Presentation to PELS, Sept 2011

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Outline

- Overview of Better Place solution
- Smart charging capabilities
- Energy storage services
- Utility benefits
- Global update

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Better Place addressing EV needs

Customer Need	Solution
Ease of use	Better Place installs personal and public charge spots making it easy to charge up wherever you are
Extended range	Battery switch stations to provide fully charged batteries on long distance trips
Affordability	Better Place pays for and owns the battery, reducing upfront cost and technological risk; customers pay an affordable monthly fee
Positive ownership experience	Energy you need every morning, zero emissions driving satisfaction
Energy supply	Smart charging management aligns electricity supply and demand with electricity system constraints

Better Place solution elements

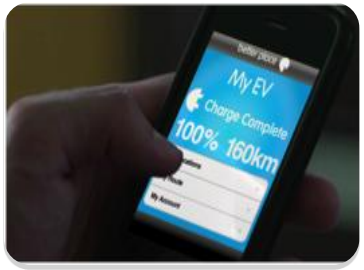
At home and out and about: Charge spots and Battery switch stations

Access to charging when and where you park

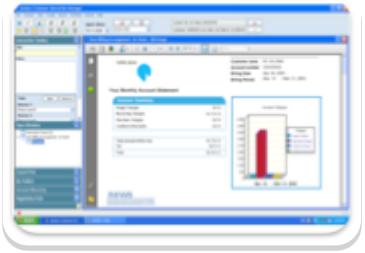
Ability to drive long distances by providing fully charged batteries on the road

In hand, in the car: Driver services

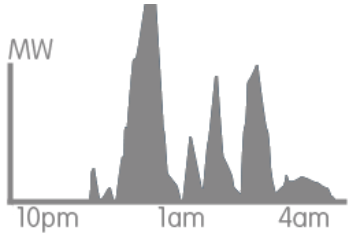
In-car and remote access to your EV's energy information, trip planning and other services



Behind the scenes: Managed EV services

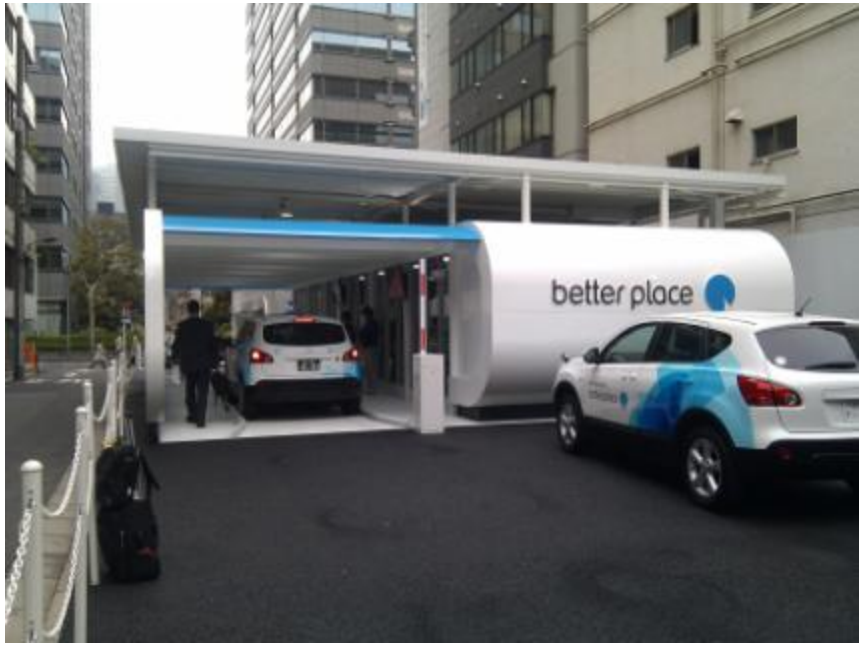


Working with utilities and customers to monitor and manage energy supply and demand



Drivers' view of the Better Place network

Charge spots



Battery Switch Stations

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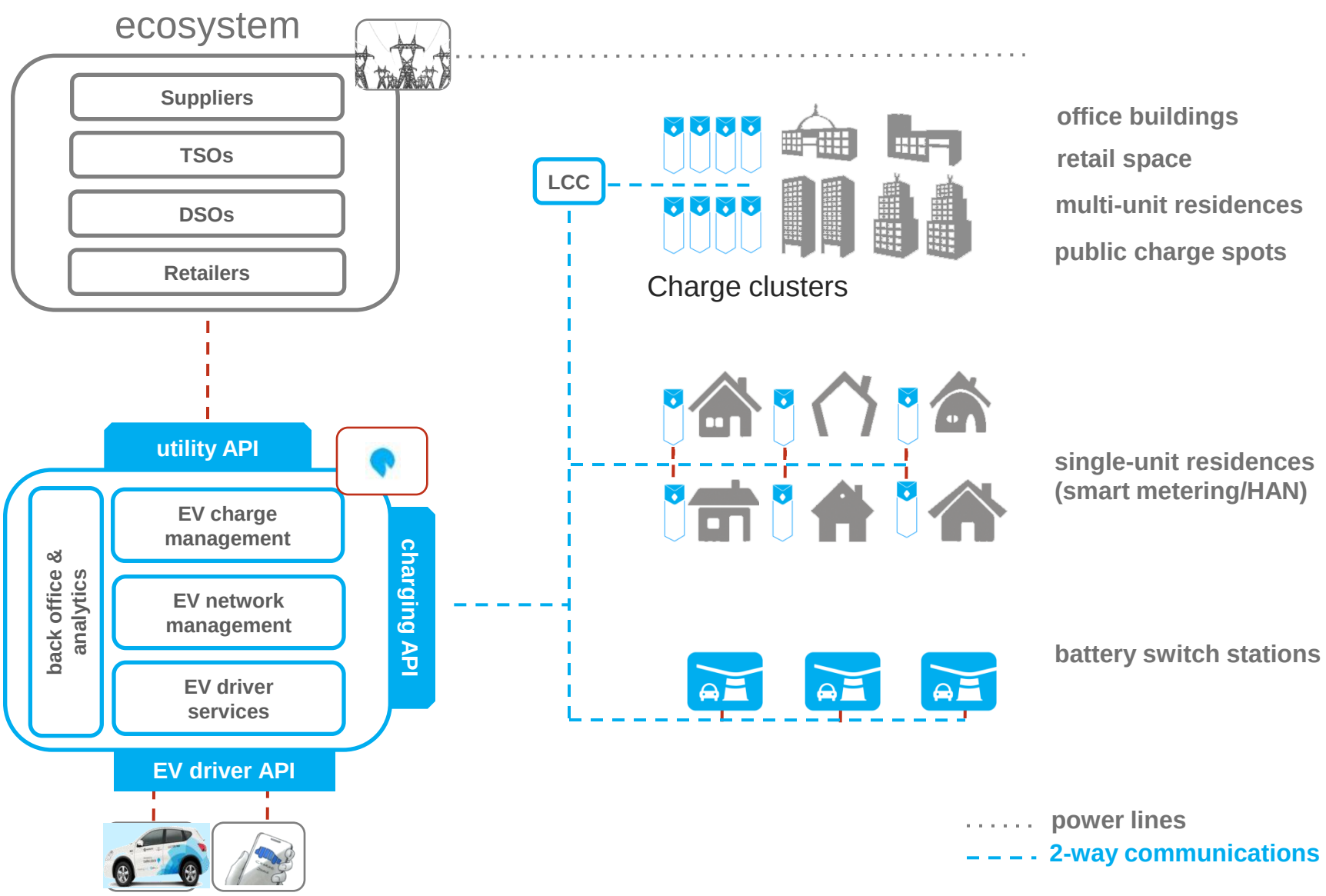
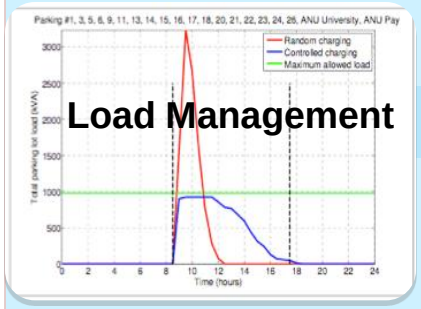
Better Place EV charge network

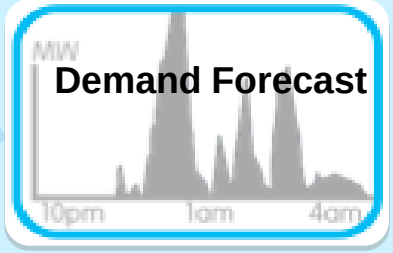


EV Charge Management

Utility System



Customers

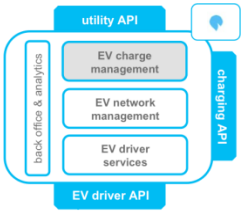


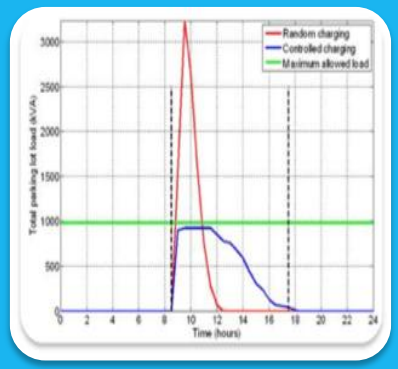
Network Operations

Smart charging optimization algorithm

Benefits

EV smart charging continuum





Optimized Charge Mgmt

- Intelligent charging for utility & user constraints
- Custom charge plans
  - Service level contracts
  - User requirements
  - Battery characteristics
  - Extended range

Dynamic Dispatch

- Load scheduling and intra-day balancing
- Dynamic response to MV network loads
- Dynamic response to system disturbances and outage restoration
- Response to price signals

Energy Storage Capabilities

- Ancillary services
- Renewables firming / ramping support
- Distributed generation and micro-grid
- Demand response, capacity management
- Energy arbitrage

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Better Place network as a distributed energy storage system

A plugged-in car is 24 kWh of storage connected at 3.3 kW

A typical Battery Switch Station (BSS) is 500 kW load 240 kWh of storage

100,000 cars + 500 batteries in BSS:

- Peak load: 330-660 MW
- Storage capacity: 2,412 MWh

Charge plan flexibility allows us to forecast power and energy demands day ahead, and change them intra-day to respond to grid needs

Better Place “energy storage” assets

CS represent networked battery asset

- Up to 5+ MW of dispatch-able load for every 1,000 EVs
- Fast “ramp” response; distribution level control

BSS are similar to distributed generation and stationary storage

- Always “on” and well-suited best for LESR applications
- 0.5 - 3 MW load rating (with optional stationary storage)
- Fast response; configurable for energy output to grid

Network Operating Center provides centralized control

- EV network charge optimization – ensures driver requirements
- Data collection and analytics (forecasts, load commitments)
- Interfaced / integrated with utility/grid operations
- Managed EV load dispatch for energy service delivery (FR, DR, ramp support, etc.)

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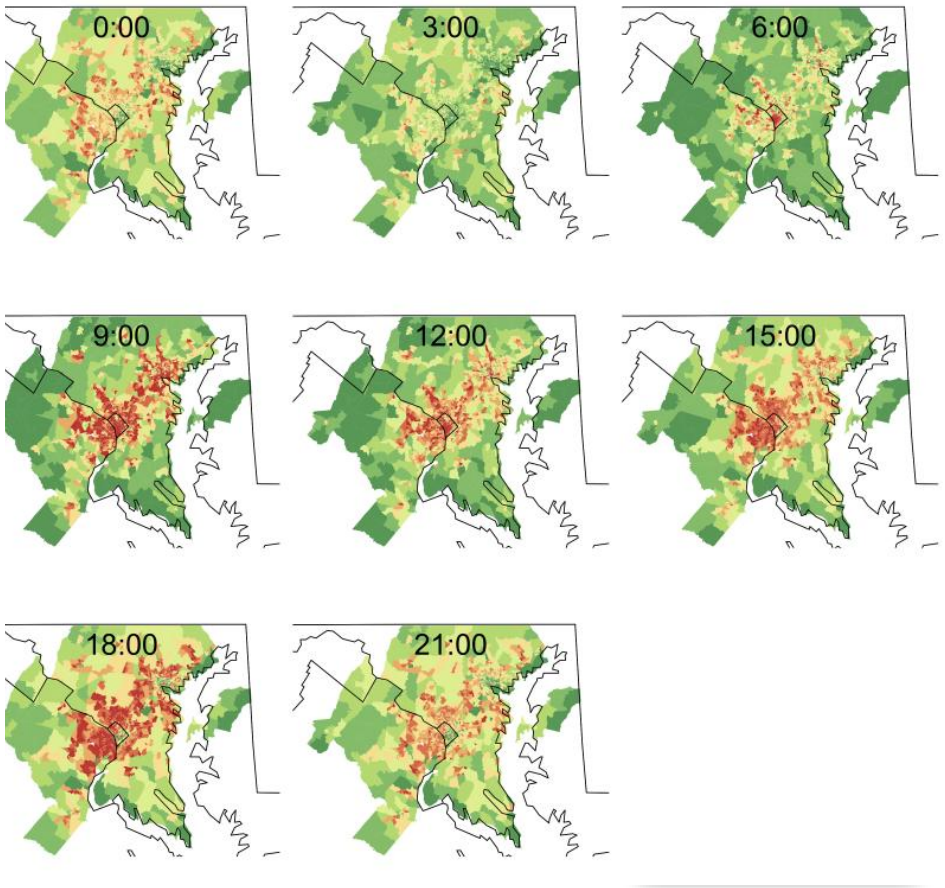
Managed charging minimizes risks and costs to utilities

Israel Electric Co. study: Managed EV charging significantly reduces system costs of EV adoption to utilities

Projected grid Impacts of 2 million electric vehicles				
Israel Electric Co. (2008)	**Additional Generation** 	**Additional Transmission** 	**Additional Distribution** 	**Total Cost**
Unmanaged Charging	2,345 MW	1 switching station 10 substations 18 transformers	2,158 km cables	$4,586M
Off-Peak Incentives	1,770 MW	1 switching station 7 substations 13 transformers	1,581 km cables	$3,414M
Managed Charging	**None**	**None**	**287 km cables**	**$471M**

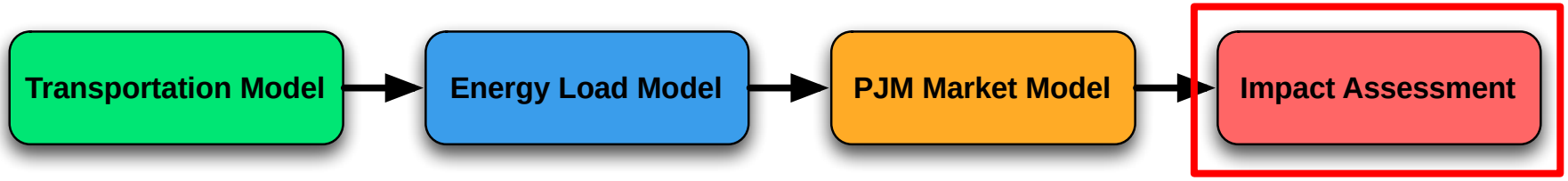
Managed charging reduces price volatility in wholesale markets (PJM and Better Place study)

- Modeled the market and pricing impact of 1M EVs.
- The greater Washington – Baltimore area was selected for modeling because it already experiences transmission congestion issues
- Demonstrate the value of EV Network Operator (Aggregator) that manages EV charging
  - Wholesale energy market
  - Production costs
  - Ancillary services
- Enabled PJM, Better Place, and other stakeholders to learn from the results



EV Load Intensity Snapshots

Wholesale Price Impact Assessment



Charging Scenario	Price Signals and Charging Control	Wholesale Energy Pool Savings	Pool Cost Savings for EV Owners
Unmanaged ("Unmanaged Scenario")	Local Ad-hoc charging	baseline	
Time of Use Pricing ("TOU Scenario")	Local 70% price sensitive to two-tier TOU rates	-$32M (-4%)	3.7%
Central Network Operator ("CNO Scenario")	Centrally managed Network is price sensitive to LMP	**$350M (45%)**	**22%**

The bottom line

EV network cross-subsidization enables highly competitive, high margin electricity products and services

Better Place will already be purchasing batteries and grid connections to provide mobility services for EVs

Through its aggregated assets, BPLC can help reliably supply large quantities of energy services relatively inexpensively

- Installed Costs Comparison

- Peaker Plant (NG): $1,394/kW[1]
- Flow battery: $1,200/kW
- Lead acid storage: $1,350/kW[1]
- Beacon Flywheel: $3,450/kW[2]

- Better Place: $0

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Better Place today

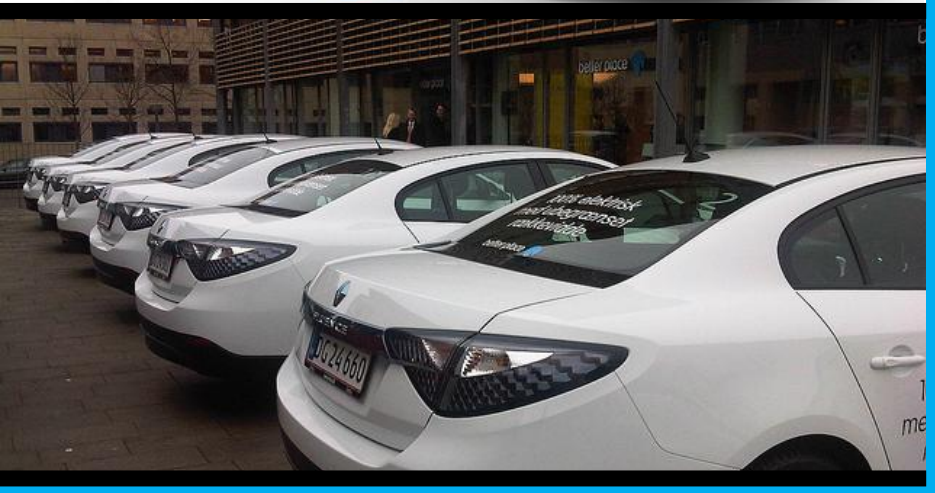
Operating companies in Israel, Denmark, Australia

Offices in Japan, U.S., Canada, China and Europe

As of March 2011:

Raised ~$700M ($550M at parent company, €103M in Denmark, AUS$25M in Australia)

Approximately 450 employees and 600 contractors globally



2011: key milestones

As of March 2011

Solution validation test started (IL)

Signed vision partnership with 340 companies accounting for 72K+ cars; replacement exp. in 4-5 years (IL)

Looking ahead: Israel

Commercial launch in 1H-2012

40+ switch stations

Thousands of charge spots (more than 1,000 already deployed to date)

Looking ahead: Denmark

Commercial launch in2H- 2012

15+ switch stations

Thousands of charge spots


better place