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Synergy is the Solution

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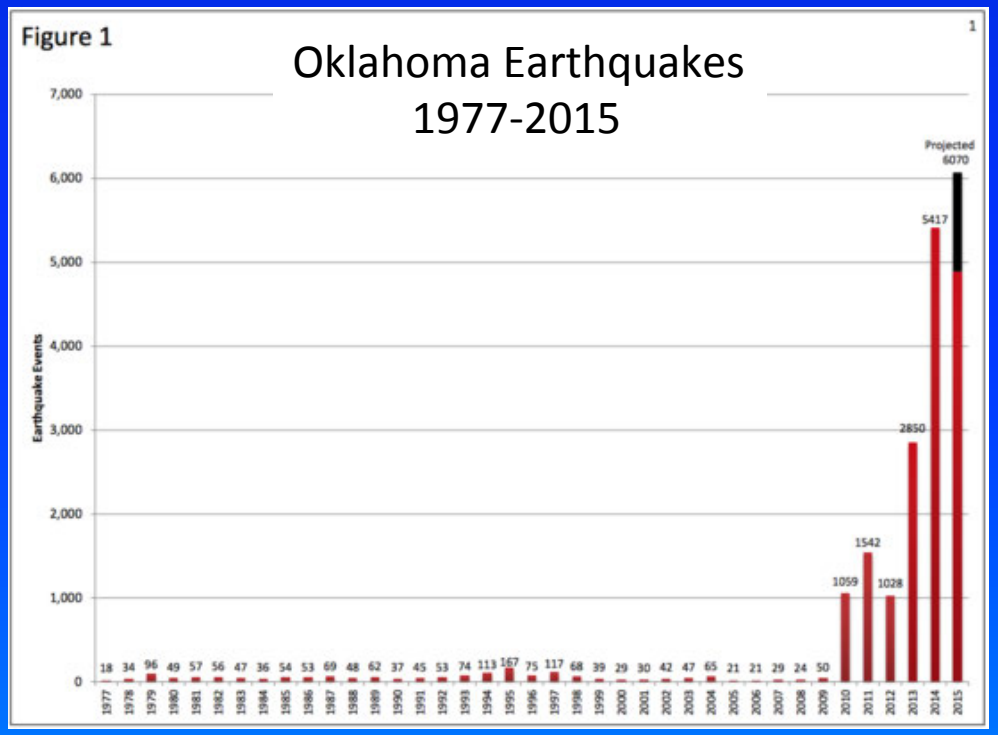
Oilfield Operator Pain

- Increasing Disposal Costs
- Disposal Well Shutdowns
- Long Term Liabilities
- Public Relations Nightmares

Environmental Issues

- Earthquakes
- Aquifer contamination
- Toxic land fills, land farms



Challenges


SOLIDS
SLUDGE
TRANSPORT
SAFETY
LANDFILL
INJECTION
EARTHQUAKES
PERMEATION

The Solution: Recycle ALL Waste

- Solids: solar ponds, road construction
- Liquids: solar ponds, fresh water
- Reconstituted drilling muds
- Skim oil

- **Eliminate disposal wells**
- **Eliminate landfills, land farms**

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Proven, Approved Technologies

- DOE, NREL, EPA approved
- US Army Corps of Engineers
- Bureau of Reclamation
- Texas DOT, RRC

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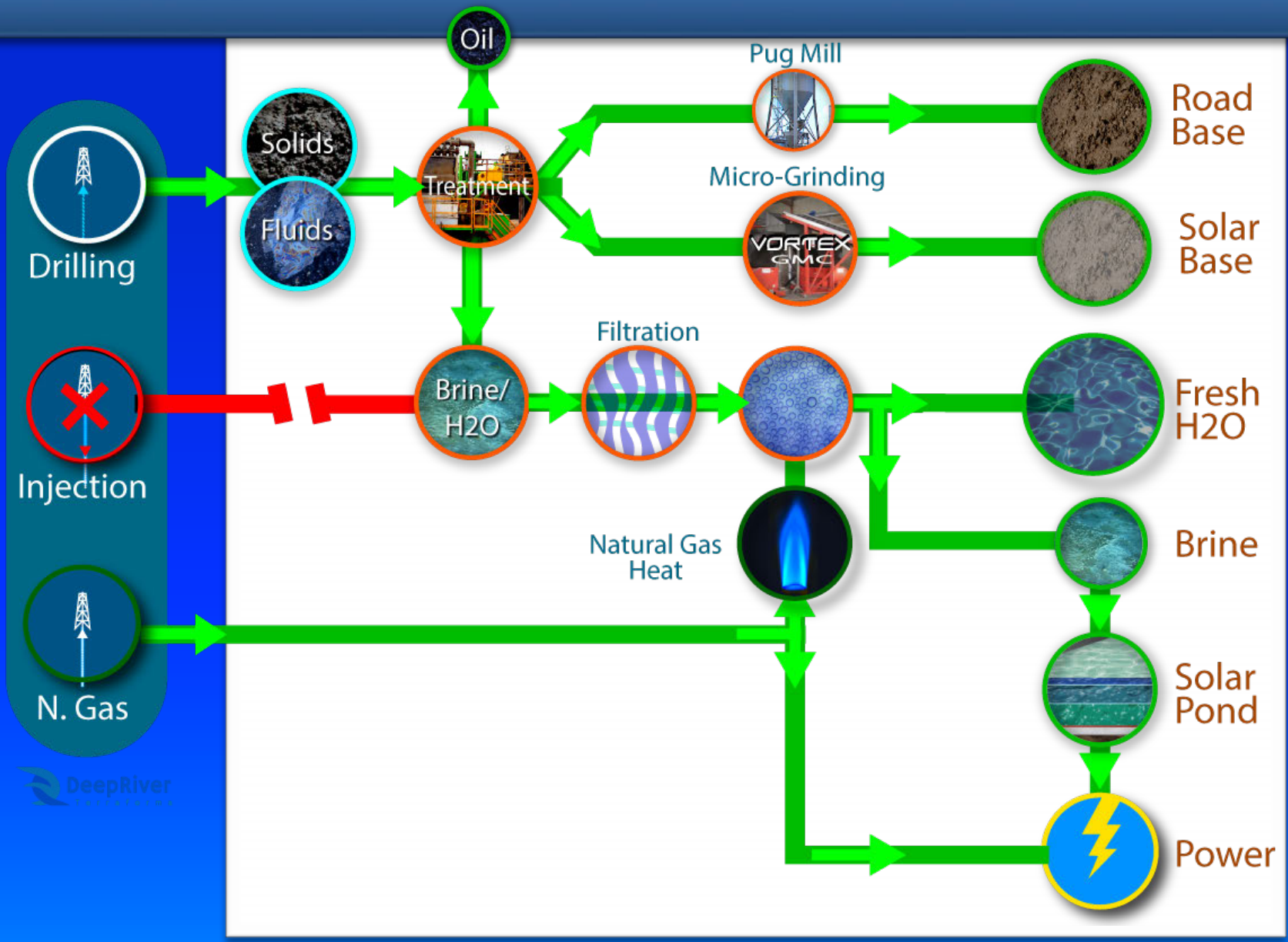
Recycled Products

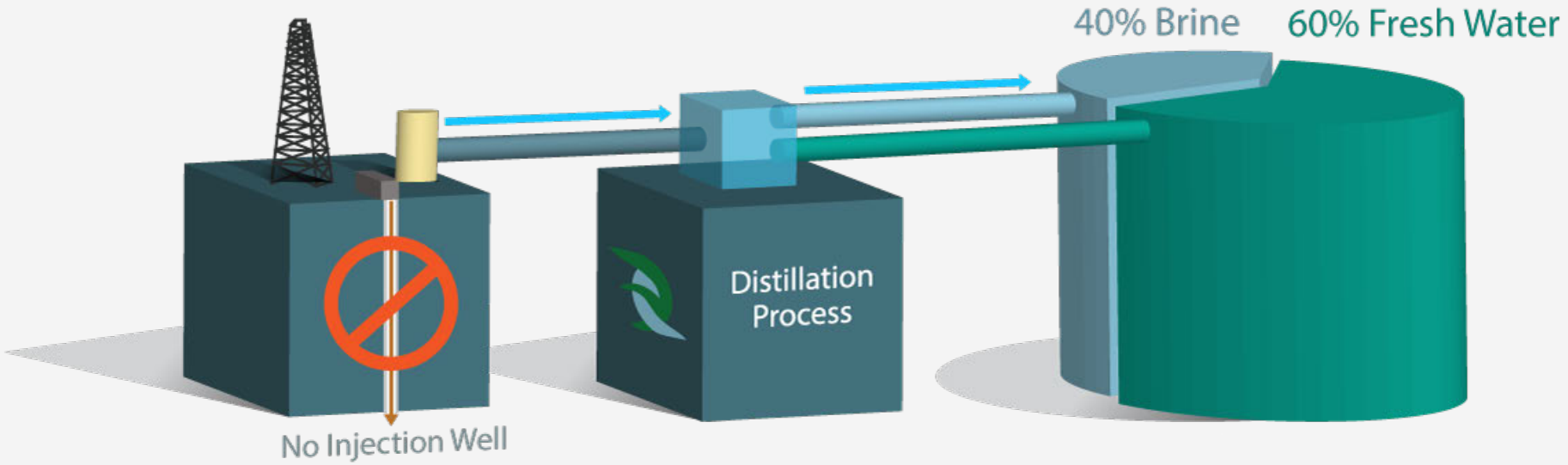
- Produced Water
  - Solar pond brine
  - Fresh water
- Solids
  - Solar Pond Base
  - Road Base
- Fluids
  - Diesel, Reclaimed Oil
  - Reconstituted Drilling Muds

Process Flow



Short Term Solution

Store brine for making solar ponds



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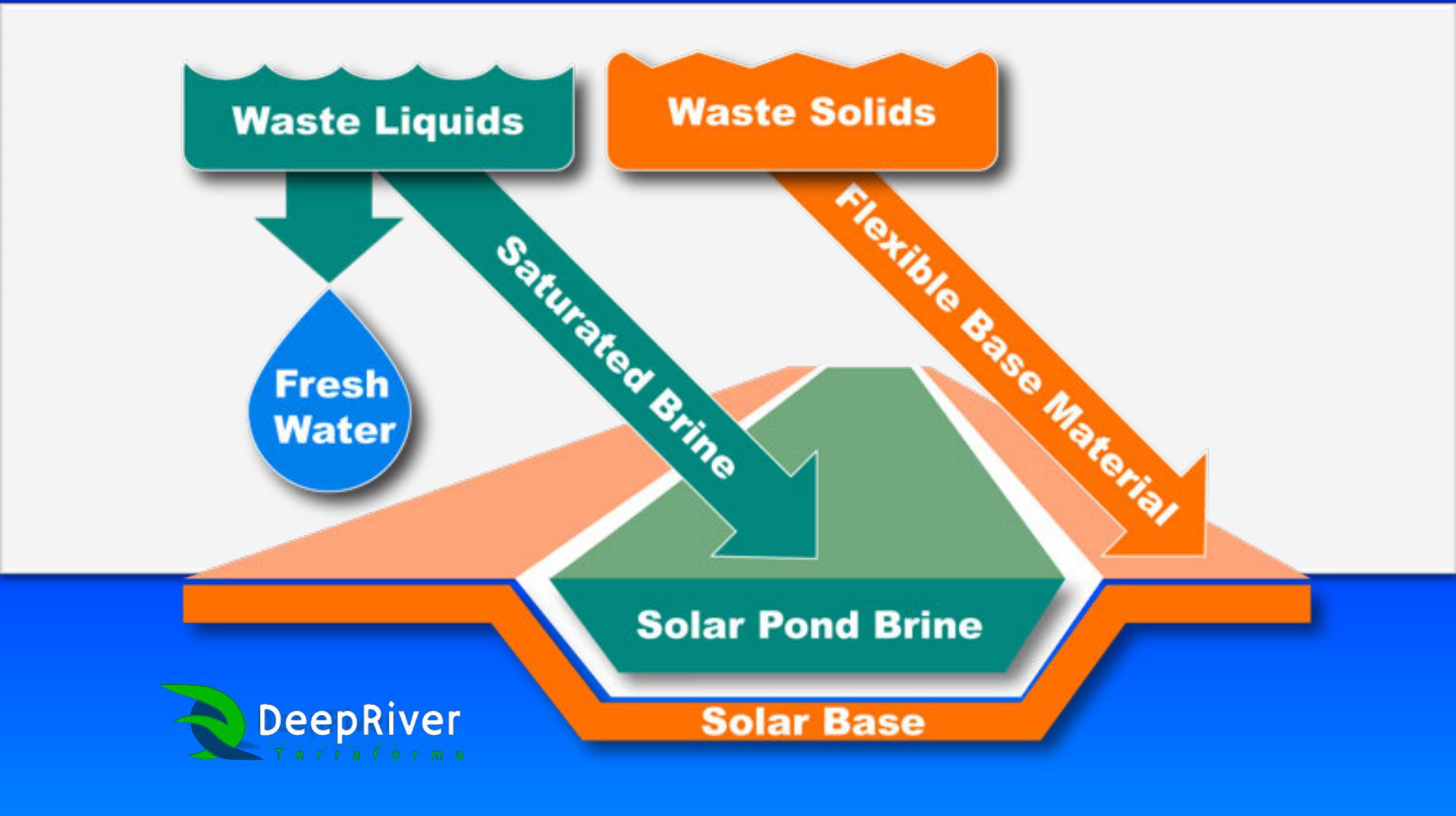
Solar Ponds

Recycle waste into clean energy



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Solar Ponds

- **Cost competitive <u>without</u> subsidies**

- NREL approved methodology
- Qualify for ITCs, RECs
- Proven technology
- Dispatchable, load leveling electric power
- Utility scale energy storage

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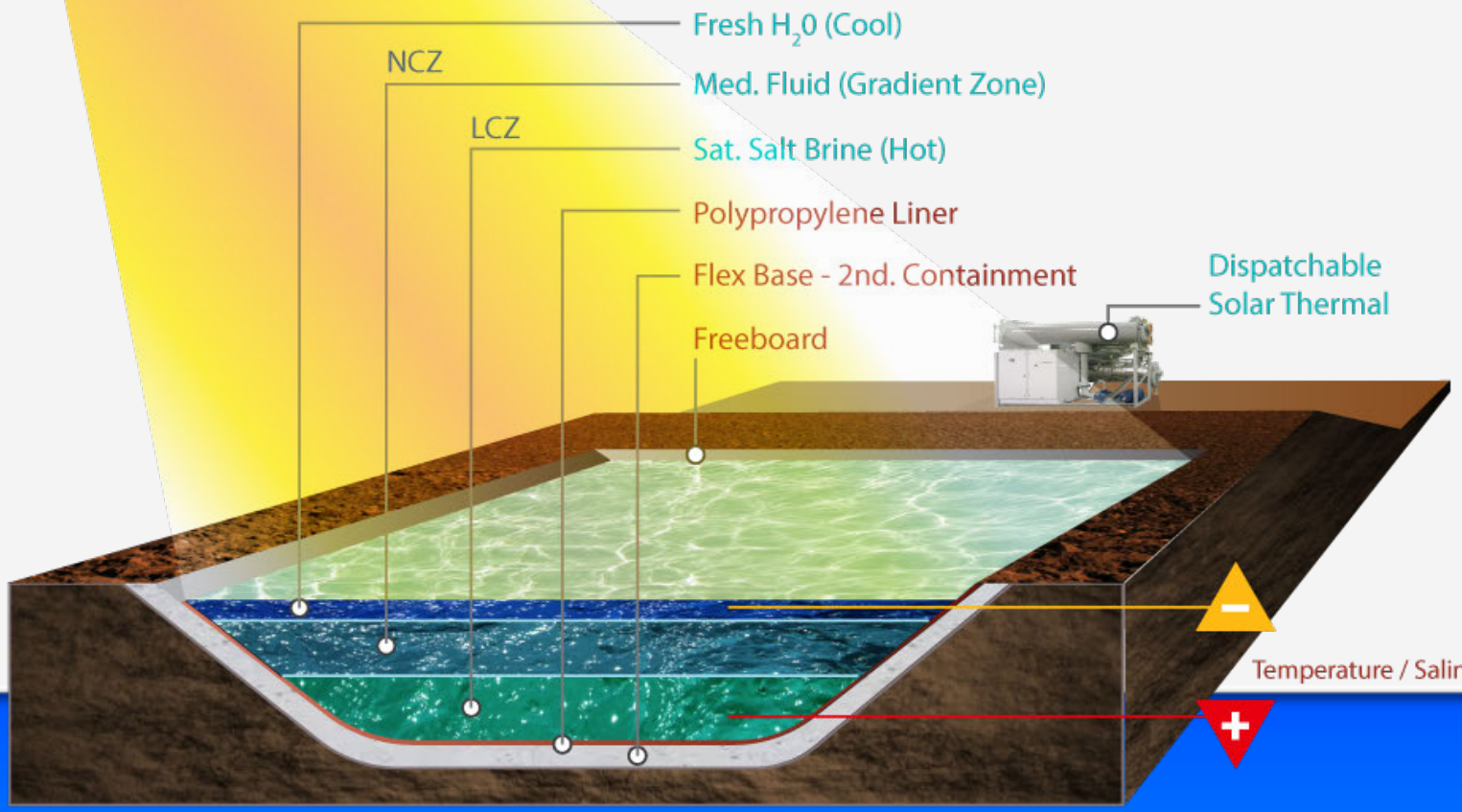
Solar Pond System

- No need for injection of waste water
- Shelf technology for fast deployment



Scale Slope Model

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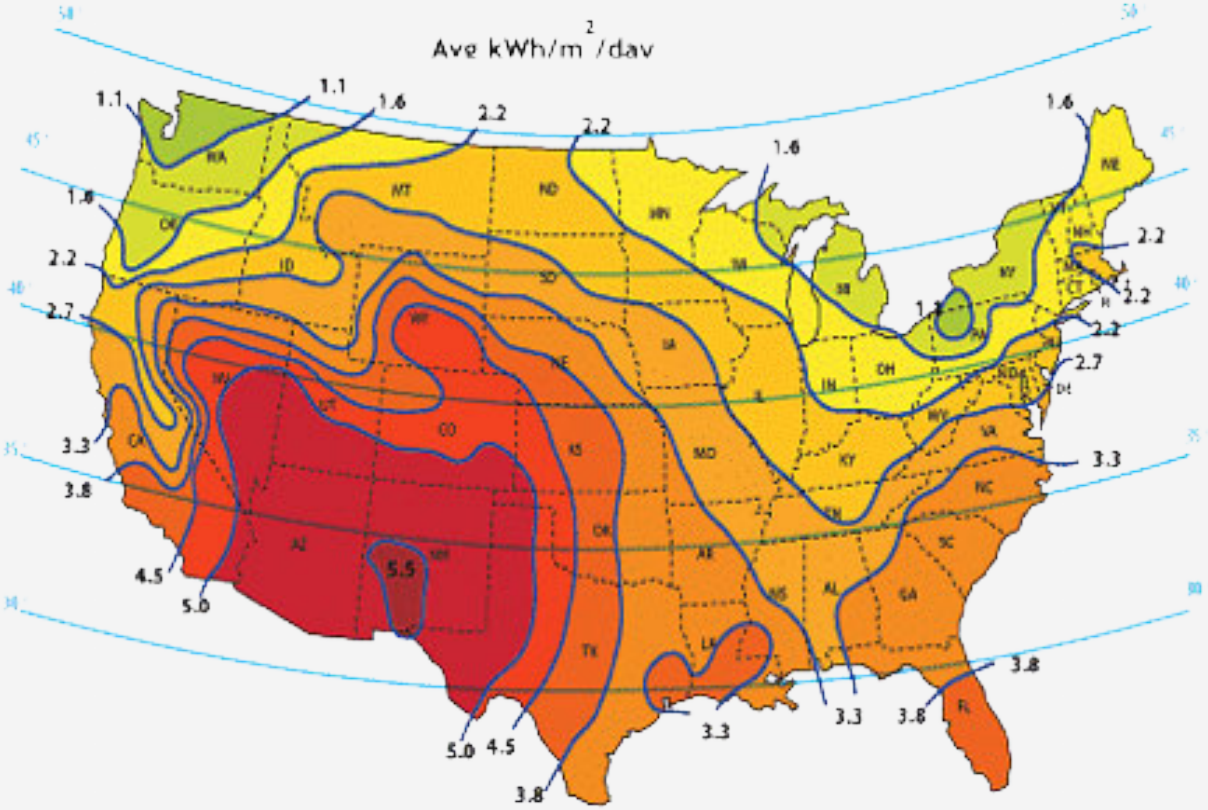
Solar Insolation Map - US

Solar energy in hours, received each day on an optimally tilted surface during the worst month of the year.



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Solar Pond Volumetrics

Representative Values

Produced Water Flow Rate	150,000	bpd
Produced Water TDS	120,000	ppm
Concentration Ratio (for 10 ppg brine)	2.49	
Recovered H2O	89,759	bpd
Required Wellhead Gas	3,129	Mcf/day

SGSP MW Build Rate (base-load equiv.)	6.40	MW/yr
SGSP Land Requirement (per MW)	90	acres/MW
SGSP Land Requirement (per yr)	576	acres/yr

Levelized Energy Costs

U.S. Average Levelized Costs (2013 $/megawatthour) for Plants Entering Service in 2020						
	Capacity Factor	Levelized Capital Costs	Fixed O&M	Variable O&M (including fuel)	Transmission Investment	Total System Levelized Cost
Dispatchable Technologies						
Conventional Coal	85	60.4	4.2	29.4	1.2	95.1
Advanced Coal	85	76.9	6.9	30.7	1.2	115.7
Advanced Coal CCS	85	97.3	9.8	36.1	1.2	144.4
Natural Gas-fired						
Conv. Comb. Cycle	87	14.4	1.7	57.8	1.2	75.2
Adv. Comb. Cycle	87	15.9	2.0	53.6	1.2	72.6
Advanced CC + CCS	87	30.1	4.2	64.7	1.2	100.2
Conv. Comb. Turb.	30	40.7	2.8	94.6	3.5	141.5
Adv. Comb. Turb.	30	31.0	2.6	64.7	3.6	101.8
Advanced Nuclear	90	70.1	11.8	12.2	1.1	95.2
Geothermal	92	34.1	12.3	0.0	1.4	44.4 (ITC: -3.4)
Biomass	83	47.1	14.5	37.6	1.2	100.5
SGSP	**95** *duty cycle* **33**	**43**	**27** **17**	**0**	**5**	**75 (ITC: -24)** **55 (ITC: 0)**
Non-Dispatchable Technologies						
Wind	36	57.7	12.8	0.0	3.1	73.6
Wind – Offshore	38	168.6	22.5	0.0	5.8	196.9
Solar PV	25	109.8	11.4	0.0	4.1	114.3 (ITC: -11.0)
Solar Thermal	20	191.6	42.1	0.0	6.0	220.6 (ITC: -19.2)
Hydro	54	70.7	3.9	7.0	2.0	83.5

Note: CCS = Carbon Control and Sequestration; ITC = Investment Tax Credit; SGSP insert by GEM

Source: U.S. Energy Information Administration | 2020 Levelized Costs AEO 2015

http://www.eia.gov/forecasts/aeo/pdf/electricity_generation.pdf

Oilfield Operator Benefits

- Reduce waste disposal costs
- Reduce consumable costs
  - Fresh water
  - Electrical power
  - Drilling muds
  - Pad/road material
  - Diesel
- Eliminate disposal wells
- Turnkey waste disposal solution
- Eliminate contingent liability
- Improve public relations

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Synergy is the Solution

- Integrate proven technologies
- Strategic partnerships
- License key processes, technologies

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Integrate Proven Technologies

- GEM Solar Ponds
  - Clean, renewable, load leveling electricity
  - Utility scale power generation and storage
  - ITCs, RECs
- Vortex Micro Grinding
  - Recycled barite
  - New products from oilfield waste
- Vary Emulsion Separation
  - Improved oil recovery
- MVC Environmental
  - Recycle oilfield solids into road base

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Our Partners

Growth Plan

- Solar ponds to handle produced fluids
- Recycling plants to handle solids, muds
- Integrate fluid transport infrastructure to realize economies of scale
- Micro grinding plants

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