

	0:01
Narrator: QUICK -- WHAT DO YOU THINK	
	0:04
IS THE BIGGEST ENVIRONMENTAL HAZARD IN THIS PICTURE?	
	0:06
IT'S NOT THE CARS.	
	0:08
IT'S THE BUILDINGS.	
	0:10
WE WORK IN THEM, PLAY IN THEM, LIVE IN THEM,	
	0:14
BUT THEY ALSO ACCOUNT FOR 45% OF ALL GREENHOUSE-GAS EMISSIONS.	
	0:18
NOW, A NEW GREEN GENERATION	
	0:20
OF SCIENTISTS, ARCHITECTS, AND ENGINEERS	
	0:23
ARE RADICALLY RETHINKING HOW WE BUILD.	
	0:25
AND WHAT THEY'RE COMING UP WITH WILL CHANGE YOUR LIFE.	
	0:29
IMAGINE FLYING OVER THE CITY	
	0:31
AND SEEING PRAIRIES INSTEAD OF BLACK ROOFTOPS.	
	0:35
Narrator: FROM A SMART BUILDING	
	0:36
THAT ACTUALLY RESPONDS AND ADJUSTS TO YOUR BODY...	
	0:39

TO A HOUSE POWERED BY HYDROGEN GAS MADE FROM TAP WATER...	
	0:42
THIS IS THE ULTIMATE ENERGY SYSTEM.	
	0:44
Narrator: ...AND AIR-CONDITIONING	
	0:46
THAT RUNS ENTIRELY OFF THE SUN,	
	0:48
HERE ARE AMAZING BUILDING TECHNOLOGIES	
	0:50
WHICH WILL TRANSFORM THE WAY WE LIVE.	
EACH YEAR, THE AVERAGE AMERICAN HOME	
	1:18
EMITS ABOUT 23,000 POUNDS OF CARBON DIOXIDE	
	1:22
AND SPENDS OVER \$1,500 IN UTILITY BILLS,	
	1:25
AND THAT'S NOT VERY GOOD FOR YOU OR ME.	
	1:28
BUT THIS HOME EMITS NO CARBON GASES	
	1:31
AND WILL NEVER HAVE A GAS OR ELECTRIC BILL,	
	1:34
WHICH IS WHY IT'S BEEN CALLED	
	1:36
THE MOST REVOLUTIONARY HOUSE IN AMERICA.	
	1:38
AND LIKE THE SUN, IT'S POWERED BY HYDROGEN.	
	1:47

COME HERE. I WANT TO SHOW YOU SOMETHING.	
	1:49
HI, MY NAME IS MIKE STRIZKI,	
	1:50
AND WELCOME TO THE NATION'S FIRST	
	1:52
SOLAR/HYDROGEN-FUEL-CELL-POWERED HOME IN NORTH AMERICA.	
	1:56
Narrator: STRIZKI, A SCIENTIST AND ENGINEER	
	1:58
WITH YEARS OF SOLAR-POWER EXPERIENCE UNDER HIS BELT,	
	2:01
MAY JUST HAVE THE SOLUTION TO GLOBAL WARMING	
	2:05
RIGHT HERE IN THESE TANKS -WELL, KIND OF.	
	2:09
Strizki: WE'RE STANDING RIGHT IN THE MIDDLE OF MY STORAGE AREA.	
	2:12
THESE TANKS HOLD 19,000 CUBIC FEET OF HYDROGEN,	
	2:15
WHICH IS THE EQUIVALENT OF 56 GALLONS OF PROPANE	
	2:18
OR 40 GALLONS OF GASOLINE.	
	2:20
YET THIS IS ENOUGH ENERGY, WITH THE SOLAR AND GEOTHERMAL,	
	2:23
TO POWER MY HOME FOR AN ENTIRE YEAR --	
	2:26
COOKING GAS, HEATING GAS, AND FUEL FOR THE VEHICLE.	

	2:30
Narrator: AND WHERE DOES MIKE GET ALL OF THIS HYDROGEN?	
	2:33
HE MAKES IT HIMSELF FROM ORDINARY TAP WATER.	
	2:37
BUT WHEN MOST PEOPLE THINK OF HYDROGEN,	
	2:39
THEY REMEMBER THIS -THE HINDENBERG.	
	2:42
Strizki: POPULAR SCIENCE DID A STUDY A FEW YEARS AGO	
	2:46
ON WHAT HAPPENED WITH THE HINDENBERG.	
	2:49
THE SKIN OF THE AIRSHIP WAS COATED WITH ALUMINUM OXIDE,	
	2:53
WHICH IS ROCKET FUEL.	
	2:54
SO WHAT PEOPLE SAW BURNING AS THE SHIP IGNITED	
	2:57
WAS THE ALUMINUM OXIDE ON THE SKIN AND THE DIESEL TANKS.	
	3:01
ANY HYDROGEN THAT WAS GOING TO BURN OR ESCAPE	
	3:04
WENT UP IN A TENTH OF A SECOND.	
	3:05
WHAT YOU SAW CRASHING, COMING DOWN IN THIS EVENT --	
	3:08
IT WASN'T THE HYDROGEN,	
	3:10

BUT APPARENTLY THAT INSTANCE HAS GIVEN HYDROGEN A BAD RAP.	
	3:13
Man: IT'S THE GREATEST OF MIRACLES	
	3:15
THAT ANYONE CAME OUT OF THE DISASTER ALIVE.	
	3:18
[DRAMATIC MUSIC PLAYS]	
	3:21
Strizki: THE TANKS ARE NOT DANGEROUS AT ALL.	
	3:22
IF THEY WERE TO HAVE A LEAK,	
	3:24
THE HYDROGEN WOULD TRAVEL AT 45 MILES AN HOUR	
	3:27
UP INTO THE ATMOSPHERE.	
	3:29
Narrator: IN TRUTH, HYDROGEN IS...	
	3:37
THIS IS THE HEART OF THE SYSTEM.	
	3:39
THE ELECTROLYZER TAKES WATER,	
	3:41
AND IT RUNS IT THROUGH A DEIONIZING PROCESS	
	3:44
AND REVERSE OSMOSIS,	
	3:46
AND IT FEEDS THAT CHEMICALLY PURE WATER	
	3:49
INTO THE ELECTROLYZER.	

	3:50
AND THIS DEVICE HERE SPLITS IT OFF INTO HYDROGEN AND OXYGEN.	
	3:55
Narrator: THE PROCESS IS KNOWN AS ELECTROLYSIS	
	3:57
AND USES ELECTRICITY	
	3:58
TO SEPARATE HYDROGEN AND OXYGEN ATOMS	
	4:01
FROM WATER MOLECULES.	
	4:02
AND WHERE DOES MIKE GET THE POWER FOR HIS ELECTROLYZER?	
	4:06
THE POWER IS FOR FREE, COURTESY OF THE SUN.	
	4:10
THE AVERAGE AMERICAN HOME	
	4:12
USES ABOUT 1,000 KILOWATTS OF POWER PER MONTH,	
	4:16
AND MIKE'S PHOTOVOLTAIC CELLS PROVIDE ABOUT 1,000 KILOWATTS.	
	4:20
BUT BECAUSE MIKE'S MADE HIS HOUSE SUPEREFFICIENT,	
	4:24
THAT'S 60% MORE POWER THAN HE NEEDS DURING THE DAY.	
	4:28
THE EXTRA ELECTRICITY IS STORED BY CONVERTING IT TO HYDROGEN.	
	4:32
Strizki: THIS TANK HERE HAS HYDROGEN IN IT.	
	4:34

Narrator: THE HYDROGEN CAN BE CONVERTED BACK TO ELECTRICITY	
	4:37
BY PUTTING IT THROUGH A FUEL CELL.	
	4:39
Strizki: YOU CAN SEE HERE'S THE INDIVIDUAL FUEL-CELL STACKS.	
	4:42
Narrator: FUEL CELLS ARE SIMPLY ELECTROLYSIS IN REVERSE --	
	4:46
THIS TIME, BRINGING HYDROGEN AND OXYGEN BACK TOGETHER	
	4:49
TO PRODUCE ELECTRICITY.	
	4:51
THE SIMPLE SCIENCE TO THIS HOME	
	4:53
IS THAT WE'RE TAKING SUNLIGHT, CONVERTING IT INTO ELECTRICITY.	
	4:56
WE'RE STORING EXCESS ELECTRICITY	
	4:58
IN THE FORM OF HYDROGEN, USING WATER.	
	5:00
WE RECOMBINED IT AGAIN TO GET THE ELECTRICITY BACK.	
	5:03
WE'RE MAKING WATER AGAIN.	
	5:04
AND THE SYSTEM IS REPEATABLE ENDLESS TIMES.	
	5:08
THIS IS A HYDROGEN VEHICLE.	
	5:09
Narrator: WHAT MAKES MIKE'S SYSTEM REALLY INCREDIBLE	

	5:12
IS THAT IT'S ALL OFF-THE-SHELF TECHNOLOGY.	
	5:16
THIS IS THE PERFECT ENERGY SYSTEM	
	5:17
THAT NOTHING GETS CONSUMED EXCEPT SUNLIGHT.	
	5:20
AND IF WE FAIL TO HAVE SUNLIGHT, WE'RE ALL DEAD.	
	5:25
Narrator: MIKE HAS EVEN BUILT	
	5:26
A HYDROGEN-POWERED CAR FOR HIMSELF.	
	5:29
THAT'S RIGHT -- MIKE HAND-BUILDS HYDROGEN-POWERED CARS	
	5:32
AS A HOBBY.	
	5:34
Strizki: I'M TAKING THE HYDROGEN THAT I GENERATE	
	5:36
FOR MY FUEL CELL THAT POWERS MY HOUSE,	
	5:38
AND I CAN FILL MY CAR RIGHT WITH THE SAME HYDROGEN.	
	5:42
WHEN I BUILT THIS CAR, I DESIGNED IT	
	5:44
THAT IT COULD BE PLUGGED INTO A HOUSE	
	5:45
IN THE EVENT OF A POWER FAILURE,	
	5:47

SO I CAN ALWAYS POWER MY HOUSE AND MY CAR.	
	5:50
HOW COOL IS THAT?	
	5:51
Narrator: THE PRICE TAG OF MIKE STRIZKI'S SYSTEM IS HIGH --	
	5:54
ABOUT \$500,000.	
	5:56
BUT LIKE ANY PROTOTYPE, THE COST WILL COME DOWN	
	5:59
AS MORE OF HIS SYSTEMS ARE BUILT.	
	6:01
THIS BACKYARD HYDROGEN SYSTEM IS STILL IN THE EXPERIMENTAL STAGE,	
	6:06
BUT IF IT PROVES TO BE NEARLY AS EFFICIENT AS MIKE CLAIMS,	
	6:09
IT MIGHT JUST HELP SAVE THE PLANET, ONE HOUSE AT A TIME.	
	6:13
HYDROGEN-POWERED HOMES MIGHT BE	
	6:15
THE COOLEST AND NEWEST TECHNOLOGY AROUND,	
	6:17
BUT EVEN SOLAR POWER IS UNDERGOING A REVOLUTION.	
	6:20
WE'RE TRYING TO UTILIZE THE SUN TO ITS FULLEST EXTENT	
	6:24
TO CREATE ENERGY TO RUN ALL THE SYSTEMS OF THIS HOUSE.	
	6:28
Narrator: THIS HOUSE IN COLORADO	

	6:30
IS POWERED ENTIRELY BY SOLAR ENERGY.	
	6:32
THAT MIGHT NOT BE NEW, BUT THIS IS.	
	6:35
THE TUBES ON THIS ROOF ARE AN AMAZING NEW TECHNOLOGY	
	6:38
WHICH COULD MAKE OBSOLETE	
	6:40
CONVENTIONALLY-POWERED WATER HEATERS	
	6:42
AND HOME-HEATING SYSTEMS.	
	6:43
THEY'RE CALLED SOLAR EVACUATED TUBES,	
	6:46
AND THEY'RE MADE UP OF ROWS	
	6:47
OF VACUUM-SEALED TRANSPARENT GLASS CYLINDERS.	
	6:51
INSIDE EACH ONE IS A FLUID LIKE AN ANTIFREEZE	
	6:54
THAT ABSORBS SOLAR RADIATION.	
	6:57
THE ANTIFREEZE IS DIRECTED TO THE BASEMENT,	
	6:59
WHERE IT WILL HEAT UP	
	7:01
THE 600-GALLON SUPERINSULATED HOT-WATER TANK.	
	7:04

THAT WILL HEAT THE HOUSE AND SUPPLY ALL ITS HOT WATER	7:07
WITHOUT THE NEED FOR GAS OR ELECTRICITY.	7:11
WHEN IT COMES TO HEATING YOUR HOME AND HOT WATER,	7:14
SAY GOODBYE TO GAS AND ELECTRIC BILLS.	7:16
Pendergast: THE EFFICIENCY OF THIS SYSTEM	7:19
IS SO MUCH BETTER THAN A STANDARD SYSTEM	7:21
BECAUSE WE'RE ABLE TO PULL THAT HOT WATER FROM THE ROOF	7:25
FOR MOST OF THE HEATING NEEDS,	7:28
AND IT IS ENTIRELY SOLAR-POWERED,	7:30
SO THERE IS NO CALL FOR GAS.	7:33
THERE'S NO CALL FOR ELECTRICITY.	7:37
IT'S LOOKING GREAT.	7:39
Narrator: IN THE BACKYARD, FINISHING TOUCHES	7:41
ARE BEING PUT ON SOLAR PANELS	7:42
WHICH WILL SUPPLY ALL THE ELECTRICAL NEEDS OF THE HOUSE.	

	7:45
PUT THAT CORNER DOWN FIRST, AND THEN LIKE THAT.	
	7:50
Pendergast: IT'S A 10-KILOWATT SYSTEM.	
	7:51
ANY TIME THE SUN IS SHINING,	
	7:53
WE'RE GONNA BE PRODUCING 10,000 WATTS OF ELECTRICITY,	
	7:56
AND THAT WILL MORE THAN SUPPLY WHAT THEY'RE USING	
	7:59
AT ANY TIME DURING THE DAY.	
	8:01
Narrator: OVER ITS LIFETIME,	
	8:03
THE ARRAY WILL ELIMINATE THE NEED FOR POWER PLANTS	
	8:06
TO PRODUCE OVER 28,000 POUNDS OF CARBON DIOXIDE.	
	8:09
AND TO ABSORB THAT AMOUNT OF CARBON DIOXIDE,	
	8:11
YOU'D NEED TO PLANT ALMOST FOUR ACRES OF TREES.	
	8:16
Pendergast: WHEN THE SUN IS OUT,	
	8:17
THEIR ELECTRIC METER WILL BE SPINNING BACKWARDS.	
	8:21
AND AS IT SPINS BACKWARDS,	
	8:23

IT WILL REDUCE THE AMOUNT OF ENERGY THAT THEY'RE PAYING FOR.	8:28
IN THE END, IT'S A NET ZERO HOME.	8:30
Narrator: AND THAT MEANS THIS HOUSE	8:32
IS ACTUALLY SUPPLYING ENERGY TO THE POWER COMPANY.	8:35
JIM'S HOUSE, DRAWING ALL OF ITS POWER NATURALLY FROM THE SUN,	8:39
IS JUST ANOTHER SMALL STEP TOWARDS SAVING THE PLANET.	8:42
BUT CAN EVEN MORE RAW ENERGY BE COAXED FROM THE SUN?	8:46
COULD SOLAR POWER PROVIDE ALL OF THE ENERGY NEEDS	8:50
FOR OUR HOMES SOMEDAY?	8:52
TO FIND OUT, YOU NEED TO COME HERE	8:55
TO THE WORLD-RENOWNED NATIONAL RENEWABLE ENERGY LAB.	8:58
MY NAME IS MEL McLAURIN.	9:00
I'M A POSTDOC RESEARCHER AT THE NATIONAL RENEWABLE ENERGY LAB.	9:04
AND WE'RE WORKING ON THE NEXT GENERATION OF MATERIALS	9:06
FOR CONCENTRATOR PHOTOVOLTAICS.	

	9:08
Narrator: MOST OF THE PHOTOVOLTAIC PANELS	
	9:10
ON THE MARKET TODAY	
	9:11
ARE MADE OF THE SEMICONDUCTING MATERIAL SILICON.	
	9:14
IT WAS CONSIDERED A BREAKTHROUGH MATERIAL	
	9:17
A HALF-CENTURY AGO,	
	9:18
BUT ONLY A SMALL AMOUNT OF THE LIGHT IT RECEIVES	
	9:21
IS USED EFFICIENTLY.	
	9:22
TODAY, THE SEARCH IS ON	
	9:24
FOR AN EVEN MORE EFFICIENT SEMICONDUCTING MATERIAL.	
	9:27
IMAGINE A PHOTOVOLTAIC ARRAY	
	9:31
USING A VARIETY OF NEW SEMICONDUCTING MATERIALS	
	9:34
THAT CAN EFFECTIVELY USE MOST OF THE LIGHT IT COLLECTS.	
	9:37
THAT SYSTEM IS CALLED A MULTI-JUNCTION ARRAY,	
	9:40
AND IT MIGHT JUST REVOLUTIONIZE	
	9:42

HOW WE POWER OUR HOMES IN THE FUTURE.	
	9:44
TO DO THIS TYPE OF WORK,	
	9:47
YOU'LL NEED AN M.B.E.	
	9:51
M.B.E. IS MOLECULAR BEAM EPITAXY	
	9:53
OR MIGHTY BIG EVAPORATOR.	
	9:55
WHAT WE'RE TRYING TO DO IS TO ACTUALLY GROW COMPOSITIONS	
	9:59
OF INDIUM GALLIUM NITRIDE, WHICH IS A SEMICONDUCTOR,	
	10:02
A COMPOUND SEMICONDUCTOR, THAT'S RELATIVELY NEW.	
	10:04
IT'S ONLY BEEN GROWN FOR THE LAST 10 OR 15 YEARS.	
	10:08
AND WHAT IT WILL LET US DO IS ACTUALLY BUILD DEVICES	
	10:10
WHICH CAN EFFICIENTLY COLLECT POWER FROM SUNLIGHT	
	10:13
ACROSS THE ENTIRE SOLAR SPECTRUM.	
	10:15
AND SO IN THIS CHAMBER, WHAT WE'RE DOING RIGHT NOW	
	10:18
IS GROWING GALLIUM NITRIDE AS AN INITIAL EXPERIMENT	
	10:21
TOWARDS ACTUALLY GROWING INDIUM-GALLIUM-NITRIDE DEVICES.	

	10:24
WHAT WE CAN DO IS COMBINE A BUNCH OF THESE MATERIALS	
	10:26
SO THAT OUR DEVICES ABSORB EACH WAVELENGTH	
	10:29
AND EXTRACT THE OPTIMUM AMOUNT OF ENERGY FROM EACH ONE.	
	10:33
AND SO BY USING GALLIUM NITRIDE AND INDIUM GALLIUM NITRIDE,	
	10:36
WE CAN ACCESS THE ENTIRE SOLAR SPECTRUM	
	10:39
AND CONCEIVABLY MAKE DEVICES IN A VERY SIMPLE WAY	
	10:42
THAT EFFICIENTLY --	
	10:43
MUCH MORE EFFICIENTLY THAN CURRENT DEVICES --	
	10:45
PRODUCE POWER FROM SUNLIGHT.	
	10:47
Narrator: REFLECTORS AND LENSES	
	10:49
WOULD CONCENTRATE THE SUN'S RAYS	
	10:51
ON THESE NEW, SMALLER SEMICONDUCTING SURFACES,	
	10:54
YIELDING AN ABUNDANCE OF ELECTRICITY.	
	10:56
WITH THE CONCENTRATOR TECHNOLOGIES	
	10:58

BEING DEVELOPED IN THIS LAB,	
	11:00
THE FUTURE COULD BE A VERY DIFFERENT PLACE.	
	11:01
INSTEAD OF HAVING LARGE COAL PLANTS	
	11:05
OR LARGE NATURAL-GAS PLANTS,	
	11:06
IMAGINE THESE CONCENTRATOR TECHNOLOGIES AS LARGE FARMS,	
	11:09
AND THAT BECOMES THE BASIS OF THE ELECTRICAL GRID.	
	11:11
SO INSTEAD OF GETTING YOUR ELECTRICITY	
	11:13
FROM COAL OR NATURAL GAS,	
	11:14
YOU'LL BE GETTING YOUR ELECTRICITY FROM SOLAR,	
	11:16
JUST LIKE YOU DO NOW, JUST RIGHT FROM THE GRID.	
	11:19
WE'RE NOT PRODUCING ANY WASTE.	
	11:20
THESE THINGS ARE COMPLETELY GREEN.	
	11:22
THEY TAKE IN SUNLIGHT, THEY PRODUCE ELECTRICITY.	
	11:24
THERE'S NO WASTES, THERE'S NO COAL, THERE'S NO NATURAL GAS,	
	11:27
THERE'S NO DEPENDENCE ON ANYTHING.	

	11:29
Narrator: THE POTENTIAL IS TREMENDOUS,	
	11:32
BUT THERE'S STILL MORE RESEARCH TO BE DONE.	
	11:35
THIS IS SO CUTTING-EDGE TECHNOLOGY	
	11:38
THAT IT DOESN'T QUITE WORK RIGHT YET,	
	11:40
AND THAT'S WHY WE'RE HAVING TO SPEND SO MUCH TIME	
	11:42
WORKING ON GROWTH AND MAKING DEVICES	
	11:43
AND FIGURING OUT HOW THESE MATERIALS WORK.	
	11:46
Narrator: BUT THESE SCIENTISTS ARE CONFIDENT	
	11:48
THAT THEY'RE ON THE RIGHT TRACK	
	11:49
AND THAT THIS NEXT GENERATION OF MULTI-JUNCTION PHOTOVOLTAICS	
	11:53
COULD SUPPLY POWER TO THOUSANDS OF HOMES AT A TIME.	
	11:57
AND THAT JUST MEANS THAT EVERY ARRAY OF COLLECTORS	
	12:00
ARE ONLY GONNA BE THAT MUCH MORE EFFECTIVE	
	12:02
AT GATHERING ENERGY FROM THE SUN.	
	12:05

Narrator: MULTI-JUNCTION SOLAR COLLECTORS	
	12:07
MIGHT JUST BE THE BREAKTHROUGH TECHNOLOGY	
	12:09
THAT COULD SAVE THE PLANET.	
	12:10
BUT THIS IS ONLY PART OF THE STORY.	
	12:13
SOME SCIENTISTS AND ENGINEERS	
	12:15
ARE USING EXTRAORDINARY TECHNIQUES	
	12:17
TO CREATE A FREE, CLEAN,	
	12:19
AND VIRTUALLY UNLIMITED SOURCE OF HEAT.	
	12:22
AND IT HOLDS THE POTENTIAL	
	12:24
OF FREEING US FOREVER FROM FOSSIL FUELS.	
	12:36
Narrator: SOME PEOPLE BELIEVE THE SUN'S POWER ALONE	
	12:39
MAY BE ENOUGH TO FILL THE PLANET'S POWER NEEDS,	
	12:41
AND IT CAN BE HARNESSSED IN MANY DIFFERENT WAYS.	
	12:44
TAKE, FOR EXAMPLE, THIS HOUSE.	
	12:47
IT'S 80% MORE ENERGY-EFFICIENT THAN A CONVENTIONAL HOME,	

	12:51
YET USES NO INSULATION, SHEETROCK, OR PAINT,	
	12:55
AND CAN BE ASSEMBLED WITH A POWER SCREWDRIVER.	
	13:01
MY NAME IS MICHAEL SYKES,	
	13:03
AND I'M THE INVENTOR OF THE ENERTIA BUILDING SYSTEM.	
	13:06
BEHIND ME IS AN ENERTIA HOME.	
	13:08
Narrator: MADE FROM 100% RENEWABLE WOODEN BLOCKS,	
	13:11
ENERTIA HOMES USE THE POWER OF THE SUN AND THE EARTH	
	13:14
TO HEAT THEMSELVES.	
	13:15
ONE THING I LEARNED FROM BUILDING LOG HOUSES --	
	13:18
THE CUSTOMERS WERE TELLING ME	
	13:19
THEIR LOG HOMES WERE EXTREMELY ENERGY-EFFICIENT.	
	13:22
SOLID WOOD ACTS AS A THERMAL BATTERY.	
	13:24
THE SOLID-WOOD WALL IS MORE ENERGY-EFFICIENT	
	13:27
THAN A FRAME WALL THAT HAS INSULATION IN IT.	
	13:30

Narrator: IN THE WINTER, AIR ON THE SOUTH-FACING WINDOW WALL	
	13:33
HEATS UP AND FORMS A CONVECTION CYCLE AROUND THE INNER SHELL,	
	13:37
TRANSFERRING HEAT TO THE SOLID-WOOD STRUCTURE.	
	13:40
THAT HEAT SLOWLY RADIATES OUT THROUGH THE DAY.	
	13:43
YOUR WOOD WALLS ARE LIKE A THERMAL BATTERY.	
	13:47
Burke: THE ENERTIA BUILDING SYSTEM --	
	13:50
IT USES THE THERMAL MASS ACTUALLY WITHIN WOOD	
	13:53
AS THE SORT OF MEDIUM FOR ABSORBING THE HEAT	
	13:56
AND USING THAT THROUGHOUT THE DAY	
	13:58
TO MODULATE THE TEMPERATURES ON THE INSIDE.	
	14:00
Narrator: IN THE SUMMER, THE HOUSE KEEPS COOL	
	14:02
BY VENTING HOT AIR THROUGH THE ATTIC	
	14:05
AND CYCLING IN THE COOLER BASEMENT AIR.	
	14:08
Sykes: LIKE MOST SOLAR HOMES,	
	14:10
THERE'S A LOT OF GLASS ON THE SOUTH SIDE,	

	14:12
AND THERE IS A CAVITY IN THE ROOF WHERE THE HEAT CAN GO.	
	14:15
AND THERE'S A CAVITY IN THE NORTH WALL	
	14:17
SO THAT THE HEATED AIR	
	14:19
CAN TRAVEL COMPLETELY AROUND THE HOUSE,	
	14:21
HEATING IT IN WINTER.	
	14:22
Narrator: ENERTIA HOMES ARE ACTUALLY LIKE	
	14:25
HAVING A HOUSE WITHIN A HOUSE.	
	14:26
Sykes: SO, EVERY OPENING HAS TWO WINDOWS.	
	14:30
Narrator: ENERTIA HOMES COST A LITTLE MORE TO BUILD,	
	14:32
BUT WITH THE ADDITION OF SOLAR PANELS,	
	14:33
ENERGY COSTS COULD BE REDUCED	
	14:36
BY AS MUCH AS 80% OVER A CONVENTIONAL HOME.	
	14:41
MY TRAINING IS A MECHANICAL ENGINEER	
	14:44
WITH A SPECIALTY IN THERMODYNAMICS,	
	14:46

WHICH LED ME TO BE A LITTLE BIT MORE CURIOUS	
	14:49
ABOUT HOW THE BUILDING MATERIALS ARE STORING ENERGY.	
	14:51
Narrator: HERE AT THE ENERTIA FACTORY,	
	14:53
WOODEN LOGS ARE CUT, NUMBERED, AND READY TO SHIP OUT.	
	14:57
LUMBER IN THIS HOUSE IS ASSEMBLED	
	15:00
OUT OF SMALL PIECES OF LUMBER AND THEIR GLUE LAMINATIONS.	
	15:04
THEY'RE FINGER-JOINTED WHERE THE TWO PIECES COME TOGETHER.	
	15:07
FOUR PIECES OF LUMBER ARE GLUED TOGETHER TO FORM ONE UNIT,	
	15:12
WHICH IS MORE SUSTAINABLE AND STRONGER AND BETTER	
	15:14
THAN THE SOLID LUMBER WOULD BE.	
	15:18
Vinsel: THE CUT CHART INCORPORATES ALL THE PARTS AND PIECES	
	15:21
THAT ARE IN THE HOME VIA INSTRUCTIONS ON THAT SHEET --	
	15:23
TELLS THESE GUYS WHAT PIECE GOES WHERE,	
	15:26
WHAT LENGTH TO CUT IT, WHAT OPERATIONS TO DO,	
	15:28
AND WHERE IT GOES IN THE HOME.	

	15:33
AND THEY'LL BE SHIPPED OUT TO THE SITE.	
	15:35
Sykes: THIS PARTICULAR HOUSE WILL PROBABLY TAKE	
	15:38
ABOUT 12 BUNDLES TOTAL TO FINISH OUT.	
	15:40
GLUE-LAMINATED MATERIAL COMES FROM SUSTAINABLE FORESTRY.	
	15:45
THEY'RE CERTIFIED, AND THEY HAVE THEIR OWN TREE FARMS	
	15:48
AND HAVE HAD FOR OVER 50 YEARS.	
	15:50
Narrator: THE SYSTEM IS SO EFFICIENT	
	15:52
THAT TRASH IS KEPT TO A MINIMUM.	
	15:54
THIS BASKET RIGHT HERE	
	15:56
REPRESENTS THE WASTE OF TWO ENERTIA KITS.	
	15:58
Narrator: CONVENTIONAL STICK-FRAME HOUSES	
	16:01
MIGHT PRODUCE 20 TIMES THAT AMOUNT OF WASTE.	
	16:04
IF WE CAN DESIGN THINGS INTELLIGENTLY	
	16:07
FROM THE BEGINNING FOR THEIR DISASSEMBLY,	
	16:09

WE'RE MUCH MORE LIKELY TO BE ABLE TO CAPTURE	
	16:12
WHICH METABOLISM OR WHICH WASTE STREAM	
	16:14
THEY WANT TO GO INTO.	
	16:15
AND WHAT WE'RE SEEING NOW IS A MOVEMENT	
	16:17
ALMOST BACK TO RELEARNING	
	16:20
THE MOST BASIC PRINCIPLES AROUND BUILDINGS.	
	16:26
Narrator: ONE EXTRAORDINARY COMMUNITY	
	16:27
IN THE HIGH DESERT OF NEW MEXICO	
	16:29
USES THERMAL MASS TO SUPPLY ALL OF THEIR HEATING NEEDS.	
	16:33
THEY DISCONNECTED YEARS AGO FROM ALL THE GRIDS --	
	16:36
ELECTRIC, SEWER, AND WATER.	
	16:40
THE STYLE IS CALLED BIOTECHTURE,	
	16:42
AND THE HOMES ARE CALLED EARTHSHIPS.	
	16:45
AND THEY'RE BEING BUILT BY PEOPLE	
	16:46
WHO WANT TO SIGNIFICANTLY REDUCE THEIR CARBON FOOTPRINT.	

	16:51
I'M ZACH HELMBERGER.	
	16:52
AND I'M NICOLE LeDUC. THIS IS OUR EARTHSHIP.	
	16:55
LIVING IN THE EARTHSHIP, IT'S BEEN A TRIP.	
	16:59
WE REALLY ENJOY THE FACT THAT WE ARE SELF-SUFFICIENT	
	17:04
AND WE'RE NOT TIED INTO THE GRID	
	17:06
AND WE SPEND \$100 A YEAR ON ENERGY.	
	17:10
PEOPLE DON'T GET THAT AN EARTHSHIP IS MADE OF EARTH,	
	17:14
BUT IT'S NOT LIKE WE'RE BELOW GROUND OR IN ANY WAY SUFFERING.	
	17:18
EARTH IS NOT PRIMITIVE.	
	17:19
EARTH IS ACTUALLY A WONDERFUL BUILDING MATERIAL.	
	17:21
EARTHSHIPS EMPLOY SMALL SOLAR ARRAYS	
	17:24
THAT SUPPLY POWER FOR LIGHTS AND APPLIANCES.	
	17:27
RAINWATER CAPTURED ON THE ROOF PROVIDES DRINKING WATER,	
	17:31
AND LOW-LEVEL SEWERAGE FEEDS FOOD-PRODUCING GARDENS	
	17:35

WITHIN EACH EARTHSHIP.	
	17:37
BUT AT THE HEART OF EVERY EARTHSHIP,	
	17:38
AND WHAT MAKES THEM UNIQUE,	
	17:41
IS A GIANT EARTHEN WALL, A THERMAL MASS,	
	17:43
MADE OF ONE OF THE MOST UBIQUITOUS DISCARDED ITEMS	
	17:46
OF OUR CIVILIZATION -OLD RUBBER TIRES.	
	17:52
SOMEWHERE AROUND 3 BILLION SCRAP TIRES ARE IN U.S. LANDFILLS.	
	17:56
WE DO TIRES JUST LIKE YOU WOULD LAY BRICKS.	
	17:59
WE CENTER TIRES ON THE ONES BELOW.	
	18:02
A LOT OF PEOPLE GET SCARED AWAY FROM EARTHSHIPS	
	18:05
JUST BY THE TIRE POUNDING, ACTUALLY,	
	18:07
BUT IT'S REALLY PRETTY EASY.	
	18:09
AND WITH A CREW, HONESTLY,	
	18:11
IT ONLY TAKES ABOUT A WEEK TO DO 1,000 TIRES.	
	18:15
YOU CAN SEE HOW THE TIRE -IT JUST EATS UP THE DIRT.	

	18:22
WE'VE EXPERIMENTED WITH A LOT OF THINGS.	
	18:24
AND WE HAVE ENDED UP WITH ONE BYPRODUCT OF OUR SOCIETY	
	18:28
THAT IS A PROBLEM ALL OVER THE GLOBE IS TIRES.	
	18:33
Narrator: MIKE REYNOLDS INVENTED THE CONCEPT OF EARTHSHIPS	
	18:36
OVER 30 YEARS AGO.	
	18:38
THERMAL MASS IS A STORAGE AGENT OF ENERGY.	
	18:43
YOU MAKE AS THICK A WALL AS YOU CAN.	
	18:45
OUR WALLS ARE THE THICKNESS OF THE TIRES	
	18:48
PLUS ANOTHER THREE FEET,	
	18:49
AND THEN WE INSULATE OUTSIDE OF THAT.	
	18:51
IF YOU BEAT THE DIRT INTO THE TIRES,	
	18:54
THE DIRT FROM YOUR SITE,	
	18:56
YOU HAVE A STEEL-BELTED, RUBBER-ENCASED,	
	18:59
THERMAL, HIGH-COMPRESSION BRICK,	
	19:01

AND WE BUILD THE BUILDINGS OUT OF THESE.	
	19:03
THEY ARE VERY GOOD FOR EARTHQUAKE. THEY'RE RESILIENT.	
	19:06
THEY HOLD A TREMENDOUS AMOUNT OF WEIGHT.	
	19:07
THE BEATING THE EARTH INTO THE TIRES IS VERY LOW-TECH,	
	19:11
BUT IT'S VERY SOPHISTICATED PHYSICS.	
	19:14
Narrator: IN THE WINTER MONTHS,	
	19:17
THE SUN'S RAYS, WHICH ARE LOW IN THE SKY,	
	19:19
HEAT UP THE TIRE WALL.	
	19:21
THEN AT NIGHT, THE TIRE WALL'S THERMAL MASS	
	19:24
SLOWLY RADIATES THAT STORED HEAT BACK INTO THE EARTHSHIP.	
	19:28
IN THE SUMMER, THE SUN'S RAYS ARE HIGH IN THE SOUTHERN SKY	
	19:32
AND CAN'T REACH THE INTERIOR TIRE WALL.	
	19:34
MOST IMPORTANTLY, THE TIRE WALL, WHICH IS UNDERGROUND,	
	19:38
NOW ACTS LIKE AN AIR-CONDITIONER,	
	19:41
COOLING THE INTERIOR	

	19:42
BY TAPPING INTO THE EARTH'S CONSTANT 55-DEGREE TEMPERATURE.	
	19:46
Reynolds: THIS SPACE IS PROBABLY 70 DEGREES.	
	19:49
BUT THIS IS WHERE PEOPLE HANG OUT.	
	19:51
THE TEMPERATURE THAT'S IN THIS ROOM RIGHT NOW	
	19:53
IS THIS TEMPERATURE YEAR-ROUND.	
	19:57
Narrator: EARTHSHIPS HAVE BEEN BUILT SUCCESSFULLY	
	19:59
IN OVER 20 COUNTRIES.	
	20:01
WHAT WE LEARN FROM THIS BUILDING	
WE'RE TAKING INTO OTHER VERY SIMPLE BUILDINGS	
	20:06
AND TAKING THE SAME TECHNOLOGY	
	20:08
AND PUTTING IT OUT THERE IN A VERY AFFORDABLE WAY	
	20:11
IN THE SAME PRICE RANGE AS CONVENTIONAL HOUSING.	
	20:13
AND THAT HAS TO HAPPEN.	
	20:15
PEOPLE ARE NOT GONNA BUY SOMETHING	
	20:16

IF IT COSTS MORE EXPENSIVE	
	20:18
EVEN IF IT IS GONNA TAKE CARE OF THEM.	
	20:23
Burke: EARTHSHIPS GO BACK	
	20:24
TO SOME VERY VARIED PRINCIPLES ABOUT BUILDINGS	
	20:26
THAT ARE REALLY ANCIENT.	
	20:27
THE NOTION THAT THERMAL MASS CAN BE EMPLOYED WITHIN A BUILDING	
	20:30
AND CAN HELP MITIGATE INTERIOR TEMPERATURES,	
	20:33
CAN STORE HEAT DURING THE DAY AND REUSE IT AT NIGHT --	
	20:37
THAT'S A BASIC TENET OR BASIC PROPERTY OF PHYSICS	
	20:40
THAT IS BEING EMPLOYED INTELLIGENTLY	
	20:42
WITHIN THE BUILDING	
	20:44
WITHOUT THE RELIANCE UPON MECHANICAL SYSTEMS	
	20:47
TO PROVIDE COOLING OR HEATING.	
	20:51
WE HAVE ALL THE NORMAL COMFORTS OF HOME.	
	20:52
YOU CAN WATCH TV, RUN THE COMPUTER.	

	20:55
IT TEACHES APPRECIATION.	
	20:56
YOU LEARN TO CONSERVE YOUR POWER BECAUSE YOU KNOW YOU HAVE	
	20:59
A FINITE AMOUNT STORED IN THE BATTERY.	
	21:01
SO YOU TURN LIGHTS OFF	
	21:02
WHEN YOU LEAVE THE HOUSE OR LEAVE A ROOM.	
	21:04
WHAT WE DO WITH THE PHOTOVOLTAIC PANELS AND THE BATTERIES,	
	21:07
WHICH ARE ALSO HIGH TECHNOLOGY,	
	21:09
IS WE MAKE THE HOUSE	
	21:10
SO IT DOESN'T NEED MUCH ELECTRICITY TO START WITH.	
	21:13
A HOUSE HAS A PRECONCEIVED IDEA, USUALLY.	
	21:15
THIS IS A DIFFERENT ANIMAL.	
	21:17
IT'S AN EARTHSHIP, IT'S A VESSEL,	
	21:19
THAT I SAY WOULD SAIL ON THE SEAS OF TOMORROW.	
	21:21
Basehart: IT DOESN'T NEED ANY WIRES CONNECTED TO IT	
	21:24

OR ANY WELLS.	
	21:25
IT HAS EVERYTHING IT NEEDS ONBOARD.	
	21:29
Burke: IN A SENSE, YOU'RE TRIMMING THE SAILS.	
	21:31
YOU'RE OPERATING THE BUILDING.	
	21:33
AND YOU'RE VERY IN TUNE AND IN TOUCH	
	21:35
WITH THE WAY THE BUILDING IS	
	21:36
MOVING THROUGH ITS DAY AND MOVING THROUGH THE SEASON.	
	21:39
Reynolds: WHAT I HAVE SEEN OTHER BUILDERS AND ARCHITECTS DO --	
	21:42
I AM GOING IN THE OPPOSITE DIRECTION OF THAT,	
	21:45
BECAUSE IT APPEARS TO ME THAT IT'S NOT WORKING.	
	21:48
THAT'S WHY I'VE COME UP WITH THIS WORD "BIOTECTURE,"	
	21:50
BECAUSE ARCHITECTURE IS NOT REALLY THE CONCEPT	
	21:52
THAT WE NEED FOR THE FUTURE.	
	21:53
Narrator: BUT IF EARTHSHIPS ARE THE BODY AND SOUL	
	21:55
OF THE HOMES OF TOMORROW,	

	21:57
THERE'S RESEARCH HAPPENING ON THE CUTTING EDGE OF SCIENCE	
	21:59
THAT WILL FINALLY GIVE BUILDINGS THAT ONE ESSENTIAL INGREDIENT	
	22:03
THAT COULD HELP THEM REDUCE CARBON EMISSIONS,	
	22:05
AND THAT INGREDIENT IS INTELLIGENCE.	
	22:22
Narrator: SOMETIMES THE WORK THAT'S GOING ON TO SAVE THE PLANET	
	22:25
IS HAPPENING IN THE MOST UNLIKELY PLACES.	
	22:28
TAKE, FOR EXAMPLE, THIS REST AREA.	
	22:30
WHAT'S BEING TESTED HERE	
	22:32
COULD HAVE AN ENORMOUS IMPACT WORLDWIDE.	
	22:35
MY NAME IS BALA BALAGURU.	
	22:44
Narrator: THESE TEST SWATCHES OF PAINT	
	22:46
ARE SUPPLYING PROOF OF SOME VERY REMARKABLE ABILITIES.	
	22:50
ULTIMATE PAINT IS GRAFFITI-RESISTANT.	
	22:52
IT CAN REPAIR CONCRETE.	
	22:54

IT'S IMPERVIOUS TO MOLD, IS FIREPROOF,	
	22:57
AND ONCE DRY,	
	22:59
SOLIDIFIES TO NEARLY THE HARDNESS OF A DIAMOND.	
	23:02
PAINT YOUR HOME ONCE WITH IT,	
	23:04
AND YOU SHOULDN'T NEED ANOTHER COAT FOR AT LEAST 1,000 YEARS.	
	23:07
AND HOW DOES DR. BALAGURU KNOW	
	23:10
THAT ULTIMATE PAINT WILL LAST 1,000 YEARS?	
	23:22
Narrator: BUT WHAT REALLY MAKES ULTIMATE PAINT SPECIAL	
	23:24
IS ITS UNIQUE ABILITY TO PURIFY THE ATMOSPHERE.	
	23:28
THAT'S RIGHT -- IT ACTUALLY CLEANS THE AIR.	
	23:50
Narrator: PAINTED ON WALLS AND BUILDINGS,	
	23:53
ULTIMATE PAINT COULD HELP CLEAN THE AIR	
	23:55
OF CITIES AROUND THE WORLD.	
	23:57
NITROGEN OXIDE PARTICLES, A BYPRODUCT OF CAR EXHAUST,	
	24:00:00
LAND ON SURFACES TREATED WITH ULTIMATE PAINT.	

	24:02:00
NANOPARTICLES IN ULTIMATE PAINT, ACTIVATED BY THE SUN'S RAYS,	
	24:06:00
IMMEDIATELY BEGIN TO BREAK DOWN THE DEADLY NITROGEN OXIDE	
	24:10:00
INTO HARMLESS NITROGEN AND OXYGEN GASES.	
	24:19:00
Narrator: ULTIMATE PAINT IS STILL IN THE TEST PHASE,	
	24:21:00
BUT INITIAL RESULTS LIKE THOSE FOUND AT THE REST AREA	
	24:24:00
ARE VERY PROMISING.	
	24:26:00
YET EVEN ULTIMATE PAINT CAN'T ADDRESS	
	24:28:00
ONE OF THE BIGGEST INEFFICIENCIES	
	24:31:00
IN MODERN BUILDINGS -WINDOWS.	
	24:33:00
BUT THAT'S CHANGING.	
	24:35:00
MEET TWO OF THE NATION'S LEADING SCIENTISTS --	
	24:37:00
SATYEN K. DEB AND ED TRACY.	
	24:41:00
ARE YOU LOOKING FOR A WINDOW FOR YOUR HOME?	
	24:43:00
DO YOU WANT THE BEST WINDOW IN THE UNITED STATES?	
	24:45:00

WELL, I'VE GOT THE PRODUCT JUST FOR YOU.	24:47:00
THEY'VE DEVELOPED AN AMAZING NEW TECHNOLOGY	24:50:00
CALLED AN ELECTROCHROMATIC WINDOW	24:52:00
THAT LETS YOU, WITH THE PRESS OF A BUTTON,	24:54:00
CONTROL THE AMOUNT OF LIGHT AND HEAT THAT GOES THROUGH GLASS.	24:58:00
I'LL USE A 1 1/2-VOLT BATTERY,	25:00:00
CHANGE ITS TRANSMITTANCE CHARACTERISTICS.	25:03:00
I CAN NOW BLEACH THE DEVICE BY REVERSING POLARITY.	25:09:00
THIS COMMERCIAL-SIZED WINDOW	25:11:00
IS MADE UP OF FIVE LAYERS OF CERAMIC-THIN FILM,	25:14:00
EACH LESS THAN 1/50 THE THICKNESS OF A HUMAN HAIR.	25:18:00
WHEN LOW VOLTAGE IS APPLIED, THE WINDOW SLOWLY DARKENS.	25:22:00
REVERSING THE VOLTAGE POLARITY	25:24:00
CAUSES THE WINDOW TO AGAIN BECOME CLEAR.	25:26:00
Burke: IN SOME WAYS, THE BUILDING STARTS TO BECOME ALIVE.	

	25:29:00
IT RESPONDS TO THE NATURAL ENVIRONMENT.	
	25:31:00
AT CRITICAL TIMES OF THE DAY,	
	25:33:00
THE BUILDING CAN START TO THROTTLE BACK,	
	25:35:00
TO SHUT DOWN A LITTLE BIT,	
	25:37:00
ONLY TO OPEN BACK UP AT THE RIGHT TIMES.	
	25:39:00
THIS IS SORT OF MOVING TOWARDS AN IDEA OF A LIVING BUILDING.	
	25:43:00
Narrator: IF THIS WINDOW TECHNOLOGY	
	25:45:00
WERE DEPLOYED ACROSS THE UNITED STATES,	
	25:47:00
ESTIMATES ARE WE COULD SAVE 2% TO 3%	
	25:50:00
OF OUR CURRENT ENERGY USAGE.	
	25:51:00
THAT MAY NOT SOUND LIKE MUCH,	
	25:54:00
BUT IT'S THE EQUIVALENT OF 2.7 MILLION BARRELS OF OIL PER DAY.	
	25:57:00
ELECTROCHROMATIC WINDOWS ARE STILL VERY EXPENSIVE	
	26:00:00
AND REPRESENT ONLY ONE PART OF THE EQUATION.	
	26:03:00

TO SEE THE NEXT GENERATION OF SMART BUILDING DESIGN,	26:06:00
YOU NEED TO TRAVEL HERE	26:08:00
TO CARNEGIE MELLON UNIVERSITY'S INTELLIGENT WORKPLACE.	26:12:00
THE INTELLIGENT WORKPLACE IS CONSIDERED	26:14:00
A LIVED-IN AS WELL AS LIVING LABORATORY.	26:16:00
WE LIVE HERE. WE DO OUR WORK HERE.	26:18:00
BUT WE'RE ALSO CONSTANTLY EXPERIMENTING WITH THINGS	26:21:00
AND ALSO TRYING TO DEMONSTRATE PRODUCTS THAT CAN BE USED NOW.	26:25:00
Narrator: SOME REALLY SMART PEOPLE HERE	26:26:00
ARE WORKING ON SOME REALLY HIGH-TECH STUFF FOR YOUR HOME.	26:29:00
I'M BASICALLY GONNA BE DOING EXHAUST-GAS ANALYSIS.	26:33:00
I'M WORKING ON DEVELOPING CONTROLS FOR THE FAN COILS	26:36:00
USING SENSOR NETWORKS.	26:38:00
I'M WORKING	26:39:00
ON THE BIODIESEL-FUELED ENGINE GENERATOR WITH HEAT RECOVERY,	

	26:42:00
WHICH IS PART OF THE OVERALL	
	26:43:00
INTELLIGENT WORKPLACE ENERGY-SUPPLY SYSTEM.	
	26:45:00
THAT'S AIR-CONDITIONING TO YOU AND ME.	
	26:47:00
ATTACHED TO THE EXTERIOR FRAME OF THE SPACE ARE SMART LOUVERS.	
	26:52:00
Betz: WHAT THE SMART LOUVERS DO	
	26:54:00
IS THEY HAVE A SENSOR ON THE ROOF	
	26:56:00
THAT TRACKS THE LOCATION OF THE SUN.	
	26:58:00
USING COMPUTER ALGORITHMS CONTROLS THE LOUVERS	
	27:01:00
SO THE ANGLE OF THE LOUVER MATCHES THE ANGLE OF THE SUN,	
	27:04:00
BLOCKING OUT THE GLARE.	
	27:05:00
THEY CAN REFLECT LIGHT INTO THE SPACE	
	27:08:00
SO WE DON'T HAVE TO USE AS MUCH ARTIFICIAL LIGHTING,	
	27:11:00
AND IT ALSO FILTERS OUT SOME OF THE U.V. COMING IN	
	27:14:00
SO WE CAN REDUCE THE COOLING LOAD	
	27:16:00

SO WE DON'T HAVE TO EXPEND AS MUCH ENERGY	
	27:18:00
BOTH IN LIGHTING AND IN COOLING.	
	27:20:00
Narrator: INTELLIGENT WORKSPACE'S	
	27:21:00
INNOVATIVE RAISED-FLOOR MODULAR DESIGN	
	27:24:00
ALLOWS FOR REMODELING WITH LITTLE OR NO WASTE.	
	27:27:00
MODULES CONTAINING POWER, PHONE, AND COMPUTER CONNECTIONS	
	27:30:00
CAN BE MOVED ANYWHERE ON THE FLOOR.	
	27:32:00
THIS AREA WE'RE CURRENTLY IN IS THE CONFERENCE ROOM,	
	27:35:00
BUT IT COULD BE JUST AS EASILY, WITHIN A DAY,	
	27:37:00
MADE INTO SEVERAL OFFICES.	
	27:39:00
WE'RE SAVING IN INSTALLATION COSTS SUBSTANTIALLY.	
	27:41:00
IT'S NOT HARD TO PULL THEM UP.	
	27:43:00
THEY ARE CONNECTED WITH FLEXIBLE, LONG CORDS.	
	27:47:00
Betz: SO, I MOVED ONE TILE TO ANOTHER.	
	27:49:00
A PERSON CAN PUT THEIR OFFICE IN ITS NEW SPOT HERE.	

	27:51:00
IT'LL HAVE FULL CONNECTIVITY, AND THEY'RE ALL SET TO GO.	
	27:55:00
Narrator: ONE SYSTEM IN PARTICULAR	
	27:56:00
IS BEING DEVELOPED HERE	
	27:57:00
THAT MAY HAVE FAR-REACHING IMPLICATIONS.	
	28:01:00
IN OUR BUILDINGS TODAY,	
	28:02:00
THE AIR-CONDITIONER COMES ON AND OFF	
	28:04:00
WHILE THE HVAC SYSTEM REACTS	
	28:06:00
BASED ON A THERMOSTAT THAT'S MOUNTED ON THE WALL,	
	28:08:00
WHEREAS HERE, WE'RE TRYING TO DEVELOP SENSORS	
	28:11:00
THAT THE PERSON CAN WEAR ON THEIR WRIST OR ON THEIR ARM,	
	28:15:00
AND THESE SENSORS CAN THEN COMMUNICATE	
	28:17:00
WITH THE CONTROL SYSTEM,	
	28:18:00
TELLING THE SYSTEM WHAT THE PERSON'S PULSE RATE IS,	
	28:21:00
WHAT THE PERSON'S SKIN TEMPERATURE IS,	
	28:23:00

WHETHER THE PERSON IS PERSPIRING.	
	28:25:00
IF YOU'RE WEARING THIS	
	28:26:00
AND YOU WALK INTO YOUR HOUSE OR INTO YOUR OFFICE SPACE,	
	28:30:00
THE CONTROL SYSTEM WOULD IMMEDIATELY KNOW	
	28:32:00
THAT YOU'RE THERE, WHO YOU ARE,	
	28:34:00
AND IT WOULD CUSTOMIZE THE AIR TEMPERATURE, THE LIGHTING	
	28:37:00
TO THE WAY YOU LIKE IT.	
	28:39:00
THIS BASICALLY MAKES YOUR METABOLISM	
	28:40:00
A PART OF THE BUILDING'S METABOLISM,	
	28:42:00
WHERE YOU BECOME AN INTEGRAL PART OF THE BUILDING.	
	28:46:00
THE THOUGHT OF A BUILDING	
	28:47:00
ACTUALLY BECOMING MORE LIKE A LIVING SYSTEM,	
	28:50:00
I THINK, IS TREMENDOUSLY EXCITING.	
	28:52:00
Narrator: THE REMARKABLE RESEARCH GOING ON HERE	
	28:55:00
AT THE INTELLIGENT WORKSPACE	

	28:57:00
IS DESIGNED FOR SMALL TO MEDIUM-SIZED SPACES.	
	28:59:00
BUT NEW GREEN TECHNOLOGIES ARE BEING DEVELOPED	
	29:03:00
TO COOL OUR URBAN CENTERS,	
	29:05:00
AND IF SUCCESSFUL,	
	29:07:00
THEY COULD CHANGE THE VERY NATURE OF OUR CITIES.	
	29:21:00
Narrator: THERE'S SOMETHING GOING ON HERE IN CHICAGO	
	29:23:00
THAT MAY HELP MAKE THE PLANET GREENER.	
	29:26:00
ON A TYPICAL SUMMER DAY,	
	29:28:00
CHICAGO, LIKE MOST CITIES IN THE WORLD,	
	29:32:00
IS SEVERAL DEGREES WARMER THAN THE ADJACENT COUNTRYSIDE.	
	29:35:00
IT'S KNOWN AS THE HEAT-ISLAND EFFECT.	
	29:40:00
OUR CITIES HAVE BECOME HOT, HARSH ENVIRONMENTS	
	29:43:00
AND REQUIRE VAST AMOUNTS OF ENERGY TO MAKE LIFE COMFORTABLE.	
	29:49:00
THE STRAIN ON POWER LINES IS ENORMOUS,	
	29:51:00

AND ELECTRIC COMPANIES MUST SCRAMBLE TO MEET PEAK DEMAND.	
	29:55:00
BUT NOW THERE'S A WAY	
	29:56:00
TO MAKE URBAN CENTERS MORE ENVIRONMENTALLY FRIENDLY,	
	30:00:00
AND ALL WE HAVE TO DO IS LOOK UP TO THE ROOFTOPS.	
	30:06:00
MY NAME IS SADHU JOHNSTON.	
	30:08:00
I'M COMMISSIONER OF CHICAGO'S DEPARTMENT OF ENVIRONMENT,	
	30:10:00
AND WE'RE ON THE GREEN ROOF OF CITY HALL.	
	30:12:00
IT'S 20,000 SQUARE FEET OF PRAIRIE	
	30:15:00
12 STORIES ABOVE STREET LEVEL IN DOWNTOWN CHICAGO.	
	30:22:00
Narrator: GREEN ROOFTOPS LIKE THIS	
	30:23:00
CAN BE AS MUCH AS 60 DEGREES COOLER	
	30:26:00
THAN CONVENTIONAL BLACK-TAR ROOFTOPS.	
	30:29:00
THESE AIR-CONDITIONING INTAKES FOR CITY HALL	
	30:32:00
ARE LOCATED DIRECTLY OVER THE GREEN ROOF.	
	30:34:00
AND THAT MAKES IT EASIER TO AIR-CONDITION INSIDE,	

	30:37:00
WHICH, OF COURSE, AIR-CONDITIONING GENERATES HEAT,	
	30:39:00
SO THAT'S LESS HEAT THAT WE GENERATE	
	30:42:00
WHEN WE'RE PUTTING A GREEN ROOF ON,	
	30:43:00
BRINGS OUR AIR-CONDITIONING COSTS DOWN,	
	30:45:00
AND KEEPS THE AMBIENT ENVIRONMENT COOLER.	
	30:49:00
Narrator: THE PRAIRIE GARDEN HAS SAVED CITY HALL	
	30:51:00
\$6,000 A YEAR IN ENERGY COSTS,	
	30:54:00
ELIMINATING THE NEEDS FOR POWER PLANTS	
	30:56:00
TO PRODUCE 45 TONS OF CO2 EMISSIONS.	
	30:59:00
IT ALSO HELPS REDUCE THE AMOUNT OF STORM WATER	
	31:02:00
THAT FLOODS INTO CHICAGO'S OVERTAXED SEWER SYSTEM.	
	31:06:00
Johnston: THIS GREEN ROOF,	
	31:08:00
WE'VE GOT BETWEEN TWO TO FOUR INCHES OF SOIL,	
	31:10:00
AND IT'S A SUPERLIGHT SOIL.	
	31:12:00

IT'S 80% INORGANIC, SO IT ABSORBS THAT RAINWATER	
	31:15:00
AND ACTUALLY HOLDS IT FOR ABOUT A 48-HOUR PERIOD,	
	31:18:00
DURING WHICH TIME, THE PLANTS CAN USE IT OR IT CAN EVAPORATE,	
	31:21:00
SO LESS OF IT GETS INTO THE STORM-SEWER SYSTEM.	
	31:24:00
Narrator: MOST BLACK-TAR ROOFS NEED TO BE REPLACED	
	31:25:00
EVERY 20 YEARS.	
	31:29:00
BUT CHICAGO CITY HALL'S GREEN ROOF	
	31:31:00
MAY NOT HAVE TO BE REPLACED FOR 50 YEARS OR MORE	
	31:34:00
BECAUSE THE LAYERS OF SOIL AND VEGETATION	
	31:37:00
PROTECT THE ROOF MEMBRANE FROM HARMFUL ULTRAVIOLET RAYS.	
	31:41:00
Johnston: THERE'S HUNDREDS OF THOUSANDS OF PEOPLE	
	31:44:00
THAT LOOK DOWN ON THIS EVERY DAY,	
	31:45:00
AND PEOPLE HAVE ACTUALLY MOVED THEIR OFFICES	
	31:47:00
TO BUILDINGS THAT OVERLOOK THIS GREEN ROOF	
	31:50:00
BECAUSE THEY ENJOY THE BEAUTY.	

	31:51:00
SO IT DOES HAVE A QUALITY-OF-LIFE IMPACT	
	31:53:00
AS WELL AS AN ECONOMIC IMPACT.	
	31:54:00
Narrator: THOUGH THE INITIAL INVESTMENT IS HIGH,	
	31:58:00
A MOVEMENT IS UNDERWAY IN CHICAGO	
	32:00:00
TO ENCOURAGE THE GREENING OF ROOFTOPS ACROSS THE CITY.	
	32:04:00
THE RESULTS COULD ULTIMATELY SAVE MILLIONS OF DOLLARS	
	32:06:00
AND PLAY AN IMPORTANT ROLE IN REDUCING GLOBAL WARMING.	
	32:11:00
IMAGINE FLYING OVER THE CITY,	
	32:13:00
BEING A BIRD AND FLYING OVER AND LOOKING DOWN	
	32:16:00
AND SEEING PRAIRIES INSTEAD OF BLACK ROOFTOPS	
	32:19:00
THAT ARE COOLING THE CITY AND CAPTURING STORM WATER,	
	32:23:00
REALLY BRINGING THE CITY TO ITS ECOLOGICAL FUNCTION,	
	32:25:00
WHICH IS A BEAUTIFUL PRAIRIE CITY.	
	32:28:00
Narrator: IN THIS VISION OF THE FUTURE,	
	32:30:00

THE ROOFTOPS MAY BE GREEN,	32:31:00
BUT REDUCING THE CARBON FOOTPRINT	32:33:00
OF AIR-CONDITIONING SYSTEMS	32:35:00
WILL STILL BE ONE OF THE BIGGEST CHALLENGES FOR THE ENVIRONMENT.	32:39:00
Burke: MOST BUILDINGS,	32:40:00
THEY ACTUALLY CREATE MORE HEAT WITHIN THEIR OPERATIONS.	32:44:00
AN OFFICE BUILDING, FOR INSTANCE, IS A HEAT GENERATOR.	32:47:00
IT'S IN PART THE EQUIPMENT IN THE BUILDINGS,	32:49:00
IT'S THE LIGHTING, AND ACTUALLY, IT'S THE PEOPLE.	32:52:00
PEOPLE ARE A TREMENDOUS HEAT LOAD UPON OUR BUILDINGS.	32:58:00
Narrator: SOME OF THE MOST CUTTING-EDGE RESEARCH	33:00:00
ON HOW TO COOL BUILDINGS IS BEING DONE HERE	33:03:00
AT THE ADVANCED THERMAL CONVERSION LABORATORY.	33:06:00
COME ON INTO THE LAB.	33:08:00
WE CAN TEST ANY KIND	

	33:10:00
OF HEATING VENTILATION OR AIR-CONDITIONING EQUIPMENT	
	33:13:00
THAT MIGHT GO INTO A BUILDING.	
	33:14:00
OF COURSE, WE'RE INTERESTED IN ONES THAT ARE ULTRAEFFICIENT.	
	33:17:00
Narrator: LIKE SOMETHING OUT OF A SCIENCE-FICTION MOVIE GONE MAD,	
	33:20:00
ALL THESE TUBES AND CONDUITS CAN ACTUALLY FINALLY MEASURE	
	33:23:00
THE EFFECTIVENESS OF ALMOST ANY HEATING OR COOLING EQUIPMENT.	
	33:28:00
THESE BIG DUCTS ARE WHERE WE PUT THE AIR IN	
	33:31:00
THAT MIGHT HAVE A MIAMI-SUMMER CONDITION	
	33:34:00
OR AN ALASKA-WINTER CONDITION.	
	33:35:00
AND THIS IS ONE OF OUR TEST OBJECTS.	
	33:38:00
THIS IS THE AIR COMING OUT.	
	33:40:00
AND WE HAVE SENSORS ALL THROUGH HERE, YOU CAN SEE.	
	33:45:00
WE CAN MEASURE THINGS LIKE TEMPERATURE AND HUMIDITY	
	33:50:00
AND THE EXACT NATURE OF THE AIR COMING OUT.	
	33:53:00

Narrator: THE EQUIPMENT BEING TESTED TODAY MAY LOOK STRANGE,	
	33:56:00
BUT IT'S ACTUALLY PART OF THE NEXT GENERATION	
	33:59:00
OF ULTRA-HIGH-EFFICIENT AIR-CONDITIONING.	
	34:01:00
IT'S CALLED A DESICCANT ENHANCED EVAPORATIVE COOLER.	
	34:05:00
IT'S A NAME ONLY A SCIENTIST WOULD LIKE,	
	34:08:00
BUT IT'S A TECHNOLOGY ALL OF US WILL LOVE.	
	34:11:00
AND AS THE NAME IMPLIES,	
	34:13:00
IT USES DESICCANT TO SUPERCHARGE AN EVAPORATIVE COOLER,	
	34:17:00
UNLIKE TRADITIONAL AIR-CONDITIONING,	
	34:18:00
WHICH BASICALLY USES COOLANT TO BLOW CHILLED AIR INTO A ROOM.	
	34:23:00
DESICCANTS ARE LIQUID SALT SOLUTIONS,	
	34:25:00
LIKE LITHIUM BROMIDE,	
	34:27:00
THAT HAVE THE ABILITY TO ABSORB WATER	
	34:30:00
AND DRY OUT THE AIR.	
	34:31:00
THAT PRODUCES A LOW DEW POINT	

	34:33:00
AND INCREASES THE COOLING CAPACITY	
	34:35:00
OF AN EVAPORATIVE COOLER,	
	34:36:00
PRODUCING A MORE COMFORTABLE TEMPERATURE AND HUMIDITY LEVEL	
	34:40:00
IN THE HOME.	
	34:41:00
THE WET DESICCANT THEN CYCLES AROUND,	
	34:43:00
AND WHEN HOT AIR HITS IT, IT EXPELS THE WATER,	
	34:47:00
WHICH EVAPORATES AWAY INTO THE OUTSIDE AIR.	
	34:51:00
IT'S ONE OF THE UNIQUE PROPERTIES OF DESICCANT --	
	34:53:00
THE WAY YOU DRY IT OUT IS WITH HEAT.	
	34:57:00
IN ESSENCE, IT USES HEAT TO COOL.	
	34:59:00
FORTUNATELY, IT TAKES A VERY LOW-GRADE HEAT.	
	35:02:00
THIS IS THE KIND OF HEAT YOU CAN GET FROM A SOLAR COLLECTOR.	
	35:04:00
Narrator: THE DRY DESICCANT IS THEN CYCLED BACK	
	35:07:00
AND IS READY TO BE USED AGAIN AND AGAIN	
	35:10:00

TO PULL MORE WATER OUT OF THE AIR.	
	35:12:00
WHEN FULLY OPERATIONAL, THE PROTOTYPES SEEN HERE	
	35:15:00
WILL USE 1/4 OF THE POWER OF A CONVENTIONAL AIR-CONDITIONER,	
	35:18:00
AND THAT MEANS FEWER CARBON EMISSIONS.	
	35:22:00
IT COULD FOREVER ALTER THE WAY WE COOL OUR BUILDINGS.	
	35:26:00
WE THOUGHT, YOU KNOW,	
	35:27:00
HOW COULD WE PUT ALL THOSE THINGS TOGETHER?	
	35:29:00
ME AND ANOTHER RESEARCHER PUT OUR HEADS TOGETHER,	
	35:32:00
AND WE CAME UP WITH THIS.	
	35:34:00
AND WE WERE LIKE, "AHA!"	
	35:36:00
IT HAS THE POTENTIAL	
	35:38:00
TO REALLY REVOLUTIONIZE COOLING TECHNOLOGY,	
	35:42:00
JUST MAKE IT MUCH MORE EFFICIENT.	
	35:46:00
COOLING TECHNOLOGY IS ON THE BRINK OF A TRANSFORMATION,	
	35:50:00
AND WHEN IT COMES TO TRANSFORMATION,	

	35:52:00
SOME REMARKABLE NEW BUILDINGS IN NEW YORK	
	35:54:00
ARE TURNING THE BIG APPLE INTO THE GREEN APPLE.	
	36:07:00
Narrator: THE FIGHT TO REDUCE GLOBAL WARMING	
	36:10:00
WILL ULTIMATELY TAKE US TO THE WORLD'S LARGEST CITIES.	
	36:15:00
YOU DON'T USUALLY THINK OF NEW YORK CITY	
	36:17:00
AS HAVING ECO-FRIENDLY BUILDINGS.	
	36:20:00
BUT THAT'S ABOUT TO CHANGE IN A BIG WAY.	
	36:23:00
I'M RAFAEL PELLI. I'M THE DESIGNER OF THE SOLAIRE.	
	36:30:00
WE HAD THE PRIVILEGE OF DOING	
	36:33:00
THE FIRST REAL GREEN APARTMENT BUILDING IN THE CITY.	
	36:36:00
Narrator: THE SOLAIRE'S GREEN ROOF CAPTURES RAINWATER,	
	36:39:00
WHICH IS REUSED IN SOME OF THE BUILDING'S SYSTEMS.	
	36:44:00
IT HAS ITS OWN WASTEWATER-TREATMENT PLANT --	
	36:47:00
A FIRST FOR AN APARTMENT BUILDING IN NEW YORK.	
	36:50:00

THE BIGGEST GREEN TECHNOLOGICAL BREAKTHROUGH	36:52:00
CAME WITH ITS PHOTOVOLTAIC CELLS, OR P.V.s,	36:56:00
WHICH SUPPLY 5% OF THE BUILDING'S POWER.	36:59:00
THE P.V.s ACTUALLY BECAME PART OF THE DESIGN OF THE BUILDING.	37:03:00
Hess: SO, IT'S REALLY ONE OF THE FIRST TIMES	37:06:00
THAT YOU ACTUALLY PUT P.V.s INTO THE WALL OF THE BUILDING	37:10:00
INSTEAD OF PUTTING THEM ON THE ROOF.	37:12:00
SO WE REALLY HAD TO WORK WITH A LOT OF THE WINDOW MANUFACTURERS	37:15:00
TO COORDINATE HOW YOU SORT OF CONNECTED GLASS	37:19:00
TO AN ELECTRICAL COMPONENT.	37:22:00
Burke: THE PHOTOVOLTAICS ARE NOT SEEN	37:24:00
AS SOMETHING THAT'S AN APPENDAGE,	37:26:00
BUT ACTUALLY INTEGRATED INTO THE DESIGN IN A SUCCESSFUL FASHION.	37:29:00
NOT ONLY IS THIS PANEL PROVIDING ENERGY,	37:33:00
BUT IT'S ACTUALLY SERVING AS PART OF THE BUILDING EXTERIOR --	

	37:36:00
THE BUILDING SKIN.	
	37:37:00
Narrator: ACROSS THE STREET AT THE VERDESIAN,	
	37:40:00
ANOTHER GREEN TECHNOLOGY IS BEING EMPLOYED	
	37:42:00
TO LITERALLY REDIRECT SUNLIGHT.	
	37:45:00
MY NAME IS KEVIN GRADY.	
	37:46:00
I'M THE BUILDING ENGINEER HERE AT THE VERDESIAN.	
	37:49:00
Narrator: THEY'RE CALLED HELIOSTATS.	
	37:50:00
AND WHEN FULLY OPERATIONAL,	
	37:52:00
THEY'LL AUTOMATICALLY FOLLOW THE PATH OF THE SUN	
	37:54:00
THROUGHOUT THE DAY.	
	37:56:00
Grady: THE PARK NEXT DOOR ONLY GETS 3% OF SUNLIGHT DURING THE DAY.	
	38:00:00
THE HELIOSTATS LOOK FOR THE SUN,	
	38:02:00
AND THEY DIRECT IT INTO THE PARK	
	38:04:00
SO TREES AND PLANT LIFE CAN GET MORE LIGHT OUT OF THEM.	
	38:07:00

Narrator: SUNLIGHT WILL BE BOUNCED	
	38:09:00
FROM THE SPECIALLY DESIGNED EIGHT-FOOT-WIDE MIRRORS	
	38:12:00
TO A PARK ACROSS THE STREET	
	38:13:00
WHICH IS STILL UNDER CONSTRUCTION.	
	38:15:00
WITHOUT THESE HELIOSTATS,	
	38:17:00
THIS NEW PARK WILL RECEIVE LITTLE DIRECT SUNLIGHT.	
	38:21:00
Grady: THEY'RE CONTROLLED REMOTELY THROUGH A MODEM FROM GERMANY	
	38:23:00
WHERE THEY CAN BE MOVED THROUGHOUT DIFFERENT TIMES.	
	38:27:00
THEY CAN ALSO BE MOVED HERE AT THE BUILDING BY ENGINEERS.	
	38:31:00
WE'RE ALSO LOOKING AT HAVING IT AT NIGHTTIME	
	38:32:00
SO THE MOON CAN REFLECT LIGHT	
	38:34:00
SO YOU WON'T HAVE TO SPEND AS MUCH ELECTRICITY	
	38:36:00
ON LIGHTING CONTROLS.	
	38:37:00
Narrator: A FEW BLOCKS AWAY,	
	38:39:00
AN EVEN GREENER APARTMENT BUILDING IS UNDER CONSTRUCTION	

	38:42:00
CALLED THE VISIONAIRE.	
	38:44:00
EACH OF ITS 33 STORIES	
	38:46:00
ARE BEING BUILT WITH SUSTAINABLE MATERIALS.	
	38:48:00
THIS BUILDING USES CONCRETE MADE WITH FLY ASH.	
	38:51:00
FLY ASH IS AN INDUSTRIAL BY-PRODUCT	
	38:54:00
WHICH REPLACES CEMENT.	
	38:55:00
CEMENT, HISTORICALLY, USES A LOT OF ENERGY TO BE PRODUCED,	
	38:58:00
THUS SAVING ENERGY	
	39:00:00
AND USING A RECYCLED CONTENT IN ITS CONSTRUCTION.	
	39:04:00
Narrator: CONCRETE MADE WITH FLY ASH IS DENSER	
	39:07:00
AND HAS A SMOOTHER SURFACE THAN REGULAR CONCRETE.	
	39:10:00
HOW GREEN WILL THIS BUILDING BE?	
	39:12:00
HEATING FOR THESE APARTMENTS	
	39:14:00
WILL COME FROM GEOTHERMAL ENERGY.	
	39:16:00

GEOTHERMAL HEAT CAN BE TAPPED	
	39:18:00
FROM ALMOST ANYWHERE IN THE WORLD,	
	39:21:00
EVEN THE BEDROCK UNDERNEATH NEW YORK CITY.	
	39:24:00
THE GEOTHERMAL SYSTEM ESSENTIALLY USES	
	39:26:00
THE FREE ENERGY OF THE EARTH,	
	39:28:00
RIGHT BELOW MANHATTAN ISLAND IN THE BEDROCK.	
	39:32:00
Narrator: EVEN THE CONSTRUCTION EQUIPMENT IS BEING USED	
	39:35:00
IN AN ENVIRONMENTALLY-CONSCIOUS WAY.	
	39:38:00
Dettling: THE CRANES THAT WE'RE USING HERE AT THE PROJECT	
	39:41:00
USE ULTRA-LOW-SULFUR DIESEL FUEL,	
	39:43:00
SO IT'S BETTER FOR THE ENVIRONMENT	
	39:45:00
AND REDUCES THE FOSSIL-FUEL-EMISSION IMPACTS	
	39:47:00
ON THE AIR QUALITY.	
	39:49:00
Narrator: A LITTLE FURTHER UP IN NEW YORK'S MIDTOWN,	
	39:52:00
THE LARGEST GREEN OFFICE BUILDING IN THE WORLD	

	39:55:00
HAS JUST BEEN COMPLETED -THE HEARST TOWER.	
	39:58:00
IT HAS A RAINWATER-RECLAMATION SYSTEM.	
	40:01:00
THE FURNITURE AND BUILDING MATERIALS	
	40:03:00
ARE MADE FROM RENEWABLE RESOURCES.	
	40:06:00
AND NATURAL LIGHT IS USED THROUGHOUT THE BUILDING.	
	40:12:00
BUT THE HEARST TOWER'S MAIN CLAIM TO FAME,	
	40:14:00
BESIDES ITS BEAUTY,	
	40:16:00
IS THAT IT'S A PIONEER IN ENVIRONMENTAL SUSTAINABILITY	
	40:19:00
BECAUSE OF THE WAY IT WAS BUILT.	
	40:21:00
IT USES A SYSTEM KNOWN AS A DIAGRID,	
	40:24:00
A FIRST FOR A BUILDING IN THE U.S.	
	40:27:00
ONE OF THE UNIQUE THINGS ABOUT THE HEARST BUILDING	
	40:30:00
IS THE DIAGRID THAT WE HAVE ON THE OUTSIDE OF THE BUILDING.	
	40:32:00
IT'S REALLY THE STRUCTURE OR THE FRAME OF THE BUILDING.	
	40:35:00

A TYPICAL BUILDING HAS VERTICAL COLUMNS.	
	40:37:00
THE DIAGRID MEANS THERE ARE NO VERTICAL COLUMNS	
	40:39:00
ON THE OUTSIDE OF THE BUILDING.	
	40:41:00
THIS BUILDING REALLY IS A TRIANGLE SHAPE.	
	40:43:00
AND THE TRIANGLE SHAPE MAKES THE BUILDING STRONGER,	
	40:45:00
AND AT THE SAME TIME, YOU'RE USING LESS STEEL.	
	40:48:00
Narrator: A LOT LESS STEEL -2,000 TONS LESS,	
	40:52:00
A 20% SAVINGS OVER A COMPARABLE CONVENTIONAL OFFICE BUILDING.	
	40:57:00
TRIANGLES ARE STRONGER THAN SQUARES	
	41:00:00
BECAUSE THE FORCES SUPPLIED BY A LOAD	
	41:03:00
ARE EQUALLY DISTRIBUTED.	
	41:04:00
Burke: THE ECTOSKELETON -THE STRUCTURE OF THE BUILDING --	
	41:08:00
HELPED CREATE JUST TREMENDOUS SAVINGS	
	41:10:00
IN THE AMOUNT OF STEEL THAT WAS EMPLOYED IN THE BUILDING.	
	41:13:00
IT'S A MUCH MORE EFFICIENT STRUCTURE,	

	41:15:00
SO THAT'S LESS NATURAL RESOURCES,	
	41:17:00
LESS EMBODIED ENERGY	
	41:18:00
THAT'S BEING EMPLOYED IN THE BUILDING.	
	41:20:00
BUT THE OTHER BENEFIT IS LESS STEEL MEANS LESS ENCUMBRANCE,	
	41:23:00
LESS ELEMENTS AROUND THE PERIMETER.	
	41:25:00
SO YOU GET THESE GREAT, SWEEPING VIEWS,	
	41:27:00
AS A RESULT, OF MANHATTAN.	
	41:29:00
THE DESIGN TECHNOLOGY --	
	41:31:00
THE ENGINEERING ACTUALLY CREATES A BETTER-BUILT ENVIRONMENT,	
	41:34:00
A BETTER PLACE FOR PEOPLE THROUGH THAT INTEGRATION.	
	41:37:00
Narrator: AND WHAT WILL	
	41:38:00
THE BUILDINGS OF THE FUTURE LOOK LIKE?	
	41:40:00
KEVIN BURKE'S ARCHITECTURAL FIRM --	
	41:42:00
WILLIAM McDONOUGH AND PARTNERS --	
	41:44:00

HAS BEEN EXPLORING	
	41:46:00
SOME OF THE MOST EXCITING GREEN-BUILDING CONCEPTS.	
	41:49:00
Burke: OUR OFFICE WAS ASKED TO TAKE A LOOK	
	41:51:00
AT THE DESIGN OF THE AIRPORT	
	41:53:00
AND IMAGINE WHAT AN AIRPORT OF THE FUTURE WOULD BE LIKE.	
	41:56:00
OUR DESIGN INCORPORATES PHOTOVOLTAIC PANELS	
	41:58:00
WHERE THE ROOF OF THE AIRPORT IS ACTUALLY CREATING ENERGY	
	42:01:00
FOR THE BUILDING BELOW,	
	42:03:00
OR THE INTEGRATION OF GREEN ROOFS IN THE AIRPORT,	
	42:06:00
MITIGATING THE TEMPERATURES OF THE AIRPORT FACILITY,	
	42:08:00
CAPTURING THE RAINWATER, PRODUCING OXYGEN --	
	42:11:00
ALL OF THOSE BENEFITS THAT WE GET MUTUALLY	
	42:14:00
FROM THE INTRODUCTION OF THESE TECHNOLOGIES.	
	42:16:00
THIS IS A DESIGN FOR A CITY IN CHINA	
	42:21:00
THAT OVER 600 MILLION PEOPLE THAT THEY'RE LOOKING TO HAVE	

	42:23:00
MOVE TO THEIR CITIES IN THE NEAR FUTURE,	
	42:26:00
AND HOW WE CAN HELP THEM DO THAT IN A WAY	
	42:29:00
THAT IS NOT GONNA HAVE ADVERSE EFFECTS ON THEIR ENVIRONMENT.	
	42:32:00
OUR CHALLENGE WAS TO LOOK AT THIS FARMLAND	
	42:35:00
THAT EXISTS IN THE CHINESE COUNTRYSIDE	
	42:36:00
AND COME UP WITH A WAY TO CREATE A CITY	
	42:40:00
THAT WOULD NOT ELIMINATE	
	42:41:00
THE PRODUCTIVE CAPACITIES OF THE FARMLAND.	
	42:44:00
AND SO OUR CONCEPT HERE	
	42:46:00
IS THAT LITERALLY TO TAKE THE FARMS AND LIFT THEM UP	
	42:48:00
TO BECOME THE ROOFSCAPE OF THE BUILDINGS	
	42:51:00
AND PUT THE CITY DOWN BELOW.	
	42:53:00
THE WASTE STREAMS FROM THE BUILDING COULD BE CAPTURED,	
	42:56:00
AND THE NUTRIENTS COULD BE USED AS FERTILIZER.	
	42:58:00

WE'RE LOOKING AT PROVIDING AS MUCH CONNECTIVITY	43:01:00
FROM ROOF TO ROOF WITH THESE BRIDGES THAT WE HAVE --	43:03:00
ALSO, THE INCORPORATION OF SOLAR PANELS,	43:06:00
BOTH FOR THE CREATION OF ENERGY AND FOR HOT WATER.	43:08:00
EACH OF THESE INDIVIDUAL BUILDING BLOCKS COULD OPERATE	43:12:00
AS AN ORGANISM WITHIN THE SORT OF CONTEXT OF THE OVERALL CITY.	43:16:00
WE WERE COMMISSIONED BY A MAGAZINE	43:20:00
TO GIVE OUR THOUGHTS	43:21:00
ABOUT WHAT THE WORKPLACE OF THE FUTURE WOULD BE LIKE.	43:23:00
AND THE BUILDING CLADDING, OR SKIN,	43:25:00
WOULD BE COMPOSED OF A PHOTOVOLTAIC-PANEL SYSTEM	43:28:00
SO IT WOULD BE CREATING ENERGY,	43:30:00
OR LOOK TO INCORPORATE PLANTS,	43:33:00
BOTH ON THE BUILDING EXTERIOR	43:35:00
BUT ALSO WITHIN INDOOR/OUTDOOR ATRIA,	

	43:37:00
SO PEOPLE WITHIN THE BUILDING	
	43:39:00
AT EACH OF THE VARIOUS LEVELS	
	43:40:00
WOULD HAVE PLACES WHERE THEY COULD GO OUTSIDE	
	43:43:00
AND BE CONNECTED TO THE OUTDOORS.	
	43:45:00
FINALLY, WE THOUGHT	
	43:47:00
ABOUT NOTIONS OF DESIGN FOR DISASSEMBLY,	
	43:50:00
SO HOW THIS BUILDING, AT THE END OF ITS LIFE,	
	43:52:00
MIGHT BE ACTUALLY TAKEN APART	
	43:54:00
AND SOME OF ITS CONSTITUENT PARTS	
	43:56:00
BE RECYCLED FOR FURTHER USE AS BUILDING PRODUCTS.	
	43:59:00
Narrator: INDIVIDUALS EVERYWHERE ARE STUDYING WAYS	
	44:03:00
TO REDUCE THEIR CARBON FOOTPRINT	
	44:05:00
AND CONSTRUCT MORE EFFICIENT BUILDINGS.	
	44:08:00
THE WORK OF SCIENTISTS, ENGINEERS, AND DESIGNERS	
	44:13:00

IS PROVING THAT IT IS POSSIBLE TO LIVE A SUSTAINABLE LIFESTYLE	
	44:18:00
AND THAT OUR BUILDINGS CAN, IN FACT,	
	44:20:00
HAVE A POSITIVE IMPACT ON THE ENVIRONMENT.	
	44:24:00
THEY'RE SHOWING ALL OF US THAT EACH DAY,	
	44:26:00
A GREENER WORLD IS WITHIN OUR REACH.	