

# Comparison of the technologies of the Japanese Shinkansen and Chinese High-speed Railways

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# Aim of Shinkansen

- Aim of Shinkansen was NOT the world first high-speed railway nor the world fastest railway BUT to increase capacity of Tokaido main line
- Chosen from the three alternatives: (1) quadrupling of the existing narrow gauge double track, (2) addition of (partly) separated double track with necessary interchanges, and (3) construction of standard gauge double track line with better performance
- Inside Japanese National Railways (JNR) majority supported (1) or (2)
- President SOGO (十河) and Chief Engineer SHIMA (島) were among minority
- To persuade majority, freight traffic was to deal with Shinkansen as well but never realised

# Success of Shinkansen

- Success of Shinkansen is mainly due to systematic approach under targeted date of inauguration using proven technologies
- JNR's Railway Technical Research Institute (RTRI) had already disclosed its confidence to realise connection Tokyo and Osaka within three hours at its 50 years commemorative presentation in 1957
- Technical roots of the success were (1) bullet train project in 1940, which was only partly started and discontinued by the war, (2) light weight emu car realized jointly by a private railway and RTRI, and (3) ac electrification using industrial frequency developed by JNR
- All important technologies were thought proven

# Chinese first approach

- Chinese approach is quite different from the case in Japan
- No concrete targets of date, speed or other requirements
- Voluntary developments learned from developed countries but not license agreements were revealed to be too slow and lack of availability to meet the requirement of rapid developing society at the year 2003
- Change of ways of realizing high-speed railways taken by clever authority in 2003 to be mentioned later

# European approach

- European approach started just after Japanese success was anticipated
- Questions of Japanese traction systems, knowledge of adhesion, current collection etc were motive forces of development of different trainsets from Japanese
- British HST and French TGV's success surprised engineers in Japan very much but Japanese practice was not changed substantially

# Shinkansen's Series 300

- Shinkansen's Series 300 was really innovative; ac motor traction with regenerative braking, light weight, energy and maintenance saving and environmental friendly
- The then world best high speed trainset, TGV, changed suddenly to be obsolete but French engineers did not realise the fact soon
- Development of AGV, the successor of TGV, were too slow and they lost the chance to export trainset to China, except for Italian designed CRH 5, which was not for the need of Chinese high-speed railway

# Shinkansen's Series 300



# Chinese change of ways of realising high-speed railways

- Chinese change of ways of realising High-speed railways in 2003 was very clever to catch up with developed countries and to become world best high-speed railway holder
- CRH 1 and CRH 5 were base of developing medium speed trainsets
- CRH 2 and CRH 3 were base of developing high speed trainsets of Chinese origin, CRH380 series
- Loading gauge of Japanese and Chinese HSRs are common for both countries but Chinese track design are much favorable for operation at high speed

# Necessary and important relationship of Japan and China

- Coordination of advantages of both sides and early escape from disadvantages of each side
- Required coordination of Japan and China in other fields of high-speed railways
- Medium speed railways; Japan has almost nothing although latent demand for it is very high
- Urban railway systems; Japan has the world best practice but Chinese high demand has been still subconscious