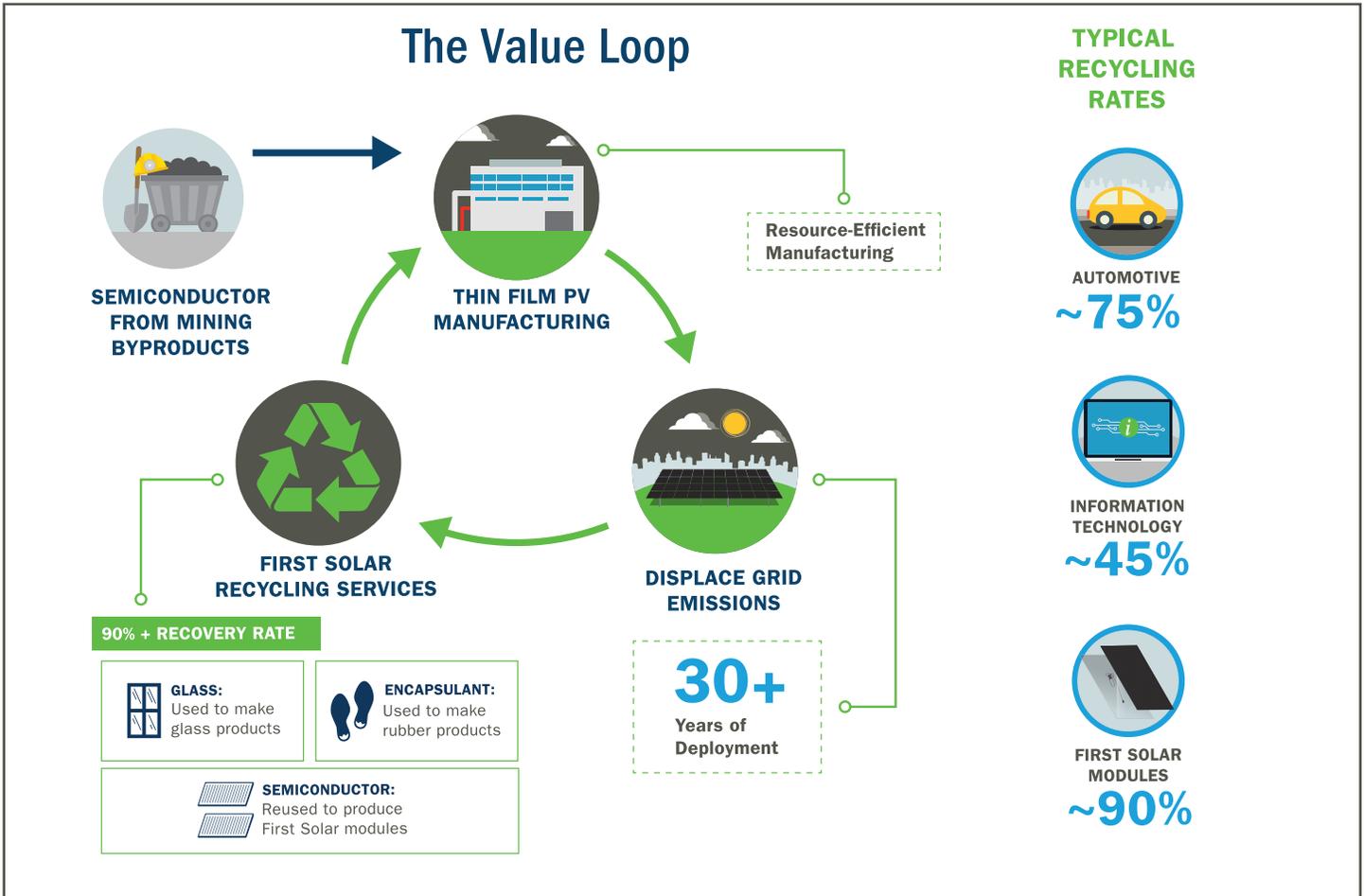




**HIGH-VALUE  
RECYCLING  
SERVICES.**

# POWERING A CIRCULAR ECONOMY

First Solar is contributing to a circular economy by converting mining byproducts into a leading eco-efficient PV technology that can be manufactured using less energy, water and semiconductor material than other commercially available PV technologies. First Solar modules are designed for high-value recycling to maximize material recovery at end-of-life and recover more than 90% of module materials for reuse, providing high quality secondary resources for new solar panels, glass, rubber and aluminum products.



## High-value recycling maximizes resource recovery and increases the sustainability of PV.

While most PV recycling processes focus only on recovering high-mass fraction materials such as glass and frames (i.e. bulk recycling), First Solar’s high-value recycling process goes further by recovering more than 90% of the semiconductor material for reuse in new First Solar panels and 90% of the glass for use in new glass container products. Due to the shredding and crushing involved in the recycling process, material losses are inevitable, and the recovery ratio is always less than 100%. The remaining 5-10% of the recycled module scrap consists primarily of glass fines which are captured by dust control systems and High Efficiency Particulate Air (HEPA) filtration systems.

### DID YOU KNOW?

*One kilogram of First Solar’s semiconductor material can be recycled 41 times over, which translates into a use time of more than 1,200 years.*

# PROGRAM DETAILS

First Solar offers industry-leading Recycling Service Agreements to help PV module owners meet their end-of-life (EOL) obligation simply, cost-effectively and responsibly:



**Cost-effective:** 2-year termed renewable pricing allows prices to decrease as recycling costs are reduced over time



**Scalable:** Designed for high-volume recycling and decommissioning



**No up-front fees:** “pay as you go” model priced on a per-module basis using later year project cash flows



**Flexible:** Start date at module sale, throughout plant life, and/or decommissioning

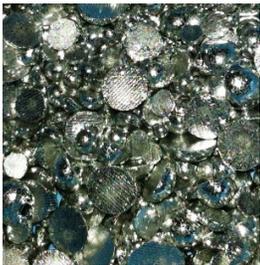


**Globally available:** Recycling services offered in all regions of the world



**Responsible:** Maximizing material recovery while operating to sound and responsible global standards

Owner is responsible for module removal, packaging and logistics to First Solar recycling center. Costs may vary regionally according to local market conditions.



## PRODUCT DESIGN

Designed for high-value recycling



## PRODUCT USE

Faster CO<sub>2</sub> reductions and greater return on energy invested



## MATERIAL SOURCING

Converting mining byproducts into a stable semiconductor



## MANUFACTURING

Manufacturing with less energy, water and GHG emissions



## COLLECTION & RECYCLING

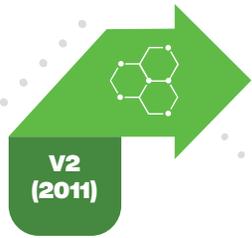
Recovering over 90% of material at end-of-life for new PV modules



# RECYCLING LEADERSHIP

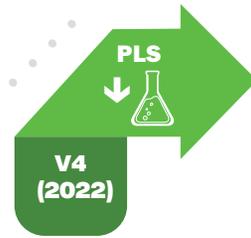
First Solar has a unique and long-standing leadership position in PV recycling as the only solar manufacturer with global in-house PV recycling capabilities and more than 15 years of experience operating high-value PV recycling facilities on a global and industrial scale. Recognizing the importance of responsible product life cycle management, First Solar voluntarily established the industry's first global solar panel recycling program in 2005 and has been investing in recycling technology improvements ever since.

Batch process based on mining industry



Batch process based on chemical industry

Continuous process with 30% less capital, chemicals and waste



Higher leaching efficiency with reduced chemical consumption

First Solar currently operates recycling facilities in Ohio, Malaysia, Vietnam, Germany, and India with more than 300,000 metric tons recycled to date. Although current PV waste streams remain low due to the product's long lifetime, First Solar's proven recycling technology is scalable to accommodate future high volumes. First Solar is among more than 380 companies to sign the America Recycles pledge, which aims to address the challenges facing the nation's recycling system and create a more resilient materials economy while protecting the environment.



# SUSTAINABILITY MADE SIMPLE

Learn more about how First Solar can help you meet your module EOL management needs at a cost advantage. Our affordable recycling services are globally available today for a cleaner, more sustainable tomorrow.



LEADING THE WORLD'S SUSTAINABLE ENERGY FUTURE



Email: [recycling@firstsolar.com](mailto:recycling@firstsolar.com)  
Website: [firstsolar.com/recycling](https://firstsolar.com/recycling)