OPTIMIZED ENERGY, AESTHETICS, ECONOMY & FUNCTIONALITY:
THE PHOTOVOLTAIC ROOF T.C.R. (Triactive Core Roof)
BY DESINGERGY

KIEV ENERGY FORUM 23 NOVEMBER 2017
DANIEL LEPORI CEO
THE EVOLUTION OF ROOFING

TRADITIONAL SOLUTION

PV SYSTEM
ON THE ROOF

<table>
<thead>
<tr>
<th>PV MODULS</th>
</tr>
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<tr>
<td>TILES</td>
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<tr>
<td>OTHER PROTECTIVE LAYERS</td>
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THE EVOLUTION OF ROOFING

TRADITIONAL SOLUTION

- PV SYSTEM ON THE ROOF
- PV MODULS
- TILES
- OTHER PROTECTIVE LAYERS

NEWER SOLUTION

- BIPV REPLACES ONLY THE TILES
- PV MODULS
- OTHER PROTECTIVE LAYERS
THE EVOLUTION OF ROOFING

TRADITIONAL SOLUTION

PV SYSTEM ON THE ROOF

PV MODULS
TILES
OTHER PROTECTIVE LAYERS

NEWER SOLUTION

BIPV REPLACES ONLY THE TILES

PV MODULS
OTHER PROTECTIVE LAYERS

DESIGNERGY SOLUTION

T.C.R. FULL INTEGRATION

TCR ELEMENTS
TCR: FULLY INTEGRATED SOLUTION

- **Clean Energy with Solar PV**
- **Double Water Protection**
- **Integrated PV Modules -> Installation of Roof in One Single Operation**
- **Thermal Insulation for Saving Energy**

Several patents granted and pending
DESIGNERGY = DESIGN + ENERGY
TAILORED DUMMY MODULES

NARROW ANGLES EASILY COVERED

CHIMNEYS AND ROOF WINDOWS
FULLY INTEGRATED
A COMPLETE ROOF SYSTEM

TAILORED METAL SHEET PARTS:

- WATER PROTECTION
- VENTILATION
- AESTHETICS
SIMULATION SOFTWARE: EASY ROOF CALCULATION

BASED ON GOOGLE MAPS DATABASE
A COMPLETE PROJECT EASILY DEVELOPED: POWER, ENERGY, CAD DRAWINGS AND PART-LIST
### FOR PITCHED ROOF

#### BEST IN THE WORLD

<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>TCR 2100 “PREMIUM”</th>
<th>TCR 610 “STANDARD”</th>
<th>TCR 310 “ECO”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photovoltaic Power (Wp)</td>
<td>240 with 54 Cells</td>
<td>255 with 60 Cells</td>
<td>250 with 60 Cells</td>
</tr>
<tr>
<td>Compression Load (kg/m²)</td>
<td>&gt;1000</td>
<td>&gt;540</td>
<td>&gt;240</td>
</tr>
<tr>
<td>Watertight Layers (#)</td>
<td>3</td>
<td>3</td>
<td>1 (3)</td>
</tr>
<tr>
<td>Integrated Solution</td>
<td>Yes</td>
<td>Yes</td>
<td>No (Yes)</td>
</tr>
<tr>
<td>Lightning Protection Grid</td>
<td>Yes</td>
<td>Yes</td>
<td>No (Yes)</td>
</tr>
<tr>
<td>Thermal Isolating Material</td>
<td>Rockwool</td>
<td>PET- Foam (Rockwool)</td>
<td>PET- Foam (Rockwool)</td>
</tr>
<tr>
<td>Metallic Components</td>
<td>Anodized Aluminium</td>
<td>Galvanized Steel</td>
<td>Galvanized Steel</td>
</tr>
<tr>
<td>Lamination Materials Photovoltaic</td>
<td>Glass-Glass</td>
<td>Glass-Glass</td>
<td>Glass-Glass (Glass-Backsheet)</td>
</tr>
<tr>
<td>Expected Lifetime (Years)</td>
<td>40 +5</td>
<td>30 +5</td>
<td>20 +5</td>
</tr>
<tr>
<td>Walkable</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes (No in case of Glass-Backsheet)</td>
</tr>
<tr>
<td>Replaceable PV Modules</td>
<td>Yes (No)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Swiss made</td>
<td>Yes</td>
<td>Produced in Switzerland</td>
<td>Produced in Switzerland</td>
</tr>
<tr>
<td>Price Comparison (€/m²)</td>
<td>100%</td>
<td>75%</td>
<td>50%</td>
</tr>
</tbody>
</table>

( ) Optional

All values are an example and subject to change.
CASE 1 BARBENGO-LUGANO INDUSTRY WITH DESIGNERGY SUPERMODULES

ENGINEERING AND PRODUCTION OF PRE-ASSEMBLED SUPERMODULES (1mx10m) including everything from ceiling to solar photovoltaic module:
- EASIER TRANSPORTATION
- QUICK INSTALLATION
- LESS OPERATIONS ON BUILDING SITE

LESS PROBLEMS = PROFIT

www.designergy.ch
Supermodules are transported directly from the factory to the construction site by truck...

... and mounted in just a few minutes
CASE 1 BARBENGO-LUGANO INDUSTRY WITH DESIGNERGY SUPERMODULES

- 6500 sqm, 1MWp, Lugano – Production industry Hall with Supermodule
- Renovation of 40 years old ethernit-asbesto roof
6500 sqm, 1MWp, Lugano – Production Hall with Supermodule
Utility buys at an interesting price module and rights to use electricity 30 years
Building owner gets a… NEW ROOF FOR FREE!!!
CASE 1 BARBENGO-LUGANO INDUSTRY WITH DESIGNERGY SUPERMODULES

- BARBENGO/LUGANO is an IMMENSE SUCCESS SO FAR (60% faster than planned);
- In this picture 50% is done (left part) while the planning was expecting only 30% done!
T.C.R. - Triactive Core Roof

CASE HISTORY “GENEVA/10”

"SURELEVATION D’UN IMMEUBLE DE LOGEMENT” – ELEVATION OF A RESIDENTIAL BUILDING SUPPORTED AS SFOE PILOT PROJECT
CASE 2 GENEVA RESIDENTIAL WITH DESIGNERGY TCR

PROJECT GENEVA/10 with Designergy TCR system Vs. Traditional solution:
Total Area 1000 sqm
Total Power 97 kW
Energy production 100,000 kWh/year

COSTS
TRADITIONAL SOLUTION - NO PV:
Concrete flat roof, with no PV installation, expected life 15-20 years
646,000 CHF (according to quotations)

DESIGNERGY TCR SOLUTION - WITH PV (as-built):
2 sides with metal structure with inclination 6° + 1 flat roof for HVAC and technical installation + PV with Designergy TCR system, expected life 30-40 years
660,000 CHF (according to quotations and execution)

DELTA (PV included only in Designergy)
4% (in 2016 but in 2017 <0% ➔ Designergy costs less than a standard roof)
Savings for PV production
about 15,000-20,000 CHF/year for 30-40 years (the roof is basically for free)
Benefit for PV installation:
not considered in this calculation

THE ROOF WILL BE FOR FREE AS IT GETS PAID BACK BY THE SALE OF UNSUBSIDIZED ELECTRICITY OR THE ELECTRICITY IS BASICALLY FOR FREE AS THE DELTA BETWEEN THE STANDARD SOLUTION AND THE DESIGNERGY SOLUTION IS INSIGNIFICANT!!!!

www.designergy.ch
CASE 2 GENEVA RESIDENTIAL WITH DESIGNERGY TCR

BUILDING CONCEPT

work in progress

finished roof

www.designergy.ch
55 sqm, 8 kWp – E-mobility parking/charging for 3 electric cars plus second life recycled car-battery used as stationary buffer battery; the energy from solar roof and the buffer battery allows the three cars to drive 40’000 km per year! Yearly petrol savings from own produced electricity: 4000CHF!!!!

THE BUILDING WILL BE FOR FREE AFTER 25 YEARS OF PETROL SAVINGS!!!!
4) PORTFOLIO

750 sqm, 90 kWp, Switzerland – Production hall – Project winner of SIMULATED PRODUCTION: 79’000 kWh/Year
REAL PRODUCTION: >90’000 kWh/Year
2000 sqm, 280 kWp, Bern - Production Hall
PORTFOLIO - NEW – Q3 2017

2000 sqm, 280 kWp, Bern - Production Hall – During installation
2000 sqm, 280 kWp, Bern - Production Hall – During installation
PORTFOLIO

100 sqm, 7 kWp, Switzerland - Residential
PORTFOLIO

100 sqm, 7 kWp, Switzerland - Residential
PORTFOLIO

170 sqm, 23 kWp, Switzerland - Warehouse
PORTFOLIO

105 sqm, 10kWp, Switzerland – Residential (TCR 2000)

120 sqm, 11kWp, Switzerland – Residential (TCR 600)
TCR IS A 360° TOTAL SOLUTION

- CONSTRUCTION PHYSICS
- ELECTRICAL SAFETY
- PHOTOVOLTAIC FEATURES
- INSTALLATION SIMPLICITY
- INVESTMENT
- ENVIRONMENTAL FOOTPRINT
SUMMARY AND OUTLOOK IN PILOT MARKET **SWITZERLAND** (transition B2C → B2B):

- GROWING 150% YEAR OVER YEAR

- NEGOTIATION PIPELINE 2018-2019: >30 MWp

- NEGETIATING WITH AND LOOKING FOR INTERNATIONAL PARTNERS (LICENSING → JV) Europe, India, Africa, USA, Asia

- NEGOTIATION PIPELINE 2018-2019: >50 MWp
DESIGNERGY B2B PROGRAM

win-win teamworking

A project with Designergy TCR materials requires the strict cooperation between some players:

- Architect / Engineer
- Energy manager
- Owner/investor
- Roofing specialist
- Tinsmith
- Electric installer
DESIGNERGY B2B PROGRAM
What we offer to our Partners

- Layout/Project of TCR Elements
- Technical support for the metal parts (interface with roof)
- Supply of TCR materials and accessories
- Tools for the installation
- On site coordination and inspection
- Installation manuals and documentation
2011-2013: DESIGNERGY’S TEAM DEVELOPS TCR CONCEPT IN COLLABORATION WITH SUPSI-ISAAC (Lugano)

2012-2013: FIRST PROTOTYPES
DESIGNERGY TODAY

HQ IN SAN VITTORE (CH):
- R&D, production, offices

INDUSTRIAL PARTNERS:
- Sika/Dow Corning
- Sunage/Trina
- Flumroc/Rockwool
- Sonnen Batterien

Potential Partner:
- Flextronics
AWARDS / REWARDS

2011-14:
- Best Business Idea Award 2010 in the Canton of Ticino, sponsored by BSI Bank-
- Microcredit City of Lugano Prize for Innovative Business (2010)
- Swiss Federal Commission for Technology & Innovation (CTI) Project 2011-2013 to Support Industrial Development
- 2.Prize Swissparks Startups 2013 organized by all Swiss Start-up incubators
- TOP 100 Swiss Startup 2013, 2015 and 2016 organized by IFJ
- Venturekick Stages 1-2-3 (2011-2012) organized by IFJ and Gebert Rüf Foundation
- CTI Label 2013

2015:
- Designergy obtained as first Company the financial support of Technologiefonds of Swiss Federal Office for the Environment (FOEN) to foster sales ramp-up

2016:
- **WATT D’OR** by Swiss Federal Office of Energy (SFOE)
- Canton GR Economic Association Innovation Price
TRAINING: Designergy Academy
REFERENCES - see www.designergy.ch
Daniel Lepori  CEO & founder  d.lepori@designergy.ch
41 (0)91 971 24 66