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UNIVERSIDAD ADOLFO IBÁÑEZ  
FACULTAD DE INGENIERÍA Y CIENCIAS

# **Identifying Risks in Auction Design: Investors' and Policy Makers Perspectives in Chile**

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# Presentation Outline

- Introduction & A little bit of history
- Early auctions, the transition & new auctions
- Research objectives & Methodology
- Initial results
- Discussion

# Introduction

- Electricity auction is a widely used mechanism worldwide to allocate electricity demand based on competitive bids
- The auction mechanism has been used to steer the energy matrix development toward efficiency and public policy objectives



# A little bit of history

- Chile pioneered the deregulation of the electricity sector in 1982, establishing a market in generation and monopolies in transmission & distribution.
  - A spot price market was set up for the transactions among generators
  - Discos purchased energy at “bus price”, calculated by the government every six months.
  - The bus price was supposed to reflect an average of the spot price in time.

## A little bit of history

- In 2005, the government established auctions as the mechanism to assign the long term supply of energy and capacity to distribution companies.



# Early Auctions

- Between 2006 & 2015 the results of the auction processed were not promising

Process	Average Price (\$/MWh)	Price Ceiling (\$/MWh)	Auctioned Energy (GWh)	Awarded Energy (GWh)	Awarded Percentage
2006/01	52,91	62,69	13568	12076	89%
2006/01-2	54,55	62,69	1130	1130	100%
2006/02	59,77	61,68	14615	5700	39%
2006/02-2	65,8	71,06	9000	1800	20%
2008/01	104,31	125,16	8788	7821	89%
2008/01-2	99,49	125,16	935	935	100%
2010/01	90,3	92,04	2696	2200	82%
2012/01	129,45	129,5	924	924	100%
2012/01-2	138,9	140	1650	248	15%
2013/01	128,93	129	5000	3900	78%
Total			58306	36733	63%



# Early Auctions

- Between 2006 & 2015 the results of the auction processed were not promising
  - 94% of the energy was awarded to the 3 main incumbent companies (Endesa, Colbún & AES Gener) and a 5% to Campanario, that never operated.
  - As of 2013, Chile has one of the highest energy prices in Latin America and the second highest among mining countries worldwide
  - Although renewable generators were not explicitly excluded, the regime of supply forced them out in practical terms (24-hour supply).



# Early Auctions

- Between 2006 & 2015 the results of the auction processed were not promising
  - In the 2013 auction, only two generator participated. Two more announced in a local newspaper they were not going to participate in the auction.

TEMAS DEL DÍA LUCHSINGER MACKAY REGIÓN DE ÑUBLE GUGA ORTIZ LISTAS DE ESPERA

Jueves 21 noviembre de 2013 | Publicado a las 18:41 · Actualizado a las 18:51

**Sólo dos empresas se presentan en licitación para generar electricidad para hogares chilenos**



Archivo | Javier Valdés | Agencia UNO





# The Transition

- As a results, the government undertook a reform of the auction system looking to:
  - Add new generation companies
  - Increase competition
  - Lower energy prices
  - Diversity the energy matrix



# The Transition

- Law 20805 in 2015 established key changes in the auction design:
  - Have the government lead the auction process (from the distribution companies)
  - Increase awards to 20-year contracts to accommodate financing
  - Increase time to complete projects to up to 5 year in advance
  - Add the possibility to postpone the project providing reasonable causes
  - Make auction ceiling price more flexible and secret
  - Add blocks for renewable technologies (e.g. from 8 AM to 6 PM).



# New Auctions

- In the 2016 auction, the energy offered was 7 times the awards; 22 winning bids out of 84; 2/3 of the awards went to wind and solar technologies; from incumbents only Endesa is awarded; other incumbents get nothing.

Companies	Country	Awards (GWh)
Mainstream	Ireland	3366
Endesa	Italy/Spain	5918
WPD	Germany	786.8
Ibereólica	Spain	1034.8
Acciona	Spain	506
Opde	Spain	176
Cox Energy	Spain	264
Solarpack	Spain	280
Besalco	Chile	10.4
Aela Energía	Chile	88
Total		12430

# New Auctions

- The 2016 prices are quite competitive in general and for RES in particular. Solar marked a World record at \$29.1/MWh. The average price of the awarded bids is \$47.5/MWh.

Prices of winning bids			
Blocks	Average	Max	Min
1	40.418	43.116	38.077
2-A	50.545	64.000	43.116
2-B	41.892	47.472	29.100
2-C	52.637	73.000	43.116
3	50.792	55.440	44.053
Total	47.552	73.000	29.100

# Research Objectives

- Identify the factors that caused the change from a deficient auction system to a highly successful one

Are those factors endogenous or exogenous?

- to identify, among all the factors, which are the most relevant in the decision from projects to participate in the auctions
- to examine whether the changes favor the development of renewable or conventional energy projects



# Methodology

- The proposed methodology is a Multi-Criteria Decision-Making (MCDM) tool – AHP (Analytic Hierarchy Process) that evaluates which factors have the highest influence for auction participants and if those factors are endogenous and exogenous.
- AHP technique allows the decision makers to incorporate both quantitative and qualitative judgments into a decision problem, obtaining a ranking for the influence of the factors.



# Methodology

## Assessment of Chilean Auction Scheme for Energy Projects

### Endogenous Factors

- Lenght of contracts
- Time to build the project
- Warranties
- State run auction system
- Contract postponement due to justified causes
- Transferability
- Time blocks for bidding
- Secret ceiling price

### Exogenous factors

- Highest credit ranking of the country
- Attractive Destination for FDI
- Large renewable potential and High capacity factors (eg. solar, wind)
- Renewable Portfolio Standard (20/25)
- Availability of land
- Electricity prices
- Fossil fuel prices



# Methodology

- The key steps involved in this methodology:
  - Structure the decision problem in a hierarchy of levels with goal at the top level followed by criteria.
  - Prepare a questionnaire using pair-wise comparison between each element and assign a numerical value.
  - For each comparison matrix calculate metrics: maximum eigenvalue, consistency index (CI), consistency ratio (CR), and normalized eigenvector to obtain priority weights for each criteria.
  - Integrate the judgments over various levels of hierarchy to produce an overall priority ranking for alternatives.





# Initial Results

Criteria	Local Weights	Global weights	Rank	RES energy	Conventional Energy
<b><u>Endogenous factors</u></b>					
Length of contracts	0.331	0.264	1	0.132	0.132
Time to build the project	0.206	0.165	2	0.041	0.123
Warranties	0.017	0.014	13	0.011	0.002
State run auction system	0.041	0.033	8	0.028	0.006
Flexibility in contract postponement	0.102	0.082	4	0.041	0.050
Transferability	0.088	0.071	5	0.052	0.018
Time blocks for bidding	0.189	0.151	3	0.136	0.015
Secret ceiling price	0.025	0.020	11	0.010	0.010
<b><u>Exogenous factors</u></b>					
High credit ranking of the country	0.027	0.005	15	0.005	0.001
Attractive destination for FDI	0.042	0.008	14	0.007	0.001
Large Renewable potential/ capacity factors	0.250	0.050	7	0.045	0.005
Renewable Portfolio Standard (20/25)	0.088	0.018	12	0.016	0.002
Availability of land	0.145	0.029	9	0.026	0.003
Electricity prices	0.333	0.067	6	0.033	0.033
Fossil fuel prices	0.115	0.023	10	0.003	0.200
<b>Rank</b>				<b>0.586</b>	<b>0.413</b>

# Discussion

- Initial results shows that changes in design features of the auction scheme contributed in attracting investment, causing at the same time, an increase in competition.
- The results show that the most relevant factors are endogenous factors, including the length of contracts, length of time to build the projects & the hourly blocks.
- In addition, results show that changes favored the entrance of renewables more than conventional projects



# Discussion

- The very low prices have raised doubts about economic feasibility of awarded projects
- Guarantees pledged are rather insufficient to guarantee the realization of projects
- Other issues may come into play to archive energy matrix objectives:
  - Aging transmission infrastructure and congestion issues
  - Increasing conflict levels with local communities



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¿Questions or Comments?

