The Paris establishes an aspiration goal of holding climate change to 1.5°C, with a firmer goal of holding the global temperature decrease "well below" 2°C. As a practical matter, the 1.5°C goal almost certainly would require geoengineering, such as injecting aerosols into the stratosphere or solar mirrors. Even getting well below 2°C is likely to require steps of that kind or a technological breakthrough for another kind of geoengineering, removing CO_2 from the atmosphere. None of this has to happen soon, but sometime between now and the end of the century, something along these lines would probably be required.

It's always good to begin with the actual text of the agreement. Here's the language of the agreement about the goal in Article 2(1)(a): "Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change." Admittedly, this language is stated as an aim of the agreement rather than a mandate, but it's worth thinking about what would be necessary to accomplish this aim. And it's possible that it's really just intended as symbolic, like the 1972 Clean Water Act's long-forgotten goal of eliminating all water pollution by 1985. Nevertheless, the Paris Agreement does place these temperature goals on the table, and we should give them careful consideration.

I don't quarrel with the idea that it would be desirable to attain these goals if we can. It is true that a number of scientists now think that the 1.5° target is needed to avoid the risk of dangerous climate change. So if there's a realistical way to reach this target, or at least something under 2°, we should certainly give that serious consideration.

The question, however, is whether it is feasible to reach that goal through emission cuts. On that score, as Ann explained in an earlier post, there is considerable doubt. On an optimistic view, the goal is achievable — but only with immediate, rigorous emissions reductions combined with new technologies to remove CO_2 from the atmosphere. Ann points out that extraordinary efforts would be required for a country like the U.S., like increasing our current use of renewables thirtyfold. This is consistent with what I've read on the subject. For instance, a recent summary of the literature concludes,

IPCC results suggest that limiting temperature increase to <1.5°C by 2100 would require concentration of less than 430 ppm CO_2-eq), an enormous challenge. . . . While the literature on the feasibility of reaching this target remains scarce, aggressive mitigation strategies would be fundamental, without any further delay. This entails not only swift global cooperation and exemplary institutional agreements but also massive investments in decarbonizing the global economy with zero net emissions before the end of the century as well as substantial and early negative emissions, particularly carbon dioxide removal

strategies . . . . While some argue that a 1.5°C scenario is still feasible, others judge it as no longer within reach.

I would not bet the house, let alone the planet, on "swift global cooperation," "exemplary institutional arrangements," and "massive investments" happening quickly. This suggests that, much as we need to cut emissions, emissions are probably not going to get us to 1.5°. Indeed, I have doubts about whether the political will exists to make the huge effort required even to achieve the 2° goal purely through emission cuts. Any realistic trajectory involves, at the least, new technologies to remove massive amounts of carbon from the atmosphere (which one scientist has called a "technological utopia"). Short of enormous scientific breakthroughs one that front, solar radiation management to reduce the light reaching the surface seems necessary instead.

For these reasons, it appears to me, geoengineering begins to look necessary as a practical matter if we are going to hit such ambitious goals. Although it involves risks, the risks are less severe if we make a strong an effort as possible to cut emissions first, so that geoengineering doesn't need to carry so much of the weight of emissions reductions.

I'm not particularly a fan of geoengineering, and I will be happy to be wrong about this. Maybe new energy technologies will be able to get us the kinds of cuts we need quickly and cheaply enough to attain the goals. Otherwise, though, if we are serious about those temperature targets, we may end up with little other choice than layering some geoengineering efforts on top of aggressive emission cuts.