



Advanced Center for Electrical and Electronic Engineering

MOTIVATION





CHILEAN

Strongly based on the explotation of natural resources



CHILEAN TECHNOLOGY INDUSTRY

Few success stories (not widespread)





Between university and industry

OUR MISSION



To contribute to the technological development and competitiveness of the Chilean economy by achieving excellence in RESEARCH, forming advanced human resources, and fostering INNOVATION and TECHNOLOGY TRANSFER in areas of societal and industrial impact through the field of ELECTRICAL AND ELECTRONIC engineering



AREAS OF IMPACT





SMART INDUSTRY



Control & Automation

Renewable Energy & **Power Conversion**

Robotics

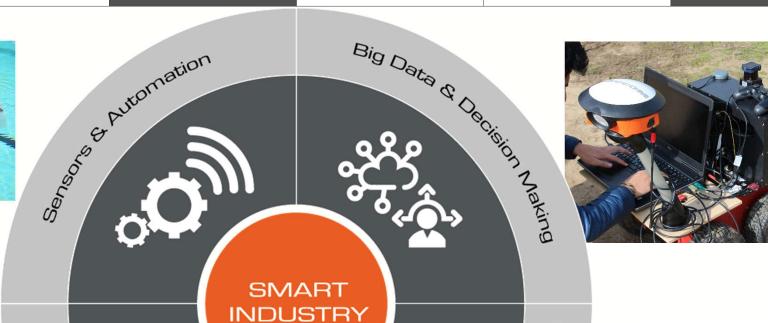
Biomedical Systems

Electrical Systems

Data Analytics & Artificial Intelligence









Advanced Control Systems

Intelligent Transportation



Vehicle i Vehicle 2

HEALTH TECHNOLOGY



Renewable Energy & Data Analytics & Control & Automation Robotics **Biomedical Systems Electrical Systems Power Conversion** Artificial Intelligence Neural & Rehabilitation Endineering io or of distances MGH 1811 **HEALTH** TECHNOLOGY Biomedical Data Analytics Physiological Modelical Physiological Physio U.S. AIR FORCE

ENERGY & POWER SYSTEMS



Renewable Energy & Data Analytics & Control & Automation Robotics **Biomedical Systems Electrical Systems Power Conversion** Artificial Intelligence Power Converter Lobologies, Que and the Energy Octobersion Systems sunandplay **ENERGY** Electrical Power Systems & POWER Electromobility & Energy Storage TMEIC **SYSTEMS**

AC3E IN NUMBERS





AC3E IN NUMBERS



EXCELLENCE IN RESEARCH*



24 H-index



UTFSM #1

In LatAm In Automatic Control and EEE (Shanghai ranking 2018)



6

Associate Editors in TOP journals (Automatica, IEEE Trans)



3

Best
PhD thesis
awards (Chilean
Academy of
Science)



7

best paper awards in IEEE journal



National Prize of Technology and Applied Sciences, Ministry of Education CHILE



IEEE-IES J.David Irwin Early Career Award



2 Clarivate
Analytics Highly
Cited researches
2017 & 2018



3 Best Innovation & Technological Development Award AIE 2015, 2016, 2018



2 Energy Efficiency Innovation Awards from ABB (2017, 2018)



Humboldt Research Award 2015

CUSTOMERS & STAKEHOLDERS



















Massachusetts Institute of Technology













PATAGONIA WILDLIFE

PRODUCTOS Y SERVICIOS EN FAUNA SILVESTRE



























AGC



WORLDWIDE COLLABORATION NETWORK







ENERGY & POVVER SYSTEMS

SOME PROJECT EXAMPLES





Motivation







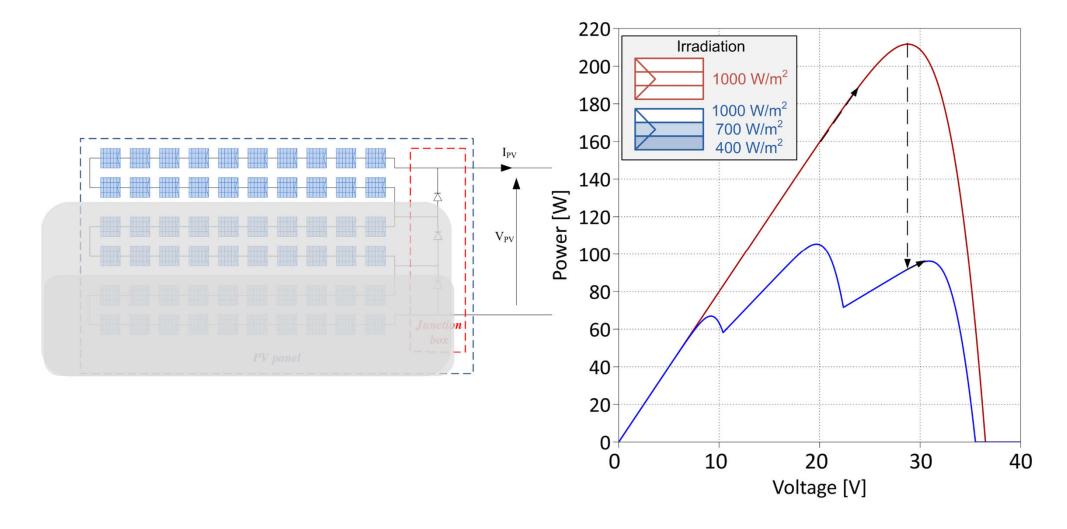
- Shadow (dynamical)
- Snow and dust (static)
- Asymmetrical aging



Cumulative degradation and energy generation reduction

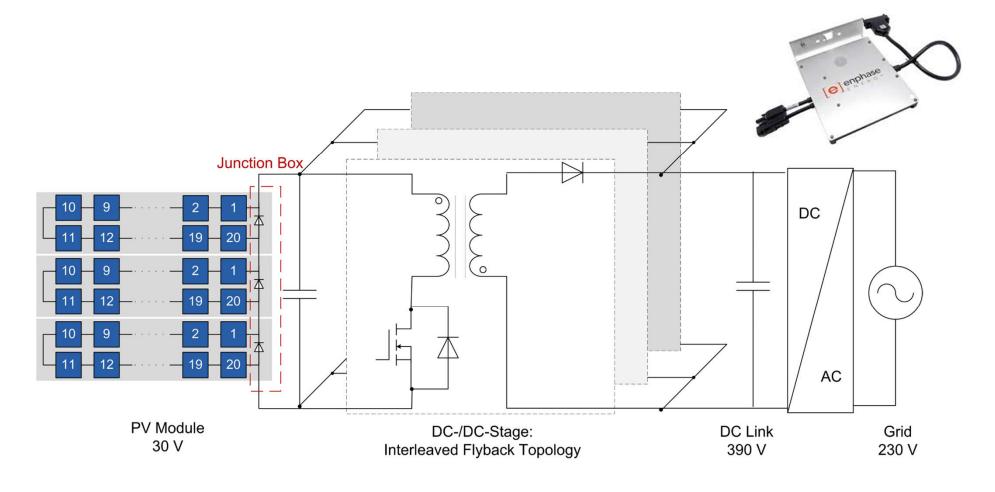


Partial shadows energy loss



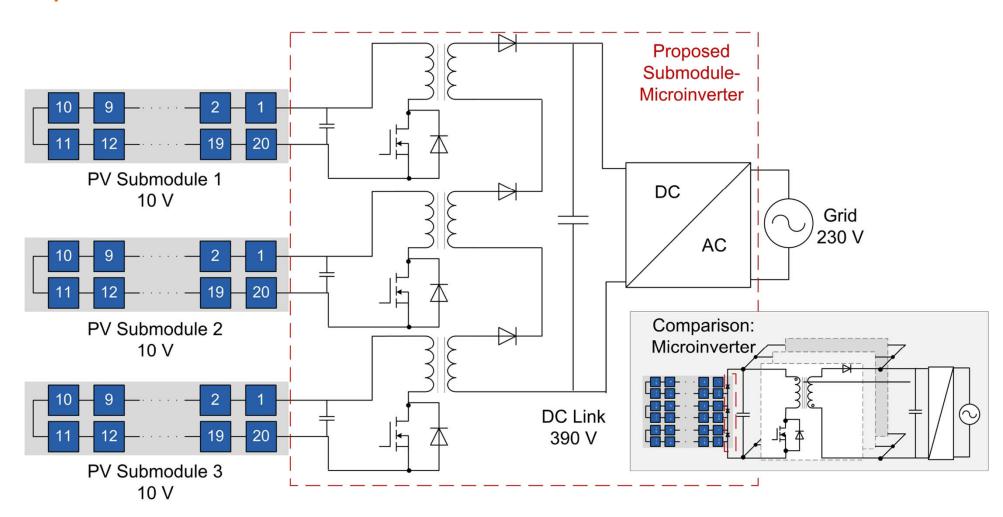


Currently available circuit (microinverter)



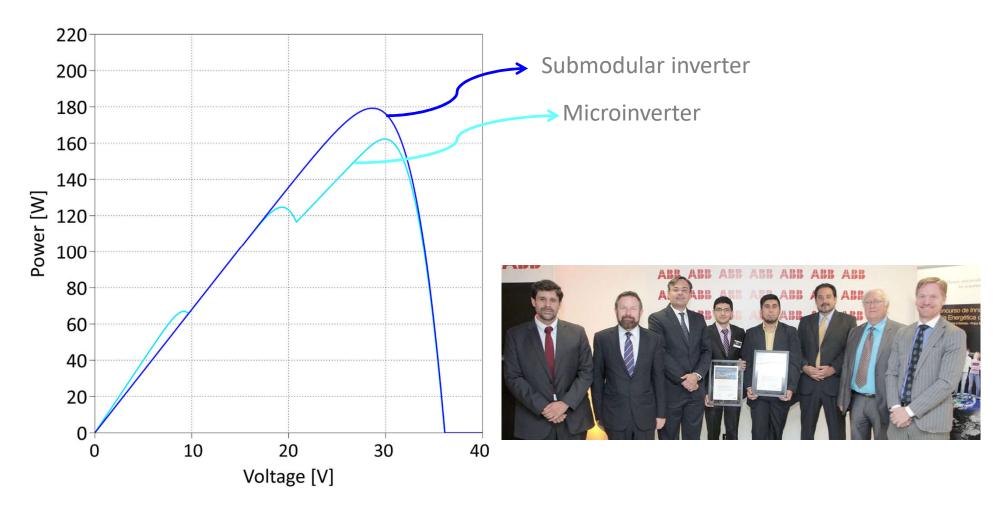


Proposed circuit





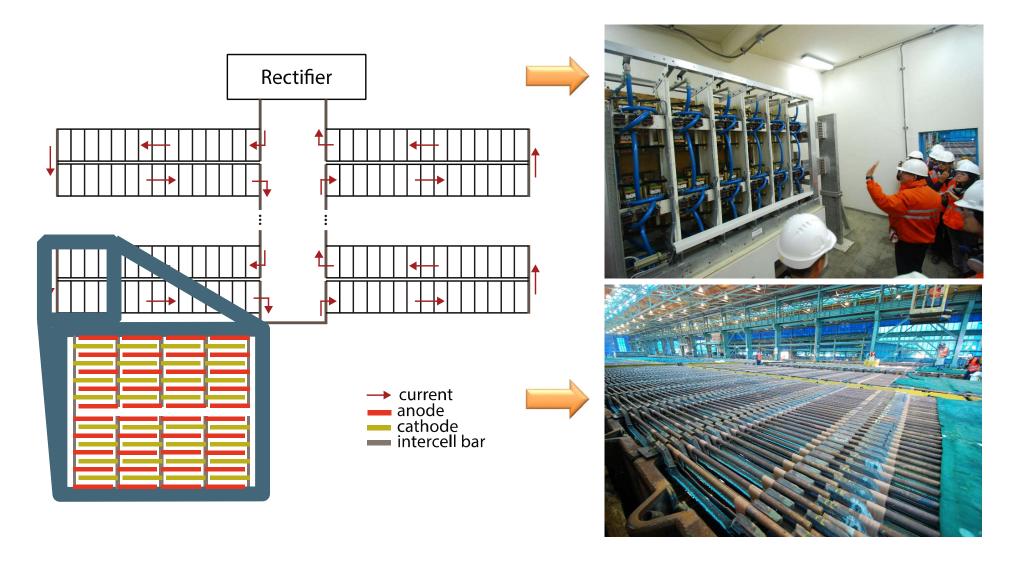
Microinverter vs submodular inverter



Submodular invertir produces 9.3% more power!

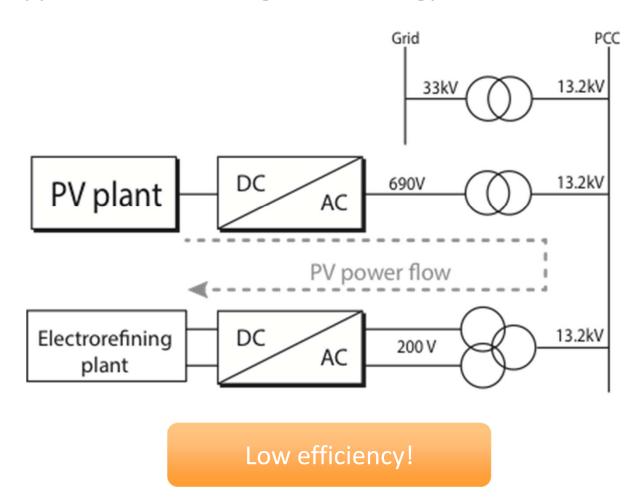


Copper electro-refining process



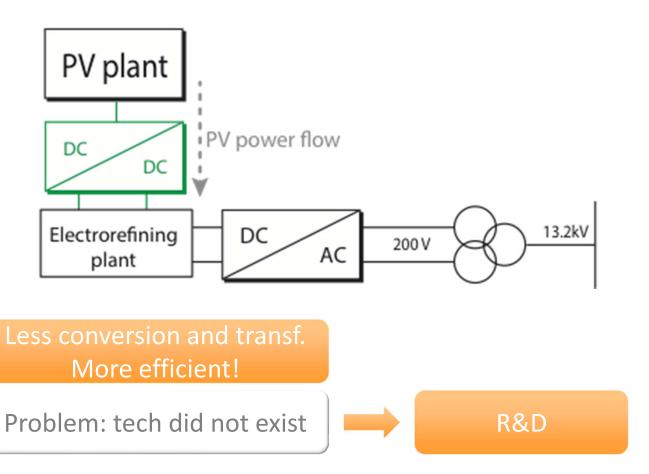


- Copper electro-refining process
 - Conventional approach, with existing PV technology

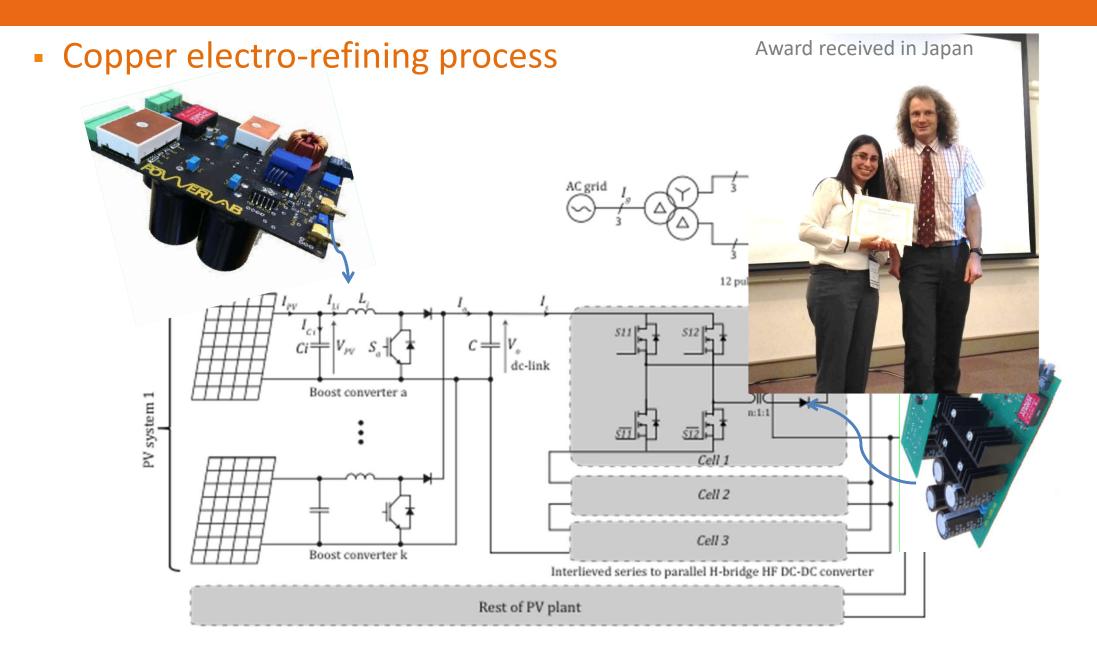




- Copper electro-refining process
 - Proposed technology









Objective

- Study the impact of soiling on the energy yield
- Develop online monitoring system (irradiance, temperture, power)
- Develop mathematical model of soiling impact
- o Obtain an optimized stragegy for a cleaning program for the PV plant



Amanecer Solar PV plant 100MW peak (Copiapó, Chile)



Monitoring stations



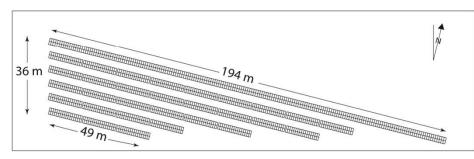
Subsole PV plant (Copiapó, Chile)



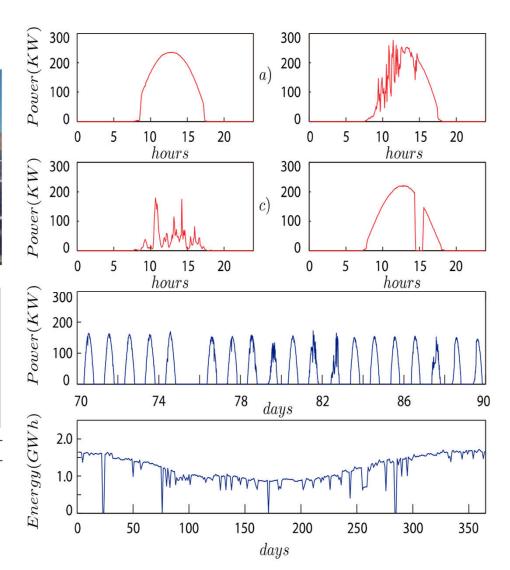
Impact on generation

Subsole PV plant (Copiapó, Chile)



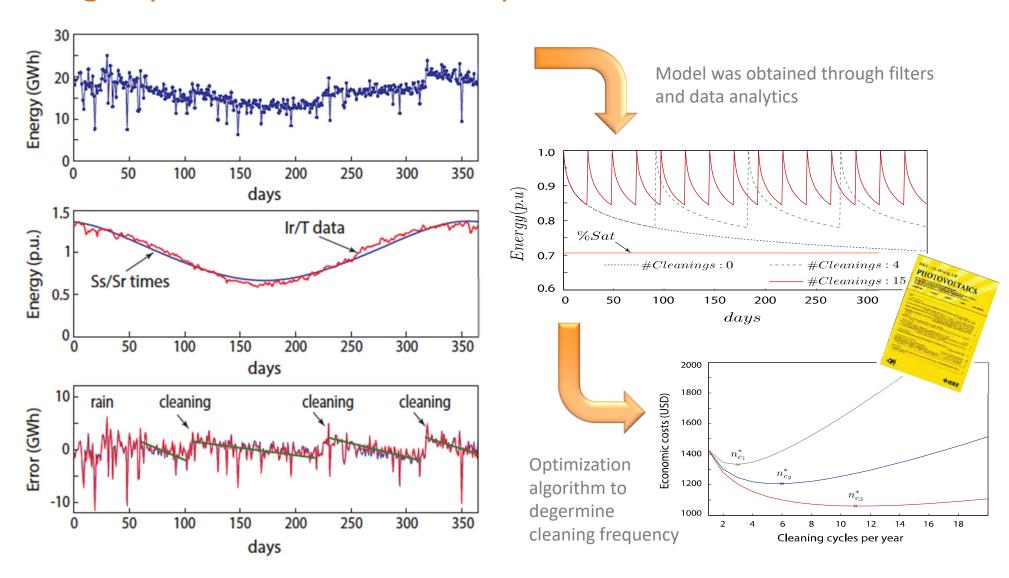


Variable	Parameter	Value
P_{pv}	PV module peak power	240 [W]
V_{mpp}	Voltage at maximum power point	29.9 [V]
I_{mpp}	Current at maximum power point	8.03 [A]
P_n	Nominal installed power	310 [KW]
G_{stc}	Solar irradiance at STC	$1000 \text{ [W/m}^2\text{]}$
T_{stc}	Temperature at STC	25 [°C]





Soiling deposition model development



SMALL URBAN EV



Development of all electronics in-house:

- Inverter
- Battery pack
- Control platform
- Onboard charger







SMALL URBAN EV



Storage system

Multidisciplinary work with our mechanical engineers



CHARGING OF ELECTRIC VEHICLES



Features

- Onboard
- Slow charging for night time

Offboard

- Daily use of fixed routes
- Half charge to keep it running
- Work, supermarkets, parking lots
- Fast charging for range extension
- Use on highways
- Electric charging stations



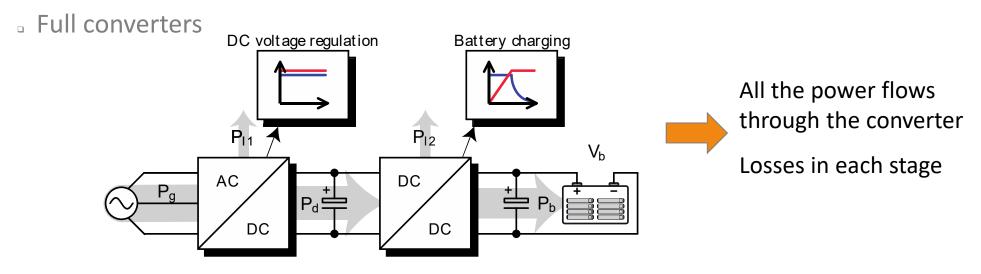




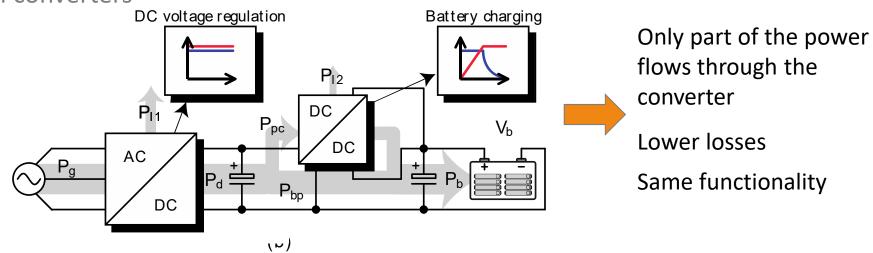
EV CHARGING



New concept developed in AC3E



Partial converters



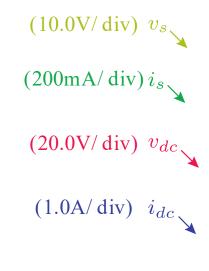
EV CHARGING

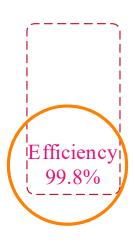


New concept developed in AC3E

- The battery can be charged processing only 30% of the power
- High efficiency (> 99%)
- Small volume and low cost



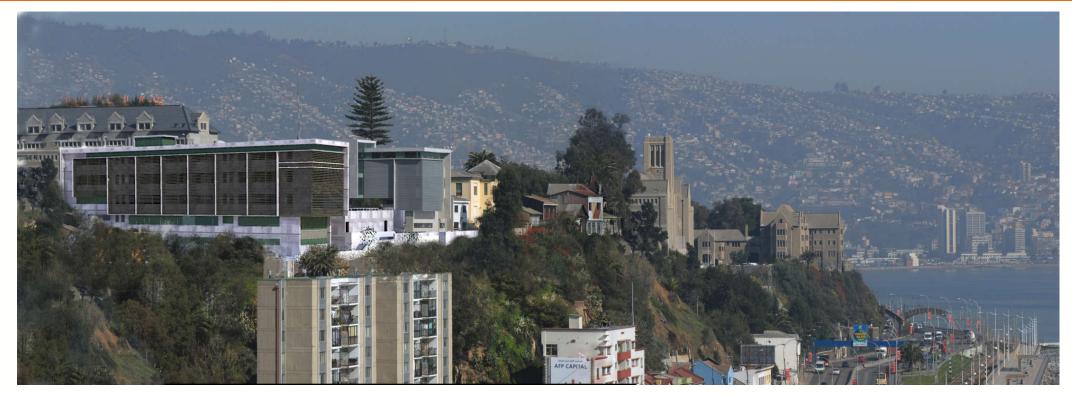




 $(5.0\mu \text{s/div})$

New Building: Bari II (2nd semester 2019)









New Building: Bari II (2nd semester 2019)











The AC3E Team





WORLD-CLASS RESEARCH FOR WORLD CHALLENGES

