

A man and a child are sitting on a rocky outcrop, both wearing VR headsets. The man is reaching out with his right hand towards a glowing digital network of lines and nodes that fills the sky. The child is sitting next to him, also looking up. The background is a bright blue sky with soft clouds. The overall theme is technology and innovation.

Innovation at the heart of business strategies: the future of energy

Robert Denda

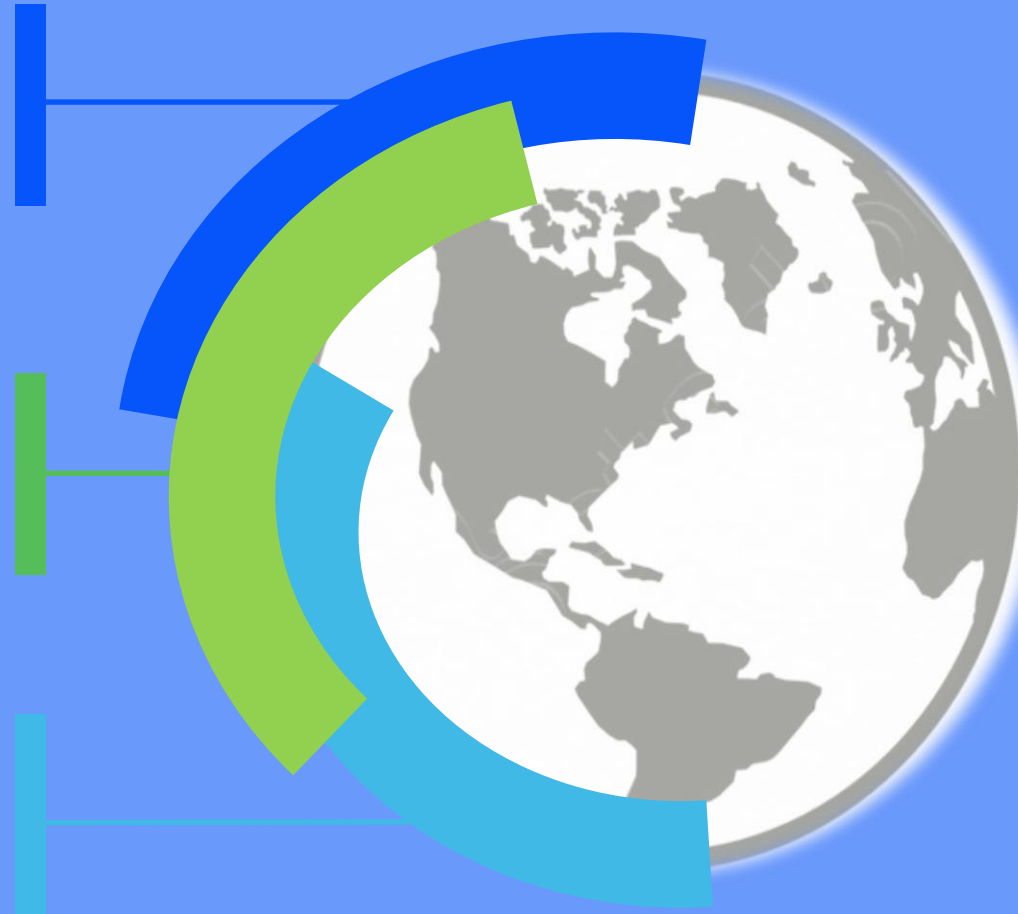
Head of New Technology and Innovability

enel

1st **network** operator¹

World's largest private
player² in **renewables**

Largest retail **customer**
base worldwide¹



73 mn end users



43 GW capacity²



46.5 GW capacity³



5.7 GW demand response



~ 64 mn customers⁴

1. By number of customers. Publicly owned operators not included
2. By installed capacity. Includes managed capacity for 4.2 GW
3. It includes nuclear
4. Includes customers of free and regulated power and gas markets

Positioning and key figures

enel

COLOMBIA

3,5 M customers
23% (2nd DSO)

PERU

1,5 M customers
25% (2nd DSO)

CHILE

1,9 M customers
33% (2nd DSO)

SPAIN

12,2 M customers
42% (1st DSO)

ITALY

31,5 M customers
85% (1st DSO)

BRAZIL

17,3 M customers
21% (1st DSO)

ARGENTINA

2,6 M customers
16% (2nd DSO)

ROMANIA

2,9 M customers
36% (2nd DSO)

Key figures

Distributed energy (TWh)

2018

485

2019

509

End-users (mn)

72.8

73.3

Enabling the future flexible and resilient ecosystem

enel

Digital City

Climate Change

Decentralized Generation

Electrification of Everything

Digital Grid

Active Customer

Digital Worker



Smart Metering

enel

3rd generation of Smart
Meter Technology

Cloud-based system

Italy: >7.000.000.000.000
data per year

Meter as sensor
for smart LV grid
management

Data lake:
Predictive
Maintenance
Anomaly
detection

- 45 million smart meters in operation
- Deployments in Italy, Spain, Romania and Chile
- Pilots in Argentina, Brazil, Colombia and Peru



Projeto Smart Meter



Nova interação
com os clientes

- Consumo consciente e informação online
- Leitura e operação: remotas e otimizadas
- Flexibilidade tarifária e mercado livre efetivo
- Pré-Pagamento
- Melhora da qualidade do serviço
- Sustentabilidade: redução de emissões

Projeto
Brasil

- Estudo de roll-out massivo começando por São Paulo
- Pioneirismo brasileiro pela experiência internacional da Enel

Digital Customer

enel

**New
Flexible
Tariffs**

**Meter to Smart
Home interface**

**Chatbot as new
customer care
channels**

**Crowd-
Working**

**Real-time
Outage
notification**

- Italy: quarter-hourly load and measurement curves available daily
- Spain: Dynamic pricing (PVPC)
- Chile and Colombia: Ranking with neighbours

Sustainable Microgrids

Off-grids in areas of DSO concession

Brazil
Colombia
Peru

enel

Access to
electricity to
increase quality
of life and local
development

Standardization
of 3 technical
solutions



Standardized cost-efficient, transportable micro-grid solutions for:

- isolated homes
- communities (up to 100kW)
- larger off-grids



18/06/2019

The Network Digital Twin

Enabling central coordination, agile organization and information flow the future organizational model

enel

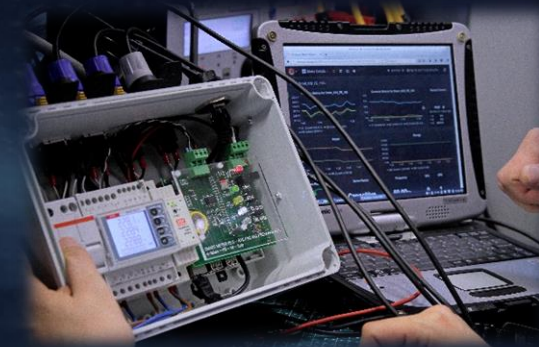
Human interface

Augmented reality
Wearables
Control room of the future



Dynamic device and sensor data

Dynamic data from legacy systems
IoT sensors
Digital work flows



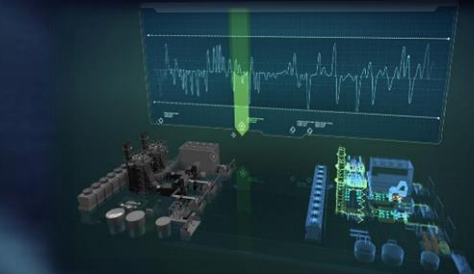
Global Data Lake

Artificial Intelligence

Automated network modeling
Predictive maintenance
Anomaly detection
Simulation

Foundation layer

Network legacy systems
Network 3D modeling
LIDAR acquisition
Communication and cyber security



Virtual Network for a Global Platform

Future of Energy: maior laboratorio vivo Enel



From challenges:

- Urbanization
- Electrification
- Digitalization
- Decentralization



- Enabler for **long term value creation**
- Lever for **SDGs achievement** improving quality of life (safety, low emissions, local development, ...)
- Shaper from megacity to city of tomorrow

Network Digital Twin®
as enabler for the grid edge transformation



To solutions and benefits:

- Open Ecosystem
- Circularity Approach
- Customer centricity and community engagement
- New Products and services for stakeholders
- Digital Platform as value proposition

Technical and digital transformation at the service of the City

A Network of Innovation

enel

I&N Innovation Labs and Bootcamps

67

Challenges collected

6

crowd-sourcing

4

bootcamp

I&NNOVATION CHALLENGE

253

GI&N employees proposal

5

GI&N Challenges

Proof of Concept

91

Innovation Projects

23

Finished in 2018

Start Up Program

370

startups assessed

19

launched

Santiago de Chile

São Paulo

Fortaleza

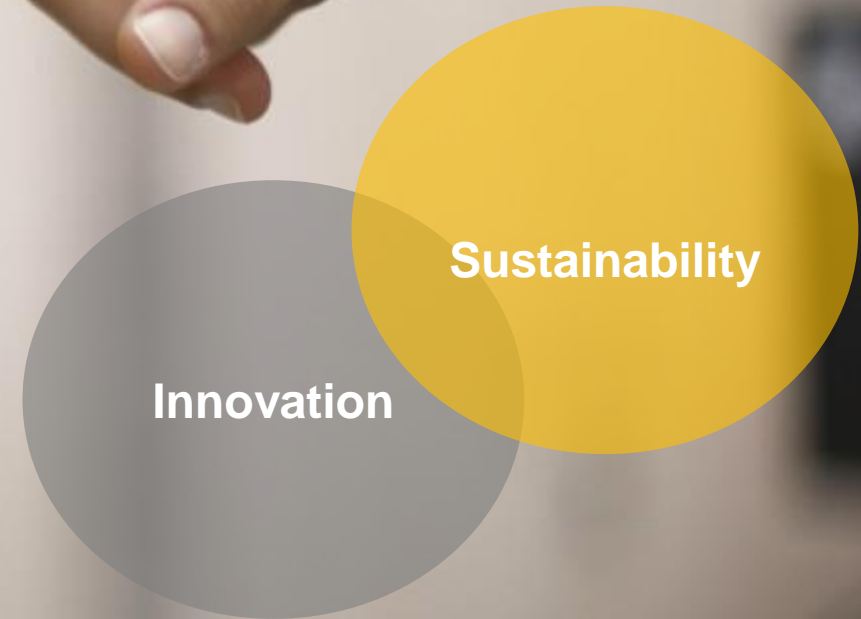
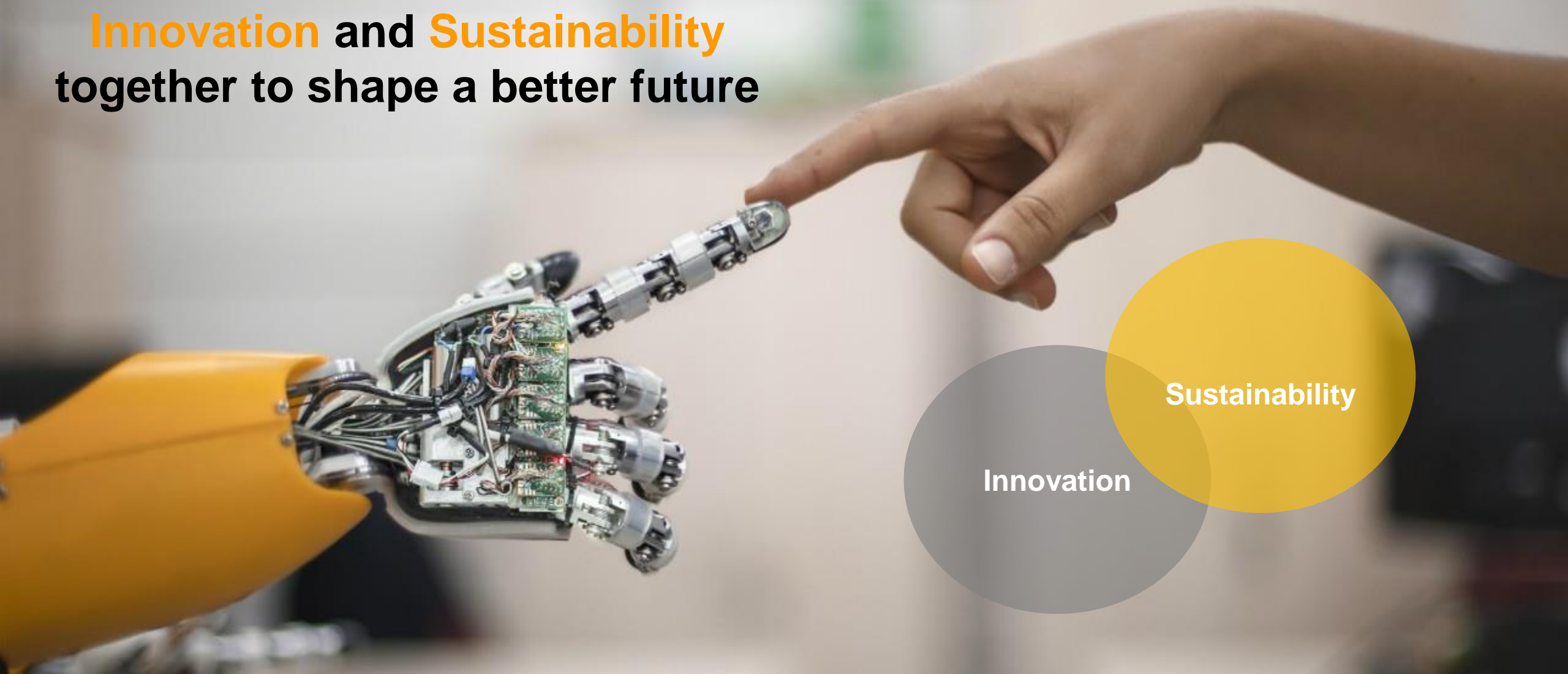
Barcelona
Malaga

Bari

Milano

Haifa

Innovation and Sustainability
together to shape a better future



Sustainability is driving **Innovation** towards long term value



enel

Thank you

Back up



Future of Energy – District São Paulo



Network
Digital
Twin®

Modelagem 3D

Sensoriamento

Gestão de Ativos (AI/ML)

Segurança aos trabalhadores
com AR/MR

Novo patamar da
Eficiência energética

>40
Iniciativas
Tecnológi
cas

Proteção Inteligente

Novos Self-Healings

Automação na Baixa Tensão

Gestão Inteligente
da rede e do consumo



Maior Laboratório Vivo da Enel

Future of Energy: maior laboratorio vivo Enel



From challenges:



- Urbanization
- Electrification
- Digitalization
- Decentralization



To solutions:



- Open Ecosystem
- Circularity Approach
- Customer centricity and community engagement
- New Products and services for stakeholders
- Digital Platform as value proposition

Network
Digital
Twin®

- Enabler for **long term value creation**
- Lever for **SDGs achievement** improving quality of life (safety, low emissions, local development, ...)
- Shaper from megacity to city of tomorrow

Technical and digital transformation at the service of the city