CE51 TOGETHER

Komplet subvencija i poticaja integriranih u upravljanje potražnjom (DSM)
D.T2.2.3

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TOGETHER

TOwards a Goal of Efficiency THrough Energy Reduction

Set of subsidies and incentives integrated with Demand Side Management

D.T2.2.3

PP2 – Energy Agency Vysočiny (EAV)

PP7 – Hegyvidék (Municipality of 12th District of Budapest)

PP8 - Slovak Innovation and Energy Agency (SIEA)

Izvršni sažetak

Većina mjera energetske učinkovitosti koja se provodi (ili e se tek provoditi) u Europi uključuje tehnološke intervencije, no jednako će se trebati osloniti na ljude koji će trebati prilagoditi svoje ponašanje u pogledu potrošnje energije. U ovom dijelu ukratko su prikazani glavni čimbenici koji mogu utjecati na ponašanje potrošača kako bi se uštedjela energija.

Autori će u prvom dijelu (treće poglavlje) čitatelju dati osnovne informacije o mogućim mjerama koje se mogu poduzeti ili alatima koji se mogu upotrijebiti kako bi se uštedjela energija promjenom ponašanja korisnika zgradom. Cilj mu je uvjeriti čitatelja da je moguće postići bolju energetsku učinkovitost jednostavnim mjerama kao što su jednostavno prenošenje sveobuhvatnijih informacija korisnicima o potrošnji energije ili osmišljavanje natjecanja među korisnicima na temelju društvenih mreža.

Opisuje se ovih šest alata:

- Alate za prenošenje obavijesti
- Simulacijske, edukativne i alate za obuku
- Alate za trenutačnu povratnu informaciju
- Obrazovno-zabavne i gemifikacijske alate
- Financijske i ekonomske poticaje
- Alate temeljene na natjecanju i društvenim mrežama

Drugi se dio (četvrto poglavlje) bavi prilagodbom navika potrošača energetskim tarifama. Problem energetskih tarifa vrlo je širok i postoje brojni različiti tarifni modeli prema vrsti energije, a koji se također mogu razlikovati među državama članicama.

U slučaju električne energije dobavljači korisnicima dopuštaju da upotrebljavaju energiju u različitim cjenovnim razinama – energetskim tarifama. Uobičajeno postoje dvije tarife – visoka tarifa (VT) i niska tarifa (NT). Niska se tarifa primjenjuje u određenim razdobljima tijekom dana, a ostatak vremena primjenjuje se visoka tarifa. Niska je tarifa uglavnom pogodna za uređaje koji troše više energije, primjerice električne uređaje za grijanje, grijanje akumulirane vode itd. Zahvaljujući cjenovnim razlikama između energetskih tarifa, dobavljači energije mogu smanjiti potrošnju energije u razdobljima vršne potrošnje i uspostaviti uravnoteženiju potražnju za energijom tijekom 24 sata u danu. Nužnost dijeljenja potrošnje energije rezultat je ograničenog kapaciteta sustava prijenosa, stoga se dobavljači energije uobičajeno koriste ovim modelom energetskih tarifa.

U trećem se dijelu (prilog) navode savjeti prilagođeni korisnicima za najuobičajenije vrste javnih zgrada: zgrade sa stalnim stanarima (npr. uredi javne uprave), obrazovne zgrade i zgrade kojima se uglavnom koriste posjetitelji (npr. knjižnice, sportski centri, kulturni centri. U različitim se vrstama zgrada razlikuju i bihevioralni problemi te su potrebna specifična rješenja i mjere. U tom se dijelu navode praktični i korisni savjeti za organiziranje najučinkovitijih mjera DSM-a.

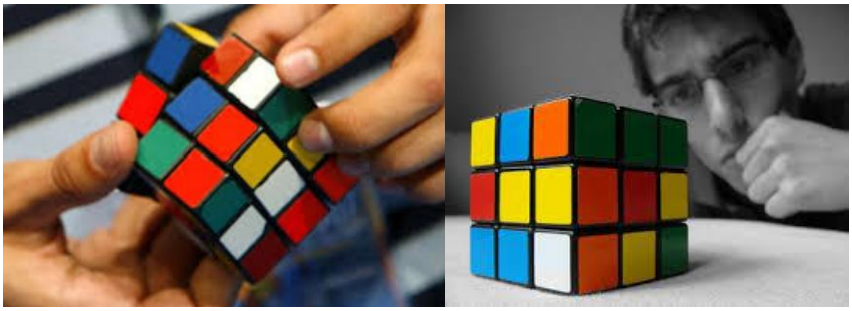
Contents

1. Introduction

The Project TOGETHER offers a transnational capacity building platform, where partners with different levels of knowledge can strengthen their competences together, thus reducing their disparities and promoting actions on both the supply and demand side, in the context of planning EE in public buildings. The main goal of the project is improving energy efficiency and energy saving in public buildings by changing behaviour of building users and promoting energy efficiency measures.

This document provides common guidelines to the partners for drafting their respective pilot project implementation plans and developing the presentation of their Pilot Actions in their pilot buildings clusters with a common framework and visual identity.

This tool is contextualized within the framework of the second objective of the project TOGETHER: if the first project objective "To increase energy efficiency and secure investments thanks to improved multidisciplinary in-house staff skills and thanks to an Alliance system with more engaged and motivated buildings users" calls for the observation and learning of possible tools to be combined together for achieving energy efficiency in public buildings, and the second one "To produce and test the most appropriate combinations of technical, financial and Demand Side Management tools for the improvement of the energy performance of public infrastructures" calls for the practical and concrete implementation of the possible identified measures.



1.1. Project TOGETHER

The three main objectives of the project TOGETHER consist in:

1. Increasing public buildings energy efficiency and securing investments, through the improved multidisciplinary in-house staff capacity building of Public Administrations and the establishment of a system of alliances with more engaged and motivated building users;
2. Producing and pilot testing the most appropriate combinations of technical, financial and Demand Side Management tools for the improvement of the energy performance of public infrastructures, currently in the 8 regional Pilot Actions involving a total of 85 buildings;
3. Codifying the project outcomes into a comprehensive policy package for a large-scale implementation, bringing local buildings governance practices to the centre of ambitious energy saving policies.

In its inception, TOGETHER plans the organisation of an interdisciplinary "Training of Trainers" course for building owners, managers and public decision makers that integrates the traditional technical inputs on energy management and buildings retrofitting with targeted contributions from behavioural science, economics and psychology, aiming to engage the end users in the building energy performance goals.

The “Training of Trainers” course is completed by the provision of an Integrated Smart Toolkit, including:

1. Guidelines for implementing the innovative EPIC (Energy Performance Integrated Contract) scheme, combining technological devices and behavioural-based components;
2. A set of exemplary models of Energy Management Systems in schools, institutional and other type of buildings;
3. An innovative Building Alliance concept among building owners/managers/users who cooperate within a Negotiating Panel to achieve energy savings to be reinvested through a Reinvestment Action Plan.

Additionally, and by the project’s end, the Partners will jointly elaborate a Transnational Strategy and Mainstreaming Programme, including policy/strategic and operational recommendations for an appropriate follow-up and a sustainable take-up of the project outputs.

1.2. Purposes of this tool

The objective of this tool is to give a theoretical overview and provide practical guidance of demand side management. A set of subsidies and incentives are discussed and personalised tips are provided for the most typical public building types. The listed subsidies and incentives are partly financial, partly social. Financial incentive can be an energy performance contract, social incentive can be an award.

1.3. Usage of this tool

The first and second part of the tool gives a comprehensive theoretical overview about incentives and subsidies applied in demand side management. The time management for a more efficient utilisation of energy tariffs is also discussed.

For personalised practical problem detection and tips for solutions can be found in the annex. For defining a concrete action plan for a public building this toolset should be used and applied.

2. Subvencije i poticaji za smanjenje energetske potražnje bihevioralnom promjenom

2.1. Uvod

Većina mjera energetske učinkovitosti koja se provodi (ili e se tek provoditi) u Europi uključuje tehnološke intervencije, no jednako će se trebati osloniti na ljude koji će trebati prilagoditi svoje ponašanje u pogledu potrošnje energije. U ovom dijelu ukratko su prikazani glavni čimbenici koji mogu utjecati na ponašanje potrošača kako bi se uštedjela energija.

Bihevioralni modeli nužni su da bi se razumjelo što potrošači rade i zašto to rade. Takvi se modeli obično razlikuju teorijom, konceptima i primjenama. Važna je poruka da su veze između različitih čimbenika koji utječu na ponašanje i potrošačke prakse te ljudskog elementa dinamične i statične, kao ih se opisuje u velikom korpusu literature o ovoj temi. Mijenjaju se tijekom vremena, zbog čega se ponašanje potrošača i proces potrošačkih praksi čine donekle iracionalnima te u određenoj mjeri nepredvidljivima. (EEA, 2013.)

Autori će u ovom poglavlju čitatelju dati osnovne informacije o mogućim mjerama koje se mogu poduzeti ili alatima koji se mogu upotrijebiti kako bi se uštedjela energija promjenom ponašanja korisnika zgradom. Cilj mu je uvjeriti čitatelja da je moguće postići bolju energetsku učinkovitost jednostavnim mjerama kao što su jednostavno prenošenje sveobuhvatnijih informacija korisnicima o potrošnji energije ili osmišljavanje natjecanja među korisnicima na temelju društvenih mreža.

Bit će predstavljeno sljedećih šest alata:

- alati za prenošenje obavijesti
- simulacijski, edukativni i alati za obuku
- alati za trenutačnu povratnu informaciju
- obrazovno-zabavni i gemifikacijski alati
- financijski i ekonomski poticaji

alati temeljeni na natjecanju i društvenim mrežama

2.2. Alati za prenošenje obavijesti

Pod alatima za prenošenje obavijesti podrazumijevaju se tradicionalne metode prenošenja informacija o potrošnji energije, kao što su računi. Ova se vrsta prenošenja informacija u literaturi često naziva i neizravnim povratnim informacijama.

Neizravne povratne informacije (povratne informacije koje se na neki način obrade prije nego što dođu do korisnika energije, uobičajeno putem računa) obično su primjerenije od izravnih povratnih informacija za dokazivanje bilo kakva učinka koji na potrošnju mogu imati promjene u grijanju prostora, sastav kućanstva i učinak ulaganja u učinkovite mjere ili uređaje visoke potrošnje. (Darby, 2006.)

Međutim, „[standardni] komunalni račun oblik je povratne informacije u kojemu je povratna veza predaleka u odnosu na upotrebu ulaznih informacija da bi imala ikakvu informativnu vrijednost". No računi se mogu prilagoditi kako bi tijekom vremena odražavali široke trendove potrošnje. Ponajprije mogu pokazivati kako je opterećenje grijanja raspoređeno tijekom godine, što je nešto čega platitelji koje se izravno tereti možda uopće nisu svjesni. Također mogu pokazati kako se potrošnja promijenila u odnosu na isto razdoblje prethodne godine, dajući korisniku energijom mogućnost da utvrdi što je moglo uzrokovati promjenu: nova osoba u kućanstvu, novi bojler ili uređaj, izolacija ili proširenje kuće. Računi također mogu uključivati „godišnje izvješće", usporedbu potrošnje kućanstva s potrošnji usporedivog kućanstva (iako to nije potpuno jednako) ili mogu prikazati podjelu kako je potrošnja distribuirana među krajnjim korisnicima u prosječnom domu.

Zadnja, ali ne manje važna činjenica jest da se tako unaprijeđeni energetski računi mogu upotrijebiti kako bi potrošačima pružili povratne informacije i potaknuli ih da promijene svoje ponašanje. Darbyjeva revizija (Darby, 2006.) također je uključivala 13 projekata neizravnih povratnih informacija koji su se bavili nizom različitih mjera:

- češćim računima
- čestim računima na temelju očitanja plus prethodnim povratnim informacijama
- čestim računima na temelju očitanja plus usporednim/normativnim povratnim informacijama
- čestim računima plus raščlanjenim povratnim informacijama
- čestim računima plus detaljnim godišnjim ili kvartalnim energetskim izvješćima.

Ključ je kućanstvima ponuditi bolje i informativnije račune o tome koliko energije upotrebljavaju i koliko na to troše, u novčanom ili ekološkom pogledu. Jasnije prezentirani računi kućanstvima bi također omogućili da vide koliko su plina ili struje uštedjeli. U Izvješću Centra za održivu energiju (Roberts i Baker, 2003.) zaključeno je da povratne informacije i informativniji računi mogu smanjiti potrošnju energije za 5 % do 10 %. (EEA, 2013.)

U sljedećoj su tablici sažeto prikazani rezultati Darbyjeva izvješća (Darby, 2006.) o 13 projekata davanja povratnih informacija:

Tablica 1: Uštede ostvarene neizravnim povratnim informacijama

Uštede:	Nije poznato	0 - 4 %	5 - 9 %	10 - 14 %	15 - 19 %	20 % i više
Studije neizravnih povratnih informacija (n = 13)	3	3	-	6	1	-

Međutim, važno je uočiti da je Europska agencija za okoliš (EEA, 2013.) zaključila da se čini da najuspješnija kombinacija mjera uključuje i izravne i neizravne povratne informacije kako bi se povećala svijest potrošača o potrošnji energije i zadržala motiviranost da se aktivno uključe u mjere energetske učinkovitosti. Alati za trenutačnu povratnu informaciju opisani su u poglavlju 2.4 ovog dokumenta.

2.3. Simulacijski, edukativni I alati za obuku

Danas se u edukaciji o energetskoj učinkovitosti susrećemo s novim izazovima. Studenti, škole i administratori kao institucije odmiču se od jednostavnog pružanja tehničke edukacije o pojedinačnim sastavnicama energetskih industrija prema sveobuhvatnijem programu koji se bavi i ekološkim, političkim, ekonomskim, kulturnim i etičkim kontekstima energetske pismenosti.

Od 1930-ih tri su glavna čimbenika polako oslabljivala pouzdanost i sigurnost energetskih tokova diljem svijeta. Prvo, nesigurnost opskrbe, posebice nafte, izazvala je velike geopolitičke napetosti i ratne sukobe. Drugo, onečišćenje zbog upotrebe fosilnih goriva i ostalih izvora energije naštetilo je lokalnom, regionalnom i globalnom zdravlju. Treće, i to posebice od 1990-ih, staklenički su plinovi od fosilnih goriva potaknuli brigu o destabilizaciji zemljine klime. Sve zajedno, navedeni čimbenici prijete dugoročnoj perspektivi čovječanstva.

Obrazovne institucije sporo odgovaraju na egzistencijalne prijetnje koje su rezultat energetskoga gospodarstva koje se uvelike temelji na fosilnim gorivima. U ovom se poglavlju govori o toj praznini u visokom obrazovanju te se zaključuje da se bavljenje potrebom energetske pismenosti studenata, fakulteta i administratora dotiče brojnih pitanja, od kojih je na neka jednostavno odgovoriti, dok druga zahtijevaju teži odgovor.

Neovisno o tome, edukacija o energiji predstavlja znatne izazove za studente, fakultet i administratore. Učenicima je teško jer takva edukacija često ili ne postoji ili ju je teško pronaći. Dodatno, zahtijeva najmanje nešto kvantitativnog razumijevanja, zbog čega mnogim studentima nije ugodno. Za razliku od toga, studentima orijentiranima na tehniku trebat će široko kontekstualno razumijevanje energije u njihovu radu kako bi nadopunili kvantitativne vještine, a možda ne postoje kolegiji koji se bave takvim potrebama. Općenito, energetski kolegiji i akademski programi i dalje su malobrojni i nepovezani.

Edukacija o energiji teška je za škole jer je riječ o novom polju velikih zahtjeva za međudisciplinarnim razumijevanjem. Podučavatelji se moraju i sami educirati, brinuti se o svojoj ovlaštenosti i položaju te o drugim nagradama za svoj rad te tražiti novu intelektualnu zajednicu. Nadalje, teško je i administratorima jer moraju ujednačavati resurse između novih i postojećih programa te zato je se mogu suočiti s protivljenjem i unutrašnjih i vanjskih jedinica.

Edukacija o energiji možda je teška, ali je izvediva. Fakulteti strojarstva i narodna učilišta nastavit će proizvoditi potrebne stručnjake za dizajniranje i rad energetske infrastrukture, no studiji održivosti i ekologije te ostala polja moraju nadopunjavati znanje inženjera i tehničara. Postojeći programi studija ekologije i održivosti već su se pokazali uspješnima u pružanju interdisciplinarne edukacije. Potičemo kolege da u sklopu tih programa prihvate izazove sveobuhvatnog interdisciplinarnog poučavanja i učenja o energiji, koja je primarni uzrok poremećaja klime, najveća prijetnja osim nuklearnog rata na putu prema održivosti. Klimatska promjena jedna je od ključnih promjena našeg vremena, a ulaganje u edukaciju o energiji ključno je kako bi se moglo odgovoriti na taj izazov. (Blockstein, 2015)

2.4. Alati za trenutačnu povratnu informaciju

Povratna informacija ključan je element učinkovitog učenja: to jednako vrijedi i u domaćem i u stranom okruženju. Postoje različite vrste povratnih informacija, a pregledana literatura sugerira da imaju ključnu ulogu u podizanju svijesti o energiji i promjeni stavova potrošača o potrošnji energije. Izravne povratne informacije obuhvaćaju niz sustava osmišljenih da daju trenutačan (u stvarnom vremenu) pristup informacijama o potrošnji energije na učestaloj ili kontinuiranoj bazi. (EEA, 2013.)

Primjeri izravnih povratnih informacija:

- izravni prikazi
- interaktivne povratne informacije računalom
- pametni mjerači
    - pokretani pametnim karticama
    - dvosmjerno (automatsko) mjerenje
- uređaji s okidačem / ograničavatelji potrošnje
- mjerači prethodnog plaćanja
- samoočitanje mjerača
- očitanje mjerača sa savjetnikom

- troškovni čepovi (engl. cost plug).

2.4.1. Izravni prikazi na monitorima zasebnima od mjerača

Izravni prikazi dodatak su mjeraču. Gotovo svi dostupni mjerači pokazuju potrošnju energije iako postoji jedan zabilježeni primjer prikaza koji je pokazivao potrošnju plina od prethodnog dana u vezi s ciljem koji je bio prilagođen vremenskim prilikama, što je rezultiralo uštedama od 10 % u odnosu na kontrolna mjerenja.

Uz samostojeći prikaz, mjerač može biti ostavljen bez nadzora kad se pričvrsti transponder. Stanovnici mogu pogledati u prikaze kako bi dobili trenutačne informacije i/ili informacije o prethodnoj potrošnji. Na tim istim prikazima mogu postaviti i alarm koji će se oglasiti kada opterećenje prijeđe prethodno zadanu razinu.

Uštede uglavnom iznose 10 % za relativno jednostavne prikaze (McLelland i Cook 1979.; Dobson i Griffin 1982.; Mountain 2006.). Riječ je o malim pločama koje se mogu prenositi po zgradi i koje uobičajeno pokazuju trenutačnu potrošnju struje zajedno s troškom po satu po trenutačnoj stopi. Najnoviji prikazi također pokazuju emisije ugljikova dioksida za danu stopu potrošnje. Cijena im je od 15 do 80 funti.

2.4.2. Upotreba televizora i osobnih računala za prikaz

Razvijaju se i složeniji prikazi poput složenog interaktivnog internetskog prikaza. Ono što se prije nekoliko godina smatralo kompliciranim zadatkom, danas, zahvaljujući napretku informatičke tehnologije, postaje jednostavno i prikladno rješenje. Brojna komercijalna društva pružaju usluge postavljanja mjerača potrošnje energije s izravnom vizualizacijom podatka na računalu, tabletu ili čak pametnom telefonu.

Takvi sustavi mjerenja često se koriste internetom za prijenos podataka i njihovo pohranjivanje na sigurnom daljinskom poslužitelju koji korisniku ili upravitelju zgradom omogućuje praćenje potrošnje energije bilo kojeg mjesta. Komercijalno postavljeni sustavi danas pružaju vrlo jasne i raščlanjene informacije (u tablici kao i u grafičkom obliku), što pomaže u postizanju ciljeva uštede energije. Mjerene se vrijednosti mogu izvesti za daljnju analizu. Na sljedećoj slici prikazan je primjer prikaza podataka na različitim uređajima.

Slika 1: Primjer prikaza podataka pametnog sustava mjerenja na različitim uređajima

Pregled (Darby, 2006.) 38 različitih projekata izravnih povratnih informacija koji su provedeni u različito vrijeme između 1975. i 2000. pokazao je potencijal nekih vrsta povratnih informacija za uštedu energije. Unatoč izazovima pri usporedbi, tumačenju, čak i kategoriziranju tih studija (jer sve sadržavaju različiti spoj elemenata), autor je zaključio da mjere povratnih informacija imaju važnu ulogu u poticanju svijesti o energiji i u očuvanju energije.

Proučavan je ukupno 21 projekt izravnih povratnih informacija, a u sljedećoj su tablici sažeto prikazani rezultati Darbyjeva izvješća (Darby, 2006.):

Tablica 2: Uštede ostvarene izravnim povratnim informacijama

Uštede:	Nije poznato	0 - 4 %	5 - 9 %	10 - 14 %	15 - 19 %	20 % i više
Studije izravnih povratnih informacija (n = 21)	-	2	8	7	1	3

Zadnje, ali ne manje važno, kao što je prethodno spomenuto, Europska agencija za okoliš u svojem je izvješću (EEA, 2013.) zaključila da je najuspješnija kombinacija mjera uključiti i izravne i neizravne povratne informacije.

2.5. Obrazovno-zabavni i gemifikacijski alati

Gemifikacijom se aktivnost iz stvarnog svijeta pretvara igru kako bi je ljudi lakše zavoljeli. Ljudski su mozgovi tako umreženi da uživaju u izazovima, pozitivnim povratnim informacijama i društvenom povezivanju koje nude igre. Napredak digitalne tehnologije jednostavno je pojačao utjecaj koji su igre oduvijek imale na nas. Tijekom proteklih pet godina pružatelji komunalnih usluga i pružatelji treće strane razvili su igre koje također motiviraju i potiču ljude na uštedu energije.

No, trebali bismo biti pozorni kako bismo razlikovali gemificirana rješenja od nagradnih programa s jedne i videoigara s druge strane. Nagradni programi, poput programa odanosti za putnike koji često putuju zrakoplovom, angažiraju ljude obećavajući im opipljivu nagradu za neku radnju. U gemificiranim rješenjima samo neki igrači mogu osvojiti takvu nagradu, a mogućnost osvajanja nagrade nije njihov jedini razlog zašto igraju. Na neki su način gemificirani programi više nalik videoigrama koje igračima nude zabavu i izazove. No, dok je jedini smisao videoigara zabaviti igrače, gemificirane aktivnosti ciljaju motivirati igrače na izvođenje stvarnih radnji. (Grossberg et al., 2015.)

Drugim riječima, dok je zabava jedini smisao videoigara, cilj je u gemifikaciji potpuno drugačiji i podrazumijeva motiviranje i poticanje ljudi na djelovanje. Gemificirana rješenja služe se zabavom kako bi angažirala igrače. Kako je to objašnjeno u Volkswagenovim videozapisima o Teoriji zabave (engl. Fun Theory), zabava je jedan od najsnažnijih alata kojima se možemo poslužiti kako bismo motivirali pozitivnu promjenu u ponašanju. Dizajniranje stepenica u obliku tipki glasovira u Stockhlomu rezultiralo je time da 66 % više ljudu radije odabire stepenice umjesto pokretnih stepenica.

Slika 2: Stepenice u obliku tipki glasovira u Stockhlomu

Skupina autora koja je radila n izvješću o Gemificiranim programima energetske učinkovitosti (Grossberg et al., 2015.) za svoju je studiju prikupila informacije o 53 igre, a namjena svake od njih bila je utjecati na ponašanje u pogledu energetske učinkovitosti i održivosti. Od te 53 igre, predstavili su studije slučaja 22 igre koje bi mogle biti ili koje zaista jesu dijelom komunalnog programa energetske učinkovitosti.

Uključuju:

- igre u kojima igrači sudjeluju u nizu aktivnosti uštede energije za koje su i nagrađeni
- izazove u vezi s uštedom energije u kojima se igrači natječu, pojedinačno ili u timovima kako bi uštedjeli najviše energije tijekom određenog vremenskog razdoblja
- igre koje se koriste granularnim podacima iz stvarnog vremena o upotrebi energije igrača povratnim informacijama za svoje djelovanje
- igre koje se uvelike koriste virtualnim svjetovima

Studija slučaja

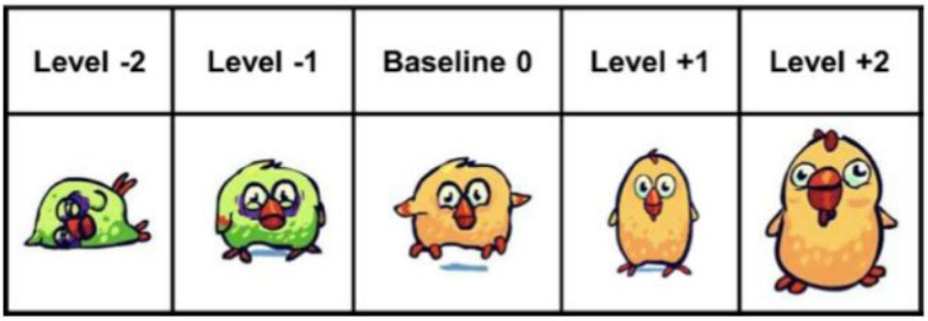
U ovom bismo alatu pojedinca voljeli upoznati s evaluiranim igrama pod nazivom „Energetski pilići" (engl. Energy Chickens").

Pod nazivom „Energetski pilići" krije se virtualna igra s ljubimcima koja uredske radnike motivira da štede energiju kojom se koriste uobičajeni uredski uređaji. Osmislio ju je tim istraživača sa sveučilišta Pennsylvania State University, a testirana je na 57 radnika u srednje velikom uredu tijekom šest mjeseci u razdoblju 2012. – 2013. (Orland et al. 2014.).

Na početku studije istraživači su utvrdili polazišnu točku potrošnje energije. Počevši u razdoblju prije igre, kampanja plakatima poticala je radnike da štede energiju Dva različita plakata (koja su se mijenjala svaki tjedan) bila su stavljena na visokofrekventna područja u uredu. Na njima su bili podsjetnici, primjerice „Isključi me" ili „Iskopčaj iz struje".

Tada je počela igra. Igrači su potpisali obećanje da će smanjiti svoju potrošnju energije za 15 % i svaki je igrač dobio komplet naljepnica „Isključi me" da ih postavi na svoje uređaje. Tada se na radnoj površini svakog igrača pojavila virtualna farma s do pet animiranih pilića. Svaki pilić na farmi odgovarao je jednom uređaju igrača. Kako su igrači iskapčali uređaje iz struje, isključivali ih i smanjivali njihovu upotrebu, tako su njihovi pilići napredovali i nesli jaja. Suprotno tomu, ako se njihova upotreba energije povećala, njihovi

su se pilići smanjili i izgledali su bolježljivo. Zdravlje pilića bilo je ocijenjeno ljestvicom s pet bodova (-2, -1, 0, +1, +2), pri čemu je osnovna vrijednost, odnosno neutralno zdravlje, iznosila „0". Navedene razine prikazane su na sljedećoj slici:



Slika 3: Razine zdravlja energetskih pilića. Izvor: Orland et al. 2014.

Pilići na razinama 0, 1 i 2 nesli su jaja. Ta su jaja predstavljala valutu koju su igrači mogli upotrebljavati u virtualnoj općoj trgovini pri prodaji artikala za farmu po cijeni od 5 do 200 jaja. Jeftiniji artikli uključivali su male šešire, cvijeće i ograde. Skuplji artikli uključivali su otmjenije šešire, grmove voća i patuljke. Nagrade igračima za postignuća u pogledu uštede energije bile su ograničene na virtualna jaja i robu. Istodobno je svaki igrač dobio 100 dolara za ispunjavanje anketa prije igre, nakon igre i dnevnih anketa u vezi s dobrobiti i produktivnosti.

Rezultati testa bili su impresivni. Istraživači su utvrdili 13 % ukupnog smanjenja potrošnje energije uređaja uključenih u struju dok se igrala igra. Posebice je iznenađujuće bilo smanjenje od 23 % uređaja uključenih u struju tijekom neradnih dana. Dodatno, 69 % sudionika kazalo je da su postali svjesniji u pogledu energije.

Cijelo izvješće zaključilo je da se gemifikacija ne bi trebala usredotočiti samo na uštede energije, već i na edukaciju. Kad je riječ o gemificiranim rješenjima uštede energije, možda je najbolje o njima misliti kao o kotačima koji pokreću obrazovanje, načinu kako ljude upoznati s intrinzičnim zadovoljstvom zbog vlastite svijesti o energiji nakon uklanjanja aparatusa igre. Činjenica je da je ušteda energije iznimna nagrada sama po sebi te da je najveće postignuće kojem igra može stremiti poticanje više oblika zadovoljstava koja su postojala i ranije, ali ih je trebalo otkriti.

2.6. Financijski i ekonomski poticaji

U energetskom se sektoru primjenjuju brojni ekonomski instrumenti. Sustavi oporezivanja energije diljem Europe razlikuju se zbog strukturnih značajki (postojeća infrastruktura) kao i zbog političkih izbora (podizanje prihoda zaštita/promicanje nacionalnih kompanija, međunarodna konkurentnost itd.).

Financiranje mjera energetske učinkovitosti provodi se ili putem središnje/lokalne vlasti u obliku subvencija za određena ulaganja (obično uključuje tehničku mjeru) ili privatnim ulaganjem na razini zajednice (npr. komunalije). U financijske i ekonomske poticaje ubrajaju se:

- subvencije
- pristojbe
- nadoplate
- porezi
- bonusi

- porezne diferencijacije
- povrati poreza
- financijski instrumenti kao što su beskamatni zajmovi

- nagrade i kazne.

Nagrade mogu biti učinkovite ako su dobro osmišljene. No, istraživanje je pokazalo da učinci nagrada i poticaja nisu uvijek dugotrajni – u većini slučajeva traju samo onoliko dugo koliko traje i sama intervencija. (Martiskainen, 2007.)

Tri istraživanja u sklopu projekta ERDP (Projekt istraživanja potražnje za energijom, engl. Energy Demand Research Project) uključivala su financijske poticaje kako bi se smanjila potrošnja, no samo je društvo Scottish Power uočilo smanjenja u potrošnji kad su se poticaji primijenili – samo u slučaju kreditnih korisnika s pametnim mjeračima i samo kratkoročno.

2.7. Alati temeljeni na natjcanju i društvenim mrežama

Društvene mreže i igre temeljene na natjecanju imaju veliku ulog u uštedama energije. Društvene mreže prilagođene su korisniku kako bi na središnje mjesto stavile uštedu. Sada je jasno, zahvaljujući bihevioralnim istraživačima, da novac nije najveći motivator u znatnoj upotrebi energije. Umjesto toga, ključne uloge imaju sljedeći čimbenici osjećaj pripadnosti postignuća, natjecanje, jednostavna upotreba, održivost. (huffingtonpost.com)

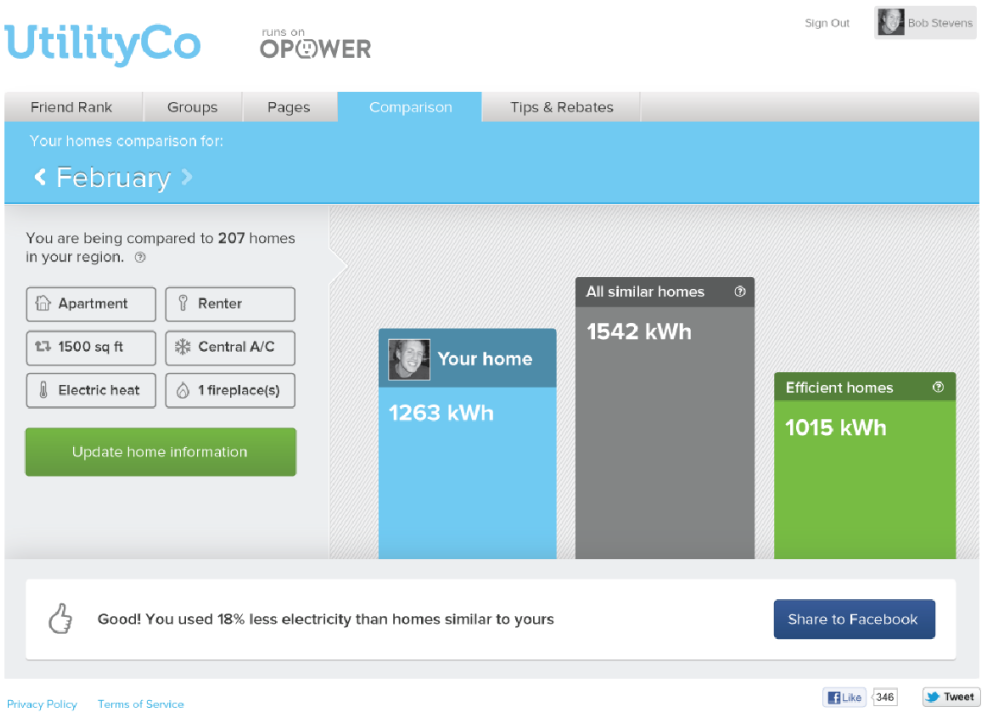
Zato društvene mreže sa svojim vezama, dijeljenjem, usporedbom i ažuriranjima u stvarnom vremenu mogu motivirati ljude na način na koji se to neće dogoditi ako istu informaciju komunicirate preko mrežne stranice, pamfleta u poslovnoj e-pošti ili reklamom n autobusu. Društvene mreže mogu ostvariti nekoliko ključnih zadataka. Mogu:

- kreirati način na koji se natječemo
- pametno dijeliti savjete
- ciljati poruku.

Skupina autora koja je radila n izvješću o Gemificiranim programima energetske učinkovitosti (Grossberg et al., 2015.) za svoju je studiju prikupila informacije o 53 igre, a namjena svake od njih bila je utjecati na ponašanje u pogledu energetske učinkovitosti i održivosti. Jedna od igara bila je Aplikacija za društvenu energiju Opower (engl. Opower Social Energy App) koja se koristi društvenim medijima te se temelji na natjecanju, što je čini savršenim primjerom za ovo poglavlje.

Aplikacija za društvenu energiju Opower mrežni je alat dostupan za pametne telefone, a razvijen je u partnerstvu s Facebookom i Vijećem za obranu prirodnih resursa (engl. Natural Resources Defence Council, NRDC). Marcy Scott Lynn, voditeljica programa održivosti u Facebooku, smatra „Namjena je aplikacije uštedu energije učiniti društvenim elementom te pokrenuti razgovor o postignućima energetske učinkovitosti kojih trenutačno nema" (Alliance, 2012.). Opower, NRDC i Facebook svoju su aplikaciju o društvenoj energiji pokrenuli 3. travnja 2012.

Aplikacija radi na Facebooku i izvan njega. Zahvaljujući integraciji na Facebooku, aplikacija Opower usmjerena je prema mlađoj publici koja je potpuno opuštena u pogledu društvenih mreža i dijeljenja vlastitih informacija na mreži. To može odvratiti neke korisnike kojima je energetska učinkovitost važna,a ali koji nisu spremni podatke o svojoj potrošnji objavljivati na svojim društvenim mrežama, iako pojedinac može odbiti poziv aplikacije Opower da „objavljuje na Facebooku u tvoje ime".



Slika 4: Usporedba upotrebe energije Opowera

Jedna od glavnih značajki aplikacije Opower jest usporedba vašeg doma sa sličnim domovima. To se može učiniti bez povezivanja na Facebook. Od vas će se zatražiti osnovne pojedinosti o vašem domu, počevši s iznosom prošlomjesečnog računa za struju. Nakon spremanja tih podataka, aplikacija uspoređuje vašu energetsku učinkovitost s usporedivim domovima diljem Sjedinjenih Američkih Država.

Nakon što se prijavite putem Facebooka, aplikacija Opower pita vas: „Smatraš se konkurentnim?" te nudi gumb na koji možete kliknuti da biste pozvali prijatelje. Kartica Skupina omogućuje vam stvaranje skupine prijatelja, suradnika ili susjeda, a s ciljem promicanja prijateljske konkurentnosti Nakon što se članovi skupine prijave i ostave svoje podatke, aplikacija Opower svaki mjesec generira izvješće u kojemu se rangiraju svaka osoba ili svako kućanstvo ovisno o njihovoj upotrebi energije.

Kartica Načini kako uštedjeti nudi savjete u kategorijama uređaja, hlađenja, grijanja, svjetlo, zagrijavanja vode i ostaloga. Klikom na svaki savjet otvaraju se dodatne informacije: objašnjenje o tome zašto je jer korisna, procijenjeni financijski troškovi i koristi te vrijeme potrebno da promjena postane isplativa sama po sebi. Objašnjenja su vrlo informativna i detaljna. Međutim, za razliku od nekih drugih igara u izvješću, ove su mjere tek preporuke, to jest, one nisu povezane s bodovima, značkama ili drugim virtualnim ili stvarnim nagradama (Grossberg et al., 2015)

3. Optimisation of energy demand with respect to energy tariffs

3.1. Introduction

The issue of energy tariffs is very broad and there are many different tariff models according to types of energy and also can vary across member states.

In case of electricity, energy suppliers allow users to use energy in different price levels – energy tariffs. Usually there are two energy tariffs - high tariff (HT) and low tariff (LT). During the day in certain periods low tariff is applied, in the rest of the time the high tariff. Low tariff is suitable mainly for devices with higher energy consumption i.e. electrical heating, accumulating water heating etc.

Thanks to price differences between the energy tariffs, the energy suppliers are able to reduce energy consumption in consumption peaks and establish a more balanced energy demand during the 24 hours of the day. The necessity of dividing the energy consumption is due to limited transmission capacity of the transmission system so the energy suppliers usually use this model of energy tariffs.

3.2. Building administrators – setting up of time management

Building administrator should have an overview of their current energy consumption and optimize the operation of their buildings according to energy tariffs – Set up appropriate time management and motivate building users to comply it.

Basic steps for setting up an appropriate time management:

- Discover the tariffs set in the energy supply contract
- If necessary change the contract for a more appropriate tariff
- Discover the current energy consumption profile of the building and compare it to the tariff schedule, find gaps
- Setting up a time management of the building in order to introduce a more appropriate energy consumption profile
- Communication/Promotion of the new time management to all staff/users of the building
- Regular time management compliance check

3.2.1. Discover the tariffs set in the energy supply contract

Each building administrator should have an overview of the energy sources used in the building. There are few basic questions each building administrator should be able to answer:

- What kind of energy supply contract has been arranged with energy supplier?
- What prices and conditions are set in the energy supply contract?
- Are the prices appropriate, does exist an offer with lower prices?
- Does the building use two tariffs (high tariff and low tariff)?
- If yes, at what time of the day are the tariffs switched?

If the building administrator knows the answers for this question the next step can be applied.

3.2.2. Current energy consumption profile of the building

In order to set up an energy consumption profile a chart of Building occupancy progress can be used in line with D.T.3.1.2 – Technical and users profile of the building. In addition to the data of building occupancy, monitored energy consumption can also be analysed where available to have an overview how the energy consumption correlates with the building occupancy.

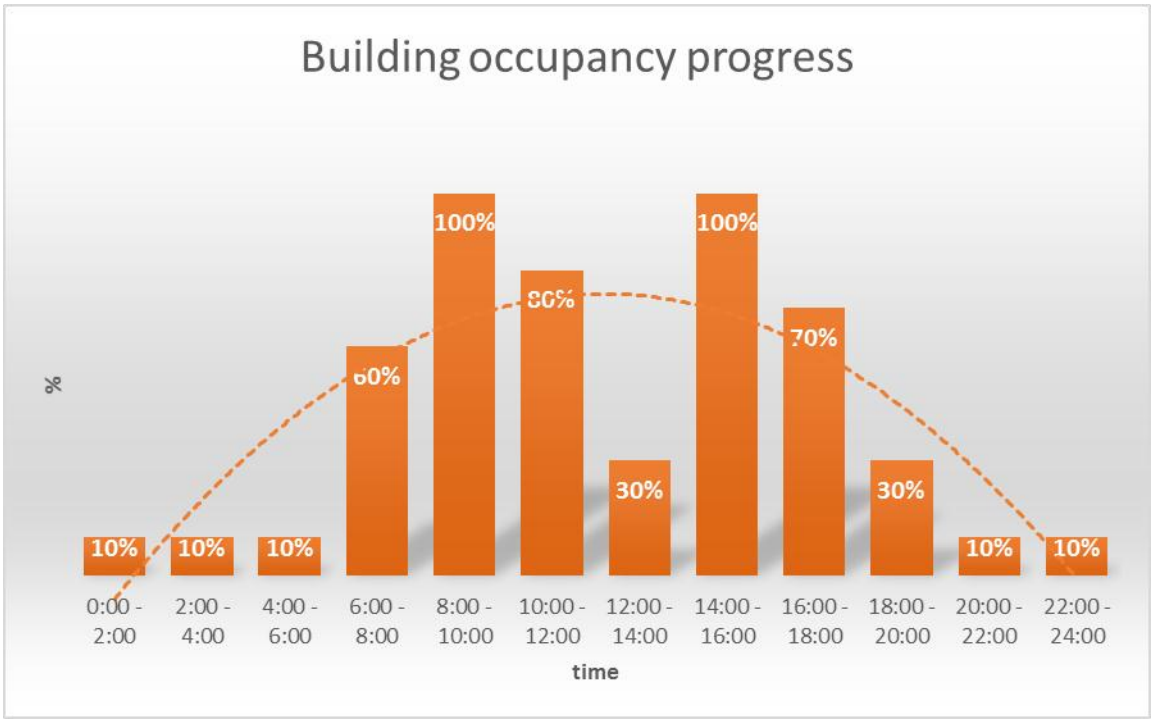


Figure 5: Building occupancy progress

Table 3: Building occupancy progress

Time of the day	% of occupancy of the building	Energy consumption (kWh)
0:00 - 2:00	10 %	-
2:00 - 4:00	10 %	-
4:00 - 6:00	10 %	-
6:00 - 8:00	60 %	-
8:00 - 10:00	100 %	-
10:00 - 12:00	80 %	-
12:00 - 14:00	30 %	-
14:00 - 16:00	100 %	-
16:00 - 18:00	70 %	-
18:00 - 20:00	30 %	-
20:00 - 22:00	10 %	-
22:00 - 24:00	10 %	-

Example:

It is obvious that in administrative buildings there are peaks in electric energy consumption in the morning when all the employees come to work and make a cup of tea or coffee. On the other hand, there is a valley in consumption when people go out for lunch.

All these cases should be monitored and described in Energy consumption profile of the building. The setting up of the measured energy consumption profile is simple using installed smart meters in the pilot buildings. If smart metering is not implemented, there is possibility for manual data collecting as well at least during office hours, ideally every 30 minutes. Based on this data it is easy to get an overview of energy consumption progress in the building.

3.2.3. Setting up a time management of the building in order to introduce a more appropriate energy consumption profile

In this step, the time management of the “consumption processes” is discussed. The approach of time management can be very specific and is usually based on the concrete situation in the building and its operation, therefore it is discussed through some examples on time management improvements as follows.

Project office - printing and plotting of documentation in off-peak period

All the employees of the project office can prepare the documentation of a project during office hours (which is usually within the high tariff period), but the printing and plotting of the documentation can be realised during low tariff periods. Due to the large number of documents it can lead to significant savings.

Optimization of working hours of the cleaning staff

Cleaning staff use hot water and in certain types of public buildings (schools, public administration office buildings) it is typically heated by electricity. For the hot water preparation it is advised to use low tariff. So it is good to optimize working hours of cleaning staff according to the energy tariff – in LT periods or if hot water is prepared using storage tanks with programmable thermostat immediately after the LT periods to have enough hot water (to avoid water heating in HT periods).

Shift work in the building

In case of shift work in the building it is recommended to strengthen shift load during low tariff periods and reduce shift load during high tariff periods.

Connection of accumulation devices to tariff switch

The accumulation devices (electric hot water production or room heating with buffer tanks)should be directly connected to tariff switches and heat generation should work only during LT periods.

3.2.4. Communication/Enforcement of the new time management to all users of the building.

The users have to be familiar with the new time management to be able to follow it. Ways of promotion can be different according to the building function and the type of users:

- Educational buildings
- Administrative buildings
- Building for health services
- Building for sport activities
- Cultural buildings

The approach of promotion and enforcement of new time management is very different according to the type of users of the building. It is not possible to elaborate one common scheme for promoting the newly introduced time management. The easiest way of promotion can be realized in **educational buildings**, where pupils/students can directly participate in the "new" activities within games or contests (actions on behavioural change for improving energy efficiency). Users of **administrative buildings** are different – they are adults, they spent 8-9 hours per day on average in the building, they work in the building and must fulfil their duties. Therefore the fulfilment of the new time management should be part of their duties and they can be motivated positively (rewards for compliance the rules) or negatively (penalties). In other building types (b**uilding for medical services, buildings for sport activities, cultural buildings, etc.**) can be characterised by many different users during the day who visit the building just for short periods. The promotion and engagement of them is not an easy task and can be based on posters, notes, stickers, etc.

3.3. Building users – time management compliance

Building users have different engagement and relationship to the building depending on the building function (educational, administrative, etc. - see chapter above) and the type of users. Building administrators must check time management compliance according to the building type and should choose different approaches for different type of users such as:

- Adult / children
- Visitors / permanent users

Thus, there are 4 combinations of users, which requires different approaches:

- Adult visitors
- Adult permanent users
- Children visitors
- Children permanent users

Certainly, further classification might be necessary in special cases.

3.3.1. Adult visitors

Adult visitors can be informed about measures taken in the building, but they cannot be forced to take actions. The time management can be realised by opening hours, lighting regulation rules during the day, but definitely not by forcing any behavioural change of the visitors. Information posters and signs might have an effect.

3.3.2. Adult permanent users

Adult permanent users of public buildings are mainly staff of the building (i.e. administrative building). Their behaviour can be monitored and can be influenced by many different positive or negative motivation actions (as described in previous chapter).

3.3.3. Children visitors

This group is very similar to the first one (adult visitors). The time management can optimize only operational measures, which are not based on behavioural change of the building users. It is very difficult to realize any behavioural change on children visitors.

3.3.4. Children permanent users

Children permanent users are students or pupils of school building. This group of users is probably the easiest for setting up a new time management and checking its compliance. There defined schedule can be closely linked to the time management. It is easy to monitor who stayed where and when and in case of any rule violation who should be warned/punished. The compliance check can be taken as a game for pupils i.e. a supervisor can be appointed to checks if the lights are off when leaving the class.

4. Conclusion

In the first part of this tool, authors have provided the reader with basic information about possible measures that can be taken or actions that can be used in order to achieve energy savings by behavioural change of the building users. It specially focused on possible ways how to motivate the user to save energy.

During the processing of the topic and literature study, it became clear that some of the introduced tools are becoming very popular (mainly the untraditional ones) and other (traditional methods) are becoming obsolete. Studies have proven that for example financial motivation is not so significant and lasting as for example more untraditional methods as creating a competition between users or for example transferring energy saving in to a game. This is especially notable in this age full of information technology (with smartphones and social media) which makes it easy to collect, process, visualize and share the data.

In chapter 3 time management issues are discussed to profit from different energy tariffs during the day. However such actions are possible, only when differentiated tariffs available.

Different building types require different DSM actions, because of users have different relationship with the building. From this aspect buildings can be classified as follows:

- Buildings occupied by regular users with main activity of learning
- Buildings occupied by permanent staff
- Buildings occupied by users of occasional activities
- Buildings occupied by regular users with main activity of living

A personalised toolset for the listed building types can be found in the annex.

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Glossary

EAV	-	Energy Agency Vysočiny
EE	-	Energy Efficiency
EPIC	-	Energy Performance Integrated Contract
HT	-	High Tariff
LP	-	Lead partner
LT	-	Low Tariff
PP	-	Project Partner
SIEA	-	Slovak Innovation and Energy Agency (SIEA)

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Appendix: DSM toolsets for characteristic building types

4.1. Buildings occupied by regular users with main activity of learning

Building types:

schools, kindergardens, university buildings

User characteristics:

This building type can be characterised by different users. First, permanent staff (mostly teachers, but also administrators, maintenance staff) working all year long weekdays in office hours. In summer their presence is significantly decreased for 1-2 months. Second, students, children (in kindergardens) who can be considered also as permanent users, with similar occupancy profile as teachers, but in certain caes they spend less hours than teachers in the building. Third, cleaning staff working mostly early mornings and/or late afternoons. Their number is low, but their behaviour can have a significant impact on the building's energy consumption. Forth, in certain building types there are also visitors, like parents in kindergardens or primary schools who also might have an impact on energy use (entrance door left open).

<table>
<tr><td colspan="3">Building characteristics:

These buildings often have a significant heat loss through the roof and to the ground due to low number of floors. The glazed ratio is also often high to increase daylight, so shading and the appropriate use of shading can be important. The most significant energy demand belongs to heating, particularly in kindergardens, where high indoor air temperatures are maintained for the childrens' comfort. Hot water consumption is moderate in these buildings. Cooling is not typical, because the hot periods overlaps with summer brakes. Demand on fresh air is high influencing heating energy demand. Some buildings are equiped with central mechanical ventilation system. Lighting is often switched on, particulary during winter season.</td></tr>
<tr><td colspan="3">Main behavioural problems:
• Overheating to avoid any complaints
• Not proper use of programmed heating (if exists)
• Entrance door opened many times in the mornings and in the afternoons when workers / students / children arrive or leave the building
• Windows left open in the brakes too long or left open after leaving the room
• Lights left on after leaving the classroom
• Lights left on in common spaces after closure
• Wasting water for cleaning
• Taps left open
• Hot water temperature set too high</td></tr>
<tr><td>Stakeholders involved:</td><td>Objectives, tasks and responsabilities:</td><td>DSM actions to engage stakeholder:</td></tr>
<tr><td>Building owner:

Municipality</td><td>• Signing the most appropriate contract with utility companies
• Setting up energy performance contract with building manager
• Fund raising and cost allocation on EE investments
• Invest in:</td><td>• Financial and economic incentives
• Education and training tools</td></tr>
</table>

	○ audits ○ smart metering system ● trainings and DSM and communication actions ● small (and large) EE measures	
Building manager	● Get informed ○ know the building ○ know the users ○ know the consumption ○ be aware of gaps and problems ○ discover the current energy consumption profile ○ participate in trainings ○ study audits and certificates about the building ● Ensure proper settings for an efficient use of building shell and technical building systems ○ appropriate thermostat program for heating, hot water and cooling, etc. ● Prepare decision making: ○ recommendation for EE investments ○ recommendation to change for proper contract with utilities ○ setting up a time management for a more appropriate energy consumption profile ● Communication with owner ● Communicate proper building use with occupants ● Communicate roles and tasks (e.g. with cleaning staff) ● Organise discussions and events ● Prepare and install information panels, signs, instructions ● Regular time management compliance check	● EPC (energy performance contract) ● Bonuses ● Education and training tools ● Information delivery tools: ○ indirect feedback (utility bills) ○ more frequent bills / reading of meters ● Instant feedback tools ○ Smart meters ○ Direct displays ○ Interactive feedback via a PC

Building occupants: Students	• Learn how to use the building in an efficient way and act: o switch off lights after use o close taps after use o close windows and external doors after use o use proper cloths for the season to avoid discomfort and complaints	• Education and training tools • Instant feedback tools o Direct displays on energy consumption • Edutainment and gamification tools • Competition based and social networking tools • Social awards (e.g. green energy class) • Information panels, signs, posters placed on the proper place
Children (kindergarden)	• Learn environmental basics • Learn to avoid wasting water and ressources • close taps after use • learn to use water saving toilet flush	• Education and training tools (applied by teachers) • Edutainment and gamification tools • Information panels, signs, posters placed on the proper place
Teachers and administrators	• Learn how to use the building in an efficient way and act: o switch off lights after use o close taps after use o close windows and external doors after use o use proper cloths for the season to avoid discomfort and complaints o etc. • Help in educating students and children on the o importance of saving resources	• Financial, economic and social incentives o bonuses o rewards and penalties o social awards • Information panels, signs, posters placed on the proper place

	o on the efficient use of the building	
Cleaning and maintenance staff	• Learn how to use the building in an efficient way and act: o switch off lights when left on o close taps after use o avoid wasting water o close windows and external doors when left open o use proper cloths for the season to avoid discomfort and complaints o etc. • Maintain information panels and signs on EE installed in the building	• Education and training tools • Financial, economic and social incentives o bonuses o rewards and penalties o social awards • Information panels, signs, posters placed on the proper place
Building visitors: parents	• Learn how to use the building in an efficient way and act: o close external doors after entering/leaving or when found open o dress children in proper cloths for the season to avoid discomfort and complaints o etc.	• Information panels, signs, posters placed on the proper place

4.2. Buildings occupied by permanent staff

<table>
<tr>
<td>  </td>
<td>  </td>
<td>Building types:

municipal administration buildings, governmental administration buildings office buildings</td>
</tr>
<tr>
<td colspan="3">User characteristics:

The most important user type in this building category is the permanent administrative staff working all year long weekdays in fix office hours. Cleaning staff is also important, they work mostly early mornings. Their number is low, but their behaviour can have a significant impact on the building’s energy consumption. Finally, usually there are also public visitors who also might have an impact on energy use (entrance door left open, taps left running).</td>
</tr>
<tr>
<td colspan="3">Building characteristics:

These buildings often have a significant heat loss through windows if glazed ratio is high in order to increase daylight, so shading and the use of shading can be important. The most significant energy demand belongs to heating and in certain cases</td>
</tr>
</table>

cooling. Hot water consumption is moderate in these buildings. Cooling is frequently applied, because staff must be dressed in a formal way no matter what the weather is like. Some buildings are equiped by central mechanical ventilation system. Lighting is often switched on, particulary during winter season.		
Main behavioural problems: • Overheating /overcooling, particularly in case of employees working near large glazed areas to avoid comfort complaints • Overcooling because of too formal dressing requirements • Not proper use of programmed heating and cooling (if programmable thermostat exists at all) • Entrance door opened many times when workers or visitors arrive or leave the building • Windows left open when heating / cooling system running • Not properly used shading in winter • Not properly used shading in summer • Lights on during daytime, because tables are not positioned well to achieve enough daylight • Lights left on after leaving the office • Lights left on in common spaces after closure • Office equipment running when not used • Office equipment running during peak electricity periods • Hidden consumption of office equipment out of office hours (low power mode) • Wasting water for cleaning • Taps left open • Hot water temperature set too high		
Stakeholders involved:	**Objectives, tasks and responsabilities**	**DSM actions to engage stakeholder**
Building owner: *Municipality*	• Signing the most appropriate contract with utility companies • Setting up energy performance contract with building manager • Fund raising and cost allocation on EE investments • Allow casual dressing for the staff if possible,	• Financial and economic incentives • Education and training tools

	particularly in hot periods • Invest in: o audits o smart metering system o trainings and DSM and communication actions o small (and large) EE measures	
Building manager	• Get informed o know the building o know the users o know the consumption o be aware of gaps and problems o discover the current energy consumption profile o participate in trainings o study audits and certificates about the building • Ensure proper settings for an efficient use of building shell and technical building systems o appropriate thermostat program for heating, hot water and cooling, etc. • Prepare decision making: o recommendation for EE investments o recommendation to change for proper contract with utilities o setting up a time management for a more appropriate energy consumption profile • Communication with owner • Communicate proper building use with occupants o Communicate roles and tasks (e.g. with cleaning staff) o Organise discussions and events o Prepare and place information panels, signs,	• EPC (energy performance contract) • Bonuses • Education and training tools • Information delivery tools: o indirect feedback (utility bills) o more frequent bills / reading of meters • Instant feedback tools o Smart meters o Direct displays o Interactive feedback via a PC

	instructions on proper places • Regular time management compliance check	
Building occupants: Administrative staff	• Learn how to use the building in an efficient way and act: o switch off lights after use o switch off office equipment when not used o avoid hidden consumption (switch off LOPOMO) o close taps after use o close windows and external doors after use o don't open windows in case of mechanical ventilation o use shading devices in a proper way o wear proper cloths for the season to avoid discomfort and complaints o etc.	• Financial, economic and social incentives o bonuses o rewards and penalties o social awards • Information panels, signs, posters placed on proper places
Cleaning and maintenance staff	• Learn how to use the building in an efficient way and act: o switch off lights when left on o close taps after use o avoid wasting water o close windows and external doors when left open o use proper cloths for the season to avoid discomfort and complaints (casual cloths when allowed) o etc. • Maintain information panels and signs on EE installed in the building	• Education and training tools • Financial, economic and social incentives o bonuses o rewards and penalties o social awards • Information panels, signs, posters placed on the proper place
Building visitors:	• Learn how to use the building in an efficient way and act: o close external doors after entering/leaving or	• Information panels, signs, posters placed on the proper place

parents	when found open o dress children in proper cloths for the season to avoid discomfort and complaints o etc.	

4.3. Buildings occupied by users of occasional activities

Building types:

cultural buildings, conference halls, libraries, museums, concert halls, theaters, cinemas, sport centers, swimming pools, health centers, hospitals

User characteristics:

The most important user type in this building category is represented by the visitors who come into the building only oocasionally for a couple of hours to do sporting activities, to entertain or to spend free time. Opening hours varies according to the function, in sport buildings all day long, except nights, for theaters in the evenings, for museums during daytime. Most buildings are open whole year long, all days of the week. There is a smaller user group, the permanent operating staff for technical, service, administrative and cleaning purposes. Cleaning and technical staff have an imortant role, because their behaviour can have a significant impact on the building's energy consumption. Health centers and hospitals are slightly different, becasue the permanent medical staff has a significant role as well.

Building characteristics:

These buildings often have a compact building shell with low glazed ratio, but there are examples for the opposite case (large glazed facades for representative purposes). The most significant energy demand belongs to heating, ventilation and in certain cases cooling. Hot water consumption is moderate in these buildings except for sport centers and swimming pools where visitors often take a shower. Central mechanical ventilation and climatisation is frequently applied, because natural ventilation is often not sufficient and internal heat loads are high due to the high number of visitors. Artificial lighting has an important role as well, paricularly in case of low glazed ratio when they must continuously be swiched on during operating hours.

In addition, in case of certain functions there is an important technological energy demand and internal heat load: special lighting equipment and stage technology in theaters, cine-projectors in cinemas, lighting for exhibition items, swimming pool technology, hospital technology, etc.

Main behavioural problems:

- Taps left open
- Not proper use of programmed heating, cooling and mechanical ventilation (if programmable thermostat exists at all)
- Entrance door left open when visitors arrive or leave the building
- Windows left open
- Lights left on after closure
- Wasting water for cleaning
- Hot water temperature set too high
- Energy waste related to technology:
  - Pools left open out of operating hours (cover foil recommended)
  - Hidden (low power mode) consumption of technological units out of operating hours
  - etc.

Stakeholders involved:	**Objectives, tasks and responsabilities**	**DSM actions to engage stakeholder**
Building owner:	• Signing the most appropriate contract with utility companies	• Financial and economic incentives

Municipality	• Setting up energy performance contract with building manager
	• Fund raising and cost allocation on EE investments
	• Invest in:
	  o audits
	  o smart metering system
	  o trainings and DSM and communication actions
	  o small (and large) EE measures
		• Education and training tools

Building manager	• Get informed
	  o know the building
	  o know the users
	  o know the consumption
	  o be aware of gaps and problems
	  o discover the current energy consumption profile
	  o participate in trainings
	  o study audits and certificates about the building
	• Ensure proper settings for an efficient use of building shell and technical building systems
	  o appropriate thermostat program for heating, hot water and cooling, etc.
	• Prepare decision making:
	  o recommendation for EE investments
	  o recommendation to change for proper contract with utilities
	  o setting up a time management for a more appropriate energy consumption profile
	• Communication with owner
	• Communicate proper building use with occupants
	  o Communicate roles and tasks (e.g. with cleaning staff)
		• EPC (energy performance contract)
		• Bonuses
		• Education and training tools
		• Information delivery tools:
		  o indirect feedback (utility bills)
		  o more frequent bills / reading of meters
		• Instant feedback tools
		  o Smart meters
		  o Direct displays
		  o Interactive feedback via a PC

	○ Organise discussions and events • Prepare and place information panels, signs, instructions on proper places • Regular time management compliance check	
Building occupants: Permanent staff Cleaning and maintenance staff	• Learn how to use the building in an efficient way and act: ○ switch off lights after use ○ switch off technological equipment when not used ○ avoid hidden consumption (switch off LOPOMO) ○ close taps after use ○ check regularly and close windows and external doors ○ don't open windows in case of mechanical ventilation ○ use shading devices in a proper way ○ wear proper cloths for the season to avoid discomfort and complaints ○ etc.	• Education and training tools • Financial, economic and social incentives ○ bonuses ○ rewards and penalties ○ social awards • Information panels, signs, posters placed on proper places
Building visitors	• Learn how to use the building in an efficient way and act: ○ close taps after use ○ switch off lights after use (e.g. in toilets) ○ close external doors after entering/leaving or when found open (if not automatic) ○ etc.	• Information panels, signs, posters placed on the proper place

4.4. Buildings occupied by regular users with main activity of living

<table>
<tr>
<td>  </td>
<td>  </td>
<td>Building types:
dormitories, senior homes, homeless shelters</td>
</tr>
<tr>
<td colspan="3">User characteristics:
This building type can be characterised by different users. First, permanent tenants (in dormitories students, in senior homes elderly or disable people) who might show various behavioural pattern. Second, staff (teachers, administrators, medical staff, social workers) working all year long, partly full day, partly in weekdays during office hours. In dormitories occupancy is decreased in summer except in touristic areas where they are often used as used hostels. Third, cleaning staff working in certain periods of the day. Their number is low, but their behaviour can have a significant impact on the building’s energy consumption. Forth, in dorms there can be events, like parties in certain evenings with a high number of young external guests and internal tenants. During such events high ventilation rates and cooling demand might appear.</td>
</tr>
<tr>
<td colspan="3">Building characteristics:</td>
</tr>
</table>

<table>
<tr><td colspan="3">These buildings can be various in size and shape (particularly dorms). The most significant energy demand belongs to heating, but hot water consumption is also important. Cooling and ventilation are not typical to keep investment and operation costs low. Some part of the buildings used for common activities (party rooms, dining rooms) can be equipped with mechanical ventilation system. Lighting in common spaces is often switched on, which might be inevitable for safety reasons to support disabled people.</td></tr>
<tr><td colspan="3">Main behavioural problems:
Overheating to avoid any complaints
Not proper use of programmed heating (if exists)
Entrance doors opened
Windows left open in common rooms
Windows left open in private rooms
Lights left on in common rooms
Lights left on in private rooms
Wasting water for taking a shower
Taps left open in common bathrooms
Hot water temperature set too high
Office equipment (laptops) not switched off when not used (in dorms)
TVs running all day long in senior homes</td></tr>
<tr><td>Stakeholders involved:</td><td>Objectives, tasks and responsabilities:</td><td>DSM actions to engage stakeholder:</td></tr>
<tr><td>Building owner:

Municipality</td><td>Signing the most appropriate contract with utility companies
Setting up energy performance contract with building manager
Fund raising and cost allocation on EE investments
Invest in:
audits</td><td>Financial and economic incentives
Education and training tools</td></tr>
</table>

	○ smart metering system ● trainings and DSM and communication actions ● small (and large) EE measures	
Building manager	● Get informed ○ know the building ○ know the users ○ know the consumption ○ be aware of gaps and problems ○ discover the current energy consumption profile ○ participate in trainings ○ study audits and certificates about the building ● Ensure proper settings for an efficient use of building shell and technical building systems ○ appropriate thermostat program for heating, hot water and cooling, etc. ● Prepare decision making: ○ recommendation for EE investments ○ recommendation to change for proper contract with utilities ○ setting up a time management for a more appropriate energy consumption profile ● Communication with owner ● Communicate proper building use with occupants ● Communicate roles and tasks (e.g. with cleaning staff) ● Organise discussions and events ● Prepare and install information panels, signs, instructions ● Regular time management compliance check	● EPC (energy performance contract) ● Bonuses ● Education and training tools ● Information delivery tools: ○ indirect feedback (utility bills) ○ more frequent bills / reading of meters ● Instant feedback tools ○ Smart meters ○ Direct displays ○ Interactive feedback via a PC
Building occupants:	● Learn how to use the building in an efficient way and act:	● Education and training tools ● Instant feedback tools

Tenants	o switch off lights after use o close taps after use o close windows and external doors after use o use proper cloths for the season to avoid discomfort and complaints o switch of TVs and laptops after use (LOPOMO not enough)	o Direct displays on energy consumption • Edutainment and gamification tools • Competition based and social networking tools • Social awards (e.g. green energy class) • Information panels, signs, posters placed on the proper place
Permanent supporting and administrative staff	• Learn how to use the building in an efficient way and act: o switch off lights after use o close taps after use o close windows and external doors after use o use proper cloths for the season to avoid discomfort and complaints o etc. • Help in educating tenants on the o importance of saving resources o on the efficient use of the building	• Financial, economic and social incentives o bonuses o rewards and penalties o social awards • Information panels, signs, posters placed on the proper place
Cleaning and maintenance staff	• Learn how to use the building in an efficient way and act: o switch off lights when left on o close taps after use o avoid wasting water o close windows and external doors when left open o use proper cloths for the season to avoid discomfort and complaints	• Education and training tools • Financial, economic and social incentives o bonuses o rewards and penalties o social awards • Information panels, signs, posters placed on the proper

	o etc. • Maintain information panels and signs on EE installed in the building	place
Building visitors: relatives	• Learn how to use the building in an efficient way and act: o close external doors after entering/leaving or when found open o dress children in proper cloths for the season to avoid discomfort and complaints o etc.	• Information panels, signs, posters placed on the proper place