PRESENTATION TO THE METRO RAILWAY ADVISORY BOARD ON BANGALORE METRO RAIL PROJECT AT RDSO, LUCKNOW ON 29-06-2012
Outline of Presentation

- Introduction
- Implementation Strategy
- Safety Certification, Experience
- Suggestions
- Brief on Phase 1 Progress
- Phase 2 Status
- HSRL Status
Reach – 1

Reach – 2

Reach – 3

Reach – 4

North Extension

South Extension

Under Ground

East West Corridor
- Elevated Section: 13.02 Km
- Underground Section: 4.88 Km
- Elevated Stations: 12
- Underground Stations: 4

North South Corridor
- Elevated Section: 19.87 Km
- Underground Section: 4.00 Km
- Elevated Stations: 21
- Underground Stations: 3
Bangalore Metro Rail Project

REACH 1: The 7 km of Reach 1 is commissioned on 20th Oct 2011. 60 Lakh passenger trips have been made so far.
IMPLEMENTATION STRATEGY OF BMRCL

- BMRCL has a Lean Organisation for Project implementation.
- BMRCL have engaged General Consultants (GC) consisting of a consortium of RITES/India, Oriental Consultants/Japan, Parsons Brinkherhoff/USA and SYSTRA/France for Implementation of the Project.
- They have both expatriates and Indian personnel having expertise in Design, Procurement, Construction/Installation, Testing and Commissioning of Metro Railway Systems conforming to International codes and practices.
ROLE OF GC

- GC is entrusted with the responsibility of preparation of Technical specifications to latest International standards, Lay Down Qualification Criteria, preparation of tender documents, scrutiny and evaluation of tender bids for selection of contractors and award of works.

- Post contract award stage, GC carries out Review of Design & their finalization/approval, methodology of construction, selection of vendors and their approval as per international norms, supervision of construction/manufacture, witnessing Factory Acceptance Tests, Inspection/clearance of equipment at manufacturer’s works.

Continued........
ROLE OF GC

- The site installation, testing & commissioning of various sub-systems- Track, Traction Power Supply, Signal & Telecom, Rolling Stock and work shop equipments etc including integrated testing and commissioning which is also the responsibility of the GC.

- Each manufacturer/contractor is having Independent and Separate Safety Organization to certify safety of the respective sub-system.

Continued........
BMRCL have also engaged independent safety assessor (ISA) which is an accredited international agency to conduct technical audit, certify Signaling and Train Control System after scrutiny of the procedures and witnessing of the tests similar to the practices adopted on International Metro Rail System.

BMRCL have also engaged another international agency (M/s.Interfleet/UK- Former British Rail Research Centre) to verify Train Bogie Design independently in regard to safety as per international codes.
Both the above international agencies along with General consultants have witnessed Integrated Testing and Commissioning of the System before being offered to Commissioner of Railway Safety for clearance.

Thus for Metro Railways, International Accredited Agencies engaged as General Consultants, Independent Safety Assessors and Independent Checking Engineers are ensuring the safety of Metro Rail System and their role is akin to role of RDSO/Zonal Railway on Indian Railway System.
SAFETY CERTIFICATION PROCEDURE FOLLOWED FOR COMMISSIONING REACH-1 OF BMRCL

- BMRCL submitted all design documents (after checking by GC) to RDSO from December 2009/onwards in respect of Track, Traction Power, Signaling/Telecom & Rolling Stock.
- The queries raised by RDSO were also replied promptly. After protracted correspondence, RDSO issued a Speed Certificate MC/BMRC dated: 01.11.2010 for conducting Oscillation trials.
- The same speed certificate was withdrawn by RDSO vide RDSO letter NO: MC/BMRC dated: 18.02.2011 on the plea that SOD and Track Structures are yet to be approved.
- Thus it has taken about 16 months for RDSO/MOR to approve designs, SOD and issue speed certificate for conducting oscillation trials.
RDSO conducted Oscillation Trials during June 2011 at a maximum speed of 85 kmph. Though the results were satisfactory, the maximum speed of the Rolling Stock was arbitrarily fixed at 55 kmph in July 2011. Upon strong representation by BMRCL, DG/RDSO was kind to depute testing team to Bangalore for extended trials on priority for 2 days along with long confirmatory runs at maximum speed of 85 Kmph.

Based on extended Oscillation trial results, RDSO vide letter dated : 12.08.2011 certified the maximum speed of 75 Kmph applying mainline railway criteria.

Railway Board while giving condonation to SOD reduced the maximum speed further from 75 Kmph to 65 Kmph besides imposing speed restrictions on curves.
SAFETY CERTIFICATION PROCEDURE FOLLOWED FOR COMMISSIONING REACH-1 OF BMRCL

A representation was made by BMRCL management to the highest authority in Railway Board for restoring the maximum speed of 75 Kmph. It was assured that after service of three months the speed of 75 kmph (as certified by RDSO) would be restored. BMRCL vide letter BMRCL/14/PPCCRS/2012/780 dated: 8th May 2012 has sent consolidated report on operation of metro services after satisfactory completion of six months of revenue services with the request to permit maximum speed of 75 Kmph as certified by RDSO. But NO RESPONSE HAS BEEN RECEIVED SO FAR.
OUR SUGGESTIONS TO METRO ADVISORY BOARD

- Metro systems have improved safety arrangement viz. ATP, ATO, ATS, CBI, complete track circuit unlike Railways. There are onboard computers, state of the art traction/braking, door control systems & train radio system etc. on the Rolling Stock. Track is ballastless with Head Hardened Rails. Such integrated systems are not existing on Indian Railways. Therefore review and checking of designs (already reviewed by GC/International Agencies) by RDSO is not required as this causes unnecessary correspondence, education/explanation to the RDSO Engineers. Certificate from GC, ISA and Independent checking engineer should be sufficient for ensuring adequacy of safety.

- Instrumentation by RDSO during oscillation trials is very crude and requires welding. On the other hand instrumentation done by RS manufactures is state of the art. Therefore should be acceptable.
OUR SUGGESTIONS TO METRO ADVISORY BOARD

- On Metro Railway Systems stations are about 1 km apart requiring high acceleration and retardation. To maintain required headways, trains have to run at close intervals with minimum separation distance ensured by Signaling System automatically and quick turn back facility at terminals. Reduction of maximum speed arbitrarily (applying mainline railway criteria) is un-warranted as it impacts headway and running time. Further we are becoming laughing stock before international agencies. The reduction from the maximum test speed should be NIL because instrumentation and sensors provided are “state of the art” and precise.

- Reduction of speed by 10% by RDSO from the oscillation trial speed is illogical in the context of Metros. This is done in IR system as
  - The control of the speed of the train is in the hands of the train driver
  - To overcome the driver’s reaction time, etc.
  - Manual controlling of speeds is difficult and cannot be precise
OUR SUGGESTIONS TO METRO ADVISORY BOARD

In the calculation of safe speeds on curves, it is rounded off to lower 5kmph. This is not necessary in metro as speeds can be controlled very precisely due to sophisticated Train Control System available. It is suggested it may be rounded off to the lower 1kmph.

The Speed certificate has been indicated as valid for Reach-1 only and RDSO requires that repeat trials be conducted again for other Reaches. As the train, track structure, traction power supply, S&T system design basically remain the same, repeating the Oscillation trial for remaining reaches is not considered necessary.
OUR SUGGESTIONS TO METRO ADVISORY BOARD

- Track, Traction, Signalling & Communication manuals have been sent to RDSO for concurrence. Some manuals have been sent more than 3 months back. There is no response from RDSO regarding their concurrence. The respective Metro Railway Administration should be authorized to approve their maintenance manuals.

- The role of RDSO/MOR should be minimal as they have no stake in completing the projects on time and within budget.

- Summarizing for safety certification of Metro Rail System International practices including engagement of International consultants should be permitted through an open tendering process. RDSO also should quote against the tender committing time schedule and cost in respect of safety certification like other international consultants/Agencies.
Bangalore Metro Rail Project

REACH 2

- 89% of Viaduct is completed. Remaining work on Viaduct is expected to be complete by October 2012
- 45% of progress is recorded in the stations and civil works are estimated to be complete by Dec 2012
- The commencement of trials will begin by April 2013
Bangalore Metro Rail Project

REACH 3

- Launching is almost coming to completion. 96% of the work already has been completed.
- With regard to stations around 60% of progress is completed and remaining civil works are estimated to complete by Dec 2012.
- The commencement of trials will begin latest by Jan-Feb 2013
Bangalore Metro Rail Project

REACH 3A

- 90% progress has been achieved in the construction of Viaduct.
- With regard to stations, 45% of civil works is completed.
- The commencement of trials will begin by Jan-Feb 2013
REACH 3B

- 68% of Viaduct has been completed.
- Regarding stations, 33% of civil works are over and expected to be completed by April-May 2013.
- The commencement of trials will begin by June 2013.
Bangalore Metro Rail Project

REACH 4

- Viaduct works have been completed. The roads are made good for public under the viaduct.
- Around 78% of progress has been achieved in stations. Off road structure are under progress.
- The commencement of trials will begin by June 2013
Bangalore Metro Rail Project

REACH 4A

- 86% of Viaduct is completed. Pile caps, pier construction and erection of segments are at various stages of progress for the remaining work.
- Overall 35% of Progress has been achieved in stations.
- The commencement of trials will begin by June 2013.
Bangalore Metro Rail Project

Underground Section

East-West Corridor.

Tunneling and civil works at stations are progressing well. The Tunnel between Majestic and Central college has been completed. Overall 37% Progress has been achieved.

North-South Corridor.

One TBM has been received and another TBM is on the way. Civil works at ramps and for the shaft are under progress.
Progress as on May 2012 – 59%
## Bangalore Metro Rail Project

### Physical Progress up to May 2012

<table>
<thead>
<tr>
<th>Percentage in terms of work executed</th>
<th>59%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage in terms of tenders awarded</td>
<td>98%</td>
</tr>
</tbody>
</table>

### Financial Progress up to May 2012

| In Crore | 6940.99 |
| In Percentage | 59.79% |
### Bangalore Metro Rail Project

#### Commissioning Schedule

<table>
<thead>
<tr>
<th>Reach</th>
<th>Length in</th>
<th>Scheduled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peenya Depot - Yeshwanthpur - Sampige Road</td>
<td>9.70</td>
<td>March 2013</td>
</tr>
<tr>
<td>Peenya Depot - Hessarghatta cross</td>
<td>3.40</td>
<td>June 2013</td>
</tr>
<tr>
<td>UG Section – East West Corridor</td>
<td>4.8</td>
<td>December 2013</td>
</tr>
<tr>
<td>UG Section - North Corridor</td>
<td>4.0</td>
<td>December 2013</td>
</tr>
<tr>
<td>City Station - Mysore Road</td>
<td>6.90</td>
<td>December 2013</td>
</tr>
<tr>
<td>K.R.Market - R.V Road - Puttenahalli cross</td>
<td>8.30</td>
<td>December 2013</td>
</tr>
<tr>
<td>Majestic Station will be ready by April-May 2014</td>
<td></td>
<td></td>
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</tbody>
</table>
## Operations & Maintenance

### Ridership and Revenue From 20\textsuperscript{th} Oct 2011 (UPTO 24-06-2012)

<table>
<thead>
<tr>
<th>Revenue (₹) (From 02-09-2011)</th>
<th>Ridership (From 20-10-2011)</th>
</tr>
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<tbody>
<tr>
<td>8,66,23,648.48</td>
<td>60,21,791</td>
</tr>
<tr>
<td>Sl. No.</td>
<td>METRO CORRIDOR OF PHASE-2</td>
</tr>
<tr>
<td>--------</td>
<td>------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>R-1 Extension (Baiyappanahalli to Whitefield (via ITPL).</td>
</tr>
<tr>
<td>2</td>
<td>R-2 Extension (Mysore Road to Kengeri).</td>
</tr>
<tr>
<td>3</td>
<td>R-3 Extension (Hessaraghatta cross to BIEC).</td>
</tr>
<tr>
<td>4</td>
<td>R-4 Extension (Puttenahalli cross to Anjanapura Township).</td>
</tr>
<tr>
<td>5</td>
<td>R-5 Line (RV Road to Bommasandra via Electronic city).</td>
</tr>
<tr>
<td>6</td>
<td>R-6 Line (Gottigere to Nagavara via IIMB)</td>
</tr>
<tr>
<td></td>
<td><strong>Total project completion cost</strong></td>
</tr>
</tbody>
</table>
# FUNDING PATTERN OF PHASE-2 (RUPEES IN CRORES)

<table>
<thead>
<tr>
<th>METRO CORRIDOR</th>
<th>GOK</th>
<th></th>
<th>GOI</th>
<th></th>
<th>SENIOR TERM DEBT</th>
<th>TOTAL</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>EQUITY</td>
<td>SUB DEBT</td>
<td>TOTAL</td>
<td>EQUITY</td>
<td>SUB DEBT</td>
<td>TOTAL</td>
</tr>
<tr>
<td>BAIYAPPANAHALLI TO WHITEFIELD</td>
<td>15%</td>
<td>15%</td>
<td>30%</td>
<td>15%</td>
<td>10%</td>
<td>25%</td>
</tr>
<tr>
<td>MYSORE ROAD TO KENGERI</td>
<td>15%</td>
<td>15%</td>
<td>30%</td>
<td>15%</td>
<td>10%</td>
<td>25%</td>
</tr>
<tr>
<td>PUTTENAHALLI TO ANJANAPURA</td>
<td>15%</td>
<td>15%</td>
<td>30%</td>
<td>15%</td>
<td>10%</td>
<td>25%</td>
</tr>
<tr>
<td>HESSARAGHATTA CROSS TO BIEC</td>
<td>15%</td>
<td>15%</td>
<td>30%</td>
<td>15%</td>
<td>10%</td>
<td>25%</td>
</tr>
<tr>
<td>SUB-TOTAL FOR FOUR EXTENSIONS</td>
<td>1447.1</td>
<td>1447.05</td>
<td>2894.1</td>
<td>1447.1</td>
<td>964.72</td>
<td>4341.18</td>
</tr>
<tr>
<td>RV ROAD TO BOMMASANDRA</td>
<td>15%</td>
<td>15%</td>
<td>30%</td>
<td>15%</td>
<td>10%</td>
<td>25%</td>
</tr>
<tr>
<td>GOTTIGERE TO NAGAVARA</td>
<td>15%</td>
<td>15%</td>
<td>30%</td>
<td>15%</td>
<td>10%</td>
<td>25%</td>
</tr>
<tr>
<td>SUB-TOTAL FOR TWO NEW LINES</td>
<td>2513.7</td>
<td>2513.72</td>
<td>5027.4</td>
<td>2513.7</td>
<td>1675.79</td>
<td>7541.14</td>
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<tr>
<td>GRAND TOTAL</td>
<td>3960.8</td>
<td>3960.77</td>
<td>7921.5</td>
<td>3960.8</td>
<td>2640.51</td>
<td>11882.3</td>
</tr>
</tbody>
</table>
Status of Phase 2 clearance

- CMs meeting with MoUD and MoF
- Proposals referred to EXPD, DEA and Planning Commission by MoUD
- Presentation on DPR made to above Ministry Officials by BMRCL
- Presentation made to Dr Kasturirangan, Member Planning Commission
- Review of Phase2 progress by Chairman, BMRCL.
BMRCL Preparatory actions

• Alignment mapping and tech surveys in respect of Whitefield, Kengeri and Electronic city lines commenced.
• Informal enquiries of JICA, WB, AfD, ADB and EIB addressed.
• MoU signed with HUDCO for loan – enabling borrowing upto Rs 1800 crs (present exposure Rs 700 crores)
• Tender documents for civil works under preparation
MG ROAD CAT – 0.095 KM

HEBBAL – 8.822 KM

YELAHANKA – 15.073 KM

DEVANHALLI AIRPORT – 33.25 KM

HIGH SPEED RAIL LINK (HSRL) TO BANGALORE INTERNATIONAL AIRPORT
Status Report on High Speed Rail Link

HPC, 22nd meeting held on 13th June 2012 examined the matter regarding

- Implementation of HSRL as in the DPR prepared by DMRC or
- the aforesaid alignment needs to be taken underground from BRV grounds to beyond Hebbal and upto Government Flying Training School or
- extending the proposed Gottigere – Nagawara line to the Airport.
Status Report on High Speed Rail Link

• After detail deliberations, HPC decided that the situation now is completely different from the time when the HSRL was conceived since it pre-dates the proposal for Phase-2 of Bangalore Metro.

• Extending the Gottigere-Nagavara line to the Airport is definitely an option which is presently available for consideration, which was not available earlier.

• HPC desired that a detailed note be submitted by BMRCL for consideration of the State Government.
Bangalore Metro Rail Project

Thank You