



**Coatings Trends
& Technologies
SUMMIT**



**Sustainability Trends
in Epoxy Systems for
Coatings**

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(Speaker)

Westlake
Epoxy

Global regulatory drivers to Improve Sustainability

Climate Change



Circular Economy



European Green Deal



US Inflation Reduction Act



UN Sustainability Goals



Labor and Human Rights



SEC



Reporting Requirements



United Nations Sustainable Development Goals



Global Carbon Neutrality Targets

- EU target carbon neutrality by 2050 (-55% emission by 2030)
- US target carbon neutrality by 2050 (-50% emission by in 2030)
- China 's 14th five-year plan target carbon neutrality by 2060



Commitment to Sustainability Goals

ESG Goals



Carbon Emissions

Reduce Scope 1 and Scope 2 CO₂ equivalent emissions per ton of production by 20% by 2030 from 2016 baseline.



Water

Sponsor water reduction efforts and introduce a water management program at water stressed and other relevant sites by 2030.



Health & Safety

Achieve zero accidents and zero injuries. We strive to achieve this every day.



Community Engagement

Sponsor a community outreach event annually at each of our global operations in alignment with our core value of citizenship.



Diversity & Inclusion

Achieve racial, ethnic and gender representation that reflects the diversity of the communities in which we operate.



Circular Economy

Continue to expand our participation in recycling and sustainable products.

Integrated Sustainability commitments

Alignment with the important ESG frameworks



Growing Portfolio of products with positive environmental attributes



One pallet polyethylene solution



Epoxy in coatings and composites



Molecular-oriented (PVCO-O) pipes

Awards and industry memberships



Measuring & Reporting Frameworks

Green House Gas emissions

Voluntary Reporting Frameworks

- Enable company to set targets and report on carbon-related emissions
- Provide structure on how best to publicity share data
- Does not rate the quality of disclosure or information



Assessments

- Identify a company's level of disclosure and transparency in their policies, actions and result
- Does not describe the report data as high or low emission

ecovadis

Mandatory Reporting Frameworks

- Introduction of Corporate Sustainability Reporting Directive (CSRD) start from 2025
- SEC proposes that companies include certain climate-related disclosures in their registration statements and periodic reports



Green House Gas Emissions

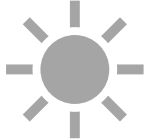
Three Distinct Categories that depend on the Company's Level of Control

Scope 1 emissions: Direct emissions that are owned or controlled by the reporting Company.

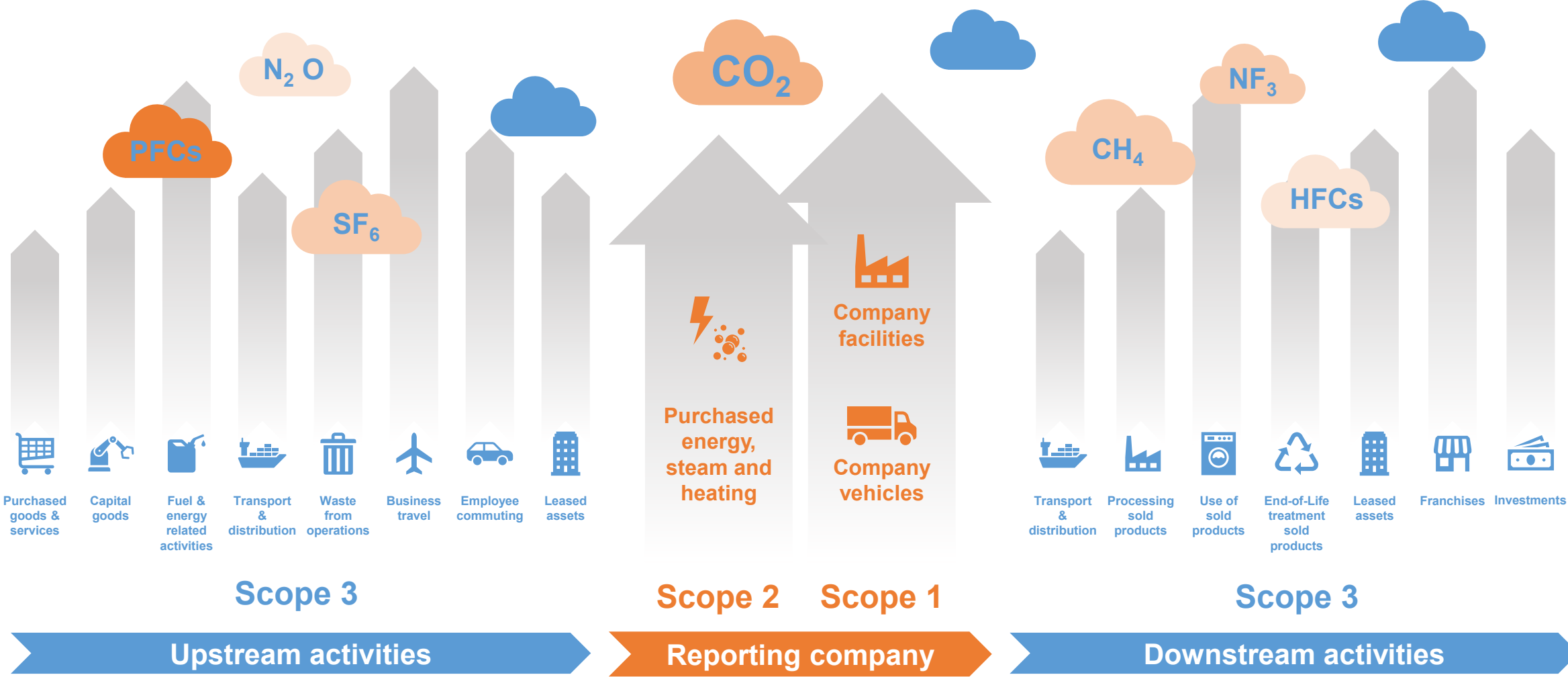
Scope 2 emissions: Indirect emissions related to operational electricity use (e.g., purchased electricity or heat used in the plant).

Scope 3 emissions: Indirect emissions that are produced by customer's customer and the supply chain that includes transportation, waste disposal or product use.

Industry is Working to Reduce Emissions



Addressing scope 1, 2, and 3



Scope according to GHG protocol

Options to Reduce Emissions (Scope 1 and 2)

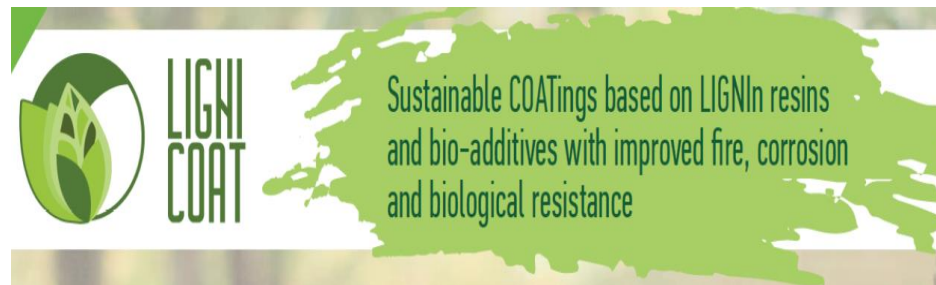
- Convert to renewable electricity from steam or coal-fired generation plants. This can be combination of wind energy, solar power or hydro-powered electricity.
- Use improved weatherization and insulation in buildings, use LED lighting, upgrade to ENERGY STAR® appliances.
- If a lot of fossil fuel is burned onsite, invest in upgrading or replacing boilers, furnaces and processing equipment to improve their efficiency.
- Replace fossil fuels with cleaner, low-carbon alternatives. Switching to renewable energy, biodiesel, biogas or bioethanol can help reduce the carbon footprint
 - Biofuel-powered vehicles can help reduce emissions from the company's fleet or distribution and delivery network.
 - Another option is to switch to electric vehicles; however, this might cut your Scope 1 emissions, but the electricity you buy will be included under Scope 2. Consider using renewable electricity.

Enhance Renewable Carbon Content (Scope 3)

Biobased resins derived from renewable sources

Some examples from global epoxy suppliers include:

- Lignin-based epoxy resin
- Modified Isosorbide epoxy resin
- Sorbitol glycidyl ether epoxy resin
- CNSL-based glycidyl ether epoxy resin
- Epoxidized soybean oil



Enhance Renewable Carbon Content (Scope 3)

Increasing product circularity using internal & external waste streams

Examples from composites industry include:

- Chemical recycling via solvolysis
- Mechanical recycling in new engineering applications
- Thermal recycling of plastic waste into pyrolysis oils



Safer Materials by Reformulating Products

Remove CMR- & SVHC- substances

Examples include:

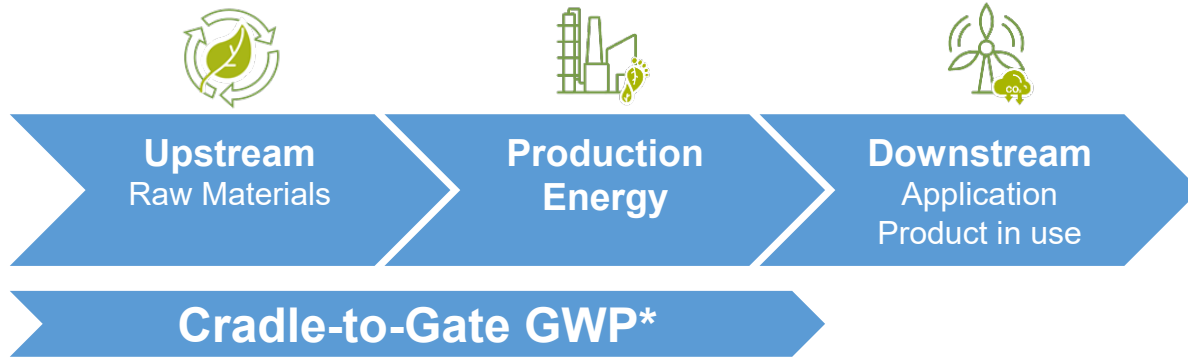
- Salicylic acid free
- Alkylphenol free
- APEO-free formulation

➤ **Replacing CMR & SVHC substances in products is an ongoing process**



Product Carbon Footprint

Total Greenhouse Gas (GHG) emissions from “Cradle-to-Gate”



Product Carbon footprint (PCF)

Reduce energy consumption

Re-use energy

Replace fossil-based energy sources

Use renewable raw materials & mass balancing

**GWP = Global Warming Potential*

ISCC+ Mass Balance Approach

ISCC Organization

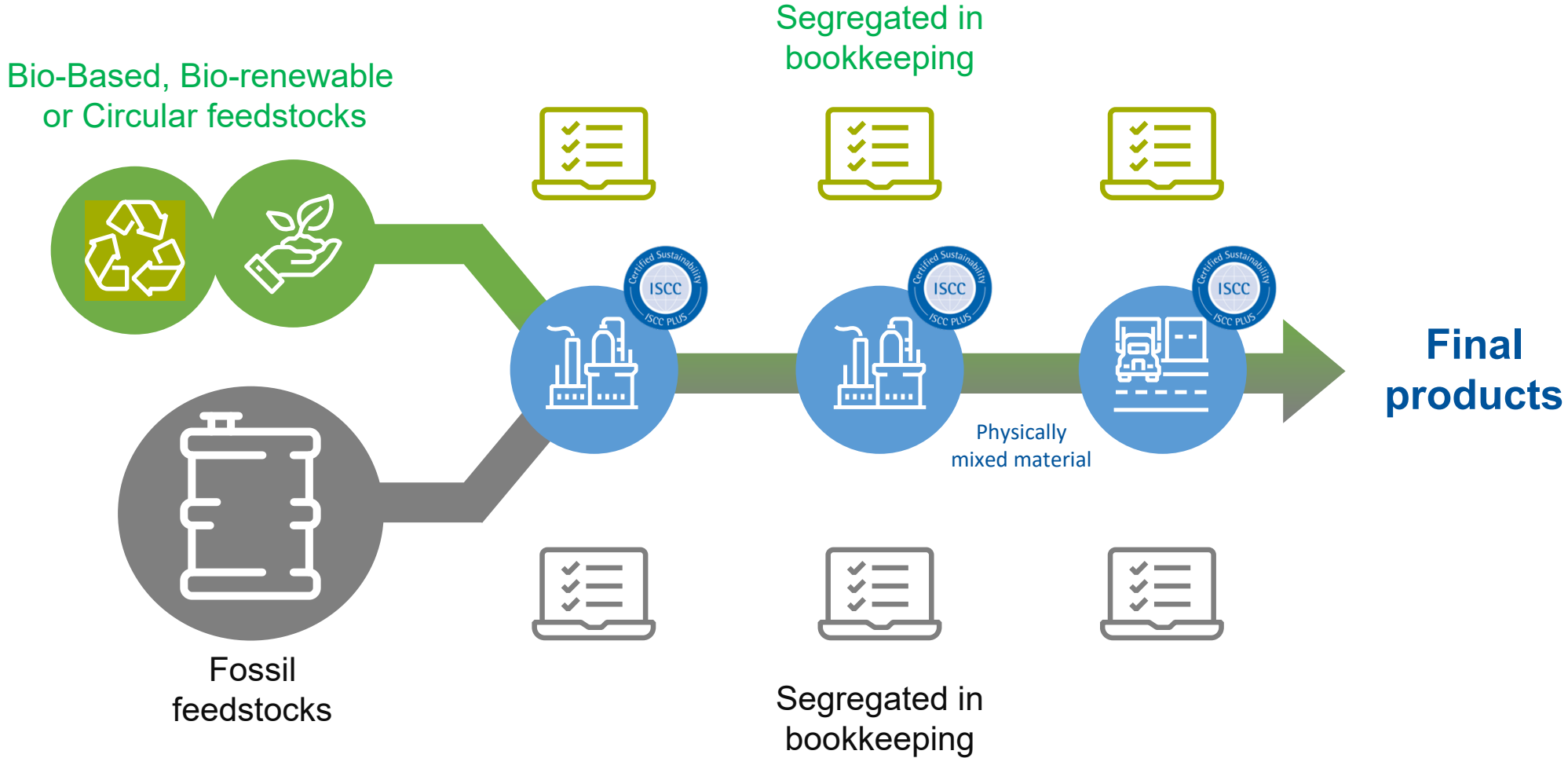


ISCC PLUS Certification (Mass Balance Approach)

- A voluntary program that is applicable to the bioeconomy and circular economy for food, feed, chemicals, plastics, textiles and renewable feedstock from processes using renewable energy sources.
- ISCC+ covers the same certification requirements as ISCC EU but can be customized for the needs of different markets and specific applications. All kinds of biomass, waste and residues, non-biological renewables and recycled plastics and other carbon materials can be certified under ISCC+.

Find more details at [ISCC PLUS – ISCC System \(iscc-system.org\)](https://iscc-system.org)

ISCC+ certification along the supply chain



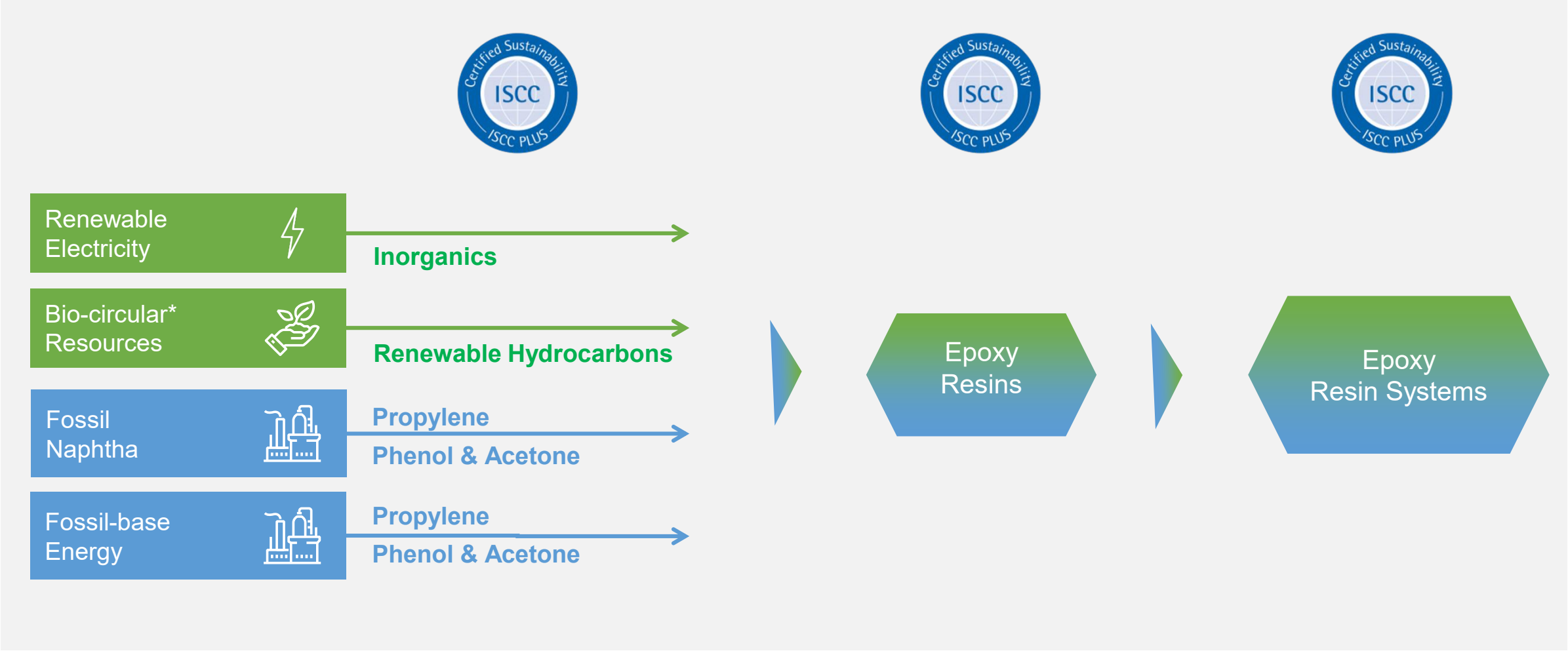
Certified renewable electricity

Like when consumers buy renewable electricity. An official certificate is issued proving that a specific amount of renewable electricity has been generated. The certificates represent the environmental value of renewable energy production and can be traded separately from the energy produced.



Renewable electricity & hydrocarbon epoxy offerings

(Westlake Epoxy example)



*Bio-circular : <https://www.iscc-system.org/markets/feedstocks/bio-circular/> :

Sourcing & certification for renewable hydrocarbons

***Renewable Phenol or Renewable Acetone:**

- Based on Used Cooking Oil
- ISCC PLUS mass balance certification

Bio ECH:

- Based on Glycerin
- ISCC PLUS mass balance certification

*Renewable: e.g., based on used cooking oil

Renewable offerings (differing certification levels)

Depends on requirements and customer commitment

CO2 reductions*		~21%			~71%			~100%		
Description	Feedstock	Bio ECH			Renewable Phenol/ Renewable Acetone			Renewable Phenol / Renewable Acetone / Bio ECH		
	Renewable electricity	✓			✓			✓		
	Renewable hydrocarbons	✓			✓			✓		
	Availability	++++			+++			+++		
Impact	Costs	+			+++			++++		
Standard		ISCC PLUS & ISO-14067			ISCC PLUS & ISO-14067			ISCC PLUS & ISO-14067		

* With consideration of biogenic CO2 fixation (ref: ISO 14607)

Sustainability Trends (Epoxies for Coatings)

- **Global epoxy manufacturers have established clear goals and developed sustainability plans to reduce green house gas emissions and improve sustainability.**
- **Epoxies suppliers (e.g., Westlake) are committed to offering products made with renewable energy and renewable materials, therefore, they have a lower carbon footprint.**
- **Value chain collaborations are essential to achieve reduced emission targets**

Westlake

