TA RSC-C61011 (VIE):

Ho Chi Minh City Metro Rail System Project, Viet Nam

HCMC MRT:
Strategic Financial Model Update
- Approach & Key Findings

29 April 2009

HPEC Seminar

Objectives of Update / Review Study

- Indicative study
- Review previous estimates affecting MRT financial performance
  - demand & revenue
  - capital cost
  - operating & maintenance costs
- Update the initial financial model
  - Use new parameters
  - Add probability-based risk analysis
  - Test alternative MRT configurations

Outputs:

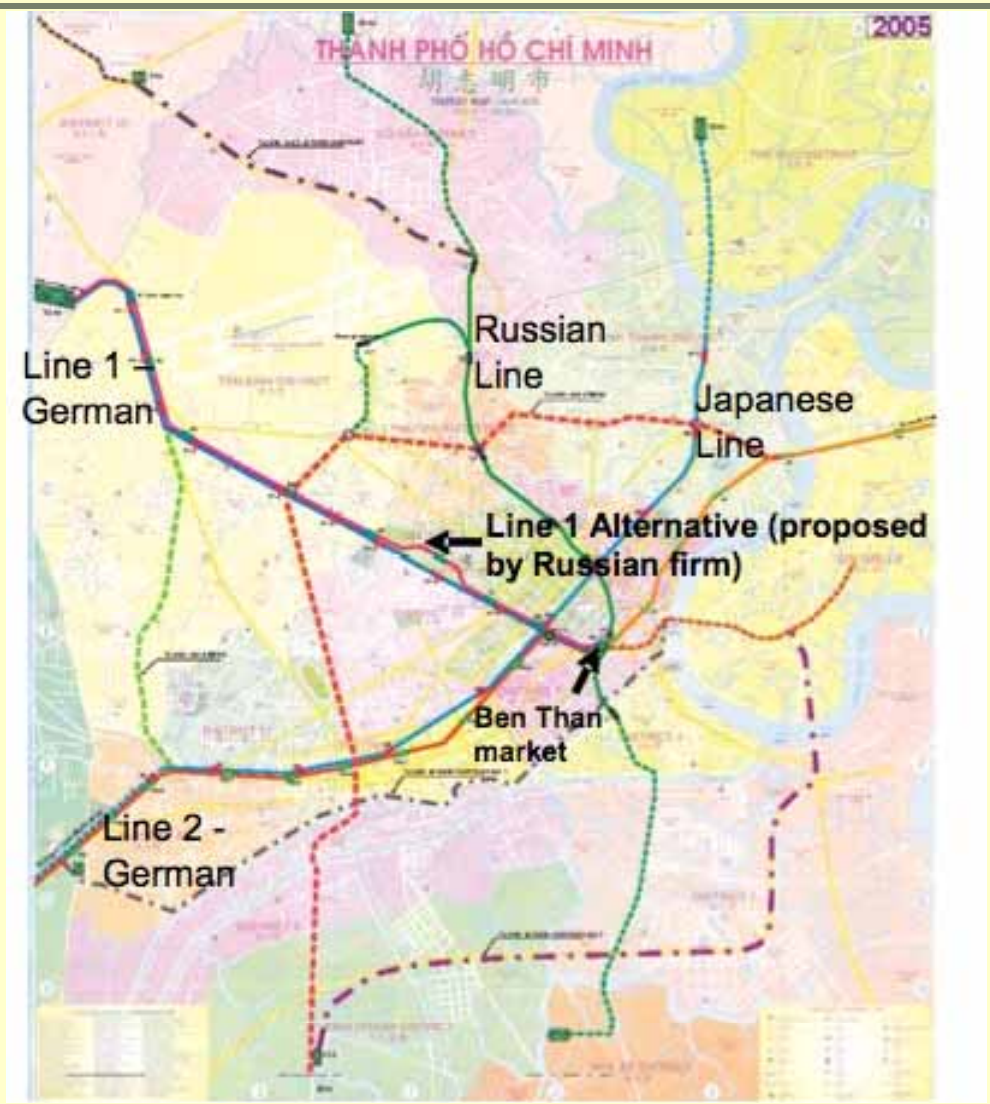
- ***Understanding of robustness of demand & revenue forecasts & risks***
- ***Capital & O&M costs – likely outturn***
- ***Likely whole-of-life financial impact including annual financial support***
- ***Spreadsheet model relating MRT line length & form of construction to demand and financial outturn***

MRT Lines Considered

Line 1:
0.60 km at-grade,
1.13 km elevated and
8.46 km of underground track
(a total of 10.24 km)

Line 2:
5.85 km of elevated line and
4.56 km of underground track
(a total of 10.41 km).

Economic & financial case depends on form of network, type of construction and technology, demand & pricing and policy framework



Conclusions on Review of Demand

- 122,000 boarding/day in 2010, rising to 327,000 in 2020.
- Demand forecasts generally based on reasonable practice
- Ramp up assumptions were optimistic
- Affordability of MRT fares may be better than assumed (eg use graduated fares)
- However, substantial risks are present
  - the absence of any similar MRT project
  - present limited role of public transport,
  - effect of competing modes & dispersed land use
  - government policy on fares
- General issue of uncertainty & optimism bias

Issues for future consideration

Consider the effect of:

- Land use
- Demography
- Competing & complementary modes
- Fare structure & level
- Service frequency & quality
- Station access & quality
- Prominence – underground or at-grade/elevated

Review of Capital Cost

- Previous MRT feasibility studies
  - Are at best carried out to a pre-feasibility stage
  - Designs, if any, are conceptual
  - Based on limited cadastral survey data, geotechnical, hydrological information etc
  - Initial engineering investigation only with limited optimization
- Many choices for design and operation of an MRT system will require review through the PPTA including:
  - Feasibility, method of construction & cost of underground & elevated sections and possible alignment and construction type changes
  - Land acquisition requirements which are likely be in excess of that assumed in the initial studies
  - MRT system needs, eg air-conditioning for underground stations, greater use of escalators for elevated or underground stations, electronic ticketing, etc

Previous Cost Estimates (TEWET)

- Public Sector Investment

Use of Funds / Cash Outflow in Million USD	Year						Total
	-5	-4	-3	-2	-1	0	
Detailed Projekt Design DPD	10,0						10,0
Resettlement	42,3	24,8					67,1
Civil Construction and Tracklaying		148,0	169,2	105,7			422,9
Track Material				17,2			17,2
Building Services	2,5	4,9	9,9	12,4	9,9	9,9	49,4
E&M German Supply	12,0	23,9	47,8	59,8	47,8	47,8	239,0
E&M Austrian Supply		3,9	5,2	6,5	5,2	5,2	25,8
Total Investment Public Sector	**66,7**	**205,6**	**232,0**	**201,5**	**62,8**	**62,8**	**831,4**

- Private Sector Investment

Use of Funds / Cash Outflow in Million USD	Year						Total
	-5	-4	-3	-2	-1	0	
Depot Construction			7,7	11,6			19,3
Depot Equipment			2,3	4,6	4,6	11,5	22,9
Rolling Stock (Part of)		13,8	18,3	22,9	18,3	18,3	91,7
Total Investment Private Sector	**0,0**	**13,8**	**28,4**	**39,1**	**22,9**	**29,8**	**133,9**

- Total: US$ 965 Million *2005 prices*

Revised Indicative Capital Cost Estimate

- Review used data from other recent relevant experience
- It is judged indicatively that the capital cost of the MRT as proposed in TEWET could be about

$1.78 billion, in mid-2006 prices

Comprising:

- $114m for rolling stock ($2m per rail car including stock of spare parts, with TEWET estimate of an initial fleet of 19 three-car trains)
- $70m for resettlement
- $1,589m for fixed infrastructure:
  - $9m for at-grade line ($15m/km)
  - $280m for elevated line ($40m/km)
  - $1,300m for underground line ($100m/km)

Review of Train Needs

- Initial feasibility study used
  - Capacity of 660 passengers per three car train (based on 6 passengers/m^2)
  - Can use an average of 95% of this capacity over the peak hour
  - On balance, not too bad
- Number of trains
  - Previous work indicated 21 three-car trains (including spares) needed to carry 382,000 people (in 2020) along lines with a total length of 19.7 km
  - Bangkok experience suggest 27 trains for equivalent conditions
  - Concluded 24 trains needed initially
- Train use
  - Previous work used 380 km &11.9 hours/operational train/-working weekday
  - Bangkok gets 430 km &14.1 hours/train/working weekday

Review of Operating and Maintenance Costs

- O&M costs reported in the initial feasibility studies were not fully explained
- Review prepared an indicate MRT unit O&M cost model appropriate for planning purposes

	Unit cost for each operating and infrastructure resource(1)					
	Train-hours	**Car- hours**	**Car-km**	**Peak train car(2)**	**Station**	**Line Length(2)**
Resource unit	per train-hour	per car-hour	per car-km	per peak car per year	per station per year	per km of dual track line length per year
Elevated and at-grade	29.00	34.30	1.10	93,000	290,000	2,700
Underground	36.90	34.30	1.10	93,000	764,000(3)	2,700

(1) US$, mid-2006 prices. Total O&M cost is the sum of each resource and unit cost. Based on conditions such as those in Bangkok.
(2) Cost for the first ten years of the life of new infrastructure.
(3) For an airconditioned station. For a non-airconditioned station, it is recommended that a cost of $500,000 per station be used.

Conclusions of O&M Cost Review

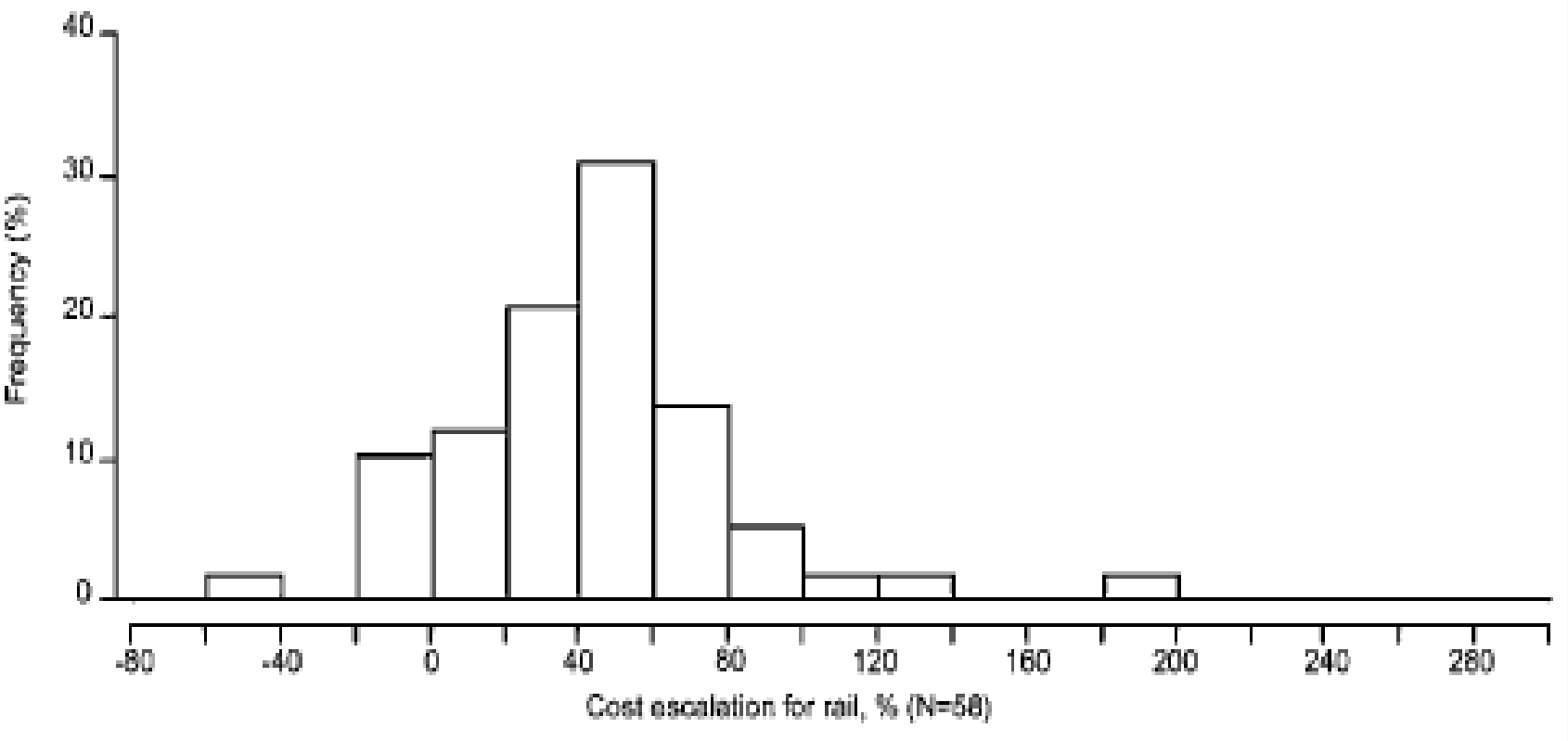
- Need more trains used more intensively than estimated in the previous work
- Average total cost for O&M
  - Previous estimate = $0.91m/train/year
  - Unit cost model above = $1.67m/train/year
  - Recent study for UMRT Line 1 = $1.09m/train/year
  - Using UMRT costs for Line 1&2 conditions = $1.28m/train/year
- Suggests costs in HCMC likely to be less than for Bangkok

Uncertainty

- All inputs to the cost and revenue for the MRT are estimates
- How confident can we be about the estimates?
- The Review used a probability-based approach to consider the effects of uncertainty

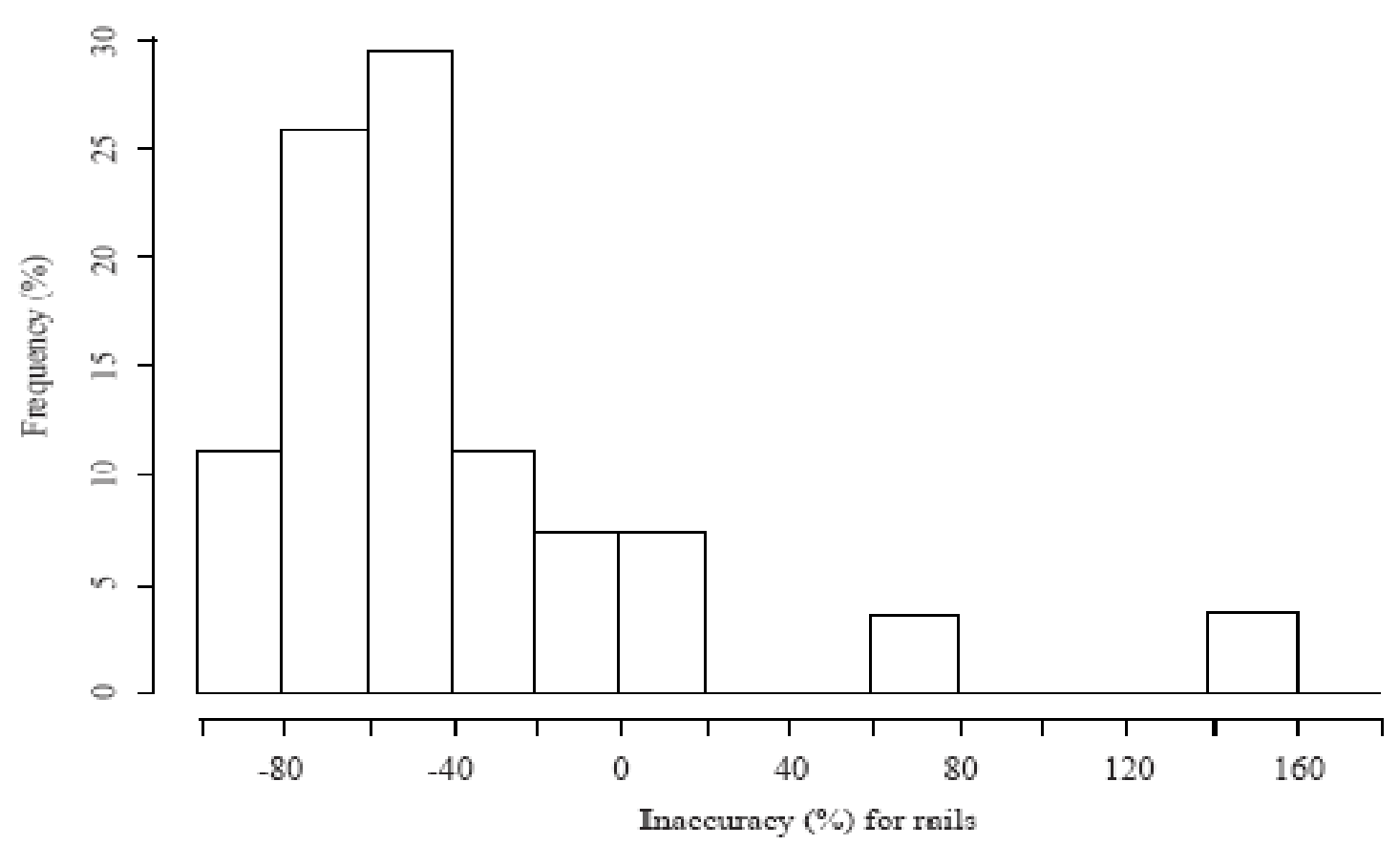
Uncertainty - Capital Costs

International review of 58 rail projects –
on average, the cost of rail projects was 45% higher than the estimate of cost on which the decision was made



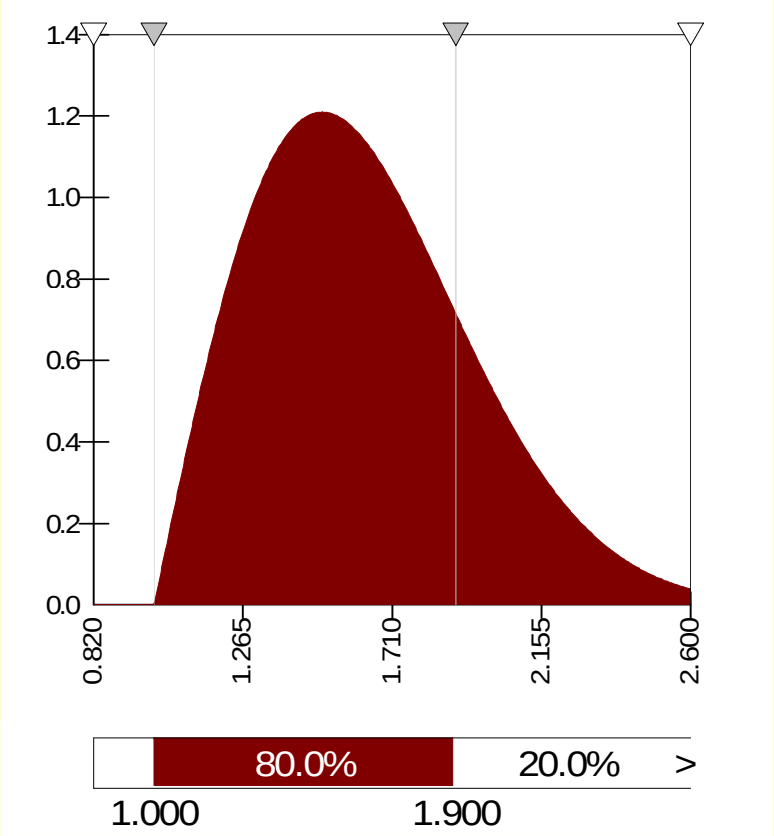
Uncertainty - Patronage

International review of demand for 27 rail projects – on average, demand in the first year was 49% of the forecast for that year



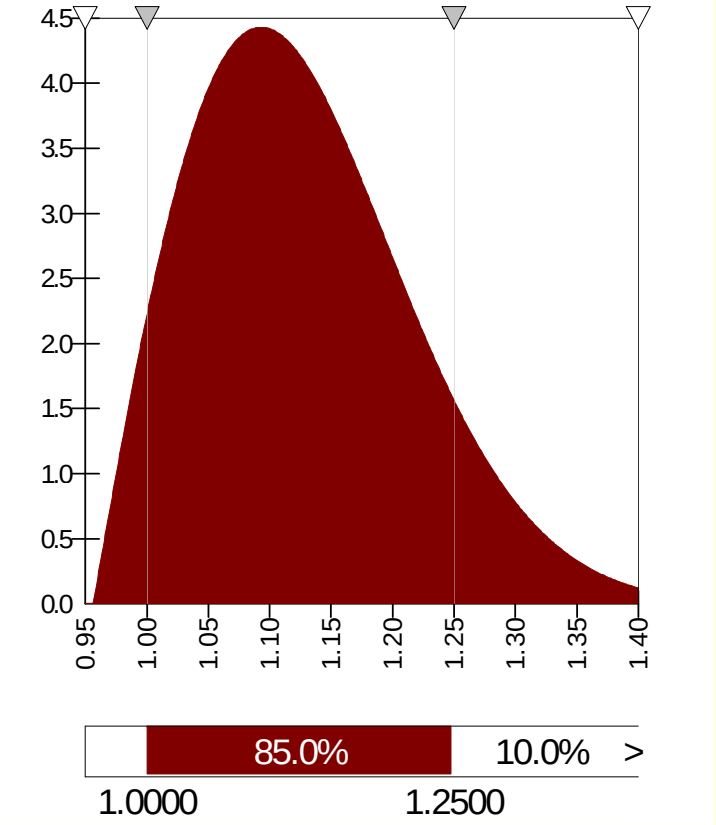
Potential Distribution of Capital Costs

TEWET cost estimate



1.00 = best estimate

Revised cost estimate



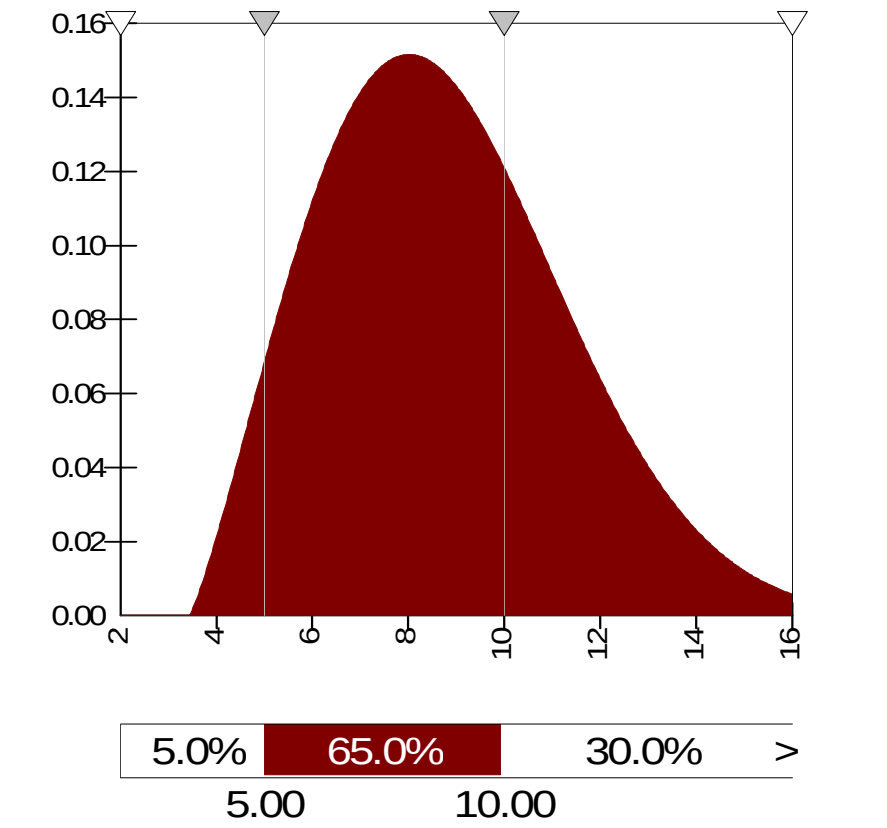
5% chance < best estimate

10% chance > 1.25 times best estimate

Potential Range for MRT Patronage

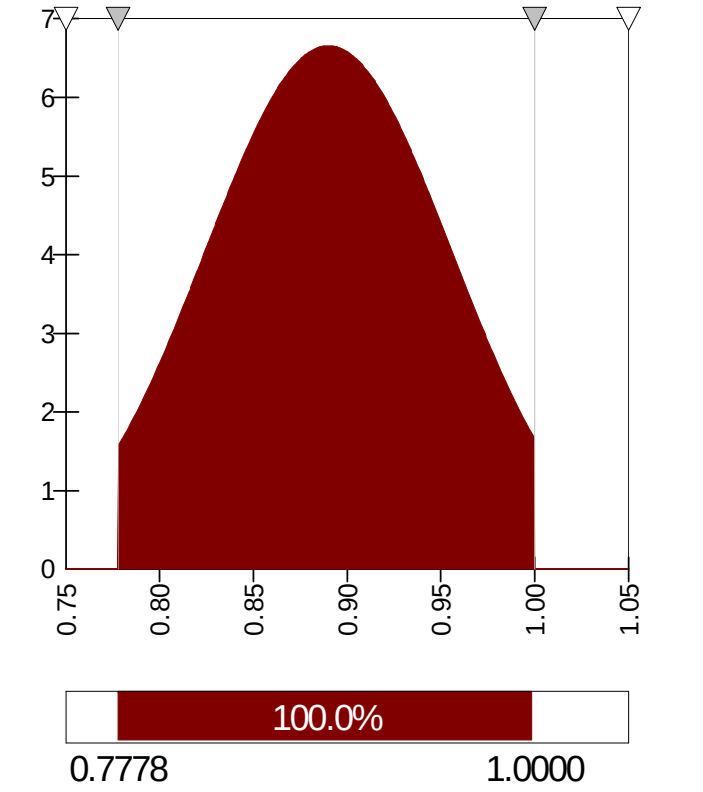
- Previous estimate taken to be P_{70} – a 70% chance that the actual patronage will be at or below this estimate
- 5% chance that demand could be less than half the best estimate (compared with 37% for past experience)
- 5% chance that demand could be more than one-third higher than the best estimate

10.0 = best estimate



Potential Range of Train Fleet and O&M Costs

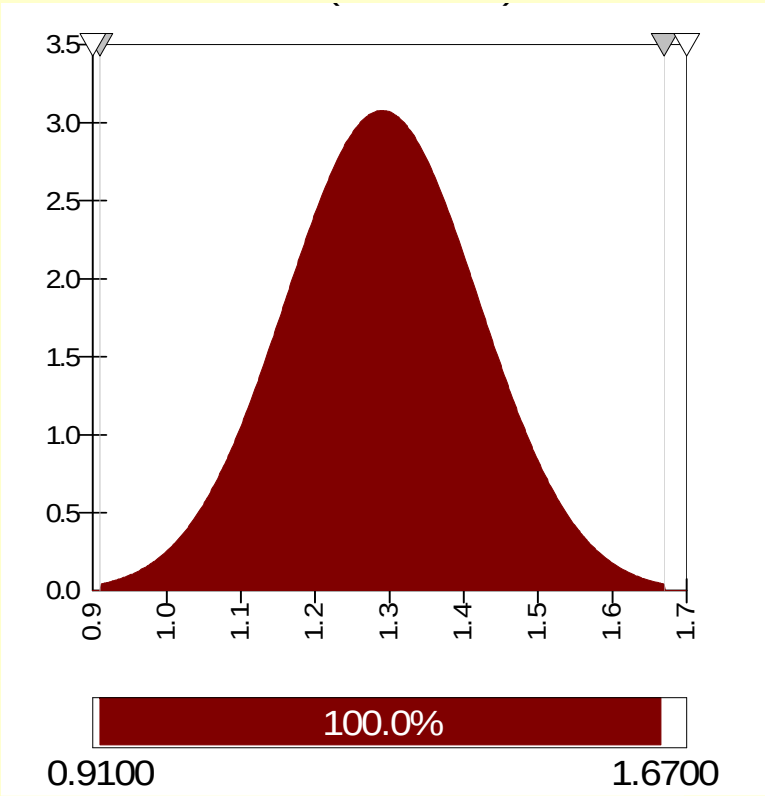
Train fleet



1.0 = Review estimate

0.78 = TEWET estimate

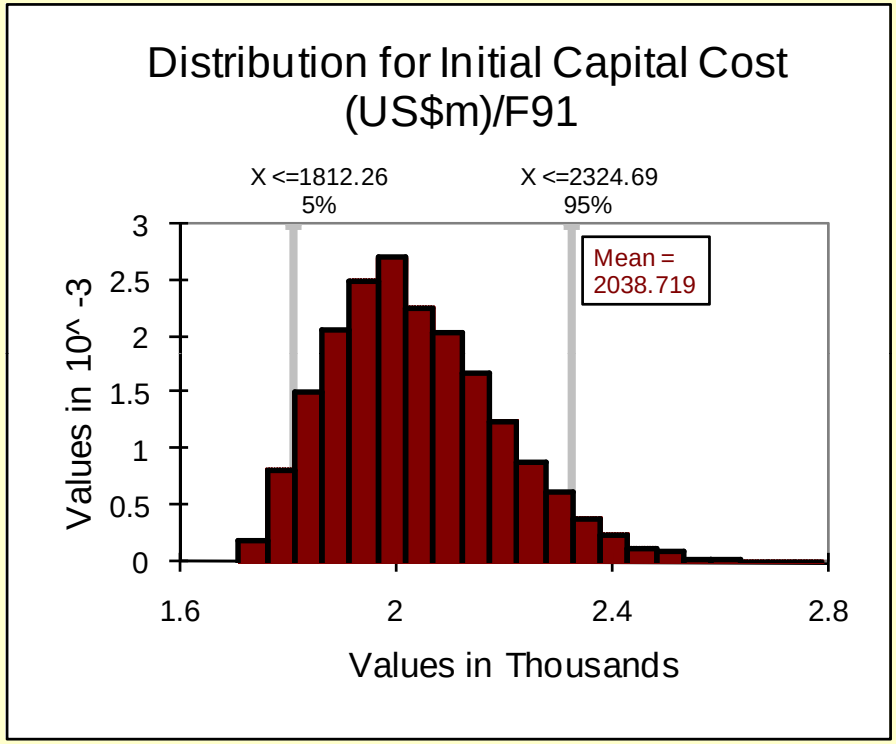
O&M costs

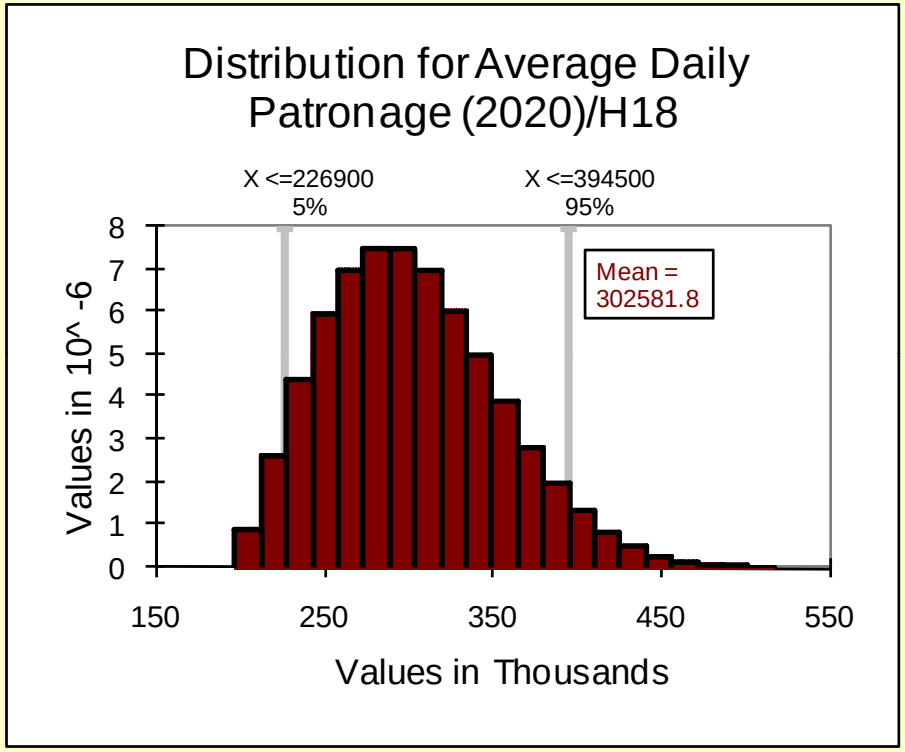


$m/year

Range: TEWET estimate to Review estimate

Resulting Cost and Patronage Estimates

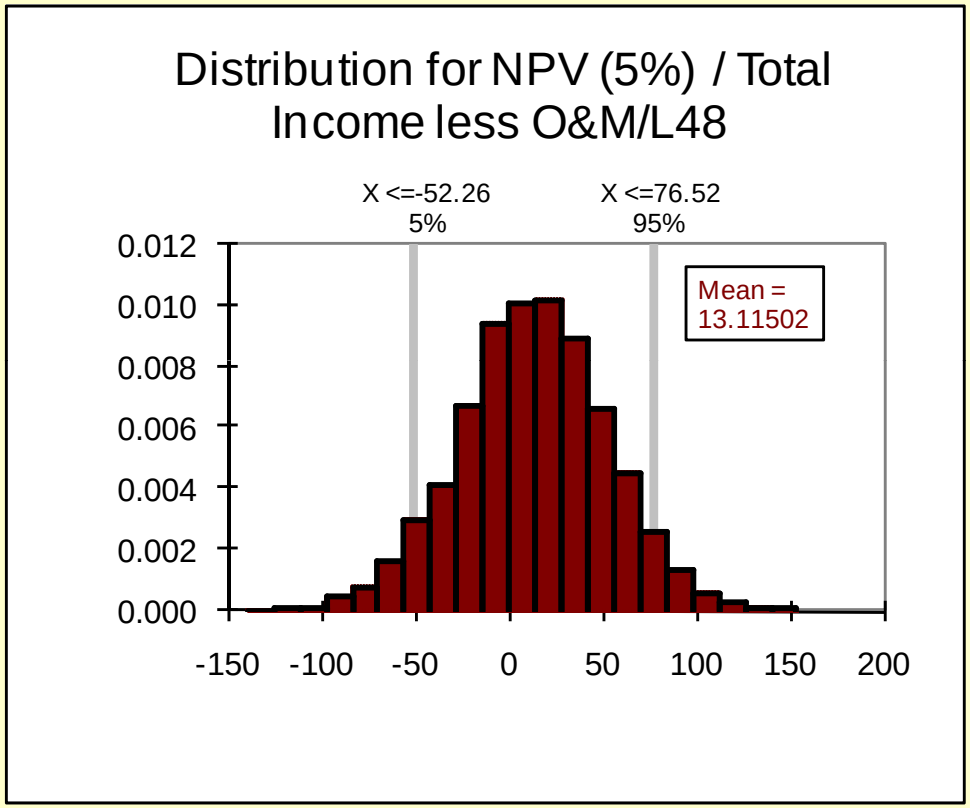




Lines 1 and 2

Results of the Risk Analysis

- a definite need for the government to finance fixed infrastructure from its own sources,
- an almost certain need to finance rollingstock from its own sources, and
- a 35% probability that it will also need to subsidize MRT operations on an on-going basis.



Conclusions of the Review

- Previous studies were at best pre-feasibility studies
- A project of similar extent & likely similar demand could likely be built within the defined project limit
- Demand forecasting carried out to date is considered of reasonable quality but there are several risks:
  - the absence of any similar MRT project in HCMC
  - the present limited role of public transport
  - the effect of competing modes and dispersed land use
  - government policy on fares
- The project is likely to require a high government subsidy
- Two key future needs:
  - Estimate patronage & costs with a higher level of confidence
  - Identify ways to reduce the cost of the project with the least detrimental impact on patronage

Some Suggested Objectives for MRT in HCMC

- User convenience with safety – this needs
  - Physically integrated system so that people can use combinations of lines to reach more destinations
  - Common ticketing so that people do not need a different ticket for each line
  - Integrated fares so that people are not penalized if they transfer between lines used by different concessionaires
  - Inclusion of other modes
  - Safety and security regulation
- Value for money to the government – this needs
  - Review of options for financing capital costs
  - Competitive tendering with contestable market and several operators
  - Transfer of appropriate risk to concessionaire
- Policy flexibility for government – this needs
  - Ability for government to implement changes in the future as needed to meet the public interest