DEMONSTRATOR MEXICUS 120 MEGATON CLASS - TRANSOCEANIC (transoceanic.us) COSTS

(Interactive file - inputs in green cells)

SUMMARY

THIS IS A DEMONSTRATION PROJECT PROPOSAL TO BRING MEXICAN RIVER WATER TO NW MEXICO AND TO EXCHANGE WATER RIGHTS AND/OR TO PIPELINE THE WATER WITH/TO THE US.

Source rivers (multiple; chose one or more):	**Pacific Mexican Rivers discharging between Yaqui and San Lorenzo Rivers**
Deliveries place (with partial price of pipeline canals included):	**El Golfo de Santa Clara, or San Felipe, or Puerto Peñasco (preferred), Mexico, then equivalent to Mexico's Colorado Water Rights are exchanged with Lower and Upper Colorado River Basin states. Pipelines can be built for direct water import to the US Lower Colorado Basin, but are costly.**
Average rivers' flow (mil cubic meter per year)	16,538
Average rivers' flow (cubic meter per second)	524
Required flow (cubic meter per second)	4
Delivered water (cubic meter per year)	125,000,000
Delivered water, AFY	101,339
Delivered water cost with water price-at-source included (US$ per cubic meter)	0.1238
Delivered water cost with water price-at-source included (US$ per AF)	153
CAPEX (US$)	$ 141,931,266

The water price-at-source can be covered by deliveries of water to Mexico's points of landing and their surroundings.

DELIVERY

PROJECT PRESENTATION

Supply station(s)	**Pacific Mexican Rivers discharging between Yaqui and San Lorenzo Rivers**
Delivery station	**El Golfo de Santa Clara, or San Felipe, or Puerto Peñasco (preferred), Mexico, then equivalent to Mexico's Colorado Water Rights are exchanged with Lower and Upper Colorado River Basin states. Pipelines can be built for direct water import to the US Lower Colorado Basin, but are costly.**
Submersible Travel, one way, km	**800**

CONSTANTS AND TRANSFORMATIONS

cubic meters for one acre ft	1233.48

meters for one ft	0.3048
Sea water density is (kg/cubic meter)	1028
Pi value	3.14159
Kilometers in one mile	1.60934

SUBMERSIBLE TRANSPORTER DESIGN

Radius, meters	20
Radius, ft	66
L/(2R) RATIO	7
Equivalent submersible length, m	280
Submersible Section, square meters	1257
Submersible surface (cylinder, considered closed by hemispheres)	40212
volume (cylindrical length), cubic meters	351,858
volume, acre-ft	285.26

STRUCTURE

Relative density of concrete	2.4
ballasting required (on cylindrical part), kg/square meters	280
thickness of concrete wall, m	0.204
Volume of concrete required, cubic meters	8207
Volume of concrete required, cubic yards	10734
Weight of concrete structure, metric tonnes	19696
Chamber thickness (average), meters	0.28
Total hull thickeness (average), meters	0.48

STRESSES

Max tangent force, Newton/linear meter (for reference only)	164,808
Max tangent force, metric tonne force/linear meter (for reference only)	16.80

HYDRODYNAMICS

cx (drag coefficient referred to the radial section)	0.1
speed v, m/s	2.5
speed km/h	9
Drag force, Newton	403,694

Drag force, metric tonne force		41.15
Power required for cruising (w)		1,009,236
Power for cruising, Mw		1.009

POWER AND ENGINE

Hydrodynamic efficiency		0.7
Required Engine power, Mw		1.442
Engine reserve, %		20%
Total Engine Installed Power		1.730

FIXED COSTS

SUBMERSIBLE COST

Unit Concrete price, $/cubic meter		70.00
Unit cost of armature, $/cubic meter		60.00
Unit cost of work, $/cubic meter		120.00
Total unit price of concrete, $/cubic meter		250.00
Cost of concrete for submersible, $	$	2,051,651

PROPULSOR COSTS

Cost of propulsion $/Mw		500,000
Total cost of propulsion	$	865,059

WATER BAGS, WATER CONNECTOR, INSTRUMENTATION, COMMAND AND CONTROL (ICC) +MISCELLANEOUS	$	1,025,825
Complexity Factor		3.00
Total cost of one submersible	$	**11,827,605**

COST OF FIRST ARTICLE (1 X BOAT + LOAD/UNLOAD STATIONS at 150% over average costs)	$	**53,224,225**

VARIABLE COSTS (FUEL)

FUEL COST PER HOUR

Fuel Consumption, kg/kWh		0.165
Fuel cost (LNG), $/kg		0.2000
Cost of fuel per hour (at required power) $/hour		48

TRIP COMPUTATION

Distance, one way, km		**800**
Distance, one way, miles		497
Stationing, days at each station		1
Cruise time, round trip, hours		177.78
Cruise time, round trip, days		7.41
Total travel time, hours		226
Total travel time, days		9.41
Fuel cost per trip (stationary at full consumption per hour), $	$	10,742
Submersible life (years)		30
Amortization of submersible (30 year life) $/hour		54.01
Cost of submersible per trip	$	12,194
Net cost per trip (submersible+fuel)	$	22,936
Net transport cost $/acre-ft		80.40
Cost of O+M/R+R and other costs (% of net cost)		50%
Brut cost per trip, $		29033
Brut transport cost $/acre-ft		**101.78**
Brut transport cost $/cu meter		**0.0825**

TRANSPORTATION SYSTEM CONFIGURATION AND COST

Transported water, cubic meter / year		**125,000,000**
Transported water, acre-ft per year		**101,339**
Transporter capability per boat, trips/year		38.799
Transporter capability per boat, mil cubic m/year		13.65
Total project transport capability, acre-ft/year		11,068
Project trnsport capability acre-ft/year		110,677
Required number of transporters		**10**
Cost of transporters (boats)	$	118,276,055
Cost of two teminal stations (each equal to one submersible transporter cost)	$	23,655,211
Total cost of transportation system	$	141,931,266
Additional cost for 150 km of onshore pipeline/canals		525,000,000
Energy cost for transfer of water should be added		

PARAMETERS

Transportation pressure drop equivalent, meters		187
Transportation pressure drop equivalent, ft		614

Water flow at stations for continuous filling/emptying, cubic m/sec		3.96
Transportation system capability (acre-ft/yr)		110,677
Cost of O+M/R+R and other costs, $	$	4,074,045
Unit cost of water at purchase ($/cubic meter)		0
Total cost of water, $/year		-
Markup (water)		0%
Water sale markup, $/year (includes G&A)		-
The total cost of water transportation, $/year		**10,314,029**
Unit cost of water at transportation, $ / cubic meter		**0.0825**
Unit cost of water, delivered, $ / acre-ft		**101.78**
Price for transported water with exchanged and water rights included (+50%) $ / cubic meter		**0.1238**
Cost for transported water with exchanged and water rights included (+50%) $/AF		**152.67**

29.32150667

123348000

0.7927448

136,518,164.50