

Päikeseenergeetika ja innovatsioon

Andres Meesak

Eesti Päikeseelektri Assotsiatsioon



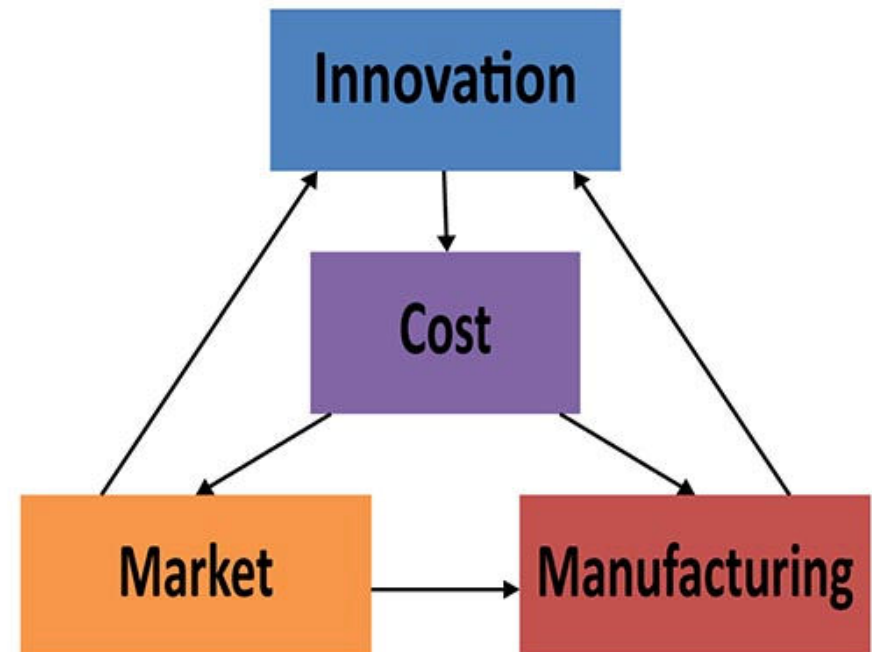
INNOVATSIOON...

... on protsess mis tõlgib idee või leiutise kasulikku tootesse või teenusesse, mis loob väärtust ja mille eest on kliendid nõus maksma.

Innovaatiline idee peab olema majanduslikult tasuvalt korratav ja peab rahuldama mingit spetsiifilist vajadust.

Innovatsioon hõlmab teabe, kujutlusvõime ja initsiatiivi tahtlikku rakendamist, et saada ressurssidest suuremaid või erinevaid väärtusi, ning see hõlmab kõiki protsesse, mille abil uusi ideid luuakse ja muudetakse kasulikeks toodeteks

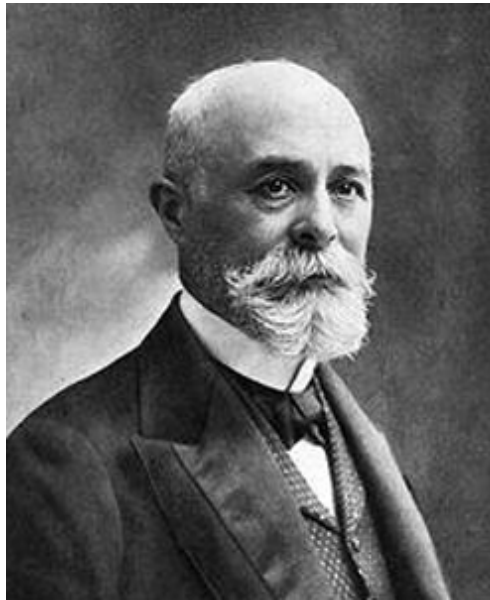
Innovatsioon iseenesest ei
tekita turgu!



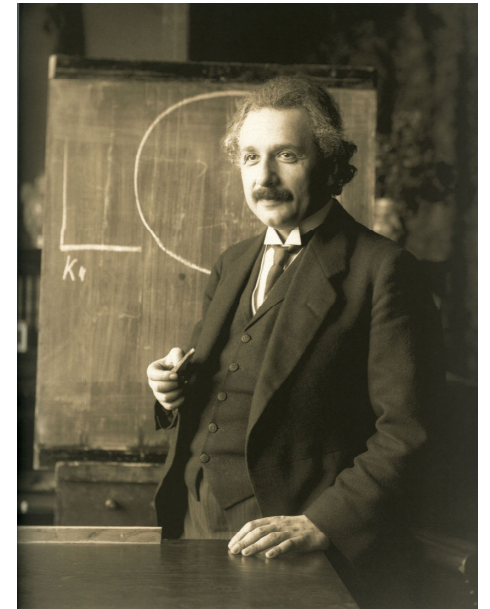
Päikeseenergia rakendamine on lugu innovatsioonist



Alexandre Edmond Becquerel



Charles Edgar Fritts



Albert Einstein

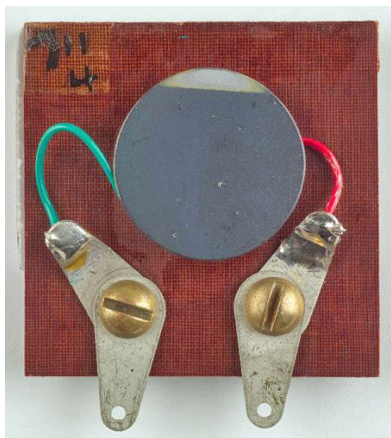


“I’d put my money on the sun and solar energy. What a source of power! I hope we don’t have to wait until oil and coal run out before we tackle that.”

Thomas A. Edison, 1931

Thomas A. Edison

Päikeseenergia rakendamine on lugu innovatsioonist



1954 Bell Labs



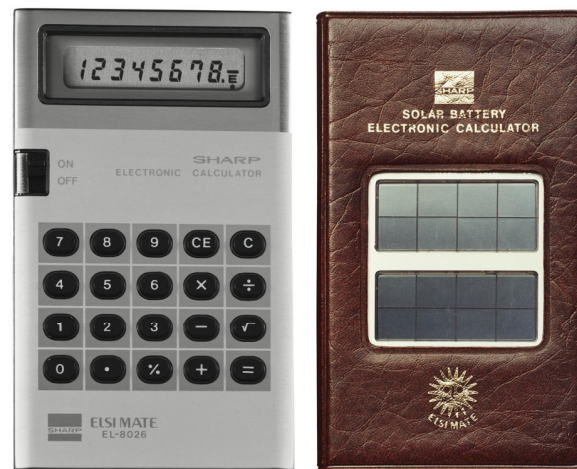
1958 NASA Vanguard 1



1963 Sharp 242W PV-jaam



1966 1kW jaam NASA

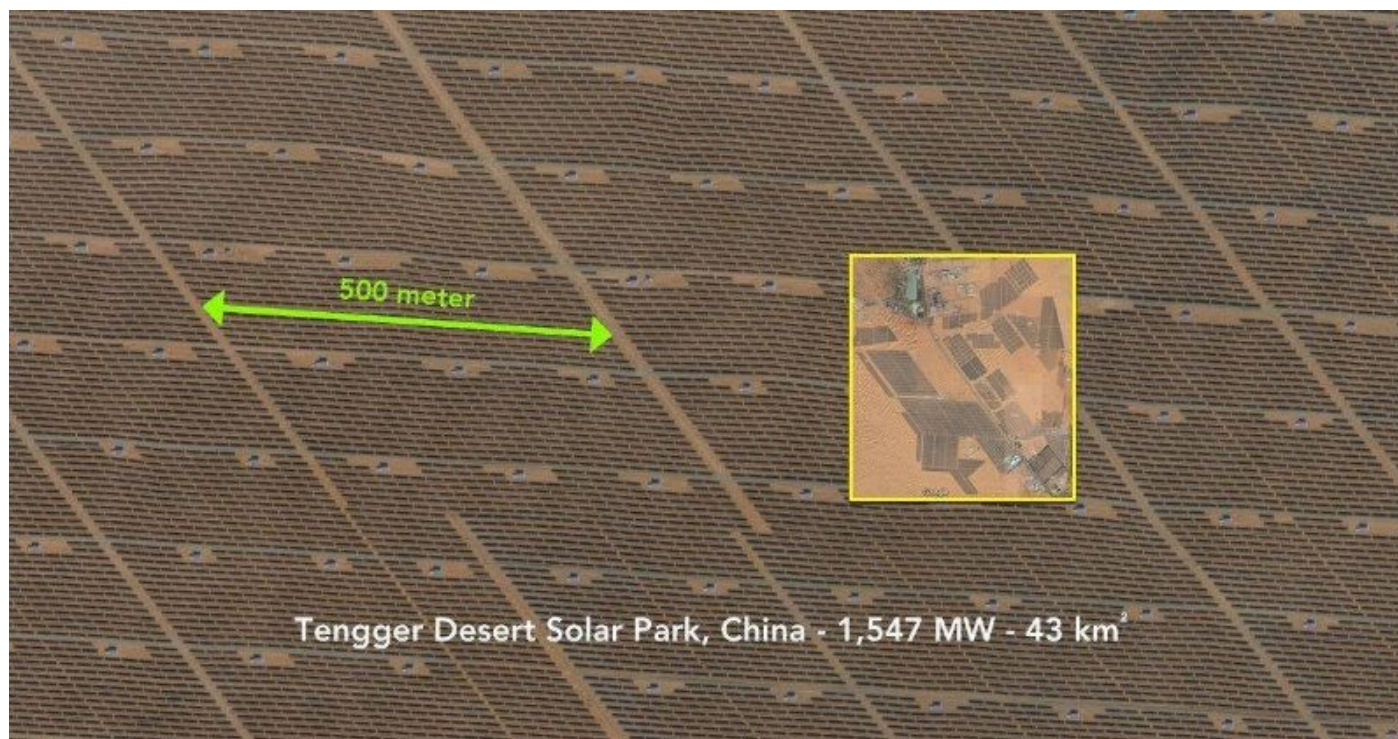


80-dad laiatarbe väikeseadmed



EPEA

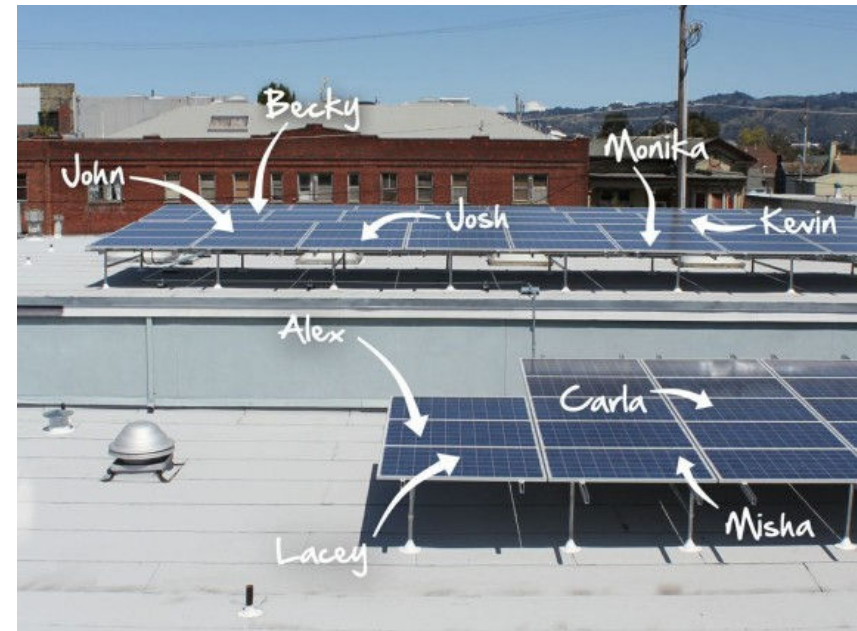
Päikeseenergia rakendamine on lugu innovatsioonist



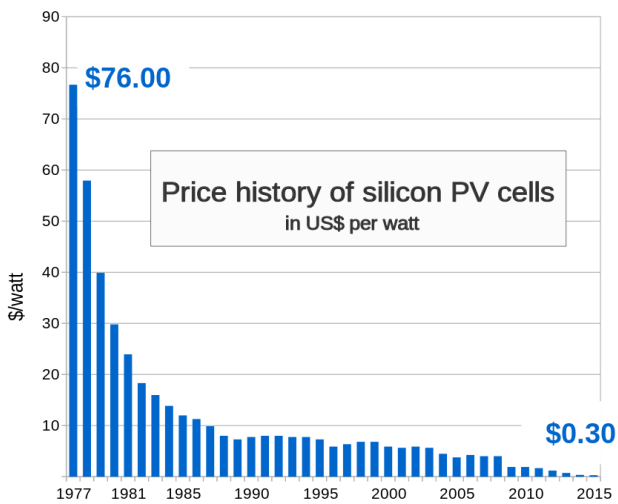
Tehnoloogiline innovatsioon ja ärimudeli innovatsioon



- Kogukondlik ja ühistuline tootmine
- ühisrahastus
- Sotsiaalsed projektid



Tehnoloogiline innovatsioon



Source: Bloomberg New Energy Finance & pv.energytrend.com



Ärimudelite innovatsioon

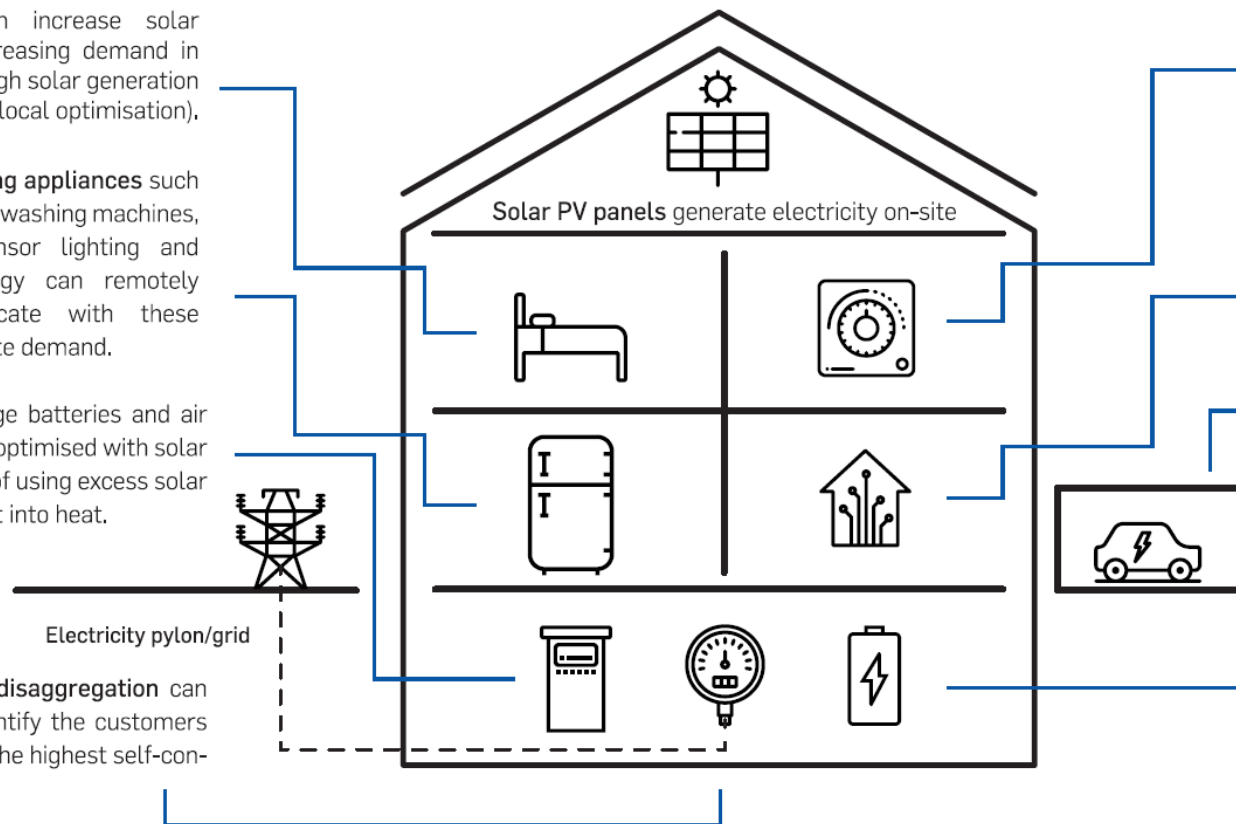
THE SMART BUILDING PACKAGE

Demand response can increase solar self-consumption by increasing demand in the building at times of high solar generation and vice versa (known as local optimisation).

Smart automated building appliances such as fridges, tumble dryers, washing machines, dishwashers, motion-sensor lighting and blinds. Digital technology can remotely control and communicate with these appliances to adapt on-site demand.

Heat pumps, heat storage batteries and air conditioning units can be optimised with solar generation and be a way of using excess solar electricity by converting it into heat.

Smart meter data and disaggregation can also be used to help identify the customers that are likeliest to have the highest self-consumption rates.



Smart learning thermostats that are internet connected can be combined with electric heating or cooling. Solar providers in the US are already offering customers free smart thermostats.


Smart building energy management systems which can also provide monitoring, are made possible with wireless communications, advanced data analytics and the Internet of Things.

Smart electric vehicle charging in car parks and the PV4EV 'drive on sunshine' solution could significantly increase self-consumption rates for some households and businesses, especially when combined with storage.

Battery storage is a mutually reinforcing technology when combined with PV. Residential storage can increase solar PV self-consumption rates from approximately 30% to 70% with added system benefits of reducing network and system costs.

Päikeseaknad



A hand is holding a thin, rectangular, transparent solar cell panel. The panel is held up against a bright blue sky and a blurred background of a building. The panel appears to be a thin-film solar cell, possibly perovskite-based, given its transparency and thinness. The text is overlaid on the image in a bold, yellow font.

**Päikeseaknad võivad tuleviks teoreetiliselt
katta pea kogu hoonetes vajatava
elektrienergia.**

**Hetkel on tehnoloogia veel väheefektiivne –
kõigest ca. 5% kasuteguriga võrreldes
tavapaneelide 15-18% kasuteguriga, kuid
potentsiaal on jõuda kristallräni paneelidega
võrreldava kasuteguri ja hinnani..**

Isetasuvad (kergliiklus)teed



Solaroad kergliiklustee P-Hollandis 2014

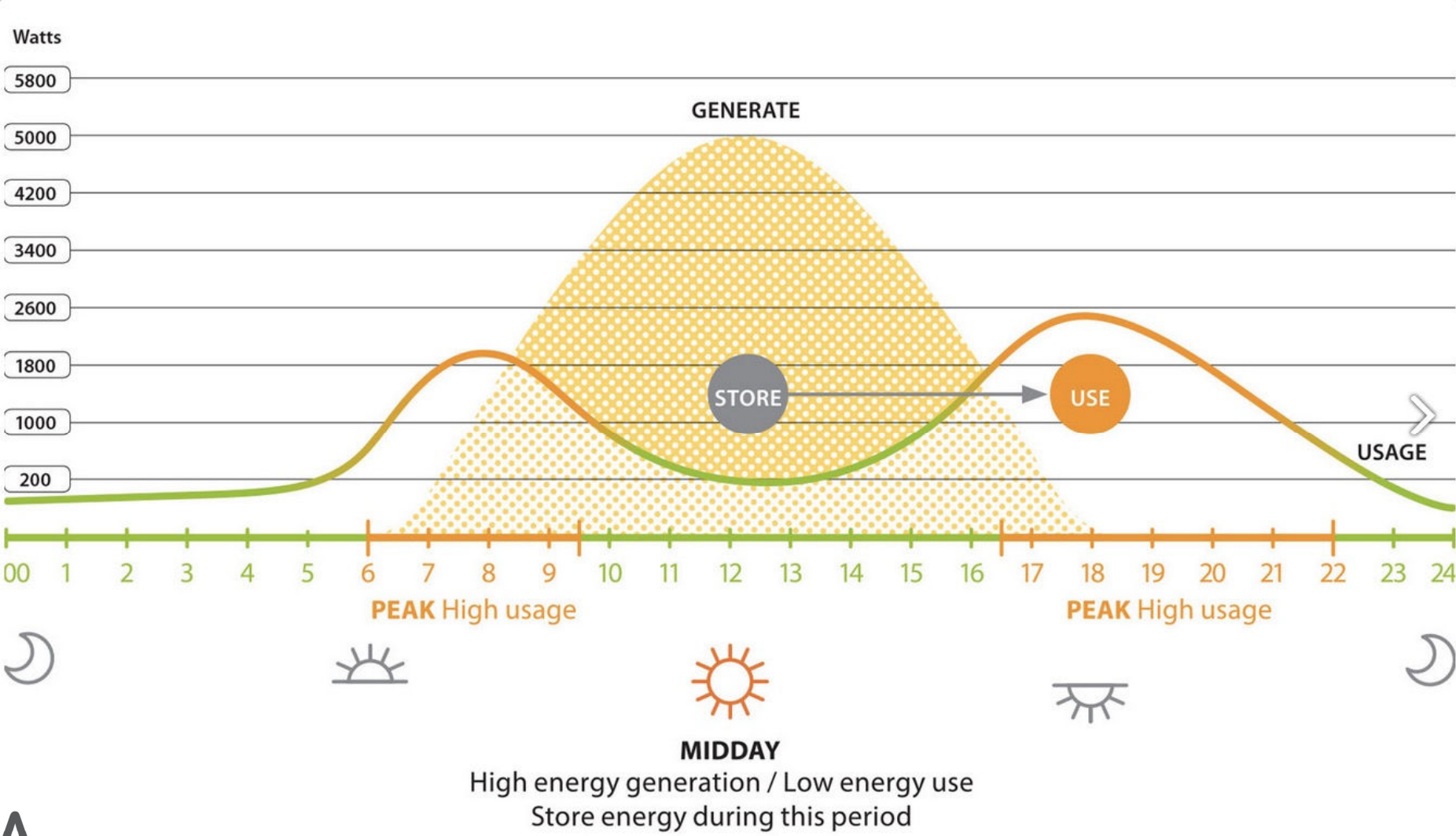
- Pikkus 70m
- Ehitajaks Hollandi ettevõtte Solaroad
- Pool tavalise betoonkattega ja pool PV-kattega
- 1. aasta toodang LOODETI ligi 10 000 kWh, katab 3 keskmise Hollandi majapidamise aastase elektritarbe, TEGELIK 3000 kWh/a
- Tulevikus ennustatakse selliste teede tasuvusajaks 15 aastat

WATTWAY sõidutee Prantsusmaal 2016

- Pikkus 1km, paneelide pind 2800m²
- Normandias Tourouvre au Perche nimelises külakeses
- Ehitajaks Prantsuse-UK ettevõtte Colas
- Elektrit kasutatakse külakese tänavavalgustuse tarvis
- Maksumus 5M €
- Prognoositav toodang 420 MWh aastas (ca. 140 majapidamise aastane elektrivajadus)
- Eesmärk 1km iga 1000km tee kohta päikesetee

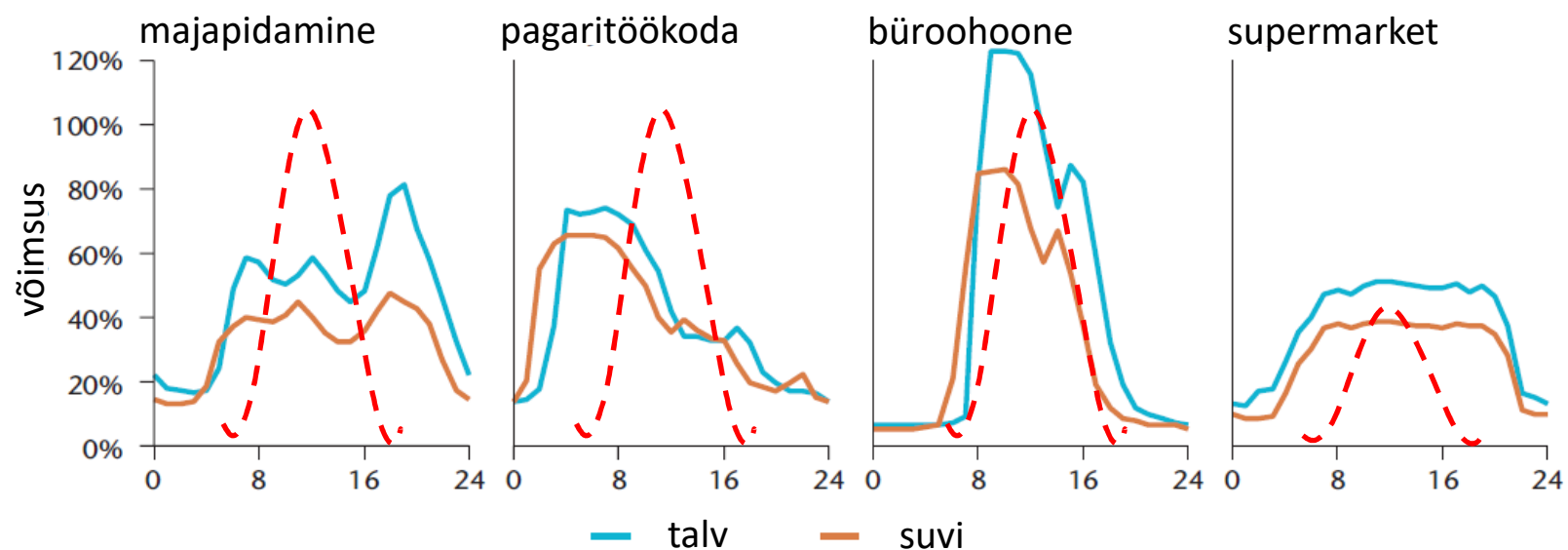


Kodumajapidamise tarbimine ja PV

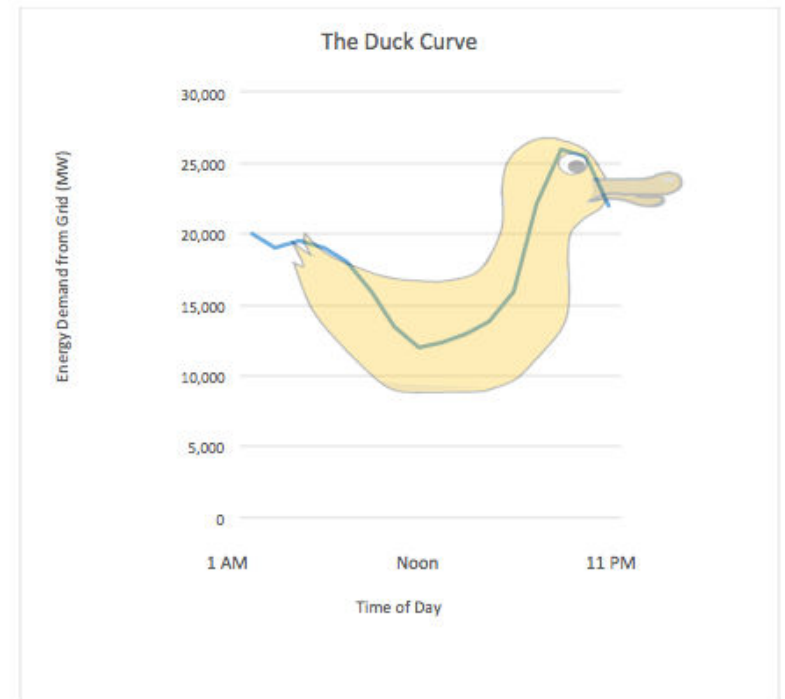
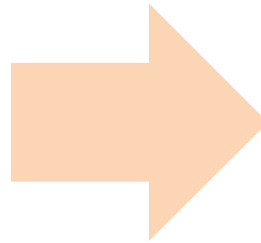
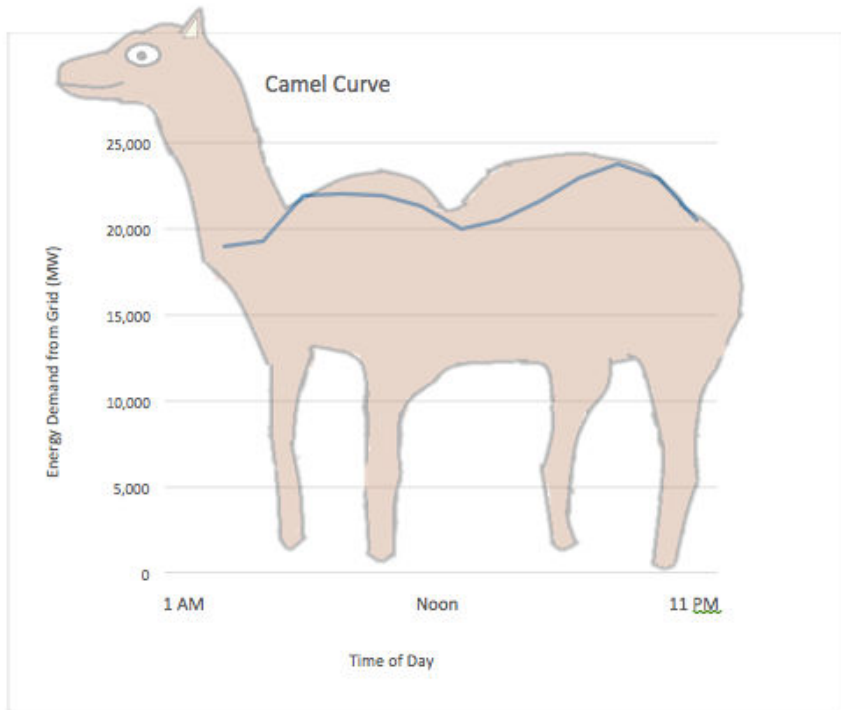


Kes kuidas ja millal elektrit tarbib?

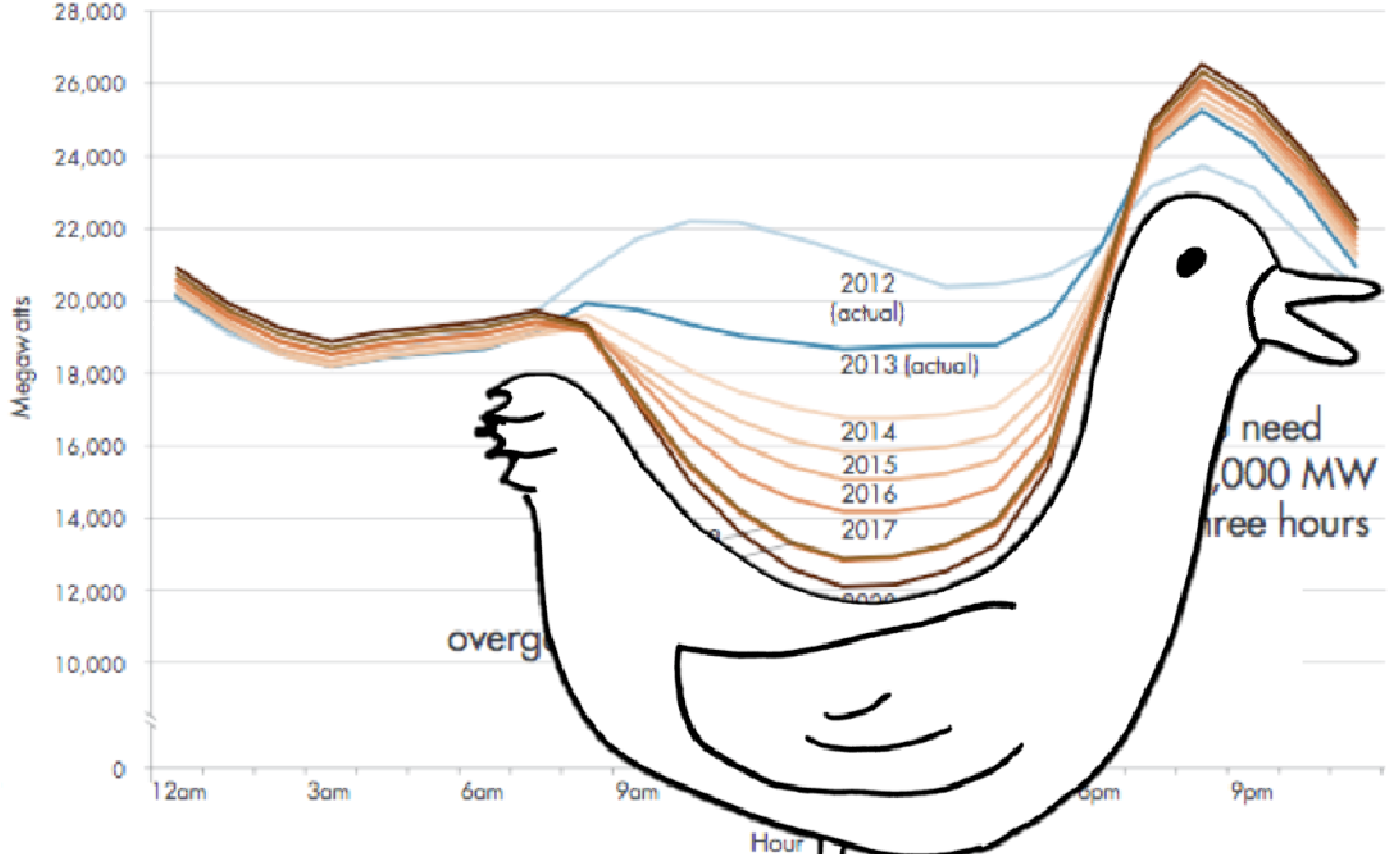
Erinevate tarbijate ööpäevane suvine ja talvine elektritarbimise muster ja päikeselektrijaama toodang



Kaamel ja part



Net load - March 31



Quack!

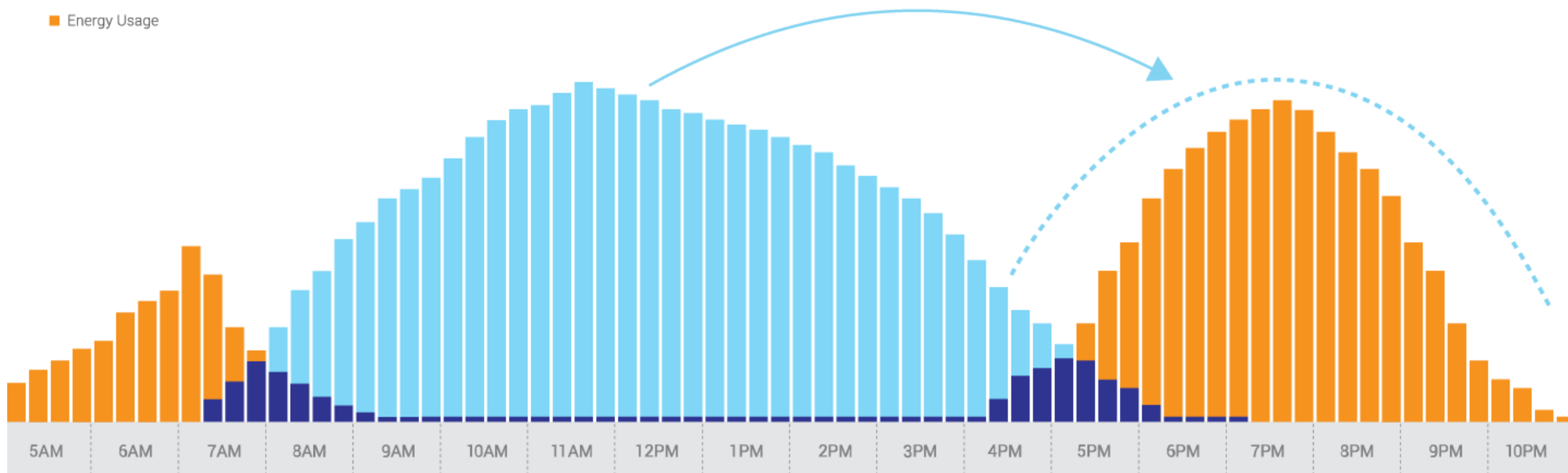
need 10,000 MW three hours

Päike ja salvestus käivad kokku nagu või ja leib, nagu suvi ja rand, sukk ja saabas...

Kuluefektivne salvestus lahendab päikeseenergia kasutamise fundamentaalse probleemi – tootmise ja tarbimise erineva tsükli. Salvestuse abil õnnestub päeva tootmine nihutada katma tarbimistippe õhtul ja hommikul.

Save It for Later: The Value of Energy Storage

- Solar Production
- Energy Usage



**The issue with existing batteries
is that they suck.**

Elon Musk



Koduse akusalvestuse omahind



Toodetud ja salvestatud elektri omahind

=

Tootmise omahind (LCOE)

+

salvestuse omahind (LCOS)

Tootmise omahind 8 ... 10 €/kWh

Salvestuse omahind ~ 10 ... 12 €/kWh

Kokku 18 ... 22 €/kWh

vs.

Elekter võrgust:

EE; LT, CZ, HU: 11 ... 12€/kWh

EU avg 21 €/kWh (2015)

DK 30€/kWh (2015)

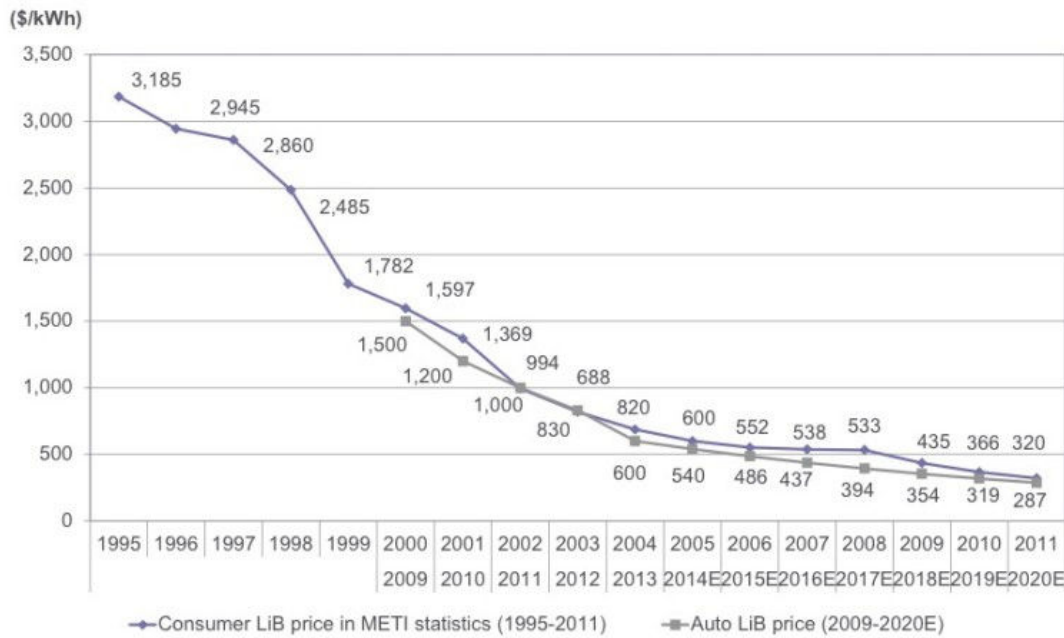
DE 29€/kWh (2015)

BG 9€/kWh

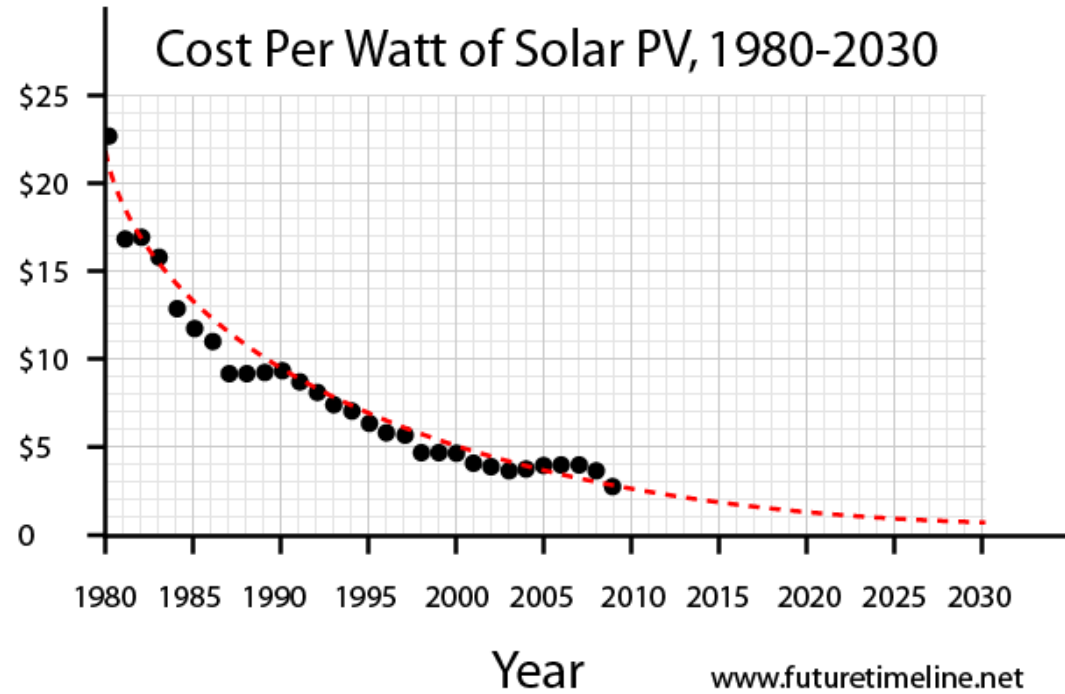


Akusalvestuse hind on langemas... Kas langus on võrreldav PV hinnalangusega?

Figure 37. Historical price declines in consumer and automotive lithium-ion batteries



Note: We assume ¥100/\$ for consumer lithium-ion battery prices.
Source: Company data, TSR, METI, Citi Research



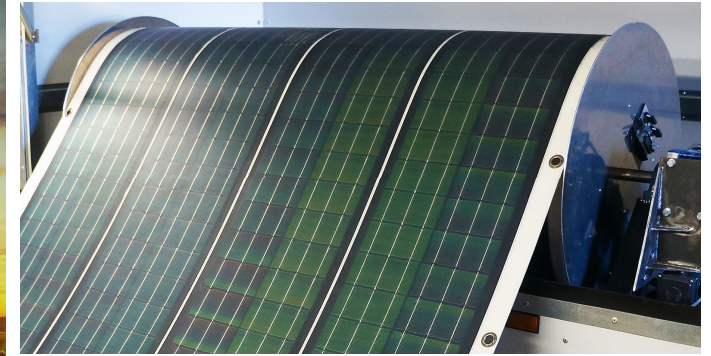
Mõned näited tulevikust...



Seljaskantav päikeseenergia



Elektrit genereerivad seinad, katused, aknad



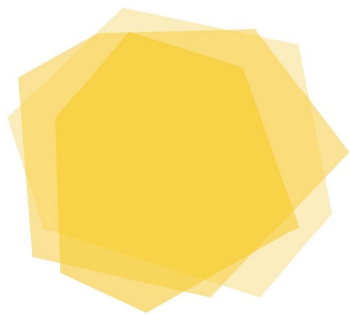
Prinditavad ja lahtirullitavad PV moodulid



Päikeseenergiat töötav lennumasin



Ujuvad PV-jaamad



EESTI
PÄIKESEELEKTRI
ASSOTSIATSIOON

energiateenus
Vajaduspõhised energialahendused



SOLARSTREET



ENERGIA
PARTNER



Helioest
energiasäästlikud hooned