Contents

I. Rail Network in Korea
II. About KNR
III. KNR’s Performance
IV. Overseas Projects
01 Rail Network in Korea
### Rail Network in Korea – History of Korean Railways

<table>
<thead>
<tr>
<th>From beginning to decline</th>
<th>2004</th>
<th>New beginning and renaissance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1899 to 1950</strong></td>
<td></td>
<td>Talk: Restructuring of railway industry</td>
</tr>
<tr>
<td>Birth of railways in Korea and first steps</td>
<td></td>
<td>Traveling the future in eco-friendly railway</td>
</tr>
<tr>
<td>1899: Opening of first railway (Gyeongin Line)</td>
<td></td>
<td>2015: Honam HSR opened</td>
</tr>
<tr>
<td>1950: Korean war</td>
<td></td>
<td>2016: Suseo HSR opened</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1960 to 2003</th>
<th>2004 to 2010</th>
<th>2011 to today</th>
</tr>
</thead>
<tbody>
<tr>
<td>Railway industry on decline</td>
<td>Separate infrastructure from operation</td>
<td>Travelling the future in eco-friendly railway</td>
</tr>
<tr>
<td>1969: Saemaeul train launched for commercial service</td>
<td>2004: Opening of first HSR (Gyeongbu HSR, 300 km/h)</td>
<td>2015: Honam HSR opened</td>
</tr>
<tr>
<td>1974: Opening of first MRT (Seoul Metro 1)</td>
<td>2010: KTX-Sancheon launched for commercial service (100% Korean technology)</td>
<td>2016: Suseo HSR opened</td>
</tr>
<tr>
<td>2017: Wonju-Gangneung HSR opened</td>
<td>2021: KTX-Eum launched for commercial service (EMU, 260 km/h)</td>
<td></td>
</tr>
</tbody>
</table>
I. Rail Network in Korea – Railway organizations

- Railway construction
- Rail infrastructure management
- Station and railway land development
- Training & consulting
- Railway projects in other countries

- Railway policy & planning
- Investment programs
- Safety regulations, etc.

- Railway technology research & development

- Train operation
- Rolling stock management
About KNR
## II. About KNR – General information

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name</strong></td>
<td>Korea National Railway</td>
</tr>
<tr>
<td><strong>Founded</strong></td>
<td>1 January 2004</td>
</tr>
<tr>
<td><strong>Organization type</strong></td>
<td>State-owned agency</td>
</tr>
<tr>
<td><strong>Annul budget</strong></td>
<td>USD 8,361 million (as of 2022)</td>
</tr>
<tr>
<td><strong>Total asset</strong></td>
<td>USD 15,085 million (Independent Auditors’ Report 2022)</td>
</tr>
<tr>
<td><strong>Credit rating</strong></td>
<td>Domestic AAA Moody’s Aa2 S&amp;P AA</td>
</tr>
<tr>
<td><strong>Employees</strong></td>
<td>2,194</td>
</tr>
</tbody>
</table>

Head Office in Daejeon, Republic of Korea
II. About KNR – Organization chart

7 departments (34 divisions), 1 research institute, 5 regional offices, and 6 overseas branch offices

Branch Offices
- India
- China
- Mongolia
- Indonesia
- Thailand
- Peru
## II. About KNR – Business portfolio

### Business areas

1. Rail network planning
2. Project management
3. Railway construction
4. Railway infrastructure management
5. Training & consulting
6. Station area and railway land development
7. Overseas railway projects

### PM capabilities

- Planning stage management
- Design control
- Construction mgnt. (Supervision and Inspection)
- Interface management
- Verification, testing & commissioning

**Economical, safe and efficient railway**
II. About KNR – Technology development

**Hi FIVE, 5 innovative engineering technologies**

Localization of technologies in five key areas including catenary system, signaling, and communications

- KR Express Catenary System (KR ECS)
- KR Train Control System (KTCS)
- KR Long Term Evolution-Railway (LTE-R)
- KR Rail Fastening Device (KR RFD)
- KR Line Allocation System (KR LAS)
II. About KNR – Technology development

Development and application of KR ECS

- 100% localization of catenary components
- Commercialized high speed catenary system capable of 350 km/h
- Developed high speed catenary system capable of speeds exceeding 400 km/h
- Developed & commercialized KR ECS design for speedup of conventional lines to 250 km/h
- R-bars developed for 250 km/h and undergoing type testing

KR ECS installed in different civil work environments

<table>
<thead>
<tr>
<th>At-grade</th>
<th>Elevated</th>
<th>Tunnel</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.jpg" alt="At-grade" /></td>
<td><img src="image2.jpg" alt="Elevated" /></td>
<td><img src="image3.jpg" alt="Tunnel" /></td>
</tr>
</tbody>
</table>
## II. About KNR – Technology development

### Before

- **On-board device**
- **Track circuit** (Check train integrity)
- **Interlocking device**
- **LEU** (Lineside electronic unit)
- **Balise**

### After

- **On-board device**
- **Track circuit** (Check train integrity)
- **Interlocking device**
- **RBC** (Radio block center)
- **LTE-R**

<table>
<thead>
<tr>
<th>Now</th>
<th>After development</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission of train control data</td>
<td>Wireless transmission</td>
<td>World’s first train control system using wireless railway communication system (LTE-R)</td>
</tr>
<tr>
<td>Interoperability</td>
<td>Standardized</td>
<td>Adopted as international standard (interoperable with Europe’s ETCS and China’s CTCS)</td>
</tr>
</tbody>
</table>
Application of LTE-R using 4G technology for the first time in the world

Strong points of LTE-R

- World’s first reliable wireless railway communication at 250 km/h
- Highly competitive and globally marketable technology
- Linked to national emergency response system for rapid response
- Send videos and large data which is not possible with TRS
- Rapid accident recovery possible with simultaneous video calls
II. About KNR – Technology development

Successful development and commercialization of rail fastening device for high speed slab tracks

- Screw spike
- Rail clip
- Rail pad
- Guide plate
- Base plate
- Elastic pad
- Tie plate
- Underplate

Functions

- Underplate
  - Guide plate
  - Rail clip
  - Screw spike

- Tie plate
  - Elastic pad
  - Base plate
  - Rail pad

Fasten rail and sleeper together, maintain the rail gauge

Decrease vibration and shock of the train on rails, prevent vertical movement of rails
II. About KNR – Technology development

Track accessing entity
Search track access requests/plans
Track access plan
Result of track allocation

Track allocation system
Run simulation of optimized track allocation based on track access requests

Track access rights
Download track access request form
Fill out request form
Upload completed request form
Enter track access plan

Confirm track access plan
Track allocation result

Run simulation of optimized track allocation based on track access requests
KNR’s Performance
III. KNR’s Performance – Railways in Korea today

<table>
<thead>
<tr>
<th></th>
<th>Linking points</th>
<th>Station-station distance</th>
<th>Financing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total length</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4,274 km</td>
<td></td>
</tr>
<tr>
<td><strong>Electrified</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2,965 km (74.4%)</td>
<td></td>
</tr>
<tr>
<td><strong>HSR (over 300 km/h)</strong></td>
<td>3 lines</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Conventional &amp; commuter lines</strong></td>
<td>34 main lines, 55 branch lines</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Linking points</th>
<th>Station-station distance</th>
<th>Financing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HSR (300 km/h)</strong></td>
<td>Major cities</td>
<td>40 km</td>
<td>Central govt. 50%, KNR 50%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(65% of Gyeongbu HSR Phase 1 financed by KNR)</td>
</tr>
<tr>
<td><strong>Conventional</strong></td>
<td>Major or midsized cities</td>
<td>20 km</td>
<td>Central govt. 100%</td>
</tr>
<tr>
<td><strong>Commuter</strong></td>
<td>Downtown – suburbs</td>
<td>2 to 7 km</td>
<td>Central govt. 70%, local govt. 30%</td>
</tr>
</tbody>
</table>
III. KNR’s Performance – High speed rail construction

**Gyeongbu HSR**
- Length: 412.5 km
- Budget: USD 19 billion
- Phase 1 opened in April 2004
- Phase 2 opened in November 2010

**Honam HSR**
- Length: 183.8 km
- Budget: USD 10 billion
- Opened in April 2015

**Suseo HSR**
- Length: 61.1 km
- Budget: USD 3.4 billion
- Opened in December 2016
III. KNR’s Performance – Conventional and commuter lines

**Completed projects**
- 343 stations
- 83 lines: 3,413.6 km (electrified 2,308 km)

**Ongoing projects including upgrading of existing railways**
- Conventional lines: 22 projects (1,361.5 km)
- Commuter lines: 7 projects (267.6 km)
04 Overseas Projects
IV. Overseas Projects

USA
- Consultancy Service for California HSR

India
- Technical consultancy for detailed design of HSR
- Lucknow Metro Phase 1 General Consultancy

Cameroon
- Railway feasibility study for railway construction
- Railway Master Plan

Morocco
- Design Contract for Nouaceur-Marrakech Section of Kenitra-Marrakech HSR

Morocco
- Feasibility study of mass rapid transit system in Kathmandu Valley
- Detailed survey and design of electrified railway line-Phase1 ~ Phase4
- Railway Capacity Building Program

Nepal
- Feasibility study of mass rapid transit system in Kathmandu Valley
- Formulation of Master Plan and Project Management Service for Railway Traffic Control Center

China
- 16 construction supervision services for HSR projects

Vietnam
- Engineering consultancy and training service for Vietnam Railway Modernization Projects

Philippines
- Consultancy Services for the LRT line 2 east extension

Bangladesh
- Technical consultancy for signaling system modernization
- Construction Supervision of Akhaura – Laksam

Indonesia
- PMC for Master Plan of JABOTAK railway circular line improvement
- System package project on Indonesia Jakarta LRT (Light Rail Transit) 1st phase
- Feasibility study on Jakarta LRT 2nd phase main project
- PMC for Jakarta LRT (Light Rail Transit) 2A phase

Malaysia
- Consultancy Services for the establishment of MRT system & telecommunication

Thailand
- PMC for high-speed rail linking three airports project

Paraguay
- PMC for FS on the railway construction
- FS for construction of intercity railway
- Building Consultancy to select main contractor for light rail transit

Sudan
- Railway Capacity Building Program

Morocco
- PMC for FS on the railway construction
- FS for construction of intercity railway
- Building Consultancy to select main contractor for light rail transit

Benin
- PMC for FS on the railway construction
- FS for construction of intercity railway
- Building Consultancy to select main contractor for light rail transit

79 projects in 23 countries
IV. Overseas Projects

- **Paraguay Railway Project**
  - FS: Asunciòn~Ypacarai
  - Length: 527 km
- **USA HSR project in California**
  - Consulting: Detail Design of HSR
  - Length: 527 km
- **India Lucknow MRT Project**
  - General Consulting
  - Length: 8.5 km
- **Malaysia MRT Project**
  - PMC for communication system
  - Length: 51 km
- **Himalayas railway project in Nepal**
  - FS: Mbalam~Kribi
  - Length: 583.4 km
- **USA California HSR project**
  - Consulting: Presino~Bakersfield
  - Length: 200 km
- **USA HSR project in California**
  - Consulting: Presino~Bakersfield
  - Length: 200 km
- **HSR project in India**
  - Consulting: Detail Design of HSR
  - Length: 527 km
- **2011 Nepal**
  - Nepal feasibility study service
- **2012 Malaysia**
  - MRT PM consulting
- **2014 Paraguay**
  - MRT feasibility study
- **2015 India**
  - Lucknow Metro GC
- **2016 Indonesia**
  - Jakarta LRT Phase 1 EPC
- **2017 Indonesia**
  - Jakarta~Surabaya FS

- **2005 China**
  - Construction supervision
- **2012 Malaysia**
  - MRT PM consulting
- **2014 Paraguay**
  - MRT feasibility study
- **2016 Indonesia**
  - Jakarta LRT Phase 1 EPC

- **23 countries**
- **79 projects**
- **450 Million $**
<table>
<thead>
<tr>
<th>Country</th>
<th>Project</th>
<th>Duration (months)</th>
<th>Contract value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>Construction Supervision Service for Akhaura-Laksam Double Tracking</td>
<td>74 mos.</td>
<td>USD 30M</td>
</tr>
<tr>
<td>Egypt</td>
<td>Consulting Service for Modernization of Railway Signaling System on Nagh Hammady-Luxor Corridor</td>
<td>52 mos.</td>
<td>USD 3M</td>
</tr>
<tr>
<td>Philippines</td>
<td>Consulting Services for LRT Line 2 West Extension Project</td>
<td>58 mos.</td>
<td>USD 6M</td>
</tr>
<tr>
<td>Indonesia</td>
<td>PMC for Jakarta LRT Project – Corridor 1 Phase 2A</td>
<td>44 mos.</td>
<td>USD 15M</td>
</tr>
<tr>
<td>Indonesia</td>
<td>Capacity Building Program for Jakarta LRT Operation</td>
<td>23 mos.</td>
<td>USD 1.8M</td>
</tr>
<tr>
<td>Thailand</td>
<td>PM and CS of 3 Airports Linked HSR</td>
<td>59 mos.</td>
<td>USD 131M</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>Feasibility Study Service for Restoration of Railway between Puntarenas and San Jose (98.3 km)</td>
<td>10 mos.</td>
<td>USD 0.6M</td>
</tr>
<tr>
<td>El Salvador</td>
<td>Feasibility study on route between Sal Salvador and La Hachadura</td>
<td>12 mos.</td>
<td>USD 0.5M</td>
</tr>
<tr>
<td>Philippines</td>
<td>Preliminary Feasibility Study for Cogen Extension of Manila LRT Line 2</td>
<td>8 mos.</td>
<td>USD 0.3M</td>
</tr>
<tr>
<td>Mongolia</td>
<td>Tavantolgoi-Zuunbayan Railway Signaling &amp; Communication System</td>
<td>11 mos.</td>
<td>USD 42M</td>
</tr>
<tr>
<td>Mongolia</td>
<td>Formulation of Master Plan and Project Management Service for Railway Traffic Control Center</td>
<td>60 mos.</td>
<td>USD 3M</td>
</tr>
<tr>
<td>Morocco</td>
<td>Design Contract for Nounceur-Marrakech Section of Kenitra-Marrakech HSR</td>
<td>24 mos.</td>
<td>USD 12M</td>
</tr>
</tbody>
</table>
KNR & WB cooperation in speed enhancement

- WB’s interest in speed enhancement of existing railways
- Speed enhancement project applicable country and railway corridor
- Financial supports from WB for feasibility studies on existing railway speed enhancement
- WB’s views on potential areas of cooperation with KNR
Thank you!