Solar Magnetic Plunger Pump
SMPP
A game changer in rural water supply

January 2020
Who we are

**Comet-ME** - NGO with 10 Yrs of hands-on in developing renewable-energy and clean water-provision projects for off-grid communities, providing services to ~8,000 Palestinians

The SMPP - developed during the last 4 years in Israel, by a team of hi-tech veterans from around the globe. Scalable for irrigation and drinking water in the developing world

A for-profit company will be established in 2020 for productization and growth
The Team

ELAD ORIAN
GM
A decade of field experience. MA in Physics & MA in Environmental Science, Policy & Management

NOAM DOTAN
Technical & Project Manager
30 Years at the forefront of the Israeli hi-tech industry. MA in Physics

RYAN BRAND
Mechanical Eng.
Track record in both the solar industry and the car racing industry. MA in Mechatronics

JUSTUS HOFFSTAEDT
Electro-Mechanical Eng.
MA in Mechatronics. Expertise in Solar Energy

GAL LIOR
Electronics Eng.
Expert in motion control

AVI SIMON
Business Development
P&L units, CMO, R&D @ Applied Materials, HP, ElOp
The Need and the Problem

Access to Water
One of the most acute issues facing impoverished off-grid rural communities

500 Million smallholder farmers
Only a fraction has irrigation = major barrier to economic growth & food security

Scaling
Solar pumps contribute to many SDGs: zero poverty & hunger, gender equality, and more

Current Products
Expensive and difficult to maintain, driving ROI to prohibitive levels for smallholder farmers

There is not a single solar pump in the market specifically tailored for smallholder farmers
Our solution: The SMPP

Reviews with all stakeholders in the field

From-scratch, clean-sheet design

SMPP - tailored in every respect for smallholder farmers (Patent Pending)

Best performance @ the lowest cost of ownership

The SMPP facilitates fast ROI, to become a game-changer in rural water services

A short video on the SMPP can be seen here.
Innovative robust design

Traditional single action piston pumps with cam shaft gear

No Gear, No rod, Fits 4” borehole

Double action piston pumps

Double action plunger pump driven by a linear electromagnetic motor
SMPP Specifications

- Shallow aquifer pumping - head range of 10-45 m.
- Daily capacity of up to 30 cubic meters, sufficient for irrigating 1 hectare/providing water for a village.
- Diameter: 90 mm (fits in 4” borehole).
- Low solar power pumping capabilities.
- Monitoring includes flow data for PAYG, as well as I/Os for soil moisture and other sensors.
SMPP competitive advantages

Advantage by specs & features:
Flow and head range tailored to smallholder farmers

Advantage by Design Concept:
- Slow-moving piston = immunity to sand, vs premature wear of high speed pumps
- Single moving part design = Reliability + field serviceability = Longest life cycle
- Operate at lower solar conditions vs high RPM pumps = more water per day
- 1/2 market price + lowest CoO + lowest cost / m³ = affordable for < 2$ p.p.p farmers

Proven advantage by tests:
- Sand concentration > 250 gr/m³ = X5 that of the leading players
- Performance as planned, best in market – see comparison tables

There is no such a pump in the market
## Competitive analysis (based on brochures)

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Model</th>
<th>Operating principle</th>
<th>Cost of pump ($)</th>
<th>Maint' Cost ($/year)</th>
<th>Additional Cost per 15 years</th>
<th>Notes:</th>
<th>Life Yrs</th>
<th>Rated power (W)</th>
<th>Flow rate at 30 m head - lpm</th>
<th>Sun hours</th>
<th>Capacity over 15 Yrs (cubic M)</th>
<th>Cost per cubic M over 15 Yrs</th>
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<tbody>
<tr>
<td>Comet-ME</td>
<td>SMPP</td>
<td>Double action Plunger</td>
<td>$1,250</td>
<td>$0</td>
<td>$650</td>
<td>7.5 Yrs motor life (field replaceable)</td>
<td>7.5</td>
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<td>45</td>
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<td>Grundfos #1 in Pumps</td>
<td>11 SQF-2</td>
<td>Helical</td>
<td>$2,200</td>
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<td>$2,200</td>
<td>7.5 Yrs life of Motor/pump</td>
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<td>Lorentz #1, Solar Pumps</td>
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<td>7.5 Yrs life of Motor/pump</td>
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<td>Sun Culture</td>
<td>Rain Maker 25</td>
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<td>$500</td>
<td>$0</td>
<td>$2,000</td>
<td>3 Yrs life of Motor/pump</td>
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<td>5 Yrs life of Motor/pump</td>
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<td>Aquatec</td>
<td>SWP-6000</td>
<td>Diaphragm</td>
<td>$695</td>
<td>$25</td>
<td>$3,725</td>
<td>5 Yrs motor, repl' seals, valves, brush every 2 Yrs</td>
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<td>Fuel Pumps *</td>
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<td>$500</td>
<td>$150</td>
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<td>3 years life time</td>
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<td>45</td>
<td>4</td>
<td>4</td>
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**SMPP X3 to X9 better**
Global LEAP – 2019 comparison

There is no pump that matches the flow rate and efficiency of the SMPP at all pump head range.

<table>
<thead>
<tr>
<th>Pump Brand, country, name</th>
<th>Tested Head</th>
<th>Tested Solar power</th>
<th>Pump type</th>
<th>Price index no PV</th>
<th>Daily capacity cubic m</th>
<th>Hrs of Ops</th>
<th>Price Score</th>
<th>Figure of merit</th>
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<tr>
<td><strong>Submersible pump - low head, low flow</strong></td>
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<td></td>
<td></td>
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<td>Bengal - India, 3DPC3.5-95-48-750</td>
<td>10</td>
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<td>Centrifugal</td>
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<td>31.4</td>
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<td>Azuri - UK, PS2-100 AHRP-23S</td>
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<td>16.2</td>
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<td>30.2</td>
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<td><strong>Submersible pump - medium head, low flow</strong></td>
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<td>SunCulture - China, RainMaker2S</td>
<td>30</td>
<td>600</td>
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<td>SMPP Comet-ME</td>
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<td>400</td>
<td>SMPP</td>
<td>$$</td>
<td>26.4</td>
<td>8</td>
<td>2</td>
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<td>SMPP Comet-ME</td>
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<td>SMPP Comet-ME</td>
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<td>600</td>
<td>SMPP</td>
<td>$$</td>
<td>20.6</td>
<td>8</td>
<td>2</td>
<td>6.867</td>
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</tbody>
</table>

**Figure of Merit** = \( \text{Head} \times \text{daily capacity/Power} \times 10 \)

(SMPP = X 2-3 better than all other pumps in head-flow range)

Note: that the daily capacity by itself has a direct effect on the ROI.
Status

Business

- **MOUs for Pilots:** ● Arieli – Ghana ● FuturePump – UK pump supplier
- **Visited in Kenya:** ● Davis & Shirtliff – big distr. ● and many holistic agri-businesses
- **Established stakeholders’ network:** (iDE, WaterMission, Water4, GIZ, E4A, GIF)
- **Visited in Ethiopia:** invited by Tikun Olam Venture ● Plans with JDC for local Pilot
- **Demo Center:** planned at Netafim, the WW leading irrigation company

Technical

- Eng. models tested for 18 mo., performs to Spec
- Check valve tested by experts (Infinity, Canada)
- Life cycle tests of piston seals and bearings are continuously performed, with excellent results

Funding

- For last 4 years by Osprey Foundation and Comet-ME
- Israel Innovation Authority - final approval stage + $-match by Comet
Global Smallholders Market
500,000,000 units

E4A 2030 estimate:
4,900,000 units

$15.6 Billion

2019 Market:
168,000 units
$500 Million

Market Sizing

SMPP Addressable Market

<table>
<thead>
<tr>
<th></th>
<th>2020</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-Units</td>
<td>$ M</td>
<td>$ M</td>
</tr>
<tr>
<td>0.04</td>
<td>125</td>
<td>4,900</td>
</tr>
<tr>
<td>10</td>
<td>10,000</td>
<td>TBD</td>
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</table>

+ Fuel Pumps Replacement
Go To Market

Pilots

- Run Pilots prior to sale in every region for presence and PR
- Start in Ethiopia by JDC, after thorough Alpha tests

1 500 M Smallholder Farmers

Initially only via agribusiness capable of providing all needs - from awareness & training to inputs & financing

2 Replace Fuel Pumps

"Low-hanging". Sales via distributors: awareness is there ● investment is lower ● financial benefits are clear

3 Africa 1st

Untapped market – scarce solar pumps coverage. Start in Ethiopia as the Government is tuned towards solar irrigation

4 India 2nd

Established market, entrenched local suppliers. Approach once regulations change to promote drip irrigation over flood irrigation
Pump Company
- Sales & Marketing
- Technical HUB and support
- Adaptation of pump & irrigation system to local supply and needs.
- Finance support
- International network

Sales Cycle
- Marketing – Country Level
- Recruit & backup Local Distributors
- Local Vendors (PV, piping...)
- Local adaptation of pump / irrigation
- Demo and Training Centre
- Gov. grants and subsidies
- Finance network and PAYG schemes
- DB and Monitoring

HUB – Regional/Country
Supporting the country level echo system
- Active Marketing, Demos
- Coordinate Financing plans for farmers
- Training and Knowledge
- Sales, Project Management
- Coordinate borehole drilling
- Installation of pumps/irrigation
- Coordinate input providers
- Service in the field, PM

Increase Farmer production & profit
Allowing for shortest ROI

Local “Last Mile” Distributor
Part of the field level echo system

2/3/2020
Milestones

- **1st Pilot Agr.**
- Define Pilot Hub
- IIA Grant

- **Low-Cost transition**
- Arieli Distr. Agr. Ghana
- Round A

- **“0” series Beta in Ethiopia**
- 1st Sale in Kenya
- Round B

- **Pilots in India**
- Distr. Agr. India

**2020 Q1**
- Complete Alpha
- 1st Ethiopia Pilot
- Demo at Netafim

**2020 Q3**
- 1st Pilot Agr.

**2020 Q4**
- Define Pilot Hub
- IIA Grant

**2021 Q2**
- Low-Cost transition
- Arieli Distr. Agr. Ghana
- Round A

**2021 Q4**
- “0” series Beta in Ethiopia
- 1st Sale in Kenya
- Round B

**2021 Q3**
- “0” Series Regulation
- Limited batch sales Ethiopia
- Demo Centers in Kenya & Ghana

**2022 Q2**
- Pilots in India
- Distr. Agr. India

- Fuel Pumps Pilot
- Start 2nd Pump Dev.
Financial Projections

Funding needs:

a. For R&D and pre-market activity: $1.5M by Q3 2020
b. For market penetration: $3.5M by Q1 2021
c. For sales infrastructure, break even and growth: $5.0M by Q1 2022

Revenue
(unit sale = $1K)

<table>
<thead>
<tr>
<th></th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>revenue</td>
<td>$100,000</td>
<td>$1,000,000</td>
<td>$7,000,000</td>
<td>$25,000,000</td>
</tr>
<tr>
<td>Break Even</td>
<td>$25,000,000</td>
<td>$45,000,000</td>
<td></td>
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<tr>
<td>+ Indian Market</td>
<td>+ High Head Pump</td>
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</table>
Use of Proceeds of $1.5M

<table>
<thead>
<tr>
<th>Expense Activity</th>
<th>USD</th>
<th>Expense Category</th>
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<tbody>
<tr>
<td>Integration (Pump, control, monitoring, PAYG)</td>
<td>500,000</td>
<td>800,000</td>
</tr>
<tr>
<td>Low cost technology transition and tests</td>
<td>300,000</td>
<td>250,000</td>
</tr>
<tr>
<td>Pilots in Africa</td>
<td>700,000</td>
<td>400,000</td>
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<td></td>
<td>50,000</td>
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</tr>
<tr>
<td></td>
<td>1,500,000</td>
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</tbody>
</table>
Thank You
Noam Dotan, Comet-ME technical manager
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Pump System Block Diagram

SMPP → directly to the irrigation system = minimal water usage + save cost of storage tank

Moisture and temperature sensors
Impact – SDGs (excerpt from 2019 UKaid E4A)

The yield uplift and greater resilience from solar-powered irrigation make considerable progress towards **SDG 1**: No poverty and **SDG 2**: Zero hunger.

**Solar water pumps provide households, schools, hospitals, with reliable sources of clean water thereby reducing water-borne diseases, supporting **SDG 6**: Clean water and sanitation and **SDG 3**: Good health and well-being.**

**The environmental befits of solar water pumps, compared to fuel pumps, contribute to furthering **SDG 7**: Affordable and renewable energy and **SDG 13**: Climate action.**

**Solar water pumps reduce the time spent on collecting water, a task most commonly undertaken by women - progress towards **SDG 5**: Gender equality.**
The SMPP vs Grundfos (#1 Global Pump Supplier)

The SMPP has very high efficiency at a wide span of pump heads
IP Status

US application 2019 0234395 A1

Notice of allowance by end of Feb 2020

PCT Application WO 2019/150364 A1

PCT examiner quote from the written opinion: “Consequently, the subject matter of claims 1, 2, 4-5, 50 is new and inventive as required under PCT Article 33(2)-(3)“