AlpStore Evaluation Workshop

Notes for discussion

Gabriele Grea

Brescia, October 1st 2014

Objectives of the workshop

To gather elements for assessing the impact of storage systems at local and regional level in terms of benefits and their accountability, fine tuning of findings reached so far. Today's research questions:

Costs:

- What is the expected scenario at 2030 for the relevant technologies and components?

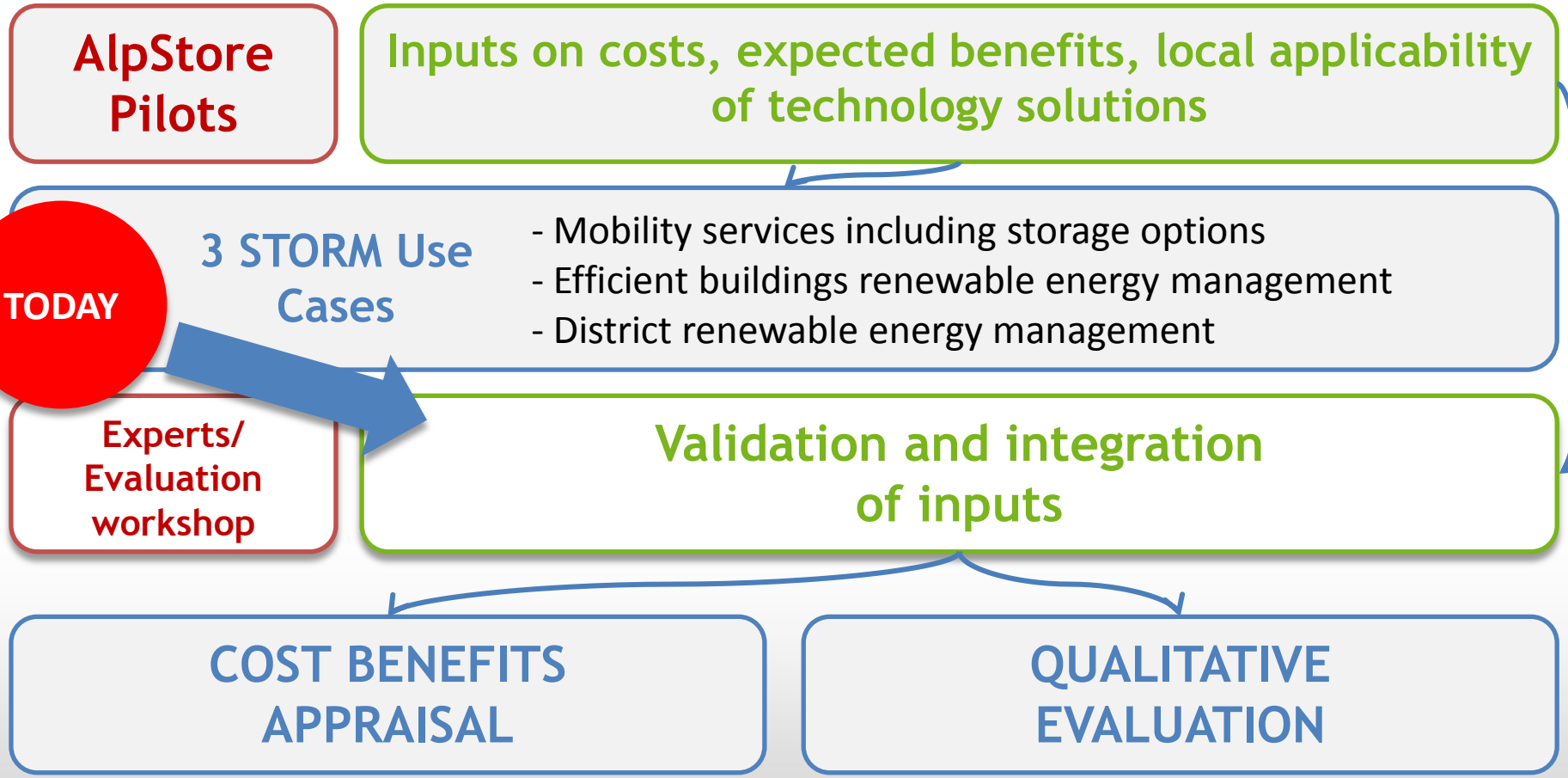
Benefits:

- Which are the main relevant benefits for each use case? Are the indicators suitable and measurable? Are identified parameters reliable?

Regional potential:

- how the three scenario might contribute to the development of efficient energy strategies in the Alpine Space regions?

Our methodological framework



Cost elements:

What is the expected scenario at 2030 for the relevant technologies and components?

1. Electric vehicles
2. Charging points (slow, fast, AC, CC)
3. Mobile batteries (different technologies)
4. Stationary batteries (e.g. REDOX)
5. Energy supply (mix, costs)

STORM use case 1 - Mobility services including storage options

A range of mobility related services based on the use of EVs will be developed in the region.

Long term rental, car sharing, provision of private and public charging points represent the main element of the mobility component; innovative business models allow the development of services based on the efficient use of renewable energy for mobility purposes.

Energy storage technologies play a fundamental role allowing a more intensive exploiting of renewable sources, providing support for functions as voltage regulation and improvements in capacity, as well as environmental benefits both in terms of CO2 and local emissions.

STORM use case 1 - Mobility services including storage options

Which are the main relevant benefits for each use case? Are the indicators suitable and measurable? Are identified parameters reliable?

Benefits

End user	3	Retail TOU energy charges
Distribution	5	Voltage support
System	12	Local capacity
	13	System capacity
	14	Renewable energy integration
ISO Markets	15	Fast regulation (1 hr)
	16	Regulation (1 hr)
	17	Regulation (15 min)
	20	Black start
	21	Price arbitrage
Environment	22	Reduced CO2 emissions
	23	Reduced Sox, Nox, PM emissions

Indicators

- ❑ **Generation(total) [kW]**
- ❑ Renewables generation (%)
- ❑ **Storage capacity [kW & kWh]**
- ❑ E.cars [number] *(env)*
- ❑ Charging point [number]
- ❑ **Electric load managed in kW and in kWh**

STORM use case 1 - Mobility services including storage options

How quantitative indicators are translated into benefits? What monetary value of marginal benefits?

			Generation(total) [kW]	Renewables generation (%)	Storage capacity [kW & kWh]	E.cars [number]	Charging point [number]	Storage performed [kW & kWh]	Electric load managed in kW and in kWh
End user	3	Retail TOU energy charges							
Distribution	5	Voltage support	?					?	
System	12	Local capacity	50%		50%	50%	?	?	50%
	13	System capacity	100%		?				
	14	Renewable energy integration	100%	100%	100%	100%	100%	?	100%
ISO Markets	15	Fast regulation (1 hr)	100%			100%	100%		100%
	16	Regulation (1 hr)	100%			100%	100%		100%
	17	Regulation (15 min)	100%			100%	100%		100%
	20	Black start	100%			100%	100%		100%
	21	Price arbitrage	100%			100%	100%		100%
Environment	22	Reduced CO2 emissions	70%	100%	70%	70%	70%	?	70%
	23	Reduced Sox, Nox, PM emissions	100%	100%	100%	100%	100%	?	100%

STORM use case 2 - Efficient buildings renewable energy management

Buildings will allow the efficient use of renewable energies balancing the intermittent production and allowing EVs to benefit and contribute to the peak load management.

Stationary and mobile storage systems will support the local generation and energy management in houses, factories and office buildings, thus optimising the energy ecosystem.

Electric vehicles such as cars, scooters and e-bikes will be connected to the buildings energy systems and will benefit-support the efficient renewable energy use.

STORM use case 2 - Efficient buildings renewable energy management

Which are the main relevant benefits for each use case? Are the indicators suitable and measurable? Are identified parameters reliable?

Benefits

End user	3	Retail TOU energy charges
Distribution	5	Voltage support
	6	Defer distribution investment
	7	Distribution losses
System	12	Local capacity
	14	Renewable energy integration
ISO Markets	17	Regulation (15 min)
Environment	22	Reduced CO2 emissions
	23	Reduced Sox, Nox, PM emissions

Indicators

- ❑ **Generation(total) [kW]**
- ❑ Renewables generation (%)
- ❑ **Storage capacity [kW & kWh]**
- ❑ Storage performed
- ❑ Consumption reduction
- ❑ Distribution losses
- ❑ Compliance with Technical/ Political requirements (grid codes)
- ❑ Functionality of the battery storage system

STORM use case 2 - Efficient buildings renewable energy management

How quantitative indicators are translated into benefits? What monetary value of marginal benefits?

			Generation(total) [kW]	Renewables generation (%)	Storage capacity [kW & kWh]	Storage performed	Consumption reduction	Distribution losses	Compliance with Technical/Political requirements (grid codes)	Functionality of the battery storage system
End user	3	Retail TOU energy charges	100%	xx	100%	100%	100%		?	?
Distribution	5	Voltage support	?		?	?			?	
	6	Defer distribution investment	100%	100%	100%	100%			?	
	7	Distribution losses	?	?	?	?	?	?	?	
System	12	Local capacity			50%	50%	50%			
	14	Renewable energy integration	100%	100%	100%	100%	100%		?	?
ISO Markets	17	Regulation (15 min)			100%				?	
Environment	22	Reduced CO2 emissions	70%	70%	70%	70%	70%	70%	?	?
	23	Reduced Sox, Nox, PM emissions	100%	100%	100%	100%	100%		?	?

STORM use case 3 - District renewable energy management

Operating villages and districts as self sufficient environments based on renewable energy will be a key issue along the Alpine Space territories.

Biogas facilities and grids must guarantee an optimized use of gas for mobile and stationary purposes (supplying energy and heat for private households).

Stationary batteries in remote areas will help reaching self sustainability of renewable solutions, integrate energy management for e-mobility and guarantee energy supply in case of main network failures.

STORM use case 3 - District renewable energy management

Which are the main relevant benefits for each use case? Are the indicators suitable and measurable? Are identified parameters reliable?

Benefits

End user	1	Power quality
	2	Power reliability
Distribution	5	Voltage support
	6	Defer distribution investment
	7	Distribution losses
System	14	Renewable energy integration
Environment	22	Reduced CO2 emissions

Indicators

- ❑ Renewables generation (%)
- ❑ **Storage capacity [kW & kWh]**
- ❑ **Thermal applications [kW]**
- ❑ Storage performed
- ❑ **Peak load transfer**
- ❑ **Consumption reduction**
- ❑ **Distribution losses**
- ❑ Energy efficiency
- ❑ Off-grid operation
- ❑ Voltage support
- ❑ Functionality of the battery storage system

STORM use case 3 - District renewable energy management

How quantitative indicators are translated into benefits? What monetary value of marginal benefits?

			Generation(total) [kW]	Renewables generation (%)	Storage capacity [kW & kWh]	Storage performed	Consumption reduction	Distribution losses	Compliance with Technical/Political requirements (grid codes)	Functionality of the battery storage system
End user	3	Retail TOU energy charges	100%	xx	100%	100%	100%		?	?
Distribution	5	Voltage support	?		?	?			?	
	6	Defer distribution investment	100%	100%	100%	100%			?	
	7	Distribution losses	?	?	?	?	?	?	?	
System	12	Local capacity			50%	50%	50%			
	14	Renewable energy integration	100%	100%	100%	100%	100%		?	?
ISO Markets	17	Regulation (15 min)			100%				?	
Environment	22	Reduced CO2 emissions	70%	70%	70%	70%	70%	70%	?	?
	23	Reduced Sox, Nox, PM emissions	100%	100%	100%	100%	100%		?	?