INSTITUT VEDECOM
DU VÉHICULE DÉCARBONÉ ET COMMUNICANT ET DE SA MOBILITÉ

EV-PV-BESS tariff design. What are the economic principles?

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AGENDA

1. VEDECOM
   - 1.1 - VEDECOM in brief
   - 1.2 - VEDECOM at a glance

2. Introduction
   - 2.1 - Context
   - 2.2 – Existing tariffs
   - 2.3 – Model description

3. Preliminary results
   - 3.1 – Example

4. Conclusion

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1 – VEDECOM

1.1 – VEDECOM in brief: Research domains and Partners

3 research **domains** covering
3 major societal stakes:

Vehicle electrification

- **Improve air quality**

Driving delegation and connectivity

- **Provide sustainable, safe and fluid mobility**

Shared mobility and energy

- **Optimize mobility systems in the territories**

50 members & partners from different sectors **collaborate** on **pre-competitive** and **pre-normative research projects**

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1 – VEDECOM

1.2 – VEDECOM at a glance: Key figures at the end of 2017

Certified as **Institute for Energy Transition** in 2014 by AGENCE NATIONALE DE LA RECHERCHE ANR

VEDECOM, hub de recherche coopérative, créé en 2014
VEDECOM, a cooperative research hub, created in 2014

- Industriels / Industrials
- Académiques / Academics
- Territoires / Local authorities

50 members & partners

3 domaines de recherche - *3 fields of research*
1 centre de formation - *1 training center*

- Vehicle electrification
- Driving delegation and connectivity
- Shared mobility and energy

FORMATION
TRAINING

175 employees
- **110** R&D
- **45** PhD
- **20** Staff

€ 30 millions / year

> 100 publications
69 thesis
28 patents
18 software program deposits

7000 m² of workshops and offices dedicated to research

In 2017
14 training modules
120 hours
242 trained people

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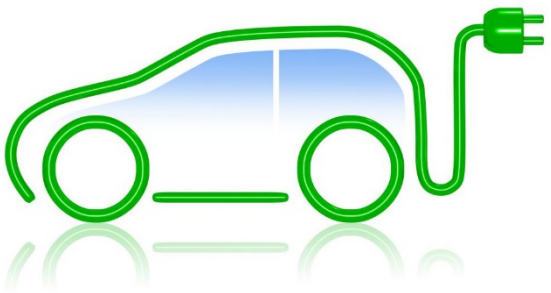
Automotive Industry

Increase of Electric Vehicles sales, supported by public policy, to decarbonize transport sector:

- Restrictions on CO2 emissions.
- Subsidy on EV sales.
- Development of the charging infrastructure.



Electricity Industry

Decarbonization of electricity sector:

- Rapid development of wind and solar energy (PV).
- Increasing flexibility needs to avoid duck curve.

Are EVs a threat in this context?

- Context of decrease of electricity consumption.
- But important contribution to peak consumption.
- Opportunity as new flexibility source with V2G.

What are the tariff roles?

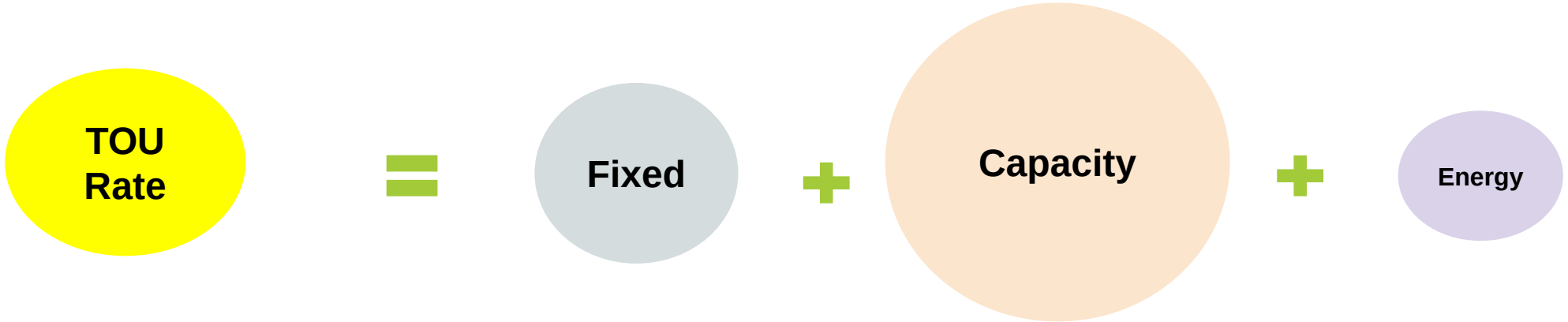
- Reflect user's total consumption (demand and energy).
- Recover utility costs.
- Avoid cost-shifting.

What are the existing tariff types?

2 – INTRODUCTION

2.2 – Electricity tariffs (From SCE)

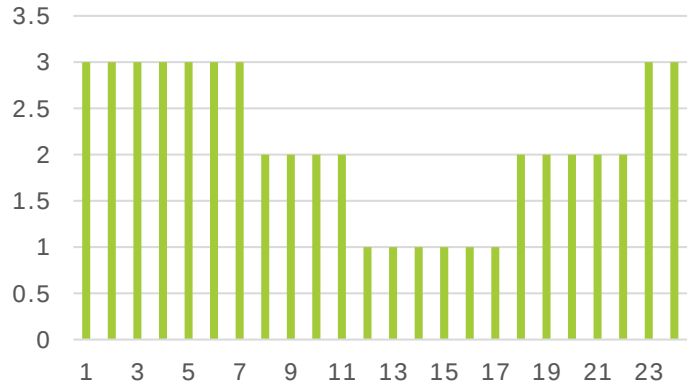
Capacity based (TOU-B and TOU-D)



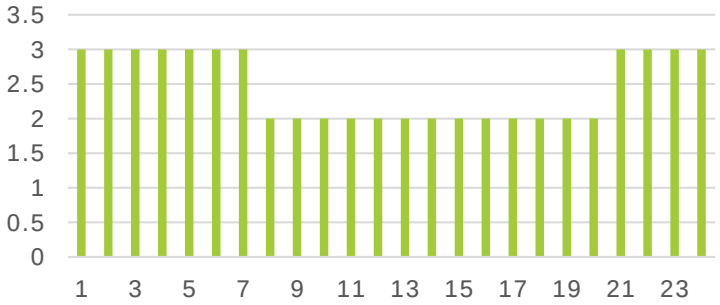
Energy based (TOU-R and TOU-E)

From (TOU-B and TOU-R)

Ancient Summer Time Schedule

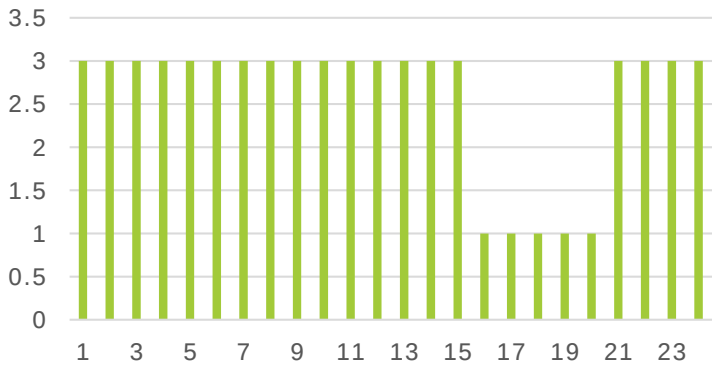


Ancient winter time schedule

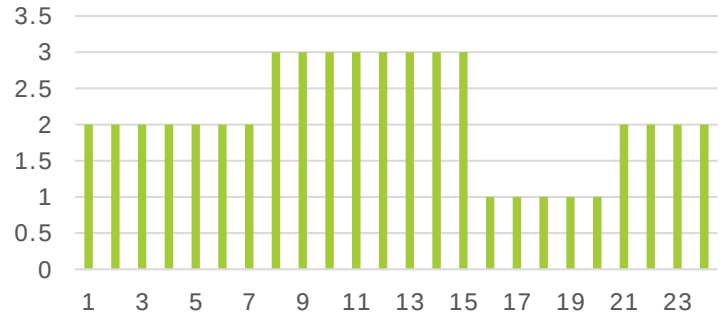


To (TOU-D and TOU-E)

New summer time schedule



New winter time schedule



2 – INTRODUCTION
2.3 Model description

DER-CAM

Avoided cost model (ACM)

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Bringing Science Solutions to the World

Coupling model

Energy+Environmental Economics

- Discharging strategies
- Demand reduction
- NPV
- Avoided cost
- Cost-shifting

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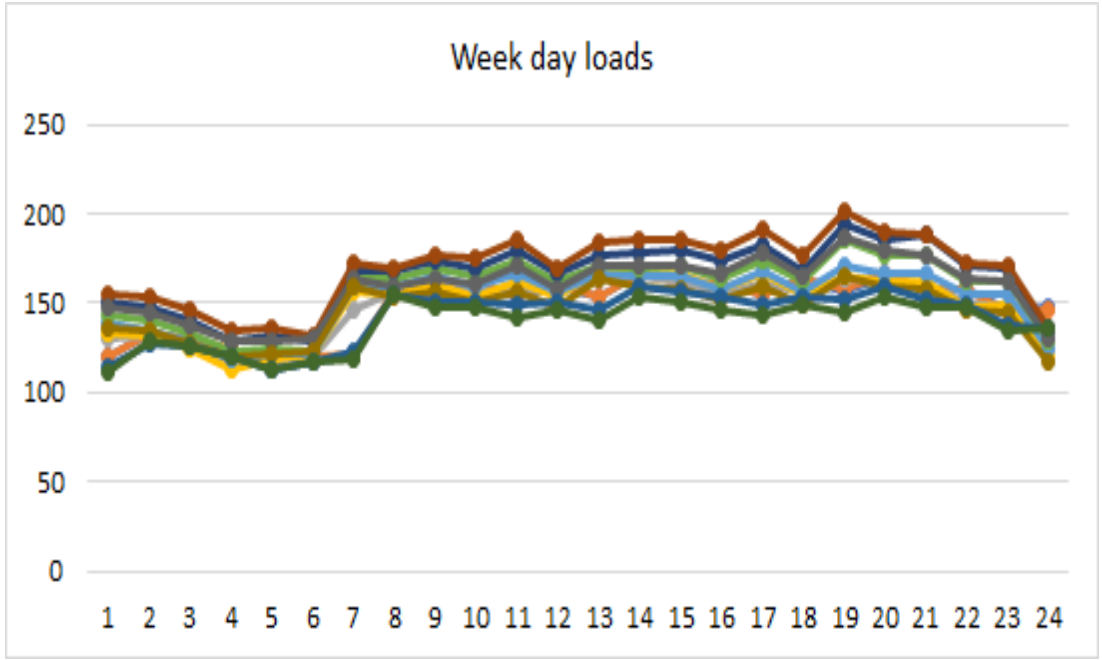
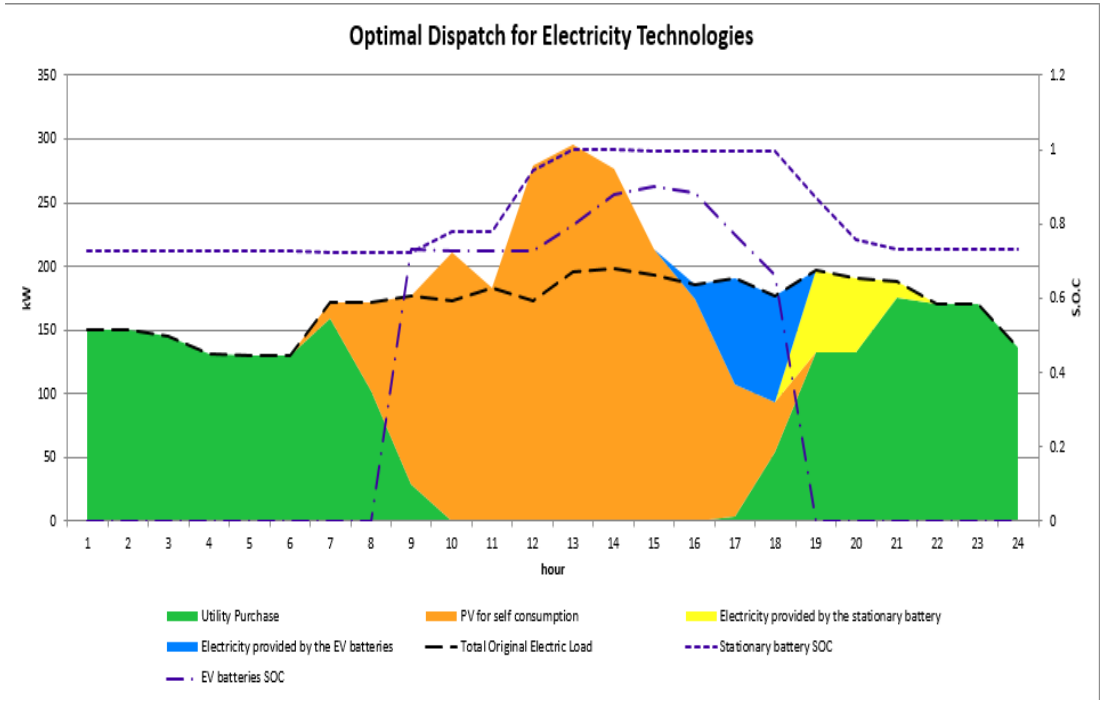
3 – PRELIMINARY RESULTS

3.1 – Example

First building load profile (under TOUE tariff):





EVs and stationary batteries working together to support the microgrid.

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5 – CONCLUSION

Preliminary results

Tariff sensitivity analysis:

- Capacity based dramatically reduce cost shifting.

	Avoided Costs ($)	Annual Savings ($)	Cost Shifting ($)
TOU-D	6 827	30 587	-23 760
TOU-E	21 061	66 892	-45 831
TOU-R	13 732	83 234	-69 502
TOU-B	7 673	39 121	-31 448

- For the GS-2 building (Maximum demand below 200 kW).

For the client (minimize the cost)	TOU-E (Energy based)
For the grid (reduce cost-shifting)	TOU-D (Capacity based)
Push EVs forward	TOU-E (Energy based)

Future research

Change the tariff power rate:

- Analyze buildings with power demand higher than 200 kW (SCE ToU GS-3)

Simulate for more building load units:

- Verify the result's robustness.
- Check the mean, standard deviations and percentiles.

Sensitivity analysis on different parameters:

- Check which are the most sensible parameters for future investors.

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Thank you for your attention

Together to accelerate the mobilities of tomorrow!