Carbon Removal 101 – Seeking Profitable Climate Change Mitigation

Thomas R. Casten, 8-10-2022

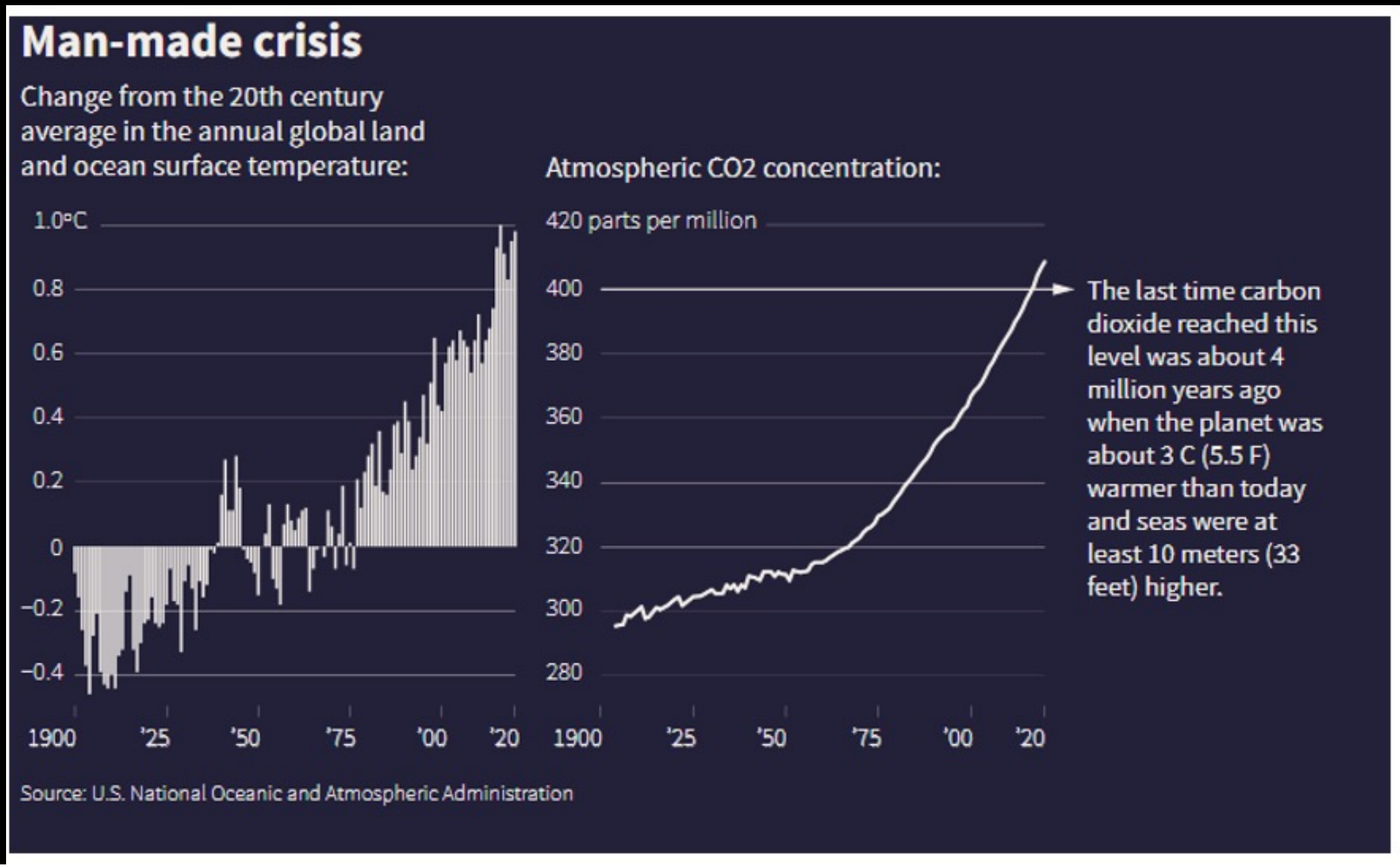
Summary of presentation

1. Achieving Paris Accord temp limits requires net-zero human GHG emissions by 2050 and reducing the atmosphere's radiative forcing by ~2 trillion tons of CO_2e by 2100.
2. Removing and permanently storing carbon dioxide – a gas – is impossible to achieve in time to avoid ecological disasters.
3. We can reduce radiative forcing without drawing down one molecule of CO_2 by removing carbon before it degrades into CO_2 and CH_4.
4. Co-producing charcoal (aka biochar) and renewable electricity with waste biomass is possible and profitable using proven technology
5. The world must double the annual carbon removal at Moore's law speed, doubling every 18 months for the next 28 years to meet the Paris Accord temperature limits.
6. **The biochar community holds the keys to optimal carbon removal.**

Helpful Definitions

1. **Radiative Forcing** is the watts per square meter of energy radiated back from the atmosphere to each meter of the Earth's surface.
   - Fifteen greenhouse gases absorb radiant energy from earth surfaces and re-radiate some of that energy back to earth.
   - Total forcing is a Goldilocks issue. Human-associated GHG emissions are making the porridge too warm
   - To simplify, climate scientists describe the forcing in equivalent tons of CO2, which is the largest component of total GHG mass but the weakest of the 15 gases.
2. Carbon Removal Facility (CRF) is a conceptual invention of Myno Carbon Corp to describe a waste biomass-fed process to produce renewable electricity and charcoal (aka biochar) for soil amendments and materials use.
   - CRFs reduce radiative forcing by avoiding multiple GHG emissions from normal residual biomass degradation replacing fossil electricity, re-enabling natural soil organic carbon building processes.

The world faces rising sea levels



2021 could be the coolest year of the rest of the century unless we act immediately

THE PROBLEM

Climate Change

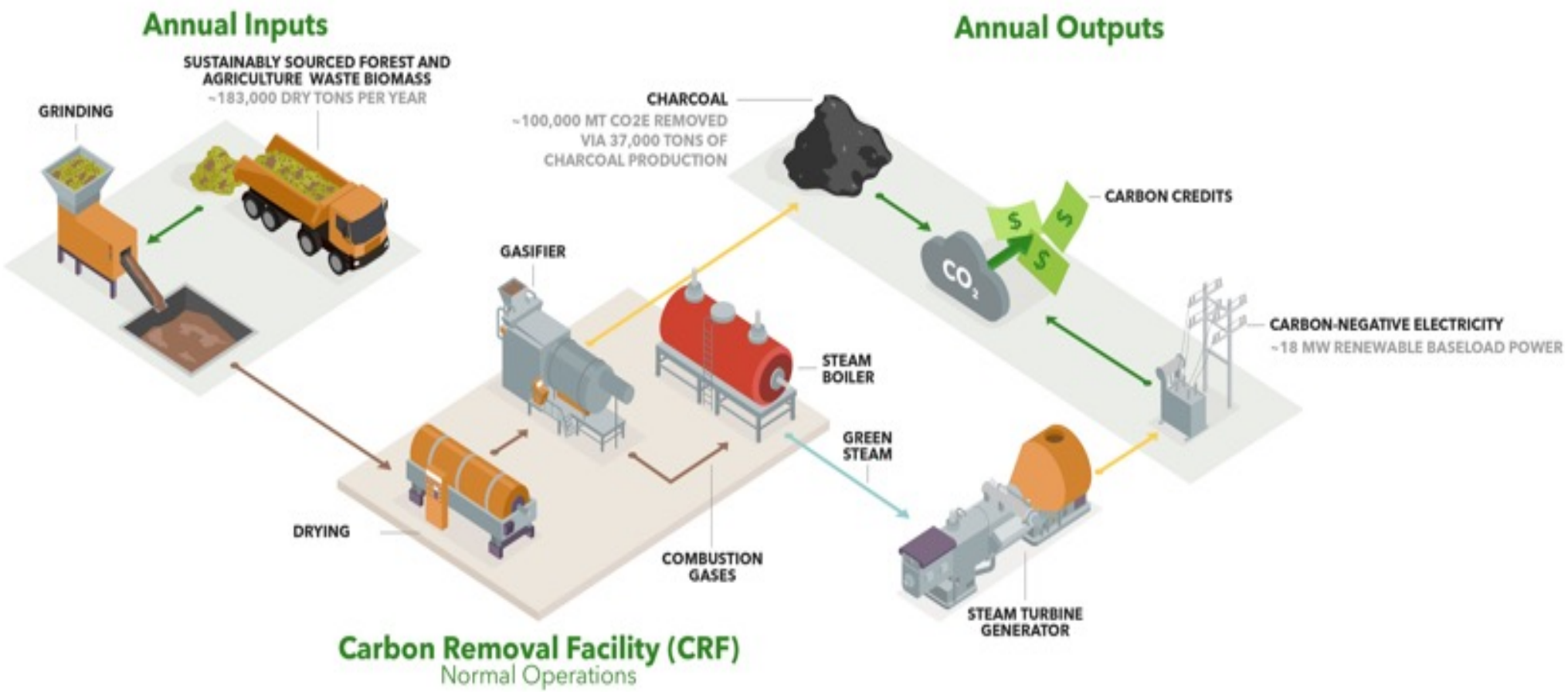
- To reach **net-zero** emissions quick enough to limit temperature rise to 1.5 deg C will require rapidly growing carbon removal.
- We currently add ~50 billion MT of CO_2e. But must limit net emissions over the next 28 years to 300 billion tons, then to net zero for the rest of the century
- We estimate the need to remove ~2 trillion tons of CO2e by 2100.
- The shorthand discussion of CO2 has created blinders that obscure profitable strategies to reduce radiative forcing
- Many seek ways to capture CO2 from the atmosphere, compress the gas to forty atmospheres, and store the compressed gas for thousands of years.

Current Strategies to Reduce Radiative Forcing

Technology	Industry Leaders	Current (Cost) / Profit to Remove a MT of CO_2e*	Notes
Direct Air Capture of CO2	Carbon Engineering, climeworks	~($2,000)	Trillions of Capex and vast power consumption. No prospect for significant revenues. Subsurface leakage risks.
Bio-Oil Injection	CHARM INDUSTRIAL	(~$600)	Thermodynamically inefficient. No revenue except carbon credits.
Carbon Removal Facilities with Waste Biomass Feedstock	Myno	~$150	Proven technology, industrial scale, can repurpose existing power plants & grid connections, multiple revenues from electricity and charcoal sales, and multiple agriculture benefits.

MYNO DEVELOPS CARBON REMOVAL FACILITIES (CRFS) THAT DELIVER:

PROFITS - ECONOMIC GROWTH - GREEN JOBS



KEY PRINCIPLES

Carbon Removal

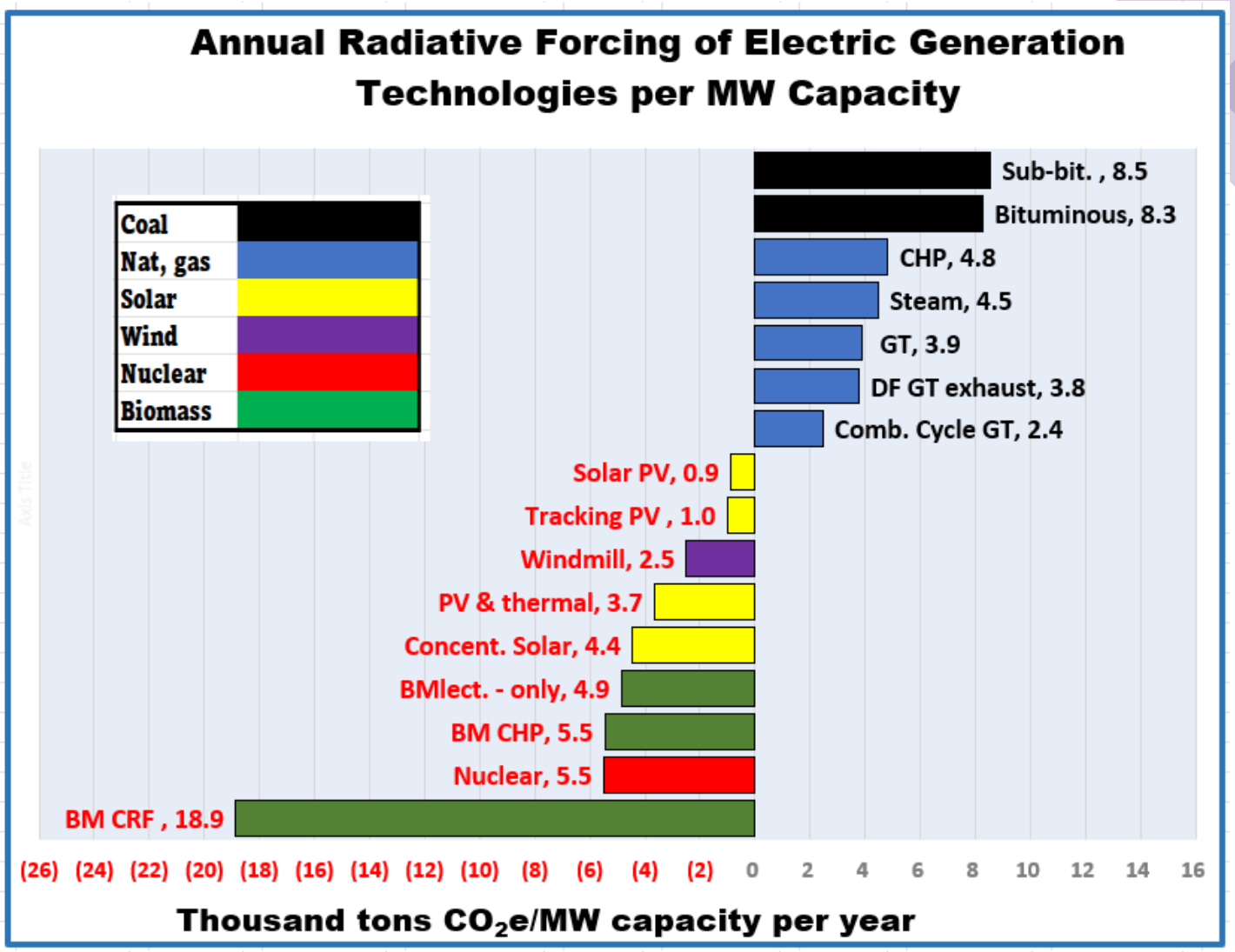
Use only low-value residual biomass as a feedstock.

Deploy carbon removal facilities (CRFs) to co-produce charcoal and baseload renewable electricity. Add flexibility to ramp up and provide renewable peak MW

Tailor-make biochar soil amendments to help nature return to pre-1750 SOC levels while increasing yield & drought resistance while reducing annual fertilizer applications.

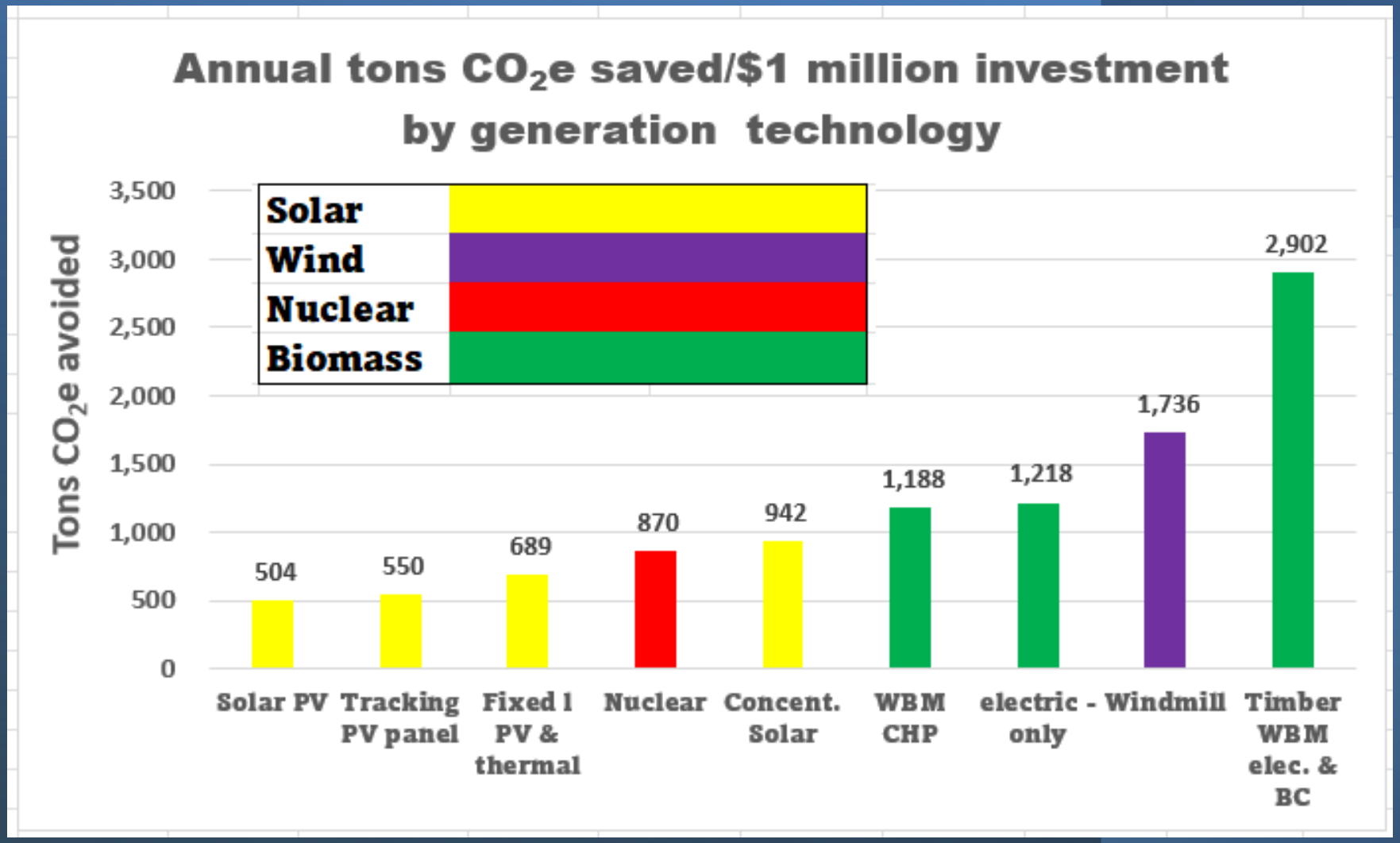
Design CRFs to provide above-market returns on investment while reducing the price of biochar to speed biochar soil amendment use and carbon removal.

Lead with what the world wants – cheap carbon-free electricity.


Annual Radiative Forcing of Electric Generation Technologies per MW Capacity
Coal
Nat, gas
Solar
Wind
Nuclear
Biomass
Sub-bit. , 8.5
Bituminous, 8.3
CHP, 4.8
Steam, 4.5
GT, 3.9
DF GT exhaust, 3.8
Comb. Cycle GT, 2.4
Solar PV, 0.9
Tracking PV , 1.0
Windmill, 2.5
PV & thermal, 3.7
Concent. Solar, 4.4
BMlect. - only, 4.9
BM CHP, 5.5
Nuclear, 5.5
BM CRF , 18.9
(26) (24) (22) (20) (18) (16) (14) (12) (10) (8) (6) (4) (2) 0 2 4 6 8 10 12 14 16
Thousand tons CO_2e/MW capacity per year

Slash pile emissions comparisons

Emission source	Tons CO_2e per thousand dry tons of timber		
	Conv. Slash Disposal	CRF Slash Use	Delta Emissions
Pile degradation and combustion	4,100	900	(3,200)
Avoided fossil gen.	0	(0)	(0)
Impact of biochar	0	(2,900)	(2,900)
Total GHG impact	4,100	(2,000)	(6,100)


Annual tons CO_2e saved/$1 million investment by generation technology
Tons CO_2e avoided
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Solar
Wind
Nuclear
Biomass
504
550
689
870
942
1,188
1,218
1,736
2,902
Solar PV
Tracking PV panel
Fixed l PV & thermal
Nuclear
Concent. Solar
WBM CHP
electric - only
Windmill
Timber WBM elec. & BC

Deeply Accomplished and Committed to Carbon Removal

Team Myno

Board of Directors

THOMAS CASTEN

Board Chair; Industry Grandee Google Him

SERIES SEED DIRECTOR

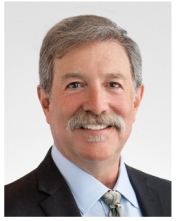
TBD Director; To Be Appointed

THOR KALLESTAD

CEO and Director

Schlumberger

Key Advisors



STEVE ROWE

GTM, Dairy, and Agribusiness

DARIGOLD

TOM MILES

Technical Advisor

USBI

Management Team

MIKE MILLER

COO

bp

ANDREA SANCHEZ-WILLIAMS

Controller & Biz Director

BAINBRIDGE ISLAND MUSEUM OF ART

DOUG KIRKBY

Operations Director

Schlumberger

GARY CANTRELL

Facilities GM

ATICA

ANDY MERCY

CRO

PACIFIC BIOCHAR

LAUREN BREYNAERT

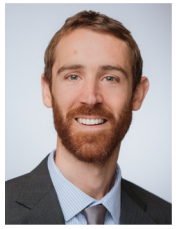
Policy & Partnerships

CLIMATE ALLIANCE FOR jobs & clean energy

BRIAN COOPER

CFO

AMOCO



MYLES GRAY

Biochar Product Dev

Geosyntec

MATT TARGETT

LCA and Stack Gas

DUPONT

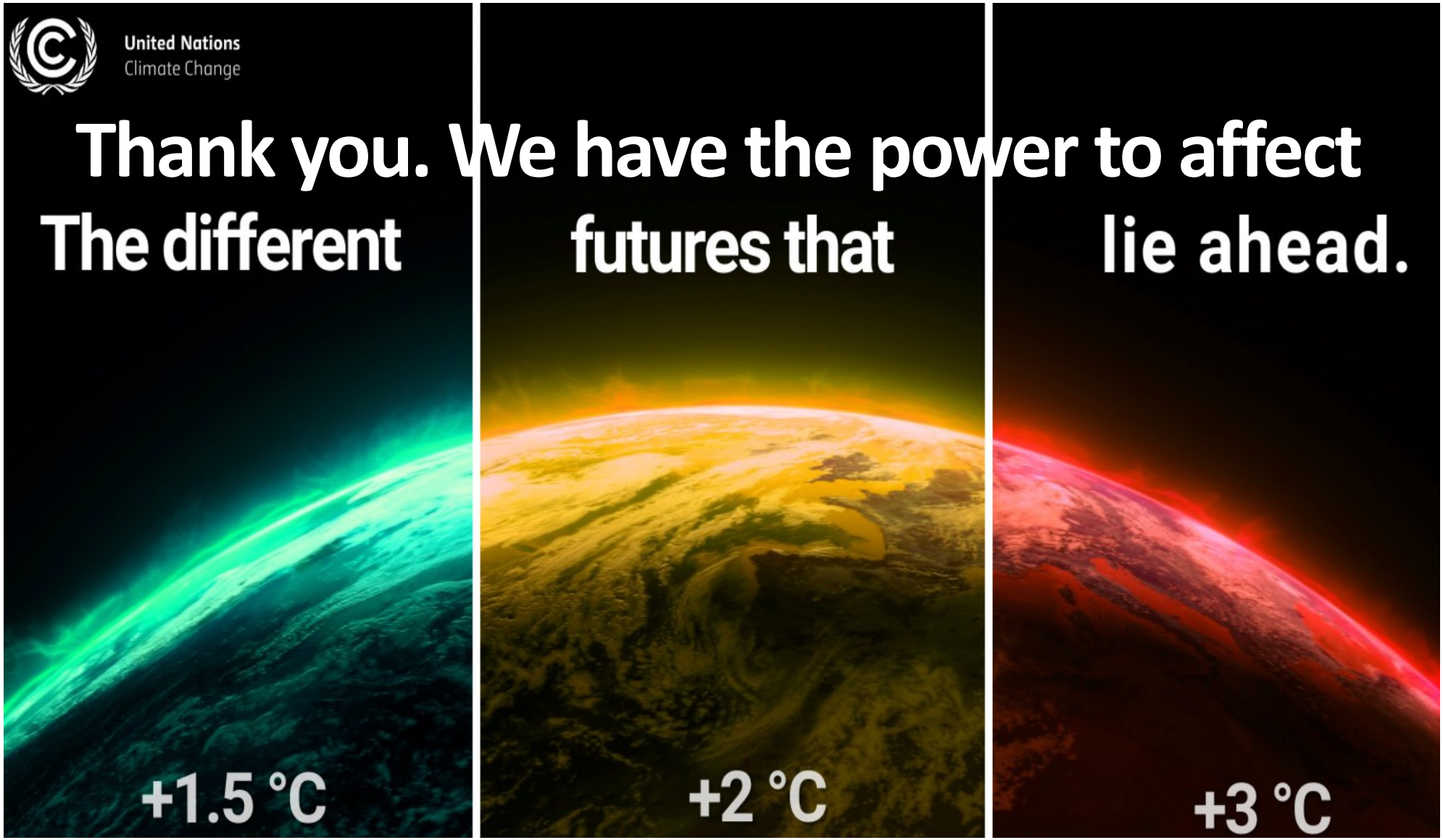
ANTHONY PENNINO

CRF Biz Dev

EXXON

Carbon Removal Insights

1. **Humanity faces dire consequences unless we rapidly reduce radiative forcing.**
   - We must to stop adding GHG emissions and lower the atmosphere's radiative forcing by nearly 1 trillion tons of CO_2 equivalent.
2. **We need to double yearly carbon removal every 18 months for the next 28 years and then hold that level for 50 years or exceed 1.5 C temperature increase.**
3. **The optimal economic and environmental approach is to convert carbon from the residual biomass of industrial operations into renewable electricity and charcoal for soil amendments.**
4. **The global biochar community holds the keys to optimal carbon removal.**


United Nations
Climate Change
Thank you. We have the power to affect
The different
futures that
lie ahead.
+1.5 °C
+2 °C
+3 °C