

# World Energy Engineering Congress

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President



Photo: Nitish Meena

## PLAN FOR RESILIENCE TO SAVE LIVES AND BUSINESSES

### ENERGY, WATER, AND ENVIRONMENTAL SUSTAINABILITY AND RESILIENCE

Businesses and governments need to take resiliency seriously and plan for it. If they don't, they are subject to litigation, not only revenue can be lost, but also lives.

To reduce and mitigate the risks we can build higher bridges and stronger infrastructure, adopt stormwater and energy management practices, and create backup plans. But when disasters happen we need to recover and adapt quickly.

### ENERGY GOALS AND PRIORITIES







SEA LEVEL RISE  
AND FLOODING BY 2050

EXPECTED SEA LEVEL RISE (SLR)  
FROM **8 IN** IN 1992  
TO ESTIMATED **1.24 FT**  
COASTAL AREAS WILL FACE  
**30 OR MORE DAYS**  
OF FLOODING EACH YEAR  
BECAUSE OF SLR

Photo: Bruno Camargo

Source: NOAA



U.S. BILLION-DOLLAR  
WEATER AND CLIMATE  
DISASTERS 1980-2016

**196** DISASTERS SINCE 1980  
TOTAL COST OVER **\$1.1 TRILLION**  
THE 1980-2015 ANNUAL  
AVERAGE IS **5.2 EVENTS**  
**8 EVENTS** IN 2016:  
2 FLOODING AND  
6 SEVERE STORMS

Photo: David Crekveill Mediante

Source: NOAA



A satellite image of Superstorm Sandy, showing a massive, swirling storm system over the Atlantic Ocean. The storm's eye is visible in the center, surrounded by dense, white cloud bands. The surrounding ocean is a deep blue, contrasting with the white and grey of the storm clouds.

## SUPERSTORM SANDY

ESTIMATED COSTS **\$67.6 BILLION**;  
**159 DEATHS**;  
STORM SURGE **12.65 FT** IN NY;  
**650,000** HOUSES DAMAGED OR  
DESTROYED;  
**8.5 MILLION** CUSTOMERS  
LOST POWER

Photo: NASA

A photograph of a long freight train consisting of numerous black oil tankers, stretching into the distance along a set of railroad tracks. The tracks are made of gravel and metal rails, curving slightly to the right. The background shows a clear blue sky and some green trees in the distance.

## FAILURE OF BACKUP DIESEL GENERATORS

FLOODED GENERATORS;  
EQUIPMENT WIPED OUT;  
LACK OF FUEL RESERVES;  
EMERGENCY EVACUATIONS  
OF OVER **2,000 PATIENTS**;  
FUEL CARRIED  
TO GENERATORS

Photo: Russ Allison Loar





## FAILURE TO PREPARE FOR RAINS AND FLOODING

IN 2014 FARMERS INSURANCE FILED **9 CLASS ACTIONS** AGAINST NEARLY **200 COMMUNITIES** IN THE CHICAGO AREA. THE LAWSUITS WERE LATER WITHDRAWN.

Photo: johndal

Source: NBC, Reuters



## HURRICANE SANDY NY

**2,000+** MILES OF ROADS AFFECTED  
**\$289.9** MILLION TO SINGLE-FAMILY  
HOMES; **10,000** HOUSEHOLDS  
ASSISTED FOR REBUILDING AND  
REPAIRS; **232+** PUBLIC  
ENGAGEMENTS MEETINGS;  
**\$20.8** MILLION IN GRANTS TO  
SMALL BUSINESSES

Photo: jmywuaco

Source: NY Governor's Office of Storm Recovery



GREEN PORT TREND  
SPRUNG FROM  
LITIGATIONS AND PROTESTS

ENVIRONMENTAL IMPACT REPORTS  
CHALLENGED,  
LAWSUITS, DELAYS, HIGH COSTS,  
E.G. **\$50 MILLION** MITIGATION;

GREEN PORT POLICY  
ADOPTED **IN 2005**

Source: Port of Long Beach, Port of Los Angeles

Photo: Port of Long Beach

Sulfur  
Oxides  
SOx

97%

Diesel  
Particulate  
Matter  
DPM

85%

Nitrogen  
Oxides  
NOx

50%

Greenhouse  
Gases

21%

2%

TEUs

Photo: Kat Janowicz



## EMISSIONS REDUCTION

2015 EPA CLEAN AIR ACT (**CAA**);  
MERCURY AND AIR TOXICS  
STANDARDS (**MATS**); CROSS STATE  
AIR POLLUTION RULE (**CSAPR**);  
NHTSA CORPORATE AVERAGE FUEL  
ECONOMY (**CAFE**) STANDARDS;  
STATE LAWS; PRESIDENT'S GOAL  
OF **80%** OF CLEAN POWER  
BY 2035

Photo: Kat Janowicz

Source: EPA, DOT, The White House

SHORTAGE IN ENERGY SUPPLY  
2012-2020 **60 GW** OF COAL-FIRED  
PLANTS WILL **RETIRED**;  
UNEXPECTED SHUTDOWNS, E.G.  
SONGS

INCREASING DEMAND WILL  
**QUADRUPLE** AT SAN PEDRO BAY  
PORTS

UTILITIES **UNABLE** TO  
MEET DEMANDS

Photo: cherezoff

Source: EPA, EIA, San Pedro Bay Ports



## MOBILE INTERNET



POTENTIAL ECONOMIC IMPACT\*  
**\$3.7 TRILLION - \$10.8 TRILLION**

**10-20% POTENTIAL COST**  
REDUCTION IN TREATMENT OF  
CHRONIC DISEASES THROUGH  
REMOTE HEALTH MONITORING

## ENERGY STORAGE



POTENTIAL ECONOMIC IMPACT\*  
**~\$3.7 TRILLION - \$10.8 TRILLION**

**40-100% OF NEW VEHICLES** SOLD  
IN 2025 COULD BE ELECTRIC OR  
HYBRID

## CLOUD



POTENTIAL ECONOMIC IMPACT\*  
**\$1.7 TRILLION - \$6.2 TRILLION**

**15-20% POTENTIAL**  
PRODUCTIVITY GAINS ACROSS IT  
INFRASTRUCTURE, APPLICATION  
DEVELOPMENT, AND PACKAGED  
SOFTWARE

## RENEWABLE ENERGY



POTENTIAL ECONOMIC IMPACT\*  
**\$0.2 TRILLION - \$0.3 TRILLION**

POTENTIAL TO AVOID EMISSIONS  
OF **1,000 MILLION - 1,200**  
**MILLION TONS OF CO<sub>2</sub>** ANNUALLY  
BY 2025

## INTERNET OF THINGS



POTENTIAL ECONOMIC IMPACT\*  
**\$2.7 TRILLION - \$6.2 TRILLION**

OFFERS POTENTIAL TO DRIVE  
**PRODUCTIVITY ACROSS \$36**  
**TRILLION** IN OPERATING COSTS  
OF KEY AFFECTED INDUSTRIES:  
MANUFACTURING, HEALTH CARE,  
AND MINING

## ADVANCED OIL AND GAS EXPLORATION AND RECOVERY



POTENTIAL ECONOMIC IMPACT\*  
**\$0.1 TRILLION - \$0.5 TRILLION**

OFFERS POTENTIAL TO SUPPLY  
AN **ADDITIONAL 3.6 BILLION - 6.2**  
**BILLION OIL-EQUIVALENT**  
**BARRELS** OF OIL AND GAS  
ANNUALLY BY 2025

## INTELLIGENT SOFTWARE



POTENTIAL ECONOMIC IMPACT\*  
**\$5.2 TRILLION - \$6.7 TRILLION**

ADDITIONAL LABOR  
PRODUCTIVITY COULD EQUAL  
THE OUTPUT OF **110 MILLION -**  
**140 MILLION** FULL TIME  
WORKERS

## 3D PRINTING



POTENTIAL ECONOMIC IMPACT\*  
**\$0.2 TRILLION - \$0.6 TRILLION**

CONSUMERS USE OF 3-D  
PRINTING COULD SAVE THEM  
**35-60% IN COSTS** PER PRINTED  
PRODUCT, WHILE ENABLING A  
HIGH LEVEL OF CUSTOMIZATION

## ADVANCED MATERIALS



POTENTIAL ECONOMIC IMPACT\*  
**\$0.2 TRILLION - \$0.5 TRILLION**

NANOMEDICINE COULD BE USED  
TO **DELIVER TARGETED DRUGS** TO  
20 MILLION NEW CANCER CASES  
WORLDWIDE IN 2025

## DRIVERLESS VEHICLES



POTENTIAL ECONOMIC IMPACT\*  
**\$0.2 TRILLION - \$1.9 TRILLION**

COULD SAVE **30,000-150,000**  
**LIVES** FROM POTENTIALLY FATAL  
TRAFFIC ACCIDENTS

## NEXT GEN GENOMICS



POTENTIAL ECONOMIC IMPACT\*  
**\$0.7 TRILLION - \$1.6 TRILLION**

**EXTENDING AND ENHANCING**  
**LIVES** ACCOUNTS FOR 75% OF  
POTENTIAL IMPACT, E.G.  
THROUGH FASTER DISEASE  
DETECTION, NEW DRUGS

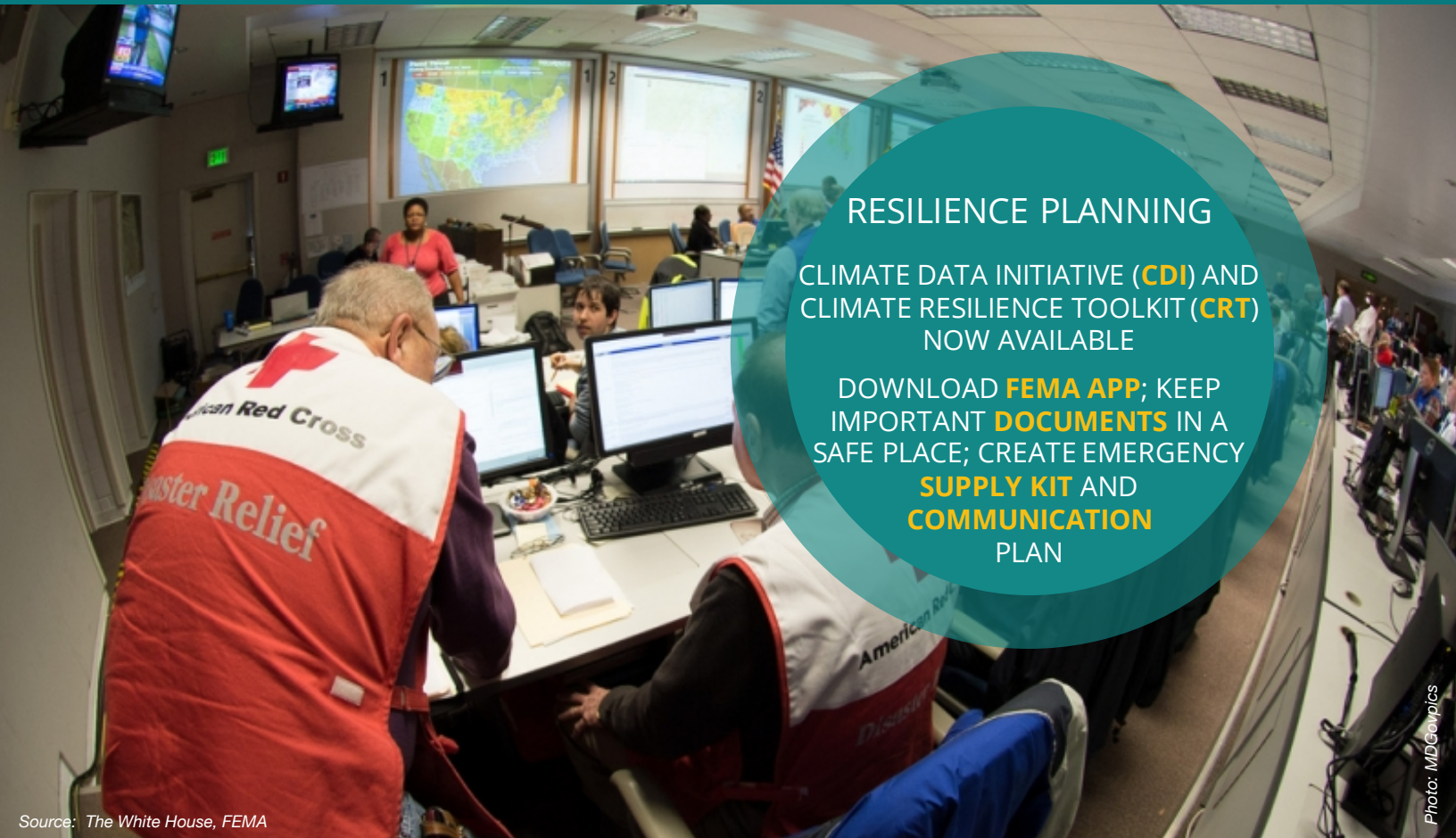
## ADVANCED ROBOTICS



POTENTIAL ECONOMIC IMPACT\*  
**\$1.7 TRILLION - \$4.5 TRILLION**

OFFERS POTENTIAL TO **IMPROVE**  
**THE LIVES** OF 50 MILLION  
AMPUTEES AND THOSE WITH  
IMPAIRED MOBILITY





## RESILIENCE PLANNING

CLIMATE DATA INITIATIVE (**CDI**) AND  
CLIMATE RESILIENCE TOOLKIT (**CRT**)  
NOW AVAILABLE

DOWNLOAD **FEMA APP**; KEEP  
IMPORTANT **DOCUMENTS** IN A  
SAFE PLACE; CREATE EMERGENCY  
**SUPPLY KIT** AND  
**COMMUNICATION**  
PLAN

Photo: MDGowpics

Source: The White House, FEMA



## ENGAGE COMMUNITIES EARLY AND OFTEN

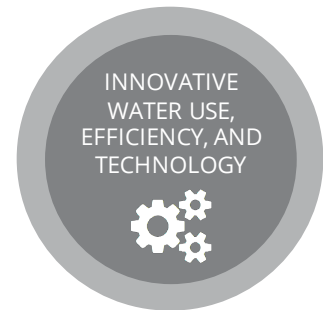
DOCUMENT PROJECT OUTCOMES;  
COORDINATE WITH **OTHER**  
**PROGRAMS**; LEVERAGE LOCAL  
**MEDIA**; ENGAGE **ASSOCIATIONS**  
FOR A THIRD-PARTY PERSPECTIVE;  
ASSIGN **RESPONSIBILITIES**;  
USE **LANGUAGE** EASY TO  
UNDERSTAND

Photo: Rawpixel










Source: FEMA



## 6 RESILIENCE GOALS



## 9 CROSS-CUTTING RECOMMENDATIONS

	PROTECT, UPGRADE, AND STRENGTHEN EXISTING SYSTEMS
	REBUILD SMARTER: ENSURE REPLACEMENT WITH BETTER OPTIONS AND ALTERNATIVES
	ENCOURAGE THE USE OF GREEN AND NATURAL INFRASTRUCTURE
	CREATE SHARED EQUIPMENT AND RESOURCE RESERVES
	PROMOTE INTEGRATED PLANNING AND DEVELOP CRITERIA FOR INTEGRATED DECISION-MAKING FOR CAPITAL INVESTMENTS
	ENHANCE INSTITUTIONAL COORDINATION
	IMPROVE DATA, MAPPING, VISUALIZATION, COMMUNICATION SYSTEMS
	CREATE NEW INCENTIVE PROGRAMS TO ENCOURAGE RESILIENT BEHAVIORS AND REDUCE VULNERABILITIES
	EXPAND EDUCATION, JOB TRAINING AND WORKFORCE DEVELOPMENT OPPORTUNITIES