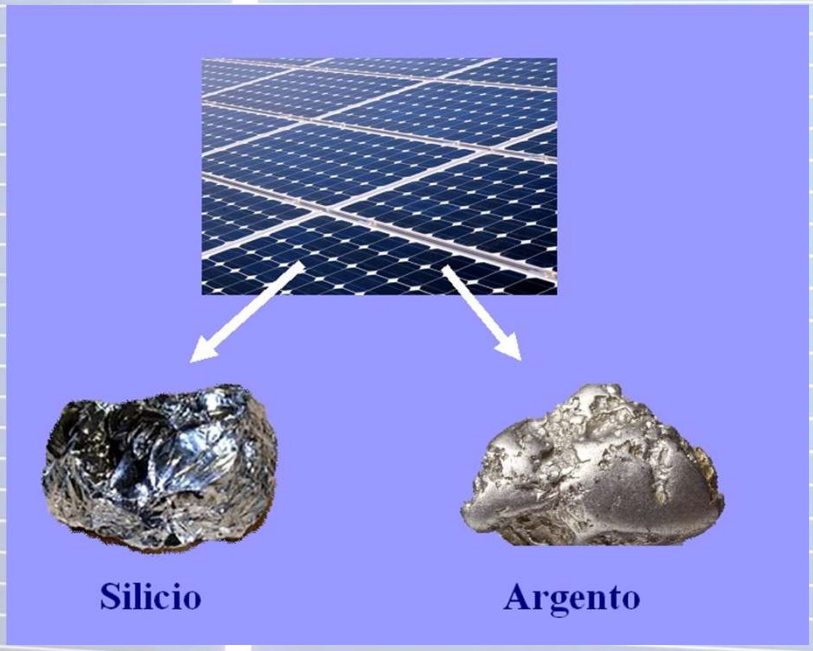
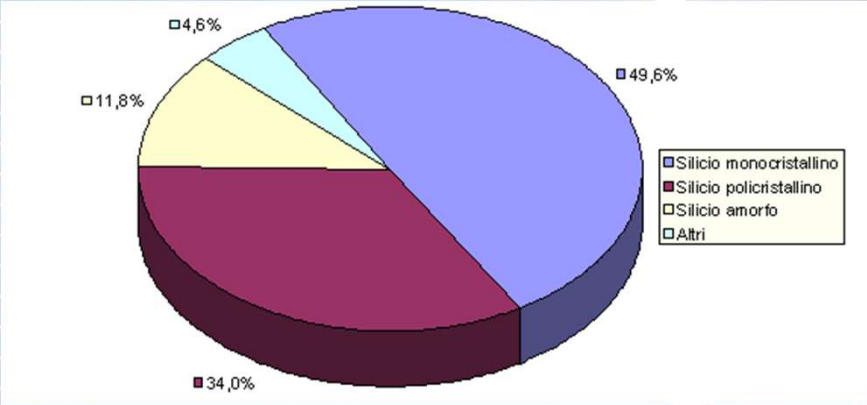
ReSIELP: Recovery of Silicon and other materials from End-of-Life Photovoltaic Panels



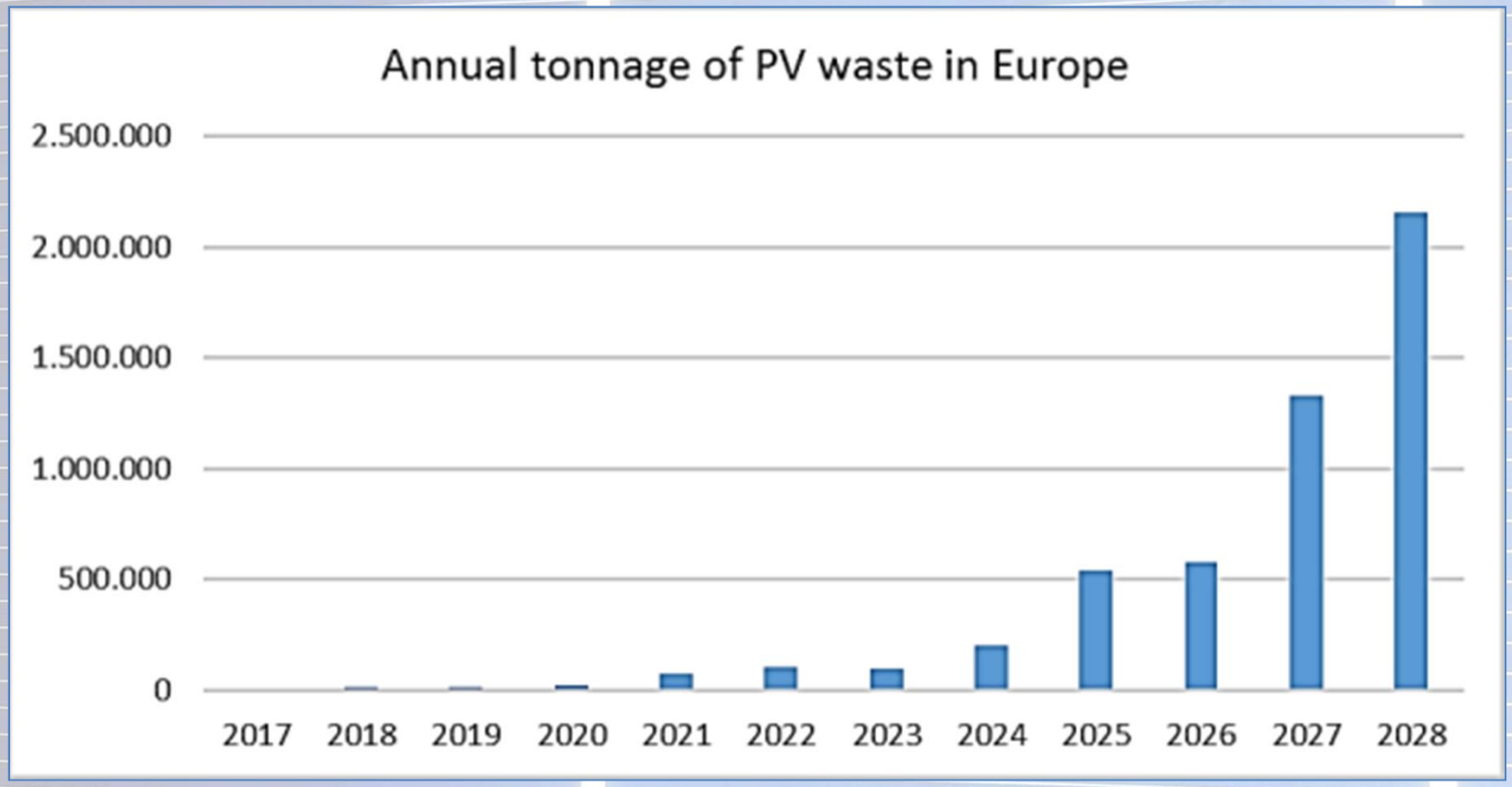
Photovoltaic in Italy

The first photovoltaic system was installed in the 1979



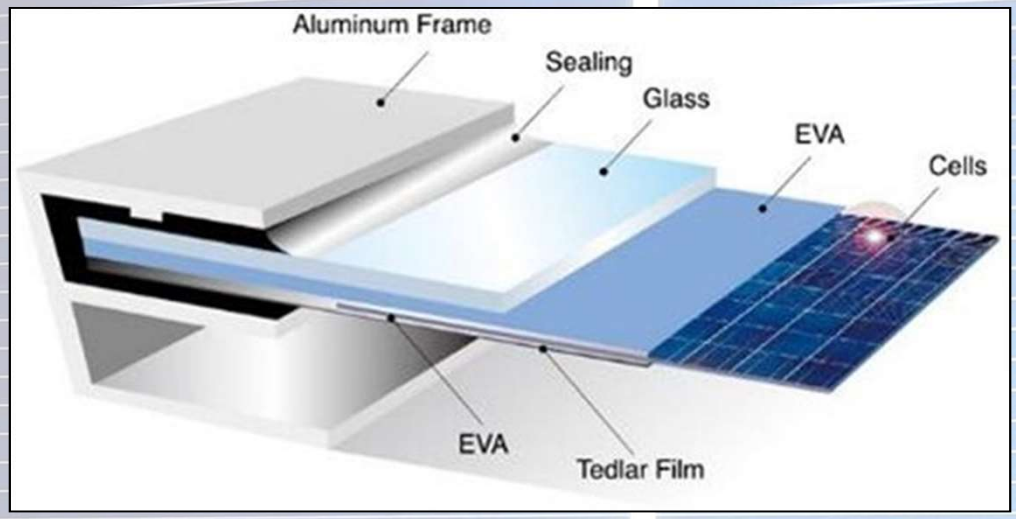
Today there are in Italy **550.533** PV systems which produces an electrical power of **17.698.255** MW

Strategic importance



With an estimated lifetime between 20 to 30 years, more than 2M tons of End-of-Life PV (EoL PV) are expected in 2020

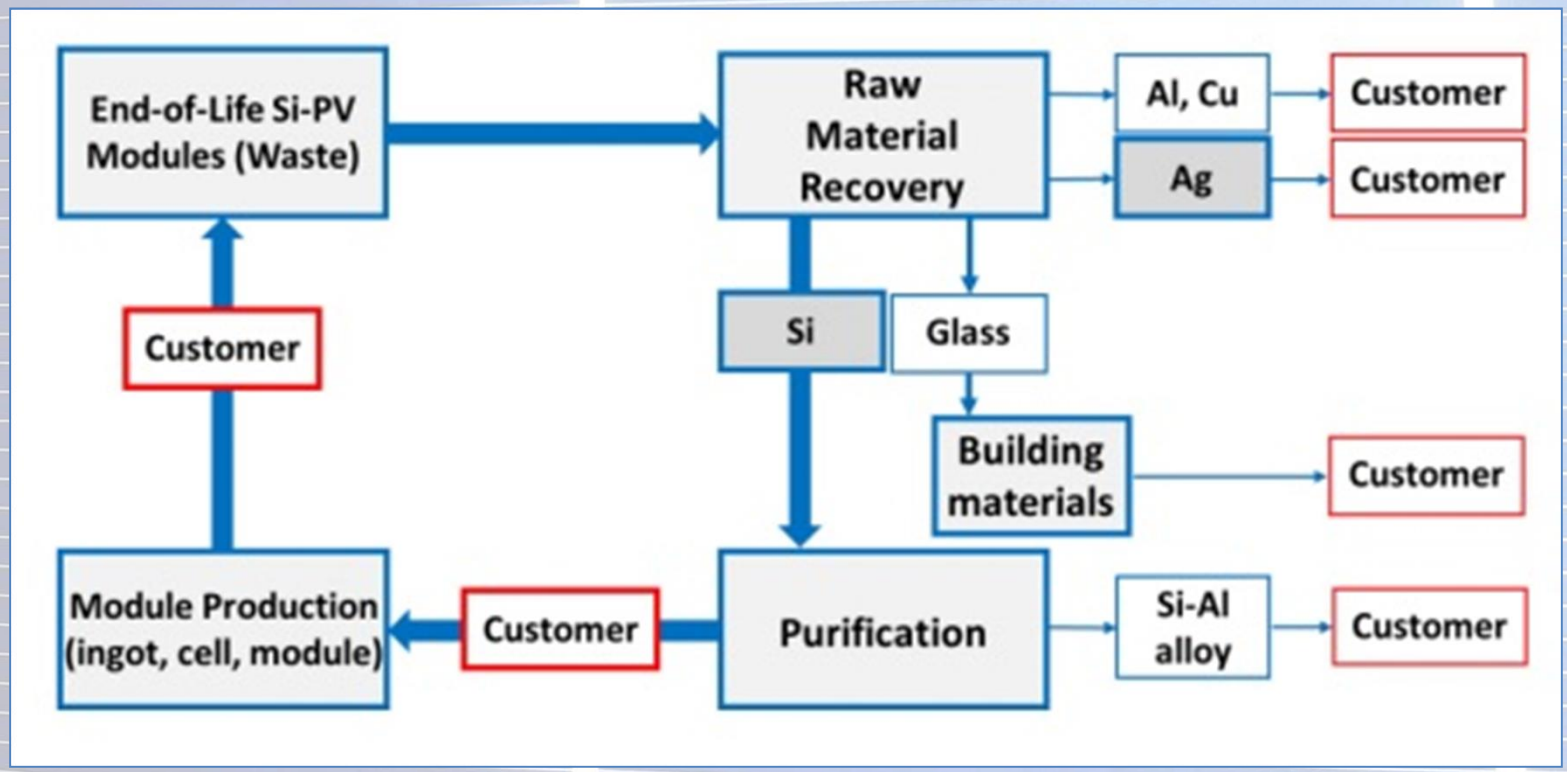
Raw materials in a PV panel



Materials	Indicative price [€/Kg]	Weight [Kg]	Value [€]
Ag	469.26	0.00889	4,18
Si	8.99	0.6	5,40
Glass	0.04	14.82	0,593
Al from cells	1.32	0.0275	0,0363
Cu	3.79	0.2	0,758
Al frame	1.36	2.5	3,40
		Panel value [€]	**14,36**

Aim of the project

ReSiELP aims at recovering critical and precious as well as non-critical raw materials with innovative tech nologies from the largely available quantity of EOL PV waste. ReSiELP proposes a circular economy with a produc centric zero-waste approach.



Critical step: PV delamination

Removal of glues

- Chemical Methods ✗
- Thermal metyhod
  - Softening (T< 300°C) ✗
  - Thermal degradation (T>300°C) ✓

Critical step: recover of silver

PV cells

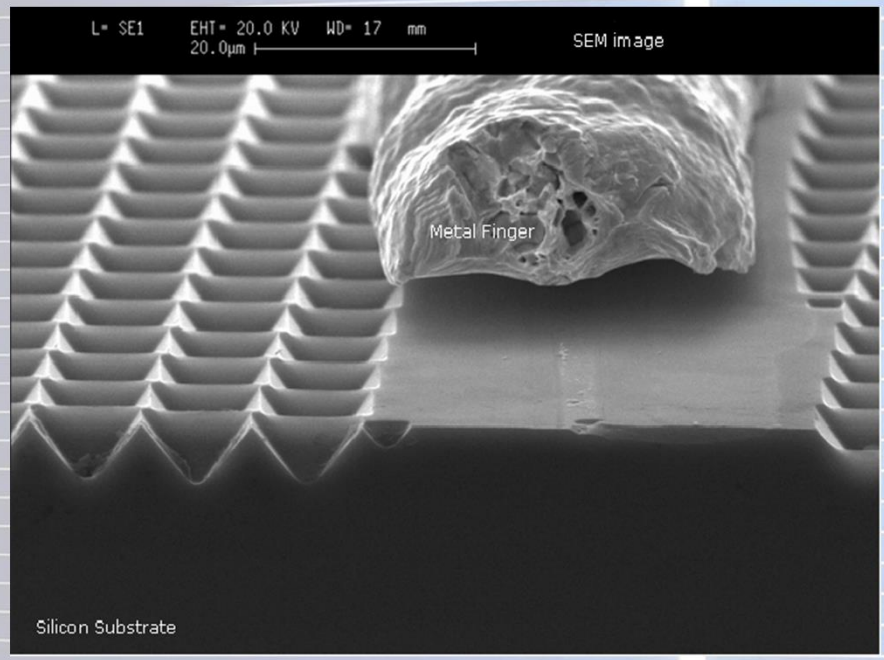
Pyrometallurgy

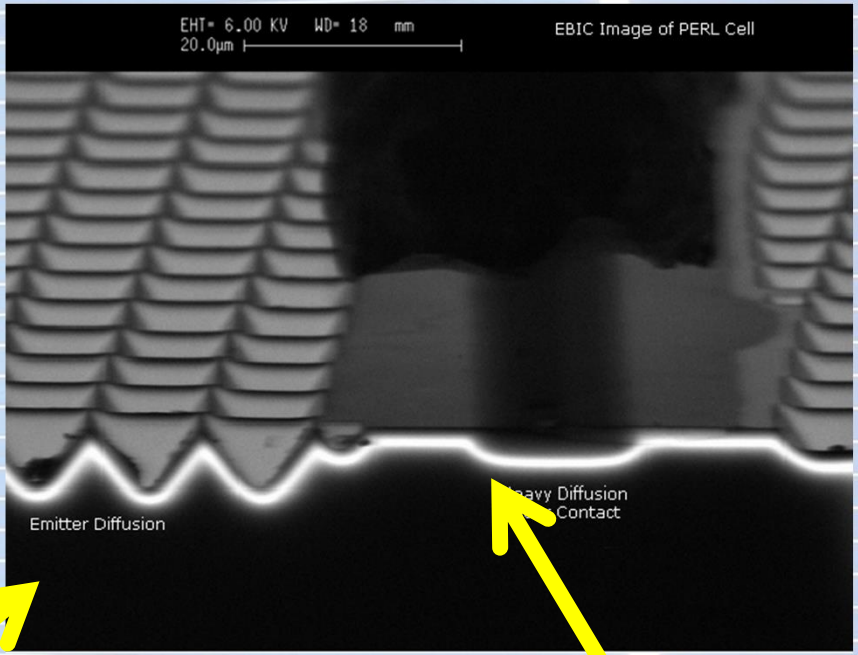
Hydrometallurgy

- Removal Al Backsheet
- Selective removal of Ag

Silver crystals obtained from PV

Critical step: recover of silicon





Boron doped silicon

Phosphorous doped silicon

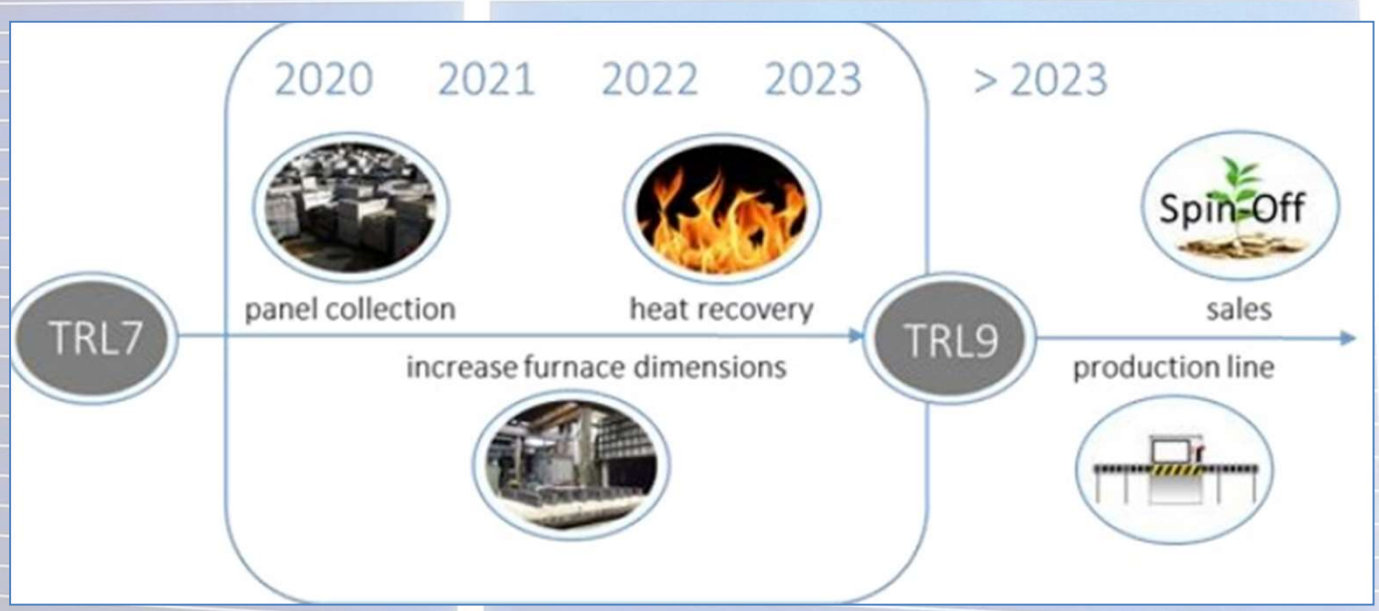
PV panels: urban mining

Materials in a PV panel

	materiale	peso stimato [Kg]	% in peso	
Parte non recuperata	tedlar	0,73	3,84	7,05%
	eva	0,61	3,21	
Parte recuperata	Telaio in alluminio	1,76	9,26	92,9%
	contatti	0,36	1,90	
	vetro	14.82	78,00	
	silicio	0,60	3,16	
	alluminio	0,11	0,58	
	argento	0,01	0,05	
Peso totale		**19,00**		

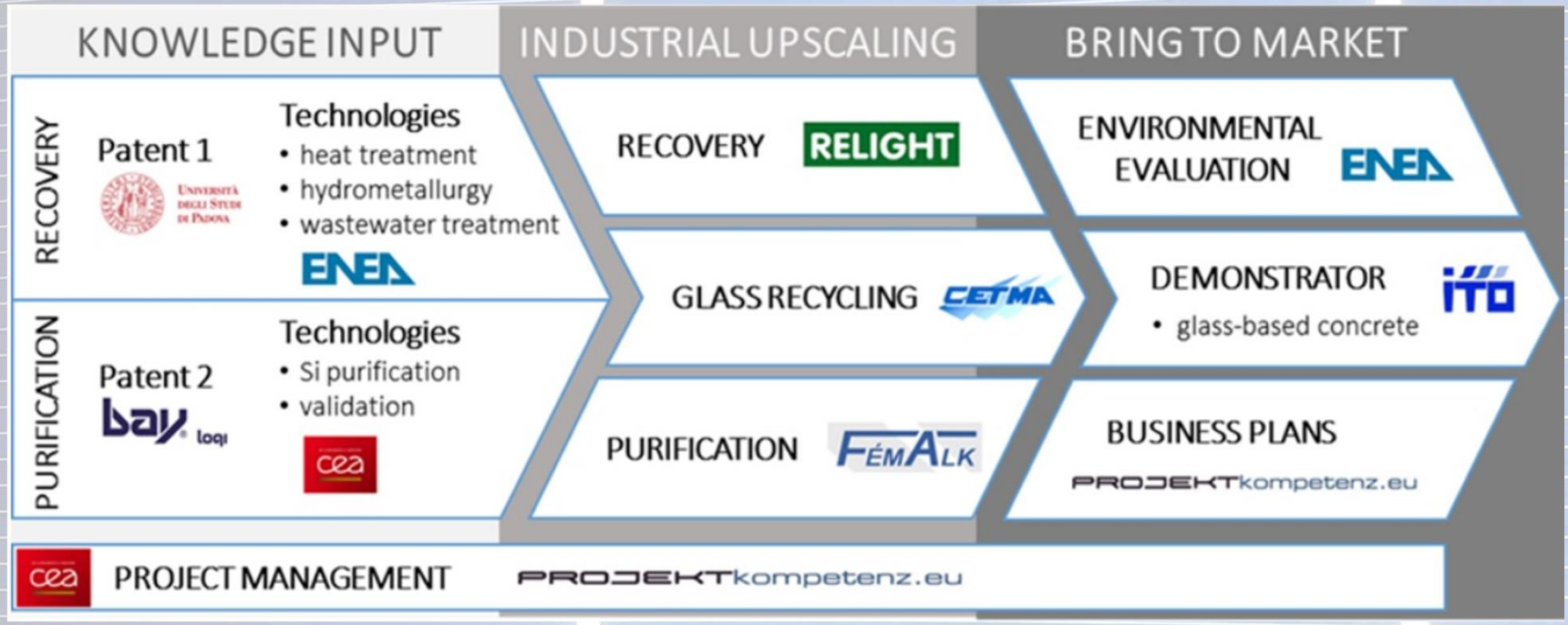
- An integrated cycle for the complete recovery is required

ReSiELP aims to upgrade the technology from TRL 5 to TRL 7



9 complementary partners:

- University of Padova, IT: Recovery of Panel technology
- ENEA, IT: Support to SME for design of device for heat treatment of panel, LCA, Hydro-metallurgical process wastewater treatment. Support to SME for design of device for heat treatment of panel, LCA, Hydro-metallurgical process wastewater treatment
- Relight, IT: Upgrade of Recovery Panel technology
- CEA, FR: Project coordinator - Technology validation through ingot/wafers/cells/modules
- Bay Zoltan, HU: First purification of Silicon technology coming from recovery
- FEMALK, HU: Upgrade of purification of Silicon & further use of the side-product (liquid Al-Si alloys)
- CETMA, IT: Development of eco-sustainable building mate rials with recycled glass fraction from EOL PV panels, supports ITO for upscale, real environ ment demonstration and economic assessment of eco-sustainable building precast components with recycled glass fraction
- ITO, IT: Upscale & real environment demonstration of eco-sustainable building precast components with recycled glass fraction from end of life PV panels
- PROKO, AU: Effective EU-wide dissemination to relevant target groups, exploitation, business plan development & IP management, overall project management.


KNOWLEDGE INPUT
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RECOVERY
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• hydrometallurgy
• wastewater treatment
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PURIFICATION
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bay logi
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THANKS FOR THE ATTENTION

Dispose responsibly your PV system