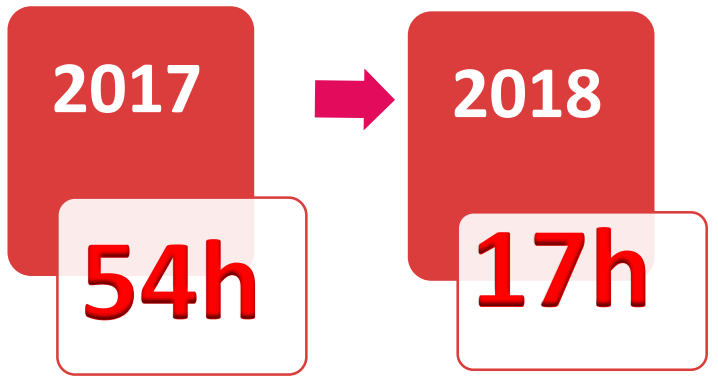
Improving Power distribution in Senegal

☞ Distribution automation with GSM/GPRS

- With the installation of more than 300 remotely controlled stations, Senelec has reversed the trend by **transforming the unit of measurement of service interruption times from hours of outages to minutes of outages**.
- **Significant impact on SAIDI**
- **Savings of 6 GWh on Non-Distributed Energy (ENSI) in 2018.**



Outage Restoration Duration for 90% of the customers.

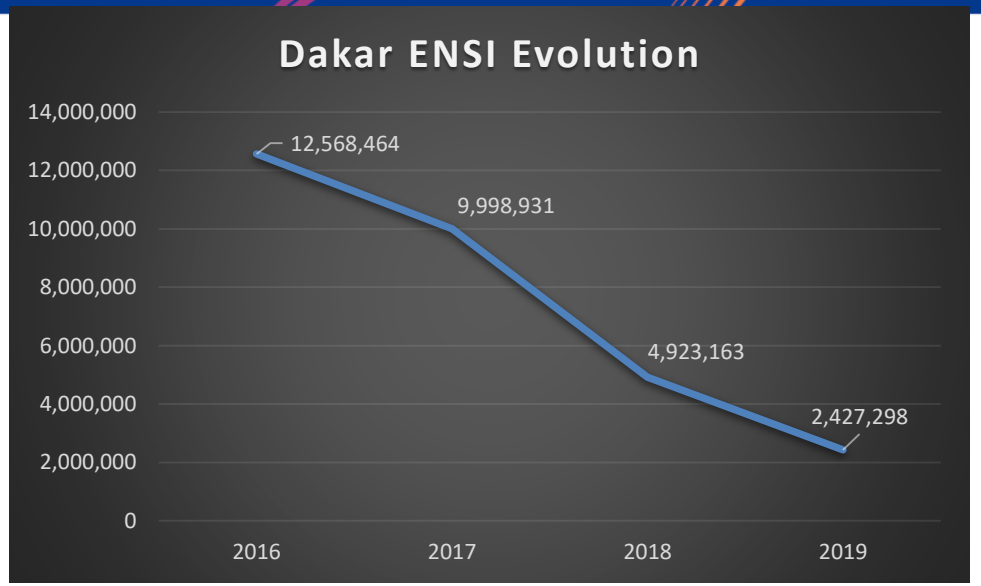


SAIDI Evolution

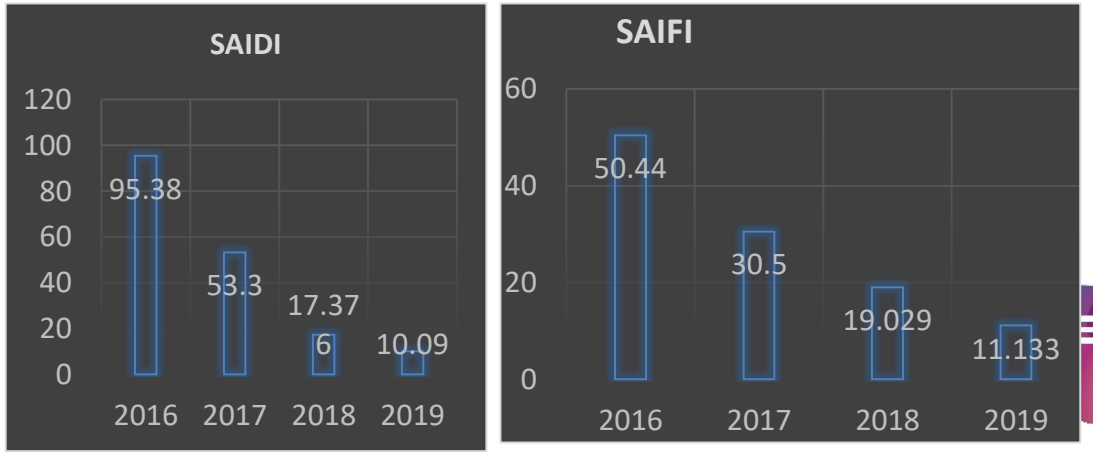
Improving Power distribution in Senegal

☞Impact 2019 performances:

- **reduction by more than 50% between 2018 and 2019**
- **The savings achieved are estimated at more than 10 millions USD over this period.**
- **Reduction of SAIFI through innovative preventive maintenance**
  - **Advanced Infrared and Ultra Sound Thermography**
  - **Preventive diagnosis of underground cables before fault occurs**
  - **Visit of the lines by Drone introduced**
  - **Implementation of Computerized Maintenance Management System - CMMS**



ENSI evolution form 2016 to 2019



SAIDI/SAIFI Evolution from 2016 to 2019

Lessons learned

- From a **cost and speed of deployment perspective**, we can see that using an existing communications network instead of deploying an entirely new infrastructure is more efficient and can **lead to quick wins**.
- In this way, the company can **save money** and **plan to invest** in a private telecom infrastructure

- The **results are extremely encouraging** and highlight the potential of telecommunication infrastructure to support the **rapid spread of the smart grid in developing countries**

- ❑ Telecom Network Reliability measurement
- ❑ SMS based data service
- ❑ RTU Design
- ❑ Solution reliability

Next Steps

Advanced Distribution Management

- **Distribution Management System (IDMS) golive on July 2019_ will grant advanced functions** :
- **the self-healing** of the distribution network (detection, location, isolation and automatic recovery of customers in a few seconds following a fault without the intervention of the BCC operator)
- automatic detection of **low voltage** failures without waiting for customers trouble call from call centres (with **smart meter**).
- **Improved monitoring** of the quality of service (current and voltage) with information from smart meters
- **Informing customers** in a more reliable and accurate way about network outages and planned work (by email and SMS)
- Preparation for the **massive introduction of renewable energy into distribution networks**, particularly distributed generation.



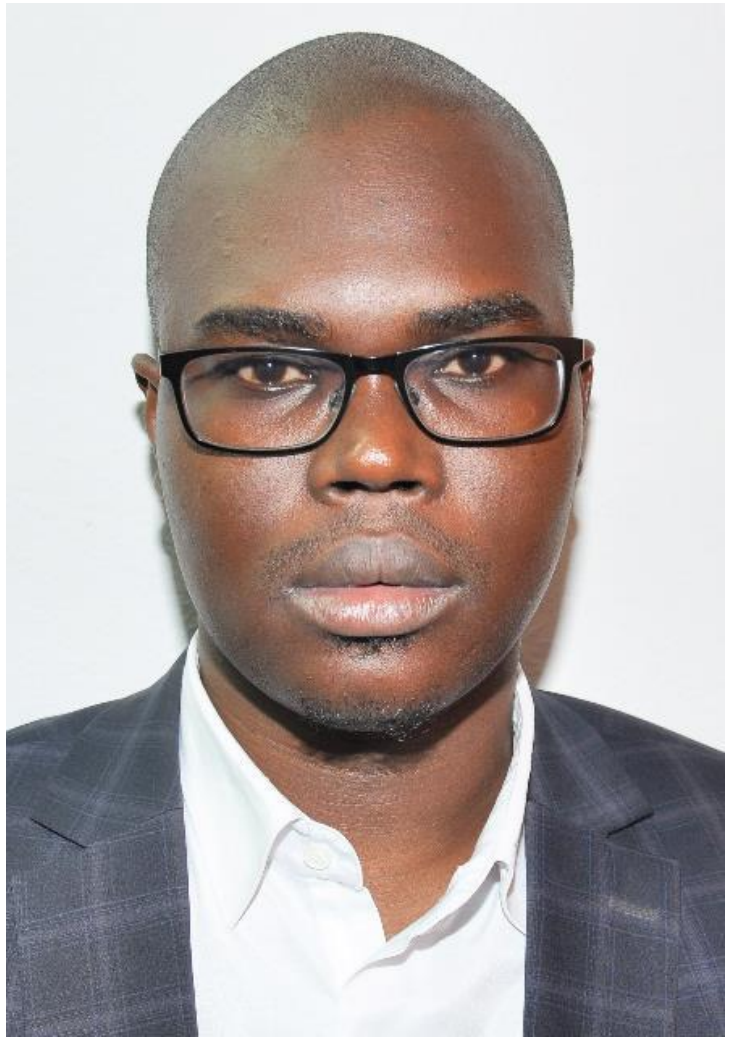
Senelec ADMS commissioned in July 2019

Next Steps: Sharing expected impact on demand management and power losses



Thanks for your attention

Biography Mouhamad Al Mansour KEBE



Manager - Head of the Operations and Technical Management of the Distribution Network Department at Senelec

With ten years of experience in power distribution networks, Mr Kebe is one of the main actors in the implementation of the latest innovative projects concerning the management of the Senelec distribution network (Senegalese main power company).

Experienced Distribution Operations Manager with a demonstrated history of working in the oil & energy industry.

Strong operations professional with a Engineer's degree focused in Electrical Engineering from Ecole Supérieure Polytechnique de Dakar.

Author of several scientific publications in international conferences and journals as part of a doctoral thesis in Mathematics and Computer Science at the Faculty of Science and Technology of the Cheikh Anta Diop University of Dakar on the theme of intelligent management of electricity distribution networks using multi-agent systems.