

FoGSi – Development, refining and recycling of solar-grade silicon feedstock, wafers and cells

Proposed STREP Project:
Scope and outline

Overall Objectives –

Reduce cost of SoG-Si to € 15/kg and energy payback time to ≤ 6 months

HOW DO WE ACHIEVE THESE OBJECTIVES?

- Securing high volume production of SoG-Si
 - Developing refining technology to suit different SoG-Si feedstock
 - Developing reprocessing techniques for manufacturing by-products, semi-finished and end-of-life products
- together with:*
- Customise wafer and cell manufacturing for FoGSi feedstock to realise 16-17% cell efficiency

Securing High Volume Production of SoG-Silicon

Continue the development of new sources of SoG-Si feedstock through:

- Development of new refining processes for SoG-Si based on pure raw materials, metallurgical grade (MG)- and recycling- sourced silicon.

And by:

- Providing a feedback loop of material specification for feedstock producers (n- and p-type)

Developing Recycling Techniques for Manufacturing by-Products, finished and end-of-life Products

Utilise waste streams and products from EG wafer and SoG-Si wafer production by recycling and reprocessing:

- Off-grade material from the DS furnace
- Top, bottom and side wall ingot off-cuts
- Highly doped (n-type) waste Si from EG wafer production
- Others

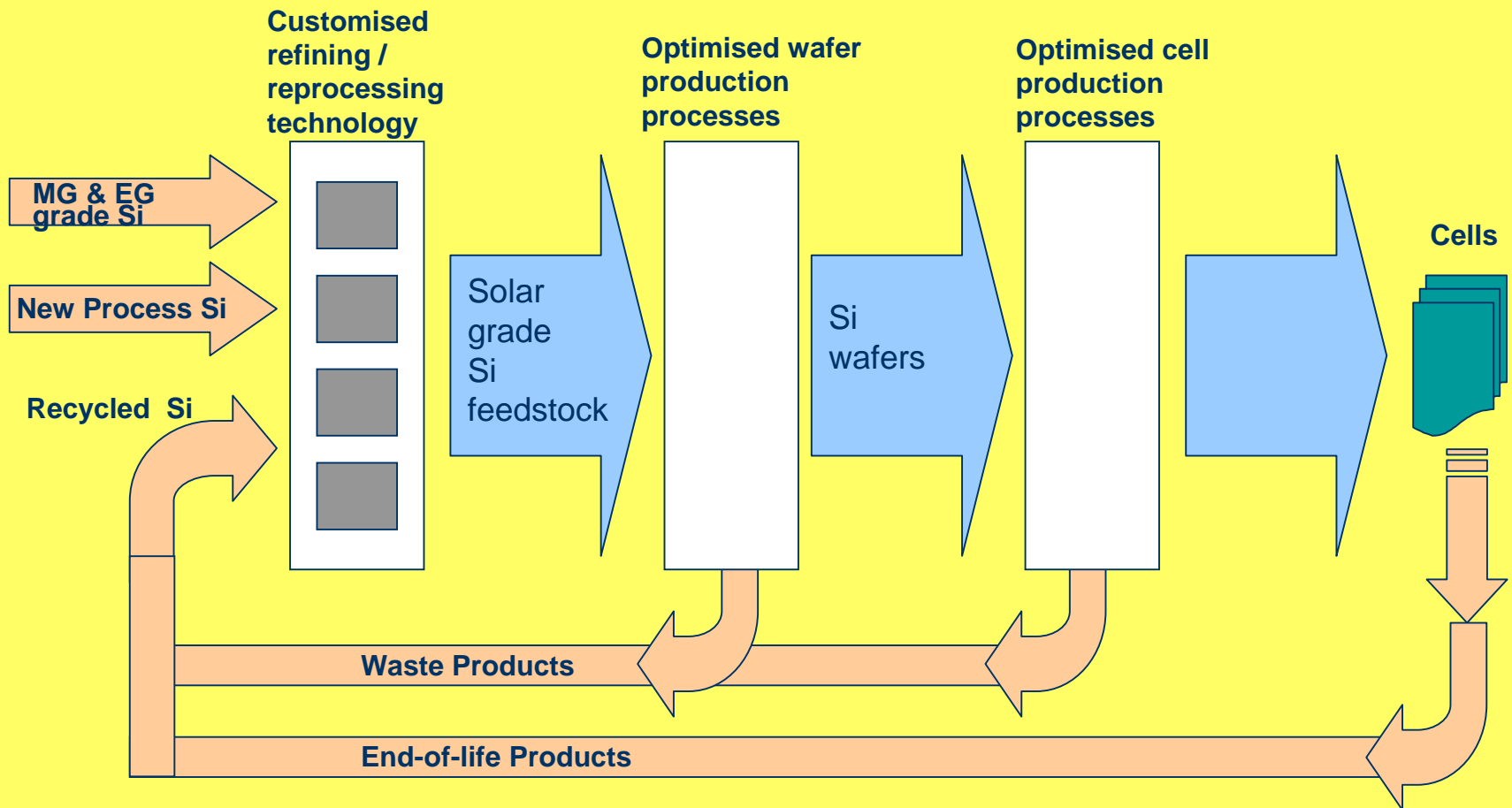
Optimised Wafer and Cell Manufacturing

Optimise production/manufacturing processes for minimum material waste and energy consumption as well as maximum efficiency performance

- Optimised traditional and alternative (direct) wafer production methods
- Improved cell production technology for large scale production
- Improved cell efficiency and reduced cost by cell production based on n-type Si

For success in these pursuits, knowledge of traditional and innovative recycling and refining processes, feedstock impurity limits and efficient crystallisation technology, is ESSENTIAL!

Project Concept "At a Glance"



Potential Partners

- SINTEF and NTNU (coordinator plus research – refining/recycling technology, crystallisation and primary purity limit specifications)
- ECN (industrial solar cell processing, secondary purity limit specifications)
- FESIL/ScanArc (providers of feedstock)
- Sunergy (commercialisation partner)
- Deutsche Solar (industrial research on crystallisation and cell recycling)
- University of Konstanz (solar cell processing and characterisation)
- Isofoton (cell and module manufacturing)
- University of Milano-Bicocca (characterisation of wafers)

Technical Work Packages

■ Refining and processing of MG-Si, New Si and recycled Si

1. Optimised (cost and purity) C, B, P removal processes
 - Electrochemical
 - Pyrometallurgical
2. Physical processing of recycled Si
3. Working with n-type (removing phosphorous less important);
4. Cheap rapid crystallisation as extra purification step
5. Evaluation cost/benefit of reaching certain purity levels

■ Wafer manufacturing (150x150mm² wafers at 16 to 17 % cell-efficiency for large-scale)

1. Improved crystallisation process for production of poly-crystalline Si wafers
2. In-line industrial cell processing, with optimised gettering and hydrogenation