# Innovation of Glass for CSP

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#### AGC Inc.

Your Dreams, Our Challenge

AGC

#### Solar resource for CSP



#### DNI: Direct normal irradiance



3 000 kWh per m<sup>2</sup> per yr
2 500 kWh per m<sup>2</sup> per yr
2 000 kWh per m<sup>2</sup> per yr
1 500 kWh per m<sup>2</sup> per yr
1 000 kWh per m<sup>2</sup> per yr
500 kWh per m<sup>2</sup> per yr
0 kWh per m<sup>2</sup> per yr

Source: Breyer & Knies, 2009 based on DNI data from DLR-ISIS (Lohmann, et al. 2006).

Technology Roadmaps Concentrating Solar Power 2010 (IEA)

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#### **Outlook of renewable energy**



 Cumulative technology contributions to power sector emission reductions in Energy Technology Perspectives 2014 (IEA) High-Renewable Scenario relative to 6 degree Scenario up to 2050.



Technology Roadmap Solar Thermal Electricity 2014 edition (IEA)

#### **Importance of Glass material**



- There are major four types of CSP technologies, namely Parabolic trough, Liner Fresnel reflector, Parabolic dish, Solar tower.
- All of solar mirrors need high performance glass.

#### Parabolic trough



Reflector Absorber tube Solar field piping

#### **Linear Fresnel reflectors**





#### **Parabolic dishes**









#### **Central receiver**



### Birds-eye view of Solar power, CSP





#### Ashalim Project (NEGEV DESERT, Israel)

#### Heliostats (reflectors of solar tower)





## **Required performance of Mirror**





### **Required performance for solar glass**



- Transparency
- Reflectivity
- Flatness

- Durability
- Light weight
- Anti-soiling



## Innovation required









- The major coloring principle of glass turns on the presence of <u>iron</u> into the glass
- The iron can be present in two oxydized forms

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Fe<sup>2+</sup> (colors the glass BLUE) + ABSORBS ENERGY !!
Fe<sup>3+</sup> (colors the glass GREEN)
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Glass for solar mirror : redox control & Fe2O3 < 250µm

Your Dreams, Our





#### Flatness







#### Product A (Better)

#### Product B

## Light weight





#### **Contribution to SDGs**

- Renewable energy
- Effective independent power source in the case of natural disaster
- Flat generation profile compared with PV
- Not only electricity but also heat can be generated.
- Japan can contribute as a global leader of glass



## **CSP** can contribute to realize **SDGs**!

#### **Joint Crediting Mechanism**



#### Detail information: http://gec.jp/jcm/



#### **Green Climate Fund**



#### Detail information: https://www.greenclimate.fund/home





