Enedis, France's main Distribution System Operator

GENERATION
Activity open to competition
Various energy sources, including nuclear, fossil fuels, and renewables such as water, wind and solar power.

TRANSMISSION
Regulated activity
RTE
RTE manages generation & load balance and operates 400KV, 225 kV, 90 kV and 63 kV networks

DISTRIBUTION
Regulated activity
Enedis
Enedis operates MV and LV networks for *95% of French customers*
150 small DSOs in France

ELECTRICITY SUPPLY
Activity open to competition
Fully open to competition since July 1, 2007

About 70 suppliers in France

ENEDIS

An **eDF** subsidiary

2 300	1,4m km	800 000	38 million
HV MV SUBSTATIONS	MV & LV GRIDS	MV LV SUBSTATIONS	CUSTOMERS

Enedis ranked 1st on Singapore Power Smart Grid Index for 2 years in a row !

Utility	Country/Market	Score	+ / - (%)	Best Practices
Enedis	FRA	98.2	1.8	
TaiPower	TWN	94.6	-	
UKPN	GBR	94.6	-	
ConEd	USA	92.9	-1.8	
WPD	GBR	92.9	-	
CitiPower	AUS	91.1	-1.8	
DEWA	ARE	89.3	-	
SP Energy Networks	GBR	89.3	1.8	
SDGE	USA	87.5	-	
FPL	USA	85.7	-	
Northern Powergrid	GBR	85.7	1.8	
SCE	USA	85.7	-	
Stedin	NLD	85.7	-	
ComEd	USA	83.9	-	
PG&E	USA	83.9	-3.6	
ENWL	GBR	82.1	-3.6	
Jemena	AUS	82.1	1.8	
PEPCO	USA	82.1	5.4	
Powercor	AUS	82.1	-	
Radius	DNK	82.1	-3.6	

SMART GRID INDEX

Measures the smartness of electricity grids globally, in seven key dimensions. The benchmarking also identifies best practices to build smarter grids that deliver better value to customers.

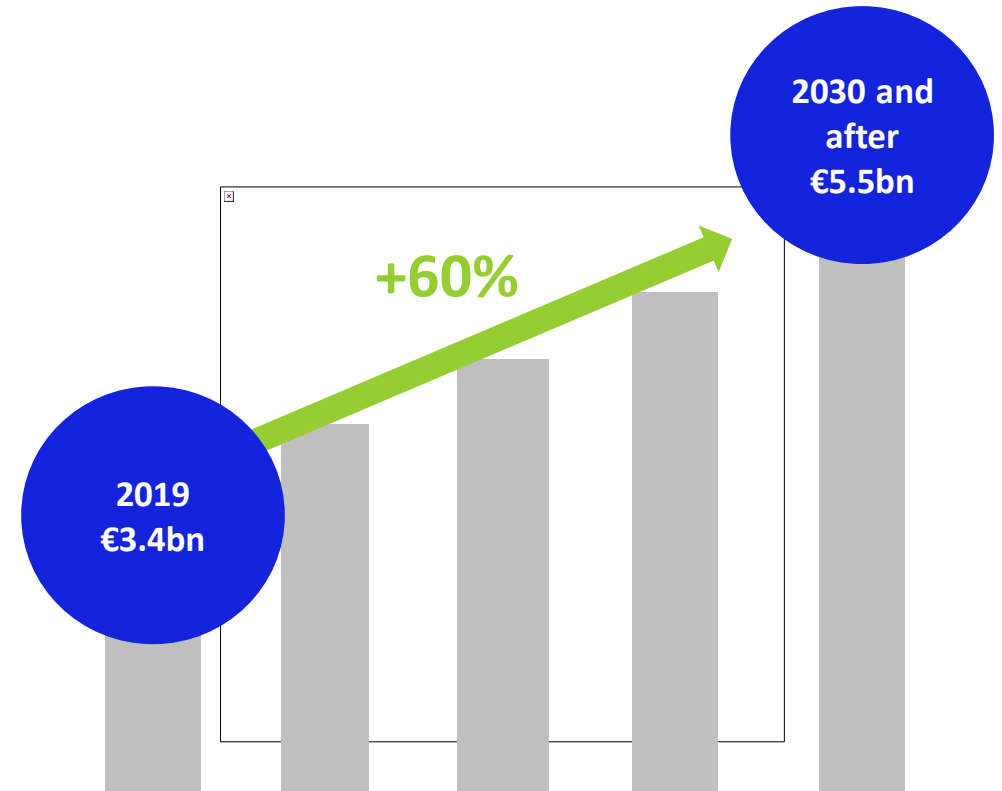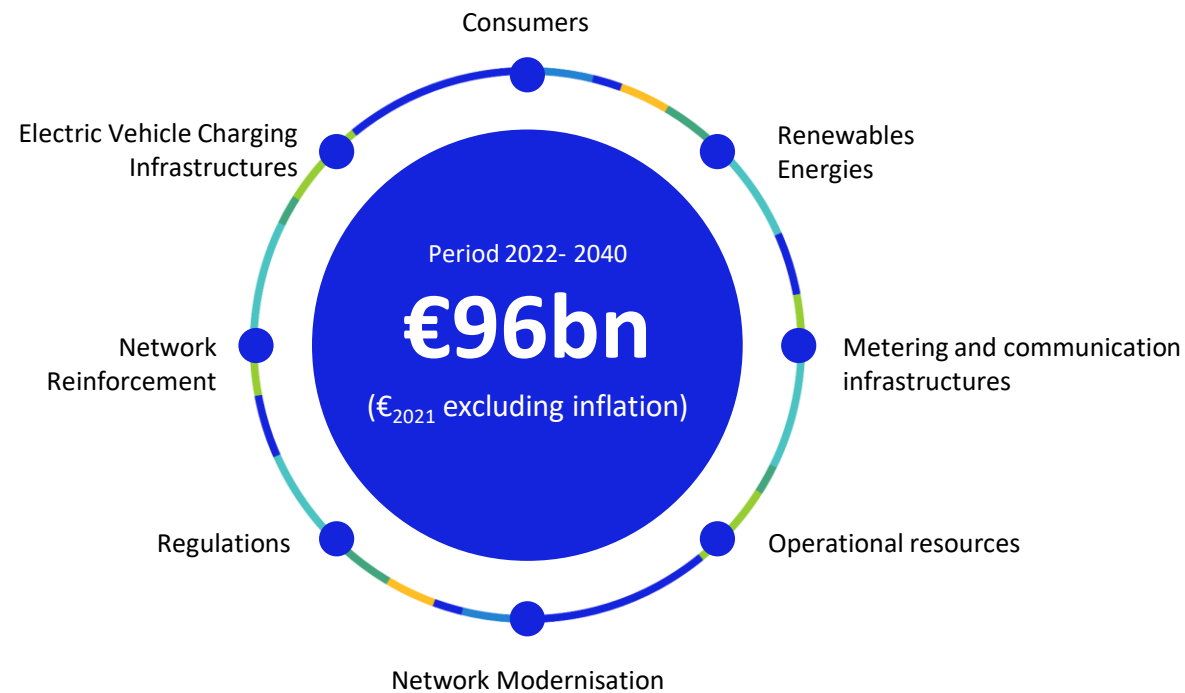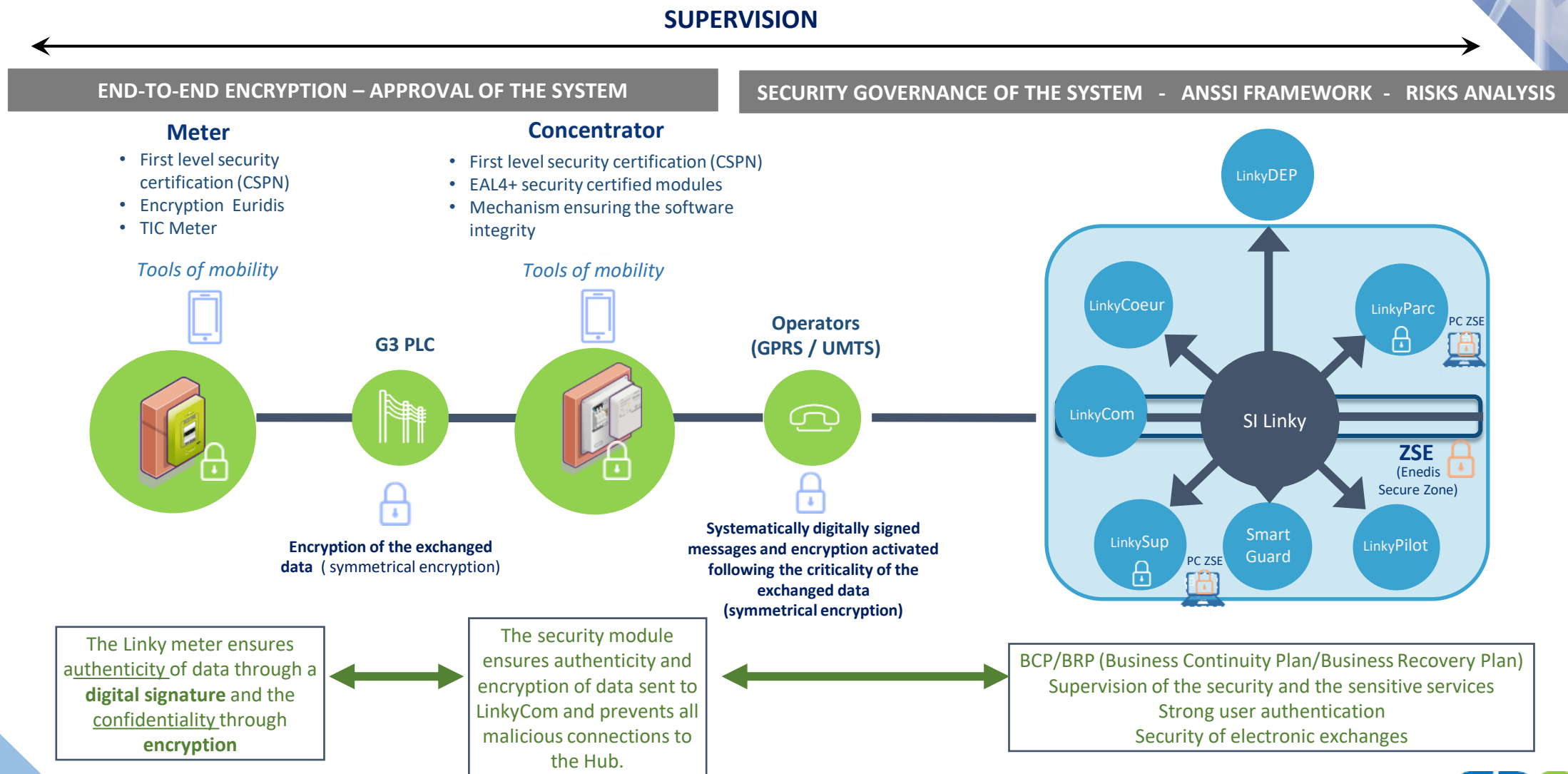|		
01.	MONITORING & CONTROL	. SCADA / . DMS / ADMS
02.	DATA ANAYTICS	. Smart Meter Coverage / . Data Analytics Application
03.	SUPPLY RELIABILITY	. SAIDI / . SAIFI
04.	DER INTEGRATION	. Management of DER Integration / . Grid Scale Energy Storage
05.	GREEN ENERGY	. Renewable Energy Penetration / . EV Facilitation
06.	SECURITY	. IT Cyber Security / . OT Cyber Security
07.	CUSTOMER EMPOWERMENT & SATISFACTION	. Real-time data to Customers / . Customer Satisfaction Feedback

Industrial project for "la nouvelle France Electrique"

Consumers

Electric Vehicle Charging Infrastructures

Renewables Energies

Period 2022- 2040

€96bn

(€$_{2021}$ excluding inflation)

Network Reinforcement

Metering and communication infrastructures

Regulations

Operational resources

Network Modernisation

2030 and after €5.5bn

+60%

2019 €3.4bn

ENEDIS

Smart metering at the heart of energy transition

Linky architecture

A Highly Secured System

SUPERVISION

END-TO-END ENCRYPTION – APPROVAL OF THE SYSTEM

SECURITY GOVERNANCE OF THE SYSTEM - ANSSI FRAMEWORK - RISKS ANALYSIS

Meter
- First level security certification (CSPN)
- Encryption Euridis
- TIC Meter

Concentrator
- First level security certification (CSPN)
- EAL4+ security certified modules
- Mechanism ensuring the software integrity

Tools of mobility

Tools of mobility

G3 PLC

Operators (GPRS / UMTS)

LinkyDEP

LinkyCoeur

LinkyParc

PC ZSE

LinkyCom

SI Linky

ZSE (Enedis Secure Zone)

LinkySup

PC ZSE

Smart Guard

LinkyPilot

Encryption of the exchanged data (symmetrical encryption)

Systematically digitally signed messages and encryption activated following the criticality of the exchanged data (symmetrical encryption)

The Linky meter ensures <u>authenticity</u> of data through a **digital signature** and the <u>confidentiality</u> through **encryption**

The security module ensures authenticity and encryption of data sent to LinkyCom and prevents all malicious connections to the Hub.

BCP/BRP (Business Continuity Plan/Business Recovery Plan)
Supervision of the security and the sensitive services
Strong user authentication
Security of electronic exchanges

ENEDIS
L'ELECTRICITE EN RESEAU

Linky Roll Out : a leopard pattern strategy
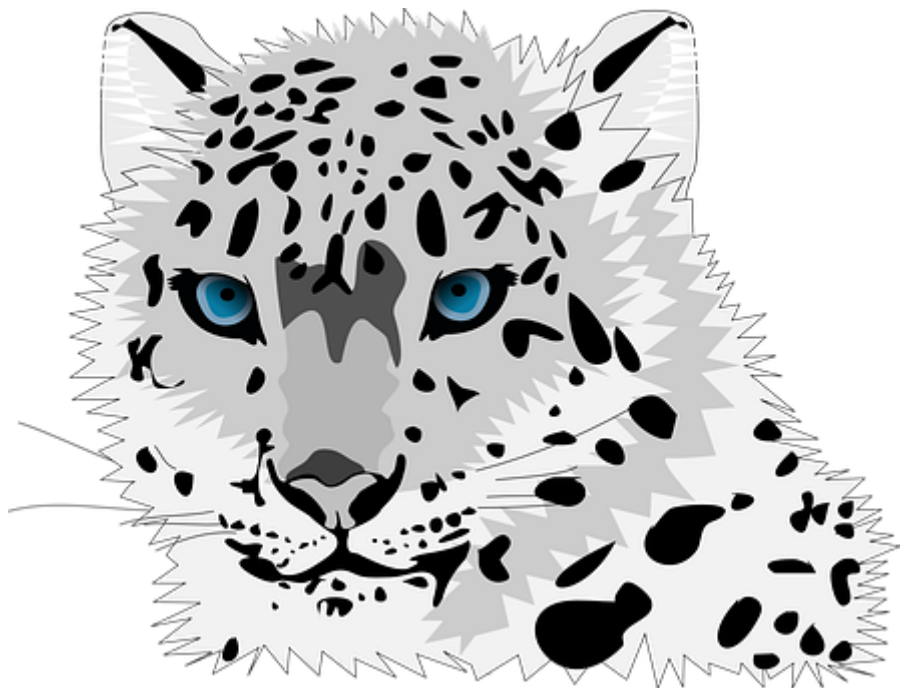
2016

2017

2018

2019

2021

ENEDIS
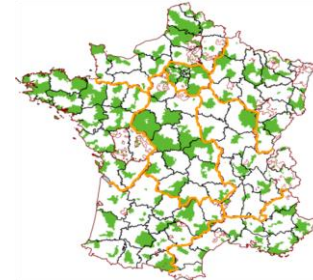
Key Figures
A Successful Deployment – On time, Below Budget with good public acceptance

Initial targets

6 years

2015>2021

Mass roll out

700,000 data concentrators

35 million meters

20-year lifetime

5 billion € CAPEX by 2021

10,000 jobs created (5000 operators in the field)

6 partners

700,000 meters produced per month

Sagemcom
- Single phase meters G1 / G3
- Three phase meters G3
- Data Concentrators G3

alfanar
- Three phase meters G1 / G3

Landis Gyr+
- Single phase meters G1 / G3
- Three phase meters G1 / G3
- Data Concentrators G1

CAHORS
- Data concentrators G1 / G3

Honeywell
- Single phase meters G3

Itron
- Single-phase meters G1 / G3
- Three phase meters G1 / G3

Key achievements

SCHEDULE ON TRACK

35,000,000 meters **installed**

30,000 meters/**day**

750,000 meters produced/**month**

4,000 operators in the field/**day**

2016	2017	2018	2019	2020	2021
3000000	5000000	8000000	8000000	6500000	3500000

MASS ROLLOUT **35 000 000**
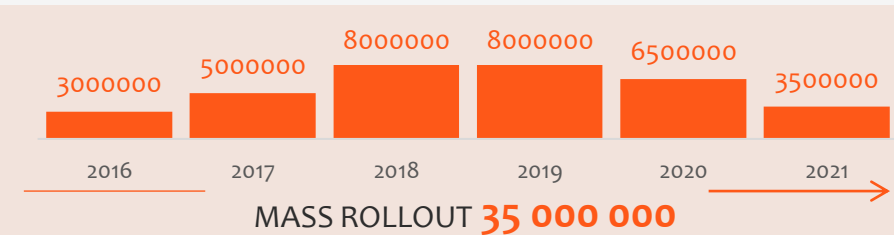
QUALITY

99% success rate of remote operation

99% daily collection rate (23h59)

BUDGET

4.2 billion € (updated forecasts vs. initial cost) CAPEX by 2021

ENEDIS
L'ELECTRICITE EN RESEAU

Take away

LINKY CONCEPTION

- Design and conception of a full end to end Smart metering solution for 35 million customers
- An IT solution based on G3-PLC technology : open standard fully supported by G3 Alliance
- Advanced cyber security architecture, compliant with the requirements of the French cybersecurity Agency (ANSSI)
- A complete interoperability for all the products in the field (Meters and Data Concentrators)
- 20 years lifespan for all the products in the field
- An evolving metering system : all the firmware are remotely upgradable

IMPLEMENTATION

- Success factors
  - Open and standardized technology : G3-PLC
  - Products certified by G3 Alliance, for a full interoperability
  - Top-level infrastructure, tools and processes for laboratory testing
  - A dedicated testing centre, the Linky Lab, developed and operated by Enedis
- An industrial rollout organization
  - IT system for rollout teams
  - Real time rollout supervision

IMPACTS

- 10 000 jobs created for the project
- CAPEX model : An investment made by Enedis, fully compensated by technical benefits : remote operations, losses reduction
- Smartphone Apps provided for free to the customer to optimize energy consumption
- A package of Network Services, for Enedis, for the benefit of the final customer
  - Real time outage detection: each Linky meter is a sensor in the field
  - Possible remote assistance to segregate issues between the public and the private network
  - Better quality of supply thanks to optimized phase balancing

Thanks for your attention

✉ Marc Delandre

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