



Why wait? Modeling the timing of EV charging station investments and the role of policy

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Challenge and objectives

EV targets require new charging infrastructure

But DC Fast Charging station investments are not economically attractive (uncertain demand)

How can policy improve investment economics?

Research tasks

How does future uncertainty impact investment timing?

How is investment timing impacted by:

- Subsidy design
- Business models (e.g. revenue sources, cost structures, co-located Li-ion and/or PV)

Approach

Investment in charging station as a **Real Option**

Table 1: Illustrative charging economics

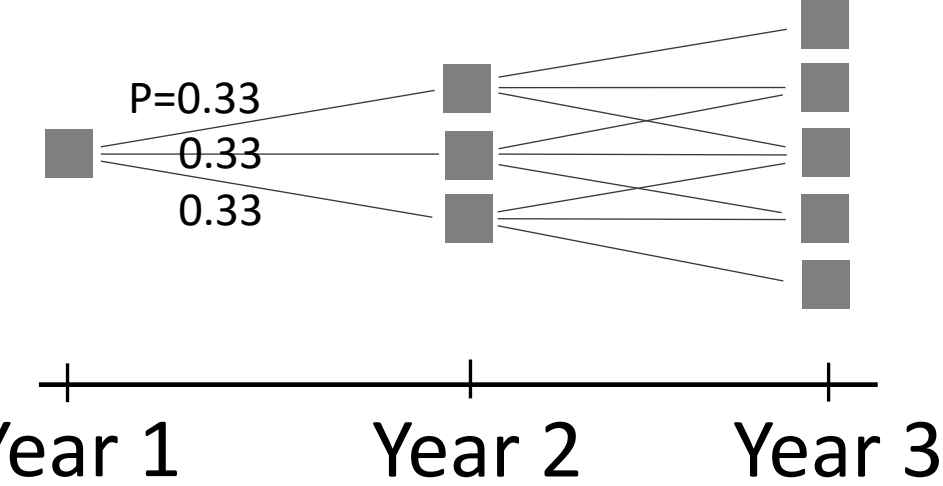
Charging station design	
Charging points (350 kW)	6
Total capacity (MW)	2.1
Costs	
Investment	\$1,728,000
O&M, annual	\$406,440
Price of electricity (\$/kWh)	\$0.12
Financing	
Default discount rate	7%
Lifetime	10
Revenues	
Price to charge (\$/kWh)	\$0.70
Utilization % in year 1	3%
Maximum utilization	20%

Assumes investment:

1. Can be delayed
2. Uncertain
3. Irreversible

Figure 1: Modeling approach

Utilization scenarios



Solution algorithm

Dynamic Programming

← Monte Carlo →

Significant results

A rational investor would delay investing until

- Utilization is high enough and
- Expected profits exceed value of waiting

Average length of investment delay is 9 years according to this preliminary analysis

Common policy approaches such as grants and low-interest loans have a limited impact

It may be important for policy design to emphasize investment de-risking (next step)

Illustration

Figure 2: Grant impact

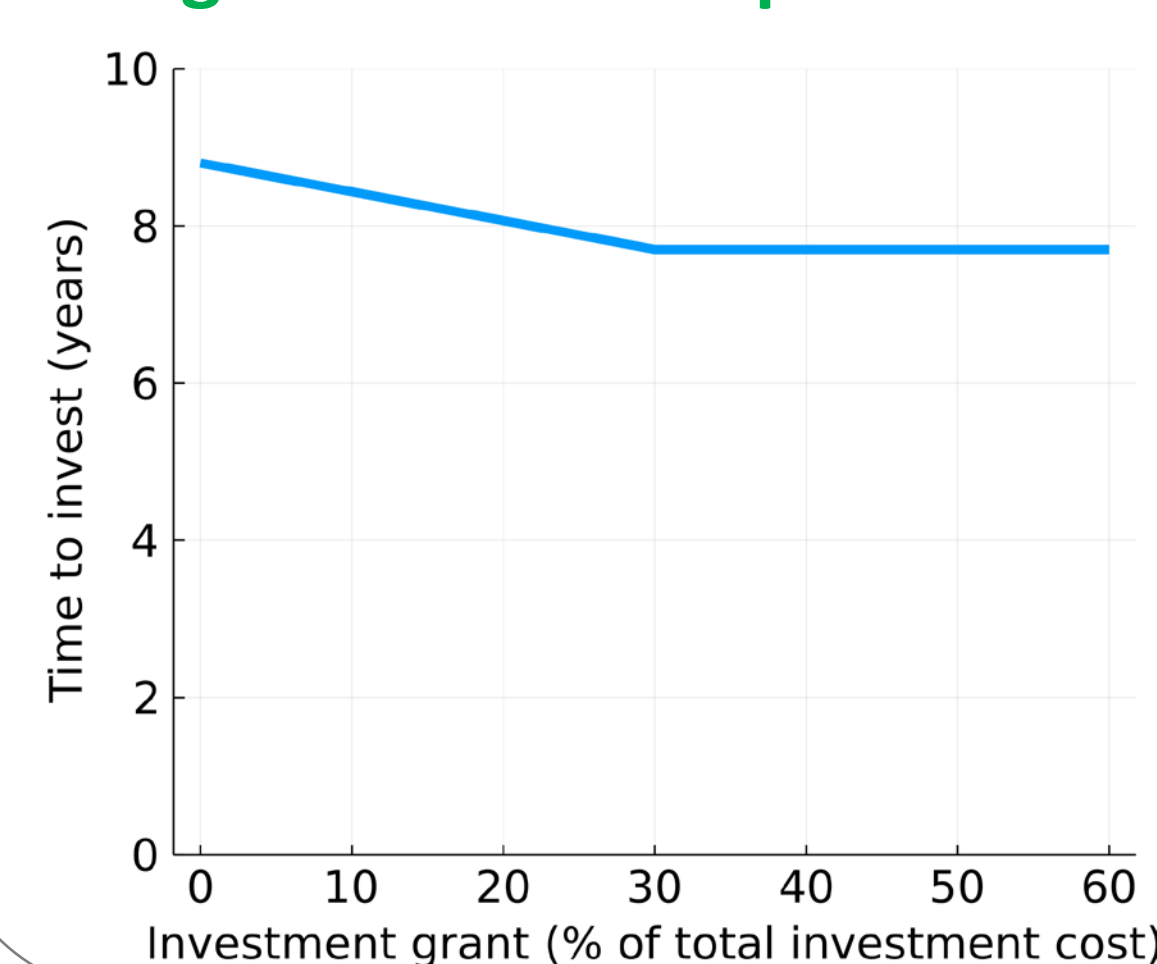


Figure 3: Interest rate impact

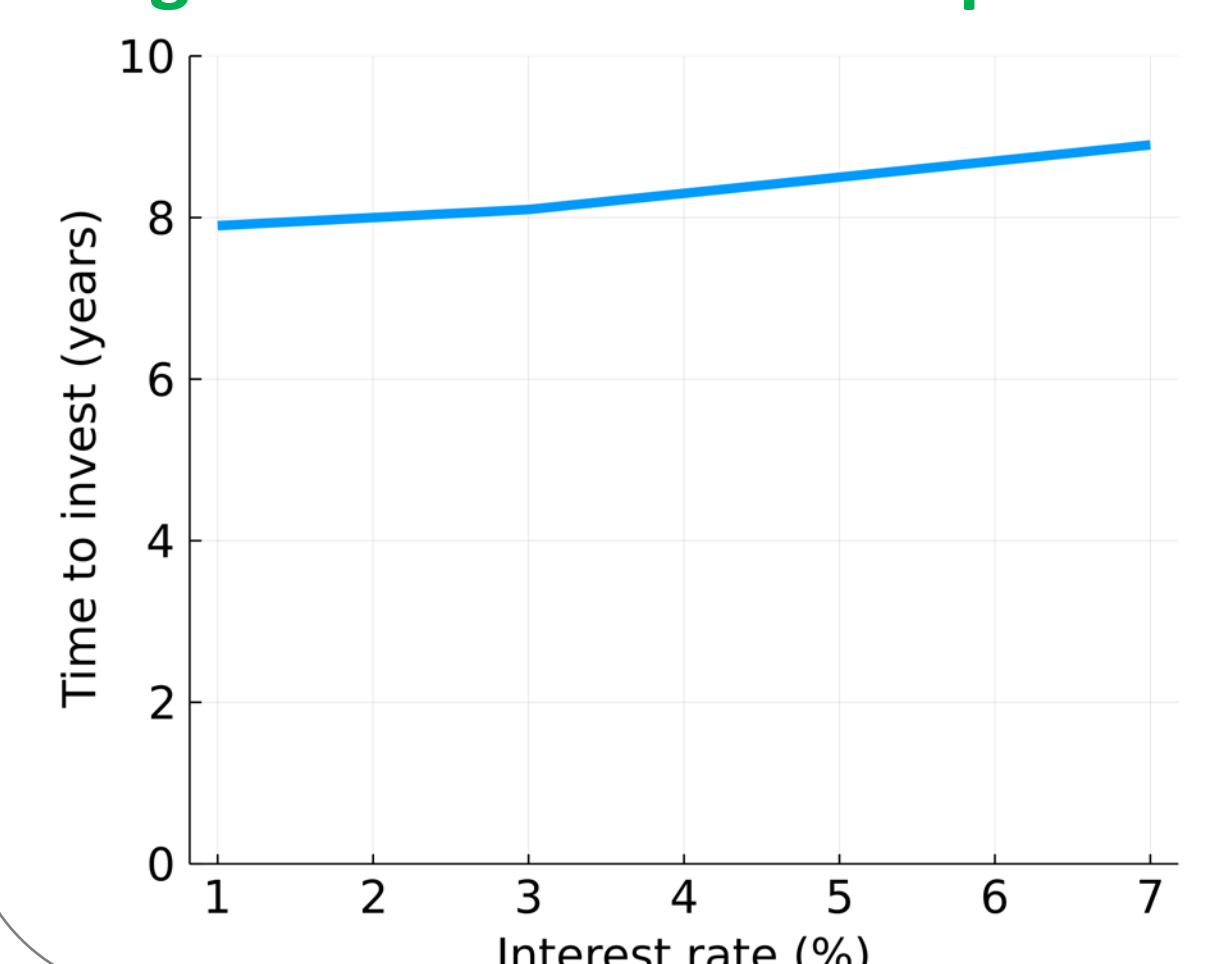


Figure 4: Real option value

