SEA WAVE ENERGY

Developed By M/s SDE (Pvt) Ltd Of Israel

Patent Registered In USA And Israel

Technology Available From SDE Or From Third Country Like China

CONCEPT

Maximum Wave Energy Prevails At Point Of Impact Of Waves Against A Breakwater or Steep Coast Line(Depth 5M Or More)

Force Of Impact And Resulting Water Flows Can Be Harvested By Specially Designed Buoys Installed Along Breakwater

Hydraulic Pressure Generated In Rams Attached To Buoys

Hydraulic Pressure Is Accumulated At Central Location

Hydraulic Motor Runs Generator To Produce Power

System Being Modular Can be Up Scaled to Any Level

ENERGY LEVELS

Wave Size	**1/2 M Upwards**
Plant Efficiency	**90%**
Wave Frequency	**75%**
Generation Factor	**67 ½ % (Avge 60%)**
100 KW	**4 M Wide Buoy**
One MW	**10 Buoys (50 M) Front**
30 MW(SR)	**1.5 KM Breakwater**
100 MW(SR)	**Manora & Clifton BWs**

DEVELOPMENT

Development Work Started Around Mid 1990s

Ten Prototype Models Have Been Built & Tested

One Model Was Operational At Jaffa And Open To Visits

Another Model Destined For China Under Factory Tests/Trials In Israel

One 150 KwH Pilot Project Operational In China And A Visit May Be Possible.

Two More Pilot Projects Of One MW Each Coming Up In Different Parts Of China

After Due Tests/Trials There Are Plans To Develop 10,000 MW Of Sea Wave Energy In China

BUSINESS MODELS

- Sale Of Power Plants
- Sale Of Electricity
- Sale Of Both Power Plants And Electricity
- Joint Ventures
- Full Consultancy Service:
  - **Construction**
  - **Feasibility Tests**
  - **Site Surveying**
  - **Project Planning**
  - **Training Of Local Staff.**

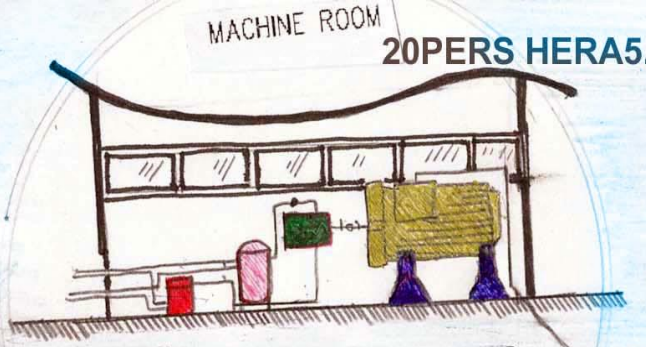
SDE

SEA WAVE POWER PLANTS

S.D.E. LTD.

SELLING POWER PLANTS FROM SEA WAVES

20PERS HERA5.05



Section

COMPETITIVE ANALYSIS

General Characteristics	SDE Energy	OSPREY Wavegen	Pelamis wave dragon	Aquamarine Power
Utilization	High 15Kw\1 meter	Low 1Kw\1 meter	Relatively low 5Kw\1 meter	Relatively low
Production Cost	The lowest 2-6 cents\1Kw	12 cents\1Kw	High	High
Maintenance Cost	Low	Low	High	High
Stability	Relatively High	Relatively High	Relatively low	Relatively low
Desalination option	Available	N\A	N\A	N\A

PROJECT SIZE AND COST

Power Requirement	**30 MW**
Installed Capacity	**50 MW**
Average Delivered Power	**30 MW(60%)**
Equipment Cost/MW	**US$ 0.8 Mn**
Allied Expenses/MW	**US$ 0.5 Mn**
Project Cost/MW	**US$ 1.3 Mn**
50 MW Project Cost	**US$ 65.0 Mn**
O&M Cost	**4-6 Cents/KwH**
Completion Time	**30 Months**

PROJECT OPTIONS

BOO:KDWP Buys Power For 25 Yrs
- Levelized(Fixed) Rate Of: 15 Cents/KwH
- Increasing@ 1C/KwH/Year : 10 Cents/KwH

BOOT: Client Buys Power For 15 Yrs@18 Cents/KwH And Then Takes Over The Plant And Runs It At Its Own

JV: Client Invests 25% Of Project Cost($ 16.0 Mn) As Equity And Becomes 40% Share Holder In The Project

COST BENEFITS

Based On Installed Capacity Of 30 MW And Average Delivered Out Put Of 18 MW
Units Generated Daily:30,000X24=720,000
Units Generated Yearly: X365= 262.8 Mn

BOO: KDWP Will Accrue Net Savings Of 10Cents/KwH At Least Which Comes To:

- Yearly Savings: 262.8X10/100=$ 26.8 Mn

- Savings In 25 Years=26.8X25=$ 670 Mn

COST BENEFITS

BOOT: KDWP Will Accrue Savings As:

- First 10 @7C=2.628X7X10= $ 183.96 Mn

- Next 5 Yrs@10C=2.628X10X5= $ 134.4 Mn

- Next 10 Yrs@20C=2.628X20X10= $ 525.6 Mn

- Total Savings For 25 Years= $ 843.96 Mn

COST BENEFITS

JV: KDWP Against Investment of $ 10 Mn Will Own 40% Shares And Accrue Savings As:

- For 25 Yrs@10C= 26.28X25=$ 670.00 Mn

- For 25 Yrs 40% Share@4C=262.80 Mn

- Total Savings For 25 Years= $ 932.8 Mn

C.B. AT A GLANCE

BOO: No Investment And Risks

- **Provide BWs And Land For Plant**
- **Provide LOI And Assured PPA**
- **Facilitate Site Survey Etc**
- **Total Savings In 25 Years: $ 670.00 Mn**

BOOT: Same As For BOO

- **Total Savings In 25 Years: $ 843.96 Mn**

JV: Investment Of $ 10.0 Mn

- **Total Savings In 25 Years: $ 932.80 $ Mn**

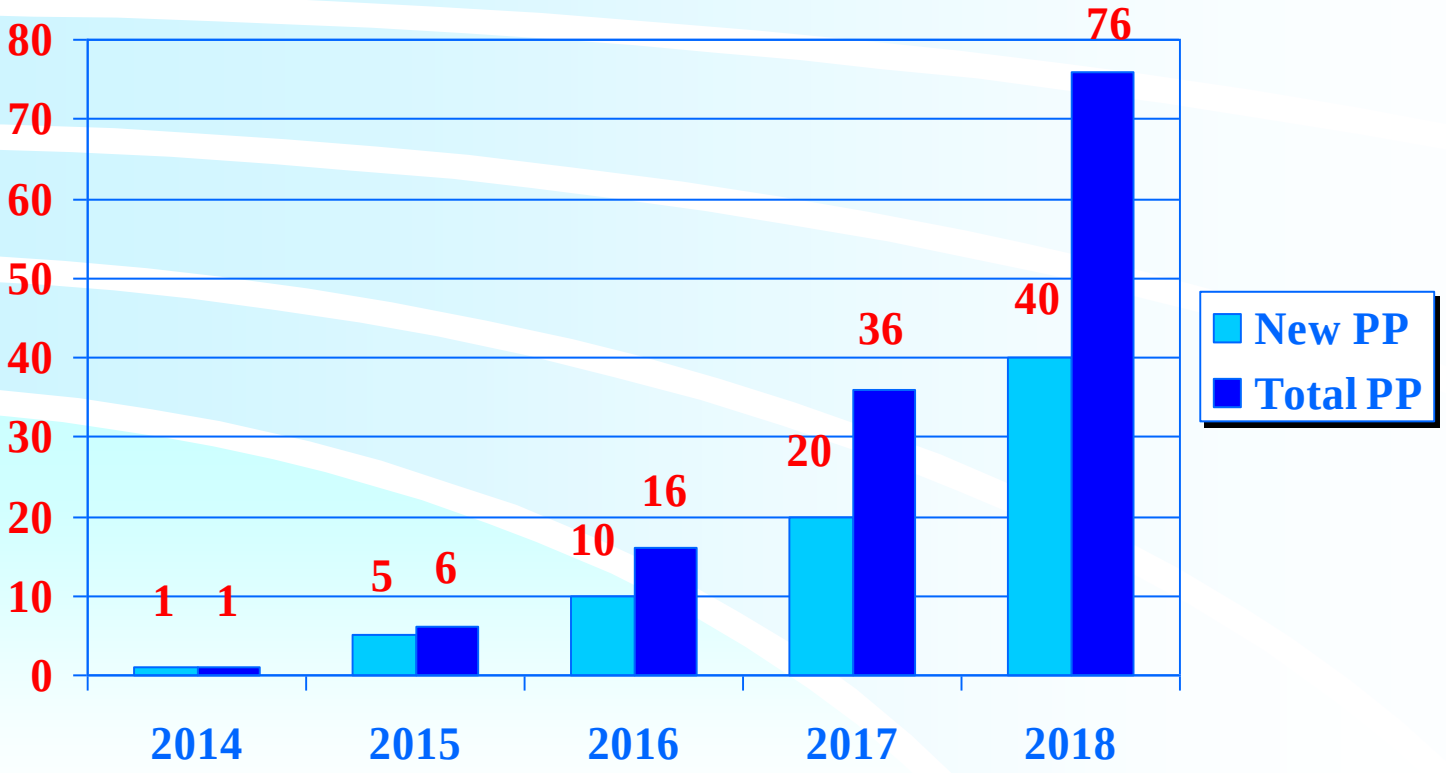
PROJECT REALIZATION

- KDWP Issues LOI To PTP For A 50 MW Wave Energy Project
- KDWP Gets NOC From KPT For Use Of Manora And Clifton Breakwaters For Wave Energy Project For 50 Years Till 2065
- PTP Gets Feasibility Study Done And Proposes Best Site For 50 MW Project
-KDWP Signs PPA With PTP For 50 MW Project For 25 Years (Dedicated To Power Needs Of KDWP)
- KDWP Provides Land In Manora And Clifton For Power Houses

PROJECT REALIZATION

- PTP Implements One MW Pilot Project In 6 Months(If Required By KDWP) Followed By 50 MW Main Project In 30 Months
- KDWP Will Guarantee Payments Under PPA As Power Comes On Line Progressively.
- KDWP Will Arrange Power Transmission Line From Power House Onward
- PTP Completes 50 MW For KDWP First And Will Continue To Expand It Till Full Potential Of Both Breakwaters is Utilized.
- Excess Power Will Be Sold To KDWP, KPT Or KESC Or To Other Interested Parties.

DEVELOPMENT PLAN FOR 100 MW POWER PLANT



Thanks for Your Time

Power Tube Pakistan
C-13/II
Navy Housing Scheme,
Zamzama, Karachi, Pakistan
Cell 0092 315 5521343
Tel 0092 21 35821633
www.powertubepakistan.com