THE WATER SUPPLY OF A LARGE CITY
THE EXAMPLE OF PARIS

ATHENS
Bruno NGUYEN – Director of Operations – EAU DE PARIS
Paris, November 15, 2011
PARIS

DRINKING WATER

SUPPLY
PARIS

- 2.1 millions inhabitants
- 3 millions consumers
- 100 km², Highest water consumption density in France
- 1 inhabitant = 2 employees
- 200 millions m³ produced per year
- 1,800 km of drinking water pipes
- 430 km of aqueducts
- 1.1 million m³ of drinking water storage capacity
- 10 billions € of assets
- Eau de Paris = 900 employees
Water in Paris
Some Facilities

Pavillon de captage Source de Foisys (région de Dreux)

Aqueduc de la Voulzie (région de Provins)

Source d’Armentières (région de Sens)

Usine de production d’eau Potable de Joinville

Arrivée de l’eau au Réservoir de Montsouris

Tulipe d’arrivée de l’eau au Réservoir de Saint-Cloud
Underground Water Treatments against Pesticides

Saint-Cloud DW Treatment Plant: 100,000 m³/d

L’Haï-les-Roses DW Treatment Plant: 140,000 m³/d

Sorques DW Treatment Plant: 50,000 m³/d

Longueville DW Treatment Plant: 50,000 m³/d
Renovated Treatment Processes

The Joinville DW Treatment Plant: 300,000 m$^3$/d

The Orly DW Treatment Plant: 300,000 m$^3$/d
Drinking Water Storage in 5 Main Storage Tanks

- St-Cloud: 356,000 m³
- Paris: 208,000 m³
- Montsouris: 92,000 m³
- Les Lilas: 202,000 m³
- L'Hay-les-Roses: 230,000 m³

A drinking water reserve worth of more than one day of consumption.
Paris Underground Water System

- Rain Water Collection
- Non-Potable Water Pipe
- Drinking Water Pipe
- Sewer Gallery
- Washing Outlet
- Building Connection
- Waste Water
Paris Underground Water System
Drinking Water and Non Potable Water Demands

The graph shows the demand for drinking water (Eau Potable) and non-potable water (Eau Non Potable) over a 24-hour period. The y-axis represents the demand in cubic meters per hour (m3/h), while the x-axis represents the hour of the day. The peak demand for both types of water occurs around 8 hours, with drinking water demand exceeding that of non-potable water.
Non Potable Water Municipal Users

THE CLEANSING DEPARTMENT OF PARIS

12,000 Washing Outlets
Artificial Lakes, Rivers and Cemeteries 6,000 Water Mouths
ORGANIZATION

OF THE WATER SUPPLY

TARIFFS & BILLING

Ministry of Health
Water Quality Control

C.R.E.C.E.P.
Water Quality Sampling & Analysis
Laboratory approved by the State

Production Transportation Pressure Quality
Concession

C.E.P.
Distribution North
Paris Leasing

E.F - P.E.
Distribution South
Paris Leasing

Consumers

: Public
: Private
: Mixed

CITY OF PARIS

EAU DE PARIS
Production Transportation Pressure Quality Régie

CEP (Veolia)
Distribution North Paris Leasing

E.F - P.E. (Suez)
Distribution South Paris Leasing

Consumers

Ministry of Health
Water Quality Control

: Public
: Private
Better perception from the user’s point of view.
The Drinking Water Billing to Households

- **93,000 Water Connections**
- **Invoice every 3 Months**
- **Domestic Consumption 130 l/day**

General meter Customer

Individual meters Consumers
How the Consumers Pay for their Water Bill

Most common situation; the invoice is made to the co-ownership and the consumers pay according to the size of their condominium.

Situation like the former one, except that the consumers pay according to the ratio of their own water consumption.
A strong commitment to stability as regards the share of drinking water in the price of water in Paris

2.9257 €/m³ in Paris (November 2011)

- Drinking water production and distribution services 33.4%
- Sanitation service 35.3%
- Taxes 31.3%

In July 2011, the City Council of Paris following the Mayor decided to reduce the drinking water part of 8%.
DRINKING WATER TARIFF

- April 2009: Flat Production Cost
- January 2010: Flat DW Cost
- July 2011: 8% Reduction DW Cost Indexed Tariff by 2012
WHOLESALES and DETAIL SALES

EAU DE PARIS

Large diameter pipes

x 35

CEP & EF-PE

Buildings water connexions

x 93,000

Customers

200 millions of m³

190 millions of m³

Drinking Water Invoicing Prior to 2010
Constitution of the Drinking Water Tariff

Calculation every Trimester: on April 1\textsuperscript{st} , 2009

\begin{itemize}
  \item \textbf{EAU DE PARIS} Production \quad \text{€} 0.5366
  \item \textbf{CEP & EF-PE} Distribution \quad \text{€} 1.0315
  \item \textbf{SANITATION} SAP, SIAAP Collection & treatment \quad \text{€} 0.9388
  \item \textbf{Taxes} Water Agency & others \quad \text{€} 0.9154
\end{itemize}

\[
\text{€} 0.5366 + \text{€} 1.0315 + \text{€} 0.9388 + \text{€} 0.9154 = \text{€} 2.8857
\]
Drinking Water Efficiency in Paris

- **Input Volume**
- **Consumption**
- **Yield**

**Graph Details**
- **X-axis** (years): 1945 to 2010
- **Y-axis (millions of m³/year)**: 0 to 400
- **Yield (%)**: 50% to 100%

Graph shows trends in drinking water efficiency from 1945 to 2010.
WATER DEMAND DECREASE

Consumption since 1945

Millions of m³/year

WATER DEMAND DECREASE

Evolution of losses

Millions of m³/year

2010
WATER DEMAND DECREASE

Drop of production volumes since 1990

 Millions of m$^3$/year

1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009
**WATER DEMAND DECREASE**

### Consumption, Losses and Input Volumes 1985 to 2009

<table>
<thead>
<tr>
<th>Period of time</th>
<th>Consumption</th>
<th>Losses</th>
<th>Input volumes</th>
</tr>
</thead>
<tbody>
<tr>
<td>end of 80’s</td>
<td>+ 0.5 % per year</td>
<td>58 M m$^3$/year</td>
<td>+ 0.2 % per year</td>
</tr>
<tr>
<td>from 1990 to 1998</td>
<td>- 1.8 % per year</td>
<td>to 22 M m$^3$/year</td>
<td>- 3.1 % per year</td>
</tr>
<tr>
<td>from 1999 to 2002</td>
<td>212 M m$^3$/year</td>
<td>to 33 M m$^3$/year</td>
<td>+ 0.6 % per year</td>
</tr>
<tr>
<td>since 2003</td>
<td>- 2.3 % per year</td>
<td>to 7.1 M m$^3$/year</td>
<td>- 3.6 % per year</td>
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</table>
ANALYSIS

Drop of consumption and reduction of losses:

→ a challenge for improved productivity for the distributors.
→ a double penalty for the producer.

Introduction of financial corrections based on yield values:

→ Principle of benefits sharing.
→ Definition of thresholds and targeted yield values.
→ Revisions following the City of Paris policy as incentives and rewards.
Corrections paid back to EAU DE PARIS

- December 30 1991, introduction of yield linked correctives coefficient: stop of the reduction of leakages.
- January 30 1997, modification of corrective coefficient: slight increase of water losses.
- December 31 2003, review of corrective coefficient: sharp reduction of leakages.

<table>
<thead>
<tr>
<th></th>
<th>CEP</th>
<th></th>
<th>EFPE</th>
<th></th>
<th>PARIS</th>
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<tr>
<td></td>
<td>Yeld %</td>
<td>Correction k€</td>
<td>Yeld %</td>
<td>Correction k€</td>
<td>Yeld %</td>
<td>Correction k€</td>
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<tr>
<td><strong>average from</strong></td>
<td><strong>1992 to 1996</strong></td>
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<td></td>
<td>89,8</td>
<td>987</td>
<td>89,8</td>
<td>439</td>
<td>89,8</td>
<td>1 426</td>
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<tr>
<td><strong>average from</strong></td>
<td><strong>1997 to 2003</strong></td>
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<td></td>
<td>89,2</td>
<td>1 132</td>
<td>85,4</td>
<td>79</td>
<td>88,0</td>
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<td>2004</td>
<td>92,9</td>
<td>462</td>
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<td>0</td>
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<td>2005</td>
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<td>694</td>
<td>94,9</td>
<td>0</td>
<td>94,4</td>
<td>789</td>
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<td>2006</td>
<td>93,2</td>
<td>473</td>
<td>92,7</td>
<td>453</td>
<td>93,1</td>
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<td>2007</td>
<td>96,6</td>
<td>925</td>
<td>95,1</td>
<td>580</td>
<td>96,2</td>
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</table>
CONSEQUENCES OF ECONOMIC FACTORS

WATER SALES

BENEFITS FOR THE PRODUCER AND FOR THE DISTRIBUTORS

<table>
<thead>
<tr>
<th>Année</th>
<th>Fourniture d'eau en gros</th>
<th>Fourniture d'eau au détail</th>
<th>A - B M€</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Prix en gros €/m³</td>
<td>Volume annuel m³</td>
<td>Montant M€</td>
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<tr>
<td>2003</td>
<td>0,4423</td>
<td>241</td>
<td>106,6</td>
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<tr>
<td>2004</td>
<td>0,4429</td>
<td>225</td>
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<tr>
<td>2005</td>
<td>0,4597</td>
<td>216</td>
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<td>2006</td>
<td>0,4675</td>
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<td>101,0</td>
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<tr>
<td>2007</td>
<td>0,5027</td>
<td>203</td>
<td>102,0</td>
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<tr>
<td>2008</td>
<td>0,5158</td>
<td>200</td>
<td>103,2</td>
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Drinking Water Input Volumes by Riverside

millions of m3/year

- RD
- RG (x2)
The cost of the m3 lost in leakage in the distribution system is **17 times cheaper** for Eau de Paris since 2010 than for the distributors until 2009: The change in the Water System Organization has a great impact on the economic strategy of leakage control.
PERIMETER CHANGE

2009

2010

UNITÉS DE DISTRIBUTION DE PARIS
- Eau des sources de la Vanne et de la Seine (traitée)
- Eau de la Marne et de la Seine (traitée)
- Eau des sources de l'Orge et de la Vouge (traitée)

NOTA: Dans l'enceinte de Paris, seuls sont indiqués les sites d'eau moyenne et téléphones et les communautés desservant les capitales.
CALCULATION OF WATER OUTPUT CHANGE

2009

CONSUMPTION = INVOICED VOLUMES

2010

CONSUMPTION = REAL OUTPUT VOLUMES

On Site Meter Reading

Automated Meter Reading

Radio Module

Impulses Emitter

Mechanical Meter
CALCULATION OF WATER OUTPUT CHANGE

Volumes consumed in 2008

Invoiced volumes consumed in 2008

Part of last trim 2007 invoiced in 2008

Part of last trim 2008 invoiced in 2009
The change in the governance of the water system in Paris which occurred in 2010 had several major impacts on the cost of the drinking water for the consumer.

Until 2009, following the adaptation of the economic balance of the delegation contracts, the leakage control strategies deployed in the distribution network have evolved.

Different leakage reduction strategies can also be identified prior to 2010 depending on the riverside of the Seine.

A new economy of leakage control had to be redefined after the change of governance.

New technologies like AMR are the key for new active leakage control means for keeping a high level of efficiency at an affordable cost.
Thank you for your attention