Developing an Advanced Manufacturing workforce for Virginia's Tobacco Region

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CCAM
COMMONWEALTH CENTER FOR ADVANCED MANUFACTURING

BCG
THE BOSTON CONSULTING GROUP

Virginia Tobacco Commission

Objectives for this document

Describe the vision for an Advanced Manufacturing hub in Southwest and Southside Virginia

Identify the gaps in supplying the workforce needed to support that hub

Evaluate the capabilities of the current technical education entities

Share recommendations to shore up the gaps and deliver the workforce needed to attract employers to the region

Outline implementation governance, timeline, and success metrics

Executive Summary (I)

Unique opportunity to create Advanced Manufacturing hub in Tobacco Region focused on aerospace, automotive, and heavy machinery

Opportunity will create significant demand for manufacturing employees, and along with region's current employers, we forecast 6,840 new job openings by 2017

Given current supply of technical graduates, there will be a critical gap in medium-skilled jobs, particularly for machinists, welders, and industrial maintenance mechanics

Executive Summary (II)

The current technical education system has a solid foundation, but greater coordination with industry and access to advanced equipment required

We recommend that CCAM and TICRC invest in 3 regional "centers of excellence" to provide hands-on training, and extend marketing efforts to increase number of people entering manufacturing careers

Additionally, to support this initiative, we outline an implementation program, with a governance model, critical workstreams, and success metrics

Work was completed in 3 phases over 10 weeks

1 — 4 weeks
Define requirements and assess existing programs

- Define employer requirements
- Baseline workforce development programs
- Develop workforce supply model for skill clusters identified above

2 — 3 weeks
Gap analysis and option development

- Identify likely skilled worker gaps
- Develop options to fill skilled worker gaps
- Estimate resource requirements and timing for options

3 — 3 weeks
Implementation plan to meet workforce needs

- Prepare plan to meet projected workforce development need

Active engagement with Steering Committee throughout the effort

Introduction and context

Section summary

Manufacturing in the Tobacco Region has been hit hard in recent years, driving some challenging demographic trends

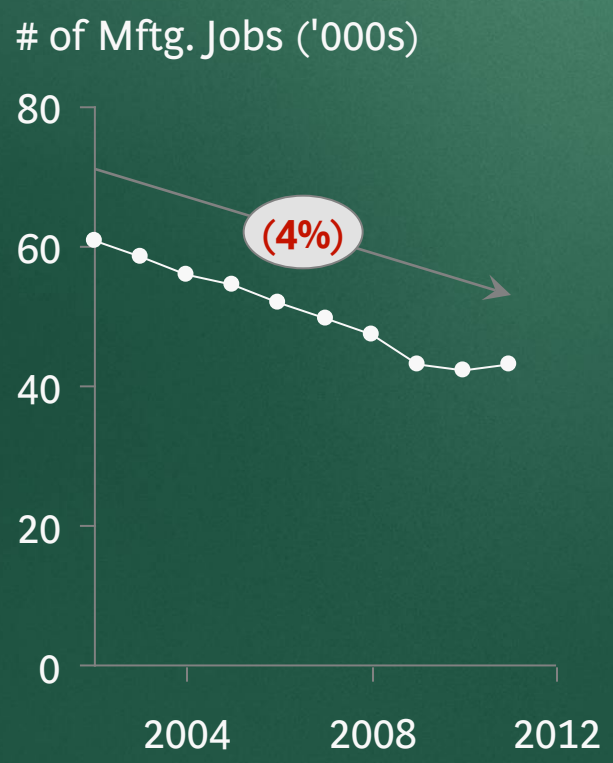
Regions with similar challenges have built "clusters" to support job creation

The vision for the Tobacco Region is to develop an Advanced Manufacturing cluster focused on aerospace, automotive and heavy machinery

To achieve this vision, the Tobacco Region will need to create a talent pool capable of meeting the cluster's needs

Tobacco Region been hit hard in recent years

Manufacturing employment shrinking



Driven by loss of employers

Dan River Inc. — 2005–06: 2,100 jobs

MasterBrand Cabinets, Inc. — 2012: 350 jobs

Stanley Furniture — 2010: 500 jobs

Burlington Industries — 2007: 550 jobs

Hooker Furniture — 2007: 275 jobs

And some challenging population dynamics

Working age population is shrinking

Unemployment in region 7% vs 5.5% in VA overall

Education levels are generally low, but getting better

- Of population >25, only 75% have high school degree vs. 87% of VA as a whole

Note: Manufacturing jobs include the following metropolitan areas: Kingsport-Bristol, Danville, Lynchburg
Source: Bureau of Labor Statistics, Virginia Economic Development Partnership, US Census Bureau American Community Survey, Virginia Employment Commission

"Clusters" have solved similar problems

Example: Automotive cluster in Decatur and Tuscaloosa, Alabama

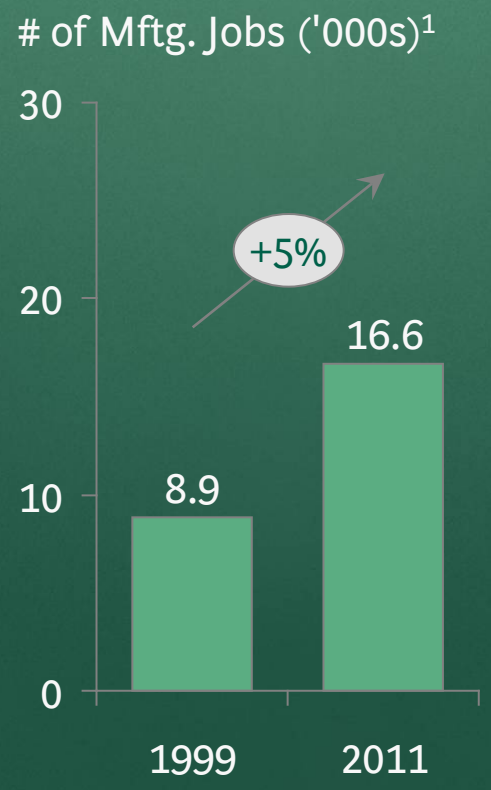
What they did

After Alabama initiated effort in 1980, Mercedes Benz announced $300M investment and 1,500 jobs in 1994

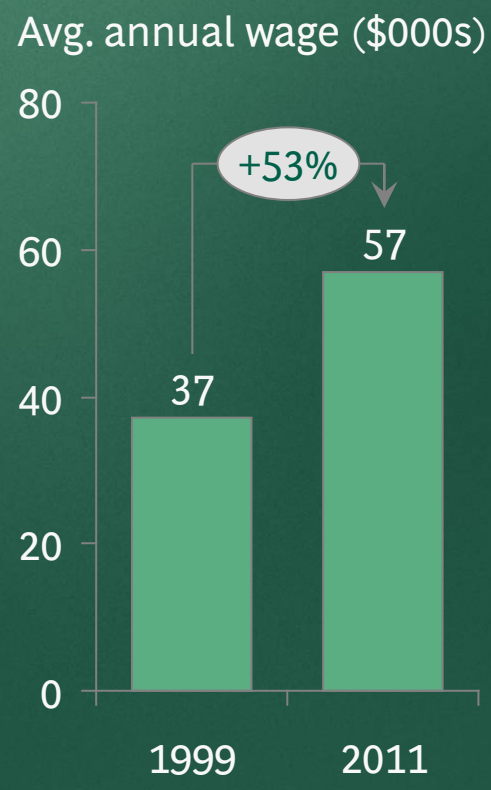
Won investment due to:

- Proximity to major port
- Presence of supply parts nearby
- ~$250M in tax incentives

Actions resulted in dramatic employment gains…



…and increase in wages



1. In Decatur & Tuscaloosa, AL 2. Only for high- /medium-skilled jobs

Source: Bureau of Labor Statistics, " The Economic Impact of the Mercedes Benz Investment on the State of Alabama ", BCG analysis

Our vision: build a world-class, Advanced Manufacturing cluster

Our vision for Tobacco Region

Develop globally competitive Advanced Manufacturing cluster

Attract employers with cost-competitiveness and skilled workforce

Leverage existing ecosystem of industry, education, government and workforce

Further develop workforce training to facilitate long-term investment by manufacturers

What this cluster could mean over the next 20 years

Transform the economic base of the region

Develop a top 10 Advanced Manufacturing cluster

>15K new Advanced Manufacturing jobs by 2032

Secure $20B in direct investment enabling increased annual economic value add by $15B

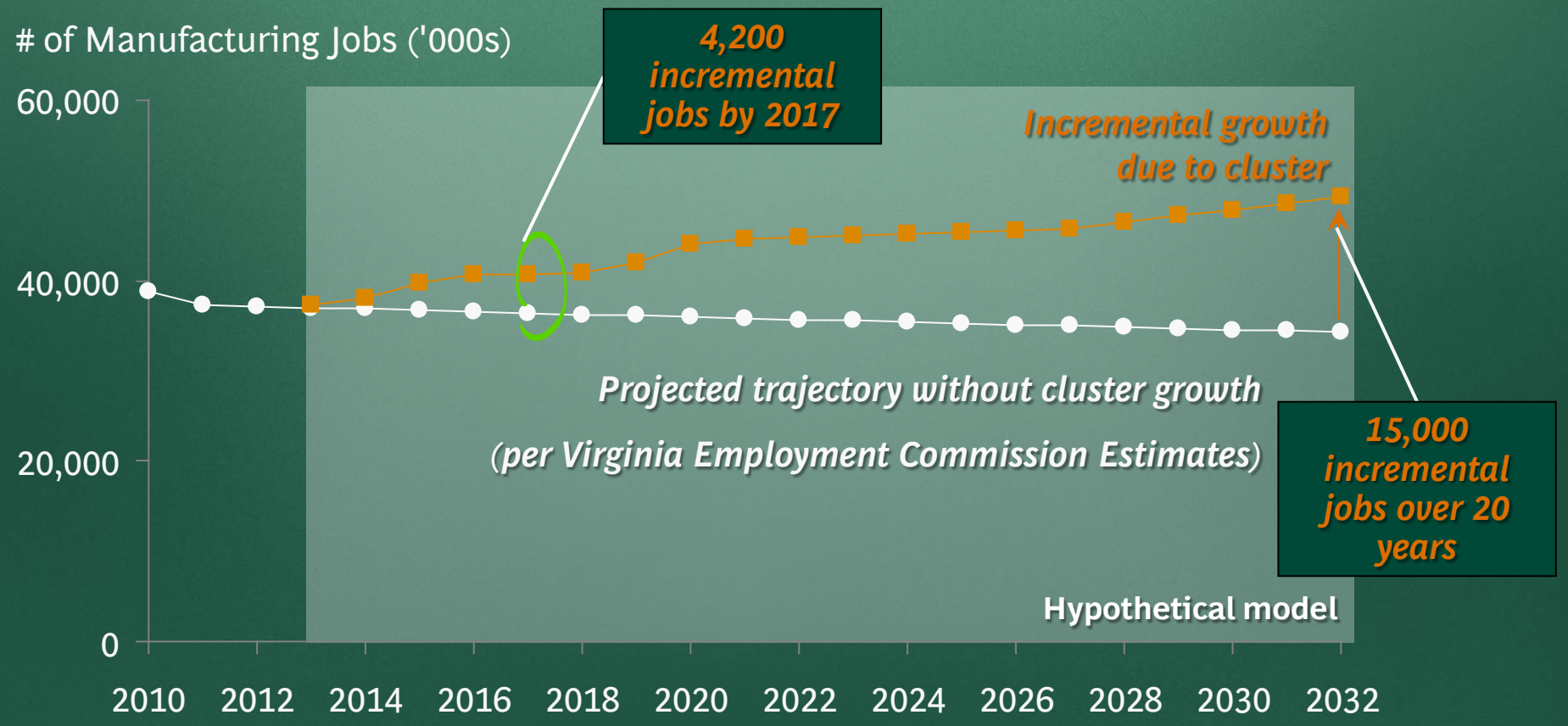
Aerospace, automotive & machinery all have potential to serve as cluster foundation

	Aerospace	Automotive	Heavy machinery
2010–2020 Annual growth potential[1]	2.7%	3.5%	3.5%
Potential to reshore[2]	60–80%	60–80%	5–30%
Match with Virginia capabilities[3]	High	Low	Medium

1. Bureau of Labor Statistics 2. Based on Made in America, BCG analysis 3. Based on Strategic Roadmap: if index of (location quotient, employment growth, relative wages and wage growth, federal R&D grants, number of patents issued, industry output multipliers) is greater than 50%, potential was high

Source: BCG "Made in America", Commonwealth Research and Technology Strategic Roadmap, Bureau of Labor Statistics, Virginia Employment Commission, BCG analysis

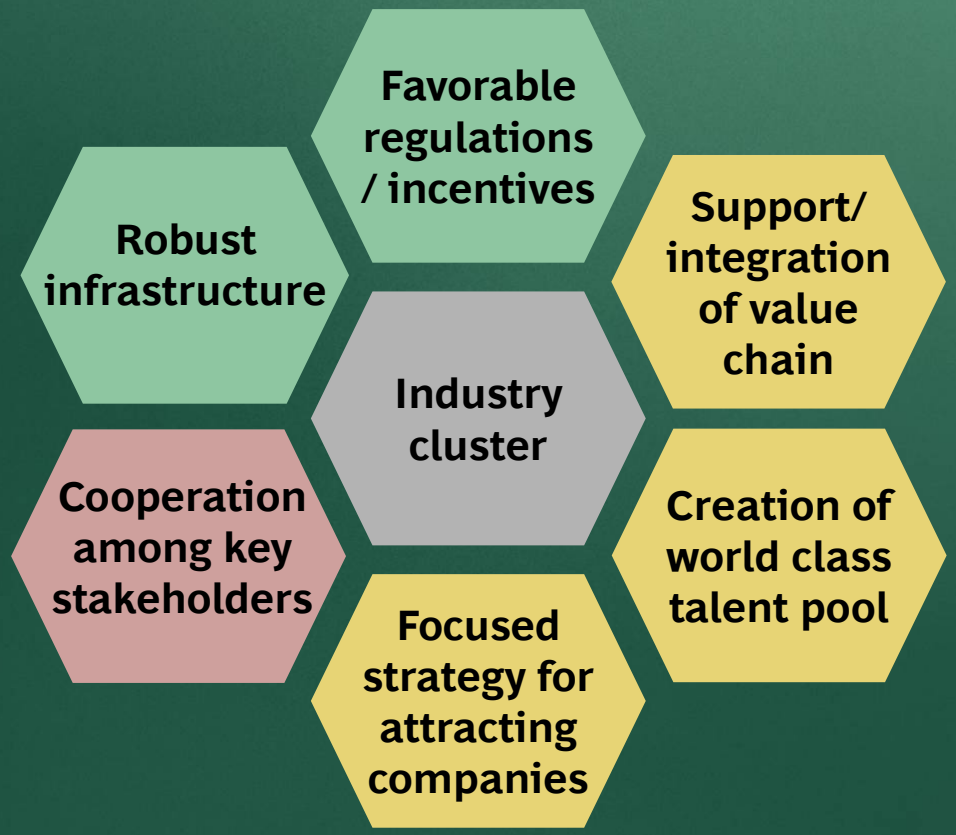
A cluster would significantly change the trajectory of manufacturing employment



Assumptions: Could recruit >2 major manufacturer(s) within next 2 years
(With total number of ~1,700 jobs by 2017) Manufacturers can attract 15-20 suppliers to the area within 5 years
(With total number of jobs ~2,500 by 2017) The multiplier of manufacturer jobs to supplier jobs (direct to indirect) is about 2.5
Source: Bureau of Labor Statistics, Moore School of Business "Economic Impact of BMW on South Carolina", Virginia Employment Commission, BCG analysis

Tobacco Region must address gaps

Tobacco Region's current state



Recommendations

Align on detailed cluster strategy

Continue supporting technical education

Foster cooperation and coordination among key stakeholders

Building block in place

Development of building block in progress

Building block still needs to be developed

Source: A.T. Kearney "Next Generation Economic Clusters", BCG analysis

Demand and priority skill areas

Section summary

By 2017, we estimate 6,840 Advanced Manufacturing job openings, driven by cluster growth as well as baseline needs

Currently have adequate supply to meet demand for low- and high-skilled jobs, but will see gap of ~1,045 in medium-skilled jobs

3 occupations account for almost all of the gap in medium-skilled jobs

- Machinists
- Welding
- Industrial Machinery Mechanics

Two sources for workforce demand

Baseline needs		Incremental cluster growth		Total workforce needs
2,640	+	4,200	=	6,840
Job openings from retirements and predicted growth (without cluster growth)		New jobs created by Advanced Manufacturing cluster		Total manufacturing job openings in Tobacco Region by 2017

Source: Bureau of Labor Statistics, Georgia Power, Moore School at University of South Carolina, Washington Aerospace Industry, Virginia Aerospace Industry, Virginia Employment Commission, BCG analysis

Demand represents a significant increase

	Typical job requirements	% increase from 2011
High-skilled	• College/post-secondary degree • Experience / on the job training	21%
Medium-skilled	• High school degree • Significant experience / on the job training • Often have Associates' degree	28%
Low-skilled	• High school degree • Experience / on the job training	15%

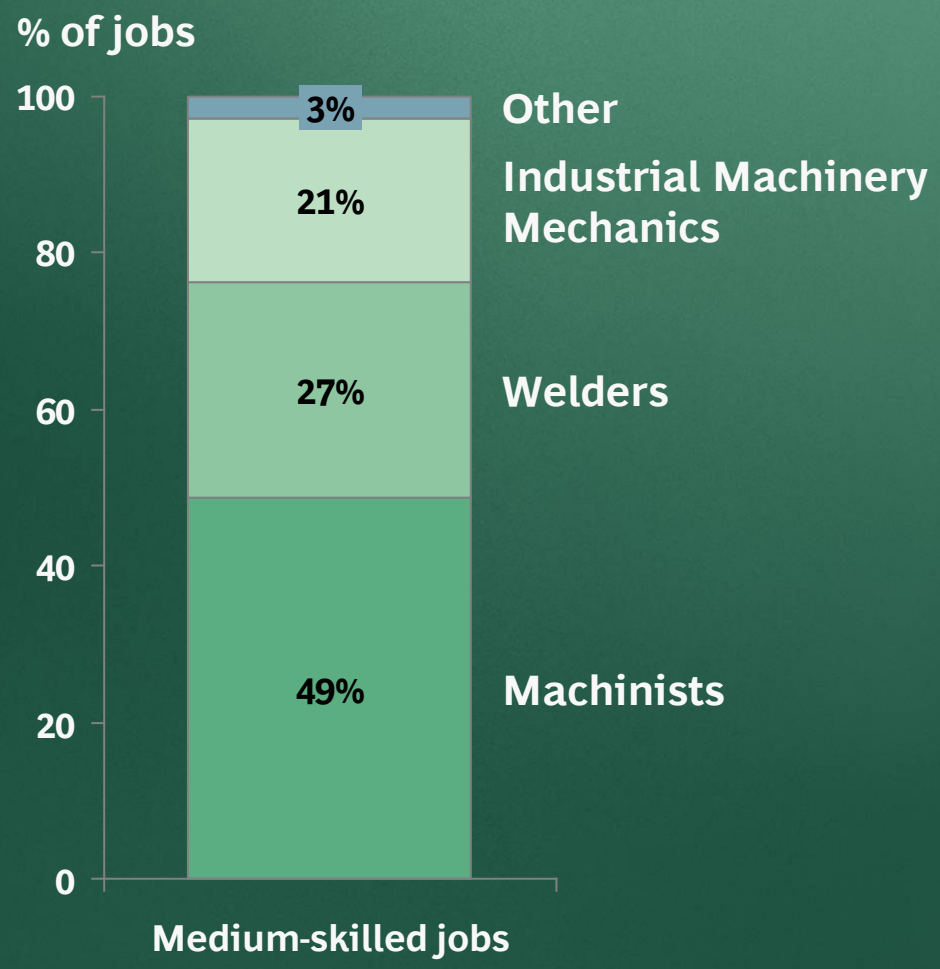
Source: Bureau of Labor Statistics, Moore School of Business "Economic Impact of BMW on South Carolina", Virginia Employment Commission, BCG analysis

Expect gap of 1,045 in medium-skilled jobs

Skill level	Primary Supply Sources	Demand	Supply	Gap by 2017
High-skilled	• 4-year institutions • Experienced hires	1,055	13,200	– Will still need to attract to manufacturing careers
Medium-skilled	• 2-year institutions • Experienced hires	1,895	850	1,045
Low-skilled	• High school students with strong math & science proficiency • Current workforce	3,890	6,600	– Will still need to attract to manufacturing careers

Source: Bureau of Labor Statistics, Moore School of Business "Economic Impact of BMW on South Carolina", Virginia Employment Commission, IPEDS Data Center, National Center for Education Statistics 2009-2010, BCG analysis

Medium-skilled demand comes from three key occupations: machinists, welders, mechanics



Example occupations

- Industrial machinery mechanics

- Welders
- Welding setters

- Traditional machinists
- CNC machinists
- Tool and die makers

Source: Bureau of Labor Statistics, Georgia Power, Moore School at University of South Carolina, Washington Aerospace Industry, Virginia Aerospace Industry, Virginia Employment Commission, BCG analysis

Within priority skill areas, gap of 990 by 2017

Occupation	Demand	Supply	Gap by 2017
Machinists	925	496	429
Welders	520	192	328
Industrial Machinery Mechanics	395	162	233
Subtotal for priority skills	**1,840**	**850**	**990**
Other	55	0	55
Total	**1,895**	**850**	**1,045**

Note: Only includes Associates degrees and awards of 1–2 years. Includes CIP codes of 15.0612, 15.0613, 15.0699, 47.0303, 47.0399, 48.05
Source: Bureau of Labor Statistics, Moore School of Business "Economic Impact of BMW on South Carolina", Virginia Employment Commission, IPEDS Data Center, National Center for Education Statistics 2009-2010, BCG analysis

Technical education system

Section summary

Virginia's technical education system has many strong elements, but is hindered by a lack of coordination across individual schools

Community colleges are primary generator of medium-skilled workforce

The most significant community college gaps are facilities and capacity

Additional opportunities in the K-12 and 4-year university systems to improve technical education

Good resources, but limited alignment

Industry participation

- + Colleges have industry advisory boards
- − Industry coordination not centralized
- − No standardized system for curriculum with industry

Coordinated school system

- + Schools working together through distance learning
- − Curriculum not standardized
- − Not leveraging scale to share resources

Student interest

- + Strong history of manufacturing in some areas
- − Manufacturing not viewed as attractive career option
- − Dated view of manufacturing prevalent

Funding tied to outcomes

- + VCCS funding to encourage innovation
- − Lack of coordination on credentials
- − Funding tied to headcount not student success

Community colleges are primary training provider for middle-skilled workforce

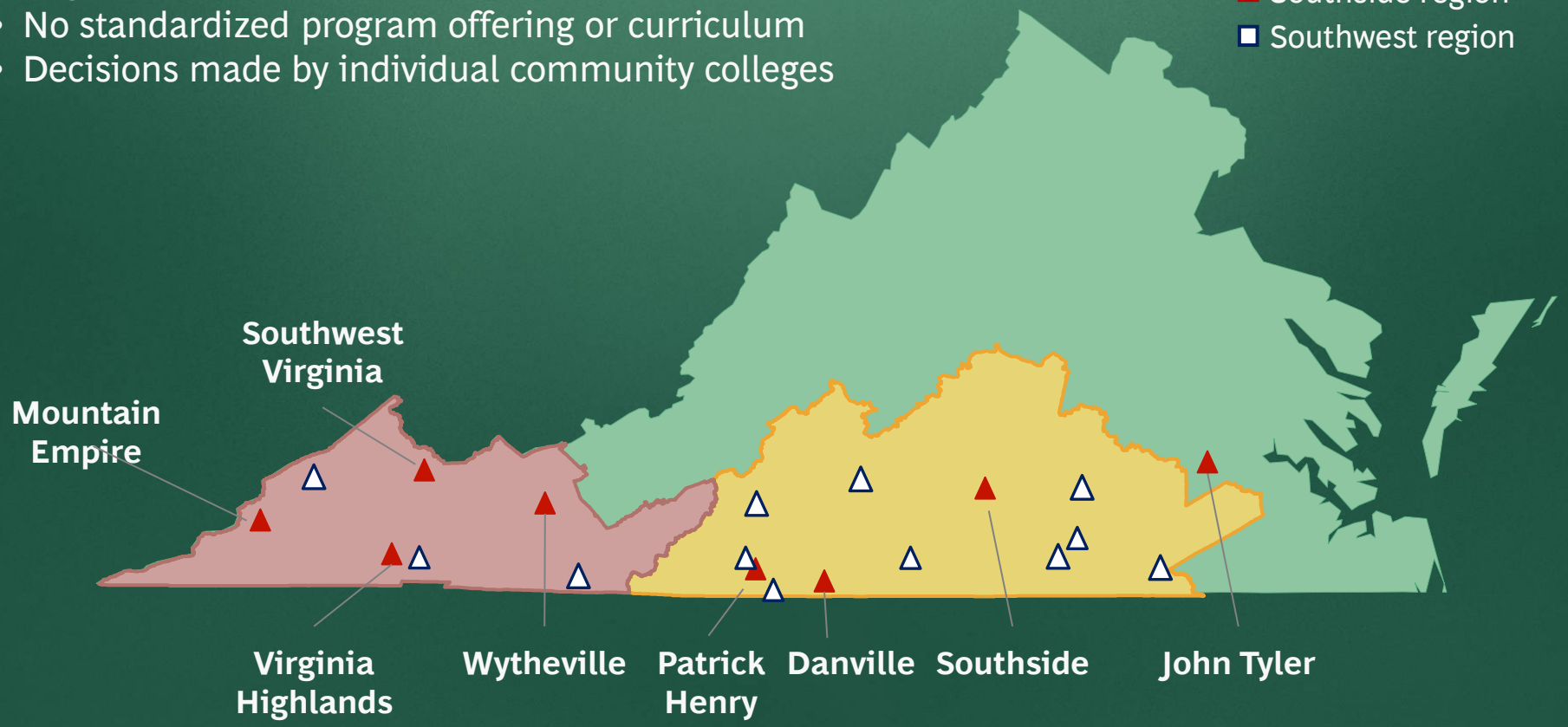
	K-12 System	Community Colleges	4-Year Universities
Role in the technical education system	• Start of workforce pipeline • Engaged with community college system for dual enrollment	• Provide for-credit training for technical careers • Provide custom non-credit training for employers • Facilitate dual enrollment programs	• Produce Bachelor's, Master's, and Professional degrees for high-skilled occupations • Focus on R&D to build engineering knowledge
Primary training for:	**Low-skilled workers**	**Medium-skilled workers**	**High-skilled workers**

Primary focus for this initiative

Virginia's Community College System has pivotal role in technical education

Overview of Virginia's Community College System (VCCS)

- Eight community colleges serving Tobacco Region
- Organized under the VCCS but operate as independent entities
- No standardized program offering or curriculum
- Decisions made by individual community colleges



Solution will need to address key gaps in community college system

	Current gaps	Best practices in VA
Curriculum Content	• Wide variation in the composition of different machining programs	• Industry advisory board provides curriculum and program input • Incorporates soft skills
Facilities	• Many labs using outdated equipment • Some lab facilities don't have physical space to add equipment	• Large, spacious facilities with state of art equipment
Capacity	• Current capacity below what's needed to reach workforce targets • Cannot scale linearly due to resource constraints	• Leverage spare faculty and equipment to provide dual enrollment with local high schools

In addition to optimizing community colleges, some addressable challenges in K-12 and 4-year

K-12 challenges

Improve STEM performance: Focus on applied math skills

Increase dual enrollment programs: Opportunity to earn college credit and experience college-level rigor

Promote manufacturing careers: Four-year degree not only path to success – attractive options in technical careers

4-year university challenges

Increase awareness: Encourage more students to pursue manufacturing focused engineering degrees

Improve applications: Ensure engineering students are gaining hands-on experience with the equipment used in production

Recommended program and investments

Section summary

Solution needs to address two challenges in producing a qualified advanced manufacturing workforce

- Grow the capacity and capabilities of education system
- Generate interest in Advanced Manufacturing careers

To increase capacity, will need to leverage technology and shared resources through distance learning and regional centers of excellence

To drive increased interest, CCAM will need to increase attractiveness of profession and lower barriers to entry

BCG estimates this model will involve a $17–20M initial capital investment, and $2-3M in annual operating costs

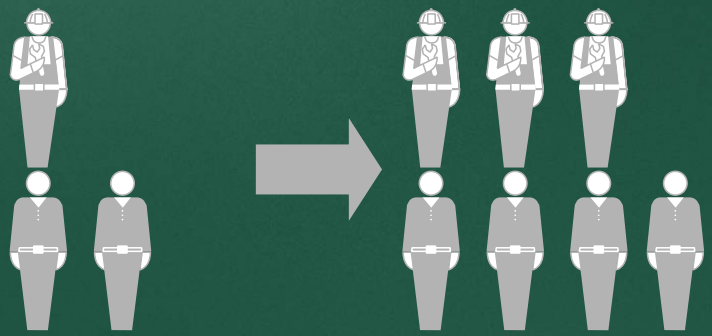
Need to increase capacity of training programs and number of interested trainees

1 Capacity of programs

Goal	Elements to consider
Increase capacity to produce workers in priority skill areas	• Student / faculty access • Tailored to employer needs • Utilization of faculty & equipment • Community presence

2 Interest in training

Goal	Elements to consider
Increase number of trainees entering workforce programs	• Increasing attractiveness • Training exposure



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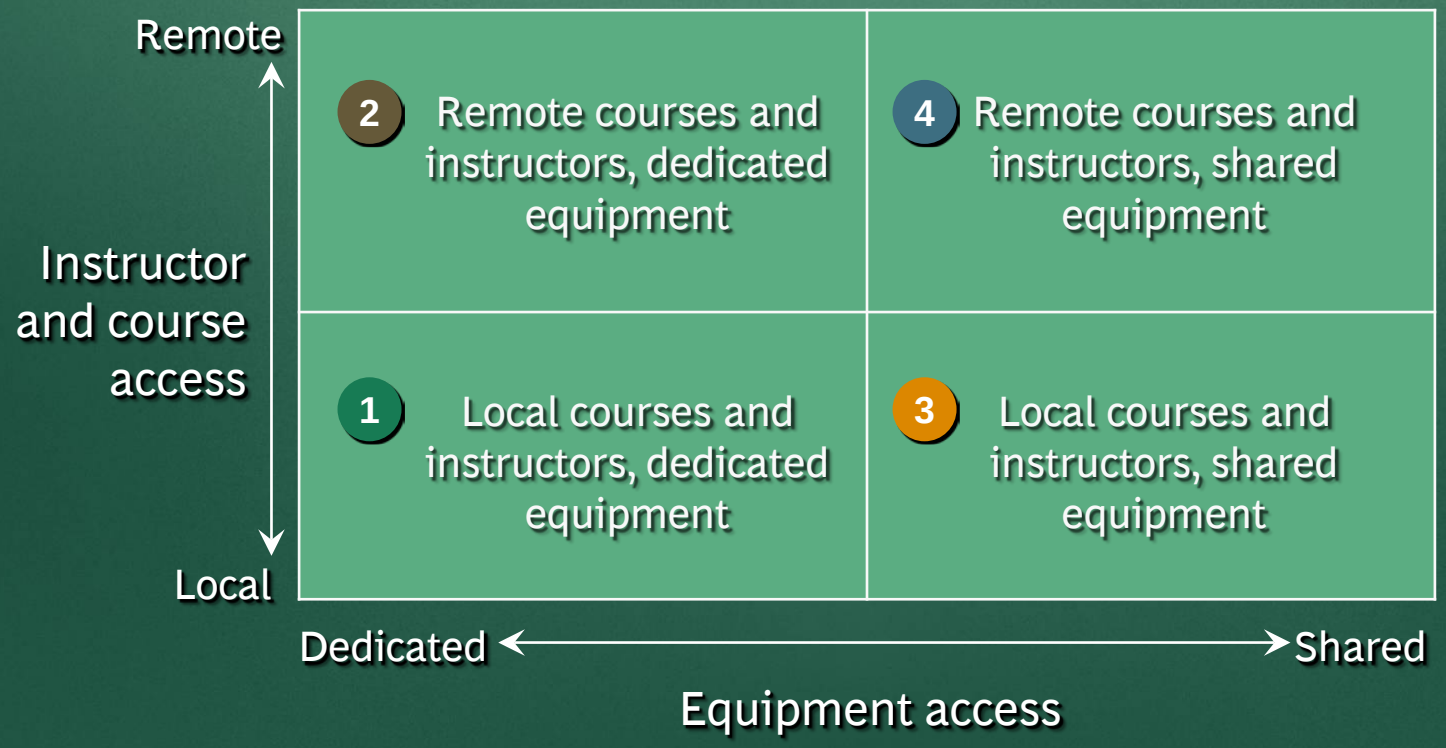
Four options to address training gaps



Apprenticeships/internships and mobile units part of all option sets

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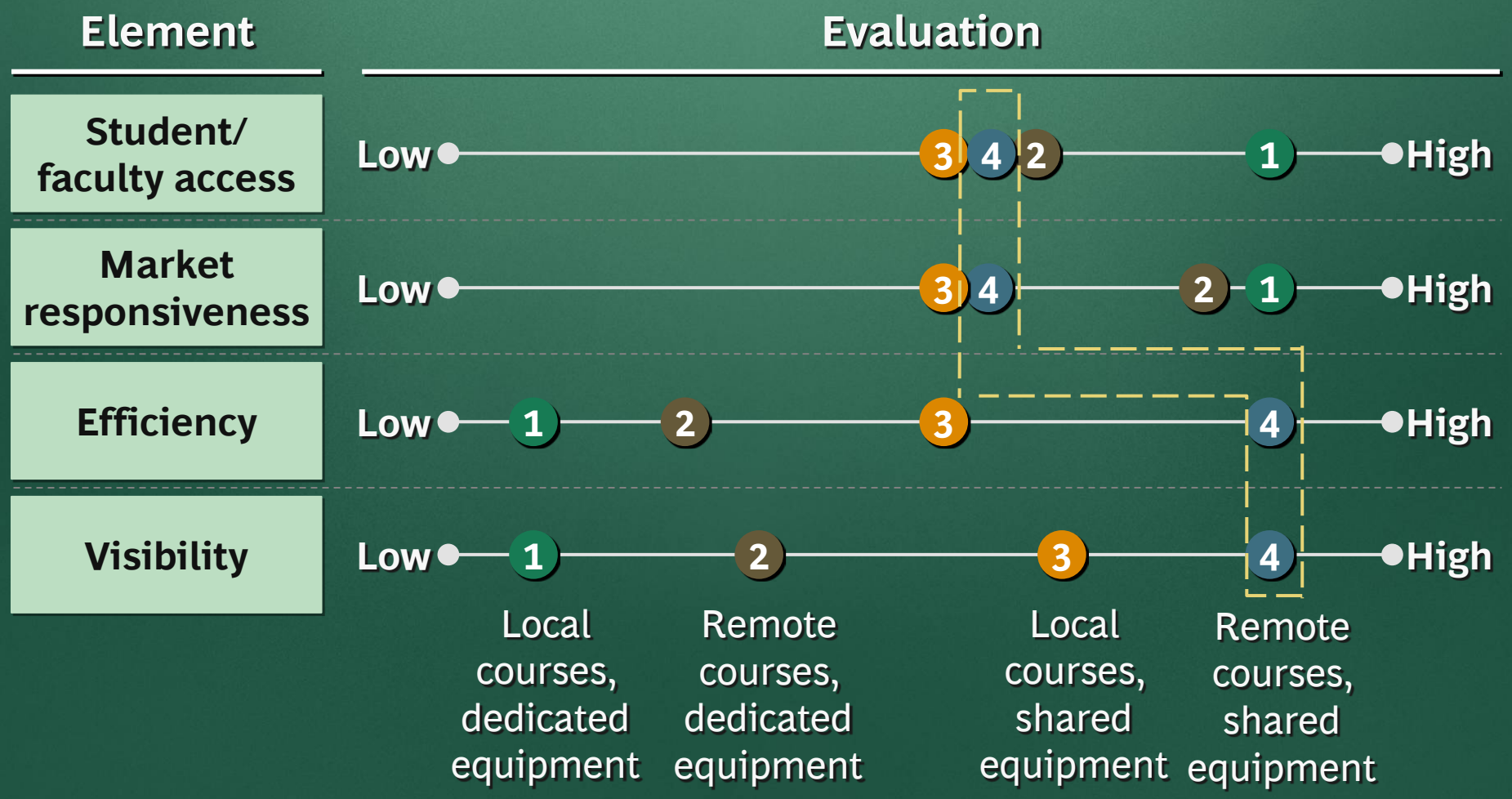
Regional "Center of Excellence" provides best opportunity to deliver training



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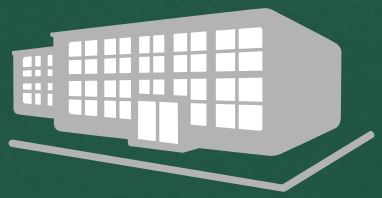
Propose three regional centers to address gap

Ideal student to teacher ratio

- Machining: 1:25
- Welding: 1:15
- Mechanics: 1:15

Supply gaps differ by region

- Southside: 130
- Southwest: 65



Proposal

3 centers each with capacity for 70–75 students

- 1 in Southwest
- 2 in Southside

Source: BCG interviews with manufacturers, Bureau of Labor Statistics, Virginia Employment Commission, BCG analysis

1

Regional center will complement existing educational landscape

Curriculum component	Delivery method
Hands-On: Specialized	Regional CoE
Hands-On: Foundational	Community college, satellite facility or mobile lab
Manufacturing Knowledge	Community college or via distance learning
Core Skills	

1

Regional CoE program fixed costs of $17–20M, operating costs of $2–3M

Fixed Costs

Item	Cost
3 facilities	$3M– $4.5M
Equipment	$12.3M–$13.2M
Software	$0.3M–$0.6M
3 Mobile units	$1.4M–$1.6M
TOTAL	**$17M–$20M**

Operating Costs

Item	Cost
Instructors & technicians[1]	$1.0M– $1.3M
Administrative support & marketing[2]	$0.6M– $0.8M
Facilities & materials	$0.6M–$1.2M
TOTAL	**$2.2M–$3.3M**

1. 1 instructor and 1 lab technician per 20–30 students/discipline; 4 instructors per CoE 2. Directors, assistants, industry liaisons, facilities workers

Source: BCG interviews with manufacturers and higher education staff, Southwestern Oregon Community College, Washington State Board for Community & Technical Colleges, Virginia Community College System, BCG analysis

2

Initiatives to attract workers should increase awareness and access

Awareness

Career coaches

- Increase knowledge of manufacturing career options
- Link adult career coaches to Virginia Employment Commission

Marketing campaign

- Broaden reach of current marketing campaigns
- Target parents with concise talking points
- Target unemployed with job fairs

Access

Access to education

- Increase dual enrollment in career & technical education
- Ensure flexible course and lab scheduling for working students
- Increase displaced worker training

Access to experience

- Expand internships for traditional students
- Increase apprenticeships for experienced workers

Implementation

Section summary

To ensure successful implementation, ten key factors to consider

Critical to create appropriate oversight by steering committee, in conjunction with the Commonwealth

Three committees as part of this initiative, each with specific workstreams

- Curriculum
- Resource coordination
- Marketing

Will be important to measure success throughout program execution

10 key success factors for implementation

Commitment from senior management / leadership	1 Clear ownership and accountability for driving success
	2 Strong leadership to drive process and influence multiple stakeholders
	3 Sense of urgency
Clearly defined milestones and objectives	4 Well defined mission and objectives, with agreed to metrics for success
	5 Rigorous implementation plan with clear milestones and ownership
Effective communication	6 Broad engagement across stakeholder groups
	7 Expertise in relevant areas (curriculum, marketing, financial sustainability...)
Employee /stakeholder buy-in	8 Commitment from employers and institutions on the direction of the program
	9 Right balance between individual employer needs and standardized program offering
Sufficient funding	10 Ensure financial commitment to project's success

Today, want to discuss CCAM's involvement in two areas

	Program Implementation	Training Center Operations
Proposed CCAM role	• Own strategic vision and program success • Drive overall implementation plan • Guide committee recommendations through Steering Committee membership • Coordinate efforts with CCAM member companies and external groups (e.g., educators, government entities)	• Funnel skill and demand needs from member companies and prospects to training center leadership • Provide expertise and guidance on equipment selection and training delivery • Monitor employer satisfaction with training quality
What it will take from you	• Board member commitment and leadership • Resource commitment – Director of Workforce Development and CCAM leadership • Disciplined project management expertise • Relationship building with external groups	• Board member input • Resource commitment – Director of Workforce Development • Coordination with CCAM's Director of Economic Development and other Economic Development groups

CCAM supporting program in 2 areas

Program Implementation

Own strategic vision and program success

Drive implementation plan

Guide committee recommendations

Coordinate with CCAM member companies and external groups

Training Center Operations

Conduit for skill and demand needs

Provide expertise and guidance on training delivery

Monitor employer satisfaction

Recommend governance with strong oversight and initiative working teams

Define & own strategic vision

Oversee working committees

Steering Team (Independent Entity)

Director of Workforce Development

Drive implementation

Foster buy-in

Working Teams

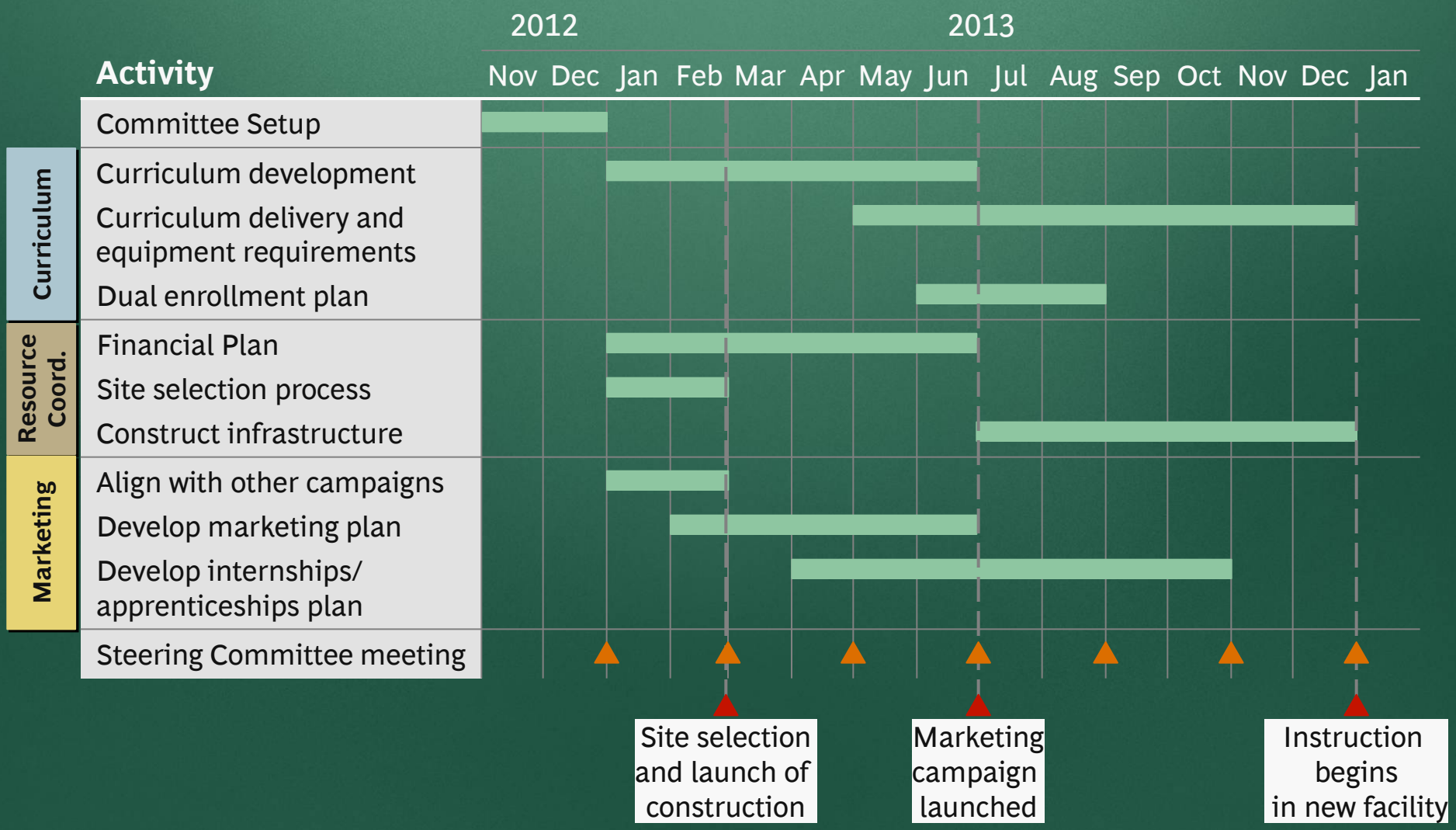
Curriculum

Design 21st century curriculum

Resource Coordination

Coordinate investments

Marketing

Promote Advanced Manufacturing careers

Preliminary high level implementation plan