

Decentralized Electrification in India

SMART
HYDRO
POWER



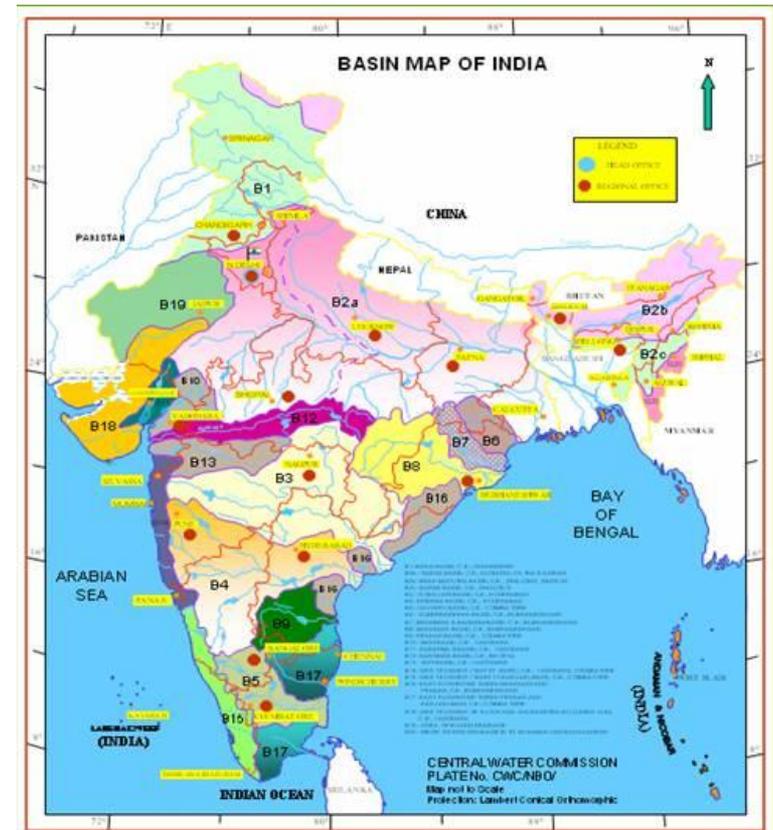
400 M Indians (33%) do not have electricity

		electrification rate 2011
1	Lakshadweep	99,7
2	Delhi	99,1
3	Daman and Diu	99,1
4	Chandigarh	98,4
5	Puducherry	97,7
6	Goa	96,9
7	Himachal Pradesh	96,8
20	Mizoram	84,2
21	Maharashtra	83,9
22	Nagaland	81,6
23	Chhattisgarh	75,3
24	Tripura	68,4
25	Manipur	68,3
**	Whole INDIA	67,2
29	Meghalaya	60,9
30	West Bengal	54,5
31	Jharkhand	45,8
32	Odisha	43
33	Assam	37
34	Uttar Pradesh	36,8
35	Bihar	16,4

- More than 400 M Indians (2011) do not have electricity.
- The electrification rate is different between the federal states; while central Delhi is fully electrified in rural Bihar more than 80% of the population do not have electricity.
- Even in electrified regions regular „black out’s“ do hinder economic development especially for small and medium enterprises.

 India is rich on streams, rivers and canals

- India is rich on natural water sources.
- Large canals control and distribute water flow for agricultural and energy purposes
- While canals are managed on national level, energy and agriculture politics are mainly defined by federal states.



🐟 Tillari canal in Maharashtra



🐟 Kinetic hydropower is easy...

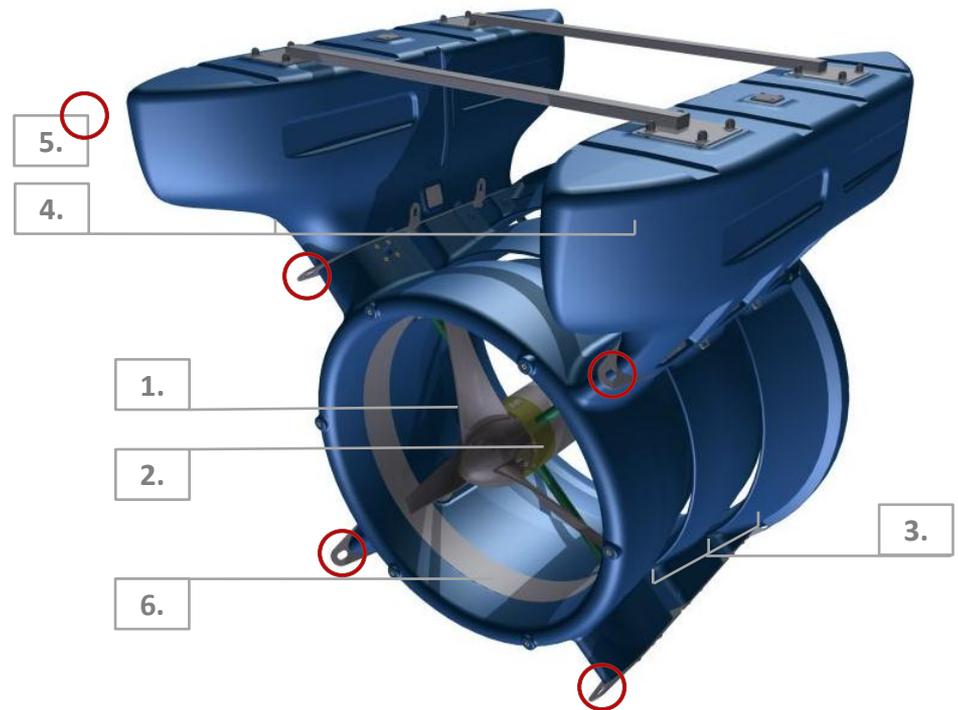
- Kinetic turbines create energy from flowing water with no head required.
- The energy output depends on the velocity of the stream and does vary with variations in the stream.
- Using a synchronous generator variations in the water stream are reflected by voltage and frequency of the generated electricity.



 ...with the right product in place

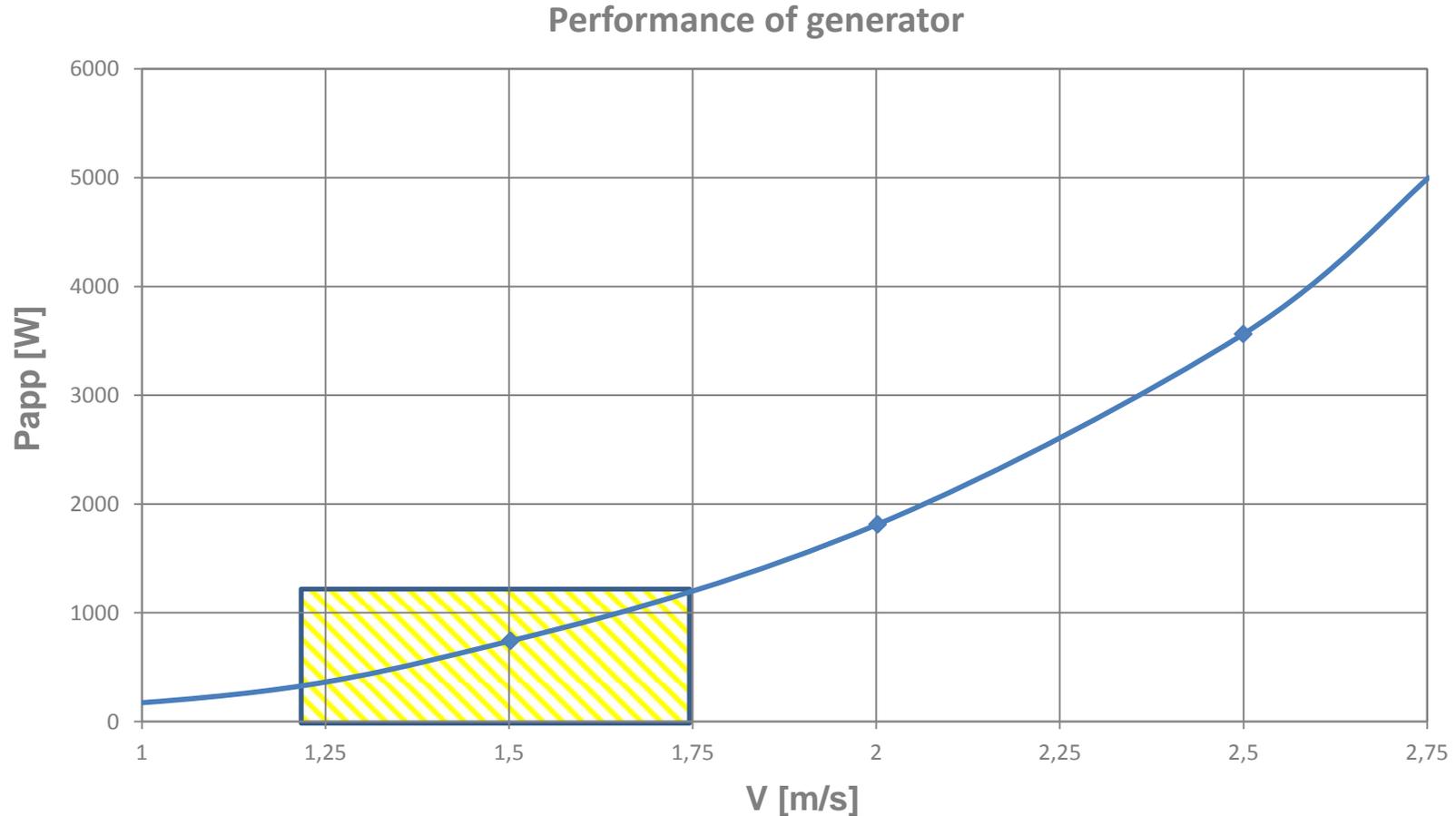
SMART kinetic turbine

1. 3 fiberglass- reinforced rotor blades (Apoxy)
2. Underwater generator
3. Diffusor (HDPE*)
4. Floats
5. 4 anchor points
6. Stabilizing Ring



* maximum power point tracking

 Even low flows allow productive electricity



The power curve is tested in SVA * Potsdam. Results may vary in natural rivers & canals. Curve was measured at the generator output.

* Schiffbau- Versuchsanstalt

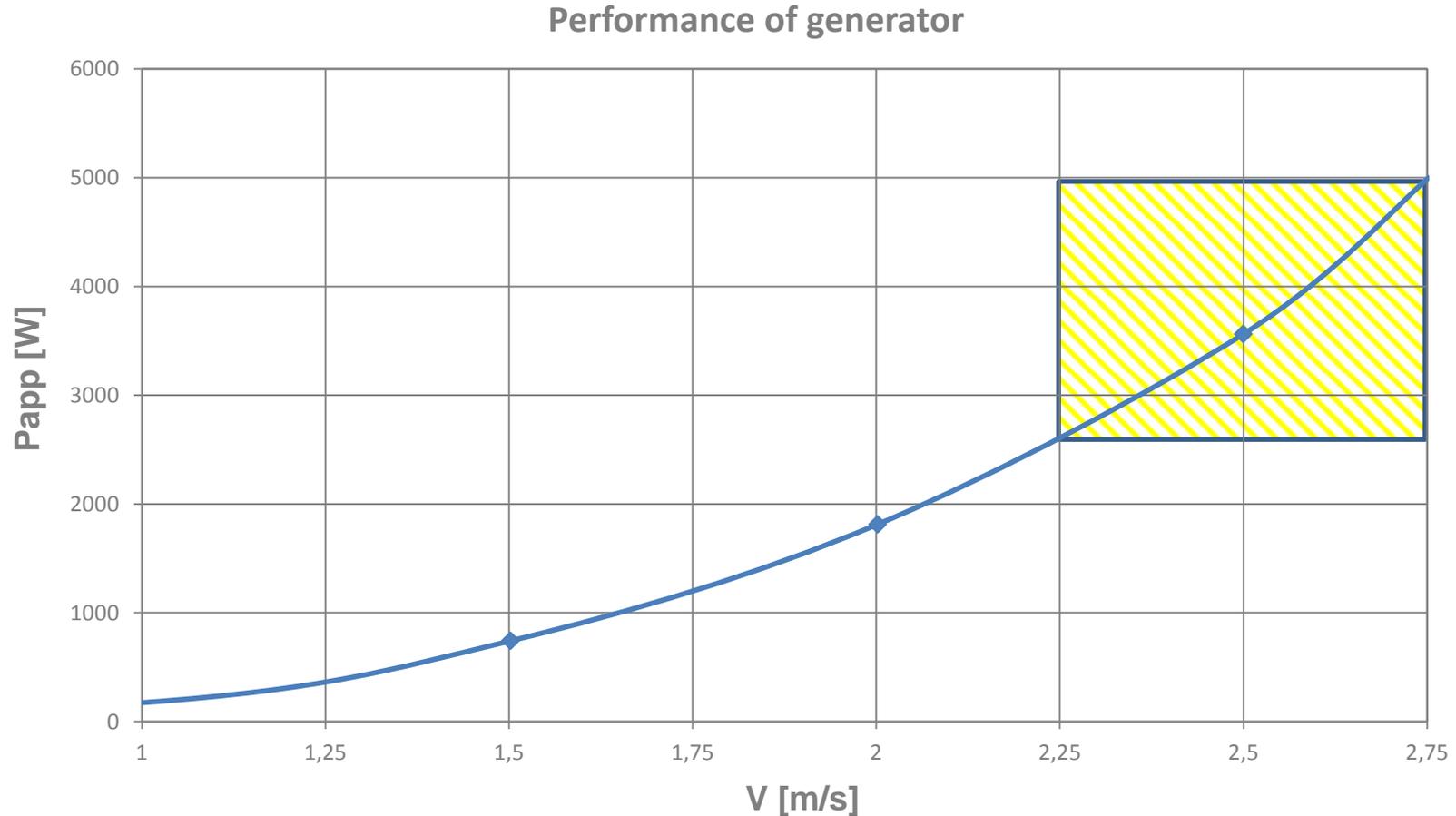
 500 Watt equal average workshop demand

- 500 Watt = 10 kWh per day
- 10 hours average demand
- 1 kWh parallel usage of
 - Lights
 - Blender
 - Fridge
 - Fan



Chocolate factory (Brazil)

🐟 Higher flows allow community lighting



The power curve is tested in SVA * Potsdam. Results may vary in natural rivers & canals. Curve was measured at the generator output.

* Schiffbau- Versuchsanstalt

Concept Isolated Grid



One to two turbines (5 kW)

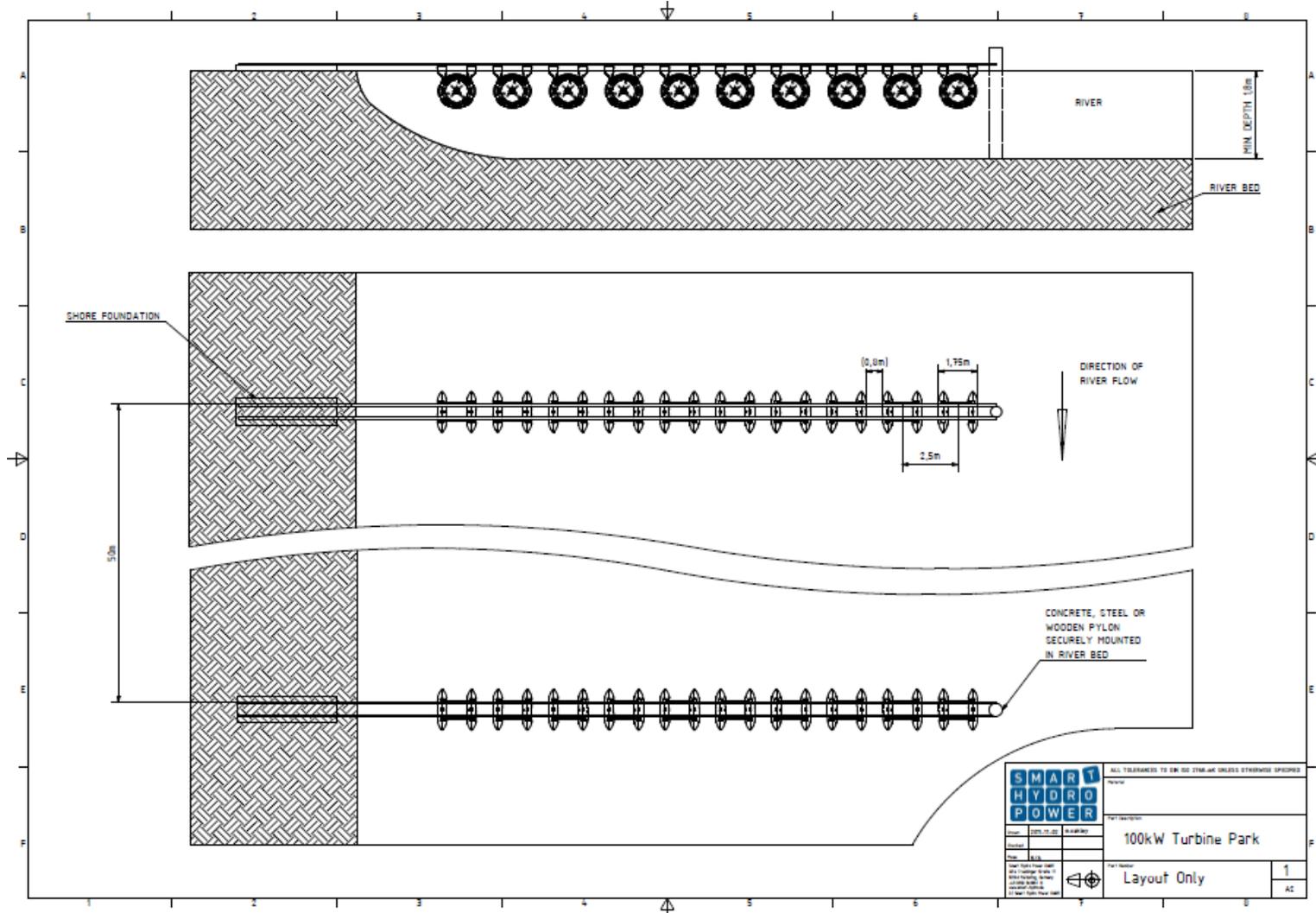
Power for 28 families, schools and a pharmacy

Computer or TV allowed

Local utility responsible for local distribution

RIO HUAYABAMBA

 A modular turbine park allows larger grids

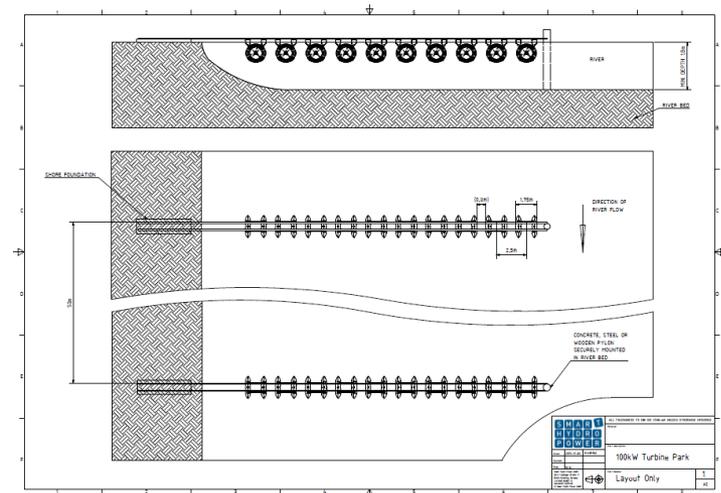


Modular power plants help grid management

- A modular power plant (30 to 50 kW) may inject into the low voltage grid (400 V three phase)
- In India the low voltage grid is designed linear not meshed
- Linear low voltage grids can be enforced by decentralized grid injection with supply meeting the volatile demand
- Smart kinetic turbines are demand driven without need of local grid management

🐟 Project Approach: India

- Implement five turbines in Goa
 - Workshop supply
 - Water treatment plant
 - Community house
- Electrify one regional cluster (100 kW / 40 turbines / 20 villages) in any non-electrified region (Maharashtra) with high river velocities
 - Develop small industry
 - Empower villages
- Build one exemplary turbine park (50 kW / 16 turbines) feeding into the grid at low voltage grid (in Goa or Maharashtra)



Integration of local population

- The project has to be „carried“ by SMART India with a local company as agent
- SMART is ready to build with own personnel and support of local personnel at site
 - Training facilities mechanical and electrical engineering
 - Workshops for assembling
 - National sourcing
 - National maintenance



🐟 Local development & technology transfer

- Local assembling of turbines possible
- Local sourcing of components possible
- Local fabrication of parts (like anchoring or debris protection) possible
- Operations with existing staff after training period
- Maintenance and service mainly by local staff after training



 Modular concept allows fast installation



- Each turbine / line of turbine works separately, easy maintenance procedure
- Generation starts with the first turbine installed
- Implementation in rural areas is feasible and allows local participation

 Impressions (1/3)



Village in Peru /
Marisol



Machinery Components for electrotechnical
somonens

 Impressions (2/3)



Preparig the turbine



Easy handling

 Impressions (3/3)



Village in Peru /
Marisol



Installation in Machinery house

 **Approx. 150 kW generation capacity**

Phase I: identify reference cases close to training facilities and install turbines with exemplary usage cases: water treatment, workshop, community house with internet facility. Analysis phase

Approx. four weeks

Phase II (a): 40 kW power plant for grid injection / grid stabilization in region of major demand; turbine imported and electronics sourced locally. Extensive training.

Approx. three month

Phase II (b): Model region along main river with high development potential hindered by lack of electricity (e.g agricultural production but no food processing), installing turbines and start selected production processes. Implementation of SMART India

Approx. nine month

Project can start as soon as approx. ten weeks after order

Pricing by phase and with high discounts

PHASE I:

- Components (5 turbines) € 65.000
- Import / nationalization € 15.000 (estimate)
- Installation, Analysis € 35.000

PHASE II (a):

- Components (16 turbines) € 200.000
- Import / nationalization € 25.000 (estimate)
- Installation, Training € 75.000

PHASE II (b):

- Components (40 turbines) € 500.000
- Import / nationalization € 55.000 (estimate)
- Supervision, Training € 100.000

*Price will be decided at the time of finalization of order above figure are indicative

€ 1070.000

Next steps (proposal)



- General agreement and Lol
- Technical meeting with representatives from SHP Germany
- Visit to India
- Finalization of contract
- First delivery

The Company



- Founded in 2010,
- Based in Feldafing near Munich, Germany
- Promoted by the Bavarian Ministry for Commerce
- Internationally-renowned partners like Siemens, EPSA, GIZ

Mission: Development, production and commercialization of affordable and environmentally-friendly kinetic micro hydropower systems.



Nitin Umesh (Group Chairman & Founder)

Email :

nitin@stbtechnology.com

Info@stbtechnology.com

Website :

www.stbtechnology.com