

## GOING GREEN: QUESTIONS AND ANSWERS

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Question	Answer
1. What is the carbon footprint of manufacturing/transporting of solar panels?	<p><u>Manufacturing Carbon footprint:</u> We have prepared a document reviewing and summarizing three peer-reviewed articles on this subject. <a href="#">Here</a> is the document with summaries and references. We conclude that the solar panels would pay back the carbon emissions at manufacture in the first 2 years of their estimated 25 to 30 year lifetime.</p> <p><u>The transport</u> cost in emissions of the 103 panels 412 miles from Dalton, GA via Interstate 40 would require only 0.151 metric tons of carbon emissions, less than 0.56% of the 26.9 metric tons of emissions averted in the project's first year, and only 0.02% of the 615 metric tons of emissions averted for the production of 869,609 kWh over the panels' expected lifetime of 25 years. Here is the <a href="#">calculation</a>.</p>
2. Is this taking money away from other CHFM building needs, e.g. improving outside safety/accessibility, renovating the foyer/library area – both of which are projects that have been considered for over 10 years? <b>(provide your opinion)</b>	<p>Friends may differ about what they personally believe are priorities for CHFM capital expenditures, and to what they want to contribute in addition to their annual contribution for the regular expense budget. These differing priorities and opinions are what we are "threshing". We welcome each person's thoughts about whether renovating the foyer/library, or other important projects in the <b>future</b> is a higher priority for their personal giving than this investment <b>now</b> in energy saving</p>

	<p>expense for our CHFM budget and reducing our carbon impact on the planet. And is it really a fair question, namely would we be "taking money away from other important CHFM building needs?" This can only be answered objectively and definitively when folks decide whether, or how much, they will contribute to a solar panel fundraising project. If folks don't contribute sufficiently to the project, the project simply won't go forward. But suggesting that there is an either or choice to be made now, unfairly and deleteriously attempts to block approval of the first step: the application for the \$25,650 rebate. If this first step is blocked, the project is most likely blocked.</p> <p>The continuing renovation of the Meeting House is a choice, not a demand. Nothing critical will be harmed if the Library and Foyer continue as they are for another year or two or three. The design phase of the project is still in process and has actually paused since no one is in the building.</p>
<p>3. Would the construction be disrupting to the Early School?</p>	<p>No. The installation of the panels will be done in a single day. The trench for the cable will not affect the parking lot and will temporarily disrupt only part of the playground.</p>
<p>4. What is the carbon impact of a single tree? Trees are the most important living system on earth for mitigating the impact of Climate Change – <i>especially in urban areas.</i></p>	<p>A tree is an excellent way to sequester carbon, and the project will sequester the carbon equivalent for many trees. Each year, the proposed rooftop solar project would avert emissions of 26.9 metric tons of CO<sub>2</sub> and thereby eliminate greenhouse gas emissions equivalent to the carbon sequestered by 35.1 acres of forests (26.9 metric tons/0.72 metric tons per acre) or 0.18 acres preserved from</p>

	conversion to cropland or 444 tree seedlings grown for 10 years according to <a href="#">data and calculations</a> from the USDA and the EPA.
5. Is there sufficient environmental and ethical justification for removing the trees deemed necessary for the project? This is an area directly adjacent to a creek that is already prone to high surface run-off and flooding.	The trees would best be left in place as spars, shortened trees that then can be homes for a myriad of creatures who only live in spars. Spars have become rarer since people tend to treat them as “rubbish” instead of having a respectable place in the landscape.
6. A single native tree provides shade during hot summers that significantly reduces A/C energy consumption, as well as reducing the adjacent ground surface temperature. Would the energy needs of the School building increase with the loss of these trees?	Whereas the shade from a tree reduces A/C energy consumption only in the summer, the rooftop solar will reduce energy consumption throughout the entire year to near zero fossil fuel.
7. Would removing trees behind the School building detrimentally increase the surface runoff rate and erosion?	The trees behind the School House (north of the school) have no effect on the solar panels and are a B&G concern.
8. Trees are essential for self-mulching to reduce surface earth temperatures and providing nutrients to enrich clay soils and reduce erosion. Would we be increasing the risk of a sink hole by removing trees in this area prone to sinking?	The sink hole was due to a water leak in the building which has been attended to. If the trees are left as spars, the roots will remain.
9. A single native tree hosts insects that are symbiotic for its own health as well as providing insects and caterpillars that are essential nutrients to native birds, bees/wasps, butterflies, etc. Is removal of these trees environmentally justifiable given the ongoing extensive loss of forest habitat happening in the Chapel Hill area, related to massive development projects?	Again, we are recommending that the trees only be shortened to spars, which will have these benefits and additional benefits beyond what is being discussed here. For one instance, a spar becomes a feast for woodpeckers, since all the wood eating insects show up for the party.
10. Given the pandemic, <b>where might our 2020/21 CHFM “Earthcare witness” efforts have the greatest impact?</b> Where is our current environmental priority focus – CHFM property, our own homes/businesses/schools, the facilities of our benevolences, our State natural	It is always best to set your own house in order before going to clean up other peoples’ houses. Because we are a public space, we can be an example for everyone who comes to either the Meeting or the Schoolhouse.

<p>environment (conservation areas, hurricane-impacted communities), other?</p>	<p>The NC Legislature authorized Duke Energy to offer a rebate of about 30% off the cost of a solar system – a rebate CHFM is likely to get. In contrast, residential and commercial customers have little chance of getting a rebate because of the fierce competition in the anticipated frenzy in the first five minutes of the next rebate opportunity, 9:00 to 9:05 am, January 4, 2021. Because CHFM is non-profit, CHFM has a much better chance of getting the rebate and therefore making a much greater impact, dollar for dollar, than an individual or a business.</p>
<p><b>11. What funds do we want to earmark for pragmatic projects that mitigate climate change?</b> Given currently reduced donations, can we justify the cost of the solar panel project? Is this a one-time special project funding support or should we consider budgeting funds annually for Earthcare Witness activities and/or programs?</p>	<p>This is a very pragmatic project that will have immediate good effects for the planet. Going off the fossil fuel grid is one of the most effective ways we can mitigate climate change. The solar rooftop project is a one-time opportunity for Friends to give to save money for the Meeting, to save money for Carolina Friends School, to improve the air we breathe, and contribute to the health of the planet. Just as Friends contributed generously to renovate the Meetinghouse, we anticipate Friends will see solar energy as a great way to help the Meeting, help Carolina Friends School, and help the planet.</p>
<p>12. If we put them in and then have to deal with a high rise building next door in the empty parking lot in a few years, will the solar panels remain operative?</p>	<p>The UNC parking lot lies almost directly east of the Schoolhouse. Although a new building may seem remote in the current financial straits of the University, if UNC were to erect a building to the maximum height permitted by the town, the building might block a portion of the morning sun's rays from reaching the Schoolhouse. However, as the sun rises, the UNC building would not block the majority of the sunlight coming from the South and</p>

	<p>the West. The sun on our rooftop panels would continue to generate energy and reduce our greenhouse gas emissions. See the image of the hypothetical UNC building on the parking lot on the last page of this document.</p> <p>The chances that UNC will give up parking are minimal, but the prospect of such an event is a respectable thought experiment. Perhaps it would lead to a well-considered piece of legislation to protect existing solar installations and balance the rights of neighbors.</p>
<p>13. Who owns the early school, is it CHFM, CFS, or are both co-owners?</p>	<p>CHFM owns the School building. CFS is renting it for \$1/year plus taking on all maintenance responsibility.</p>
<p>14. With regards to the above is there a lease, contract or MOU?</p>	<p>Yes, it is up for renewal in 2023.</p>
<p>15. It will need to be clear if there is an expectation for financial involvement from CFS, e.g. for the initial capital outlay of adding the solar panels, or the maintenance, fees, etc.</p>	<p>Yes, that is under negotiation. We would not expect Meeting to approve the final expense without a clear agreement with CFS.</p> <p>The matter of who purchases: there is an idea on the table. Which is this:</p> <p>CHFM pays for the installation up front. CFS then pays CHFM \$3,400 (current elec. charge in their budget) to CHFM for 9 years. In the tenth year they pay the remainder needed to pay off 70 percent of the final cost of the project. This percentage is based on the current balance of use between CHFM and CFS.</p>

<p>16. There are three inverters proposed to be put under the school, is there a possibility of school disruption or danger to students? I believe a figure of \$2,100 per inverter was mentioned. Who pays for these? I realize the inverters, installation and the panels - with or without subsidy - are not big expenses, but still clarity is important.</p>	<p><u>Inverter Safety:</u> SolarEdge Inverters meet National Electric Code (NEC) 2014 and NEC 2017, which require the rapid shutdown of the inverters under dangerous circumstances. The inverters automatically shut down under any of the following conditions:</p> <ul style="list-style-type: none"> <li>• A building is disconnected from the electrical grid</li> <li>• The inverter is turned off</li> <li>• The power optimizer thermal sensors in each module detect a rising temperature above 85 degrees centigrade.</li> </ul> <p>The SolarEdge inverters have a product guarantee of 12 years extendable to 25 years. The current replacement cost is about \$2,100 per inverter plus about \$200 labor. The cost of the warranty extension to 25 years is \$316.</p>
<p>17. Will the additional weight of the solar panels and their framework cause damage to the underpinnings of the schoolhouse? As a UNC construction dump decades ago, the ground under the schoolhouse is unstable. (Actually, a lot of the ground around Chapel Hill can be considered unstable as a result of the unusual combination of clay, Chapel Hill gravel, etc.) A crack appeared last year in a wall of the multi-purpose room. Over the last few years sinkholes have appeared at the SE corner of the building and in the ground nearby. How much weight will the panels and framework add? Before weight is added to the building, should a civil/structural engineer be hired to test the stability of the ground under the schoolhouse?</p>	<p>The foundations issues have no bearing (pun) on the strength of the roof. The original drawings of the building show that the school had the roof sized to hold solar panels. The option is drawn showing how panels would be added.</p> <p>Also, 8MSolar will do an inspection of the roof and supports to verify that they are strong enough. They are doing this from a very quakerly attitude of being responsible for all aspects of the project, whether the law requires it or not (it doesn't). They have already shown that they are devoted to doing good projects, not just anything that a client might be willing to pay for, good or wasteful. 8MSolar has the highest engineering and construction credentials.</p> <p>The solar panels themselves weigh only 44 pounds each, about 20 percent lighter than older model panels. The total weight of the 103 panels x 44 pounds = 4,532</p>

	<p>pounds. For a building of 4,000 square feet, the panels add just 1.1 pounds per square foot in contrast to the live load architects regularly specify of 30 pounds per square foot.</p>
<p>18. Will the daylighting featured in the schoolhouse be negatively affected by the solar panels and/or the structures holding them? Will the panels produce glare? Will the panels and their structures block the light coming into the classrooms from above, reducing the effects of daylighting?</p>	<p>We appreciate the concern for the daylight. Fortunately, there is not a conflict. The location of the panels are on the roof will not obstruct the light entering the windows.</p>
<p>19. Will the screws piercing the shingles to hold the panel framing to the roof underlayment create leaks over time?</p>	<p>The screws penetrate only the first shingle. Several roof manufacturers have stated that the installation does not violate their warranties. The contractor installs comprehensive flashing for all the solar panels. Read on the <a href="#">Solar Reviews website</a> the 48 reviews from the contractor's customers. None of the 51 customers have reported a leak. Read <a href="#">here</a> on the Google website the 110 favorable reviews for the contractor, 8MSolar. None report a leak.</p>
<p>20. How difficult or easy is it to repair leaks in a roof covered by solar panels?</p>	<p>The major problem for repairing a roof leak is identifying the source. Once the source of the leak is identified, solar panels are not a significant problem. Again, none of the contractor's customers have reported a leak from the panels. See the 48 reviews on the <a href="#">Solar Reviews website</a> and the 110 reviews on the Google website <a href="#">here</a>.</p>
<p>21. Before the shingles must be replaced (about 20 years from now), plans will need to be made to pay to remove the solar panels and frames and then return/replace them once the new shingles have been laid. That sure complicates any re-roofing project.</p>	<p>Fortunately, the Baker Roofing Company installed on the Schoolhouse this year a very high quality roof warranted for 40 years, not 20 years. The solar panels have a production warranty of 25 years but a life expectancy of at least 30 years. Realistically we know the roof might not last 40 years. Ok, say the roof lasts only 35 years. At current Duke Energy rates,</p>

the project for both buildings would save about \$5,200 per year. Historically, Duke rates have gone up about 2% per year so \$5,200 is a conservative estimate. After 9 years to pay back investment in equipment, we could anticipate 35 years minus 9 years = 26 years of savings. 26 years x \$5,200 = \$135,200. Earlier this year, we got a quote of \$600-\$800 for removing and replacing a smaller number of solar panels. So even if it might cost \$3,000 to remove and replace the panels, we would still be ahead by \$132,200.

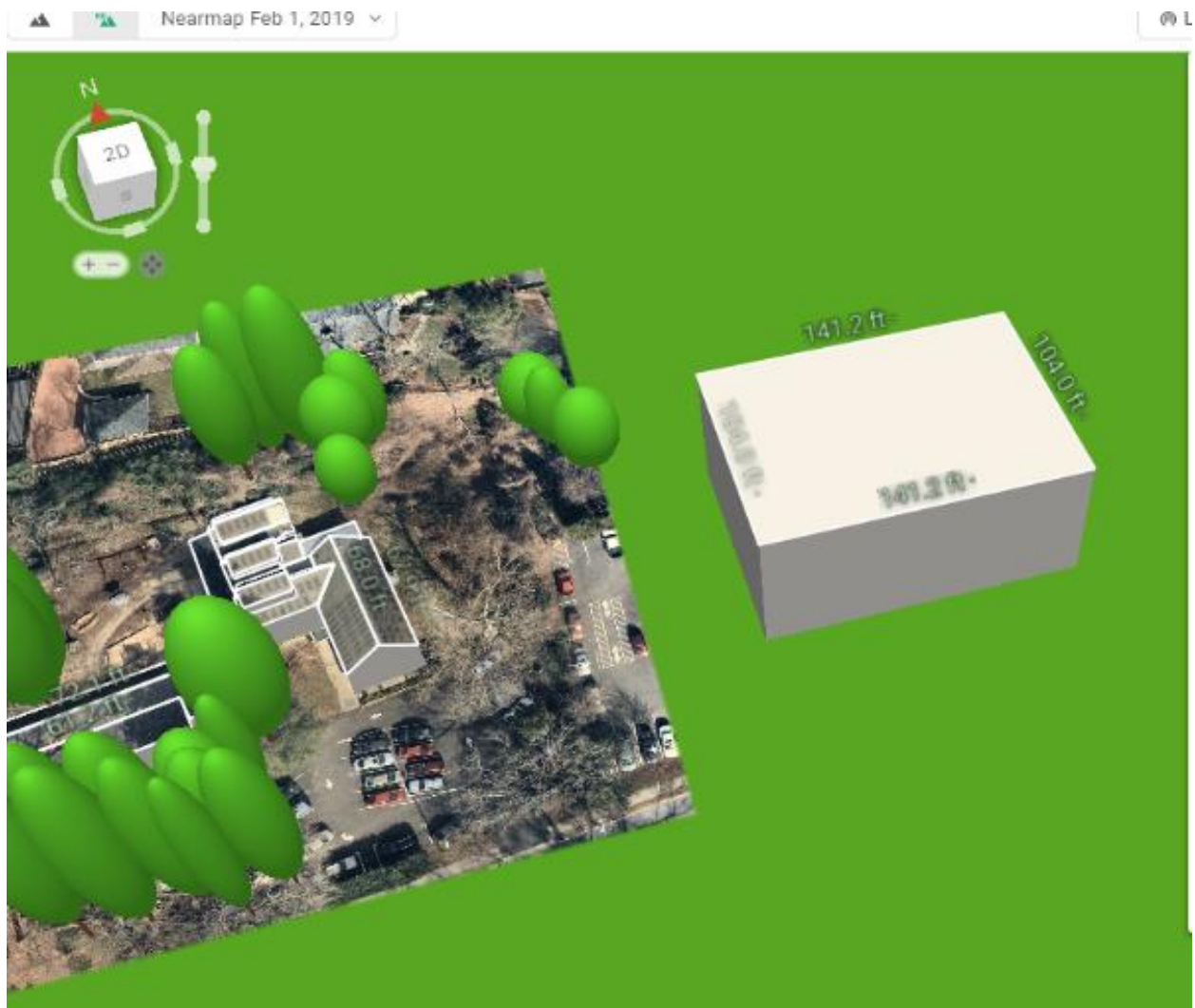


Image. Schoolhouse and Hypothetical UNC Building on the Parking Lot