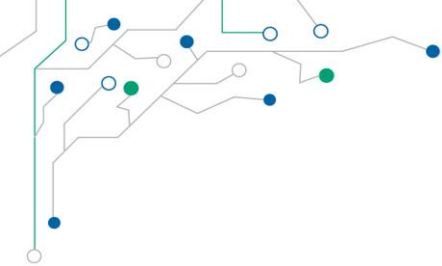# Energy Efficiency

Fabio Massimo Marchetti

Actual trends

• Use of **IP communication at every level** enables infrastructures capable of supporting new functional paradigms.

• **Application virtualization**, applications become independent from the physical platform that hosts them within the overall IP infrastructure.

• Higher and higher **elaborating and storage capacity** in even smaller physical dimension

• Growing reliability and usability of **wireless communications** which guarantee consistent saving in building and updating industrial communication infrastructures.

Present and future: the IoT paradigm

Internet of Things:

- Hierarchical architectures become collaborative architectures
- Devices publish their data (measures, status, ….) and can consume data published by other devices.
- Applications are not directly linked to the device but they can subscribe the data generated by them. The notifications of data modification can be automatic.
- Devices auto configuration.
- Device auto provisioning: the device is automatically linked to a service platform without any need of human intervention.

IoT allows:

- Infrastructures optimization
- Availability of huge amount of data (Big Data)
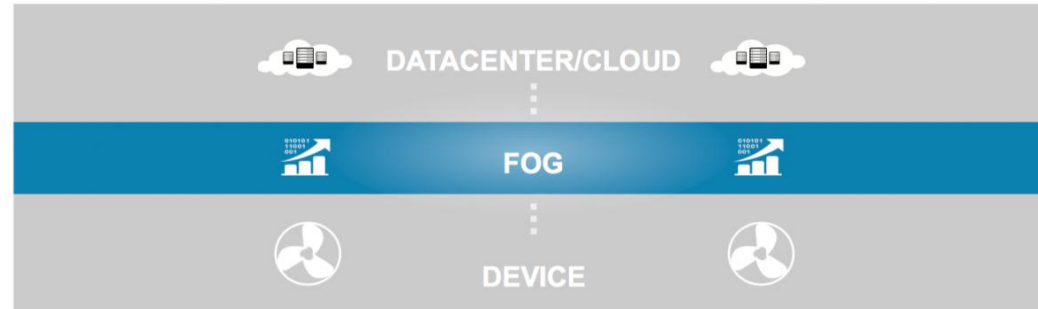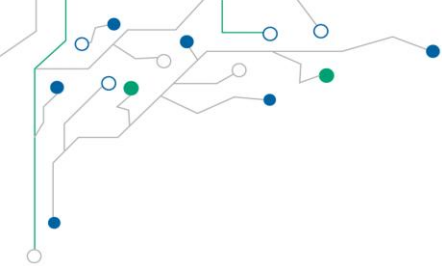- Focus on the applications not to the technologies need to build them
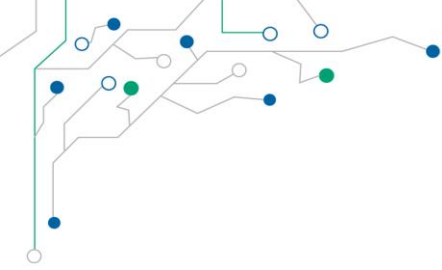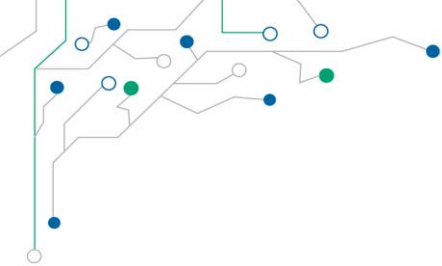
IoT: data flow
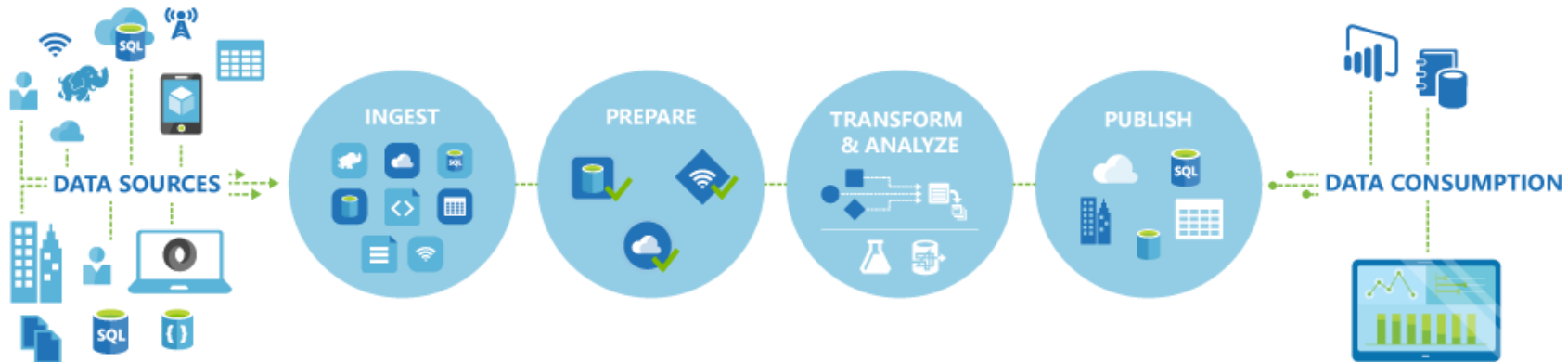
IoT: from cloud to fog….

Fog computing is an architecture that uses one or a collaborative multitude of end-user clients or near-user edge devices to carry out a substantial amount of storage, communication, and control, configuration, measurement and management.

IoT-Fog and energy efficiency

A technological IOT-FOG platform for continuous monitoring of energy consumption responds to the ever more pressing need to constantly, reliably and precisely know any measurement related to the various characteristics of the energy used. This allows to identify some action drivers those bring the organization to obtain an efficiency improvement.

An IOT-FOG approach features:

• it enables actual and future scenarios by facilitating the integration of existing and new devices by connecting different local networks (old and new)

• it simply introduces the IoT paradigm creating a local layer for data gathering and optimization

• it takes advantage of the new communication technologies including an extensive use of wireless to reduce infrastructure costs

Efficiency: a continuous improvement route

MIGLIORAMENTO CONTINUO ⑥

PERFORMANCE IMPROVEMENT

① Pre-Audit
② Smart Metering
③ Audit
④ Azioni di efficientamento energetico
⑤ Controllo

Misurare per conoscere

SOFT
- Sensibilizzazione comportamentale
- Contratti di fornitura

HARD
- Smart Control
- Sostituzione impianti e apparati - BAT

Sistema di	Processo Produttivo	Edificio Residenziale1	Edificio Residenziale2
Monitoraggio	3% - 9%	2% - 8%	2% - 8%
Controllo	10% - 15%	8% - 14%	7% - 13%
Supervisione	15% - 20%	12% - 19%	13% - 18%

Avarage savings

(Source: Energy Strategy Group)

Efficiency: a continous improvement route

MIGLIORAMENTO CONTINUO ⑥

PERFORMANCE IMPROVEMENT

① ② ③ ④ ⑤

Pre-Audit | Smart Metering | Audit | Azioni di efficientamento energetico | Controllo

SOFT
- Sensibilizzazione comportamentale
- Contratti di fornitura

HARD
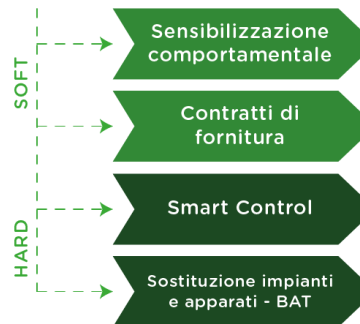- Smart Control
- Sostituzione impianti e apparati - BAT

③

A new audit service to be performed before the issue of the technical supply proposal to update or replace a machine.
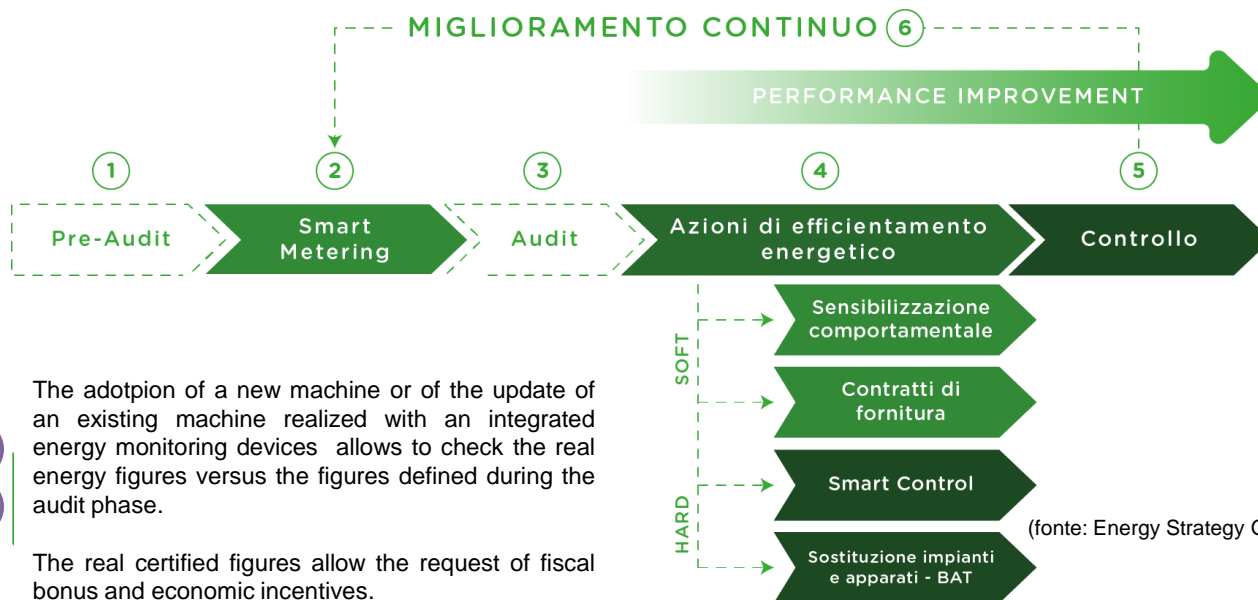
It allows to add some ROI sources belonging to the possible savings related to energy efficiency produced by the new or updated technologies.

Moreover, it allows to gather some more ROI from national or international fiscal bonus and economic incentives.

(fonte: Energy Strategy Group)
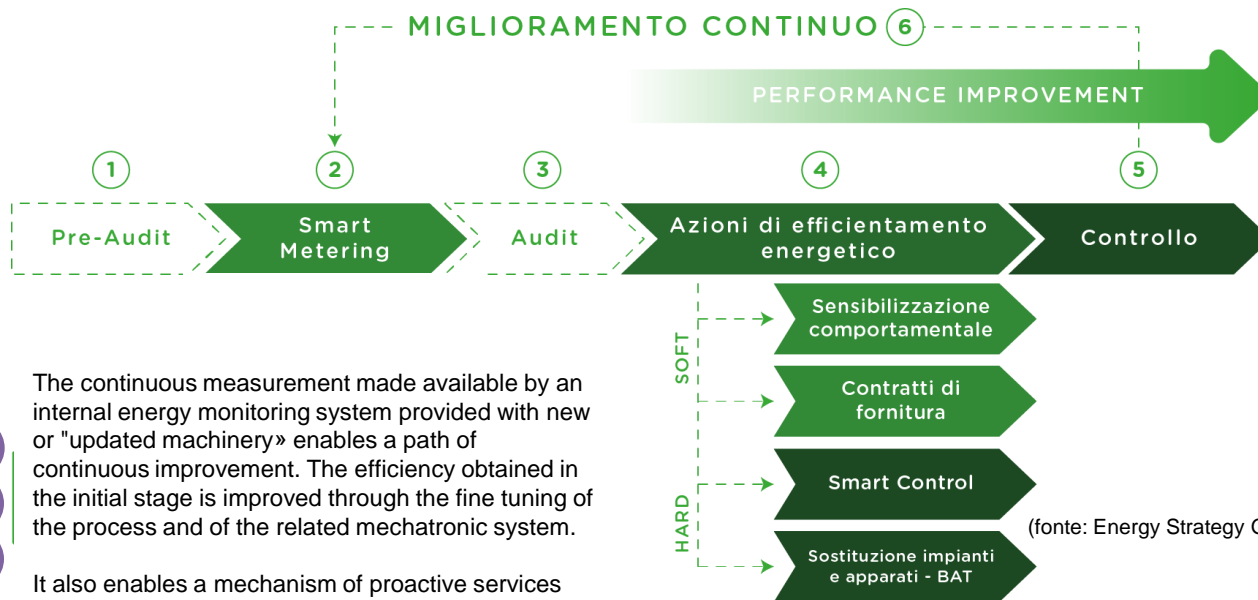
Efficiency: the continous improvement route

MIGLIORAMENTO CONTINUO (6)

PERFORMANCE IMPROVEMENT

(1) Pre-Audit
(2) Smart Metering
(3) Audit
(4) Azioni di efficientamento energetico
(5) Controllo

SOFT
- Sensibilizzazione comportamentale
- Contratti di fornitura

HARD
- Smart Control
- Sostituzione impianti e apparati - BAT

(fonte: Energy Strategy Group)

4
5

The adotpion of a new machine or of the update of an existing machine realized with an integrated energy monitoring devices allows to check the real energy figures versus the figures defined during the audit phase.

The real certified figures allow the request of fiscal bonus and economic incentives.

Efficiency: the continous improvement route

MIGLIORAMENTO CONTINUO (6)

PERFORMANCE IMPROVEMENT

① Pre-Audit
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(fonte: Energy Strategy Group)

4 5 6

The continuous measurement made available by an internal energy monitoring system provided with new or "updated machinery» enables a path of continuous improvement. The efficiency obtained in the initial stage is improved through the fine tuning of the process and of the related mechatronic system.

It also enables a mechanism of proactive services based on the analysis of the equipment energy consumption and functional data. This converged analysis leads to push energy efficiency as well as operational efficiency.