



## ISOP

### INNOVATION IN SUPERCRITICAL CO<sub>2</sub> POWER GENERATION SYSTEMS

Call for the selection of doctoral network (DC01, DC02, DC07 and DC17) to be hired for participation in the project and Work Packages:

| DC | Title  | WP |
|----|--|----|
| 01 | <i>"Integration of power systems based on directly-fired oxycombustion sCO<sub>2</sub> power cycles"</i>             | 1  |
| 02 | <i>"Market uptake of supercritical CO<sub>2</sub> power systems to enable carbon-neutrality by 2050"</i>             | 1  |
| 07 | <i>"Dynamic operation of sCO<sub>2</sub> power generation systems under variable load and variable energy input"</i> | 2  |
| 17 | <i>"Innovative turbine designs for enhanced flexibility of megawatt scale axial sCO<sub>2</sub> turbines"</i>        | 3  |

to be developed at University of Seville, Spain, as part of the European Doctoral Network "Innovation in Supercritical CO<sub>2</sub> Power generation systems - ISOP", funded from the European Union's Horizon Europe programme under the Marie Skłodowska-Curie with grant agreement No. 101073266.

Call launched on May 10<sup>th</sup>, 2023


#### MINUTES

The candidates have been evaluated by

- Sánchez Martínez, David T., Professor of Energy Engineering at University of Seville
- García Rodríguez, Lourdes, Professor of Thermodynamics at University of Seville
- López Postiglione, Soledad, Business Development Manager at Empresarios Agrupados Internacional, Madrid.
- Alonso Zábalo, Félix, Deputy Engineering Manager at Empresarios Agrupados Internacional, Madrid

in their capacity as members of the Selection Panel of DC01 "Integration of power systems based on directly-fired oxycombustion sCO<sub>2</sub> power cycles"

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- Sánchez Martínez, David T., Professor of Energy Engineering at University of Seville
- García Rodríguez, Lourdes, Professor of Thermodynamics at University of Seville
- Špolcová, Jitka, Project Officer at ETN Global, Brussels.
- Vijgen, René, Senior Technical Manager at ETN Global, Brussels
- Facci, Enrico

in their capacity as members of the Selection Panel of DC02 *“Market uptake of supercritical CO<sub>2</sub> power systems to enable carbon-neutrality by 2050”*

- Sánchez Martínez, David T., Professor of Energy Engineering at University of Seville
- Crespi, Francesco M., Lourdes, Lecturer at University of Seville
- Pastricakis, Vasileios, Consulting Engineering Manager at SoftInWay, Zug

in their capacity as members of the Selection Panel of DC07 *“Dynamic operation of sCO<sub>2</sub> power generation systems under variable load and variable energy input”*


- Sánchez Martínez, David T., Professor of Energy Engineering at University of Seville
- Crespi, Francesco M., Lourdes, Lecturer at University of Seville
- Glos, Stefan, Project Manager Innovation at Siemens Energy, Muelheim an der Ruhr
- Dekkers, Mathias, Director of Steam Turbine Technology Management at Siemens Energy, Muelheim an der Ruhr
- Pastricakis, Vasileios, Consulting Engineering Manager at SoftInWay, Zug

in their capacity as members of the Selection Panel of DC17 *“Innovative turbine designs for enhanced flexibility of megawatt scale axial sCO<sub>2</sub> turbines”*

The tables below include the ranked list of applicants for positions DC1, DC2, DC07 and DC17, according to the selection criteria:

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|                                      |   |               |            |
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| CANDIDATE DC01              | STAGE 1   |            |                      |                      |                 |                    |                         |         | STAGE 2           |           |         |
|-----------------------------|-----------|------------|----------------------|----------------------|-----------------|--------------------|-------------------------|---------|-------------------|-----------|---------|
|                             | EDUCATION | EXPERIENCE | APP. PACKAGE         |                      |                 |                    | REQUIREMENTS (Specific) | TOTAL 1 | Moving to stage 2 | INTERVIEW | TOTAL 2 |
|                             |           |            | Motivation (0-5) 20% | Assessment (0-5) 30% | Video (0-5) 50% | Total App. Package |                         |         |                   |           |         |
|                             | 0-5       | 0-3        | 0-5                  | 0-5                  | 0-5             | 0-5                | 0-5                     | 0-18    |                   | 0-7       | 0-25    |
| Dominique Savio Barahira    | 2         | 1          | 3                    | 3                    | 2               | 2.5                | 2                       | 7.5     |                   |           | 7.5     |
| Babras Khan                 | 4         | 2          | 4                    | 1                    | 5               | 3.6                | 0.5                     | 10.1    |                   |           | 10.1    |
| Arian Shabruhi Mishamandani | 4         | 2          | 5                    | 2                    | 2               | 2.6                | 3.5                     | 12.1    | Yes               |           | 12.1    |
| Esmaeil Aboukazempour       | 5         | 2          | 4                    | 4                    | 2               | 3                  | 4                       | 14      | Yes               | 2.5       | 16.5    |
| Giovanny Lopez Muñoz        | 4         | 2          | 4                    | 2                    | 4               | 3.4                | 3                       | 12.4    | Yes               | 6         | 18.4    |
| Ihtishamul Haq              | 4         | 2          | 2                    | 3.5                  | 3               | 2.95               | 3                       | 11.95   |                   |           | 11.95   |
| Leonardo Provana            | 4.5       | 3          | 5                    | 4                    | 4               | 4.2                | 4                       | 15.7    | Yes               | 5.5       | 21.2    |
| Muhammad Nouman Saleem      | 4.5       | 3          | 4                    | 4                    | 3               | 3.5                | 3                       | 14      | Yes               | 5         | 19      |
| Ramin Ghiami Sardroud       | 4         | 2          | 2                    | 2                    | 2               | 2                  | 2.5                     | 10.5    |                   |           | 10.5    |
| Shamsoddin Ghiami           | 4         | 2          | 3                    | 3                    | 2.5             | 2.75               | 2                       | 10.75   |                   |           | 10.75   |
| Syed Safer Mehdi Shamsi     | 3.5       | 2.5        | 3                    | 4                    | 4               | 3.8                | 4                       | 13.8    | Yes               | 4.5       | 18.3    |

(\*) Candidates in red either are not selected because they either reject the contract or are selected for other DC at another academic beneficiary of the ISOP project.

| CANDIDATE DC02           | STAGE 1   |            |                      |                      |                 |                    |                         |         | STAGE 2           |           |         |
|--------------------------|-----------|------------|----------------------|----------------------|-----------------|--------------------|-------------------------|---------|-------------------|-----------|---------|
|                          | EDUCATION | EXPERIENCE | APP. PACKAGE         |                      |                 |                    | REQUIREMENTS (Specific) | TOTAL 1 | Moving to stage 2 | INTERVIEW | TOTAL 2 |
|                          |           |            | Motivation (0-5) 20% | Assessment (0-5) 30% | Video (0-5) 50% | Total App. Package |                         |         |                   |           |         |
|                          | 0-5       | 0-3        | 0-5                  | 0-5                  | 0-5             | 0-5                | 0-5                     | 0-18    |                   | 0-7       | 0-25    |
| Dominique Savio Barahira | 2         | 1          | 3                    | 3                    | 2               | 2.5                | 2                       | 7.5     |                   |           | 7.5     |
| Esmaeil Aboukazempour    | 5         | 2          | 4                    | 4                    | 2               | 3                  | 4                       | 14      | Yes               | 2.5       | 16.5    |
| Gonzalo Hidalgo Torres   | 4         | 3          | 2                    | 4                    | 2               | 2.6                | 2.5                     | 12.1    | Yes               | 2.5       | 14.6    |
| Mehdi Doostini           |           |            |                      |                      |                 | 0                  |                         | 0       |                   |           | 0       |
| Mohamed Elzayed          | 3         | 1          |                      |                      |                 | 0                  | 2                       | 6       |                   |           | 6       |
| Muhammad Yousaf Arshad   |           |            |                      |                      |                 | 2                  |                         | 2       |                   |           | 2       |
| Sergio Díaz              | 5         | 0          | 5                    | 2.5                  | 4               | 3.75               | 3                       | 11.75   | Yes               | 3         | 14.75   |
| Van-Thang Nguyen         | 5         | 2          | 4                    | 4                    | 5               | 4.5                | 3                       | 14.5    | Yes               | 4         | 18.5    |
| Waqar Ahmed              | 4         | 2          | 3                    | 4                    | 3.5             | 3.55               | 3                       | 12.55   | Yes               | 3         | 15.55   |
| Amgad Khamis             | 4         | 2.5        | 4                    | 2                    | 2               | 2.4                | 3.5                     | 12.4    | Yes               | 5         | 17.4    |

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| CANDIDATE DC07           | STAGE 1   |            |                      |                      |                 |                    |                         |         | Moving to stage 2 | STAGE 2   |         |
|--------------------------|-----------|------------|----------------------|----------------------|-----------------|--------------------|-------------------------|---------|-------------------|-----------|---------|
|                          | EDUCATION | EXPERIENCE | APP. PACKAGE         |                      |                 |                    | REQUIREMENTS (Specific) | TOTAL 1 |                   | INTERVIEW | TOTAL 2 |
|                          |           |            | Motivation (0-5) 20% | Assessment (0-5) 30% | Video (0-5) 50% | Total App. Package |                         |         |                   |           |         |
|                          | 0-5       | 0-3        | 0-5                  | 0-5                  | 0-5             | 0-5                | 0-5                     | 0-18    |                   | 0-7       | 0-25    |
| Amgad Khamis             | 4         | 1.5        | 4                    | 2                    | 2               | 2.4                | 3.5                     | 11.4    |                   |           | 11.4    |
| Dominique Savio Barahira | 2         | 1.5        | 1                    | 2.5                  | 2               | 1.95               | 0.5                     | 5.95    |                   |           | 5.95    |
| Ihtishamul Haq           | 4         | 1          | 2                    | 3.5                  | 3               | 2.95               | 2.5                     | 10.45   |                   |           | 10.45   |
| Leonardo Provana         | 4         | 2.5        | 5                    | 4                    | 4               | 4.2                | 4                       | 14.7    |                   | 5         | 19.7    |
| Muhammad Nouman Saleem   | 4         | 2          | 4                    | 4                    | 3               | 3.5                | 4                       | 13.5    | Yes               | 6         | 19.5    |
| Syed Safeer Mehdi Shamsi | 3.5       | 2.5        | 3                    | 4                    | 4               | 3.8                | 4                       | 13.8    | Yes               | 5.5       | 19.3    |
| Waqar Ahmed              | 4         | 2          | 3                    | 4                    | 3.5             | 3.55               | 3                       | 12.55   | Yes               | 2.5       | 15.05   |
| Leonard Muke             | 4         | 2          | 4.5                  | 3                    | 4               | 3.8                | 4.5                     | 14.3    | Yes               | 5.5       | 19.8    |
| Marco Alborghetti        | 4.5       | 1.5        | 4                    | 3.5                  | 2.5             | 3.1                | 4.5                     | 13.6    | Yes               | 6.5       | 20.1    |

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| CANDIDATE DC17           | STAGE 1   |            |                      |                      |                 |                    |                         |         | Moving to stage 2 | STAGE 2   |         |
|--------------------------|-----------|------------|----------------------|----------------------|-----------------|--------------------|-------------------------|---------|-------------------|-----------|---------|
|                          | EDUCATION | EXPERIENCE | APP. PACKAGE         |                      |                 |                    | REQUIREMENTS (Specific) | TOTAL 1 |                   | INTERVIEW | TOTAL 2 |
|                          |           |            | Motivation (0-5) 20% | Assessment (0-5) 30% | Video (0-5) 50% | Total App. Package |                         |         |                   |           |         |
|                          | 0-5       | 0-3        | 0-5                  | 0-5                  | 0-5             | 0-5                | 0-5                     | 0-18    |                   | 0-7       | 0-25    |
| Amgad Khamis             | 4         | 2          | 4                    | 2                    | 2               | 2.4                | 2.5                     | 10.9    |                   | 4.5       | 15.4    |
| Ammar Ahmed              | 2.5       | 2          | 3.5                  | 2.5                  | 3               | 2.95               | 3.5                     | 10.95   |                   |           | 10.95   |
| Dominique Savio Barahira | 2         | 1.5        | 1                    | 2.5                  | 2               | 1.95               | 0.5                     | 5.95    |                   |           | 5.95    |
| Ifthikar Ali             | 2.5       | 1          | 2.5                  | 2                    | 3               | 2.6                | 1.5                     | 7.6     |                   |           | 7.6     |
| Leonardo Provana         | 4.5       | 3          | 5                    | 4                    | 4               | 4.2                | 4                       | 15.7    | Yes               | 6.5       | 22.2    |
| Marco Alborghetti        | 4.5       | 1.5        | 4                    | 3.5                  | 2.5             | 3.1                | 4.5                     | 13.6    | Yes               | 6.5       | 20.1    |
| Mayra Akhtar             | 3.5       | 2          | 5                    | 5                    | 2.5             | 3.75               | 4                       | 13.25   | Yes               | 4         | 17.25   |
| Muhammad Nouman Saleem   | 4         | 2.5        | 4                    | 4                    | 3               | 3.5                | 4                       | 14      | Yes               | 5.5       | 19.5    |
| Syed Safeer Mehdi Shamsi | 3.5       | 2.5        | 3                    | 4                    | 4               | 3.8                | 4                       | 13.8    | Yes               | 6         | 19.8    |
| Sukhrob Shakirov         | 4         | 2          | 5                    | 2                    | 3               | 3.1                | 4.5                     | 13.6    | Yes               | 4         | 17.6    |
| Leonard Muke             | 4         | 3          | 5                    | 3                    | 4               | 3.9                | 4.5                     | 15.4    | Yes               | 5.5       | 20.9    |

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Based on the evaluations shown in the table, the following candidates have been selected:

- **Giovanny López Muñoz**

to be hired as *“Integration of power systems based on directly-fired oxycombustion s CO<sub>2</sub> power cycles”* (DC1)

- **Amgad Khamis**

to be hired as *“Market uptake of supercritical CO<sub>2</sub> power systems to enable carbon-neutrality by 2050”* (DC2)

- **Leonard Muke**

to be hired as *“Dynamic operation of s CO<sub>2</sub> power generation systems under variable load and variable energy input”* (DC07)

- **Leonardo Provana**

to be hired as *“Innovative turbine designs for enhanced flexibility of megawatt scale axial sCO<sub>2</sub> turbines”* (DC17)

Seville, July 20<sup>th</sup>, 2023,

Prof. David Sánchez Martínez

Principal Investigator of DC01; *“Integration of power systems based on directly-fired oxycombustion sCO<sub>2</sub> power cycles”*, DC02; *“Market uptake of supercritical CO<sub>2</sub> power systems to enable carbon-neutrality by 2050”*, DC07; *“Dynamic operation of sCO<sub>2</sub> power generation systems under variable load and variable energy input”* and DC17; *“Innovative turbine designs for enhanced flexibility of megawatt scale axial sCO<sub>2</sub> turbines”*.

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