

# Diego Villarreal Singer

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## SUMMARY OF QUALIFICATIONS

- Domain expertise in renewable energy, energy system modeling, techno-economic analysis, life-cycle analysis and emissions modeling.
- Sophisticated understanding of mathematical optimization, data analysis, electricity markets (US and Denmark) and energy storage.
- Climate & Energy policy.
- 4 years of industry experience in the financial risk analysis and technology sectors.
- 2 years of project management experience including deployments of technology at a major U.S. hedge fund and a major consulting firm.

## EDUCATION

Columbia University, New York, NY

2012-Expected 6/2016

**Ph.D. Earth and Environmental Engineering. Advisor: Dr. Klaus S. Lackner**

**Expertise:** Energy systems; distributed infrastructure; sustainable fuels; emissions modeling.

**Research Focus:** Distributed infrastructure for carbon neutral fuel synthesis and electricity production; Developing computational models (written in Python) for determining optimal operating strategy for electrolysis/fuel cell technology used for electricity arbitrage applications in the Danish electricity markets; Direct Air Capture of CO<sub>2</sub> as a climate mitigation strategy.

Columbia University, New York, NY

8/2010-8/2011

**M.A. in Climate and Society.**

Purdue University, West Lafayette, IN.

8/2001-5/2006

**B.S. Chemical Engineering.**

**B.S. Chemistry.**

## PROFESSIONAL EXPERIENCE

9/2011-7/2012

Columbia Climate Center, Earth Institute Columbia University, New York, NY

- Planned, developed and maintained an energy and emissions model used by Deutsche Bank Climate Change Advisors (DBCCA) to analyze and quantify the impact of energy and CO<sub>2</sub> reduction policies and strategies.
- Tasks included mapping out and developing model framework, enhancements, conducting sensitivity analysis, running scenarios, and analyzing results for publication.
- In charge of managing team of 1 analyst and 3 grad students working on the project.
- Model Results have been published by DBCCA as part of their investor reports.
- Model framework was generalized and published in the peer-reviewed literature.

Lytix LLC, Mexico City, Mexico

6/2008-5/2010

**Senior Engineer**

- Collaborated in the development of a Systemic Risk Monitoring Tool designed to help regulators and private investors analyze and visualize risks and vulnerabilities in complex financial networks. Tool drew from concepts of graph theory, law, economics and semantic computing.
- Managed team of 4 developers.
- Led deployment of Lytix's analytical platform at a major U.S. hedge fund with the purpose of identifying key investment targets.
- Spearheaded a project with a major consulting firm where our system was used to identify key players within a network of companies, people and governments. Analysis was used for strategic decision making.

Lytix LLC, Mexico City, Mexico

9/2006-5/2008

**Analyst**

- Product design: Collaborated in the design of a framework used to structure qualitative and quantitative information for graphical analysis and visual representation.

- Researched and prototyped analytical modules based on graph theory metrics to analyze indirect interconnections within a complex network of relationships.

## **RESEARCH EXPERIENCE**

**Lenfest Center for Sustainable Energy, Columbia University, NY, NY**

**8/2012-present**

**Graduate Researcher**

- Research in the area of energy systems and carbon neutral fuels.
- Development of computational models for power-to-methanol systems for seasonal energy storage.
- Developing dynamic optimizations of electrolysis/fuel cell systems that adapt to hourly changes in electricity prices.

**Technical University of Denmark, Riso, Denmark**

**8/2014-10/2014**

**Research Assistant**

- Techno-economic analysis of high temperature electrolysis/fuel cell systems used for electricity storage applications.
- Modeling of optimum strategies for carbon neutral fuel production and electricity arbitrage in the Danish electricity market.

## **PUBLICATIONS:**

### **Peer-Reviewed:**

- **Villarreal-Singer, D.**, de Obeso, J.C., Rubenstein, Carr, M-E (2013). A New Tool to Quantify Carbon Dioxide Emissions from Energy Use and the Impact of Energy Policies. *Journal of Greenhouse Measurement and Management*. . 3(3-4), 128-148.
- **Villarreal-Singer, D.**, Graves C., Lackner, K.L (In progress). Optimum operating strategy of Reversible Solid Oxide Cells: a temporal economic optimization.

### **Other Publications:**

- **Villarreal Singer, Diego**, (2015) “Emisiones negativas: la pieza clave para la meta de los 2 grados Celsius”, *Foreign Affairs Latinoamérica*, Vol. 15: Núm. 4, pp. 23-30. Disponible en: [www.fal.itam.mx](http://www.fal.itam.mx)
- Fulton, M., Carr, M-E, **Villarreal, D.**, Cotter, L., Rubenstein, M. (2012). Global Climate Change Policy Tracker: Efficiency Mandates Drive Emissions Abatement. Deutsche Bank Climate Change Advisors Report. Deutsche Bank Group. 12pp. [http://www.dbcca.com/dbcca/EN/\\_media/Policy\\_Tracker-Impact\\_of\\_Mandates.pdf](http://www.dbcca.com/dbcca/EN/_media/Policy_Tracker-Impact_of_Mandates.pdf)
- Fulton, M., Carr, M-E, **Villarreal, D.**, Cotter, L., Sharples, C., Carbon, M., Rubenstein, M. (2012). Global Climate Change Policy Tracker: Continued Progress on Mandates but Emission Challenge Remains. Deutsche Bank Climate Change Advisors Report. Deutsche Bank Group. 51pp. [http://www.dbcca.com/dbcca/EN/\\_media/Global\\_Policy\\_Tracker\\_20120424.pdf](http://www.dbcca.com/dbcca/EN/_media/Global_Policy_Tracker_20120424.pdf)
- “Sea level rise in a changing climate” (M-E Carr, M. Rubenstein M., A. Graff, **D Villarreal**) in Gerrard M.B., Wannier G.E (ed), *Threatened Island Nations: Legal Implications of Rising Seas and a Changing Climate*, Cambridge: Cambridge University Press, 2013.

## **SKILLS**

- **Technical:** Energy modeling; mathematical optimization; data analysis; policy analysis; emissions modeling; life-cycle analysis.
- **Languages:** Spanish (Native Language), English (Fluent), French (Competent).
- **Computer Languages & applications:** Python, R, MATLAB, LaTeX, ASPEN Plus, MS Office Suite
- **Operating Systems:** Mac OSX, UNIX, Linux Ubuntu, Windows.
- **Teaching:** Assisted and co-taught undergraduate and graduate level courses in alternative energy systems, carbon sequestration, environmental analysis, climatology and hydrology.

## **AWARDS**

- Consejo Nacional de Ciencia y Tecnología (CONACYT) Fellowship. **2012-2016**
- Columbia University, Graduate Fellowship. **2012-2016**
- Columbia University, GSAS Scholarship. **2010**
- Society of Hispanic Professional Engineers Professional Scholarship. **2006**
- Summer Undergraduate Research Fellowship. **2005**