Information about the project “Construction of the light rail transit line in Almaty”

Version for potential private partners
• 2017 year is a new starting point for the implementation of the project "Construction of the light rail transit line in Almaty"
• On August 16, 2017, the route of LRT line was approved
• On October 12, 2017, a working group was established
• On February 1, 2018, an approval from the state examination of the feasibility study of the project was received
Total route with a total length of 22.72 km has two lines. The first line will pass from Depot in the south direction along Momyshuly street, then in the east direction along Tole Bi street, in north along Panfilov street, in the east direction along Makatayev street, and finally in the north direction along Zhetysuskaya street until the turn ring; and the second line runs from Depot in a southerly direction along Momyshuly street, then in the west direction along Tole Bi street, in the northern direction along Yassauai street, and again in the western direction along Raiymbek avenue to the intersection with Ashimova street.
The depot should be able to provide all the necessary requirements for operation and maintenance of the line, and should be a fully equipped LRT depot.

- The site for depot placement LRT is located in the industrial zone, east of THPS 2 and covers an area of 18.9 hectares (building area 11.3).
- The area of the site allows placing about 40 rolling stocks, and has reserve territories for the expansion of depot facilities in the future.
- The main sections of the depot: administrative and residential building, complete transformer substations with dispatching, rolling stock washing, rolling stock parking, warehouse of finished products, etc.

- In addition, provision should be made for the maintenance and storage of spare parts and materials for tracks and equipment of the overhead power line.
- The management system is provided in the depot: depot management and drivers appointment; workshop management and logistics; the Transportation Management Center (TMC).

The types of service necessary for the operation and maintenance of rolling stock should include the following:

- 1 - Sorting station,  
- 2 - Cleaning and maintenance,  
- 3 - Inspection,  
- 4 - Small and large repairs of rolling stocks,  
- 5 - Repair work,  
- 6 - Re-equipment and modification,  
- 7 - Testing,  
- 8 - Storage of spare parts and materials,  
- 9 - Acceptance of safety.
Tracing of the LRT line includes a lot of intersected streets and roads, which requires a special approach in designing the priority LRT movement.

- Presently in Almaty, ATCS "Agat" (automated traffic control system), managed by LLP “SMEU Almaty”, is used for the system of traffic signaling, the system is centralized and the main server is located in the control center in the building of the Almaty Department of Internal Affairs.
- As part of the installation of a traffic light control system, a priority controller will be installed that communicates with the urban control system. Each LRT rolling stock, approaching the intersection with the road, communicates with the central controller, which in turn sends a request for priority to the city’s traffic control system. The warning system should activate the traffic lights and barriers for a certain time before arriving at the intersection (at least 20 s).
A separate LRT line on streets with two-way traffic is placed, usually, in the center of the street between the oncoming traffic. If there are two or more lanes in each direction on the street, separate LRT line should always be placed in the center of the street. LRT line is arranged on the side in one-way streets and on streets with two-way traffic with limited space. The LRT line is separated from the road by a curbstone with a height of 0.15 m, 1.20 m high barrier fence of a separate LRT line is provided for high-speed sections of the road.

The LRT traffic using catenary free power system with a length of 1600 m will be carried out along the route from Zheltoksan street to Tole bi street and from Astana square along Panfilov street up to the Makatayev street, it is planned to power by accumulated energy using batteries or supercapacitors, depending on the manufacturer.
The feasibility study developed 5 structure types of upper track, on the basis of the method of St. Petersburg’s structure and the remaining 4 types are derived from the main method.

Crushed granite – 32.5 cm
Sand layer – 2.5 cm
Thin Concrete B10 – 20 cm
Concrete B25 – 13.5 cm
Fine-grained dense Asphalt – 4 cm
Asphalt fine-grained dense cast – 4 cm

Fastening of rails to reinforced concrete plate is made of anchor bolts with diameter 22mm, in chequered manner every 1.5 m. The number of stations is 37 (one way). The location of this platforms, according to construction standards, CH PK 3.03-04-2011, are mainly after the street intersections that will more accurately set the priority at traffic lights. Dimension: two types of platforms “coastal” type – 75m x 3M, island-type – 75m x 4m.

Characteristics of the LRT line
Main technical parameters of track:
- Designed speed – up to 70 km/h.
- Rail type: type R65, R65K; R65K, R50; P60K, R50, T58, T68
- Rail length – 25,0 m
- Track gauge – 1435 mm (European standard)
- The width of the corridor of 8.0-12.0 m
- Width of inter track – 3,90 m
- Minimum number of seats – 60.
- Minimum number of places for standing passengers 4 passengers/m2 – 150.
- Minimum total number of seats – 210.

The base model shows that average speed on the route of LRT in Almaty is estimated to be 21.62 m/h, assuming that only partial priority will be reached at intersections.

Characteristics of the LRT line
### Characteristics of the LRT line

#### Parameters

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Track gauge</td>
<td>mm</td>
<td>1435</td>
</tr>
<tr>
<td>Length</td>
<td>m</td>
<td>27-40</td>
</tr>
<tr>
<td>Width</td>
<td>m</td>
<td>2,65</td>
</tr>
<tr>
<td>Maximum speed</td>
<td>km/h</td>
<td>70</td>
</tr>
<tr>
<td>Floor level</td>
<td>mm</td>
<td>300-350</td>
</tr>
<tr>
<td>Pantograph height</td>
<td>m</td>
<td>5,5</td>
</tr>
<tr>
<td>Minimal total number of passenger capacity (seats and standing place passengers 4 passengers/m²)</td>
<td></td>
<td>60+150</td>
</tr>
<tr>
<td>Energy saving</td>
<td></td>
<td>YES</td>
</tr>
<tr>
<td>Voltage</td>
<td>W</td>
<td>600W</td>
</tr>
<tr>
<td>Minimal turning radius</td>
<td>m</td>
<td>30</td>
</tr>
</tbody>
</table>

#### Required scope:

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Interval (single, min)</th>
<th>Duration</th>
<th>Rolling stock</th>
<th>Rolling stock (spare)</th>
<th>Rolling stock (total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2022</td>
<td>15</td>
<td>4.0</td>
<td>108</td>
<td>28</td>
<td>3</td>
</tr>
<tr>
<td>2027</td>
<td>17</td>
<td>3.5</td>
<td>114</td>
<td>33</td>
<td>3</td>
</tr>
<tr>
<td>2037</td>
<td>20</td>
<td>3.0</td>
<td>116</td>
<td>39</td>
<td>4</td>
</tr>
</tbody>
</table>
Power supply system of LRT include the reconstruction of 6 existing traction and construction of 2 new traction substations.

<table>
<thead>
<tr>
<th>Substation number</th>
<th>Location</th>
<th>Capacity of substation</th>
<th>Maximum possible power consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Substations for reconstruction</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substation №30 three-aggregate 3x1330 kVA</td>
<td>Momoshuly str./Margulan str.</td>
<td>4110 kVA</td>
<td>2720 kW</td>
</tr>
<tr>
<td>Substation №6 three-aggregate 3x1330 kVA</td>
<td>Sain str./Tole bi str.</td>
<td>4110 kVA</td>
<td>2720 kW</td>
</tr>
<tr>
<td>Substation №17 three-aggregate 3x1330 kVA</td>
<td>Tole bi str./Surikova str.</td>
<td>4110 kVA</td>
<td>2720 kW</td>
</tr>
<tr>
<td>Substation №1 three-aggregate 3x1330 kVA</td>
<td>Kunaev str. /Aiteke bi str.</td>
<td>4110 kVA</td>
<td>2720 kW</td>
</tr>
<tr>
<td>Substation №2 four-aggregate 4x1330 kVA</td>
<td>Baitursynov str. / Kazbek bi str.</td>
<td>5440 kVA</td>
<td>4050 kW</td>
</tr>
<tr>
<td>Substation №34 three-aggregate 3x1330 kVA</td>
<td>Raimber ave. 540</td>
<td>4110 kVA</td>
<td>2720 kW</td>
</tr>
<tr>
<td><strong>Substation to be build</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substation №1A three-aggregate 3x1330 kVA</td>
<td>Opposite to Almaty Arena</td>
<td>4110 kVA</td>
<td>2720 kW</td>
</tr>
<tr>
<td>Substation №2A three-aggregate 3x1330 kVA</td>
<td>Depot</td>
<td>4110 kVA</td>
<td>2720 kW</td>
</tr>
</tbody>
</table>

Characteristics of the LRT line
Principles of restructuring the bus network system:

- Stage 1: Identification of the main route and elimination of the competitive mode of transport;
- Step 2: Planning feeding routes towards residential areas;
- Stage 3: Filling in additional transport, which partially goes along the route (reducing such maintenance);
- Stage 4: Construction of multimodal hubs at the ends of the line.

Integration with public transport of the city
For a more rational management of constriction works of the LRT, it is proposed to be divided into three phases:

Construction of all three phases of the LRT line will be conducted simultaneously, which will reduce the standard duration of construction.

- **Primarily phase**: Reconstruction and removal of utility networks, heat networks within the area of the construction corridor LRT – these are preparatory works and will be implemented by the local Executive body, akimat;
- **Second phase**: the construction of the LRT corridor with associated infrastructure;
- **Third phase**: construction of the LRT depot with the connection of all utilities.

To follow the scheduled period of construction work, certain activates has to be developed and followed; organization of work, technological methods, material resources, in which it may be secured to follow up with the normative duration of construction. The construction duration includes the time spent in all activities, starting from the preparatory period till the entry into the service.

Construction period in combination with preparatory period is 36 months (not including development of design estimates for 6 months).
The project is expected to be implemented through the conclusion of a PPP contract, the life cycle contract. The life cycle contract assumes DBFOM (Design - Build - Finance - Operate - Maintain) - Design-Construction-Financing-Operation-Maintenance.

When implementing the project, public partner uses these normative-legal acts:

- Law of the Republic of Kazakhstan "On public-private partnership"
- Rules of the MNE RK "On some issues of planning and implementation of public-private partnership projects"
- Rules of the MNE of RK "On approval of the methodology for determining the limits of state obligations for public-private partnership projects, including state concession obligations, the Government of the Republic of Kazakhstan and local executive bodies"
- Rules of the MNE RK "On approval of the Rules for the formation and approval of tariffs (prices, charge rates) for regulated services (goods, work) of natural monopoly entities operating under a public-private partnership agreement, including under a concession agreement".

Legal model of the project
**Investments**
- Infrastructure: 56 907 mln. tenge. (including depot: 5 117 mln. tenge.)
- Rolling stock: 36 512 mln. tenge.
- Total: 94 203 mln. tenge. (with tax)

<table>
<thead>
<tr>
<th>Financing scheme</th>
<th>Source of financing</th>
<th>Contribution, %</th>
<th>Government support</th>
<th>Income, compensation</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPP Project, Life Cycle Contract</td>
<td>Public partner</td>
<td>50% of PPP facility</td>
<td>Co-financing</td>
<td>Income from passenger transportation</td>
</tr>
<tr>
<td></td>
<td>Private partner</td>
<td>50% of PPP facility</td>
<td></td>
<td>Availability payment: 1. Compensation of investment costs; 2. Compensation of operating costs; 3. Operating payment</td>
</tr>
</tbody>
</table>

**Financial model of the project**
Option 1: Proposed scenario: 50% - infrastructure (without networks), 50% - rolling stock. Period = 10 years

146,5 KZT billion includes: 45,1 KZT billion – capital grant including VAT (co-funding of capital expenditures), 45,1 KZT billion – compensation of investment costs (7,5 KZT billion annually), 12,8 – compensation of operating costs (2,1 KZT billion annually), 43,5 KZT billion – management fee minus revenue traffic (7,2 KZT billion annually).

Total net costs for akimat minus traffic revenue since the operating start – 16,6-17,2 KZT billion annually (average of 16,9 KZT billion annually).

Senior debt drawdown by the private partner – 35,7 KZT billion, interest payments and bank fees – 13,9 KZT billion, principal repayment on senior debt – 42,5 KZT billion.

Total = 146,5 bln. tenge
NPV (7,48%) = 91,6 bln. tenge
Option 2: Proposed scenario: 50% - infrastructure (without networks), 50% - rolling stock.
Period = 23 years

Total = 163,1 bln. tenge
NPV (7,61%) = 100,3 bln. tenge

161.1 KZT billion includes: 47.6 KZT billion – capital grant including VAT (co-funding of capital expenditures), 47.6 KZT billion – compensation of investment costs (7.9 KZT billion annually), 29.2 – compensation of operating costs (4.9 KZT billion annually), 38.8 KZT billion – management fee minus revenue traffic (6.5 KZT billion annually).
Total net costs for akimat minus traffic revenue since the operating start – 18.2-20.2 KZT billion annually (average of 19.3 KZT billion annually).
Senior debt drawdown by the private partner – 44.0 KZT billion, interest payments and bank fees – 21.4 KZT billion, principal repayment on senior debt – 51.2 KZT billion.
Presently, a number of additional preparatory works are carried out by the public partner:

- Expert evaluation of design and estimate for the removal of engineering and backbone networks along the LRT line;
- An assessment of the facilities located along the line of the LRT and measures for their redemption;
- Expected acceptance of limits of government obligations;
- Changes in regulatory legal acts have been initiated for the adoption by local projects of the status of special significance.

The evaluation of technical and financial proposals will be carried out at the second stage.

Discussion of the PPP contract will be held at the second stage.
Thank you for attention