SUMMARY

CHAPTER 1
ENGIE and the Energy Revolution

CHAPTER 2
Heating & Cooling what is at stake ?
The role of District Heating & Cooling

CHAPTER 3
District Heating & Cooling
AN ENERGY REVOLUTION IS ONGOING

DECARBONIZATION
Worldwide renewable energies: annual additional capacity to grow by +70% in 2030 vs 2015

DIGITALIZATION
Digital disrupts energy systems and improves customer offers

DECENTRALIZATION
Decentralized solutions to more than double by 2030
ENGIE GOES BEYOND ENERGY

WE HELP OUR CUSTOMERS TO IMPROVE THEIR USE OF ENERGY AND TO REDUCE CO₂ EMISSIONS

Low CO₂ power generation

We develop, build and operate power plants delivering low CO₂ energy based on renewables and ever greener natural gas.
- #1 in independent power production
- 103GW \(^{(1)}\) installed
- 90% low CO₂
- 23% renewables \(^{(2)}\)

Global networks

We develop, build and operate large gas and electricity infrastructures, ensuring energy supply.
- #1 gas infrastructure operator in Europe
- 12 billion m\(^3\) gas storage capacity
- Global presence in power transmission and distribution

Customer solutions

We help our customers – individuals, businesses, cities and territories – with a wide range of energy, and beyond energy, solutions.
- 24 million contracts worldwide
- Global leader in energy solutions for cities
- 350+ District heating and cooling networks worldwide

\(^{(1)}\) At 31/12/2017, at 100 %. \(^{(2)}\) Excl. pumped storage for hydro (3 %).
PRESENT IN 70 COUNTRIES ACROSS 5 CONTINENTS

€65 billion
TOTAL REVENUE

2,4 billion
RECURRING PROFIT AFTER TAX

150,000
EMPLOYEES

14,3 billion
DEDICATED TO THE 2016-2018 INVESTMENT PROGRAM

€3.9 billion
total revenue
North America (1)

€51.0 billion
total revenue
Europe (1)

€0.9 billion
total revenue
Middle East

€2.8 billion
total revenue
Asia

€4.3 billion
total revenue
Latin America (1)

€0.4 billion
total revenue
Africa

€1.9 billion
total revenue
Oceania

(1) Including Mexico
(2) Including Turkey
CITIES & REGIONS

AT THE HEART OF THE ENERGY TRANSITION IN A FAST CHANGING WORLD

IEA Scenario “Energy for all” 2030

- **B2T & B2B**
  - Microgrids
  - 36%

- **B2C**
  - Off-grid Solutions
  - 20%

- **Centralized power generation**
  - 44% (80% today)

Source: IEA, Energy for All, 2011; MIT 2015
AT THE HEART OF THE ENERGY TRANSITION IN A FAST CHANGING WORLD

Cities

- 2 % of World Area
- 50 % of World Population
- 75 % of World Energy Consumption
- 80 % of World GHG

Source: IEA, Energy for All, 2011; MIT 2015
A PRESENCE ON ALL « VERTICALS » ANSWERING TO TRANSVERSAL CUSTOMERS NEEDS

Our customer’s needs

- To improve **SECURITY** and **RESILIENCE**
- To benefit from **FLUID** and **GREEN MOBILITY**
- To allow **REDUCE COSTS**
- To ensure an **ENJOYABLE ENVIRONMENT**
- To develop the **LOCAL ATTRACTIVENESS**
CITIES

A PRESENCE ON ALL « VERTICALS » ANSWERING TO TRANSVERSAL CUSTOMERS NEEDS

Smart Government

- Distributed Energy
- Waste (with partners)
- Building
- District Heating & Cooling
- Green Mobility
- Security
- Lighting
- Water (with partners)
- ICT Infrastructure
- CityOS
- Data Analytics

Includes city management tools such as dashboards to enable city stakeholders to make informed decisions.
A SYSTEMIC APPROACH TO LEAD CITIES TOWARDS THE TRANSITION

Digital tools & platforms

Energy services to buildings – synergies with B2B, B2C

Smart cities - green mobility - real estate management - air quality solutions

District Heating as backbones of sustainable cities

- Energy services to buildings
- Digital tools & platforms
- Smart cities - green mobility
- Real estate management
- Air quality solutions
- District Heating as backbones of sustainable cities
HEATING AND COOLING
WHAT IS AT STAKE?
The role of District Heating & Cooling
Cooling is set to expand 625% by 2050 in selected regions of Asia & Latin America.

World final energy use for cooling in the IEA’s 2°C scenario, 2010–2050

District Cooling A solution to answer cooling needs while respecting major energy and environmental issues.

1 Source : IEA (2014b)
DISTRICT COOLING: A solution for sustainable cities

Cooling energy demand
Growth factors

- Climate change
- Urban expansion
- Income rise

By 2050 70% of the population will live in cities

Constraints

- Electricity peak demand in summer
- Evolution of regulations (HCFC...)
- CO₂ emissions
- Rules of architecture

3,740 Mt World total emissions of cooling sector

2 Source: Green cooling initiative
Heat dominates global energy consumption providing key services such as space heating, hot water and industrial process heat.

District Heating accounted for around **12%** of heating energy consumption.

**60 million** EU citizens are served by DHS.

*Source: Commission services using data supplied by Euroheat and Power*
JUNE 2017 : 40% STAKE OF TABREED

TABREED, A LEADING OPERATOR OF DCS NETWORKS IN THE MIDDLE EAST

- Established in 1998 in UAE
- 2003: launch of Qatar Cool, first expansion project in other GCC countries
- 2004: expansion in Bahrain
- 2006: expansion in Saudi Arabia and Oman
- 2010: recapitalization of the company (due in particular to the slowdown of construction activity in Dubai); Mubadala injected ~800 k€

**RECENT DEVELOPMENTS**

- 100 M€ net profits in 2016
- Cooling capacity growing ~8% p.a. since 2012
- Currently building ~350 MW (7 plants) of new cooling capacity in UAE, Qatar, Saudi Arabia, Oman
- Pipeline of long term projects: Doha metro (cooling for 7 stations), additional capacity for King Khalid International Airport in Riyadh, additional capacity in Maryah Island (Abu Dhabi)
WITH TABREED, ENGIE BECOMES WORLD LEADER IN DCS

Major DC operators (excluding municipalities) and corresponding DC operated capacity by country (MW$_c$) – 2016 (e)

* As reported by the operator

Regional operator

International operator

12 major “private” DC operators mostly with regional positions, Veolia and ENGIE the only ones present in several geographical areas;
DISTRICT HEATING & COOLING

Comparison of performance with stand-alone systems

- **50%** Improvement in energy efficiency
- **50%** Less CO₂ emissions
- **65%** Less water consumption
- **35%** Less electricity consumption
- **80%** Less usage of chemicals
DCS REFERENCES in ASIA PACIFIC

- **Malaysia**
  - **Megajana DCS**: 14,000 RT & 48 Buildings
  - 4,100 Tons of CO2 avoided since 2013

- **Philippines**
  - **Northgate DCS**: 12,000 RT & 16 Buildings
  - 1st Brownfield District Cooling project in Asean

- **New Zealand**
  - **Christchurch DCS**: 14% estimated savings on energy bills

3 networks in operation in 2017 and the will to develop local expertise in DCS
4TH generation DISTRICT HEATING & COOLING as renewables energy integrator

4TH generation DHC:

- Decarbonize existing buildings
- Heat recovery of waste heat (fatal heat from industries, data centers, waste incineration...)
- Key enabler of RES integration as flexibility provider
MOVING FROM BD SUPPORT TO OPERATIONS

“Maximize created value for Business Development and existing operations”

DIGITAL TOOLS AS KEY ENABLERS

PROCUREMENT

BEST OPERATIONAL PRACTICES
ENGIE DHC PLATFORM, the answer to business needs
2 TRANSVERSAL PROCESSES TO LEVERAGE ENGIE SIZE & DIVERSITY

CATEGORY MANAGEMENT

AIM: to deliver the optimum conditions for recurrent & common purchases

LEADER
CM – Category Manager

ACTORS
CLB – Category Lead Buyer
CLU – Category Lead User

SOURCEING & ADVANCE LEVERS

IMPLEMENTATION IN THE BU

MANAGE THE SUPPLIER PANEL

AIM: to develop a panel of performing suppliers in accordance with the rules, the law, & the Group’s CSR requirements

1 (Key) SAM
(Supplier Account Manager) per Strategic and Preferred supplier

GROUP LEVEL

STRAATEGIC
4

PREFERRED
250

MAJOR (BU)

OTHER ACTIVES SUPPLIERS

BU LEVEL

26
OPERATIONAL EXCELLENCE : DHC BEST PRACTICES SHARING
Ultrasound nondestructive thickness testing

Audits to Secondary Network (Client’s)

Comissioning DHC networks

Chiller and Cooling Tower Optimization

NEMO.Market
A BRILLIANT FUTURE for DHC and a PRIVILIGED GROWTH VECTOR for ENGIE

The new energy world is characterized by **decarbonization**, **decentralization** and **digitalization** with modern DHC at the heart of the energy revolution.

3rd and 4th generation **DHC Systems are the most efficient way to decarbonize dense areas** like City Centers, or tertiary or industrial parks, and will be **the backbone of the sustainable City of Today and of Tomorrow**.

Engie together with its partners in different parts of the world, like Mubadala and Tabreed for the GCC region, the ministry of Finance in Malaysia.... believes that DHC will create **tremendous value for customers and stakeholders** and has identified it as a privileged growth vector significantly contributing to Engie transformation.