Research Impact & Innovation Portfolio (RIIP)

Candidate: Fernando Manuel Gómez Castro

Expertise: Solar Energy R&D | Modeling & Simulation

1. Executive Scientific Summary

Fernando Manuel Gómez Castro is a distinguished Research and Development Engineer with over a decade of specialized experience in solar energy technologies. His work bridges the gap between theoretical physics and practical engineering, specifically in the optimization of solar air-conditioning and renewable energy systems.

Visionary Impact

Throughout his career, Fernando has focused on the "Energy-Water-Climate" nexus. His research into liquid desiccant systems addresses the global challenge of sustainable cooling in tropical and Mediterranean climates, providing a pathway to reduce the carbon footprint of HVAC systems worldwide.

2. Timeline of Key Research Initiatives

- **2024 – 2025: Water Infrastructure Optimization (Esslingen)**
  Developed advanced models for cistern systems and rainwater-based cooling, focusing on feasibility and efficiency metrics.
- **2016 – 2025: Doctoral Research (Kassel)**
  Led a comprehensive investigation into direct solar regenerators, managing a €360,000 budget and delivering a validated dissertation.

- **2011 – 2018: Advanced Solar Thermal Systems (Stuttgart)**
  Iterated on indirect and direct regenerator designs, significantly improving calculation models in COMSOL and EES.
- **2008 – 2011: PV Concentrator Dynamics (Mexico)**
  Explored non-uniform illumination patterns and thermal behavior of PV modules in tropical environments.

3. Publication & Citation Record

With 18+ scientific publications, Fernando's work is recognized in top-tier journals such as *Renewable and Sustainable Energy Reviews*. Below is a selection of high-impact outputs:

Publication Title	Venue/Journal	Core Contribution
Review of indirect and direct solar thermal regeneration	Renewable & Sustainable Energy Reviews	Comprehensive state-of-the-art analysis for liquid desiccant systems.
A new method for determining Nusselt & Sherwood numbers	EuroSun 2022	Introduced a mathematical framework for simultaneous heat/mass transfer.
Thermal computational model to analysis PV modules	ASME Int. Conf. on Energy Sustainability	Developed a predictive model for PV performance under extreme conditions.

4. Case Study: Advancing Heat & Mass Transfer

In his recent work, Fernando addressed the complexity of simultaneous heat and mass transfer in solar collector/regenerators. By developing a new methodology to determine dimensionless numbers (Nusselt and Sherwood), he provided the industry with a more accurate tool for sizing systems, reducing material waste and improving operational reliability.

5. Intellectual Property & Technical Assets

- **Proprietary Simulation Scripts:** A library of Wolfram Mathematica notebooks for liquid desiccant chemistry and thermodynamics.
- **Experimental Architecture:** Design blueprints for solar regenerator test beds currently utilized in academic research environments.
- **Optimization Algorithms:** Custom-coded ray tracing tools for urban BIPV (Building Integrated Photovoltaics) performance assessment.

6. Global Collaborative Network

Fernando has successfully navigated international research landscapes, collaborating with institutions in Germany (Kassel, Stuttgart, Esslingen) and Mexico (Yucatan). This cross-cultural technical leadership ensures that his solutions are globally applicable and resilient.