

# Decommissioning/End-of-Life Considerations for Renewable Energy Components (“Spent Materials”) – USA and Global Trends

CHWMEG Global Interest Committee Meeting

March 3, 2021

ClarkHill.com

CLARK HILL

# Agenda

Overview of the Issue

U.S. Trends

International Trends

Q&A



---

## Today's Speakers



**Christopher B. Clare**  
Senior Attorney – Washington, DC



**Maram T. Salaheldin**  
Associate – Washington, DC

# CLARK HILL

ESTABLISHED 1890



650+ ATTORNEYS



150 ATTORNEYS NAMED  
BEST LAWYERS IN AMERICA (2020)



72 PRACTICES RATED TIER 1  
(2020 U.S. News & World Report and  
Best Lawyers® "Best Law Firms")



25 OFFICES



11 STATES, D.C.,  
IRELAND & MEXICO



## ADVANCED SERVICES

Business Process Improvement • HR Advantage Advisory  
Information Governance (IG) 360  
Reputation Governance (RG) 360 Crisis Management  
ASSET360 Cyber & Defense

## ABOUT CLARK HILL

Clark Hill is a full-service, international law firm that draws on our attorneys' comprehensive industry and policy knowledge and a global network of industry advisors and subject matter experts to provide innovative legal solutions and client-service excellence worldwide. Our work is guided by our deeply held shared values, including practicality, entrepreneurship, mutual respect, diversity, ethical behavior, and a commitment to client and community service.

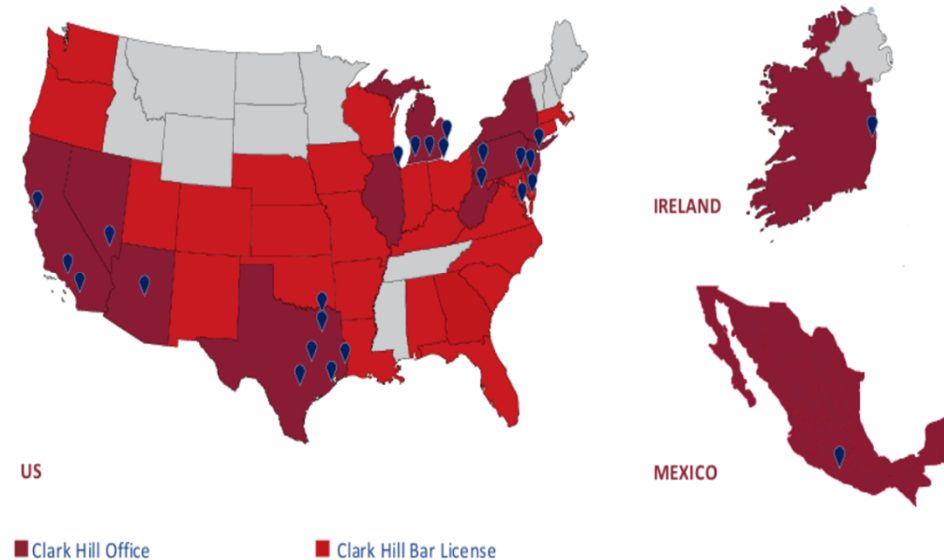
## ABOUT DIVERSITY & INCLUSION AT CLARK HILL

- CLARK HILL BOLD - encourages the professional growth and promotion of women throughout the firm, the legal profession, and the global business community
- CLARK HILL THRIVE - emphasizes the value of multiculturalism to the firm, the legal profession, and the global business community
- CLARK HILL PRIDE - elevates our LGBTQ lawyers and fosters a culture that recognizes a fully present professional is a stronger client advocate

## ABOUT CLARK HILL'S GLOBAL EXPANSION

- **2019.** Our presence in Dublin grows to almost 20 attorneys, reinforcing our position as the only US law firm with a full-service practice in Ireland.
- **2018.** Clark Hill and Strasburger & Price merged, bringing nationwide support and strength to both firm's clients.
- **2017.** Clark Hill merged with Morris Polich and Purdy LLP, providing clients with capabilities on the West Coast.

## WHERE CLARK HILL PRACTICES



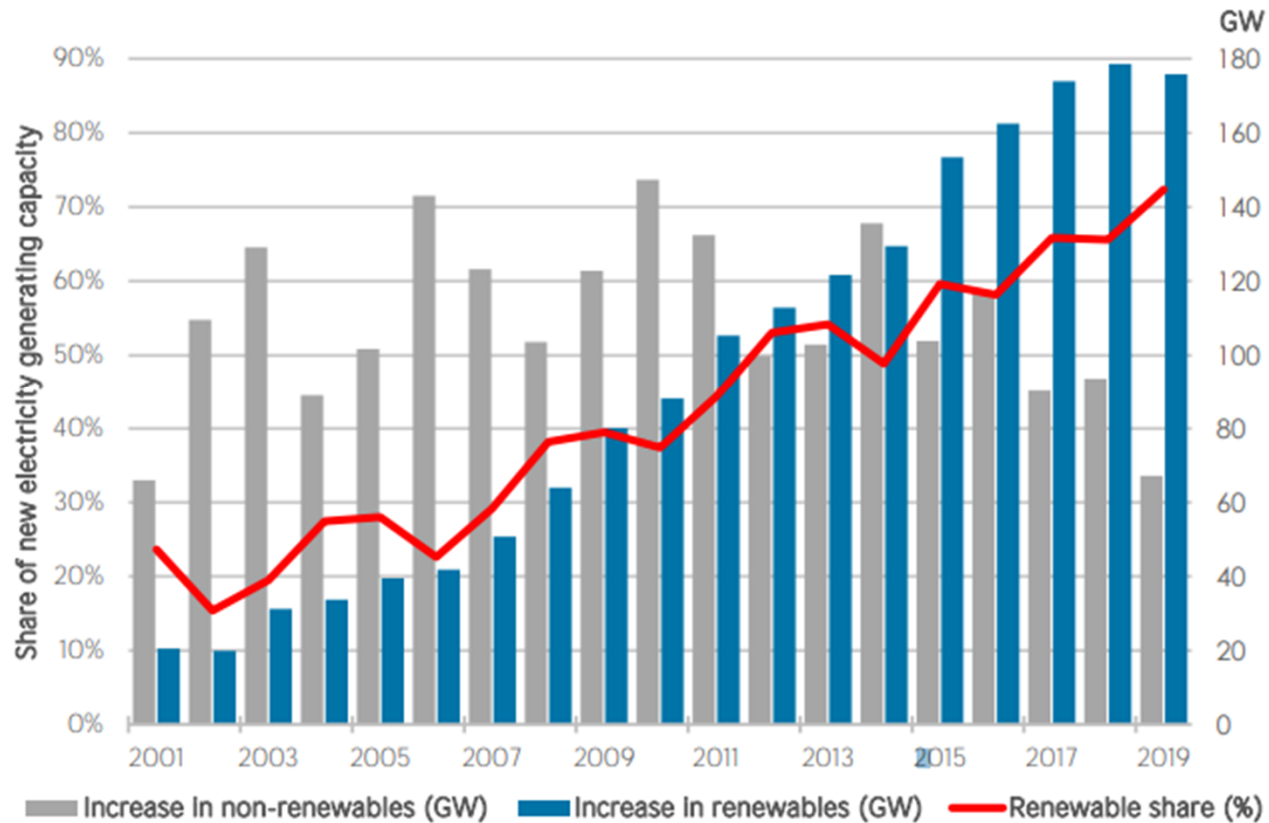
## KEY SERVICE AREAS

- Administrative
- Banking & Financial Services
- Construction
- Corporate
- Corporate Restructuring & Bankruptcy
- Cybersecurity, Data Protection & Privacy
- Education & Municipal
- Employee Benefits/ERISA & Compliance
- Environment, Energy & Natural Resources
- Estate Planning & Probate
- Family
- Fidelity & Surety
- Food, Drug & Device
- Government & Regulatory Affairs
- Healthcare
- Immigration
- Insurance & Reinsurance
- Intellectual Property & Technology
- International Trade
- Labor & Employment
- Litigation
- Municipal
- Political
- Professional Ethics & Risk Management
- Public Finance
- Real Estate
- White Collar Criminal Defense

# Overview of the Issue

# Global Transition to Renewable Energy

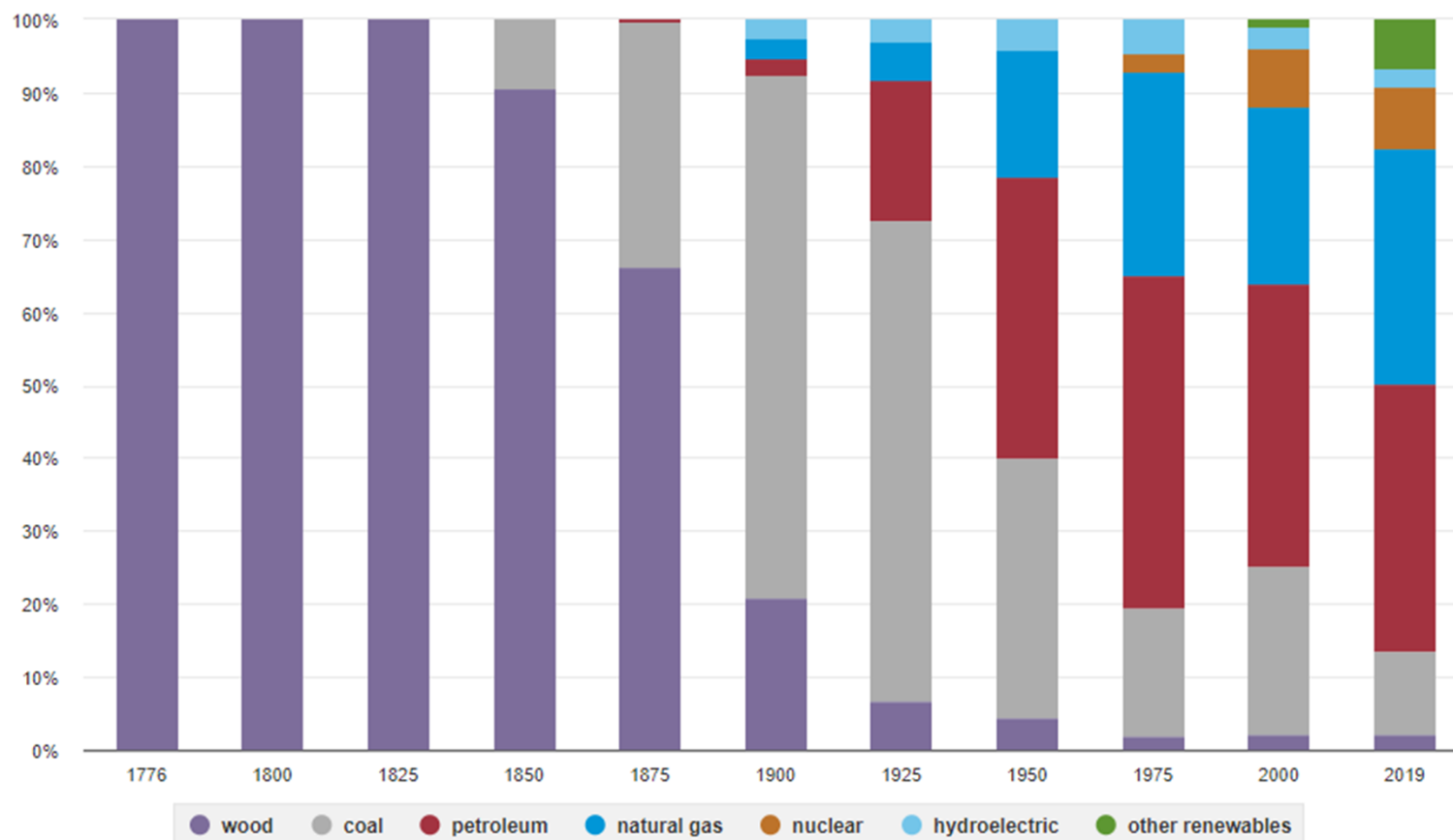
Renewable share of annual power capacity expansion



Credit: The International Renewable Energy Agency (IRENA)

# U.S. Transition

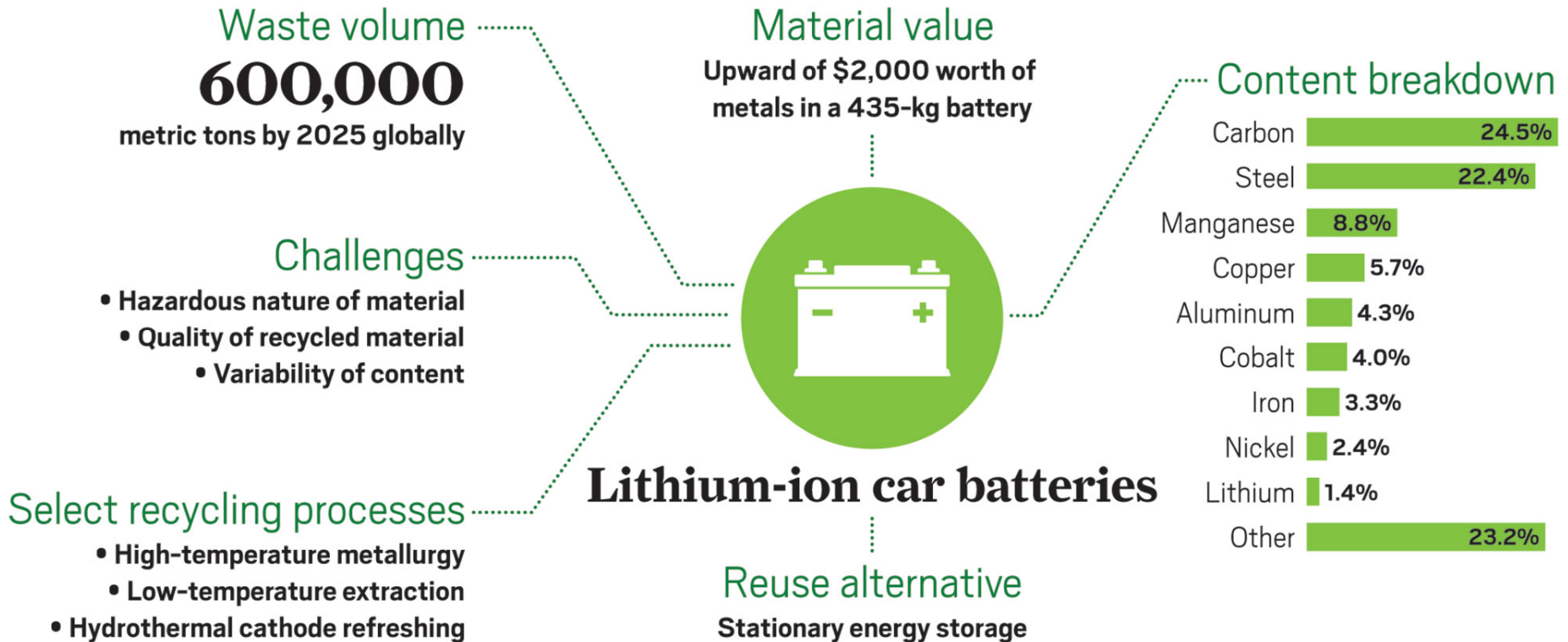
Shares of total U.S. energy consumption by major sources in selected years (1776-2019)



Note: Wood includes wood and wood waste; other renewables includes biofuels, geothermal, solar, and wind.

Source: U.S. Energy Information Administration, *Monthly Energy Review*, Appendix D.1, and Tables 1.1 and 10.1, April 2020, preliminary data for 2019

# Renewable Energy Components: Waste Management Challenges

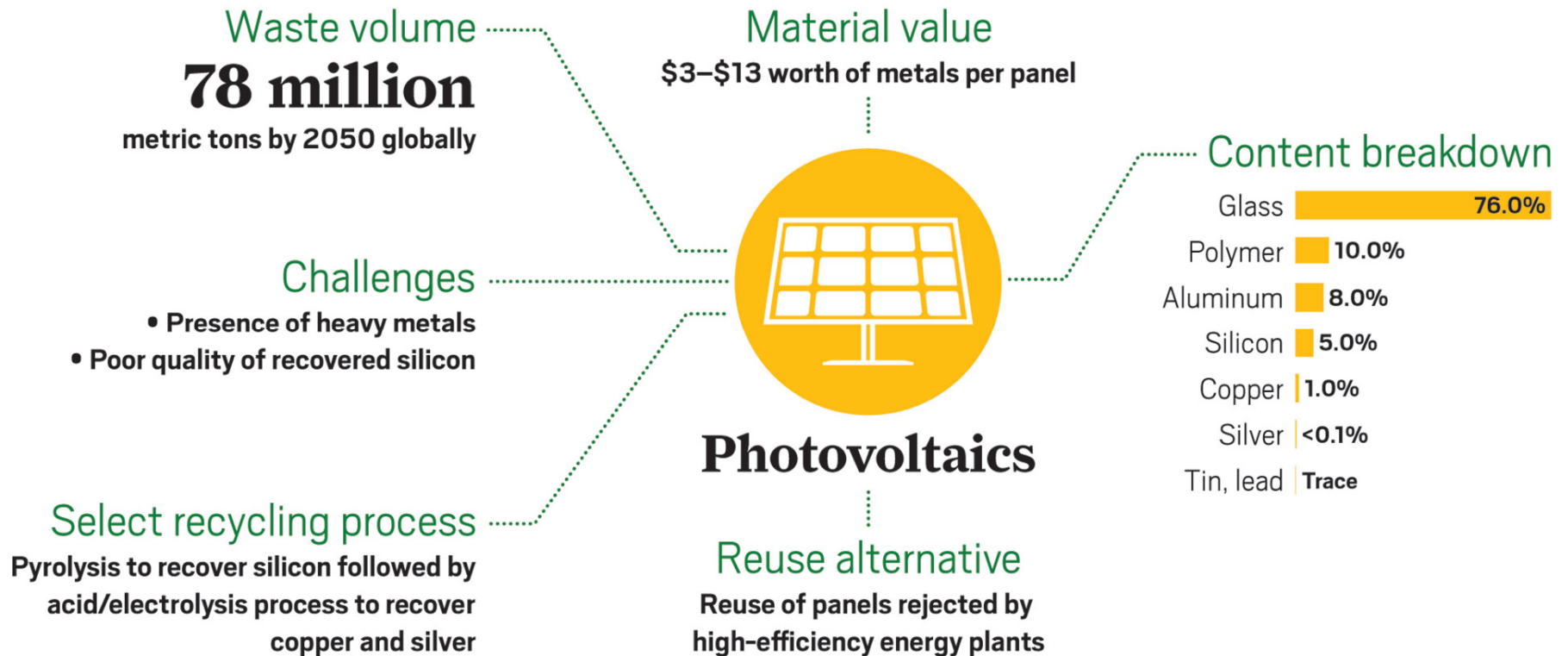


Credit: C&EN/Shutterstock

Sources: Bloomberg New Energy Finance; Esticast Research & Consulting; FREL; Gabrielle Gaustad, Rochester Institute of Technology; InfoMine; International Renewable Energy Agency; London Metals Exchange; ReFiber; Resour. Conserv. Recycl., 2014. DOI: 10.1016/j.resconrec.2013.11.008; WindEurope



# Renewable Energy Components: Waste Management Challenges



Credit: C&EN/Shutterstock

Sources: Bloomberg New Energy Finance; Esticast Research & Consulting; FRELP; Gabrielle Gaustad, Rochester Institute of Technology; InfoMine; International Renewable Energy Agency; London Metals Exchange; ReFiber; Resour. Conserv. Recycl., 2014. DOI: 10.1016/j.resconrec.2013.11.008; WindEurope

# Renewable Energy Components: Waste Management Challenges

Waste volume  
**300,000**  
metric tons by 2038 in Europe

## Challenges

- Massive size and weight
- Difficulty of recycling thermoset polymers
- Low value of material

## Select recycling processes

- Pyrolysis to recover fibers
- Mechanical degradation plus addition of adhesive to make construction panels
- Fuel for cement production

Material value  
Not assessed



## Content breakdown

Borosilicate glass fiber **>75%**  
Thermoset resins, including epoxy **<25%**

## Wind turbine blades

## Reuse alternatives

- Reuse at wind farms in other geographies
- Artificial reef, seating, playgrounds

Credit: C&EN/Shutterstock

Sources: Bloomberg New Energy Finance; Esticast Research & Consulting; FREL; Gabrielle Gaustad, Rochester Institute of Technology; InfoMine; International Renewable Energy Agency; London Metals Exchange; ReFiber; Resour. Conserv. Recycl., 2014. DOI: 10.1016/j.resconrec.2013.11.008; WindEurope

# U.S. Trends

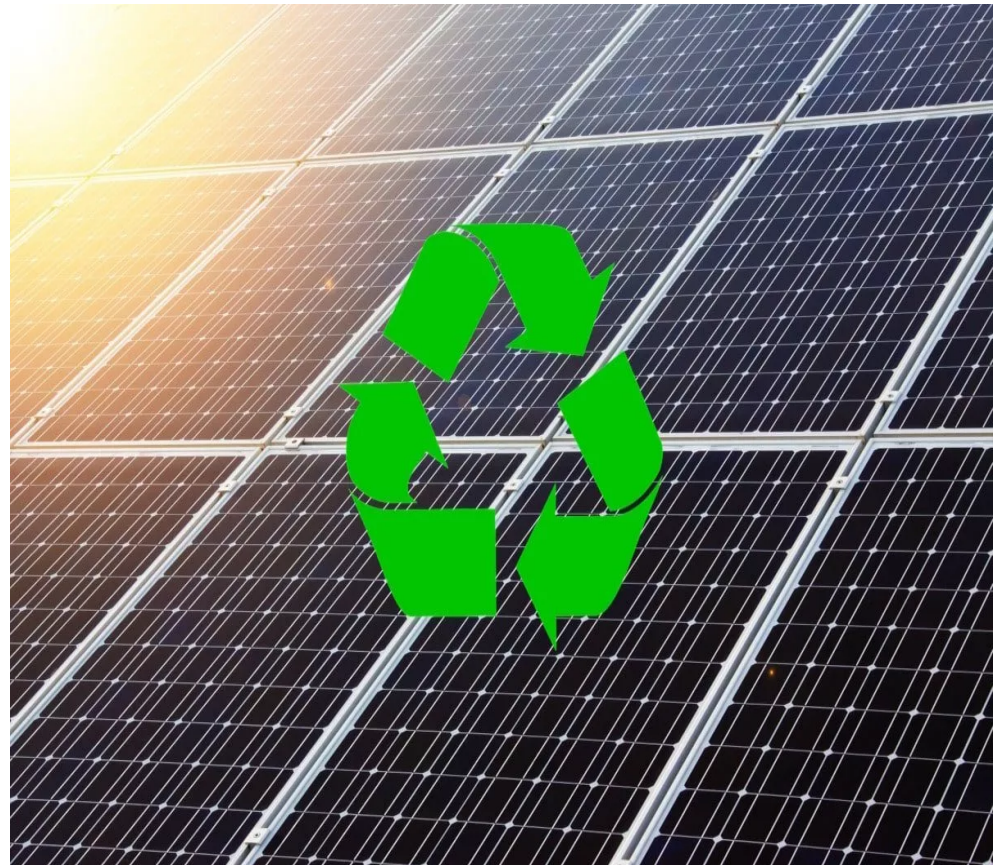
# Regulation in the United States

- Current lack of federal level regulation
- No federal law addresses e-waste (e.g. solar panels) or requires recycling of decommissioned renewable materials
- Patchwork of state and local approaches



# Washington State: Takeback Program

- First solar recycling mandate in U.S. (2017)
- Mandate requires solar panel manufacturers to implement takeback programs
- Includes requirement that manufacturers submit stewardship plan to Department of Ecology
- 2020 law creating task force to study solar end-of-life issues



---

# North Carolina: Rules in Process

- Second in U.S. in solar power energy production
- 2019 law that requires the Environmental Management Commission to come up with rules by Jan. 1, 2022 for the decommissioning of solar and wind power plants and management of PV modules, batteries, and other e-waste
- Department of Environmental Quality released report in Jan. 2021 to aid in rulemaking process



# California:

## Solar Mandate and Universal Waste

- Statewide solar panel mandate; requires photovoltaic (PV) solar panel installation in virtually all new home construction
- Classifies PV solar panels as universal waste as of Jan. 1, 2021 (helps ease waste handling burdens)
- Before this change, California required that each panel be tested to determine if hazardous (up to \$1,500)
- Federal government and other states monitoring closely



# U.S. EPA

- Jan. 6, 2021 Briefing Paper *Renewable Energy Waste Streams: Preparing for the Future*
- Examines waste impacts from solar panels, lithium ion batteries, and windmills
- Discusses photovoltaic (PV) solar panels being considered hazardous waste under RCRA based on toxicity characteristics
- Suggests partnering with DOE to address
- Briefing paper now archived by new administration, pending further review



The screenshot shows the EPA website's navigation bar with links for Environmental Topics, Laws & Regulations, and About EPA. A search bar is visible on the right. Below the navigation bar, the main heading reads "Archived: Briefing Paper January 2021". A sub-heading states: "EPA archived the paper titled *Renewable Energy Waste Streams: Preparing for the Future*. The paper was originally posted on January 6, 2021; however, it did not follow the appropriate review process before posting, so the document has been removed from the EPA website while the agency completes its review."

The footer of the website is divided into four columns:

- Discover.**
  - Accessibility
  - Budget & Performance
  - Contracting
  - Grants
  - EPA www Web Snapshots
  - No FEAR Act Data
  - Privacy
  - Privacy and Security Notice
- Connect.**
  - Data.gov
  - Inspector General
  - Jobs
  - Newsroom
  - Regulations.gov
  - Subscribe
  - USA.gov
  - White House
- Ask.**
  - Contact EPA
  - Hotlines
  - FOIA Requests
  - Frequent Questions
- Follow.**
  - Facebook
  - Twitter
  - YouTube
  - LinkedIn
  - Instagram

LAST UPDATED ON FEBRUARY 5, 2021



---

# Other Federal Agencies

- DOE – Lithium-ion battery recycling research and development initiative (ReCell Center, with at least 50 researchers in six labs and universities across the country)
- DOE – \$5.5M Battery Recycling Program to research ways to reduce dependence on cobalt and lithium for battery production; Battery Recycling Prize for public
- USAID – Proposed legislation would allow USAID to procure used wind turbine blades to use in international development projects.



# International Trends

---

# Australia:

## State-Level and Industry-Led Actions

### Solar Panel Recycling

- Absence of federal policy
- Mid-2020: Australian states begin to take action
  - **Victoria** banned landfilling of all e-waste, including solar panels
  - **New South Wales** allocated a \$10 million two-stage grant funding scheme aimed at keeping end-of-life PV systems out of the ground
- **Reclaim PV Recycling** setting up Australia's first large-scale solar panel recycling operation
  - 2011: Started business, conducted grant-funded research and small-scale operations
  - 2021: Secured new facility site and kickstarted nationwide collection network

### EV Battery Pack Solutions

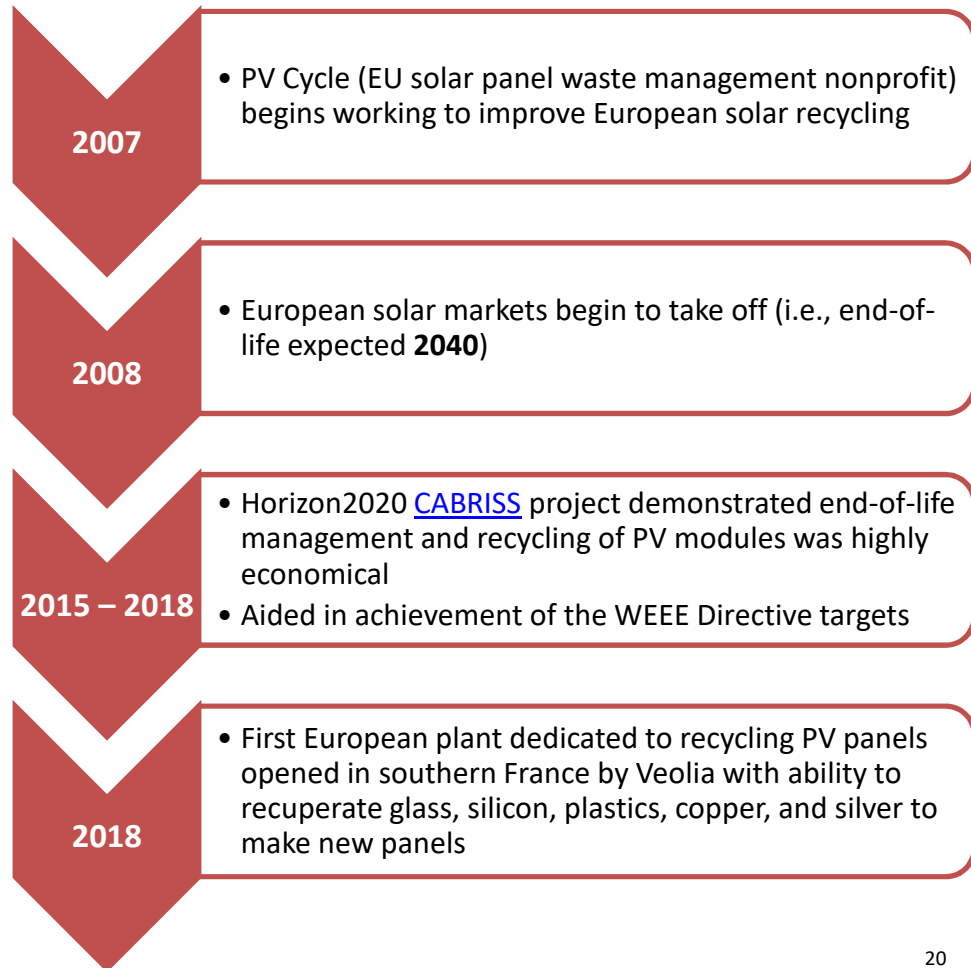
- Recycling
  - 2020: **Envirostream** Australia concluded recycling trials illustrating its ability to process end-of-life battery packs safely, effectively, cost-efficiently, and sustainably
  - Recycling end-of-life battery packs from six different types of electric vehicles at Melbourne facility
  - Signed non-exclusive recycling agreements with two battery suppliers
- Remanufacturing
  - Melbourne-based **Injectronics** will be rolling out its Hybrid Battery Remanufacturing Exchange Program in the second quarter of 2021, assisted by a \$103,000 federal grant
  - Offers cheaper replacement hybrid vehicle batteries using less energy and producing less waste than recycling

# European Union:

## First PV-Specific Waste Regulations + Early Planning

Waste Electrical and Electronic Equipment (“WEEE”) Directive, 2012 Recast (entered into force 14 FEB 2014)

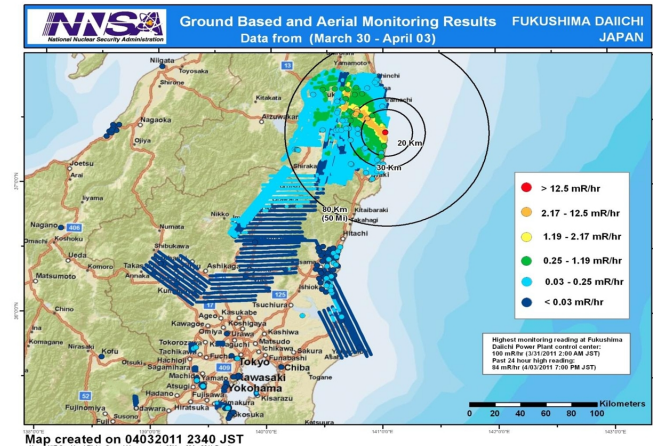
- Expanded to include PV panels
- Extended Producer Responsibility (EPR) Scheme
  - Places responsibility for processing (landfilling banned) the end-of-life panels on PV module “Producers”
  - Producers include: EU manufacturers, distributors/resellers, importers, internet/distance sellers directly selling to EU end-users
- Obligations include: Registration and declaration, end-user information and marking, collection and weighing, dismantling and recovery instructions, take-back operations, annual reporting



# Japan:

## Advanced Market / Developing Regulations

- Surge in solar projects after 2011 Fukushima disaster
- PV panel waste projected to skyrocket to 800,000 metric tons by 2040
- Little to no legislation regarding safe disposal
  - Guidance by Ministry of Environment (MOE) and Ministry of Economy, Trading and Industry (METI)
  - Proposed amendment to the Renewable Energy Act adding mandatory external decommissioning fee reserve requirement
- Pilot projects by New Energy and Industrial Technology Development Organization (NEDO)
- Heavy investment by industry in R&D related to solar waste, as well as other renewables



Japan's Aikawa Solar Power Plant WIKIMEDIA COMMONS

# Japan:

## Industry Innovation – EV Battery Packs



Used Toyota Prius batteries have been installed at 7-Eleven stores throughout Japan

- Charged by solar panels
- Used to power drinks refrigerators, fried chicken ovens, and sausage grills inside the stores



Namie, Japan: Nissan teamed up with Sumitomo to set up Japan's first lithium-ion battery reuse and recycling plant

- Reassembling used battery modules from Nissan Leaf electric car batteries
- Best-performing modules: Used in replacement Leaf batteries
- Lesser modules: Reassembled and used in batteries for electric fork-lift trucks, golf carts, and street lights (The Reborn Light project)

---

# Singapore: EPR Scheme for E-Waste

- First EPR scheme to be introduced in Singapore
- Focused on electrical and electronic waste (e-waste) falling under the following classes:
  - **Solar photovoltaic panels**
  - Information and Communications Technology (ICT) equipment
  - Large appliances
  - **Batteries**
  - Lamps
- “Producers” – Manufacturers and importers
- Berlin-based Alba Group to serve as Producer Responsibility Scheme (PRS) Operator between July 1, 2021 and June 30, 2026. Responsibilities to include:
  - Collect e-waste and sent to licensed e-waste recyclers
  - Set up data management system to track and report e-waste quantities to National Environment Agency (NEA)
  - Organize outreach programs to raise public awareness on the importance of responsibly managing e-waste and to promote a culture of recycling



**ALBA** Group  
the recycling company

---

# Key Takeaways



## Challenges

- Uncertainty due to evolving issue (science + policy + law)
- Expect additional focus by regulatory bodies
- Public attention and interest



## Opportunities and Next Steps

- Conduct applicability assessments
- Participate in regulatory and policy development
- Lead and innovate within industry
- Increase business sustainability and success



# Contact Us for Further Assistance



**Christopher B. Clark**  
[cclare@clarkhill.com](mailto:cclare@clarkhill.com)  
202.572.8671



**Maram T. Salaheldin**  
[msalaheldin@clarkhill.com](mailto:msalaheldin@clarkhill.com)  
202.640.6664

# CLARK HILL

## *Legal Disclaimer*

This document is not intended to give legal advice. It is comprised of general information.

Businesses facing specific issues should seek the assistance of an attorney.

---

To help provide perspective and education on COVID-19 and to assist clients through this difficult and rapidly-changing time, Clark Hill attorneys have produced thought leadership : [clarkhill.com/pages/covid-19](https://clarkhill.com/pages/covid-19).