

# Water and Energy Nexus Enel Strategy

Rome, 2/10/2018



## Enel Group Highlights Global Presence



Enel Presence

Integrated Energy Utility with Presence in Four Continent

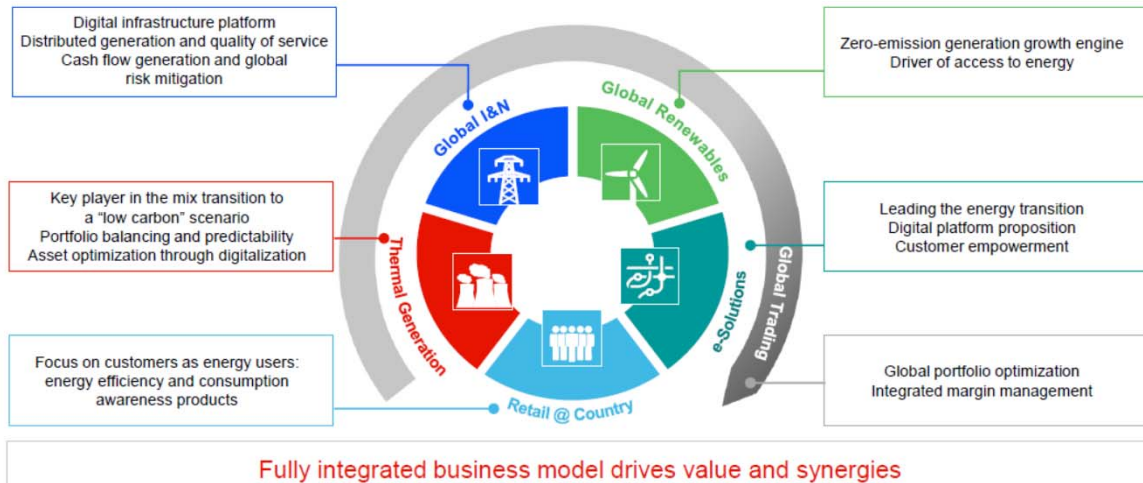


### Key Figures 2017

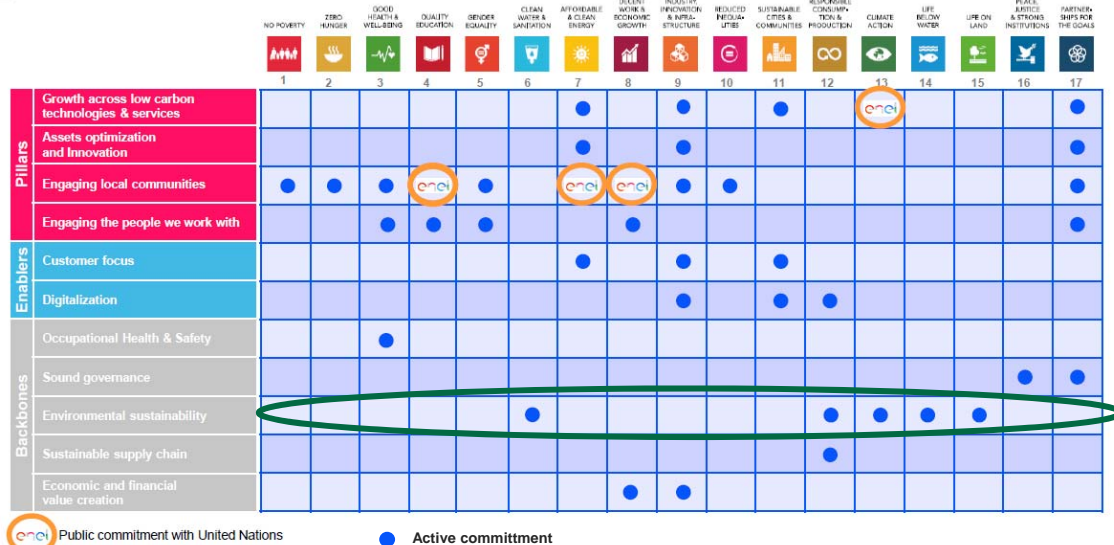
Distributed energy (TWh)	441
End-users (mn)	65
Tot. Installed Power (GW)	80
Renewable Power (GW)	37,1
Energy Produced (TWh)	236
Demand Response (GW)	5

**62.900 employees**

## Enel Group Highlights Integrated Model



## Enel Group Highlights Sustainable Development Goals



## Sustainability as a part of Enel Strategic Plan



### INDUSTRIAL PLAN 2018-2020



### SUSTAINABILITY PLAN 2018-2020



Sustainable long-term shared value creation

### Enel commitments to the Sustainable Development Goals



800,000 people by 2020<sup>1</sup>



3 million of people, mainly in Africa, Asia and Latin America by 2020



3 million people by 2020<sup>2</sup>



<350 gCO<sub>2</sub>eq / kWh by 2020  
(-25% base year 2007)

1. Target was upgraded from 0.4 mln people commitment, reached 2017  
2. Target upgraded 2 times, from 0.5 mln people reached in 2016 to 1.5 mln people commitment that was achieved during 2017

## Enel Group Highlights Decarbonization Goals



### Plan actions

Electrification, storage & demand response

Development of renewable capacity and reduction of thermal capacity

Implementation of environmental international best practices to selected coal plants

Specific CO<sub>2</sub> emissions reduction

Promote actions in line with UN 'Making cities resilient' campaign

### Related targets/commitments (2020)

+0.6 GW storage capacity

+5 GW demand response

+7.8 GW renewable capacity<sup>1</sup>  
-7.3 GW thermal capacity

~500 €mn investment

< 350 gCO<sub>2</sub> /KWheq (-25% base year 2007)

300 cities

## Environmental Highlights Environmental Targets



### Plan actions

### Related targets/commitments (2020)

Reduction of SO <sub>2</sub> specific emissions	-30% (vs 2010)
Reduction of NO <sub>x</sub> specific emissions	-30% (vs 2010)
Reduction of particulates specific emissions	-70% (vs 2010)
Reduction of water specific consumption	-30% (vs 2010)
Reduction of waste produced	-20% (vs 2015)

2017 Enel Group Water Consumption : 126 Mm<sup>3</sup> (-28% respect to 2015)

7

## Environmental Highlights Enel Environmental Policy

Uso riservato



### Explicit commitment

Efficient use of water resources, with special attention to “water stressed” areas

8

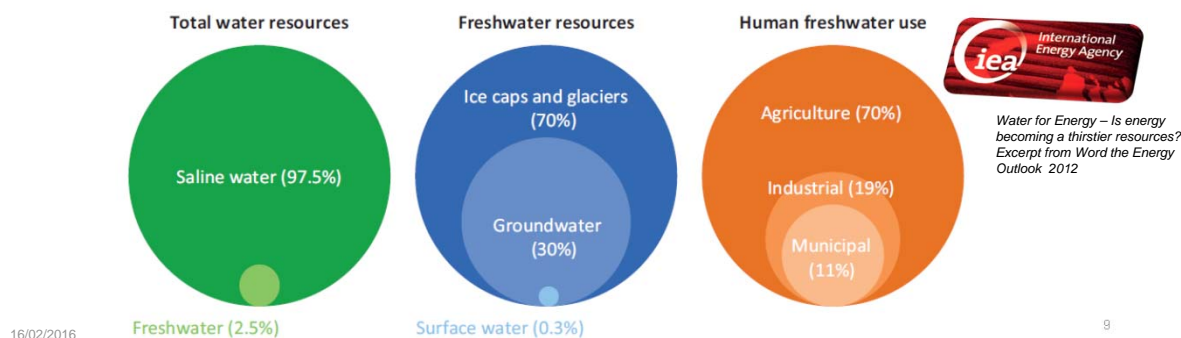
## Water and Energy nexus

### Context



Water is a plentiful resource, but it is not always available for human use in the quantities or at the quality, time and place required. Only about 2,5% of the world's water is freshwater.<sup>1</sup> Of that, less than 1% is accessible via surface sources and aquifers – the rest is locked up in glaciers and ice caps, or is deep underground.

<sup>1</sup> sources: Shiklomanov (1993); UN FAO Aquastat database



Water for Energy – Is energy becoming a thirstier resources?  
Excerpt from Word the Energy Outlook 2012

## Water and Energy nexus

### Cross link



#### Energy for water

**Increasing water demand**, as a result of population growth and improved standards of living

**Scarcer freshwater supplies** in the proximity of population centers, due to climate change. Water will have to be transported longer distances, pumped from greater depths or undergo additional treatment

**More stringent standards** for water treatment

**A general shift in irrigation** practices from surface or flood (relying on gravity) to **pumped methods**, which are more water-efficient but require energy for operation



#### Water for energy

**Primary Energy production** - oil and gas drilling and hydraulic fracturing; injection for enhanced oil recovery; coal beneficiation; irrigation for biofuel feedstock crop growth

**Power Generation** - **Cooling for steam condenser**; boiler feed water (water used to generate steam and hot water; process water for pollution control systems; **PV module cleaning**;  
**Hydropower**;



Water for Energy – Is energy becoming a thirstier resources?  
Excerpt from Word the Energy Outlook 2012

16/02/2016

10

## Water and Energy nexus Enel Strategy



### 1 - Water Use Efficiency



- ☐ Advanced Water use accounting (New GRI303)
- ☐ Gather, address and originate current and future initiatives/projects on Water use efficiency;
- ☐ Foster best practices and scouting of best available technologies

### 2 – Integration and Circularity



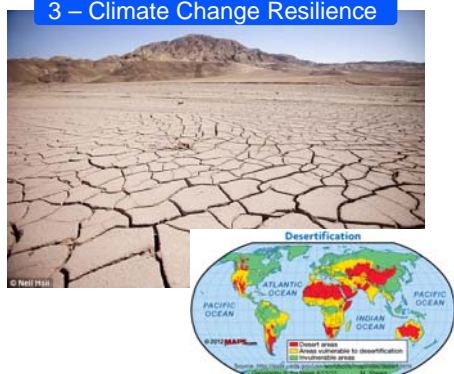
- ☐ Promote a Circular Water Management policy, introducing KPIs and Target on Water Circularity;
- ☐ Promote integration at basin level in a CSV approach that consider multiple uses in the area.

11

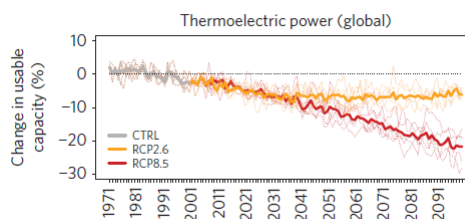
## Water and Energy nexus Enel Strategy



### 3 – Climate Change Resilience



- ☐ Development of climate scenarios for Enel assets;
- ☐ Set up functional/operative assets' risk assessment tools to support investments;
- ☐ Introduce resilience indicators and targets.



Source: Van Vliet et al 2016 "Power-generation system vulnerability and adaptation to changes in climate and water resources" Nature Climate Change

12



## Water and Energy nexus

### Circularity KPIs



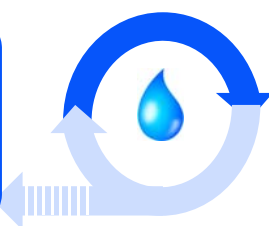
#### Align Environmental Reporting with emerging KPIs and new Target requirements

Implementation of the new standard GRI 303 "Water and Effluents" (2017)

- ❑ Additional requirements on mngm't approach disclosures; water consumption and discharge quantity/quality; criteria and specifications for water-stressed areas.
- ❑ Identify application needs (guidelines, tools) while minimizing operational criticalities a/o communication drawbacks

#### Actions for circularity

**Reduce** losses by boosting water efficiency  
**Reuse** water for the same or different processes  
**Recycle** wastewater  
**Recover** resources from wastewater and put them to use



#### Assessing circularity

Index of water circularity  
 % of linearity vs circularity  
 ...



13

## Water and Energy nexus

### Water and biodiversity



#### Supporting the integration of the mitigation hierarchy in the energy sector

*IUCN and Enel signed a collaboration agreement in September 2017, to support the company in identifying opportunities for increasing biodiversity values around its sites and raise awareness in the broader energy utility sector about best management practices.*

*Management of releases from hydroelectric plants through specific programs to guarantee the volumes needed to preserve the ecological status of rivers (minimum vital outflows);*



14

## Best Practices

### Diego de Almagro e Chanãres PV plant case (Chile)



#### Soiling on PV modules has impacted Chanãres plant since commissioning (Nov14)

An average monthly **6% loss of production due to Soiling effect** have been observed

A dedicated cleaning strategy is required in relation to the **water unavailability** in the area

Different cleaning techniques has been tested onsite in order to minimize water requirements, reaching **8.000 m3 water saved per year (-77% water use)**



15

## Best Practices

### Global Thermal Generation commitment for water consumption reduction



#### IMPROVEMENT PLAN

#### WATER PROJECT

#### OPTIMIZATION & WATER SCARCITY

Water **Consumption Model**  
Water **Balance** Optimization  
Water **Stressed Area** Analysis

HSEQ

#### BoP EFFICIENCY

Plant **efficiency**  
improvement assessment  
(Costanera, Konacoskaya)

O&amp;M

#### Ongoing

- Rainwater recovery maximization (Brindisi Project)
- Dry ash management (Termozipa Project)
- Substitution of water injection burners with DLN (Malacas Project)
- Recovery maximization (Bocamina, Fusina Projects)
- Costanera new wastewater treatment plant for industrial water production

#### Improvement initiatives under assessment:

- Water management and measures refinements (i.e. water meter installation)
- Specific maintenances of systems (i.e drainages, valves)
- More efficient systems for DEMI water production



#### Malacas Power Plant (Peru)

Use of Dry Low-Nox Burner for emission reduction as alternative to water injection

16



# Thank You



## Environmental Highlights HSEQ Organization

Uso riservato



### How to reach the goal



#### Holding Level

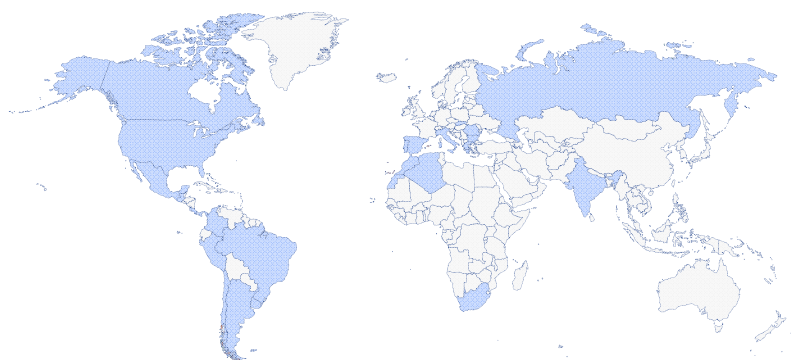
- ✓ Fostering Group strategy in guidelines and projects
- ✓ Monitoring Group KPIs and targets achievement

#### Business Line Level

- ✓ Deployment of strategic objectives in operative projects and improvement initiatives
- ✓ Business Lines targets achievement

18

## Environmental Highlights Group Performance



Perimetro:	Gruppo
	2017
Emissioni dirette di CO <sub>2</sub> , assolute - kt	105331,474
Emissioni specifiche CO <sub>2</sub> , g/kWheq	411
Emissioni SO <sub>2</sub> , assolute - t	214,057
Emissioni NO <sub>x</sub> , assolute - t	203,329
Emissioni polveri, assolute - t	68,095
Emissioni specifiche SO <sub>2</sub> , g/kWheq	0,84
Emissioni specifiche NO <sub>x</sub> , g/kWheq	0,79
Emissioni specifiche polveri, g/kWheq	0,27
Consumi di acqua - Mm3	126,0
prod.termo	110,4
prod.nuke	15,6
geot+dep e movimentazione combustibili	0,043
Consumo specifico acqua - l/kWh	0,49
Rifiuti - t	

19

## B Sustainability as a strategic factor



The integration of sustainability in the strategies and operational choices of the business is a logic that guides our change and reflects our attention for the **ENVIRONMENT, SOCIAL DEVELOPMENT and ECONOMIC SUSTAINABILITY**

We believe that **INNOVATION** is the way to answer to our clients' needs and those of the territory, **offering new products and energy services which favor the social and environmental development of communities in which we operate, generating SHARED and long-lasting VALUE.**

Energy and water availability to the community is one of the key factor of producing shared value



20

## Sostenibilità ambientale

Indici e target di Sostenibilità Ambientale



Indice di cavitazione =74% al 2019

Attuazione del Piano per la Biodiversità

Circular Economy

Catena fornitori sostenibile

Contenziosi e criticità ambientali

Bilancio di Sostenibilità 2016

21