Video #20: Do We Need a $10B Climate Moonshot?

Links to Video

Do We Need a Climate $10B Moonshot?
https://www.youtube.com/watch?v=ihTGiOEKrns

Bill, What about getting involved in a Climate R&D Moonshot?
David, Perhaps we need a Climate R&D Moonshot?

https://www.youtube.com/watch?v=ihTGiOEKrns

Introduction

Hi, my name is Glenn Weinreb,
and today we're going to look at how to solve the climate problem,
with a surge,
in research,
and development.

Occasionally,
R&D is used,
to solve a problem.

For example, {Pic: power / fusion / JFK-speech-man-landing (sound off)}
in 1961,
President Kennedy,
stated he wanted a man on the moon,
by the end of the decade.

In response, {Video: power / fusion / NASA-vehicle-assembly-building}
a program,
was set up,
and funded.

In theory,
a so-called **moonshot**,
like this,
could be initiated,
for climate change.

But what might be developed,
and how much,
might it cost?

Well,
that's what we're going to look at,
today.

What is a Climate Moonshot?

Before we begin,
we're going to define,
several terms.

{Pic Definition} We define "Climate Moonshot" as:
Conducting R&D,
to the extent required,
to solve the **entire**,
climate problem.

And, we {Pic ...} define, "solving the problem" as,
{Pic ...} preventing the collapse of sea ice,
{Pic ...} preventing the collapse of ocean currents,
{Pic ...} preventing the collapse of the west Antarctic ice sheet,
{Pic curve} and bending the global warming curve,
so that the Earth's temperature,
peaks,
and then,
drops back down.

To achieve *ALL* of these objectives,
our moonshot does,
two things.

One,
it does R&D,
{Pic Green/Fuel} to drive down the cost of 24/7 green energy,
to below that,
of fossil fuel.

And two,
it does R&D,
to determine {Pic Reflect 1%} how to reflect sunlight,
back into outer space,
to cool the planet,
and offset global warming.

Obviously,
we would want to do this,

at a reasonable cost,
and without harm.

It is worthing noting,
{Pic Guy} many people are nervous,
about reflecting.

Also, {Pic bullets}
to prevent runaway climate change,
we probably need to {*} reflect,
approximately 1% of sunlight,
within 15 years,
near the {*} North,
and South poles.

And, in theory, this can be {Pic big spray plane} done by spraying gases,
with reflective properties,
into the upper atmosphere.

{Pic skeptical woman}
But how much might this cost?

{Pic Wake Smith} Well,
according to one study,
reflecting might cost,
tens of billions,
of dollars,
annually.

This might seem expensive,
however,
it might be,
the lowest cost way,
{Pic dominos} to prevent,
runaway climate change.

Moonshot Strategy

An R&D moonshot,
would probably be funded by people,
who want to use their money,
to save the planet,
from climate change,
as opposed to investors,
who seek,
a financial return.

Planet saving,
and investing,
differ,
in multiple ways.

Candidates,
for moonshot sponsorship,
include,
high-net-worth individuals,
foundations,
and governments.

In theory,
sponsors,
could require produced materials,
be placed on the internet,
for open review.

Open-source,
often saves time,
and money,
since it reduces,
inaccurate claims.

{Pic people at board} When doing R&D,
small money,
is spent before medium money,
and medium,
before large.

For example,
within a moonshot initiative,
1 million dollars might support proposal writing,
10 million might support doing detailed design work,
and 100 million,
might support building prototypes.

Ultimately,
{Pic billions} we need to think about how to spend billions of dollars,
to save trillions.

And,
for *no* money,
one person,
or one group of people,

can design a moonshot program,
by putting together,
a list of things,
to develop.

In other words,
they can {Pic Moonshot Question} focus on the following question:

What is a list of things,
{*} *that if developed,*
{*} *solve the entire,*
{*} *climate problem?*

{Pic /bp} For an example list,
click on the link,
in the description below.

It is possible,
perhaps probable,
a climate moonshot,
is the ONLY way,
to solve,
the climate problem.

{Pic /v19} For a video that explores this concept, visit the link, shown here.

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The Climate Solution is More R&D [#19]
https://www.youtube.com/watch?v=LGPGiIDZoDA

What is The World's Climate Plan? [#21]
https://www.youtube.com/watch?v=9-nU31iTTUo
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Example Moonshot

We're now going to examine,
an example moonshot,
program.

This is not being done,
however,
it could be done.

{Pic $10B example} Our example costs
10 billion dollars,
over 5 years.

And, it divides the climate problem,
into 10 different research areas,
with roughly 1 billion dollars,
devoted,
to each.

The initial phase,
costs 10 *million* dollars,
and it supports
writing proposals,
designing machines,
and developing experiments.

Now let's review,
the 10 research areas,
one at a time.

Moonshot Area I: Improve Climate Models

{SLW} We need to calculate,
{SLW} how much sunlight needs to be reflected,
{SLW} from where,
{SLW} and when.

And to do this,
we need *better* climate models.

And to get these,
we need {video reflect / 6397313_Clouds_Nimbus} to conduct,
experiments on clouds,
{Pic Reflect off city arrows} and we need to measure how much sunlight,
reflects off,
air pollution.

{Pic /CSS} For details on clouds, visit the link, shown here.

$250M Cloud Research Surge (PDF)
https://ma2life.org/g/eet/eetcs_plan/decarb_plan/cloud_science_surge_ChatGPT.pdf

{Pic /v8} And for details on pollution, see video number 8.

The Uncertainty of Climate Change [#8]
https://www.youtube.com/watch?v=HoqX7uBaeKU

Moonshot Area II: Conduct Reflectivity Field Experiments

Sulfur occurs naturally {Pic coal and oil} in coal and oil,
and is therefore {Video: smoke / chimney-smoke-from-enterprise}
emitted into the atmosphere,
when these fuels,
are burned.

In principle,
{Pic filter} it could be extracted before combustion,
{Pic truck} moved to an airplane,
{video reflect / passenger-jet-flying} and emitted into the upper atmosphere,
{Pic bus exhaust} instead of being emitted,
at ground level.

Sulfur in the Upper atmosphere,
stays aloft for one to two years,
while sulfur emitted at low altitudes,
typically stays aloft for only hours to days.

Also, sunlight reflects off, sulfur.

Therefore,
changing the emissions site,
reduces the planet's temperature,
while *not* increasing,
total sulfur emissions.

To better understand this,
we need to develop airplanes,
that emit material,
into the upper atmosphere,
and then monitor,
that material,
for days to weeks.

{Pic Videos 9...10 /RSV} For details, see videos 6 through 10.

The Climate Acceleration Problem [#6]
https://www.youtube.com/watch?v=6r3Xag24iOI

The Science of Global Warming [#7]

https://www.youtube.com/watch?v=Por9aWKLdc4

The Uncertainty of Climate Change [#8]
https://www.youtube.com/watch?v=HoqX7uBaeKU

Reflecting Sunlight [#9]
https://www.youtube.com/watch?v=AJ-ddFDiA4w

Can Air Pollution Save the Planet? [#10]
https://www.youtube.com/watch?v=p4O2hv9tSDA

Moonshot Area III: Develop Large Automated Spray-Plane

To control global warming,
we probably need large airplanes,
that can emit,
100 tons of material,
every several hours.

And,
to do this at a reasonable cost,
we probably need a system,
that supports automated flying,
automated refueling,
and automated reloading.

And,
we probably need 100 to 200,
of these automated airplanes.

But before we build hundreds of planes,
we need to build 1.

In other words,
{video scientists / 6280804_Engineers} we need to design,
{video reflect / team-of-aircraft} and prototype,
an automated system,
{video reflect / klm-boeing-777} that supports *one* *large* spray plane.

Moonshot Area IV: Automate Nuclear Power Construction

Okay,
so the first 3 billion dollars of R&D,
sets us up,
to reflect sunlight.

Eventually,
{Video gov't / businessman-meditating} future leaders,
would need to compare,
reflecting,
with,
not reflecting.

Also, {video smoke / 568237_Chimney} we have a carbon dioxide emissions problem.

And,
to transition to a green economy,
we need to reduce the cost of 24/7 green energy,
to below that,
{video fossil fuel / coal / truck} of fossil fuel.

Fortunately, this is easy.

We just need to automate {pic nuclear power construction},
the construction,
of nuclear power plants.

More specifically,
we need to develop,
custom machines,
that build these sites.

And,
this would cost little,
{Pic Hinkley} compared to the cost of a nuclear power plant.

{Pic /drd} For details, see videos 11 through 13.

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Low-Cost Nuclear Power [#11]
https://www.youtube.com/watch?v=AIlbovU67wI

Automated Nuclear Power Construction [#12]
https://www.youtube.com/watch?v=afO0cy1l7Qo

How to Make $10 Trillion Dollars [#13]
https://www.youtube.com/watch?v=4gqmKGV1h5Y
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Moonshot Area V: Co-locate Chemical Processing with Nuclear Power

{pic beakers} To make chemicals without emitting carbon dioxide,
at a cost less than the traditional approach,
we need to co-locate,

{video power / nuclear / chemical-production-facility} chemical processing equipment,
{video power / nuclear / aerial-view-to-nuclear} with low-cost,
nuclear reactors.

More specifically,
we need to develop standards that define how this fits together.

And, to reduce the cost of the processing equipment,
we need to develop a transportation system,
{pic platform} that moves large platforms of chemical processing equipment,
{pic factory} from a shipyard or factory,
{video power / nuclear / factory-nuclear-power} to a nuclear power site.

{Pic /v11} For details, see video, number 11.

```
Low-Cost Nuclear Power [#11]
https://www.youtube.com/watch?v=AIlbovU67wI
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Moonshot Area VI: Achieve Economic Fusion

[Pic 3x Fission vs. Fusion] There are primarily two types of nuclear power: fission and fusion.

[Video: power / fission / aerial-drone-view-of-Doel-nuclear] Fission is the traditional form,
that generates electricity with uranium fuel.

[Pic 5x fission problems] However,
this is not popular,
due to meltdown risk,
nuclear waste,
proliferation risk,
and cost.

{Pic fusion} Fusion,
on the other hand,
does not have these issues;
[Video: science / two-men-with-the-tablet-standing} however,
it is still in development.

In theory, we can accelerate this development,
with a surge in funding.

{Pic /v14} For details, see video number 14.

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Fusion Moonshot [#14]
https://www.youtube.com/watch?v=CvZzGHSugy4
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Moonshot Area VII: Develop Next Generation Solar Farm

In theory,
we can reduce the cost of solar power,
by developing a technique,
{Pic solar farm} for placing solar material,
directly,
onto soil.

{Pic /v17} For details, see video number 17.

Next Generation Solar Farms [#17]
https://www.youtube.com/watch?v=3aOSrsZD2MY

Moonshot Area VIII: Develop Green Standards

{SLW} In a green new world,
{SLW} we need more standards,
{SLW} that define how things fit together,
{SLW} mechanically,
{SLW} electricity,
{SLW} and with communications.

This includes
{Pic devices} standards for devices in automated buildings,
{Pic EV} standards for swappable EV batteries,
{Pic ship} and standards for ships powered by liquid ammonia.

{Pic /grd} For details, visit the links, shown here.

Green Cars: Swappable Batteries [#15]
https://www.youtube.com/watch?v=jY_jNQ77FA8

Next Generation Building Automation [#16]
https://www.youtube.com/watch?v=T_obb_z77co

Moonshot Area IX: Develop Vertical Tunnel Boring Machine

To extract underground geothermal energy,
at a low cost,
{Pic TBM} we need vertical tunnel boring machines,
{SLW} that operate,
{SLW} at high temperatures.

{Pic /grd} For details, visit the link, shown here.

Geothermal Moonshot (e.g. high temperature vertical tunnel boring machine)
https://ma2life.org/g/eet/eetcs_plan/decarb_plan/geothermal_conversation.pdf

Moonshot Areas X: Develop Policy Making Tools

In theory, we can build
{SLW} a **website,**
{SLW} that creates climate plans,
{SLW} based on requirements,
{SLW} specified by the website user.

This would allow policymakers,
and concerned citizens,
to get a better sense,
of how to fix climate,
at the lowest-cost.

{Pic Video 4-5} For details, see climate videos 4 and 5.

What is Our Climate Plan? [#4]
https://www.youtube.com/watch?v=aTzmZGHa9EM

What does a Climate Plan Look Like? [#5]
https://www.youtube.com/watch?v=IZLFWarYlbw

Are We Ready for a Climate Moonshot?

{SLW} A surge of R&D,
{SLW} in key areas,
{SLW} can probably solve,
{SLW} the climate problem.

And,
{SLW} it can get started,
{SLW} for roughly 10 million dollars.

{video activism / three-siblings-playing-and-having-fun-in-a-golden-field} Yet most importantly,
a path forward exists,
and it is not blocked,
by politics,
or financial constraints.

Okay, that's it for me, and I'll talk to you all, real soon.

References

Sunlight Reflectivity Field Experiments (PDF)

https://ma2life.org/g/eet/eetcs_plan/decarb_plan/arctic_sai_experiment.pdf

$250M Surge in Cloud Research (PDF)

https://www.aplantosavetheplanet.org/css

Experiments that Measure How Much Sunlight Reflects off Aerosols (PDF)

https://www.aplantosavetheplanet.org/ae

Conversation with AI: Cloud Experiments

The Earth's albedo changed 1.7W/m^2 over last 25 years, and the average global temperature changed 0.6°C. James Hansen believes 1W/m^2 out of the 1.7W/m^2 is due to cloud changes. Yet the AR5 and AR6 climate models assume clouds change 0.42W/m^2/°C, and this is one-fourth of what we observe (1W/0.6°C = 1.6W/m^2/°C). In other words, cloud changes exceed that predicted by climate models. What experiments do we need to conduct, to better understand clouds?

Assume you have $250M to spend over 5 years ($50M/yr on average), and you are to improve our understanding of clouds. What would you do?

What might this accomplish?

https://grok.com/c/5461d986-21d1-4fc5-b78d-b35bcf9b970c?rid=a02d9c3e-a29b-4ee8-bcee-bf8b556715c0
https://gemini.google.com/app/4ac7f51c85744772
https://chatgpt.com/c/69554bfe-d75c-832e-980b-88e8ad0a3fc4