Presentation of the project Lyon-Turin Ferroviaire by M. Stephen Slot Odgaard, Project Manager
Agenda

European Transportation politics
  - Objectives
  - Priority projects

Railway transport corridors of the Alpine arc
  - Historical
  - Future

The Project Lyon - Torino Ferroviaire
  - History
  - Technical
  - The role of COWI
  - The future of the project
DG-TREN
TEN-T Priority axes and Projects

TRANS-EUROPEAN
TRANSPORT NETWORK

TEN-T priority axes and projects 2005

DFTU - New Rail link between Lyon and Torino

Presentation by Stephen Slot Odgaard
Railway transportation corridors of the Alpine arc
Historical and future

2006 traffic:

<table>
<thead>
<tr>
<th></th>
<th>Goods [Mil. t]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpine passage</td>
<td></td>
</tr>
<tr>
<td>Tauern</td>
<td>20.2</td>
</tr>
<tr>
<td>Brenner</td>
<td>45.9</td>
</tr>
<tr>
<td>St-Gothard</td>
<td>26.2</td>
</tr>
<tr>
<td>Simplon</td>
<td>9.7</td>
</tr>
<tr>
<td>Mont-Blanc + Frejus</td>
<td>21.6</td>
</tr>
<tr>
<td>Mont-Cenis</td>
<td>6.1</td>
</tr>
<tr>
<td>Ventimille</td>
<td>19.4</td>
</tr>
</tbody>
</table>
European transport politics
Alpine arc

Inter ministeriel agreement of the Alpine countries (FR, IT, DE, AU, CH) of 2-3 June 1994:

- Freight volume will double the next 20-30 years. The four countries (DE, AU, IT, CH) have already conclude this and decided on:
  - A modernization of the two existing axes (new base tunnels)
    - Saint-Gothard
    - Lötschberg
  - The need of at least two additional routes with high capacity:
    - The Brenner axe (north-south)
    - The Lyon-Turin axe (east-west)
### Railway transportation corridors of the Alpine arc
#### Historical and future

<table>
<thead>
<tr>
<th>Name</th>
<th>Opening</th>
<th>Length [km]</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frejus - Montcenis</td>
<td>1871</td>
<td>13.7</td>
<td>Undergoing enlargement</td>
</tr>
<tr>
<td>Saint-Gothard</td>
<td><strong>1882</strong> (2016)</td>
<td><strong>Old: 15</strong></td>
<td><strong>New.: 57</strong> New base tunnel</td>
</tr>
<tr>
<td>Simplon</td>
<td>1906 (1.) 1922 (2.)</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Lötschberg</td>
<td>1913 2007</td>
<td><strong>Old: 14.6</strong></td>
<td><strong>New.: 36</strong> New base tunnel</td>
</tr>
<tr>
<td>Brenner</td>
<td>(2018)</td>
<td>56</td>
<td>New alignment</td>
</tr>
<tr>
<td>Lyon-Turin</td>
<td>(2020)</td>
<td>54+14</td>
<td>New alignment</td>
</tr>
</tbody>
</table>
Lyon - Turin Ferroviaire
Why this project?

- Existing east-west oriented railway links:
  - Vintimille (Nice - Genova)
  - Historical line via Modane - Fréjus - Mont Cenis

- Swiss transportation politics

- Risk of freight transport on road. The accidents:
  - Mont Blanc (39 dead)
  - Tauern (12 dead)
  - Gothard (12 dead)
  - Fréjus (2 dead)
European transport politics
EU TEN-T, Priority Axis No 6

- Railway axis Lyon – Trieste – Divaca/Koper–
- Divaca - Ljubljana – Budapest – Ukrainian border
There are currently three modes:

- **Dedicated goods trains**: trains entirely composed of goods wagons, ensuring the transport of freight between two marshalling yards or between a marshalling yard and the final destination. These trains typically transport heavy materials such as coal or minerals.

- **Combined road/rail transport**: this is a multimode system whereby goods are placed in containers that are in turn loaded onto trucks and train wagons.

- **Railway motorway**: this system involves loading full lorries, or trailers onto wagons specially designed to this effect.
Technical specifications:

- Test service and special Modalohr wagons 2003-2008: 4 shuttles run everyday between Aiton-Bourgneuf (in the French Savoie) and Orbassano (on the outskirts of Turin). 175 km covered in 3 hours.

- Build new \textbf{(Modalohr)} wagons, specially designed to transport lorries and trailers offering three advantages:
  - they are lowered to facilitate access,
  - the loading/unloading system is lateral,
  - in addition to full lorries, they can also transport trailers separately.
European transport politics
Railway Experimental Motorway Savoy - Piedmont

- Semi-trailer maximum Dimensions:
  - Height: 4.04 m
  - Length: 13.7 m
  - Weight: 38 t.

- Transit (Unloading/loading) time: 30 min.

- Differs from other systems adopted in Switzerland and in Austria known as “rolling roads”, load/unload vehicles in a single line at the end of the train (as the Channel Tunnel).
European transport politics
Railway Experimental Motorway Savoy - Piedmont

Requires construction of terminals. A full size terminal has the following configuration:

- ~30 loading stations for large platform
- Space requirement: 800 m
### European transport politics

**Decision on the development of the Lyon-Turin project**

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Dec. 1994</td>
<td>The European council in Essen includes the railway link Lyon-Turin on its list of 14 priority projects.</td>
</tr>
<tr>
<td>July 1996</td>
<td>European parliament and council adopts decision no 1692/96/CE on the development of the Trans-European Transport Network (TEN-T) in order to approach its regions. Quote of the Transportation white book of 2001: &quot;Revive the railroads :Support the realisation of new infrastructures and in particular the railway links with priority on freight.&quot;</td>
</tr>
<tr>
<td>24 Nov. 1994 - 23 Dec. 2001</td>
<td>The company Alpetunnel GEIE is established to manages the feasibility studies</td>
</tr>
<tr>
<td>Jan. 2002</td>
<td>The company Lyon Turin Ferroviaire (LTF) is established in October 2001 as a subsidiary of RFF et RFI, and is given the scope of developing the international section. Law 228/2002 is rectified by the Italian Parliament. Start of work on the access tunnels.</td>
</tr>
<tr>
<td>29 apr. 2004</td>
<td>Project is approved by the European Parliament (Decision 884/2204)</td>
</tr>
</tbody>
</table>
Lyon - Turin Ferroviaire
The project

- Historical
  - Alpetunnel
- CIG
- Participants
  - LTF
  - RFF
  - RFI

- Phasing
  - 2001-2005: Feasibility studies ~150 mio EURO
  - 2003-2012: Exploratory construction works of access tunnels

<table>
<thead>
<tr>
<th>Section</th>
<th>French Section</th>
<th>International Section</th>
<th>Italian Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lyon - St. Jean de Maurienne</td>
<td>St. Jean de Maurienne - Bruzolo Est</td>
<td>Bruzolo East - Turin</td>
<td></td>
</tr>
<tr>
<td>Infrastructure owner</td>
<td>RFF</td>
<td>RFF+RFI</td>
<td>RFI</td>
</tr>
<tr>
<td>Developer (Study phase), Coordination, supervision of studies</td>
<td>RFF</td>
<td>LTF</td>
<td>RFI</td>
</tr>
</tbody>
</table>
Lyon - Turin Ferroviaire
The project - National sections

Réseau Ferré de France (RFF):
- High speed passenger railway line Lyon - Chambéry ~79 km
- Freight line Lyon - la Combe de Savoie ~84 km
- Freight/passenger line la Combe de Savoie - Saint-Jean -de-Maurienne (with 3 longs tunnels: Dullin/Lépine, Chartreuse, Belledonne) ~32 km.

Rete Ferroviaria Italiana (RFI):
- Freight/passenger line (with one long tunnel: Orsiera).
- Freight line via new freight terminal at Orbassana
Lyons - Turin Ferroviaire
Why this project?

Ligne historique :
Profil de montagne.
Pente maximale : 33 °/100

Ligne nouvelle :
Profil de plaine.
Pente maximale : 12,5 °/100

Viaduc de Val Cenischi
Lyon - Turin Ferroviaire
Int. section: St. Jean de Maurienne - Bruzolo East

Sections:
- Base tunnel, 54 km
- Val Cenischia Viaduct 1 km
- Bussoleno Tunnel 12 km
- Open by-pass section Bruzolo, 4.4 km
- Totale 71.5 km

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DFTU - New Rail link between Lyon and Torino
07.11.20
Presentation by Stephen Slot Odgaard
Lyon - Turin Ferroviaire
Safety and ventilation

Schéma général de la partie commune franco-italienne

Tunnel de base
(53.1 km)

Puits d'Avrieux

Puits de Val Clarza

Voies d'évitement

Remises de communication

Saint Jean de Maurienne
Station de sécurité à l'extérieur

Tunnel de Bussoleno
(12.2 km)

Val Cumiachia
Station de sécurité à l'extérieur

Venaus
Galerie et site d'intervention

Modane
Descendre, site d'intervention et station de sécurité

La Praz
Descendre et site d'intervention

Saint Martin la Porte
Descendre et site d'intervention

Intervention site (750m) and underground technical station (400m)

Doors of closing of the railway communication branches between the two tunnels in case of fire
## Lyon - Turin Ferroviaire

### Safety

<table>
<thead>
<tr>
<th>Name of Tunnel</th>
<th>Length of Tunnel (m)</th>
<th>Emergency Stations (Nos. / max distance to safe zone *)</th>
<th>Distance between Cross passages (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTF Base Tunnel, Italy - France</td>
<td>53</td>
<td>1**/14</td>
<td>400</td>
</tr>
<tr>
<td>Gothard Base Tunnel, Switzerland</td>
<td>57</td>
<td>2/10</td>
<td>325</td>
</tr>
<tr>
<td>Brenner Base Tunnel, Austria – Italie</td>
<td>56</td>
<td>3/10</td>
<td>336</td>
</tr>
<tr>
<td>Lötschberg Base Tunnel, Switzerland</td>
<td>35</td>
<td>2/12</td>
<td>333</td>
</tr>
<tr>
<td>Hallandsås Tunnel, Sweden</td>
<td>9</td>
<td>0/4.5</td>
<td>500</td>
</tr>
<tr>
<td>Great Belt Tunnel, Denmark</td>
<td>8</td>
<td>0/4</td>
<td>250</td>
</tr>
</tbody>
</table>

* *Emergency station or ends of tunnel
** **2 stations just outside the tunnel
Lyon - Turin Ferroviaire
Safety and access during construction
Lyon - Turin Ferroviaire
Environmental

• Hydrology
  – Water quality
  – Risk of dry out of streams and rivers

• Impact on the valleys crossed
  – Noise
  – Visual
  – Separation of communities

• Health
  – Asbestos
  – Radon
  – Uranium
Lyon - Turin Ferroviaire
Construction methods

- TBM D&B
- D&B TBM D&B
- D&B
- TBM

- Descenterie
- St. Martin-la-Porte
- Descenterie La Praz
- Descenterie & Station Souterrain Mondane
- Souterrain Mondane

- Tunel de Base
- Tunnel de reconnaissance et accès
- Bussoleno bypass Tunnel
- Val Cenischia

- 7 (+3) km
- 2 km
- 2.6 km
- 4 km

- St. Jean de Maurienne
- Descenterie
- St. Martin-la-Porte
- Descenterie La Praz
- Descenterie & Station Souterrain Mondane

- Tunel de Base
- Tunnel de reconnaissance et accès

- 7.2 km
- 9.6 km
- 12.2 km
- 23.9 km
- 11.8 km
## Lyon - Turin Ferroviaire Construction Methods

<table>
<thead>
<tr>
<th>Tunnel</th>
<th>Site</th>
<th>Main function</th>
<th>Duration of works (years)</th>
<th>Excavated Volume (million tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Tunnel</td>
<td>St. Julien</td>
<td>Excavation of tunnel</td>
<td>3 - 4</td>
<td>2.4</td>
</tr>
<tr>
<td></td>
<td>St. Martin de La Porte</td>
<td>Excavation of tunnel (initially access tunnel)</td>
<td>3 - 4</td>
<td>3.4</td>
</tr>
<tr>
<td></td>
<td>La Praz</td>
<td>Excavation of tunnel (initially access tunnel)</td>
<td>3 - 4</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td>Modane</td>
<td>Excavation of tunnel (initially access tunnel)</td>
<td>4 - 5</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Venaus</td>
<td>Excavation of tunnel (initially reconnaissance tunnel)</td>
<td>4 - 5</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Val Clarea</td>
<td>Only limited activities</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Support sites for Venaus et Berno</td>
<td>Esclosa</td>
<td>Loading Station for cablecar, Usine Voussoies, Temporary Depot, Water treatment plant</td>
<td>4 - 5</td>
<td></td>
</tr>
<tr>
<td>Bussoleno Bypass Tunnel</td>
<td>Berno</td>
<td>Excavation of tunnel</td>
<td>3 - 4</td>
<td>1.4</td>
</tr>
<tr>
<td></td>
<td>Foresto</td>
<td>Excavation of tunnel</td>
<td>3 - 4</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td>Chianocco</td>
<td>Excavation of tunnel</td>
<td>3</td>
<td>2.5</td>
</tr>
</tbody>
</table>
Lyon - Turin Ferroviaire
TBM typical cross section
Lyon - Turin Ferroviaire
Access tunnels

- Modane
- La Praz
- Saint Martin La porte
Lyon - Turin Ferroviaire
Access tunnel - Modane

Length 4 km. Max slope 12%. Cross section 65-80 m².
Descent: 360 m
Progress November 2007: Completed.

Rate of excavation 5-7.5 m/24 hrs

Main concern:
- Control of water
Lyon - Turin Ferroviaire
Access tunnel - La Praz

Length 2.6 km. Cross Section 70-100 m². Sections of carbonaceous rock / slate ("skifer")
Progress November 2007: 1.3 km.

Main concern:
- Convergence > 1m the 1st month after excavation
- Risk of gas (no use of explosives possible)
Lyon - Turin Ferroviaire
Access Tunnel - Saint Martin la Porte
Lyon - Turin Ferroviaire
Access Tunnel - Saint Martin la Porte

Length 2.3 km. Cross Section 70-100 m². Sections of carbonaceous rock / slate ("skifer")
Progress November 2007: 1.7 km.

Main concern:
- Convergence > 1m the 1st month after excavation
- Risk of gas (no use of explosives possible)
Lyon - Turin Ferroviaire
Access Tunnel - Saint Martin la Porte
Lyon - Turin Ferroviaire
Exploration Tunnel - Venaus

Length 7 km + 3 km optional
Excavated by TBM
Lyon - Turin Ferroviaire
Role of COWI

Basis

- Susa valley conflict
  - Asbestos
  - Radon
  - Traffic volume through valley

Scope 2006

- To verify the coherence of the work performed by LTF for EU DG-TREN.

Root of Conflict:

- Not in my backyard
- EIA of permanent structures
  - Mandatory
- EIA of the temporary phases (including access tunnels)
  - France: Mandatory
  - Italy: Optional (Legge Obiettivo)

Conclusions:

- EIA of access tunnels should also be performed, as they cannot be considered temporary works.
Lyon - Turin Ferroviaire
Pro's and Contra's
Lyon - Turin Ferroviaire
Val Cenis
Lyon - Turin Ferroviaire
Architectural renderings
Lyon - Turin Ferroviaire
Val Cenis - site installation
Lyon - Turin Ferroviaire
Future of the project

- Construction Schedule
  - Critical path: Modane - Venaus
  - Start of Service 2015 - 2020

- Public Opinion
  - France
  - Italy

- Decisions of the developers
  - France & Italy
  - European Commission

- Financing (International section)
  - 7.6 billion Euros updated value January 2006
  - Commission European (At least 20%)
    New EU financing of 23rd May 2007 now allows for 30% for TEN-T projects.
  - France & Italy (37% - 63% of the part not covered by the EU)