



Nantes  Métropole
O M M U N A U T É U R B A I N E

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Extending the life of Semitan rolling stock:

A tradition in Nantes

Nantes city and conurbations :



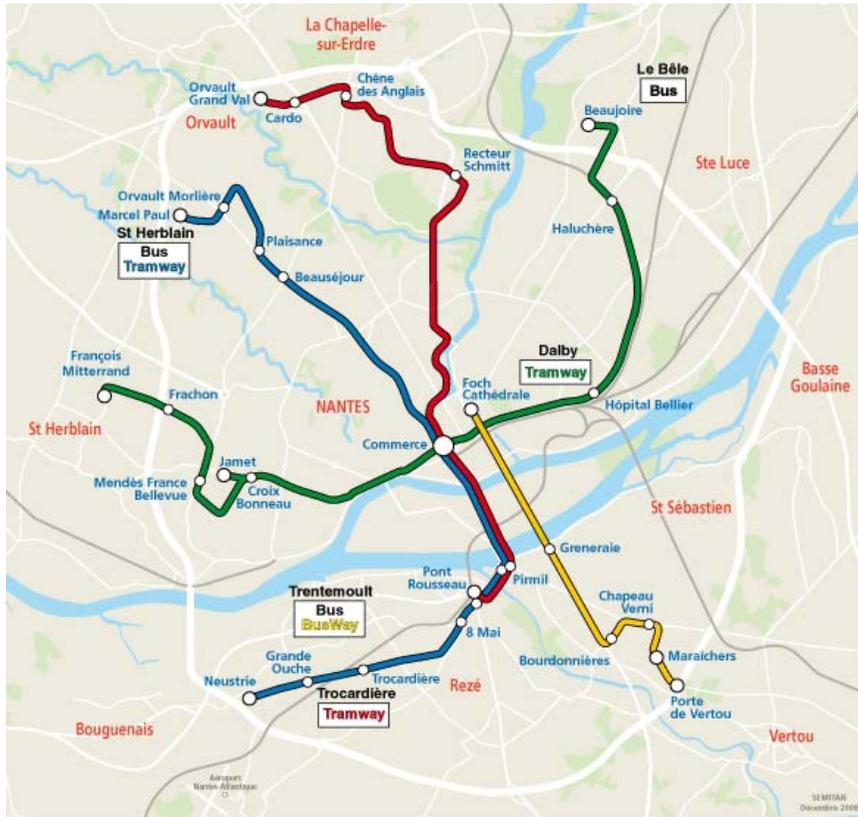
Some figures

- 36th biggest city in Europe
- Nantes conurbation: 6th biggest in the French provinces
- 24 municipalities
- Area: 524 square kilometres
- Population 590,000
- 274,500 jobs
- 50,000 students



Semitan:

- 113.1 million passenger journeys in 2010
- 23.8 million kilometres:
 - 5.5 million tram and BusWay
 - 18.3 million buses



3 tram lines (42km)

- 1 BusWay route (7km)
- 7 routes with articulated buses
- 52 routes with standard buses (22 routes contracted out)
- 1 special route between the city and the airport
- 1 service for customers with reduced mobility
- 2 river shuttle services

The fleet:

475 vehicles, including:

- 79 trams: 46 Alstom and 33 Bombardier
- 110 articulated buses: including 75 running on CNG + 20 BusWay CNG
- 238 standard buses including 186 running on CNG
- 30 minibuses for passengers with reduced mobility
- 3 midi-buses between the city and the airport
- 3 boats

Numbers of passenger journeys

477,000 journeys per day, including 265,000 by tram

- > Route 1 : 111,600 journeys per day
- > Route 2 : 79,800 journeys per day
- > Route 3 : 73,500 journeys per day
- > Route 4 : 26,700 journeys per day

The workforce:

1,638 employees:

- | | |
|--|--|
| <ul style="list-style-type: none"> - 23 ACIC* - 23 AAP* - 1048 drivers, including <ul style="list-style-type: none"> - 71 drivers / ACIC* - 39 drivers / AAP* - 9 drivers / ASPR* | <ul style="list-style-type: none"> - 165 technical staff - 38 sales staff - 59 admin staff - 228 supervisors - 59 executive level staff |
|--|--|



SEMITAN Organization chart



Alain Boeswillwald
Managing Director

Sales Department

Director : Pascal Leroy

Staff : 69 people

Main activities : defining and coordinating policies to adapt, promote and market the company's products and services; providing accurate real-time information to users in all situations and respecting a safe high-quality service.

Administrative and Finance Department

Director : Marc Kowalski

Staff : 39 people

Main activities : implementing administrative and financial policies; reporting on accounting and budgeting issues; managing internal and external legal relations as well as informing the board of management.

Maintenance and Operations Department

Director : Marc Doizon

Staff : 1,435 people

Main activities : promoting and implementing the sales offer in the city and surrounding area; maintaining the good running conditions of the equipment; committed to ensuring the safety of staff and users.

Human Resources Department

Director : Sylvie Denis

Staff : 29 people

Main activities : staff management of individuals and teams; implementing social rules within the company.

Infrastructures and Development Department

Director : Stéphane Bis

Staff : 66 people

Main activities : managing network development projects; maintaining and renovating the network.



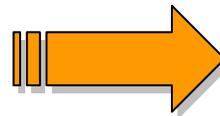


The bodywork was entirely refurbished on approximately one hundred **Mercedes O 305 buses** with amazingly well preserved chassis and highly robust engines.

The result: the GX44

Strip down (removal of bodywork down to the chassis) and a complete mechanical overhaul were carried out by SEMITAN in its workshops in Nantes.

The rebuilding of the new bodywork on the existing chassis was done by HEULIEZ in its workshops.





The GX44s were all taken out of service in recent years. Their chassis were over 30 years old. But their withdrawal was more due to their problematic accessibility than their general condition.

These vehicles, which have had two lives at Semitan, have generated substantial savings on local authority investment.



THE CONDITIONS TO BE MET FOR SUCCESS:

- ➔ A maintenance policy constantly focused on quality and preventive action,
- ➔ Skilled body repair personnel and mechanics with the competence needed to forestall deterioration in vehicle condition.



The negotiation of the delegated public service agreement unfolded with a strengthened economic requirement and a forced capacity of investment from the Nantes city and community council over the period.

In this context, SEMITAN proposed the following saving:

- ➡ By extending the life of the first 20 Alstom trams **from 30 to 40 years** and keeping them in service until 2024 (entered service in 1984).
- ➡ By extending the life of the 52 GX317 Diesel buses and the 130 GX317 CNG buses **from 15 to 20 years.**





The life-extension programme for the 20 ALSTOM TFS trams

This rolling stock was designed in the 1980s and entered service in 1984 in Nantes.

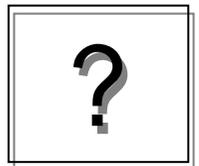
They were the first modern French trams



They were designed to be used for 30 years with an investment payback over 25 years.

ONE QUESTION: IS IT REALLY NECESSARY TO REPLACE THEM IN 2014 ?

- ⇒ The RATP (Paris) keeps its metro trains in service for 40 years
- ⇒ Rouen will be replacing its TFS trams after only 20 years (and what about Grenoble and Strasbourg, to come ?)
- ⇒ Some parts are already obsolete



An external audit was realized



The audit ordered covered the rolling stock:

- Could it last ten or more extra years in service?
- What actions needed to be planned for this?

The upshot of the audit surprised us:

=> naturally, the experts studied the rolling stock closely, and did not seem at all worried

But they also audited:

- => our maintenance policy,
- => our document management procedures,
- => our execution and modification procedures,
- => our computer-assisted maintenance management system.

And their conclusion was:

**“ ...YOUR TFS TRAMS CAN LAST 40 YEARS:
BECAUSE YOU ARE CAPABLE OF CARRYING OUT SATISFACTORILY
THE NECESSARY ACTIONS ... »**



The programme includes:

- Bodywork and internal fixtures and fittings
- Internal refurbishment
- Improvements to shock absorbers
- Modernisation of the mechanical braking system
- Replacement of the door mounting plates
- Replacement of the excitation chopper
- Replacement of the wheel flange lubrication systems
- Replacement of the bogie electrical cabling
- Modification or replacement of the main cut-out switch
- Modification or replacement of the static converter
- Expert assessment and overhaul of the bogies
- Modification of the voice announcements rack
- Replacement of battery elements
- Reworking of the intercirculation system





Budget / Planning for the 20 Alstom trams



Rolling stock DSP mandate: Extension of the service life of Alstom trams							Period of project execution			
Numéro	Opération		2010	2011	2012	2013	2014	2015	2016	Total K€
1	Shock absorber		410							410
2	Brake system									2880
2.1		Study	80							
2.2		Proto	100							
2.3		Electrical		1500						
2.4		Mechanical		1200						
3	Sound racks									
3	Cut-out		350							350
4	Static converter 750-72-24		290							290
5			950							950
6	Chopper			300						300
7	Electrical cabling				2500					2500
8	Door function									1020
8.1		Proto			100					
8.2		Series				920				
9	Bogie									1440
9-1		Proto			150					
9-2		Serial				1290				
10	Intercirculation									500
10.1		Expert assessment								
10.2		Execution			50					
11	Batteries					450				
12	Vehicle refurbishment					255				255
12.1		Study								
12.2		Proto		100						
12.3		Execution			200					
						2900				
	TOTAL		2180	3100	3000	5815	0	0	0	14095



Investment of €14m is planned to gain 10 years service life
for 20 trams

=> **K€700** for 1 tram for 10 years



Procurement of new rolling stock would have cost, as part of a large
production series :

K€3,000 for a use life of 30 years

=> **K€1,000** for 1 tram for 10 years



The saving is therefore a very real one but it remains the case that these vehicles have high floor entry and a former design and are more expensive to maintain.

The main advantage in this programme is therefore to postpone the investment for the city and community council at a time when it is looking for room for manoeuvre in its financing arrangements.



Extending the life of the 317 CNG and 317 Diesel buses



This fleet comprises 130 + 52 standard buses. Their replacement (after 15 years) was to begin in 2011.

Mechanically speaking, their gearboxes were overhauled after 400,000 km and are in good condition. The engines should last longer if given a renovation.

The bodywork of these vehicles was overhauled after 9 years – external paintwork and replacement of internal fittings.

We note that after 15 years' service these vehicles are still in good condition and that extending their life would have advantages in terms of:

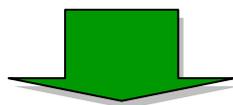
- => **economics**
- => **sustainable development**





Our objective: to extend their service life to 20 years

=> Note that the CNG tanks have a use life of no more than 20 years



The programme involves a very major overhaul of the **engine** and certain **mechanical parts** that are coming to the end of their useful life at 15 years, in order to extend them to 20 years. If this is not done, these vehicles would be taken out of service when their engines finally give out.

➔ The investment is approximately K€60 by vehicle to extend the life of vehicles in good condition for a minimum of five more years

➔ The purchase of new vehicles would cost K€270 apiece.

The calculation is an interesting one insofar as the expected level of service in the next few years can be met, in particular where accessibility is concerned.

During the term of the delegation of public service agreement (2010 – 2016), Nantes city and community will have no need to invest in new vehicles!



Where sustainable development is concerned, we avoid scrapping equipment that does not merit scrapping,



Ecological Impact

We are in a period when the clean buses of the future do not yet exist (hybrids, discontinuous electrical power...): there are advantages in gain a few years of time before replacing a large part of the fleet,



Strategic Energy Impact

Financially, Nantes city and community is extremely interested in postponing the time when it must imperatively replace the fleet,



Financial Impact

From the standpoint of the maintenance teams, it is an interesting challenge to plan and execute the necessary actions with regard to the drive train to allow these vehicles to withstand so many years of service.



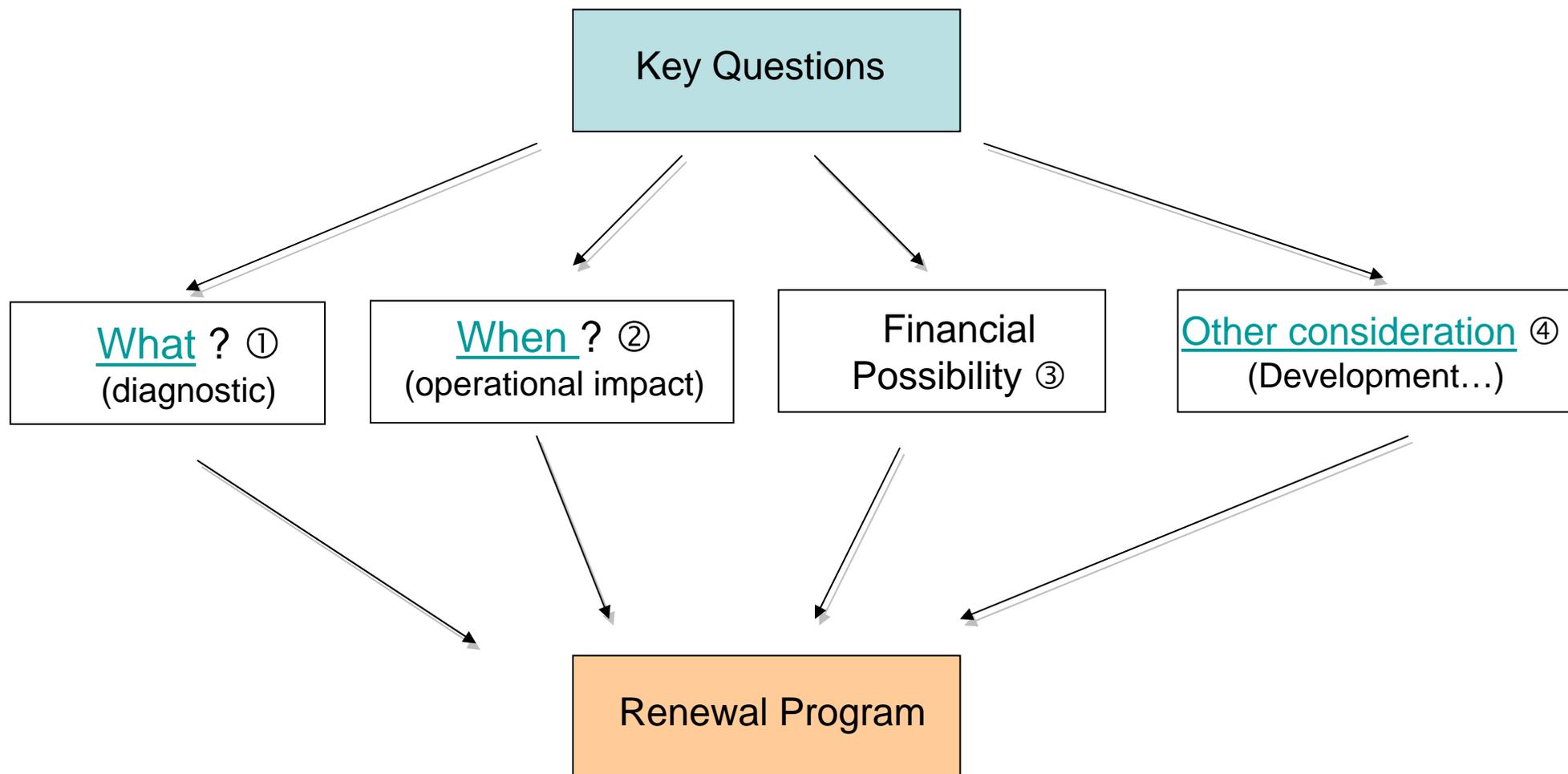
Managerial Impact



How to build a comprehensive infrastructure renewal program ?



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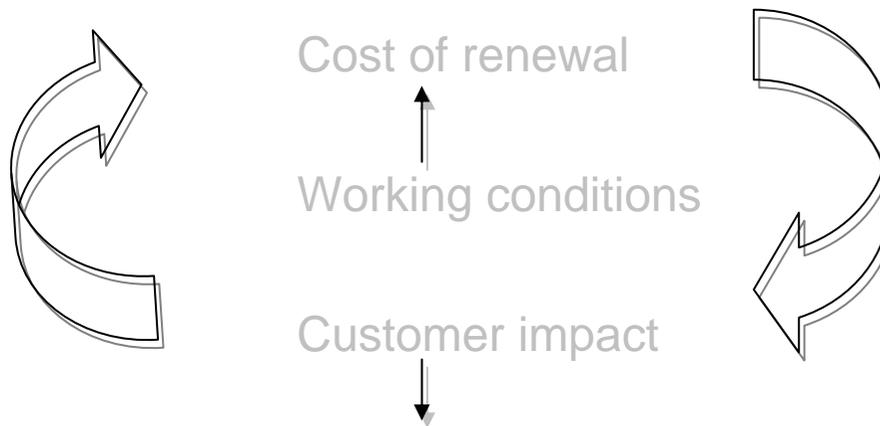
- Diagnostic is a permanent process
- A periodic review is required
- It must be comprehensive (short to long term approach, all type of equipment should be considered)
- Maintenance team must be listened
- Key issues may require additional analysis performed by recognized experts
- For each issue identified, a technical solution is provided

=> the output of a the diagnostic process is a technical renewal plan





- There is no predefined choice : each case requires a detailed analysis
- Working conditions (night work, multishift work, single line work, complete possession....) determine the cost of the renewal work and the customer impact of this work
- An iterative choice has to be performed :



- Each time, an analysis should be performed to identify all works concerned by the same area to avoid further customer impact



Renewal is an opportunity to do more than a basic replacement

- Benchmark techniques, working methods, find innovations
- Can renewal be an opportunity to :
 - Improve or develop the system hence be better accepted by all stakeholders ? (e.g. increase line speed)
 - Improve system safety ?
 - Improve productivity ... ?





Thank you for your attention.