



ANIGAS

# Smart Gas Metering: 10 years (2007-2016) of Experience in Italy

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# *Presentation Overview*

- **Anigas: Who are we?**
  - **Natural Gas Distribution and Metering: Business overview**
  - **Italian Smart Gas Metering Regulation**
  - **Technologies of M2M connectivity provided by technical specifications**
  - **State of art of the smart gas metering connectivity (GSM/GPRS) and new M2M technologies**

# Anigas : who are we?

**Anigas, the National Association of the Gas Industry**, represents all the companies, regardless of their constitution, that are engaged in any one or more of the following activities: **storage, transportation, distribution, sale of natural gas / biomethane on the wholesale/retail market, and storing and re-gasifying LNG.**

Roughly **70 companies** are represented within Anigas, which has a **workforce of 13,600** employees. Among the members are the largest industry players, as well as small and medium-sized companies, which together represent more than **60% of the Italian natural gas market.**

Member companies distribute **over 50 billion cubic meters** of natural gas each year for power generation, commercial, industrial and residential use.

The member companies that serve **12 million customers** throughout Italy, are located in **more than 4,000** municipalities both large and small

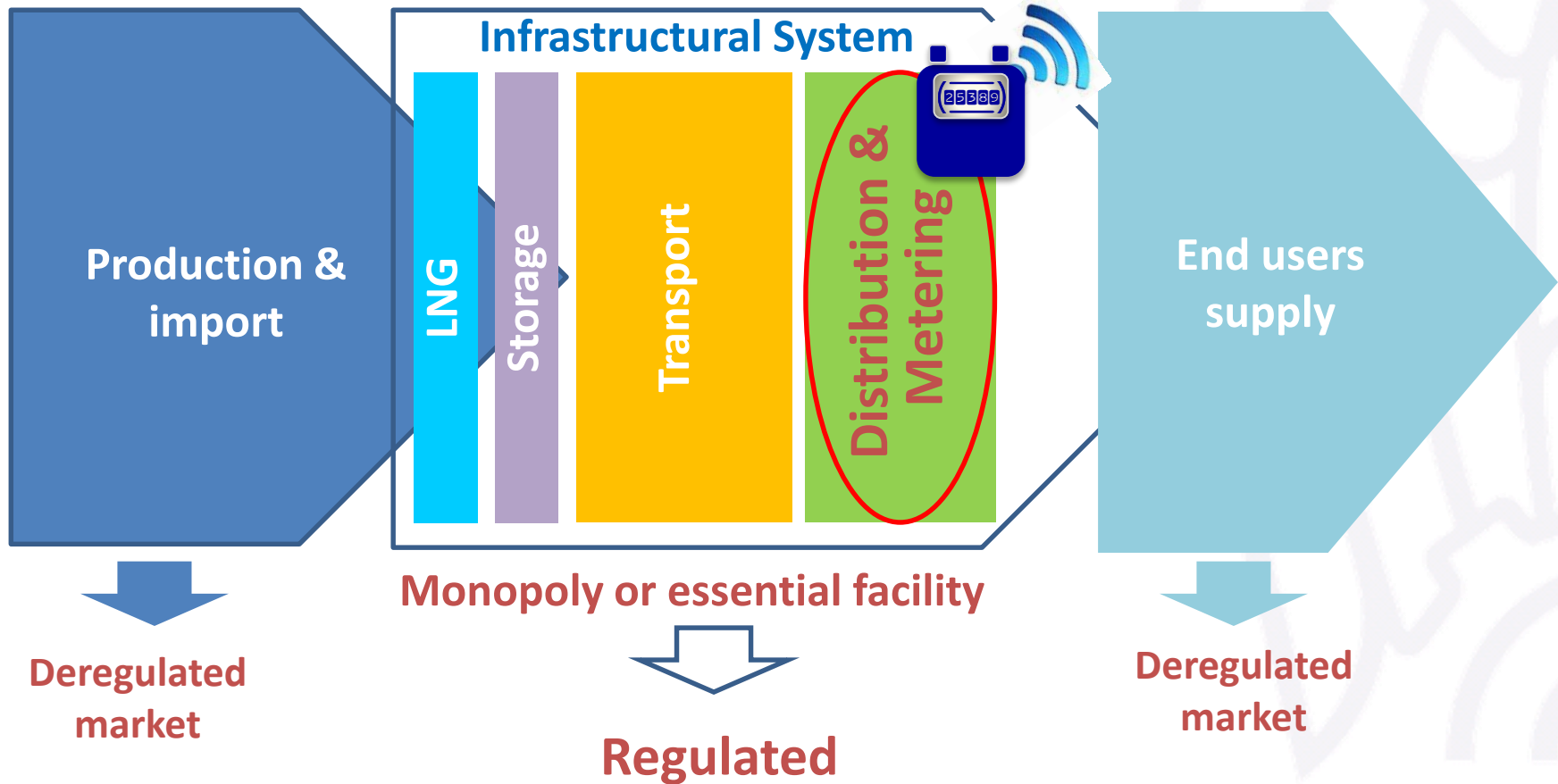
- ✓ 29 DSOs
- ✓ 2 TSOs: Snam Rete Gas, Trans Adriatic Pipeline
- ✓ 1 STORAGE: Stogit
- ✓ 2 LNG: GNL Italia, Terminale GNL Adriatico
- ✓ 38 SUPPLIER & SHIPPERS
- ✓ 2 NG VEHICLES Associations (Assogasmetano & NGV Italia)
- ✓ 1 BIOGAS/BIOMETHANE Association (CIB)

**Anigas  
represents  
60% of Italian  
Natural Gas  
Market**

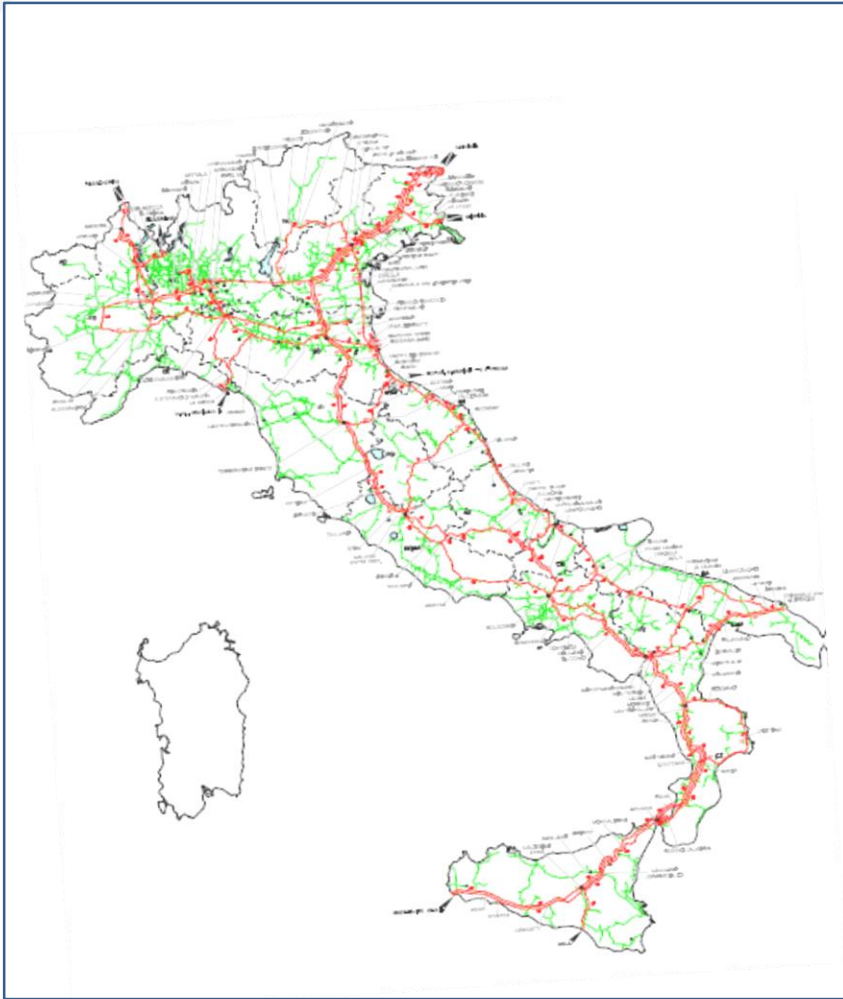
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# Italian Natural Gas Chain



# Italy: Natural Gas DSOs Frameworks



- 226 Distribution System Operators ( DSOs )
- 31 Bm<sup>3</sup>/y of NG delivered (30 DSOs deliver more than 80% of NG)
- 23,425,000 of customer served ( 35 DSOs serve more than 100,000 customers )
- 22,900,000 small customers served ( =15,93 Bm<sup>3</sup>/y )
- 525,000 big/medium customers served ( = 15,07 Bm<sup>3</sup>/y )
- 24,600,000 NG delivery points
- 250,000 Km of NG distribution pipelines
- 6,500 interconnection points with TSO networks
- 7,130 Municipalities served ( total 8,000 )
- 82% of the Italian families using NG (Eurogas)

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# Smart Gas Metering: 10 years (2007-2016) of Regulation

**GAS DIRECTIVE  
2009/73/CE**

**E.C. RECOMMENDATION  
on preparations for the  
roll-out of smart metering  
system**

**JRC  
Guidelines CBA of  
Smart Metering  
Deployment**

**Italian Law  
D.Lgs 102/14  
Energy Efficiency**

**2007 2008 2009 2010 2011 2012 2013 2014 2015 2016**

## Smart Gas Metering Regulation Path by Italian Energy NRA (AEEGSI)

*Impact  
Analysis &  
CBA*

**155/2008**  
*Decisions to  
launch roll-out  
To 2016*

**28/2012**  
*1 roll-out plan  
revision to 2018 &  
metering standard  
costs*

**575/2012**  
*2 roll-out plan  
revision for big  
and medium  
size meters*

**631/2014**  
*3 roll-out plan  
revision for  
medium and little  
size meters*









**554/2015**  
*4 roll-out plan  
revision for little  
size meters*

**AEEGSI Mandate**

**Smart Gas Metering Technical Specifications by UNI/CIG  
(Italian National Gas Standardization Body) UNI/TS 11291**



# Smart Gas Metering in Europe

Member State	% of household using NG	Meters $\leq$ G6 ( $\leq 10\text{m}^3/\text{h}$ )	Smart Gas Metering rollout period		Penetration rate % by end rollout	Res.ble party for rollout	Remote reading	Remote control of valve
BELGIUM 	NA	4.600.000	NA	NA	NA	DSO	Y	NA
EIRE 	37%	650.000	2022	2026	100%	DSO	Y	Y
FRANCE 	38%	11.000.000	2014	2020	100%	DSO	Y	N
GB 	81%	22.600.000	2012	2020	100%	SUPPLIER	Y	Y
 ITALY 	82%	22.900.000	2010	2018	50%	DSO	Y	Y
LUX 	NA	80.000	2015	2020	95%	DSO	Y	NA
NL 	95%	7.600.000	2024	2020	95%	DSO	Y	Y

# DSOs / Meters Clusters: Snapshot 2007-2016

## NUMBER OF DSOs

DSOs' SIZE CLUSTERS ( customers served)	2007	2016
LARGE (more 500,000)	7	8
MEDIUM (from 50,000 to 500,000)	53	22
SMALL (less 50,000)	255	196
<b>TOTAL</b>	<b>315</b>	<b>226</b>

## NUMBER OF GAS METERS

GAS METER SIZE CLUSTERS	2007	2016
BIG SIZE (> G40)	60,000	70,000
MEDIUM SIZE (from G40 to G10)	373,000	455,000
SMALL SIZE ( $\leq$ G6)	18,567,000	22,900,000
<b>TOTAL</b>	<b>19,000,000</b>	<b>23,300,000</b>

## GAS VOLUMES METERED BY METER SIZE CLUSTERS – MILLION CUBIC METER

GAS METER SIZE CLUSTERS	2012	2016
BIG SIZE (> G40)	10,027	9,948
MEDIUM SIZE (from G40 to G10)	5,135	4,574
SMALL SIZE ( $\leq$ G6)	18,602	16,485
<b>TOTAL</b>	<b>33,764</b>	<b>31,007</b>

# Smart Gas Metering – 2008 AEEGSI Directives

## SMART GAS METERING SYSTEM FUNCTIONAL REQUIREMENTS

<i>Customer Size</i>	<i>Annual consumption bands</i>	<i>Meter size</i>
<b>Big / Medium</b>	<b>more 5,000 m<sup>3</sup>/y</b>	<b>&gt; G6</b>
<b>Small</b>	<b>less 5,000 m<sup>3</sup>/y</b>	<b>≤ G6</b>

<b>N</b>	<b>Minimum Functional Requirements by Regulation</b>	<b>&gt;G6</b>	<b>≤G6</b>
1	Temperature adjustment (temperature condition 15 c°)	YES	YES
2	Pressure adjustment (standard 1,01325 bar)	YES	NO
3	Electro -valve switch off available on meter	NO	YES
4	Metering Units' clock/calendar capable of managing seconds	3 min	5 min
5	Interval metering: 70 days capacity, saves minimum 6 monthly	1 hour	1 day
6	Self diagnostic checks	YES	YES
7	Display at the costumer's request	YES	YES
8	Remote up-dating of the meter's software	YES	YES
9	Information on real-time withdrawal at the costumer's request	Pulse emitter output	Physical or logical gate
10	Security and data protection: mechanisms to protect and monitor withdrawal registers	YES	YES

# Smart Gas Metering Regulation Upgrading

## > G6 Roll-out Target

- ❑ Gross Target: upgrading 100 % before Dec 31<sup>st</sup> 2017 (525,000 meters)

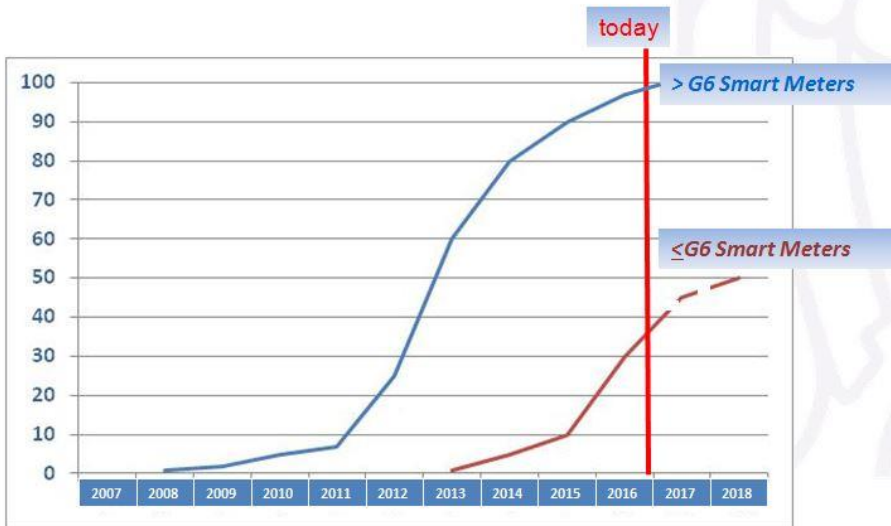
## ≤ G6 Roll-out Target

- ❑ Gross Target: upgrading 50 % before Dec 31<sup>st</sup> 2018 (11,450,000 meters)
- ❑ The DSO Companies are divided into 4 clusters: **BIG** (>200,000 customer served) **MIDDLE** (100,000 < customers ≤ 200,000) **SMALL** (100,000 < customers ≤ 50,000) **OTHERS** (<50,000)
- ❑ There are different obligations and different targets for each DSO cluster
- ❑ As of Jan 1<sup>st</sup> 2015 the DSOs are obligated to install only smart meters

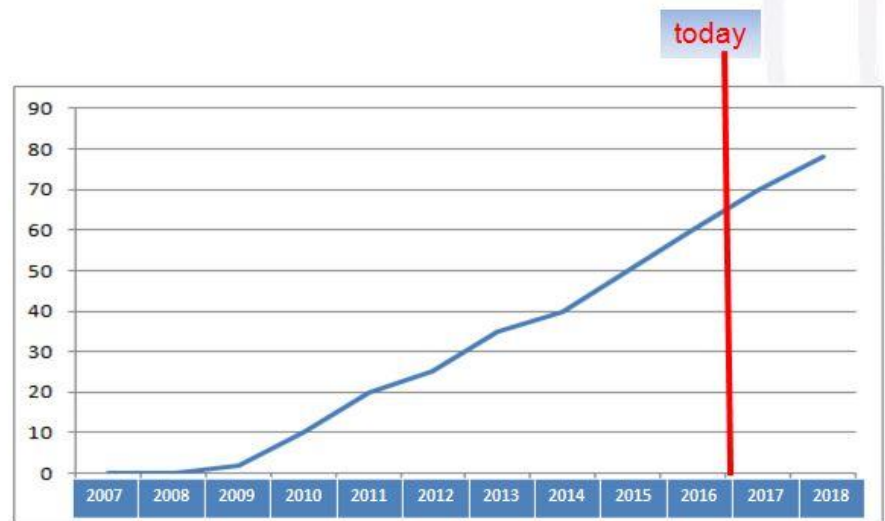
≥ G6 meters roll-out plan DSO's Targets				
DSO's cluster (customers served)	2015	2016	2017	2018
BIG - more 200,000	3%	15%	33%	50%
MIDDLE - from 100,000 to 200,000	--	3%	15%	33%
SMALL- from 100,000 to 50,000	--	--	--	8%
OTHER - less 50,000	No obligations			

# Roll-out : 2016 where the DSOs are

## % of smart meter installed



## % of gas consumption "under gas smart metering"



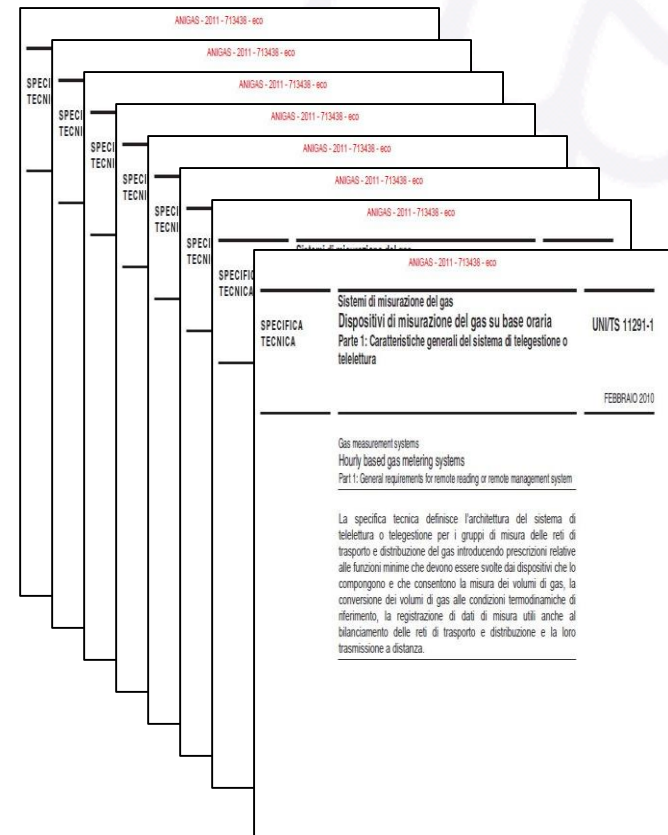
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# Italian Technical Specifications (UNI TS 11291)



- Standardization activities according to smart metering technologies are defined starting from 2010 by the UNI CIG (Italian National Gas Standardization Body) with the publication of **UNI TS 11291 set** defining architecture, protocols and infrastructure functionalities for smart gas metering
- The standardization of connectivity provides for two Technologies those the DSOs can choose:
  - ❑ **P2P - Point to Point GSM/GPRS**
  - ❑ **PMP - Point Multi Point @ 169 MHz**



# Architecture, Protocols and Infrastructure Network

## TECHNICAL SPECIFICATION UNI TS 11291

Smart gas  
metering  
general  
characteristics

CTE  
Protocol

CTR  
Protocol

Commercial  
and industrial  
meters  
requirements

Mass market  
meters  
requirements

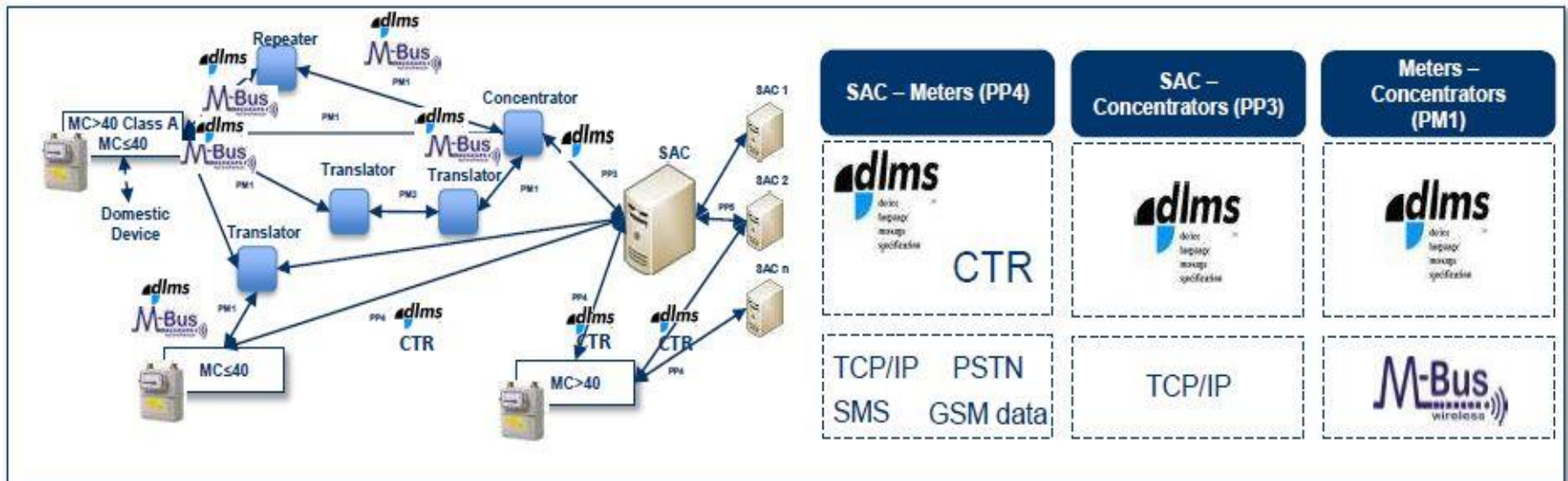
Data  
acquisition  
system,  
concentrators,  
repeaters and  
translators

Communication protocols  
for gas  
distribution  
networks

Interoperability  
test

Data  
security

Mass market  
meters  
interchangeability



Source: SNAM 2013

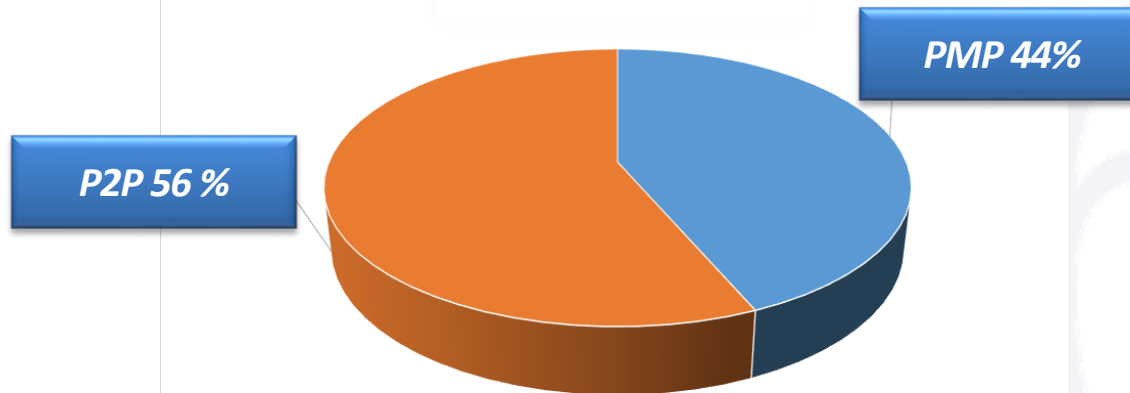


# Main Technical Specifications

<b>Communication System meters/data concentrators</b>	<b>GPRS/GSM - RF</b>
<b>Frequency/protocol RF</b>	<b>169 Mhz/M-bus</b>
<b>Communication System data Concentrators/Remote Data Collection &amp; Management Center (SAC)</b>	<b>GPRS/GSM</b>
<b>Application layer RF 169 Mhz M-bus Protocol</b>	<b>Italian Technical Specification UNI CIG UNI TS 11291-11</b>
<b>Application layer GPRS</b>	<b>DLMS – COSEM CTR</b>

Source: CIG 2011

# Small meters ( $\leq G6$ ): technologies adopted by DSOs



## P2P - Point to Point GPRS



Point to Point Meters

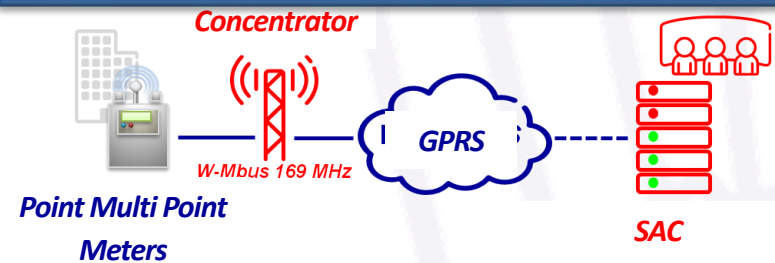


- Less complexity to implement
- Less impact on Business processes
- Less Capex



- More expensive for connectivity (more SIMs)
- More energy consumption = Lower lifetime of battery
- GPRS coverage is not present everywhere

## PMP - Point Multi Point @ 169 MHz



Point Multi Point Meters



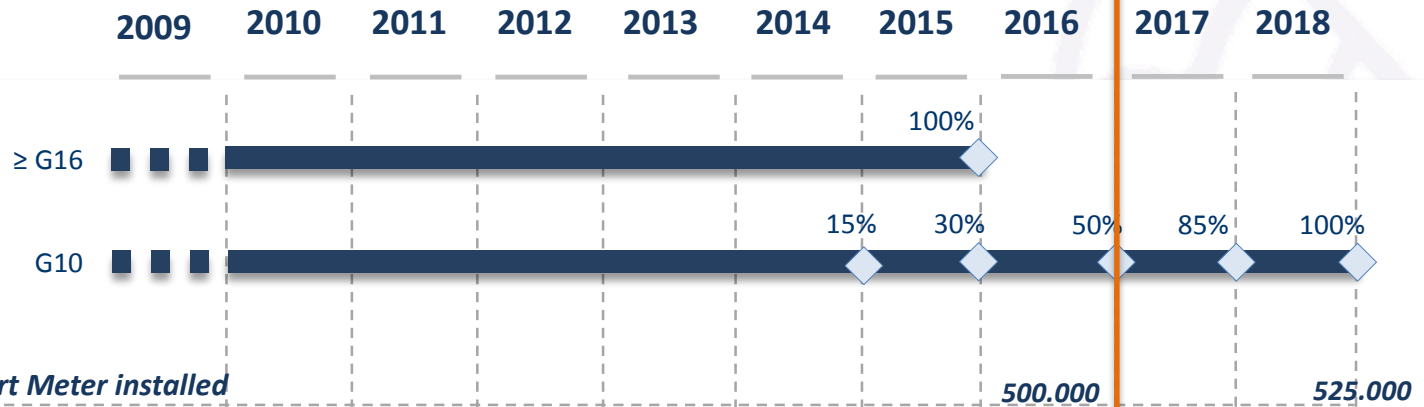
- Less cost for connectivity (less SIMs)
- Less energy consumption = Higher lifetime of battery



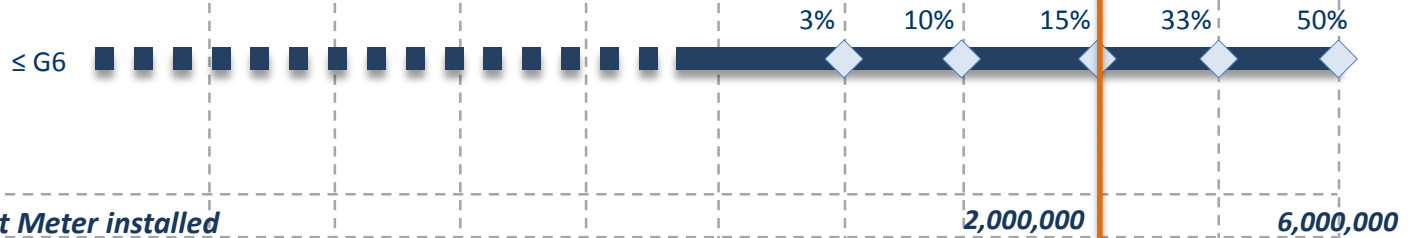
- More complexity to design & implement due to the complexity of radio network

# Smart Gas Metering - DSOs obligations

Big & Medium Customers



Small Customers



TODAY

Source: ANIGAS 2016

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# State of art of GSM/GPRS connectivity

## Today

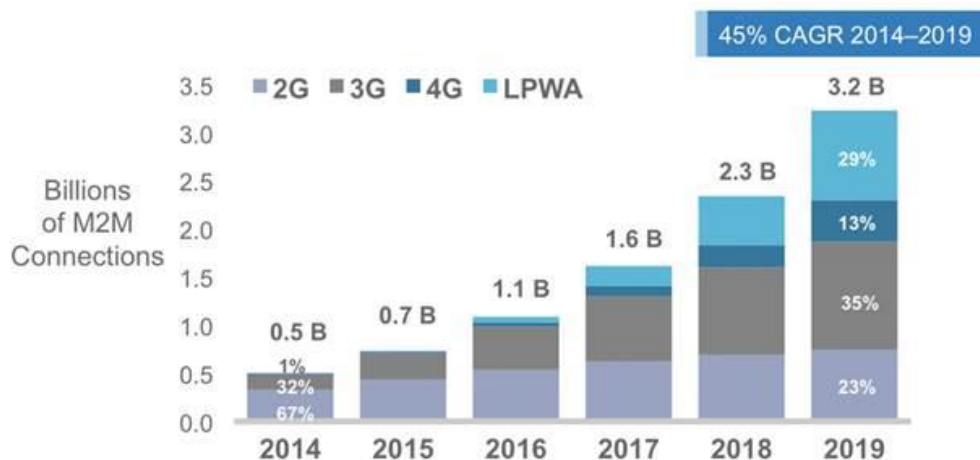
- The DSOs will buy the smart gas meters (P2P) until 2018 with a modem GSM/GPRS
- This technology is necessary for operating the automatic meter reading
- For the smart meters to be installed in 2018 it is necessary to guarantee the GSM/GPRS technology until 2033 (metrological life of meters 15 years)

## Future-proof GPRS?

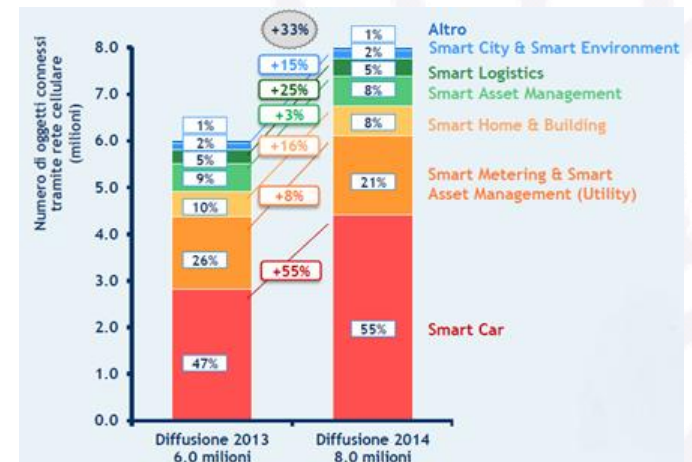
- The phase-out of the GSM/GPRS has already been implemented in many countries
- In Italy, the expiration date of the licenses for GSM frequencies (900 and 1,800 MHz) is set to end 2029

# Focus GSM/GPRS connectivity

- The growth of related objects in the coming years is expected to have a major impact on the demand for connectivity services in the mobile
- A significant share of the investments already made and of those planned for the coming years, concerns 2G technologies, including GSM/GPRS
- Smart Metering is only one of the M2M applications that use GSM/GPRS connectivity



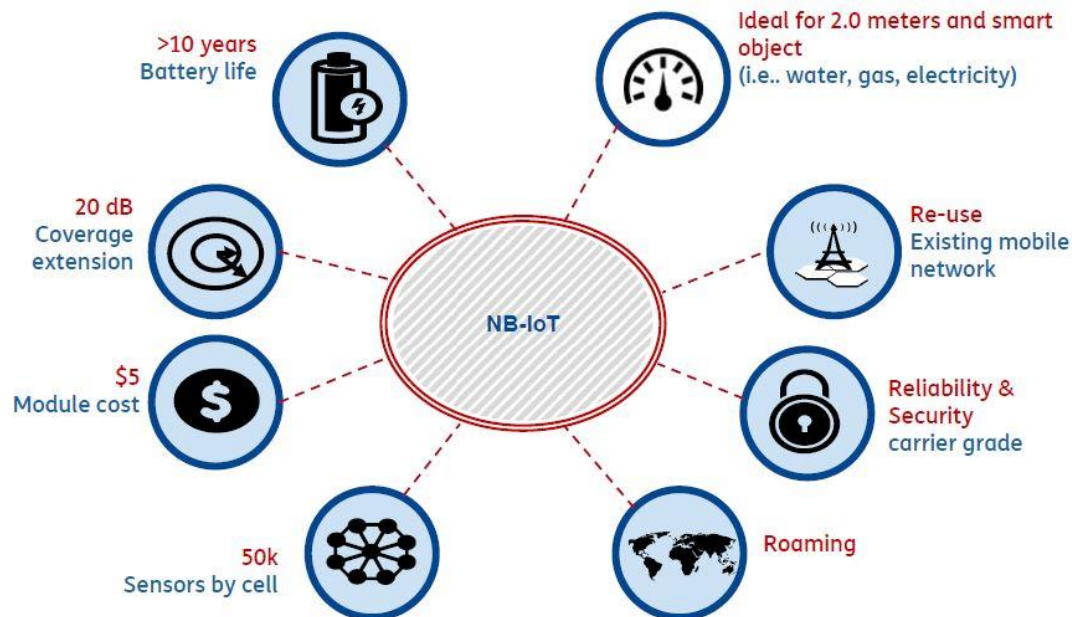
Number of connections M2M at a global level for technology (Source: Cisco Visual Networking Index Mobile, 2015)



Smart Metering in Italy today represents about a quarter of the connections M2M on cellular network (Source: Politecnico di Milano, Osservatorio Internet of Things)

# Evolution of LTE technologies

- At international level (3GPP, GSMA) telecom technological solutions dedicate to M2M “low bit-rate” segment have been defined;
- The NB-IoT technical solution represents the LTE (4G) evolution notably suited for several applications, included smart metering
- The TELCO first offers to gas industry (DSOs) from the 2Q of 2017



Source: TIM 2016

Commercial & Industrial meters



National operators' RANs

GPRS/SMS

**Thank you !**

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Mass Market



GPRS/SMS

Mobile Operator  
M2M Platform

IP traffic collected from endpoints

**AMM**

External communication platform module



M-Bus



Data Concentrator

GPRS