

AI Datacenters Can Help Close the Gap between Electricity Demand and Electricity Supply by Using the Solar Energy Stored in Sustainably Sourced Biomass

How Much Biomass-Derived Fuel will it Take?

Presented by William Strauss, PhD – Founder and President of *FutureMetrics*

Presented on February 25, 2026



First a few slides about FutureMetrics and some recent analytics...



FutureMetrics™ LLC

FutureMetrics™ services include:

- Due diligence services to investors and lenders,
- Market information and analysis,
- Operations guidance and optimization,
- Project development,
- Feasibility studies,
- Strategic advice in the pellet sector.

***FutureMetrics* is the go-to consultancy when considering the production or use of torrefied, highly carbonized, or steam exploded biomass. See [HERE](#).**



Department for Energy Security & Net Zero

RioTinto

FutureMetrics - Consultants to Many of the World's Leading Companies with Interests in the Wood Pellet Fuel Sector

GLENCORE



Ayo Biomass
Green & Renewable Energy

BioMasters

EMI
Energy Management Inc.

circa

CEFC
CLEAN ENERGY FINANCE CORP

TOLKO

nsfp
Neville-Smith Forest Products

Aroostook Band of Micmacs

DOOSAN

idemitsu

genesis

IRVING

WESTERN COAST ENTERPRISE LTD.

Lignium energy

Lignetics

PEAK RENEWABLES

A. WILBERT'S SONS

SEWALL

VATTENFALL

THERMA GLO
FEEL THE HEAT™

AGRINIKA

Trans Pacific Fibre

drax

OSAKA GAS

Marubeni

AMERICAN INDUSTRIAL PARTNERS

Paul Weiss

Advent International
GLOBAL PRIVATE EQUITY

UPC
Renewables™

AtlanticPower Corporation

RECAST ENERGY

Seaonus

VERTO™

INTERFOR™

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

BFL CANADA

BioDean

LYNEMOUTH POWER

bioena

MITSUI & CO.

FORUM
EQUITY PARTNERS

arbaflame

GOLDEN STATE
Finance Authority™

FREEMAN
Sustained Forests

Hancock Natural Resource Group

EQUIS

RIO CLARO

ROMSPEN

MESYS
MAINE ENERGY SYSTEMS

LAHMEYER INTERNATIONAL

Highland

ASHMORE

AGRA Industries

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LEBEL
Since 1956
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Européenne de Biomasse

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MITSUBISHI RESEARCH INSTITUTE, INC.

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ITOCHU

ARBECC
LE BOIS, UNE PASSION

Sumitomo Corporation

NRI
未来創発
Dream up the future.

WOOD PELLET ASSOCIATION OF CANADA

GP Georgia-Pacific

cosan

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RAINBOW PELLET

INDORAMA

Char-Broil

Spectrum ENERGY

PARKSIDE TIMBER

Pinnacle RENEWABLE ENERGY

DELCO

U.S. Endowment for Forestry and Communities

SBP
Sustainable Biomass Program

WIKWEMIKONG
UNCEDDED INDIAN RESERVE
Proud. Progressive.

WIKWEMIKONG
UNCEDDED INDIAN RESERVE
Proud. Progressive.

FULGHUM FIBRES

IOGEN CORPORATION

Ask me later about our soon to be published *FutureMetrics* research.

It is about storm water runoff from the outdoor storage of torrefied and steam exploded pellet fuels. (summary on the next slide)

The leachate from black pellet runoff is very different than the leachate from coal.

Coal leachate treatment systems are ineffective in treating the high chemical oxygen demand (COD) loading of black pellet leachate.

After 24-hour agitation leaching in 20⁰ C water – solids to water ratio = 1:10

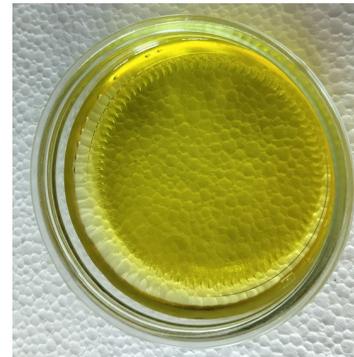
Torrefaction after
Pelletization (TAP)



Torrefied Before
Pelletization (TBP)



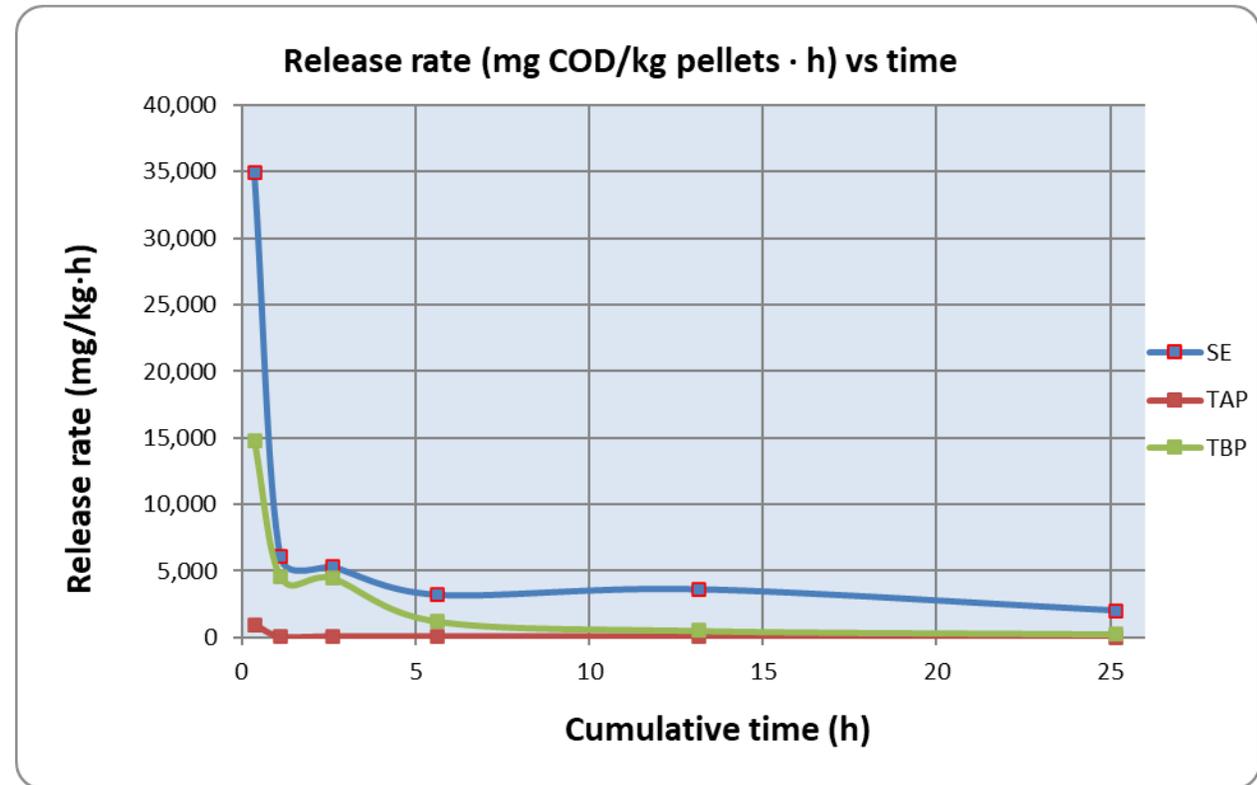
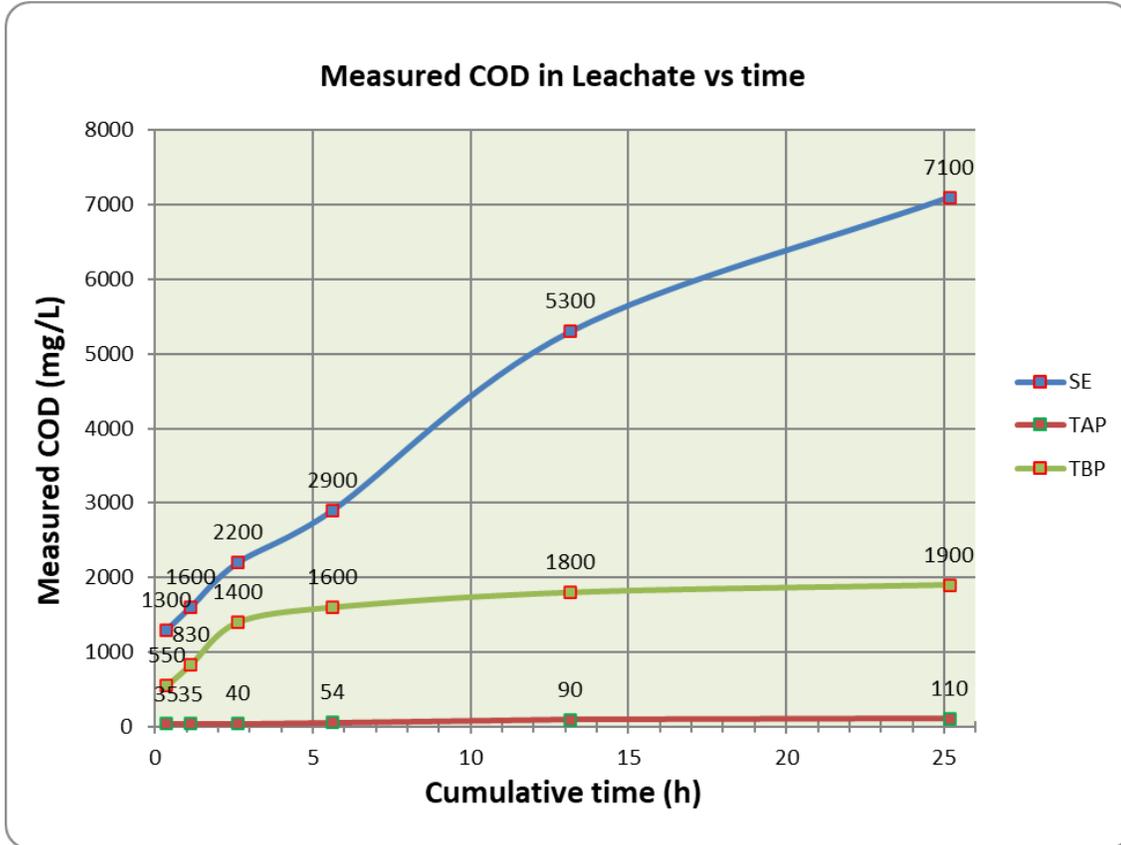
Steam Exploded
Pellets



EFB Steam Exploded
Pellets



Plotted data from our testing of SE (steam exploded), TAP (torrefaction after pelletization), and TBP (torrefaction before pelletization)



FutureMetrics Black Pellet Storage Pile Storm Runoff Services

- We look at the whole complex from an economic perspective.
- That includes fuel management (SE vs. TBP vs. TAP), pile management (geometry), runoff management (first flush, buffer basins, continuous monitoring), treatment options (biological, ozone, ozone and AOP, combinations).
- We explore the release rate of COD-active compounds from various black pellet fuels, the BOD/COD ratio, the characteristics of leachates from different pellet types, the mobilization coefficient, and the activation energy for each pellet type **to enable selection of the best-fitting approach.**

New Addition to the *FutureMetrics* Team!

Enhancing our operations optimization services

FutureMetrics is pleased to announce the addition of **Darren Swaan** to its team of experts.

Darren is a pellet manufacturing project management specialist who has over 20 years of experience delivering large-scale industrial wood pellet projects from concept through commissioning.

Darren will compliment the expertise and experience of FutureMetrics' operations specialist, John Swaan.

FutureMetrics is proud to be a part of the next generation of the **Swaan legacy** in global pellet trade that was started by John with the first ever contract to ship pellets in bulk.

That first bulk shipment of pellets were produced in John's pellet plant that came to be called Pacific BioEnergy. The pellets, produced in Prince George, British Columbia, went via bulk carrier ship from Prince Rupert, British Columbia to Sweden in 1998.

The **Swaan legacy** includes John's brothers, Jim and Rob Swaan, who founded "Pinnacle Feed and Pellet" in 1988.

Over the following 30 years, that company became the dominant pellet manufacturer in western Canada. **Darren was involved in nearly all of the expansion projects.**

The name changed to Pinnacle Renewable Energy in 2018. Pinnacle Renewable Energy was acquired by Drax in 2021.

Darren was the project manager on the Drax Longview Washington project until Drax decided to indefinitely pause the project in late 2025 with no near-term or medium-term plans to expand wood pellet production capacity.



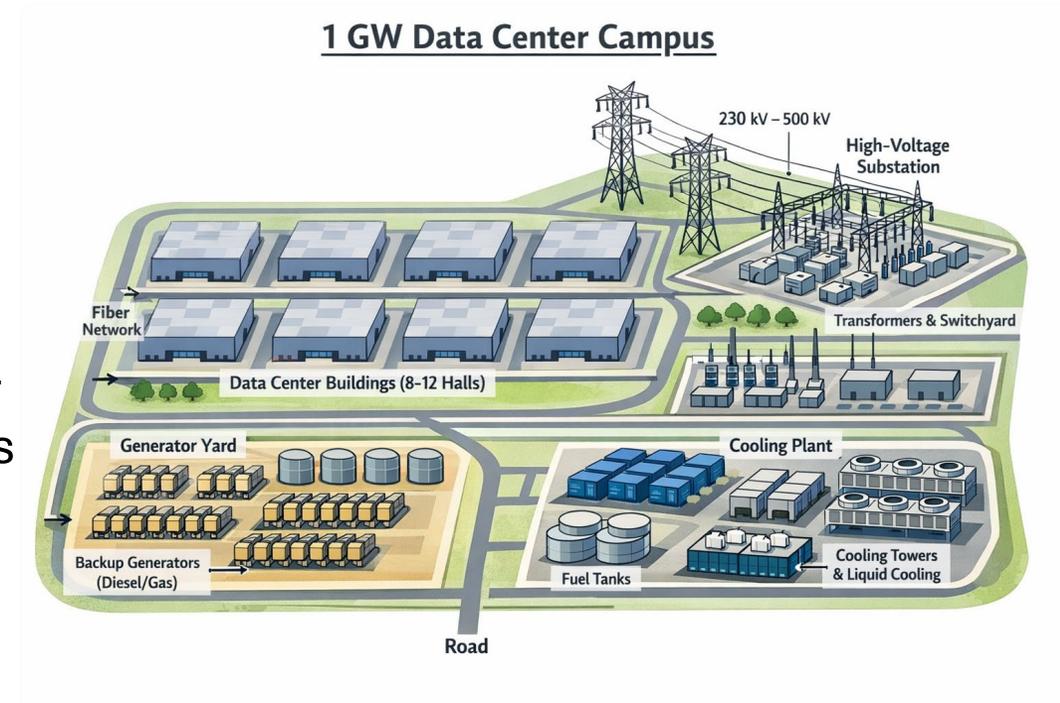
Now to the topic at hand!

The Challenge:

AI Data Centers Need Baseload Power

Hyperscale AI centers demand constant electricity -
some at gigawatt scale!

- Wind and solar are intermittent and non-dispatchable
- Utility-scale battery storage to buffer wind and solar is insufficient at TWh scale other than functioning as an uninterruptable power supply until fossil fuel generation kicks in
- SMR's are at least a half a decade away and probably much longer



A scalable storage solution for green energy is required

Mitigating the Baseload Demand Challenge with Steady Green Power

There is a sustainable non-carbon emitting energy storage solution that can play an important role in the transition from now to a decarbonized future.

And **the solution can be implemented NOW** with almost no lead time.

The solution leverages nature's natural solar energy storage and packages it into wood pellet fuel that can easily replace coal in already operating large utility scale generating units.

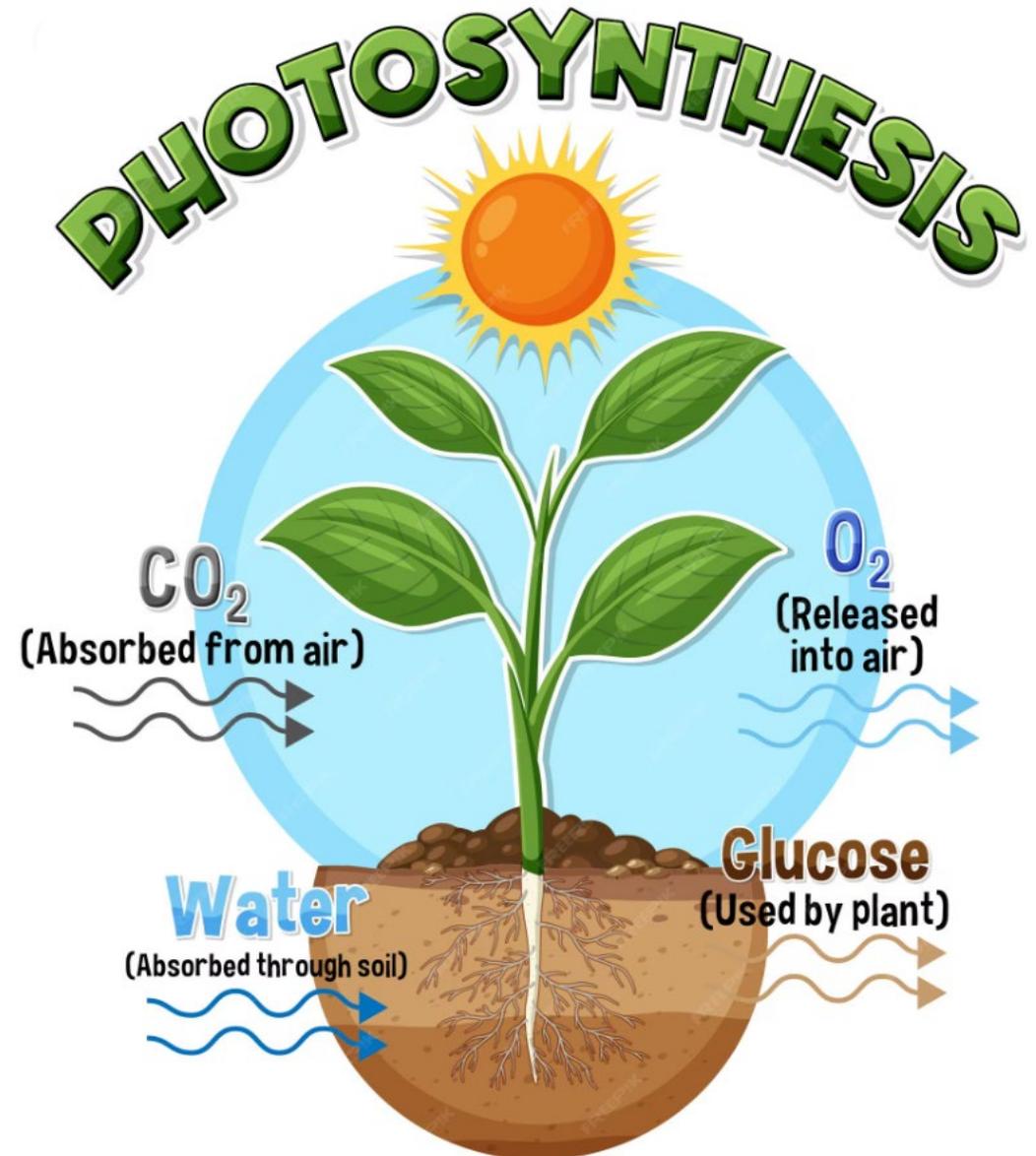
Nature's Natural Solar Energy Storage

Every year about 5.7×10^{24} joules of solar energy irradiates the earth's surface¹.

This is about 9,200 times larger than annual global energy demand.

Plants utilize that energy to convert large amounts of CO_2 into sugars like $\text{C}_6\text{H}_{12}\text{O}_6$ (glucose) that the plants convert into carbohydrates like cellulose.

Glucose from photosynthesis can be described by the simplified chemical reaction $6\text{H}_2\text{O} + 6\text{CO}_2 + \text{energy} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$.

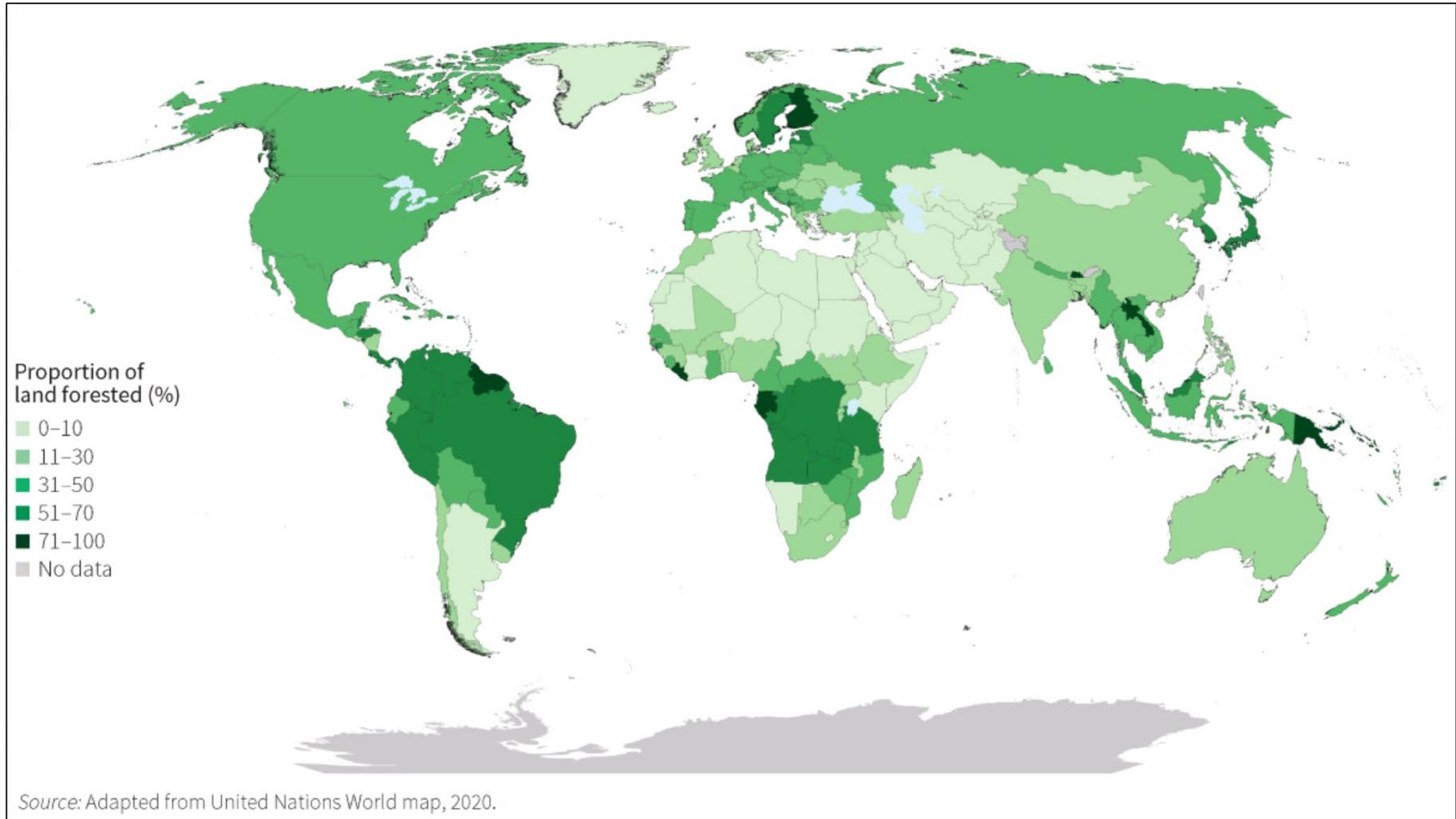


¹Source: FAO <http://www.fao.org/docrep/w7241e/w7241e06.htm#TopOfPage>

Every year solar energy and photosynthesis converts billions of tonnes of CO₂ and water into plant matter and oxygen.

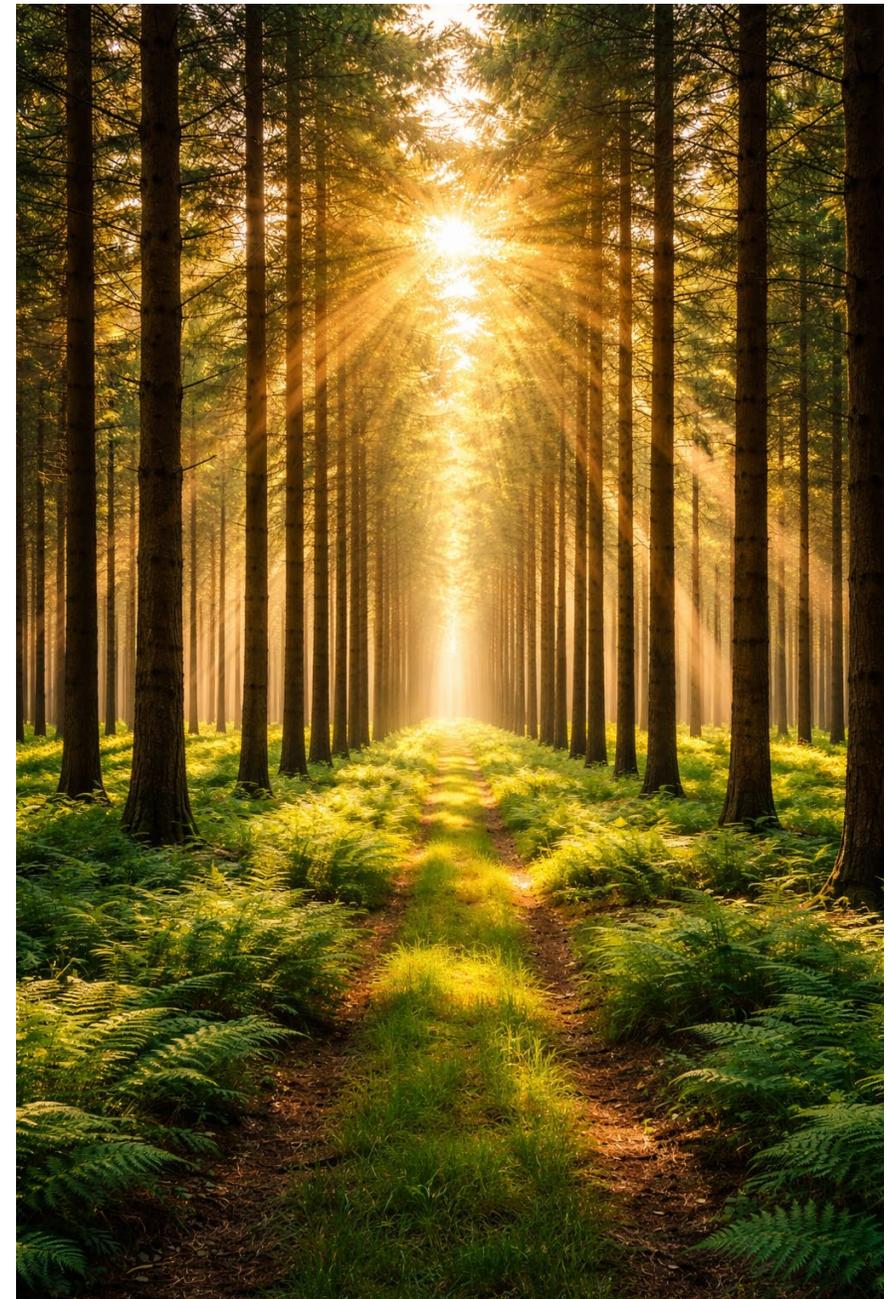
A portion of biomass produced every year is in the form of trees

Forests cover 31 percent of the world's land surface. That is about 4.1 billion hectares.



While some forests should not be used to supply the forest products industry, many millions of hectares of forests are managed and cultivated to continuously produce logs for lumber, wood chips for pulp and paper, packaging, tissue, and engineered wood products used in construction and furniture.

On average a managed forest will contain about 350-400 tonnes per hectare at maturity and will have grown at an average rate of about 12 tonnes per year per hectare.



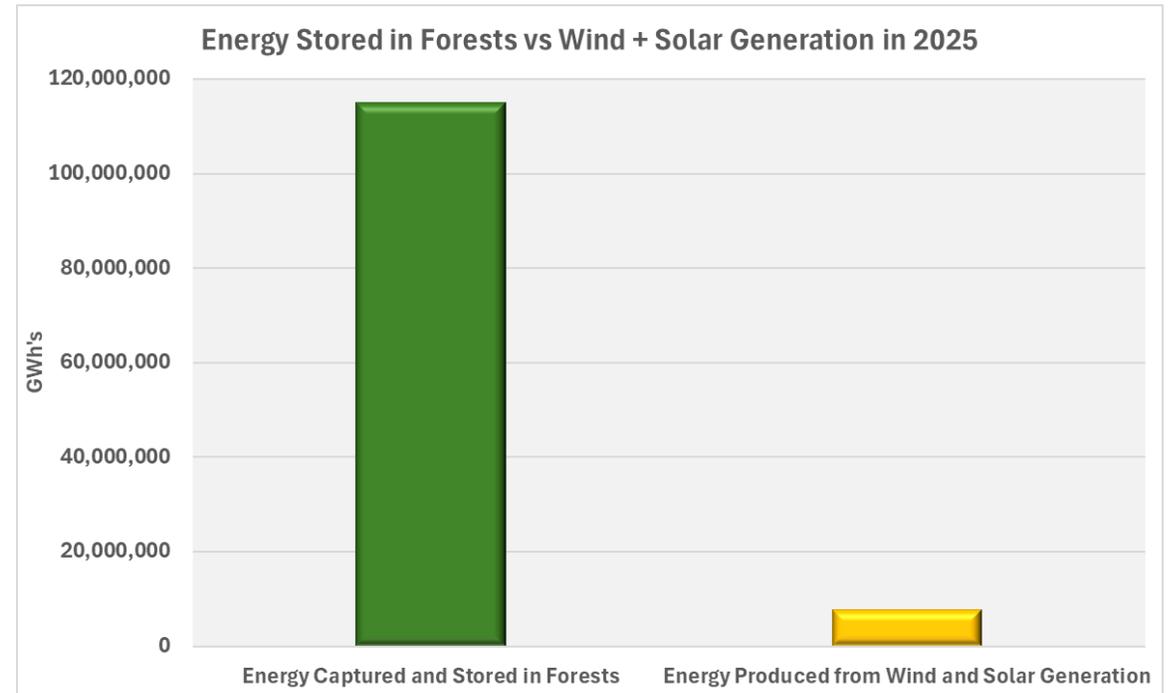
Southern yellow pine plantation

The average energy content per tonne of wood is about 8.65 gigajoules (GJ)¹.

The world's forests store about 415 billion GJ or
115,000,000 gigawatt-hours (GWh's) per year.

Total solar and wind generation in 2025 was about 7,700,000 GWh's².

**The earth's forests captured
and stored about 15 times
more energy in 2025 than what
was produced by wind and
solar generation in 2025.**



¹The gross energy content per tonne is based on wood with a moisture content of 50%.

²Source: Extrapolated from mid-2025 IRENA data [HERE](#).

Without intermediate energy/battery storage, solar and wind power
are not dispatchable.

Whereas the solar energy captured by the world's forests is stored.

Forests are nature's natural solar energy battery.

And just like wind and solar, some of those
forests can be a

perpetually renewing resource.

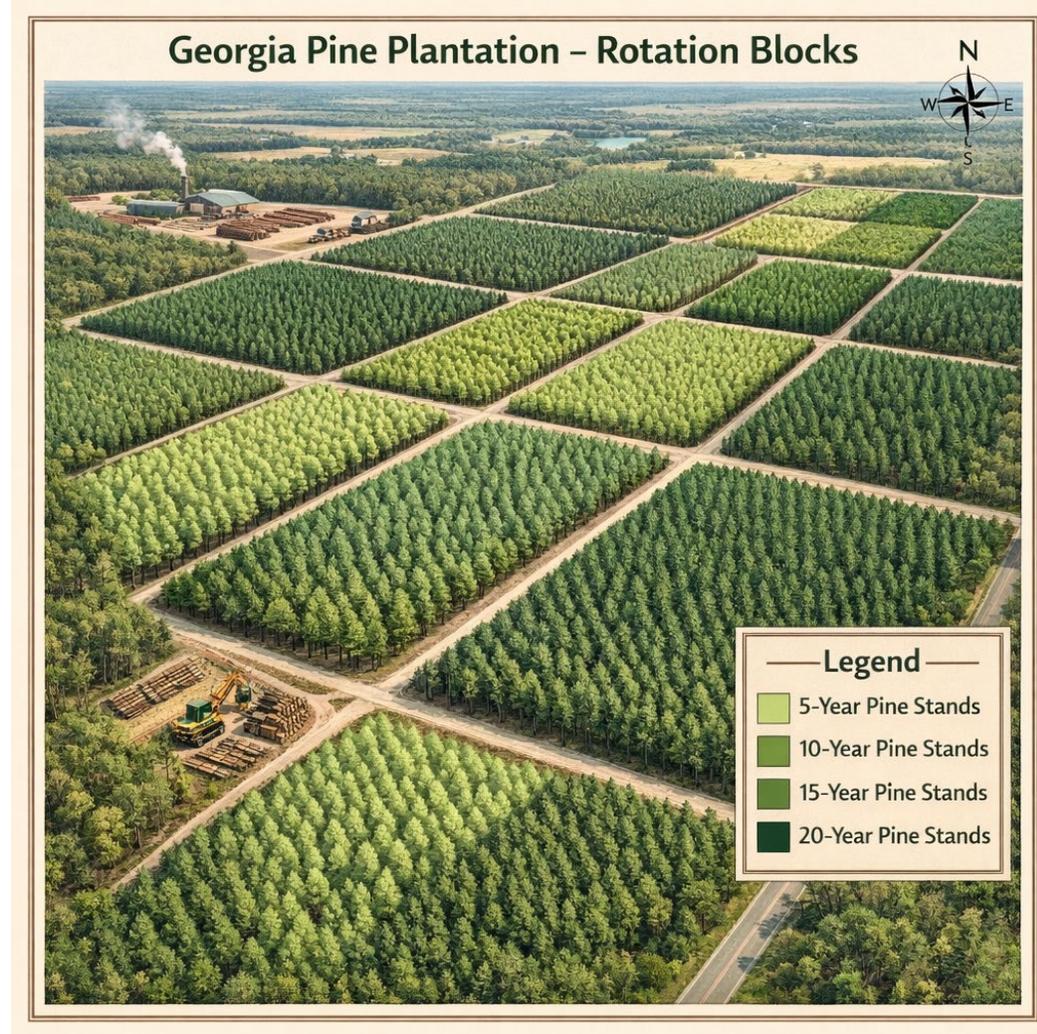
Can We Sustainably Use the World's Largest Energy Storage System to Supply On-Demand Carbon Free Power?

Not all of the 4.1 billion hectares of global forested land is used to produce the primary feedstocks for the forest products industries.

About 1.15 billion hectares are formally designated for the production of wood and wood related products.*

*<https://gfr.wri.org/forest-designation-indicators/production-forests>

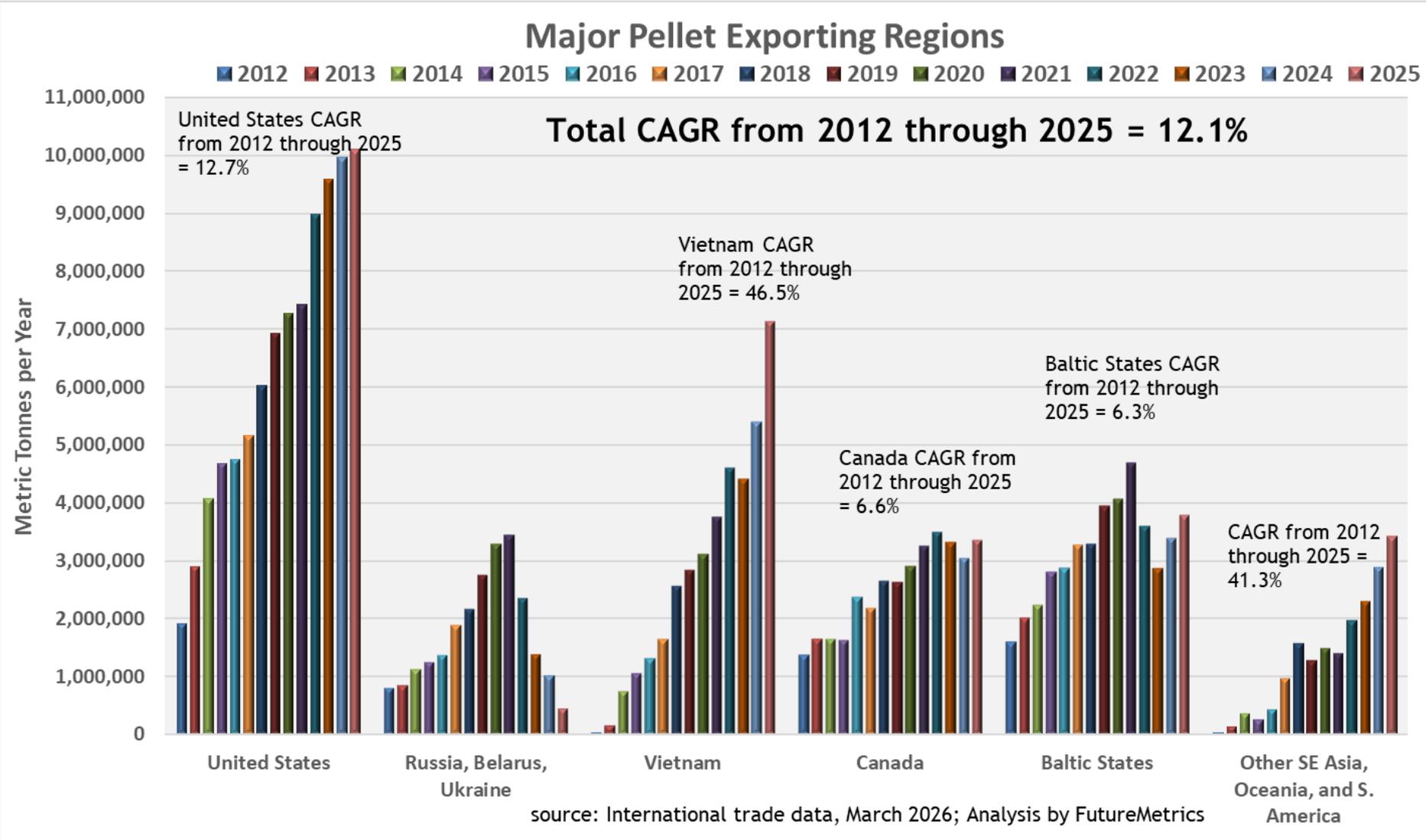
**Sustainable forest
management
guarantees a
perpetually renewing
resource that is
continuously available**



The sawmill in the upper left is receiving a continuous supply of mature sawlogs. In the bottom left is a mature block being harvested to supply the sawmill.

Where does the feedstock for pellet production come from?

The largest pellet exporting country in the world is based on the US southeast's vast pine plantations.



The cascading principle in the US southern pine plantations



Wood pellet manufacturing sector uses parts of the harvested tree that are not suitable for making lumber or other higher-value products.



Wood pellet producers are “bottom feeders” taking up the scraps.

Some 35% to 55% of the incoming wood to a sawmill does not become lumber, or flooring, or cabinetry, etc.

(depends on diameter and straightness of the sawlog)

Pellet manufacturers provide a value-adding outlet for the by-products of sawmills that were once called waste.



The sawdust, bark, and slabs were burned in uncontrolled “beehive” burners →



How Many Megawatts of Generation Capacity Can a Managed Forest Support?

Putting pellet production into perspective...

FutureMetrics has created an interactive dashboard to show how to answer this question.

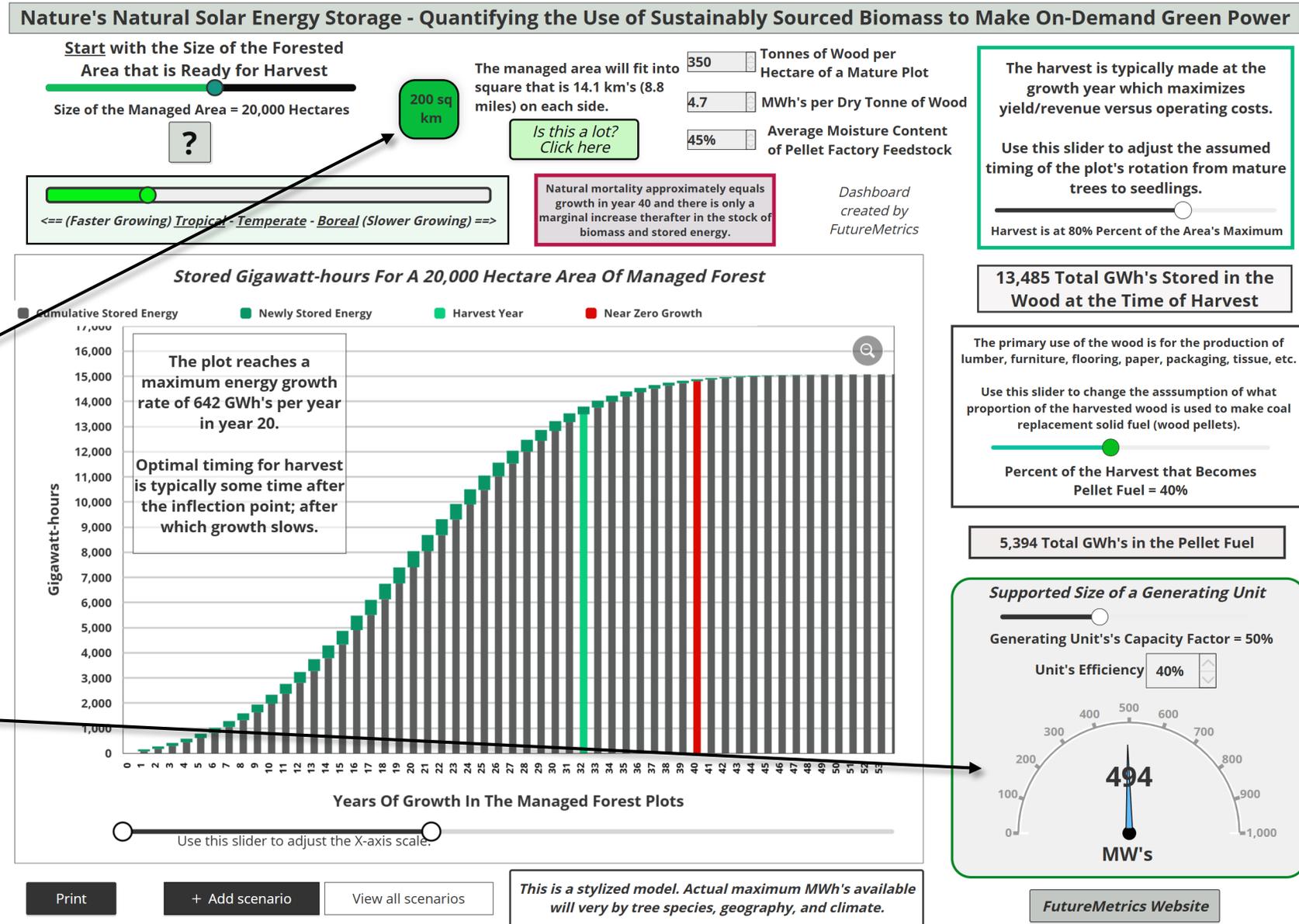
The dashboard is free to use at the [FutureMetrics website](#).

The dashboard tells the story of an area of forest that is managed to produce the wood needed by mills that convert it into boards, paper, cardboard, tissue, flooring, etc.

The “scraps”, i.e., the leftovers from the initial harvest and the sawmill by-products that have no higher value use, find their way to a pellet factory.

This is a screenshot of the dashboard. Live version is [HERE](#).

At the default settings, all of which can be adjusted by the user, a managed plot of 20,000 hectares, which fits into a square that is only 14 kilometers (8.8 miles) on a side, will produce enough residuals to produce enough pellet fuel to generate about 500 megawatts of low carbon power.



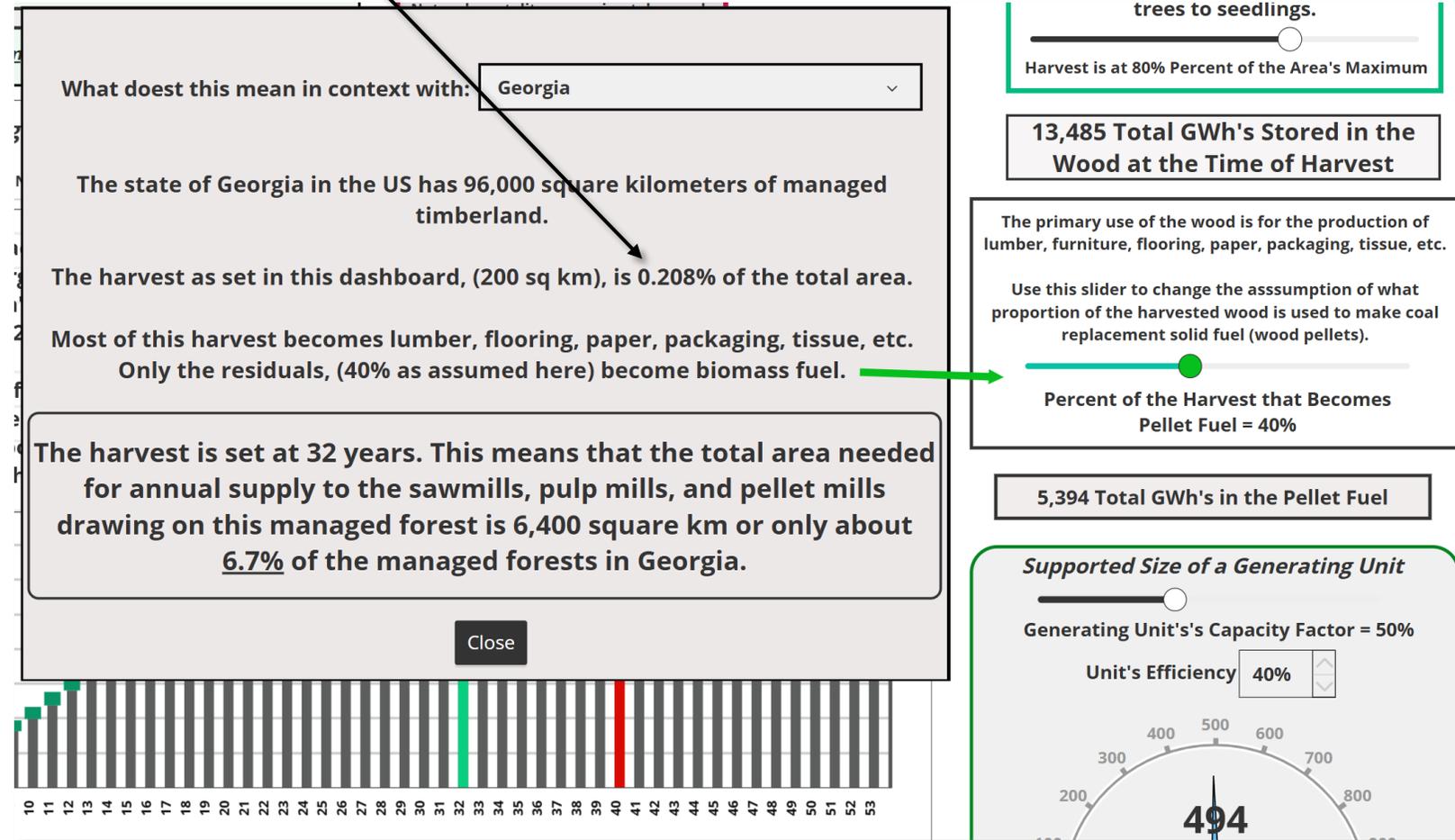
Clicking on the “Is this a lot” button brings up the window shown below.

The managed plot, 200 km², is just 0.208% of the managed forest area in the US state of Georgia.

The default dashboard settings have the plots ready for harvest after 32 years of growth.
(That would be 32 plots organized as is as shown in [slide 16](#)).

Thus, the total area of the managed forest land supplying sawmills, etc., and producing residuals for pellet production is about 6.7% of the total managed forestland in Georgia.

In this one state in the US southeast there is **tremendous potential for supplying coal replacement fuel for generating baseload green power.**



Conclusion

The use of coal-replacement fuel produced from upgraded woody biomass garners a lot of misguided criticism around the idea that forests are being destroyed in the process of producing the fuel – and thus that the CO₂ emitted in combustion is net positive to the atmosphere.

Yet those same critics do not fret about how lumber or cabinets or packaging or toilet paper is produced even though **they all come from the same source – continuously renewing forests**

But clearly there are limits to the application of this coal-replacement strategy.

Solar energy captured by forests that is available for sustainable power generation is limited to the size and growth rates of the managed forest resource.

Respecting the growth/removal ratio boundaries and nurturing the resource are essential.

But within those constraints, there are significant opportunities.

AI Hyperscalers Take Notice!

By expanding our perspective of energy storage to include the biomass that is produced every day by solar energy powering the chemistry of plant life, we can expand our perspective on reliable low carbon baseload power generation for datacenters.

And adding carbon capture and permanent storage allows AI datacenters to have their baseload power and be carbon negative!!

More on that as this session continues.

Thank you!

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FutureMetrics LLC TM



Bill Strauss enjoying some British Columbia powder...