

School of Electrical, Electronics and Communication Engineering

Course Code : MPSE2505

Course Name: Smart Grid and Energy Mngement



UNIT III

PHEV

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Name of the Faculty: Dr. Shagufta Khan

Program Name: M.Tech

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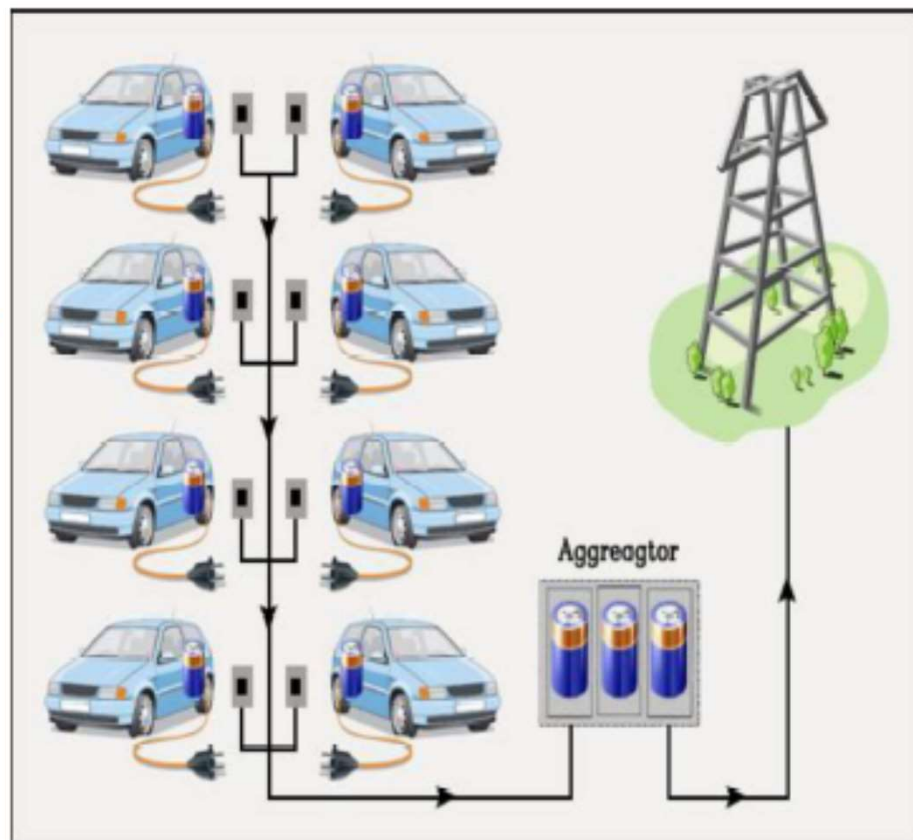
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Vehicle-to-grid (V2G)

- Vehicle and Smart Grid interaction
- Enables stored energy in EVs to sell back to the electrical grid
- Allows for Peak-load shifting

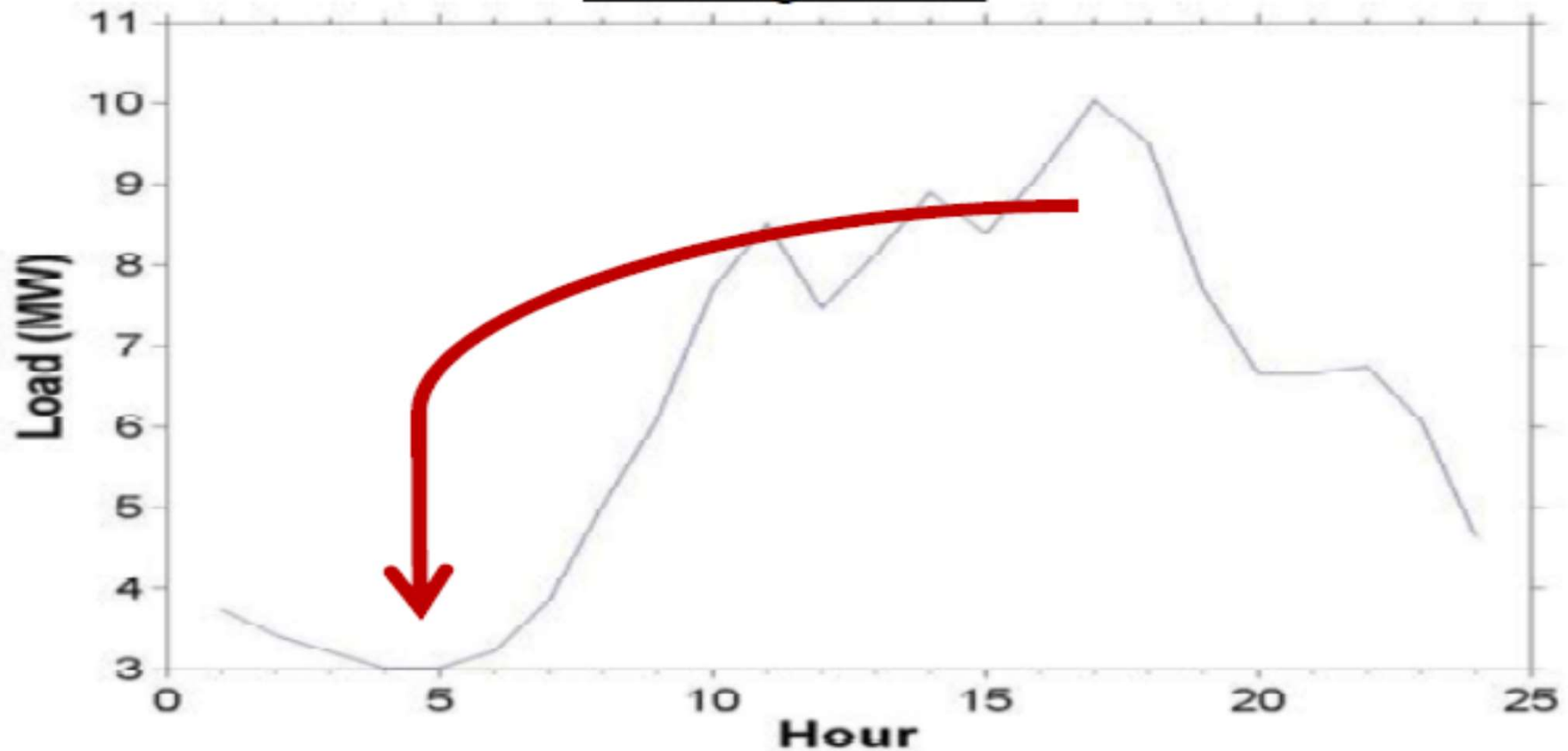


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Loading Curve



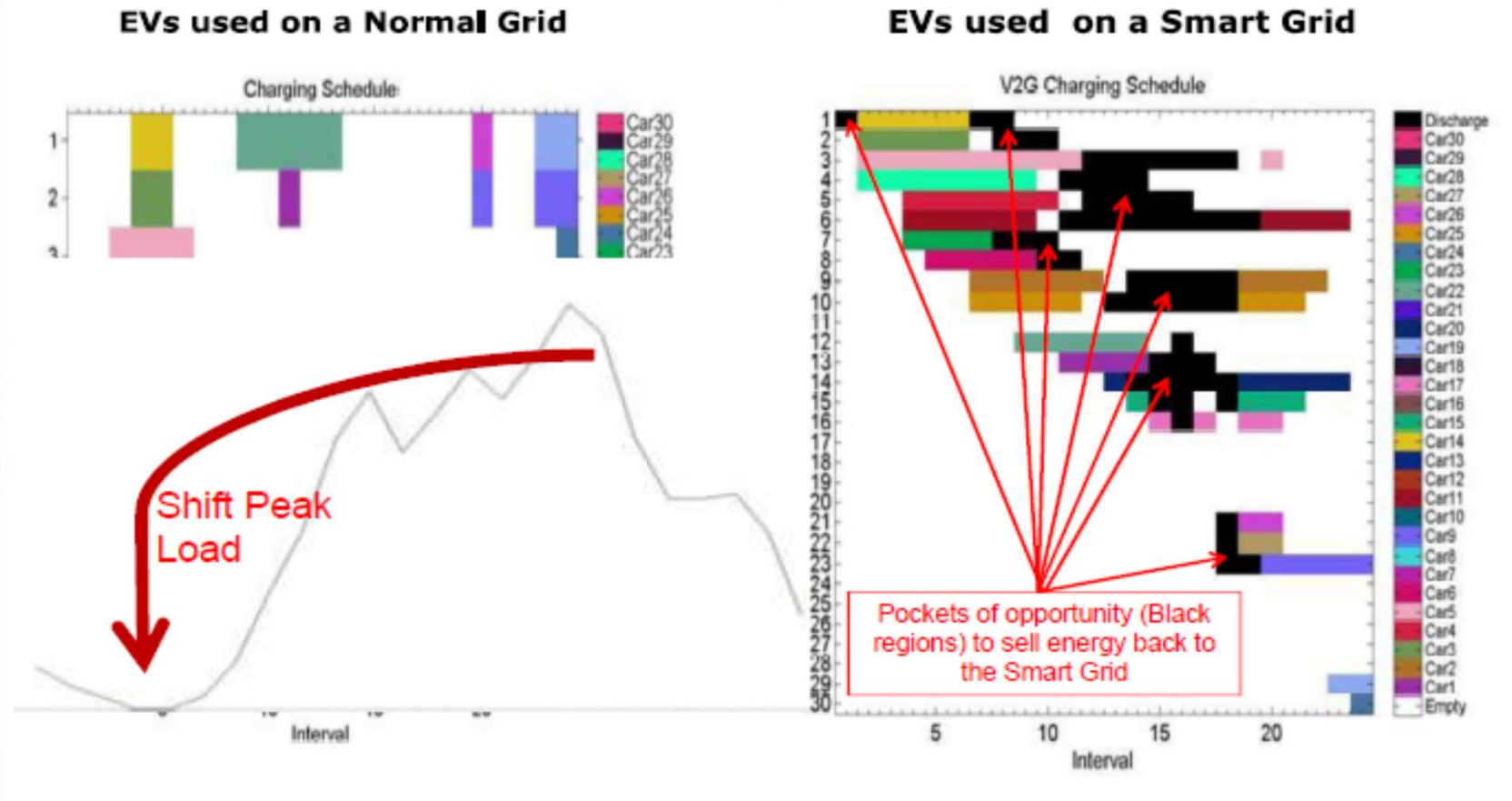
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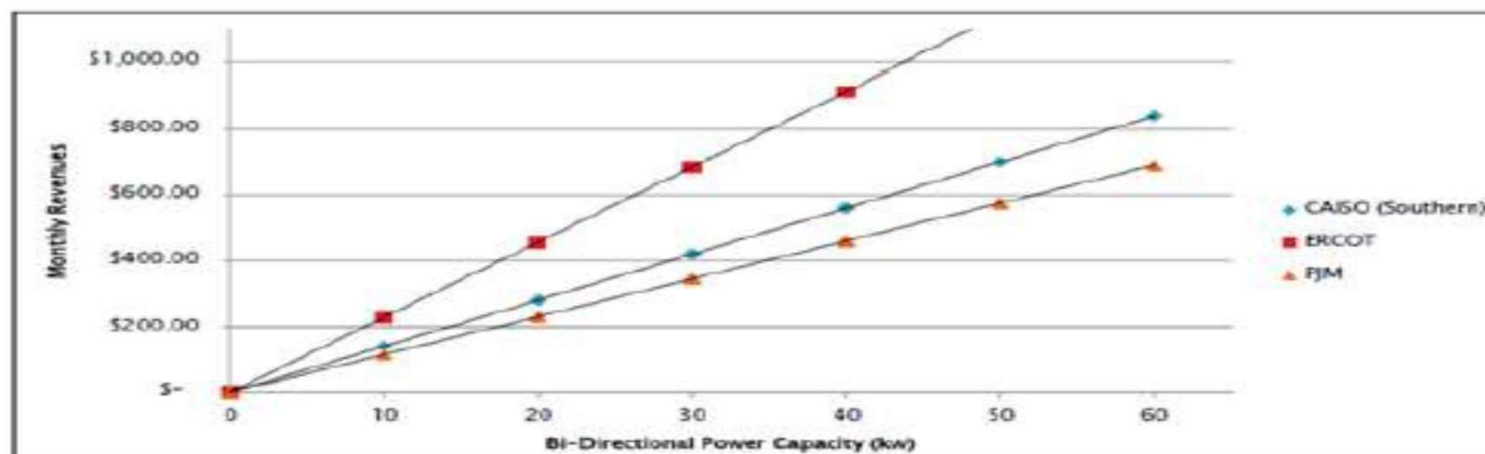
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2011 Monthly Bi-Directional Power Capacity Revenues



Assumptions:

- Lease Price: \$290/month
- 15KW bi-directional capability
- 12,000 miles driven per year
- Typical operation from 9am to 5pm (parked 90% of the time)
- 2011 remuneration values for California ISO, in Southern California

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Cost of EV can be reduced by time-based pricing.

- EVs can be charged during “off-peak” hours
- EVs can sell back energy during “peak” hours

ICE Sedan	V2G Sedan
GSA lease price: \$174/month Operating cost (\$.145/mile): \$145/month	Base lease price: \$290/month Operating cost (\$.06/mile): \$60/month V2G value: \$150/month
Net Cost: \$319/month	Net Cost: \$200/month
Net Savings for V2G: \$119/month	

Bottom line

- Bi-directional capacity alone can reduce the monthly lease price of a EV sedan by about 72%
- More savings expected with the increase in fuel prices

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- With the increase in EV numbers, the Smart Grid will be more efficient in managing peak loads (Peak Load Shifting & Time-based pricing)
- Smart Grid allows for better integration of the EVs into the market
- With improvements to the V2G technology in the Smart Grid, it is more economically feasible to own an EV

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