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Pressure - Retarded Osmosis For Power Generation From Salinity Gradients Energy & Environmental Science

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Abstract: In this study the relevance of pressure retarded osmosis power generation was investigated so as to fulfil electricity demand in India. Pressure retarded osmosis (PRO) method is a renewable and green technology with zero carbon emission to the atmosphere. Salinity gradient through a membrane is that the key parameter in osmotic pressure development. in theory it's a pressure increment of twenty six bar that is equivalent to 270 m high water column for mounted volume of salt water compartment. This hydraulics pressure are often used to generate electricity by causing pressurised water through a rotary engine. consistent with the literature, one MW electricity generation requires 1m3/s flow of water. India has a nice potential to develop this technology because it is enclosed by the ocean. later the country has 103 number of water rich river basins over the country. currently the electricity demand of the entire country is about 2100MW and it's already being provided by each hydro and thermal power station. The country spends associate degree large quantity of cash for the thermal power generation once a year. this may be reduced by introducing PRO power generation. Calculations over the PRO power generation reveal that it's possible to generate 8.14% of country energy requirement.

I. INTRODUCTION:

Owing to the high energy consumption of the globe, the speed of depletion of natural fossil deposits accelerates on a daily basis. thus it's essential to put the utmost drive to search out new energy sources and develop existing technologies to achieve high potency. By virtue of that the globe is trying to find cost- effective renewable energy sources to establish. in a country, the availability of energy plays a significant role in development methods. Inadequate supply of power is taken into account because the main issue for economic and social development .According to the statistics, India has a demand of electricity 24/7 that's 50,000 to 60,000 MW

considering both parties of domestic and industrial sectors. the most electricity generation is done with the contribution of hydro power, Thermal energy, nuclear energy and fossil fuels .There the average unit generation price by hydro power and thermal power generations are about Rs. 1.71 and Rs. 14.33 respectively.

Source	GWh
Hydro Energy	42.63
Thermal, Oil and Coal	210.35
NCRE	5.76

In addition to hydro and thermal power generation, country is getting to expand the renewable energy sector by developing dendron, wind and solar energy generations. generally 1MW of dendron power station needs about 400 hectares of land to supply necessary fuel demand. Further, plantation of crops takes a long time and uncertainty of sustainable supply creates negative impact on dendron power

generation. many international agencies have done practicableness studies to spot the wind resource potential areas so as to put in wind mills with the collaboration of the native authorities. it's been found that there are nearly 5000 Km2 of wind areas with good-to-excellent wind resource potential in country. although such places have been known and studied most utilisation wasn't been achieved owing to issues faced in wind generation development Pressure retarded osmosis (PRO) power generation is an upcoming green technology to come up with electricity at zero green house gas emission .Salinity gradient power is known as sustainable and totally renewable and has the highest energy concentration (energy density) among the marine renewable energy sources .Since 1997 the North European power producer Statkraft has engaged in the research and development of osmotic power and currently they're the world leader in this development.

II. PROCESS

In this process, the river water (low salt) and see water (high salt) are fed in to the plant. it's needed to filter the each water streams before enter the membrane modules in order to stop fouling the membranes due to particulate matters. This pre treatment depends according to the water quality. present the schematic of pressure retarded osmosis power station.
Fig.1

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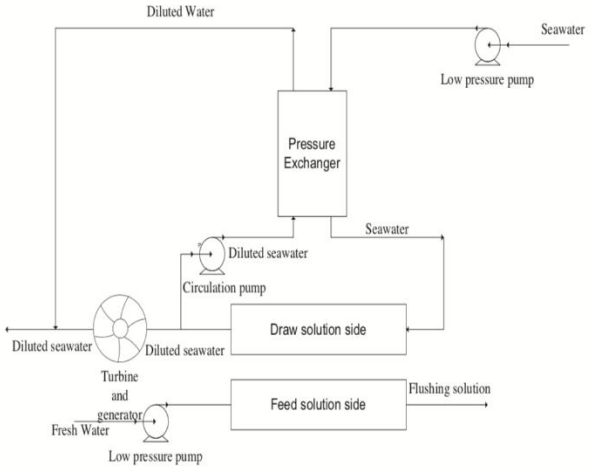

Membrane modules are often either hollow fibber or spiral wound membranes and 80-90% of the water with low salt .
gradient is transferred by osmosis across the membrane into the pressurised salty water. pressurised salt water is shipped in to the turbines to generate electricity. in order to pro to be economically viable, power density with 5 W/m2 is important to generate electricity affordably. The objective of having pressure money handler is employed to recycle a region of energy that is carried by salt water so as to boost the pressure of feed salty water.
There are many essential facts that need to be thought-about before installing a pro power station in a very specific river basin. the amount of water in the river, qualities of fresh and ocean water, characteristics of the membranes and physical and chemical conditions within the body of water should be thought-about so as to develop an economically viable pro power station.peculiarities. For example, the head margin in this template measures proportionately more than is customary. This measurement and others are deliberate, using specifications that anticipate your paper as one part of the entire proceedings, and not as an independent document. Please do not revise any of the current designations.

III. RESULTS

States/UTs	Hydro		Thermal		Nuclear		RES		Total		Growth Rate(2015-16 to 2016-17)
	31.03.16	31.03.17	31.03.16	31.03.17	31.03.16	31.03.17	31.03.16	31.03.17	31.03.16	31.03.17	
Chandigarh	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.01	0.02	**154.33**
Delhi	0.00	0.00	2.49	2.49	0.00	0.00	0.01	0.06	2.50	2.55	**1.68**
Haryana	0.88	1.08	5.47	5.03	0.00	0.00	0.19	0.25	6.54	6.37	**-2.66**
Himachal Pradesh	2.14	2.37	0.00	0.00	0.00	0.00	0.79	0.83	2.94	3.20	**9.00**
Jammu & Kashmir	1.23	1.23	0.18	0.18	0.00	0.00	0.16	0.16	1.56	1.56	**0.12**
Punjab	2.23	2.57	7.79	7.79	0.00	0.00	0.76	1.15	10.79	11.52	**6.76**
Rajasthan	0.99	1.09	8.99	8.99	0.00	0.00	5.40	6.24	15.38	16.32	**6.08**
Uttar Pradesh	0.52	0.72	11.25	12.57	0.00	0.00	2.11	2.30	13.88	15.59	**12.34**
Uttarakhand	1.98	1.98	0.10	0.55	0.00	0.00	0.32	0.52	2.40	3.05	**26.71**
Central Sector NR	8.27	8.27	13.11	13.61	1.62	1.62	0.00	0.00	23.00	23.50	**2.17**
Sub-Total (NR)	18.25	19.31	49.38	51.21	1.62	1.62	9.75	11.52	79.00	83.66	**5.90**

Power (P) = Power per Unit Volume (W / m^3) Flow rate
(m^3) 9 According to the electricity power calculation, results reveal that 62.77 MW could be generated from selected river basins.

Power can be increased by increasing the allocated river water flow rate to the PRO process. Table 3 shows how the power generation increases with the increase of use of river water flow percentage for the PRO process.

Increases of power generation with the increase of percentage of river flow for the PRO process

Percentage of water used for PRO process	Power generated by PRO process (MW)
5%	62.77
10%	125.54
15%	188.31
20%	251.08

Finally under different river water flows, the percentage of power generation via PRO Process over country gross electricity generation was calculated

$$\%\,0f\ energy\ generation = \frac{energy\ via\ pro}{total\ energy\ generation}$$

Percentage of PRO power generation under different river flows.

Source	Expexted Power generation (%)			
	5%	10%	15%	20%
PRO	1.96	3.92	5.88	7.84

IV. OBSERVATION

My observation from the results and the PRO research is that hydro PRO technique is the it is an economical and environmentally sustainable and renewable source of energy and is a very big leap of technology and it is natural.

V. CONCLUSION

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In this research it is recognized that india is rich with assets for the development of pro power generation and can achieve a stage where the conventional thermal power generation can be minimized.After consideration and analysis of the consequences it's far recommended that pro procedure is a suitable green technology which may be applied efficiently in India. further to that pro system allows to qualify for green certificate and other supportive coverage measures for renewable electricity

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