Current Stage of affairs of the magnetic levitation project in Munich

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Introduction

The idea of establishing a rapid traffic connection between the Main Station and the Airport in Munich has been in existence for a long time. But it was only when the enormous boom in air traffic and thus the growth of Munich Airport became obvious and the certainty that this growth would continue in the future that this project became feasible.

Bavaria would have liked to have been the first to operate a commercial Maglev train route. However, the extraordinarily efficient People's Republic of China was so fast with its decisions on planning and realisation and with construction and the assumption of operations that no one could catch up with it.

The BMG would like to pass on very special congratulations on this success.

The aim in Bavaria is, with the help of the Maglev system, to establish a traffic link from the centre of the city to the airport which will offer the passenger a connecting service "in 10 minutes every 10 minutes". This is the basic requirement made of the project. As a result it will be possible to cope with the volume of traffic forecast for the future, even in the years 2020 and thereafter.

The magnetic levitation system is still as ever a controversial transport system in Germany. This has doubtless primarily to do with the fact that no experience has as yet been gained with a system developed and commercially operated in Germany. And so it is all the more important that we take the first step at last.

In order to carry out the planning for all the accompanying procedures the Bayerische Magnetbahnvorbereitungsgesellschaft (Bavarian Magnetic Levitation Railway Preparatory Company Ltd.) (BMG) has been set up.

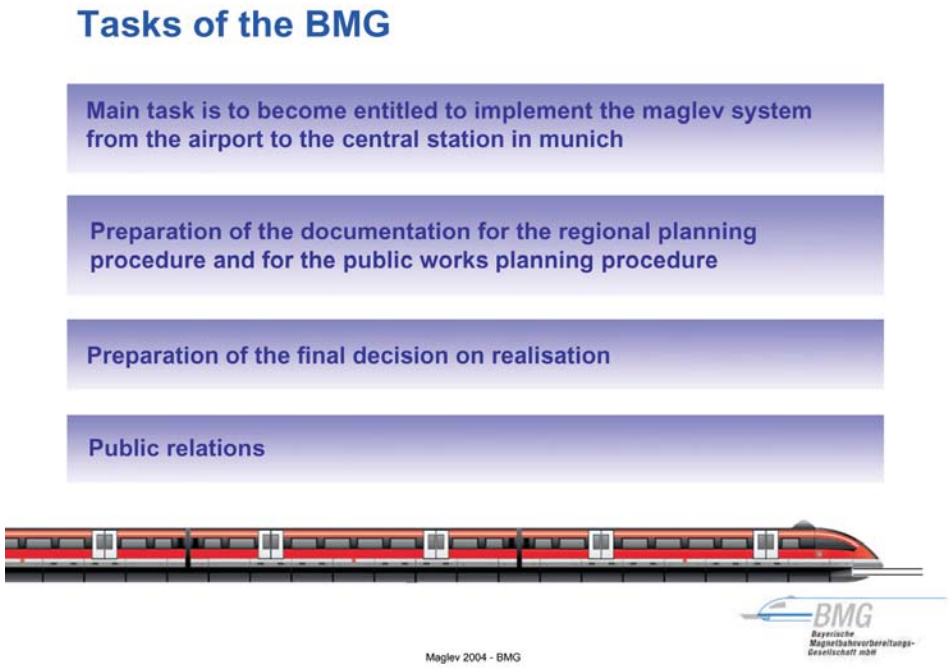

Fig. 1: Tasks of the BMG

The purpose of the BMG (Fig.1) consists in the main in the organisation of the entire plan regulation process and the preparation of the final decision on realisation. The land use regional planning procedure was completed in 2003 and at the moment we are involved in the public works plan regulation process. The plans with their accompanying explanatory reports have been drawn up and filed with the Federal Railway Office (Eisenbahn-Bundesamt, EBA).

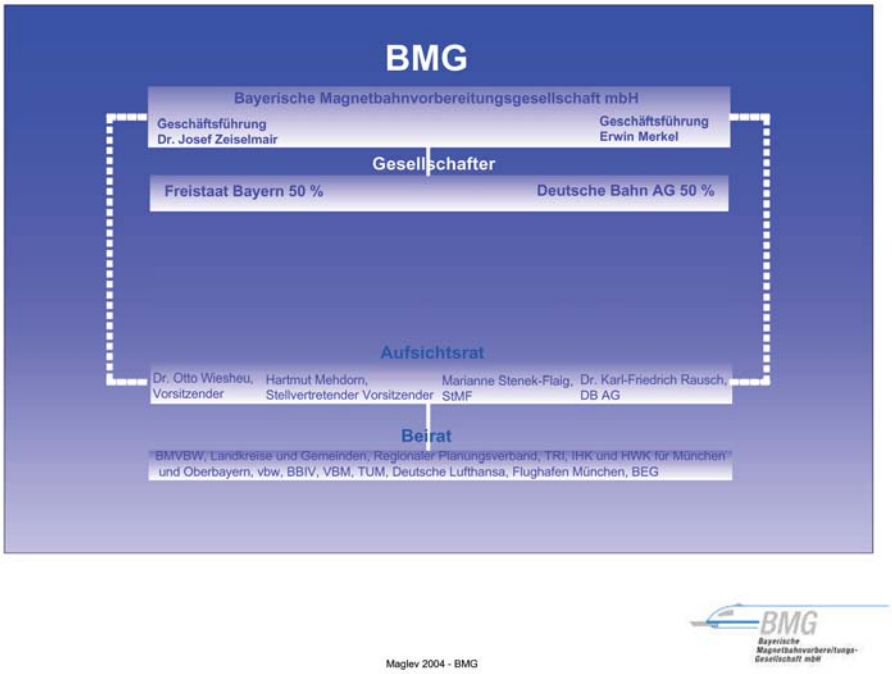

Fig. 2: Organigram BMG

The BMG is a subsidiary company of the Free State of Bavaria and the DB AG, each to the tune of 50%. The Chairman of the Supervisory Board is Dr. Otto Wiesheu, Bavarian State Minister for Economic Affairs, Infrastructure, Transport and Technology. Vice-Chairman is Dr. Hartmut Mehdorn, CEO of the DB AG (Fig. 2).

What are the underlying tasks which the project has to address?

The underlying tasks which the project tackles have basically to do with coping with the volume of traffic which is expected for the year 2015 and later between the Main Station in Munich and the Airport and with providing an accompanying range of services to the passengers.

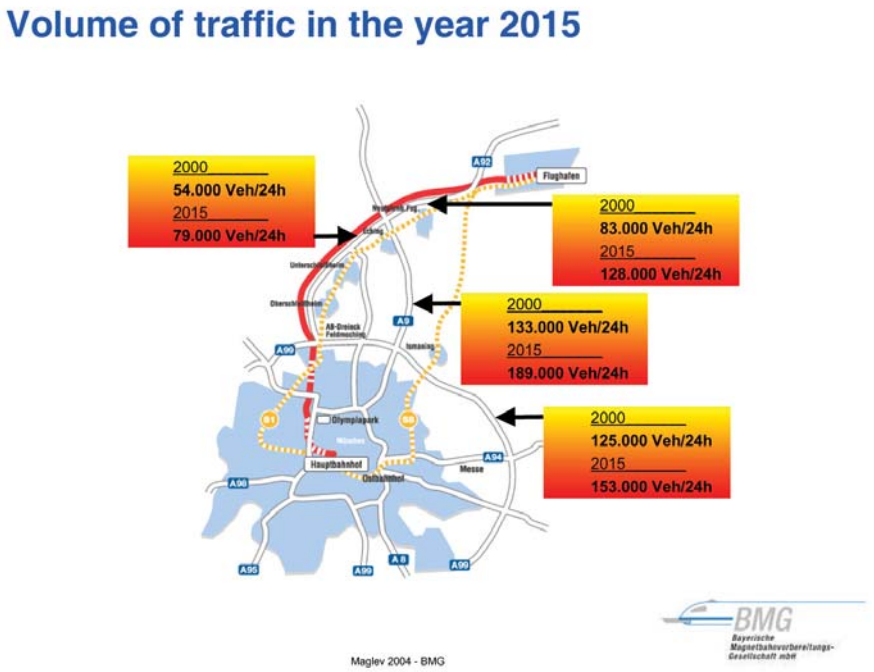

Fig. 3: Volume of traffic in the year 2015

The Transrapid will make an important contribution towards solving one of the most urgent traffic problems in the North of Munich. The road traffic density here is today already one of the highest in the whole of Europe.

When, by 2015, air traffic in munich will, as all forecasts say, have doubled to about 48 million passengers a year, then simply maintaining the present traffic connections to the airport and back would lead to permanent traffic jams and slow-moving traffic on the access roads and to a complete overloading of the S-Bahn rapid transit train routes.

Today already at peak-traffic hours the motorways are getting close to their maximum load levels. Taxis and buses do not bring any relief because they are subject to precisely the same restrictions as individual traffic.

A significant improvement of the airport link to the city centre is therefore urgently necessary.

Figure 3 shows the volume of traffic on the motorways in the years 2000 and 2015.

Especially the A9 between Munich and the Neufahrn motorway intersection is remarkable. This section of the Autobahn is already today one of the most frequented stretches of motorway in Europe.

The only way of really taking the load off the access roads with lasting effect is to provide an attractive means of transport which will move the motorist to switch to public transport.

This would also have the effect of influencing more travellers to use the long-distance trains to Munich Main Station from where they can then reach the airport in just ten minutes. The magnetic levitation train will, thanks to its high efficiency, attract new passengers from the individual transport sector and complement the existing range of S-Bahn rapid transit services.

According to present-day forecasts the Maglev link with its 10-minute service frequency will in 2015 take over about 7.9 million passengers out of the total volume expected and will thus contribute substantially to a significant improvement in the overall situation.

The short time for the journey of 10 minutes and the service frequency of 10 minutes will constitute the central feature of the attractiveness of this transport system. The passengers will not constantly have to take account of a set schedule, they can simply make their way in a relaxed manner to the Transrapid station, be it in the airport or the Main Train Station, and wait a short time on the next train.

There will be no intermediate stops between the Main Station and the airport.

The service will be an important aspect of the overall offer.

In the Main Station passengers who intend to fly from Munich Airport will be able to make use of a check-in service.

The customer will be able to hand over his luggage at a check-in counter at the Main Station and will see it again only when he reaches his final destination.

The train will consist of three sections with a total of 140 seats. It will reach a top operating speed of 350 km/h. For this route 350 km/h is very suitable, also from the economic point of view. During operating hours between 4 a.m. and midnight four trains will be in use. A fifth will be at hand for maintenance coverage and in case a train should break down.

After going into more detail as regards the tasks which the project involved, it was further developed and the requirements for construction and for realisation drawn up.

All the stipulations for the planning and construction of the system are contained in comprehensive design specifications drawn up by the DB AG.

How was this project developed out of the tasks set?

The required project steps are depicted in the phase plan (Fig. 4).

The technical development phase is missing since the magnetic levitation train system has already been developed to a large extent.

Where some of the components are concerned, modifications have been required so as to adapt to operation as an airport shuttle, since the magnetic levitation train had up to this point always been conceived as a long-distance transport system.

Fig. 4: Phase Plan

Some technical adjustments based on technological progress will be carried out. There have, for example been further developments in propulsion technology and in the operation control system technology as well as in connection with the guideway itself.

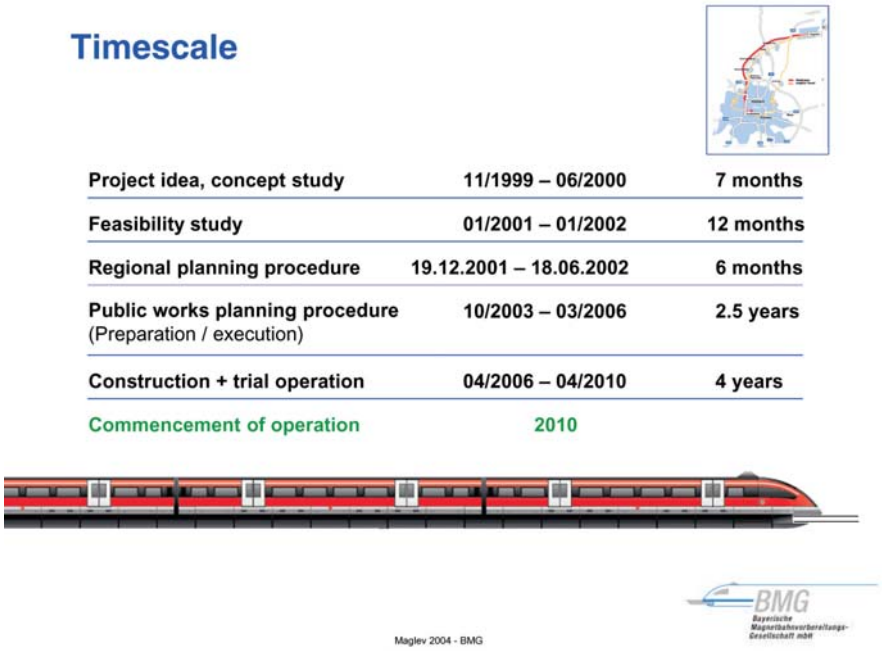

Fig. 5: Timescale

Figure 5 shows the timescale of the project with the two key dates:

- the end of the public works plan regulation process and
- the assumption of operations

It is important here to draw attention to the very short time of two-and-a-half years for the planning and four years for construction.

In the spring of 2002 the feasibility study (Fig. 6) with an integrated environmental impact study was handed in. It constitutes an appropriate help in the decision-making process from which one can ascertain whether the routes studied - the magnetic levitation train routes in Nord Rhein Westfalen and Bayern - are feasible in respect of traffic planning considerations and in economic terms. All the relevant traffic, land use, technological, ecological and economic aspects of the project which could have a concrete influence on its outcome are addressed.

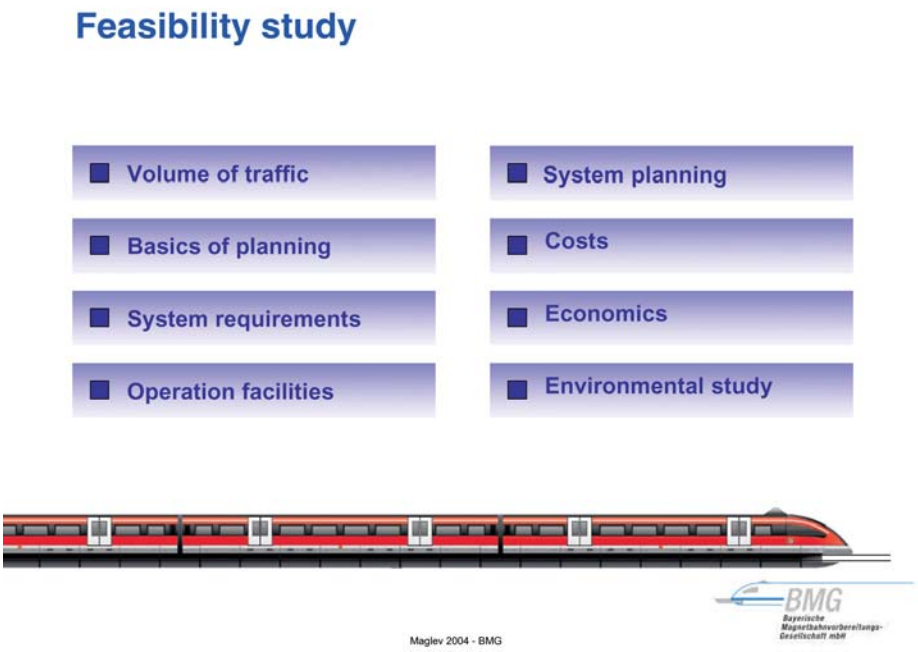

Fig. 6: Feasibility study

Forecasts in relation to demand and profits for both routes were made. Operating concepts were drawn up and a comprehensive environmental impact study carried out. On the basis of these investigations provisional planning and specifications for the magnetic levitation operating systems and the infrastructure were worked out.

In accordance with regional planning legislation and the Bavarian State planning laws the land use regional planning procedures were then carried out. Two possible routes (Fig. 7), the East Route, with a link to the New Munich Trade Fair, and the West Route via Feldmoching parallel to the motorways A9 and A92 were the subject of investigation.

The result was a decision in favour of the West Route taking into consideration several land use measures required.

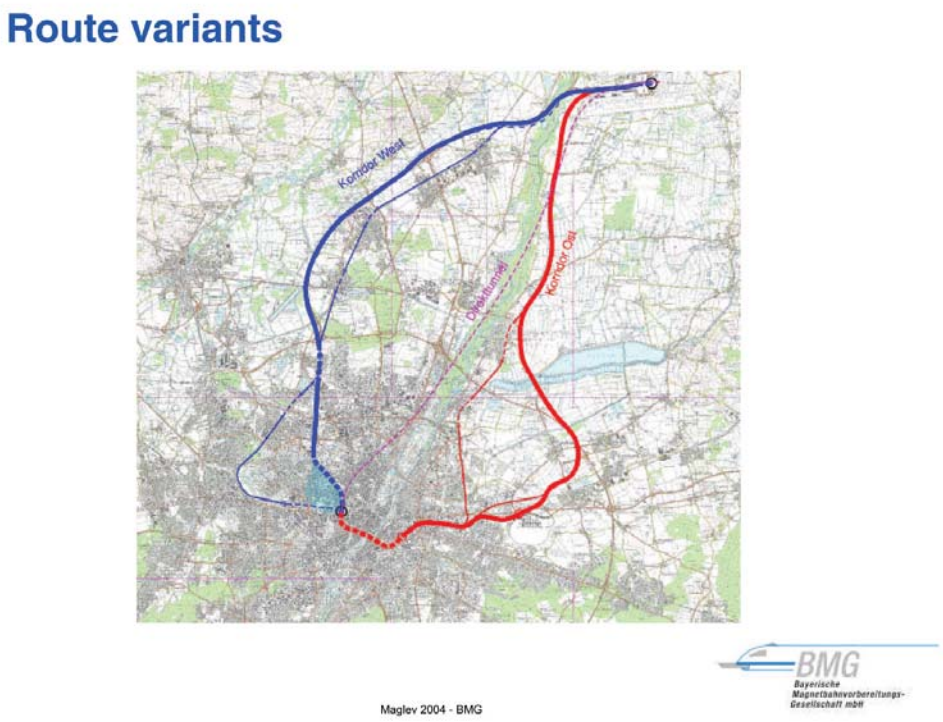

Fig. 7: Route variants

The next phase of the project was the preparatory planning. With this the actual design planning had already begun. A feasible planning concept was the result of intensive co-ordination work with the project partners involved.

In the course of the subsequent design activity phase and ratification planning a complete approvable plan of the total system was developed.

A constituent part of the entire planning activity was the close co-operation with the public authorities, with the DB AG, which will one day operate the system, and with the Federal Railway Office, the Eisenbahn-Bundesamt - EBA. The EBA assumes the parallel functions of being the responsible authority for the plan regulation process, for building inspection and for granting the licence to operate.

A planning status had to be reached which will make it possible to quickly commence realisation following on the planning stage.

The documents had to be drawn up for proper submission and the entire process of approval of planning has to be constantly accompanied right up to the final instance.

The final phase in the planning program is the plan regulation process.

The body responsible for planning the venture, the BMG, has to submit the plans to the Federal Railway Office, EBA. The EBA passes on the documents to the authority which conducts the hearing, in our case the Government of Upper Bavaria.

In the course of the hearing anyone affected can raise objections which will then have to be discussed with the planners and the authorities.

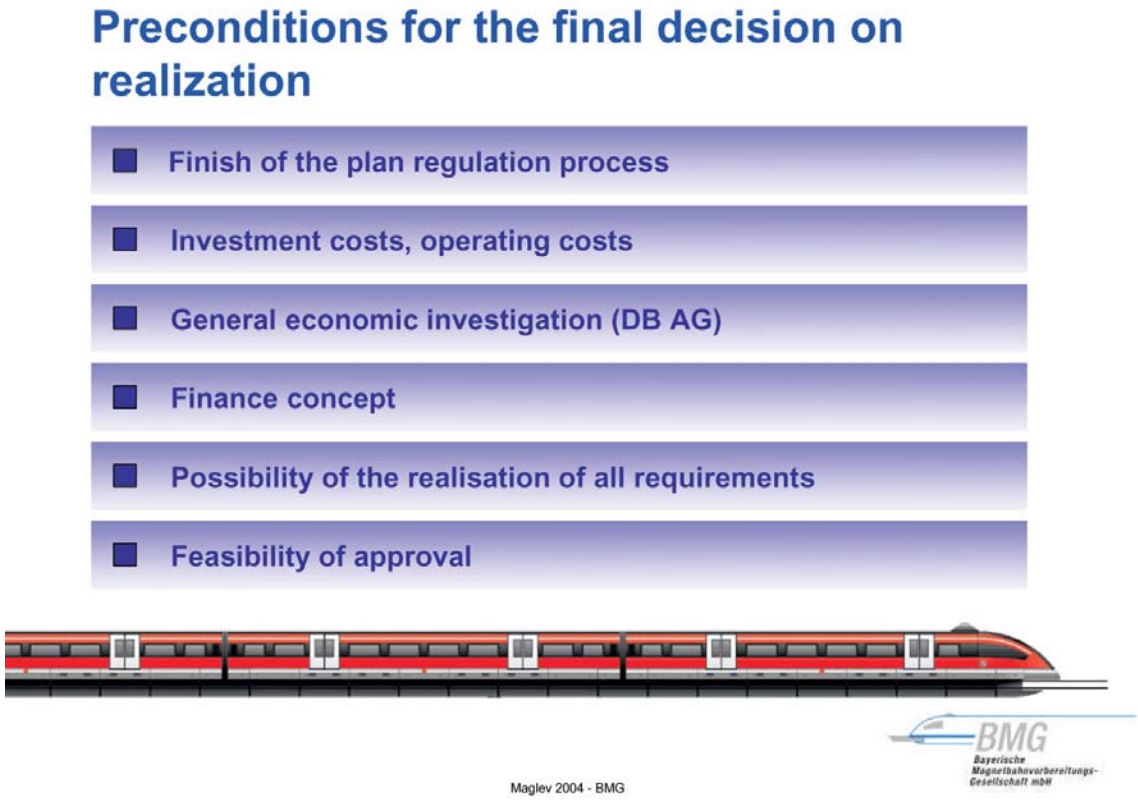

Fig. 8: Preconditions for the final decision on realization

Immediately following the planning phases, the final decision on realisation has to follow (Fig. 8).

This means that all the analysis and proof needed to take a final decision must be produced parallel to the planning work.

The costs situation and general economic feasibility are here of interest. The investment costs and the operation costs must be kept transparent during the entire planning process.

What project requirements result out of the overall tasks set?

When it comes to the subjects of coping with the volume of traffic and providing a certain range of services, requirements arise in relation to the design and dimensions of

- the technical systems
- the stations
- the vehicles
- the operating concept and
- the marketing concepts

The DB AG has compiled a description of all the requirements necessary from a marketing point of view in a product and services concept (Fig. 9). Each point has been functionally described and is part of the overall system design.

The magnetic levitation train between the Main Station and the airport is conceived as a special product of the airport feeder transport system. It will be planned and offered as a premium product

within the framework of the regional transport system of the DB AG.

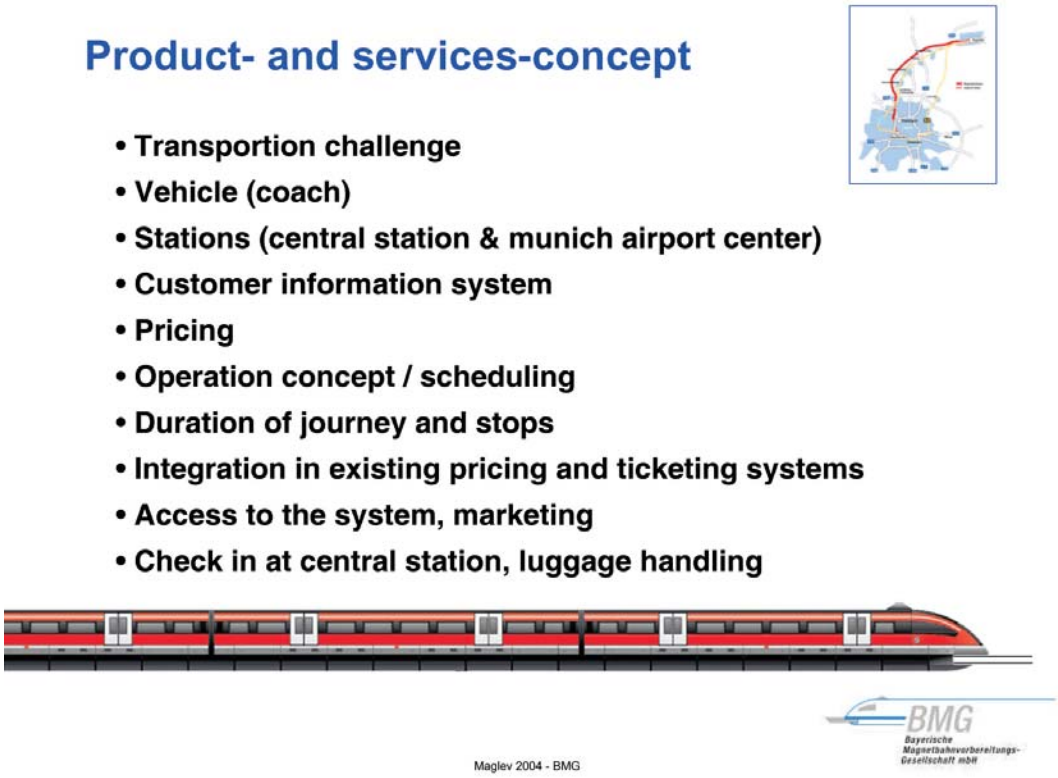

Fig. 9: Product- and services-concept

This means an improved standard in terms of

- the space available for the passengers
- a travelling time of 10 minutes
- a service frequency of 10 minutes
- service in the station and the vehicles
- convenient access to the system

Legal stipulations and the regulations of the authorities must be observed. In particular the laws and statutes relating to the magnetic levitation train including the magnetic levitation train building and operations regulations (MbBO) and the magnetic levitation train noise protection ordinance. In order to regulate the planning procedure the magnetic levitation train planning law was passed.

Status of planning

The planned route

The route was selected in the land use regional planning procedure completed in 2002.

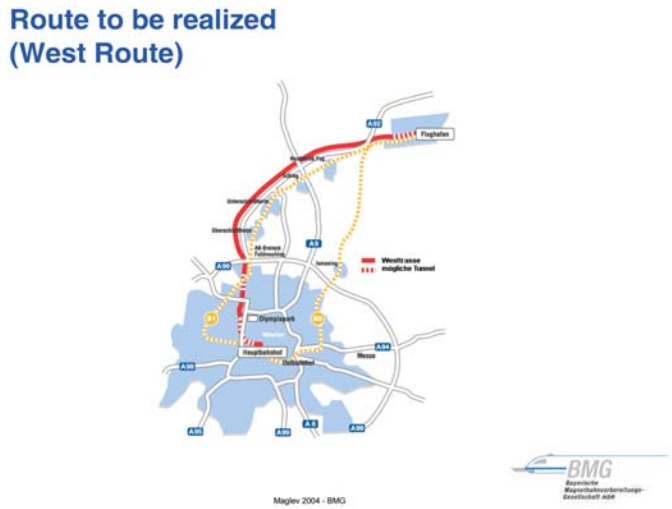

Fig. 10: Route to be realized

This decision in favour of the West Route (Fig. 10) parallel to the motorway was taken mainly for reasons of environmental compatibility. Environmental impact investigations were carried out during the phase of the feasibility study prior to the regional planning procedure. An important argument in favour of this route was that it follows to a high degree already existing traffic routes so that the landscape is not cut up and any disturbance of existing settlement structures is extremely slight (Fig. 11).

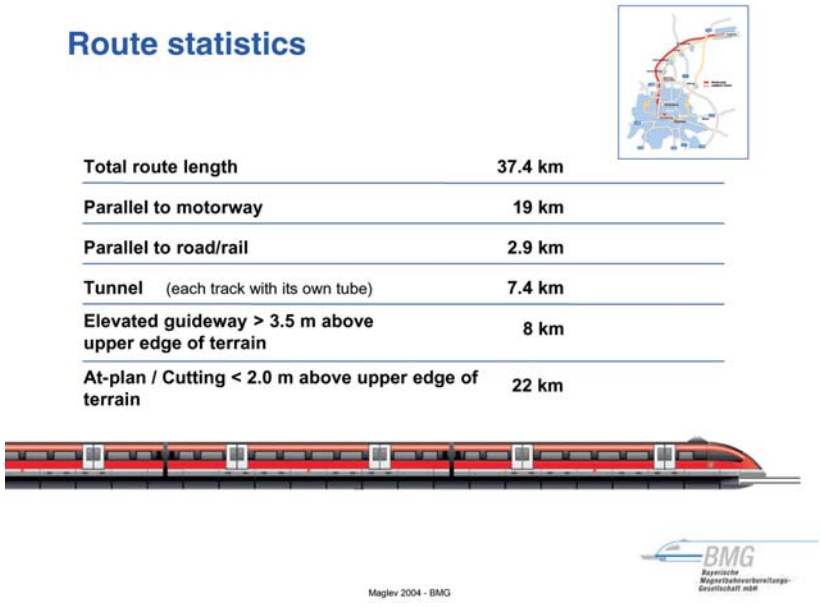

Fig. 11: Route statistics

The route is 37.4 km long, runs at-grade for about 18 km, and includes three tunnels comprising a total length of 7.2 km. About 12 km of the total guideway will be more than two metres above the ground surface.

Noise protection measures will only be necessary along around three kilometres of the total route.

Track plan and propulsion

The track plan of the system is relatively simple (Fig. 12). A crossing connection with four switches is planned in the Main Station in front of the platform, while in the airport changing tracks will be possible behind the platform with the help of one switch.

The link to the maintenance facilities will take place via one switch leading off the Airport - Main Station track.

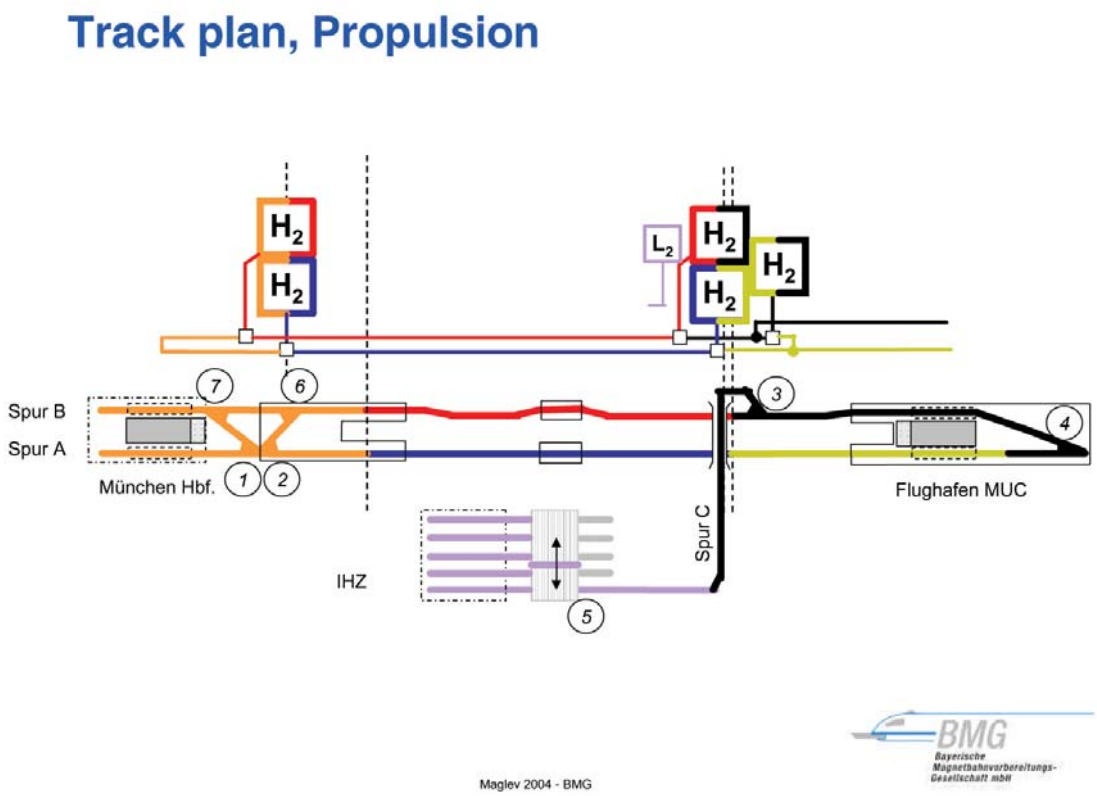

Fig. 12: Track plan, Propulsion

Before finally deciding on the track plan, intensive operating simulations were carried out, taking into account all the reaction and switching times, stops, degrees of acceleration and different speeds.

As a result it was possible to ascertain just how long it takes before delays can be made up for in regular service and how, in the event of disturbed service, delays accumulate or if operations can only be maintained subject to restrictions.

The propulsion configuration is so conceived that the operating concept “in 10 minutes every 10 minutes” can be made possible and the switch of a vehicle into the maintenance depot during operating hours can take place**.**

Stations

The magnetic levitation train arrives at the first-tier level of munich-central-station (Fig. 13). Here the check-in counters will be situated.

Fig. 13: Munich central station

Gates will be arranged along the edge of the platform to guarantee the safety of the passengers waiting on the platform. This is an essential part of the safety concept since, as a result, the possibility of fall off the edge of the platform is prevented.

At the head of the train a track length of 30 metres must be kept free to ensure in any event that the final braking distance is sufficient. The length of the platform for a three-section vehicle is therefore around 105 m.

Architectural design does not have priority at the moment. At present we are still investigating technical aspects of the system in the station including, amongst other things, matters of luggage handling.

Maintenance depot

The maintenance depot contains five working trains all connected with each other by means of a travelling platform. On one section the exterior cleaning facilities are to be found and the remaining four are for maintenance work. When operations have ceased then all the vehicles can be driven to the depot and serviced.

Safety concept

In accordance with the stipulations contained in the magnetic levitation train regulations MbBO, a safety concept must be drawn up and filed with the EBA. It must evaluate all recognisable dangers and risks and clearly define protective measures. We are at present preoccupied with carrying out a risk analysis for this route based on methods established in the development to date and with defining protective measures (Fig. 14). The questions that must be answered are:

- What can happen?
- How often can it happen?
- What must on no account happen?
- What protective measures are necessary?

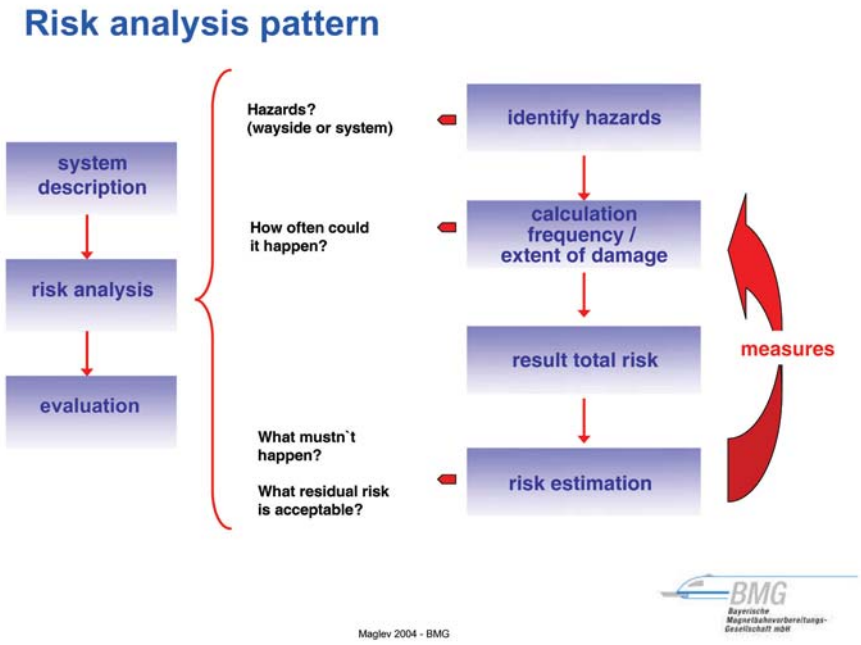

Fig. 14: Risk analysis pattern

Take the following example. Along the motorway stretches safety barriers will have to be positioned to ensure that any vehicle that may leave the road will not reach the magnetic levitation train.

At at-grade level it must be ensured that unauthorized persons cannot reach the guideway area. For this purpose the route here will be enclosed or fenced in.

A comprehensive safety concept proving the safety of the system must be handed in before operating permission can be granted.

Vehicles

The vehicles will be equipped with identical carriages of superior standard. The colours will be adapted to suit the DB Regio standard.

The 75-metre long trains consist of two end sections and a middle section (Fig. 15). In order to guarantee a smooth, quick switch of passengers, doors of 1.20 m width will be installed. Construction Investigations are at present being carried out in this connection.

In order to protect the passengers from changes in pressure when meeting an oncoming train and

travelling through tunnels all the vehicles will be pressure-resistant.

Fig. 15: Vehicle in munich central station

The seating will be such that even at peak hours approx. 78% of all passengers will find a seat. In the entrance areas there will be room for storing luggage.

In accordance with general standards both the vehicles and the stations will be declared non-smoking areas.

The passenger will be provided with information on his journey, for example, the speed and position of the train, with the help of clearly visible displays.

As a result of the new technology involved, the planning of a completely new transport system as complex as a magnetic levitation train requires a high degree of interdisciplinary co-operation in many different fields. Traffic planners are called upon just as much as bridge construction engineers and propulsion specialists.

The BMG, together with the Free State of Bavaria and the DB AG wants to use the chance of establishing a new, independent, absolutely innovative system.