# Enel international experience in smart grid cluster and possible solutions for Russian market

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### **Enel a World Class Operator**





\*including CELG Brazil (acquired 2017)

# Why Smart Grid and Smart Metering are so important

Enel Smart Grid Experience – toward operational excellency

- Reduce Operation & Maintenance costs
- Reduce outage duration

- Reduce Meter operation
  costs
- Reduce energy losses
- Improve collection rate



- Streamline Maintenance
  costs
- Optimize capex allocation

- Increase workforce productivity
- Improve safety

Enel approach to Smart Grid is based on four technologies and a deep process/ organization re-engineering



• Smart Metering is the cornerstone of Smart Grid cluster program, leading to strong benefit to Consumers and profitability for DSO

# Why Smart Grid and Smart Metering are so important

Enel Smart Grid Experience – toward operational excellency

#### **Smart Meter (AMI)**

- 47 M smart meter installed
- Focus on massive quick implementation, 100% coverage of customers,
- Typical benefit are loss reduction, collection rate improvement, productivity increase, back office rationalization
- Key features of Enel solution are
  - Meters and More PLC communication, robust, noise resistant,
  - high success rate remote Reading & Work Order Management
  - Security by design antitamper and cyber security,
- Now new breakthrough solution integrated with LV network automation, multimetering + new services



## **System Architecture**

PLC based



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## **Enel CERVANTES Solution**

Current generation of Smart Metering for Enel Subsidiaries





• 2nd generation of Smart Meters, implemented from 2010

12/1/17 Confidential – for discussion

# **Smart Metering solution**

Enel experience

#### **Function**

Smart Meter remote reading & work order management

#### **Benefits**

- Meter reading & operation costs
- False Dispatch reduction
- Power Failure of Meter
- Contract change

Revenue protection

- Energy losses
- Fraud/ tamper verification success rate improvement
- Credit collection



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Based on Enel experience significant improvement of opex and revenue protection

1 Improvement estimation based only on Enel experience

#### **Enel new Open Meter Platform**

#### Enel new generation platform, now in roll-out in Italy for 32 M Smart Meters



Web interface Smartphone App

(\*) not included in SEC specs/ Enel offer

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### **Enel Open Meter Solution**

Additional features of newest generation - a quantum leap in Smart Metering





#### • Not only a Smart Meter but an active grid component

12/1/17 Confidential – for discussion

# Why Smart Grid and Smart Metering are so important

Enel Smart Grid Experience – toward operational excellency

#### **Network Automation**

- 100% of HV/ MV substations remotely controlled; 100% MV self healing network
- Typical benefit are maintenance cost reduction/ productivity increase, outage duration reduction and longer lifetime of assets,
- Key features of Enel solution are
  - Integrated SCADA + DMS
  - Full HV and MV network decentralized automatic faults identification & clearing with full standardized product line (RTU, RMU, Fault Detectors..)
  - Advanced RES integration



## **Distribution Automation System**

Enel solution

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check cost





DMS SE system specific customization for Enel

**OMS** Outage Management System

Enel standardized solution for Fault Location, Isolation and Supply Restoration: RTUs, Fault Detectors, Motorized switchgears\*\*\*



## **Distribution automation system solution**

Enel experience

#### **Function**

MV network automation with decentralized Fault Location, Isolation and Supply Restoration, DMS, OMS

#### **Benefits**

- Reduced outage transitory, frequency and duration
- Optimized lifetime of assets
- Safer operation
- Reduced Operation & Maintenance costs
- Extended lifetime of assets

Grid Full Digitalization:

- WFM,
- Asset management

- Crew dispatch automation: higher productivity & shorter response time
- Optimized investment planning
- Real time operation planning
- Higher safety
- Optimized investment planning, lower maintenence costs



1 Improvement estimation based only on Enel ex

## **Distribution automation system solution**

Enel experience





# Significant cost redution can be achieved in short

# **Further improvements in Enel Grid optimization**





•with A.I. and big data

Best practice sharing

CSR projects

Loss detection analysis

Optimization of energy losses/ loss detection analysis

- Smart fault selection: self-healing new generation technology with Fault clearing in one second
- LV remote control
- Artificial Intelligence: Predictive Maintenance, Fault identification, chat bot for customer care, gualification documentation check

# Why Smart Grid and Smart Metering are so important

Enel Smart Grid Experience – toward operational excellency



#### Asset Management

- Used for all Enel worldwide network developments
- Optimization of network investments and maintenance based on risk-return analysis

#### WFM

- All Enel teams connected via GIS localization, on board network cartography
- Paperless operation: mobile Apps for all field operations + Dynamic work scheduling/ control
- Optimization of assignement and routing, productivity increase
- Now implementing virtual reality + wearables aimed at zero accident

## **Asset Management - ATLANTE methodology**

Risk based network planning and asset allocation



- Satellite mapping of network assets
- Database of network events available and for all main grid elements
  - power outage notification,
  - fault detection
- Advanced DSS SW platform, supports
  - Investments allocation based on a risk analysis for various network and load flow configurations

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- Predictive maintenance
- Process reengineering

Network investment allocation and maintenance risk based optimization

## **Asset Management - ATLANTE methodology**

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#### Network Planning main steps



## **Enel's Android based WFM2**

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- Android Smartphone, Android Market Applications
- GPS Navigation system integrated with electric grid data for automatic assignment
- on-board SW for grid maintenance/ Fault Management, smart metering
- On board Safety black box
- Camera, Barcode, RFID
- Augmented Reality Applications, wearables to improve productivity and safety
- Access to company e-mail and intranet website



#### **Technological leadership to further improve operations**



# Enel approach on how to implement a Smart Cluster



### What required for Smart Grid

Enel experience on Regulation and Legislation - possible solutions for Russian market

regulation and visibility for Support to long term Stable investment and Allowing for sustainable and clear innovation payback of investments **Smoothing** regulation of tariff Incentives for national **Job creation** 2 meters and other smart 3 **Focus on** efficiency and **Quality of Service** 



- Tariff fixation to meet the technical objectives
- Premium rate on innovation
- Economic criteria to define asset base
- **Quick 100% roll-out of Smart** Meters, clear allocation of ownership/ responsibility to **Distributor** to merge the patchy metering systems into a uniform, wellfunctioning large-scale AMM system
- **Quality of service**: prize and penalties
- Loss reduction
- Operational efficiency: X factor to promote further efficiencies
- Investment level

Stable long term

in smart meters

**R&D** initiatives in

grid elements

manufacturing smart

4 years

distribution tariff

# Благодарю!

## Lorenzo Colovini

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