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# A Feasibility Analysis of Powering a Cohousing Community Using Solar and Wind Energy

Jake Schomaker, Mike Doyle, Stephen Ruck, Dillion O'Toole  
 Advisor: Professor David Spanagel

## Abstract

A radical alternative to the current, fossil-fuel dependent, massive electricity grid is possible. This study explored ways to structure local community energy production to favor renewable energy sources and decentralized democratic control. Within the realm of new ideas about cluster housing and "smart" development, energy considerations are paramount. We found intentional communities (condensed neighborhoods planned by people who share similar values and goals) to be the most promising avenue for realizing the vision of self-sustainable residential power through feasible power production using solar and wind energy.

## Problem

The problem with society today is we are dependent on fossil fuels. We use fossil fuels for everything; heating, electricity, and transportation. These fossil fuels are polluting and destroying our environment. We need to break form these habits and part of the solution are these communities we are proposing. However, a problem lies within these communities.

The problem is if a community was to produce a significant portion of its own energy, and that power production was spread unevenly between homes depending on the ideal conditions, it would be essential for all residents to be able to interact, cooperate, and make decisions as a whole in order for the community to successfully function. As individual homes are more isolated from the rest of their neighborhood communities today, it is crucial to find an innovative format for communities which will facilitate the necessary social interaction for the project to succeed.

## Results

**Wind:** A 4kW to a 10kW wind turbine could power an average house consuming 800-2000kWh. Small wind turbines are also much cheaper than photovoltaic cell solar panels. A 400 watt turbine, costs \$699.00, which is less than double the price. However, the payback period is very hard to determine. It depends on the certain location and conditions encountered by the turbine.

**Intentional Community:** Out of all the possibilities we have researched, we have found that cohousing is the best possibility for success. This conclusion is due to the fact that these communities have already provided successful environments for the necessary social interactions for this project to succeed, as the residents must all be able to agree upon all changes and decisions which are made within the community, and cooperate with one another in many aspects in order to keep it functioning. Thus we believe that cohousing communities would be the most efficient means of producing and consuming self generated energy in a social atmosphere.

**Solar:** A system in the Boston, MA area would consist of 28 panels, taking up a total of 448 square feet, and costing \$27,580. The system will meet the household's energy needs in January, but exceed them in every other month except November and December. Due to this, the house could sell its excess electricity to other houses in the area. At 10 cents a kWh, that amount would be \$244. That may seem small, but that coupled with the money the household won't be spending each year to purchase electricity leads to a payback period of 21 years. Considering the panels' warrantee of 20 years, and standard lifespan of 40, that payback period is reasonable, although defiantly in the long-term.

Month	January	February	March	April	May	June	July	August	September	October	November	December	Yearly
Monthly Requirement	62	62	62	62	62	62	62	62	62	62	62	62	62
Solar Panel Production	62	691	678	682	688	694	699	705	710	715	720	725	730
Difference	0	629	616	626	636	642	647	653	658	663	668	673	678
Price For kWh Difference	0	\$62.90	\$61.60	\$62.60	\$63.60	\$64.20	\$64.70	\$65.30	\$65.80	\$66.30	\$66.80	\$67.30	\$67.80
Money Made Selling Power	\$0.00	\$629.00	\$616.00	\$626.00	\$636.00	\$642.00	\$647.00	\$653.00	\$658.00	\$663.00	\$668.00	\$673.00	\$678.00
Added to Total Production	62	751.90	740.00	748.60	754.60	760.20	765.70	771.30	776.80	782.30	787.80	793.30	798.80
Money Made Selling Power	\$0.00	\$751.90	\$740.00	\$748.60	\$754.60	\$760.20	\$765.70	\$771.30	\$776.80	\$782.30	\$787.80	\$793.30	\$798.80
Added to Total Production	62	813.90	800.00	814.60	820.60	826.20	831.70	837.30	842.80	848.30	853.80	859.30	864.80
Money Made Selling Power	\$0.00	\$813.90	\$800.00	\$814.60	\$820.60	\$826.20	\$831.70	\$837.30	\$842.80	\$848.30	\$853.80	\$859.30	\$864.80
Added to Total Production	62	875.90	862.00	876.60	882.60	888.20	893.70	899.30	904.80	910.30	915.80	921.30	926.80
Money Made Selling Power	\$0.00	\$875.90	\$862.00	\$876.60	\$882.60	\$888.20	\$893.70	\$899.30	\$904.80	\$910.30	\$915.80	\$921.30	\$926.80
Added to Total Production	62	937.90	924.00	938.60	944.60	950.20	955.70	961.30	966.80	972.30	977.80	983.30	988.80
Money Made Selling Power	\$0.00	\$937.90	\$924.00	\$938.60	\$944.60	\$950.20	\$955.70	\$961.30	\$966.80	\$972.30	\$977.80	\$983.30	\$988.80
Added to Total Production	62	1000.00	986.00	1000.60	1006.60	1012.20	1017.70	1023.30	1028.80	1034.30	1039.80	1045.30	1050.80
Money Made Selling Power	\$0.00	\$1000.00	\$986.00	\$1000.60	\$1006.60	\$1012.20	\$1017.70	\$1023.30	\$1028.80	\$1034.30	\$1039.80	\$1045.30	\$1050.80
Added to Total Production	62	1062.00	1048.00	1062.60	1068.60	1074.20	1079.70	1085.30	1090.80	1096.30	1101.80	1107.30	1112.80
Money Made Selling Power	\$0.00	\$1062.00	\$1048.00	\$1062.60	\$1068.60	\$1074.20	\$1079.70	\$1085.30	\$1090.80	\$1096.30	\$1101.80	\$1107.30	\$1112.80
Added to Total Production	62	1124.00	1110.00	1124.60	1130.60	1136.20	1141.70	1147.30	1152.80	1158.30	1163.80	1169.30	1174.80
Money Made Selling Power	\$0.00	\$1124.00	\$1110.00	\$1124.60	\$1130.60	\$1136.20	\$1141.70	\$1147.30	\$1152.80	\$1158.30	\$1163.80	\$1169.30	\$1174.80
Added to Total Production	62	1186.00	1172.00	1186.60	1192.60	1198.20	1203.70	1209.30	1214.80	1220.30	1225.80	1231.30	1236.80
Money Made Selling Power	\$0.00	\$1186.00	\$1172.00	\$1186.60	\$1192.60	\$1198.20	\$1203.70	\$1209.30	\$1214.80	\$1220.30	\$1225.80	\$1231.30	\$1236.80
Added to Total Production	62	1248.00	1234.00	1248.60	1254.60	1260.20	1265.70	1271.30	1276.80	1282.30	1287.80	1293.30	1298.80
Money Made Selling Power	\$0.00	\$1248.00	\$1234.00	\$1248.60	\$1254.60	\$1260.20	\$1265.70	\$1271.30	\$1276.80	\$1282.30	\$1287.80	\$1293.30	\$1298.80
Added to Total Production	62	1310.00	1296.00	1310.60	1316.60	1322.20	1327.70	1333.30	1338.80	1344.30	1349.80	1355.30	1360.80
Money Made Selling Power	\$0.00	\$1310.00	\$1296.00	\$1310.60	\$1316.60	\$1322.20	\$1327.70	\$1333.30	\$1338.80	\$1344.30	\$1349.80	\$1355.30	\$1360.80
Added to Total Production	62	1372.00	1358.00	1372.60	1378.60	1384.20	1389.70	1395.30	1400.80	1406.30	1411.80	1417.30	1422.80
Money Made Selling Power	\$0.00	\$1372.00	\$1358.00	\$1372.60	\$1378.60	\$1384.20	\$1389.70	\$1395.30	\$1400.80	\$1406.30	\$1411.80	\$1417.30	\$1422.80
Added to Total Production	62	1434.00	1420.00	1434.60	1440.60	1446.20	1451.70	1457.30	1462.80	1468.30	1473.80	1479.30	1484.80
Money Made Selling Power	\$0.00	\$1434.00	\$1420.00	\$1434.60	\$1440.60	\$1446.20	\$1451.70	\$1457.30	\$1462.80	\$1468.30	\$1473.80	\$1479.30	\$1484.80
Added to Total Production	62	1496.00	1482.00	1496.60	1502.60	1508.20	1513.70	1519.30	1524.80	1530.30	1535.80	1541.30	1546.80
Money Made Selling Power	\$0.00	\$1496.00	\$1482.00	\$1496.60	\$1502.60	\$1508.20	\$1513.70	\$1519.30	\$1524.80	\$1530.30	\$1535.80	\$1541.30	\$1546.80
Added to Total Production	62	1558.00	1544.00	1558.60	1564.60	1570.20	1575.70	1581.30	1586.80	1592.30	1597.80	1603.30	1608.80
Money Made Selling Power	\$0.00	\$1558.00	\$1544.00	\$1558.60	\$1564.60	\$1570.20	\$1575.70	\$1581.30	\$1586.80	\$1592.30	\$1597.80	\$1603.30	\$1608.80
Added to Total Production	62	1620.00	1606.00	1620.60	1626.60	1632.20	1637.70	1643.30	1648.80	1654.30	1659.80	1665.30	1670.80
Money Made Selling Power	\$0.00	\$1620.00	\$1606.00	\$1620.60	\$1626.60	\$1632.20	\$1637.70	\$1643.30	\$1648.80	\$1654.30	\$1659.80	\$1665.30	\$1670.80
Added to Total Production	62	1682.00	1668.00	1682.60	1688.60	1694.20	1699.70	1705.30	1710.80	1716.30	1721.80	1727.30	1732.80
Money Made Selling Power	\$0.00	\$1682.00	\$1668.00	\$1682.60	\$1688.60	\$1694.20	\$1699.70	\$1705.30	\$1710.80	\$1716.30	\$1721.80	\$1727.30	\$1732.80
Added to Total Production	62	1744.00	1730.00	1744.60	1750.60	1756.20	1761.70	1767.30	1772.80	1778.30	1783.80	1789.30	1794.80
Money Made Selling Power	\$0.00	\$1744.00	\$1730.00	\$1744.60	\$1750.60	\$1756.20	\$1761.70	\$1767.30	\$1772.80	\$1778.30	\$1783.80	\$1789.30	\$1794.80
Added to Total Production	62	1806.00	1792.00	1806.60	1812.60	1818.20	1823.70	1829.30	1834.80	1840.30	1845.80	1851.30	1856.80
Money Made Selling Power	\$0.00	\$1806.00	\$1792.00	\$1806.60	\$1812.60	\$1818.20	\$1823.70	\$1829.30	\$1834.80	\$1840.30	\$1845.80	\$1851.30	\$1856.80
Added to Total Production	62	1868.00	1854.00	1868.60	1874.60	1880.20	1885.70	1891.30	1896.80	1902.30	1907.80	1913.30	1918.80
Money Made Selling Power	\$0.00	\$1868.00	\$1854.00	\$1868.60	\$1874.60	\$1880.20	\$1885.70	\$1891.30	\$1896.80	\$1902.30	\$1907.80	\$1913.30	\$1918.80
Added to Total Production	62	1930.00	1916.00	1930.60	1936.60	1942.20	1947.70	1953.30	1958.80	1964.30	1969.80	1975.30	1980.80
Money Made Selling Power	\$0.00	\$1930.00	\$1916.00	\$1930.60	\$1936.60	\$1942.20	\$1947.70	\$1953.30	\$1958.80	\$1964.30	\$1969.80	\$1975.30	\$1980.80
Added to Total Production	62	1992.00	1978.00	1992.60	1998.60	2004.20	2009.70	2015.30	2020.80	2026.30	2031.80	2037.30	2042.80
Money Made Selling Power	\$0.00	\$1992.00	\$1978.00	\$1992.60	\$1998.60	\$2004.20	\$2009.70	\$2015.30	\$2020.80	\$2026.30	\$2031.80	\$2037.30	\$2042.80
Added to Total Production	62	2054.00	2040.00	2054.60	2060.60	2066.20	2071.70	2077.30	2082.80	2088.30	2093.80	2099.30	2104.80
Money Made Selling Power	\$0.00	\$2054.00	\$2040.00	\$2054.60	\$2060.60	\$2066.20	\$2071.70	\$2077.30	\$2082.80	\$2088.30	\$2093.80	\$2099.30	\$2104.80
Added to Total Production	62	2116.00	2102.00	2116.60	2122.60	2128.20	2133.70	2139.30	2144.80	2150.30	2155.80	2161.30	2166.80
Money Made Selling Power	\$0.00	\$2116.00	\$2102.00	\$2116.60	\$2122.60	\$2128.20	\$2133.70	\$2139.30	\$2144.80	\$2150.30	\$2155.80	\$2161.30	\$2166.80
Added to Total Production	62	2178.00	2164.00	2178.60	2184.60	2190.20	2195.70	2201.30	2206.80	2212.30	2217.80	2223.30	2228.80
Money Made Selling Power	\$0.00	\$2178.00	\$2164.00	\$2178.60	\$2184.60	\$2190.20	\$2195.70	\$2201.30	\$2206.80	\$2212.30	\$2217.80	\$2223.30	\$2228.80
Added to Total Production	62	2240.00	2226.00	2240.60	2246.60	2252.20	2257.70	2263.30	2268.80	2274.30	2279.80	2285.30	2290.80
Money Made Selling Power	\$0.00	\$2240.00	\$2226.00	\$2240.60	\$2246.60	\$2252.20	\$2257.70	\$2263.30	\$2268.80	\$2274.30	\$2279.80	\$2285.30	\$2290.80
Added to Total Production	62	2302.00	2288.00	2302.60	2308.60	2314.20	2319.70	2325.30	2330.80	2336.30	2341.80	2347.30	2352.80
Money Made Selling Power	\$0.00	\$2302.00	\$2288.00	\$2302.60	\$2308.60	\$2314.20	\$2319.70	\$2325.30	\$2330.80	\$2336.30	\$2341.80	\$2347.30	\$2352.80
Added to Total Production	62	2364.00	2350.00	2364.60	2370.60	2376.20	2381.70	2387.30	2392.80	2398.30	2403.80	2409.30	2414.80
Money Made Selling Power	\$0.00	\$2364.00	\$2350.00	\$2364.60	\$2370.60	\$2376.20	\$2381.70	\$2387.30	\$2392.80	\$2398.30	\$2403.80	\$2409.30	\$2414.80
Added to Total Production	62	2426.00	2412.00	2426.60	2432.60	2438.20	2443.70	2449.30	2454.80	2460.30	2465.80	2471.30	2476.80
Money Made Selling Power	\$0.00	\$2426.00	\$2412.00	\$2426.60	\$2432.60	\$2438.20	\$2443.70	\$2449.30	\$2454.80	\$2460.30	\$2465.80	\$2471.30	\$2476.80
Added to Total Production	62	2488.00	2474.00	2488.60	2494.60	2500.20	2505.70	2511.30	2516.80	2522.30	2527.80	2533.30	2538.80
Money Made Selling Power	\$0.00	\$2488.00	\$2474.00	\$2488.60	\$2494.60	\$2500.							