

## Appendix – C Numerical calculation

### C.1 Error estimation

The number of incoming beam rays from the TIS plays a crucial role in determining the final results observed at BRS. As in Section 5.4, the value of  $N_{TIS}$  is estimated to be 1800. However, it can be validated by considering the remaining error in the solution with two different parameters. Here in, to obtain the optimized number of rays passing through the TIS, a common case is considered when  $\Phi$  is  $90^\circ$ . In this scenario, the relative errors with respect to two important aspects are determined: (i) the value of solar irradiation reaching the BRS ( $\epsilon_I$ ) and (ii) the value of optical efficiency ( $\epsilon_\eta$ ). The value of  $\epsilon_I$  and  $\epsilon_\eta$  is obtained by averaging difference between two consecutive core points from the TIS, named  $N_{TIS}^i$  and  $N_{TIS}^{i+1}$  respectively and it is calculated as shown in Eq. (C.1) and Eq. (C.2) (K. Chen et al., 2016; Nakano & Liu, 2023; Villa et al., 2014).

$$\epsilon_I = \frac{|I_{BRS}^{i+1} - I_{BRS}^i|}{I_{BRS}^i} \quad (C.1)$$

$$\epsilon_\eta = \frac{|\eta_{BRS}^{i+1} - \eta_{BRS}^i|}{\eta_{BRS}^i} \quad (C.2)$$

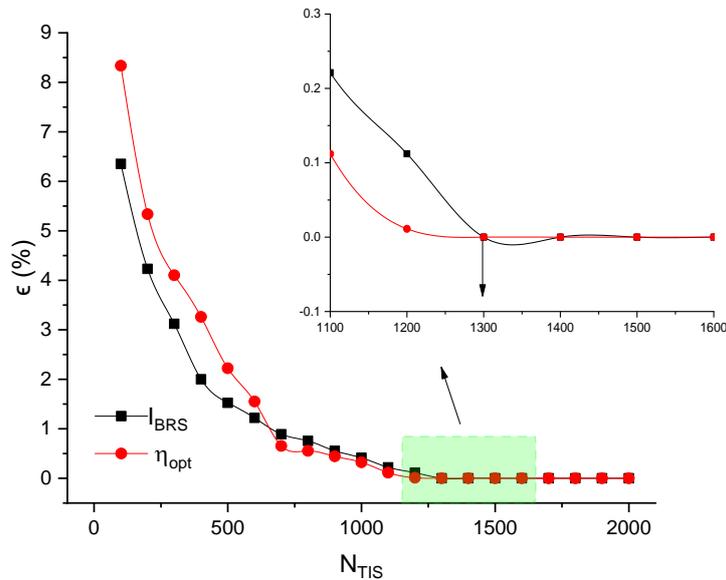


Fig. C.1.1 Adequate number of incoming rays on TIS.

The results are presented in Fig. C.1.1 and it is observed that there is no variation in  $\epsilon_I$  and  $\epsilon_\eta$  once the value of NTIS reaches 1800. Notably, the relative error is relatively stable when  $N_{TIS}$  is greater than 800. However, for the value of  $N_{TIS}$  ranges between 800 to 1200, the variation in  $\epsilon$  is very small. As value of  $N_{TIS}$  reaches 1300, the change in relative error approaches zero and its absolute zero when the value of  $N_{TIS}$  reaches 1800. To study the trend, the results have been obtained for up to 2000 core points, but no significant variation is observed beyond  $N_{TIS}$  1800. Based on this study number of core points considered on the TIS is kept at a constant value of 1800 for all subsequent analysis.



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Date: 12th April 2022

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To,

Mr Jay Indravadan Patel, Research Scholar,

Department of Mechanical Engineering,

Faculty of Technology and Engineering,

The Maharaja Sayajirao University of Baroda,

Vadodara – 390 001

Sub: Releasing research grant for your Ph D work worth US\$ 10,000

Ref: Assessment of your research work titled ‘Studies on Operation of Large-Scale Solar Furnaces using Heliostat Reflectors and its Thermal Performance’

Dear Jay,

In continuation to our discussion about your research activity and subsequent review we are happy to inform you that our management has agreed to approve a research grant equivalent to US\$10,000. The said grant will be in the form of the downloadable historical solar radiation data of various locations of the globe. These data may include DNI, DHI, zenith angle, air temperature, etc.

To enable this, The SOLCAST added US\$10,000 worth of data in your SOLCAST account. This will help you acquire solar data for your research endeavour. We also request you to acknowledge SOLCAST against your use of these data in all your future publications.

We wish good luck for your research activity.

Yours truly,

Alistair Northam,

Strategic Projects Lead,

Sydney, SOLCAST

Australia.

*Alistair Northam*

Fig. C.1.2 Letter of USD 10,000/- received from the Solcast.