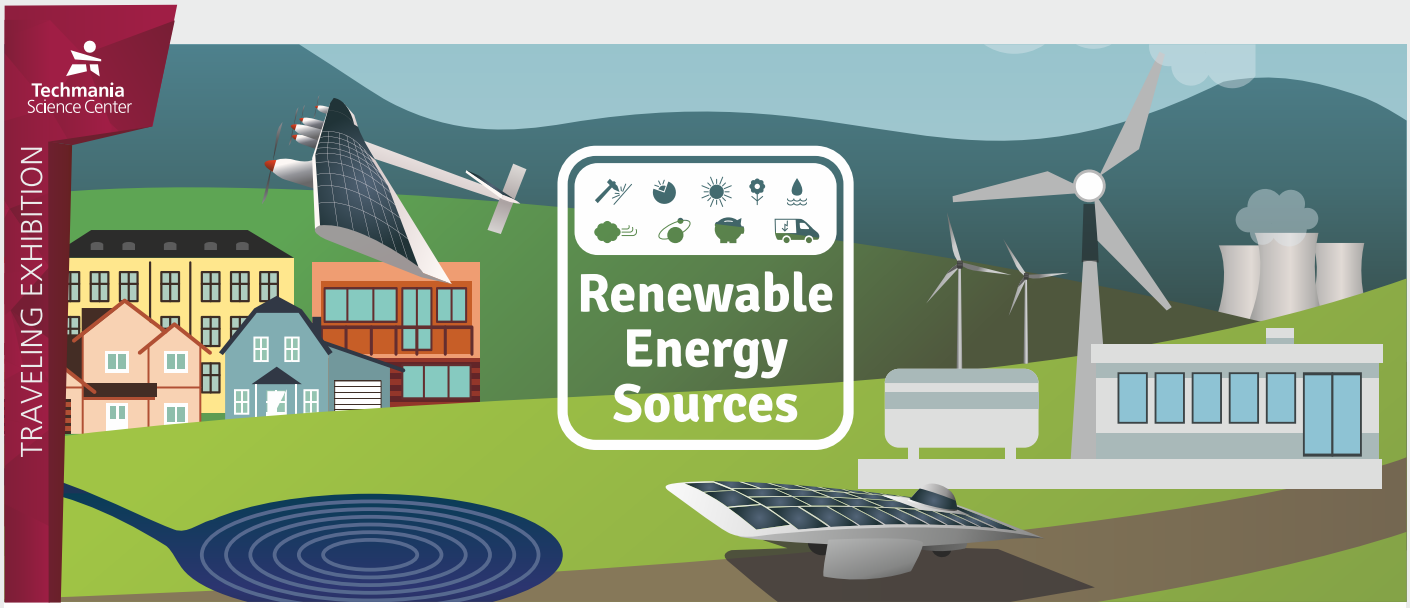
Techmania Science Center / CATALOGUE OF EXHIBITS

Renewable resouces of energy



Why is our energy consumption so crucial for the future of the Earth?

Which of the Enewable Energy Sources can be used by anyone today as well as in the future? Do we know ourselves, how could save energy in everyday life ?

EXHIBITION AIMS

This educational exhibition deals with renewable energy sources and presents both the actual situation and the possibilities for drawing energy sources from our environment, as well as their return to nature. The 23 exhibits erected in an area covering 700 square meters (7, 532 sq. ft.) place strong emphasis on humanity's exploitation of energy and on the limits of individual energy resources. The exhibition covers several groups of topics dealing with biomass, solar, wind, nuclear, geothermal and water energy, and it provides information that covers a whole series of natural and technical fields of science to the visitors.

Special attention is paid to how certain energy sources are treated. It also informs the public about issues related to the energy resources on which humanity is dependent. Among the exhibits that are dedicated to energy distribution is a pumped-storage power plant, a model of a nuclear power station and an exhibit covering electricity distribution. Major emphasis is placed on energy savings and consumption.

FACTS AND FIGURES

Area: 700 m2 (7532 sq. ft.)
23 interactive exhibits
Graphic design is set up for three language versions (current language versions: Czech, English, German)

Produced in 2014
Designed by Techmania Science Center

TARGET GROUP

The exposition is intended for the general public; however, specific stress is focused on primary and secondary school students.

EDUCATIONAL AREA

physics, chemistry, geography, social studies

RENTAL CONDITIONS

The rental fee is 150 000 EUR per year.
Insurance, transport and install / deinstall will be at the expense of the hirer.
Techmania will at the hirers cost change all graphics and computer programs into the hirers languages.
Translation into the hirers language will be at the expense of the hirer.

Available from: July 2015

Techmania
Science Center

For more information
(terms, prices and availability)
please contact:

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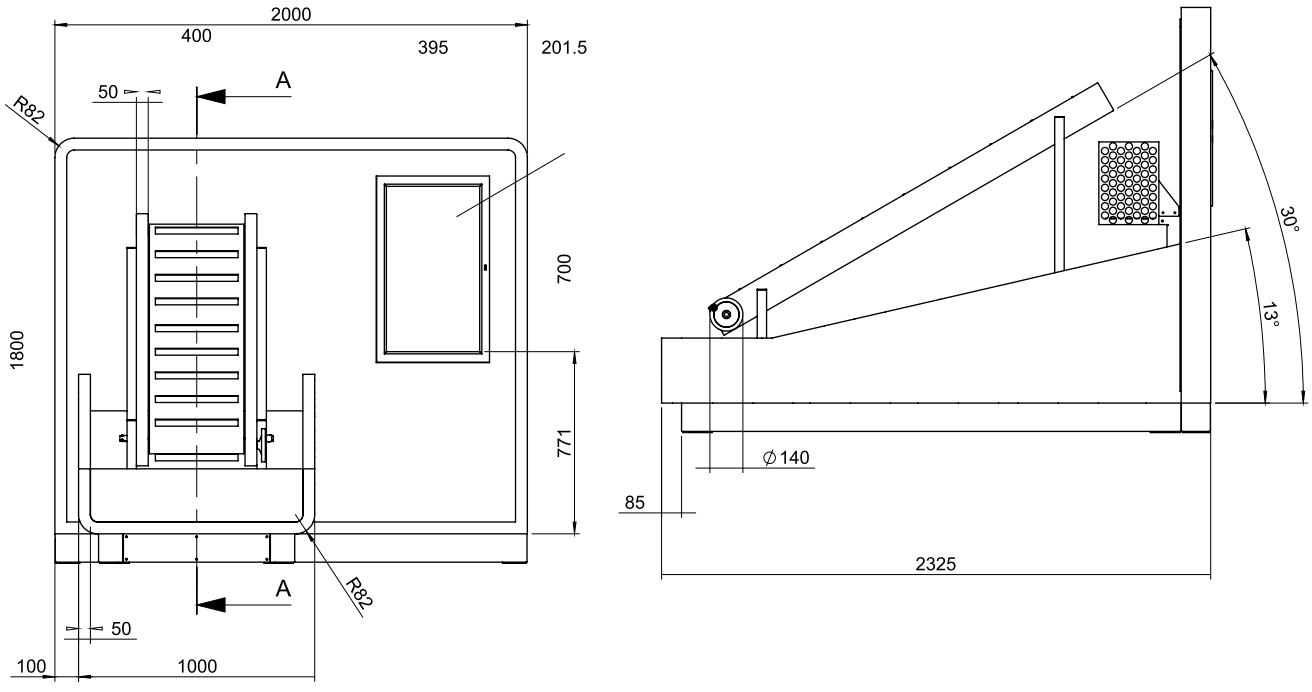
Renewable resouces of energy

Coal transportation 01

A visitor puts coal onto the conveyor belt. When the coal falls into the container, the weight will be displayed on the display and the values will immediately be recalculated. Then the visitor can add more coal or wait until the bottom automatically opens, returning all the coal to the beginning.



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Renewable resouces of energy

Coal transportation 01

The main phenomenon:	Use of non-renewable (exhaustible) sources of energy. .
Target group:	The general public, basic and secondary school students
A description of the exhibit:	The exhibit consists of two parts. The first part ensures coal circulation – a conveyor. The second part shows data calculated from the actual weight of coal – on a wall perpendicular to the conveyor. The part ensuring coal circulation consists of a conveyor-belt system and a container into which the coal falls. The container weighs the coal. Above the container is a display showing the actual weight in kilograms. The container's bottom can open. It automatically opens after a certain period of time and returns the coal to the beginning. The conveyor-belt system moves the coal to the container. The second part shows values continuously calculated based on the actual weight. In front of the conveyor is space (container) for where the coal accumulates. The exhibit is continuously switched on and reacts only to the weight. The total number of coal briquettes = 200 pieces, the size of one briquette: 120x70x50 mm. Their colour is black and they are made of solid plastic.
The main idea be retained:	We obtain energy by burning fossil fuels.
Questions to be raised:	Are fossil fuels replaceable? How much energy can be obtained from fossil fuels?

8+ old | 2 min. | 2 | 230 V | LCD | | info poster

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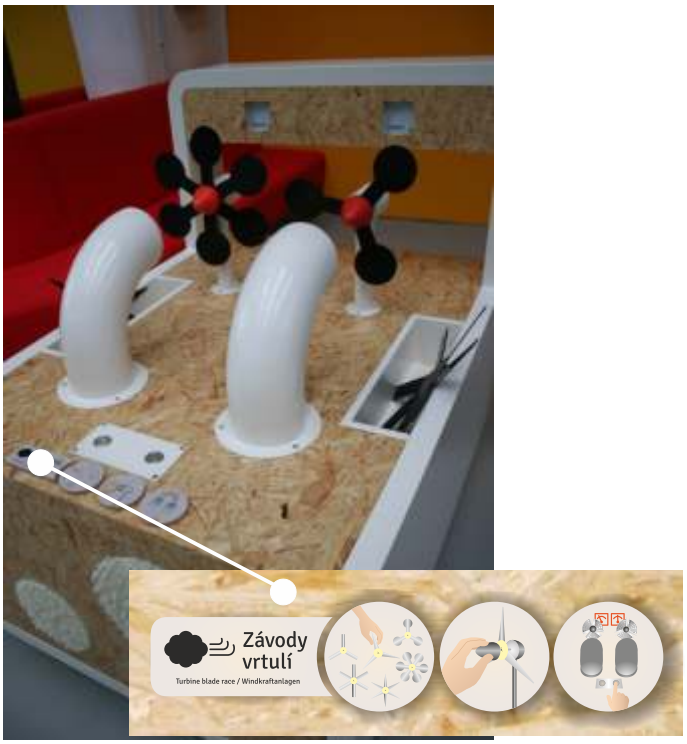
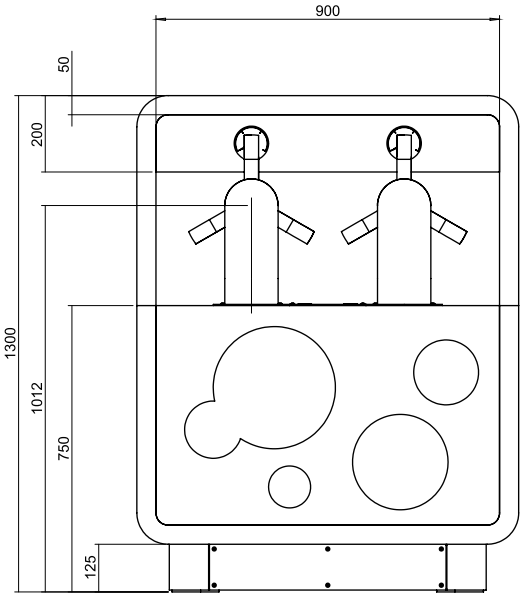
Renewable resouces of energy

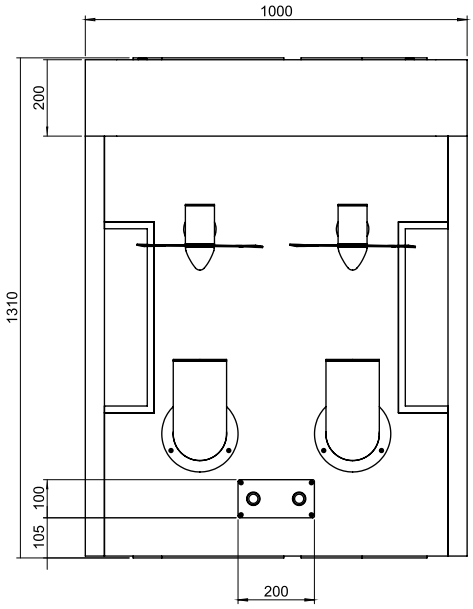
Blade races

02



A visitor comes to the exhibit and selects the blade of his/her choice from the trays on the sides of the table, puts it on the axis of the turbine rotor and secures it using the magnetic cone. He/she pushes the “Start” button on the fan, thereby setting the blades in motion. The kinetic energy of the wind is thus transformed into mechanical energy when the turbine is set in motion because of the wind flowing over the turbine blades. The actual rotating speed of the turbine per minute can be seen on the analogue indicator behind the turbines. The visitor can freely replace the turbines' blades to test the most efficient use of blades.





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Renewable resouces of energy

Blade races

02

The main phenomenon:	The wind direction and strength cause a difference in the efficiency of wind power plants.
Target group:	The general public, basic and secondary school students
A description of the exhibit:	The exhibit is a table on which two blow air towards turbines that are placed in front of them and that are set in motion by the flowing winds. Each fan can be switched on using the stand-alone “Start” button with a timer that switches it on for 15 seconds. The air speed is always the same. 2 sets of turbines are securely placed at the same distance of 30 centimetres from the fans. Trays on both sides of turbines contain various types of replaceable blades (various types of blades of wind power plants that occur in the landscape). Replaceable blades are changed on the axis of the turbine rotor and adjusted using a magnetic cone. The connection of the axis and blade uses a tongue-and-groove system. Analogue indicators behind the turbines show the actual rotational speed of the turbine per minute.
The main idea be retained:	The kinetic energy of wind is transformed into mechanical energy when the turbine is set in motion from the wind flowing over the turbine's blades.
Questions to be raised:	What is the most efficient position of blades? Which blades are the fastest ones?

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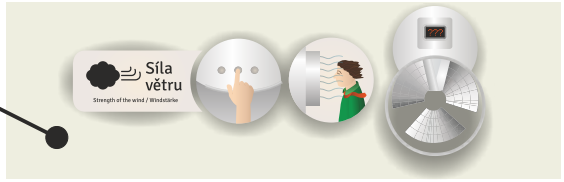
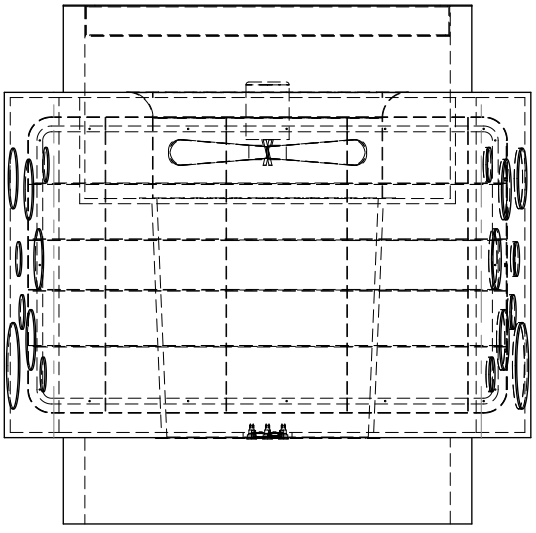
Renewable resouces of energy

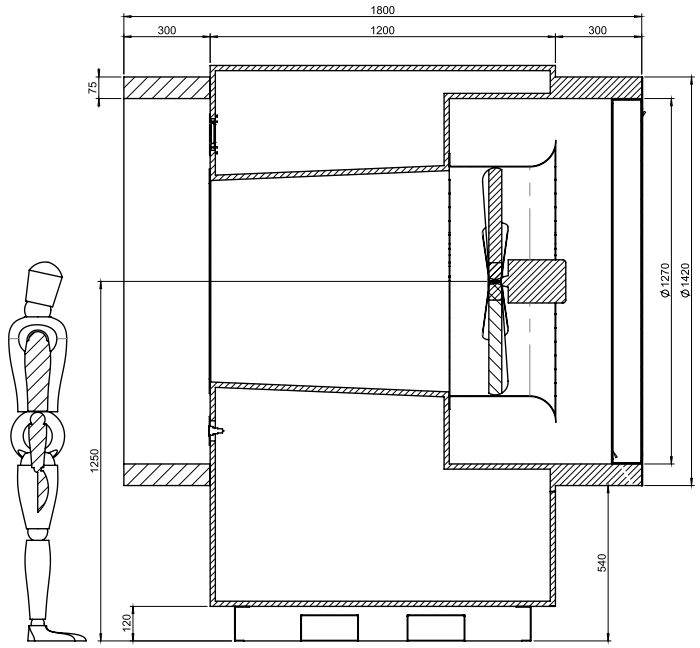
Wind strength

03



A visitor comes to the railings that are placed in front of the exhibit. He/she starts the fan by pressing one of three switches placed on the ground. The visitor examines the wind strength by pressing the individual switches.There is an anemometer on the side into which visitors can blow air; the air makes the fan spin and the speed is shown on the display.





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Renewable resouces of energy

Wind strength

03

The main phenomenon:	A demonstration of wind strength.
Target group:	The general public, basic and secondary school students
A description of the exhibit:	The exhibit is a large fan that is integrated into the tunnel. The fan is bordered by fine gauze from the outer access side and the overall area of the fan is surrounded by railings that prevent visitors from entering the immediate area. The railings are firmly anchored into the ground. The switches and controlling elements of the wind strength intensity are located on the ground in front of the railings. The visitor starts the exhibit by pressing one of the switches. There are 3 switches on the ground that correspond to various wind strength settings (the switches are embedded into the ground). The side of the exhibit contains an anemometer with a display that indicates air speed. The 3 switches have various values: 1) wind strength 29 - 39 km/hour - fresh breeze 2) wind strength 40 - 49 km/hour - strong wind 3) 50 - 61 km/hour - mild whirlwind.
The main idea be retained:	Wind strength can be classified according to a specific scale.
Questions to be raised:	Can wind be dangerous? At what wind speed can a house be destroyed?

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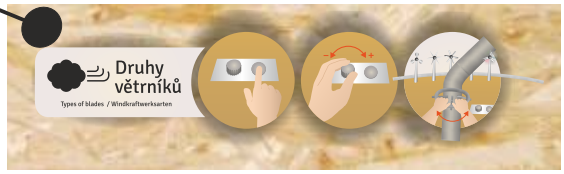
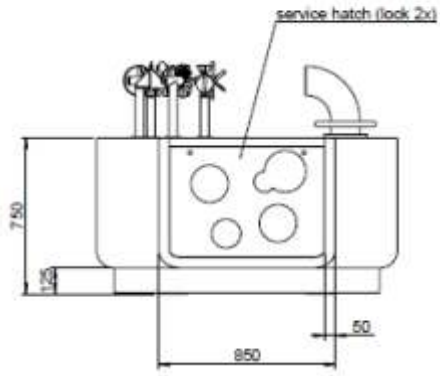
Renewable resouces of energy

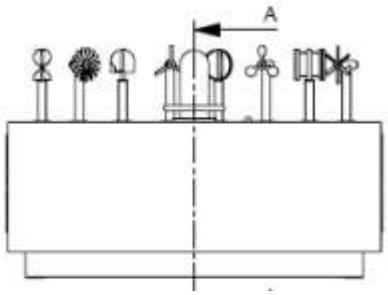
Types of blades

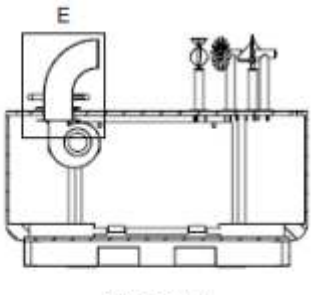
04



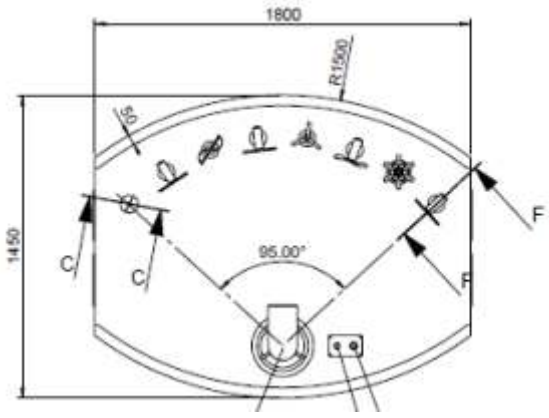
A visitor comes to the exhibit and starts the fan by pressing the “Start” button. The flow of air is directed towards individual blades by rotating the fan using a handle. The visitor can determine the strength of air flowing towards the blades using a potentiometer.







SECTION A-A



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Renewable resouces of energy

Types of blades

04

The main phenomenon:	Use of various types of wind turbines.
Target group:	The general public, basic and secondary school students
A description of the exhibit:	The exhibit consists of an oval table onto which different types of blades and a turning fan are firmly secured. There are 8 separate blades placed side-by-side on the table so that the air flow from the fan can reach all the blades. The fan is started by pushing the “Start” button and the length of time the air flow is limited by a timer to 15 seconds. The fan speed can be controlled by a potentiometer that is placed near the Start button. The 8 separate blades represent different models of various turbines.
The main idea be retained:	There are many types of wind turbines.
Questions to be raised:	Which blade is the most efficient? Which blade rotates the fastest?

8+ old | 2-3 min. | 1 | 230 V | LED | | info poster

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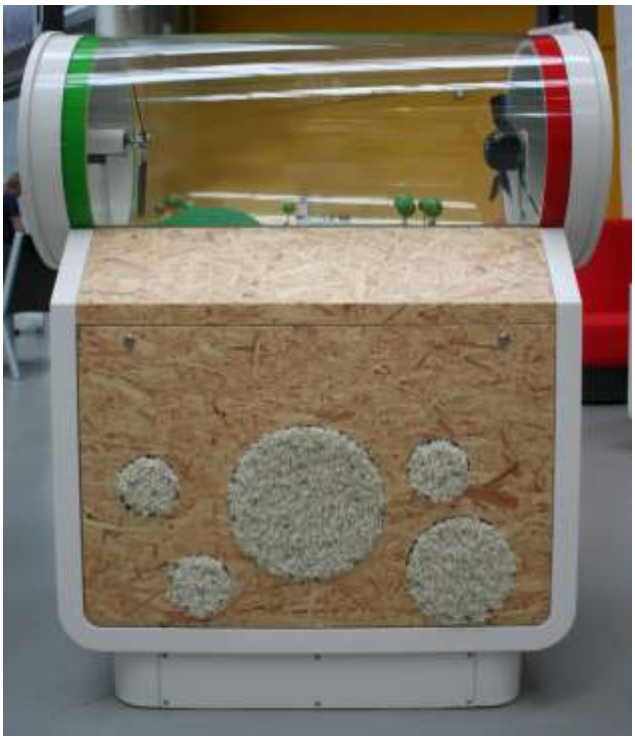
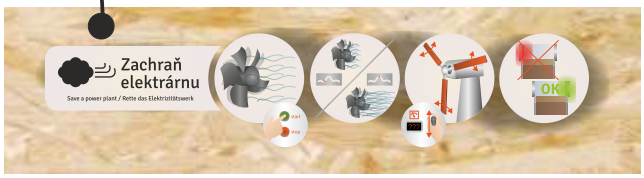
Renewable resouces of energy

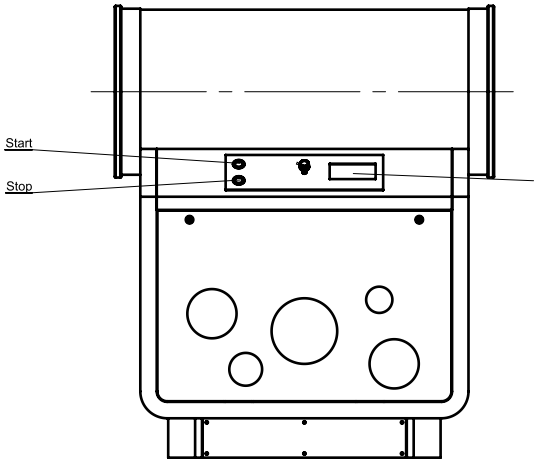
Save a power plant

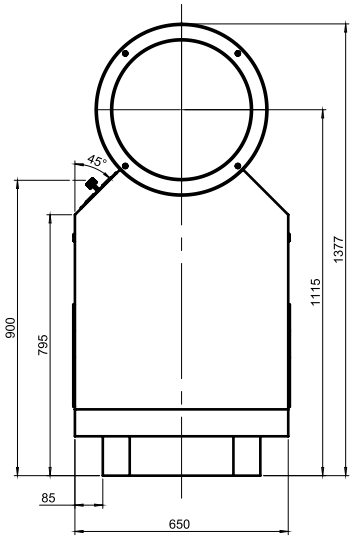
05





A visitor comes to the exhibit and starts the fan by pressing the “Start button”. He/she then observes the actual strength of the wind and output of the power plant that is located in the right side of the tube. The position of the turbine blades can be set using the dial to achieve optimal output. The visitor can stop the activity by pressing the “Stop” button. When the power plant output is optimal, a green ring at the fan will illuminate. If there are any dangerous turbine settings, a warning red ring at the turbine will illuminate. In case of any possible danger, a siren will sound for three seconds, and if the turbine output is not optimized, the turbine will stop showing a critical state. The visitor can restart the operation by pressing the “Start” button..





Techmania Science Center

Renewable resouces of energy

Save a power plant 05

The main phenomenon:	A demonstration of wind strength.
Target group:	The general public, basic and secondary school students
A description of the exhibit:	The exhibit is a model of a landscape with one wind turbine (a wind power plant). The model of the landscape is enclosed in a transparent tube that is affixed to a base. One end of the tube (inside) contains is a wind turbine and a red danger signal. The other end of the tube (inside) contains a fan and a device that indicates optimal turbine output. There is a small-scale model landscape that completes the real look of the surroundings of the wind power plant located between the turbine and the fan. A “Start” button that starts the flow of air from the fan on the other side of the tube is located near the tube - wind strength varies over time according to the chart. There is a dial next to the “Start” button that adjusts the position of turbine's blades in order to determine the best blade orientation. There is a “Stop” button on the control panel that stops all activity. An indicator showing the power plant output and a chart showing the actual wind speed is located between the buttons. The chart shows the dependence of wind speed on time. The entire chart is shows the entire time elapsed with the current state (chart section) highlighted.When the power plant output is optimal, a green ring at the fan will illuminate. If there is any possible danger, a siren will sound for three seconds. If the turbine output is not optimized, the turbine will stop showing a critical state.
The main idea be retained:	The activity of the wind turbine must be optimized to avoid damaging it.
Questions to be raised:	What is the correct orientation of the turbine blades? Does the position of the blades depend on wind speed?

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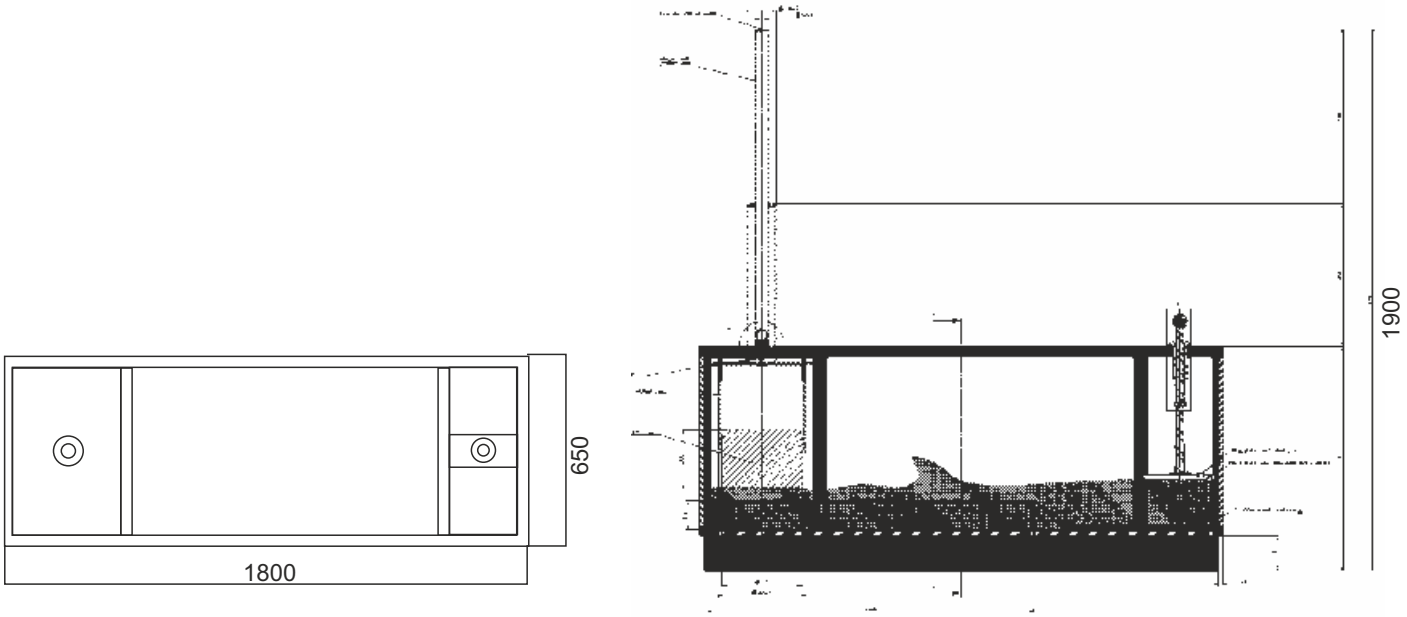
Renewable resouces of energy

Wave power

06

A visitor comes to the exhibit and sinks the trapezium in water using a pull rod in the left section (the rod projects out of the exhibit). This movement generates waves. The movement of waves results in compressed air that shoots the ball up through the transparent cylinder.



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Renewable resouces of energy

Wave power

06

The main phenomenon:	Generating energy from waves.
Target group:	The general public, basic and secondary school students
A description of the exhibit:	The exhibit consists of a closed transparent container that is divided into three interconnected parts, all of which are filled with the same level of water. The left part contains a wave that is formed by applying a compressive force to a trapezium. The wave flows over the central section into the right section, where its energy generates compressed air formed in an air cushion that shoots a ball into a transparent cylinder and out above the exhibit.
The main idea be retained:	Waves transmit energy.
Questions to be raised:	Are there any power plants that use the force contained in waves? Does the generated amount of energy depend on the speed of the waves?

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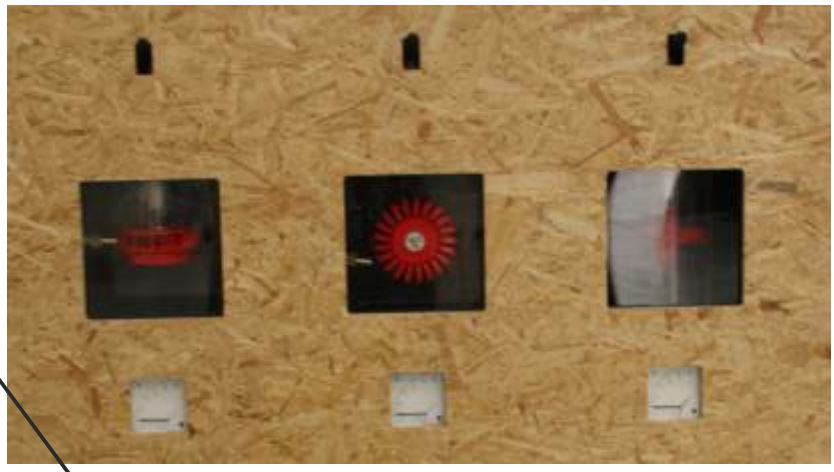
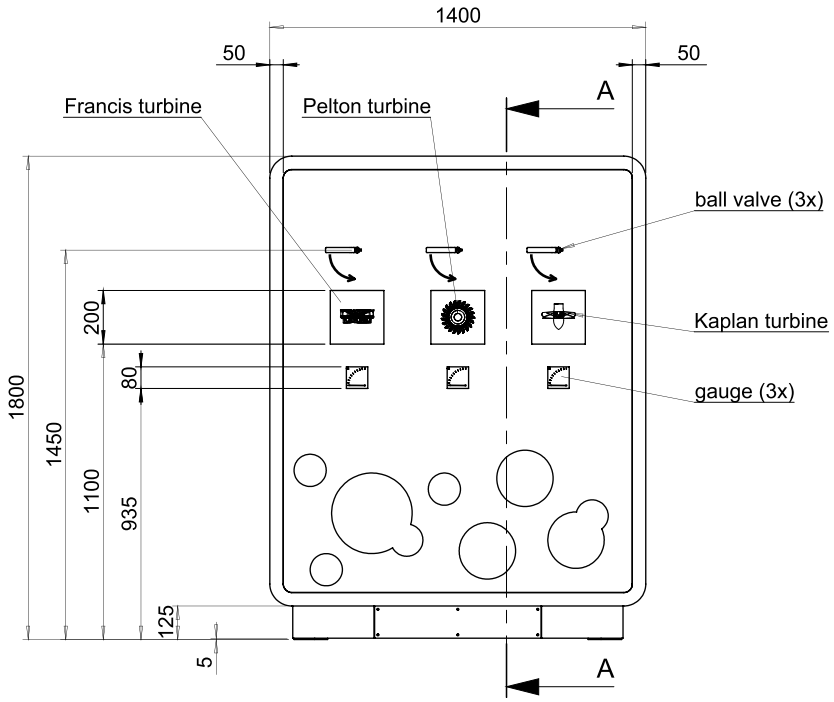
Renewable resouces of energy

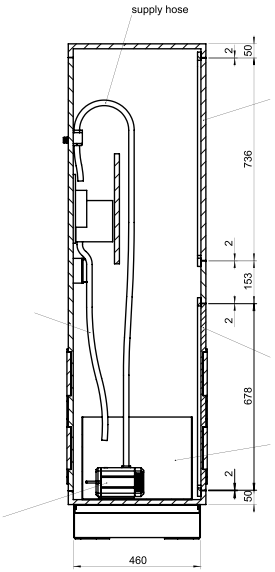
Getting to know turbines

07



A visitor comes to the exhibit. By turning valves, he/she starts the activity of individual turbines that are located behind transparent glass. The visitor observes the output of the turbines by looking at indicators located below them.





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Renewable resouces of energy

Getting to know turbines

07

The main phenomenon:	Various efficiencies of water turbines.
Target group:	The general public, basic and secondary school students
A description of the exhibit:	The exhibit is a closed box consisting of three horizontally divided parts. The highest part is a transparent reservoir that provides water for the middle part. The upper reservoir contains a level sensor that switches on a pump in the lower reservoir. Water flows into the middle part from the upper reservoir. The middle part contains 3 turbines (a Francis turbine, a Kaplan turbine and a Pelton turbine) behind the glass allowing the visitors to observe how they work. Above each turbine is a valve that the visitor can turn from outside the box to regulate the amount of water flowing through the turbine. It is possible to try all three turbines at once. The lower part contains an output indicator under each of the turbines. Water flows from the middle part to the lower part, which is also a reservoir – via a pump inside that refills water into the upper reservoir if necessary so that the phenomenon can be repeated again and again.
The main idea be retained:	Each of turbines has its own advantages and disadvantages.
Questions to be raised:	Which of the turbines is the best? Which of the turbines is used in dams?

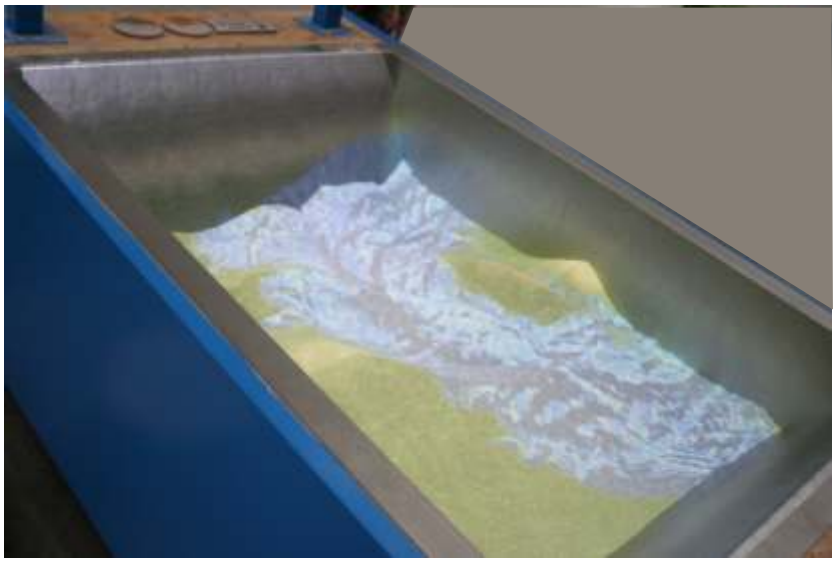
8+ old | 1-2 min. | 1 | 230 V | LCD | | info poster

Techmania Science Center

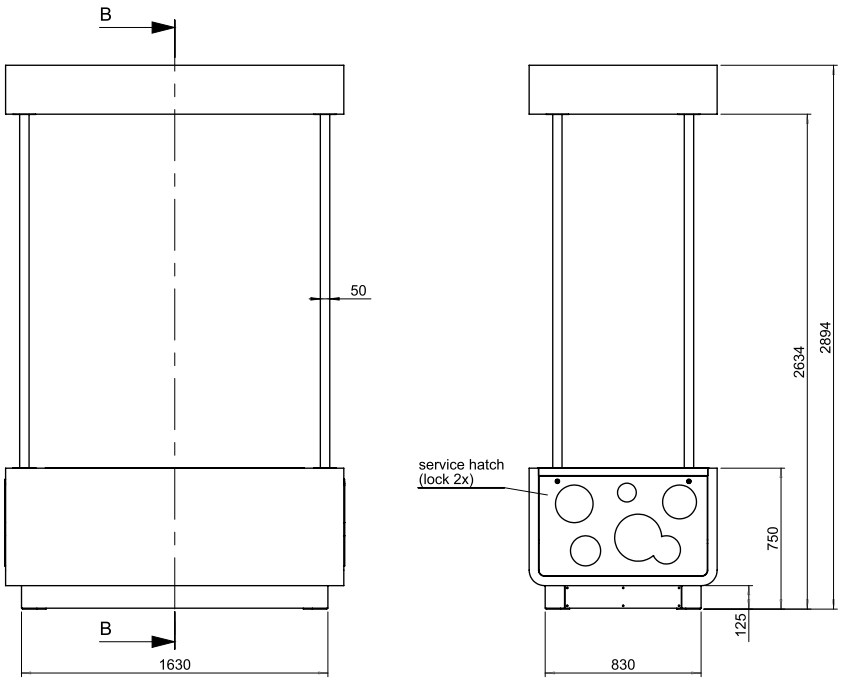
Renewable resouces of energy

Building your own dam

08



A visitor comes to the sandbox and forms shapes from the sand with his/her hand. These shapes are changed into e. g. mountain ranges, valleys, lakes and others with the help of projected images. The visitor's task is to create a natural dam. With his/her hand, he/she creates a dam in the sand that must be filled up – by placing his/her hand above the reservoir area, the projector will produce rain and fill the reservoir.



Techmania Science Center

Renewable resouces of energy

Building your own dam

08

The main phenomenon:	Building a natural dam.
Target group:	The general public, basic and secondary school students
A description of the exhibit:	The exhibit consists of a reservoir with a square sandbox and a projector. It is possible to change depths in the sandbox using an image that is continuously projected onto the sand. The exhibit must be located in a dark area.
The main idea be retained:	The natural landscape is an important element when building a dam.
Questions to be raised:	What are dams used for?

8+ old | 3-5 min. | 5 | 230 V | LCD | | info poster

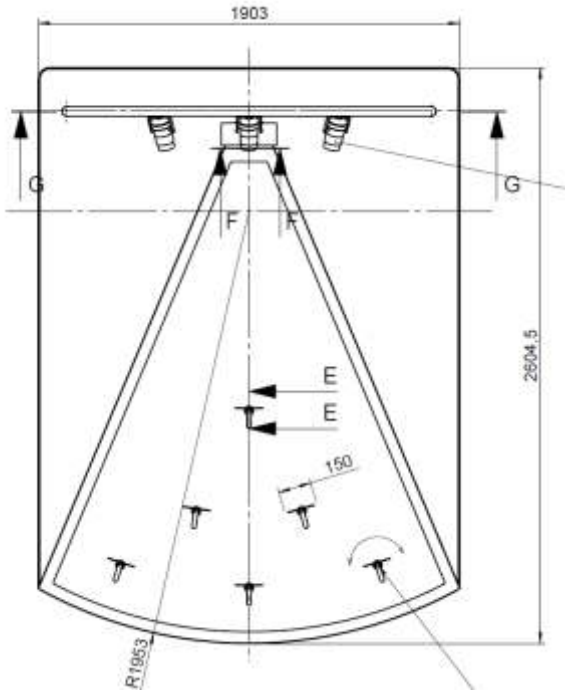
Techmania Science Center

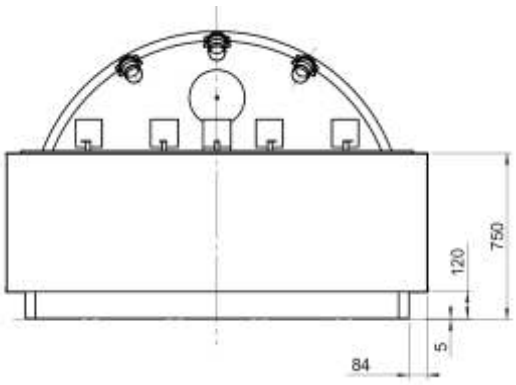
Renewable resouces of energy

Hot spot

09

A visitor comes to the exhibit and by pressing the button, he/she turns on one of three light sources. The mirrors are set so that a beam of light is directed at the solar tower and the current temperature is displayed on the thermometer located on the tower. By pressing a different button, the light source will change and the visitor will have to re-adjust the mirrors.





Techmania Science Center

Renewable resouces of energy

Hot spot

09

The main phenomenon:	Solar energy accumulation and storage
Target group:	The general public, basic and secondary school students
A description of the exhibit:	The exhibit consists of three parts – a solar tower, adjustable mirrors and lighting imitating the Sun. The solar tower includes a thermometer that indicates the current temperature on the display. Mirrors are placed within a semi-circle around the solar tower and are adjustable (allowing for tilting of the mirrors in all directions). Lighting imitating the Sun consists of three individual sources that are placed on an arc above the solar tower. Only one light source always emits light for a certain period of time. The source can be changed by pressing a button – with the buttons, one of three lighting possibilities is randomly chosen.
The main idea be retained:	Ssolar energy can be concentrated into one spot with the help of mirrors and thus the energy can be stored.
Questions to be raised:	Where is a similar power plant located? How does the principle of energy storage work?

8+ old | 2-5 min. | 1 | 230 V | LCD | info poster

Techmania Science Center

Renewable resouces of energy

Solar panels on theTSC´s roof

10

A visitor comes to the exhibit and examines the current output of the solar panels on the roof of the Techmania Science Centre. In addition, the visitor can take a look at the output history and general information about solar energy.

Techmania Science Center

Renewable resouces of energy

Solar panels on theTSC´s roof

10

The main phenomenon:	The capacity of photovoltaic power plants.
Target group:	The general public, basic and secondary school students
A description of the exhibit:	The exhibit consists of a screen where the current output of the solar panels located on the roof of the Techmania Science Centre is displayed. The screen also contains a chart showing the output history and general information about solar energy.
The main idea be retained:	The amount of energy generated by the solar power plant depends on the intensity of solar radiation.
Questions to be raised:	How efficient are solar panels?

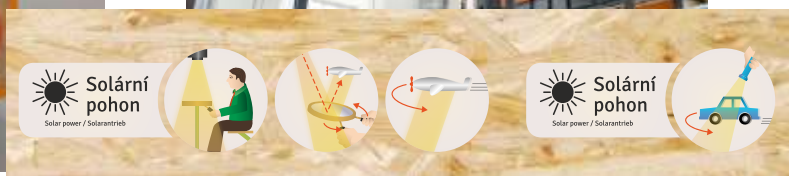
8+ old | 1 min. | 1 + | 230 V | LCD | | info poster

Techmania Science Center

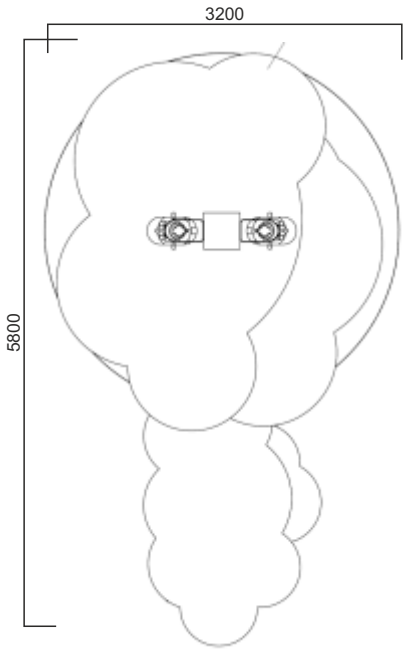
Renewable resouces of energy

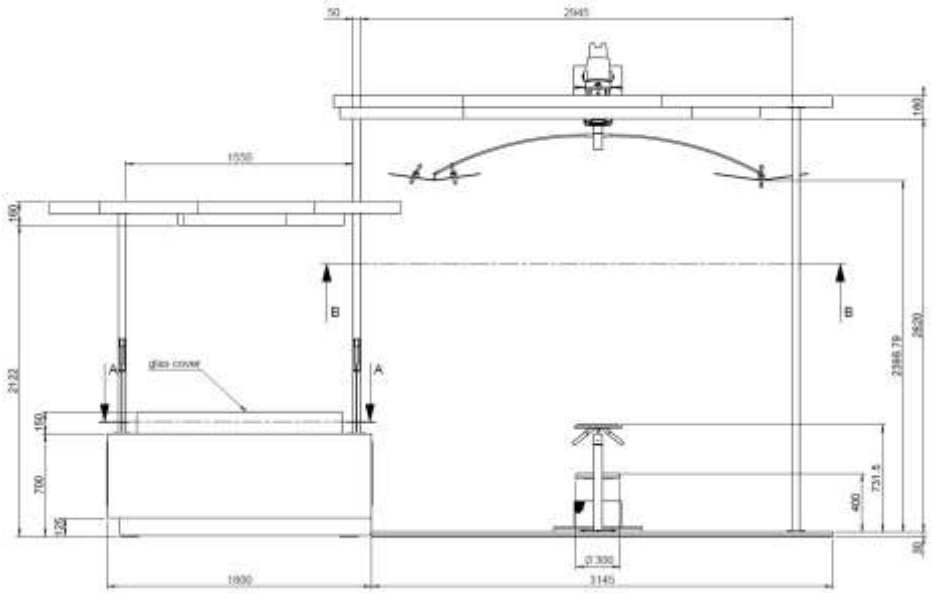
Solar power

11



A visitor comes to the exhibit and grasps the handle of a lighted mirror. He/she directs the light towards the solar cell of the airplane – putting the airplane in motion. In the second part of the exhibit, the visitor grasps the lamp and lights the car on the track – thus, the cars sitting on the rail start moving.





Techmania Science Center

Renewable resouces of energy

Solar power

11

The main phenomenon:	Power from solar energy.
Target group:	The general public, basic and secondary school students
A description of the exhibit:	The exhibit consists of two parts. The first part consists of model planes turned upside-down. Each model has its own solar cell. A spot light directed behind a mirror is also placed on the underside. The floor contains a stand with an adjustable mirror. The mirror is adjustable. The mirror handles have a switch that turns a light on. The second part consists of a base unit and a glass box with two cars with solar cells located on two rails. Two lamps are located at the top of the box – one for each rail. The lamps are long enough to cover the entire length of the track. A feeder cable runs along the underside – a battery is switched on after approximately 5 cm of cable is unwound. The whole battery is rubberised.
The main idea be retained:	Solar energy can be used thanks to solar cells.
Questions to be raised:	Is it possible to use a solar cell to power a real car?

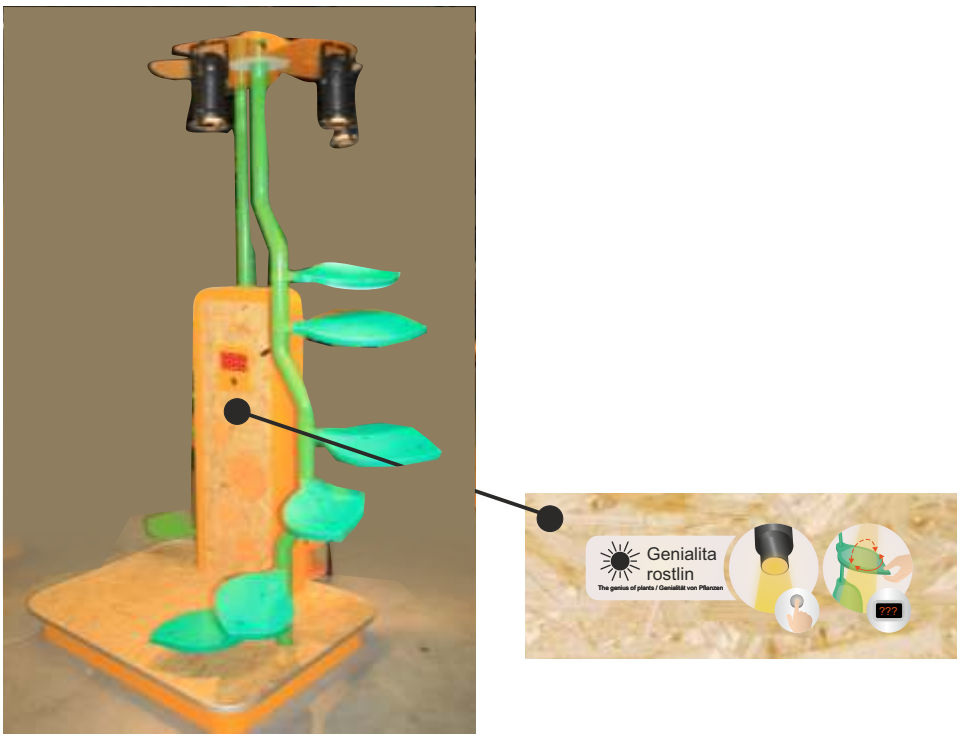
8+ old | 2-5 min. | 3 | 230 V | LCD | | info poster

Techmania Science Center

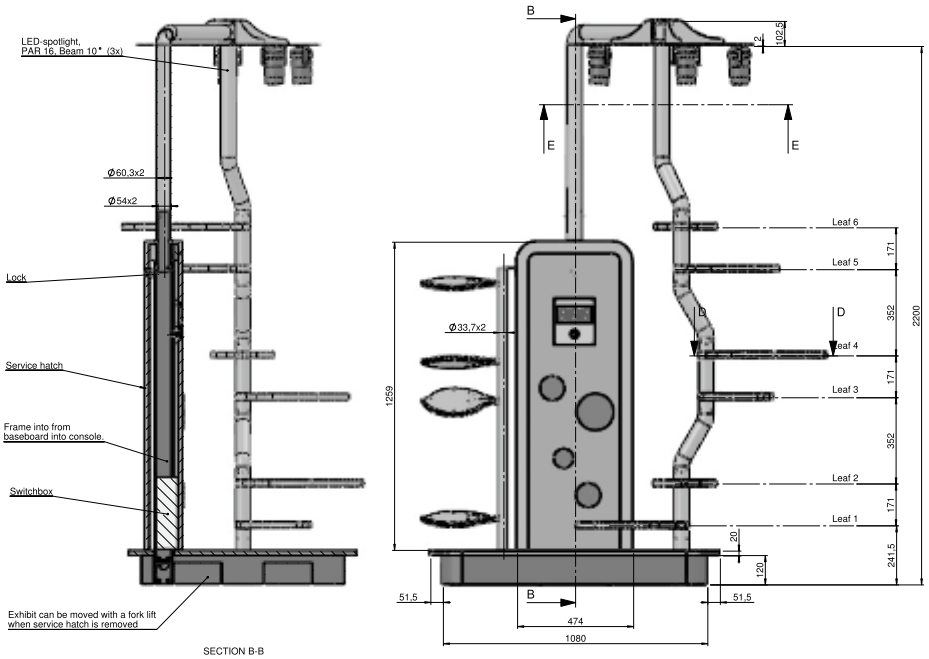
Renewable resouces of energy

The genius of plants

12



A visitor comes to the exhibit. He/she switches the appropriate light source on by using one of three buttons. By tilting and adjusting the plant leaves, the visitor searches for the optimum position in which the largest possible amount of light falls onto the plant. The percentage of coverage by solar radiation can be seen on the display.



Techmania Science Center

Renewable resouces of energy

The genius of plants 12

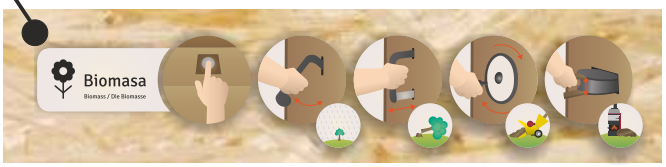
The main phenomenon:	Plants are able to use the largest possible amount of solar energy that hits them
Target group:	The general public, basic and secondary school students
A description of the exhibit:	The exhibit consists of a panel shaped like a stem around which models of plant leaves are installed. Each of the leaves includes a photo element that reacts to the intensity of solar radiation. Individual leaves can be positioned along their vertical and horizontal axes. There is a light strip at the end of each stem that contains three light sources. Only one source emits light onto the leaves. The light source control is located on the panel next to the stem – these are 3 buttons, each belonging to one light source. There is also a display on the panel next to the stem showing the total percentage of the area covered by light.
The main idea be retained:	Plants are able to use the largest possible amount of solar energy falling on them.
Questions to be raised:	How do plants react to solar radiation?

Techmania Science Center

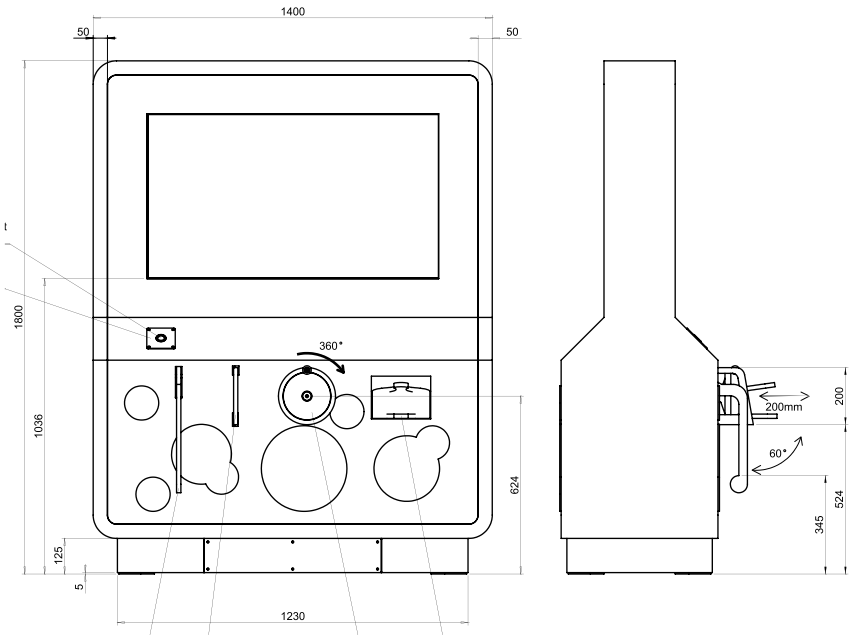
Renewable resouces of energy

Biomass

13



A visitor comes to the exhibit and starts the animation on the screen by pressing the “Start” button. He/she uses the controllers as instructed and goes through the cycle of generating and using biomass. The animation reacts to how the controllers are manipulated. The visitor obtains water to grow trees by using the pump lever. The visitor cuts trees down by moving the saw while producing wood waste. By spinning the grinder, the visitor simulates chipping. Finally, he/she makes a fire using the bellows to simulate biomass burning.3.



Techmania Science Center

Renewable resouces of energy

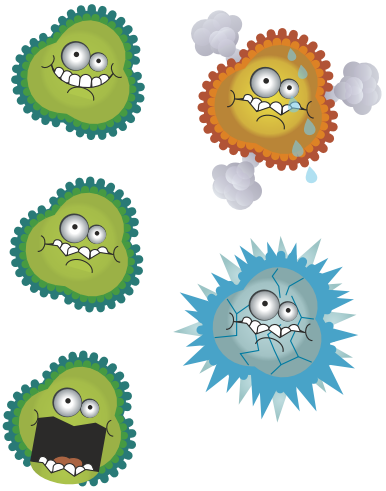
Biomass

13

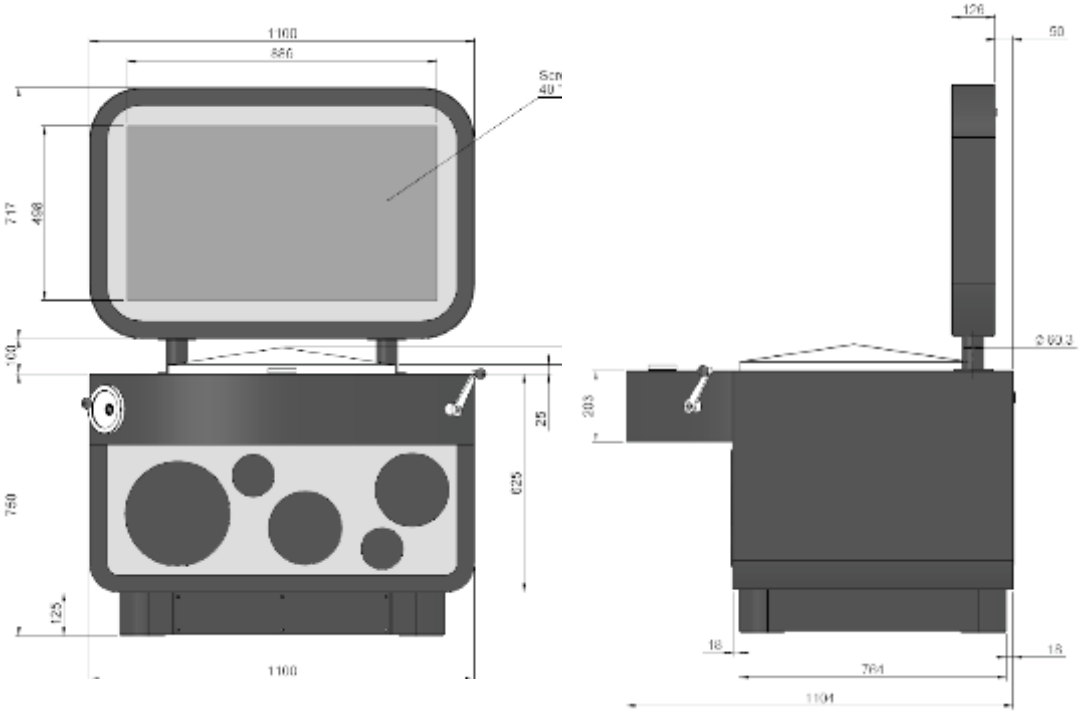
The main phenomenon:	Obtaining energy by burning biomass.
Target group:	The general public, basic and secondary school students
A description of the exhibit:	The exhibit consists of a screen and a control panel (base) located below it. A “Start” button used to run (or restart) the software (animation) is located on the control panel. In addition, there are 4 controllers on the base – an imitation pump lever, s model of a saw, a model of a chipping grinder and a bellows for blowing air into a fire. The pump lever is used to simulate how water is obtained. The model of the saw is used to simulate how trees are cut down. The model of the grinder is used to simulate how wood waste is chipped. The bellows are used to simulate how matter is incinerated. The base is made of a transparent material and is filled with various types of pellets. For a description of the screen software, see the Annex.
The main idea be retained:	Biomass burning is eco-friendly energy production.
Questions to be raised:	Why is biomass burning eco-friendly? How does the biomass processing cycle work?

Techmania Science Center

Biogas



A visitor comes to the exhibit and looks at the current state of the fermenter on the screen – shown as numerical values and animations. Using the controls, he/she sets the temperature, movement and amount of biomass in order to achieve the optimal conditions in the fermenter and to enable the visitor to watch the biogas production on the screen.



Renewable resouces of energy

Biogas

14

The main phenomenon:	Simulation of biogas production from biological waste.
Target group:	The general public, basic and secondary school students
A description of the exhibit:	The exhibit consists of a base (table) imitating a fermenter and a screen attached to it. The table contains three control elements: biomass, temperature and movement regulation, as well as an animation screen that reacts to the visitor's manipulation of the controls. The left part contains a spiral conveyor; the visitor delivers an amount of biomass to the fermenter by turning it. The middle section contains a controller that the visitor uses to regulate temperature. The right section contains a controller that the visitor uses to simulate movement. The visitor attempts to achieve the optimal conditions for producing biogas using the controllers. The visitor receives continuous feedback on the actual values on the screen – both numerically and as animation. See the Annex - software.
The main idea be retained:	Under certain conditions, bacteria are able to produce methane, which is combustible.
Questions to be raised:	How does a fermenter work? Are there any biogas power plants in the Czech Republic?

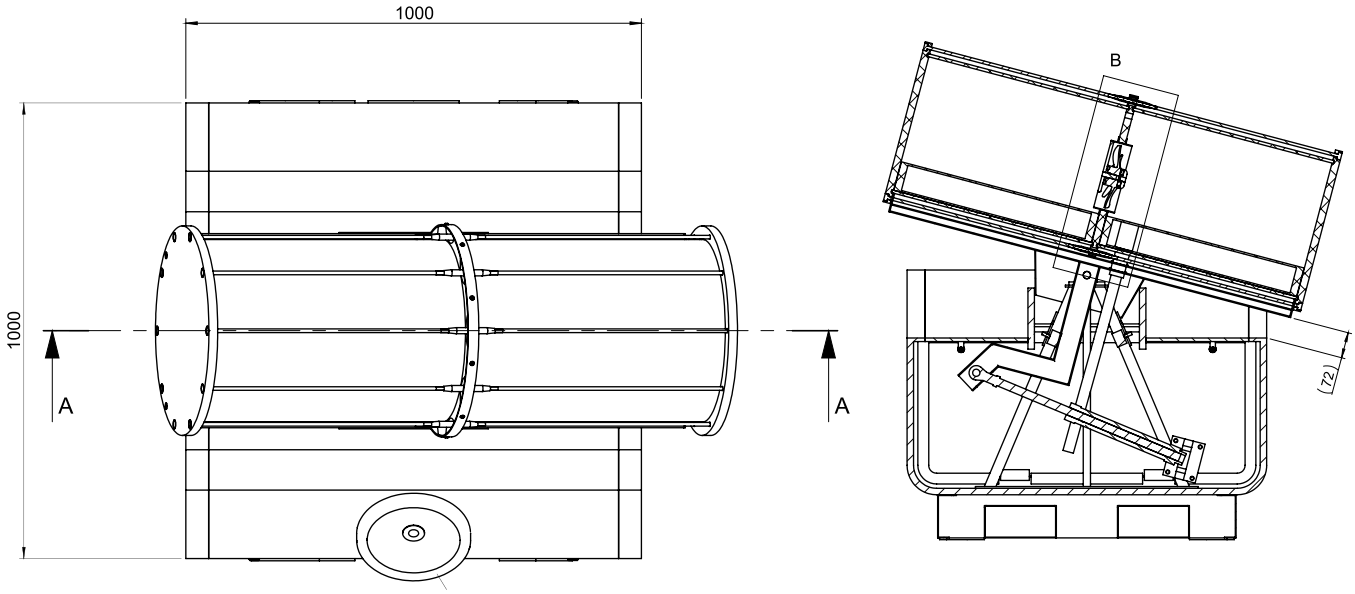
Techmania Science Center

Renewable resouces of energy

Tidal power plants

15

The visitor comes to the exhibit and he/she grasps handles to rotate the reservoir that contains water. He/she then observes the operation of the turbine in the middle of the reservoir.



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Renewable resouces of energy

Tidal power plants

15

The main phenomenon:	Tidal power plant activities.
Target group:	The general public, basic and secondary school students
A description of the exhibit:	The exhibit consists of an enclosed glass reservoir located on a base. The reservoir is attached to the base by a swivel joint that allows is to be tilted in both directions. The middle of the reservoir contains a model of a natural dam with a tidal two-way turbine placed at the top. The water level is in a horizontal plane and is symmetrical to the top of the turbine – thus, the turbine is immersed. The reservoir has two positions – marginal and horizontal. The rotational speed of the turbines is slowed down with pistons. There are handles on both sides of the reservoir that are used to rotate it.
The main idea be retained:	Tides are able to produce energy.
Questions to be raised:	How does a tidal power plant work?

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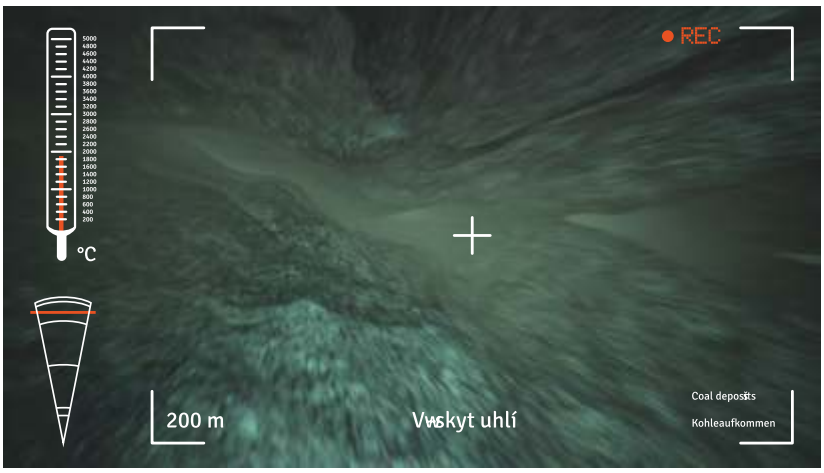
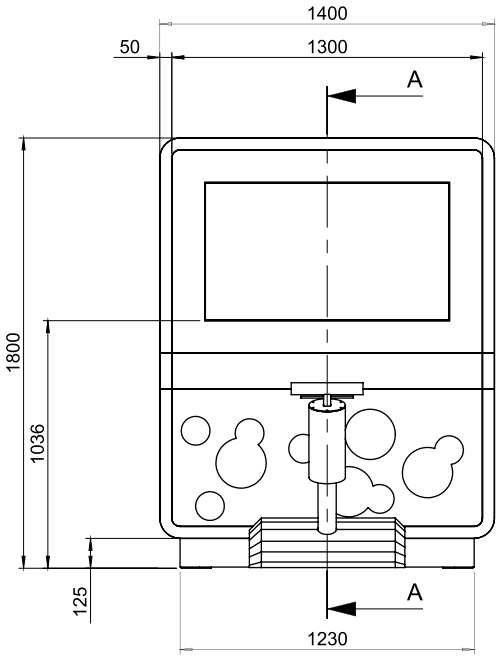
Renewable resouces of energy

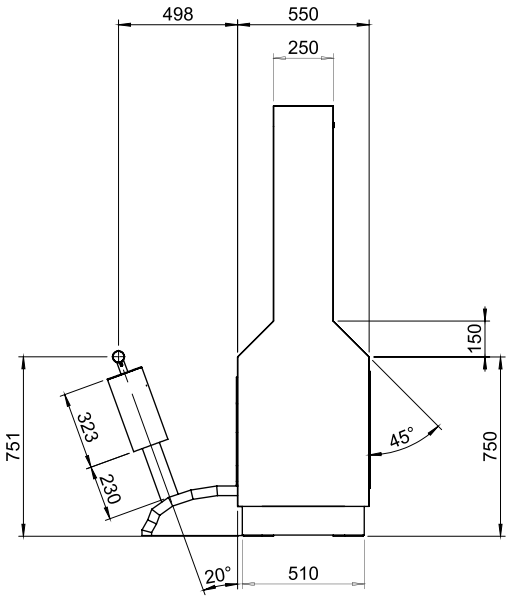
Drilling

16



A visitor comes to the exhibit and presses the model of the drill. When pressed, the exhibit is put into operation – screens with animations and information are illuminated. After being pressed, virtual drilling is shown on the screen along with actual values (depth, temperature and soil profile). Certain data that are illuminated are based on the actual borehole depth and are contained on the information panel above the screen. After releasing the drill, the values return to their starting position.





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Renewable resouces of energy

Drilling

16

The main phenomenon:	Obtaining geothermal energy.
Target group:	The general public, basic and secondary school students
A description of the exhibit:	The exhibit consists of 1 screen and a model of a drill. The model is located in front of the screen and the entire exhibit is put in operation when the model is pressed – drilling into the ground is started by pressing the drill. A soil profile is projected on the screen according to the depth of drilling. The current depth, temperature and soil texture are also shown on the screen. There is an information panel above the screen showing certain data that are illuminated depending on the current borehole depth – illuminated information corresponds to certain phases of drilling. After releasing the drill, the values return to their starting position.
The main idea be retained:	Energy can be obtained from the depths of the Earth.
Questions to be raised:	What are the individual soil layers? What is the deepest possible depth of drilling?

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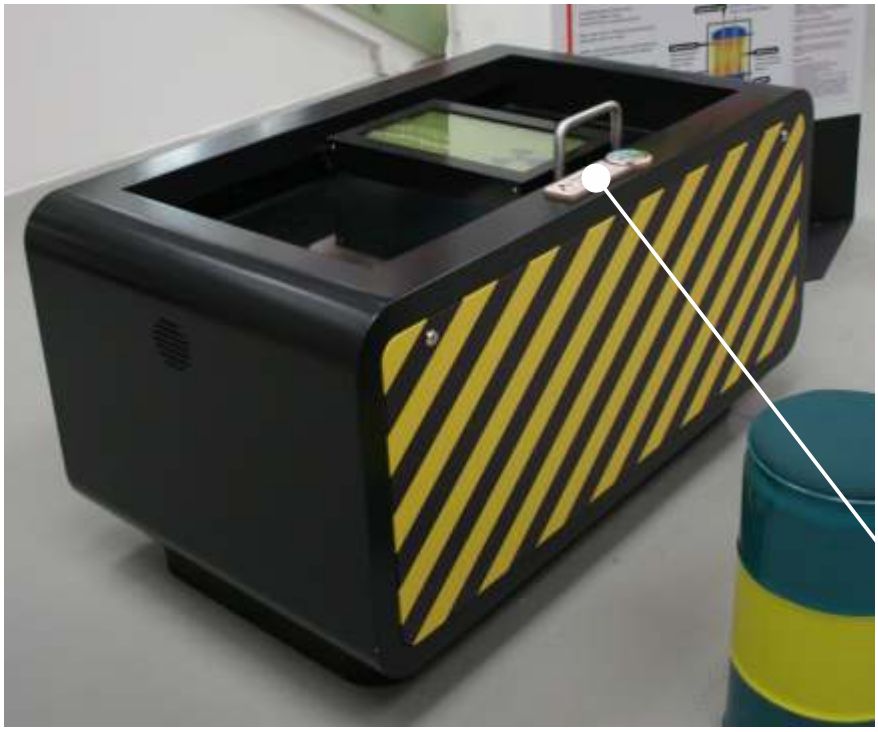
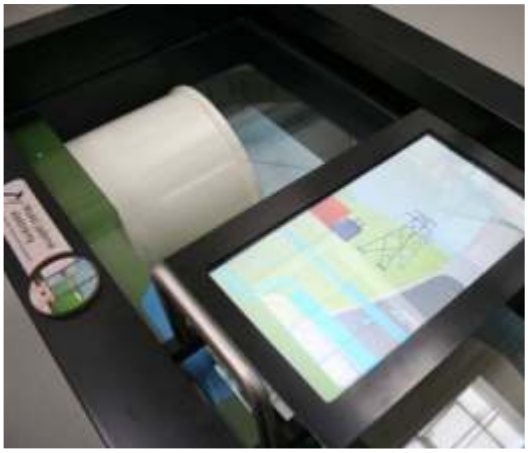
Renewable resouces of energy

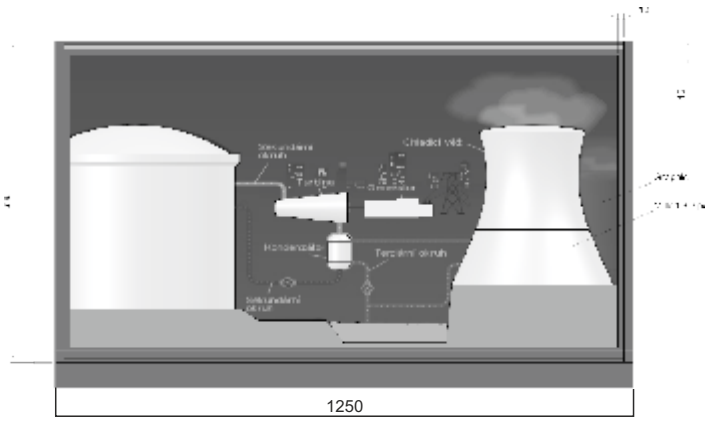
A nuclear power plant model

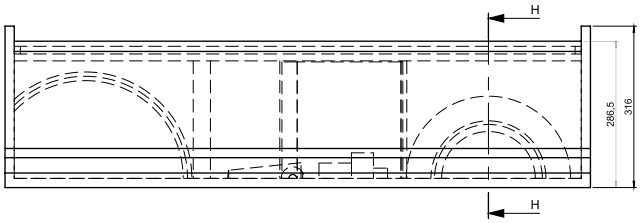
17





A visitor comes to the exhibit. On the first panel, he/she has two choices – automatic inspection or manual inspection. For manual inspection, the visitor moves the laser beam to where they want it. The visitor points the laser at the place in the model in which he/she is interested and then presses the button on the control panel. Information about its location in the model and what happens there will be displayed on the screen. If the visitor chooses automatic inspection, the laser moves automatically and points at individual spots in the model – information about individual locations is displayed on the screen. The visitor then goes to the second control panel where he/she answers questions – then, he/she is informed by the PC what grade of security at the Temelín Nuclear Power Station they achieved.





Techmania Science Center

Renewable resouces of energy

A nuclear power plant model

17

The main phenomenon:	Obtaining energy from a nucleus.
Target group:	The general public, basic and secondary school students
A description of the exhibit:	The exhibit consists of three parts. The first part is a display case containing an exact model of the Temelín Nuclear Power Station. There are energy flows inside the power plant marked with coloured strips. The second component is above the display case and can be controlled by a visitor via the control panel next to the exhibit. The component moves in two axes (similarly to heads in CNC machines). The component includes a laser that is pointed at the model. The component's position is scanned by a PC. The exhibit includes a screen to display information. The third component is a panel placed close to the exhibit that shows visitors whether or not he/she could pass the security screening at the Temelín Nuclear Power Station.
The main idea be retained:	How do individual stations in the nuclear power station work?
Questions to be raised:	How does a nuclear power plant work?

8+ old | 2-5 min. | 1 + | 230 V | LCD | | info poster

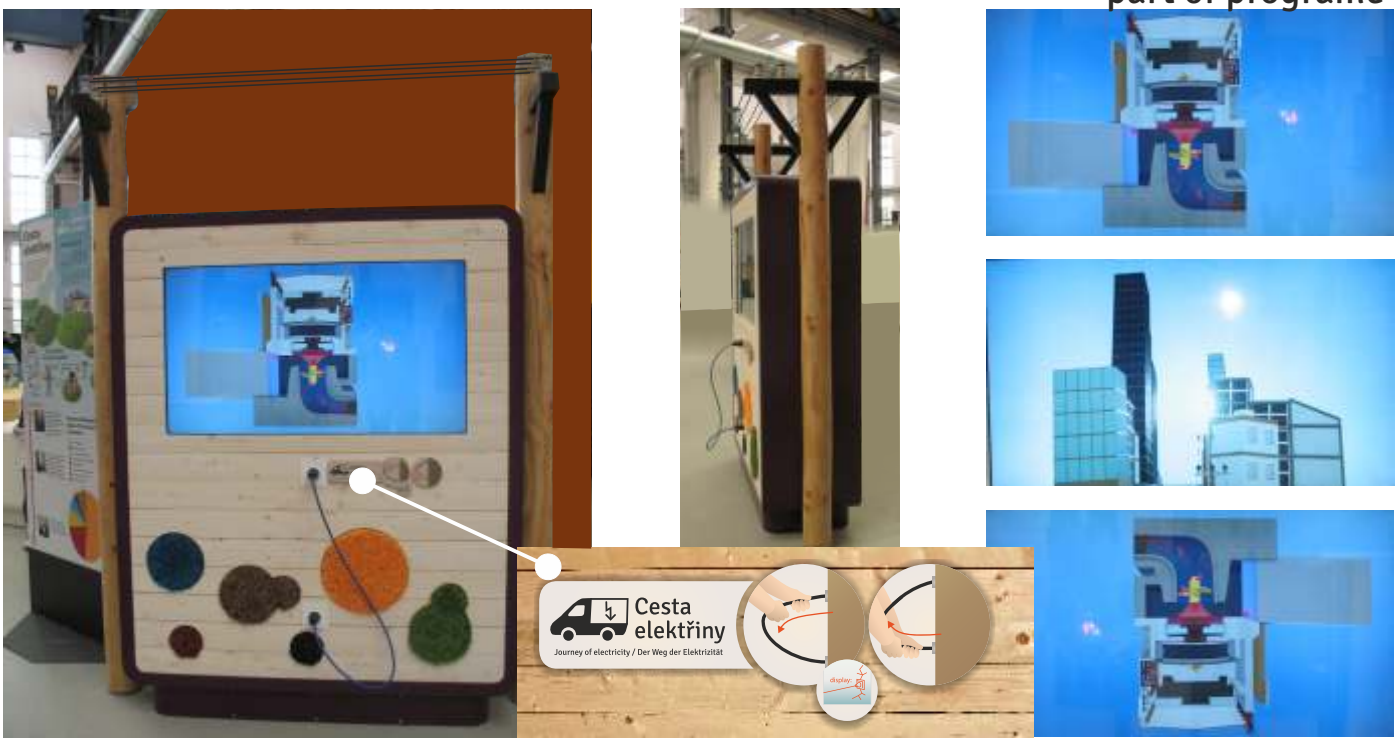
Techmania Science Center

Renewable resouces of energy

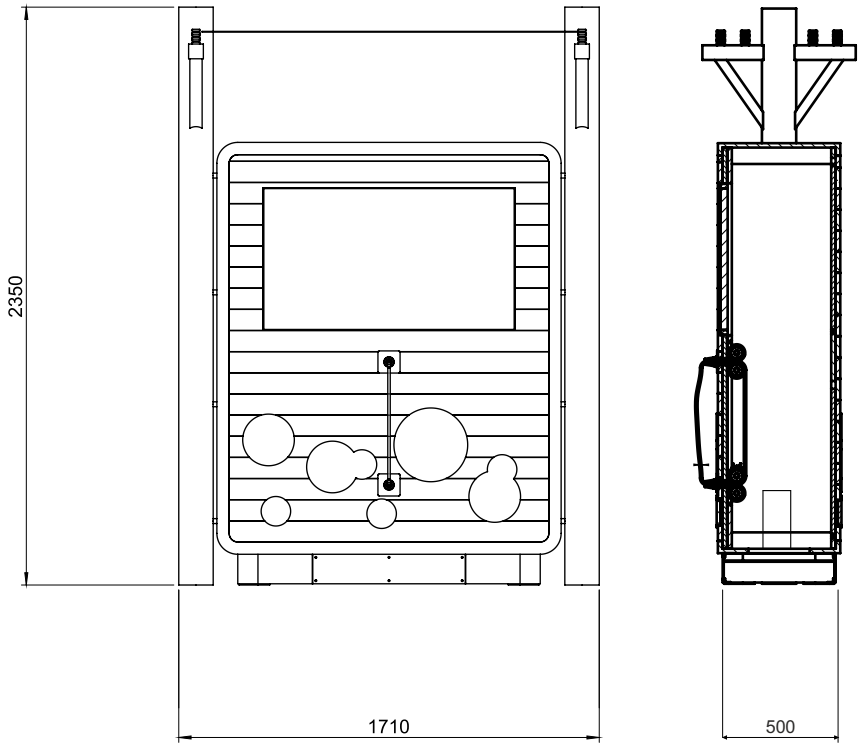
The path electricity takes

18

part of programe



A visitor pulls the cable that is sticking out and enters the exhibit. The animation changes on the screen as if he/she were pulling real electric wiring.



Techmania Science Center

The path electricity takes

18

The main phenomenon:	Electricity generation, transmission and distribution systems
Target group:	The general public, basic and secondary school students
A description of the exhibit:	The exhibit consists of a large screen (approx. 100 cm diagonally) onto which the animation is projected. There is a 1 cm diameter cable sticking out of the base under the screen that returns at a distance of approx. one-half meter. The cable is connected inside the base to form a loop. There is a sensor inside the base connected to the cable that records if the cable is pulled, in what direction and how fast. The animation on the screen corresponds to movement in the cable. If the cable stops, the animation will also stop. The faster the visitor pulls the cable, the faster the animation is in both directions, forward and backward. The animation shows the path of electricity through the cable, from the exhibit to the power plant station. The electricity gradually moves from 230/400 V in the socket via the 22.35 kV switchboard, onto the 110 kV transformer station and ending with 400 kV very high voltage. The current will terminate at a transformer station near the power plant; transmission to lower voltage; a look into the power plant station; and the generator (alternator) principle. It can be set in the environment of Techmania, Plzeň or Temelín. The animation can be viewed forward as well as backward depending on the direction that the cable is pulled. It is also possible to pause the animation anywhere along the way and then continue from the same spot. As soon as the visitor reaches the end of the animation, the animation will promptly return to its beginning. In case of long periods of inactivity (30 seconds), the animation will automatically return to the beginning. There is a voltage meter in the corner of the screen indicating the current voltage in the cable. There is a panel with various types of conductors (thicknesses and materials) hanging down on the side of the exhibit. A table indicating each of their voltages and the space required for their practical usage is contained in photographs of the transmission and distribution network.
The main idea be retained:	Where and how is electricity produced and how is it distributed to customers?
Questions to be raised:	Why does voltage change along its journey and why do wires have different widths.

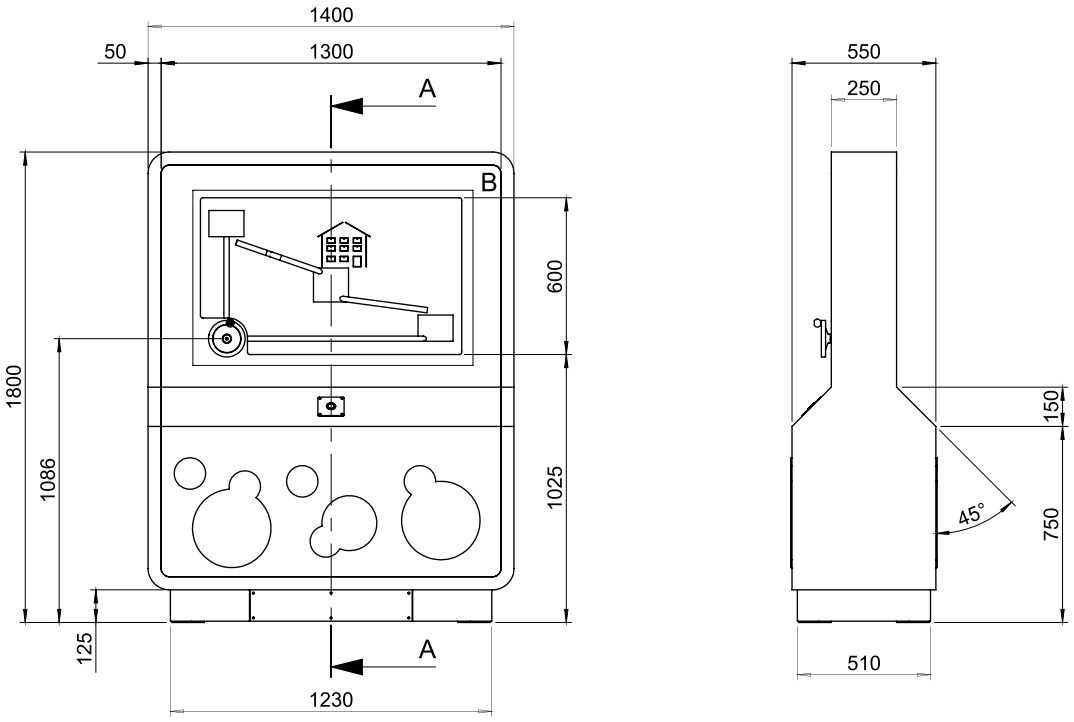
Techmania
Science Center

Renewable resouces of energy

Pumped-storage power plants

19

A visitor comes to the exhibit and transfers water from the lower reservoir to the upper reservoir using a mechanical wheel. After the visitor fills the upper reservoir, he/she will press the button – water will be conveyed to the pressure feeder, the turbine will be spun and the light in the plant will turn on. The activity can be performed repeatedly.



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Renewable resouces of energy

Pumped-storage power plants

19

The main phenomenon:	The action and function of a pumped-storage power plant.
Target group:	The general public, basic and secondary school students
A description of the exhibit:	The exhibit consists of a model landscape with a pumped-storage power plant and model plant. There is a reservoir in the lower part, and underground power plant with a turbine, pressure feeders and piping with a pump that transfers water to the upper reservoir. The entire model is enclosed in a transparent case and shows a model of a pumped-storage power plant in the landscape. There is a mechanical wheel outside the exhibit that a visitor can turn to pump water from the lower reservoir to the upper reservoir. There is also a button outside the exhibit that the visitor can push to release the water back into the lower reservoir through a pressure feeder. The upper reservoir contains safety features so that it cannot be overfilled. When water flows through the pressure feeder, the turbine is spun – energy is created and the light in the plant will turn on.
The main idea be retained:	Thanks to pumped-storage power plants, an excessive amount of electricity can be generated.
Questions to be raised:	How is water pumped into the reservoir? Where is a pumped-storage power plant located in the Czech Republic?

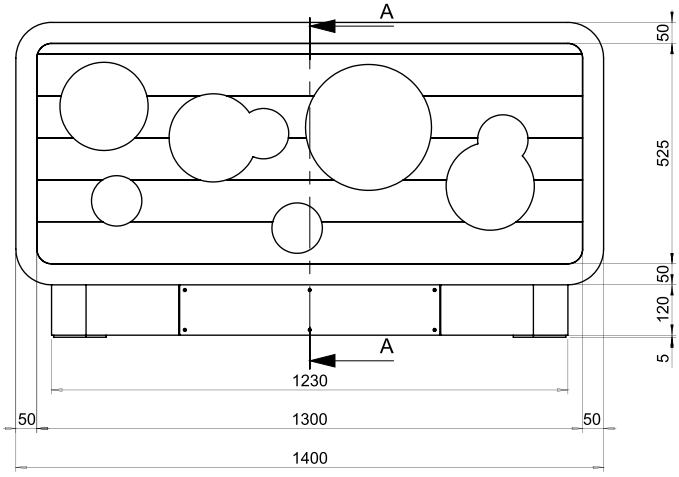
Techmania Science Center

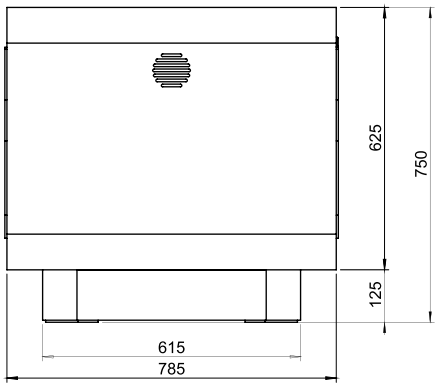
Renewable resouces of energy

Management of power generation

20

The visitor controls the touch screen using clear icons (input, help, reports, critical conditions...). The game has several levels that must be managed by the visitor. Example of the game: Normal day – people come to town and start to work – smoking chimneys, a large amount of cars driving on the roads. The consumption increases. How can we cover the consumption? It is necessary to choose a pumped-storage power plan, turn the heating off for a part of inhabitants for two hours and start a gas power station. Windy day – a strong wind blows and a wind park generates a large amount of energy. What should we do with the electricity? We will turn off the gas power plant, limit the production in the hydroelectric plant and remotely turn the electrical heating on for all people in the town. The production curve should copy the consumption curve. Sunny day – all solar power plants are working. It is cloudy in the neighbouring state, so we can sell a part of the (excess) energy.





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Management of power generation

20

The main phenomenon:	Energy transmission and generation
Target group:	The general public, basic and secondary school students
A description of the exhibit:	The exhibit is an interactive touch table with software. The software is designed for a competition between two visitors or for individuals. The interactive table displays a bird's eye view of a landscape. The landscape contains several types of power plants (a constant load andnuclear power plant a wind park, a solar park, a pumped-storage power plant etc. The middle of the table contains an aerial view of a town and its streets, each player has a graphical indicator showing the actual power generation for each sources, the tow´s actual consumption and a clock. The time passes very quicly. The visitor´s task is to supply the whole town with elecricity for a given period of time (one day lasts a approximately 6 minutes)
The main idea be retained:	Energy cannot be generated from nothing. Something must always be transformed. It is difficult to store energy, especially in large quantities. Alternative sources each have their own disadvantages.
Questions to be raised:	Does the Czech Republic sell electricity? Where is the excessive amount of produced energy stored?

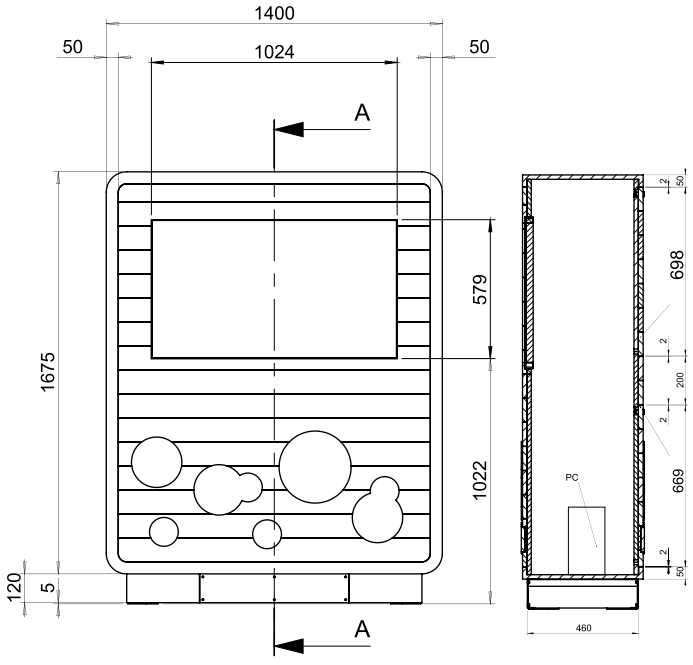
Techmania
Science Center

Renewable resouces of energy

Savings in households

21

The visitor comes to the exhibit and presses the “Start” field on the touch screen with his/her hand. The software will be started by pressing “Start” – see the annex. The visitor's task is to score points by following the instructions on the screen. The game is divided into three levels. The visitor clicks certain spots in the virtual room with his/her hand as instructed in order to save energy. He/she can see on the chart on the screen how total household consumption decreases due to energy savings.



Techmania Science Center

Savings in households

21

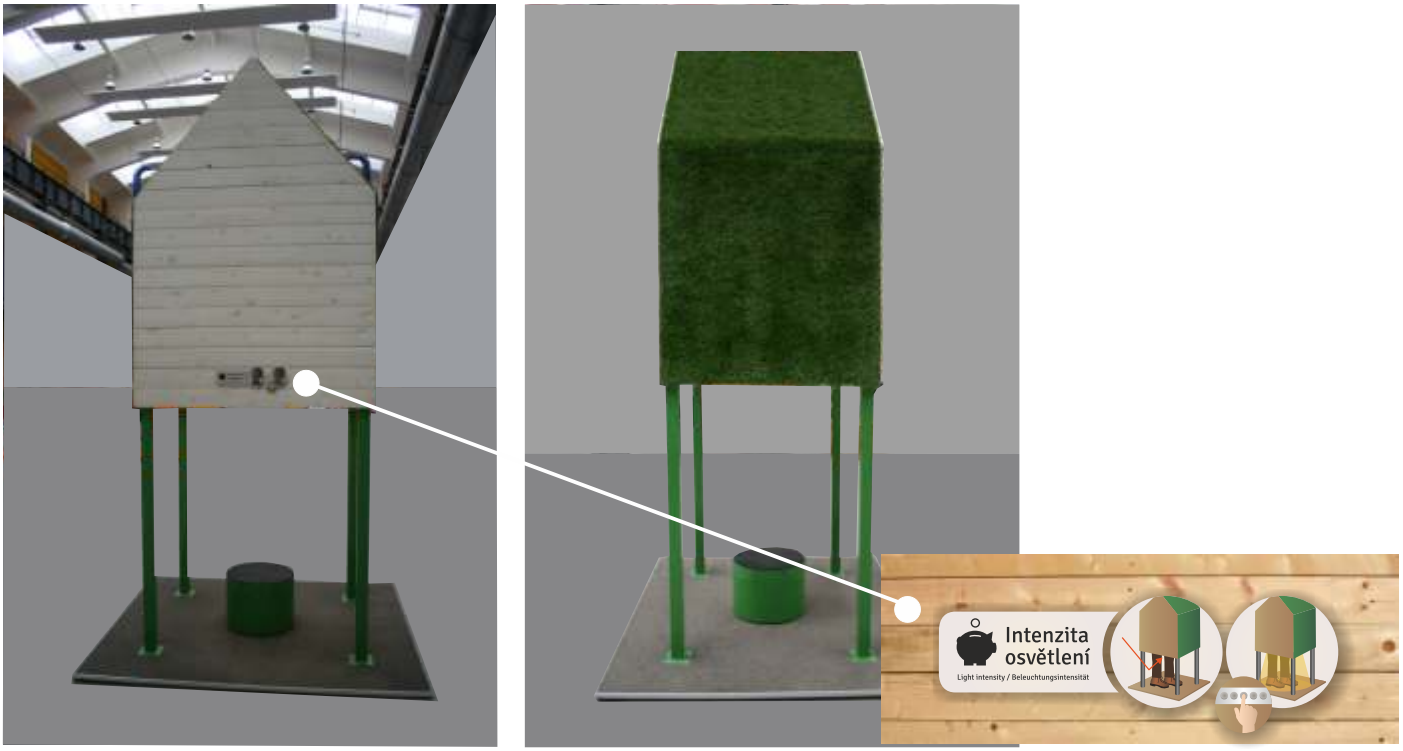
The main phenomenon:	Household energy saving tips.
Target group:	The general public, basic and secondary school students
A description of the exhibit:	The exhibit consists of a touch screen affixed to a base. The base contains a computer with software (a game) installed – see the annex. The animation is projected on the screen. The visitor follows the instructions on the screen and looks for appliances or other objects in the room that waste energy. The visitor plays through three rounds with each round having being more difficult. The game starts by pressing the "Start" button on the screen or by pressing the "Restart" button which is permanently displayed in the bottom right corner of the screen.
The main idea be retained:	There are needless energy losses in households.
Questions to be raised:	How can I save energy in my household?

Techmania
Science Center

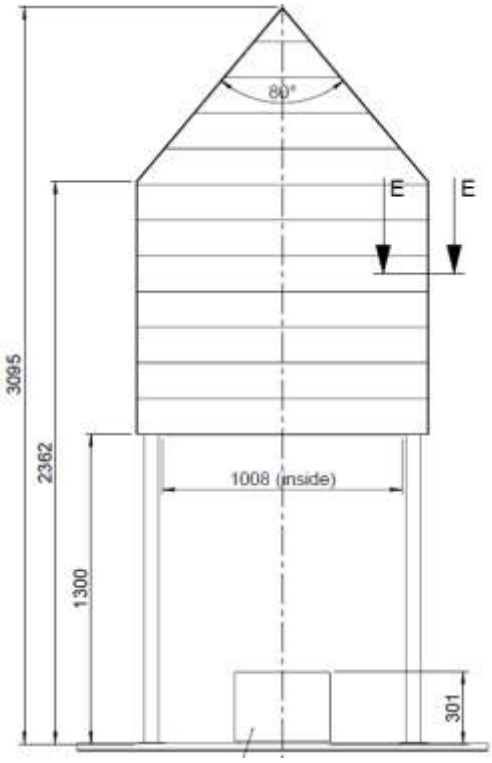
Renewable resouces of energy

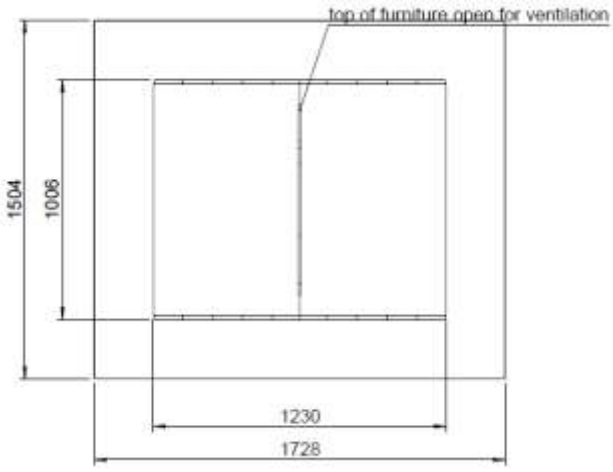
Light intensity

22



A visitor enters the tube so that he/she is standing with one half of his/her body inside the exhibit. He/she switches on the light source using individual buttons that each have a corresponding light intensity measured in lumens.





Techmania Science Center

Renewable resouces of energy

Light intensity

22

The main phenomenon:	Examples of light intensity.
Target group:	The general public, basic and secondary school students
A description of the exhibit:	The exhibit contains a non-transparent box shaped like a house that sits on four legs. There is a platform under the tube that the visitors walk into. There is a light source on top of the tube. There are 5 buttons on the inner wall of the tube that operate the light source – each of the buttons corresponds to a certain value and intensity of light measured in lumens. The light will remain turned on while the button is pressed.
The main idea be retained:	Excessive lighting.
Questions to be raised:	Unpleasant light – too intense for the eyes.

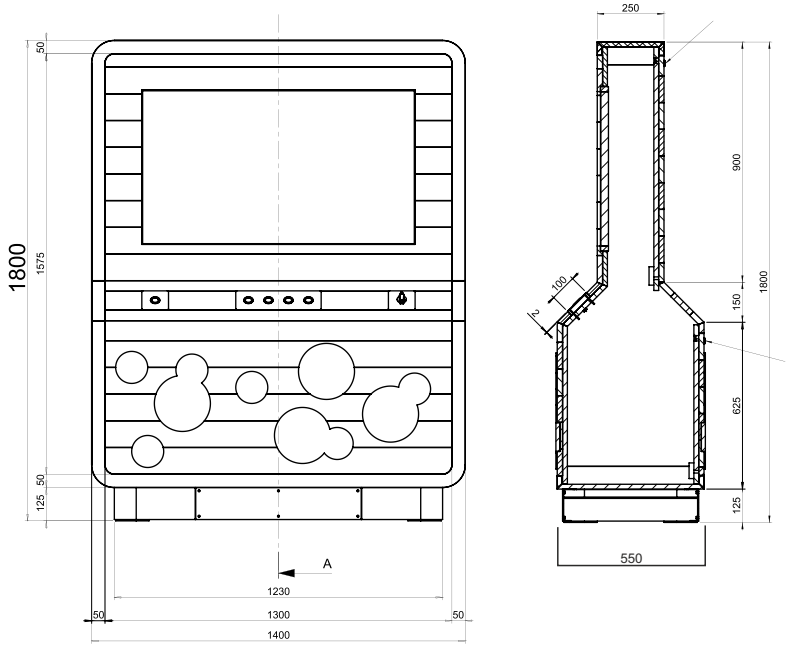
Techmania
Science Center

Renewable resouces of energy

Find a solution to energy issue

23

The visitor sits at the exhibit and presses one of two information panels on the left side in order to display text about a certain territory. A map of that territory will be displayed on the left screen. The visitor chooses different types of power plants by pressing individual buttons. Spots showing the location of the respective type of the power plant will be marked on the map of the left screen and at the same time, informational text will be displayed on the right screen.



Techmania Science Center

Renewable resouces of energy

Find a solution to energy issue

23

The main phenomenon:	In this exhibit, the visitor will summarize all his/her knowledge that he/she has gained in the Renewal Energy Sources exposition and will apply it to a specific territory.
Target group:	The general public, basic and secondary school students
A description of the exhibit:	The exhibit consists of two basic parts. There is a control panel with two screens that are located in front of it. There are two information panels on the left part of the control panel that are illuminated when pressed to show text. The information panels are two separate large buttons with text on them that briefly describe a certain territory. When pressed, the text will be illuminated and at the same time, a map will be displayed on the left screen. The right side of the control panel contains six buttons that are assigned to different types of power plants – a nuclear power plant, a solar power plant, a hydroelectric plant, a wind power plant, a thermal power plant and a biomass power plant. By pressing one of the six buttons, the power plant's location will be displayed on the map on the left screen, and at the same time, text showing that particular type of plant's pros and cons will be displayed on the right screen. Information concerning the proportion of power provided by this type of plant in the chosen territory will also be displayed. 2 stools are included in the exhibit.
The main idea be retained:	The advantages and disadvantages of individual types of power plants.
Questions to be raised:	What is the most used type of power plant? What is the most eco-friendly power plant type?

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